REPORT CONFIDENTIAL APPROVED C4007224

Client South Sudan Electricity Corporation (SSEC)

Subject Feasibility Study, Detailed Design and Preparation of Tender Documents; Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection Project
Final Full ESIA Report – South Sudan

Order NELSAP/OLWIYO-BIBIA-NIMULE JUBA/CTR/2022/FS/ESIA/RAP-01 Signed by SSEC in October 2022

Notes This Environmental and Social Impact Assessment (ESIA) has been prepared by CESI-ELC-COLENCO for South Sudan Electric Corporation (SSEC). This Environmental and Social Impact Assessment (ESIA) addresses the environmental and social impacts of the South Sudan Section of Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection Project in compliance with the African Development Bank (AfDB) policies and guidelines.

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Prepared Ettore Romagnoli

Verified Paola Chiodi

Approved Paola Chiodi

CESI S.p.A.
Via Rubattino 54
I-20134 Milano - Italy
Tel: +39 02 21251
Fax: +39 02 21255440
e-mail: info@cesi.it
www.cesi.it

Capitale sociale € 8.550.000 interamente versato
C.F. e numero iscrizione Reg. Imprese di Milano 00793580150
P.I. IT00793580150
N. R.E.A. 429222

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REVISIONS HISTORY

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ESIA TEAM

- Ettore Romagnoli – Lead Environmental Planner
- Paola Chiodi – Lead Social Development Specialist
- Pietro Macchi – Archaeologist and Cultural Heritage Expert
- Thomas Francis Lado – Zoologist
- Mekonnen Biru – Botanist
- Clement Okumu – Ecologist
- Joel Nyamwya – Land Economist

SYMBOLS AND ABBREVIATIONS

AfDB	African Development Bank
AIDS	Acquired Immune Deficiency Syndrome
AU	African Union
BAU	Business As Usual
BoQ	Bill of Quantity
CA	Child Abuse/Exploitation
CH	Critical Habitat
CBA	Cost-Benefit Analysis
CITES	Convention on International Trade in Endangered Species
CSO	Civil Society Organization
EAAA	Ecologically Appropriate Area of Influence
EAC	East African Community
EAPP	Eastern African Power Pool
EHSGs	Environmental, Health and Safety Guidelines
EIA	Environmental Impact Assessment
EMF	Electric and Magnetic Fields
EOO	Extent of Occurrence
EPFI	Equator Principles Financial Institution
ESS	Environmental and Social Standard
ESIA	Environmental and Social Impact Assessment
ESMD	Environmental and Social Management Division
ESMO	Environmental and Social Management Organization
ESMP	Environmental Social Management Plan
FGD	Focus Group Discussion
FPIC	Free, Prior and Informed Consent
GBV	Gender-based Violence
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GIS	Geographic Information System
GOSS	Government of South Sudan
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
HH	Household
HIV	Human Immunodeficiency Virus
HPP	Hydro Power Plant
HV	High Voltage
HVRM	Highly Vulnerable Rural Minorities
HVTG	High Voltage Transmission Grid
IAoI	Indirect Area of Influence
IBA	Important Bird and Biodiversity Area
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IFC	International Finance Corporation
ILO	International Labour Organization

ISS	Integrated Safeguards System
JTC	Joint Technical Committee
KII	Key Informant Interview
MEF	Ministry of Environment and Forestry
MoED	Ministry of Energy and Dams
MV	Medium Voltage
MWCT	Ministry of Wildlife Conservation Tourism
NBI	Nile Basin Initiative
NELSAP	Nile Equatorial Lakes Subsidiary Action Program
OHTL	Over Head Transmission Line
OPGW	Optical Ground Wire
OS	Operational Safeguard
PA	Protected Areas
PAP	Project Affected Person
PCB	Polychlorinated Biphenyls
PCR	Physical Cultural Resources
PIMS	Project Implementation Manuals
POP	Persistent Organic Pollutant
PV	Photovoltaic
RAP	Resettlement Action Plan
RES	Renewable Energy Sources
RoW	Right of Way
SDGs	Sustainable Development Goals
SEAH	Sexual Exploitation, Abuse and Sexual Harassment
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
SS	Substation
SSEC	South Sudan Electricity Corporation
SSFC	South Sudan Forest Commission
SSWS	South Sudan Wildlife Service
STD	Sexual Transmittable Disease
TB	Tuberculosis
TEP	Transmission Expansion Plan
TL	Transmission Line
UETCL	Uganda Electricity Transmission Company Limited
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WB	World Bank

1 EXECUTIVE SUMMARY

Overview of the project

The Government of South Sudan (GoSS) through the South Sudan Electricity Corporation (SSEC) proposes the construction of the 400 kV Power Interconnection Project between Olwiyo (Uganda) and Juba (South Sudan). This Project was prioritized by the Governments of Uganda and South Sudan under Nile Basin initiative (NBI) and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP). It is a bilateral project that is jointly undertaken by the Governments of Uganda and South Sudan, each country being responsible for its portion of the interconnection.

The specific objectives of the Project include:

- provide transmission capacity to cater for grid interconnection between Uganda and South Sudan and its neighboring countries;
- provide transmission infrastructure to cater for grid interconnections to other Nile Basin Initiative countries upstream and downstream;
- promote regional cooperation through sharing of power generation resources i.e. cross-border electricity trading (promotion of electricity markets);
- Improve security in the project area by providing stable power supply;
- facilitate rural electrification and improve the standard of living for the population in the project areas;
- provide a stable power supply to the South Sudan around the Capital Juba and the Ugandan communities near the border in order to improve businesses for social and economic development of the project area;
- poverty reduction and improvement in the standard of living by providing electricity needed for health, education, clean water and communication infrastructures;
- reduce dependence of South Sudan on thermal power thus reducing carbon emissions.

The ultimate goal of the project is regional integration by improving the livelihood of the people as well as the quality of the socioeconomic development environment for Uganda and South Sudan, through increased availability and affordability of electricity supply.

According to the energy generation and demand forecast scenarios analyzed in the Feasibility Study, the energy flowing on the interconnection is expected to increase more and more over the interconnection project lifetime.
In the first period of operation of the interconnection, until 2038, the energy is expected flowing from Uganda to South Sudan, due to the significant increase of the demand and the lack of generation in South Sudan.
In the second period of operation of the interconnection, after the development of the transmission grid in South Sudan and the interconnection between Ethiopia and South Sudan, Uganda is expected to import from the interconnection with South Sudan.
In addition, Juba substation will play a very crucial role allowing connection of the new planned hydro power plants, the development of the transmission grid towards the other countries of South Sudan and the development of the interconnections towards Ethiopia and Kenya. In this phase, South Sudan will play a crucial role in the development of the energy trade for the Eastern African Power Pool (EAPP) power system.

This report presents the outcomes of the Environmental and Social Impact Assessment (ESIA) on the selected and approved transmission line route of the 400 kV Power Interconnection Project in South Sudan.

Brief description of the project

The South-Sudanese section of the Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection Project will be located in Equatoria Region, crossing the states of Eastern and Central Equatoria.
The line route runs outside the boundaries of the Nimule National Park, near the South Sudan – Uganda border, and then roughly follow the route of Juba – Nimule Highway (A43).

Figure 1-1 illustrates the six main agro-climatic zones of South Sudan. The project area cross only the so-called "Green Belt" and the "Hill and mountains" zones. The green belt has rich soils and farming is the main livelihood activity, especially in the southwest part of the zone. Conversely, Hills and mountains are found along the Nile to the north of the Greenbelt. There are a variety of different livelihood activities in this zone, with a focus on agriculture and pastoralism.

As shown in Figure 1-2, in the project's area the land use is mainly shrubs and grass.

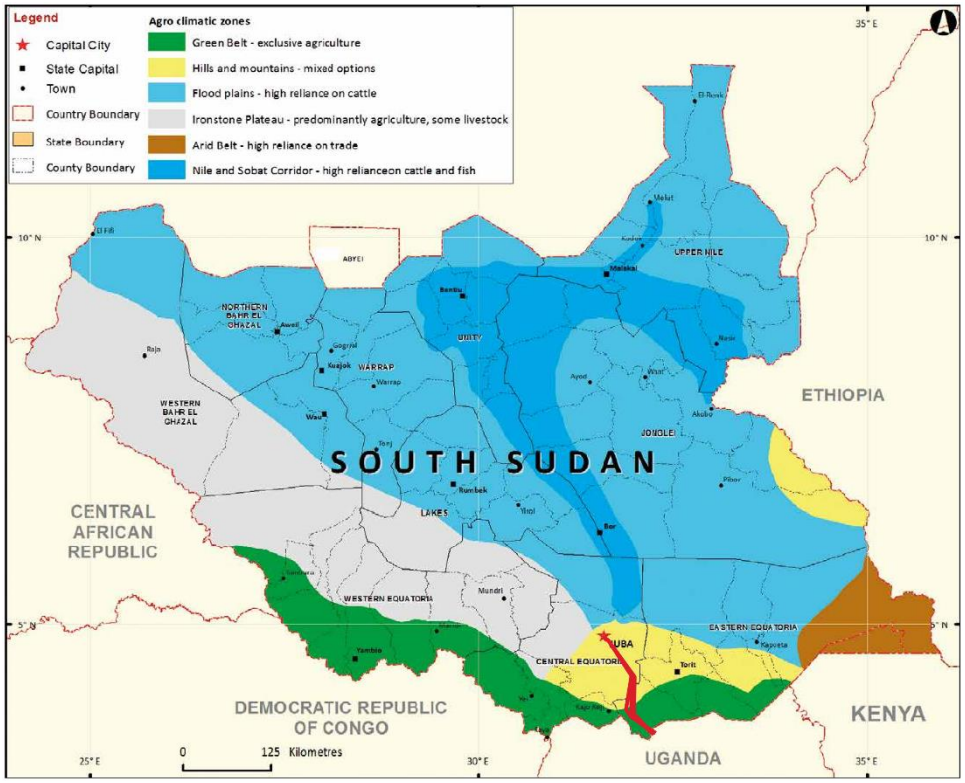


Figure 1-1 – Location of the project area in the context of the Agro-Climatic Zone of South Sudan.

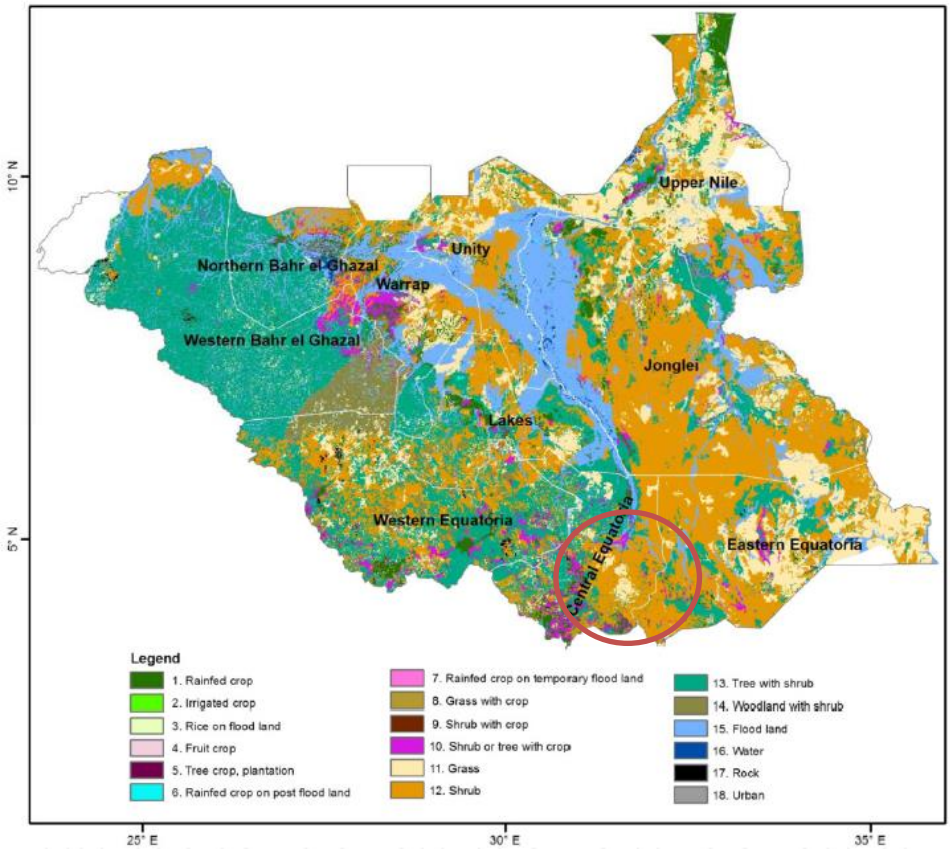


Figure 1-2 – Land use map of South Sudan.

The transmission line route and substation location has been defined through an alternative analysis. Three different line route options connecting Uganda border (East of Nimule) with Juba S/S, together with three different substation locations, have been evaluated and compared.
The proposed alternatives routes were the following:

a. Option 1 (blue line) – length 167 km
b. Option 2 (green line) – length 161 km
c. Option 3 (red line) – length 156 km

Regarding the new substation 400/220/132/33 kV to be constructed near Juba, three alternative locations were initially proposed. The Substation Option No. 1 and No. 2, however, are located in a residential area and therefore not attractive for the Project.

The most optimal line route was selected by analyzing all technical considerations as well as environmental and socio-economic characteristics of the three route options through the application of quantitative Multi Criteria Decision Analysis (MCDA). To score each transmission line route Alternative, including associated substation, a weight is assigned to each environmental and social impact component. A weighted value is calculated for each positive and negative impact.
The weights of the considered environmental and social factors, or impact categories, has been defined by applying the Analytic Hierarchy Process (AHP) methodology.
The outcome of this process is the selection of the optimal line route, which is the one that has the least environmental, social, economic and technical impacts.
In particular, Option 2 has been selected as the preferred line route through desk study. This option, in particular, intersects less rivers and forested areas than the other two alternatives. Moreover, it runs

closer, on average, to the main road between Nimule and Juba (A43), thus requiring lower length of access roads.
Then, based on the findings acquired during the field reconnaissance, the preferred line route has been furtherly optimized, adding some angle points in order to improve accesses and adherence to site conditions. Also, Juba substation options have been discarded and substation has been moved in the proximity of Nesitu.

The so obtained Optimal transmission line route has been formally approved by South Sudan Electricity Corporation (SSEC) with Office of the Deputy Chairperson's Letter dated 20 February 2024.

The approved South-Sudanese section of the project envisages the following components:

- **Construction** of the **400 kV HVAC Over Head Transmission Line (OHTL)**, double circuit configuration, 1100 MVA rated capacity, 2-bundle conductors, 149 km long, from Uganda border to Juba S/S;
- **Construction** of the completely new 400/220/132/33kV **Juba substation**, located in the proximity of Nesitu.

The approximate length of the proposed transmission line is 149 km. The line route runs outside the boundaries of the Nimule National Park, near the South Sudan – Uganda border, and then roughly follow the route of Juba – Nimule Highway (A43). The transmission line route and the Nesitu substation location are shown in Figure 1-3 and Figure 1-4.

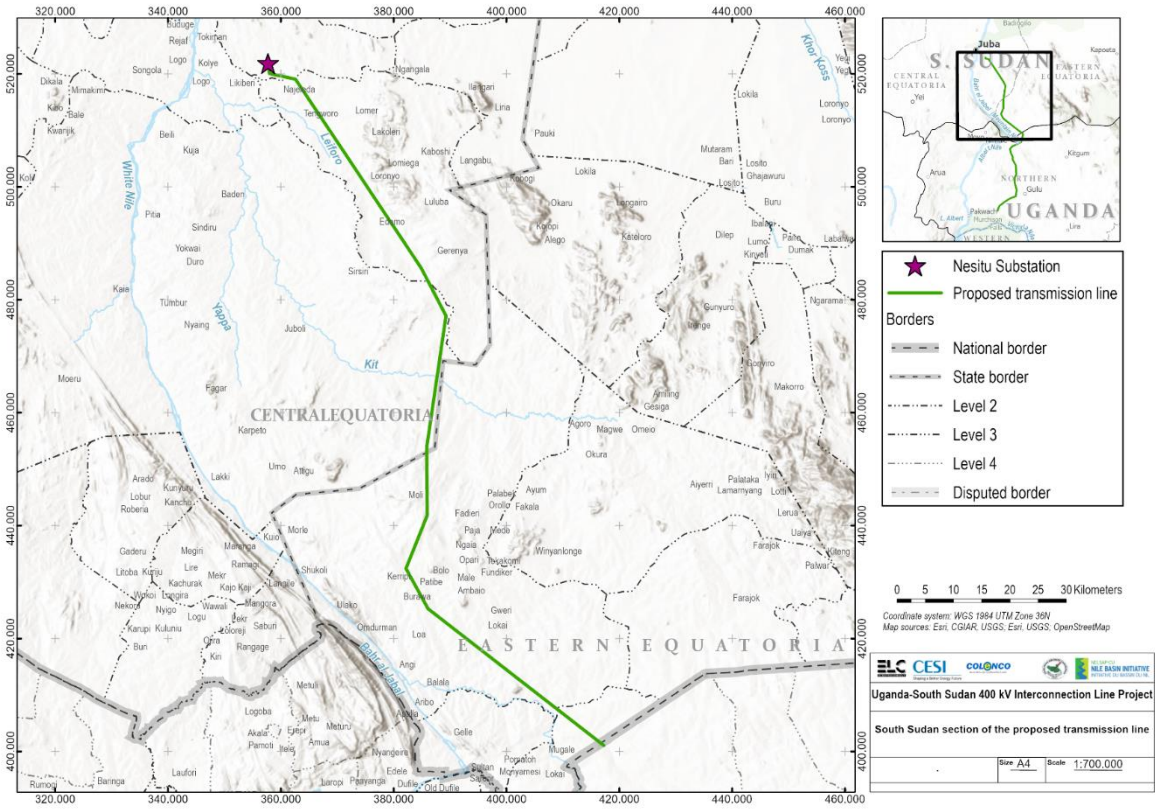


Figure 1-3 – Proposed transmission line route for the South-Sudanese section of 400 kV Interconnection project.

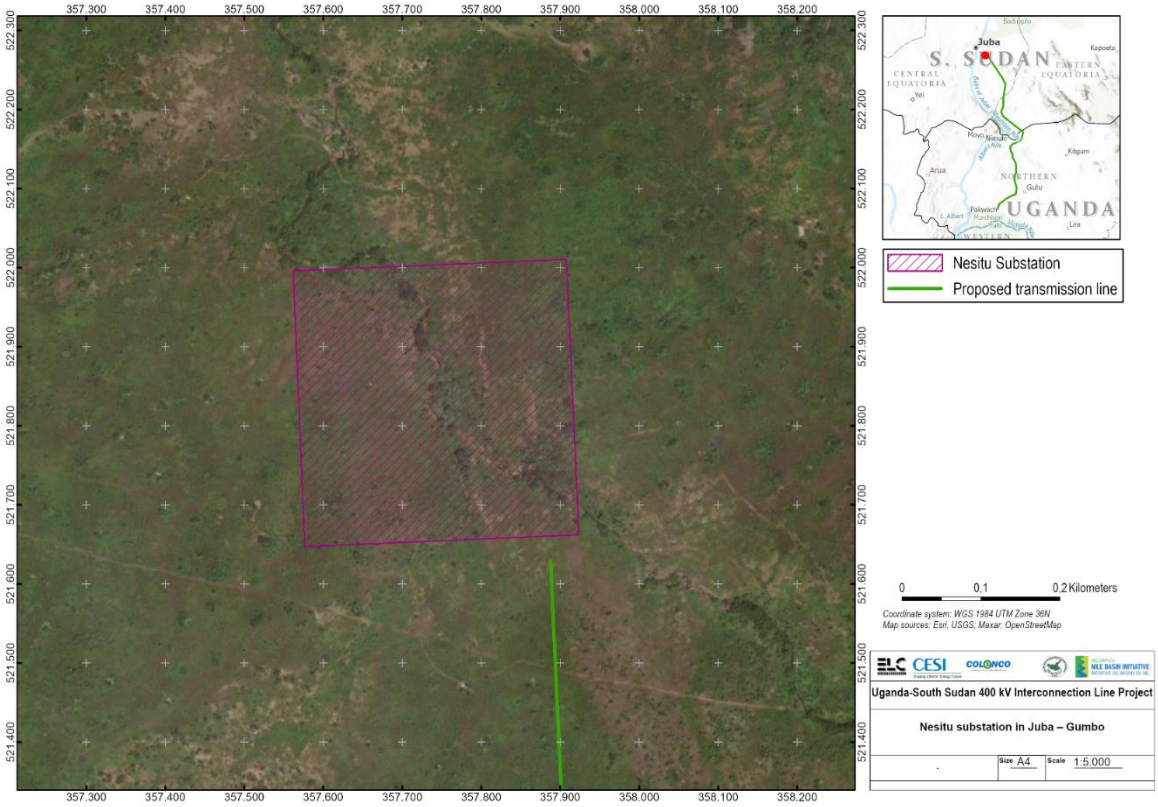


Figure 1-4 – Proposed 400/220/132/33 kV Substation site in Juba – Gumbo.

The corridor for the 400 kV transmission line is 60 m, according to the standards adopted in Uganda (UETCL Policy): 10 m for the Right of Way (RoW) and additional 25 m of Wayleave to each side of the RoW.

RoW of 10 m is enough for both the access track and the four legs of towers and will be acquired permanently and ownership transferred to the project proponent. The Wayleave is the strip of 25 m on either side of the right of way, is recognised as the safety corridor outside of which negative impacts from transmission lines (electro-magnetic fields and corona-noise effects emitted from the line) are assumed to be negligible.

No permanent structures, such as buildings will be allowed to remain or be constructed within the corridor. Within the wayleave, growth of crops will be permitted, but limited to a height of 1.8 m (6 feet) or less, thus mostly annual crops and low growing perennial crops. The land required for the wayleaves will remain under the ownership of the owners and no transfer is required.

The project will be located in Equatoria Region, crossing the states of Eastern and Central Equatoria. The project will cross the following administrative boundaries.

Table 1-1 – Payams affected by the Project

State	County	Payam
Central Equatoria	Juba	Gondokoro
Central Equatoria	Juba	Lokiliri
Central Equatoria	Juba	Lobonok
Eastern Equatoria	Magwi	Pageri
Eastern Equatoria	Magwi	Mugali

The project Direct Area of Influence (AoI) is defined through consideration of the project footprint including the Transmission Line corridor (Right of Way and Wayleave), the Substation, the access roads and all ancillary project components.
The Indirect Area of Influence (IAoI) of the project is determined by biological and ecological factors, including the movement of species through the environment that may be affected by the project. It has been identified as a 1 km habitat connectivity zone surrounding the project footprint.

Table 1-2 – Project area calculations

Project Area	Area (ha)
Right of Way (RoW)	148.77
Wayleave	743.96
RoW + Wayleave	892.73
Direct Area of Influence	904.84
Indirect Area of Influence	29888.97

Table 1-3 – Calculations of area of direct influence in relation to administrative boundaries.

State	County	Payam	Area (ha)
Central Equatoria	Juba	Gondokoro	49.64
		Lokiliri	259.45
		Lobonok	186.15
Eastern Equatoria	Magwi	Mugali	57.77
		Pageri	351.83
		Total	***904.84***

The valued environment and social compounds (VECs) have been recognized as the environmental and social components of major concern that can be severely impacted by the Project activities, based on the impact assessment and stakeholder feedback.

Table 1-4 – List of valued environmental and social compounds (VECs).

Component	Description
Biodiversity and Habitats	The project is outside of existing protected areas; however, protected areas are present in the proximity of project footprint (i.e Juba Game Reserve, Badingilo National Park and Nimule

Component	Description
	National park). Moreover, the project is situated within formally Important Bird Areas (IBAs), especially the Imatong IBA and Nimule IBA.
	Sensitive habitat of *Combretum* savanna and *Butyrospermum* savanna are potentially present in project area.
	Wetlands (mainly seasonal) and riverine habitats in the proximity of project footprint
Flora and vegetation	Presence of tree species classified as vulnerable (Annona senegalensis, *Afzelia Africana*, *Burkea Africana*, *Combretum hartmannianum*, *Khaya senegalensis*, *Vitellaria paradoxa*) and near threatened (*Dalbergia Melnoxylon*, *Bulbostylis clarkeana*). *Oxytenanthera abyssinica* reported as an endangered species, based on expert opinion.
Fauna	Presence of threatened terrestrial wildlife species (4 mammals and 4 reptiles) in the 1 km buffer zone around the project footprint
	Presence of 16 threatened bird species in the 1 km buffer zone around the project footprint. The northern part near Badingilo National park is the most sensitive area.
Livelihood	The majority of the people in the project area rely on land-based livelihoods, especially agro-pastoralism and agriculture.
	Access to timber and non-timber forest products
	Poverty and food insecurity
Landholding and ownership	Landholding and ownership based on different forms of land tenure, including customary land
	Presence of Internal Displaced People (IDP) connected to conflicts
Community and culture	Linguistic and cultural diversity, traditional knowledge and ethnic identity
	Gender roles and inequality, disadvantaged groups

Institutional and legal framework for implementation of the project

Since the signing of the Comprehensive Peace Agreement (CPA 2005) and the subsequent independence on 9 July 2011, the Government of the Republic of South Sudan (GOSS) has adopted a new Constitution, has developed a number of new policies and legislations while others are still being drafted, with the ultimate aim of enhancing sustainable socio-economic development in the country.

The proposed interconnection project is in line with aspirations of South Sudan's Vision 2040, a national policy which set goals to achieve by the year 2040 ranging from political, economic, social, energy and environment.

The National Environmental Policy was passed in 2015 and the Environmental Protection Bill was drafted in 2010, and updated in 2013 and 2015. However, an Environmental and Social Impact Assessment (ESIA) process is not yet legally established in national regulations.

Other Acts and Regulations of particular relevance to the proposed 400kV interconnection project are:

- the Transitional Constitution of the Republic of South Sudan, 2011)
- the Labour Act, 2017
- the Wildlife Conservation and Protected Areas Bill, 2015

- the National Electricity Bill, 2015
- the Draft Wildlife Bill, 2013
- the Water Bill, 2013
- the Forests Bill, 2009
- the Land Act,2009
- the Local Government Act, 2009
- the Wildlife Conservation and National Parks Act, 2003

The project implementation agencies of the project are:

- Nile Basin initiative (NBI) / Nile Equatorial Lakes Subsidiary Action Program (NELSAP): NBI / NELSAP was mandated in the signed Inter Governmental MOU of 2015 between and the Governments of Uganda and South Sudan to mobilize financing of the project.
- South Sudan Electricity Corporation (SSEC): SSEC is a government parastatal whose primary purpose is to generate electricity for use in South Sudan and for sale to neighboring countries. SSEC is responsible for the Olwiyo-Nimule transmission line project on South Sudan side, overseeing its construction, operation, and maintenance.

Other relevant institutional actors in the environmental assessment, resettlement process and project implementation are presented in the following:

- Ministry of Energy and Dams (MoED): the Ministry plans and provides power generation, transmission and distribution facilities to industrial and domestic consumers through the South Sudan Electricity Corporation (SSEC);
- Ministry of Environment and Forestry (MEF): the Ministry is mandated with the Protection and conservation of the environment as well as ensuring sustainable utilization of the environmental resource base to meet the needs of both the present and future generations. The ministry will be essential in providing oversight in implementation of environmental and social safeguards pertaining to the project;
- Ministry of Wildlife Conservation and Tourism (MWCT): the Ministry is mandated to protect, conserve and propagate the wildlife resources to support the development needs of South Sudan and the cultural, economic, and social wellbeing of its people;
- Ministry of Labour, Public Service and Human Resource Development: The mandate of the Ministry includes regulation of the Private Sector labour market in a manner that is consistent with national priorities, values, and cost-effective service delivery. The ministry will ensure that the project's labour policies and guidelines are in line with its requirements and labour standards.
- Ministry of Gender, Social Welfare and Religious Affairs: It is responsible for formulation and implementation of policies and legislations for promotion of gender equality, women's empowerment, child protection, social Protection and Social Welfare of the vulnerable groups in general welfare. As such, the ministry will ensure that gender equality and social justice are considered during the development of the project.
- South Sudan Central Equatoria State
- South Sudan Eastern Equatoria State
- South Sudan Land Commission (SSLC)
- Central and Eastern Equatoria Land Commissions
- Authorities of local administrative levels (Counties, Payams and Bomas officials)
- Nimule National Park

In addition to compliance with national regulatory requirements, the Project will also adhere to the international conventions ratified by South Sudan, such as the Convention on Wetlands of International Importance especially as waterfowl habitat (1971), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES – 1973), the United Nations Convention on Biological Diversity (1992), the United Nations Framework Convention on Climate Change (1992), the Paris Agreement (2015), etc.
Moreover, the Project will be implemented according to the principles defined in Africa Union Vision 2063 and in the 2030 Sustainable Development Goals (SDGs).
This Project was prioritized by the Governments of South Sudan and Uganda under Nile Basin initiative (NBI) and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP), therefore will comply with NBI Strategic Action Program (1999), NELSAP Preliminary environmental and Social Management Framework (2009) and NBI Gender Mainstreaming Policy and Guidelines (2012).

The 400 kV Power Interconnection Project is financed by the African Development Bank (AfDB) and therefore must undergo environmental and social impacts screening as per the Bank's Environmental and Social Safeguards Policy. The AfDB's Environmental and Social (E&S) Operational Safeguards, set out in the current Integrated Safeguard System (ISS), that are triggered by the Project are the following:

- *Operational Safeguard 1* (*OS1*): Environmental and Social Assessment;
- *Operational Safeguard 2* (*OS2)*: Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation;
- *Operational Safeguard 3* (*OS3*): Biodiversity, Renewable Resources and Ecosystem Services;
- *Operational Safeguard 4* (*OS4*): Pollution Prevention and Control, Hazardous Materials and Resource Efficiency;
- *E&S Operational Safeguard 5* (*OS5*): Labour Conditions, Health and Safety;

A gap analysis has been conducted between the national legislation and the African Development Bank Environmental and Social Operational Safeguards (E&S OSs).
For example, the South Sudan Draft Environmental Protection Bill (2015) introduces the requirements for Environmental Impact Assessments, Environmental Monitoring and Environmental Audits.
OS1 instead requires to Conduct a full Environmental and Social Impact Assessments (ESIA) of the project, undertake stakeholder engagement and disclose appropriate information, develop an Environmental and Social Management Plan (ESMP) and conduct monitoring and reporting on the environmental and social performance of the project against the OSs.

Stakeholder Engagement and Information Disclosure
During this study the consultation process was structured on two rounds of meetings, the first with district authorities and environmental authorities to verify the critical aspect of the project alternatives. The sectorial experts met the different officers after a formal introduction of SSEC. This round was essential to gain all the contacts of the key stakeholders at local level. A second round was organized during the census survey, from district, sub county and village level to share information about the project and organize the meeting with affected PAPs. The target villages are those crossed by the project. Through the support of village leaders, meeting with PAPs were carried out. Meeting was conducted with two days' notice by the village leader, the meetings were carried out with the help of translators. During the meeting the concept were presented through posters and maps.

1st round of consultations
The social consultant travelled to South Sudan from 16th to 27th July 2023 in order to engage various stakeholders and discuss matters relating to acquisition of land and land assets in the Republic of South

Sudan. The mission included visits in Juba (Central Equatoria State), Torit and Magwi (Eastern Equatoria State). The following organizations / offices were engaged for the purpose of the study:

- South Sudan Electricity Corporation;
- Ministry of Lands, Housing and Urban development;
- State Ministry of Housing, Lands and Urban Utilities;
- South Sudan Land Commission;
- Department of Natural Resources, University of Juba;
- Deputy Governor, Eastern Equatorial State;
- State Ministry of Housing, Land and Public Utilities;
- County Commission of Magwi;
- County Commission of Juba.

The field mission allowed to assess the stakeholders' roles and capacities, as well as institutional and organizational arrangements. It also provided field observations that have been compared with the desk study on the South Sudanese legal and policy framework.

For what concerns environmental issues, the 1st round of consultations with stakeholders (Ministries of Electricity, Environment and Forestry, and Wildlife Conservation and Tourism) was carried out in concomitance of the site reconnaissance survey from October 4th to Sunday October 8th, 2023. The stakeholder consultation and the site reconnaissance survey were done to have a glimpse of the environment of the areas along the three proposed transmission routes. The mission included visits at the following sites: proposed substations, Lokiliri, Lobonok, Pageri (Opari and Moli) and Mugali.
The following organizations / offices were engaged in the consultations:

- Ministry of Energy and Dams and South Sudan Electricity Cooperation (SSEC)
- Ministry of Environment and Forestry
- Ministry of Wildlife Conservation and Tourism
- Nimule National Park

The field mission allowed to present the project at the stakeholders and start the communication for the baseline data collection.

A second round of consultations was carried out during the Land Survey with the affected communities in January 2024. During these meetings, the team briefed the local community about the project and more specifically on the following issues:

- Description of the project, indicating the purpose, the scope and benefits to the country and the individual project affected persons
- The land survey activities
- The collection and purpose of socio-economic survey in the project area
- Compensation and Valuation of assets within the project area.

Local leaders facilitated the organization of these meetings who were translated in local language. The affected communities were given the possibility to raise their concerns and ask for information about land expropriation and compensation process. The results of these meetings allowed to outline socio-economic profiles, local livelihoods of PAPs and to have an overview of risk dynamics of most vulnerable groups.

Environmental baseline

Climate

South Sudan experiences a tropical climate. Temperature averages are normally above 25°C, with highs exceeding 35°C, particularly during the dry season (January to April). Juba, the capital city, has an average annual high temperature of 34.5°C and an average annual low of 21.6°C. The rainy season differs by location, but it generally occurs between April and November. The project area is characterized by an average rainfall around 1000 mm per year.

Geology

South Sudan's geology ranges from Precambrian crystalline basement rocks to Quaternary unconsolidated alluvial deposits. Significant periods of erosion during the Palaeozoic and Mesozoic removed most of the sedimentary cover deposited on the crystalline basement during these times.
The project's area is located were Precambrian crystalline basement rocks outcrop.
In terms of seismic risk South Sudan is part of the East African Rift system, a 3,000-km long continental rift originating in the Cenozoic Era. Earthquakes and volcanic eruptions occur throughout the East African Rift system and are characterised by mainly shallow earthquakes due to the earth's crust rupturing and tearing apart, and volcano-tectonic earthquakes.

Soils

In the project area the soils belong to the following categories:

- Ferric Luvisols are generally fertile and widely used for agriculture.
- Eutric Nitosols are generally fertile and widely used for agriculture, even if in sub-saharan areas soil degradation and nutrient depletion have gradually increased and have become a serious threat to agricultural productivity.
- Lithosols are very shallow soils (less than 10cm thick) and occur in the most eroding positions of the landscape.

Land use

South Sudan is naturally endowed with agricultural potential given its favourable soil, water, and climatic conditions. It is estimated that about 70 percent of total land area is suitable for producing a wide range of agricultural products. Conversely, the largest part of the country is still under trees and shrubs (62.6 %). The project's area the land use is mainly shrubs and grass.

Hydrology

South Sudan is drained by the Nile and its main tributary, the White Nile (Al Bahr al Abyad). The White Nile has several substantial tributaries that drain southern Sudan: the Bahr al Ghazal in the southwest and the Sobat River in southeast Sudan. The Sobat River drains an area of western Ethiopia and the hills near the Sudan-Uganda border. The Sobat's discharge is considerable, at its confluence with the White Nile just south of Malakal, the Sobat accounts for half the White Nile's water.

Water Quality

The Nile Basin Initiative's 2021 State of the River Nile Basin report states that the quality of the Nile waters has generally deteriorated over the previous decades, because of population growth, urbanization, agricultural intensification, and industrial development. Data on the state of South Sudan's water quality and quantity are lacking, but given that it is more sparsely populated than other Nile Basin countries, it is likely that water quality still corresponds to standards set by the riparian countries and the World Health Organization (WHO).
According to the Nile Basin Water Resources Atlas (UNDP), the percentage of the rural and urban population of South Sudan with access to improved drinking water sources was equal to 16% in 2015.

Moreover, the percentage of the population using improved sanitation was 57% in rural areas and 67% in urban areas.

Air Quality

In the urban areas of South Sudan, there is relatively little air pollution because vehicle numbers are still low and there is no heavy industry that emits polluting fumes.

Vast section of the project area is in rural areas which are very sparsely settled and have no major anthropogenic activities that contribute to air pollution levels beyond the natural background levels. The current source of air pollution is thus limited to occasional dust generated by traffic on the gravel or earth roads. Occasional whirlwinds sweeping across bare land also contribute to intermittently elevated dust levels.

Noise

Noise levels along the corridor is mainly ambient influenced by human settlement nature. Along the corridor the main noise pollution is from the vehicles along the road, motorcycles, and human noise from traders and consumers during normal business hours.

The noise levels are low throughout most of the corridors except for areas close to the market centres, where the level increases, due to concentration of people, vehicles, motorcycles and businesses activities.

During the 2024 environmental survey, baseline noise levels have been recorded at the transects along the transmission line corridor. The measured noise levels ranged from 15 to 58 dBA. All recorded values remained within the permissible normal range as specified by relevant regulations.

Ecosystem and Landscape Diversity

South Sudan's physical environment, geography and climate are factors that support a wide range of ecosystems and habitats. This diversity of habitats is however threatened by climate change: available data on trends in temperature and rainfall highlight that South Sudan is highly vulnerable to the impacts of rising temperatures and increased rainfall variability due to climate change, since pastoralists and farmers rely heavily on seasonal rains.

South Sudan’s savannah woodland forms the largest ecological region in the country, stretching diagonally from South Sudan's northwestern borders to the Ugandan borders in Western and Central Equatoria and Magwi County in Eastern Equatoria.

The project area crosses the so-called “Green Belt” and the “Hill and mountains” agro-climatic zones. The green belt is found in the southern parts of Eastern Equatoria, Central Equatoria and the western parts of Western Equatoria. This zone has rich soils and enjoys two rainy seasons, except for the southern part of Eastern Equatorial state, which receives little precipitation. Farming is the main livelihood activity.

Most of the proposed project area is covered by the East Sudanian savannah and small parts by Sudd flooded grasslands. In general, the ecoregion East Sudanian savannah is a hot, dry and wooded savannah. It is recognisable by the tall elephant grass, which is home to many large mammals. The ecoregion is mostly flat, with elevations ranging from 200 m to 1,000 m. The climate is tropical and highly seasonal. Annual rainfall is as high as 1,000 mm in the south. Climate change is a further threat, exacerbating the impact of human activities by reducing the ability of the ecosystem to recover from overexploitation when rainfall is low.

Protected areas

Protected areas (PAs) have been established in South Sudan to conserve ecosystems, their component species and the services they provide. The total area currently protected represents the 13% of the country. South Sudan has six National Parks, twelve Game Reserves, one Forest Reserve and one Ramsar site, the Sudd Swamp, which is recognised under the Ramsar Convention as a Wetland of International Importance and one of the largest tropical wetlands in the world.

The proposed project area is outside of existing protected areas, but there are some in its proximities. The closest PAs to the project are Juba Game Reserve (distance approx. 1 km), Badingilo (5 km) and Nimule National Parks (10 km).

The Badingilo National Park is part of a larger ecosystem that stretches east through the Jonglei corridor to Boma National Park and north to the Sudd. This area is home to one of the largest land mammal migrations in the world.

Characterised by wooded savannah and the White Nile River, Nimule National Park and its buffer zone are located in the Eastern Equatorial State of Southern Sudan, near the border with Uganda. The park is characterised by deciduous tree species typical of savannah and bush environments. Nimule National Park hosts a variety of fauna of high conservation concern.

Biological Environment

The environmental conditions of South Sudan support a very rich diversity of animal and plant species throughout the country, as well as several important biological processes and ecosystem services.

Several direct and indirect impacts of the project could potentially affect biodiversity and ecosystems at different spatial scales, therefore a multi-scalar approach, from the regional level to the project area, was used to assess the baseline information and the impacts of the project on the biological environment.

The International Union for Conservation of Nature (IUCN) products were used to gather general information on the conservation status, management and threats to species and protected areas that could be affected by the implementation of the project.

A fundamental tool for species conservation is the IUCN Red List of Threatened Species. From the same source, spatial data of species potentially present in the project and its surrounding areas were downloaded and analysed. the spatial distribution of species was weighted by their conservation status to produce a conservation value map, showing how the different species are distributed and highlighting sensitive areas with high numbers of species and threatened species.

This spatial analysis was carried out for each species and only for threatened species (VU, EN and CR) in each taxon. The ranges were considered in the 50 km buffer around the project area to allow for a broader scale assessment. The 1 km buffer was then used to determine which species ranges overlapped with the proposed project area.

Forest diversity

No detailed forest surveys and inventories have been carried out in South Sudan, and there is no reliable data on the extent of South Sudan's forests. Depending on the source, estimates of the proportion of South Sudan's land area covered by forest range from 11.1 percent to 35 percent.

Natural forests form the vast majority of South Sudan’s forest estate. They are located mainly on the Ironstone plateau of Central and Western Equatoria. In addition to the forests west of the Nile, Eastern Equatoria has a significant forested area.

Plantation forests are those that have been established through forestation or reforestation for commercial purposes. Plantations include both indigenous and exotic species.

Although they look luxurious, forests in South Sudan are fragile ecosystems which suffer varying levels of degradation through uncontrolled fires, uncontrolled grazing, and over harvesting. Currently, the level of degradation is high in all states and there is urgent need to reverse the trend.
The percentage plant endemism in South Sudan is 1.7% or, if near-endemics are included, 2.4%.
In term of protection status, 125 plant species were present in the IUCN database within a 50 km buffer around project area, of which 124 with a Least Concern (LC) conservation status and only one, *Bulbostylis clarkeana*, classified as Near Threatened (NT).

Wildlife diversity

Nimule National Park is home to a variety of fauna of high conservation concern, including mammals such as *Loxodonta africana*, *Hippotamus amphibius*, *Kobus defassa*, *Tragelophus scriptus*, *Cercopithecus acthios* and *Procavia cupensis*, and reptiles such as *Cyclanorbis elegans* and *Crocodylus niloticus*.
The IUCN spatial indicate the presence of the following wildlife within 50 km of the proposed project area:

- 177 mammal species, of which 154 are Least Concern, 8 Near Threatened, 5 Vulnerable, 5 Endangered and 5 Data Deficient. The conservation values map shows areas of higher conservation status in the north-east and south. These areas are in and around the Imatong Forest Reserve, Nimule and Bandingilo National Parks.
- 82 reptile species, of which 76 are listed as Least Concern, 2 as Near Threatened, 3 as Vulnerable and 1 as Critically Endangered. The distribution map shows a higher conservation value in the northern side of the area.
- 23 amphibians species, distributed mainly in the north-west and east side of the area. The majority of these species (22 amphibians) are listed as Least Concern and only one species as Data Deficient category.
- 138 arthropods species, of which 137 are Least Concern and only one Data Deficient. The southern part of the area is the richest in terms of species diversity.
- 609 birds species. There are several IBAs in the proposed project area and its surroundings, which indicate bird hotspots, most of which overlap with National Parks or Game Reserves. The higher conservation values are located in the south-east, near the Imatong Forest Reserve. The Nimule IBA is located in Nimule National Park on the border with Uganda.

The protected species in South Sudan are listed in the Draft Wildlife Conservation & Protected Areas Bill 2015. There are four mammal species range that overlap the 1 km buffer around the proposed project area, all of which are classified as Vulnerable (Table 1-5). These charismatic species are also protected by the national law.

Table 1-5 – List of threatened mammals within 1 km buffer around project proposed area. VU: Vulnerable.

N	Species name	Red List category	Trend
1	*Hippopotamus amphibius*	VU	Stable
2	*Smutsia temminckii*	VU	Decreasing
3	*Giraffa camelopardalis*	VU	Decreasing
4	*Panthera pardus*	VU	Decreasing

In the 1 km buffer around proposed transmission line routes 16 threatened birds species range are present, six are Vulnerable, six are Endangered and four are Critically Endangered (Table 1-6).

The threatened reptile community assessed by the IUCN spatial data and potentially present in the 50 km buffer area includes four species, one Critically Endangered and three Vulnerable. Three of these species are freshwater turtles, which are strictly associated with aquatic habitats, and the venomous snake, the Gaboon Viper.

In general, in the 50 km buffer around project area, following the IUCN spatial data, five animal species are Critically Endangered, 11 Endangered and 15 Vulnerable. More in detail, the number of threatened animal species in 1 km buffer around project area are five Critically Endangered, six Endangered and 13 Vulnerable (Table 1-7).

Table 1-6 – List of threatened birds within 1 km buffer around project proposed area. VU: Vulnerable, EN: Endangered, CR: Critically Endangered.

N	Species name	Red List category	Trend
1	*Balearica pavonina*	VU	Decreasing
2	*Bucorvus abyssinicus*	VU	Decreasing
3	*Balaeniceps rex*	VU	Decreasing
4	*Polemaetus bellicosus*	EN	Decreasing
5	*Sagittarius serpentarius*	EN	Decreasing
6	*Terathopius ecaudatus*	EN	Decreasing
7	*Falco vespertinus*	VU	Decreasing
8	*Aquila rapax*	EN	Decreasing
9	*Gyps africanus*	CR	Decreasing
10	*Gyps rueppelli*	CR	Decreasing
11	*Necrosyrtes monachus*	CR	Decreasing
12	*Aythya ferina*	VU	Decreasing
13	*Torgos tracheliotos*	EN	Decreasing
14	*Trigonoceps occipitalis*	CR	Decreasing
15	*Aquila nipalensis*	VU	Decreasing
16	*Acrocephalus griseldis*	EN	Stable

Table 1-7 – Number of Vulnerable, Endangered and Critically Endangered species for each taxon in the 1 km buffer around project proposed area.

Taxa	VU	EN	CR
Mammals	4	-	-
Birds	6	6	4
Reptiles	3	-	1
Amphibians	-	-	-

Baseline data surveys – Biological Environment

Field surveys of biological environment have been performed. Distinct sampling methodologies were deployed for each taxonomic group of interest, encompassing plants, mammals, birds, herptiles, and arthropods. These scientifically sound sampling techniques ensure the collection of robust baseline data, fostering a rigorous and comprehensive assessment of the biodiversity within the project area.

The proposed methodology involves conducting:

- transect surveys, where surveyors systematically assessed habitat, plant, and wildlife species along designated paths. This approach provides valuable insights into the distribution, abundance, and diversity of species across different habitats and landscapes. Transects of 500 m were surveyed by different team of experts.
- point count method, which is a widely used bird survey method in ornithology and ecological research. It involves stationary observations of birds from specific points, during which bird species and their behaviours are recorded. Points were located in the middle of each 500m transects.
- Vegetation plot sampling, which is a systematic method used in ecology and environmental science to study and analyse plant communities in a particular area. At the beginning of each transect a vegetation plot of 10x10m has be placed. The botanist collected vegetation data including species name, abundance (% cover of the 10x10 m plot), habit, DBH and Hight for trees, and the use of the plants by locals.

The vegetation survey reported the presence of 50 plant species: the majority is classified as Least Concern, 1 is Near Threatened (*Dalbergia melnoxylon*), 6 are Vulnerable (*Annona senegalesis*, *Afzelia africana*, *Burkea africana*, *Combertum hartmannianum*, *Khaya senegalensis*, *Vitellaria paradoxa*), 1 is Endangered according to expert's opinion (*Oxytenanthera abyssinica*) and 1 is data deficient (*Sarcocephalus latifolius*).

Transects and point counts methods were used to study wildlife along the transmission line. A total of fifteen (15) 500 m by 200 m transects were used to collect information on presence of mammals, herpeto-fauna and arthropods. In addition, for bird's presence and diversity, a 100m circular plot or point was located within each transect.

The following wildlife species were recorded across the 15 transects and sites:

- 16 mammal species. The most abundant species were *Sylvicapra grimmia, Lepus microtis, Tragelaphus scriptus, Cryptomys ochraceocinerus* and *Hystrix cristata*. Two species were near threatened and endangered, *Eidolon helvum* and *Loxodonta africana.*
- 42 bird species. The most abundant bird species were *Ploceus cucullatus, Pyncnonotus barbatus,* and *Alcedo cristata*. No endangered birds were observed in the study area.
- A total of five reptile observed in the area, 2 snake species and 3 lizard species.
- Different species of grasshoppers, crickets and butterflies.

Critical Habitat Assessment

An assessment using available data was undertaken to identify the possible existence of Critical Habitats (CHs) within the project area and in the Indirect Area of Influence (IAoI) in accordance with the criteria outlined in the International Finance Corporation (IFC) Performance Standard 6 (PS6). The assessment took into account data collected in the field by local experts and other data sources using open access global databases, the Global Biodiversity Information Facility (GBIF) and IUCN Red List spatial data. As a

result, ten bird species, one reptile and one mammal have been identified as potentially triggering CH based on the criterion 1. The species not observed during field activities were considered potentially present based on literature review. In particular, one Endangered bird species, *Acrocephalus griseldis*, has been categorized as potentially present, as determined by literature data, and is designated as triggering "Potential Critical Habitat".

Socio-Economic and Cultural baseline

The socio-economic environment was investigated socio-economic questionnaires to PAPs aimed at deeply investigate the social profile of affected people and through checklists necessary to carry out the census of the affected landowners. The findings of the questionnaire were corroborated with secondary data.

Demographic features

According to the central burau of Statistic, the projection of population in South Sudan for 2022 is of 14,234,976 people with 7,268,273 males and 6,966,703 females. South Sudan has suffered continued conflict, and most recently, climate-change-related flooding, which displaced 1 million people and destroyed roads and health facilities. Estimated demographic data on Juba and Magwi counties are presented the table below.

Table 1-8 – Juba and Magwi Counties Population

State	County	Male (2020)	Female (2020)	Total (2020)
Central Equatoria	Juba	302838	280499	583339
Eastern Equatoria	Magwi	148945	147378	296326

The transmission line project mainly affects agricultural areas and some structures in two of the 5 payams that it crosses:

i) Nesitu in Lokiliri Payam CES: an area of future development planned by the Payam. At the moment the area is not developed and no people live or work there.
ii) Aru Junction, Lokiliri Payam CES: a total of 50 PAPs were identified and registered in the area.
iii) Pageri Payam EES: 30 PAPs were registered.

Table 1-9 – Affected HHs

MHH	FHH	TOTAL
42	7	49

All the affected people except one do not live in along the transmission line, the majority lives in Aru Junction and other live abroad.

Literacy and Education

More than 2.8 million children, or over 70 per cent, are out of school in South Sudan. Some of the out-of-school children are living in pastoral communities, moving with their cattle and are not able to attend regular classes. The largest group of out-of-school children in South Sudan are girls. Poverty, child marriage and cultural and religious views all hinder girls' education.

Enrolment rates are some of the lowest in the world, with a range of groups desperately marginalised, such as girls, children with disabilities, children in rural areas, those displaced by conflict, those who are over-age for their grade, IDPs, refugees, child labourers, street children, and pastoralist children.
Other challenges to education include: the lack of actual school buildings, insecurity, social norms and culture, as well as distances to school.

Health
9.4 million South Sudanese are in need of humanitarian assistance, 5.4 million of these are children. Maternal mortality is over 1,150 per 100,000 live births. This is one of the highest in the world.
Floods of 2022 which destroyed health clinics and 1,500 clean water sources and increased food insecurity further.

Ethnicity, Religion and Language
South Sudan is home to 64 different ethnic groups, within each of which there are further subdivisions. In Greater Equatoria states, 36 ethnic groups are found.
The population of the affected payams is mainly composed of sedentary agropastoralists. Smallholder farmers depend on rain-fed agriculture for their livelihoods. Livestock also plays an important role in the local farming system, and they are the primary store of wealth and a source of food.
The area also hosts Internally Displaced Persons, mainly Dinka cattle herders from Bor County of Jonglei State. Since 2022 tensions between armed herders from Dinka Bor and local farmers have been reported in Mangala, Gondokoro and Lokiliri payam.
In Pageri payam of Magwi county, tensions dating back to 2011 are due to a disagreement over where the demarcation of the border between the Madi-dominated Pageri Payam and the primarily Acholi Magwi Payam should be.

Local Economy and Livelihood
In South Sudan agro-pastoralism is the main livelihood system in rural areas. The project falls under two agroclimatic zones: hills and mountains and green belt zones.

Gender, disadvantaged and vulnerable groups

As of the latest available data, South Sudan ranks among the countries with the highest levels of gender inequality globally with especially low scores on educational attainment and political representation for women and girls. Key factors contributing to gender inequality in South Sudan include limited access to education and healthcare for women and girls, high rates of child marriage and gender-based violence, as well as unequal representation in decision-making positions and economic opportunities. These challenges are exacerbated by ongoing conflict, which further impacts women's security, mobility, and access to resources.

In the project affected area the census survey reported the following figures among directly affected people in terms of Female Households and elderly Households. Nevertheless, the living conditions of all affected Households in terms of access to services and income level is extremely poor therefore all the Households are to be considered vulnerable. All the AHs are above 18 years old, and no disable people have been found.

House Ownership and Types
Over the years, the communities of the areas affected by heavy flood events have developed resilience approaches to mitigate the impact on their assets and livelihoods, relying mostly upon a nomadic lifestyle to tackle the episodic nature of the rise in water level.

The primary form of vernacular housing in South Sudan is the tukul. Essentially, tukuls are single-room shelters with low, windowless walls and high-pitched grass roofs. Most daily activities take place outdoors in space adjacent to tukuls. An average size for the shelter of 16m^2 for 4 people.
The average shelter cost may vary from about 75 USD up to 2,000 USD depending on the materials employed for its construction, the shelter size and finishes.
Other buildings in concrete were inventoried in the project area, all were abandoned, some resulted to belong to people presently residing in Uganda.

Landholding and land ownership

With more than 80 per cent of its population living in rural areas, a great deal of land in South Sudan is communally owned. Land is considered common property with no individual ownership, but strong usufructuary rights are inherited through generations.
In 2009, the Land Act introduced the distinction between three general types of land: public, private and communal, respectively owned by the state, private entities and communities.
Nevertheless, this distinction between public, private, and communal land is inaccurate because these categories often overlap and cannot be treated as distinct entities. Land tenure combines elements of the statutory and customary laws.
It is important to point out that the surveying and titling process of customary land is particularly problematic. This is because, in some cases, customary land that is surveyed eventually becomes freehold land once registered and titled, with equivalent rights of alienability.

War in South Sudan has displaced 4.43 million people, including 1.96 million internally displaced persons (IDPs) and 2.47 million refugees. The internal displacement is an ongoing process.
Under customary law, in most of South Sudan when a person leaves his home for however long a time, with the intention of returning, he does not lose his right to the land.
Land became an increasing focus of dispute and conflict during the interim period (2005–2011) as a result of population return and growing urbanization. In particular, tensions were mostly located in the three Equatorian states, where people displaced from other areas of the country had moved during the war. Returnees often found their former plots of land inhabited by soldiers or displaced civilians, prompting accusations of land grabbing. This can lead to a complex situation of conflicting land claims or primary and secondary land rights that need to be acknowledged.
In some states, chiefs form a community land committee to resolve disputes over customary land use, often involving returnees who claim family land occupied by others.
In this context, rather than referring to the distinction between public, private, and communal land enshrined in national policies, the assessment for compensations should be carried out by referring to two criteria: the resident status of the occupants, and the analysis of actual use of land parcels.

Physical Cultural Resources

Overall, the literature highlights that proper burials in South Sudan are seen as critical both for the deceased and for the living. Graves are generally located within or close to family homesteads: they are important for maintaining connections with ancestors and family land, and increasingly, as proof of land ownership.
Nevertheless, from a preliminary analysis there is no evidence of burial sites and listed cultural-archaeological sites in the project corridor. The potential presence of such kind of sites will be furtherly verified in the next phases of the assignment.

Environmental and Social Impacts

The impact factors identified during the analysis of the project and through the definition of the project phases and project actions are assessed in their relevance, using a scoring system.

- Duration (D): is the duration of the impact factor and can vary from short to long according to the following definitions.
- Frequency (F): is the frequency with which the impact factor manifests itself.
- Spatial extent (E): is the geographical area within which the impact factor can exert its effects.
- Intensity (I): is a measure of the physical, biological, economic or social severity of the impact factor.
- Sensitivity (S): The sensitivity of an environmental or social component is typically evaluated on the basis of the presence/absence of some features which define both the current degree of the environmental or socio-economic quality and the susceptibility to environmental or social changes of the component.
- Reversibility (R): is the property of an impact to diminish its magnitude over time and to eventually recede entirely.

The Impact Value (IV) obtained from the aggregation of the previous attributes represents a quantitative measure of the impact magnitude or significance.
Possible mitigation measures have been therefore defined, with reference to the Mitigation Hierarchy Approach. The effectiveness of the identified mitigation measures to reduce or eliminate the negative impact, or enhance positive impacts, has been also rated. The residual impact is obtained multiplying the impact value (IV) by the mitigation effectiveness (or the enhancement effectiveness in the case of positive impacts).

A description of identified impacts is provided in Table 1-10 and Table 1-11 in matrix format.

Table 1-10 – Matrix of impact significance during the construction phase

ENVIRONMENTAL AND SOCIAL COMPONENTS	IMPACTS	IMPACT VALUE	RESIDUAL IMPACT
PHYSICAL ENVIRONMENT - CONSTRUCTION PHASE			
Climate	Increased emission of GHG	Low (-)	Negligible (-)
	Reduction of carbon sinks (due to vegetation clearance)	Medium (-)	Medium (-)
Geology and Soils	Changes in local morphology	Low (-)	Low (-)
	Soil disposal	Low (-)	Negligible (-)
	Soil erosion and slope instability	Medium (-)	Low (-)
Hydrogeology	Groundwater contamination	Medium (-)	Low (-)
Surface Water Resources	Increased turbidity and total	Low (-)	Negligible (-)
	Pollutants contamination in	Medium (-)	Low (-)
Air Quality	Exhaust gas emissions	Negligible (-)	Negligible (-)
	PM and dust emissions	Medium (-)	Low (-)
Noise and Vibration	Increase of Noise and vibration levels	Low (-)	Negligible (-)
Waste	Waste production	Low (-)	Negligible (-)
BIOLOGICAL ENVIRONMENT - CONSTRUCTION PHASE			
Habitat, Vegetation and Wildlife	Agricultural lands disruption and damage	Negligible (-)	Negligible (-)
	Habitat degradation, disturbance and fragmentation	Medium (-)	Low (-)
	Loss of flora and vegetation	Medium (-)	Low (-)
	Invasive alien species	Medium (-)	Low (-)
	Impact to threatened and protected species and habitat	High (-)	Low (-)
	Wetland alteration and degradation	Medium (-)	Medium (-)
	Desease	High (-)	Medium (-)
	Illegal hunting and other human disturbance	Low (-)	Low (-)
SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT - CONSTRUCTION PHASE			
Beneficial	Job opportunities	Medium (+)	Medium (+)
	Increase of business opportunities	Medium (+)	Medium (+)
Displacement	Physical displacement	Low (-)	Negligible (-)
	Economic displacement	High (-)	Low (-)
	Physical Cultural Resources	Low (-)	Negligible (-)
Disturbance	Disturbance during construction	Negligible (-)	Negligible (-)
	Sexual harassment	Very High (-)	Medium (-)
	Increase of social conflicts	High (-)	Low (-)
	Increase of STD and VBD	Very High (-)	Medium (-)
	Child labor	Very High (-)	High (-)

Table 1-11 – Matrix of impact significance during the operation phase

ENVIRONMENTAL AND SOCIAL COMPONENTS	IMPACTS	IMPACT VALUE	RESIDUAL IMPACT
PHYSICAL ENVIRONMENT - OPERATION PHASE			
Climate	Reduction of GHG emissions from electricity consumption	Very High (+)	Very High (+)
	GHG fugitive emissions (SF_6)	Low (-)	Negligible
Landscape	Visual and aesthetic impact	Very High (-)	Very High (-)
Water Resources	Reduction of aquifer's recharge area	Low (-)	Negligible (-)
	Risk of groundwater and surface water contamination	Medium (-)	Negligible (-)
Noise	Operation of the substations	Negligible (-)	Negligible (-)
	Wind effect on cables and corona discharge	Negligible (-)	Negligible (-)
EM field	Increase of Electromagnetic field	Medium (-)	Negligible (-)
BIOLOGICAL ENVIRONMENT - OPERATION PHASE			
Habitat and Vegetation	Degradation of ecosystem services	Medium (-)	Medium (-)
	Loss of flora and vegetation	Medium (-)	Negligible (-)
	Habitat degradation and fragmentation	High (-)	Medium (-)
Wildlife	Disturbance and mortality of avifauna and bats	Very High (-)	Medium (-)
	Habitat degradation and fragmentation	High (-)	Medium (-)
	Electric and Magnetic Fields, noise effect	Low (-)	Low (-)
SOCIO-ECONOMIC AND CULTURAL ENVIRONMENT - OPERATION PHASE			
Beneficial	Rural electrification	Very High (+)	Very High (+)
Disturbance	Disturbance during operation and maintenance	Negligible (-)	Negligible (-)

Cumulative impact assessment

The presence of other transmission lines in the area may contribute to increase the impacts on bird species. However, detailed information on planned projects and infrastructure in South Sudan is very scarce and the development of such infrastructures will not be immediate.

According to the information collected during the site visit, there are no other existing (or under construction) transmission lines in the proximity of the Interconnection project route. Furthermore, no information is available on future planned transmission lines crossing the Interconnection project route. Conversely, during the land survey some limited information have been collected on a prospective future urban / industrial development area in the proximity of Nesitu substation, close to the existing solar power plant.

The Interconnection project already includes rigorous mitigation measures to reduce the risk of bird collision and electrocution, including bird flight diverters along the entire route and ongoing monitoring to ensure that the cumulative impacts are mitigated.

There would also be cumulative impacts on habitat (and therefore species). These would be directly proportional to the amount of ground disturbed and would be limited to the transmission line right of way. Cumulative impacts also depend to some extent on whether or not other construction activities in the project area are concurrent or overlapping. Increased land acquisition, traffic and possibly increased habitat disturbance could result from concurrent construction. However, there are no projects under construction in the project area and implementation of the mitigation measures identified for the proposed project will ensure that impacts are mitigated.

Environmental and Social Management Plan (ESMP)

The purpose of the Environmental and Social Management Plan (ESMP) is to describe in detail the possible actions that must be taken to ensure that identified impacts will be mitigated as much as possible.

Most of the impacts, which occur during the construction phase, can be reduced, or avoided through the application of sound construction management guidelines.

Some impacts will be permanent and cannot be mitigated. In some cases, these impacts will be compensated, or enhancement activities will be implemented. Enhancement is an important part of the overall management plan as it is used to improve existing environmental conditions, restrict any likely environmental degradation (which is not directly related to the project) in the future, and it can form a part of compensatory measures.

This Environmental and Social Management Plan (ESMP) further acts as a framework for the Contractor to develop its mitigation and management plans. SSEC and the Contractor will be required to develop standalone mitigation and monitoring plans, implementing the requirements contained within this document as a minimum, according to the responsibilities specified in the subplans.

SSEC will have the overall responsibility for the compliance of the scheme during the construction and operation phases and for the implementation of the mitigation measures outlined within this ESMP.

SSEC will ensure that the agreements will legally oblige the Contractor to comply with this ESMP using the GIIP (Good International Industry Practices) and enforcing the principle that the stricter among national and international standard applies.

SSEC shall monitor the Contractor's performance and all subcontractors on a regular basis.

Mitigation measures described for the operational phase will be implemented by SSEC.

To furtherly detail the necessary mitigation and management actions of ESMP, the Contractor shall provide the following Sub-Plans, which shall be developed as guidelines for minimizing environmental impacts from specific activities of the Project, primarily during construction.

- SP01: Erosion and Sediment Control
- SP02: Water Pollution Control
- SP03: Air pollution and Dust Control
- SP04: Noise and Vibration
- SP05: Waste Management
- SP06: Hazardous Material Management
- SP07: Vegetation Clearing
- SP08: Biodiversity Management
- SP09: Construction and management of Work Camps
- SP10: Traffic and Access
- SP11: Cultural Heritage and Chance Finding Procedure
- SP12: Occupational and Community Health and Safety Management
- SP13: Stakeholders Engagement
- SP14: Local Employment
- SP15: Contractor Management
- SP16: GBV/SEA/CAE

An Environmental and Social Management Division (ESMD) within the project structure will actively liaison with the concerned stakeholders and Government of South Sudan (GoSS) agencies to assure a smooth implementation of the plans. The ESMD will have three sections namely Environmental Section, Grievance Section and Social Section.

The ESMD will have three sections namely Environmental Section, Grievance Section and Social Section. Environmental Section will be responsible for implementing physical and biological mitigation and enhancement programs and relevant monitoring activities, as well as compliance monitoring of programs implemented by the contractors as per contractual agreement.
Social Section will work on land acquisition and compensation, resettlement and rehabilitation, community development, livelihood programs, health related programs, etc. and relevant monitoring of social programs implemented by the project and compliance monitoring of programs implemented by the contractors as per contractual agreement.
Grievance Redress Organization will work with Project Affected Persons (PAPs) to raise their concerns and grievances to the Project in a transparent manner over the agreed procedural steps.

During the project construction phase, ESMD will be a full-fledged office, but it will be reduced in size as Environmental and Social Management Organization (ESMO) during the operation phase.
The detailed description of all the mitigation (and enhancement) measures envisaged in the Environmental and Social Management Plan (ESMP) have been subdivided for physical, biological and social environment.
The mitigation (and enhancement) measures for both pre-construction/construction and operation phases are illustrated in tables, providing the following details:

- Environmental or social component to be addressed;
- Project area;
- Description of each mitigation and enhancement measure;
- Identification of the parties responsible for the implementation of the mitigation measure and for the monitoring during implementation;
- Monitoring frequency
- Cost of the mitigation (or enhancement) measure;
- Phase of the project during which the mitigation (or enhancement) measure has to be implemented

The most important mitigation measures included in the ESMP are provided in the following table:

Table 1-12 – Mitigation and management measures on biological environment

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring		
Flora	All construction area and its surroundings	▪ prepare a general **Vegetation clearing Management Plan** including conceptual design of vegetation clearing and controls to be implemented on-site in accordance with project's specific requirements; ▪ minimize and possibly avoid access road construction and construction material within the boundaries of the Riverine and hill side forest; ▪ carefully select the trees that need to be cut to implement the project activities; ▪ avoid any useless cutting of trees with particular attention to protected species; ▪ minimize as much as possible the construction areas; ▪ revegetate the temporarily used areas only with local species, forbidding any use of alien and invasive species and enhance natural regrowth; ▪ buy timber required for construction only from authorized dealers; ▪ provide energy for cooking to the workers to avoid the use of local timber and wood; ▪ strictly forbid any buying or selling of timber or any other floral natural product within the construction area; ▪ strictly forbid any poaching of floral natural product by the contractors' workers; ▪ avoid any fire risk caused by activities within the project area; ▪ Adjust pole placements to span wetlands or limit equipment access in wetlands, wherever possible; ▪ avoid introduction of invasive alien species: early detection and eradication are recommended; ▪ consider translocation of protected species in suitable habitat;	Contractor	ESMD	Detailed design stage; Before construction activities begin; During construction; During the decommissioning stage	C

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring		
		▪ if necessary, a compensatory reforestation plan to be defined based on baseline surveys and final alignment.				
Fauna	All construction area and its surroundings	▪ prepare a general **Biodiversity Management Plan** including conceptual design of biodiversity management controls to be implemented on-site in accordance with project's specific requirements; ▪ all animal dens close to the work areas must be marked as no-go areas; ▪ the project work force should be instructed to avoid harassment and disruption of wildlife; ▪ if the use of explosive is necessary, it should be used only within specified time and distances from any wildlife sensitive area; ▪ awareness creation training to construction workers at toolbox meetings, so that they contribute to the effort of protection of wildlife; ▪ carry out periodic monitoring of habitat integrity of the area;	Contractor	ESMD	During construction activities	C
	All construction sites	▪ establish and monitor implementation of a speed limit of 25 km/hour in the habitat zone or wildlife crossing area and 40 Km/hour in the rest of construction roads; ▪ clearly identify by warning signs, habitat zones or wildlife crossing areas; ▪ strictly forbid to all vehicles involved in the project to honk at wild animals, especially while the animals are crossing the road; ▪ all vehicles' drivers involved in the project must attend at least one wildlife safety training before they start working	Contractor	ESMD	Ensure all measures are included in ToR of the Contractor. Check drivers' training. Check traffic signs every month.	C
	All construction sites	▪ adhere to National or IFC EHS standards for noise quality, whichever are higher. All vehicles and heavy equipment shall have an adequate silencer and shall be properly maintained;	Contractor	ESMD	Check measures are implemented. Monitor noise every 3 months	C

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring		
		▪ minimize traffic congestion by proper traffic management;				
	Project area	▪ strictly forbid to construction workers to hunt and/or poach wildlife and to fish as well as to buy and/or sell wild animals; ▪ strictly forbid workers to supply food from hunting or fishing; ▪ implement adequate practices of food waste management at the camps to avoid any attraction of wildlife scavengers;	Contractor	ESMD	Check measures are regularly implemented. Inspect local workers camps' and relevant food disposal every month	C
		▪ Transmission line height greater than 6 meters to avoid electrocution of terrestrial species, such as giraffes and elephants	Contractor	ESMD	Ensure all measures are included in ToR of the Contractor.	C
		▪ Installation of BIRD-FLIGHT Diverter (BFD) along the entire transmission line to avoid electrocution and bird collision. The installation of BFD must follow the guidelines of the IUCN reported in the 'Wildlife and power lines: guidelines for preventing and mitigating wildlife mortality associated with electricity distribution networks' report. Martín Martín, J., Garrido López, J.R., Clavero Sousa, H. and Barrios, V. (eds.) (2022). Wildlife and power lines. Guidelines for preventing and mitigating wildlife mortality associated with electricity distribution networks. Gland, Switzerland: IUCN.	Contractor	ESMD	Ensure all measures are included in ToR of the Contractor.	C

Table 1-13 – Mitigation and management measures on social environment

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring		
Land	HHs affected by project land taking	Avoid as much as possible any settlement through design. Develop a RAP inclusive of a Livelihood Restoration Plan for HHs who lose more than 20% of their productive assets (they will be entitled of livelihood restoration programs proportionally to their loss and vulnerability status).	SSEC	ESMD	Quarterly basis After compensation payment of biannual basis for two years	P
Labor Equity in local employment benefits/ minimize social conflicts	All National and international workers, included labor from nearby communities	Develop **Project Human Resource Policy** which includes provision: – to prioritize local employment considering available skills in accordance with Local Authorities/Village leaders and SSEC, – to promote non-discrimination and equal opportunities, – to provide additional specialized training to local workforce in skills required by contractor (i.e. administrator, driving etc.).	Contractor	ESMD	Quarterly basis	C
Labor Labor grievance mechanism	All National and international workers, included labor from nearby communities	Develop **Project Grievances Mechanism for labor.** – Complaint from worker about unfair treatment or unsafe living or working condition. – Grievance policies and mechanism must be developed and disclosure.	Contractor	ESMD	Quarterly basis	C
Labor Protecting the workforce	All National and international workers, included labor from nearby communities	Develop **a Project Human Resource Policy** which consider at least the following aspect: - freedom of association and collective bargaining; - prohibit the hiring of underage workers, as defined in relevant ILO Conventions; - prohibit recruitment, use and practices of forced labor and child labor; - prohibit discrimination in hiring practices or pay;	Contractor	ESMD	Quarterly basis	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring		
		- provide fair and favorable working conditions as per contract terms and make sure that conditions are transparent and understood by workers prior to recruitment; - avoid excessive recruitment or transportation fees, or to keep identity documents or working papers; - guarantee freedom of movement in and out of the workplace and workforce accommodation; - guarantee wages as per industry standards/minimum wage; - guarantee access to workforce grievance mechanisms; - guarantee provision of sufficient rest periods and rest days to avoid fatigue; - guarantee safe and healthy workplace conditions; - guarantee provision of food and water for drinking and sanitation; - guarantee working conditions and accommodation standards, as per guidance note by IFC; - guarantee provision of appropriate personal protective equipment (PPE) These requirements shall also be reflected in subcontractors' employment policy.				
Occupational Health Maintain the wellbeing of workers living in camps	All National and international workers, included labor from nearby communities	– Worker's accommodation shall follow international best practices such as ILO recommendation, guidance note by IFC on Workers' accommodation. – Systematically planned and participatory hygiene promotion campaigns can reduce water, sanitation, and hygiene (WASH)-related diseases in camps. – Hence, hygiene promotion campaigns focus on addressing the riskiest practices for diarrheal disease transmission through safe disposal of excreta, effective handwashing, and reduction of household drinking	Contractor	ESMD	Quarterly basis	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring		
		water contamination.				
Occupational and community health Spread of STD	All National and international workers, included daily labor from nearby communities and villages directly impacted by the project construction activities	– Inform workers and community of risks, infectious and all communicable diseases and protection to minimize risk of infection to workers and communities. – Provision of awareness and prevention briefings. – Include requirements for case-finding and treatment of curable STIs, social marketing of condoms, peer educators' program, condom distribution, and Voluntary Counselling & Testing (VCT) targeting PACs. Implement and evaluate quarterly. This activity shall be planned in conformity to Health Regulation at District Level	Contractor	ESMD	Quarterly basis	C
Occupational and community health Spread of Respiratory Disease	All National and international workers, included daily labor from nearby communities and villages directly impacted by the project construction activities	– Prevent spread of respiratory disease, including the production of epidemics that can pass back and forth between the project and the community. – Communicate with local-level TB-control program coordinator to initiate case finding, treatment, and follow-up with family members and others living within the same housing compound as workers diagnosed with active TB. – Distribute of mask to prevent from dust in the villages most impacted by the air pollution. These activities shall be planned in conformity to Health Regulation at Payam Level	Contractor	ESMD	Quarterly basis	C
Occupational and community health	All National and international	– Provision of Mosquito nets and repellent – Training on good practices and behavior to minimize the risks	Contractor	ESMD	Quarterly basis	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring		
Spread of Vector Borne Disease	workers, included daily labor from nearby communities and villages directly impacted by the project construction activities					
Community Grievance Mechanism	Affected communities	– Implement Community Grievances Redress Mechanism to address complains related to direct and indirect project impacts	SSEC	ESMD	Quarterly basis	C
Occupational and community health Restrict access to sites, especially hazardous areas	All National and international workers, included daily labor from nearby communities and villages directly impacted by the project construction activities	Develop a **Project Occupational Health and Safety Plan** and **Community Health and Safety Plan** including, at least: – Provision to guarantee a safe and healthy work environment, considering inherent risks in the specific sector and specific classes of hazards in the work areas, including physical, chemical, biological, and radiological hazards. – provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; – training of workers; – documentation and reporting of occupational accidents, diseases, and incidents; – Emergency prevention, preparedness, and response arrangements. – Appropriate fencing / signage at site entrance. – Appointment of site security personnel.	Contractor	ESMD	Quarterly basis	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring		
		– Road safety measures. – First aid and medical assistance. – HS measure at community level.				
Security social conflict	Villages of the Project Area	Prepare a - **Security Management Plan** with provisions for respect of Voluntary Principles on Security and Human Rights (VPSHR) and manage the influx of workers and followers through a **Labor Influx Management Plan** Harmonize the above plans with: - Local Employment Plan - Workers Code of Conduct - GBV/CAE/SEA plan, Occupational and Community Health and Safety plan - Establish continuous communication with Key stakeholders and traditional leaders. – Train foreign workers on local culture and traditions	Contractor	Contractor and ESMD	Quarterly Basis	C
Vulnerable Groups	Villages of the Project Area	GBV and CAE • Contractors are required to have sexual harassment policies and **Worker's Code of Conduct.** It is recommended that Codes of Conduct include specific prohibitions against SEA, including prohibition of sexual activities with children, defined as anyone younger than 18. This standard must hold even when national standards, laws and policies have a younger age of consent. • Worker Code of Conduct shall be translated in local language(s) • The Contractor is obliged to create and maintain an environment which prevents gender-based violence (GBV) and child abuse/exploitation (CAE) issues, and where the unacceptability of GBV and actions against	Contractor	ESMD	Quarterly Basis	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring		
		children are clearly communicated to all those engaged on the project. • Complains on GBV and CAE episodes shall be channelized through the **Project Grievances Redress Mechanism**, it should state in simple, up-front language that perpetrators will be sanctioned. System of sanctions must be put in place that will unambiguously reflect the project's commitment to a violence-free workplace. • Standardized training against sexual harassment and GBV should be part of on-boarding procedures for all contractor's employees at site.				
		CHILD LABOR - Develop a "child labor monitoring" system, a three-person team of community members (such as a schoolteacher, mothers' club member or retired policeman) are given training in how to monitor child labor. They then periodically visit places where children are likely to be working. If they find a child, they report the case to a specially constituted community committee, as well as to the labor inspector or local government authority for follow-up. Depending on the child's situation, the committee will recommend a course of action, - Protecting older children in or at risk of hazardous work offering comprehensive packages of training and services to facilitate the transition from school to decent work (skills, apprenticeships, vocational training, job counselling, enterprise development, financing) - Raising awareness among employers of productivity gains to be achieved through improvement of working	Contractor	ESMD, Communities	Quarterly basis	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring		
		conditions to a level that is safe for young people to work. - Establishing joint worker-employer safety committees, safety representatives and connections to workers' organizations to provide support for young people in the work environment. - Ensuring regular inspection of enterprises regarding workplace conditions and adherence to minimum age restrictions - Training frontline health-care providers to detect and document occupational injuries and illnesses of children These strategies are presented separately but they are interrelated. For instance, most preventive strategies also protect young workers, as is the case with regular monitoring of working conditions.				
Cultural heritage	Project area	Establish a **Chance Finding Procedure** – Inventory of any archaeological finding and unmarked graves	Contractor	ESMD	Quarterly basis	C

Environmental and Social Monitoring Plan

Monitoring will be done throughout the project life. Apart from external expert monitoring, internal monitoring by the project will be done as well as participatory monitoring involving governmental authorities or other stakeholders.

SSEC (ESMD) will have the principal responsibility for environmental and social baseline monitoring during the pre-construction phase.

Environmental and social monitoring during project construction will include two major groups of activities:

- Review of the contractor's plans such as 'storage and construction waste management plan', 'domestic waste management plan', 'health and safety plan', 'emergency medical response unit' and other environmental plans. Monitor implementation arrangements, compliance and impacts.

- Systematic observation to check that contract arrangements by contractors, and other agencies such as government, NGO/CBO, etc. are in fact complied with, and that emerging impacts are properly mitigated.

Both compliance and impact monitoring will be carried out during project operation phase. The compliance monitoring will focus on determining if the prescribed mitigation and enhancement measures in the operation phase are being fully and properly carried out by the project.

Impacts of activities implemented during construction phase and operation phase will be monitored at regular intervals. However, the monitoring intensity during the operational phase will be much lower, compared to the construction phase.

The detailed description of all the envisaged monitoring actions is provided in Chapter 10, subdivided for physical, biological and social environment.

The foreseen monitoring actions for both pre-construction/construction and operation phases are illustrated in tables, providing the following details:

- Project phase;
- Issue or impact to be monitored;
- Parameters to be monitored;
- Location of monitoring action;
- Monitoring frequency
- Identification of the party responsible for the implementation of the monitoring action;
- Cost of the monitoring action.

The most important monitoring parameters included in the *Environmental and Social Monitoring Plan* are provided in the following table:

Table 1-14– Environmental monitoring actions on biological environment

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Impacts on vegetation	- Survey to assess threatened species and habitat distribution and location. - mapping of *Combretum* savanna and *Butyrospermum* savanna. - Assessment of the abundance and distribution of *Oxytenanthera abyssinica*	Areas will be indicated in the Biodiversity Management Plan	Single survey before construction	ESMD / Main Contractor / District Forest Office	5,000
	Impacts on wildlife	Surveys to assess: a. Vultures and other threatened bird species distribution and abundance, roots counts and location, other supplementary feeding stations. b. Bats distribution, diversity and activity levels. c. Human-wildlife conflict	Entire Project Site	Two surveys before construction	ESMD / Main Contractor / District Wildlife Department	20,000
		Number of wild animals and birds affected by traffic accidents involving.	TL and SS Construction sites and vicinity (including the alignment of the access roads	Monthly	ESMD / Main Contractor / District Wildlife Department	Included in the operational costs of ESMD
		Unwanted and illegal activities such as: - On vegetation: logging and poaching with a specific focus on particular areas shall be monitored. If necessary, watchmen will be relocated to vulnerable and sensitive sites. - On wildlife: hunting, poaching, etc. shall be monitored. If necessary, guards may be relocated to vulnerable areas. Monitoring of enforcement of the agreed sanctions for illegal activities.	Entire Project Site	Continuous	ESMD / Main Contractor / District Forest Office / District Wildlife Department	40,000

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
Operation	Loss of resident avifauna (collisions, barrier effect & displacement)	Number and location of mortality/injured birds identified / affected & species of carcass found including whole carcass, decomposed, partial carcass, etc.	Transmission line corridor and its surroundings	Monthly	ESMD / ESMU	Included in the operational costs of ESMD
	Residual impacts after construction to design further mitigation measures	Surveys to assess: a. Birds distribution, diversity and abundance. b. Vultures and other threatened bird species distribution and abundance, roots counts and location, other supplementary feeding stations. c. Bats distribution, diversity and activity levels.	Entire Project Site	Twice per year (in dry and wet season) for five years, after project completion	ESMD / ESMU	100,000

Table 1-15 – Social monitoring actions

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Land Acquisition	– Performance monitoring against timetable (Public meetings held; Census, assets inventories, assessments, and socioeconomic studies completed; Grievance redress procedures in place and functioning; Compensation payments disbursed; Housing lots allocated; Housing and related infrastructure completed; Relocation of people completed; Income restoration and development activities initiated; Monitoring and evaluation reports submitted). – Impact monitoring such as livelihood restoration against the baseline Assessment of PAP satisfaction	Acquired Areas	– Quarterly Basis for performance monitoring. – Semiannual basis for impact monitoring	SSEC	Included in RAP Costs

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
	Equity in local employment benefits / minimize social conflicts.	– Disclosure of contractor recruitment plan at Site offices and to Chiefs of Affected Villages – Percentage of workers hired from all nearby communities. – Percentage of workers belonging to disadvantage groups – Grievances – Records of specialized training for local staff provided by contractor. – Certificates from contractor issued to employees (copied to SSEC) detailing training received / new skills acquired while employed.	Project area and affected villages	Quarterly Basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Labor grievance mechanism	– Established of grievance mechanism shall be documented. – Complaints log and resolution action must be recorded.		On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Protecting the workforce	– Regular weekly work hours, rest periods, lunch, etc. – Overtime limits and exceptions. – Hour averaging minimum wage. – Overtime requirements and conditions. Labour contract provisions. – Social system payment liability. – Annual leave – Laws to protect disadvantaged workers. Severance pays. – Number and frequency of accidents. – Number and frequency of near misses. – Cases of illness due to working conditions. – Copy of training certificates.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
	Maintain the wellbeing of workers living in camps	– Worker camps audit reports as per CHECKLIST ON WORKERS' ACCOMMODATION (IFC Workers Accommodation Standards 2009) – corrective measures and action plan, – Photographs demonstrating corrective measures implemented.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Labor and Community Health and Safety – Sexual Transmittable Diseases – Vector Borne Diseases – Respiratory Disease	– Number of STIs treated. – Attendance list of induction meetings and HSE induction material which raises malaria, dengue and other VBD or STD awareness and preventative measures. – number of TBs treated	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Community Grievance Mechanism	– Documented grievance mechanism established. – Maintenance of complaints log and resolution process.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Occupational and community Health and Safety	– Contractor HS internal audits and statistics. – Records of accidents and near misses. – Record of illness, diseases. – Record of grievances. – Record of emergencies. – Informal feedback on effectiveness of Occupational and Community HS plan.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Restrict access to sites, especially hazardous areas	Provision / review of the following documentation: – Description / photographs of fencing / signage around site perimeter. – Contractors to provide SSEC with CV and training certification of security personnel proposed as per contract requirements.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
		– Site registry identification system.				
	Occupational and community Health and Safety Minimize traffic hazard within community	– Road Safety Plan documentation including identification of maximum speed limits for site and access routes. – Requirement for contractor program of monitoring – Reporting of accidents and statistics inclusive in HS performance records. – Community training on safety – Signs for local communities – Document traffic safety sessions and maintain session schedule. – Maintain attendance register.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Local Market distortion Avoid distortion of local food prices and necessities due to influx of workers and followers	– Pre-project and project local market prices for food, services and entertainment. – No. of vulnerable groups in comparison to the pre-project level. – Income level and living standard conditions in comparison to pre-project level.	Local Markets	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Vulnerable Groups GBV	– Safety Audits through key informant interviews, FGD – N and Records of the awareness Trainings – Men & Boys Self-Assessment Form – Awareness Raising – No. of qualified experts involved in the management and follow up of issues related to GBV – GRM log – No. of cases registered or reported by Health care providers	Project Area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
	Cultural Heritage	Reporting / notification of finds to the Archaeological Heritage Office	Project area	On monthly basis	Contractor	-
	Cultural Heritage/tombs	– Records from Chance Finding Procedures – Photographs of findings – Remediation measures adopted – Payment completion – Relocation completion – Records of meeting	Construction site / excavation sites	Pre displacement and post displacement	SSEC (ESMD)	Included in the operational costs of ESMD
	Stakeholder Engagement	– Records of public meetings, FGD, meeting with authorities, meeting with workers and community, dissemination of information.	Project area	Quarterly Basis	Contractor / SSEC (ESMD)	Included in the operational costs of ESMD
	Security Social Conflicts	– No. of accidents, violence, strikes, brutal death – Way of dispute solution – Interviews with key informants – Evidence of training of security staff on Voluntary Principles on Security and Human Rights (VPSHR)	Project area	On monthly basis	Contractor / SSEC (ESMD)	Included in the operational costs of ESMD

Budget

An indicative budget for the environmental and social mitigation, management and monitoring measures of the project impacts of the South-Sudanese stretch of the Uganda-South Sudan Interconnection is included in the ESIA study.

In the following table the overall summary of the environmental costs to mitigate, manage and monitor all the impacts considered in this study is given. In this table also 10% contingency costs are also considered.

Table 1-16 – Budget Summary of Environmental and Social management and monitoring activities included in ESMP.

ITEM	US $
Physical environment management measures	705,000
Biological environment management measures	1,010,000
Social environment management measures	885,000
Overall management measures	**2,600,000**
Physical environment monitoring measures	340,000
Biological environment monitoring measures	165,000
Social monitoring measures (included in operational cost of ESMD)	-
Overall monitoring measures	**505,000**
Operational Cost of ESMD	**300,000**
Total	**3,405,000**
Contingencies (10%)	340,500
GRAND TOTAL	**3,745,500**

(*) Resettlement Action Plan (RAP) costs are excluded from this ESMP budget

The overall environmental and social cost of project implementation represent the 2.3% of the project development costs (159,892,000 US$).

2 INTRODUCTION

2.1 Project Background

The countries within the Nile Basin Initiative and Eastern Africa Power Pool (EAPP) are building their interconnected electricity networks at several voltage levels including 132 kV, 220 kV, 400 kV as well as 500kV HVDC. The proposed 400 kV AC Overhead Transmission Line between Olwiyo (Uganda) and Juba (South Sudan) is an important additional asset to facilitate regional integration of electricity networks and facilitate power trade.
The proposed transmission line includes a first section in South Sudan from Juba to Nimule/Elegu (at the Uganda/South Sudan Border) which is estimated to cover a distance of 170 km, and a second section in Uganda from Nimule/Elegu (close to Bibia) and Olwiyo, with an estimated length of 138 km.

2.2 Overall objectives of the project

The ultimate goal of the project is regional integration by improving the livelihood of the people as well as the quality of the socioeconomic development environment for South Sudan and Uganda through increased availability and affordability of electricity supply.
The purpose of the Project is to improve access to electricity in South Sudan and Northern Uganda through increased cross-border sharing of power. Outputs of the preparatory activities would enable the NELSAP, the South Sudanese and the Ugandan involved stakeholders to take the necessary steps to have the transmission line constructed.
The required scope of work in the South Sudan section is summarized as below:

- **Construction** of the **400 kV HVAC Over Head Transmission Line (OHTL)**, double circuit configuration, 1100 MVA rated capacity, 2-bundle conductors, 149 km long, from Uganda border to Juba S/S;
- **Construction** of the completely new 400/220/132/33kV **Juba substation**, located in the proximity of Nesitu.

2.3 Objectives of the ESIA study

The Environmental and Social Impact Assessment (ESIA) is a procedure for establishing which impacts a proposed project is likely to have on the environment and for recommending changes to the project to minimize any predicted negative impact. The goal of the Environmental Impact Assessment activity is to evaluate the temporary and permanent impact of the project on the natural and human environment and to propose mitigation measures.

The activities proposed as part of the Project, the prevailing legislation and the receiving environment were assessed to determine the level of assessment required. In terms of AfDB guidelines, a full ESIA is required and as the global standards require adherence to host country standards as a minimum, this is then a Category A project in terms of the IFC Performance Standards and a Category C (Projects that will have a significant impact on the environment) according to the South Sudan Draft Environmental Protection Bill.

The specific objectives of the ESIA are:

- To characterize the project area using scientific methods of environmental and social analysis and undertake baseline studies on the environmental, social, economic and cultural conditions in the project area;

- To identify, analyse and evaluate the type and extent of likely potential environmental and social impacts of the proposed project with emphasis on duration, significance, magnitude and distribution of beneficial/adverse effects of the planned project on the existing biophysical, socio-economic and cultural components, and assess the capacity of the institutions responsible for management of these impacts;
- To provide mitigation measures for the identified environmental and social impacts and where residual impacts are predicted, a plan for their management including but not restricted to offsets, action plans etc should be included;
- Evaluate the social and socio-economic aspects of proposed project, identify stakeholders, carry out public consultations, including potentially project affected persons (PAPs), analyse their views regarding the environmental and social impacts, design social provisions and measures, formulate strategies for participatory implementation, and recommend the incorporation of the findings into the project design;
- To assess the best alternative project option with most benefits and least costs in terms of financial, social, and environmental considerations;
- To develop the Environmental and Social Management Plans (ESMP). The ESMP shall outline the mitigation/enhancement, monitoring, consultative and institutional strengthening measures to prevent, minimize, mitigate or compensate for adverse environmental and social impacts and to enhance beneficial impacts, costs of the measures and monitoring requirements;

2.4 Structure of the Report

The Preliminary Environmental and Social Impact Assessment is organized as follows:

- Section 1 – Executive Summary;
- Section 2 – Introduction;
- Section 3 – Project description;
- Section 4 – Analysis of the Project alternatives
- Section 5 – Legal and Institutional Framework;
- Section 6 – Stakeholder engagement and Information disclosure;
- Section 7 – Environmental and Social Baseline;
- Section 8 – Environmental and Social Impacts;
- Section 9 – Environmental and Social Management Plan
- Section 10 – Environmental and Social Monitoring Plan
- Section 11 – Budget and Schedule
- References and Annexes

2.5 ESIA Team

An interdisciplinary team of International and National experts has contributed to the Preliminary Environmental Impact Assessment Report. Their names are listed below.

- Ettore Romagnoli – Lead Environmental Planner
- Paola Chiodi – Lead Social Development Specialist
- Pietro Macchi – Archaeologist and Cultural Heritage Expert
- Thomas Francis Lado – Zoologist
- Mekonnen Biru – Botanist
- Clement Okumu – Ecologist
- Joel Nyamwya – Land Economist

3 PROJECT DESCRIPTION

3.1 Background on South Sudan power sector

South Sudan has one of the lowest electrification rates in the world; only 7% of its population had access to electricity in 2020, according to the latest estimates from the World Bank. Those connected to the power network experience frequent blackouts or forced load shedding, which makes standby generators necessary to meet energy needs. There is no inter-connected grid system in South Sudan, although the government has indicated plans to develop a national grid.

Juba's existing electrical distribution system consists of 33 kV network around Juba and 0.415 kV connected to consumers. At present, it has electric supply system based on fossil fuels (mainly diesel or HFO) based generators with rated capacity of 17 MW at Juba Power Station, which is currently out of operation. Juba is currently being supplied from Ezra Power Plant across the river with a capacity of 33 MW. This power is transmitted through 33 kV network to Juba Substation. The load demand is expected to increase and since Ezra Power supply might be overstretched, there is a need to venture into other sources of energy including regional interconnection.

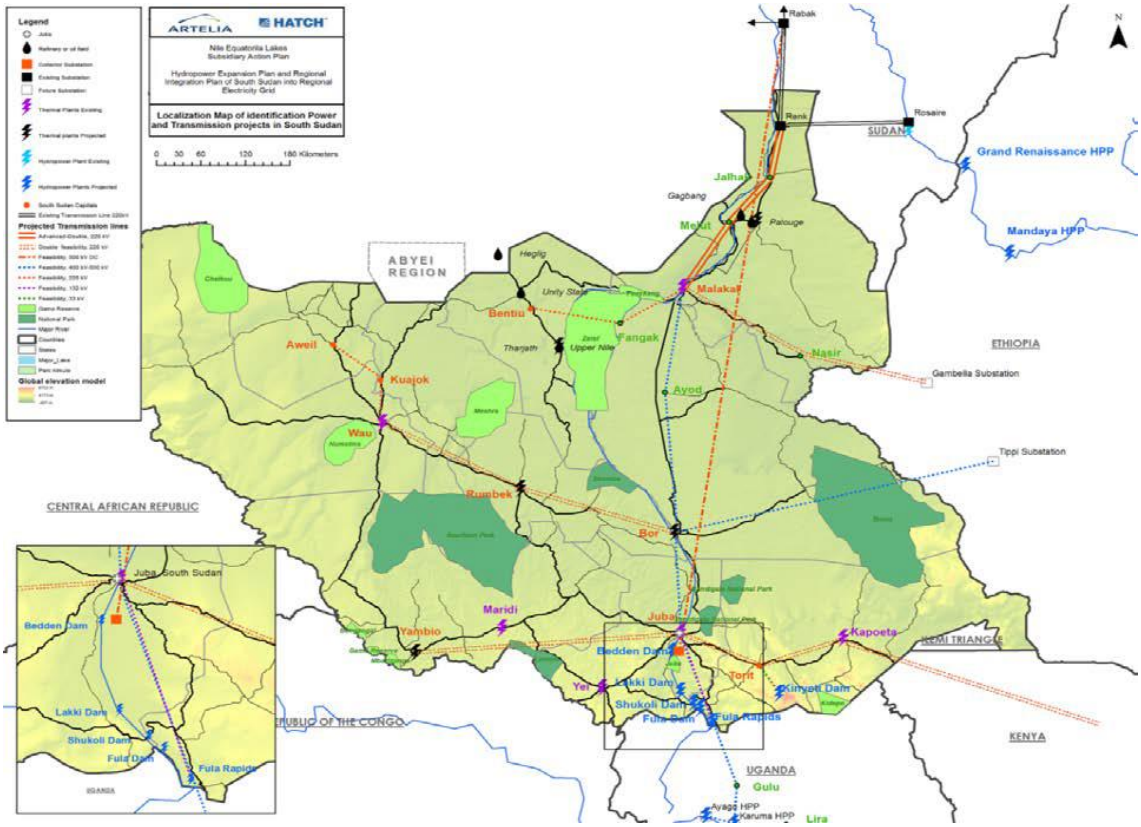


Figure 3-1 – Power Transmission Network in South Sudan (source: Terms of Reference).

3.2 Description of the Power Interconnection Project

The Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection Project aims at contributing to the economic development of South Sudan in particular and to the regional integration of Uganda and South Sudan to aid in power trade in general. This Project was prioritized by the Governments of South Sudan and Uganda under Nile Basin initiative (NBI) and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP). It was also prioritized in the Regional Integration Plan of South Sudan into Regional Electricity Grid completed in July 2015 as well as in the EAPP master plan study of 2014.

In the South Sudan section, the proposed Interconnection Project envisages the following components:

- **Construction** of the **400 kV HVAC Over Head Transmission Line (OHTL)**, double circuit configuration, 1100 MVA rated capacity, 2-bundle conductors, 149 km long, from Uganda border to Juba S/S;
- **Construction** of the completely new 400/220/132/33kV **Juba substation**, located in the proximity of Nesitu, designed to have enough space in the future to receive connection from Ethiopia and transmission to the states in the Country, as well as to connect future hydropower plants.

The specific objectives of the Project include:

- Provide transmission capacity to cater for grid interconnection between Uganda and South Sudan and its neighboring countries,
- Provide transmission infrastructure to cater for grid interconnections to other Nile Basin Initiative countries upstream and downstream.
- Promote regional cooperation through sharing of power generation resources i.e. cross-border electricity trading (promotion of electricity markets).
- Improve security in the project area by providing stable power supply
- Facilitate rural electrification and improvement in the standard of living for the population in the project areas.
- provide a stable power supply to the South Sudan around the Capital Juba and the Ugandan communities near the border in order to improve businesses for social and economic development of the project area;
- Poverty reduction and improvement in the standard of living by providing electricity needed for health, education, clean water and communication infrastructures.
- Reduce dependence of South Sudan on thermal power thus reducing carbon emissions

According to the energy generation and demand forecast scenarios analyzed in the Feasibility Study, the energy flowing on the interconnection is expected to increase more and more over the interconnection project lifetime.

In the first period of operation of the interconnection, until 2038, the energy is expected flowing from Uganda to South Sudan, due to the significant increase of the demand and the lack of generation in South Sudan.

In the second period of operation of the interconnection, after the development of the transmission grid in South Sudan and the interconnection between Ethiopia and South Sudan, Uganda is expected to import from the interconnection with South Sudan.

In addition, Juba substation will play a very crucial role allowing connection of the new planned hydro power plants, the development of the transmission grid towards the other countries of South Sudan and the development of the interconnections towards Ethiopia and Kenya. In this phase, South Sudan will

play a crucial role in the development of the energy trade for the Eastern African Power Pool (EAPP) power system.
In accordance with the Terms of Reference, the consultancy assignment will involve conducting Feasibility Study, Detailed Design, Tender Documents, Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection Project.

The main features of the 400 kV Power Interconnection Project are inferred from the preliminary studies and design conducted in 2020 on the Ugandan section of the project, from Olwiyo to Elegu (at the Uganda – South Sudan border).
The 400 kV transmission line envisages the use of lattice towers. The steel monopoles are not used since there are no major stretches of fragile ecosystems affected to warrant the use of such structures.

The steel lattice towers are the commonly used type worldwide. Tension towers were proposed to be used at angle points, dead end points, at points where the local topography demands it, and at intervals of approximately 5km along straight stretches of line. They are designed to take horizontal and vertical loads and thus, are heavier than the suspension towers.

Concrete pad and chimney foundations shall be used for the towers though raft foundations may be required for some locations especially around areas where the water table is high (wetland ecosystem), if erecting towers in wetlands is deemed necessary. The towers will be about 30-33 m in height, although the specific height of the towers may vary depending on the topography and other factors. The distance between towers will vary between 300-450 m.

The corridor for the 400 kV transmission line is 60 m (see Figure 3-1), according to the standards of Uganda (UETCL Policy): 10 m for the Right of Way (RoW) and additional 25 m of Wayleave to each side of the RoW.

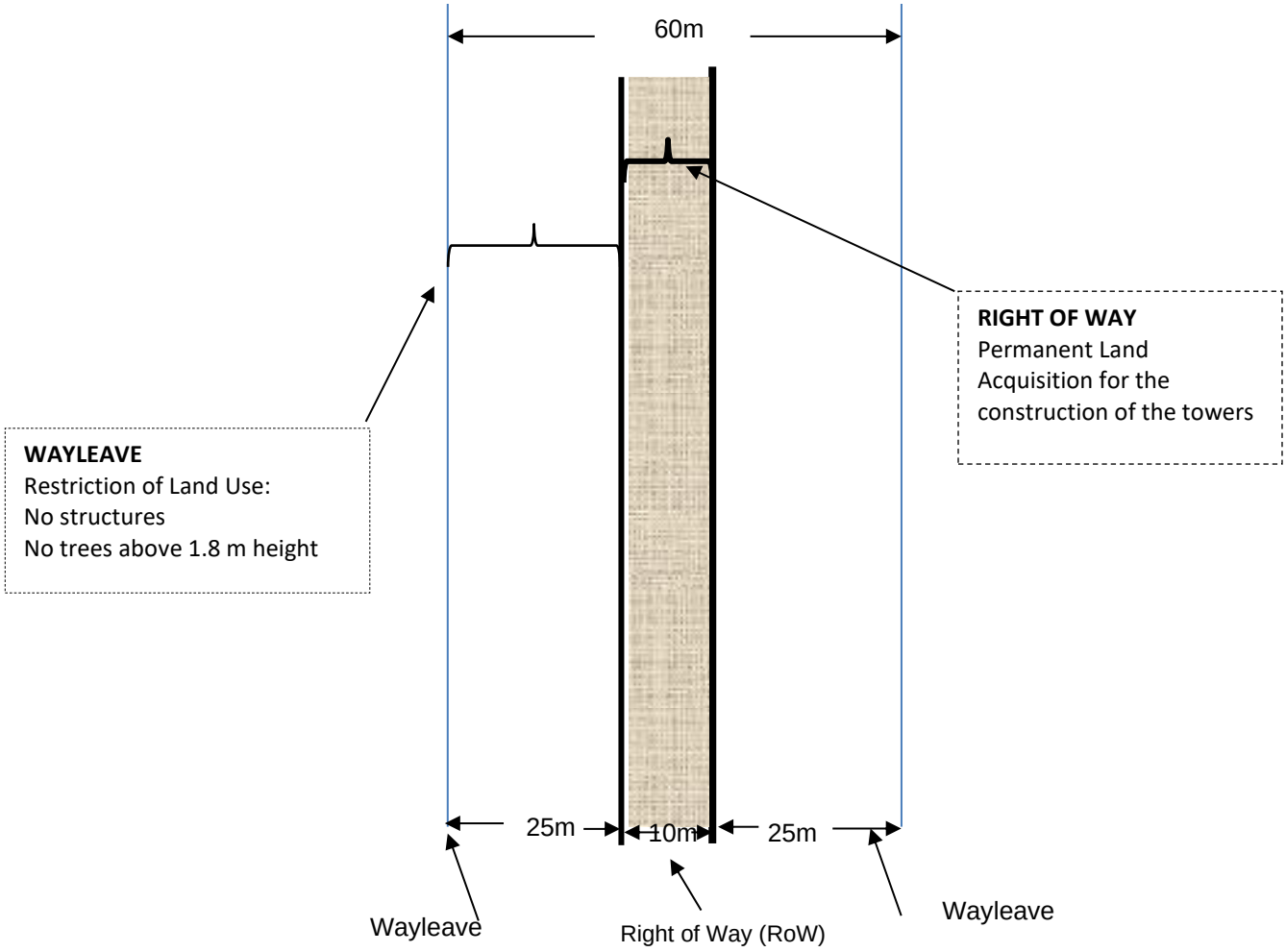


Figure 3-2 – Representation of the Right of Way and Wayleave (according to standards of Uganda, UETCL).

RoW of 10 m is enough for both the access track and the four legs of towers, and will be acquired permanently and ownership transferred to the project proponent. As per the UETCL's Wayleaves Policy, the wayleave is the strip of 25m on either side of the right of way, is recognised as the safety corridor outside of which negative impacts from transmission lines (electro-magnetic fields and corona-noise effects emitted from the line) are assumed to be negligible.
No permanent structures, such as buildings will be allowed to remain or be constructed within the corridor.
Within the wayleave, growth of crops will be permitted, but limited to a height of 1.8 m (6 feet) or less, thus mostly annual crops and low growing perennial crops.

The land required for the wayleaves will remain under the ownership of the owners and no transfer is required. However, a percentage of the value of land will be paid for restricting (instituting an encumbrance) owner from planting trees and installing permanent structures on the land.

3.3 Site Location and Extent

The project will be located in Equatoria Region, crossing the states of Eastern and Central Equatoria. Each State is subdivided into counties, which are further divided into Payams, then Bomas. Each county is led by a County Commissioner, appointed by the State Governor in consultation with the President.

The Counties that will be interested by the project will be mainly Juba (Central Equatoria) and Magwi (Eastern Equatoria).

A primary road connects Nimule with Juba to its north, with branching roads connecting (across the river) to Kajo-Keji town (Kajo-Keji County) to its northwest and Magwi town to its northeast. These roads were open during both the rainy and dry season in 2019, according to the Logistics Cluster.

The project will cross the following administrative boundaries.

Table 3-1 – Payams affected by the Project

State	County	Payam
Central Equatoria	Juba	Gondokoro
Central Equatoria	Juba	Lokiliri
Central Equatoria	Juba	Lobonok
Eastern Equatoria	Magwi	Pageri
Eastern Equatoria	Magwi	Mugali

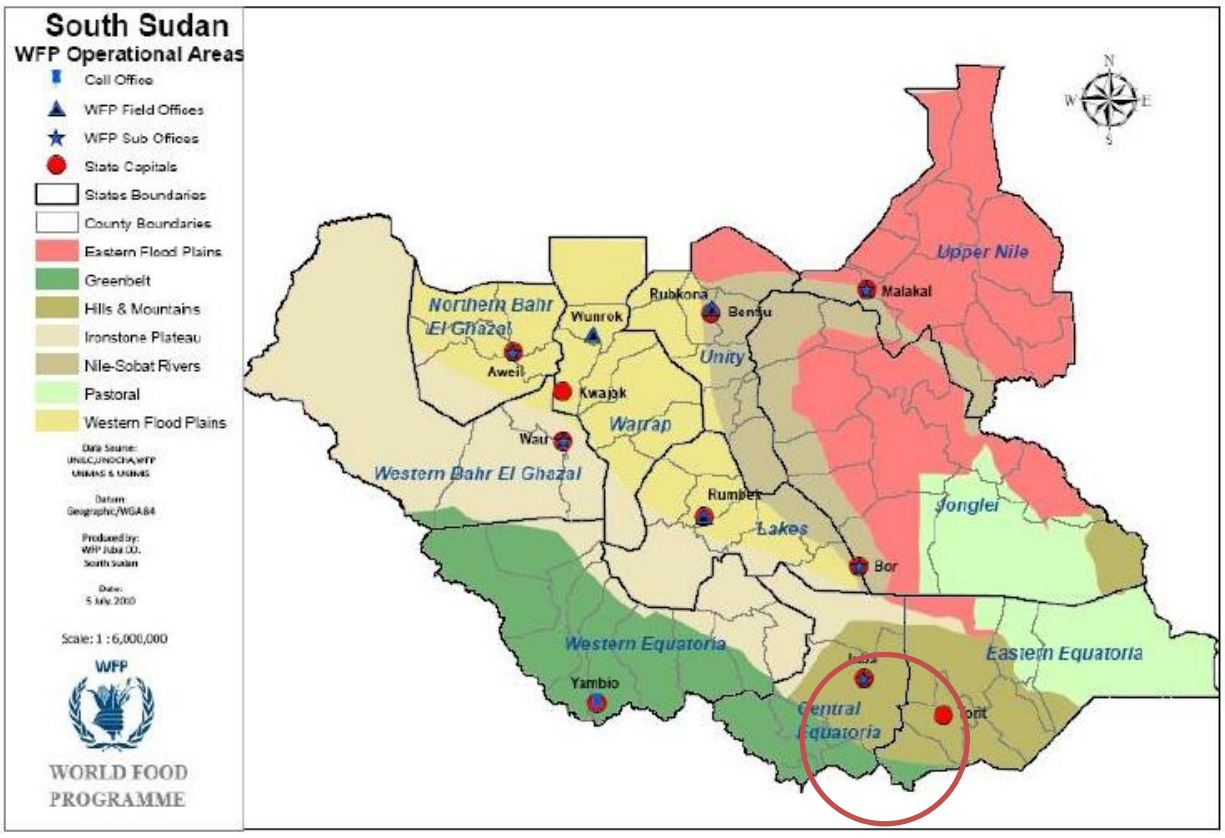


Figure 3-3 – Map of South Sudan with indication of Project area.

3.4 Project features

For the South Sudanese section, the proposed 400 kV transmission line route has been defined in two steps:

- comparison of three different alternative alignments, based on environmental and social criteria, and consequent selection of the best option, as presented in Chapter 4;
- optimization of the selected line route, based on the verifications and findings acquired during the field reconnaissance.

The approximate length of the proposed transmission line is 149 km. The line route runs outside the boundaries of the Nimule National Park, near the South Sudan – Uganda border, and then roughly follow the route of Juba – Nimule Highway (A43). The proposed transmission line alignment is shown in Figure 3.4.

The interconnection project envisages also the construction of a new 400/220/132/33 kV Juba Substation, located in the proximity of Nesitu.

Three different substation location were initially compared from the environmental and social points of view, as described in Chapter 4. Then, based on evidences from the site reconnaissance, a fourth location has been proposed (named Option 3bis), which is currently selected as the preferred one.

The proposed substation site is located on the southern side of the Juba – Bor – Malakal Highway, just outside Juba and approximately 9 km east of the A43 bridge on White Nile. It is shown in Figure 3-5.

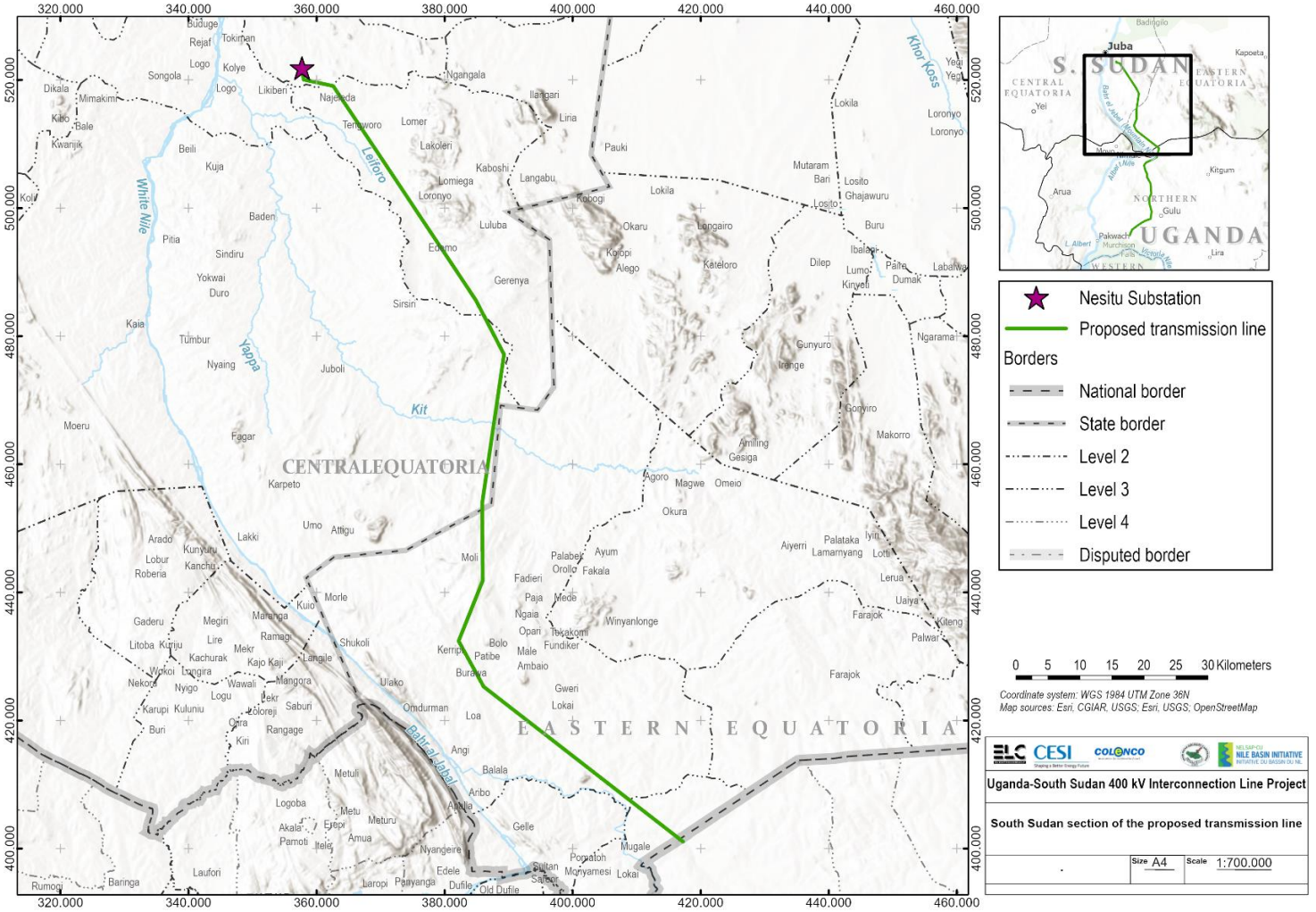


Figure 3-4 – Proposed transmission line route for the South-Sudanese section of 400 kV Interconnection project.

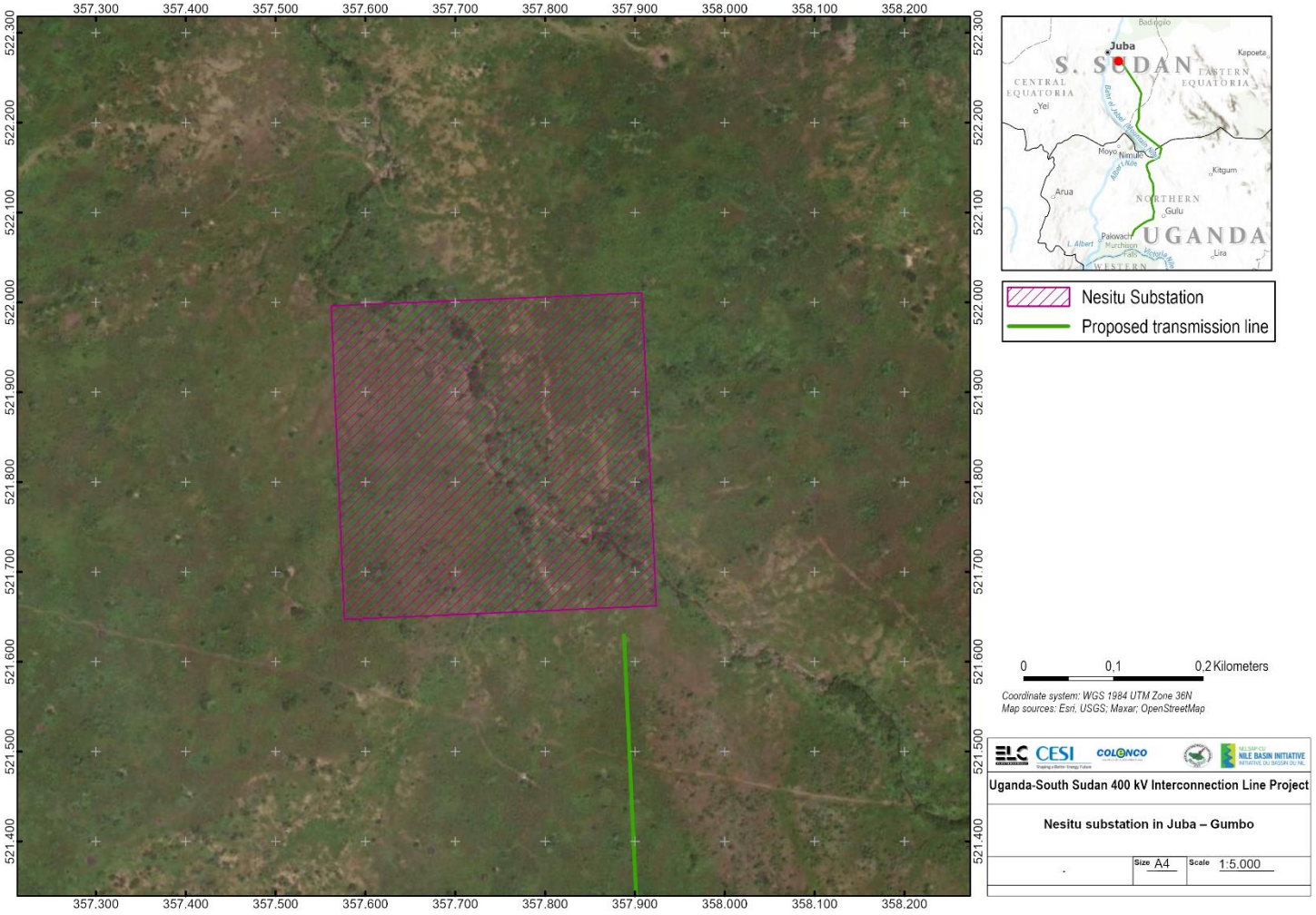


Figure 3-5 – Proposed 400/220/132/33 kV Substation site in Juba – Gumbo.

3.5 Project Area of Influence

The project **Direct Area of Influence** (AoI) is defined through consideration of the project footprint including the Transmission Line corridor (Right of Way and Wayleave), the Substation, the access roads and all ancillary project components.

The **Indirect Area of Influence** (IAoI) of the project is determined by biological and ecological factors, including the movement of species through the environment that may be affected by the project. It has been identified as a 1 km habitat connectivity zone surrounding the project footprint. This decision was based on data gathered during field surveys, particularly considering the movement patterns of species that might be impacted by the project.

Annex 1 provides a map of the project Direct Area of Influence overlapped on satellite imagery.

Table 3-2 – Project area calculations

Project Area	Area (ha)
Right of Way (RoW)	148.77
Wayleave	743.96
RoW + Wayleave	892.73
Direct Area of Influence	904.84
Indirect Area of Influence	29888.97

Table 3-3 – Calculations of area of direct influence in relation to administrative boundaries.

State	County	Payama	Area (ha)
Central Equatoria	Juba	Gondokoro	49.64
		Lokiliri	259.45
		Lobonok	186.15
Eastern Equatoria	Magwi	Mugali	57.77
		Pageri	351.83
		Total	***904.84***

3.6 Project Phases

3.6.1 Pre-construction Phase

Pre-construction activities associated with design work include geotechnical investigations and detailed survey of the transmission line route and substation location. Before entering in the construction phase, the transmission line corridor (including Right of Way and Wayleave) shall be marked and acquired by the Project proponent.

For the overhead transmission line, it is expected that the towers will be of lattice steel type, with each tower requiring four reinforced concrete foundations. The foundation depth and design will depend on the findings of the geotechnical investigations. The exact bearing capacity has to be determined from

soil investigation at the site. The design and selection of tower foundations and earthing depends on the findings of geotechnical investigation, to be carried out at transmission line angle points in this phase.

3.6.1.1 Land acquisition and resettlement

Land acquisition is required for the proposed project, mainly for the 10 m Right of Way which must be cleared of vegetation and obstacles to a certain extent (bush clearing) and for the construction of an access road (where it is not feasible to use the existing adjacent access road).
A process is required to identify, consult and compensate project affected persons (PAPs) for any physical or economic displacement as a result of project activities. This is undertaken through a Resettlement Action Plan (RAP).
The resettlement process includes two main phases: planning followed by implementation. Stakeholder engagement will run in parallel alongside these activities and build on what was undertaken during the ESIA. It may be in the form of key informant interviews, focus group meetings, public meetings, public sharing of documents and information, and consultation with individual households. Thereafter 'after project' community support, overlapping with the construction and operational phases, is required to ensure the resettlement is effectively implemented.

3.6.2 Construction Phase

The construction activities of the overhead transmission line (OHTL) include the following:

- Clearance works for the Right of Way (RoW) prior to the installation of the towers;
- Construct the site access tracks and Contractor's site camps;
- Storage and transportation of equipment and materials;
- Tower spotting;
- Construction of access and tower corridor tracks;
- Tower foundation and erection;
- Installation of tower suspension accessories: they are erected manually by hauling the accessory using chain pulley;
- Stringing of pulling line over each stringing block for the conductor: the pilot wire is manually strung over valley in mountainous area which is attached to power cable. The pilot wire is sometimes shot using winch or through drones;
- Tensioning and sagging of conductor: tension and sag corrected using manual winch, chain pulleys, bull wheel type pullers and other associated equipment;

The construction activities of the substation include the following:

- Site preparation: including but not limited to: site clearance (limiting ground disturbance to existing networks during site preparation), fences construction, preparing site camp, preparing access road (if needed) for moving construction material and machineries and temporary storage of construction materials, machineries, etc.
- Besides the site preparation, the approvals or the permissions from the competent authorities and surrounding establishments shall be obtained.
- Construction of concrete works: (footing, foundations, SS framework, support structures and equipment) and other concrete construction for OHTL path, etc.
- Construction of Supporting buildings: including administration building and facilities, control room, etc.
- Erection of the equipment: including transformers, switches yards, electrical panel, etc.

- Waste management: including generated domestic and construction waste (hazardous and non-hazardous). This activity will include waste identification, temporary storage, handling and transportation to the designated landfill.

3.6.3 Operation Phase

Once the transmission lines are constructed there is relatively little ongoing maintenance required. The key maintenance activities will involve surveillance of the condition of the transmission line and way leaves; emergency maintenance and repairs; and vegetation maintenance activities. Vehicular access to sections of the way leaves during O&M will be for supervision, monitoring and to carry out line repairs when needed.

Cropping and grazing beneath the conductors is normally permitted. Outside agriculture areas or otherwise cleared areas, undesirable vegetation within the way leaves will be controlled by cutting. Herbicides will not be used in vegetation control. The vegetation clearance in the weaves will take place in accordance with existing wayleaves clearance programme which allows it to be done once annually.

As for the substations, their normal operations will generally be manned by 3-5 operational staff whose work will be to monitor and guard the installations. There will be modest public health facilities to serve such staff in the substations. The majority of traffic to and from the substation will be light vehicles, i.e. no regular loads greater than two tonnes, and should be no more than five vehicle movements per day.

The transmission system will be almost free from noise, and emissions will be limited to a low hum. This will not be noticeable from within buildings outside the substation site.

At the substation, the regular maintenance will be limited to annual cleaning and checking of circuit breaker connections, and will require a team of approximately five engineers and semi-skilled workers, for approximately one week. Regular/routine changing of transformer oil will not be required.
Other maintenance activities that could be required at the substation include:

- General check: for the fitting, oil quality, performance of the transformers, gas insulation quality and quantity etc.
- Oil filtration: during operation of the GIS/AIS substation. Please note that during the operation and maintenance, it is expected to generate limited amounts of the rejected oil, since oil is generally filtered using the oil filter machine available at the SS site.
- Transformer replacement: Due to the increased power demand at some areas, the owner may change the transformer. The old transformer would be reused at other SS with less demand on electricity.
- Replacement of cables and insulators: the old and rejected insulators, OHTL cables, etc.
- Waste management: including the generated domestic waste and rejected waste (rejected cables and spare parts). The waste management will include waste identification, temporary storage, handling and transporting to the designated landfill.

3.6.4 Decommissioning Phase

It is anticipated that the transmission facilities will be continuously maintained and repaired, and will be operated for several decades. Because of its long useable life, the circumstances under which it might ultimately be decommissioned are difficult to foresee at this stage.
Project facilities such as towers, cables and substation equipment have long lifespans. However, following their useful lifespans they may become less effective to continue operation, become difficult to repair or simply obsolete. In such an event, it can be deemed necessary to replace existing project equipment with new project equipment on the same site or abandon the line altogether.

The major components that will be required for decommissioning of a transmission line after its lifespan include:

1. Transmission line components removal;
2. Electrical systems removal;
3. Structural foundations removal;
4. Re-vegetation.

General decommissioning guidelines are provided below. However, it is noteworthy that the specific requirements and approach for each activity may not be as exactly as it was before commissioning because the technologies and construction techniques available when the project will be decommissioned may have changed.
Assuming the transmission line has gone through its useful life and no longer serves a useful purpose for the area, it will be disassembled and removed. Initially the conductors will be de-energized, removed from the tower hangers, collected and be transported and disposed-off in accordance with relevant national waste management regulations and guidelines applicable at the time of decommissioning. The lattice steel tower components would then be disassembled and removed, including grounding rods. Using lifting cranes, tower sections would be loaded in trucks and managed in accordance with relevant national waste management regulations guidelines applicable at the time of decommissioning.
The disassembly and removal of substation equipment will essentially be the same as its installation, but in reverse order.
The areas around the transmission line towers, along with any access roads that were necessary, will be reclaimed. When towers are removed from their foundations, the foundations need to be removed too so as to enable re-vegetation of the land. The concrete and steel in the foundations will be broken-up and removed to appropriate depth. All concrete and steel debris will be removed from the site and disposed-off as per National and financier's guidelines. The excavated lattice tower foundations are to be backfilled with soil material.

A re-vegetation plan is to be prepared following the project useful lifespan for re-vegetation of the project footprint. This plan is to be prepared in collaboration with a botanical expert and the following elements are to be considered in its preparation:

- Best native plant species to be chosen for restoration;
- Best time for re-vegetation depending on species to plant and habitat to restore;
- Preferential habitats for endangered species.

Reclaimed areas will then be re-vegetated according to the plan.

3.7 Project components

3.7.1 Access Roads

To the extent feasible, access to the transmission line wayleaves and substations will be gained largely by use of existing public highways and access roads. Where the planned transmission line follows the existing transmission line, the existing access tracks within such way leaves will be used. Access to the new tower locations will be gained via a short 'spur' from such way leaves.
The right of way may also be used by the project proponent for building a maintenance road along the whole alignment, linking all pylons. This requirement however depends on the accessibility of the area and level of theft and vandalism of tower structures in the area. Where there are high incidents of thefts of tower parts and vandalism, the access road is required for rapid response and reconstruction.

The access roads leading to the transmission line corridor and substations will be constructed where they are absolutely necessary. However, where there are no existing access tracks, an access track (single carriage) of approximately 5 m width will be cut through vegetation along the way leaves following the centreline of the way leaves. To the extent feasible, in areas of the way leaves outside the access tracks, clearance of vegetation will be minimized.
No paved access roads would be constructed, unless there are steep sections of the route where erosion is a risk. Generally, the access track would be a single dirt track with limited earthworks to protect the road and surroundings from erosion.
According to recommendations in the ESIA report, no permanent access roads will be built in wetland areas. If there is any temporary access requirement in wetlands, all construction activities should happen during the dry season. All temporary access roads will also be decommissioned after construction activities in order to minimize permanent line footprint in sensitive ecosystems.
The additional access road designs/routings will be determined by the Contractor prior to construction. They are excluded from the present ESIA's scope.

3.7.2 Clearing of the Right of Way

A permanent area (60m in width, i.e. 5 m Right of Way + 25 m of Wayleave per each side from the centre line, see Figure 3-2) of land will be required to accommodate the transmission line, when completed. A parallel strip of land through those sections of the route which pass through vegetation shall be completely cleared of all trees, scrub and undergrowth vegetation during the construction stage.
Routine maintenance is carried out along the RoW to ensure the appropriate clearances between towers, conductors and vegetation and other objects are maintained according to the required safety/operation specifications listed above. A 5m wide path along the line route will be required in the absence of a public road. Maintenance is normally carried out twice a year (dependent on site conditions).

3.7.3 Foundations

Following construction of the access tracks and the clearance of the Right of Way, the construction of the overhead lines would begin with the construction of the foundations for the towers. Tower foundations will vary according to the prevailing geology. In flat or moderately hilly areas, the foundations would generally comprise either standard pad and chimney, concrete block designs or be piled depending on ground conditions.
For the majority of towers, pad and chimney foundations will be used, which will be excavated mechanically. By this method, a concrete pad will be constructed at the bottom of the excavation, and each foot of the tower erected within its own 'chimney' of steel reinforced concrete. After 48 hours, the form work will be removed, and the excavation will then be back-filled to original ground level and compacted.
Pre-mixed concrete would be delivered to site along with steelwork for the foundation frames and bases. The foundation would comprise reinforcing steelwork cylinders encased in concrete.

In areas that may be prone to seasonal flooding and wetland areas, a raft foundation for transmission line towers will be used. The raft foundation is similar in concept to the pad and chimney foundation, except all four feet of each tower will be set on a single raft of concrete. If the tower is sited upon hard rock, a minimal foundation only is required. Any required excavation of rock will be carried out by drilling, barring, wedging or use of compressed air tools. It is not anticipated that blasting will be necessary.

Additional temporary land will be required for worker camps and storage of construction materials during the dry season as well as the line corridor.

3.7.4 Tower structures and equipment erection

All the towers of the transmission line will be constructed prior to the installation of conductors.
The tower structure is primarily made of lattice steel bolted together. The Tower shape will be designed for vertical arrangement, Lattice steel self-supporting double circuit towers will be used.
The positioning of the conductors and of the earth-wires on the tower shall be determined considering the following clearances:

- Clearance to ground and obstacles.
- The clearances between tower's live and earthed parts.
- The clearances between the conductors and between conductors and earth-wires in mid-span and still air.
- The earth-wire's shade protection angle.
- Clearances between conductors at structures.

Upon delivery of the steelwork from the storage yard to the tower location, erection of the transmission towers will proceed using a winch and gin pole. Typically, the gin pole will be supported on one leg of the tower while the sections are bolted on. The gin pole will then be lifted to a higher attachment point to repeat the process.
The modular lattice towers would be erected in sections, with a mobile crane. The insulators would be fastened to the towers in preparation for the installation of the conductors.

3.7.5 Conductor stringing

Once the towers are erected, the conductors and shield wires will be strung and tensioned with specialized equipment to achieve the designed sag. The conductor lines would be delivered to site on drums using HGVs and would be installed in sections between tension poles using tensioning and pulling machines.
Stringing is carried out first by hanging a pilot wire from each tower, connecting the pilot wires together, and then using the pilot wire to draw the conductor along the insulators. This is normally done in sections of six to seven km at a time. Guard structures will be used when installing the conductor over highways, main roads, waterways, railroads or any overhead power or communication lines to ensure the conductors do not cause a hazard to the public or the construction staff.
Compression dead-ends and splices will be used to secure the conductor to certain towers and join sections of conductor. After the conductors and shield wires are attached to the insulators or clipped to supports, the lines will be sagged to the proper tensions, and fitted with vibration dampers.

Scaffolding may be required in some instances to protect members of the public and assets from overhead line construction works. Items that may require protection include roads, tracks, railways, buildings, and lower voltage overhead lines. Scaffolding would be assembled in situ prior to stringing or other works on the overhead lines. Where scaffolding is not used temporary road closures would be used.

A number of tests will be undertaken to ensure that the line performs to specification. During testing, line ground clearance will also be thoroughly checked. Once construction of the transmission line is completed, the soil along the right-of-way will be assessed for problems such as erosion or compaction, and corrective action will be taken as appropriate.

3.7.6 Substation

Detailed technical analysis and power system studies are required to determine the orientation of equipment and the extension of the new substation.
During selection of the substation site, several factors are put into consideration which include:

- Sufficient land area required for installation of equipment with necessary clearances for electrical safety, and for access to maintain large apparatus such as transformers.
- Enough space for expansion due to load growth or planned transmission additions.
- Very low environmental effects such as drainage, noise and road traffic.
- Other factors to be considered is calculation of Grounding (earthing) and ground potential rise to protect passers-by during a short-circuit in the transmission system.
- Site accessibility (existing road network, land topography, etc.).
- Ingoing and outgoing distribution line configuration.

Generally, substation works will entail both civil and several mechanical processes such as site grading and levelling, construction of control rooms, construction of all substation infrastructure and installation of transformers and other support structures and equipment.

For the proposed new substation, topsoil would be removed, and an appropriate working platform established for the development. Construction of concrete foundations for some of the electrical equipment would be undertaken. A series of earth tapes or an earth grid would be installed below the ground to create an 'earth mat' to make the compound electrically safe. The substation support structures, electrical equipment and GIS/AIS buildings, where appropriate, would then be erected.
Substations would be constructed mainly on areas of permeable stone chippings. Rainfall intercepted by the site would run off external impervious surfaces into filter drains. Impervious site drainage would be collected in piped drains. Surface water drainage and disposal would follow GIP and would be formalised within a management plan for the substation.
Upon completion of the works temporary site installation facilities and working areas would be removed and the soil replaced.

4 ANALYSIS OF THE PROJECT ALTERNATIVES

The EIA International Financing Institutions requires that potential alternatives shall be considered during the ESIA process. This step can be done later in the process when all alternatives are assessed in detailed in the ESIA assessment phase.
However, by identifying constraints in the early and/or planning stages of the project and doing a high-level assessment of alternatives at this stage, the project can be designed around the constraints and opportunities. This assists in ensuring a smoother transition through the project phases and prevents delays.

4.1 "No-go" Alternative

If the Project were not to proceed a number of significant economic and environmental benefits to both South Sudan and Uganda would be foregone.
The interconnection line is envisaged to provide a medium-term prospect of reliable power supply to the southern parts of South Sudan around Juba, where the lack of a reliable electricity network constitutes a big constraint to economic growth, together with the insecurity problems experienced in the recent past. The project will in addition, contribute towards poverty reduction and improvement of the standard of living and socio-economic aspects by providing gainful employment opportunities.
It is also foreseen that the Project represent an important step towards regional integration of power markets, in the framework of the planned interconnected electricity networks within the NELSAP/Nile basin Initiative and Eastern Africa Power Pool (EAPP) countries.

Neither of these benefits would be realised if the Project did not proceed. If the Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection Project will not be built, the consequences would be as follows:

- The power grid system capacity and the reliability of supply in South Sudan will not increase;
- Reduced technology advancement in the country and interaction both at local, national and international levels;
- Facilitation of rural electrification and improvement in the standard of living for the population in the project areas will not be achieved;
- Poverty reduction and improvement in the standard of living will not be fulfilled, due to lack of electricity needed for health, education, clean water and communication infrastructures;
- No employment and business development opportunities will be created in the project area;
- As a result, an increase in the economic activities in the region would not be possible;
- No grid interconnections to other Nile Basin Initiative countries will be provided, with consequent impossibility of regional cooperation through sharing of power generation resources i.e. cross-border electricity trading (promotion of electricity markets);
- Reduction of South Sudan dependence on thermal power thus reducing carbon emissions will not be achieved.

Conversely, if the No Project alternative is selected, the identified adverse environmental and social impacts would also not be realised and Project funds could be invested in alternative projects such as rural infrastructure development.

4.2 Routing and Substations Alternatives

The selection of OHTL route should be undertaken according to criteria that fulfils technical, environmental as well as socioeconomic objectives in order to achieve the most feasible application.

The proposed alternatives routes are shown in Figure 4-1 and their length are the following:

a. Option 1 (blue line) – length 167 km
b. Option 2 (green line) – length 161 km
c. Option 3 (red line) – length 156 km

Regarding the new substation 400/220/132/33 kV to be constructed near Juba, three alternative locations are currently proposed (Figure 4-2):

1) Option 1 (blue line) – Substation site close to the existing thermal / solar power plant, East of Juba
2) Option 2 (green line) - Substation site close to the existing thermal / solar power plant, East of Juba
3) Option 3 (red line) – Substation site in Gumbo area, East of Juba

The Substation Option No. 1 and No. 2, however, are located in a residential area and therefore not attractive for the Project.

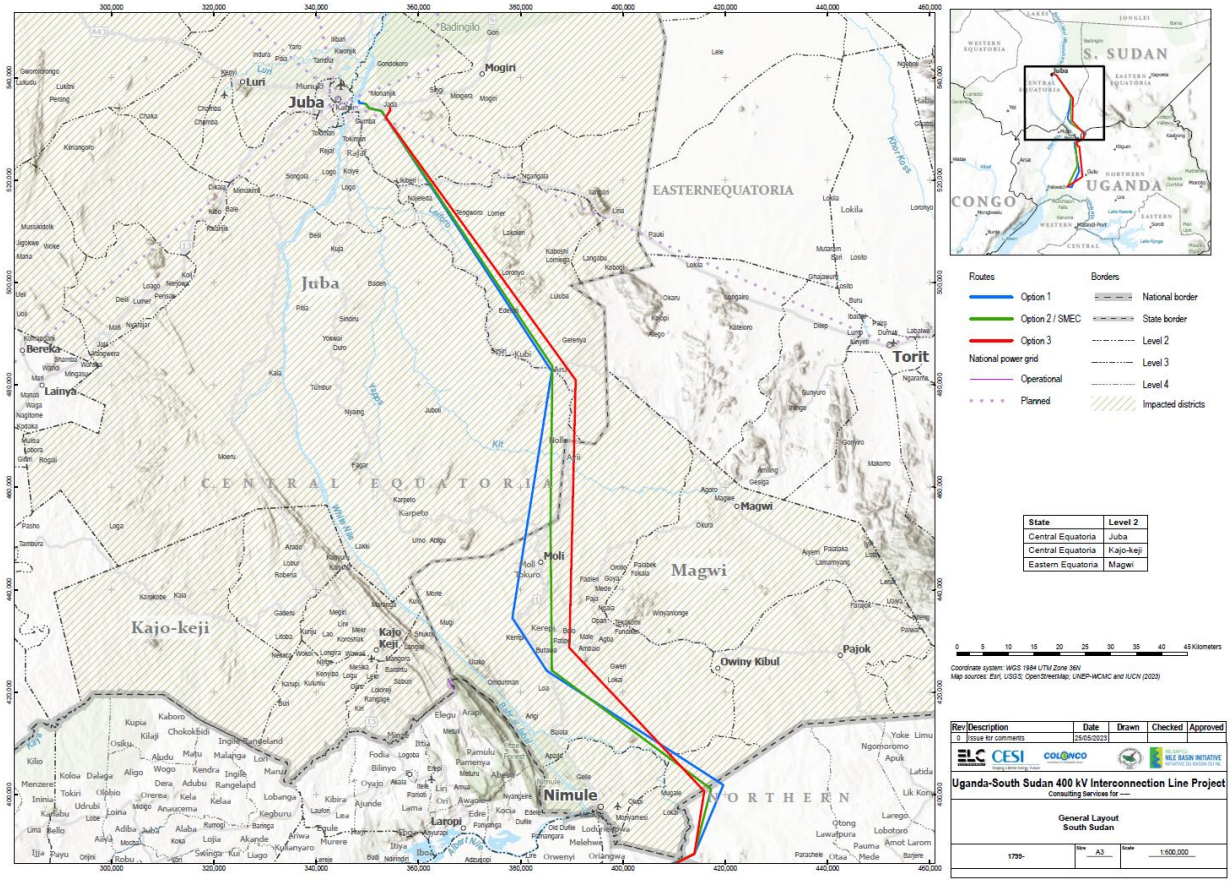


Figure 4-1 – Alignment options for the South-Sudanese section of 400 kV Interconnection project.



Figure 4-2 - Substation Sites in Juba – Gumbo.

4.2.1 Environmental and Social Ranking Methodology

The environmental and social ranking methodology is based on standard literature indications on this topic (PADC Environmental Impact Assessment and Planning Unit). Table 4-1 below defines the existing environmental and social conditions which might be affected by actions. In the present analysis, 9 environmental and social factors and 5 actions which might impact certain factors have been identified (see Table 4-2). It is underlined the present analysis considers only the environmental and social factors and impacting actions that are expected to distinguish the different alternatives.

Table 4-1 – Environmental and social factors.

WATER	Alteration of wetlands and/or riverine habitats
LANDSCAPE	Alteration of natural landscape
VEGETATION	Loss of forested or natural areas
FAUNA	Terrestrial corridor fragmentation
	Risk of collision and electrocution
	Migratory route fragmentation
HABITAT	Loss of sensitive habitat
LAND	Agriculture
	Barren/Grazing
	Urban/semi urban
PEOPLE	Physical displacement
	Economic Displacement
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources

Table 4-2 – Actions which might impact environmental and social factors.

Site Preparation (access roads)	Costruction Phase
Vegetation clearing	
Construction of TL (foundation and tower structure erection)	
Construction of Substations	
Wire-stringing operations	
Operation & Maintenance	Op. Ph.

The matrix resulting from the combination of the environmental and social factors and the impacting actions is called Matrix of Identification of Impacts. The following is the matrix of identification of impacts for Option 1, in which positive, negative or negligible impacts have been defined.

Table 4-3 – Matrix of identification of Impacts for an Alternative.

Option 1 (167 km)

E&S FACTORS	IMPACT	IMPACTING ACTIONS – Costruction Phase 1: Site Preparation (access roads)	2: Vegetation clearing	3: Construction of TL (foundation and tower structure erection)	4: Construction of Substations	5: Wire-stringing operations	Op. 6: Operation & Maintenance
WATER	Alteration of wetlands and/or riverine habitats	✗	✗	✗		✗	
LANDSCAPE	Alteration of natural landscape		✗	✗			✗
VEGETATION	Loss of forested or natural areas	✗	✗	✗		✗	
FAUNA	Terrestrial corridor fragmentation	✗	✗	✗	✗	✗	✗
	Risk of collision and electrocution	✗					✗
	Migratory route fragmentation		✗		✗		✗
HABITAT	Loss of sensitive Habitat		✗	✗		✗	✗
LAND	Agriculture	✓		✗		✗	✗
	Barren / Grazing	✓	✗	✗			
	Urban / Semi-urban	✓		✗	✗		✗
PEOPLE	Physical displacement			✗	✗		
	Economic displacement			✗	✗		
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources		✗	✗			

Legend	
	Negative impact ✗
	Positive impact ✓
	Positive or negative impact with little relevancy or no impact -

4.2.2 Description of Environmental and Social Factors

The list of the environmental and social factors which could be impacted during the different project phases is given below. It is underlined that environmental and social factors which are deemed equivalent for all the transmission line routes (e.g. air quality, soil, noise, vulnerable groups, employment, etc.) are not taken into account in the present alternative analysis. Instead, a more detailed and complete set of environmental and social impacts will be considered in the subsequent impact assessment on the selected project alternative.

WATER

Alteration of wetlands and/or riverine habitats: The construction of access roads and transmission line may interfere with the natural drainage systems and modify flow of surface water. These changes can contribute to soil erosion, flooding, channel modification, downstream scouring and sedimentation in streams, drainage channels and wetlands/swamps. This impact is evaluated on the number of rivers/water bodies and wetlands crossed by the project components (access road,

transmission line). This impact is expected to occur during the construction activities and is deemed reversible in the medium term.

LANDSCAPE

Alteration of natural landscape: The overhead transmission lines would be highly visible in natural landscapes. The artificial appearance of a transmission line may have visually intrusion associations for some, particularly in a predominantly natural landscape. Generally, transmission lines and new roads are more easily accepted when they are situated close to existing roads. Visual evidence of these projects cannot be completely avoided, reduced or concealed.

VEGETATION

Vegetation (loss of forested or natural areas): The construction of the transmission line will involve tree removal and reduction of woody biomass due to clearance in the 60m wide corridor, included in the Right of Way (RoW) and/or wayleave. However, being a narrow line, the vegetation loss will be relatively small in comparison to the total coverage of the affected vegetation types.

The RoW will be managed by periodic vegetation maintenance during operation of the transmission line. However, vegetation will generally be allowed to grow under the overhead line up to a height of about 2-3 m. Permanent vegetation loss will hence be restricted to the immediate areas surrounding the tower foundations and the access roads.

FAUNA:

Terrestrial corridor fragmentation: The construction of the transmission line will involve vegetation clearance in the Right of Way / Wayleave, resulting in habitat loss or habitat fragmentation for wildlife. However, the line corridor is small in comparison to the entire habitat size and therefore no considerable loss is anticipated. The line is not likely to permanently displace birds and animals from their native habitats since they can easily relocate to adjacent undisturbed areas, even if some microhabitat for specific animals, such as amphibians, could be destroyed (e.g. wetlands).

Risk of collision and electrocution: A special feature of transmission line projects is the danger of accidental kills of birds and flying or climbing animals. The kills can occur as a result of collision between the flying animal and a power cable, or it can occur if a climbing or resting animal happens to short circuit the conductors. The risk for collisions is influenced by the way the line runs in the landscape. Power lines following hill crests are less likely to cause kills than line in hillsides or line crossing valleys. The danger of attracting climbing animals is greatest for lines running through a dense forest with high trees on each side. The risk of collision and electrocution is also increased if a transmission line is located within important bird migratory routes.

Migratory route fragmentation: The open space created by the access roads and in the right of way can potentially act as a barrier to wildlife and lead to habitat fragmentation. Therefore, in case the transmission line corridor crosses migratory routes of terrestrial fauna, this can lead to disturbance to the animal passage in the open space of the corridor.

HABITAT

Loss of sensitive habitat: The potential presence of sensitive or critical habitats impacted by the project footprint represents an additional risk to be evaluated in the analysis. The impacts on habitats with high biodiversity value, of significant importance or unique ecosystems (e.g. forest reserves, natural parks, wetlands, etc.), which deserves particular attention, have to be considered.

LAND

Impact on Agriculture – Barren / Grazing – Urban / Semi-urban land: The project will lead to land acquisition for transmission line right of way, causing permanent loss of land ownership for a number of families, clans and ethnic communities.
Cultivation of seasonal crops and grazing/pastoral activities are likely to continue in the right of way / wayleave, although crop damage and restrictions to livestock movement is expected to occur during the construction phase and possibly also during repair and maintenance. Restricted land use will prevent the cultivation of trees and some perennial crops as well as erection of new buildings or other physical structures.
Overall, however, the change in current land use will be small. The need of permanent land acquisition cannot be estimated at the moment. Only preliminary analysis on the land use is possible, based on the available alignments and desktop studies.

PEOPLE

Physical displacement (Loss of residential land / relocation of inhabitants): The project will lead to land acquisition for transmission line right of way, causing permanent loss of land ownership for a number of families, clans and ethnic communities. A number of houses, secondary structures and community buildings that are located within the RoW will be demolished or moved. Upgrading of new and existing roads may also cause some displacements. This impact shall be mitigated by adequate compensation of the property losses.
Secondary displacement, especially in areas previously under conflict, is not considered in the alternative analysis, since at the present stage there are no sufficient data to evaluate this specific impact. The alternative line routes cross the same regions and at present it is impossible to differentiate the potential secondary displacement associated to each option. Therefore, this impact (secondary displacement) will be included in the detailed assessment of the selected line route.
Economic displacement (Loss of agricultural, grazing and commercial land): Land is an important asset in South Sudan in general and in the project area in particular, as the majority of the people rely on land-based livelihoods. The project construction activities may cause some minor losses in agricultural/grazing/commercial land. This impact shall be mitigated by adequate compensation of the property losses.

PHYSICAL AND CULTURAL RESOURCES

Physical and cultural resources: Archaeological sites, burial grounds, sacred sites and local shrines could potentially be encountered along the transmission line corridor in the process of corridor clearing and foundations excavation. This kind of impact can be mitigated through appropriate measures, e.g. relocation of small holy places.
The presence of trees or natural areas with spiritual or socio/cultural values is an additional factor to consider. If such kind of natural sites are impacted by a project component, could be permanently lost.

4.2.3 Definition of the Impacting Actions

The following actions have been identified as the ones which could impact the environmental and social factors. It is underlined that the impacting actions which are deemed equivalent for all the transmission line routes (e.g. installation of contractor's camps, exploitation of borrow and disposal areas during the construction phase; etc.) are not taken into account in the present alternative analysis.
A number of 5 impacting actions are considered during the construction phase.

Construction Phase

- **Site preparation (access roads)**: The construction of access roads can impact the environment through vegetation clearance, loss/fragmentation of habitat, compaction of land and permanent loss of land. Wetlands and riverine habitats can be also impacted during the construction of access road.
  In South Sudan, where the transmission line routes cross a region with low density of human activities, the opening of new roads is considered a positive impact, providing increased opportunity for agricultural, grazing and urban development.
- **Vegetation clearing**: this impacting action includes vegetation clearing in the transmission line right of way / wayleave and in other permanent and temporary works areas.
- **Construction of TL (foundation and tower structure erection):** this impacting action includes all the activities required for the construction of the transmission line: excavation, preparation of foundations, steelwork structure erection, installation of insulators, etc. The impacts related to the acquisition of land in the right of way/wayleave of the transmission line are considered in this impacting action.
- **Construction of substations**: this impacting action includes all the activities required for the construction of the substations: excavation, foundations, civil works for control building, electrical equipment installation, etc.
- **Wire-stringing operations:** the conductors and shield wires will be strung and tensioned with specialized equipment to achieve the designed sag. This operation will potentially cause additional damage to the vegetation and existing annual crops.

Operation and Maintenance Phase

- **Operation & Maintenance**: during the normal operation of the OHTL and annexed substations, the main impacts are due to the presence of the suspended wires (risk for collision and electrocution of wildlife and avifauna) and the creation of an electromagnetic field around the conductors. Periodic maintenance along the RoW / wayleave of the transmission line will also require clearing of regrowth vegetation along and adjacent to the line. Cropping and grazing beneath the conductors is normally permitted.
  Regular maintenance and monitoring activities along the transmission lines and at the substations are minimum: it involves periodically inspecting the OHTL, assuring that the safety clearances are maintained, and annual cleaning and checking of circuit breaker connections at the substations. Exceptional maintenance interventions could be: replacement of cables and insulators along OHTL, replacement of electrical equipment at substations (transformers, circuit breakers, etc.), change of transformer oil, etc.

4.2.4 Definition of the Importance of the Impacts

The *importance* of the impact on an environmental and social factor is calculated using defined attributes: sign, magnitude, spatial extension, duration, reversibility and frequency.
The mentioned attributes are defined as follows:

- **Sign:** this attribute defines nature of the impact (beneficial or harmful).
- **Magnitude**: this attribute defines magnitude of the incidence of the impacting action on the considered environmental or social actor. Its intensity is classified as low, medium, high.
- **Spatial Extent**: this attribute represents the extension of the affected area in relation to the project components. The spatial extension is classified as site specific, local, regional.

- **Duration**: this attribute refers to the time lap between the beginning of the impacting actions and the end of the relevant impacting effect. The time of occurrence is classified as short term, medium term and long term.
- **Reversibility:** this attribute refers to the possibility of restoring the affected factor and, if possible, the time lap necessary for the restoration. The reversibility is classified as short term, medium term and irreversibility.
- **Frequency:** this attribute refers to the frequency of occurrence of the impact. The frequency is classified as unfrequent, frequent and continuous.

The *importance* of an impact is calculated, per each action impacting an environmental and social factor, with the following equation:

$$I_{ij} = Si \cdot (MA_{ij} + SE_{ij} + DU_{ij} + RE_{ij} + FR_{ij})$$

The scores are given as indicated in Table 4-4.

Table 4-4 – Attributes for the definition of the importance of an impact, with related scores.

Attributes	Description		Score
Sign (Si)	+	Positive	+1
	-	Negative	-1
Magnitude (MA)	L	Low	1
	M	Medium	2
	H	High	6
Spatial Extension (SE)	SS	Site Specific	1
	Lo	Local	2
	Re	Regional	6
Duration (DU)	S	Short Term	0,5
	M	Medium Term	1
	L	Long Term	2
Reversibility (RE)	S	Short Term	1
	M	Long Term	2
	I	Irreversible	6
Frequency (FR)	I	Unfrequent, aperiodic, discontinuous	0,5
	F	Frequent	1
	C	Continuous	2

The attributes for the definition of the *importance* of the impacts on environmental and social factors, as reported in Table 4-4, were evaluated in relative terms among the different project Alternatives, according to the estimation of the impact. In fact, the intensity and spatial extension of some of the impacts were defined in quantitative terms according to the available data, documentation and calculations. Whenever the quantification of the impacts was deemed difficult, the impacts were evaluated according to the Consultant's judgement.

The impacts of the transmission line on the existing environmental and social factors, i.e. forest areas, physical and economic displacement, etc., will be quantified basing on the available topographic/satellite cartography, thematic maps, secondary data and will be subsequently verified during the site visits.

The preliminary alignment of the access roads was defined for the Alternative considered. Since the impact of access roads on forest areas, physical and economic displacement, religious sites, etc., can be

hardly defined now and since the final access road alignment is not yet defined, the impacts of the access roads were quantified as proportional to the transmission line length.
As an example, the following table shows the definition of the importance of the impacting action "Construction of Transmission Line" on the different environmental and social factors.

Table 4-5 – Definition of the importance of the impacting action "Construction of Transmission Line" on the different environmental and social factors for Option 1.

Construction of TL (foundation and tower structure erection)
Option 1 (167 km)

		ATTRIBUTES						
FACTOR	**IMPACT**	**Sign**	**Magnitude**	**Spatial Extent**	**Duration**	**Reversibility**	**Frequency**	**IMPORTANCE**
WATER	Alteration of wetlands and/or riverine habitats	-	H	SS	L	I	C	-17
LANDSCAPE	Alteration of natural landscape	-	M	Re	L	I	C	-18
VEGETATION	Loss of forested or natural areas	-	M	Lo	L	I	C	-14
FAUNA	Terrestrial corridor fragmentation	-	M	Lo	S	S	I	-6
	Risk of collision and electrocution							
	Migratory route fragmentation							
HABITAT	Loss of sensitive Habitat	-	H	Lo	L	I	C	-18
LAND	Agriculture	-	M	SS	L	I	C	-13
	Barren / Grazing	-	L	SS	L	I	C	-12
	Urban / Semi-urban	-	L	SS	L	I	C	-12
PEOPLE	Physical displacement	-	M	SS	L	I	C	-13
	Economic displacement	-	M	SS	L	I	C	-13
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources	-	M	SS	L	I	C	-13

Sign	Magnitude	Spatial Extent	Duration	Reversibility	Frequency
+	L	SS	S	S	I
-	M	Lo	M	M	F
	H	Re	L	I	C

4.2.5 Matrices of Importance

The matrix, which includes the importance of the impact of all the actions on the environmental and social factors, is called Matrix of Importance. This matrix of importance is built aggregating the vectors of importance (i.e. the last column of Table 4-5) relevant to each considered impacting actions. Through this procedure, the matrix of identification of impacts (Table 4-3) is compiled with the importance values given to the E&S factors.
Summing all the importance values on each row of the matrix of importance, the overall positive and negative scores of each environmental and social factor is computed.

The matrices of importance of the different project alternatives are provided in the following. The negative impacts are highlighted in red while the positive impacts in green. Empty cells represent positive or negative impacts with little relevancy or no impact at all.

Table 4-6 – Matrix of Importance for Option 1 – Negative impacts in red, positive in green

Option 1 (167 km)

FACTOR	IMPACT	IMPACTING ACTIONS: Costruction Phase 1 – Site Preparation (access roads)	2 – Vegetation clearing	3 – Construction of TL (foundation and tower structure erection)	4 – Construction of Substations	5 – Wire-stringing operations	Op. Ph. 6 – Operation & Maintenance	Sum of Impacts: Positive Impacts	Sum of Impacts: Negative Impacts
WATER	Alteration of wetlands and/or riverine habitats	-8	-9	-17		-9		0	-43
LANDSCAPE	Alteration of natural landscape		-10	-18			-18	0	-46
VEGETATION	Loss of forested or natural areas	-10	-10	-14		-5		0	-39
FAUNA	Terrestrial corridor fragmentation	-10	-14	-6	-10.5	-6	-22	0	-68.5
	Risk of collision and electrocution	-6					-22	0	-28
	Migratory route fragmentation		-14		-10.5		-22	0	-46.5
HABITAT	Loss of sensitive Habitat		-10	-18		-14	-12.5	0	-54.5
LAND	Agriculture	9		-13		-4	-12	9	-29
	Barren / Grazing	9	-5.5	-12				9	-17.5
	Urban / Semi-urban	9		-12	-17		-13	9	-42
PEOPLE	Physical displacement			-13	-17			0	-30
	Economic displacement			-13	-17			0	-30
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources		-12	-13				0	-25
								27	-499

Table 4-7 – Matrix of Importance for Option 2 – Negative impacts in red, positive in green

Option 2 (161 km)

FACTOR	IMPACT	IMPACTING ACTIONS – Costruction Phase 1	2	3	4	5	Op. Ph. 6	Sum of Impacts – Positive Impacts	Negative Impacts
		Site Preparation (access roads)	Vegetation clearing	Construction of TL (foundation and tower structure erection)	Construction of Substations	Wire-stringing operations	Operation & Maintenance		
WATER	Alteration of wetlands and/or riverine habitats	-8	-9	-12		-5		0	-34
LANDSCAPE	Alteration of natural landscape		-9	-18			-18	0	-45
VEGETATION	Loss of forested or natural areas	-10	-9	-14		-5		0	-38
FAUNA	Terrestrial corridor fragmentation	-10	-13	-6	-10.5	-6	-22	0	-67.5
	Risk of collision and electrocution	-6					-22	0	-28
	Migratory route fragmentation		-13		-10.5		-22	0	-45.5
HABITAT	Loss of sensitive Habitat		-9	-14		-13	-11.5	0	-47.5
LAND	Agriculture	9		-13		-4	-12	9	-29
	Barren / Grazing	9	-5.5	-12				9	-17.5
	Urban / Semi-urban	9		-12	-17		-13	9	-42
PEOPLE	Physical displacement			-13	-17			0	-30
	Economic displacement			-13	-17			0	-30
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources		-12	-13				0	-25
								27	-479

Table 4-8 – Matrix of Importance for Option 3 – Negative impacts in red, positive in green.

FACTOR	IMPACT	IMPACTING ACTIONS: Costruction Phase 1 – Site Preparation (access roads)	2 – Vegetation clearing	3 – Construction of TL (foundation and tower structure erection)	4 – Construction of Substations	5 – Wire-stringing operations	Op. Ph. 6 – Operation & Maintenance	Sum of Impacts: Positive Impacts	Sum of Impacts: Negative Impacts
WATER	Alteration of wetlands and/or riverine habitats	-12	-13	-13		-9		0	-47
LANDSCAPE	Alteration of natural landscape		-14	-22			-18	0	-54
VEGETATION	Loss of forested or natural areas	-14	-14	-18		-5		0	-51
FAUNA	Terrestrial corridor fragmentation	-10	-18	-6	-6.5	-6	-22	0	-68.5
FAUNA	Risk of collision and electrocution	-7					-22	0	-29
FAUNA	Migratory route fragmentation		-18		-6.5		-22	0	-46.5
HABITAT	Loss of sensitive Habitat		-14	-18		-14	-12.5	0	-58.5
LAND	Agriculture	9		-12		-4	-12	9	-28
LAND	Barren / Grazing	9	-5.5	-12				9	-17.5
LAND	Urban / Semi-urban	9		-12	-12		-13	9	-37
PEOPLE	Physical displacement			-12	-12			0	-24
PEOPLE	Economic displacement			-12	-12			0	-24
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources		-12	-12				0	-24
								27	-509

Option 3 (156 km)

4.2.6 Comparison of Substation

The importance of the impacts related to substation construction is extracted from the previous matrices, in order to allow for a direct comparison between the different substation options. The corresponding matrices of importance of the three options are provided in the following.

Table 4-9 – Matrix of Importance for Substation Option 1 – Negative impacts in red, positive in green.

SS Option 1			Sum of Impacts	
FACTOR	IMPACT	Construction of Substations	Positive Impacts	Negative Impacts
WATER	Alteration of wetlands and/or riverine habitats		0	0
LANDSCAPE	Alteration of natural landscape		0	0
VEGETATION	Loss of forested or natural areas		0	0
FAUNA	Terrestrial corridor fragmentation	-10.5	0	-10.5
	Risk of collision and electrocution		0	0
	Migratory route fragmentation	-10.5	0	-10.5
HABITAT	Loss of sensitive Habitat		0	0
LAND	Agriculture		0	0
	Barren / Grazing		0	0
	Urban / Semi-urban	-17	0	-17
PEOPLE	Physical displacement	-17	0	-17
	Economic displacement	-17	0	-17
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources		0	0
			0	-72

Table 4-10 – Matrix of Importance for Substation Option 2 – Negative impacts in red, positive in green.

SS Option 2			Sum of Impacts	
FACTOR	IMPACT	Construction of Substations	Positive Impacts	Negative Impacts
WATER	Alteration of wetlands and/or riverine habitats		0	0
LANDSCAPE	Alteration of natural landscape		0	0
VEGETATION	Loss of forested or natural areas		0	0
FAUNA	Terrestrial corridor fragmentation	-10.5	0	-10.5
	Risk of collision and electrocution		0	0
	Migratory route fragmentation	-10.5	0	-10.5
HABITAT	Loss of sensitive Habitat		0	0
LAND	Agriculture		0	0
	Barren / Grazing		0	0
	Urban / Semi-urban	-17	0	-17
PEOPLE	Physical displacement	-17	0	-17
	Economic displacement	-17	0	-17
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources		0	0
			0	-72

Table 4-11 – Matrix of Importance for Substation Option 3 – Negative impacts in red, positive in green.

SS Option 3			Sum of Impacts	
FACTOR	IMPACT	Construction of Substations	Positive Impacts	Negative Impacts
WATER	Alteration of wetlands and/or riverine habitats		0	0
LANDSCAPE	Alteration of natural landscape		0	0
VEGETATION	Loss of forested or natural areas		0	0
FAUNA	Terrestrial corridor fragmentation	-6.5	0	-6.5
	Risk of collision and electrocution		0	0
	Migratory route fragmentation	-6.5	0	-6.5
HABITAT	Loss of sensitive Habitat		0	0
LAND	Agriculture		0	0
	Barren / Grazing		0	0
	Urban / Semi-urban	-12	0	-12
PEOPLE	Physical displacement	-12	0	-12
	Economic displacement	-12	0	-12
PHYSICAL CULTURAL HERITAGE	Impact on sacred and cultural resources		0	0
			0	-49

The Substation Option No. 1 and No. 2 have the same negative impact due to their vicinity to the river (White Nile) and to the presence of existing buildings. However, it should be highlighted that Option 1 seems located in a residential area, while Option 2 location is occupied by scattered houses / sheds. Option 3, instead, is located in a rural/natural area with very few existing buildings, farther from the river, and therefore has a lower environmental and social impact than the other two options.

4.2.7 Comparison of Alternatives

To score each transmission line route Alternative, including associated substation, a weight is assigned to each environmental and social impact component. A weighted value is calculated for each positive and negative impact.

The weights of the considered environmental and social factors, or impact categories, has been defined by applying the Analytic Hierarchy Process (AHP) methodology (Saaty, 1980). This is a Multi Criteria decision making method that relies on judgements of experts to derive priority scales. The pairwise comparisons are made ranking the factors *importance* in the decision-making process, i.e. in the selection of the most preferable project Alternative.

In this analysis each impact category is compared with all the other categories on a numerical scale from 1 to 10, in ascending order of importance, according to the judgement of a team of environmental and social experts. The explanation of the ranking given to each project impact is detailed below in Table 4-12.
A final comparative matrix was elaborated while putting both in rows and columns the considered impact categories as well as assigning to each element a_{ij} the ratio between the rankings of the corresponding impact in row *i* and the ranking of the impact in column *j*.
For each column, every single entry was divided by the sum of entries of the corresponding column. This yields a new normalized matrix, in which the sum of the elements of each column vector is 1. By computing the average value of all elements in a row, an estimate of the best value for the vector of the weights $w^*=\{w_i^*\}$ is obtained.

The calculated figures represent the mathematical weights of the ranking (based on expert's judgement) assigned to each impact component. The list of the obtained weightings for the various impact categories is reported in Table 4-12.

Table 4-12 – Ranking and weighting of the impact categories.

IMPACT CATEGORY	RANK	EXPLANATION	WEIGHT
WATER	3	Alteration of wetlands and/or riverine habitats	8.3%
LANDSCAPE	2	Alteration of natural landscape	5.6%
VEGETATION	6	Loss of forested areas	16.7%
FAUNA	4	Terrestrial corridor fragmentation	11.1%
		Risk of collision and electrocution (especially for avifauna)	
		Migratory route fragmentation	
HABITAT	7	Loss of Critical habitat	19.4%
LAND	5	Agriculture	13.9%
		Barren/Grazing	
		Urban/semi urban	
PEOPLE	8	Physical displacement	22.2%
		Economic Displacement	
PHYSICAL CULTURAL HERITAGE	1	Impact on sacred and cultural resources	2.8%

The weights reported in Table 4-12 above will be used to weight the negative and positive impacts of each transmission line alternative. In particular, the positive and negative scores of each environmental and social factor from the Matrix of Importance is multiplied by the weights of Table 7 6. Then all the weighted single scores can be summed up in order to obtain an overall weighted impact score (positive and negative) of each project Alternative, as shown in Table 4-13. The best alternative is therefore selected as the one providing the lowest negative score among all the alternatives.

Table 4-13 – Final matrix for the selection of best alternative, based on weighted impact scores.

FACTOR	WEIGHT	IMPACT	WEIGHTED SCORES					
			Option 1		Option 2		Option 3	
			Positive Impact	Negative Impact	Positive Impact	Negative Impact	Positive Impact	Negative Impact
WATER	8.3%	Alteration of wetlands and/or riverine habitats		-3.6		-2.8		-3.9
LANDSCAPE	5.6%	Alteration of natural landscape		-2.6		-2.5		-3.0
VEGETATION	16.7%	Loss of forested or natural areas		-6.5		-6.3		-8.5
FAUNA	11.1%	Terrestrial corridor fragmentation		-2.5		-2.5		-2.5
		Risk of collision and electrocution		-1.0		-1.0		-1.1
		Migratory route fragmentation		-1.7		-1.7		-1.7
HABITAT	19.4%	Loss of sensitive Habitat		-10.6		-9.2		-11.4
LAND	13.9%	Agriculture	0.4	-1.3	0.4	-1.3	0.4	-1.3
		Barren / Grazing	0.4	-0.8	0.4	-0.8	0.4	-0.8
		Urban / Semi-urban	0.4	-1.9	0.4	-1.9	0.4	-1.7
PEOPLE	22.2%	Physical displacement		-3.3		-3.3		-2.7
		Economic displacement		-3.3		-3.3		-2.7
PHYSICAL CULTURAL HERITAGE	2.8%	Impact on sacred and cultural resources		-0.7		-0.7		-0.7
			1.3	-40.0	1.3	-37.6	1.3	-41.9
			Option 1		Option 2		Option 3	
			-38.7		-36.3		-40.7	

As shown in Table 4-13, the ranking methodology applied to the three project alternatives shows that the best corridor option from environmental and social point of view is Option 2 (with a weighted score of -36.3). Option 2, in particular, intersects less rivers and forested areas than the other two alternatives. Moreover, it runs closer, on average, to the main road between Nimule and Juba (A43), thus requiring

lower length of access roads. Other Alternatives rank from the best to the worst in the following order: Option 1 (weighted score -38.7) and Option 3 (-40.7).
It is remarked that the difference between Option 2 (the best one) and Option 3 (the worst) is only 4.4 points in term of weighted score.
The final selection of the optimal project Alternative, to be furtherly developed, will take into account the findings of this Environmental and Social ranking analysis, which represent one of the elements, together with the technical and economic evaluations, of the overall decision process. Any possible refinements of the present alternative analysis will be performed in accordance to feedback from the survey teams.

4.2.8 Optimization of selected line route option

The comparison of the alternatives led to the selection of Option 2 as the best line route option, from environmental and social points of view.
Then, based on the findings acquired during the field reconnaissance, the preferred line route has been furtherly optimized, adding some angle points in order to improve accesses and adherence to site conditions. The so obtained optimal transmission line route is shown in Figure 3-4.
Moreover, based on reconnaissance findings, a fourth substation location has been proposed, named **Option 3-bis**, located on the opposite side of Juba – Bor – Malakal Highway with respect to Option 3 site. This location is currently selected as the preferred one and is shown in Figure 3-5.

5 LEGAL AND INSTITUTIONAL FRAMEWORK

This chapter describes the relevant policies, laws and administrative framework within which the project will be implemented. The Consultant has identified the pertinent regulations and standards, both at local and international levels (AfDB Safeguard Policies, World Bank Environmental and Social Standards, Equator Principles), governing the environmental quality, health and safety, protection of sensitive areas, protection of endangered species, land use control and ecological and socio-economic issues. The examination of the legislation includes the relevant international conventions to which the governments are signatories. The Consultant has identified also the relevant government agencies involved in environmental and social management issues, to ensure that the ESMP will be effectively implemented.

5.1 South Sudan Policies, Laws, Rules, Conventions and Guidelines

Since the signing of the Comprehensive Peace Agreement (CPA 2005) and the subsequent independence on 9 July 2011, the Government of the Republic of South Sudan (GOSS) has adopted a new Constitution, has developed a number of new policies and legislations while others are still being drafted, with the ultimate aim of enhancing sustainable socio-economic development in the country. The policies and laws governing environmental and social aspects provide procedures to be followed in the planning and implementation of projects.

It should be noted that prevailing policy, legal and regulatory framework in South Sudan is categorized as follows:

a) Post 2011 (post-independence) policies, laws and associated institutions established by the Government of the Republic of South Sudan; and
b) 2000-2011 (New Sudan, pre-independence) policies, laws associated institutions established by the Government of South Sudan (GOSS)[1] and the Sudan People's Liberation Movement/Army (SPLM/A) administration.

Below are some of the reviewed existing laws, policies and acts, which are applicable in the implementation of projects in the energy sector.

[1] The GOSS was formed in 2005 with the signing of the Comprehensive Peace Agreement (CPA) that granted regional autonomy to Southern Sudan. Thus, before the enactment of the 2011 Constitution, the GOSS under the Interim Constitution of Southern Sudan 2005, governed Southern Sudan.

5.1.1 National Policies and Guidelines applicable to the Project

Table 5-1 – National Policies and Guidelines applicable to the Project.

National Policy / Guideline(s)	Description	Relevance to the Project
Environmental Policy of South Sudan (2015 – 2025)	The Policy was passed in 2015. The objectives of the Policy are: (i) to improve livelihoods of South Sudanese through sustainable management of the environment and utilization of natural resources; (ii) to build capacity of the government at all levels of governance and other stakeholders for better management of the environment; (iii) to integrate environmental considerations into the development policies, plans, and programs at the community, government and private sector levels; and (iv) to promote effective, widespread, and public participation in the conservation and management of the environment. The policy addresses a number of aspect that that include: climate change, management of resources, corporate social and environmental responsibilities and environmental planning, among others. Chapter 2 of the Environment Policy discusses sector-specific environmental issues and policy guidance in relation to the impact of the sector's activities on the environment. Section 4.3 of the Environment Policy elaborates the need for a systematic environmental impact assessment, audits, monitoring and evaluation to mitigate adverse impacts and enhance environmental benefits on all the upcoming development activities and investments.	The project will entail activities such as civil works as part of construction of electricity infrastructure and creation of rights of way for electricity transmission infrastructure. Execution of these activities may involve vegetation clearance which should be undertaken in a sustainable manner. Additionally, the project will generate hazardous and non-hazardous waste during its respective phases that should be responsibly managed to avoid pollution of environmental media.
Forest Policy, 2019	The Forest Policy of South Sudan was launched in 2019. The Policy is broadly intended to protect the roles forests play in stabilizing natural global systems including the hydrological balance, the carbon balance, atmospheric systems/cycles, etc. The policy broadly aims to achieve ecological stability of river systems, the lakes, swamps, agricultural production and other natural	Development of the transmission line project could affect sensitive ecosystems such as forests and swamps. Activities that involve removal or conversion of forests and other natural resources, that may

National Policy / Guideline(s)	Description	Relevance to the Project
	ecological systems. It is also meant to ensure that there are optimal benefits from forestry and agro-forestry activities for food security and poverty alleviation among rural communities through provision of woody and non-wood forest products. The policy integrates forest sector actions with rural development efforts to ensure that the rural population of South Sudan has access to basic needs which include: sustainable household food security, shelter, wood fuel, safe clean water, sanitation and health facilities, primary education, good local governance, empowerment and self-reliance.	cause long term, permanent and/or irreversible loss of major forest habitats including habitats of wildlife and significant loss of biodiversity are not eligible for financing.
Draft Wildlife Conservation and Protected Area Policy, June 2012	The policy envisions an effective and professional Wildlife Service that will guide the sustainable management and utilization of natural resources, including land, water, fauna and flora for the benefit and enjoyment of the people of South Sudan. It provides for the formulation of legal frameworks to rationalise the protected area system, wildlife utilization and benefit sharing. It also recognises and addresses security and landscape management.	This draft policy is relevant as far as wildlife conservation and management is concerned. Transmission line route may cross national parks or protected areas.
The South Sudan National Gender Policy, 2012	The goal of achieving gender equality in South Sudan is anchored in the country's Transitional Constitution and guided by a vision of equality as an inalienable right for all women, men and children, and gender equality as a human right. The ultimate goal of this policy is to ensure that gender equality is an integral part of all laws, policies, programs and activities of all South Sudan's public institutions, the private sector and civil society so as to achieve equality in the cultural, social, political and economic spheres in South Sudan.	Gender related concerns such as Gender Based Violence, sexual harassment, gender discrimination among others that may be associated with the development of the project should be addressed in line with the policy to ensure that the project objectives/desired benefits are attained.
Water Policy, 2007	The Water Policy outlines the water resources of South Sudan: goals, purpose and scope and the policy on water resources management. The Policy states that access to sufficient water of an acceptable quality and quantity to meet basic human needs is a human right. The policy provides	The transmission line route is expected to cross some water bodies of the secondary drainage network.

National Policy / Guideline(s)	Description	Relevance to the Project
	that: the right to water shall be given the highest priority in the development of water resources; rural communities shall participate in the development and management of water schemes; and the involvement of NGOs and the private sector in water projects shall be encouraged. In relation to the Nile River, it is stated (referring to the 2007 political framework) that GoSS 'is committed to playing an active role within the Federal structure in order to ensure Sudan fulfils its international obligations'. GoSS, through the Ministry of Water Resources and Irrigation, will actively participate in the Nile Basin Initiative (NBI), including representation on the Technical Advisory Committee. Notably, there is no water legislation or regulations yet ratified by GoSS.	The potential impact on swamps or wet areas, if present along the line corridor, should be minimized or avoided.
South Sudan's Vision 2040	The Vision is aimed at ensuring equality, freedom, justice, peace and prosperity for all. The overarching goals of Vision 2040 are to create a vibrant, competitive and diversified economy driven by agriculture, industry, mining, tourism and services that attracts investors. The Vision does also promise the Government of South Sudan's commitment to sustainable environmental management alongside limiting environmental pollution due to other development programs such as industrialization. The Vision emphasizes the need to minimize greenhouse gas emissions as a measure against climate change while building on traditional knowledge and supporting community-based resilience. The Revised National Development Strategy (R-NDS) for South Sudan, 2021 – 2024, is the main vehicle being used to pursue and realize aspects of the Vision.	The building of critical infrastructure for sustainable development, that includes energy, is cited among the key objectives that the R-NDS has to deliver as part of South Sudan's Vision 2040 aspirations. The proposed Interconnection Project and its socio-economic transformation aspects ties in with this aspiration.

5.1.2 Legislative Framework

Table 5-2 – National legal framework applicable to the Project

Legislation	Description	Relevance to the Project
The Transitional Constitution of the Republic of South Sudan, 2011	The Transitional Constitution of the Republic of South Sudan came into force in 2011 and is the overarching legal instrument in the management of the country. It commits all levels of government in the Republic of South Sudan to sustainable development so as to ensure that the environment is protected for the benefit of both present and future generations, through reasonable legislative action and other measures. Section 41 (1) provides that the people of South Sudan shall have a right to a clean and healthy environment; Section 41 (2) states that every person shall have the obligation to protect the environment for the benefit of present and future generations; Section 41 (3) states that every person shall have the right to have the environment protected for the benefit of the present and future generations, through reasonable legislative actions and other measures that include: (i) prevention of pollution and ecological degradation; (ii) promoting conservation; (iii) securing ecologically sustainable development and use natural resources while promoting rational economic and social development so as to protect the bio-diversity of South Sudan. Section 166 (6) mandates local governments to involve communities in decision making regarding the promotion of a safe and healthy environment.	The project's construction, operation and decommissioning activities are associated with both positive and negative environmental and social impacts and will therefore need to be undertaken in a manner that: - Promotes sustainable development; and - Protects the right to a clean and healthy environment for communities and persons in the project host area(s).
The Labour Act, 2017	The purpose of this Act is to establish a legal framework for the minimum conditions of employment, labour relations, labour institutions, dispute resolution and provision for health and safety at the workplace; in accordance with the Constitution of the Republic of South Sudan, 2011, and in conformity with international and regional obligations of South	A number of people will be employed as a result of the implementation of the project; therefore health, safety, welfare, age of employment and appropriate training of persons employed in workplaces should be considered.

Legislation	Description	Relevance to the Project
	Sudan. It further reinforces the right to equal remuneration for work of equal value as guaranteed by the constitution. Section 6(1) of the Labour Act provides that 'No person shall discriminate, directly or indirectly, against an employee or job applicant in any work policy or practice'. Section 6(2) also forbids discrimination by any Trade Union, Employers Association or Federation. Section 6(3) defines discrimination as 'any distinction, exclusion or preference with the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation' based on a series of grounds including sex and pregnancy or childbirth.	
The Draft Environmental Protection Bill, 2015	This legislation aims to protect the Environment in South Sudan and to promote ecologically sustainable development that improves the quality of life. It grants the right to a decent environment to every person and the attendant right to bring an action to enforce that right if it is threatened as a result of an activity or an omission. Section 18 of the South Sudan Draft Environmental and Protection Bill introduces the requirement for Environmental Impact Assessments. An Environmental Impact Assessment (EIA) is defined as a systematic examination conducted to determine whether or not a project will have any adverse impact on the environment and prescribe mitigation measures. Section 20 intends to introduce the requirement for Environmental Monitoring, which is defined as the continuous determination of actual and potential effects of any activity or phenomenon on the environment, whether short or long term. Section 32 of the Draft Environment Protection Bill, 2015 introduces the requirement for Environmental Audits. An Environmental Audit, according to this Bill, is defined as the systematic, documented, periodic and objective evaluation of how well Environmental organization,	The Bill is key to addressing pollution prevention, control and waste management since activities associated with the implementation of the project will generate waste. It is the duty of the Ministry of Environment and Forestry to oversee aspects related to protection of the environment in which the project is being undertaken.

Legislation	Description	Relevance to the Project
	management and equipment are performing in conserving the Environment and its resources during a project implementation process. The Bill empowers the Ministry of Environment and Forestry to supervise and coordinate all matters relating to the environment and to be the principal instrument of government in the implementation of all policies relating to the environment including biodiversity.	
Wildlife Conservation and Protected Areas Bill, 2015	The Ministry of Interior and Wildlife Conservation (MIWC) is developing a Wildlife and Protected Area Policy, from which a new set of legislation will be developed to replace the Wildlife Conservation and National Parks Act, 2003. The purpose of this Bill is to cover all issues regarding Wildlife Conservation, the establishment and management of protected areas (PAs) and the sustainable management and conservation of South Sudan's natural heritage and wildlife for the benefit of its citizens. The Bill contains principles that introduces new concepts of: public participation, community -based conservation; participation of local and traditional leaders, cultural and social benefits for conserving wildlife resources; recognition of indigenous knowledge Wildlife Conservation and mitigation of human-wildlife conflicts wherever they occur. The Bill allows local communities around PAs to manage wildlife in collaboration with the South Sudan Wildlife Service (SSWS) and permits other organizations to manage any PA on behalf of Government. Significantly, the Draft Wildlife Bill increases the number of wildlife offences as well as explicitly providing for the crime of wildlife trafficking. These include illegal hunting, capture and trafficking of animals in the protected list. The Bill shows serious commitment to conserve biodiversity by providing a list of wildlife species to be protected.	This law is relevant as far as wildlife conservation and management is concerned. Transmission line route may cross national parks or protected areas.

Legislation	Description	Relevance to the Project
National Electricity Bill, 2015	The Bill provides for the regulation of generation, transmission, distribution, export and import of electricity in South Sudan. The Bill provides for the power of a licensee (or a project developer) and transmissions (Section 33). The Bill also provides for the establishment and governance of the South Sudan Electricity Regulatory Authority (SSERA) which, as part of its core responsibilities, is supposed to monitor the performance and compliance with the law and license conditions, and the functioning of regulated entities of the electricity supply industry. Chapter IV deals with the establishment of the South Sudan Electricity Corporation (SSEC) and the State Electrical Distribution Company. Chapter XI gives provisions to issues related to land. Schedule 1, particularly part 4, gives detailed explanatory guidance in the process of acquisition of way leaves.	The project will be implemented in accordance with this bill since it will involve the transmission of electricity.
Draft Wildlife Bill, 2013	The Draft Wildlife Bill (2013) establishes an autonomous South Sudan Wildlife Service (SSWS) as proposed by the Constitution with a board of trustees and headed by a Director-General both appointed by the President. One of its key functions will be coordination with other relevant authorities of all issues affecting wildlife management including issues of security, infrastructure, private investment and land use planning. This will be done by ensuring the enforcement and implementation of the law with respect to the use of wildlife, the management of protected areas and other uses of natural resources.	This law is relevant as far as wildlife conservation and management is concerned. Transmission line route may cross national parks or protected areas.
Water Bill, 2013	The Water Bill (2013) provides for the protection of water sources from pollution, erosion or any other adverse effects by creating Protected Zones within a catchment draining to, or above any water facility forming part of a water supply or any catchment, lake, reservoir, aquifer, wetland, spring, or any other source of water (section 34). The Bill aims to develop procedures for prioritizing allocation of water resources for different	The transmission line route is expected to cross some water bodies of the secondary drainage network. The potential impact on swamps or wet areas, if present along the line corridor, should be minimized or avoided.

Legislation	Description	Relevance to the Project
	social, economic and environmental uses, efficiency, system reliability and environmental sustainability principles. It also aims to conserve available water resources, to manage water quality and to prevent pollution of ground and surface waters; manage floods and droughts and mitigate water-related disasters, and; establish appropriate management structures including mechanisms for inter-sectoral coordination and stakeholder participation.	
South Sudan Access to Information Act No. 65 of 2013	The South Sudan Access to Information Act No. 65 of 2013 spells out that every citizen shall have the right of access to information. It focuses on the right to access information held by public bodies in South Sudan. The purpose of the Act is to give effect to the constitutional right of access to information, promote maximum disclosure of information in the public interest and establish effective mechanisms to secure that right.	This emphasises the need to disseminate project information to all the respective stakeholders and which go a long way in ensuring transparency on various aspect of the project.
Forests Bill, 2009	The Forests Bill (2009) is meant to operationalize the Forestry Policy covering all matters concerned with all forests and woodlands and all forest reserves in the country. The Forests Bill provides for a governance structure for all the forests in the country, national sustainable forest management standards, certification systems and schemes, and private and voluntary standards; procedures and decision-making processes, and complaint and appeal mechanisms. The Bill establishes the South Sudan Forest Commission (SSFC) to function as semiautonomous body which is business oriented. The SSFC will have regulatory and administrative responsibilities relating to the management of forests on public and private lands. It makes provisions for the effective forest protection, penalties for illegal forest activities and institutions needed for sustainable management of forests. The Bill provides for the arming of the disciplined force of SSFC to carry out its functions.	The construction of the transmission line will involve tree removal and reduction of woody biomass due to clearance in the transmission line corridor.
The Land Act, 2009	One of the key objectives of the Land Act is to promote a land management system that protects and preserves the environment and ecology for the	The project should seek to fairly and promptly compensate persons/communities whose

Legislation	Description	Relevance to the Project
	sustainable development of South Sudan. It also provides for fair and prompt compensation to any person whose right of occupancy, ownership or recognized long standing occupancy of customary use of land is revoked or otherwise interfered with by the Government. The Land Act reinforces government recognition of customary land tenure. The Act states that "Customary land rights including those held in common shall have equal force and effect in law with freehold or leasehold rights". Section 58 states that community Land may be registered in the name of: (i) a Community; (ii) a clan or a family; and (iii) a community association and a traditional leader. Section 63: Community land can be allocated to investors as long as investment activity "reflects an important interest for the community' and 'contributes economically and socially to the development of the local community". The Act requires that state authorities approve land acquisitions above 250 feddans (105 hectares) and create a regulated ceiling on land allocations. The Land Act requires that the government consults local communities and consider their views in decisions about community land. Section 64 states that any community or person affected by investment activities shall be compensated in accordance with the provisions of the Constitution. Section 75 details that the compensation shall be in cash or in kind or both according to the agreement. The Act also gives pastoralists special protection.	land will be earmarked to host project components/activities. Additionally, during the implementation of the project, local communities (affected communities) must be adequately consulted.
Local Government Act, 2009	The Act provides for establishment of powers, structure and functions of local governments. It defines the decentralized structure of the government administration. It also contains provisions for land administration and management in accordance with the Land Act and defines roles and responsibilities of traditional authority councils in the dispute resolution process. It also gives wide-ranging powers to Local	Implementation of the project must conform with the respective ordinances and by-laws of the local governments within projects area of influence.

Legislation	Description	Relevance to the Project
	Government councils to perform functions aimed at improving community livelihoods. This Act stipulates the following: • Section 19 (2) States that the traditional leaders shall represent their people in developing legislatures on natural resource management. • Section 19 (3) states that the Boma shall be the main domain of the traditional authority where traditional leaders perform their administration and customary function. • Section 19 (4) states that in the Town Council, the traditional authority shall perform its administrative and customary functions within the quarter council. The Local Government Act 2009 also defines the traditional authority, customary law and the authority of traditional chiefs in South Sudan.	
Public Health (Water and Sanitation) Act, 2008	The Public Health Act emphasizes the prevention of pollution of air and water and also encourages improvement in sanitation. Key provisions include the protection of the sanitation of the environment and encompasses the measure to address the pollution of water and air. It also provides the need for the protection of pollution of water through the enforcement of regulations and measures necessary to combat all elements of pollution and protect the natural level of the environment and public health.	The project construction activities will cause air pollution and potentially also water contamination.
Wildlife Conservation and National Parks Act, 2003	The Wildlife Conservation and Environmental Protection Act states that: (i) wildlife constitutes an important national natural wealth and heritage of the New Sudan, and (ii) the New Sudan authority, shall conserve, protect and utilize this natural wealth for the benefit and enjoyment of all its people in accordance with the Law. Chapter 4, Section 14 of the Act states that “except with the written authorization of the Director General, of which authorization shall be given	This law is relevant as far as wildlife conservation and management is concerned. Transmission line route may cross national parks or protected areas.

Legislation	Description	Relevance to the Project
	only in the interest of the proper management and development of the national park: it is unlawful to: - Cut, clear, burn or otherwise damage remove any tree, bush, plant or other vegetation or any part thereof; - Obstruct, divert or pollute any river, pool, lake or other points of water; - Perform any act or engage in any other activity likely to destroy, endanger or disturb wildlife in the national park or to destroy, shelter or alter its natural habitat and environment" Schedules I, II and III of the Wildlife Conservation and National Parks Act give detailed lists of the completely protected, specially protected and the protected species respectively.	
Forests and Renewable Natural Resources Act, 2002	This is another Act that is no longer legally binding but whose principles remain useful in guiding the management of forest resources in South Sudan. The 2002 Act attempts to follow a more holistic approach by providing a framework for the management and protection of forests and renewable natural resources, including pastures, rangelands and certain aspects of agricultural land use. It also provides a framework governing the management of the forestry sector. Investors are obliged to convert the cleared trees into forest products. The Act imposes a deterrent penalty, namely the confiscation of any property, including the means of transport used in the commission of a forestry offence.	There is need to safeguard natural resources such as trees during project implementation.
The Environmental Protection Act, 2001	This legislation was in force before South Sudan gained her independence. The Act is not legally binding in South Sudan although it remains an important piece of legislation that is used to give guidance in ensuring environmental conservation in the country.	Environmental and Social impacts of the respective sub-projects of the Energy Access Project should be addressed in a proactive manner by subjecting the respective projects

Legislation	Description	Relevance to the Project
	Its principal objectives are: (i) To protect the environment in its holistic definition for the realization of sustainable development; (ii) To improve the environment while ensuring sustainable exploitation of natural resources; (iii) To create a link between environmental and developmental issues, and to empower concerned national authorities and organs to assume an effective role in environmental protection. Section III of the Act outlines general policies and principles regarding the protection of the environment. Article 17 of the Act required that any individual who intends to implement any project that was likely to have a negative impact on the environment, should present an Environmental Impact Assessment (EIA) for approval by the Monitoring and Evaluation Committee of the Higher Commission for Environment and Natural Resources (HCENR) of the then Federal Government of Sudan.	to environmental and assessments prior to their commencement.

5.1.3 International Conventions

In addition to compliance with regulatory requirements, the Project will also adhere to the international conventions ratified by South Sudan. Key conventions and treaties potentially relevant to the Project are outlined in Table 5-3. Other important international instruments relevant to the Project are also outlined in Table 5-4.

Table 5-3 – International Treaties, Conventions or Agreements relevant to the Project.

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the Project
International Labour Organisation's Fundamental Conventions	Labour, working conditions, health and safety are the subject of numerous international agreements, conventions, policies and standards. Fundamental labour standards formulated by the International Labour	2012	Labour policies for the Project and impact mitigation measures for employment should be in accordance

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the Project
	Organisation (ILO) include forced labour, child labour and workmen's compensation among others.		with the requirements of these Conventions.
Ramsar Convention on Wetlands of International Importance especially as waterfowl habitat, 1971	The Convention is an international treaty for the conservation and sustainable utilization of wetlands, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific and recreational value. It advocates the conservation of flora and fauna, and especially waterfowl by combining national policies with international actions. It was signed at Ramsar, Iran on 2nd February 1971 and amended by the protocol of 3rd December 1982. Further amendments were done on 28th May 1987.	10th October 2013	South Sudan currently has one (Sudd wetlands) site designated as a Wetland of International Importance. This wetland should be conserved during the development of the project.
Vienna Convention on the Protection of the Ozone Layer, 1985	Parties should take appropriate measures to protect human health and the environment against adverse effects resulting or likely to result from destruction of the Ozone layer.	12th January 2012	The Proposed Project should undertake measures to minimize emissions that deplete the Ozone layer by locally sourcing for materials that are required for the project to avoid long overland transportation of imported materials.
Convention on the Rights of the Child, 1989	The Convention is the most comprehensive compilation of international legal standards for the protection of the human rights of children. It acknowledges children as individuals with rights and responsibilities according to their age and development, as well as members of a family or community. This includes non-discrimination, the best interest of the child, the right to life, survival and development and the right to participation.	23rd January 2015	Activities associated with the development of project such as construction activities will require semi-skilled and unskilled labour that pose a potential risk of engaging child labour.

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the Project
Bamako Convention, 1991	Requires party states to use legal, administrative and other measures to prevent the import of hazardous waste into Africa from non-contracting parties. All signatories to the Convention are required to impose strict, unlimited liability as well as joint and several liabilities on hazardous waste generators; ensure that environmentally sound treatment and disposal facilities for hazardous wastes are located, to the extent possible, within its jurisdiction; and ensure that persons managing hazardous wastes take all actions necessary to prevent pollution arising from the management of such wastes.	24th January 2013	Hazardous waste generated during the implementation of the proposed Project and therefore there is need for compliance with the requirements of this Convention.
UN Convention on Biological Diversity, (1992)	Its objectives are to conserve biological diversity or (biodiversity), promote the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and technologies, and by appropriate funding (Article 1). The National Biodiversity Strategy and Action Plan (NBSAP, 2018 – 2027) has been developed by the National Ministry of Environment and Forestry as the core instrument for implementation of the CBD at national level. The document aims to serve as "the principle instrument for undertaking biodiversity management and conservation in the country, and as a framework for optimally integrating the management of the country's vast biodiversity resources	17th February 2014	South Sudan has a lot of biodiversity and Wildlife outside protected areas. Project planning should ensure that the project takes appropriate measures to minimise potential impacts on biodiversity and key habitats that may occur in areas earmarked to host project components.

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the Project
	into national economic prosperity and social welfare targets of the Vision 2040".		
United Nations Framework Convention on Climate Change (UNFCCC), 1992	The Convention seeks to regulate levels of greenhouse gases (GHGs) concentration in the atmosphere, so as to avoid the occurrence of climate change at levels that would harm economic development, or that would impede food production. The Convention is founded on the principle that contracting parties should take action, in respect of their economic and social activities, and with regard to the Convention's specific requirements, that will protect the global climate to ensure sustainable development. Under Article 3 (3) parties are required to take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. The National Adaptation Plan of Action (NAPA) to Climate Change was published in 2016 by the Ministry of Environment. To mitigate these impacts, the plan advocates for reforestation programs, the creation of forest reserves, encouragement of the use of alternative fuel sources, fire management plans, increased public awareness, as well as the establishment of seed banks. In doing so, it is anticipated that the threats of desertification, flooding and droughts will also be reduced.	17th February 2014	Given the fossil fuel heavy nature of South Sudan's energy mix, the solarisation aspect of the project will help to reduce the energy generation related emissions and thus contributing to the country's Greenhouse Gas reduction ambitions as set out in the country's second Nationally Determined Contributions (NDC) report. In the second NDC, South Sudan has significantly increased its climate ambition of reducing emissions across its sectors by 109.87 million tonnes of carbon dioxide equivalent while sequestering an additional 45.06 million tonnes by 2030. This among other things is designed to ensure that South Sudan adopts a sustainable and low-carbon growth pathway while also supporting the country's vision to 'transition from a least developed country to a middle-income country by 2030.
The Treaty of the East African Community, 1999	Articles 111 and 112 of the EAC Treaty provide for conservation and management of environmental and natural resources. They require member states to take	15th April 2016	River Nile is a transboundary water resource shared between Uganda and South Sudan; therefore, measures should

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the Project
	measures to control trans-boundary air, land and water pollution arising from development activities and take necessary disaster preparedness, management, protection and mitigation measures especially for the control of natural and man-made disasters.		be undertaken to minimise/prevent pollution of surface water resources within the Nile Basin during the development of the project.
African Convention on the Conservation of Nature and Natural Resources, 2003	The convention aims at enhancing environmental protection, conservation and sustainable use of natural resources in Africa in accordance with the scientific principles and with due regard to the best interest of the people. The convention further identifies water as a critical resource which needs to be maintained at quantitative and qualitative levels.	24th January 2013	Project planning should ensure that the project takes appropriate measures to minimize potential impacts on biodiversity by putting in place measures to control siltation of water bodies and wetlands, disorientation of migrating birds and hunting/illegal exploitation of wildlife resources by contracted teams.
Convention for the Safeguarding of the Intangible Cultural Heritage, 2003	The objectives include to: safeguard the intangible cultural heritage, ensure respect for the intangible cultural heritage of the communities, groups and individuals concerned and raise awareness at the local, national and international levels regarding the importance of the intangible cultural heritage, and of ensuring mutual appreciation thereof.	23rd October 2017	The people of South Sudan have a number of customs and beliefs that may entail tangible and intangible cultural heritage. Additionally, there could be graves/burial areas in sites that are earmarked to host project components. The implementation of the project should consider the potential impact on cultural heritage in the project area and implement measures to safeguard them where they exist.
Paris Agreement, 2015	Its goal is to limit global warming to well below 2 degrees Celsius, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse	23rd February 2021	

Treaty, Convention, Agreement	Requirement of the Treaty, Convention, and Agreement	Ratification	Relevance to the Project
	gas emissions as soon as possible to achieve a climate neutral world by mid-century.		

Table 5-4 – Other important international instruments relevant to the Project

Title	Description	Relevance to the Project
Africa Union Vision 2063 (AUC, 2015)	This is Africa's transformation plan over the next 50 years and sets out a number of aspirations that are to be realized during that period. The agenda has since been adopted by the African Union (AU), within the global context of the Sustainable Development Goals (SDGs). The following action items that are applicable to South Sudan: - Develop strategies to grow African Green Economies. This action item is directly linked to SDG 12 (Responsible consumption and production); - Act with a sense of urgency on climate change and the environment. The AU proposes implementing the Programme on Climate Action in Africa, which includes, for example, climate resilient agricultural development programme, sustainable forest management programmes, national adaptation plans, systems and structures, etc. Each of these action items will support South Sudan's sustainable development, helping to mitigate climate change and adapt to its impacts.	The agenda promotes the development of infrastructure which is in tandem with proposed Project. The project will lead to the development of electricity infrastructure in South Sudan. This should promote a reduction of South Sudan dependence on thermal power, thus reducing carbon emissions.
The 2030 Sustainable Development Goals (SDGs)	The SDGs were formally adopted by South Sudan and other UN member states in September 2015 as an integral part of the 2030 Agenda on Sustainable Development. Among other things, the document contains a set of 17 SDGs and 169 accompanying targets. These were further elaborated through indicators focused on measurable outcomes. SDG indicators and targets are to be integrated in the appropriate Sector and Local Government Plans and budgets coupled with implementation, monitoring and evaluation frameworks. South Sudan's main challenges related to SDG implementation include: institutional arrangements, adequacy of financing and means of	Development of the proposed project should comply with SDG 9 (industry, innovation and infrastructure). Additionally, this project will lead to economic growth of South Sudan (SDG 8 – Decent work and Economic growth) and contribute to reduction of poverty levels (SDG 1 - No poverty and SDG 10 – Reduced Inequalities). Furthermore, the project shall and provide energy to remote areas, contributing to achievement of SDG 7 (Affordable and clean

Title	Description	Relevance to the Project
	implementation, domestic and external resources, mobilization and partnership with stakeholders and the private sector.	Energy) and promote a reduction of South Sudan dependence on thermal power, thus reducing carbon emissions (SDG 13 – Climate action).
NBI Gender mainstreaming Policy and Guidelines, 2012	The purpose of the NBI gender mainstreaming Policy and Strategy is to achieve gender equality and women's empowerment in all NBI policies, strategies, processes, programs and projects through capacity building, rationalization and harmonization, research, resource mobilization, partnership development and advocacy. Guiding principles for the implementation of the NBI Gender mainstreaming Policy and Strategy: a) Gender Equality and non-discrimination: Working towards equity and justice by ensuring that everyone irrespective of sex, age, race, color, ethnicity, class and religion has an equal opportunity to express and utilize her/his potential; b) Gender mainstreaming: Taking into account gender concerns systematically from planning through implementation strategies and programs to outcomes; c) Inclusiveness: this policy stresses paying attention to special needs and the disadvantaged groups; d) Partnership and collaboration of all stakeholders at all levels; e) Sensitivity to socio-cultural diversity in the Nile Basin region.	The strategy forms an integral part of projects activities and aims at providing a view of the gender goals and to facilitate a process of learning and increased capacity to analyze and mainstream gender in the course of the work.
NELSAP Preliminary Environmental and Social Management Framework, 2009	This Environmental and Social Management Framework (ESMF) lays down the guiding principles and procedures for addressing environment and social concerns during the preparation and the implementation of NELSAP investment projects. The objectives of the ESMF therefore include the following: (i) to establish clear procedures and methodologies for the environmental and social planning, review and approval of the projects to be prepared under	The ESMF recognizes the laws, regulations as well as national policies on environment and social issues and relevant World Bank safeguards. The ESMF includes procedures for screening all the projects to be prepared for environmental issues and impacts using national as well as International frameworks.

Title	Description	Relevance to the Project
	NELSAP; (ii) specify roles and responsibilities, and outline the necessary reporting procedures, for managing and monitoring environmental and social concerns related to projects; (iii) determine the training, capacity building needed to successfully implement the provisions of the ESMF and (iv) establish the project financing required to implement the ESMF.	
Nile Basin Initiative (NBI) Strategic Action Program, 1999	The NBI's Strategic Action Program is made up of two complementary programs: the basin-wide *Shared Vision Program* to build confidence and capacity across the basin, and *Subsidiary Action Programs* to initiate concrete investments and action on the ground at sub-basin levels. The *Shared Vision Program* (*SVP*), which focuses on building regional institutions, capacity, and trust, lays the foundation for unlocking the development potential of the Nile. The *Subsidiary Action Programs* (*SAP*) are investment-oriented programs aimed to implement on the ground actual development projects at sub-basin level. These programs operate in two distinct sub-regions, the Eastern Nile Region and the Nile Equatorial Lakes Region.	This Project was prioritized by the Governments of South Sudan and Uganda under Nile Basin initiative (NBI) and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) for Scaling up the NELSAP Power Program following the Study for Hydropower Expansion Plan. It is within this background that the NELSAP/Nile Basin Initiative was mandated in the signed Inter Governmental MOU of 2015 between and the Governments of Uganda and South Sudan to mobilize financing of the project.
Vulnerable and Marginalized Groups Framework	A Vulnerable and Marginalized Groups Framework is developed when a proposed project design is not yet finalized so that it is impossible to identify all of the adverse impacts, as is required to prepare a Vulnerable and Marginalized Groups Plan (VMGP). The VMGF is used to qualify for funding from the World Bank and following best practice documented in the World Bank's Environmental and Social Policy for Investment Project Financing (ESS7).	The Project implementing agency will identify the individuals and groups who might be vulnerable and at risk of suffering adverse, compounded or disproportionate impacts, be discriminated against, marginalized, under-served or excluded from intended benefits in the given operation/project context (The same as "OS 7: Vulnerable Groups" section). The Project aims to help Marginalized and vulnerable groups to have access to energy.

Title	Description	Relevance to the Project
East African Community (EAC) Gender Policy, 2018	This Policy provides a framework, intended to accelerate the realization of gender equality, fairness between men and women, non-discrimination and fundamental rights in East Africa. The Policy framework is a tool to facilitate the advancement of East Africa's political and social economic integration, guarantee that gender issues are included in the East African Community agenda, accelerate gender mainstreaming, contribute to higher living standards and enhance the efforts exerted by the East African people to play their rightful role in a globalizing world. The EAC is committed to increase access to affordable energy for men and women in order to increase economic development and improve standards of living.	Gender, Energy and Lighting is a priority action area of the Gender policy, and the commitment of increasing access to energy for men and women is expressed in the Project.
The IGAD Regional Gender Equality Strategy (2023-2030)	The IGAD Gender Equality Strategy sets the strategic framework for priority interventions areas of the implementation of IGAD's Vision 2050 and builds on several ongoing programs established to develop resilient ecosystems and economic growth. The gender strategy outlines an approach that intends to translate IGAD's commitments to gender equality, inclusion, and empowerment into demonstrable results and impacts. The priorities of the strategy include: • Increase women's participation in sustainable management of natural resources, resilience building, food, and nutrition security; • Advance gender equality in regional trade and economic integration; • Increase equitable access to health and basic social services for gender transformation; • Increase the participation of women in peace building and conflict management and protect women living in situations of conflict; • Advance efforts to eliminate all forms of violence against all women and girls in public and private spheres, including trafficking, sexual exploitation, and all other forms of exploitation;	The Project aims to promote gender equality in regional trade and economic integration by improving energy accessibility in remote areas. This will enable women to start new trades at a local level or connect existing ones to the rest of the country. Availability of energy will also improve the access of women to technology, education and health.

Title	Description	Relevance to the Project
	• Strengthen IGAD's institutional capacity for leadership and coordination of Gender Equality and Women's Empowerment interventions.	
The African Development Bank Group Gender Strategy (2021-2025)	The African Development Bank has made gender equality and women central to its activities through developing and implementing strategies that integrate women's concerns into the Bank's internal and external operations and engagement. The Gender Strategy 2021-2025 will prioritize the need to reduce gender inequalities across Africa by increasing access to finance and technical assistance, enhancing technical skills and gender-responsive infrastructure. In recognition of the opportunity to further enhance gender equality and women and girl's empowerment on the continent, the Bank, through its High 5s, intends to accelerate the continent's economic and social transformation. The 5s are: Light up and Power Africa, Feed Africa, Industrialize Africa, Integrate Africa, Improve the Quality of Life for the People of Africa.	In a country such as South Sudan, where gender inequalities are prevalent, this Project will provide women in relatively isolated areas with access to electricity. This resource will contribute to the development of their local businesses and economy, ensuring a higher level of security. The Project is placed into the first High 5, Light up and Power Africa, with the aim of empowering women increasing access to social services through infrastructure and creating job opportunities.

5.2 Institutional Framework

In terms of the institutional framework for environmental and social governance, it is important to note that South Sudan is still at its nascent stage and is currently still building its institutions.
The development of the proposed Project will require the coordination of national agencies assisted by lower-level sectoral departments. Some of the relevant institutions will be key in the implementation of the proposed Project are as presented below.

Table 5-5 – National institutions in South Sudan and their relevance to the Project.

Institution / Agency	Mandate and relevance to the proposed project
Ministry of Energy and Dams (MoED)	The Ministry plans and provides power generation, transmission and distribution facilities to industrial and domestic consumers through the South Sudan Electricity Corporation (SSEC). The MoED will be the main implementing agency of the project.
Ministry of Environment and Forestry (MEF)	The Ministry is mandated with the Protection and conservation of the environment as well as ensuring sustainable utilization of the environmental resource base to meet the needs of both the present and future generations. The ministry will be essential in providing oversight in implementation of environmental and social safeguards pertaining to the project.
Directorate of Climate Change and Meteorology	The Directorate develops and implements programmes to address climate change issues and coordinates the implementation of South Sudan's obligations under the UN Framework Convention on Climate Change (UNFCCC) and the Convention on Biodiversity (CBD). The project will entail the clearing of standing biomass and a consequent loss of carbon sequestration potential. On the other hand, the project is expected to mitigate the effects of climate change through the decarbonization of country's energy generation mix. The project should, therefore, remain cognizant of relevant Climate Change Action Plans to ensure that its activities are undertaken in tandem with the plans.
Ministry of Finance and Planning	The ministry allocates financial resources to government ministries and agencies, thus enabling them to implement government plans, policies, and programmes. The ministry will be essential in negotiating and administering/monitoring the grant funds earmarked for the project by the African Development Bank.
Ministry of Internal Affairs	The Ministry is responsible for ensuring and maintaining security and stability. It oversees agencies such as the police that will be key in the provision of security to the project personnel and assets.
Ministry of Humanitarian Affairs and Disaster Management	Its mandate is to oversee all humanitarian work in South Sudan. Therefore, the ministry will be key in decision-

Institution / Agency	Mandate and relevance to the proposed project
	making on humanitarian related interventions that will be addressed by the project related interventions.
Ministry of Labour, Public Service and Human Resource Development	The mandate of the ministry includes regulation of the Private Sector labour market in a manner that is consistent with national priorities, values, and cost-effective service delivery. The ministry will ensure that the project's labour policies and guidelines are in line with its requirements and labour standards.
Ministry of Gender, Social Welfare and Religious Affairs	It is responsible for formulation and implementation of policies and legislations for promotion of gender equality, women's empowerment, child protection, social Protection and Social Welfare of the vulnerable groups in general welfare. As such, the ministry will ensure that gender equality and social justice are considered during the development of the project.
South Sudan Electricity Corporation (SSEC)	The SSEC is a government parastatal whose primary purpose is to generate electricity for use in South Sudan and for sale to neighboring countries.

5.3 International Environmental and Social Policies

Development partners or their agencies fund most development projects in developing countries, Uganda inclusive. Most development partners require either the African Development Bank (AfDB) or World Bank (WB) guidelines as a basis for funding development projects. Therefore, the 400kV Olwiyo-Nimule transmission line ESIA addresses the AfDB's and WB's social and environmental safeguard policies. The following guidelines and procedures are relevant to the 400kV Nimule (Uganda border) - Juba interconnection project.

5.3.1 The African Development Bank's Safeguard Policies and Procedures

Following the environmental and social safeguard policies established by the African Development Bank (AfDB) is a prerequisite for most development projects in developing countries, including Sotuh Sudan, funded by external development partners or their agencies. This ensures projects comply with internationally recognized sustainability standards. The proposed project will specifically address the AfDB's Integrated Safeguards System (ISS), which was adopted in 2013.
The AfDB ISS is a comprehensive framework which established the Bank Group's commitment to sustainable development and has been designed to address environmental and social impacts anticipated from the implementation of development projects. The ISS aims to:

- *Integrate sustainability*: Ensure environmental, climate change, and social considerations are incorporated into development plans (Country Strategy Papers, Regional Integration Strategy Papers) across Africa.
- *Identify and mitigate risks*: Proactively assess the potential environmental and social impacts (including gender, climate change, and vulnerability) of AfDB-funded projects.

- *Minimize negative impacts*: Prioritize avoiding negative environmental and social impacts. If unavoidable, minimize, mitigate, and compensate for these impacts on affected communities.
- *Stakeholder engagement*: Ensure meaningful participation of stakeholders, particularly affected communities, throughout the project cycle. This includes timely access to information and consultation on issues that may affect them.
- *Effective risk management*: Guarantee effective management of environmental and social risks throughout project implementation and beyond.
- *Strengthen regional member countries capacity*: Support regional member countries (RMCs) in strengthening their environmental and social risk management systems. This includes assessing and building their capacity to meet AfDB's ISS requirements.

The ISS surpasses the limitations of the previous Environmental and Social Assessment Procedures (ESAP) by providing a robust procedural framework for integrating safeguards throughout the project cycle. It outlines specific procedures for the Bank, borrowers, and clients to ensure project compliance with the five Operational Safeguards (OS) at each stage.
The five AfDB's Operational Safeguards are the following:

- **Operational Safeguard 1 – Environmental and Social Assessment**
  This safeguard creates a framework for project Environmental and Social Assessments (ESAs). It defines risk categories, assessment scope (climate change, consultation, etc.), client responsibilities (conducting ESA, ESMP), Bank staff roles (support, compliance), and legal/regulatory considerations. It builds on the Bank's existing environmental policy.
  Additionally, OS 1 emphasizes public disclosure of the ESA process and findings to ensure transparency and stakeholder engagement. It outlines procedures for incorporating public feedback into the assessment and mitigation strategies.
  While the primary focus is on identifying and mitigating environmental and social risks, the ESA process can also identify opportunities for positive social and environmental outcomes. The safeguard might encourage the project to create benefits for the local community or contribute to climate change adaptation/mitigation efforts.

- **Operational Safeguard 2 – Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation**
  This safeguard strengthens the Bank's involuntary resettlement framework. It emphasizes avoiding resettlement whenever possible and minimizing impacts when unavoidable. Compensation includes social, cultural, and economic aspects to ensure fair replacement costs and improve livelihoods. The safeguard promotes inclusive resettlement through options and considerations that address specific needs of women, men, elderly, and disabled individuals. This empowers affected populations to rebuild their lives and become self-sufficient.
  Furthermore, Operational Safeguard 2 requires the development of a Resettlement Action Plan (RAP) that details the resettlement process, compensation standards, livelihood restoration measures, and grievance redress mechanisms. This plan is developed with the involvement of affected communities, ensuring their voices are heard and concerns addressed.
  The Bank also plays a role in monitoring the implementation of the RAP and the overall wellbeing of resettled populations. This ensures long-term sustainability of resettlement efforts and promotes positive outcomes for affected communities.

- **Operational Safeguard 3 – Biodiversity, Renewable Resources and Ecosystem Services**

This Operational Safeguard strengthens Bank project management regarding biodiversity and ecosystem services. It prioritizes conserving biodiversity and ecosystem integrity by minimizing project impacts. Unavoidable impacts are addressed through restoration and "net gain" offsets. The policy also safeguards natural habitats and sustains the flow of essential ecosystem services for affected communities and project success.

The Environmental and Social Assessment (ESA) integrates these goals. Borrowers identify potential opportunities, risks, and impacts on biodiversity and ecosystem services. A mitigation hierarchy is applied, prioritizing avoidance of harm, followed by reduction, mitigation/restoration, and lastly compensation/offsetting. The policy focuses on addressing major threats like pollution and habitat loss. Finally, recognized experts are consulted to assess the full range of biodiversity and ecosystem service values, including those identified by stakeholders.

In essence, this policy promotes responsible project development that safeguards biodiversity and ecosystem services for long-term sustainability.

- **Operational Safeguard 4 – Pollution Prevention and Control, Hazardous Materials and Resource Efficiency**

  This Operational Safeguard strengthens AfDB project practices by emphasizing pollution prevention and control (PPC) for high environmental performance and sustainable resource use. Borrowers adhere to a tiered compliance system, prioritizing national environmental regulations and best practices. When national regulations are less stringent, adherence to international conventions and best practices is mandatory. Justifications for alternative approaches, along with detailed technical and financial feasibility studies, are required through the environmental and social assessment process. Project-wide integration is crucial. Borrowers continuously assess and implement resource-efficient and pollution-prevention techniques throughout all project phases, ensuring cost-effectiveness alongside technical and financial viability. Ultimately, this safeguard promotes responsible project development that minimizes environmental impact and fosters long-term resource sustainability.

- **Operational Safeguard 5 – Labor Conditions, Health and Safety**

  This safeguard reinforces the Bank's commitment to worker well-being, recognizing labour as a cornerstone of poverty reduction and economic growth. It emphasizes the importance of worker rights in fostering a strong and productive workforce. Borrowers and clients are required to uphold specific standards concerning worker protections and basic needs. These include ensuring safe and healthy working conditions that meet national labour standards, respecting worker association rights, implementing robust occupational health and safety measures, and strictly prohibiting child and forced labour in any project activity. By adhering to these principles, borrowers and clients contribute to the development of a sustainable and empowered workforce, ultimately aligning with the Bank's broader goals of poverty reduction and economic growth.

The relevance of African Development Bank Operational Safeguards (OSs) to the proposed Project are outlined in Table 5-6.

Table 5-6 – African Development Bank OSs and their relevance to the Project

SAFEGUARDS TRIGGERED BY THE PROJECT	
AfDB OSs	**Relevance to the project**
OS1 – Environmental and Social Assessment	Whereas the activities to be financed by the project will have a range of environmental and social benefits, the activities could also be a source of adverse environmental and social impacts as highlighted below: - Generation of hazardous and non-hazardous waste; - Small scale soil erosion and alteration of land stability; - Landscape disturbance; - Potential risks to flora and fauna; - Introduction of occupational and community health risks; - Localized dust emissions from trenching and installation of equipment, emissions to air from vehicle fleets (exhaust emissions); and - Noise pollution from installation of equipment and transformer sets, among others. *This standard aims at identifying all the probable E&S risks on the project and defining appropriate mitigation measures in order to minimize such risks.*
OS2 – Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation	The project is expected to require land acquisition in the right of Way of the Transmission Line. *The project should aim at avoiding displacement of people. Where land take and displacement are inevitable for some project components as highlighted above, compliance with this standard must be sought to ensure compensation of affected individuals/communities. Additionally, impacts on assets and livelihoods must be considered.*
OS3 – Biodiversity, Renewable Resources and Ecosystem Services	Activities involving creation of a right of way and construction of substations, will entail clearance of vegetation to set up project components. Electricity transmission lines pose fatal risks to birds through collision and electrocution and also habitat fragmentation for terrestrial fauna. *Actions to enhance biodiversity conservation and protection of living natural resources should be considered by the project.*
OS4 – Pollution Prevention and Control, Hazardous Materials and Resource Efficiency	Improper disposal of waste and leachate that is generated in landfills could cause pollution. Erosion and sedimentation as well as pollution, can result from civil works on transmission line and substations. *The assessment of E&S risks related to the project should identify the potential of pollution of environmental media (air, water, soil) as a result of implementing project activities during the construction, operation and decommissioning phases.* *Additionally, the potential for project activities to over use natural resources such as water and energy should be considered.*

SAFEGUARDS TRIGGERED BY THE PROJECT	
AfDB OSs	**Relevance to the project**
OS5 – Labor Conditions, Health and Safety	The project will have direct and contracted workers that will be engaged by project implementing entities as well as primary supply workers. The workers will be exposed to occupational health risks when undertaking construction, operation and maintenance activities. Additionally, other risks such as exploitation and unfair wages, electrocution, discrimination at work and exposure to Gender Based Violence (GBV), Sexual Harassment (SH), spread of HIV/ AIDs and poor working conditions could impact on timely project delivery, lead to injury and even fatalities. Road accidents could also easily occur during project implementation. *The project should ensure proper labour and working conditions during the construction, operation and decommissioning phases.*

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SAFEGUARDS TRIGGERED BY THE PROJECT	
AfDB OSs	**Relevance to the project**
OS1 – Environmental and Social Assessment	Whereas the activities to be financed by the project will have a range of environmental and social benefits, the activities could also be a source of adverse environmental and social impacts as highlighted below: - Generation of hazardous and non-hazardous waste; - Small scale soil erosion and alteration of land stability; - Landscape disturbance; - Potential risks to flora and fauna; - Introduction of occupational and community health risks; - Localized dust emissions from trenching and installation of equipment, emissions to air from vehicle fleets (exhaust emissions); and - Noise pollution from installation of equipment and transformer sets, among others. *This standard aims at identifying all the probable E&S risks on the project and defining appropriate mitigation measures in order to minimize such risks.*
OS2 – Involuntary Resettlement: Land Acquisition, Population Displacement and Compensation	The project is expected to require land acquisition in the right of Way of the Transmission Line. *The project should aim at avoiding displacement of people. Where land take and displacement are inevitable for some project components as highlighted above, compliance with this standard must be sought to ensure compensation of affected individuals/communities. Additionally, impacts on assets and livelihoods must be considered.*
OS3 – Biodiversity, Renewable Resources and Ecosystem Services	Activities involving creation of a right of way and construction of substations, will entail clearance of vegetation to set up project components. Electricity transmission lines pose fatal risks to birds through collision and electrocution and also habitat fragmentation for terrestrial fauna. *Actions to enhance biodiversity conservation and protection of living natural resources should be considered by the project.*

SAFEGUARDS TRIGGERED BY THE PROJECT	
AfDB OSs	**Relevance to the project**
OS4 – Pollution Prevention and Control, Hazardous Materials and Resource Efficiency	Improper disposal of waste and leachate that is generated in landfills could cause pollution. Erosion and sedimentation as well as pollution, can result from civil works on transmission line and substations. *The assessment of E&S risks related to the project should identify the potential of pollution of environmental media (air, water, soil) as a result of implementing project activities during the construction, operation and decommissioning phases.* *Additionally, the potential for project activities to over use natural resources such as water and energy should be considered.*
OS5 – Labor Conditions, Health and Safety	The project will have direct and contracted workers that will be engaged by project implementing entities as well as primary supply workers. The workers will be exposed to occupational health risks when undertaking construction, operation and maintenance activities. Additionally, other risks such as exploitation and unfair wages, electrocution, discrimination at work and exposure to Gender Based Violence (GBV), Sexual Harassment (SH), spread of HIV/ AIDs and poor working conditions could impact on timely project delivery, lead to injury and even fatalities. Road accidents could also easily occur during project implementation. *The project should ensure proper labour and working conditions during the construction, operation and decommissioning phases.*

5.3.2 The World Bank Group's Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution

The World Bank Environmental and Social Framework also requires borrowers to apply the relevant requirements of the World Bank Group Environmental, Health and Safety Guidelines (EHSGs) which are technical reference documents, with general and industry specific examples of Good International Industry Practice (GIIP).

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. The document lists environmental issues, occupational health and safety concerns and community health and safety impacts which are associated with transmission lines.

All issues in these guidelines were either taken care of at design stage or are discussed and mitigated as part of this report. For example, air craft safety and navigation as part of the community health and safety concerns was taken care of during scoping study stage by ensuring that the line was routed away from airfields. The line was also designed to avoid Central Forest Reserves, congested areas and other sensitive habitats (wetlands and other protected areas) as a strategy of ensuring that adverse impacts are eliminated at design stage. The applicable issues are mainly terrestrial and habitat alteration, electromagnetic fields, hazardous materials, concerns due to live power lines, working at height, exposure to chemicals, visual amenity and noise.

5.3.3 Equator Principles

The Equator Principles are a credit risk management framework for determining, assessing and managing environmental and social risk in project finance transactions. Project finance is often used to fund the development and construction of major infrastructure and industrial projects.
The Equator Principles are adopted voluntarily by financial institutions and are applied where total project capital costs exceed USD 10 million. The Equator Principles are primarily intended to provide a minimum standard for due diligence to support responsible risk decision making.

The Equator Principles are based on the International Finance Corporation (IFC) Performance Standards on social and environmental sustainability and on the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines). They are intended to serve as a common baseline and framework for the implementation by each adopting institution of its own internal social and environmental policies, procedures and standards related to its project financing activities. Reference is made to the latest available edition of Equator Principles, that is EP4 dated July 2020.

Table 5-7 – Equator Principles relevance to the Project.

Equator Principle	Relevance to the Project
Principle 1: Review and Categorisation	According to the International Finance Corporation's (IFC) categorisation process, the project is categorized by the Equator Principles Financial Institutions (EPFIs) based on the magnitude of potential environmental and social risks and impacts, including those related to Human Rights, climate change and biodiversity. The proposed Project, given its features, is classified as **Category A Project**, i.e. with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented.
Principle 2: Environmental and Social Assessment	The EPFI will require the client to conduct an appropriate Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and scale of impacts of the proposed Project. For Category A Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). The client is expected to include assessments of potential adverse climate change risks as part of the ESIA or other Assessment.
Principle 3: Applicable Environmental and Social Standards	The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. The EPFI's due diligence will include, for all Category A and Category B Projects globally, review and confirmation by the EPFI of how the Project meet each of the Principles. The review of the Assessment process will establish, to the EPFI's satisfaction, with supporting advice from the Independent Environmental and Social Consultant where applicable, the Project's overall compliance with, or justified deviation from, the applicable standards. The applicable standards represent the minimum standards required by the EPFI. For Projects located in Non-Designated Countries, such as South Sudan, compliance with the applicable IFC Performance Standards on Environmental and Social Sustainability and the World Bank Group's Environmental, Health and Safety Guidelines (EHS Guidelines) shall be evaluated.

Equator Principle	Relevance to the Project
Principle 4: Environmental and Social Management System and Equator Principles Action Plan	For all Category A and Category B Projects the EPFI will require the client to develop and / or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards.
Principle 5: Stakeholder Engagement	For all Category A and Category B Projects the EPFI will require the client to demonstrate effective Stakeholder Engagement, as an ongoing process in a structured and culturally appropriate manner, with Affected Communities, Workers and, where relevant, Other Stakeholders. Disclosure of environmental or social risks and adverse impacts should occur early in the Assessment process, in any event before the Project construction commences, and on an ongoing basis. All Projects affecting Indigenous Peoples will be subject to a process of Informed Consultation and Participation, and will need to comply with the rights and protections for Indigenous Peoples contained in relevant national law, including those laws implementing host country obligations under international law. IFC Performance Standard 7 detail the special circumstances that require the Free, Prior and Informed Consent of affected Indigenous Peoples.
Principle 6: Grievance Mechanism	For all Category A Projects, the EPFI will require the client, as part of the ESMS, to establish effective grievance mechanisms which are designed for use by Affected Communities and Workers, as appropriate, to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance.
Principle 7: Independent Review	For all Category A Projects, an Independent Environmental and Social Consultant, will carry out an Independent Review of the Assessment process including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence and determination of Equator Principles compliance.
Principle 8: Covenants	The client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. Furthermore, for all Category A and Category B Projects, the client will covenant in the financial documentation: a) to comply with the ESMPs and EPAP (where applicable) during the construction and operation of the Project in all material respects; and b) to provide periodic reports that i) document compliance with the ESMPs and EPAP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and c) c) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

Equator Principle	Relevance to the Project
Principle 9: Independent Monitoring and Reporting	For all Category A Projects, in order to assess Project compliance with the Equator Principles after Financial Close and over the life of the loan, the EPFI will require independent monitoring and reporting. Monitoring and reporting should be provided by an Independent Environmental and Social Consultant.
Principle 10: Reporting and Transparency	For all Category A and, as appropriate, Category B Projects: • The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online and that it includes a summary of Human Rights and climate change risks and impacts when relevant. • The client will report publicly, on an annual basis, GHG emission levels during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually. • The EPFI will encourage the client to share commercially non-sensitive Project-specific biodiversity data with the Global Biodiversity Information Facility (GBIF) and relevant national and global data repositories, using formats and conditions to enable such data to be accessed and re-used in future decisions and research applications.

5.3.4 Gap Analysis between national legislation and AfDB Environmental & Social Safeguards and Standards

A gap analysis between the national legislation and both African Development Bank Environmental and Social Operational Safeguards (E&S OSs) and is presented in the following table.

Table 5-8 – Gap analysis between South Sudan Laws and both African Development Bank (AfDB) Environmental and Social Operational Safeguards (E&S OSs).

AfDB E&S OS Objectives	South Sudan Laws Requirements	Gaps	Recommended action
OS 1: Environmental and social assessment			
• Mainstream environmental, climate change, and social considerations into Country Strategy Papers (CSPs) and Regional Integration Strategy Papers (RISPs); • Identify and assess the environmental and social impacts and risks—including those related to gender, climate change and vulnerability—of Bank lending and grant-financed operations in their areas of influence; • Avoid or, if avoidance is not possible, minimise, mitigate and compensate for adverse impacts on the environment and on affected communities; • Provide for stakeholders' participation during the	The South Sudan Draft Environmental Protection Bill (2015) introduces the requirements for Environmental Impact Assessments (Section 18), Environmental Monitoring (Section 20, Cap. 5) and Environmental Audits (Section 32, Cap. 5). The above requirements are in line with the requirements of OS1. The Constitution of South Sudan, Article 166 (6) expects local governments to involve communities in decision-making in the promotion of a safe and healthy environment. The South Sudan Access to Information Act No. 65 of 2013 spells out that every citizen shall	The National Environmental Policy was passed in 2015 and the Environmental Protection Bill was drafted in 2010, and updated in 2013 and 2015. Therefore, the ESIA process is not legally established in national regulations. The OS1 requires to undertake, according to the nature and scale of the project, an Environmental and Social Impact Assessment (ESIA) in the project's entire area of influence (direct and indirect), which is the total area likely to be affected by project activities, assets and facilities. This may include transboundary impacts, given the project extension.	The Project implementing agency shall, according to OS1 requirements: - Conduct a full Environmental and Social Impact Assessments (ESIA) of the project; - Undertake stakeholder engagement and disclose appropriate information in accordance with OS1; - Develop an Environmental and Social Management Plan (ESMP) and implement all its measures and actions; - Conduct monitoring and reporting on the environmental and social performance of the project against the OSs. The ESIA will apply a mitigation hierarchy approach. In ESMP, the

AfDB E&S OS Objectives	South Sudan Laws Requirements	Gaps	Recommended action
consultation process so that affected communities and stakeholders have timely access to information in suitable forms about Bank operations, and are consulted meaningfully about issues that may affect them; • Ensure the effective management of environmental and social risks in projects during and after implementation; and • Contribute to strengthening regional member country (RMC) systems for environmental and social risk management by assessing and building their capacity to meet AfDB requirements set out in the Integrated Safeguards System (ISS).	have the right of access to information, promote maximum disclosure of information in the public interest and establish effective mechanisms to secure that right.	According to AfDB OS1, issues such as gender inequalities, climate change and vulnerability are constant and omnipresent considerations that need to be considered in ES assessment throughout the project life cycle. Furthermore, an Environmental and Social Management Plan (ESMP) is included among the requirements of OS1. The ESMP will be an accurate summary of the material measures and actions to address the potential environmental and social risks and impacts of the project, to be identified in accordance with the mitigation hierarchy approach.	Project implementing agency shall define and plan specific measures and actions over a specified timeframe to maximize positive impacts and avoid, minimize, reduce, mitigate or compensate specific risks and adverse impacts of the project. The Project will engage with stakeholders throughout the project life cycle and will implement meaningful consultations, by providing stakeholder with timely, relevant, understandable and accessible information and consulting them in a culturally appropriate manner. The Project will disclose project information to allow stakeholders to understand the risks and impacts of the project, and potential opportunities. The information will be disclosed in relevant local languages and in a manner that is accessible and culturally appropriate.

AfDB E&S OS Objectives	South Sudan Laws Requirements	Gaps	Recommended action
			It shall be ensured that vulnerable groups / indigenous peoples present in the project area are fully consulted about and have opportunities to actively participate in project design and the determination of project implementation arrangements.
OS 2: Involuntary resettlement: land acquisition, population displacement and compensation			
• Avoid involuntary resettlement where feasible, or minimize resettlement impacts where involuntary resettlement is deemed unavoidable after all alternative project designs have been explored; • Ensure that displaced people are meaningfully consulted and given opportunities to participate in the planning and implementation of resettlement programmes; • Ensure that displaced people receive significant resettlement assistance under the project, so that their standards of living,	The Land Act of 2009 provides for fair and prompt compensation to any person whose right of occupancy, ownership or recognised long standing occupancy of customary use of land is revoked or otherwise interfered with by the Government.	There is no operational Land Policy to inform the existing law and, as a result, the capacity of land management institutions has remained weak. The main gaps between Laws of the Country and AfDB OS2 consist in: the eligibility of compensation, the provision of livelihood restoration and specific assistance due to the land taking, the consultative and disclosure process, the definition of a cut-off date and the census-socio economic survey. Detailed Gap Analysis is included in the RAP Preliminary Report.	Involuntary resettlement should be avoided; however, where involuntary resettlement is unavoidable, appropriate measures to mitigate adverse impacts on displaced persons should be carefully planned and implemented (adequately compensated), in accordance with requirements of OS2.

AfDB E&S OS Objectives	South Sudan Laws Requirements	Gaps	Recommended action
income-earning capacity, production levels and overall means of livelihood are improved beyond pre-project levels; • Provide explicit guidance to borrowers on the conditions that need to be met regarding involuntary resettlement issues in Bank operations to mitigate the negative impacts of displacement and resettlement, actively facilitate social development and establish a sustainable economy and society; and • Guard against poorly prepared and implemented resettlement plans by setting up a mechanism for monitoring the performance of involuntary resettlement programmes in Bank operations and remedying problems as they arise.			
OS 3: Biodiversity, renewable resources and ecosystem services			
• Conserve biological diversity and ecosystem integrity by	The Forests and Renewable Natural Resources Act, 2002, even if no	Many of the key national legislations for biodiversity	The ESIA will identify the potential project-related risks and impacts

AfDB E&S OS Objectives	South Sudan Laws Requirements	Gaps	Recommended action
avoiding or, if avoidance is not possible, reducing and minimising potentially harmful impacts on biodiversity; • Endeavour to reinstate or restore biodiversity, including, where some impacts are unavoidable, through implementing biodiversity offsets to achieve "not net loss but net gain" of biodiversity; • Protect natural, modified, and critical habitats; and • Sustain the availability and productivity of priority ecosystem services to maintain benefits to the affected communities and sustain project performance.	longer legally binding, established principles that remain useful in guiding the management of forest resources in South Sudan. The 2002 Act attempts to follow a holistic approach by providing a framework for the management and protection of forests and renewable natural resources, including pastures, rangelands and certain aspects of agricultural land use. Similarly, the Wildlife Conservation and National Parks Act of 2003 provided for the protection of wildlife and associated habitat in designated National Park Areas. Furthermore, the National Environmental Policy 2015-2025 and the Forest Policy (2019) have been developed. However, they do not have an accompanying legislation to reinforce the framework.	management in South Sudan are still in the form of Bills, before the National Legislative Assembly. The Bills include: - the National Environmental Protection Bill 2015; - the Draft Wildlife Bill, 2013; - the Wildlife Conservation - and Protected Areas Bill, 2015; - The Water Bill, 2013; - the Forests Bill, 2009. The Draft Policies include: - The Draft National Environment Policy 2013; the South Sudan Wildlife Conservation and Protected Area Policy (Draft of June 2012).	on habitats and the biodiversity that they support, according to requirements of OS3. The assessment will encompass any areas of potential biodiversity importance that may be affected by the project, whether or not they are protected under national law. The project will avoid any encroachment into any sensitive habitat and/or protected areas. When avoidance of adverse impacts on natural or modified habitats is not possible, the Project proponent will implement measures to minimize adverse impacts and restore biodiversity in accordance with the mitigation hierarchy provided in OS1 and with the requirements of OS3.
OS 4: Pollution prevention and control, hazardous materials and resource efficiency			
• Manage and reduce pollutants resulting from the project—	The Constitution of South Sudan provides that the people of South Sudan shall have a right to a clean and healthy environment, that	There is need for an operational environment Act and associated resource efficiency and pollution	The project will consider ambient conditions and apply technically and financially feasible resource efficiency and pollution prevention

AfDB E&S OS Objectives	South Sudan Laws Requirements	Gaps	Recommended action
including hazardous and nonhazardous waste—so that they do not pose harmful risks to human health and the environment; and • Set a framework for efficiently using all of a project's raw materials and natural resources, especially energy and water	every person shall have the obligation to protect the environment, and that future generations shall have the right to inherit an environment protected for the benefit of present and future generations. Specific measures to ensure the objectives above include: prevention of pollution and ecological degradation; promotion of conservation; securing ecologically sustainable development and use of natural resources while promoting rational economic and social development so as to protect the biodiversity of South Sudan.	preventions regulations, that are currently missing in the country.	measures in accordance with the mitigation hierarchy approach. The measures will be proportionate to the risks and impacts associated with the project and consistent with Good International Industry Practice (GIIP), in the first instance the EHSGs and AfDB ISS guidance notes.
OS 5: Labour conditions, health and safety			
• Protect workers' rights; • Establish, maintain, and improve the employee employer relationship; • Promote compliance with national legal requirements and provide supplemental due diligence requirements where	The Labour Act, 2017: the purpose of this Act is to establish a legal framework for the minimum conditions of employment, labour relations, labour institutions, dispute resolution and provision for health and safety at the workplace, in accordance with the Constitution of the Republic of South Sudan, 2011, and in	Since South Sudan has no statutory minimum wage, there is a risk that local contractors and sub-contractors underpay the contracted or supply workers. Enforcement of labour laws is minimal. Significant amounts of unskilled jobs are filled by immigrant	The project will implement all reasonable precautions to protect the health and safety of workers as outlined in the World Bank EHS guidelines. Preventive and protective measures should be introduced according to the hazard mitigation hierarchy.

AfDB E&S OS Objectives	South Sudan Laws Requirements	Gaps	Recommended action
national laws are silent or inconsistent with the OS; • Align Bank requirements with the ILO Core Labor Standards, and the UNICEF Convention on the Rights of the Child, where national laws do not provide equivalent protection; • Protect the workforce from inequality, social exclusion, child labour, and forced labour; and • Establish requirements to provide safe and healthy working conditions.	conformity with international and regional obligations of South Sudan. Section 10 spells out that forced labour is prohibited. Section 12 provides protection for children. Minimum age for work is 14, and minimum age for hazardous work is 18. The Child Act (Act No. 10 of 2008) regulates the elimination of child labour, protection of children and young persons, hazardous child labour.	workers, often without work permit. The minimum age for general employment is 14 years, which is in accordance with ILO Convention 138, recognizing the age of 14 as the minimum age for general work for country whose economy and educational facilities are insufficiently developed. However, in practice children between the age of 10-14 are further employed. The Labour Act lacks clarity on prohibitions on the worst forms of child labor. Article 12(2) allows children between the ages 14 and 18 to be engaged in general labor, including the worst forms of child labor, which violate international standards. Forced labor takes place, for example in recruitment into the national Army.	The project will comply with the Labour Act, but it will monitor wages paid. The project should not deploy foreign workers under contractors and sub-contractors without work permit, especially as pertains to semi-skilled and unskilled jobs. Project will apply occupational health and safety management system that is consistent with the IFC General Environmental Health and Safety Guidelines (EHSGs) on Occupational Health and Safety. The Project will only allow the deployment of workers from the age of 18. The project will not allow any forced labour.

6 STAKEHOLDER ENGAGEMENT AND INFORMATION DISCLOSURE

The preliminary analysis of the stakeholders has identified three main actors:

1) Institutional Stakeholder
2) Customary Stakeholders
3) Project affected people

During this study the consultation process was structured on two rounds of meetings, the first with district authorities and environmental authorities to verify the critical aspect of the project alternatives. The sectorial experts met the different officers after a formal introduction of SSEC. This round was essential to gain all the contacts of the key stakeholders at local level. A second round was organized during the census survey, from district, sub county and village level to share information about the project and organize the meeting with affected PAPs. The target villages are those crossed buy the project. Through the support of village leaders, meeting with PAPs were carried out. Meeting was conducted with two days' notice by the village leader, the meetings were carried out with the help of translators. During the meeting the concept were presented through posters and maps.

6.1 Institutional Stakeholders

The Land Act and the Local Government Act are the main frameworks on land reform in South Sudan. According to the CPA, South Sudan was supposed to institute the South Sudan Land Commission (SSLC), which would be decentralised to the lower levels of the government (states, counties, payams, and bomas) in the following way: each state was to have a state land commission (SLC), each SLC was to be decentralised to a county land authority (CLA), each CLA to a payam land council (PLC), and each PLC to a boma land administration (BLA)[2].

Until 2017, only Jonglei and the three states of Equatoria (Eastern, Central, and Western Equatoria) managed to institute state land commissions. However, none of those commissions actually devolved their duties to the county authority, then to the payam land council, then to the boma land administration. In Nimule, land is primarily administered by a Land Board presided over by community leaders and the Town Council.

At institutional level, the South Sudan Land Commission (SSLC) was established in 2005 to provide leadership on many land-related issues, but as an independent commission without representation in the Council of Ministers, the SSLC does not have the mandate to execute the reforms called for in the Land Act. To address this gap, the 2013 Land Policy proposed the creation of a new position of Deputy Minister of Lands in the RSS Ministry of Lands, Housing and Physical Planning. The Deputy Minister would be responsible for promoting the reforms and fostering greater coherence among land governance institutions at all levels[3].

At the lower administrative levels, counties, payams, and bomas, are respectively headed by paramount, head, and executive chiefs who act as local government officials. Only paramount and head chiefs are included into government's payroll.

[2] Africa Spectrum, 2017.
[3] South Sudan Law Society, 2014.

Prominent actors in dispute resolution related to land grabbing are the state-level Ministry of Physical Infrastructure, the statutory courts, traditional authorities, and county, payam or boma officials.

County land authorities are expected to engage in diverse activities, including the holding and allocation of public land, facilitating registration, supporting land surveys and advising traditional authorities and communities on land tenure and rights.

Table 6-1 – Affected administrative bodies

State	County	Payam
Central Equatoria	Juba	Gondokoro
Central Equatoria	Juba	Lokiliri
Central Equatoria	Juba	Lobonok
Eastern Equatoria	Magwi	Pageri
Eastern Equatoria	Magwi	Mugali

6.2 Customary Stakeholders

In South Sudan, just four percent of national land is titled with physical deeds according to available figures[4], and customary tenure systems are the most prevalent means.

The Land Act reinforces government recognition of customary land tenure: 'Customary land rights including those held in common shall have equal force and effect in law with freehold or leasehold rights' (S. 8 (6)). It also sets, in S. 11(2) broad parameters for defining community land, to include:

1. Land lawfully registered in the name of group representatives under section 57 of this Act or any other law for the time being in force;
2. Land lawfully held, managed or used by specific community as community forests, cultivation, grazing areas, shrines and any other purposes recognized by Law;
3. Land lawfully transferred to a specific community by any process of law; and
4. Any other land declared to be community land by law.

It also cements the rights of traditional authorities "within a specific community… [to]… allocate customary land rights for residential, agricultural, forestry, and grazing purposes" (S15 (1)). Traditional authorities can allocate land subject to consultation with the community and must inform the County Land Authority or Payam Land Council. S. 16 (1) stipulated that an allocated customary right to land can be cancelled by Traditional Authorities on behalf of the community if:

a) The holder of the right fails to observe any condition or restriction attached to the right under customary law and practices, this Act and regulations;
b) The land is being used predominantly for a purpose not sanctioned under customary law and practices; or
c) On any other ground as may be prescribed by customary practices, this Act or any other law.

[4] CSRF 2018.

Nevertheless, a lack of clear implementing policies and regulations has undermined many of these provisions. **The influence of traditional role over land issues is stronger in rural areas, where county authorities and courts cannot intervene easily.**

6.2.1 Examples of local land governance in the project area

Available literature provides examples of customary land governance in Yei River, one of the counties of Central Equatoria state bordering with Uganda. Demographically, the Kakwa forms the majority ethnic group in this county, so local governance practices are commonly based on Kakwa traditional practices. Historical leadership in Yei was based on a group of stakeholders (*monye menu* - land custodian, *matat kudu* - chief of the rain, *katokelanit* - traditional healer, and *matat lo galaka* chief of the ranch), each tasked with a specific aspect of governance.

Some of these practices and traditional roles are still relevant today. For example, a *menu* is still the basic territorial unit owned by a clan, and *monye menu* is tasked with land administration on behalf of the landowning clan.

Traditional chiefs can also be involved in mobilizing communities against investments and land leases that are perceived as inconsistent with community's interests. For example, in Goja Boma of Otogo Payam (Yei River County, Central Equatoria State), local elders mobilized communities to stop the lease of 210 hectares for a period of 10 years because the legitimate authorities were not involved in the consultation process.

6.2.2 Private investments and acquisition of communal land

In the changing institutional context characterizing South Sudan, the land acquisition process is poorly structured and there is little clarity on the applicable procedures. Investment agreements are signed at all levels of government, irrespective of the size of the landholding.

Use of eminent domain (a legal action by the state to expropriate land or property for public use, with compensation) is a problem for community-owned land in South Sudan. The government has the ability to expropriate land for use as long as investment activity 'reflect[s] an important interest for the community' and 'contribute[s] economically and socially to the development of the local community' (Land Act S.63).

Rarely are affected communities consulted in any meaningful manner, and many rural communities are sidelined in decision-making concerning community land allocation to outsiders. Available literature presents a number of poor practices with regards to community consultation on large investments. For example, in a 2019 survey carried out among 677 households in Nimule, Torit, Wau and Yei, 68% of respondents that had their property expropriated said they were not consulted beforehand, and 85% said that they did not receive compensation[5].

Where consultations with communities are often neglected by the government and investor, some disputes have already begun to surface.

6.2.3 Key actors and emerging stakeholders in negotiating land rights

Communities that are aware of deals that have been made without their approval, tend to use whatever means are at their disposal to contest the land acquisition. Often, communities will leverage their local

[5] South Sudan Law Society, 2019.

networks to political leaders to argue for a more inclusive approach, though instances of court action have been documented as well.

This is the case of the Bari group in Juba and surrounding rural areas. Bari leaders used the CPA's protection of 'community' land rights to advance their claims as an ethnic community and in doing so to preserve the authority of traditional institutions. Thus, a Bari Community Association was constituted - a civic association led by elites from the ranks of the military, state and local government, religious organizations, and other community leaders - to release land to the Central Equatoria State government provided that 'good policies' were out in place to protect the people whose land was surrendered.

The Association delivered a list of conditions for land allocation to the CES government. It included a guarantee that the community would be given a third of all plots made out of land acquired from Bari sub-chieftaincies, 10 per cent of revenues from the lease of land (as well as annual tax proceeds from leased land), and assurances that at the end of the lease, and provided the lessee did not want to extend his arrangements, the land and its fixed assets would revert to Bari ownership.

The State Council of Traditional Authorities (or COTA) is a necessary institution for accountability of the customary system, and should be included into the consultation process as well. It can play a role in holding land authorities and other government actors accountable in respecting customary land tenure, establishing local land consultative bodies for chiefs/payams and monitoring land related decisions[6].

6.3 Stakeholder engagement program

This section presents the purpose and timing of stakeholder engagement program through a framework for the entire project life cycle.
Two matrices for the stakeholder engagement planning are hereunder presented: one for consultation and one for disclosure. Both of them are subdivided in project phases: F=Feasibility DS=Detailed Design PC/M=Pre-Construction/Mobilization C=Construction.
They have been included as living document to be populated during each step of the project implementation both for ESIA and for RAP. The SEP will be included in the ESIA and it be populated up to the full ESIA and full RAP Reports with the implemented consultations. General indication will be provided in the matrices for the construction and operational phase for what concerns Contractor's obligations.

[6] Norwegian Refugee Council, 2012.

Table 6-2 – ESIA Consultations

ESIA Consultations	Method	Stakeholder	Period	Implementing Agency
ROUND 1				
During site reconnaissance Project presentation and collection of information	**KI INTERVIEWS**	Ministry of Energy and Dams South Sudan Electric Corporation (SSEC) Ministry of Environment and Forestry Ministry of Wildlife Conservation and Tourism Nimule National Park	**October 2023**	Consultant
ROUND 2				
During baseline data collection Collection of data and information on habitat, ecosystem services, wildlife, human and wildlife conflicts.	**KI INTERVIEWS CHECKLIST**	Executive Chiefs of Affected Bomas and other key informants at local level	**January/February 2024**	Consultant

Table 6-3 – ESIA Information Disclosure Program

F=Feasibility DS=Detailed Design PC/M=Pre-Construction/Mobilization

ESIA Disclosure Process	Method	Stakeholder	F/DS	PC/M	Implementing Agency
Disclosure of Draft ESIA	**Presentation**	Affected Counties and State Ministries Paramount Head of Affected Payams Executive Chiefs of Affected Bomas	March 2024	na	SSES
Disclosure of Draft ESIA	**Presentation**	Ministry of Energy and Dams Ministry of Environment and Forestry Ministry of Wildlife Conservation and Tourism	March 2024	na	SSEC
Disclosure of Approved ESIA	**Non-technical Summary**	Paramount Head of Affected Payams Executive Chiefs of Affected Bomas	March 2024	na	SSEC
Disclosure of Approved ESIA	**Full Report**	Affected Counties and State Ministries Ministry of Energy and Dams Ministry of Environment and Forestry Ministry of Wildlife Conservation and Tourism	-	2025	SSEC
Disclosure of Approved ESIA and ESMP	**Non-technical Summary**	Paramount Head of Affected Payams Executive Chiefs of Affected Bomas s	-	2025	SSEC

Table 6-4 – RAP Consultation

RAP Consultations	Method	Stakeholder	Period	Implementing Agency
ROUND 1				
classification of the value of land by use, classification of the Land properties, land title certificates issues, customary land, cadastral maps, grievances handling, land for returnees. Means of communications.	**KI INTERVIEWS CHECKLIST**	Minister of Lands in the RSS Ministry of Lands, Housing and Physical Planning South Sudan Land Commission (SSLC) Central and Eastern Equatoria States Central and Eastern Equatoria Land Commissions	**JULY 2023**	Consultant
classification of the value of land by use, classification of the Land properties, land title certificates issues, customary land, cadastral maps, grievances handling. Means of communication.	**KI INTERVIEWS CHECKLIST**	Juba and Magwi Counties Nimule Community Leaders and Town Council Juba Town Council	**JULY 2023**	Consultant
ROUND 2				
CENSUS AND LAND SURVEY CUT OFF DATE	**HH Questionnaire with opening and closing consultations.**	All affected land holder along the right of way	**January/February 2024**	- Consultant
Project brief, land acquisition and entitlements	CONSULTATION AND FGD	PAPs	**January/February 2024**	Consultant

Table 6-5 – RAP Information Disclosure Program

F=Feasibility DS=Detailed Design PC/M=Pre-Construction/Mobilization

RAP Disclosure Process	Method	Stakeholder	F	DS	PC/M	Implementing Agency
PROJECT STUDIES ANNOUCEMENT CENSUS /CUT OFF DATES	**Information through sub district and villages to affected peoples**	Directly interested Parties	February 2024 And with Approval of RAP Brief by MLHUD			SSEC
Disclosure of RAP	**PIB (Public Information Booklet, bulletin on board in every sub districts/villages)** Collection of written comments via booklet and presentation of answer to AP representatives selected by the communities	Directly interested Parties		2024 (After approval of MLHUD)		SSEC
Payment Notification	**Letter and Meeting**	Directly interested Parties			2025	SSEC
Displacement Notification	**Letter and Meeting**	Directly interested Parties			2025	SSEC

6.4 Summary of the 1st round of consultations

For what concerns land acquisition, the social consultant travelled to South Sudan from 16th to 27th July to engage various stakeholders and discuss matters relating to acquisition of land and landed assets in the Republic of South Sudan. The mission included visits in Juba (Central Equatoria State), Torit and Magwi (Eastern Equatoria State). The following organizations / offices were engaged for the purpose of the study:

- South Sudan Electricity Corporation;
- Ministry of Lands, Housing and Urban development;
- State Ministry of Housing, Lands and Urban Utilities;
- South Sudan Land Commission;
- Department of Natural Resources, University of Juba;
- Deputy Governor, Eastern Equatorial State;
- State Ministry of Housing, Land and Public Utilities;
- County Commission of Magwi;
- County Commission of Juba.

The field mission allowed to assess the stakeholders' roles and capacities, as well as institutional and organizational arrangements. It also provided field observations that have been compared with the desk study on the South Sudanese legal and policy framework. The study findings will feed into a tentative workplan for the next consultation phases and provide guidelines to support local institutions in implementing the RAP and land acquisition campaigns.

For what concerns environmental issues, the 1st round of consultations with stakeholders (Ministries of Electricity, Environment and Forestry, and Wildlife Conservation and Tourism) was carried out in concomitance of the site reconnaissance survey from October 4th to Sunday October 8th, 2023. The stakeholder consultation and the site reconnaissance survey were done to have a glimpse of the environment of the areas along the three proposed transmission routes.
Stakeholder consultations were done cordially with the responsible and knowledgeable people at the ministries, face to face or through phone conversations.
The mission included visits at the following sites: proposed substations, Lokiliri, Lobonok, Pageri (Opari and Moli) and Mugali.
The following organizations / offices were engaged in the consultations:

- Ministry of Energy and Dams and South Sudan Electricity Cooperation (SSEC)
- Ministry of Environment and Forestry
- Ministry of Wildlife Conservation and Tourism
- Nimule National Park

The field mission allowed to present the project at the stakeholders and start the communication for the future baseline data collection.

The main findings are resumed in the following tables. The detailed Minutes of Meetings are provided in Annex 6.

Table 6-6 – Main findings of the 1st round of RAP consultations

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
18/07/23, Juba (Central Equatoria State)	South Sudan national ministry of lands housing and urban development	The Ministry has a role of supervisory, registration and policy making in relation to land acquisition for government projects. It forms the link of National land Commission representation to the Council of Ministers.	Concerning land acquisition, valuation and compensation, all private land is allotted as leases by the national Government or County. Most of the land along the project foot print is community land. However, some of the community land is demarcated even though title documents are not issued. To date, there is only one valuer in the National Government who doubles up as the undersecretary and with a background in engineering. A registry of land parcels surveyed and allocated exists, but a cadastre-based land information system is still under development.	SS_MOM_01
19/07/23 Juba (Central Equatoria State)	South Sudan Central Equatorial State, Ministry of Lands Housing and Urban Development	Within the Ministry, critical to land acquisition and valuation is the directorate of survey and Directorate of Land administration and Town planning.	The state implements national laws but has a central equatorial state constitution that guides its operation, which is also a domestication of the Southern Sudan Transitional Constitution. To date, there is a lack of coordination and standardized procedures in evaluating the worthy of assets for compensation purposes. The national Land Commission is represented at the state level with an advisory role just as it does with the National Government Ministry of Lands.	SS_MOM_02
21/07/23 Juba (Central Equatoria State)	Juba University, Deputy Dean in The Faculty of Natural Sources And Environment	To date, the State employs professional surveyors to carry out assessment of value of land for the purpose of taxation. The university of Juba trains land professionals in land use course as well as integrated natural resources management.	Possible land related conflict along the proposed transmission corridor have been identified as follows: between Dinka displaced groups, Mundari herders and CES communities around Juba and close to seasonal wet lands; among Bari community in Gondokoro and Lobonok area; in Mangalla and other payams in Juba outskirts on the east side of White Nile. In Torit, trees varieties such as Mahorgany and Kaya are used in traditional medicine and have cultural significance to local communities. The transmission corridor should avoid traversing in those areas.	SS_MOM_03

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
24/07/23 Torit (Easter Equatoria State)	East Equatorial State Administration-Deputy Governor & Hon. State Minister for Housing, Land & Utilities	Within the minister for Housing, land & Utilities, the Directorate of Mapping and Town Planning and Directorate of Survey are the technical arms involved in land acquisition, valuation and compensation.	The process of acquisition of community land by the state involve the following steps: 1. The Minister in charge of lands makes a written request to the community members/ landlords/ occupiers for a meeting to discuss about their land; 2. An agreement is reached between the community and the state; 3. The minister establishes a committee which includes officers from the technical directorates of Mapping & Town planning, survey and user directorate. This committee will be charged with survey and planning of the land for the use. The community representatives supervise the process; 4. After allocation leases are prepared and registered in the judiciary.	SS_MOM_04
25/07/23 Magwi (Easter Equatoria State)	County Commissioner And Executive Director Of Magwi County, Eastern Equatoria State		Concerning the proposed process of land acquisition, the South Sudanese Electric Corporation will write to the Governors who will mark the request to Minister in charge of lands to guide the process/ SSECO will then draw a MOU and submit to Minister who will present it to the to the council of state ministers for approval before drafting the final agreement. Drafting of MOU will take approximately from 3 to 6 months. The process of implementation of acquisition will take approximately 2-3 months to complete.	SS_MOM_05
26/07/23 Juba	South Sudan Land Commission	A body providing support to State and local government and advises on the process of land acquisition and compensation. Has offices at national level and at state level.	Land related dispute are likely to occur in sections where pastoralist communities reside, or where key resources are located. Hot spots to carry out accurate consultations have been identified as follows: Lobonok area due to existing connections between local population and government representatives Mungali area due to possible conflicts involving Madi tribes and returnees who might claim land rights and challenge land acquisition if consultation are not conducted properly.	SS_MOM_06

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
			Gondokoro Island due to possible dispute over farms and small public facilities.	

Table 6-7 – Main findings of the 1st round of environmental consultations.

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
04/10/23, Juba (Central Equatoria State)	South Sudan Ministry of Wildlife Conservation and Tourism (MWCT)	Develop and execute legislation, regulations, policies and strategies for the protection and management of Southern Sudan's wildlife resources and protected areas; Demarcate protected areas and build infrastructure in and around parks and reserves.	Following the explanation of the purpose of the mission and the project, the General Director of the MWCT has provided the permits for the ecological surveys. The Ministry of Wildlife Conservation and Tourism stressed the need to take note of presence of critical wildlife habitats for birds and other wildlife species and elephant crossing areas.	Annex 7 – Site mission report
04/10/23, Juba (Central Equatoria State)	Ministry of Energy and Dams / South Sudan Electricity Corporation	The Ministry of Energy and Dams is in charge of the energy sector. The South Sudan Electricity Corporation (SSEC) is in charge of generation and transmission and the sale of electricity to distributors.	Ministry of Energy / South Sudan Electricity Corporation asked for the environmental perspective of the proposed substations, one of which happen to be closed to the green line option.	Annex 7 – Site mission report
04/10/23, Juba (Central Equatoria State)	Ministry of Environment and Forestry	The Ministry Environment and Forestry is mandated with the Protection and conservation of the environment as well as ensuring sustainable utilization of the environmental resource base to meet the needs of both the present and future generations.	The Ministry of Environment and Forestry emphasized the need for following Environmental Impact Assessment procedures in South Sudan and the submission of the EIA report for the construction of the ETL path in an environmentally sustainable way.	Annex 7 – Site mission report

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
07/10/23, Nimule (Eastern Equatoria State)	Nimule National Park	Nimule National Park is located in the extreme south of the country on the border with Uganda.	Description of the project to the Chief Warden of Nimule National Park in order to collect information on the habitats in the area.	Annex 7 – Site mission report

Consultation lead by Dr. Thomas Lado

A meeting was held with the Lolubo communities of Jebelin, Lokiliri Payam, Juba County, Central Equatorial State, to inform them about the ongoing biodiversity data collection along the proposed transmission line. The meeting was led by Dr Thomas Lado and included team members such as Okumu Clement, the driver, and the security team leader. Community participants included the chief, deputy chief, youth representatives and other members. The purpose of the meeting was to inform the community about the biodiversity survey and the proposed transmission line project, and to seek their support for the survey activities. During the discussions, the community provided insights into the security challenges in the forest area and advised the team on how to address these concerns. Despite the security issues, the community expressed their appreciation for being approached and pledged their support for the project, emphasising their desire to be involved in any activities on their land. The team reciprocated the appreciation and assured the community of their cooperation, emphasising the importance of cooperation to the success of the project and the need for continued engagement in the future.

6.5 Summary of 2nd round of Consultation

The team conducted Focus Group Discussions with local leaders and the affected community in Aru Boma of Lokiliri Payam (Central Equatoria State) on 08/02/2024, and in Pageri Payam, Magwi County of Eastern on 09/02/2024. A socio-economic questionnaire was also used.

During these meetings, the team briefed the local community about the project and more specifically on the following issues:

- Description of the project, indicating the purpose, the scope and benefits to the country and the individual project affected persons
- The land survey activities
- The collection and purpose of socio-economic survey in the project area

Compensation and Valuation of assets within the project area. Local leaders facilitated the organization of these meetings who were translated in local language. The affected communities were given the possibility to raise their concerns and ask for information about land expropriation and compensation process. The results of these meetings allowed to outline socio-economic profiles, local livelihoods of PAPs and to have an overview of risk dynamics of most vulnerable groups. Below is a summary of key issues discussed during the focus groups.

Issue	Remarks
Livelihoods and vulnerable groups	In the project area, local livelihoods are mainly based on crop farming (maily maize, cassava, sweet potato), small scale business, selling fire wood and cutting grass. Youth are engaged in complementary seasonal activities such as riding Boda Boda, making charcoal and hunting animals in the bush. Agricultural production varies greatly depending on seasonal rainfall. beyond ecological variability, patterns of vulnerability may depend on other factors such as tensions with neighboring communities. At this regard, FGDs participants mentioned conflicts with herders who may destroy crops. In Pageri Payam of Juba County, farmers are not keeping cattle because of the risk of looting by neighbors' groups.
Land rights	It is difficult to valuate median increase of land value during the past five years because of customary tenure and informal ownership, land being in most of the cases not demarcated. Nevertheless, in all the visited payams there is a clear difference in value between customary land (used for residential purpose and different economic activities such as agriculture production, charcoal production) and parcels only used as agricultural land. Lokiliri payam, Juba County is mainly inhabited by the Ulubu tribe. Other ethnic groups like Achuli, Lokoya are found in this locality, and are using land for both agricultural and residential purpose. In Pageri payam of Magwi county, Madi tribe is the only represented ethnic group. These communities experienced land expropriation and compensation related to previous projects and construction works. Land allocation to returnees is done through consultation between local community, chiefs, elders, and land lords. According to local informants, returnees have already their own customary land. Concerning conflicting land rights, a dispute between Ulubu tribe and Achuli tribe has been reported in the area called Nyolo.

Issue	Remarks
	Among the visited communities, women are reported to have the right to own the land.
Displacement and returnees	Cases of people displaced from their land by conflict with cattle herders and gradually coming back have been reported. In Lokiliri payam of Juba County, there are members of Lokoya and Achuli tribes coming from Amei Boma and Edemo Boma. In Mageri payam of Magwi county, many returnees coming from Uganda are found. According to FGDs, it is possible to allocate land in advance to anticipate the relocation of future arrivals, even if this can trigger tensions over conflicting land rights. This is the case in Nyangua Boma, Arapi Boma and Amoria Mountain.
Grievances and traditional mechanisms for disputes resolution	Land disputes are usually settled by chiefs' councils, while the State Government is accountable for bordering disputes. Consultations are led by Land Commissioners. Sometimes, religious or church leaders may be involved in land negotiations and dispute resolution. These procedures are reported to be accessible to each and every individual, without any discrimination or bias mentioned during FGDs. In Mageri payam of Magwi county, consultation for land disputes is only customary. There are no examples of cases removed from the chiefs and customary system to reach the formal court system.

During sensitization meetings, the project affected persons (PAPs) raised a number of concerns relating to the project timelines, compensation and assets' valuation. In many cases, they expressed their fears about compensation by the SS Government due to previous experiences. Also, the meaning of cutoff date and procedures to ensure community participation in assets' valuation were matters of concern to the locals. An overview of the key issues raised during the meetings are listed in the following table.

State	County	Payam and boma	Date	Stakeholder group	attendance	Key issues discussed	Minute of M (annexes)
Central Equatoria State	Juba County	Lokiliri Payam, Aru Boma	9/02/24	PAPs and local leaders	---	Many PAPs raised their concern about compensation for perennial crops and trees (such a tree locally know as "Tik") that can be harvested several time and give yields for a long time. The consultant informed that these assets will be compensated at market rates at the time of destruction during field activities. Also, the valuer will consider the category and type of plants and trees during computations of value. Nevertheless, some of the PAPs were not satisfied and further consultations will be organized on this issue. During the meeting, a women considered that PAPs are not compensated equally depending on their status and wealth. Her comments brought the consultant to clarify valuation and compensation measures, and to point out the importance of the socio-economic survey. One of the PAPs was anxious of possible impacts of the transmission line on the ecological system, such as the increase of thunder storms. The consultant reminded that and EIA is being carried out to identify any environmental effects and provide mitigation measures. During FGDs, PAPs were expecting details on compensation rates for different areas such as	SS_MoM_1

State	County	Payam and boma	Date	Stakeholder group	attendance	Key issues discussed	Minute of M (annexes)
						parcels where pylons will be constructed. The consultant clarified the different phases of the consultation and the specific role of land valuer in this process.	
Eastern Equatoria State	Magwi County	Pageri Payam	8/02/24	PAPs and local leaders	27 PAPS	During the discussion, PAPs asked about validation of assets inventory with specific reference to size and ownership status of land. The consultant explained that the verification is done by the project affected person together with local leaders that were involved in the consultation with the survey team. A recurrent question raised by PAPs concerned project's impact on farmers' livelihood, and the possibility to keep on cultivating their land. The meeting allowed to clarify the project timelines and reasons for possible delays. The consultant explained that according to SSEC, the design phase is supposed to be completed by May 2024. PAPs were worried about valuation rates and government's engagement in paying compensation. The consultant explained that the valuation of assets is availed by local communities during participatory meetings and FGDs. Also, the consultant reminded that the project is funded by AfDB, and that the government agreed to adopt the policies of the bank that require compensation	SS_MoM_2

State	County	Payam and boma	Date	Stakeholder group	attendance	Key issues discussed	Minute of M (annexes)
						in order to avail access of the corridor for construction. The provisions of the financier is that compensation should be before construction. This applies mainly due to structures to allow the PAP relocate. Concerning destroyed assets, the consultant explained that these were recorded during inspection. The owner or representative was required to sign in order to indicate that the inspection occurs in his/her presence or representative. The consultant explained that the cut-off date will be communicated to the authorities. The discussion allowed to clarify how this date applies to existing building and structures and other types of assets.	

7 ENVIRONMENTAL AND SOCIAL BASELINE

7.1 Physical Environment

The Republic of South Sudan has an approximate area of 644.329 km^2 and is located in north-eastern Africa and bordered by Sudan to the north, Ethiopia to the east, Kenya to the southeast, Uganda to the south, the Democratic Republic of the Congo to the southwest, and the Central African Republic to the west. The country constitutes the part of the Nile Valley that includes the "Sudd" which is the largest tropical wetland in the world, formed by the White Nile (Sutcliffe and Parks, 1999).

7.1.1 Climate

South Sudan experiences a tropical climate (see Figure 7-1). Temperature averages are normally above 25°C, with highs exceeding 35°C, particularly during the dry season (January to April). Juba, the capital city, has an average annual high temperature of 34.5°C and an average annual low of 21.6°C. The rainy season differs by location, but it generally occurs between April and November. The lowland areas of Eastern Equatoria, Jonglei, the Upper Nile and Bahr el Ghazal receive annual rainfall between 700 and 1,300 mm (see Figure 7-2). The south-eastern tip of Eastern Equatoria receives about 200 mm. The heaviest rainfall occurs in the southern upland areas and lessens towards the north. Western Equatoria and highland parts of Eastern Equatoria receive between 1,200 and 2,200 mm of rainfall annually. Precipitation in South Sudan is impacted by the movement of the Inter-Tropical Convergence Zone (ITCZ).
The project is located and area where average rainfall is around 1,000 mm (see Figure 7-2).

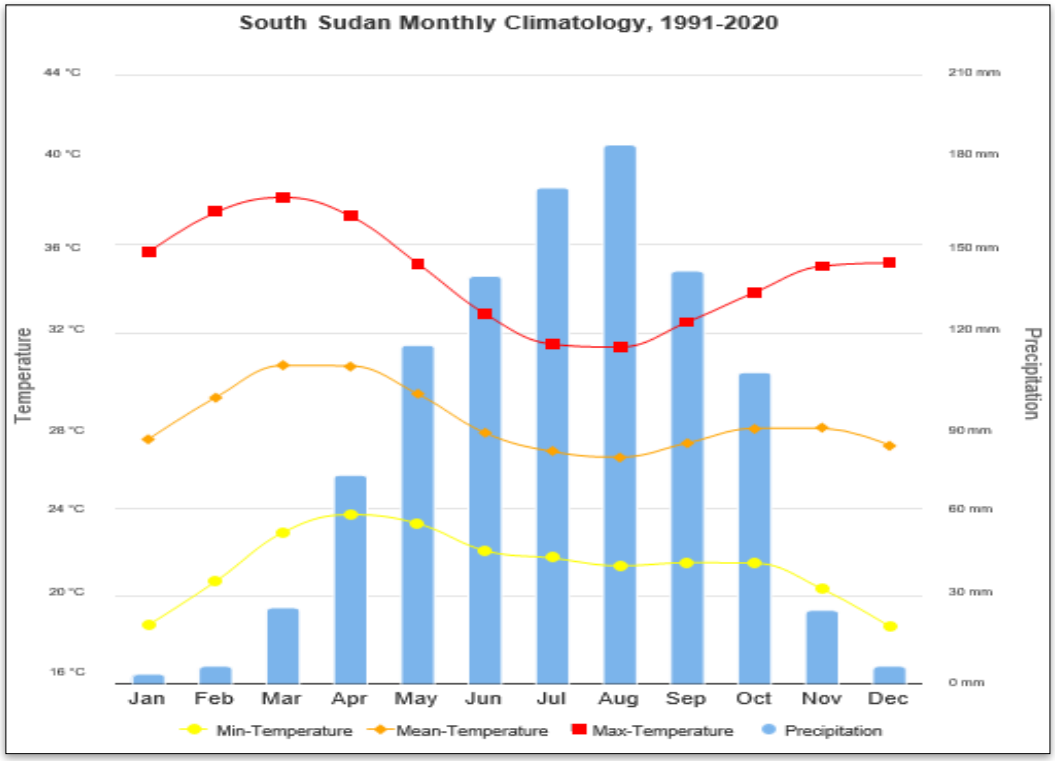


Figure 7-1 – South Sudan main climatic features.
Source Climate Change Knowledge Portal – World Bank Group.



Figure 7-2 – South Sudan rainfall distribution.
Source: First State of Environment and Outlook Report, 2018.

7.1.2 Geology

South Sudan's geology (see Figure 7-3) ranges from Precambrian crystalline basement rocks (red colour in the map) to Quaternary (yellow colour in the map) unconsolidated alluvial deposits.
Significant periods of erosion during the Palaeozoic and Mesozoic removed most of the sedimentary cover deposited on the crystalline basement during these times.
The project's area is located were Precambriam crystalline basement rocks outcrop.

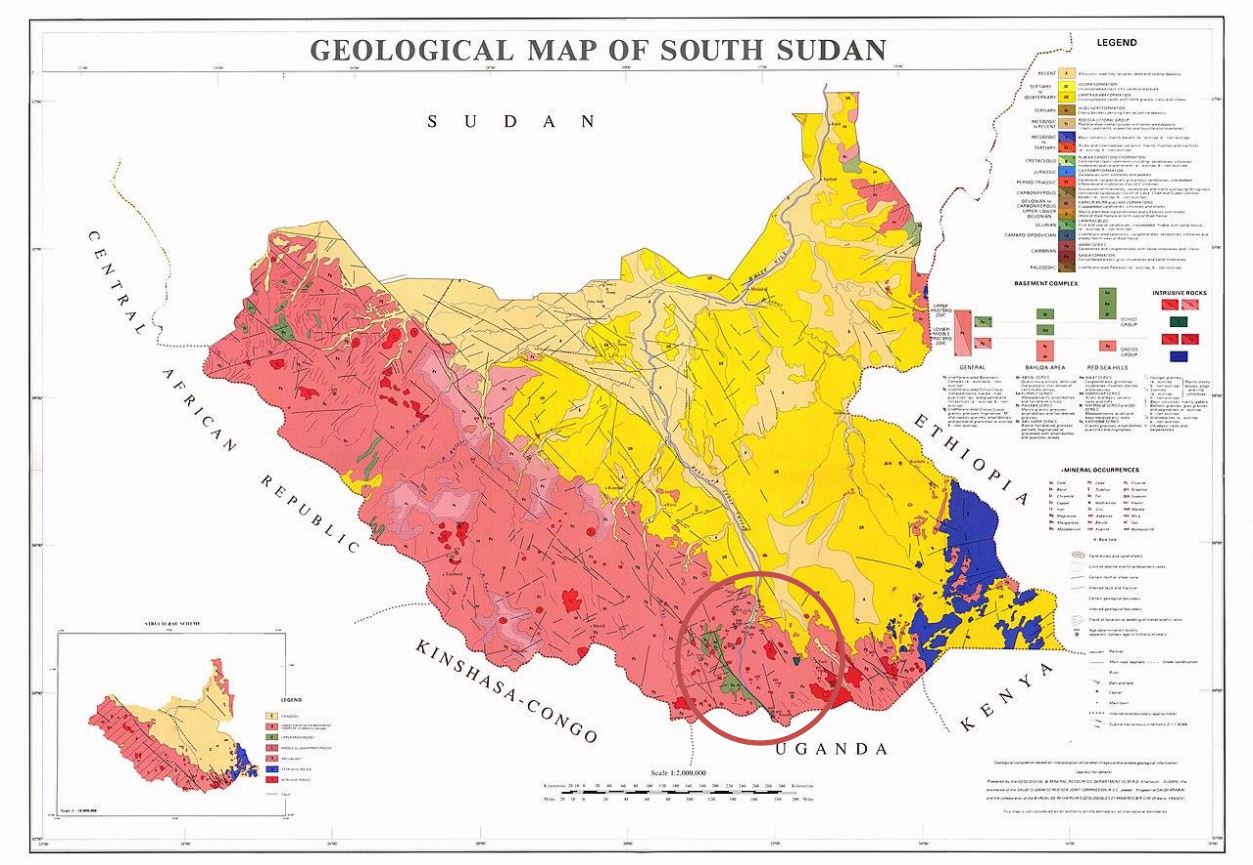


Figure 7-3 – Geological map of South Sudan (Prepared by the GEOLOGICAL & MINERAL RESOURCES DEPARTMENT with the assistance of the SAUDI-SUDANESE RED SEA JOINT COMMISSION and the collaboration of BUREAU DES RECHERCHES GEOLOGIQUES ET MINIERES - B.R.G.M. Orleans -France).

Tectonic movements of the Rift System during the Paleogene and Neogene Periods (middle to upper Tertiary) led to the formation of large structural basins across South Sudan. These are generally north-west to south-east trending, perpendicular to the Central African Shear Zone in central Sudan.
The Muglad Basin is the main rift basin in South Sudan, covering an area of approximately 120,000 km^2 across South Sudan and southern Sudan. This basin, along with others in the rift system, received thick fluvial and lacustrine deposits during the Pliocene-Pleistocene (late Tertiary to early Quaternary Period). Volcanic activity during the late Neogene and early Quaternary Periods produced the volcanic deposits that outcrop in the south-east of South Sudan.

In terms of seismic risk South Sudan is part of the East African Rift system, a 3,000-km long continental rift originating in the Cenozoic Era. It extends from the Afar triple junction, between the horn of Africa and the Middle East, to western Mozambique. Earthquakes and volcanic eruptions occur throughout the East African Rift system and are characterised by mainly shallow earthquakes due to the earth's crust rupturing and tearing apart, and volcano-tectonic earthquakes.
South Sudan is situated in the northern part of the western branch of the Afar triple junction, comprising the West Nile Region. Figure 7-4 shows the risk of seismic activity in South Sudan.

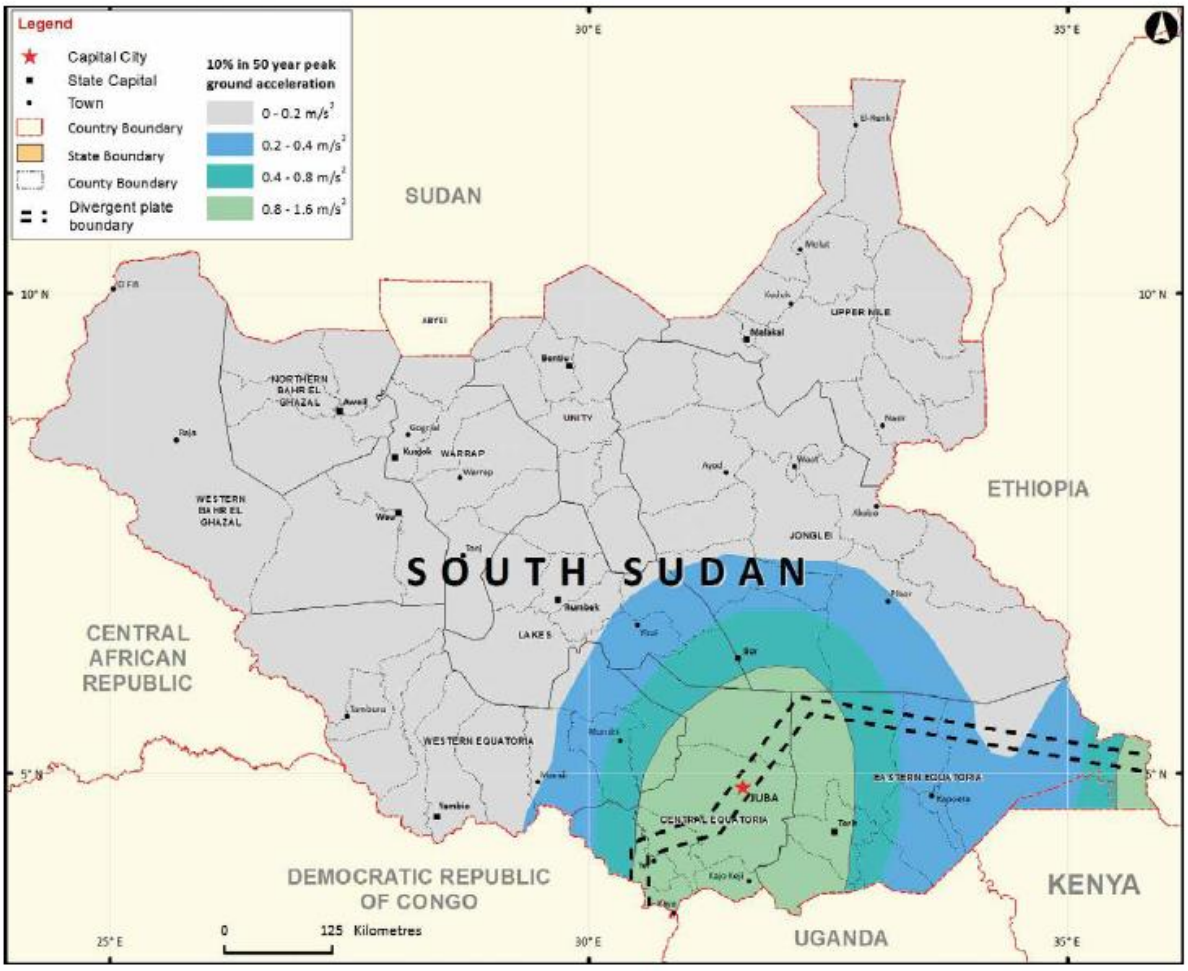


Figure 7-4 – Seismic risk of South Sudan.
Source: First State of Environment and Outlook Report, 2018.

7.1.3 Soils

The country's soils can be divided geographically into two categories: the clay soils of the central region, and the laterite soils of the south. Less extensive and widely separated, but of major economic importance, is a third group consisting of alluvial soils found along the lower reaches of the White Nile and Blue Nile rivers.

Figure 7-5 maps the soil types in South Sudan. In the project area the soils belong to the following categories: Ferric Luvisols, Eutric Nitosols and Lithosols.

- Ferric Luvisols (light pink colour in the map) are generally fertile and widely used for agriculture.
- Eutric Nitosols (dark pink colour in the map) are generally fertile and widely used for agriculture, even if in sub-saharan areas soil degradation and nutrient depletion have gradually increased and have become a serious threat to agricultural productivity.
- Lithosols (purple colour in the map) are very shallow soils (less than 10cm thick) and occur in the most eroding positions of the landscape.

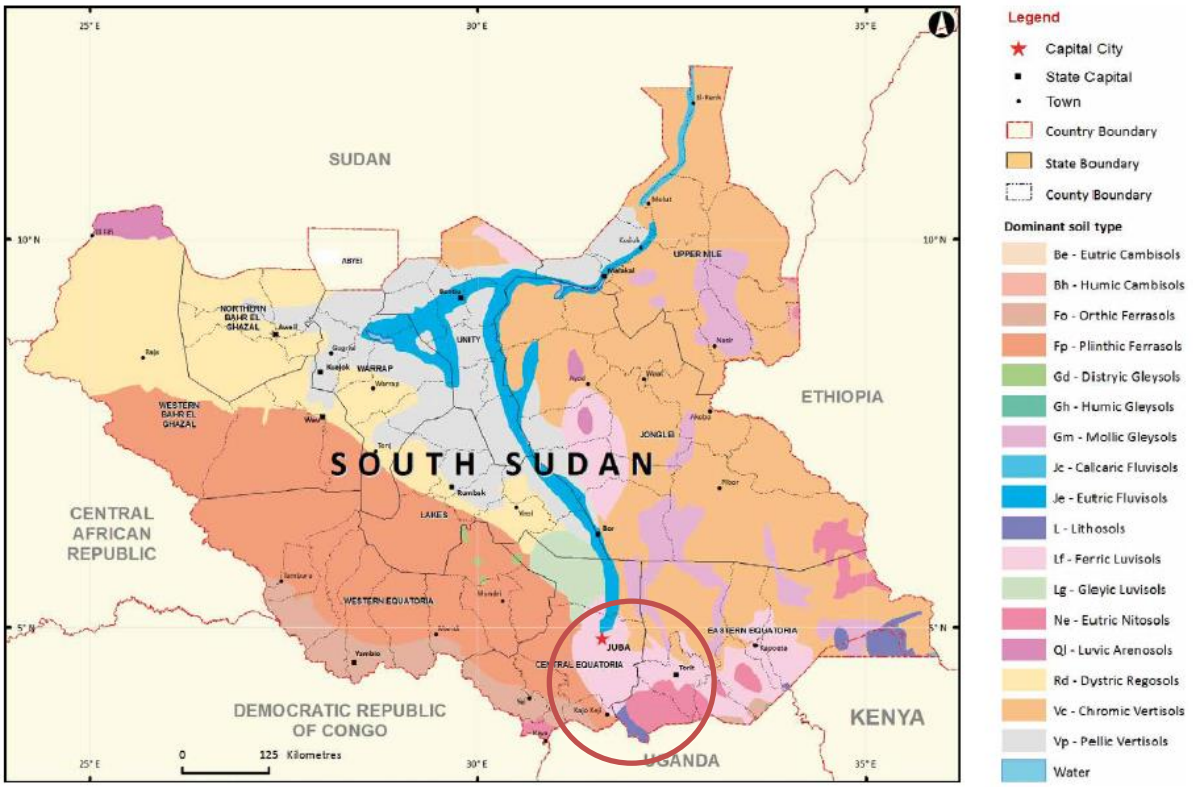


Figure 7-5 – Soil map of South Sudan. Source: FAO, 2006.

7.1.4 Land use

South Sudan is naturally endowed with agricultural potential given its favourable soil, water, and climatic conditions. It is estimated that about 70 percent of total land area is suitable for producing a wide range of agricultural products, including annual crops such as grains, vegetables, tree crops such as coffee, tea, and fruits, livestock, fishery, and various forest products.

Land that is currently under crop cultivation, most of which are rainfed, accounts for less than 4 percent of total. Conversely, the largest part of the country is still under trees and shrubs (62.6 percent). Given the country's favourable agricultural climate condition, this ratio is clearly very low as the crop areas account for more than 28 percent of national land in Kenya and 8 in Uganda.

In terms of cropland distribution, Western Flood Plains, which covers parts of Northern Bahr el Ghazal, Warrap, Unity and Lakes, is the most important livelihood zone, providing 34.2 percent of national cropland and 24.2 percent of national cropland mixed with grass and trees. Moreover, this zone has the highest ratio of cropland over total land, as cropland and cropland mixed with grasses/trees account for 8.5 and 5.4 percent of zonal territorial area, respectively. Greenbelt (spanning parts of Western Equatoria and Central Equatoria) and Eastern Flood Plains (encompassing Upper Nile and parts of Jonglei) are the two other major crop producing regions, accounting for respectively, 17.6 percent and 26.2 percent of national cropland, and 25.7 percent and 14.6 percent of the country's land mixed crops with grasses/trees. Both zones also have high ratio of cropland to total land as lands with crops and crops mixed with grasses/trees account for 11.4 percent of total land in Greenbelt and 6.8 percent of total land in Eastern Flood Plains.

As shown in Figure 7-6, in the project's area the land use is mainly shrubs and grass.

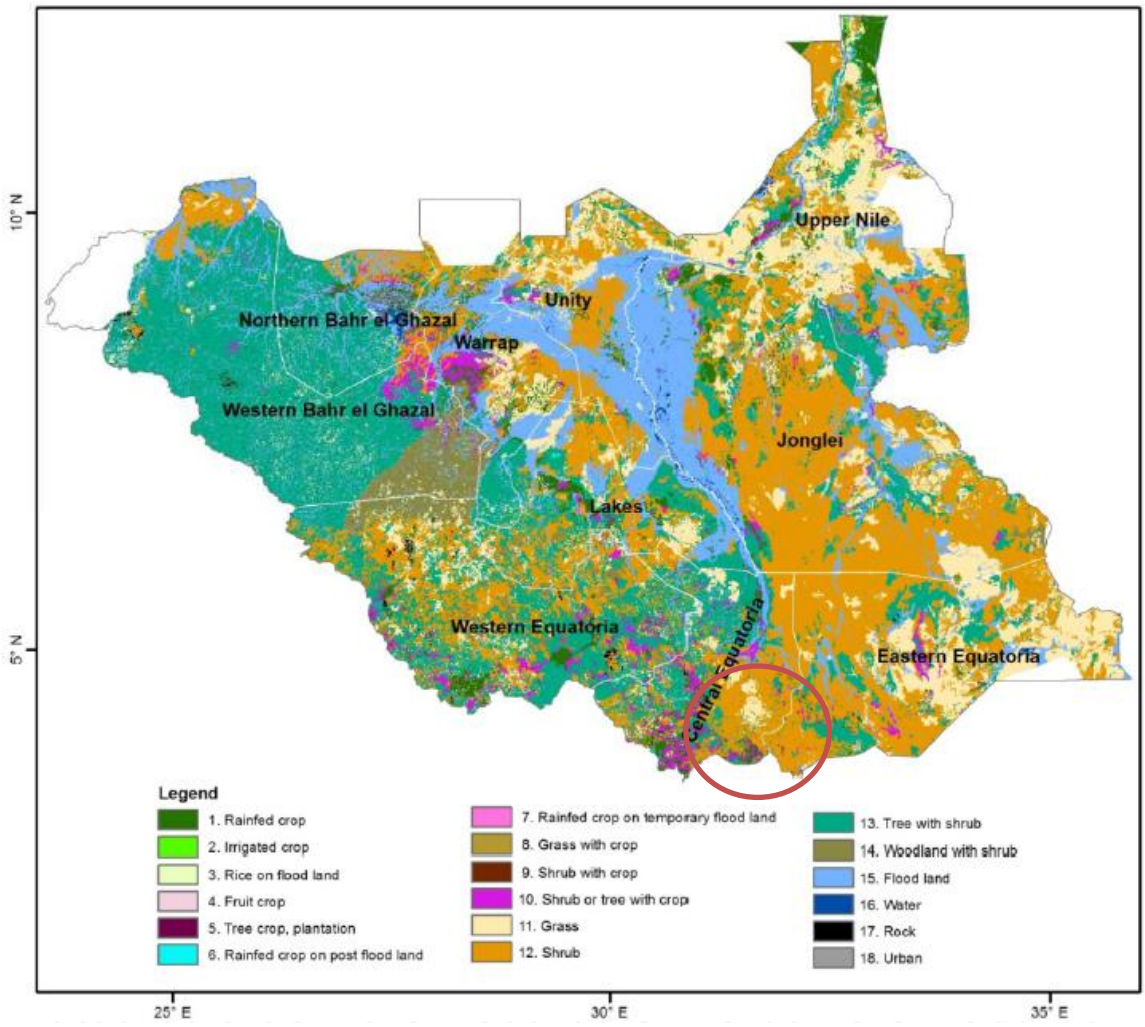


Figure 7-6 – Land use map of South Sudan.
Source: "Assessing Agricultural Potential in South Sudan – A Spatial Analysis Method" by Xinshen Diao, Liangzhi You, Vida Alpuerto and Renato Folledo. In Application of Geographic Information System – 2012.

7.1.5 Hydrology

South Sudan is drained by the Nile and its main tributary, the White Nile (Al Bahr al Abyad). The longest river in the world, the Nile flows for 6,737 kilometres from its farthest headwaters in central Africa to the Mediterranean. The importance of the Nile has been recognized since biblical times; for centuries the river has been a lifeline for Sudan.

The White Nile flows north from central Africa, draining Lake Victoria and the highland regions of Uganda, Rwanda, and Burundi. At Bor, the great swamp of the Nile, As Sudd begins. The river has no well-defined channel here; the water flows slowly through a labyrinth of small spillways and lakes choked with papyrus and reeds.

The White Nile has several substantial tributaries that drain southern Sudan. In the southwest, the Bahr al Ghazal drains a basin larger in area than France. Although the drainage area is extensive, evaporation takes most of the water from the slow-moving streams in this region, and the discharge of the Bahr al Ghazal into the White Nile is minimal. In southeast Sudan, the Sobat River drains an area of western Ethiopia and the hills near the Sudan-Uganda border. The Sobat's discharge is considerable, at its confluence with the White Nile just south of Malakal, the Sobat accounts for half the White Nile's water.

7.1.6 Water Quality

The Nile Basin Initiative's 2021 State of the River Nile Basin report states that the quality of the Nile waters has generally deteriorated over the previous decades, because of population growth, urbanization, agricultural intensification, and industrial development. Data on the state of South Sudan's water quality and quantity are lacking, but given that it is more sparsely populated than other Nile Basin countries, it is likely that water quality still corresponds to standards set by the riparian countries and the World Health Organization (WHO).

At local levels in South Sudan, however, rising urbanization is associated with municipal wastewater, sewage and industrial effluents running straight into water sources, since most towns have no wastewater treatment facilities, and lack adequate sanitation and sewage management systems (MoEF, 2014). According to the Nile Basin Water Resources Atlas (UNDP), the percentage of the rural and urban population of South Sudan with access to improved drinking water sources was equal to 16% in 2015. Moreover, the percentage of the population using improved sanitation was 57% in rural areas and 67% in urban areas.

7.1.7 Noise

Noise levels along the corridor is mainly ambient influenced by human settlement nature. Slight elevated levels are within markets and near urban centres where economic activities including workshops, commercial undertaking and entertainment points are located. Along the corridor the main noise pollution is from the vehicles along the road, motorcycles, and human noise from traders and consumers during normal business hours.

The noise levels are low throughout most of the corridors except for areas close to the market centres, where the level increases, due to concentration of people, vehicles, motorcycles and businesses activities. There may be key sensitive points such as schools located near the proposed alignments, and this is expected to be critical during the construction and operation phases.

During the 2024 environmental survey, baseline noise levels have been recorded at the transects along the transmission line corridor. The measured noise levels ranged from 15 to 58 dBA. The primary noise sources were identified as traffic on nearby roads, community activities and wind. All recorded values remained within the permissible normal range as specified by relevant regulations.

Table 7-1 presents the detailed noise levels measured at the survey transects along the line corridor. The location of noise sampling points is illustrated in the Figure 7-7.

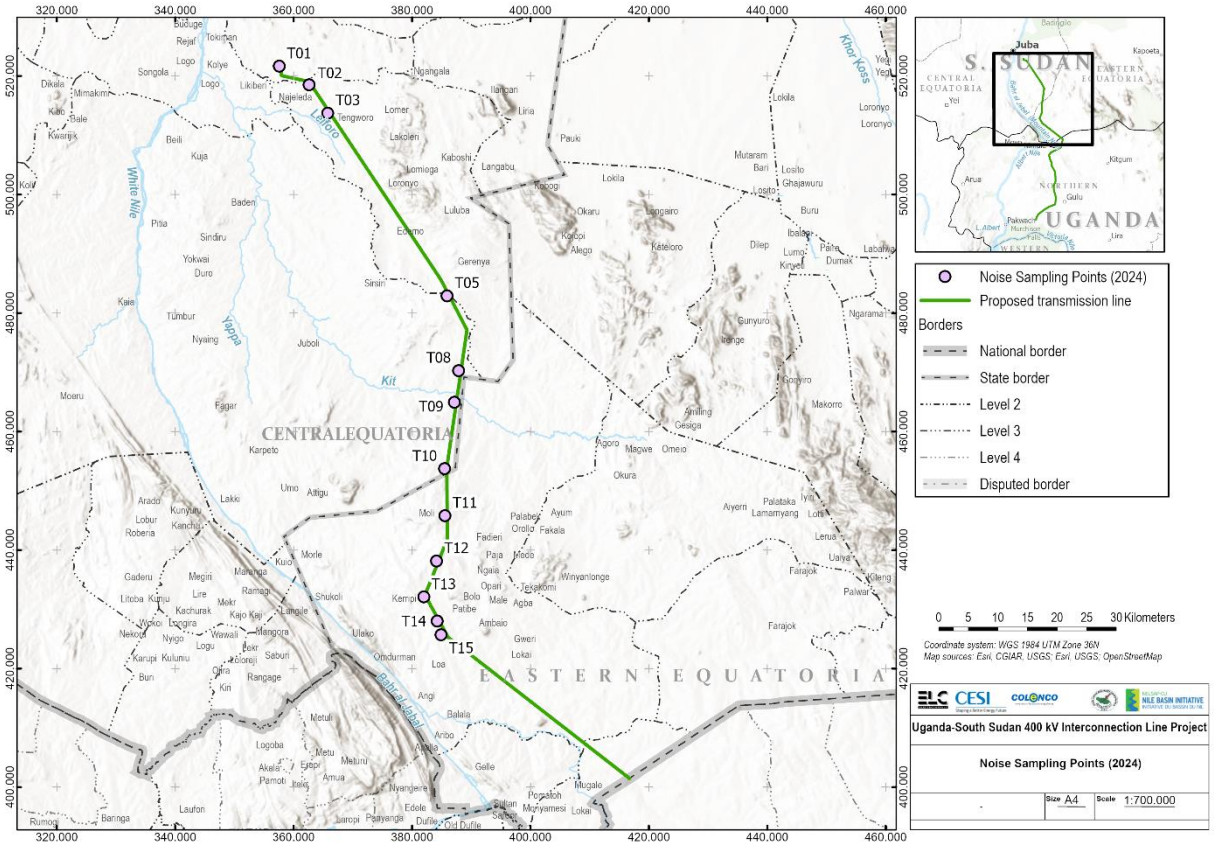


Figure 7-7 – Location of noise sampling points along the transmission line route.

Table 7-1 – Noise assessment results (2024).

Transect ID	Location	Latitude	Longitude	Date & Time	Average (dBA)	Background Environment
T1	Nesitu substation	4° 43' 06 N	31° 43' 08 E	29/01/2024 17:43	43	Light wind
T2	Nesitu	4° 41' 24 N	31° 45' 51 E	02/02/2024 18:19	58	Light wind
T3	Siriri	4° 38' 49 N	31° 47' 35 E	03/02/2024 11:04	16	Light wind
T4	Afodo-Checheri (Ngerjebe)	4° 33' 00 N	31° 51' 27 E	03/02/2024 15:39	58	Light wind
T5	Near Aru-junction	4° 22' 06 N	31° 58' 30 E	04/02/2024 12:46	29	Light wind
T6	Aru-junction (Camp)	4° 20' 44 N	31° 59' 12 E	04/02/2024 16:31	45	Light wind
T7	Aru-junction2 (Camp)	4° 18' 12 N	32° 00' 01 E	04/02/2024 18:07	42	Light wind
T8	Nyolo	4° 15' 15 N	31° 59' 33 E	05/02/2024 10:28	57	Light wind
T9	Ayii	4° 12' 20 N	31° 59' 10 E	05/02/2024 13:21	39	Light wind
T10	Kit2_Amee-junction	4° 06' 16 N	31° 58' 18 E	05/02/2024 15:20	27	Light wind
T11	Moli Tokuro	4° 01' 58 N	31° 58' 20 E	06/02/2024 11:48	54	Light wind
T12	Borangole	3° 57' 49 N	31° 57' 34 E	06/02/2024 13:34	29	Light wind

Transect ID	Location	Latitude	Longitude	Date & Time	Average (dBA)	Background Environment
T13	Kiripi	3° 54' 31 N	31° 56' 24 E	06/02/2024 15:35	15	Light wind
T14	Pageri	3° 52' 18 N	31° 57' 37 E	06/02/2024 15:35	15	Light wind
T15	Loa	3°51'03 N	31°58' E	07/02/2024 11:06	39	Light wind

7.1.8 Air Quality

In the urban areas of South Sudan, there is relatively little air pollution because vehicle numbers are still low and there is no heavy industry that emits polluting fumes.
Vast section of the project area is in rural areas which are very sparsely settled and have no major anthropogenic activities that contribute to air pollution levels beyond the natural background levels. The current source of air pollution is thus limited to occasional dust generated by traffic on the gravel or earth roads. Occasional whirlwinds sweeping across bare land also contribute to intermittently elevated dust levels. In the town centres, the air pollution is limited to local vehicular movements, market activities, and winds sweeping across the bare land. The towns have no major industrial activities that constitute major point sources of air pollution. A significant quantity of the particulate matter is associated with traffic on the road surfaces, especially during the dry seasons.

7.2 Ecosystem and Landscape Diversity

South Sudan's physical environment, geography and climate are factors that support a wide range of ecosystems and habitats. Ecosystem diversity refers to the variety and abundance of different ecosystems, including the variety of habitats, biological communities and their changes in composition and structure over time, and ecological processes in the biosphere. The interaction and association between the physical and biological environments of South Sudan results in a high level of ecosystem diversity, which is categorised into ecological zones, namely savannah, flood/swamps, montane forest, semi-desert and lowland forest (5th National Report CBD, 2015). This diversity of habitats is however threatened by climate change: available data on trends in temperature and rainfall highlight that South Sudan is highly vulnerable to the impacts of rising temperatures and increased rainfall variability due to climate change, since pastoralists and farmers rely heavily on seasonal rains. Indeed, according to the 2017 Climate Change Vulnerability Index, South Sudan ranks among the five countries in the world most vulnerable to the impacts of climate change, resulting in a significant driver of environmental change.

7.2.1 Type of Ecosystems

The following ecosystems can be identified over the South Sudan region:

- **Lowland Forest**
  South Sudan's tropical lowland moist forest is confined to a few scattered small localities in the southwest, near the borders with the Central African Republic, the Democratic Republic of Congo and Uganda, and in the foothills of the Imotong Mountains. With its biogeographical affinity to the Congo Basin, this ecosystem has some fauna and flora similar to that of Central Africa. Other lowland forests are found in the Loti, Talanga and Lobone areas of Eastern Equatoria State.

- **Montane Forest**
  South Sudan's montane forests occur mainly in the Imatong Mountains of Eastern Equatoria, and others include the Didinga and Dongotono Mountains. In this zone, rainfall increases with altitude, reaching about 2,500 mm per year at 2,600 metres above sea level. The montane vegetation is dominated by Vernonia, Hagenia, Albizia, Podocarpus and Erica species, forming zones ranging from grassland (Afro-Montane) to Afro-Alpine dominated by Erica scrub. The Imotong Mountains have a very rich birdlife, including a number of species not found elsewhere in South Sudan, some of which are endemic to this habitat type. More than 50% of South Sudan's recorded plant species occur in this region. Due to its biogeographical isolation from similar African montane forests, the Imatong Mountains represent a unique ecosystem that hosts a high number of plant and animal endemisms.

- **Savannah Woodland**
  South Sudan's savannah woodland forms the largest ecological region in the country, stretching diagonally from South Sudan's northwestern borders to the Ugandan borders in Western and Central Equatoria and Magwi County in Eastern Equatoria. This region forms an ecotone between lowland forest patches in the west and grassland savannah and floodplains in the east. Common large mammals of the woodland savannah include elephant, hippopotamus (*Hippopotamus amphibius*), waterbuck (*Kobus ellipsiprymnus*), giraffe, bushbuck (*Tragelaphus scriptus*), oribi (*Ourebia ourebi*), duiker (*Cephalophus* sp.), Uganda kob (*Kobus kob thomasi*), warthog (Phacochoerus africanus africanus), hartebeest (*Alcelaphus buselaphus lewel*), eland (*Taurotragus derbianus*), buffalo, and various species of primates and carnivores.

- **Savannah Grassland**
  This ecological zone is a contiguous area covering the northern, eastern and south-eastern parts of the floodplains of South Sudan. This area is characterised by open short grasslands with scattered trees and shrubs. The dominant woody vegetation includes species of Acacia, Balanites and Combretum. Dominant perennial grasses include *Hyperrhenia*, *Andropogon*, *Panicum* and several other species. Several species of mammals inhabit this region and some of the South Sudan's ungulate migrations also occur, at least in part, in this zone.

- **Floodplain**
  The floodplain ecological region covering an estimated area of 112,700 km^2 in central South Sudan is made up of seasonally flooded plains which extend around the Sudd swamps and on both sides of the White Nile.

- **Sudd Swamps and other wetlands**
  The Sudd Swamps, with an estimated area of about 57,000 km^2, are one of the most extensive wetlands in Africa, with a complex of channels and open water bodies. The ecosystem of the White Nile and the Sudd Swamps is vital to the wildlife, plants and local pastoral and fishing communities of South Sudan.

- **Semi-arid Region**
  The semi-arid region occupies the extreme southeastern parts of Eastern Equatoria and average annual rainfall ranges from 300 mm to 500 mm, and the soils are generally shallow and infertile. The vegetation of this area is characterised by patches of open short grass and acacia scrub. Depending on the annual rainfall, which is unpredictable, the ground cover is generally poor. The area is an extension of the north-eastern semi-arid zone of Kenya and shares the same biogeographical affinities in terms of fauna and flora.

- **Modified ecosystems and *habitats*** include areas that have been altered and no longer have their original natural characteristics. They may contain a high proportion of plant and/or animal species of non-native origin and/or where human activities have significantly altered the primary ecological functions and species composition of an area. Modified habitats may include, for example, areas managed for agriculture, forest plantations, large monoculture farms, farm forests and reclaimed wetlands etc.

7.2.2 Agro-climatic Zones

Climate and soils are primary determinants of the type of agricultural occupations that can be undertaken and how, where and when they occur. Generally, mixed cultivation takes place in the Green Belt, and livestock rearing and extensive cultivation are practised in the Ironstone Plateau and semi-arid zones. Figure 7-8 maps the country's six main agro-climatic zones.

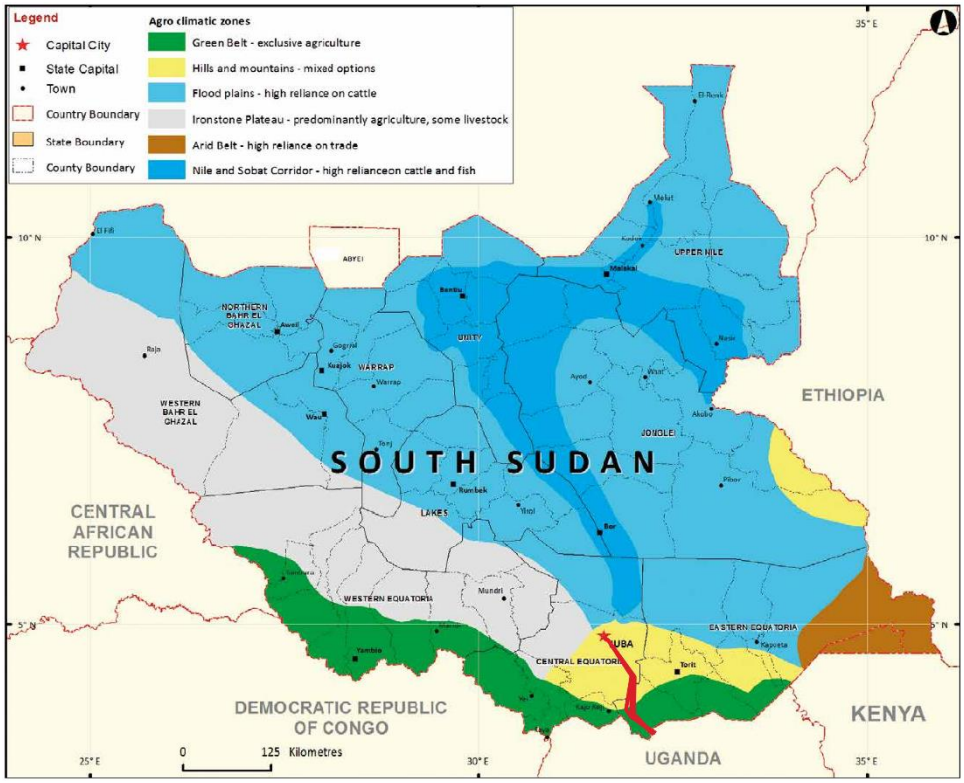


Figure 7-8 – Location of the project area in the context of the Agro-Climatic Zone of South Sudan.
Source: South Sudan climate Vulnerability profile: sector- and location-specific climate risks and resilience recommendations; USAID/South Sudan 2019.

Various agricultural activities take place in each of the 6 agro-climatic zones shown in Figure 7-8, of which the project area cross only the so-called “Green Belt” and the “Hill and mountains” zones. The green belt is found in the southern parts of Eastern Equatoria, Central Equatoria and the western parts of Western Equatoria. This zone has rich soils and enjoys two rainy seasons, except for the southern part of Eastern Equatorial state, which receives little precipitation. Farming is the main livelihood activity, especially in the southwest part of the zone, and there is often surplus production. In drier areas there is increasing reliance on root crops and exchange. Conversely, Hills and mountains are found along the Nile to the north of the Greenbelt. There are a variety of different livelihood activities in this zone, with a focus on agriculture and pastoralism. In difficult years when crops fail, people rely on cattle, trade and root crops.

7.2.3 Ecoregions

In 2017, RESOLVE and One Earth published the updated Ecoregion Snapshots, a concise guide to the world's terrestrial ecoregions that reflects 'recent advances in biogeography'. Ecoregions are defined as areas of land that contain a distinct set of natural communities and species that are distinct from their nearest neighbouring ecoregions. Ecoregions essentially represent the natural boundaries on Earth, with each area representing land containing a distinct geography, vegetation and natural communities that distinguish it from neighbouring ecoregions. Ecoregions are formed by biotic and abiotic conditions: geology, landforms, soils, vegetation, land use, wildlife, climate and hydrology. The Terrestrial Ecoregions dataset (https://www.gislounge.com/terrestrial-ecoregions-gis-data/) contains several attributes, including the name of the ecoregion, biome and realm, and also lists the NNH (Nature Needs Half) designation for each ecoregion. Nature Needs Half is an effort by a coalition of scientists,

conservationists, non-profits and public officials to protect 50% of the planet by 2030 in order to conserve biodiversity. The NNH categories are defined as follows:

- **Half Protected**: More than 50% of the total ecoregion area is already protected.
- **Nature Could Reach Half**: Less than 50% of the total ecoregion area is protected but the amount of remaining unprotected natural habitat could bring protection to over 50% if new conservation areas are added to the system.
- **Nature Could Recover**: The amount of protected and unprotected natural habitat remaining is less than 50% but more than 20%. Ecoregions in this category would require restoration to reach Half Protected.
- **Nature Imperiled:** The amount of protected and unprotected natural habitat remaining is less than or equal to 20%. Achieving half protected is not possible in the short term and efforts should focus on conserving remaining, native habitat fragments.

According to the classification of Dinerstein et al. (2017), South Sudan is home to several ecoregions (Figure 7-9), namely East African montane forest, East Sudanian savannah, Masai xeric grasslands and shrublands, Northern Acacia-Commiphora bushland and thickets, Northern Congolian forest-savannah, Sahelian Acacia savannah and Sudd flooded grasslands. Most of the proposed project area is covered by the East Sudanian savannah and small parts by Sudd flooded grasslands (Figure 7-9). All of these are categorised as “Nature Could Recover”.

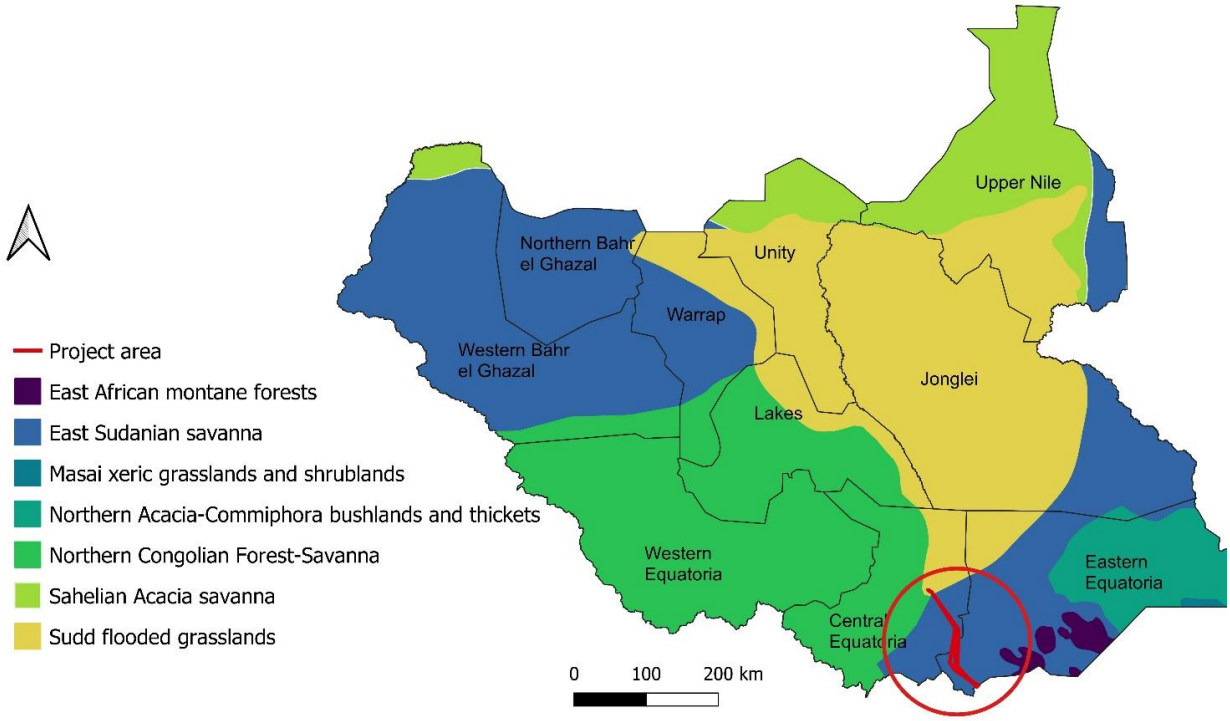


Figure 7-9 – Ecoregion of South Sudan (Dinerstein et al. 2017) and the location of the proposed project area.

In general, the ecoregion East Sudanian savannah is a hot, dry and wooded savannah. It is recognisable by the tall elephant grass, which is home to many large mammals. The ecoregion is mostly flat, with elevations ranging from 200 m to 1,000 m. The climate is tropical and highly seasonal. Annual rainfall is as high as 1,000 mm in the south, but decreases to 600 mm in the north, on the border with the Sahelian acacia savannah. The main threats to the ecoregion's habitats are seasonal shifting cultivation, overgrazing by livestock, felling of trees and shrubs for timber, burning of wood for charcoal and

uncontrolled forest fires. Climate change is a further threat, exacerbating the impact of human activities by reducing the ability of the ecosystem to recover from overexploitation when rainfall is low.

7.2.4 Landscape

The Boma-Jonglei-Equatoria Landscape of South Sudan (Figure 7-10), where the project area is located, covers an extension of just under 200,000 km^2 in Jonglei, Eastern and Central Equatoria, Lakes and Unity; and it encompasses over 68,000 km^2 of protected areas, at a national level.



Figure 7-10 – The Boma-Jonglei Landscape.

These include: Boma, Badingilo and Nimule National Parks (and their proposed extensions), Zeraf and Kidepo Game Reserves, Imatong Forest Reserve, and the proposed Loelle protected area. This landscape of global importance contains the Sudd, one of the world's largest tropical wetlands; as well as the largest cohesive wooded savannah remaining in Africa. The migration of the White-eared kob, Tiang and the Mongalla gazelle is one of the three largest ungulate migrations in the world.

7.2.5 Protected Areas

Protected areas (PAs) have been established in South Sudan to conserve ecosystems, their component species and the services they provide. The PAs system includes National Parks, Game Reserves, Forest Reserves, Nature Conservation Areas, and Bird Sanctuaries. The total area currently protected represents the 13% of the country, which is 87,030 km^2 of the land surface (5th National Report CBD, 2015); even considering the proposed area for expansion and establishment of national parks, the national percentage of protected areas is 15.5% (UNEP-WCMC 2023).

South Sudan has six National Parks, twelve Game Reserves, one Forest Reserve and one Ramsar site, the Sudd Swamp, which is recognised under the Ramsar Convention as a Wetland of International

Importance and one of the largest tropical wetlands in the world (Figure 7-11). The proposed protected areas also include two extensions of existing National Parks and the Loelle National Park (Figure 7-11).

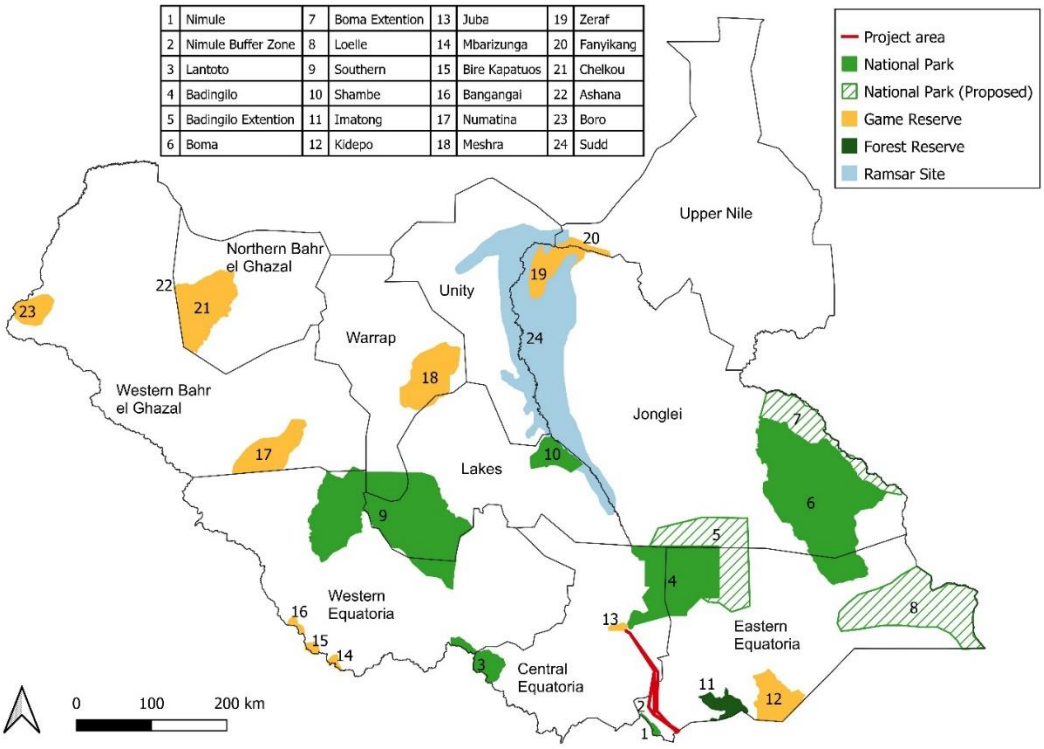


Figure 7-11 – Protected areas of South Sudan. Source: UNEP-WCMC 2023.

The PAs system has a high diversity of animals and habitats. While some of the PAs are still intact as observed in recent surveys such as Badingilo National Park, others such as Ashana Game Reserve have limited wildlife sightings and high levels of forest degradation (NBSAP South Sudan, 2018). Although the system does not include all important habitats in the country, a wide range of critical habitats/ecosystems are included in the network. Management and long-term conservation strategies in the PAs network of South Sudan are still very limited with often inadequate personnel and administrative infrastructures. However, since 2007, management has slightly improved in some PAs such as Boma, Badingilo and Nimule National Parks.
In addition to the lack of legislation on nature conservation, the network of protected areas in Southern Sudan faces several threats. These include human-induced impacts such as deforestation, encroachment by human settlements, livestock expansion, oil exploration, mining and climate change, and human-wildlife coexistence, such as wildlife poaching and trafficking.

The IUCN, the largest and most important international organisation for nature conservation, defines a protected area as "*a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*". The IUCN has proposed a global classification of PAs based on different types of management (Dudley 2008). These protected area management categories provide a global framework recognised by the Convention on Biological Diversity (CBD) and are:

- **Category Ia: Strict nature reserve** are strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values.
- **Category Ib: Wilderness area** are usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.
- **Category II: National Park** are large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
- **Category III: Natural monument or feature** are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.
- **Category IV: Habitat/species management area** aim to protect particular species or habitats and management reflects this priority. Many category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.
- **Category V: Protected landscape/seascape** are protected areas where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
- **Category VI: Protected area with sustainable use of natural resources** conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

Nine of the South Sudan PAs network (Southern, Nimule, Nimule Buffer Zone, Boma, Shambe, Badingilo, Lantoto, proposed Boma Extension and proposed Badingilo Extention) fall under the IUCN category (II). Lake Ambadi, Lake No and Lake Abiad were classified as Habitat/species management area (IV) category. Thirteen of the PAs (Ashana, Bangangai, Boro, Chelkou, Zeraf, Fanyikang, Kidepo, Meshra, Mbarizunga, Numatina, Juba, Bire Kpatues and proposed Loelle) are Protected area with sustainable use of natural resources (VI) and one (Imatong) are Protected landscape (V).

PAs within and in project area

The proposed project area is outside of existing protected areas, but there are some in its proximities (Figure 7-12). The closest PAs to the project are Juba Game Reserve, Badingilo and Nimule National Parks. The first two are located uphill from the project area, approximately 1 km for Juba Game Reserve and 5 km for Badingilo National Park, considering the nearest border between them. Nimule National Park lies to the west and is approximately 10 km from the project area.

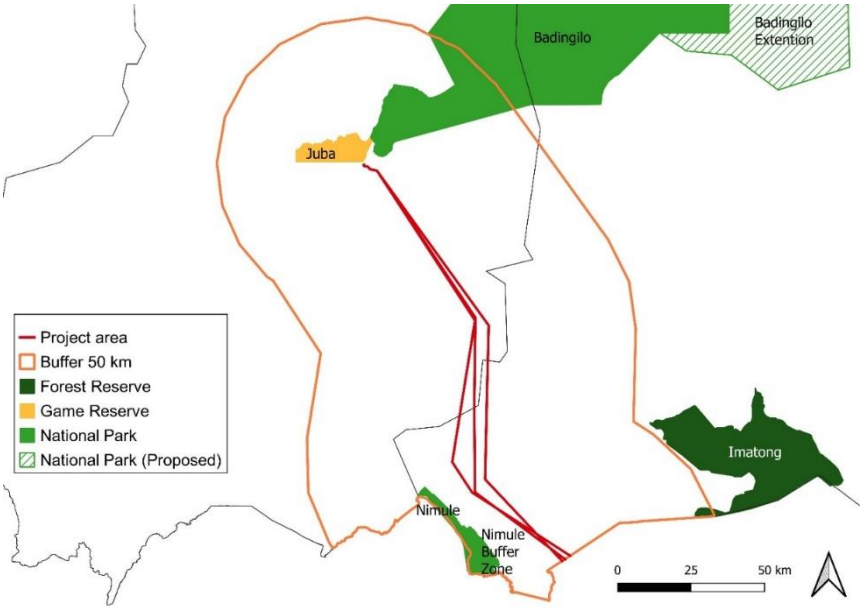


Figure 7-12 – Protected areas within the 50 km buffer around the project area.

The importance of these PAs is recognized nationally and internationally, particularly the National Parks, for their high biodiversity and conservation values and for hosting fundamental and unique biological processes.

Characterised by grassland and woodland savannah habitats, Badingilo National Park covers an area of 16,000 km^2 and was originally established in 1986 for the conservation of the black rhino, which is now locally extinct. The Badingilo National Park is part of a larger ecosystem that stretches east through the Jonglei corridor to Boma National Park and north to the Sudd. This area is home to one of the largest land mammal migrations in the world, with hundreds of thousands of white-eared kob, Mongalla gazelle, tiang and reedbuck converging on Badingilo each year during the wet season to breed before migrating north and east to Sudd and Boma National Parks and across the border to Gambella National Park in Ethiopia.

Characterised by wooded savannah and the White Nile River, Nimule National Park and its buffer zone are located in the Eastern Equatorial State of Southern Sudan, near the border with Uganda. Nimule National Park was established in 1954 mainly for the protection of large iconic mammals and for its rich biodiversity. The park is characterised by deciduous tree species typical of savannah and bush environments such as *Kigelia africana*, *Acacia seyal*, *A. abysinica*, *A. sieberiana* and *A. brevispice*, *Schelerocharya birrea*, *Afteli aquanzensi*, *Ziziphus mouritiana*, *Euphorbia candelabrum*, *Combretum molle*, *Tamarindus indica*, *Borasus aethiopium, Anona senagalensis*, and *Caesesalpinia decapetala*. Along the seasonal and permanent rivers and streams, the riverine woodland vegetation is present. Nimule National Park hosts a variety of fauna of high conservation concern (e.g., *Loxodonta africana*, *Hippopotamus amphibious*, *Kobus defassa*, *Tragelophus scriptus*, *Cercopithecus acthios*, *Procavia cupensis*; *Cyclanorbis elegans*, *Crocodylus niloticus*, etc.).

The Juba Game Reserve is located just outside the city of Juba. It covers an area of 200 km^2 and the main habitats are woodland and wooded savannah. Common tree species include *Balanites aegyptiaca*, *Combretum molle* and *Acacia hockii*, while common grasses include *Themeda triandra*, *Chrysopogon aucheri*, *Sporobolus*, *Andropogon* and *Hyparrhenia* spp.

The Integrated Biodiversity Assessment Tool (IBAT) was used to screen the project site and the biodiversity risks and opportunities within or near the project area. The IBAT is an interactive mapping tool that provides a baseline biodiversity risk screening for a proposed area and has also been used to identify priority conservation areas around the project area and to predict potential impacts at the landscape level. It brings together information on globally recognised biodiversity information from a range of IUCN knowledge products: IUCN Red List of Threatened Species, Key Biodiversity Areas (priority sites for conservation) and Protected Planet/The World Database on Protected Areas (covering nationally and internationally recognised sites, including IUCN Management Categories I-VI, Ramsar Wetlands of International Importance and World Heritage Sites).

Within a 50 km buffer around the proposed project area, there are a total of 17 national protected areas, 5 in South Sudan and 12 in Uganda, the Otze Wildlife Sanctuary (Cat. IV IUCN) and 11 Forest Reserves. As mentioned above, the closest are Juba Game Reserve, Badingilo and Nimule (and its Buffer Zone) National Parks. There are also 5 Key Biodiversity Areas (KBAs) within the 50 km buffer, all of which are Important Bird and Biodiversity Areas (IBAs): Badingilo, Juba, Imatong Mountains, Nimule and Mount Otzi Forest Reserve (in Uganda). These areas include PAs such as Badingilo National Park, but the extent of the IBAs is greater.

Further details on other Important Bird and Biodiversity Areas are described in the paragraph 7.3.4.2.

7.3 Biological Environment

The environmental conditions of South Sudan support a very rich diversity of animal and plant species throughout the country, as well as several important biological processes and ecosystem services.
Despite 25 years of civil war, South Sudan still has a vast ecological heritage, with one of the highest levels of large mammal diversity and largest intact habitats of any country in Africa (NBSAP South Sudan 2018). However, due to the historical conflict and the recent independence of South Sudan, several aspects of the biological environment remain unknown, unstudied and unprotected. Indeed, one of the drivers of biodiversity loss in the country is the lack of a clear policy, legal and institutional framework for the effective and sustainable management and conservation of natural resources.

The following sections provide details on the current status of the biological environment in South Sudan and the potential impacts of the project. Several direct and indirect impacts of the project could potentially affect biodiversity and ecosystems at different spatial scales, therefore a multi-scalar approach, from the regional level to the project area, was used to assess the baseline information and the impacts of the project on the biological environment. In particular, the biological components within a 50 km buffer around the proposed transmission line route were considered to assess the baseline information and impacts at the landscape scale. Therefore, a more detailed assessment was performed using a 1 km buffer to obtain information at local scale.

The information presented is based on official documents, published scientific literature and open access data sources obtained through a review of available reports, studies and global, African and national databases.

The International Union for Conservation of Nature (IUCN) products were used to gather general information on the conservation status, management and threats to species and protected areas that could be affected by the implementation of the project.
A fundamental tool for species conservation is the IUCN Red List of Threatened Species. It has become the world's most comprehensive source of information on the global extinction risk status of animal, fungal and plant species. Much more than a list of species and their status, it is a powerful tool for

informing and catalysing biodiversity conservation action and policy change, which is essential to protect the natural resources that need to be conserved. Red Lists classify species into the following 9 categories of threat (Figure 7-13):

- **EX** - EXTINCT. A species is assessed as Extinct when there is no reasonable doubt that the last individual has died.
- **EW** - EXTINCT IN THE WILD. Species occurring only in captivity or as naturalized populations.
- **RE** - REGIONALLY EXTINCT. Species disappeared from a nation or region and there is no doubt that the last individual has died there. However, such species may occur in other parts of the world.
- **CR** - CRITICALLY ENDANGERED. Species that face an extremely high risk of extinction and fulfil the criteria A-E for Critically Endangered.
- **EN** - ENDANGERED. Endangered species face a high risk of extinction and fulfil criteria A-E for Endangered.
- **VU** - VULNERABLE. Species considered Vulnerable face a high risk of extinction and fulfil criteria A-E for a Vulnerable species.
- **NT** - NEAR THREATENED. This category applies to species that do not currently qualify for a threatened category but is close to qualifying and is likely to qualify in the near future.
- **LC** - LEAST CONCERN. Least Concern species are usually common and face no serious threats. Species in this category do not qualify for a threat category and face little or no threat of extinction.
- **DD** - DATA DEFICIENT. A species is Data Deficient when there is not sufficient available information to assess the species against the criteria.

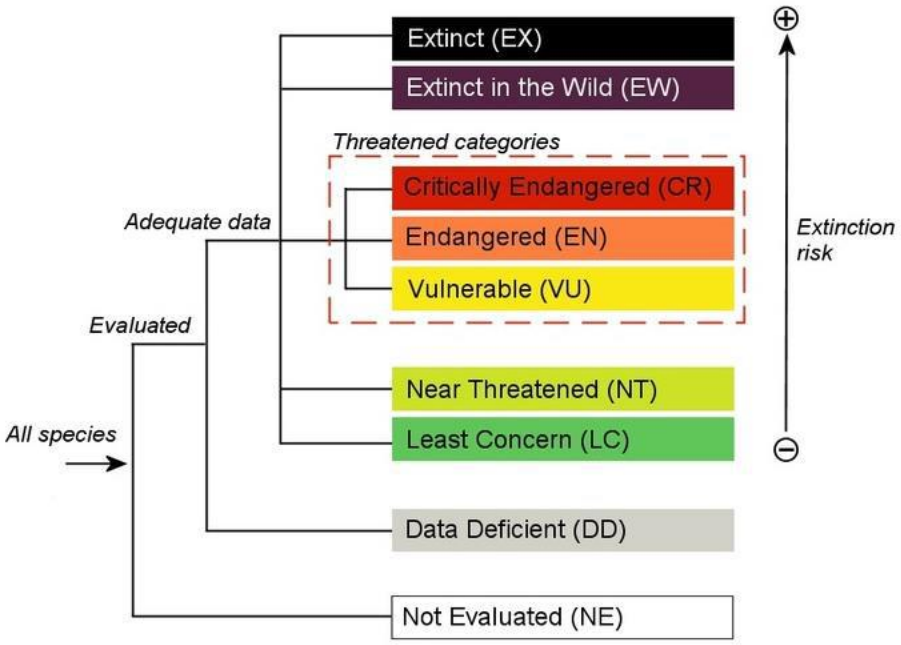


Figure 7-13 – IUCN Red List Categories (Source: https://www.iucnredlist.org/).

South Sudan does not have a National Red List; subsequent references to the status of species according to the IUCN have been taken from the Global Red List (https://www.iucnredlist.org/).

From the same source, spatial data of species potentially present in the project and its surrounding areas were downloaded and analysed. The IUCN Red List spatial data consists of georeferenced distribution ranges for each species. Major taxa were assessed including mammals, birds, reptiles, amphibians and arthropods.
Each species range was assigned a weight from 1 to 10 and the weighting was based on the IUCN categories. The lowest score (i.e., 1) was given to Least Concern species because they are considered to be common and not threatened. Critically Endangered species, on the other hand, were given a score of 10, reflecting their high conservation priority. Scores of 8, 6 and 4 were given to species classified as Endangered, Vulnerable and Near Threatened respectively. Once the conservation values had been assigned, the distribution ranges of all species were summed up to produce a single map. In this way, the spatial distribution of species was weighted by their conservation status to produce a conservation value map, showing how the different species are distributed and highlighting sensitive areas with high numbers of species and threatened species.
This spatial analysis was carried out for each species and only for threatened species (VU, EN and CR) in each taxon. The ranges were considered in the 50 km buffer around the project area to allow for a broader scale assessment. The 1 km buffer was then used to determine which species ranges overlapped with the proposed project area.

7.3.1 Forest diversity

7.3.1.1 Generality

South Sudan has a variety of habitats rich in plant species and ecosystems, and forests and woodlands cover a large proportion of the country's territory. Its natural forests are rich in biodiversity and wildlife habitat and provide important ecosystem services. According to the Government of South Sudan (2009) "Tree" means forest trees, including bushes, palms, bamboos, shrubs, brushwood, creepers and climbers at all stages of their growth. The definition of "forest land" is any land containing a vegetation association dominated by trees of any size, including woodlands, whether exploitable or not, that is capable of producing wood or other products, are potentially capable of influencing climate, which exercise an influence on the soil and water regime and provide habitat for wildlife. Forests in South Sudan include the provision of goods (shelter, timber, fuel, food, medicines, etc.) and services, carbon sequestration, water cycling, soil stabilisation and cultural services. More than 90% of the country's population is directly dependent on forests for fuelwood and charcoal, timber for construction, and non-timber forest products for food and nutritional security. No detailed forest surveys and inventories have been carried out in South Sudan, and there is no reliable data on the extent of South Sudan's forests. Depending on the source, estimates of the proportion of South Sudan's land area covered by forest range from 11.1 percent to 35 percent. Some of the country's forested areas have been set aside as Forest Reserves under the 2009 Forest Bill. A Forest Reserve is any area set aside to conserve, protect and manage natural forests, the habitat it provides and the forest environment. Tree cutting and other activities that potentially endanger the forest habitat and ecosystems are prohibited or controlled (GoSS, 2009). Gazetted Forest Reserves in South Sudan represent a comparatively insignificant portion of the total forest area, covering approximately 640,000 ha (MoE, 2014) and representing 3.1 per cent of the total forest area (USAID, 2014).

7.3.1.2 Forest Distribution

For the whole South Sudan, a Land Cover map retrieved by the Copernicus project was used. The Copernicus is the European Union's Earth observation programme built on a constellation of satellites (https://www.copernicus.eu/en). In particular, the Copernicus Global Land Service (CGLS) is earmarked as a component of the Land service to operate "a multi-purpose service component" that provides a

series of bio-geophysical products on the status and evolution of land surface at global scale. The CGLS delivers an annual global Land Cover product at 100 m spatial resolution with a three classification levels with class definitions according to the UN-FAO's Land Cover Classification System (LCCS) scheme (Buchhorn et al. 2019). Such layer is developed from PROBA-V satellite observations and organized into millions of Sentinel-2 equivalent tiles of 110x110km (with UTM projection). The latest (2019) Land Cover product was downloaded at https://lcviewer.vito.be/download to visualise the distribution of forests in South Sudan, subdivided into closed and open forests (Figure 7-14).

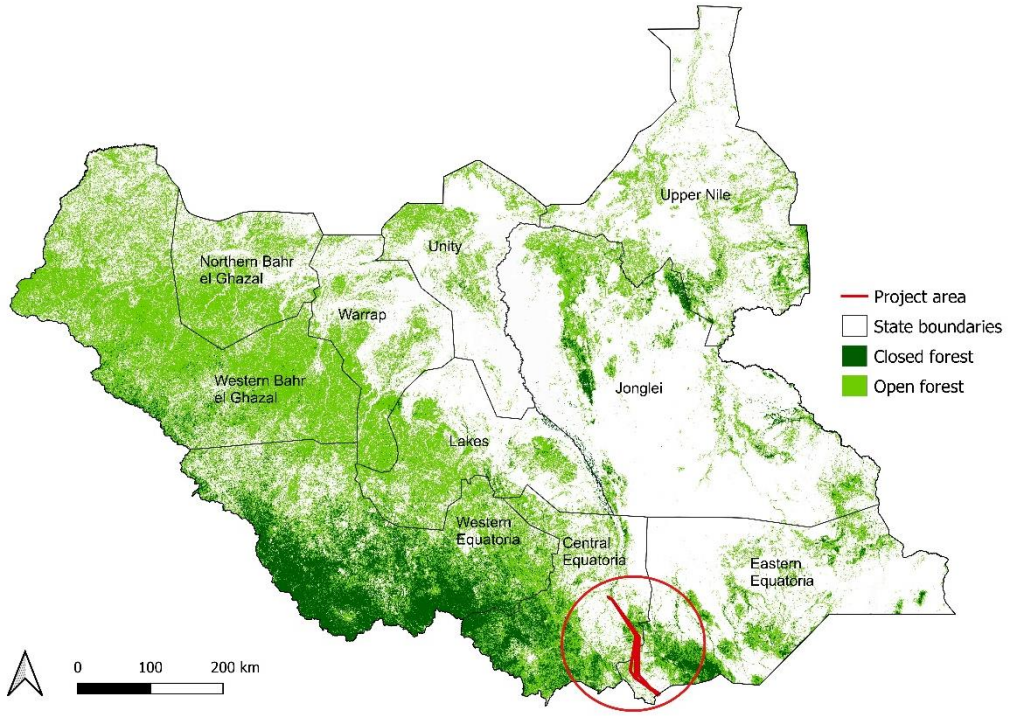


Figure 7-14 – Forest classification of the Copernicus Global Land Service Dynamic Land Cover Map at 100 m (level 3) in South Sudan.

7.3.1.3 Forest Types

Natural forests form the vast majority of South Sudan's forest estate. They are located mainly on the Ironstone plateau of Central and Western Equatoria. In addition to the forests west of the Nile, Eastern Equatoria has a significant forested area. A mixture of Congolean forest species and fire climax species characterizes the natural forests of the Equatorias. The forests of the Imatong Mountains, which are a mixture of both natural and plantation blocks, are of particular importance for their biodiversity and ecosystem services (Adkins, 2015). For management purposes, the Directorate of Forestry in the Ministry of Environment and Forestry categorises the forests of South Sudan as follows:

- *Commercial forests*: intensively managed plantation and natural woodlands that provide timber for commercial purposes. Sub-categories include industrial and non-industrial plantations, reserved natural forests and those managed for other purposes e.g. Gum Arabic, tannins, fuel wood, etc. Silviculture (reforestation, afforestation, thinning, pruning, operation of forest tree nurseries, etc.) is practised in these forests.
- *Community forests*: These are plantations in or around major settlements for productive functions, such as fuel wood supplies and poles for construction for local communities.
- *Protection forests*: these are plantation and natural forests managed to protect other land uses from the potential damage caused by winds (the trees act as windbreaks); to anchor soils and

protect them from creeping sands and soil erosion; to replenish soil fertility (as is the case with tree planting along the Jonglei Canal); and to provide water conservation services.

- *Recreational forests*: Plantations established purely for recreation or aesthetic purposes, e.g., shade trees, habitat for zoos and trees planted in national parks (MOE, 2015).

Plantation forests are those that have been established through forestation or reforestation for commercial purposes. Plantations include both indigenous and exotic species. Before the war, it was estimated that South Sudan had plantations covering 187,850 hectares. These comprised irrigated *Acacia nilotica* (Sunt) plantations along the banks of River Nile, plantations of high commercial value, indigenous species such as Khaya senegalensis, and Khaya grandiflora (concentrated in the greater Bahr-el-Ghazal area), eucalyptus plantations, and teak (*Tectona grandis*) plantations spreading over most States. The world's largest plantations are planted with Acacia used for producing Gum Arabic. Plantations were mainly established to relieve pressure on natural forests by providing fuelwood, charcoal, construction materials and non-timber forest products to local communities and to protect ecosystem services, such as soil retention and water storage. Since they comprise relatively few tree species, plantation forests contain significantly less biodiversity than natural forests. Compared to natural forests and forest reserves, the area covered by plantations in South Sudan is very small, estimated at no more than a few thousand hectares. The largest plantations in South Sudan are composed of Teak (*Tectona grandis*). South Sudan's teak forests were originally planted by British colonialists before Sudan's independence in 1956; they are the oldest teak forests in Africa and the largest of its kind in the world (Verjee, 2013). Agroforestry, a practice involving the integration of agriculture and forestry into one land-use system, is also conducted in South Sudan. It is a very sustainable alternative to traditional agriculture and modern mechanised agriculture and forestry systems since it provides a variety of products for food and household use, significantly reduces erosion and contributes to a favourable microclimate. Although not formally categorised as agroforestry, the widely-practised tradition of shifting agriculture in South Sudan includes the inter-planting of some fruit trees and shrubs with vegetables and other crops.

7.3.1.4 Timber Production

Most of the mature teak plantation trees standing today are between 35 and 50 years old. If expanded and sustainably managed, teak plantations have significant potential to boost the economy. In 2007, it was estimated that the existing teak had the potential to generate up to US $ 50 million per year in export revenue (Verjee, 2013). In the recent past, a limited number of logging concessions were given out to companies with business interest for teak timber export for ship building, which fetch a price of US$300 to 400 per cubic metre on the international market. The tropical moist forests, lying in areas of high rainfall along the southern border and Nile–Congo watershed, represent some of the richest concentrations of biodiversity in the country and contain valuable commercial products, including cabinet-grade timber species. There are substantial teak plantations, established from 1930s onward, which have matured and reached the age to deliver significant production. Based on high demand for premium quality timber, such as teak and mahogany, improved management and production is likely to generate substantial additional foreign exchange to supplement oil revenue for the country, providing an important source of economic diversification. According to some conservative estimates, less than 2,500 m^3 of teak has been exported annually in recent years. It is estimated that teak plantations alone can generate over US $ 100 million per year, and mahogany in natural forest reserves could be a source of substantial hard currency as well.

7.3.1.5 Non-Timber Forest Products

Non-wood forest products include sheanut (locally known as lulu), fruits, fibers, grasses, honey, oils, resins, gums, sand, gravel, and forest soils. Many non-timber forest products are harvested for local use

and to some extent for commercial trade. This includes lulu which grows abundantly in South Sudan. Currently, sheanut butter oil is in high demand worldwide, although only about 0.2% of South Sudan's total sheanut production is currently exported, the majority is consumed locally (Forest Policy, 2012). Gum acacia could also constitute a major export product for South Sudan. Many local villagers in the country are unaware of the economic value. In 2008, South 44 Sudan was the fourth largest producer of gum acacia in the world after Sudan, Chad, and Nigeria. Honey is another forest product which has high potential for export, providing another business opportunity to local communities. During the war, honey was exported to various destinations including neighbouring countries, and such exports should be supported and expanded. At the local community level, forests provide critical resources – and often safety nets – for rural communities, as they rely heavily on forests and trees for shelter, food, medicine, and income. Forests also have religious, social, and cultural significance. Local communities harvest timber for building purposes, fuelwood for cooking and making charcoal, and wild foods and medicines (Non-Timber Forest Products) from the forests and woodlands in their vicinities. Data on the demand and consumption of these forests products in South Sudan is not known. Currently majority of South Sudanese are involved in traditional therapy using medicinal plants. This is because they are easily accessible and cheaper. Strong cultural preference for traditional medicine has made medical as fundamental medications for well-being of many people in the country. Table 7-2 shows the commonest plant used as medicine in South Sudan.

Table 7-2 – Medicinal plants commonly used by local populations in South Sudan. Source: Lako et al. 2020.

S/No	Plants species	Local name	Family	Part used	uses
1	*Aloe vera*	Sabbar	Agavaceae	Flowers, leaves	Dermatitis,
2	*Sclerocarya birrea*		Anacardiaceae	Leaves	Glycaemia control
3	*Aristolochia bracteolate*	Dekery-timylo	Aristolochiaceae	Leaves, roots	Malaria, fever
4	*Calotroppis procera*	Uhsahr	Asclepiadaceae	Milky juice, flowers	Cholera, asthma, wounds
5	*Vernonia kotschyana*		Asteraceae	Leaves	Gastric ulcers
6	*Balanites aegyptiaca*	Laloub	Balanitaceae	Fruits kernel, leaves	Lowering blood pressure, stomach disorders
7	*Kigelia africana*	Ungoli	Bignoniaceae	Fruits	Syphilis, antibacterial
8	*Senna alata*		Caesalpiniaceae	Leaves	Mycosis, antiviral
9	*Terminalia brownii*		Combertaceae	Wood, roots	Hepatitis
10	*Tamarindus indica*	Aradib	Combertaceae	Fruits	Laxative, pneumonia
11	*Ricinus cummunis*	Castor oil	Euphorbiaceae	Leaves	Fever
12	*Euphorbia hirta*		Euphorbiaceae	Entire plant	Anti-asthmatic, antidysenteric, antifungal, diuretic
13	*Jatropha curcas*	Khirwa	Euphorbiaceae	Leaves, seeds	burns, retained placenta, dermatitis, biofuel
14	*Plectranthus amboinicus*	No local name	Lamiaceae	Leaves	Wounds and injuries
15	*Hisbiscus surratensis*	Karkedeh	Malvaceae	Leaves, fruit	Laxative, cancer, lowering blood pressure, cold and flu
16	*Khaya senegalensis*	Kir/Mahogany	Meliaceae	Leaves, roots	Diarrhea, stomach, worms
17	*Azadirachta indica*	Neem	Meliaceae	Fruits, leaves	Malaria, insecticides
18	*Accacia nilotica*	Sunt	Mimosaceae	Fruit	Antiseptic
19	*Moringa oleifera*		Moringaceae	Leaves	Dietary supplement, dysenteria
20	*Eucalyptus citriodora*	Rihan	Myrataceae	Leaves	Insect repellent
21	*Eucalyptus globulus*	Kafoor	Myrataceae	Leaves, bark	Respiratory disease
22	*Psidium goyava*	Guyava	Myrataceae	Leaves, fruit	Diarrhea
23	*Dalbergia melanoxylon*	Abunos	Papilionaceae	Leaves, bark	Parasitic worms
24	*Ziziphus mauritiana*		Rhamnaceae	Leaves, fruit	Cut, wounds, ulcers
25	*Crossopterix febrifuga*		Rubiaceae	Leaves, fruits, roots	Gonorrhea, fever, cough, worms
25	*Gardenia lutea*	Abu gowi	Rubiaceae	Fruits	Constipation
27	*Datura metel*	Mekerere	Solanceae	Seeds	Narcotic

7.3.1.6 Forest Threatens

South Sudan faces many challenges to developing and sustainably managing its forestry sector. Although they look luxurious, forests in South Sudan are fragile ecosystems which suffer varying levels of degradation through uncontrolled fires, uncontrolled grazing, and over harvesting. In arid zones, uncontrolled fire destroys trees and their regeneration capacity is severely limited by the harshness of the environment. Forest Fires Traditional use of bush fires is a major threat to forests and tree growing throughout South Sudan. The fires are used for land preparation under shifting cultivation, for hunting, and for rejuvenation of grazing areas. Forest fires also originate from lightning, smokers, and honey collectors. Even the biodiversity-rich tropical moist forests, found in areas of high rainfall along the southern border and Nile – Congo watershed, are very vulnerable to degradation. Currently, the level of degradation is high in all states and there is urgent need to reverse the trend.

7.3.2 Vegetation, Habitat and Plant communities

The vegetation units in South Sudan are mainly in marked latitudinal zones, with the major exception of the flood zone associated with the White Nile and its tributaries, and with the minor exception of the 'island-like' montane vegetation zones. This latitudinal zonation is a reflection of the strong north-south changes in annual rainfall in the South Sudan region. The vegetation units are summarised below:

- **Desert**: annual rainfall less than 75 mm, highly unreliable. Vegetation is largely absent, mainly restricted to seasonal watercourses. Ephemeral herbs and grasses occur after the infrequent rain events. This region falls within the Sahara phytochorion of White (1983).

- **Semi-desert scrub and grassland**: annual rainfall 75–400 mm, unreliable and mainly falling in July–August, except in the Red Sea lowlands where the rainfall is later, November– January. A mixture of annual and perennial grasses dominates the discontinuous herb layer whilst the woody species are scattered or absent, usually occurring as bushes to 2 m tall, becoming denser along drainage lines. This vegetation type can be further divided in two:
    a. Semi-desert on lithosols: important woody species (where present) include *Acacia tortilis*, *Leptadenia pyrotechnica*, *Maerua crassifolia* and *Salvadora persica*. In areas of saline soils, *Tamarix* species can dominate. Important grasses include a number *Aristida* spp., with the perennial *Panicum turgidum* on sandy soils.
    b. Semi-desert on clay soils: important woody species here include *Acacia mellifera*, *Balanites aegyptiaca*, *Capparis decidua* and *Ziziphus spina-christi*. Common grasses on clays include *Cymbopogon* spp., *Schoenefeldia gracilis* and *Sehima ischaemoides*. The spiny herb *Blepharis edulis* can form pure stands in some areas.

- **Thorn savanna and scrub**: annual rainfall 280–800 mm. This area is characterised by a mosaic of thickets and wooded grasslands with the dominant tree species being thorny and low in stature, most commonly Acacia species. The herb layer is often dominated by few or single grass species, these varying depending on local soils, drainage etc. This vegetation can be further divided in two main subdivisions based on soil types:
    a. Thorn savanna and scrub on sandy soils: *Acacia senegal* is the dominant tree over large areas (much of the *A. senegal* woodlands may be secondary since they often follow cultivation), dominant grasses include *Aristida sieberiana*, *Eragrostis tremula* and, in disturbed areas, *Cenchrus biflorus*.
    b. Thorn savanna and scrub on clay soils: the woody component is often dominated by *Acacia mellifera* thickets, sometimes in association with e.g. *Adansonia digitata*, *Boscia senegalensis* and *Commiphora africana*. *Acacia seyal* and *Balanites aegyptiaca* can

dominate in higher rainfall areas. Locally dominant, grasses include *Cymbopogon* spp., *Echinochloa rotundiflora*, *Hyparrhenia anthistirioides*, *Schoenefeldia gracilis*, *Sehima ischaemoides* and *Sorghum purpureosericeum*.

- **Deciduous savanna woodland**: annual rainfall 450–1300 m. This is an area dominated by a low diversity of non-spiny broadleaf woody species with an understorey of tussocky perennial grasses and is subject to regular dry season burning. Two subdivisions based on soil types can be recognized:
  a. Deciduous savanna woodland on latosols: the dominant trees of this zone include *Albizia amara* subsp. *sericocephala*, *Anogeissus leiocarpa*, *Combretum* spp., *Isoberlinia doka* and *Khaya senegalensis*. The *Khaya* is often the most frequent large tree in the wetter parts of this zone or associated with termite mounds in drier parts. Other large tree species in wetter parts include *Daniellia oliveri* and *Parkia biglobosa*. The *Isoberlinia* can be single-dominant on lighter soils or can form mixed woodland with *Burkea africana* and *Terminalia mollis*. *Vitellaria paradoxa* can be common in areas of derived open woodland. Amongst the most important grasses are a number of *Aristida*, *Eragrostis*, *Hyparrhenia* and *Pennisetum* spp. In the driest parts of this region, a woodland of *Anogeissus leiocarpa*, *Prosopis africana*, *Sclerocarya birrea* and *Terminalia laxiflora* can dominate and in these areas the grass layer can contain a more significant annual element.
  b. Deciduous savanna woodland on clay soils: these woodlands are dominated by *Anogeissus leiocarpa* and *Combretum* spp. including the near-endemic *C. hartmannianum*, together with some *Acacia seyal*. Dominant grasses include *Andropogon gayanus*, *Hyparrhenia* spp. and *Setaria incrassata*.

- **Flood region**: annual rainfall 800–1000 m or more. This area includes areas that are either occasionally, seasonally or permanently flooded; Here two subzones present different vegetatin types:
  a. Swamp and wetland savanna: includes (1) the permanent swamps of the Sudd region, dominated by Cyperus papyrus stands together with swamp grass species including *Echinochloa pyramidalis*, *E. stagnina*, *Oryza* spp., *Phragmites mauritianus* and *Vossia cuspidata*; (2) semi-permanent swamps with a more mixed grass, sedge and Typha community; and (3) the seasonally flooded wooded grasslands with important tree species including *Acacia seyal*, *A. sieberiana*, *Balanites aegyptiaca*, *Borassus aethiopum* and *Hyphaene thebaica*.
  b. 'Toposa' Grassland: this area is a transition between the flood region proper and the semi-desert grasslands and thickets further southeast in Kenya. It holds a mixed grassland with e.g. *Bothriochloa insculpta*, *Chrysopogon plumulosus*, *Hyparrhenia rufa*, *Setaria incrassata* etc. and some thickets of *Acacia mellifera*. This area falls within White's (1983) Somalia-Masai phytochorion.

- **Lowland forest**: annual rainfall over 1300 m. Small relict patches of rainforest e.g. at Azza, Aloma Plateau, Laboni, Lotti and Talanga remain within a matrix of woodland, some of which is derived from deforested areas. The dominant trees of the intact forest are varied but include *Celtis zenkeri*, *Chrysophyllum albidum*, *Holoptelea grandis* and *Mildbraediodendron excelsum*. Riverine fringing forests are also fairly widespread in this region, with important species including *Cola gigantea*, *Erythrophloeum suaveolens*, *Fleroya stipulosa*, *Khaya grandifoliola* and *Syzygium guineense* subsp. *guineense*. Large trees in the woodland areas derived from forest include *Albizia zygia*, *Terminalia schimperiana* and *Vitex doniana*. This region falls within Guinea-Congolia/ Sudania transition zone with the forests being Guineo-Congolian.

- **Hill vegetation**: this is a vegetation type occurring on isolated inselbergs ('jebels') where the vegetation is more luxuriant than the surrounding plains; the flora is mainly woody with a mixed species composition, often including e.g. *Anogeissus leiocarpa*, *Combretum hartmannianum*, *Ficus* spp., *Sterculia* spp., *Stereospermum kunthianum*, *Terminalia brownii* etc. The seasonal watercourses (khors / wadis) that runoff from these inselbergs can also have a differing vegetation to the surrounding plains.

- **Montane vegetation**: defined as upland areas where the vegetation differs markedly from that of the surrounding lowlands due to the combined influence of altitude (and so temperature) and, in some cases, associated increases in precipitation. The main 'montane' areas otherwise have varying amounts in common floristically and so should be subdivided into the four main blocks:
    a. Imatong-Dongotona-Lafit Mts: with a relatively moist montane forest of *Olea capensis* subsp. *macrocarpa*, *Podocarpus milanjianus* and *Syzygium guineense* subsp. *afromontana* as the main climax species and e.g. *Hagenia abyssinica* at higher altitudes. Above the tree-line is a well-developed Ericaceous bushland zone and areas of montane grassland.
    b. Didinga Mts: similar to Imatong-Dongotona-Lafit but with the forest at lower altitudes dominated by *Juniperus procera* and *Olea europaea* subsp. *cuspidata*.
    c. Red Sea Hills: which support drier montane forest dominated by *Juniperus procera* and/or *Olea europaea* subsp. *cuspidata*, although much of this forest has now been removed. In the driest areas, succulent tree species such as *Dracaena ombet* and *Euphorbia* spp. can dominate though they have again been heavily deforested.
    d. Jebel Marra: supports patchy dry forest with *Olea europaea* subsp. *laperrinei* fairly widespread at higher altitudes together with *Faidherbia albida* on younger soils. Valleys can have a forest vegetation, often with *Ficus palmata*. Elsewhere, grasslands are widespread. The lower slopes essentially support 'Hill Vegetation'.

7.3.3 Native Flora, Endemism and Protected species

In Table 7-3 the total numbers of angiosperm and gymnosperm families, genera, species and taxa (species and infraspecific taxa) for Sudan and South Sudan are presented. In the region as a whole, 3,969 species are recorded, of which 2,117 occur in Sudan and 2,961 occur in South Sudan.

Table 7-3 – Summary statistics for the angiosperm and gymnosperm richness in Sudan and South Sudan. 'Taxa' refers to species and infraspecific taxa.

Taxonomic Rank	Sudan + South Sudan	Sudan	South Sudan	% overlap
Families	183	135	170	67%
Genera	1351	843	1084	43%
Species	3969	2117	2961	28%
Taxa	4096	2175	3041	27%
Introduced species		140	101	
Introduced taxa		141	103	
Native species		1977	2860	
Native taxa		2034	2938	

The percentage plant endemism in South Sudan is 1.2% or, if near-endemics are included, 2%. For South Sudan they are 1.7% and 2.4%. In terms of plant species, Imatong Forest is a major biodiversity hotspot, supporting over 2,000 vascular plant species and hosting one of the largest intact Podocarpus forests in Africa. The endemic flora of South Sudan includes *Chloroselast aposana* and *Lepidochrysops nigritia*. Vascular plant species restricted to South Sudan include *Aloe diolii*, *Aloe macleayi*, a cycad *Encephalartos mackenziei*, *Chlorophytum superpositum*, *Scilla chlorantha* and *Panicum bambusiculme*. Wild Arabica coffee also grows in the forests of the Boma Plateau and Imatong Forest. In term of protection status, 125 plant species were present in the IUCN database within a 50 km buffer around project area, of which 124 with a Least Concern (LC) conservation status and only one, *Bulbostylis clarkeana*, classified as Near Threatened (NT).

7.3.4 Wildlife diversity

South Sudan has a wide range of habitats that support a rich diversity of wildlife within and outside its protected areas. It supports global important ecological and biological processes, and it is home to one of the world's great migrations - the white-eared kob (*Kobus kob*), tiang (*Damaliscus lunatus tiang*), Mongalla gazelle (*Eudorcas albonotata*) and bohor reedbuck (*Redunca redunca*) - across the eastern grassland savannahs and floodplains of Jonglei and Eastern Equatoria states, stretching into the neighbouring Gambela region of Ethiopia.

Wildlife management strategies inside and especially outside protected areas, such as community-based conservation and collaboration with state and local governments, are still scarce and need to be developed and implemented. Furthermore, South Sudan's rich natural resources and wildlife diversity could be a major tourist attraction in the future, once stability returns to the country. Neighbouring countries such as Kenya and Tanzania have capitalised on the abundance and diversity of large mammals and vast intact ecosystems to develop tourism industries that generate important economic and social benefits. Wildlife tourism can be an important economic option at both national and local levels.

However, prolonged conflict has encouraged illegal activities such as poaching, putting both wildlife managers and wildlife at risk. Indeed, during the war, civilian communities and combatants in several areas had hunted and overexploited natural resources and wildlife. Some of South Sudan's protected areas still contain landmines and other unexploded ordnance, hampering rehabilitation, research, tourism and other wildlife management activities.

In addition to these important facts, there are a number of other threats to biodiversity conservation in the country, including direct impacts on wildlife such as human-wildlife conflict, poaching and trafficking,

and impacts on habitat through deforestation, livestock expansion and agriculture, leading to destruction and fragmentation of suitable habitat. The effects of climate change are increasing desertification in some areas and altering the growing season.

7.3.4.1 Animal communities

As mentioned above, South Sudan hosts one of the largest antelope migrations in the world, which is of invaluable biological and conservation value to the country. The Sudd wetlands and the White Nile have an extremely high biodiversity, from arthropods to vertebrate, that support abundant populations of wildlife species. Of these notable species are the threatened hippopotamus (*Hippotamus amphibius*), the near threatened sitatunga (*Tragelaphus spekki*), the endemic Nile lechwe (*Kobus megaceros*), and globally endangered species such as the elephant (*Loxodonta africana*) and leopard (*Panthera pardus*).

The country's endemic fauna includes the Nile lechwe, Hoogstral's striped grass mouse, Nile sitatunga and African climbing mouse (*Dendromus ruppi*). South Sudan is known to be the only country in Africa with both species of eland - the common eland (*Taurotragus oryx*) and the Derby's (giant) eland (*Taurotragus derbianus*). Other notable species in the country include eastern chimpanzee, giraffe, oryx, lion, wild dog, buffalo and Nile crocodile.

Reptile species in South Sudan are numerous but poorly studied. However, there are many large and better-known species such as the Nile crocodile (*Crocodylus niloticus*), tortoises, particularly the leopard tortoise (*Stigmochelys pardalis*) and the African spurred tortoise (*Centrochelys sulcata*), and some threatened species such as the Nubian flapshell turtle (*Cyclanorbis elegans*) and the Senegal flapshell turtle (*Cyclanorbis senegalensis*). Snakes, lizards and geckos are also common reptiles in South Sudan. Some of the snakes found in the country include the African rock python (*Python sebae*), the black mamba (*Dendroaspis polylesis*), the Egyptian cobra (*Naja haje*) and the black-necked spitting cobra (*N. nigricollis*). Other venomous snakes include the boom snake (*Dispholidus typus*) and the puff adder (*Bitis arietans*). Lizards are quite numerous, but the most common species are the Nile monitor lizard (*Varanus niloticus*) and the Agama lizards (Agamidae).

Nimule National Park is home to a variety of fauna of high conservation concern, including mammals such as *Loxodonta africana*, *Hippotamus amphibius*, *Kobus defassa*, *Tragelophus scriptus*, *Cercopithecus acthios* and *Procavia cupensis*, and reptiles such as *Cyclanorbis elegans* and *Crocodylus niloticus*. In a recent study, Damaya et al. (2022) recorded 73 bird species in just nine dry season sites within Nimule National Park and its buffer zone.

The following sections provide information on the animal communities of mammals, reptiles, amphibians and arthropods in the area included in the 50 km buffer around the proposed project. This baseline information and species distribution has been obtained from the IUCN Spatial Data (https://www.iucnredlist.org/resources/spatial-data-download). The used data include the known ranges of the species, but the accuracy of these ranges is approximate and sometimes incomplete. For this reason, this initial assessment has been carried out to determine the potential presence of priority species and to highlight the spatial distribution of areas of high conservation value, but field-based sampling is required to assess the presence of the species.
In these sections, after the preliminary evaluation of the potentially present species in and around the proposed project area, an assessment of the potential impacts of the project on wildlife was carried out.

Mammals
The distribution of mammal species as determined by the IUCN spatial data indicates that 177 species are distributed within a 50 km buffer around the proposed project area (the complete checklist is in Annex 3). Of these, 154 are Least Concern, 8 Near Threatened, 5 Vulnerable and 5 Endangered. Five

species are in the Data Deficient category, meaning that no information is available on their conservation status. The conservation values map (Figure 7-15) shows areas of higher conservation status in the north-east and south. These areas are in and around the Imatong Forest Reserve, Nimule and Bandingilo National Parks.

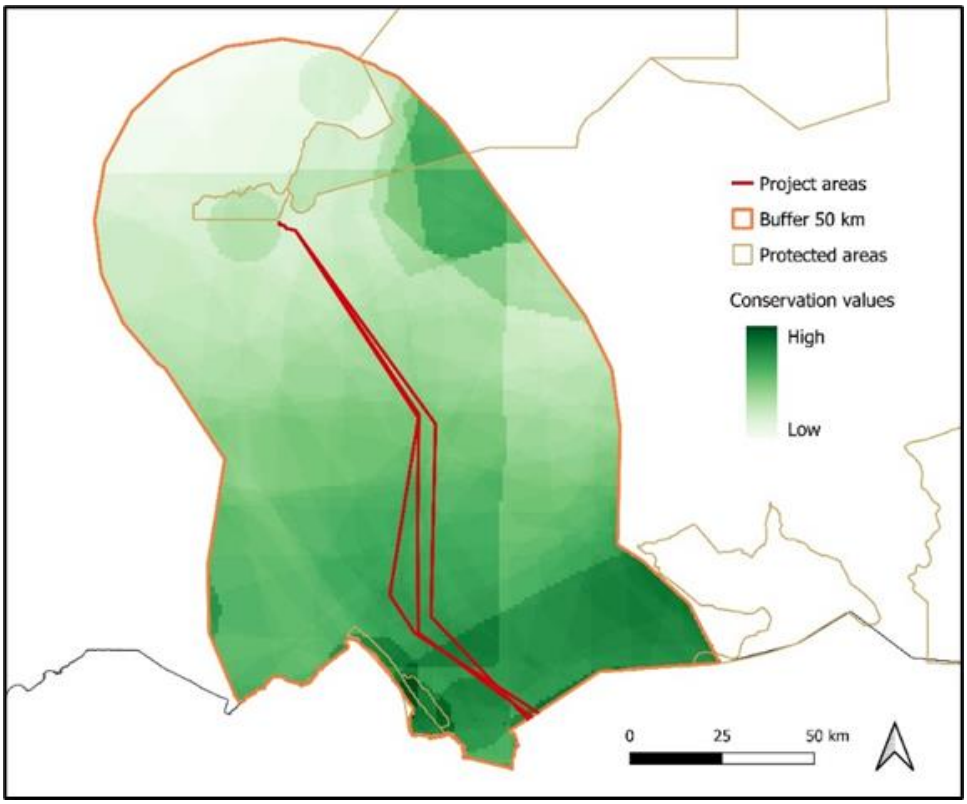


Figure 7-15 – Mammals species distribution within 50 km buffer around project proposed area weighted by their conservation value.

Reptiles

According to the IUCN spatial data assessment, there are 82 reptile species (the complete checklist is in Annex 3) within 50 km of the proposed project area. Of these, 76 are listed as Least Concern, 2 as Near Threatened, 3 as Vulnerable and 1 as Critically Endangered. The distribution map (Figure 7-16) shows a higher conservation value in the northern side of the area.

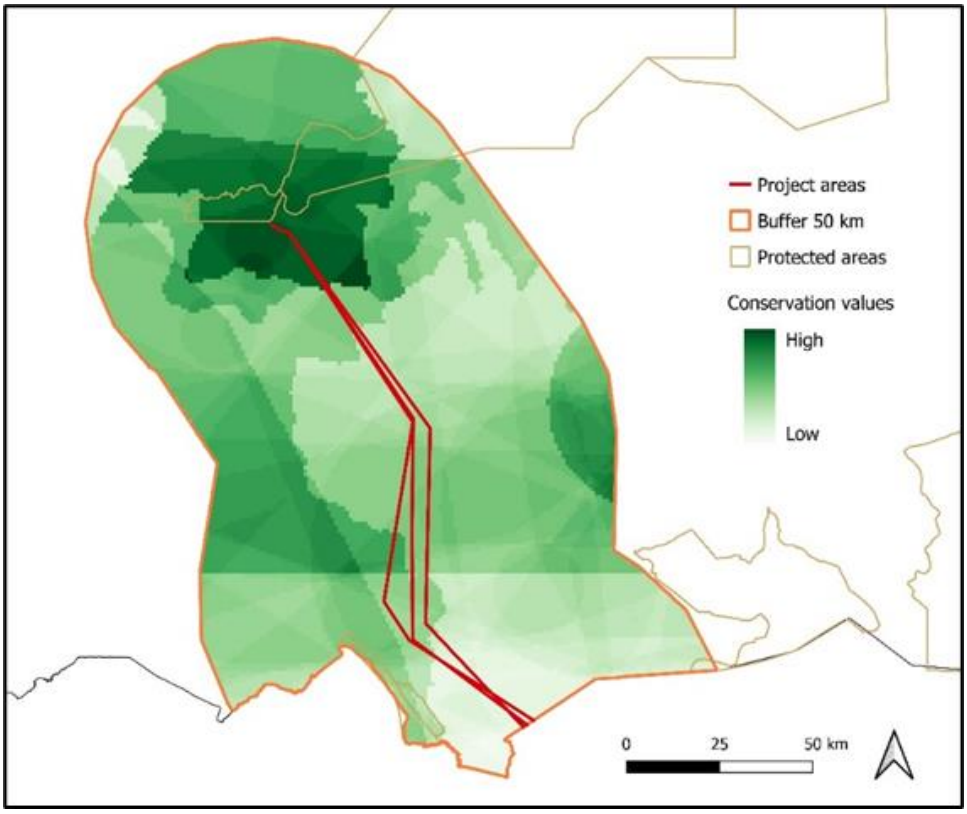


Figure 7-16 – Reptile species distribution within 50 km buffer around project proposed area weighted by their conservation value.

Amphibians

There are 23 amphibians species (the complete checklist is in Annex 3) within 50 km of the proposed project area distributed mainly in the north-west and east side of the area (Figure 7-17). The majority of these species (22 amphibians) are listed as Least Concern and only one species as Data Deficient category.

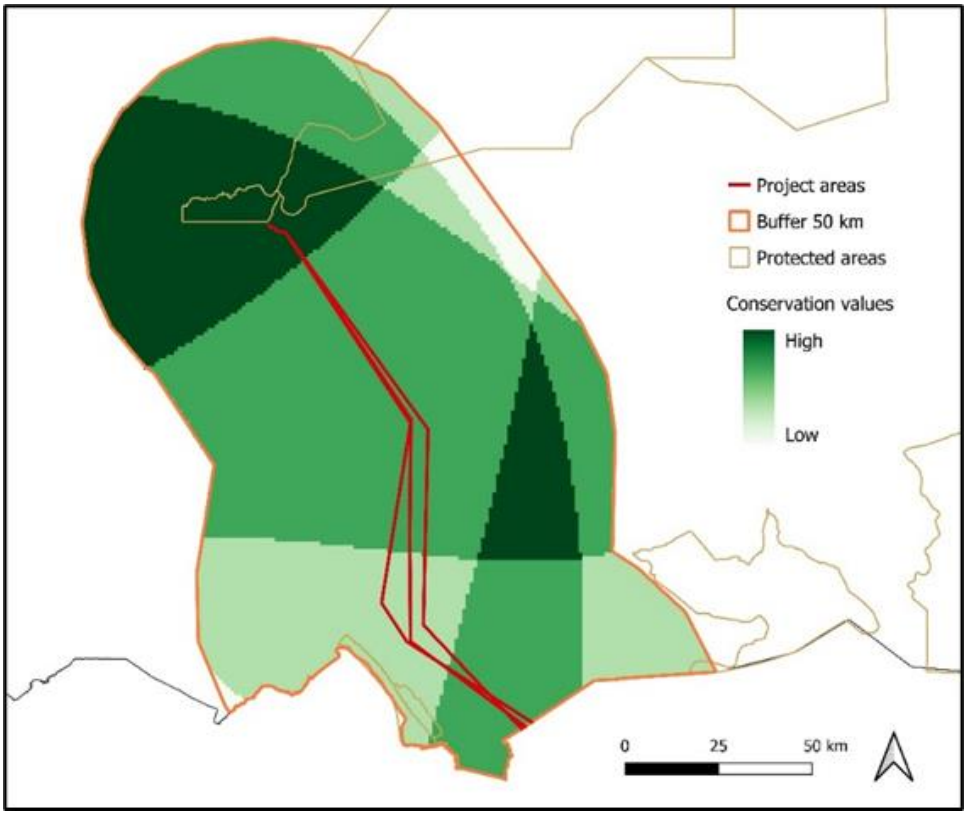


Figure 7-17 – Amphibians species distribution within 50 km buffer around project proposed area weighted by their conservation value.

Arthropods

The distribution of arthropod species as determined by the IUCN spatial data indicates that 138 species are distributed within a 50 km buffer around the proposed project area (the complete checklist is in Annex 3). Of these 137 are Least Concern and only one Data Deficient. The southern part of the area is the richest in terms of species diversity (Figure 7-18).

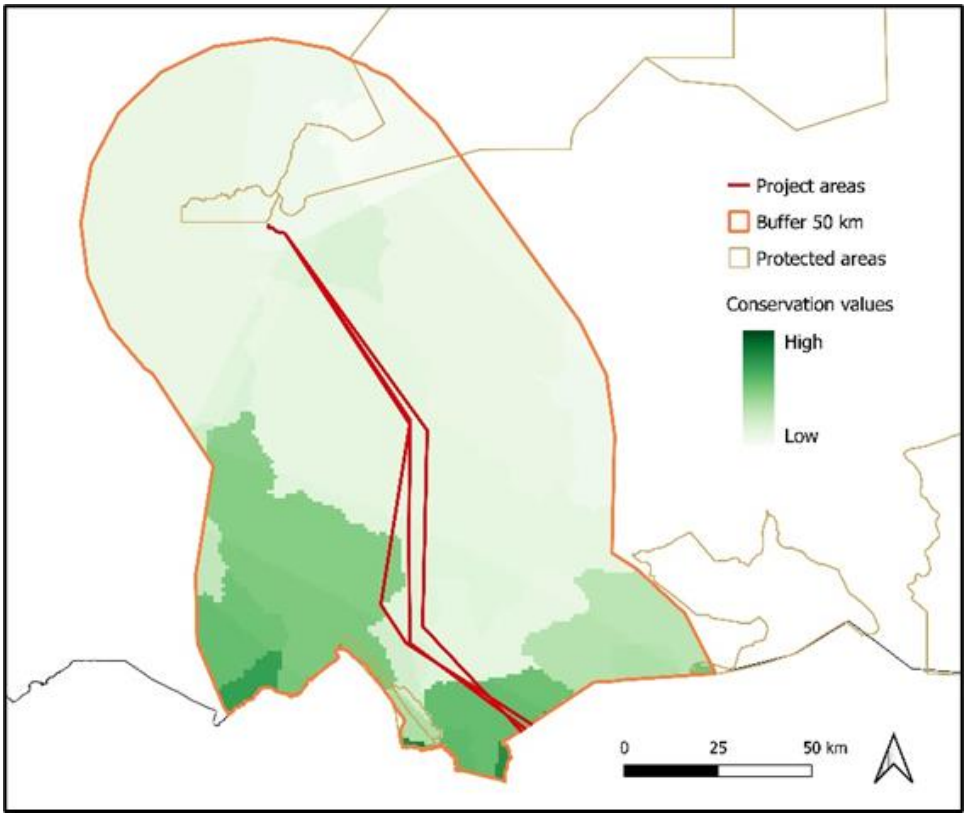


Figure 7-18 – Arthropods species distribution within 50 km buffer around project proposed area weighted by their conservation value.

7.3.4.2 Birdlife

A separate section for birds was necessary as they will be the most affected taxon of project implementation. In general, nearly 800 bird species have been recorded in South Sudan. The country is home to one of the world's largest wetlands, the Sudd swamp, which is internationally recognised as an important Ramsar site. This area supports over 20,000 waterbirds throughout the year and is a wintering area for migratory birds from Europe. It is located in the central-northern part of South Sudan and is more than 150 km from the project area. The proposed project area is close to a number of protected and important biodiversity sites (see section 7.2.5 for further details). Specifically for bird conservation, BirdLife International has developed an IBA programme to ensure the long-term conservation of sites of significant importance for birds and biodiversity. There are several IBAs in the proposed project area and its surroundings, which indicate bird hotspots, most of which overlap with National Parks or Game Reserves. The transmission line route overlaps or it is in the proximity of the following IBAs: Imatong Mountains, Nimule, Bandingilo and Juba.

The Imatong Mountains (Figure 7-19) have been designated as an IBA because they contain significant numbers of a globally threatened species (Criterion A1) and a significant proportion of the group of species whose distribution is largely or entirely confined to one biome (Criterion A3). The wide range of altitudes and the site's location at the interface of several biomes means that the Imatong Mountains support a high diversity of species. The site also contains the only known locality of *Geokichla guttata*.

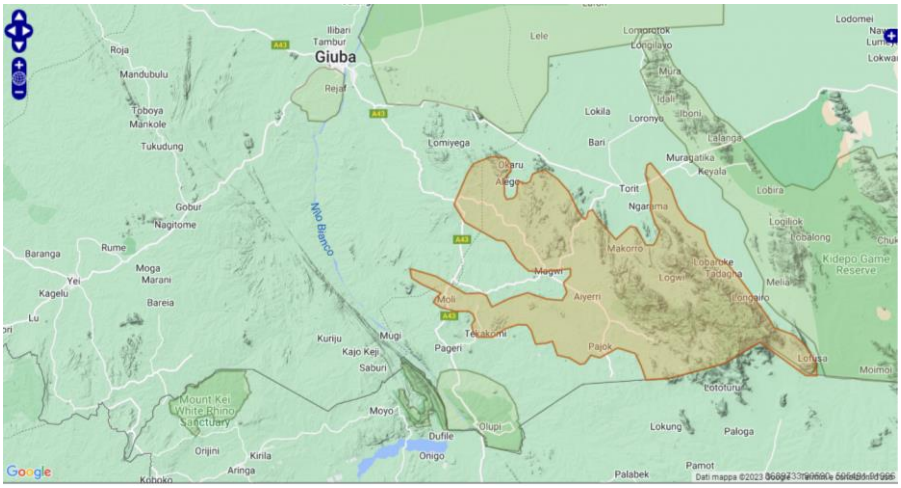


Figure 7-19 – Imatong Mountains IBA in orange.
Source: http://datazone.birdlife.org/site/factsheet/imatong-mountains-iba-south-sudan.

The Nimule IBA (Figure 7-20) was established to contain a significant proportion of the group of species whose distribution is largely or entirely confined to one biome (Criterion A3) and is located in Nimule National Park on the border with Uganda. The topography is hilly and most of the park is covered by savanna woodlands of *Acacia* spp., *Balanites aegyptiaca* and *Combretum aculeatum*. The riparian forest, found along permanent and seasonal watercourses, consists mainly of *Acacia sieberiana* and *Borassus aethiopium*. The site is adjacent to two IBAs in Uganda: Mount Kei Forest Reserve (UG022) and Mount Otzi Forest Reserve (UG023).

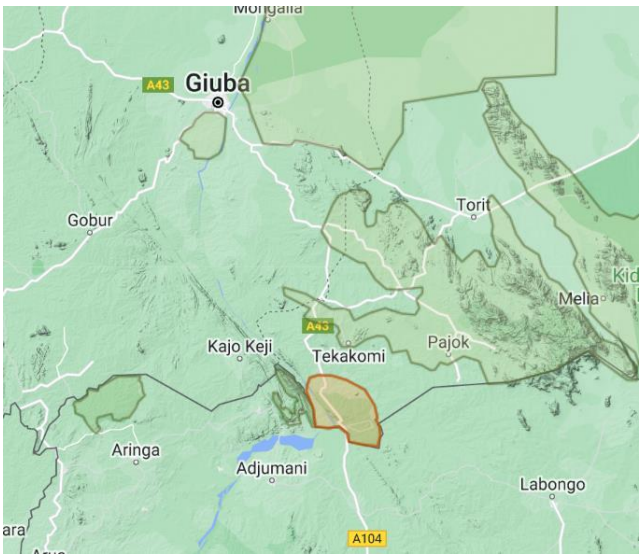


Figure 7-20 – Nimule IBA in orange. Source: http://datazone.birdlife.org/site/factsheet/nimule-iba-south-sudan.

The distribution of bird species as determined by the IUCN spatial data indicates that 609 species (the complete checklist are in Annex 3) range overlap the 50 km buffer around the proposed project area. The higher conservation values are located in the south-east, near the Imatong Forest Reserve (Figure 7-21).

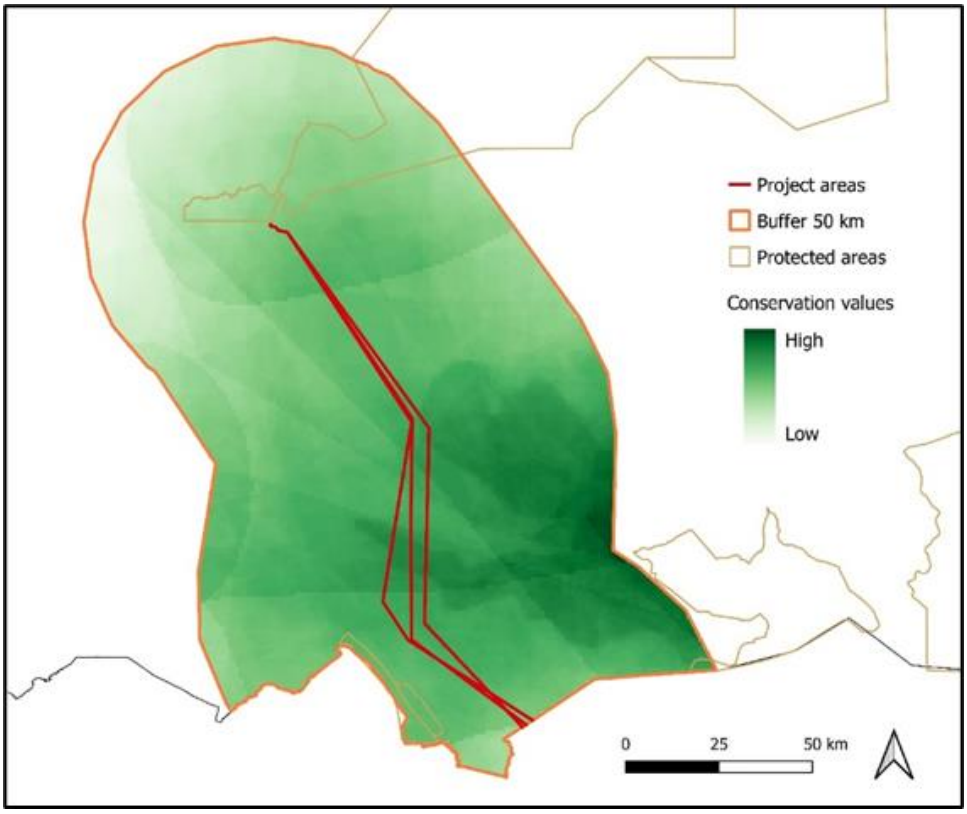


Figure 7-21 – Birds species distribution within 50 km buffer around project proposed area weighted by their conservation value.

7.3.4.3 Protected animal species

The protected species in South Sudan are listed in the Draft Wildlife Conservation & Protected Areas Bill 2015 (Table 7-4). This bill covers all matters concerned with Wildlife Conservation, the establishment and management of protected areas and the sustainable management and conservation of South Sudan's natural heritage and wildlife for the benefit of its citizens. The bill also explicitly provides for the crime of wildlife trafficking including illegal hunting, capture and trafficking of animals in the protected list.

Table 7-4 – A list of completely protected wildlife species in South Sudan (Draft Wildlife Conservation & Protected Areas Bill 2015).

Mammals	Birds	Reptiles
Aardwolf	Birds Of Prey (All Species)	Leopard Tortoise
Beisa Oryx	Bustards (All Species)	Pancake Tortoise
Black & White Colobus Monkey	Crane (All Species)	Nile Crocodile
Bongo	Eagles (All Species)	Nile Turtle
Zebra	Great Blue Turaco	Puff Adder
Buffalo (All Species)	Greater Flamingo	Python (All Species)
Caracal (African Lynx)	Hornbills (All Species)	
Cheetah	Ibis (All Species)	
Chimpanzee	Night Heron	
Eland (All Species)	Ostrich	
Elephant	Parrots (All Species)	
Giant Bushbuck	Pelicans (All Species)	
Giraffe	Saddle Bill Stork	
Grant's Gazelle	Secretary Bird	
Hippopotamus	Yellow Billed Stork	
Hyrax (All Species)	Shoe Bill	
Kudu (All Species)	Spoon Bill (All Species)	
Lelwel Hartebeest	Vultures (All Species)	
Leopard	White Stork	
Lion		
Nile Lechwe		
Orynx (All Species)		
Pangolin (All Species)		
Rhinoceros (All Species)		
Roan Antelope		
Sitatunga		
Striped Hyena		
Water Buck		
Wild Dog (Hunting Dog)		

Mammals

The mammal species classified by IUCN as Vulnerable, Endangered and Critically Endangered within the buffer of 50 km buffer are ten, five Vulnerable and five Endangered (Table 7-5). Their range, weighted by their conservation status, shows that they are mainly distributed in the north-east, near Badingilo National Park, and in the south, near Nimule National Park (Figure 7-22).

Table 7-5 – List of threatened mammals within 50 km buffer around project proposed area. CR: Critically Endangered, EN: Endangered, VU: Vulnerable.

N	Family	Species name	Seasonality	Red List category	Trend
1	HIPPOPOTAMIDAE	*Hippopotamus amphibius*	Resident	VU	Stable
2	BOVIDAE	*Redunca fulvorufula*	Resident	EN	Decreasing
3	MANIDAE	*Smutsia temminckii*	Resident	VU	Decreasing
4	MANIDAE	*Phataginus tricuspis*	Resident	EN	Decreasing
5	FELIDAE	*Acinonyx jubatus*	Resident	VU	Decreasing
6	HOMINIDAE	*Pan troglodytes*	Resident	EN	Decreasing
7	GIRAFFIDAE	*Giraffa camelopardalis*	Resident	VU	Decreasing
8	FELIDAE	*Panthera pardus*	Resident	VU	Decreasing
9	CANIDAE	*Lycaon pictus*	Resident	EN	Decreasing
10	ELEPHANTIDAE	*Loxodonta africana*	Resident	EN	Decreasing

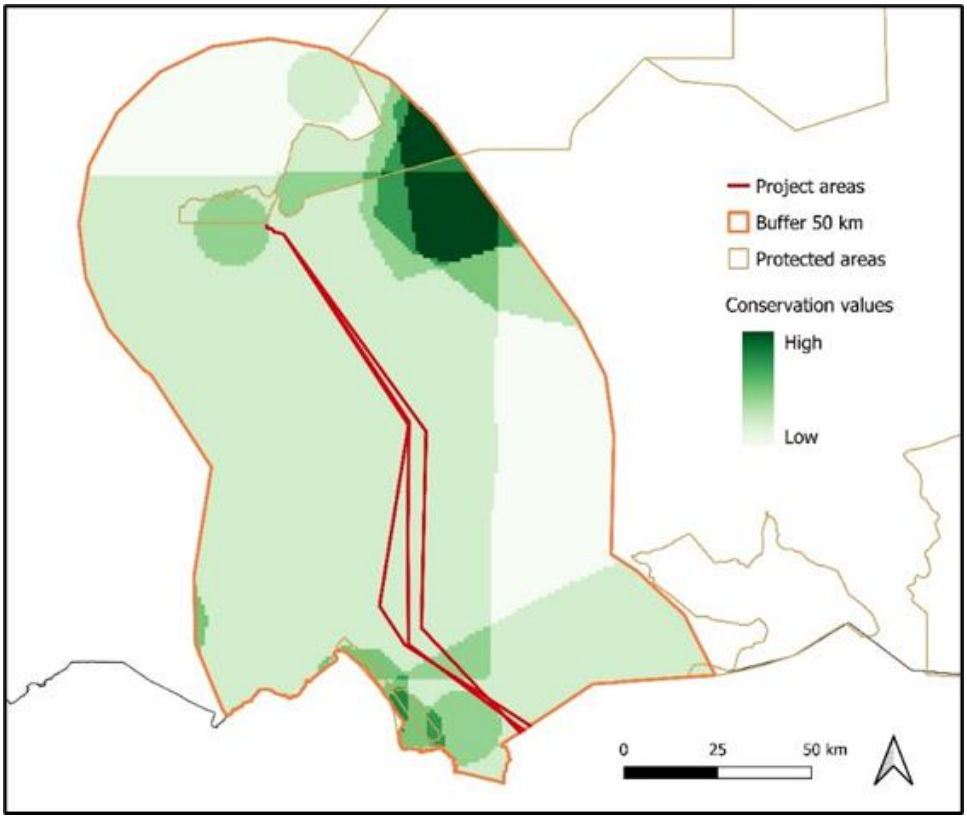


Figure 7-22 – Threatened mammals (CR, EN and VU) distribution within 50 km buffer around project proposed area weighted by their conservation value.

In more detail, there are four mammal species range that overlap the 1 km buffer around the proposed project area, all of which are classified as Vulnerable (Table 7-6). These charismatic species are also protected by the national law.

Table 7-6 – List of threatened mammals within 1 km buffer around project proposed area. VU: Vulnerable.

N	Species name	RedList category	Trend
1	*Hippopotamus amphibius*	VU	Stable
2	*Smutsia temminckii*	VU	Decreasing
3	*Giraffa camelopardalis*	VU	Decreasing
4	*Panthera pardus*	VU	Decreasing

Birds

The threatened bird species by the IUCN spatial data within the buffer of 50 km buffer are 17, seven are Vulnerable, six are Endangered and four are Critically Endangered (Table 7-7).

Table 7-7 – List of threatened birds within 50 km buffer around project proposed area. CR: Critically Endangered, EN: Endangered, VU: Vulnerable.

N	Family	Scientific name	Seasonality	Red List category	Trend
1	ACCIPITRIDAE	*Polemaetus bellicosus*	Resident	EN	Decreasing
2	ACCIPITRIDAE	*Terathopius ecaudatus*	Resident	EN	Decreasing
3	ACCIPITRIDAE	*Aquila rapax*	Resident	VU	Decreasing
4	ACCIPITRIDAE	*Gyps africanus*	Resident	CR	Decreasing
5	ACCIPITRIDAE	*Gyps rueppelli*	Resident	CR	Decreasing
6	ACCIPITRIDAE	*Necrosyrtes monachus*	Resident	CR	Decreasing
7	ACCIPITRIDAE	*Torgos tracheliotos*	Resident and Non-breeding	EN	Decreasing
8	ACCIPITRIDAE	*Trigonoceps occipitalis*	Resident	CR	Decreasing
9	ACCIPITRIDAE	*Aquila nipalensis*	Non-breeding	EN	Decreasing
10	ACROCEPHALIDAE	*Acrocephalus griseldis*	Passage	EN	Stable
11	ANATIDAE	*Aythya ferina*	Non-breeding	VU	Decreasing
12	BALAENICIPITIDAE	*Balaeniceps rex*	Resident	VU	Decreasing
13	BUCEROTIDAE	*Bucorvus abyssinicus*	Resident	VU	Decreasing
14	FALCONIDAE	*Falco vespertinus*	Passage	VU	Decreasing
15	GRUIDAE	*Balearica pavonina*	Resident	VU	Decreasing
16	SAGITTARIIDAE	*Sagittarius serpentarius*	Resident	EN	Decreasing
17	TURDIDAE	*Geokichla guttata*	Resident	VU	Decreasing

The conservation values map (Figure 7-23) indicates that the northern side, near Badingilo National Park, is the most sensitive for threatened species richness.

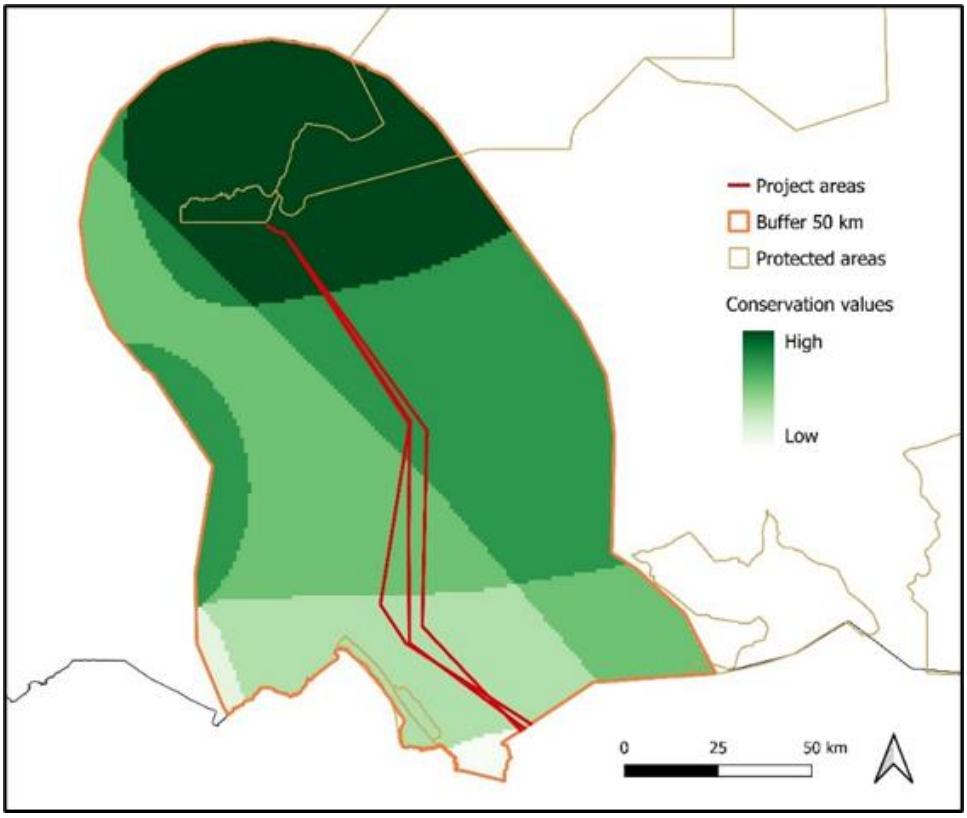


Figure 7-23 – Threatened birds (CR, EN and VU) distribution within 50 km buffer around project proposed area weighted by their conservation value.

In the 1 km buffer around proposed transmission line routes 16 species range are present, six are Vulnerable, six are Endangered and four are Critically Endangered (Table 7-8).

Table 7-8 – List of threatened birds within 1 km buffer around project proposed area. VU: Vulnerable, EN: Endangered, CR: Critically Endangered.

N	Species name	Red List category	Trend
1	*Balearica pavonina*	VU	Decreasing
2	*Bucorvus abyssinicus*	VU	Decreasing
3	*Balaeniceps rex*	VU	Decreasing
4	*Polemaetus bellicosus*	EN	Decreasing
5	*Sagittarius serpentarius*	EN	Decreasing
6	*Terathopius ecaudatus*	EN	Decreasing
7	*Falco vespertinus*	VU	Decreasing
8	*Aquila rapax*	EN	Decreasing
9	*Gyps africanus*	CR	Decreasing
10	*Gyps rueppelli*	CR	Decreasing
11	*Necrosyrtes monachus*	CR	Decreasing
12	*Aythya ferina*	VU	Decreasing
13	*Torgos tracheliotos*	EN	Decreasing
14	*Trigonoceps occipitalis*	CR	Decreasing
15	*Aquila nipalensis*	VU	Decreasing
16	*Acrocephalus griseldis*	EN	Stable

Reptiles

The threatened reptile community assessed by the IUCN spatial data and potentially present in the 50 km buffer area includes four species, one Critically Endangered and three Vulnerable (Table 7-9). Three of these species are freshwater turtles, which are strictly associated with aquatic habitats, and the venomous snake, the Gaboon Viper.

Table 7-9 – List of threatened reptiles within 50 km buffer around project proposed area. CR: Critically Endangered, EN: Endangered, VU: Vulnerable.

N	Family	Scientific name	Seasonality	Red List category	Trend
1	TRIONYCHIDAE	*Cyclanorbis elegans*	Resident	CR	Decreasing
2	TRIONYCHIDAE	*Cyclanorbis senegalensis*	Resident	VU	Decreasing
3	TRIONYCHIDAE	*Trionyx triunguis*	Resident	VU	Decreasing
4	VIPERIDAE	*Bitis gabonica*	Resident	VU	Decreasing

The distribution map of these species weighted by their conservation status shows that the most sensitive areas are in the norther side, near Juba town and Juba Game Reserve and Badingilo National Park (Figure 7-24).

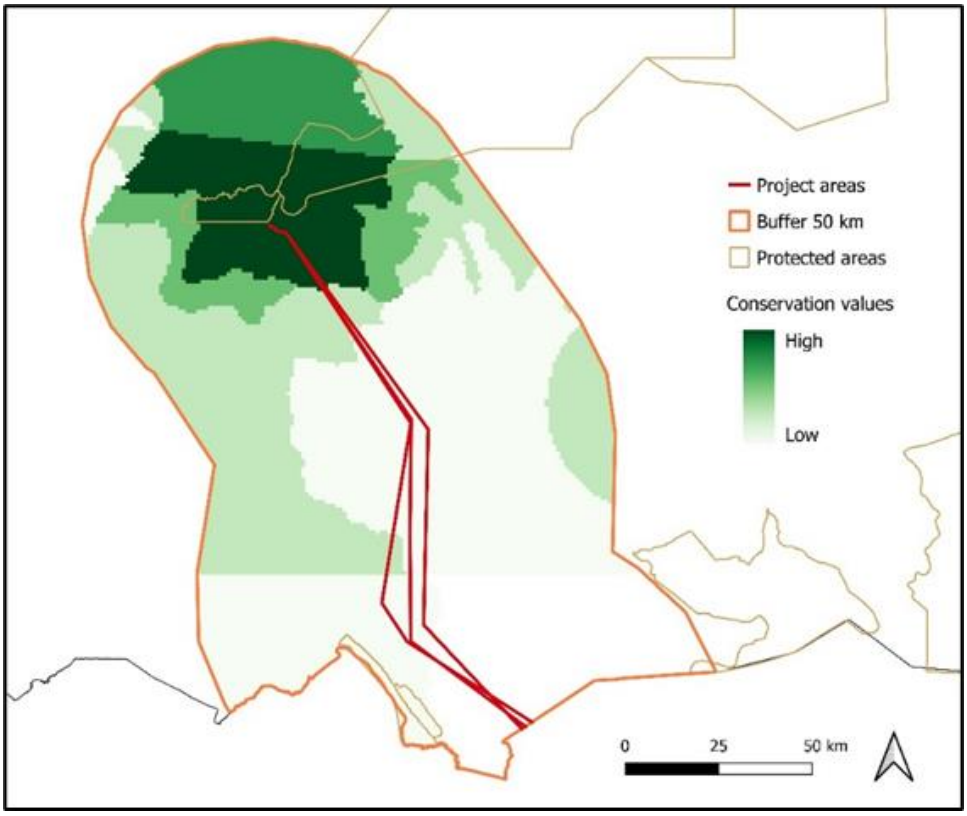


Figure 7-24 – Threatened reptiles (CR, EN and VU) distribution within 50 km buffer around project proposed area weighted by their conservation value.

All animal species

In general, the distribution of all threatened animal species is represented in Figure 7-25. In the 50km buffer around project area, following the IUCN spatial data, five species are Critically Endangered, 11 Endangered and 15 Vulnerable (Table 7-10). More in detail, the number of species in 1km buffer around project area are five Critically Endangered, six Endangered and 13 Vulnerable (Table 7-11).

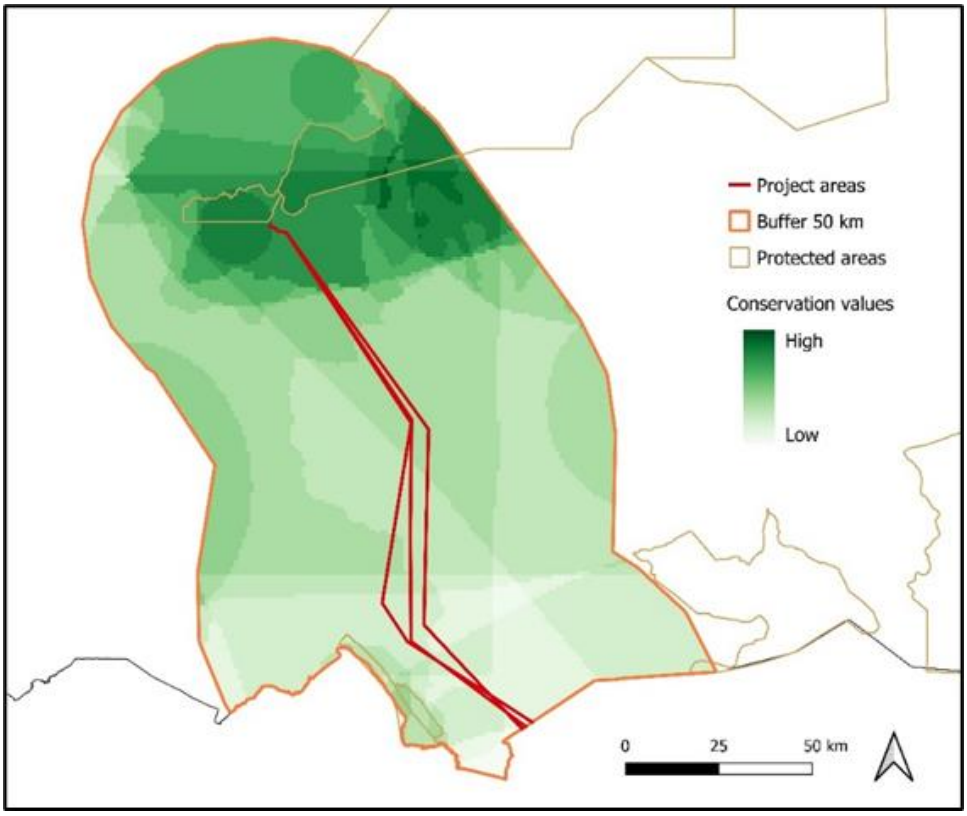


Figure 7-25 – Distribution of threatened species (CR, EN and VU) within 50 km buffer around project proposed area weighted by their conservation value.

Table 7-10 – Number of Vulnerable, Endangered and Critically Endangered species for each taxon in the 50 km buffer around project proposed area.

Taxa	VU	EN	CR
Mammals	5	5	-
Birds	7	6	4
Reptiles	3	-	1
Amphibians	-	-	-

Table 7-11 – Number of Vulnerable, Endangered and Critically Endangered species for each taxon in the 1 km buffer around project proposed area.

Taxa	VU	EN	CR
Mammals	4	-	-
Birds	6	6	4
Reptiles	3	-	1
Amphibians	-	-	-

7.3.5 Baseline data collection - Biological environment

7.3.5.1 Surveys methods

Field surveys of biological environment play a pivotal role in furnishing essential information about the prevailing biodiversity within the project area. The primary objectives of biodiversity surveys encompass the following:

1. Baseline Assessment: The foundational aim is to comprehensively assess and document the existing biodiversity in the project area before any development or human activities are undertaken. This baseline information serves as a vital reference point for evaluating the potential impacts of the proposed project on the local ecosystems.
2. Species Presence and Distribution: Through meticulous observation and data collection, biodiversity surveys seek to identify and map the presence and distribution patterns of various species residing within the project area. This includes plants, mammals, birds, herptiles (reptiles and amphibians), and arthropods.
3. Rare and Endangered Species Identification: The surveys are geared towards identifying the presence and distribution of rare and/or endangered species. Accurate documentation of these vulnerable populations helps inform conservation efforts and enables better-informed decision-making regarding project development.
4. Habitat Assessment: Detailed assessments of the habitats within the project area are conducted to comprehend their ecological significance and the role they play in supporting local biodiversity. Understanding the intricate relationships between species and their habitats aids in devising appropriate conservation strategies.
5. Biodiversity Hotspots and Sensitive Areas: The surveys aim to pinpoint areas of exceptional biodiversity significance, known as biodiversity hotspots, as well as regions that are particularly sensitive to environmental changes. By identifying such areas, appropriate measures can be devised to safeguard their unique ecological value.

To achieve these objectives, distinct sampling methodologies were deployed for each taxonomic group of interest, encompassing plants, mammals, birds, herptiles, and arthropods. These scientifically sound sampling techniques ensure the collection of robust baseline data, fostering a rigorous and comprehensive assessment of the biodiversity within the project area.

Several factors were considered in determining the location of the sampling units, encompassing ecological aspects and the practical feasibility of conducting sampling activities. By employing this approach, the survey aims to encompass a wide range of species and ecological communities within the project area. However, due to certain areas in South Sudan being inaccessible or challenging to reach, the sampling design has been adapted to prioritize areas that are easily accessible, such as those near existing roads.

Methods

Transects, point counts (birds) and vegetation plots (Figure 7-26). These field survey activities involved the surveyor sampling vegetation and wildlife in the field, walking a predetermined transect to collect vegetation, habitat and wildlife data, recording bird data using the point count technique, and collect vegetation data inside 10x10m plot.

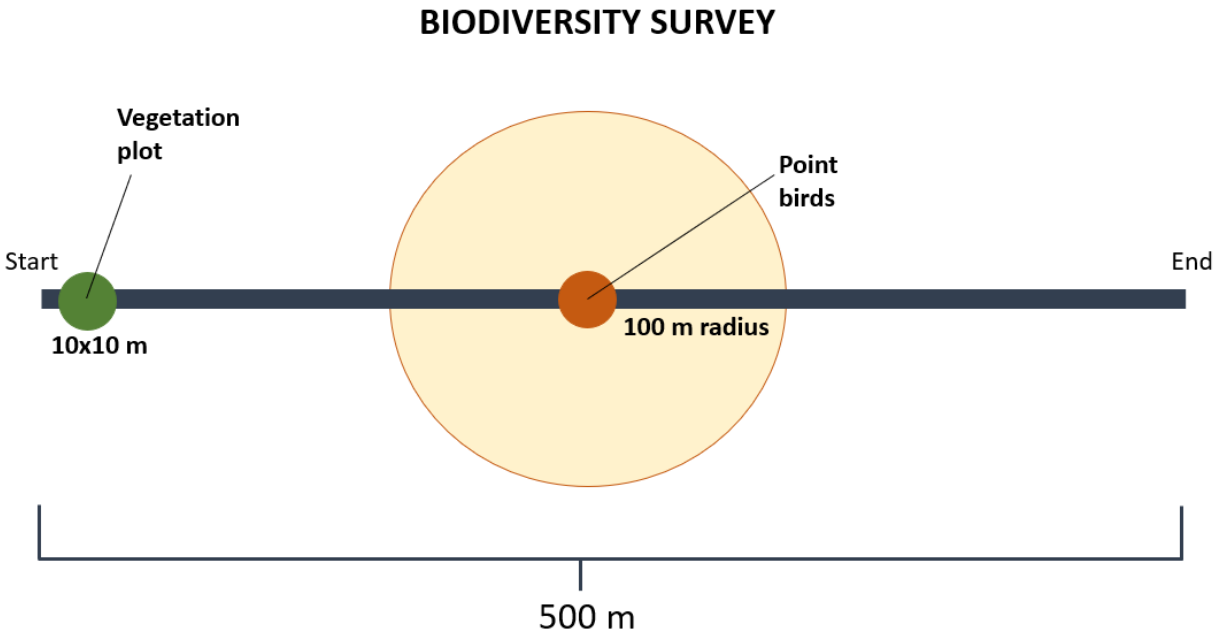


Figure 7-26 – Scheme of the sampling design for biodiversity surveys.

- The proposed methodology involves conducting **transect** surveys (Figure 7-27), where surveyors systematically assessed habitat, plant, and wildlife species along designated paths. This approach provides valuable insights into the distribution, abundance, and diversity of species across different habitats and landscapes.
  To determine the location of the transects, careful consideration will be given to habitat diversity, with special attention to sensitive habitats such as wetlands and riverine areas. Additionally, accessibility will be factored in, and each transect was situated in proximity to roads to facilitate ease of implementation.
  Transects of 500 m was surveyed by different team of experts. Bird survey points were positioned at the centre of each transect (refer to the point count section for further details), and vegetation plot at the starting point.

  During the transect surveys, surveyors collected data on wildlife and vegetation. The experts involved meticulously recorded the following information:
  1. All Plant Species: This includes trees, shrubs, and herbaceous species encountered along the transect. While the precise location of each plant species may not be feasible, the surveyors documented their presence and estimate their abundance within the transect.
  2. Wildlife: The surveyors recorded the presence and abundance of wildlife species (direct observation and/or presence signs) encountered along the transect.
  3. Length of Habitats: The surveyors taken into account the length of each habitat type encountered within each transect. This information provided insights into the extent and distribution of different habitats along the transects and along the transmission line alignment.
  4. Abundance: For both wildlife and plant species, standardized abundance classes were used to document their relative abundance within each transect.
  5. Main Habitat and Dominant Species: Observations regarding the primary habitat type and any dominant species within each transect was recorded.

By meticulously implementing this comprehensive data collection, the biodiversity surveys aimed to provide a thorough understanding of the plant and wildlife communities across different habitats within the project area.

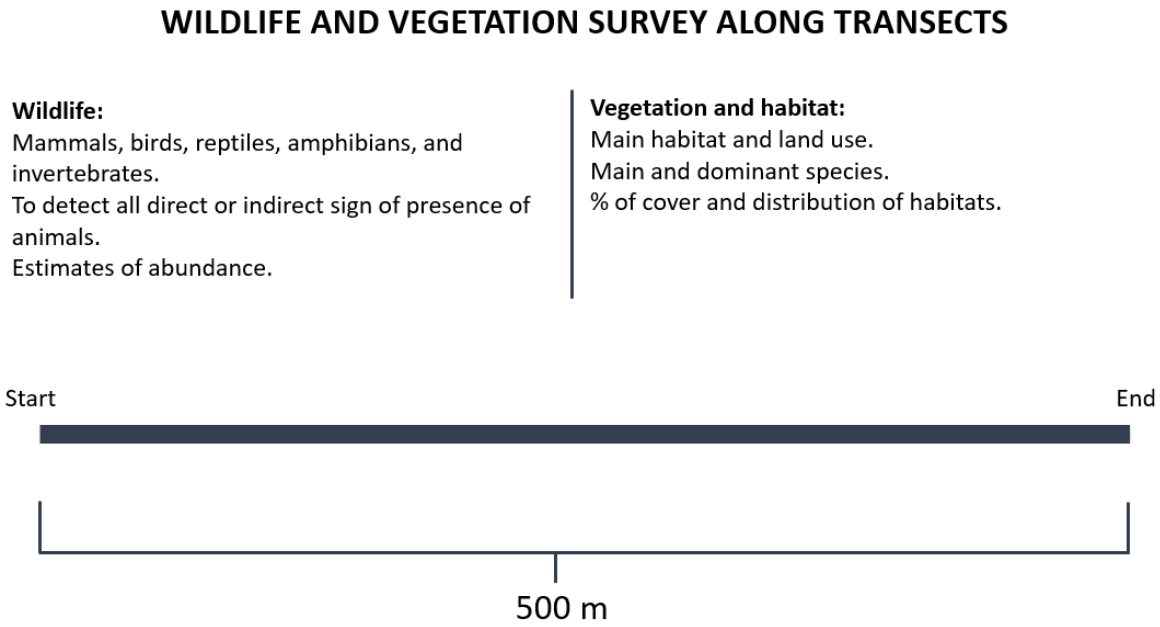


Figure 7-27 – Scheme of the transects to collect data on wildlife and vegetation.

- The **point count** method (Figure 7-28) is a widely used bird survey method in ornithology and ecological research. It involves stationary observations of birds from specific points, during which bird species and their behaviours are recorded. The primary objective of point counts is to estimate bird abundance, distribution, and diversity in a particular area, and it provides valuable data for studying bird populations and community composition. The protocol requires to reach the survey point quietly and calmly to avoid disturbing the birds. Once at the point, the observer usually stands or sits quietly, and start the observation for 10 minutes. In this period the surveyor has to record all bird species seen or heard, using binoculars and field guides for accurate identification, count all individuals of each species seen/heard and record the location and distance from the point count (in a buffer of 100 m).
  Points were located in the middle of each 500 m transects, obtaining in this way also the habitat characterization around the points and along the transmission line route and substation location.

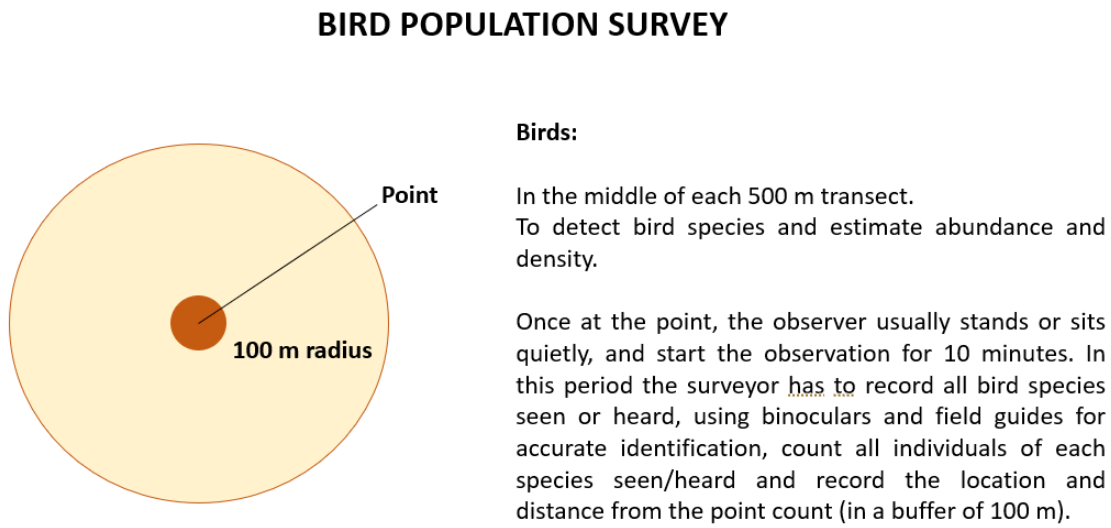


Figure 7-28 – Scheme of the bird point count to collect data on birds population.

- **Vegetation plot** (Figure 7-29) sampling is a systematic method used in ecology and environmental science to study and analyse plant communities in a particular area. At the beginning of each transect a vegetation plot of 10x10m will be placed. The botanist collected vegetation data including species name, abundance (% cover of the 10x10 m plot), habit, DBH and Hight for trees, and the use of the plants by locals.

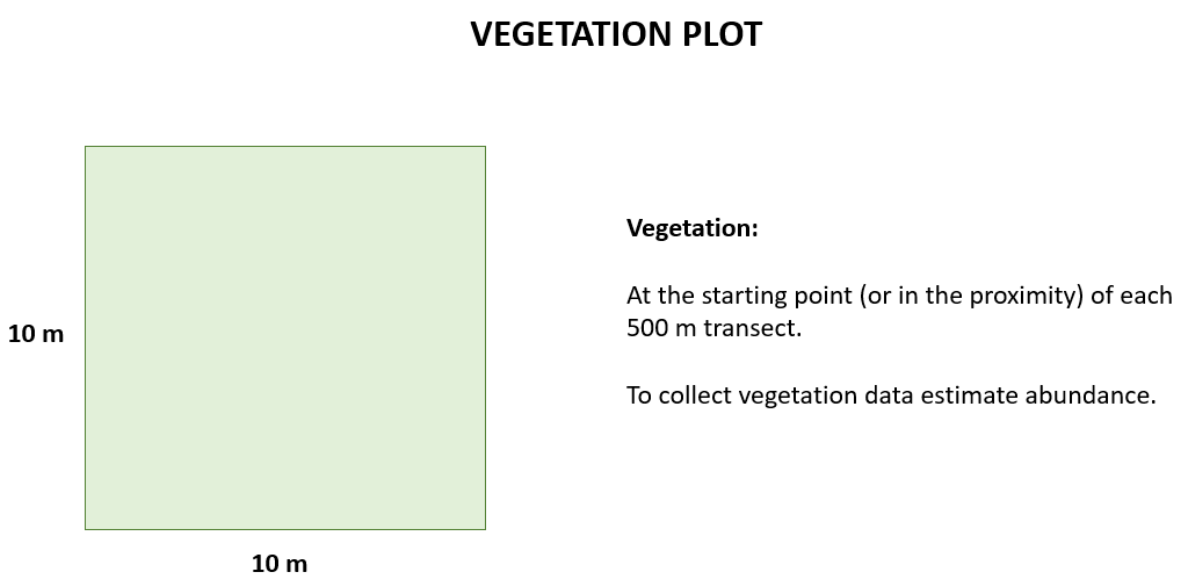


Figure 7-29 – Scheme of the vegetation plot to collect data on vegetation.

Equipment

The experts used different equipment for surveys to facilitate the successful execution of all field activities:

1. Camera: for capturing photographs during sampling activities, allowing for the meticulous documentation of various habitats and the presence or abundance of different species. By visually

recording these crucial aspects, the camera enables accurate and thorough analysis, aiding in comprehensive assessments and conclusive findings.

2. Binoculars: Specifically designed for enhanced visibility, binoculars play a pivotal role in the identification of bird species and other fauna. The capability to observe distant wildlife and closely inspect their distinctive features greatly contributes to accurate species identification, thereby enriching the overall data collection process.

3. GPS (Global Positioning System): Employing advanced GPS technology, this essential device is instrumental in registering and precisely tracking survey points, transects, and species locations within the designated project area. The accurate geospatial data acquired through the GPS ensures the creation of reliable maps.

4. Field Guides: Field guides serves as an invaluable resource for the team of ecologists and biologists. These guides provide comprehensive information on the local flora and fauna, enabling accurate species identification and aiding in the classification of various ecological components encountered during the survey.

6. Field forms: A structured data sheet is an essential element of the equipment, meticulously designed to systematically capture and organize vital information gathered during field activities. This includes details on species encountered, their habitat characteristics, abundance, and any other relevant ecological observations.

Transects, points and plots location

Location of the sampling area for vegetation and wildlife survey are shown in Figure 7-30.

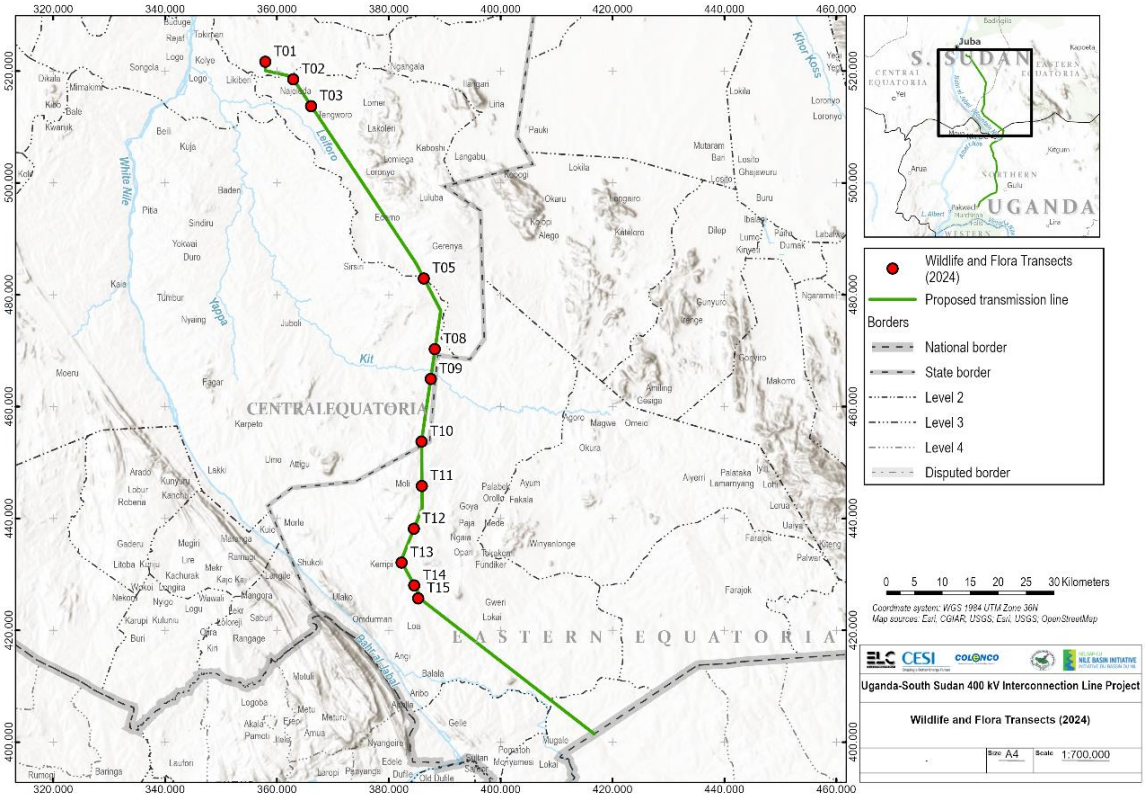


Figure 7-30 – Location of vegetation and wildlife sampling points along the transmission line route.

7.3.5.2 Surveys results – Vegetation

The species detected during the vegetation survey are reported in Table 7-12, as reported by the botanist.

Table 7-12 – Plant species detected during the survey.

No	Scientific name	Local name	IUCN category	Use by the community	Importance to the Environment	Remarks
01	*Acacia Senegal*	Hashab-Arabic,Orokopi-madi,Gum Arabic tree English	Least concern	Gum arabic	Shelter, fodder, nesting and soil fertility	The species abundant is not facing serious threaten
02	*Acacia sieberiana*	Asa-madi	Least concern	Firewood, construction	Nesting, fodder	The species abundant is not facing serious threaten
03	*Acacia hokii*	Oli-madi	Least concern	Firewood	Nesting, fodder	The species abundant is not facing serious threaten
04	*Acacia polyacantha*	Morogilo-madi	Least concern	Firewood, construction, medicine	Fodder,shelter,nesting	The species abundant is not facing serious threaten
08	*Annona senegalesis*	Africana custard app,English) ,(mvolo,madi)	Vulnerable	Fruits eaten	shade	The species is facing less threat in wild
09	*Afzelia africana*	)African maghony English),(Meli madi)	Vulnerable	Charcoal, firewood, construction	Shade, fodder	The species is facing less threat in wild
10	*Alibizia glaberima*	Ajimeli-Madi	Least concern	Firewood,caharcol, construction	shade	Facing threat from charcoal and tinber
11	*Albizia coriaria*	Oyo/Fofo-Madi	Least concern	Firewood, bark used for fishing, medicine	shade	The species abundant is not facing serious threaten
14	*Burkea africana*	Gili-madi	vulnerable	Firewood,	shade	The species not abundant, also facing less threat in wild
15	*Boscisa salicifolia*	Isebi-madi	Least concern	Firewood, construction	shade	No abundant and no facing serious threat
16	*Borassus aethiopum*	Itu-madi	Least concern	Fruit eaten, making canoes, construction	Fruits eaten by species like monkey elephant	Abundant and Facing less threat in the wild, protected by community

No	Scientific name	Local name	IUCN category	Use by the community	Importance to the Environment	Remarks
17	*Combertum glutinosum*	Mayi,madi	Least concern	Firewood, charcoal, construction, medicine		Abundant but facing serious threat from charcoal production
18	*Combertum molle*	Luceri	Least concern	Firewood, charcoal, construction	shade	Abundant but facing serious threat from charcoal production
19	*Combertum hartmannianum*	mayi	Vulnerable	Firewood, charcoal, construction, medicine	shade	Abundant species but facing lthreat from charcoal production in wild
20	*Combertum collinum*	Otubi/Itubi,madi	Abundant	Firewood, charcoal, construction, medicine	shade	Abundant, the species is facing serious threat due charcoal production
21	*Combretum molle*	Velvet bushwillow-English,Luceri-Madi	Least concern	Firewood, charcoal, construction	shade	Abundant, the species is facing serious threat due charcoal production
22	*Carissa edulis/Carissa spinarum*	Blackberry-English/Uba-Madi	Least concern	Fruits eaten	shade	The species facing high risk of extinction in the near future
23	*Dalbergia melnoxylon*	African black wood english,Poyi-madi	Near threatened	Construction, making walking sticks	Cover for animals	The species facing medium extinction threat in the wild
24	*Daniellia oliveri*	Masa-madi	Least concern	construction	Leaves brosed by animals,shade,and fruits eaten by animals	Abundant facing last risk
25	*Diospyros mespiliformis*	ackalberry, African ebony English/Dumu-madi	Least concern	Fruits eaten, construction	Fruits eaten by birds,animals	Abundant facing less risk, protected by community
30	*Ficus platyphylla*	(Jumerz,abuleben Arabic),(Boko,madi)	Least concern	Firewood	Fruits eaten by birds and animals,shade	Abundant facing less risk

No	Scientific name	Local name	IUCN category	Use by the community	Importance to the Environment	Remarks
31	*Ficus papulifolia*	(Jumeriz Arabic),(Boko,ago)	Least concern	Firewood	Fruits eaten by birds ,animals and shade	Abundant facing least rosk
32	*Ficus sycomorus*	(Gemeriz,Arabic),(Eleu,madi)	Least concern	Firewood, fruits eaten	Fruits eaten by birds, and other animals, nesting and resting	Abundant facing less risk
33	*Ficus glumosa*	Iyu-madi	Least concern	Firewood, fruits eaten	Fruits eaten by birds and other animals, Nesting, and resting	Abundant Facing less risk
34	*Ficus ingens*	Rikrike-Madi,red leaves fig-English	Least concern	Firewood, fruits eaten	Fruits eaten by birds and other animals, Nesting, and resting	Abundant facing less risk
41	*Grewia mollis*	Enzo/inju-madi	Least concern	Firewood, fruits eaten, construction	Fruits eaten by birds and other animals	Abundant facing less risk
42	*Holoptelea grandis*	Muta/Ruta-madi	Least concern	Firewood, construction	Resting for birds	Facing least risk
44	*Kigelia africana*	(Abu shudur Arabic), (Loduu madi),sausage tree-English	Least concern	Local medicine,	Foliage, fruits for animals, Flowers attractive for birds, and resting for animals	Facing least risk
46	*Khaya senegalensis*	Erie/eriago-madi	Vulnerable	Firewood, local medicine, construction, for fishing by poisoning	Nesting and shade	The species is facing serious threat in wild due wood extraction

No	Scientific name	Local name	IUCN category	Use by the community	Importance to the Environment	Remarks
47	*Lonchocarphus laxifloirus*	Melemele-madi	Least concern	Firewood, construction, leaves for conducting blessing	Fodder for wild animals	Abundant facing less risk in the wild
55	*Oxytenanthera abyssinica*	Ordra-madi,Gana Arabic,Bamboo-English	Endangered (expert opinion)	Construction	Covers for births and other animal for resting	The species is facing high risk in the wild due to over extraction
56	*Piliostigma reticulatum*	(maaba,madi),(karub Arabic)	Least concern	Local medicine, making arrows, construction	Resting for animal, animal feeding on fruits and birds perching on the tree	The species is not facing risk
58	*Pesudocedrela Kotscchyi-*	Ala-madi	Least concern	Construction, firewood ,medicine	Shade for resting and fodder	The species facing less risk
59	*Parinari curatellifolia*	Adzili/Obo-madi	Least concern	Construction ,firewood	Shade for resting	The species facing less risk
60	*Prosopis africana*	Zingili/Gili-madi	Least concern	Construction, firewood	Fruits eaten by animals	The species facing less risk
63	*Strychnos spinosa*	Lombo/Kolomboro	Least concern	Fruits eaten, firewood, construction	Fruits eaten by animals	The species facing less risk
64	*Stereospermum kunthianum*	Lope/Lupe-madi	Least concern	Firewood, construction	Flowers useful for birds	The species facing less risk
65	*Selerocarya birrea*	Lanyumu/Kalimo-madi,Marula English	Least concern	Fruits eaten, firewood	Fruits eaten by animals, shade for resting	The species facing less risk

No	Scientific name	Local name	IUCN category	Use by the community	Importance to the Environment	Remarks
66	*Sarcocephalus latifolius*	Lago/Lugo-madi	Data deficit	Fruits eaten, local medicine	Fruits eat by animals and birds, cover for animals and birds	The species facing less risk
70	*Tamarindus indica*	Arideb-arabic,Iti-madi ,Tamarind-English	Least concern	Fruits eaten, firewood, construction	Fruits eaten by animals, resting	The species facing less risk
75	*Vitex doniana*	African black plum/chocolate berry-English,Lenvi/ledu	Least concern	Fruits eaten, firewood, construction	Fruits eaten by animals, Birds,fodders,shade	The species facing less risk
76	*Vitellaria paradoxa*	Awa-madi,kawa-muru,Kumuro-Bari,Waa-Acholi and Rak Dinka	Vulnerable	Fruits eaten, firewood, charcoal	Fruits eaten by animals, Birds, shade for resting	The species facing high risk due to over extraction
77	*Ximenia americana*	Icho/Ichu-Madi	Least concern	Fruits eaten, firewood	Fruits eaten by birds ,animals	The species facing less risk
78	*Ziziphus spins christi*	Lenyu-madi	Least concern	Fruits eaten, firewood tools handle ,construction	Fruits eaten by birds, animal and nesting	The species facing less risk
79	*Ziziphus abyssinica*	Lenyu ago-Madi	Least concern	Fruits eaten, firewood tools handle construction	Fruits eaten by birds, animals and nesting	The species facing less risk
80	*Diospyros mespiliformis*	Jackalberry eng,African ebony English),Duumu madi	Least concern	Fruits eaten, firewood, construction	Fruits eaten by birds, animals	The species facing less risk
81	*Gardenia lutea*	Graden lady-English,Iroro-Madi	Least concern	Medicine		Facing least risk
82	*Calotropis procera*	Apple of Sodom,Sodom apple,rubber bark-English	Least concern	Medicine		Facing less risk
83	*Sansevieria trifasciata*	Snake plant,Viper bowsting hemp-English	Least concern	Medicine		Very small herb which is abundant in the wild

No	Scientific name	Local name	IUCN category	Use by the community	Importance to the Environment	Remarks
83	*Balanites aegypthieca*	Deset date-English,heglig/lolob-Arabic,Lugba-madi	Least concern	Fruits eaten, oil from nut and medicine,fuelwwood	Fruits eaten by birds, animals	Abundant, facing less threat

7.3.5.3 Surveys results – Wildlife

Transects and point counts methods were used to study wildlife along the transmission line. A total of 15 500m by 200m transects were used to collect information on presence of mammals, herpeto-fauna and arthropods. Within each of the 500 m by 200 m transect mammal, reptile, and arthropod species were identified based on signs of their tracks, burrows and scats or direct observation where applicable, and then an estimate of their abundance was made and noted down. In addition, for bird's presence and diversity, a 100m circular plot or point was located within each transect. At each point, birds were identified and their abundance as well as status assessed and noted down. For each transect and site the geographical coordinates were recorded using a GPS. Furthermore, noise level and weather condition at each transect site was recorded. Also at each transect site, site condition such as agricultural activity was assessed.

Table 7-13 - Characteristics of Sampling sites/ transects and point counts for wildlife and bird species

Date	Transect	Location	Latitude	Longitude
29.01.2024	T1	Nesitu substation	4° 43' 06 N	31° 43' 08 E
02.02.2024	T2	Nesitu	4° 41' 24 N	31° 45' 51 E
03.02.2024	T3	Siriri	4° 38' 49 N	31° 47' 35 E
	T4	Afodo-Checheri (Ngerjebe)	4° 33' 00 N	31° 51' 27 E
04.02.2024	T5	Near Aru-junction	4° 22' 06 N	31° 58' 30 E
	T6	Aru-junction (Camp)	4° 20' 44 N	31° 59' 12 E
	T7	Aru-junction2 (Camp)	4° 18' 12 N	32° 00' 01 E
05.02.2024	T8	Nyolo	4° 15' 15 N	31° 59' 33 E
	T9	Ayii	4° 12' 20 N	31° 59' 10 E
	T10	Kit2_Amee-junction	4° 06' 16 N	31° 58' 18 E
06.02.2024	T11	Moli Tokuro	4° 01' 58 N	31° 58' 20 E
	T12	Borangole	3° 57' 49 N	31° 57' 34 E
	T13	Kiripi	3° 54' 31 N	31° 56' 24 E
	T14	Pageri	3° 52' 18 N	31° 57' 37 E
07.02.2024	T15	Loa	3°51'03 N	31°58' E

RESULTS

Species diversity and distribution of mammals

A total of 16 mammal species were recorded across the 15 transects and sites.

Out of the 16 mammal species observed, 8 species were observed in transect7 (Aru-junction2), followed by transects4 (Afodo-Checheri, _Ngerjebe) and 11 (Moli Tukuro) each with 7 species, and transect12 (Borangole) with 6 species. Two species were near threatened and endangered *Eidolon helvum* and *Loxodonta africana.*

Table 7-14 – Mammals detected during the survey.

Scientific name	Abundance	IUCN category
Sylvicapra grimmia	A	LC
Lepus microtis	A	LC

Scientific name	Abundance	IUCN category
Taterillus emini	O	LC
Cricetomys gambianus	C	LC
Phacochoerus africanus	R	LC
Thryonomys gregorianus	O	LC
Syncerus caffer caffer	R	LC
Tragelaphus scriptus	A	LC
Papio anubis	C	LC
Mastomys sp.	F	LC
Cryptomys ochraceocinerus	A	LC
Hystrix cristata	A	LC
Manis temminckii	R	LR
Xerus erythropus	R	LC
Eidolon helvum	R	NT
Loxodonta africana	R	EN

Species diversity and distribution of birds

A total of 42 bird species were recorded across the 15 transects and sites. The most abundant bird species were *Ploceus cucullatus, Pyncnonotus barbatus,* and *Alcedo cristata* with 165, 55 and 50 individuals respectively. Three Palearctic migrant species *Oenanthe oenanthe* recorded in transect2 (Nesitu) and transect3 (Siriri)*, Oriolus oriolus* observed in transect3 (Siriri) and *Lanius senator* recorded in transect12 (Borangole) used the study area as a stopover. *Cryptomys ochraceocinerus* and *Hystrix cristata*. Out of the 42 bird species observed, most species (11) were observed in transect8 (Nyolo area), followed by transects6 (Aru-junction) and transect14 (Pageri) each with 9 species, and transect5 (near Aru-junction) and transect13 (Kiripi) each with 8 species. No endangered birds were observed in the study area (Table 7-15).

Table 7-15 – Avian species diversity and distribution

	Abundance	Distribution across habitats															Status	IUCN category
Scientific name		H 1	H 2	H 3	H 4	H 5	H 6	H 7	H 8	H 9	H 10	H 11	H 12	H 13	H 14	H 15		
Streptopelia vinacea	33	3	1	2	0	12	5	3	0	0	0	0	0	2	5	0	Resident	LC
Cinnyris pulchellus	17	1	1	0	0	1	0	0	2	2	10	0	0	0	0	0	Resident	LC
Oenanthe oenanthe	**3**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**Migrant**	**LC**
Pycnonotus barbatus	55	0	0	6	0	4	15	2	11	6	0	0	3	0	3	5	Resident	LC
Oriolus oriolus	**3**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**Migrant**	**LC**
Merops nubicus	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	Resident	LC
Lybius rubifacies	4	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	Resident	LC
Laniarius erythrogaster	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	Resident	LC
Alcedo cristata	50	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	Resident	LC
Cisticola chiniana	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	Resident	LC
Turtur abyssinicus	7	0	0	0	2	0	3	0	0	0	0	0	0	0	0	2	Resident	LC
Ploceus cucullatus	165	0	0	0	80	0	50	0	0	0	15	0	0	0	20	0	Resident	LC
Cisticola brachypterus	13	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	Resident	LC
Halcyon leucocephala	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	Resident	LC
Tchagara senegalus	10	2	0	0	0	2	2	1	0	0	2	0	1	0	0	0	Resident	LC
Tockus erythroynchus	6	0	0	0	0	2	0	0	0	0	0	0	1	3	0	0	Resident	LC
Turdoides plebejus	38	0	0	0	0	6	0	0	5	8	0	0	8	8	3	0	Resident	LC
Uraeginthus bengalus	16	0	0	0	0	0	8	0	0	0	8	0	0	0	0	0	Resident	LC
Ardea melanocephala	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Resident	LC
Colius striatus	30	0	0	0	0	0	20	0	10	0	0	0	0	0	0	0	Resident	LC
Cisticola erythrops	8	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	Resident	LC
Lamprotornis caudatus	6	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	Resident	LC
Crinifer zonurus	4	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	Resident	LC
Turaco leucolophus	10	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	Resident	LC
Treron waalia	7	0	0	0	0	0	0	0	5	0	0	0	0	0	2	0	Resident	LC
Cisticola ruficeps	17	0	0	0	0	0	0	0	2	0	0	3	6	6	0	0	Resident	LC
Ispidina picta	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Resident	LC
Dicrurus adsimilis	4	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	Resident	LC
Numida meleagris	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	Resident	LC
Cisticola sp.	4	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	Resident	LC

Species diversity and distribution of reptiles and arthropods

A total of five reptile observed in the area 2 snake species, and 3 lizard species a skink *Eurepes* sp. and two *Agama* sp1. and *Agama* sp2. Different species of grasshoppers, crickets and butterflies were also seen but not photographed.

7.3.6 Critical Habitats

Critical Habitat is a concept developed by the International Finance Corporation (IFC) in its Performance Standard 6 (PS6) on Biodiversity Conservation and Sustainable Management of Living Resources. The concept aims to identify areas of high biodiversity value where development would be particularly sensitive and require special attention. According to the International Finance Corporation (IFC, 2019) Guidance Note 6, Critical Habitats (CH) are areas of high biodiversity value that contain at least one or more of the five values identified in PS6 and/or other recognised high biodiversity values.

According to the AfDB's Environmental and Social Operational Safeguard 6 (OS6) the Critical Habitat (CH) is defined as a subset of both natural and modified habitat that has high biodiversity value and deserves particular attention. The CH is fundamentally based on the following seven criteria:

(a) Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent regional or national approaches.
(b) Habitat of significant importance to endemic or restricted-range species.
(c) Habitat supporting globally or nationally significant concentrations of migratory or congregatory species.
(d) Highly threatened or unique ecosystems.
(e) Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in (a) to (d).

IFC PS6 will be considered to establish whether critical habitat requirements are triggered and, if so, measures will be set out to ensure compliance with these.

From the baseline information, some threatened and protected species could be potentially present in the project proposed area. Most of these species are classified as Endangered and Critically Endangered by IUCN. A detailed assessment will be required to consider the possibility of the presence of critical habitat, particularly under criterion (a).

7.3.6.1 Critical habitat assessment

An assessment using available data was undertaken to identify the possible existence of Critical Habitats (CHs) within the project area and in the Indirect Area of Influence (IAoI) in accordance with the criteria outlined in the International Finance Corporation (IFC) Performance Standard 6 (PS6).

Criterion 1: Habitat of significant importance to Critically Endangered or Endangered species, as listed in the IUCN Red List of threatened species or equivalent regional or national approaches.

The evaluation considered the presence of species classified as Endangered (EN) or Critically Endangered (CR) based on global criteria established by the International Union for Conservation of Nature (IUCN). The assessment took into account data collected in the field by local experts and other data sources using open access global databases, the Global Biodiversity Information Facility (GBIF) and IUCN Red List spatial data.

During the field work, the African savanna elephant *Loxodonta Africana* classified as Endangered (EN) was observed. The botanist collected information regarding the presence of plant species *Oxytenanthera abyssinica* reported as an Endangered species, based on expert opinion. In the Global IUCN Red List no information regarding *Oxytenanthera abyssinica* were found. *Oxytenanthera abyssinica* does not have an official Extent of Occurrence (EOO) designation by the IUCN. However, this species is native to eastern Africa, including countries such as Ethiopia, Kenya, Sudan, Uganda, and Tanzania, where it occurs in various habitats such as forests and grasslands. Its distribution may be fragmented due to habitat loss and degradation, but specific EOO data may not be readily available. Other detailed surveys and assessments is required to assess the critical habitat assessment of this species.

The screening carried out on the GBIF platform consisted to identify all species of plants and animals in the 1 km buffer around the transmission line route. Only georeferenced data with a maximum georeferencing error of 100 m have been selected.

No species classified as Endangered (EN) or Critically Endangered (CR) were recorded in the GBIF platform within project area and IAoI.

The IUCN Red List spatial data consists of georeferenced distribution ranges for each species. Major taxa were assessed including mammals, birds, reptiles, amphibians, arthropods and plants. Only endangered and critically endangered species whose range was within the 1km buffer around the transmission line route (IAoI) were considered.

As a result, ten bird species, one reptile and one mammal have been identified as potentially triggering CH based on the criterion 1:

- Martial Eagle *Polemaetus bellicosus* (EN)
- Secretarybird *Sagittarius serpentarius* (EN)

- Bateleur *Terathopius ecaudatus* (EN)
- Steppe eagle *Aquila nipalensis* (EN)
- Lappet-faced Vulture *Torgos tracheliotos* (EN)
- Basra Reed-warbler Acrocephalus griseldis (EN)
- White-backed Vulture *Gyps africanus* (CR)
- Rüppell's Vulture *Gyps rueppelli* (CR)
- Hooded Vulture *Necrosyrtes monachus* (CR)
- White-headed Vulture *Trigonoceps occipitalis* (CR)
- Nubian Flapshell Turtle *Cyclanorbis elegans* (CR)
- African Savanna Elephant *Loxodonta africana* (EN)

The species not observed during field activities were considered potentially present based on literature review.

The assessment of the critical habitat for these species followed specific criteria outlined in Guidance Note 6 (GN72) of the IFC 2019 guidelines:

a) areas that support globally important concentrations of an IUCN Red-listed EN or CR species (> 0.5% of the global population AND > 5 reproductive units of a CR or EN species);

b) areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in GN70(a);

c) as appropriate, areas containing nationally/regionally important concentrations of an IUCN Red-listed EN or CR species.

The thresholds outlined in Criterion 1 (a) were utilized to evaluate all fauna and flora species classified as Endangered (EN) or Critically Endangered (CR), as determined by IUCN criteria.

In order to apply the thresholds identified in Criterion 1 (a) an “Ecologically Appropriate Area of Analysis” (EAAA) has been identified for bird and mammal species, including parts of the IBAs (Important Bird Areas) and the protected areas near to the transmission line route (Figure 730):

- Nimule and buffer zone (National Park and IBA)
- Mount Otzi-Atiya (Forest Reserve and IBA)
- Imatong (Forest Reserve and IBA)
- Juba (Game reserve)
- Badingilo (National Park and IBA)

The defined EAAA for birds and mammals reaches an extension of 15,951 km^2.

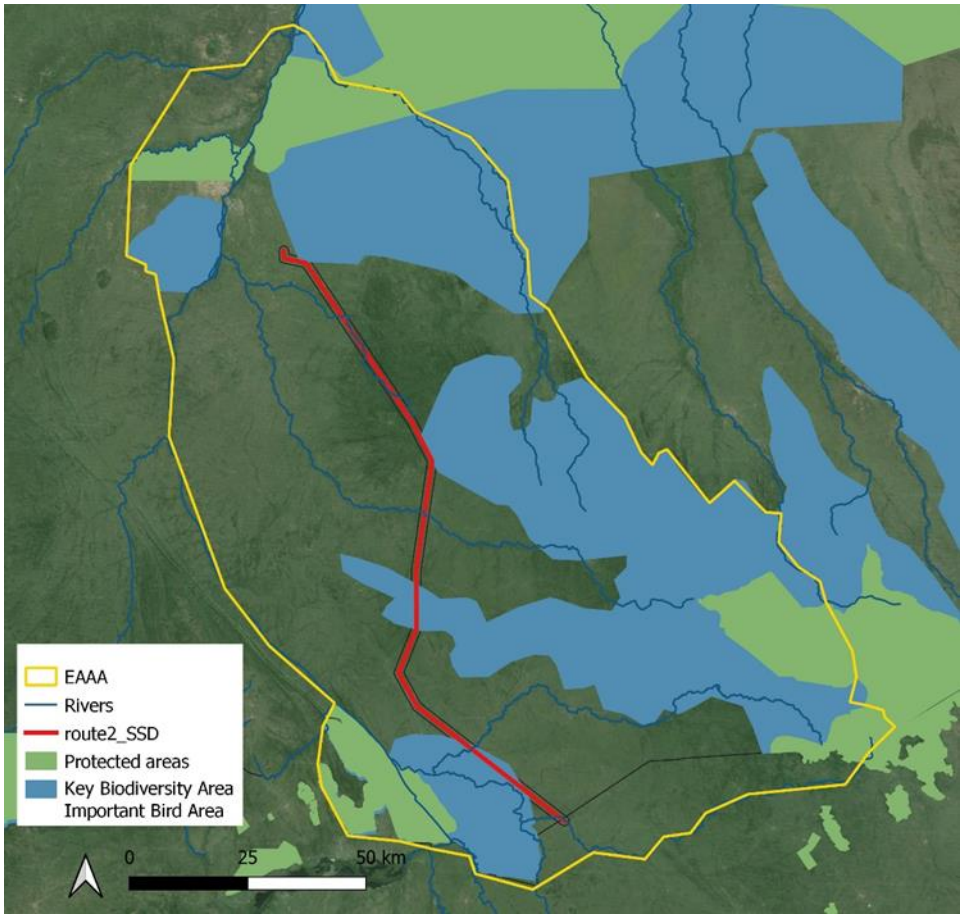


Figure 7-31 – Ecologically appropriate area of analysis (EAAA) for bird species.

The results of the critical habitat assessment for Criterion 1 are reported in Table 716. Species categorized as potentially present, as determined by literature data, are designated as triggering "Potential Critical Habitat".

Table 7-16 – Assessment for CR and EN species potentially triggering Critical Habitat according to Criterion 1 (IFC, 2019).

N	Taxa	Scientific name	Source	Red List category	Estimated extent of occurrence EOO (km²)	EAAA (km²)	0.5% of EOO (km²)	EAAA is ≥ 0.5% of EOO	Critical Habitat
1	Bird	*Polemaetus bellicosus*	Literature	EN	26000000	15951	130000	No	No
2	Bird	*Sagittarius serpentarius*	Literature	EN	23200000	15951	116000	No	No
3	Bird	*Terathopius ecaudatus*	Literature	EN	23500000	15951	117500	No	No
4	Bird	*Aquila nipalensis*	Literature	EN	12600000	15951	63000	No	No
5	Bird	*Torgos tracheliotos*	Literature	EN	34200000	15951	171000	No	No
6	Bird	*Acrocephalus griseldis*	Literature	EN	682000	15951	3410	Yes	Potentially

N	Taxa	Scientific name	Source	Red List category	Estimated extent of occurrence EOO (km²)	EAAA (km²)	0.5% of EOO (km²)	EAAA is ≥ 0.5% of EOO	Critical Habitat
7	Bird	*Gyps africanus*	Literature	CR	23400000	15951	117000	No	No
8	Bird	*Gyps rueppelli*	Literature	CR	14200000	15951	71000	No	No
9	Bird	*Necrosyrtes monachus*	Literature	CR	22500000	15951	112500	No	No
10	Bird	*Trigonoceps occipitalis*	Literature	CR	21100000	15951	105500	No	No
11	Reptile	*Cyclanorbis elegans*	Literature	CR	667637	2397	3338	No	No
12	Mammal	*Loxodonta africana*	Field survey	EN	3132238	15951	15661	No	No

Criterion 2: Habitat of significant importance to endemic or restricted-range species.

The presence of endemic or restricted-range species were considered, i.e., for terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 km². The threshold for Criterion 2 is the following: a) Areas that regularly hold ≥ 10% of the global population size AND ≥ 10 reproductive units of a species.
No endemic and restricted-range species were observed during the surveys, in the GBIF and in the IUCN spatial data screening.

Criterion 3: Habitat supporting globally or nationally significant concentrations of migratory or congregatory species.

An evaluation was conducted to consider the presence of habitat that supports significant concentration of migratory or congregatory species. The project is situated within formally Important Bird Areas (IBAs), the Imatong IBA and Nimule IBA and it is also near to some other important IBAs.
To gauge the significance of the project area for migratory and congregatory species, specific thresholds were applied, as outlined in Guidance Note 6 GN78 of the IFC 2019 guidelines. These thresholds included areas known to sustain a significant portion (≥ 1 percent) of the global population of migratory or congregatory species at any stage of their life cycle, as well as areas that reliably support at least 10 percent of a species' global population during periods of environmental stress.
All migratory or congregatory species associated with these IBAs and detected during the field survey were evaluated according to the aforementioned thresholds. An Ecologically Appropriate Area of Analysis (EAAA) was delineated (see Figure 730) and compared with the extent of occurrence (EOO) of each species, representing the global population estimate. If the EAAA encompassed ≥ 1% of the EOO for a species, it was considered potentially triggering Critical Habitat status (Table 7-17).
The screening results indicated that no species met the criteria for potentially triggering Critical Habitat according to Criterion 3.

Table 7-17 – Assessment for bird species potentially triggering Critical Habitat according to Criterion 3 (IFC, 2019).

N	Scientific name	Red List category	Trend	Estimated extent of occurrence EOO (km^2)	EAAA (km^2)	1% of EOO (km^2)	EAAA is ≥ 1% of EOO	Critical Habitat
1	*Oenanthe oenanthe*	LC	Decreasing	19300000	15951	193000	No	No
2	*Oriolus oriolus*	LC	Stable	11500000	15951	115000	No	No
3	*Lanius senator*	NT	Decreasing	12000000	15951	120000	No	No

Criterion 4: Highly threatened or unique ecosystems.

For this criterion, ecosystems that are at risk of significantly decreasing in area or quality, have a small spatial extent and protected areas were taken into consideration.
Criterion 4, as outlined in Guidance Note 79 of the International Finance Corporation's 2019 guidelines, suggests utilizing the "Red List of Ecosystems (RLE)" where formal assessments by the International Union for Conservation of Nature (IUCN) have been conducted. However, it was found that no such evaluations have been carried out in South Sudan, as indicated by the absence of data in the IUCN RLE Database. Consequently, the RLE system cannot currently be applied.
However, during the fieldwork the Combretum savanna and the *Butyrospermum* savanna were detected. Both *Butyrospermum* (i.e., *Vitellaria paradoxa*) and *Combretum* spp. were observed by botanists during the sampling campaign in the project area. These habitats and these species suggest that potentially are present in the project area sensitive habitat. Furthermore, the project area does not overlap any protected areas. Potentially, no Critical Habitat is expected to be present based on this criterion.

Criterion 5: Ecological functions or characteristics that are needed to maintain the viability of the biodiversity values described above in Criteria 1 to 4.

This criterion encompasses the presence of areas with landscape features that may be associated with evolutionary processes, or with distinct species populations that warrant special conservation consideration due to their unique evolutionary lineage. However, the study area lacks landscape features known to influence evolutionary processes leading to the formation of regional species configurations and ecological characteristics. In particular, no species or subpopulations within the project area exhibit significant isolation, spatial heterogeneity, or an abundance of environmental gradients. In addition, the area is not recognised for its importance in climate change adaptation or as a biological corridor.
Based on these considerations, it is concluded that the project area does not support critical evolutionary processes and, consequently, no Critical Habitat is expected to be present.

7.4 Socio-Economic and Cultural Context

The socio-economic environment was investigated through 49 social economic questionnaires aimed at deeply investigate the social profile of affected people and through checklists necessary to carry out the census of the affected landowners. The findings of the questionnaire were corroborated with secondary data.

Table 7-18 – Project administrative boundaries

State	County	Payam
Central Equatoria	Juba	Gondokoro
Central Equatoria	Juba	Lokiliri
Central Equatoria	Juba	Lobonok
Eastern Equatoria	Magwi	Pageri
Eastern Equatoria	Magwi	Mugali

7.4.1 Demographic features and Migration Pattern

According to the central burau of Statistic, the projection of population in South Sudan for 2022 is of 14,234,976 people with 7,268,273 males and 6,966,703 females. Age dependency in South Sudan was reported at 90.7 % in 2021, according to the World Bank collection of development indicators, compiled from officially recognized sources. High ratio means a high burden bare by the young population to manage the expenses of the dependent population through childcare, education, and pensions. Data from the International Labour Organization indicates that the unemployment1 rate in South Sudan remained relatively stable since the country gained independence, with estimated values of 12.6 % in 2010 and 12.7 % in 2020 (ILO, 20212).

Estimated demographic data on Juba and Magwi counties are presented the table below [7].

Table 7-19 – Juba and Magwi Counties Population

State	County	Male (2020)	Female (2020)	Total (2020)
Central Equatoria	Juba	302838	280499	583339
Eastern Equatoria	Magwi	148945	147378	296326

The project line affects agricultural areas and some structures on in two of the 5 payams that it crosses:

iv) Nesitu in Lokirri Payam CES, an area of future development planned by the Payam. At the moment the area is not developed and no people live or work there.
v) Aru Junction, Lokirri Payam CES with a total o of 50 PAPs was identify and registered in the area
vi) Pageri Payam EES where 30PAPs was registered, we did not meet the community leaders but the survey was successful.

Table 7-20 – Affected HHs

MHH	FHH	TOTAL
42	7	49

[7] South Sudan population projection by gender per year (2015-2020)

All the affected people except one do not live in along the transmission line, the majority lives in Aru Junction, other left the country and abandoned their properties. All the affected households living in the project area are farmers.

Table 7-21 HHs Place of residency

PLACE OF RESIDENCY	
Arapi	1
Aru	41
Torit	2
Uganda	6
NA	
Total	**50**

7.4.2 Literacy and Education

Youth illiterate population, 15-24 years, % female in South Sudan was reported at 50.15 % in 2018, according to the World Bank collection of development indicators, compiled from officially recognized sources. Adult illiterate population, 15+ years, % female in South Sudan was reported at 54.72 % in 2018 More than 2.8 million children, or over 70 per cent, are out of school in South Sudan. Some of the out-of-school children are living in pastoral communities, moving with their cattle and are not able to attend regular classes. The largest group of out-of-school children in South Sudan are girls. Poverty, child marriage and cultural and religious views all hinder girls' education.

Net enrolment is very low at 3.3% for pre-primary, 37.6% for primary and 5.2% for secondary schooling Enrolment rates are some of the lowest in the world, with a range of groups desperately marginalised. These include: girls, children with disabilities, children in rural areas, those displaced by conflict, those who are over-age for their grade, IDPs, refugees, child labourers, street children, and pastoralist children.

Other challenges to education include: the lack of actual school buildings, insecurity, social norms and culture, as well as distances to school (on average 20 per cent of children live around 45 minutes from a school and 95 per cent walk to school – making it dangerous for girls and often impossible for children with disabilities). Secondary schools are mainly in urban locations, though this is not where the majority of the population live. Other serious challenges include the lack of flexible alternative pathways in education, the lack of early childhood education to prepare children for school, the lack of teachers' capacities and materials, irregular attendance, violence in schools, and the curriculum being instituted in English.

7.4.3 Health

9.4 million South Sudanese are in need of humanitarian assistance, 5.4 million of these are children. Maternal mortality is over 1,150 per 100,000 live births. This is one of the highest in the world, and due mostly to infections, haemorrhages, and obstructed labour. According to the most recent complementary feeding indicators (2019, a composite indicator depicting quality and quantity of diets), just 4.1% of children aged 6 – 23 months were getting minimum acceptable diets. And this was before the COVID-19 pandemic and the floods of 2022 which destroyed health clinics and 1,500 clean water sources and increased food insecurity further. It is key to note that malnutrition – be it as a child, adolescent or a childbearing woman – sets a cycle of intergenerational malnutrition and deprivation,

which result in poor cognitive development, poor learning and low earnings during adulthood. Undernutrition in infants and young children is caused by: household-food insecurity, insufficient hygiene practices (e.g., hand washing), unhealthy environments, poor access to clean water and poor sanitation[8].

In the project area the affected people were asked about the STD prevalence in the area, according to the answers they are AIDS/HIV, the households identified with abstinence, faithfulness, avoid sharing sharp instruments. Use of condom was not reported among the options.

7.4.4 Ethnicity, Religion and Language

South Sudan is home to 64 different ethnic groups, within each of which there are further subdivisions. The largest ethnic group, the Dinka, for example, are divided into at least 25 ethnic sub-groups that each have their own distinct cultural practices and traditions.
In Greater Equatoria states, 36 ethnic groups are found, as detailed in the table below.

Ethnic groups of Greater Equatoria
Adio (Makaraka), Acholi, Avukaya, Azande, Bai, Baka, Bari, Dongotona, Didinga, Ifoto, Kakwa, Lokoya, Lopit, Lotuka (Otuho), Larim (Boya), Kuku, Lango, Logir, Lulubo, Madi, Moro, Mundari, Pari, Pojulu Nyangwara, Suri (Kachipo), Toposa, Imatong, Keliku, Lugbwara, Moru Mundu, Nyangatom, Tenet, Tid, Woro.
Total: 36 (55%) ethnic groups

The smaller groups in the Equatorian region of southern Sudan include the Bari, Mundari, Kakwa, Lokoya, Kuku, Pojulu and Makaraka. Living in Central Equatoria, the Bari number about 578,000 (Joshua Project, n.d.) and constitute the fourth largest ethnic group in South Sudan. There are about 50 clans among the Bari people, each of which is governed by a traditional chief called “Monye Kak”, meaning the owner of the land.

The Madi number 26,000 people in South Sudan and are found in parts of Central and Eastern Equatoria (Joshua Project, n.d.). They live on both banks of the White Nile at the border of Uganda and South Sudan. To the West are the Lugbara, and Madi customs and language are reported to be similar to those of the Lugbara. However, the Madi also share customs with their neighbors to the East, the Acholi.

Residents of the Nile’s east bank affected by the project (Bari, Latuho, Lokoya, Lulubo, Pari, and others) share modes of subsistence and social organization, age-class systems with *monyomiji* (‘owners’ or ‘fathers of the village’) who manage village affairs, and rainmakers.

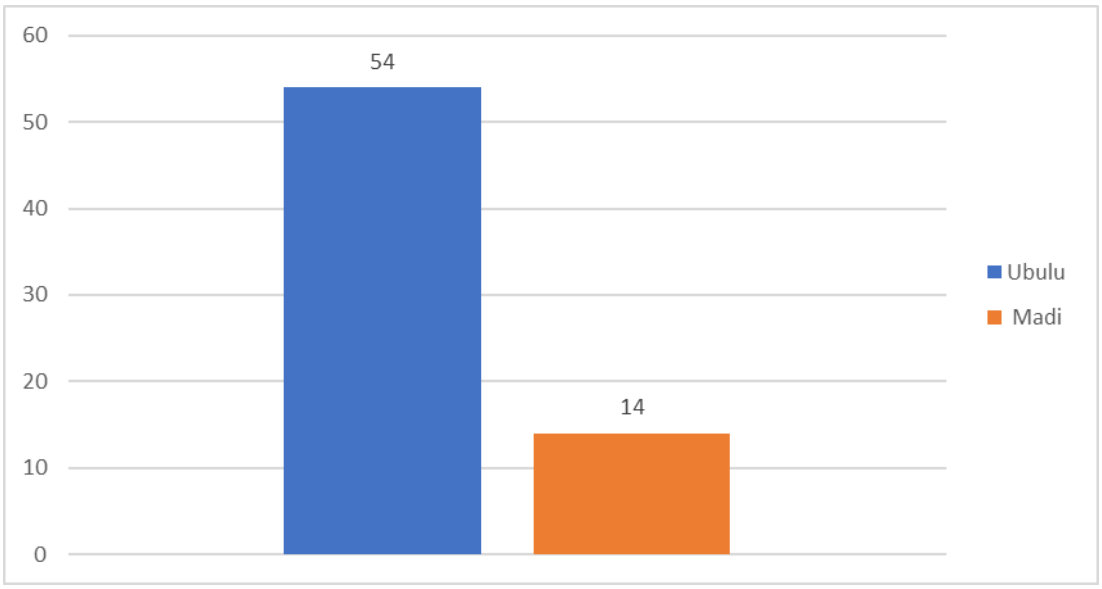
The population of the affected payams is mainly composed of sedentary agropastoralists. Smallholder farmers depend on rain-fed agriculture for their livelihoods. The rainy season, which is from April to October/November, is the right period for cultivation. Mixed cropping and shifting cultivation are practiced in fields away from homes, and farmers must clear part of the forest for their own production. These techniques are used to maintain soil fertility and control weeds. Livestock also plays an important role in the local farming system, and they are the primary store of wealth and a source of food.

[8] UNICEF, South Sudan Country Programme 2023-2025

The area also hosts Internally Displaced Persons, mainly Dinka cattle herders from Bor County of Jonglei State. In 2022, insecurity started in Mangala Payam and spread to Mori village of Gondokoro Payam resulting in the loss of lives, displacement, the destruction or abandonment of crop fields. Tensions between armed herders from Dinka Bor and local farmers have also been reported in Lokiliri payam.

In Pageri payam of Magwi county, tensions dating back to 2011 are due to a disagreement over where the demarcation of the border between the Madi-dominated Pageri Payam and the primarily Acholi Magwi Payam should be. The continued influx of long-displaced returnees acts as trigger when returning residents settle on disputed territory. In addition to the settling of land by a new tribal group, some of the IDPs have relocated with herds of goats and cattle which require large grazing lands and have also been accused of trampling and thus destroying local crop.

Table 7-22 Household's primary ethnicity



7.4.5 Local Economy and Livelihood

The project falls under two agroclimatic zones: hills and mountains and green belt zones[9] .

The Hills and Mountains Zone in South Sudan includes Juba, Torit, Budi, parts of Pibor, and parts of Magwi and Kajokeji counties. Households here are mainly agro-pastoral, relying on both agriculture and livestock. The diverse terrain of mountains, plains, and valleys helps residents cope with drought and flood. The region experiences mixed seasons, allowing households to mitigate agro-climatic risks. Labor focuses on subsistence farming, livestock protection, and village maintenance, with localized agricultural labor. Livestock serves as a safety net in tough years, while root crop reserves provide additional security. The zone benefits from trade and exchange opportunities between highland and lowland areas and trades grain and livestock with Uganda, potentially generating more income than other zones.

The Greenbelt Zone, bordering Uganda, the DRC, and CAR, includes Tambura, Ezo, Yambio, Maridi, Yei, and parts of Mundri, Kajokeji, and Magwi counties. It is southern Sudan's most fertile traditional cereal-growing area, characterized by lush broadleaf woodlands that thin towards the north. Farming is the

[9] SOUTH SUDAN Livelihood Zones and Descriptions August 2013. FEWS.NET

primary economic activity, with diverse crops such as sorghum, maize, millet, cassava, groundnuts, rice, and others. Unlike other zones, the Greenbelt has fewer cattle, and households cope by increasing root crop consumption during poor crop performance. Subsistence farming focuses on cassava, with teak grown for firewood and construction. People rely on firewood and charcoal for cooking, with no electricity access. The diet is primarily cassava-based, with no market sales of produce

The population of the affected payams is mainly composed of sedentary agropastoral. Smallholder farmers depend on rain-fed agriculture for their livelihoods. The rainy season, which is from April to October/November, is the right period for cultivation. Mixed cropping and shifting cultivation are practiced in fields away from homes, and farmers must clear part of the forest for their own production. These techniques are used to maintain soil fertility and control weeds. Livestock also plays an important role in the local farming system, and they are the primary store of wealth and a source of food.

Better off households in the vicinity of the project area grew also sorghum, cassava, pepper and tomato and sell them on the streets. In fact, there was not a specific market place, being the main road where trucks are parked the spots for the selling of products.
The main expenses of affected people were for school, food and medicines. Affected households had no savings and debts, they did not join any savings group either.

7.4.6 Gender, Disadvantaged and Vulnerable groups

Gender relations in South Sudan are influenced by extreme poverty and prolonged conflict, leading to pervasive gender inequality across political and economic spheres. Insecurity exacerbates women's challenges as caregivers and providers, especially for those heading households due to the loss of men in conflicts. Traditional norms assign women and girls household chores, water and firewood collection, and care work, while men handle financial decisions, cattle, hunting, fishing, and charcoal making. Mobility is restricted, particularly for women and girls, due to insecurity and lack of transportation.
Women and girls face significant economic and educational disadvantages, with women earning an average monthly income of $6.2 compared to men's $13.5. They also experience higher poverty and illiteracy rates. In 2019, South Sudan ranked 187th out of 189 countries on the Gender Inequality Index, highlighting low educational attainment and political representation for women.
Gender-based violence is prevalent, with women and girls subjected to killings, torture, sexual violence, domestic abuse, and trafficking. Although female genital mutilation is rare, early marriage is common, with over half of girls married by age 13, driven by the absence of a legal minimum age for marriage, conflict, and poverty.
Although there are legal provisions ensuring the equal rights of women to land, the limited social recognition and lack of enforcement create barriers to women's access and control over land. In fulfilling the expected roles from them, women do have control over household items and small animals[10].

Elderly Households and women households directly affected by the land acquisition are listed in Table 7-24 abd in Table 7-23. Among the affected people the project count 52 girls whoa re below 18 and live with their families. No female household below 18 are reported.

[10] South Sudan, Care International, 2022
A household is classified as severely food insecure when at least one adult in the household has reported to have been exposed, at times during the year, to several of the most severe experiences described in the Food Insecurity Experience Scale (FIES) questions, some of which include been forced to reduce the quantity of the food, skipping meals, having gone hungry, or having to go for a whole day without eating because of a lack of money or other resources.

Table 7-23 – HHs above 60 years old

PAP CODE	GENDER
ARU 0017	Male

Table 7-24 – Female HHs

PAP CODE	GENDER
ARA 0011	Female
ARA 0012	Female
ARA 0014	Female
ARU 0013	Female
ARU 0019	Female
ARU 0021	Female
ARU 0022	Female

7.4.7 House Ownership and Types

According to the recent studies of the École Polytechnique Fédérale de Lausanne (EPFL) which conducted a Computational Design for Resilient Shelter in 2021, it is possible to have accurate and recent information on vernacular housing in South Sudan, ranging from type, materials and costs.

The primary housing type is the tukul, a single-room shelter with low, windowless walls and a high-pitched grass roof. Tukuls vary by region and ethnic group, influenced by the availability of local materials like wood and grass. Households may have multiple tukuls for different functions, such as cooking, storage, sleeping, or livestock accommodation. Some tukuls are built on raised earthen plinths to protect against flooding. Square-plan tukuls use less timber than round-plan ones.
Typical tukuls measure around 16m² for four people, with variations based on purpose and owner's budget. With proper maintenance, tukuls can last up to 20 years. Common construction materials include mud, timber, rope, grass, bamboo, stone, clay, wood trunks, and thatch. Shelters can be upgraded or components reused over time.
Costs range from $75 to $2,000, depending on materials, size, and finishes. A 10m² shelter made of bamboo, mud, and grass costs about $115, while a 20m² shelter with a timber structure, mud bricks, and a zinc roof costs around $2,300.



Figure 7-32 – Rural residential structure in the affected area.

Other buildings in concrete were inventoried in the project area, all were abandoned, some resulted to belong to people presently residing in Uganda.



Owner Residency in Uganda



Owner Residency in Uganda



Owner Residency in Uganda



Public School



Figure 7-33 – Police station along the wayleave.

7.4.8 Landholding and land ownership

Affected Households are original from the project area as per survey data, land is customary and they do not have formal land title, hence the entitlement is confirmed by the Land Commission in Aru Junction and Pageri.

Formal and Informal Land Tenure Regimes

With more than 80 per cent of its population living in rural areas, a great deal of land in South Sudan is communally owned. Land is considered common property with no individual ownership, but strong usufructuary rights are inherited through generations. Most land is considered used, not privately owned by the individual. There is no absolute freehold ownership. Instead, families have an usufructuary right that passes down through the family and cannot be sold to another. Thus, selling or buying land to individuals has often been less important than securing land occupation within the family unit.

The right to land in the community derives from membership of the community through a common ancestry. There are four principal ways of accessing land under customary law, namely allocation, inheritance, gift, and purchase or exchange (of cows or other livestock). Of the four, inheritance is by far the most common way in which people gain access to land. Land can also be given as a gift, for instance to an in-law or to an outsider who with good intentions requests a piece of land to settle on and cultivate. In some areas such as Tore Payam in Yei County in Central Equatoria State, **an outsider who wishes to be allocated land has to associate himself with a particular chief, who will 'sponsor' his application to the elders** and will take responsibility for his good conduct within the community.

In 2009, the Land Act introduced the distinction between three general types of land: public, private and communal, respectively owned by the state, private entities, and communities « on a basis of autochthony » (GoSSa 2009: 14). This policy considers private land as owned by individuals typically in freehold (full-fledged ownership) or leasehold (for a specified duration of time). Public land is owned by the government, while community land is owned in common by the local community with regulation by local tribal/clan leadership according to customary law.

Nevertheless, this **distinction between public, private, and communal land is inaccurate because these categories often overlap and cannot be treated as distinct entities**. Land tenure combines elements of the statutory and customary laws: for example, communal land is associated with open access, but in the South Sudanese context clans and families privately own land within communal land, sometimes retaining the right to exchange it for "gifts" which are becoming increasingly monetized[11]. Similarly, different actors like the state of local association can impose their control over communal or private land in specific circumstances, such as relocation/resettlement plans, construction works and public investments. At this regard, the Land Act gives the state the right to convert community or "unowned" land into public land (GoSS 2009: 13), but the conditions for these conversions remain unclear.

In this context, the land survey will be important to assess actual practices of land uses beyond the public, private, and communal land, in order to verify existing rights and stakeholders involved, and suggest a compensation and relocation plan accordingly.

Issues in Land Rights Formalization

Common forms of land documents are those from a traditional authority (43%), tokens or informal documents given by traditional authorities or government agencies pending a complete formalization of the landholding (29%) and agreements with public authorities (26%)[12]. In this weak institutional setting, traditional authorities distribute land through parallel land administration processes. It will be important to verify the existence of formal land titles and existing relations with informal processes.

Since the end of the civil war in 2005, statutory or "formal" laws have started to replace customary laws, primarily in urban areas. In practice, most towns or cities have developed semi-parallel systems of statutory and customary law that work in complement and conflict with each other.

Major changes in customary land tenure are related to the introduction of local land policy, foreign investment, and creation of new government authorities. It is important to point out that the surveying and titling process of customary land is particularly problematic. This is because, in some cases,

[11] Leonardi, Cherry, and Martina Santschi. *Dividing Communities in South Sudan and Northern Uganda: boundary disputes and land governance*. Rift Valley Institute, 2016.
[12] South Sudan Law Society, 2019.

customary land that is surveyed eventually becomes freehold land once registered and titled, with equivalent rights of alienability.

The Ministry of Physical Infrastructure at the state level has ultimate responsibility for surveying and titling land. Agricultural land is not typically surveyed, except for large-scale investments. Thus, most agricultural land remains under the control of local chiefs. Nevertheless, the construction of large-scale infrastructures will facilitate land survey and the transfer of land from customary to private ownership.

Despite these ongoing processes and the introduction of government's land laws, traditional authorities continue to allocate and manage land through customary laws in much of the predominantly rural southern region. Therefore, many southerners did not experience a break in their control over lands held under customary law.

Migration and Displacements

War in South Sudan has displaced 4.43 million people, including 1.96 million internally displaced persons (IDPs) and 2.47 million refugees. The internal displacement is an ongoing process. Together with returnees who were displaced before 2013, some as far back as the 1970s, two-thirds (67%) of IDP respondents of a survey carried out in 2019[13] were displaced in the period since 2016. The number of returnees and resettlement of displaced populations started to increase after the signing of the last peace agreement in September 2019.

Table 7-25 – The concentration of ethnic groups in Nimule and Yei[14].

Ethnic Group	Nimule	Yei
Acholi	5%	2%
Dinka	43%	1%
Fertit	0%	1%
Kakwa	1%	59%
Kuku	2%	6%
Lango	1%	0%
Lotuka	1%	0%
Luo	0%	1%
Madi	42%	0%
Pojulu	1%	19%

Under customary law, in most of South Sudan when a person leaves his home for however long a time, with the intention of returning, he does not lose his right to the land. As long as a returnee comes back to his original land and community, there is no dispute about his entitlement to the land he left behind.

Some state and county authorities have already demarcated large areas of community land for the returnee settlements without consulting chiefs or paying any compensation[15]. This might create tensions in the future between returnees and host community.

These points should be duly considered during the assessment leading to the resettlement policy, as **land parcels which are currently empty or not used may be considered as a possible site for future**

[13] South Sudan Law Society, 2019.
[14] *ibid.*
[15] Norwegian Refugee Council, 2012.

relocations, with direct impact on project sustainability on the long term. A land mapping should be carried out by introducing specific methodological tools to demarcate parcels of land to be allocated to future returnees. If these maps are not available, consultations with local communities should be organized to introduce these tools using participatory methodologies, and gather community consensus on the location of the electric lines.

Also, land that appears unoccupied may in fact be designated for seasonal use by people and livestock. Many communities practice shifting cultivation, and an area that looks like bush may actually be a field left unused for a few years, sometimes up to a decade or more, until it is ready to be planted again. This means that the assessment should be consider a wider timeframe to acknowledge shifting patterns of land use and occupation and seasonal land rights.

Land Occupation

Land became an increasing focus of dispute and conflict during the interim period (2005–2011) as a result of population return and growing urbanization. This includes displacement from previous wars and wages of conflict, with many areas still seeing arrivals and departures on a simultaneous basis.

The return and resettlement of displaced population is a highly political issue. In particular, tensions were mostly located in the three Equatorian states, where people displaced from other areas of the country had moved during the war. Returnees often found their former plots of land inhabited by soldiers or displaced civilians, prompting accusations of land grabbing. This can lead to a complex situation of **conflicting land claims or primary and secondary land rights** that need to be acknowledged.

Local chiefs have adapted well to the challenge of returnee populations and conflicting land rights. In some states, chiefs form a community land committee (sometimes called a 'community land surveyor') to resolve disputes over customary land use, often involving returnees who claim family land occupied by others. The committees are composed of elders from the community, appointed by the chiefs who know the history of the area and can verify claims of family inheritance to land. **They can allocate land as an alternative resolution under both statutory and customary regimes, and should be involved in the stakeholder engagement plan**. The chiefs also regulate land and resource conflicts centered around agricultural use, and conflicts between tribes have traditionally been settled through chief councils.

Land claims and disputes

In rural areas of Greater Equatoria states, the effects of the statutory or formal system are less pronounced, and jurisdiction on all subjects remains in the hands of the customary authorities. Available literature shows that in 61% of the cases of land grabbing involving IDPs, the individual concerned tried to negotiate directly with the person occupying their land[16]. Self-help mechanisms and informal arrangements remain the first choice to settle land disputes, as capability to appeal to an institution responsible for land registration or to reach mediation or arbitration services to clarify land ownership issues is very weak.

In this context, rather than referring to the distinction between public, private, and communal land enshrined in national policies, the assessment should be carried out by referring to two criteria: the resident status of the occupants, and the analysis of actual use of land parcels.

[16] South Sudan Law Society, 2019.

Compensation based on residents' status

Land-related conflicts cannot be understood in terms of the opposition between the ethnic categories of "Equatorians" versus "Nilotics", the latter term often referring to pastoral and mobile groups[17]. This representation simplifies tensions and conflicting claims over land rights and should be nuanced by considering how residents' background and status as victims of war, their historical residency, and contributions to the liberation movement influence claims over land. The different views of and interests in land rights are thus articulated by these diverse local actors according to their specific socio-economic status.

Land grabbing involving plots of land left behind by IDPs or occupied by returnees is a major issue. In this case, difficulties are related to 1) missing land titles and ownership, 2) violent appropriation, 3) soil quality. Sometimes relatives have sold the land of the returnee while those were in exile. Due to this, the assessment will need to pay attention to existing land titles and how they were obtained or produced, in case proper documentation and proof is not available.

There is very little public land available, and tensions also emerged because of increased competition between returnees and host communities over good quality of land. **Most agricultural activity whether livestock grazing or farming occurs on land which is typically split apart from residences, but returnees are only allocated residential plots.** They would need permission from the local chiefs to acquire agricultural land, but this would not be easy for those who were not returning to their original village.

In many cases, upon their return returnees settled on land that was demarcated by the Ministry of Physical Infrastructure, yet the quality of land was poor as it was that prone to flooding, or was not adapted to grow crops due to absence to water. In other cases, people who were resettled received plot numbers and paid ten SDG ($3.30) to occupy the plots only temporarily. Should they wish to stay on it permanently, the market price for these plots will be between 300 and 500 SDG ($100 – $167), which is more than most returnees could afford[18].

Compensation based on actual uses of land

In some cases, negotiations between communities who are involved in displacement and land leases may be regulated through customary agreements depending of land uses. For example, in rural settings of Yei River County (Central Equatoria State) rights to use the land can be exchanged with 25 per cent of the lease value, or *kewatat* in Kakwa language. This term is used to designate a compensation when the leased land is used as hunting ground[19]. Land values may change if the land is used for other purposes other than hunting, and compensation mechanisms need to be adapted accordingly.

Generally, compensation practices are affected by high increase in land prices. According to a survey carried out in 2019 in different locations including Yei and Nimule County in Central Equatoria state, the median increase in value between what the respondent paid for the land and the respondent's estimate of its current worth was 300,000 SSP, reflecting the rapidly changing land markets and high rates of inflation in South Sudan. At the same time, land practices also differ according to the context, as land has gained new kinds of value in some areas, particularly in and around the towns.

In some cases where returnees claimed back their land, it was determined that the current inhabitant would be compensated with land elsewhere. In other cases, compensation included additional money

[17] Rift Valley Institute, 2016.
[18] Rift Valley Institute, 2016.
[19] Africa Spectrum, 2017.

for the houses and other improvements made to the property, and considering the length and degree of the occupation.

7.4.9 Access to Facilities

Access to services in Eastern and Central Equatoria, is generally limited and challenging due to various factors, including ongoing conflict, infrastructural deficits, and economic hardships.
Health services are sparse, with many areas lacking adequate medical facilities. Hospitals and clinics are often understaffed and under-equipped. Many residents must travel long distances to reach the nearest healthcare facility, which can be particularly difficult during the rainy season when roads become impassable.
There are few educational institutions, particularly at the secondary and tertiary levels. Primary schools are more common but often suffer from poor infrastructure. Schools typically lack basic resources such as textbooks, furniture, and trained teachers. Many classes are conducted in temporary shelters or open-air settings.
Access to clean water is a significant challenge. Many communities rely on contaminated sources, leading to waterborne diseases.
Along all the transmission line (from Nesitu to Nimule) there are only two primary and one secondary school, as well as few health posts. Rainy water is collected through ponds for irrigation, while drinkable water is provided to water wells.

7.5 Physical Cultural Resources

Historically, South Sudan was first inhabited by Central Sudanic-speaking groups. By 3000 BC, Nilotic peoples began to dominate, significantly expanding in the 14th century after the fall of Christian Nubian kingdoms. Before Egypt's 19th-century expansion, the region had various polities, including the powerful Shilluk and Azande kingdoms[20] .
Studies on burial practices among different ethnic groups in South Sudan is scares, though it is possible to highlights the significance of common practices. These practices typically include washing the body of the deceased, delaying burial for several days, and placing graves within or near family homesteads[21].
Additionally, PCR sites, such as burial places, cultural sites, large crown trees, etc., have been mapped out in the land survey. Three tombs have been found and they belong to one household.
Nevertheless, there was no evidence of burial sites and listed cultural-archaeological sites in the project corridor. PCR sites, such as burial places, cultural sites, large crown trees, etc., have been mapped out in the land survey. Three tombs have been found and they belong to one household.

8 ENVIRONMENTAL AND SOCIAL IMPACTS

The impact assessment phase generates the baseline (pre-project) environment, assesses the significance of the potential impacts (direct and indirect, secondary, cumulative, short medium and long term, permanent and temporary, reversible and irreversible, beneficial and adverse) identified during scoping, and identifies mitigation measures that could minimize negative impacts and/or enhance benefits.

[20] World Directory of Minorities and Indigenous People, Minorities and indigenous peoples in South Sudan
[21] Cultural practices on burial and care for the sick in South Sudan, Iffat Idris GSDRC, University of Birmingham

8.1 Methodology for impact assessment

8.1.1 Environmental impact assessment

The impact evaluation method is based on the careful analysis and classification on a qualitative/quantitative scale.
The impact factors identified during the analysis of the project and through the definition of the project phases and project actions are assessed in their relevance, using a scoring system.

- **Duration (D)**: is the duration of the impact factor and can vary from short to long according to the following definitions:
  - *Short*: when the duration is shorter than a month;
  - *medium-short*: when the duration is between one and six months;
  - *medium*: when the duration is between six months and one year;
  - *medium-long*: when the duration is between one and three years;
  - *long*: when the duration is over three years.
- **Frequency (F)**: is the frequency with which the impact factor manifests itself:
  - *sporadic*;
  - *moderately frequent*: if it consists of a few events evenly or randomly distributed over time;
  - *frequent*: if it consists of numerous events evenly or randomly distributed over time;
  - *highly frequent*: if it consists of a high number of events evenly or randomly distributed over time;
  - *continuous*: if the event has no interruption over time.
- **Spatial extent (E)**: is the geographical area within which the impact factor can exert its effects:
  - *project footprint*: the impact factor is confined within the facilities owned or exclusively controlled by the project;
  - *local*: the impact factor extends to the areas or communities neighboring the project site (within 1 km);
  - *regional*: the impact factor extends to an area beyond the surroundings of the project site and to regional physical (airshed – watershed, etc.) or administrative boundaries (within 10 km);
  - *beyond regional*: the impact factor extends throughout several regions or to the entire country (within 100 km);
  - *global*: the impact factor has a global reach
- **Intensity (I)**: is a measure of the physical, biological, economic or social severity of the impact factor:
  - *negligible*: the impact factor is generated in quantities that cannot be easily detected or perceived and that are unlikely to be able to cause any detectable change in the target environmental or social components;
  - *low*: the impact factor is generated in quantities that can be detected or perceived but whose effects are unlikely to cause tangible changes in the target environmental or social components;
  - *medium*: the impact factor is generated in quantities that are well within legal standards or accepted practices and/or whose effects are likely to cause tangible changes in the target environmental or social components;
  - *high*: the impact factor is generated in quantities that are at the limit of legal standards or accepted practices and/or whose effects are likely to cause serious impairment in the target environmental or social components;

  - *very high*: the impact factor is generated in quantities that are at risk of exceeding the limits of legal standards or accepted practices and/or whose effects are likely to cause very serious to catastrophic damage to the target environmental or social components
- **Sensitivity (S)**: The sensitivity of an environmental or social component is typically evaluated on the basis of the presence/absence of some features which define both the current degree of the environmental or socio-economic quality and the susceptibility to environmental or social changes of the component:
  - *Low*
  - *Medium-low*
  - *Medium*
  - *Medium-high*
  - *High*
- **Reversibility (R)**: is the property of an impact to diminish its magnitude over time and to eventually recede entirely:
  - *Reversible in the short term*: if the initial condition of the component will be restored within one week after the end of the impact factor and/or the restoration activities;
  - *Reversible in the short-mid-term*: if the initial condition of the component will be restored within one month after the end of the impact factor and/or the restoration activities;
  - *Reversible in the mid-term*: if the initial condition of the component will be restored within one year after the end of the impact factor and/or the restoration activities;
  - *Reversible in the long term*: if the initial condition of the component will be restored within 10 or more years after the end of the impact factor and/or the restoration activities;
  - *Irreversible*: if it is not possible to predict the restoration of the initial conditions.

Each of the parameters listed above can have a value between 1 and 5. The severity of the impact is determined through an Impact Factor Score (IFS) which is the sum of the 4 initial parameters (Duration, Frequency, Spatial Extent and Intensity), hence it can assume a value between 5 and 20.
The **Impact Value (IV)**, which represents the impact magnitude or significance, is then calculated by multiplying the Impact Factor Score by the Sensitivity (S) and by the value of the Reversibility (R), i.e. IV = IFS x S x R.

The additional step consists in assessing the effectiveness of the mitigation measures to reduce or eliminate the negative impact. The mitigation measures will be defined with reference to the mitigation Hierarchy. The effectiveness of the mitigation measures defined in the environmental and social management plan should assessed using expert judgement and the findings from the previous application of the measures to similar projects. The definitions of the **mitigation effectiveness** are:

  - *None*: the impact cannot be mitigated
  - *Low*: the measures can reduce the impacts up to 20% of the expected magnitude
  - *Medium*: the measures can reduce the impacts up to 40% of the expected magnitude
  - *Medium-high*: the measures can reduce the impacts up to 60% of the expected magnitude
  - *High*: the measures can reduce the impacts up to 80% of the expected magnitude

The Mitigation effectiveness is measured on a scale 1 – 0,2 (1 = minimum effectiveness; 0,2 = maximum effectiveness).

The assessment of positive impacts is based on the same parameters of the assessment of the negative impacts, with the only difference that the mitigation measures are replaced by enhancement measures, or measures to maximize the potential positive impacts.

The **residual impact** is obtained multiplying the impact value (IV) by the mitigation effectiveness (or the enhancement effectiveness in the case of positive impacts).
The scale of the residual impact resulting from the calculation described above ranges from 0,8 to 500. The impact value is then scaled in 5 levels by dividing the entire distribution of values obtained in 5 homogeneous classes of values.
The negative impacts and residual negative impacts are classified in 5 levels using the table below.

Residual impact score	Residual impact definition	
0,8 - 33,0	Negligible	
33,1 - 76,0	Low	
76,1 - 136,0	Medium	
136,1 - 228,0	High	
228,1 - 500,0	Very High	

The positive impacts and the residual positive impacts are classified in 5 levels using the table below.

Residual impact score	Residual impact definition	
0,8 - 33,0	Negligible	
33,1 - 76,0	Low	
76,1 - 136,0	Medium	
136,1 - 228,0	High	
228,1 - 500,0	Very High	

The methodology described above allows for an analytical assessment of impacts caused by individual impact factors over individual components, based on expert judgement and defined scoring system. Impacts are therefore presented in separate tables for negative and positive impacts.
Impact assessment is provided for the physical, biological an socio-cultural environment and is also differentiated between the two phases of project development (construction and operation phase).
As the characteristics of some impacts are different, the impact assessment of transmission line and substation components on the physical environment are presented in separate chapters. The impacts on the biological and socio-cultural environment, instead, are evaluated considering the project as a whole.

8.1.2 Social impact assessment

The assessment refers to three groups of indicators:

1. Measuring the impact of migrations and internal displacement on land-related practices
   During the last decades, South Sudan has been a country of internal movements and displacements. This point will be integrated into the methodological tools of the assessment, in order to understand how the project impact can be affected by migratory practices. The target populations of the assessment will include in the consultation process the affected groups as well as the 'host' community. The assessment will consider the ongoing changes in the

organization of access to land and other key-resources, forms of ownership of these resources, and any existing inequalities.

2. Introducing community defined indicators of project impact
   The assessment will consider the perception of the project impact among local communities by looking at community defined indicators. This is because project's impact may differ depending on the socio-economic profile and wealth status, livelihood system and productive specialization of the affected population. Other criteria may come into play in shaping local perceptions of project's impact, such as residents' background and status as victims of war, or their historical residency.

3. Using quantitative and qualitative indicators to develop a compensation and relocation plans
   Beyond qualitative community impact indicators, quantitative data will be collected to appreciate local opinions, perceptions and feeling related to the project activities that can be expressed numerically using participatory ranking or scoring methods. This approach will be useful to evaluate the appropriateness of non-monetary compensation measures (such as the procurement or delivery of inputs, the construction of schools or health centers), for example by referring to increase of school attendance and access to basic services in other areas where similar measures have been already introduced. In case of relocation, these indicators will consider whereas houses and other improvements were made to the property, as well as the length and degree of the occupation, in order to introduce adequate compensation according to these criteria.

8.1.3 Carbon sequestration and climate change assessment

The methodology for estimating carbon stock as described in Inception Report relies on the combined use of the Invest software and R software, along with the use of Sentinel II imagery.
The choice of Sentinel II imagery is driven by its suitability for land cover and vegetation analysis. Imagery with the appropriate resolution (10 meters) will be selected to ensure accurate delineation of different land cover types and vegetation densities.

Spatial and Temporal Segmentation: the analysis will indeed be segmented into distinct periods, capturing variations in carbon dynamics throughout the year and focusing on key seasons, aligning with significant seasonal changes in vegetation growth and land cover patterns. This segmentation will enhance the precision of carbon stock estimation. For imagery and GIS Scripts, the GIS Specialist will be provided with detailed softcopies of the imagery, including metadata information. This will allow to assess the accuracy of the image classification and verify the spatial distribution of land cover types. Additionally, the scripts used for data preprocessing, image classification, and carbon stock calculation will be shared. These scripts will be well-documented and structured to ensure transparency and reproducibility.
In terms of the modelling and calculation process:

a. **Image Preprocessing**: we will perform radiometric and atmospheric corrections on the Sentinel II imagery to ensure accurate reflectance values for subsequent analysis.

b. **Land Cover Classification**: Using the sen2r R package, we will employ machine learning algorithms to classify land cover types in each seasonal image. This step involves training the algorithm with labelled data and then applying it to classify the entire image.

c. **Carbon Stock Calculation**: Carbon stock will be estimated using established relationships between land cover types and carbon content. We will leverage existing studies and databases to assign carbon density values to each land cover class. By overlaying the classified images with these values, we will calculate carbon stock for both above-ground and below-ground vegetation. The Invest software will be used to manage this task.

d. **GIS Analysis**: Spatial analysis tools in GIS will help validate the accuracy of the classified imagery, assess changes in land cover over time, and calculate the spatial distribution of carbon stock.

Detailed provisions to mitigate GHG emissions will be included in ESMP, with a specific reference to PCBs (Polychlorinated Biphenyls) and SF_6 (Sulphur hexafluorides), even if PCBs are banned by Stockholm International Convention since 2001 and the convention entered into force in Sudan in 2006.

8.2 Potential Positive Impacts on the Physical Environment

8.2.1 Reduction of Greenhouse Gases (GHG) emissions

The project is expected to cause as a positive impact the reduction of Greenhouse Gases (GHG) emissions associated to electricity generation from fossil fuels in South Sudan. It is expected that the interconnection project will increase the reliability of electricity supply, reducing the use of domestic diesel-driven generators, and promote the use of energy from renewable resources, with particular regard to hydropower generation. This perspective is aligned with national commitment under the Paris Agreement (2015), the South Sudan's Vision 2040 and the Sustainable Development Goals (SDGs) related to Africa Union Vision 2063.

The major advantage that the interconnection is expected to give to the South Sudanese network is the availability of clean energy coming from the hydropower plants of Uganda that can replace the old and unreliable diesel generators installed in the capital. This will increase the reliability of supply of the load erasing the risk of Energy Not Supplied (ENS) and it avoids the need of burning fuel.
During the first years of service (2028-2033), the interconnection is not particularly exploited since only the load demand of Juba is reachable by the transmission grid; moreover, the interconnection is exploited only in one direction from Uganda to South Sudan.
According to the Transmission expansion Plan, starting from 2033 the national transmission infrastructure will begin its evolution, reaching the major cities and villages of all the neighbouring regions close to Juba and finally connecting all the country. From the generation standpoint, in addition to the connection of local photovoltaic (PV) plants that will be no more isolated from the main network, the biggest addition to the South Sudanese generation fleet will be given by the planned construction and operation of four major hydropower plants (Grand Fula HPP from 2033, Bedden HPP from 2043, Lakki and Shukoli HPPs from 2048).
The significant evolution of the transmission system of South Sudan, together with the conclusion of the hydropower plants, will represent an important step in the evolution of the country, allowing the possibility of South Sudan to export the power produced by its own hydropower plants to the neighbouring countries acting as a hub for the energy exchanged in the area.

An additional co-benefit of the rural electrification associated to the project is the possibility to provide rural households the opportunity to use electricity for their energy needs, as an alternative to firewood and charcoal. Firewood harvesting is responsible for much deforestation, and the project could help reduce the deforestation rate in the areas to be connected to the line and their surroundings.

The illustrated aspects represent a positive impact with very high significance, producing direct and permanent benefits at regional level and contributing to reduce GHG emissions on a global scale. The detailed evaluation of this positive impact is provided in the following matrix.

Table 8-1 – Matrix of positive impacts on physical environment

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Reduction of GHG emissions from electricity consumption	Duration (D):	Long	Medium-high	Long term	Very High	Low	Very High
	Frequency (F):	Continuous					
	Spatial extent (E):	Global					
	Intensity(I):	Medium					

8.3 Negative Impacts on the Physical Environment

8.3.1 Negative impacts during the Construction stage – Transmission line component

8.3.1.1 Climate

The project construction activities likely to cause negative impact on climate are:

- The greenhouse gases (GHGs) emissions due to fuel consumption in construction equipment, vehicles and construction camps;
- The permanent clearance of vegetation along transmission line corridor, new SS area and access roads.

Greenhouse gases emission

The emissions of greenhouse gases (GHGs) derive from fuel consumption in equipment, vehicles and construction camps during the construction activities. This can be considered in the context of contribution to global climate change, with a medium-long term duration. However, the intensity of such impact is deemed negligible, since the total amount of GHG emissions expected in the construction of the transmission line is considered low.

The GHG emission is therefore evaluated as an impact with low significance, given that it will contribute with an extremely moderate degree to global climate change.

Moreover, this impact can be successfully reduced by adopting appropriate mitigation measures, such as proper maintenance of vehicles and construction machinery, periodical monitoring of engine emissions, reduction of vehicle velocity, etc. The residual impact value is negligible.

Reduction of carbon sinks

The vegetation clearing in the transmission line right of way / wayleave and in other permanent and temporary works areas will result in a loss of vegetation biomass and consequent loss of carbon sequestration capacity. Based on land cover classification from satellite imagery (Par. 8.6.2.2), it is estimated that approx. 322 ha of forest will be cleared in the transmission line 60m RoW and Wayleave. Calculations of cleared biomass and corresponding carbon stock are carried out according to the methodology described in Par. 8.1.3 and are provided in Annex 5. The loss of total carbon stock attributable to project implementation is estimated in 45880.08 tons.

Since the cleared forested area represents approx. 22% of the overall extent of transmission line RoW and Wayleave, this impact is judged of very high intensity. The project area sensitivity is deemed low.

The reduction of carbon sinks due to vegetation clearance is rated as an impact with medium significance, overall. The loss of biomass is almost irreversible, given that vegetation growth will not be allowed in the transmission line right of way and limited to a height of 1.8 m in the wayleave.

8.3.1.2 Geology and Soils

Project activities with the greatest potential to affect geological features and soils of the area include land-clearing and vegetation removal, and excavation for tower foundations and the substation. Specific activities and potential effects include:

- Erosion and topsoil loss due to land clearing and vegetation removal along roads, at tower foundations/excavations, at construction staging areas, along new roads, and at the substation: exposing the soil to precipitation and run-off makes it subject to erosion, which in turn leads to loss of topsoil and less fertile soils, and erosion can smother areas where the eroded material comes to rest. Loss of fertile topsoil may impact agricultural productivity, causing loss in livelihoods. If proper care is not taken valuable topsoil could be lost and this in turn could affect the success of the program to restore vegetation. Depending on weather conditions, permanent or temporary measures to ensure proper drainage may need to be taken. If proper care is not taken, some areas could become more susceptible to landslides and mudslides.
- Erosion and topsoil loss due to excavation: to install the tower foundations, it will be necessary to remove topsoil from an area of about 1.5-2 meters square at each of the four corners of each tower and then dig through soil and rock to a depth of 1-2 meters. At the substation site, the substation will be built on top of the current ground surface, but some excavation may be required. Excavations will generate up to several cubic meters of topsoil and spoil at each tower location and some amount at the substation. If not properly stored and protected, soil and spoil can erode and damage other land where it is deposited, and topsoil can be lost.
- Opening borrow pits or other excavations to acquire fill material: if spoil generated at individual sites is not enough for site stabilization and restoration, the contractor may need to buy rock and spoil or to exploit suitable deposits. It is likely that little or no additional spoil will be needed. However, without proper management and closure, quarries or borrow pits lead to significant erosion and, in steep terrain, landslides or mudslides.
- Machinery operations: movement of vehicles and equipment can compact soil, leading to losses in fertility and hinder the re-establishment of vegetation; particularly in wet weather conditions, it can also cause rutting, disturb soil, and increase the potential for erosion. The risk is higher in areas that have not been disturbed and in lowlands with clay soils.

Some minor maintenance of roads will be needed during operation, especially to maintain proper drainage and prevent erosion, but such minor works will not cause significant impacts.
Occasionally, towers or conductors may need to be replaced, in which case many of the same risks would apply but on a smaller scale.
The main impacts generated by all the foregoing activities, that would take place during construction, are illustrated in the following.

Changes in local morphology
Changes in local morphology, direct and permanent, are expected, but limited to the points of implantation of each of the tower pillars and the substations' areas. The extent of the impact is local since it is likely to occur in a well-defined area within the RoW. Given that the project area is generally flat or gently sloped, this impact is considered to have negligible intensity and low sensitivity. Changes in local morphology are therefore rated as an impact of low significance.

Disposal of excavation materials
It is probable that the construction works will generate residual excavation soil, not used for backfilling. This impact may be mitigated if the excavated soils are used for the project's embankments demands or

on other engineering works that are being carried out in the surroundings. Also important to mitigate the excess of soils that cannot be used on local embankments is their use on quarries requalification located around the project influence area. This impact is anyway rated of low significance.
The application of mitigation measures allows to reduce the residual impact to a negligible value.

Soil erosion and slope instability
Clearance of vegetation and earthworks for the camps, substations, access roads and the tower foundations during the construction phase would result in loss of vegetation and removal of topsoil and subsoil to varying depths, as well as soil compaction.
This would result in these limited areas of ground becoming exposed, thus being vulnerable to erosion by wind and water; stockpiles would be also vulnerable to erosion. Compaction of soils in areas heavily utilised by machinery (e.g. at the camps, access tracks and around the towers) reduces permeability and results in decreased infiltration and increased runoff. Removal of the topsoil horizon changes the soil profile, which may inhibit soil rehabilitation which may, in turn, increase the erosion potential of the soil.

The impact is considered of medium importance, since the potential for soil erosion in the project area is medium. The extent of the impact is limited to the project footprint and its duration is medium-long, as it could occur throughout and beyond the entire construction phase.
The application of general mitigation measures (soil and erosion management plan, proper drainage throughout construction and on permanent works, revegetation program after construction, etc.) will reduce soil vulnerability to erosion or compaction. As a matter of fact, the residual impact is deemed low.

8.3.1.3 Hydrogeology – Groundwater contamination

Construction sites involve the handling and management of a number of pollutants, namely hazardous materials including fuel, solid waste, wastewater, as well as concrete/cement runoff.
Possible negative impacts may result from on-site accidents during the works, especially with the spillage and leakages of oil tanks, vehicles or machinery used. Spills and leaks of fuel; leachate from waste management practices or from hazardous solid waste (such as solvent bottles, oily rags etc.) being disposed of incorrectly, sewage from ablution facilities (with the potential to spread waterborne diseases and change the dissolved oxygen content of the water as organic wastes are decomposed); and runoff from concrete batching areas all pose a risk to the groundwater environment and could potentially contaminate the aquifer.

The negative impact of an accident contaminating groundwater quality is considered of low intensity, even if generally having medium-long duration and affecting potentially the regional scale. Sensitivity is judged medium, depending on the local depth of water table. The impact as a whole is rated of medium importance, but it can be significantly mitigated adopting appropriate mitigation measures (proper storage and handling of oil, fuel and lubricants; satisfactory disposal of solid and liquid waste generated by campsites; safety procedures; implementation of water management system; etc.). the residual impact value is rated low.

8.3.1.4 Surface Water Resources

Surface water and groundwater could be affected by construction activities near rivers or other surface water, excavations in areas of shallow groundwater, and spills of fuel or other materials into or near water as briefly described below. Specific activities and potential effects include:

- Construction activities would include land clearing at towers, construction sites, roads, and the substation site as well as vehicle fuelling or maintenance that is undertaken near water bodies. Disturbing the ground surface will allow soil run-off into nearby surface waters, thus increasing total solids and turbidity in surface water, which could affect its use by humans or wildlife and affect fisheries. Compaction of roads and land clearing could increase surface runoff, which could reduce infiltration, and this in turn could affect groundwater. Eventually, working near rivers or streams and crossing small streams with vehicles and equipment could contaminate water with petroleum products.
- Excavations for tower foundations could intercept shallow groundwater, which may have to be pumped out until foundations are installed.
- Pollution: Accidental spillage or leakage of fuel, lubricants, paints, or other materials could contaminate surface water and/or groundwater directly or could contaminate soils that are then eroded into surface water. Improper disposal of used oil and inadequate provision of sanitary and waste facilities would have adverse effect to the ground and surface water quality. Concrete works can also contaminate water and contribute excess alkalinity, which would make it less useful by people or wildlife. Herbicides used for vegetation control could contaminate water.
- Withdrawal of water for construction purposes (for washing equipment, for use in cement, etc.) could reduce availability of water for other purposes.
- Interruption of floodwaters: generally, towers are not located in drainageways or occupy a significant portion of floodplains, so there is limited or no risk of towers interfering with floodwaters and making floods worse. However, a higher risk will be where roads cross small streams; such streams may be ephemeral in nature, and disturbance of drainageways could lead to erosion when water flows through the drainage way following rainfall or could lead to contamination from materials carried or o in the vehicles. In addition, stringing conductors between towers will require heavy equipment to cross some streams and drainage ways and to be near riverbanks of larger rivers, and this disturbance could lead to erosion and present the risk of spills.

The main impacts generated by all the foregoing activities, that would take place during construction, are illustrated in the following.

Increased turbidity and total suspended solids in rivers and streams

Land clearance and excavation activities allow soil run-off into nearby surface waters, thus increasing total solids and turbidity in surface water, which could affect its use by humans or wildlife and affect fisheries.

The impact is considered of medium intensity, since the potential for soil erosion in the project area is medium. The extent of the impact is considered local and its duration is medium-long, as it could occur throughout and beyond the entire construction phase, and potentially frequent. The impact significance is rated low.

The application of general mitigation measures (soil and erosion management plan, proper drainage throughout construction and on permanent works, revegetation program after construction, etc.) will reduce soil vulnerability to erosion or compaction and, consequently, also increase of turbidity and suspended solids in affected water courses. The residual impact is considered negligible.

Pollution of rivers and streams

Contaminated run-off from spill sites could have an adverse impact on water quality if it is drained into surface water bodies or infiltrated in the groundwater. The extent of this impact will vary depending on the size, frequency, and timing of spills (if any) and leaks in relation to conditions in the receiving surface water bodies, soil properties at the point source, and the nature of the materials involved, including their toxicity.

The extent of this potential impact will also vary depending on the location and properties of soil at discharge points and the dilution/mixing regime possible in the receiving waters.
The negative impact of an accident contaminating surface water quality is considered of medium intensity, generally having medium-long duration and affecting the local scale. Sensitivity of existing water bodies is judged medium-high. The impact is rated of medium importance as a whole, but it can be significantly mitigated adopting appropriate mitigation measures (proper storage and handling of oil, fuel and lubricants; satisfactory disposal of solid and liquid waste generated by campsites; safety procedures; implementation of water management system; etc.). The residual impact value is judged low.

8.3.1.5 Air Quality

Site preparation activities which are to take place onsite by the Contractor for the OHTL transmission towers and the various Project components to include foundations, cables, access roads, etc. are expected to include land clearing activities, levelling, excavation, grading, etc. Such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities will likely result in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. If improperly managed, there is a risk of nuisance and health effects to construction workers onsite. In addition, construction activities will likely entail the use of vehicles, machinery, and equipment (such as generators, compressors, etc.) which are expected to be a source of other pollutant emissions (such as SO_2, NO_2, CO, etc.) which would also have minimal direct impacts on ambient air quality. Specifically, the primary activities that could generate air pollution include:

- Movement of vehicles and equipment on unpaved roads and construction zones will create dust. The amount of dust will depend on vehicle speed (higher speeds and larger size vehicles generate more dust), silt content (smaller particle size of silt vs sand will increase dust generation), and moisture content of the ground surface (wet vs dry). Very small particles can be carried relatively long distances by high winds, but usually dust settles within a few tens of meters of where it is created.
- Earthworks (clearing and grubbing) and excavations at construction sites will also create dust. Again, the distance dust is carried would depend on particle size and wind; most dust would settle within a short distance of the site except under windy conditions.
- Open piles of topsoil and spoil, and areas of bare earth at constructions sites can generate dust in windy conditions.
- Operation of combustion engines in vehicles, heavy equipment, generators, and other equipment will generate exhaust gases that contain air pollutants, including particulates (soot), sulphur dioxide, nitrogen oxides, and volatile organic compounds. These pollutants can affect visibility, create smog, and damage health.

The main impacts generated by all the foregoing activities, that would take place during construction, are illustrated in the following.

Exhaust gases emissions

Construction activities will likely entail the use of vehicles, machinery and equipment (such as generators, compressors, etc.) which are expected to be a source of gaseous pollutant emissions (such as SO_x, NO_2, CO_2, CO, etc.) which would also have minimal direct impacts on ambient air quality.

The intensity of the impact is judged medium. The extent is regional since exhaust emissions are likely to be generated along the road network and within the RoW and construction sites. The duration of the impact is medium-long since air quality deterioration is likely to be experienced throughout the entire construction phase. The project area is mainly located in rural areas where atmospheric pollution is low, therefore the sensitivity is judged medium-low. The application of appropriate mitigation measures (maintenance of vehicles and construction machinery, periodical monitoring of engine emissions, reduction of vehicle velocity, etc.) will help reducing significantly exhaust emissions. The impact on air quality during the construction phase is thus considered of minor importance.

Particulate matter and dust emissions

Site preparation activities which are to take place onsite by the Contractor for the OHTL transmission towers and the various Project components to include foundations, cables, access roads, etc. are expected to include land clearing activities, levelling, excavation, grading, etc. Such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities will likely result in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. If improperly managed, there is a risk of nuisance and health effects to construction workers onsite.

Each of these operations has its own duration and potential for dust generation and therefore the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations and the prevailing meteorological conditions.

The intensity of the impact is considered potentially high. The extent is regional since dust and particulate matter emissions are likely to be generated in all construction sites, including access roads and local road network, and can spread in nearby areas, according to meteorological conditions. The duration of the impact is medium-long since air quality deterioration is likely to be experienced throughout the entire construction phase. The dust impact is rated as an impact with medium importance.

The application of appropriate mitigation measures (dust suppression, locate dust causing activities and soil stockpiles away from sensitive receptors, introduction of speed limits, regular maintenance of vehicles and machinery, etc.) will help to reduce significantly dust and PM emissions, lowering the residual impact to low value.

8.3.1.6 Increase of noise and vibration levels

Noise and vibration levels are likely to be increased at the construction phase during site preparation, tower erection, construction of substations and access roads. In some locations, work will be done in close proximity to residences, farms or businesses located along the RoW and near substations. Traffic, as well as the use of construction equipment and machinery, will lead to temporary noise emissions that may disturb neighbouring communities and local fauna. If not managed properly, they can lead to a risk of nuisance and adverse health effects for construction workers on site, given that construction activities can produce sound levels superior than what is recommended by the IFC Guidelines.

Noise levels measurements that have been conducted revealed no significant noise stress in the project area.

The intensity of the impact is considered medium and the extent is local. The duration is medium-long, since increase of noise and vibration is likely to be experienced throughout the entire construction

phase. The impact is highly frequent but is not continuous, since noise level would vary substantially from day to day depending on the level of activity, the specific operations, and the topographical and atmospheric conditions.
The noise and vibration impact is rated as an impact with low importance, overall. Moreover, noise resulting from the construction work will only be experienced during a limited time frame and can be significantly reduced with the implementation of general mitigation measures. These measures include maintaining machinery and equipment in good running conditions and restricting noise-generating activities to daytime hours.
The residual impact is rated negligible.

8.3.1.7 Waste production

Construction activities will result in the generation of a number of different waste streams including domestic waste, rubble, hazardous waste and sewage. These are from the presence of construction workers (domestic waste and sewage), the generation of rubble and spoil from earthworks as well as the use of hazardous chemicals and by-products thereof, such as fuel and concrete/cement.
Contractors and sub-contractors will be required to develop and implement waste management plans that comply with relevant AfDB/IFC waste management guidelines in order to ensure that various types of waste to be produced during the construction phase are adequately recovered, stored and disposed of. With adequate management and disposal of solid waste and effluents, the impact is expected to have negligible significance.

8.3.1.8 Summary of negative impacts on the physical environment during the construction phase of transmission line

The potential negative impacts expected to arise from the construction of the transmission line on physical environment are summarized in the following matrix.

Table 8-2 – Matrix of negative impacts on physical environment during the construction phase of transmission line.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increased emission of GHG	Duration (D):	Medium-long	Low	Irreversible	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Global					
	Intensity(I):	Negligible					
Reduction of carbon sinks (due to vegetation clearance)	Duration (D):	Long	Low	Irreversible	**Medium**	None	**Medium**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Very high					
Changes in local morphology	Duration (D):	Long	Low	Irreversible	**Low**	None	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Negligible					
Soil disposal	Duration (D):	Medium-short	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Soil erosion and slope instability	Duration (D):	Medium-long	Medium	Mid term	**Medium**	Medium-high	**Low**
	Frequency (F):	Moderately frequent					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Groundwater contamination	Duration (D):	Medium-long	Medium	Long term	**Medium**	Medium-high	**Low**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Regional					
	Intensity(I):	Low					
Increased turbidity and total suspended solids in river and streams	Duration (D):	Medium-long	Medium	Short-term	**Low**	Medium	**Negligible**
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Pollutants contamination in rivers and streams	Duration (D):	Medium-long	Medium-high	Short-mid-term	**Medium**	Medium	**Low**
	Frequency (F):	Moderately frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Exhaust gas emissions	Duration (D):	Medium-long	Medium-low	Short-term	**Negligible**	Medium	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
PM and dust emissions	Duration (D):	Medium-long	Medium-high	Short-mid-term	**Medium**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	High					
Increase of Noise and vibration levels	Duration (D):	Medium-long	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Waste production	Duration (D):	Medium-long	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					

8.3.2 Negative impacts during the Operation stage – Transmission line component

8.3.2.1 Landscape - Visual and Aesthetic Impact

Visual impacts associated typically concern the OHTL towers themselves (e.g., colour, height and number) and impacts relating to their interaction with the character of the surrounding landscape and the visual receptor which might be present.
The landscape and visual resources of an area, which include both natural and man-made features, are of great importance to people living in and passing through the area. The overall aesthetic impact of a transmission line is likely to be negative for most people, especially where proposed lines would cross natural landscapes and private property. However, some people may not notice transmission lines or may not find them aesthetically objectionable. Aesthetic effects depend on the physical relationship between the viewer and the transmission line, the activity of the viewer and the contrast between the transmission structures and the surroundings.

The visual and aesthetic impact of the transmission line is permanent, irreversible, affecting the regional scale and of high intensity. Since the project area is mainly a rural area with few infrastructures, the sensitivity of the environment to this impact is deemed high. Therefore, the visual and aesthetic impact of the project is rated very high and not mitigable.

8.3.2.2 Water resources

Reduction of aquifer's recharge
The construction of substation and transmission line foundations will lead to an increase of impervious surfaces in the project footprint, reducing locally the infiltration rate of rainfall and potentially affecting the recharge of aquifers. However, it must be considered that the expected reduction of recharge area is very small and will therefore represent a negligible impact.

8.3.2.3 Increase of noise levels

During the operation phase, overhead transmission lines can be sources of noise, due to the wind effect on the conductor cables and the corona effect (noise from electrical discharges). However, the project mostly lies in rural areas and most of the sensitive receptors are at a safe distance from the source. Furthermore, these noise sources are weather related and during dry weather the lines are usually quieter. During periods of wind and rain, ambient noise levels also tend to increase, so the noise generated in the power lines is also considered negligible.

8.3.2.4 Electromagnetic field

All equipment that generates, distributes or uses electricity produces electromagnetic fields (EMFs). Transmission lines generate EMFs around the conductors. Electric field depend on the operating voltage of the equipment, which is a relatively constant value, and are measured in V/m (volts per meter). Magnetic fields depend on the electrical currents flowing, which vary according to the electrical power requirements at any given time, and are measured in µT (microteslas).
Most electric power systems operate at a frequency of 50 or 60 Hz (50 Hz in the case of South Sudan) and the associated EMF is therefore classified in the range of extremely low frequency (ELF) fields, i.e. comprised in the range >0 to 100 kHz.

Since the late 1970s, questions have been raised whether exposure to these extremely low frequency (ELF) electric and magnetic fields (EMF) produces adverse health consequences. Since then, much research has been done, successfully resolving important issues and narrowing the focus of future research. For example, there are established biological effects from acute exposure at high levels (well above 100 µT) that are explained by recognized biophysical mechanisms.

Much of the scientific research is examining long-term risks from ELF magnetic field exposure. In 2002 the International Agency for Research on Cancer (IARC) published a monograph classifying ELF magnetic fields as "possible carcinogenic to humans", based on some limited evidences of correlation (childhood leukaemia). However, there is no agreement among the scientific community about certain chronic effects of EMFs. The World Health Organization (WHO) states that no adverse health effects from low level, long-term exposure to electromagnetic fields have been confirmed to date, but scientists are actively continuing to research this area.

The recommendations and guidelines of the European Union for limiting the exposure of the general public (EU recommendation 1999/519/EC) or workers (EU Directive 2013/35/EU, which replaced the former EU Directive 2004/40/EC) are a common basis for legislation in many countries in Europe. In both guidance documents, the limits are derived in large part from the recommendations of the "*ICNIRP Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (up to 300 GHz)*", published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) in 1998.

The recommended exposure limits to ELF fields are defined so that the threshold at which the interactions between the body and the external electric and magnetic field causes adverse effects is never reached inside the body. The exposure limits outside the body, called reference levels, are derived from the basic restrictions using worst-case exposure assumptions, in such a way that remaining below the reference levels (in the air) implies that the basic restrictions will also be met (in the body).

ICNIRP has issued new guidelines for EMF with frequencies between 1 hertz and 100 kilohertz in 2010 ("*ICNIRP Guidelines for Limiting Exposure to Time-varying Electric and Magnetic Fields (1 Hz – 100 kHz)*), but these have not yet led to changes in the EU recommendation. The reference levels for general public and occupational exposure, according to ICNIRP guidelines published in 1998 and 2010, are provided in the following table.

Table 8-3 – Reference (threshold) levels for public and occupational exposure to extremely low frequency (ELF) electromagnetic fields (EMFs) from ICNIRP Guidelines.

	Frequency (Hz)	General public Exposure		Occupational Exposure	
		Electric Field (V/m)	Magnetic Flux Density (µT)	Electric Field (V/m)	Magnetic Flux Density (µT)
ICNIRP 1998 and EU guidelines	50	5,000	100	10,000	500
	60	4,150	83	8,300	415
ICNIRP 2010	50	5,000	200	10,000	1,000
	60	4,150	200	8,300	1,000

Both electric fields and magnetic fields decrease rapidly as the distance from the source increases. Therefore, in order to maintain safety of the general public and minimize exposure to EMFs, a suitable RW/wayleave distance from the transmission line is adopted so that the EMFs would effectively attenuate at the edge of this RoW. The proposed 10m for the Right of Way (RoW) and additional 25m of Wayleave to each side of the RoW is considered sufficient to mitigate any perceived health effect from the transmission line.

Electric and magnetic field profiles under a 400 kV transmission line (at 1 m from ground) are reported in Figure 8-1 and Figure 8-2, respectively.

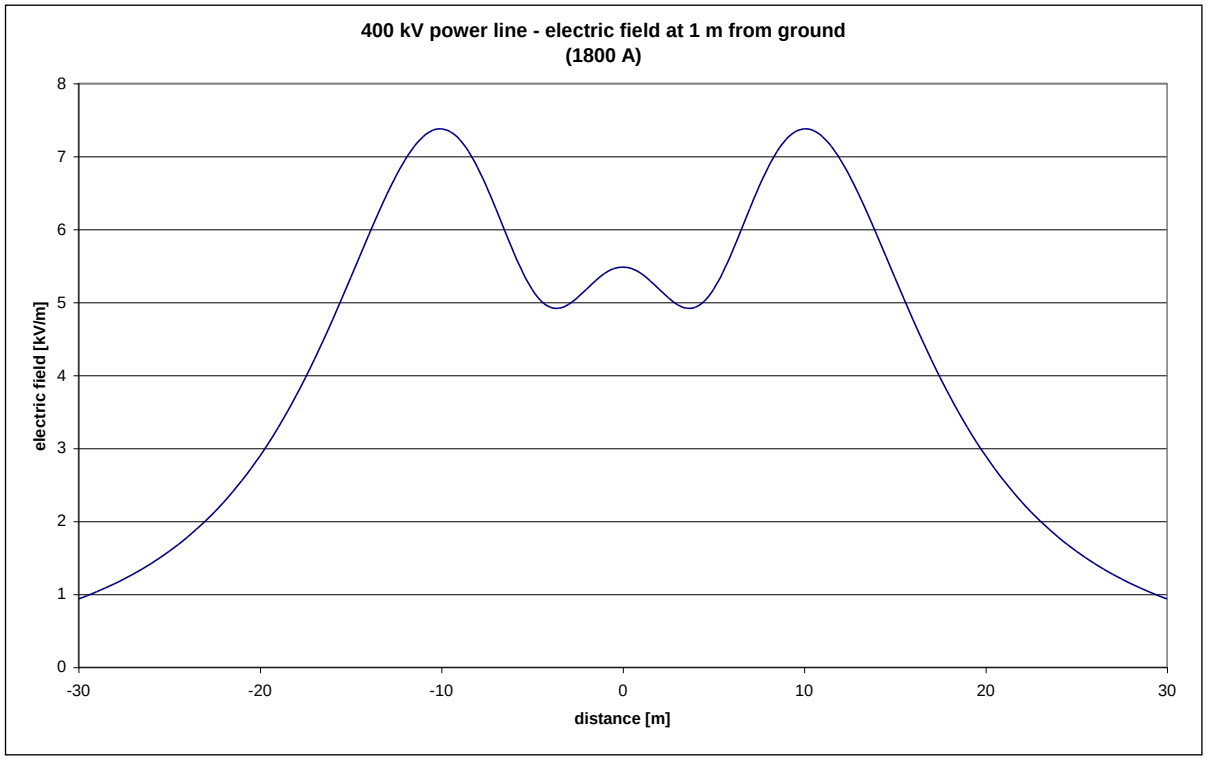


Figure 8-1 – Electric field [kV/m] at 1 meter from ground generated from a 400 kV power line (1,800 A).

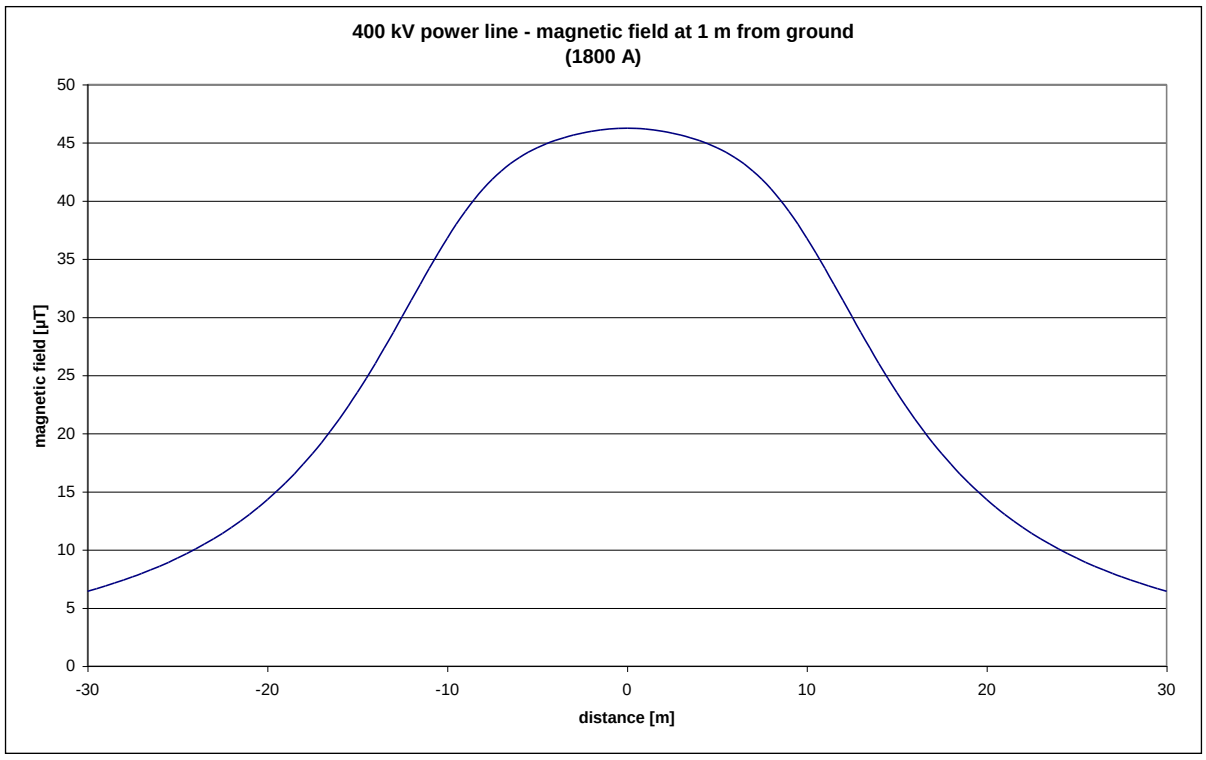


Figure 8-2 – Magnetic field [µT] at 1 meter from ground generated from a 400 kV power line (1,800 A).

Calculation shows that outside a belt of about 16 + 16 m width on both sides of the power line, unperturbed electric field levels are lower than 5 kV/m. Moreover, calculated magnetic field values are always well under 100 µT for locations that can be attended by general public.
As far as general public exposure is concerned, it is to be noted that the ground-level electric field is often reduced due to the screening effect produced by objects such as trees, buildings, fences, vehicle, etc. As far as buildings are concerned, it is important to recall that, in addition to the attenuation of the ground-level electric field they determine in their vicinity, they also act as good screens for their interiors. Indeed, due to the considerable screening effect of walls, the electric field generated by external sources undergoes a ten- to hundred-fold reduction.

The impact due to EMF field during project lifetime is a permanent, long-term and continuous impact, limited to the project footprint. According to the expected levels of electric and magnetic fields, the impact is considered of low intensity. Since transmission line passes through rural areas, with low population density, the sensitivity to this impact is judged medium-low. As previously stated, the expected levels of electric and magnetic fields are abundantly below the general public exposure limits outside the transmission line Right of Way and Wayleave. Therefore, the residual impact is rated negligible.

8.3.2.5 Summary of negative impacts on the physical environment during the operation phase of transmission line

The potential negative impacts expected to arise from the operation of the transmission line on physical environment are summarized in the following matrix.

Table 8-4 – Matrix of negative impacts on physical environment during the operation phase of the transmission line.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Visual and aesthetic impact	Duration (D):	Long	Medium-high	Irreversible	**Very High**	None	**Very High**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	High					
Reduction of aquifer's recharge area	Duration (D):	Long	Low	Irreversible	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Negligible					
Noise - Wind effect on cables and corona discharge	Duration (D):	Long	Medium-low	Short-term	**Negligible**	None	**Negligible**
	Frequency (F):	Moderately frequent					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Increase of Electromagnetic field	Duration (D):	Long	Medium-low	Irreversible	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					

8.3.3 Negative Impacts during the Construction stage – Substation component

8.3.3.1 Climate

Greenhouse gases emission

The GHG emission is evaluated as an impact with low significance, given that it will contribute with an extremely moderate degree to global climate change.

Moreover, this impact can be successfully reduced by adopting appropriate mitigation measures, such as proper maintenance of vehicles and construction machinery, periodical monitoring of engine emissions, reduction of vehicle velocity, etc. The residual impact value is negligible.

Reduction of carbon sinks

Vegetation clearance in the substations area is limited and therefore the reduction of carbon sinks due to vegetation clearance is rated as an impact with low significance. However, the loss of biomass is almost irreversible, given that vegetation growth will not be allowed in the substation area. The residual impact is equally low.

8.3.3.2 Geology and Soils

Project activities with the greatest potential to affect geological features and soils of the area include land-clearing and vegetation removal, and excavation for the substation. Specific activities and potential effects include:

- Erosion and topsoil loss due to land clearing and vegetation removal at the substation site;
- Erosion and topsoil loss due to excavation at substation site: : earthworks will be performed to make the substation land suitable for installation of supporting structures and equipment, for erection of control building and related dependencies, with drainage to evacuate water in all conditions and of sufficient size to allow access to maintenance equipment;
- Machinery operations: movement of vehicles and equipment can compact soil, leading to losses in fertility and hinder the re-establishment of vegetation in the surrounding of the substation

site; particularly in wet weather conditions, it can also cause rutting, disturb soil, and increase the potential for erosion. The risk is higher in areas that have not been disturbed and in lowlands with clay soils.

The main impacts generated by all the foregoing activities, that would take place during construction, are illustrated in the following.

Changes in local morphology

Changes in local morphology, direct and permanent, are expected in the substation area. The extent of the impact is limited to project footprint since it will occur in a well-defined area. This impact is considered to have negligible intensity and low sensitivity. Changes in local morphology are therefore rated as an impact of low significance.

Disposal of excavation materials

It is probable that the construction works will generate residual excavation soil, not used for backfilling, that will require proper disposal. This impact is judged having low importance.
It may be mitigated if the excavated soils are used for the project's embankments demands or on other engineering works that are being carried out in the surroundings. Also important to mitigate the excess of soils that cannot be used on local embankments is their use on quarries requalification located around the project influence area. The residual impact is rated of negligible significance.

Soil erosion and slope instability

Clearance of vegetation and earthworks for the substation during the construction phase would result in removal of topsoil and subsoil to varying depths, increase of erosion potential as well as soil compaction.
The impact is considered of low importance, given the limited extensions of substation sites. The extent of the impact is limited to the project footprint and its duration is medium-long, as it could occur throughout and beyond the entire construction phase.
The application of general mitigation measures (soil and erosion management plan, proper drainage throughout construction and on permanent works, etc.) will reduce soil vulnerability to erosion or compaction. The residual impact is deemed negligible.

8.3.3.3 Hydrogeology – Groundwater contamination

Impacts on groundwater would arise due to activities that cause soil erosion, discharge of sanitary water, contaminant spills (especially oil) and leaching of accumulated/dumped wastes at the event of rainfall or runoff water. Soil contamination could also occur by merely the contact between the waste and the soil.
The negative impact of an accident contaminating groundwater quality is considered of low intensity, generally having medium-long duration and affecting the local scale. Sensitivity is judged medium-low. The impact as a whole is rated of low importance, but it can be significantly mitigated adopting appropriate mitigation measures (proper storage and handling of oil, fuel and lubricants; satisfactory disposal of solid and liquid waste generated by campsites; safety procedures; implementation of water management system; etc.). The residual impact value is rated negligible.

8.3.3.4 Surface water resources

Regarding the potential pollution of surface water, the substation at Nesitu is currently located in correspondence of a river (Wanga river, tributary of White Nile).

Surface water and groundwater could be affected by excavations, construction activities and spills of fuel or other materials into or near water as briefly described below. Specific activities and potential effects include:

- Construction activities would include land clearing at the substation site as well as vehicle fueling or maintenance that is undertaken near water bodies. Disturbing the ground surface will allow soil run-off into nearby surface waters, thus increasing total solids and turbidity in surface water, which could affect its use by humans or wildlife and affect fisheries. Eventually, working near rivers or streams and crossing small streams with vehicles and equipment could contaminate water with petroleum products.
- Pollution: Accidental spillage or leakage of fuel, lubricants, paints or other materials could contaminate surface water and/or groundwater directly or could contaminate soils that are then eroded into surface water. Improper disposal of used oil and inadequate provision of sanitary and waste facilities would have adverse effect to the ground and surface water quality. Concrete works can also contaminate water and contribute excess alkalinity, which would make it less useful by people or wildlife. Herbicides used for vegetation control could contaminate water.
- Withdrawal of water for construction purposes (for washing equipment, for use in cement, etc.) could reduce availability of water for other purposes.
- Partial obstruction of floodwaters, with consequent increase of water levels in case of floods.

The main impacts generated by all the foregoing activities, that would take place during construction, are illustrated in the following.

Increased turbidity and total suspended solids in rivers and streams

Land clearance and excavation activities allow soil run-off into nearby surface waters, thus increasing total solids and turbidity in surface water, which could affect its use by humans or wildlife and affect fisheries.

The potential for soil erosion in the substation area is medium-high. The extent of the impact is considered local and its duration is medium, as it could occur throughout and beyond the entire construction phase of substation. The impact could have a medium intensity and its overall importance is considered low.

The application of general mitigation measures (soil and erosion management plan, proper drainage throughout construction and on permanent works, revegetation program after construction, etc.) will reduce soil vulnerability to erosion or compaction and, consequently, also increase of turbidity and suspended solids in affected water courses. The residual impact is considered negligible.

Pollution of rivers and streams

Contaminated run-off from spill sites could have an adverse impact on water quality if it is drained into surface water bodies or infiltrated in the groundwater. The extent of this impact will vary depending on the size, frequency, and timing of spills (if any) and leaks in relation to conditions in the receiving surface water bodies, soil properties at the point source, and the nature of the materials involved, including their toxicity.

The extent of this potential impact will also vary depending on the location and properties of soil at discharge points and the dilution/mixing regime possible in the receiving waters.

The negative impact of an accident contaminating surface water quality is considered of high intensity, generally having medium duration and affecting the local scale. Sensitivity of existing water bodies is judged medium-high. The impact is rated of medium importance as a whole, but it can be significantly mitigated adopting appropriate mitigation measures (proper storage and handling of oil, fuel and

lubricants; satisfactory disposal of solid and liquid waste generated by campsites; safety procedures; implementation of water management system; etc.). The residual impact value is judged low.

8.3.3.5 Air Quality

Construction of the SS and installation of the equipment will include several activities such as excavation, land clearing, earthworks, stock piling transportation of construction material and equipment, burial of cables and pipes, etc. Those activities in consequence are expected to emit air pollutants to the ambient air, however it will be conducted for a short period. The following air pollutants are foreseeable for most of the construction activities:

- Dust and particulate matter emissions (PM_{10}, $PM_{2.5}$)
- Exhaust of vehicles or equipment such as temporary generators, trucks, trolley, etc.

Particulate matter and dust emissions

In the vicinity of project site, dust emissions will slightly negatively impact ambient air quality, particularly during the initial phases of construction.

Site preparation activities which are to take place onsite by the Contractor for the substation are expected to include land clearing activities, levelling, excavation, grading, etc. Such activities are limited to the relatively small substation areas and the actual area of disturbance is limited. Nevertheless, such activities will likely result in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. If improperly managed, there is a risk of nuisance and health effects to construction workers onsite.

Each of these operations has its own duration and potential for dust generation and therefore the extent of dust emissions would vary substantially from day to day depending on the level of activity, the specific operations and the prevailing meteorological conditions.

The intensity of the impact is considered high. The extent is local since dust and particulate matter emissions will be generated in substation construction sites and can spread in nearby areas, according to meteorological conditions. The duration of the impact is medium since air quality deterioration is likely to be experienced throughout the substation construction phase. The dust impact at substation is rated as an impact with low importance.

The application of appropriate mitigation measures (dust suppression, locate dust causing activities and soil stockpiles away from sensitive receptors, introduction of speed limits, regular maintenance of vehicles and machinery, etc.) will help to reduce significantly dust and PM emissions, lowering the residual impact to negligible value.

Exhaust gases emissions

Construction activities will likely entail the use of vehicles, machinery and equipment (such as generators, compressors, etc.) which are expected to be a source of gaseous pollutant emissions (such as SO_x, NO_2, CO_2, CO, PM, etc.) which would also have low direct impacts on ambient air quality.

The intensity of the impact is judged medium. The extent is local since exhaust emissions are likely to be generated at the substation construction site. The duration of the impact is medium. The project area is mainly located in rural areas where atmospheric pollution is low, therefore the sensitivity is judged medium. The application of appropriate mitigation measures (maintenance of vehicles and construction machinery, periodical monitoring of engine emissions, reduction of vehicle velocity, etc.) will help reducing significantly exhaust emissions. The impact on air quality during the construction phase is thus considered of minor importance.

8.3.3.6 Increase of noise and vibration levels

Noise and vibration levels are likely to be increased at the construction phase during site preparation, and construction activities at substations. Traffic, as well as the use of construction equipment and machinery, will lead to temporary noise emissions that may disturb neighbouring communities and local fauna. If not managed properly, they can lead to a risk of nuisance and adverse health effects for construction workers on site, given that construction activities can produce sound levels superior than what is recommended by the IFC Guidelines.
Construction activities will also result in varying degrees of ground-borne vibration depending on the stage of construction, the equipment and construction methods employed, the distance from the construction locations to vibration-sensitive receptors and soil conditions. According to the proposed activities during the construction phase of substations, the concern of vibration comes from the truck movements and construction of the infrastructures and installation of the equipment.

Noise levels measurements that have been conducted revealed no significant noise stress in the project area.
The intensity of the impact is considered high and the extent is local. The duration is medium, since increase of noise and vibration is likely to be experienced throughout the substation construction phase. The impact is highly frequent but is not continuous, since noise level would vary substantially from day to day depending on the level of activity, the specific operations, and the topographical and atmospheric conditions.
The noise and vibration impact is rated as an impact with low importance, overall. Moreover, noise resulting from the construction work will only be experienced during a limited time frame and can be significantly reduced with the implementation of general mitigation measures. These measures include maintaining machinery and equipment in good running conditions and restricting noise-generating activities to daytime hours.
The residual impact is rated negligible.

8.3.3.7 Waste production

Construction activities will result in the generation of a number of different waste streams including domestic waste, rubble, hazardous waste and sewage. These are from the presence of construction workers (domestic waste and sewage), the generation of rubble and spoil from earthworks as well as the use of hazardous chemicals and by-products thereof, such as fuel and concrete/cement.
Contractors and sub-contractors will be required to develop and implement waste management plans that comply with relevant AfDB/IFC waste management guidelines in order to ensure that various types of waste to be produced during the construction phase are adequately recovered, stored and disposed of. With adequate management and disposal of solid waste and effluents, the impact is expected to have negligible significance.

8.3.3.8 Summary of negative impacts on the physical environment during the construction phase of substation

The potential negative impacts expected to arise from the construction of the substation on physical environment are summarized in the following matrix.

Table 8-5 – Matrix of negative impacts on physical environment during the construction phase of the substation.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Increased emission of GHG	Duration (D):	Medium	Low	Long term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Negligible					
Reduction of carbon sinks (due to vegetation clearance)	Duration (D):	Long	Low	Irreversible	**Low**	None	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Changes in local morphology	Duration (D):	Long	Low	Irreversible	**Low**	None	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Soil disposal	Duration (D):	Medium-short	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Moderately frequent					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Soil erosion and slope instability	Duration (D):	Medium-long	Medium-low	Mid term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Moderately frequent					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Groundwater contamination	Duration (D):	Medium-long	Medium-low	Long term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Increased turbidity and total suspended solids in river and streams	Duration (D):	Medium	Medium-high	Short-term	**Low**	Medium	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Pollutants contamination in rivers and streams	Duration (D):	Medium	Medium-high	Short-mid-term	**Medium**	Medium	**Low**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Exhaust gas emissions	Duration (D):	Medium	Medium	Short-term	**Low**	Medium	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
PM and dust emissions	Duration (D):	Medium	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Increase of Noise and vibration levels	Duration (D):	Medium	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Highly frequent					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Waste production	Duration (D):	Medium	Medium	Short-term	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					

8.3.4 Negative Impacts during the Operation stage – Substation component

8.3.4.1 Climate – Greenhouse gases emission

In operation phase, other GHG emission sources are related to possible fugitive emissions of Sulphur hexafluorides (SF_6). Sulphur hexafluorides is a gas typically used as an insulator for electrical switching equipment and in cables, tubular transmission lines and transformers. If gas-insulated equipment is installed and used at the substation, SF_6 may escape as fugitive emissions during manufacturing, use, maintenance and disposal. SF_6 is a powerful greenhouse gas that must be managed carefully to avoid leaks and emissions. The scale of SF_6 emissions will be dependent on the type of and number of equipment used during operation as well as the maintenance and recycling procedures employed during operation and decommissioning.

This impact can be considered in the context of contribution to global climate change, with a medium-long term duration. However, the operational emissions are unlikely to be significant, if appropriately managed and proper maintenance practices are implemented to ensure emissions are kept to a minimum. Therefore, the GHG emission during operation is evaluated as an impact with low significance, given that it would contribute with an extremely moderate degree to global climate change.
Detailed provisions to avoid and mitigate SF_6 emissions are included in ESMP. The residual impact value is negligible.

8.3.4.2 Water resources

Reduction of aquifer's recharge
The construction of substation will lead to an increase of impervious surfaces (control building, foundations for electrical equipment and paved areas), reducing locally the infiltration rate of rainfall and potentially affecting the recharge of aquifers. However, it must be considered that the expected reduction of recharge area is very small and will therefore represent a negligible impact.

Groundwater and surface water contamination
Sources of soil and water contamination during the operations phase will result from spillage of fuels, lubricants and other toxic materials from project equipment such as transformers at substation sites and maintenance vehicles. This could lead to ground and surface water contamination, in proportion with the magnitude of these accidental events.
It must be underlined that the use of insulating oil containing Polychlorinated Biphenyls (PCBs) shall be avoided, since PCBs are banned by Stockholm International Convention since 2001 and the convention entered into force in Sudan in 2006.
Domestic and sanitary waste will also be generated during operations and maintenance of the power plant even though there will be a limited number of project personnel at the site.
The negative impact of an accident contaminating groundwater or surface water quality is considered of medium intensity, generally having medium-long duration and affecting the local scale. Sensitivity of existing groundwater table and water bodies is judged medium-low. The impact is rated of medium importance as a whole, but it can be significantly mitigated adopting appropriate mitigation measures (proper storage and handling of oil, fuel and lubricants; satisfactory disposal of solid and liquid waste; safety procedures; implementation of water management system; etc.). The residual impact value is judged negligible.

8.3.4.3 Increase of noise levels

During the operation phase, substations comprise several sources of noise emissions, the most significant being the continuous radiation of audible discrete tones. The noise of this type is primarily generated by power transformers, reactors, emergency generators, etc. Despite this, the expected noise levels are low and thus the impact is negligible.

8.3.4.4 Electromagnetic field

As far as general public exposure is concerned, it is to be noted that the ground-level electric field is often reduced due to the screening effect produced by objects such as trees, buildings, fences, vehicle, etc. As far as buildings are concerned, it is important to recall that, in addition to the attenuation of the ground-level electric field they determine in their vicinity, they also act as good screens for their interiors. Indeed, due to the considerable screening effect of walls, the electric field generated by external sources undergoes a ten- to hundred-fold reduction.
The reference levels for general public and occupational exposure, according to ICNIRP guidelines published in 1998 and 2010, are provided in Table 8-3.
With respect to substations, in general, the strongest EMF around a substation comes from the power lines entering and leaving the substation. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Calculation shows that outside a belt of about 16 + 16 m width on both sides of the power line, unperturbed electric field levels are lower than 5 kV/m. Moreover, calculated magnetic field values are always well under 100 µT for locations that can be attended by general public.
Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels.

The impact due to EMF field during project lifetime is a permanent, long-term and continuous impact, limited to the project footprint. According to the expected levels of electric and magnetic fields, the impact is considered of low intensity. Since transmission line passes through rural areas, with low population density, the sensitivity to this impact is judged medium-low. As previously stated, the expected levels of electric and magnetic fields are abundantly below the general public exposure limits outside the substation area. Therefore, the residual impact is rated negligible.

8.3.4.5 Summary of negative impacts on the physical environment during the operation phase of substations

The potential negative impacts expected to arise from the operation of the transmission line on physical environment are summarized in the following matrix.

Table 8-6 – Matrix of negative impacts on physical environment during the operation phase of the substation.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
GHG emissions	Duration (D):	Medium-long	Low	Irreversible	**Low**	Medium-high	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Global					
	Intensity(I):	Negligible					
Reduction of aquifer's recharge area	Duration (D):	Long	Low	Irreversible	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Negligible					
Risk of groundwater and surface water contamination	Duration (D):	Medium-long	Medium	Long term	**Medium**	High	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Noise - Operation of the substations	Duration (D):	Long	Low	Short-term	**Negligible**	None	**Negligible**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Increase of Electromagnetic field	Duration (D):	Long	Medium-low	Irreversible	**Medium**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					

8.4 Negative Impacts on the Biological Environment

Transmission lines might cause significant impacts on the environment both during the construction and operation phases (Figure 8-3). The most obvious impacts of power lines on the environment are associated with the Right of Way (RoW), the zone below the cables where vegetation is cleared and managed to avoid interference and risk to line structures and/or to energy transmission.

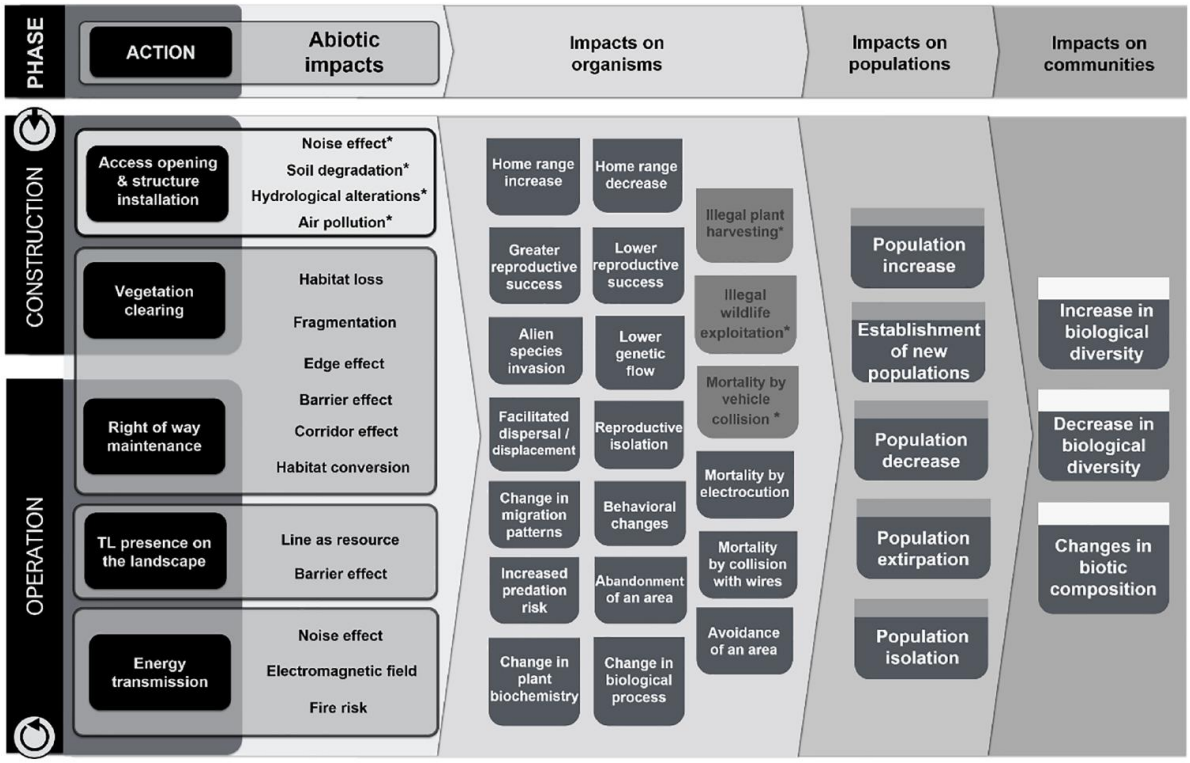


Figure 8-3 – Framework summarizing abiotic and biotic impacts documented in the systematic review, with their respective phases and main causal actions. Note that "Vegetation clearing" and "Right of way maintenance" are common to both phases and share the same set of abiotic impacts. Modified by Biasotto & Kindel 2018.

The impact from the construction of a transmission line can be measured in several different ways. Useful measurements of impacts may be area, distance, or the number of transmission structures. The effect of the transmission line on the area may depend on the topography, land cover, and existing land uses. In forested areas for example, the entire right-of-way (RoW) width is cleared and maintained free of tall-growing trees for the life of the transmission line. The result is a permanent change to the RoW land cover. In agricultural areas, heavy construction vehicles traverse the RoW and temporarily suspend the use of the land for crop production. After construction ends and the fields are properly restored however, the land beneath the line can be cropped or pastured. The degree of impact of the transmission line is determined by the quality or uniqueness of the existing environment along the proposed route. The quality of the existing environment is influenced by several factors:

1) The degree of disturbance that already exists

The significance of prior disturbance can be evaluated by determining how close the place resembles pre-settlement conditions. Many areas have been substantially altered by logging, the installation of drain tiles, residential and commercial developments, or conversion to cropland.

2) The uniqueness of the resources

Proposed transmission route is reviewed for species or community types that are uncommon or in decline in the region. The environmental review evaluates whether the resource possesses a feature that would make it unique, such as its size, species diversity, or whether the resource plays a special role in the surrounding landscape.

3) The threat of future disturbance

The resource is compared to surrounding land uses that may affect the quality of the resource over time. Considerations include whether the current and likely future land uses may threaten some aspect of the resource or whether the resource is valued by the adjacent community and therefore, likely to be preserved.

8.4.1 Impacts during the Construction stage

8.4.1.1 Impacts on Agricultural Lands

During the construction phase of this project, agricultural lands within the project area face significant impacts that can disrupt farm operations and increase operational costs for farm operators. The placement of transmission lines and associated structures introduces various challenges to agricultural activities:

- Disruption of Field Operations: The construction activities may disrupt regular field operations, complicating the movement of machinery and interrupting established fieldwork patterns crucial for efficient farming practices.
- Soil Compaction and Damage: Transmission structures have the potential to compact soils and damage drain tiles, compromising soil structure and the integrity of drainage systems vital for agricultural productivity.
- Safety Hazards: The installation of poles and guy wires poses safety hazards, presenting risks to farm workers and equipment operating in the vicinity.
- Interference with Irrigation: Transmission lines may interfere with the movement of irrigation equipment, limiting access to water resources essential for crop growth and management.
- Impediments to Land Use: The presence of transmission structures may impede future land consolidation efforts or subdivision for residential development, restricting the flexibility of land use within the project area.

Soil mixing, erosion, rutting, and compaction represent common challenges associated with transmission construction, all of which can significantly affect future crop yields and soil health. Excavation activities conducted for pole foundations or underground electrical lines may lead to soil mixing, highlighting the importance of avoiding the mixing of excavated parent material or subsoils with topsoils. Moreover, significant rutting may occur, particularly in areas with saturated or sensitive soils, exacerbating issues related to soil mixing, erosion, and compaction. The degree of soil compaction depends on soil type and saturation levels, with heavy construction equipment potentially exacerbating compaction concerns. Inadequate erosion controls during construction may lead to the erosion of valuable topsoils during rain events, impacting agricultural productivity and potentially affecting nearby wetlands and waterways. Proper protection and mitigation measures for agricultural soils during transmission line construction are crucial to prevent decreased yields in the years following construction. Therefore, it is imperative to implement effective management practices and adhere to environmental regulations to mitigate adverse impacts on agricultural lands, ensuring the long-term sustainability of farming operations within the project area.

8.4.1.2 Impacts to Endangered/Threatened and Protected Species and habitat

Endangered species, those whose continued existence is at risk, and threatened species, which are likely to become endangered, face potential disruption and habitat alteration during the construction and maintenance of transmission lines. Additionally, species classified under the Special Concern category, indicating suspected problems with abundance or distribution, may also be affected. The primary concern is the potential destruction of individual plants and animals or alterations to their habitat that render it unsuitable for their survival. For instance, trees utilized by rare birds for nesting purposes may be cut down, or soil erosion resulting from construction activities may degrade rivers and wetlands crucial for providing necessary habitat. To mitigate these impacts effectively, it is essential to map the

presence and distribution of endangered, threatened, and special concern species. Given the presence of vulnerable species in the area, the need for mapping is particularly crucial, as it informs targeted conservation efforts and proactive measures to protect these species and their habitats throughout the project lifecycle.

8.4.1.3 Impacts by Invasive Alien Species

Non-native plants found outside of their natural range can become invasive. Many non-native species are harmless because they do not reproduce or spread abundantly in their new surroundings. However, a small percentage of non-native species are able to become quickly established, are highly tolerant of a wide range of conditions, and are easily dispersed. Over time, non-native, invasive species can overwhelm and eliminate native species, reducing biodiversity and negatively affecting both ecological communities and wildlife habitats. Human actions are the primary means of invasive species introductions. Transmission line construction causes disturbance of RoW soils and vegetation through the movement of people and vehicles along the RoW, access roads, and laydown areas. These activities can contribute to the spread of invasive alien species. Parts of plants, seeds, and root stocks can contaminate construction equipment and essentially "seed" invasive alien species wherever the vehicle travels. Once introduced, invasive species will likely spread and impact adjacent properties with the appropriate habitat.

8.4.1.4 Impacts to wetlands

Wetlands occur in many different forms and serve vital functions including storing runoff, regenerating groundwater, filtering sediments and pollutants, and providing habitat for aquatic species and wildlife. The construction of the transmission line can impact wetlands in several ways including the following:

- Heavy machinery can crush wetland vegetation;
- Wetland soils, especially very peaty soils can be easily compacted, increasing runoff, blocking flows, and greatly reducing the wetland's water holding capacity;
- The construction of access roads can change the quantity or direction of water flow, causing permanent damage to wetland soils and vegetation;
- Construction and maintenance equipment that crosses wetlands can stir up sediments and endanger fish and other aquatic life;
- Clearing forested wetlands changes the habitat type for decades, and can expose the wetland to invasive and shrubby plants, thus removing habitat for species in the forest interior;
- Vehicles and construction equipment can introduce exotic plant species. With few natural controls, these species may out-compete high-quality native vegetation, destroying valuable wildlife habitat.

Any of these and other activities can impair or limit wetland functions. Organic soils consist of layers of decomposed plant material that formed very slowly. Disturbed wetland soils are not easily repaired. Severe soil disturbances may permanently alter wetland hydrology. A secondary effect of disturbance is the opportunistic spread of invasive weedy species such as *Phragmites* or other similar species. These invasive species provide little food and habitat for wildlife.

8.4.1.5 Impacts on Woodlands

These can be many and differently classified, based on the nature of the forests (natural or artificial) and their extent. In general, the following impacts can be recognised:

Forest Fragmentation

The transmission line RoW can fragment a larger forest block into smaller tracts. Fragmentation makes interior forest species more vulnerable to predators, parasites, competition from edge species, and catastrophic events. The continued fragmentation of a forest can cause a permanent reduction in species diversity and suitable habitat. This loss of forested habitat increases the number of common (edge) plants that can encroach into what was the forest interior. This encroachment can have impacts on the number, health, and survival of interior forest species, many of which are usually rare.

Invasive Plants
The activities associated with tree clearing and constructing a transmission line through or along the edge of forested areas can destroy and degrade forest habitat. Seeds and other propagating parts of non-native plants may be carried into a forest inadvertently by construction equipment. Disturbance caused by construction can then encourage aggressive growth of these invasive species. Habitat providing food and cover for local wildlife may be altered or lost if these invasive species out-compete existing native plants, resulting in a loss of plant and animal diversity.

Disease
Trimming and clearing trees at certain times of the year can also contribute to the spread of disease. The cause of the disease can be usually represented by fungi that can carried by sap-feeding beetles or spread through common root systems.

8.4.1.6 Other Impacts

A cleared RoW increases access into a forest which may lead to trespassing and vandalism. It can also provide recreation opportunities such as access for hunting.

- Habitat loss and alteration
Defined as the decrease in suitable habitat amount for organism and populations, and increase of habitat differentiations. Particularly during construction phase the route of the transmission line, the access roads to pole sites, at pole sites and staging areas will be undertaken the vegetation clearance. This impact will result into loss of vegetation cover, soil erosion in cleared areas and displacement of wildlife species that use the cleared areas as habitats. Furthermore, forest edges created by vegetation clearing could positively affect animal species from initial successional stages but negatively impacts forest-specialist species.

- Illegal hunting and human-wildlife conflict
The construction of a transmission line has resulted in illegal hunting and increased human-wildlife conflicts in the affected areas. As the project progresses, these negative impacts are likely to escalate, posing threats to both wildlife populations and human safety. Effective mitigation measures and proactive strategies are imperative to address these issues and ensure the sustainable coexistence of humans and wildlife in the project area.

- Human Disturbance
The presence of transmission lines may increase human activity in the area, including maintenance activities, vehicular traffic, and noise pollution. This human disturbance can further degrade habitats and disrupt wildlife behavior, particularly in sensitive areas such as breeding grounds or migratory routes.

8.4.1.1 Summary

The potential negative impacts expected to arise from the project construction on biological environment are summarized in the following matrix.

Table 8-7 - Matrix of negative impacts on biological environment during the construction phase.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Agricultural lands disruption and damage	Duration (D):	Medium	Medium-low	Short-mid-term	Negligible	Medium-high	Negligible
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Habitat degradation, disturbance and fragmentation	Duration (D):	Medium-long	Medium	Mid term	Medium	Medium-high	Low
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
Loss of flora and vegetation	Duration (D):	Medium	Medium-high	Mid term	Medium	Medium-high	Low
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Invasive alien species	Duration (D):	Long	Medium	Mid term	Medium	Medium	Low
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Impact to threatened and protected species and habitat	Duration (D):	Medium	Medium-high	Irreversible	High	Medium-high	Low
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Wetland alteration and degradation	Duration (D):	Medium-short	Medium-high	Long term	Medium	Low	Medium
	Frequency (F):	Sporadic					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Medium					
Desease	Duration (D):	Medium	Medium-high	Long term	High	Medium	Medium
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Illegal hunting and other human disturbance	Duration (D):	Medium-long	Medium-low	Short-mid-term	Low	Low	Low
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					

8.4.2 Impacts during the Operation stage

8.4.2.1 Impacts on Agricultural Lands

During the operational phase of the project, the placement of transmission structures may permanently alter land uses and disrupt existing windbreaks, leading to significant agricultural impacts within the project area. These impacts may include:

- Soil Erosion: The necessity to remove windbreaks for transmission line construction can increase soil erosion rates. Windbreaks, comprising rows of trees strategically planted along field edges or between fields, act as barriers against wind erosion and protect crops. Their removal may result in the permanent loss of topsoil, diminishing crop productivity and exacerbating soil degradation within the project area.
- Encroachment of Weeds and Pests: alterations to land use patterns due to transmission line construction can create opportunities for the encroachment of weeds and pests within the project area. Windbreaks can also serve as natural barriers that help deter the spread of weeds and pests into agricultural fields. Removal of windbreaks may lead to increased weed infestation and pest pressure, posing challenges to crop management and productivity specifically within the project area.

Preserving the integrity of windbreaks and implementing measures to mitigate soil erosion are critical considerations during the construction and operational phases of the project. Implementing strategies to protect existing windbreaks and adopting sustainable land management practices are essential for maintaining soil health and ensuring the long-term sustainability of agricultural operations within the project area.

8.4.2.2 Impacts by Invasive Alien Species

Infestation of invasive species can also occur during periodic transmission RoW maintenance activities especially if these activities include mowing and clearing of vegetation.

8.4.2.3 Mortality of birds and bats

This impact affects mainly bird species, but available evidence indicates that transmission lines could pose a collision risk and electrocution risk for bats and other mammals (as example, elephants). In the fieldwork, the presence of *Loxodonta Africana* is confirmed, specific mitigation measure to avoid mortality due to collision of this specie with the cable must be implement, such as incrementing the high of the transmission line.

Furthermore, bird electrocution and collision with transmission line is one of the negative responses to transmission lines and it has been observed mainly for raptors. Bird mortality from electrocution and collision could lead to population decline and for rare species, even at low mortality rates, this impact could lead to population extirpation.

The literature review highlights the presence of some endangered and critically endangered bird species in the project area. There are not georeferenced and recent data on endangered birds in the project area and further surveys focusing on these species need to be planned for detailed mapping before the construction. However, the presence of a transmission line in the area of a large number of IBAs suggests that the route will have a serious impact on the bird population, with consequent effects on the status of the species, population decline, etc. For this reason, the entire route of the transmission line must be considered a sensitive area for birds, where mitigation measures to reduce collisions must be implemented. It is therefore recommended that Bird Flight Diverters be installed along the entire line, with particular attention to areas where the line overlaps with the IBAs (see Figure 8-4), where the best bird collision avoidance systems should be implemented.

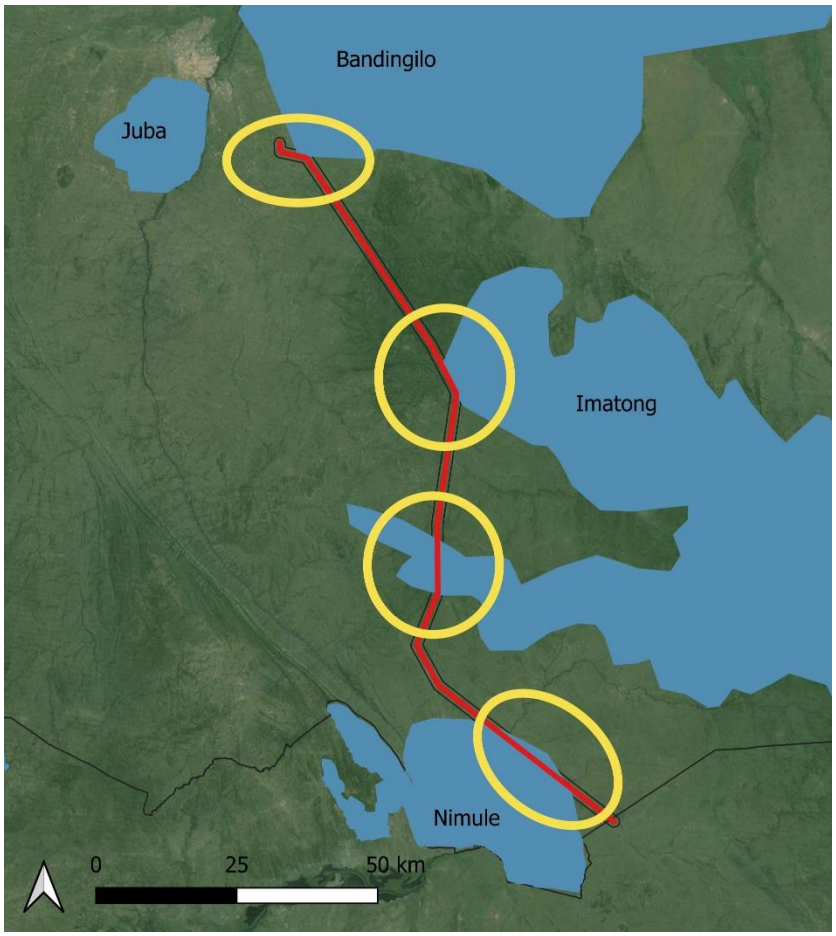


Figure 8-4 – Map of the transmission line route and IBAs overlapping and near to the project area. In yellow the macro-areas more sensitive for birds.

8.4.2.4 Illegal hunting and human-wildlife conflict

During the operational stage of a transmission line, instances of illegal hunting and human-wildlife conflicts persist as ongoing challenges. These issues pose threats to wildlife populations and human safety in the vicinity of the transmission line.

8.4.2.5 Habitat degradation and fragmentation

During the operating stage, transmission lines can cause habitat degradation and fragmentation for wildlife due to several factors:

1. **Vegetation Clearance**: Transmission lines often require the clearing of vegetation along their corridors to maintain clearance from transmission line. This vegetation clearance can lead to the loss of habitat for many species of plants and animals that rely on the vegetation for food, shelter, and breeding sites.
2. **Fragmentation of Habitat**: The construction of transmission lines can divide contiguous habitats into smaller, isolated patches. This fragmentation disrupts the natural connectivity of habitats, making it difficult for wildlife to move between areas.
3. **Barrier Effect**: Transmission lines act as physical barriers to some species movement. Animals may be hesitant to cross open spaces created by transmission line corridors, leading to isolation of

populations and limiting access to resources such as food, water, and mates. This can result in genetic isolation and reduced biodiversity within fragmented habitats.

8.4.2.6 Human Disturbance

The presence of transmission lines may increase human activity in the area, including maintenance activities, vehicular traffic, and noise pollution. This human disturbance can further degrade habitats and disrupt wildlife behavior, particularly in sensitive areas such as breeding grounds or migratory routes.

8.4.2.7 Electric and Magnetic Fields (EMF) Impact

The impacts of electromagnetic waves on organisms are still uncertain. However, some studies suspect that continuous exposure to an electromagnetic field (EMF) might generate behavioural changes and impact the reproductive success and the individual survival.

8.4.2.1 Summary

The potential negative impacts expected to arise from the project operation on biological environment are summarized in the following matrix.

Table 8-8 - Matrix of negative impacts on biological environment during the operation phase.

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Degradation of ecosystem services	Duration (D):	Medium-long	Medium	Irreversible	**Medium**	Medium	**Medium**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Loss of flora and vegetation	Duration (D):	Medium-long	Medium-low	Long term	**Medium**	High	**Negligible**
	Frequency (F):	Frequent					
	Spatial extent (E):	Regional					
	Intensity(I):	Medium					
Habitat degradation and fragmentation	Duration (D):	Medium-short	Medium	Irreversible	**High**	Medium	**Medium**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Regional					
	Intensity(I):	High					
Disturbance and mortality of avifauna and bats	Duration (D):	Long	Medium-high	Irreversible	**Very High**	Medium-l	**Medium**
	Frequency (F):	Frequent					
	Spatial extent (E):	Project footprint					
	Intensity(I):	High					
Habitat degradation and fragmentation	Duration (D):	Long	Medium-low	Irreversible	**High**	Medium	**Medium**
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	Low					
Electric and Magnetic Fields, noise effect	Duration (D):	Medium-long	Low	Irreversible	**Low**	None	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					

8.5 Positive Impacts on the Socio-Economic and Cultural Environment

8.5.1 Impacts during the Construction stage

8.5.1.1 Employment and Income

Positive opportunities for PAPs and communities can be in the form of temporary employment, as casual labour, cooking and cleaning services.
It is expected that some jobs will be available during construction of the power transmission line for the local population, mainly as casual workers. However, these employment opportunities are expected to be temporary and benefit the community in the short term only. There will be a moderately positive impact on employment, since limited number of people are likely to be employed. Nevertheless, it is a good opportunity in consideration of the poverty level in the region.

8.5.1.2 Small business opportunities

As for job opportunities, small business can raise during the construction phase, for all what concern the provision of services like the sale of food and other consumable goods to workers from other parts of the country and abroad.

Table 8-9 – Matrix of positive impacts on socio-economic and cultural environment during the construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Job opportunities	Duration (D):	Medium-long	Medium	Short-mid-term	**Medium**	High	**Medium**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Low					
Increase of business opportunities	Duration (D):	Medium-long	Medium	Short-mid-term	**Medium**	High	**Medium**
	Frequency (F):	Continuous					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					

8.5.2 Impacts during the Operation stage

8.5.2.1 Rural electrification

One of the most important anticipated benefits to the population is increased electricity supply to communities and households. With the additional energy supply, community institutions and trading centres could improve services, increase economic activity and accelerate their development in their areas of expertise. Effects of rural electrification are long terms and continuous, with high sensitivity in consideration of the lack of stable power in South Sudan.

Rural electrification will enhance the following aspects of livelihoods:

- Lighting: Rural electrification brings a significant improvement in lighting compared to traditional methods like candles. This translates to brighter and more energy-efficient light sources like fluorescent lamps. Additionally, connecting to the grid ensures reliable lighting, unlike candles that can be easily extinguished and require constant refilling.
- Education: energy access allows schools to be equipped with modern technologies, providing a better service. Schools can benefit from the use of appliances such as computers, printers, and copying machines and water and clean cooking.

- Communication and entertainment: With the advent of cheaper energy access, television is more accessible to consumers. Their value may be estimated by the increase time of usage. Grid electricity also makes easier charging mobile phones easing communication and empowering rural businesses.
- Productivity: businesses are empowered through the timesaving resulting from the use of electrical appliances. For example, it allows to operate at lower costs larger machines that are required for agro-processing and producing trade, both sectors with a significant value adding potential in rural areas.
- Health: Improvements in health levels are a consequence of a multitude of factors. For instance, the possibility to operate water pumps allows an increase in hygienic standards; the reduced use of kerosene lamps, instead, reduces respiratory illnesses, relieving private and public healthcare. As reported by other studies in similar conditions connection to the grid can enhance the use of computers, printers, and copying machines, but also autoclaves, kettles and boilers. Other use of devices such as microscopes, fridges, freezers, and radio call antenna can guaranteed with grid connection, instead of generators as it happens.

Table 8-10 – Matrix of positive impacts on socio-economic and cultural environment during the operation phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features - Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Rural Electrification	Duration (D):	Long	Very high	Irreversible	Very High	High	Very High
	Frequency (F):	Continuous					
	Spatial extent (E):	Regional					
	Intensity(I):	High					

8.6 Negative Impacts on the Socio-Economic and Cultural Environment

8.6.1 Impacts during the Construction stage

8.6.1.1 Physical Displacement

The project will lead to land acquisition for transmission line right of way, causing permanent loss of land ownership for a number of families. Physical displacement can be also secondary, due to the presence of Internal Displaced People (IDP) connected to conflicts.
However, it is highlighted that the transmission line mostly passes in inhabited or sparsely populated areas. As a matter of fact, out of a total of 14 impacted structures, 12 are abandoned and 2 are currently in use, i.e. a police office and a mud hut. For this reason, the intensity and the sensitivity of the physical impact are judged low. This impact shall be mitigated by adequate compensation of the property losses equal to market price with assistance for relocation. Land is an important asset in South-Sudan in general and in the project area in particular, as the majority of the people rely on land-based livelihoods.
The impact will have a medium duration, since the procedure of land survey, land acquisition will take approximate a year and will be continuous throughout all the RAP process. The mitigation effectiveness is medium-high since the RAP give the possibility to compensate for the loss of structures paying the asset at full replacement costs, giving assistance in finding alternative land and in moving in the new locations. Therefore, the impacting factor is considered low and will have a negligible residual impact.

8.6.1.2 Economic Displacement

Economic displacement refers to the loss of income streams or means of livelihood resulting from land acquisition or obstructed access to resources (land, water, or forest) resulting from the construction or

operation of a project or its associated facilities. As specified above, the transmission line will require the permanent land acquisition of the Right of Way, that is a 10 m strip along the transmission line.
Cultivation of seasonal crops and grazing/pastoral activities are likely to continue in the right of way / wayleave, although crop damage and restrictions to livestock movement is expected to occur during the construction phase (conductor stringing activities) and possibly also during site specific repair and maintenance interventions.
Restricted land use will forbid the cultivation of trees in the RoW and the erection of new buildings or other physical structures. Along the wayleaves (25 m on each side of the RoW) the cultivation of trees below 1,8 m will be still allowed.

According to the analysis, the agricultural land that will be impacted represent less than 1% of the project footprint, since most of the corridor is occupied by shrubs, herbaceous vegetation, forest and by urban areas for a minimum part. In consideration of this, the permanent loss of productive land can be considered negligible as intensity of the impact (less than 1%). The impact will have a medium duration, since the procedure of land survey, land acquisition will take approximate a year and will be continuous throughout all the RAP process. The sensitivity was marked at medium, because the impacted people losing agricultural land (even if in low number) are temporarily deprived of their main source of livelihood. The impact is compressively rated high.
Despite this, given that affected people are relatively low in number, they can still cultivate their land and the project will give agricultural assistance as restoration measure, the effectiveness of the mitigation measures is expected to be medium-high. Therefore, the residual impact results low.

8.6.1.3 Physical Cultural Resources

The survey has detected 3 graves and a valuable tree affected by the proposed transmission line.
The impact is medium-long since it will happen during all the tower foundation works and it will be strictly localized to the RoW. The intensity is rated negligible and the sensitivity is low, even if the impact is irreversible. This kind of impact can be mitigated through appropriate measures, e.g. relocation of small holy places. Monetary provision (contingency) considered in the RAP budget and chance finding procedure included in ESMP for the undetected PCR. For this reason, the mitigation is considered medium high. The impact is rated low, and it can be reduced to negligible importance through the application of mitigation measures.

8.6.1.4 Disturbance during construction

Communities living in the proximity of project construction corridor will be affected by temporary disturbance factors, such as noise, air pollution, traffic that will affect Community health and safety.
The impacts will continue for all the project implementation, nevertheless being the project linear the disturbance will follow the progress of tower constructions and line stringing. Therefore, all the location nearby the line will be impacted for few months only, for this reason the intensity is low and the sensitivity is medium low, with reversible effects and high mitigation effectiveness with a well implemented ESMP. The overall impact is rated as negligible.

8.6.1.5 Sexual Harassment

Large influx of male labor may also lead to an increase in exploitative sexual relationships and human trafficking whereby women and girls are forced into sex work. The impact will be continuous during all the project construction and it will have a local extension, the intensity is considered high since conflict-related sexual violence against women and girls is widespread and systematic throughout South Sudan[22]

[22] Human Rights Council, 2022

Sensitivity therefore is considered high as well and the impact irreversible, nevertheless still manageable through prevention and proper awareness training, workers code of conducts and effective GRM.
The impact is judged potentially very high, but can be appropriately mitigated and reduced to a medium residual value.

8.6.1.6 Increase of social conflicts

The risk of social conflicts in the project area can be triggered either by land conflicts or by the influx of workers with different lifestyles or cultural backgrounds on the host community, in particular issues such as religious or other cultural proscriptions, local traditions and community structure and the relationship between men, women and youths. For this reason, the intensity of the impact is considered medium and the sensitivity medium high, nevertheless with a goof GRM, stakeholder engagement and workers awareness the impact is mitigable. During the first two consultation phases, field activities were hampered by a very fragile security situation near the border with Uganda. In the next stages of the project, it will therefore be essential to ensure the direct involvement of other institutional actors, starting with the Minister of the Interior. The objective will be the creation of a coordination unit or ad hoc committee including, UETCL, SSEC and Lenders focusing on security issues, to be activated in cooperation with other interested ministers or departments, to follow the process of activities on the ground and ensure the presence of security personnel. The overall impact is rated high, but the application of mitigation measures allows to reduce to a low residual impact.

8.6.1.7 Increase of STD and VBD

HIV prevalence in South Sudan is estimated at 2.7% among 15–49-year-olds and there are an estimated 200,000 people living with HIV in the country[23]. The number of both new infections and AIDS-related deaths in South Sudan are estimated to have increased by 3% since 2010 , an oppose trend compared to sub-Saharan countries where HIV incidence is under control or decreasing[24]. Women and girls constitute 64 per cent of new infections. Female sex workers and their clients are estimated to make up 54 per cent of all new HIV infections. Young people and other key populations, particularly sex workers and persons with disabilities, have poor access to integrated sexual and reproductive health (SRH) information and services, including knowledge of their HIV status and HIV prevention. Poverty, insecurity and limited availability of quality information and services on reproductive health and prevention of sexually transmitted infections and HIV remain key barriers for marginalized populations including internally displaced persons, youth, and sex workers accessing health services.[25] WHO South Sudan Report2018 reports that South Sudan in the year has identified more than 10 000 cases, 76% of whom were pulmonary and 12% had TB/HIV co-infection. Regarding malaria, it is endemic in the Country, with highest prevalence in the north of the country. World Health Organization (WHO 2020) reports that malaria deaths in South Sudan reached 5,342 or 6.37% of total deaths.

In consideration of the actual situation, the influx of workers from abroad or form other parts of South Sudan can increase the transmission of HIV and TB through contact with local communities, while poor management of water resources in camp or construction sited could increase the spread of malaria mosquitos. The community of the project is well aware on the risk and prevention practices of these

[23] UNAIDS. South Sudan | UNAIDS 2019
[24] Hakim AJ, Bolo A, Werner M, Achut V, Katoro J, Caesar G, Lako R, Taban AI, Wesson J, Okiria AG. High HIV and syphilis prevalence among female sex workers in Juba, South Sudan. PLoS One. 2020 Sep 28;15(9):e0239543. doi: 10.1371/journal.pone.0239543. PMID: 32986767; PMCID: PMC7521730.
[25] UNFPA. South Sudan

diseases though awareness campaigns conducted by the Government and NGOs. Hence, the impact has been considered medium highly sensitive, irreversible. Nevertheless, mitigation effectiveness has been considered high, because with an Occupational and Community Health and Safety in place the risk can be extremely reduced and managed (medium residual impact).

8.6.1.8 Child Labor

The country's 2008 census found that 45.6 per cent of children aged 10—14 was engaged in work, with 60.2 per cent of them in agriculture. Nearly all street children in Juba are involved in some form of child labour. UNICEF describes child labour as 'endemic' to South Sudan[26]. Labour is found in many economic sectors and predominantly in the agricultural sector. While in the construction sector child labor is found in activities such as building and transporting materials, rock breaking, making bricks, gold mining[27] A Contractor will require local workforce for casual labour and in consideration of this trend the potential risk for the project to increase child labour is high and the impact highly frequent, highly intense and irreversible. Construction works, or quarry activities are considered as heavy work that can compromise the development of children, therefore also the residual impact remain high.

8.6.1.9 Summary

The potential negative impacts expected to arise from the project construction on socio-economic environment are summarized in the following matrix.

Table 8-11 – Matrix of negative impacts on socio-economic and cultural environment during the construction phase

Impact Factor	Impact Factor Features		Component Sensitivity	Impact Features Reversibility	Impact Value	Mitigation effectiveness	Residual impact value
Physical displacement	Duration (D):	Medium	Low	Irreversible	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Economic displacement	Duration (D):	Medium	Medium	Irreversible	**High**	Medium-high	**Low**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Physical Cultural Resources	Duration (D):	Medium-long	Low	Irreversible	**Low**	Medium-high	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Negligible					
Disturbance during construction	Duration (D):	Medium-long	Medium-low	Short-term	**Negligible**	High	**Negligible**
	Frequency (F):	Continuous					
	Spatial extent (E):	Project footprint					
	Intensity(I):	Low					
Sexual harassment	Duration (D):	Medium-long	High	Irreversible	**Very High**	Medium-high	**Medium**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Increase of social conflicts	Duration (D):	Medium-long	Medium-high	Irreversible	**High**	High	**Low**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	Medium					
Increase of STD and VBD	Duration (D):	Medium-long	High	Irreversible	**Very High**	Medium-high	**Medium**
	Frequency (F):	Sporadic					
	Spatial extent (E):	Local					
	Intensity(I):	High					
Child labor	Duration (D):	Medium-long	High	Irreversible	**Very High**	Medium	**High**
	Frequency (F):	Frequent					
	Spatial extent (E):	Local					
	Intensity(I):	High					

[26] UNICEF, Situation Assessment of Children and Women in South Sudan. 2015
[27] 2018 FINDINGS ON THE WORST FORMS OF CHILD LABOR

8.6.2 Impacts during the Operation stage

8.6.2.1 Disturbance during operation and maintenance

Communities living in the proximity of project construction corridor will be affected by temporary disturbance factors, such as noise, air pollution, traffic and damages to crops. The impacts could happen during maintenance operations. Physical damages to crops will be compensated while disturbance will be limited in time, therefore the impact during operation is considered negligible.

8.6.2.2 Land use

Changes caused by project's development could be permanent or temporary, and direct or indirect, as follows:

- Permanent direct impacts: such impacts will occur on the entire Transmission Line corridor, including land acquired and land whose use will be restricted with easements. Land will be acquired at the substation, tower locations and for roads (in practice, a small portion of land will be needed for roads). Most livelihoods activities such as production of annual crops, fruits trees that do not grow over a certain height, and grazing of livestock are allowed under easement agreements. Thus, the restriction on use will be legal but will not require changes in most uses. However, forests and orchards will be changed permanently since trees will be cut in the vegetation control zone and not allowed to grow over four meters high in future.
- Temporary direct impacts: land use will be affected temporarily during the construction phase for construction storage and staging areas near the tower locations and for a construction staging area and offices near the substation. Wires stringing would stay mostly on access roads and in the corridor, so would affect little or no additional land; however, it is possible that conductor stringing would cause some impacts on land plots (damage to crops, fences, etc.).
- Temporary restriction of access to land: access to areas under construction will be limited while construction is underway. Such restrictions will be temporary, no more than a few hours or days, and would apply to relatively small areas at any one time. In addition, improper construction practices can lead to temporary or permanent changes in land use due to erosion, landslides, unnecessary vegetation clearance, landslides, and other undesirable events.

Estimated direct impact on land use, based on land cover classification by Copernicus satellite imagery, along the transmission line route are provided in the following table.

Table 8-12 – Estimated direct impact on land use, based on Copernicus land cover classification.

State	County	Sub-County	Land Use	Right of Way (ha)	RoW + Wayleave (ha)	Total (ha)
Central Equatoria	Juba	Gondokoro	Herbaceous vegetation	0.57	3.39	3.96
			Shrubs	5.67	34.13	39.80
			Sub-total	*6.23*	*37.52*	*43.75*
		Lobonok	Closed forest, unknown	0.34	2.06	2.40
			Cultivated and managed vegetation/agriculture	0.07	0.63	0.70
			Herbaceous vegetation	6.34	37.12	43.46
			Open forest, deciduous broad leaf	0.50	2.99	3.49
			Open forest, unknown	10.51	63.92	74.43
			Shrubs	13.25	79.33	92.59
			Sub-total	*31.01*	*186.06*	*217.07*
		Lokiliri	Closed forest, deciduous broad leaf	3.56	21.29	24.85
			Closed forest, unknown	6.40	39.25	45.65
			Herbaceous vegetation	6.79	40.77	47.56
			Open forest, deciduous broad leaf	4.51	26.66	31.17
			Open forest, unknown	16.42	98.53	114.95
			Shrubs	5.53	32.86	38.39
			Sub-total	*43.23*	*259.35*	*302.57*
			Juba Total	*80.47*	*482.93*	*563.40*
Eastern Equatoria	Magwi	Mugali	Closed forest, deciduous broad leaf	0.10	0.63	0.73
			Closed forest, unknown	0.08	0.54	0.62
			Herbaceous vegetation	9.04	54.12	63.16
			Open forest, deciduous broad leaf	0.02	0.15	0.17
			Open forest, unknown	0.22	1.29	1.51

State	County	Sub-County	Land Use	Right of Way (ha)	RoW + Wayleave (ha)	Total (ha)
			Shrubs	0.17	0.99	1.16
			Sub-total	***9.62***	***57.73***	***67.35***
		Pageri	Closed forest, unknown	0.64	4.01	4.66
			Cultivated and managed vegetation/agriculture	0.97	5.98	6.95
			Herbaceous vegetation	18.49	111.29	129.78
			Open forest, unknown	17.62	106.44	124.07
			Shrubs	20.89	123.93	144.82
			Sub-Total	*58.61*	*351.66*	*410.27*
			Magwi Total	*68.23*	*409.38*	*477.62*
			Final Total	***148.70***	***892.31***	***1,041.01***

8.7 Transboundary and cumulative impacts

Transboundary impacts on the two affected countries (Uganda and South Sudan) are considered in terms of wildlife movements and cross border security. The project analysed the wildlife migration patterns in both countries and identified the section of the project subject to the migratory routes, both Countries have to develop a specific biodiversity management plan to manage the possible impacts on migratory fauna. For what concern security, as stated in the previous chapters, the border of the two Countries is characterized by a very fragile security situation. These difficulties relate to the section of the power line route through Lamwo district territory. In the next stages of the project, it will therefore be essential to ensure the direct involvement of other institutional actors, starting with the Minister of the Interior. Contractors are required to develop their own security management plan.
It is recommended that UETCL and SSEC project unit will set up a special committee for the management of transboundary issues: it can be structured starting from respective ESMD and Grievances Committee, using the same funds. No other transboundary impacts except the ones between the two considered countries can be envisaged.

Cumulative impacts are impacts which result from the incremental impact of a proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Potential cumulative impacts could arise in the following environmental and social components: soil degradation and site related oil spills, loss of flora, proliferation of invasive species, solid waste, air quality, noise and vibration, increased traffic, strain in water resources, strain on natural resources due to construction materials requirements (sand, stone, gravel, etc.), increased demand of firewood, social impacts including labour influx, crime, disruption of services, increased conflicts, impacts on children and vulnerable groups, gender-based violence, sexual exploitation and abuse.
These potential cumulative impacts could occur if the construction of other nearby projects is performed simultaneously with the implementation of the proposed transmission line project.
Other potential cumulative impacts could arise during the normal operation of the OHTL and annexed substations, in particular the risk for collision and electrocution of wildlife and avifauna and the creation of an electromagnetic field around the conductors, in case of concurrent or future implementation of other transmission lines in the vicinity.

In particular, the presence of other transmission lines in the area may contribute to increase the impacts on bird species. However, detailed information on planned projects and infrastructure in South Sudan is very scarce and the development of such infrastructures will not be immediate.
According to the information collected during the site visit, there are no other existing (or under construction) transmission lines in the proximity of the Interconnection project route. Furthermore, no information is available on future planned transmission lines crossing the Interconnection project route. Conversely, during the land survey some limited information have been collected on a prospective future urban / industrial development area in the proximity of Nesitu substation, close to the existing solar power plant.
The Interconnection project already includes rigorous mitigation measures to reduce the risk of bird collision and electrocution, including bird flight diverters along the entire route and ongoing monitoring to ensure that the cumulative impacts are mitigated.
There would also be cumulative impacts on habitat (and therefore species). These would be directly proportional to the amount of ground disturbed and would be limited to the transmission line right of way. Cumulative impacts also depend to some extent on whether or not other construction activities in the project area are concurrent or overlapping. Increased land acquisition, traffic and possibly increased

habitat disturbance could result from concurrent construction. However, there are no projects under construction in the project area and implementation of the mitigation measures identified for the proposed project will ensure that impacts are mitigated.

8.8 Possible effects of climate change on the Interconnection project

A specific overview of climate change scenario in South Sudan, according to available information from international agencies, is provided in Annex 5.

Changing climatic conditions in South Sudan are significantly impacting the region's rainfall and temperature patterns, leading to irregular seasonal precipitation. GCM predictions indicate that rainfall patterns in South Sudan may intensify during most seasons from 2011 to 2030. These changes could have severe consequences for the environment and the livelihoods of households across the nation. Notable impacts include increased events of droughts and heightened flooding. Additionally, there is a growing trend of experiencing both floods and droughts within the same season, with droughts occurring earlier and floods later than usual, particularly around May/June and August/September, respectively. Moreover, flooding has become more severe, especially in the northern part of the country, with floodwaters taking longer to recede.

GCM models predict that mean annual temperatures will rise by 1°C by 2060 compared to 2020 values. Due to temperature changes, the resulting hotter climate will amplify drought effects in South Sudan. Any observed warming of more than 1°C is equivalent to a further decrease of 10-20% in rainfall. Reduced and variable rainfall may lead to more flooding as rains become unpredictable and inconsistent in volume. This is already being observed in several parts of the country.
South Sudan is particularly vulnerable to the effects of climate change because its population is heavily dependent on climate-sensitive industries, such as rain-fed agriculture, for their livelihoods and food security. Climate change is predicted to affect not only agriculture but also the energy, tourism, water, and health sectors.

As a consequence of this climate change framework, the 400 kV Interconnection project could be subject to the negative effects of increased natural hazards, in particular flooding and hydrogeological risks. Focusing on these aspects, it is underlined that the transmission line route crosses some rivers, especially close to the border with Uganda: it is worth to mention Nyimur and Ateppi rivers, both tributaries of Achwa river, and Kit river, tributary of White Nile.

It is considered unlikely that climate change would have a significant effect on the Interconnection project. However, some events exacerbated by climate change could affect the transmission line under some circumstances. Such events could include:

- Floods and flash floods: although the line will cross several rivers, damage from floods is unlikely. To cope with this risk, tower foundations shall be properly designed and will not be located inside or close to any rivers or waterways.
- Landslides and mudslides: rainfall induced landslides and mudslides could occur, but project design will evaluate such risk and avoid such areas or foundations and towers shall be designed with a safety factor that would lead to resistance to major damage from all but the most severe slides.
- Wind: extreme winds may cause line breakage or even tower failure. However, the project design will consider maximum expected winds in towers and line’s design.

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The purpose of the Environmental and Social Management Plan (ESMP) is to describe in detail the possible actions that must be taken to ensure that identified impacts will be mitigated as much as possible.
Most of the impacts, which occur during the construction phase, can be reduced, or avoided through the application of sound construction management guidelines.
Some impacts will be permanent and cannot be mitigated. In some cases, these impacts will be compensated, or enhancement activities will be implemented. Enhancement is an important part of the overall management plan as it is used to improve existing environmental conditions, restrict any likely environmental degradation (which is not directly related to the project) in the future, and it can form a part of compensatory measures.
For each of the potential environmental and social impacts described in Chapter 8, measures are suggested either to prevent those impacts or to mitigate their effects. This chapter presents the various preventative and/or mitigation measures proposed for the different types of impacts, the responsible agencies, and where these are not part of the usual construction or operation activities, the cost estimates and duration of the measures.
As with the description of the impacts, the environmental measures are presented here in two parts:
Pre-construction and construction of Project facilities; Operation of the Transmission Line and relevant Substations. This Environmental and Social Management Plan (ESMP) further acts as a framework for the Contractor to develop its mitigation and management plans. SSEC and the Contractor will be required to develop standalone mitigation and monitoring plans, implementing the requirements contained within this document as a minimum, according to the responsibilities specified in the subplans.
SSEC will have the overall responsibility for the compliance of the scheme during the construction and operation phases and for the implementation of the mitigation measures outlined within this ESMP.
SSEC will ensure that the agreements will legally oblige the Contractor to comply with this ESMP using the GIIP (Good International Industry Practices) and enforcing the principle that the stricter among national and international standard applies.
SSEC shall monitor the Contractor's performance and all subcontractors on a regular basis, and will undertake the following throughout the duration of the construction period:

- review the effectiveness and comprehensiveness of Contractor's documents (for example, associated sub-management plans, procedures, and mechanisms for reporting, record keeping and auditing) against the requirements of this ESMP;
- undertake regular audits;
- set up a contractor reporting structure; and
- conduct meetings at a sufficient frequency to ensure E&S is a priority agenda item.

Mitigation measures described for the operational phase will be implemented by SSEC.
To furtherly detail the necessary mitigation and management actions of ESMP, the Contractor shall provide the following Sub-Plans, which shall be developed as guidelines for minimizing environmental impacts from specific activities of the Project, primarily during construction.

- SP01: Erosion and Sediment Control
- SP02: Water Pollution Control
- SP03: Air pollution and Dust Control
- SP04: Noise and Vibration

- SP05: Waste Management
- SP06: Hazardous Material Management
- SP07: Vegetation Clearing
- SP08: Biodiversity Management
- SP09: Construction and management of Work Camps
- SP10: Traffic and Access
- SP11: Cultural Heritage and Chance Finding Procedure
- SP12: Occupational and Community Health and Safety Management
- SP13: Stakeholders Engagement
- SP14: Local Employment
- SP15: Contractor Management
- SP16: GBV/SEA/CAE

The Environmental and Social Management Plan (ESMP) will be updated and/or revised, both for construction and operation phases, to adapt the measures to the prevailing conditions and/or additional monitored impacts during the construction period.
Additionally, to strictly prevent and decrease the impacts or to mitigate their effects, the Contractor's Environmental Management Plan (Contractor's EMP) shall be developed both for the Environmental and Social Management and Monitoring Plan (ESMMP) and Site Specific Environmental and Social Management and Monitoring Plan (SSESMMP), to comply with AfDB's guidelines and requirements.
The details of ESMMP and SSESMMP shall be presented in terms of:

- Reporting requirements;
- Emergency response procedures;
- Capacity development and training measures;
- Performance indicators to check the effectiveness of the mitigation and management actions considered;
- Residual impacts analysis and provision of relevant compensatory measure (also in monetary terms); and

The monitoring measures shall include parameters, methods and sampling locations for the Project environmental aspects.

9.1 Mitigation Hierarchy Approach

The identified environmental and social impacts will be mitigated according to the mitigation hierarchy, which consists of 5 steps:

- Avoid
- Minimize
- Rectify
- Reduce

- Offset

The hierarchy begins from the most beneficial method of mitigation and goes on to the least beneficial method of mitigation (see Figure 9-1).

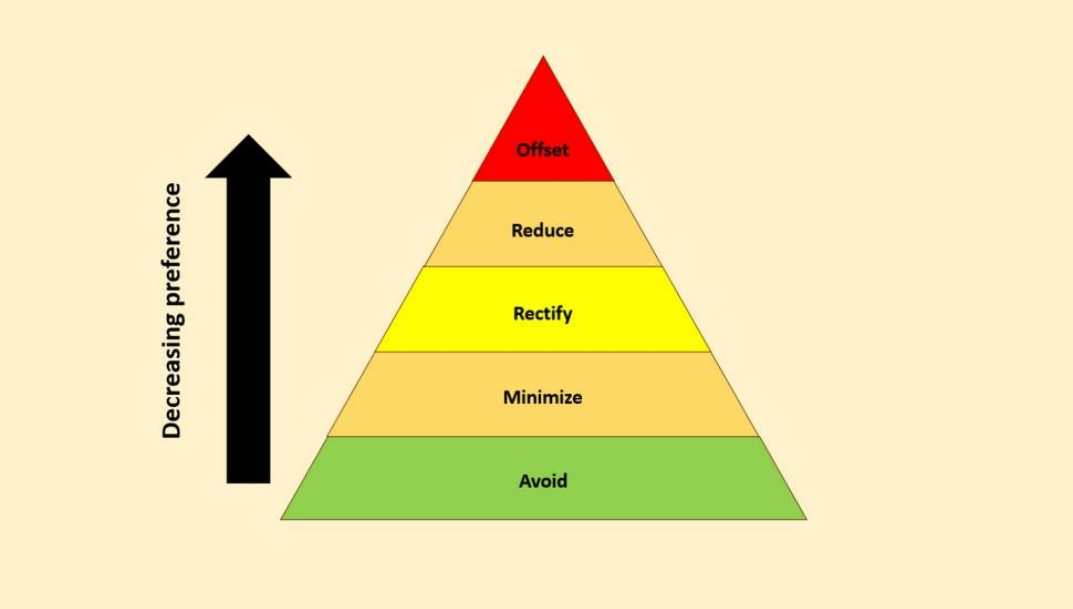


Figure 9-1 – Mitigation Hierarchy

Avoidance is the first step in the mitigation hierarchy. It is the complete mitigation of an impact, by preventing it from happening. It is obviously the most preferred form of mitigation because it ensures no environmental damage. One of the scopes of the analysis of alternatives, described in the previous section, is to avoid as much as possible the impacts by selecting the less impacting line route. The avoidance of the impact will be furtherly considered in the ESIA analysis by trying to avoid as much as possible the most significant impacts by furtherly moving the location of the towers in the tower spotting phase. It is worth reminding that the route selection intends to identify the best corridor (500 m wide) where the final alignment will be located. The tower spotting phase and the definition of the final alignment will allow further impact avoidance.

The second step in this hierarchy is **minimize**. If the impact cannot be completely avoided, it shall be minimized to ensure that minimal damage is done to the environment. Also, this is one of the scopes of the of the line route selection phase (i.e., if the line shall not avoid the crossing of a forested area, the line route selection phase allows to select the one that crosses the less forested area or the one with less ecological values, etc). This criterion is furtherly used in the tower spotting within the selected corridor.

Third, is **rectify**. Rectification of an impact implies that an impact will happened and can only be managed by enhancement, restoration, or revegetation of degraded or former habitat, etc.) In a way, rectification tries to correct the mistake that led to the adverse environmental impact. This is a mitigation strategy that applies generally during the construction stage. These measures will be detailed in the ESMP.

If rectification is not possible, the **reduction** of the extent of the impact through management practices and/or change is the further mitigation strategy. Also, these measures will be detailed in the ESMP.

When even reduction is not possible, the final step of the mitigation hierarchy applies: environmental offset. Environmental **offset** is commonly defined as actions taken outside of the development site to compensate for the impacts in the development site. In fact, this means that the development authorities undertake environment conservation activities to compensate for what they do to achieve

"no net environmental loss", or more specifically "no net biodiversity loss". Such environmental mitigation strategy of the hierarchy will be considered if the previous ones will not achieve the "no net biodiversity losses" targets, will be described in the ESIA and developed during the construction phase.

9.2 Implementation responsibilities

The proponent (SSEC) will be the overall responsible for the implementation of the ESMP. It will hire the experts and staff necessary to formulate the proposed plans in the ESMP through consultative processes with relevant stakeholders. Each plan/program/measure will be disclosed to the stakeholders and agreements made with them to ensure implementation viability. The ESMP is meant to be adaptable to changes that may occur in the project area, policy and regulatory mechanisms, and stakeholder concerns and views.

An Environmental and Social Management Division (ESMD) within the project structure will actively liaison with the concerned stakeholders and Government of South Sudan (GOSS) agencies to assure a smooth implementation of the plans.

Different parties to be involved directly and indirectly for environmental management of the proposed project components include among others:

- Donor Agencies;
- Project Management Unit of SSEC;
- Supervising Engineers for SSEC implementation;
- Construction Contractor; and
- Regional and Local level political and governmental institutions, Community-based Organizations (CBOs), etc.

The effective implementation of ESMP will require a continuous monitoring of its environmental performance, and where necessary initiate appropriate planning and implement corrective actions to rectify any shortfalls in performance that may occur. The standard is based on the methodology known as Plan-Do-Check-Act principle, which can be briefly described as follows:

- Plan: establish the objectives and processes necessary to deliver results in accordance with the organization's environmental policy.
- Do: implement the processes.
- Check: monitor and measure processes against environmental policy, objectives, targets, legal and other requirements, and report the results.
- Act: take actions to continually improve performance of the environmental management system.

To complete this cycle, SSEC will adopt the following approaches in the implementation of Environmental and Social Management Plan (ESMP).

Partnership Approach: The partnership principle implies close cooperation between the SSEC and interested agencies at county and national level, NGOs and CBOs at local. Although SSEC ESMD (Environmental and Social Management Division) will lead the project's environmental activities, it will accommodate all the concerned people and institutions that have roles and responsibilities in the planning, implementation and monitoring of environmental mitigations. Similarly, a monitoring committee will be developed in the county to perform joint monitoring of the impact mitigation measures carried out by different service providers (among which also NGOs shall be involved).

Involving Community Based Organizations: recent evolution of community organizations has strengthened the view that these bottom-up organizations are more effective in addressing local needs than larger charitable organizations.
Information Sharing: throughout the project construction and operation period, SSEC ESMD will play coordinating roles with agencies and stakeholders in the district. Information sharing is another important aspect to building cooperation between the stakeholders and the project.
The ESMD will have three sections namely Environmental Section, Grievance Section and Social Section.
Environmental Section will be responsible for implementing physical and biological mitigation and enhancement programs and relevant monitoring activities, as well as compliance monitoring of programs implemented by the contractors as per contractual agreement.
Social Section will work on land acquisition and compensation, resettlement and rehabilitation, community development, livelihood programs, health related programs, etc. and relevant monitoring of social programs implemented by the project and compliance monitoring of programs implemented by the contractors as per contractual agreement.
Grievance Redress Organization will work with Project Affected Persons (PAPs) to raise their concerns and grievances to the Project in a transparent manner over the agreed procedural steps.
During the project construction phase, ESMD will be a full-fledged office, but it will be reduced in size as Environmental and Social Management Organization (ESMO) during the operation phase. Functions and responsibility of ESMO will be influenced by the findings of the Environmental and Social Audit conducted by the project through outsourced agency within three months of the completion of the construction work, which will assess the environmental and social compliance during construction phase, identify the emerging problems, assess the environmental and social works to be done, and recommend mitigation and enhancement measures to be implemented during operation phase.
The ESMD will review Environment Protection Plan, Health and Safety Plan, Waste Management Plan, and other environmental and social plans prepared by the contractors and assist the Project Director Office for their timely approval. Liaison with local communities, agencies, NGOs/CBOs, and other major stakeholders will be the major task of ESMD Environment Manager.

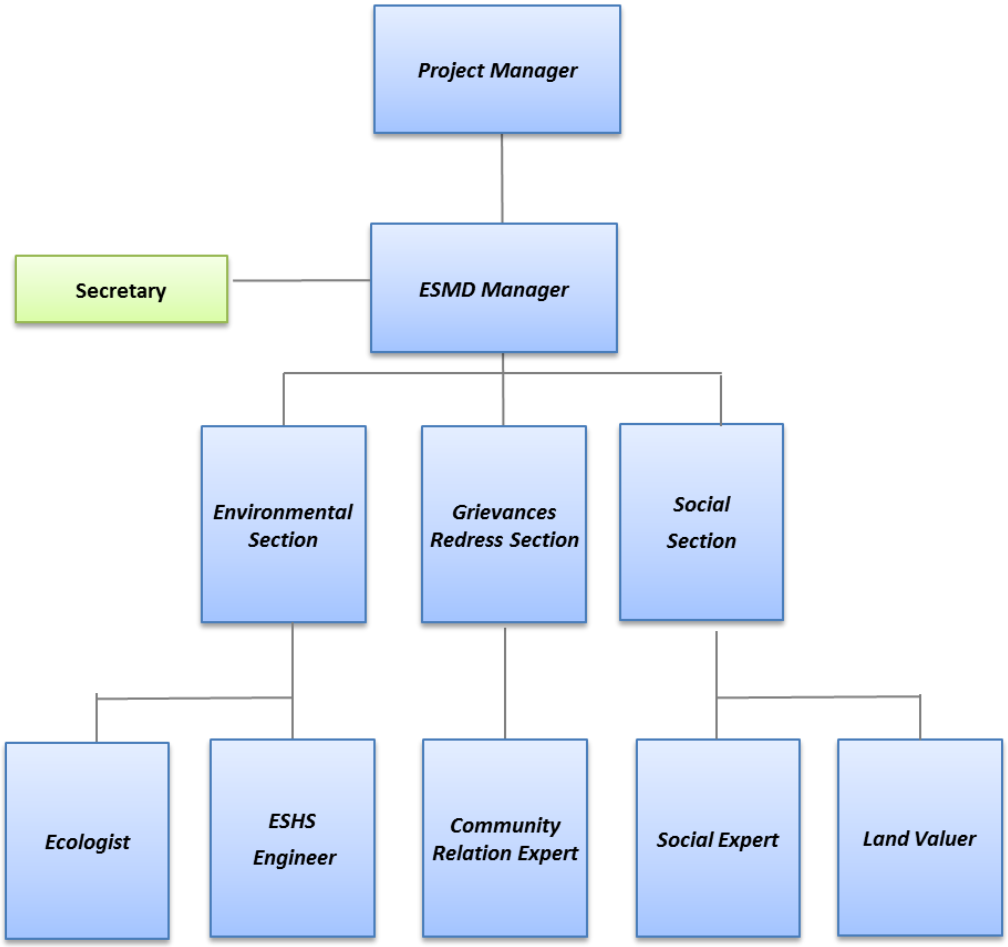


Figure 9-2 – ESMD Organization Chart

9.3 Environmental and Social Management Matrix

Project will implement environmental programs as compensatory, protective and enhancement measures in the project area. These programs will be implemented directly by the project in partnership /association with local and county level public and private stakeholders, and by contractors as per contractual agreement under the guidance and supervision of the project ESMD. Environmental programs are summarised in the tables below: Table 9-1 refers to physical environment, Table 9-2 refers to the biological environment and Table 9-3 refer to the social environment.

Table 9-1 – Mitigation and management measures on physical environment

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
Climate	Substations	▪ establish a lifecycle approach for SF_6 management through company policies, protocols, and standard operating procedures; ▪ establish procedures for gas inventory, accounting, and tracking. Including labelling, inventory and storage of gas cylinders, using log sheets for warehouse cylinders, and inventorying all SF_6 equipment; ▪ Train employees annually in SF_6 handling and in using the necessary equipment. ▪ recycle SF_6 gas at equipment servicing or disposal; ▪ track leak history of equipment to identify priorities for repairs and replacement; ▪ implement leak detection and repair strategies. Leak detection with soap and water solutions, bagging, or thermal imaging to detect minor, chronic leaks without taking equipment out of service. Leak detection teams regularly inspect equipment to identify SF_6 leaks and prioritize repair or replacement; ▪ upgrade equipment to reduce SF_6 use and leaks. New equipment designs use less SF_6 and tighter seals to reduce leaks; ▪ evaluate alternatives to SF_6, like vacuum-based technology with CO_2, or "Clean Air" as a base gas; ▪ implement proper decommissioning using SF_6 recovery systems to prevent emissions.	SSEC (Contractor during construction activities)	ESMO (ESMD during construction)	During construction activities. Monthly during operation activities	5,000 (cost to borne by SSEC during operation)	C/O
Geology and Soils	Project construction sites	▪ conduct land clearing activities during dry periods to help minimize erosion impacts; ▪ prepare a general Erosion and Sediment Control Design Plan including conceptual design of erosion and sediment controls to be implemented on-site in accordance with project's specific requirements;	Contractor	ESMD	Before construction activities starts. During construction activities.	100,000	C

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		▪ implement erosion and sediment protection works prior to the commencement of any construction works; ▪ minimize, wherever possible, land clearing and vegetation removal footprint to maintain as much as possible the original ground cover; ▪ landscape construction areas to reflect natural contours; ▪ restore suitable drainage paths in all areas disturbed by construction activities, ▪ stockpile and stabilize soil and spoil removed during the construction process separately and far away from the drainage lines; ▪ minimize and completely avoid any soil compaction outside of construction sites and access roads. ▪ construction sites shall be stabilized and rehabilitated during and after construction. ▪ spread mulch generated from cleared vegetation across exposed soils after construction. ▪ restrict land acquisition, clearing and grubbing to what is necessary. ▪ replant cleared areas and slopes vulnerable to erosion such as cut-and-fill slopes with autochthonous plant species (grasses, shrubs and/or trees) which can: - armor the surface against erosion; - support the slope by propping from the base (tree and shrub boles and roots).					

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
Water and soil pollution	Substations	strictly forbid the use of insulating oil containing PCBs[28]	Contractor / SSEC	ESMD / ESMO	During construction activities. During operation activities when adding or changing insulating oil is required.	-	C/O
	Project construction sites	▪ prepare a general **Water and Soil Pollution Management Plan** including conceptual design of pollution control to be implemented on-site in accordance with project's specific requirements; ▪ implement an effective water management system; ▪ construct sufficient cross and longitudinal drainage structures to allow for the proper passage of runoff or flood water under or along access roads; ▪ avoid water pollution by spillages of oil, fuel or lubricants by proper storage and handling; ▪ Prepare a **Waste Management Plan**; ▪ provide satisfactory disposal of solid and liquid waste; ▪ ensure the proper sealing of all pipelines, valves, and vessels to avoid water loss;	Contractor	ESMD	Continuous	100,000	C

[28] Some of the commercial names used of Oils containing PCBs are (source EPA (Environmental Protection Authority -USA): Guidance for local authorities regarding lands potentially impacted by Poychlorinated Biphenyls)**:** *Aceclor; Adkarel; Apirolia; Apirolio; Areclor (t); Arochlor 1221; Arochlor 1232; Arochlor 1248; Arochlor 1254; Arochlor 1260; Arochlor 1268; Arochlor 1270; Arochlor 1342; Arochlor 2565; Arochlor 4465; Arochlor 5460; Aroclor; Arubren; Asbestol, AmericanCorp; Asbestol, Monsanto; ASK; Askarel; Auxol; Bakola 131; Biclor (c); Chloroextol; C(h)lophen A30; C(h)lophen A50; Clophen A60; Clophen Apirorlio; Chloresil; Chlorinated Diphenyl; Chlorinol; Chlorintol; Chlorphen; Clorphen (t); Deler; Delor; Diaclor; Diaconal; Dialor (c); Diconal; Disconon (c); DK; DP 3; DP 4; DP 5; DP 6.5; Duconal; Dykanol; Educarel; EEC-18; Elaol; Electrophenyl; Elemex c; Elemex t; Elexem; Eucarel; Fenclor 42; Fenclor 54; Fenclor 64; Fenclor 70; Hexol; Hivar (c); Hydol; Hyvol; Inclar; Inclor; Inerteen 300; Inerteen 400; Inerteen 600; Kan(e)chlor (KC) 200-600; Kanechor; Kaneclor 400; Kaneclor 500; Keneclor; Kennechlor; Leromoli; Leromoll; Magvar; MCS 1489; Montar; Nepolin; Niren Non-Flamable Liquid,ITE; No-Flamol, WagnerElectric; Phenoclar DP6; Phenoclor DP6; Phyralene; Physalen; Plastivar; Pydraul; Pyralene 1460; Pyralene 1500; Pyralene 1501; Pyralene 3010; Pyralene 3011; Pyralene T1; Pyralene T2; Pyralene T3; Pyranol; Pyrochlor; Pyroclar; Pyronal; Pysanol; Safe-T-America; Safe-T-Kuhl; Saft-Kuhl; Sant(h)osafe; Santosol; Santotherm; Sant(h)othern FR; Santothern FR; Santovac; Santovac 1; Santovac2; Santowax; Santvacki; Saut(h)otherm; Siclonyl (c); Solvol; Sorol; Sovol; Terpenylchlore; Therminol; Therminol FR*

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		▪ avoid any dumping of excavated material in drainage pattern; ▪ prepare a **Hazardous Material Management Plan**; ▪ register all potentially hazardous materials to track type, quantities stored, quantities used or generated; ▪ allow only trained personnel to handle hazardous materials; ▪ seal well chemicals after use; ▪ record movements from storage and to waste disposal sites; ▪ develop and display at each construction site emergency response procedures; ▪ establish and include in the workers training program handling and use of hazardous materials safety procedures; ▪ locate workshop facilities at least 100m away from the water sources; ▪ provide workshops with spilled oil and grease trapping systems;					
	Construction sites and access roads	▪ cover vehicles carrying hazardous materials during transport; ▪ locate warning signs and rules in proper places: entrance to the storage warehouse, the office, and other places where these materials might be used or where workers will congregate; ▪ clean daily workers workshops and offices; ▪ treat through proper wastewater treatment systems all the waters coming out from the construction site; ▪ adopt the following waste minimization hierarchy: reduce the overall number of wastes, reuse and recycling of any wastes that are unavoidably created and disposal as a last resort; ▪ implement proper waste segregation and disposal at the designated waste disposal site;	Contractor	ESMD	Continuous	50,000	C

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		▪ any waste material which is unable to be reused, reprocessed, or recycled shall be disposed at an authorized landfill; ▪ construction wastes will not be allowed to accumulate on the construction site but will be collected promptly and removed regularly from the site; ▪ enough garbage bins and container will be made available at all construction sites;					
Air pollution	Construction sites and access roads	▪ prepare a general **Air pollution and dust Management Plan** including conceptual design of air pollution and dust controls to be implemented on-site in accordance with project's specific requirements; ▪ prepare and implement a health and sanitation program to prevent and cure respiratory infection and other air-borne diseases; ▪ provide masks to workforce working in air pollution prone area; ▪ locate dust causing activities and soil stockpiles away from sensitive receptors and considering the wind direction; ▪ switch-off engines when stopped and not leave the vehicle idling; ▪ sprinkle water on unpaved roads to reduce incidence of dust at least 2 times in the dry season; ▪ wash vehicles before leaving the site; ▪ cover loads entering and leaving the site transporting dusty materials; ▪ properly maintain vehicles and construction machinery; ▪ locate stationery engines away from settlement and camp areas; ▪ periodically monitor engine emissions to check compliance with national Standards and/or IFC criteria (IFS EHS 2007).	Contractor	ESMD	Continuous	200,000	C

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
Noise	Construction sites and access roads	▪ prepare a general **Noise and Vibration Management Plan** including conceptual design of noise and vibration controls to be implemented on-site in accordance with project's specific requirements; ▪ provide all workers with proper Personal Protective Equipment (PPE) for noise protection; ▪ provide all noise generating construction equipment with effective sound-control devices (exhaust mufflers); ▪ limit during daytime all construction activities that may generate harmful noise, to minimize community disturbance; ▪ install noise barriers at the construction camp and near villages along access roads if noise levels are found to exceed standards during monitoring; ▪ prepare, before the beginning of any construction activity, a detailed Noise Management Plan to reduce noise impact from Project activities according to the final localization of the potential noise sources in relation to the existing noise vulnerable receptors (settlements, houses, etc.); ▪ regularly monitor noise intensity level;	Contractor	ESMD	Continuous	150,000	C
Vibration	Construction sites, especially substations	▪ prepare a general **Noise and Vibration Management Plan** including conceptual design of noise and vibration controls to be implemented on-site in accordance with project's specific requirements; ▪ assure that vibrations are within the limits set by international standards (guideline levels in IFC EHS 2007); ▪ avoid blasting operation during night-time and control blasting by using limited detonators in small lot; ▪ provide compensation to house owners for the damage of their housing structures due to blasting; ▪ temporarily shift vulnerable population to vibration	Contractor	ESMD	Continuous	50,000	C

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		and noise to safe locations during blasting period; ▪ use current state-of-the-art technology to assure that blast-related vibrations at offsite residential and other occupied structures are as low as possible, consistent with blasting safety; ▪ monitor and verify that air blast and vibration for blasts within 1,000 feet (330 m) of occupied structures are within the recommended limits at those locations. If blasting is found to exceed specified levels employ alternative methods, complying with required limits;					
Land Use	Construction area	▪ restore as soon as possible the temporarily used areas to pre-construction conditions, giving priority to the most disturbed and to the landslide prone areas; ▪ revegetate the areas to prevent erosion and to restore the vegetation cover, enhancing the recovering of the natural vegetation, by placing the previously stockpiled local soil; ▪ use only local vegetation for revegetation activities and regularly monitor the on-going process.	Contractor	ESMD	During construction activities	50,000	C
					TOTAL COST	***705,000***	

Table 9-2 – Mitigation and management measures on biological environment

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
Flora	All construction area and its surroundings	▪ prepare a general **Vegetation clearing Management Plan** including conceptual design of vegetation clearing and controls to be implemented on-site in accordance with project's specific requirements; ▪ minimize and possibly avoid access road construction and construction material within the boundaries of the Riverine and hill side forest; ▪ carefully select the trees that need to be cut to implement the project activities; ▪ avoid any useless cutting of trees with particular attention to protected species; ▪ minimize as much as possible the construction areas; ▪ revegetate the temporarily used areas only with local species, forbidding any use of alien and invasive species and enhance natural regrowth; ▪ buy timber required for construction only from authorized dealers; ▪ provide energy for cooking to the workers to avoid the use of local timber and wood; ▪ strictly forbid any buying or selling of timber or any other floral natural product within the construction area; ▪ strictly forbid any poaching of floral natural product by the contractors' workers; ▪ avoid any fire risk caused by activities within the project area; ▪ Adjust pole placements to span wetlands or limit equipment access in wetlands, wherever possible; ▪ avoid introduction of invasive alien species: early detection and eradication are recommended; ▪ consider translocation of protected species in suitable habitat;	Contractor	ESMD	Detailed design stage; Before construction activities begin; During construction; During the decommissioning stage	200,000	C

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		▪ if necessary, a compensatory reforestation plan to be defined based on baseline surveys and final alignment.					
Fauna	All construction area and its surroundings	▪ prepare a general **Biodiversity Management Plan** including conceptual design of biodiversity management controls to be implemented on-site in accordance with project's specific requirements; ▪ all animal dens close to the work areas must be marked as no-go areas; ▪ the project work force should be instructed to avoid harassment and disruption of wildlife; ▪ if the use of explosive is necessary, it should be used only within specified time and distances from any wildlife sensitive area; ▪ awareness creation training to construction workers at toolbox meetings, so that they contribute to the effort of protection of wildlife; ▪ carry out periodic monitoring of habitat integrity of the area;	Contractor	ESMD	During construction activities	200,000	C
	All construction sites	▪ establish and monitor implementation of a speed limit of 25 km/hour in the habitat zone or wildlife crossing area and 40 Km/hour in the rest of construction roads; ▪ clearly identify by warning signs, habitat zones or wildlife crossing areas; ▪ strictly forbid to all vehicles involved in the project to honk at wild animals, especially while the animals are crossing the road; ▪ all vehicles' drivers involved in the project must attend at least one wildlife safety training before they start working	Contractor	ESMD	Ensure all measures are included in ToR of the Contractor. Check drivers' training. Check traffic signs every month.	10,000	C
	All construction sites	▪ adhere to National or IFC EHS standards for noise quality, whichever are higher. All vehicles and heavy equipment shall have an adequate silencer and shall be properly maintained; ▪ minimize traffic congestion by proper traffic	Contractor	ESMD	Check measures are implemented. Monitor noise every 3 months	-	C

Environmental component	Project area	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		management;					
	Project area	▪ strictly forbid to construction workers to hunt and/or poach wildlife and to fish as well as to buy and/or sell wild animals; ▪ strictly forbid workers to supply food from hunting or fishing; ▪ implement adequate practices of food waste management at the camps to avoid any attraction of wildlife scavengers;	Contractor	ESMD	Check measures are regularly implemented. Inspect local workers camps' and relevant food disposal every month	-	C
		▪ Transmission line height greater than 6 meters to avoid electrocution of terrestrial species, such as giraffes and elephants	Contractor	ESMD	Ensure all measures are included in ToR of the Contractor.	-	C
		▪ Installation of BIRD-FLIGHT Diverter (BFD) along the entire transmission line to avoid electrocution and bird collision. The installation of BFD must follow the guidelines of the IUCN reported in the 'Wildlife and power lines: guidelines for preventing and mitigating wildlife mortality associated with electricity distribution networks' report. Martín Martín, J., Garrido López, J.R., Clavero Sousa, H. and Barrios, V. (eds.) (2022). Wildlife and power lines. Guidelines for preventing and mitigating wildlife mortality associated with electricity distribution networks. Gland, Switzerland: IUCN.	Contractor	ESMD	Ensure all measures are included in ToR of the Contractor.	600,000	C
					TOTAL COST	***1,010,000***	

Table 9-3 – Mitigation and management measures on social environment

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring			
Land	HHs affected by project land taking	Avoid as much as possible any settlement through design. Develop a RAP inclusive of a Livelihood Restoration Plan for HHs who lose more than 20% of their productive assets (they will be entitled of livelihood restoration programs proportionally to their loss and vulnerability status).	SSEC	ESMD	Quarterly basis After compensation payment of biannual basis for two years	Included in RAP Costs	P
Labor Equity in local employment benefits/ minimize social conflicts	All National and international workers, included labor from nearby communities	Develop **Project Human Resource Policy** which includes provision: – to prioritize local employment considering available skills in accordance with Local Authorities/Village leaders and SSEC, – to promote non-discrimination and equal opportunities, – to provide additional specialized training to local workforce in skills required by contractor (i.e. administrator, driving etc.).	Contractor	ESMD	Quarterly basis	200,000	C
Labor Labor grievance mechanism	All National and international workers, included labor from nearby communities	Develop **Project Grievances Mechanism for labor.** – Complaint from worker about unfair treatment or unsafe living or working condition. – Grievance policies and mechanism must be developed and disclosure.	Contractor	ESMD	Quarterly basis	100,000	C
Labor Protecting the workforce	All National and international workers, included labor from nearby communities	Develop **a Project Human Resource Policy** which consider at least the following aspect: - freedom of association and collective bargaining; - prohibit the hiring of underage workers, as defined in relevant ILO Conventions; - prohibit recruitment, use and practices of forced labor and child labor; - prohibit discrimination in hiring practices or pay;	Contractor	ESMD	Quarterly basis	20,000	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		- provide fair and favorable working conditions as per contract terms and make sure that conditions are transparent and understood by workers prior to recruitment; - avoid excessive recruitment or transportation fees, or to keep identity documents or working papers; - guarantee freedom of movement in and out of the workplace and workforce accommodation; - guarantee wages as per industry standards/minimum wage; - guarantee access to workforce grievance mechanisms; - guarantee provision of sufficient rest periods and rest days to avoid fatigue; - guarantee safe and healthy workplace conditions; - guarantee provision of food and water for drinking and sanitation; - guarantee working conditions and accommodation standards, as per guidance note by IFC; - guarantee provision of appropriate personal protective equipment (PPE) These requirements shall also be reflected in subcontractors' employment policy.					
Occupational Health Maintain the wellbeing of workers living in camps	All National and international workers, included labor from nearby communities	– Worker's accommodation shall follow international best practices such as ILO recommendation, guidance note by IFC on Workers' accommodation. – Systematically planned and participatory hygiene promotion campaigns can reduce water, sanitation, and hygiene (WASH)-related diseases in camps. – Hence, hygiene promotion campaigns focus on addressing the riskiest practices for diarrheal disease transmission through safe disposal of excreta, effective handwashing, and reduction of household drinking water contamination.	Contractor	ESMD	Quarterly basis	30,000	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring			
Occupational and community health Spread of STD	All National and international workers, included daily labor from nearby communities and villages directly impacted by the project construction activities	– Inform workers and community of risks, infectious and all communicable diseases and protection to minimize risk of infection to workers and communities. – Provision of awareness and prevention briefings. – Include requirements for case-finding and treatment of curable STIs, social marketing of condoms, peer educators' program, condom distribution, and Voluntary Counselling & Testing (VCT) targeting PACs. Implement and evaluate quarterly. This activity shall be planned in conformity to Health Regulation at District Level	Contractor	ESMD	Quarterly basis	30,000	C
Occupational and community health Spread of Respiratory Disease	All National and international workers, included daily labor from nearby communities and villages directly impacted by the project construction activities	– Prevent spread of respiratory disease, including the production of epidemics that can pass back and forth between the project and the community. – Communicate with local-level TB-control program coordinator to initiate case finding, treatment, and follow-up with family members and others living within the same housing compound as workers diagnosed with active TB. – Distribute of mask to prevent from dust in the villages most impacted by the air pollution. These activities shall be planned in conformity to Health Regulation at Payam Level	Contractor	ESMD	Quarterly basis	30,000	C
Occupational and community health Spread of Vector Borne Disease	All National and international workers, included daily	– Provision of Mosquito nets and repellent – Training on good practices and behavior to minimize the risks	Contractor	ESMD	Quarterly basis	30,000	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring			
	labor from nearby communities and villages directly impacted by the project construction activities						
Community Grievance Mechanism	Affected communities	– Implement Community Grievances Redress Mechanism to address complains related to direct and indirect project impacts	SSEC	ESMD	Quarterly basis	100,000	C
Occupational and community health Restrict access to sites, especially hazardous areas	All National and international workers, included daily labor from nearby communities and villages directly impacted by the project construction activities	Develop a **Project Occupational Health and Safety Plan** and **Community Health and Safety Plan** including, at least: – Provision to guarantee a safe and healthy work environment, considering inherent risks in the specific sector and specific classes of hazards in the work areas, including physical, chemical, biological, and radiological hazards. – provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; – training of workers; – documentation and reporting of occupational accidents, diseases, and incidents; – Emergency prevention, preparedness, and response arrangements. – Appropriate fencing / signage at site entrance. – Appointment of site security personnel. – Road safety measures. – First aid and medical assistance.	Contractor	ESMD	Quarterly basis	20,000	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		– HS measure at community level.					
Occupational and community health Minimize traffic hazards within community	All National and international workers, included daily labor from nearby communities and villages directly impacted by the project construction activities	– Develop a **Project Implement Traffic Management Plan**. – Road safety plans / maximum speed limits for site and access routes. – Contractor program to monitor and enforce safety plans, accident reporting and statistics, establishing penalties for violations.	Contractor	ESMD	Quarterly basis	30,000	C
Occupational and community health Improve road safety	Villages directly impacted by the project construction activities	– Develop a **Project Implement Traffic Management Plan**. – Traffic safety sessions for children including distribution of safety awareness brochures.	Contractor	ESMD	Quarterly basis	30,000	C
Local market Avoid distortion of local food prices and necessities due to influx of workers and followers	Local markets nearby the project area	Significant food or housing inflation can adversely impact existing vulnerable groups, – Consider whether vulnerable groups/individuals are included in project consultations and stakeholder engagement, and whether they are given opportunities to express their concerns. – Include vulnerable community in labor activities as much as possible. – Link to governments program for the support of vulnerable people	SSEC	ESMD	Quarterly basis	NA	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring			
Security social conflict	Villages of the Project Area	Prepare a - **Security Management Plan** with provisions for respect of Voluntary Principles on Security and Human Rights (VPSHR) and manage the influx of workers and followers through a **Labor Influx Management Plan** Harmonize the above plans with: - Local Employment Plan - Workers Code of Conduct - GBV/CAE/SEA plan, Occupational and Community Health and Safety plan - Establish continuous communication with Key stakeholders and traditional leaders. – Train foreign workers on local culture and traditions	Contractor	Contractor and ESMD	Quarterly Basis	20,000	C
Vulnerable Groups	Villages of the Project Area	GBV and CAE • Contractors are required to have sexual harassment policies and **Worker's Code of Conduct.** It is recommended that Codes of Conduct include specific prohibitions against SEA, including prohibition of sexual activities with children, defined as anyone younger than 18. This standard must hold even when national standards, laws and policies have a younger age of consent. • Worker Code of Conduct shall be translated in local language(s) • The Contractor is obliged to create and maintain an environment which prevents gender-based violence (GBV) and child abuse/exploitation (CAE) issues, and where the unacceptability of GBV and actions against children are clearly communicated to all those engaged on the project. • Complains on GBV and CAE episodes shall be channelized through the **Project Grievances Redress**	Contractor	ESMD	Quarterly Basis	45,000	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		Mechanism, it should state in simple, up-front language that perpetrators will be sanctioned. System of sanctions must be put in place that will unambiguously reflect the project's commitment to a violence-free workplace. • Standardized training against sexual harassment and GBV should be part of on-boarding procedures for all contractor's employees at site.					
		CHILD LABOR - Develop a "child labor monitoring" system, a three-person team of community members (such as a schoolteacher, mothers' club member or retired policeman) are given training in how to monitor child labor. They then periodically visit places where children are likely to be working. If they find a child, they report the case to a specially constituted community committee, as well as to the labor inspector or local government authority for follow-up. Depending on the child's situation, the committee will recommend a course of action, - Protecting older children in or at risk of hazardous work offering comprehensive packages of training and services to facilitate the transition from school to decent work (skills, apprenticeships, vocational training, job counselling, enterprise development, financing) - Raising awareness among employers of productivity gains to be achieved through improvement of working conditions to a level that is safe for young people to work. - Establishing joint worker-employer safety committees, safety representatives and connections to workers'	Contractor	ESMD, Communities	Quarterly basis	100,000	C

Social component	Target population	Mitigation and enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Preconst. (P) Constr. (C) Oper. (O)
			Mitigation	Monitoring			
		organizations to provide support for young people in the work environment. - Ensuring regular inspection of enterprises regarding workplace conditions and adherence to minimum age restrictions - Training frontline health-care providers to detect and document occupational injuries and illnesses of children These strategies are presented separately but they are interrelated. For instance, most preventive strategies also protect young workers, as is the case with regular monitoring of working conditions.					
Cultural heritage	Project area	Establish a **Chance Finding Procedure** – Inventory of any archaeological finding and unmarked graves	Contractor	ESMD	Quarterly basis	10,000	C
Stakeholder Engagement	Affected authorities from Boma to Payam and County level	Develop a **Stakeholder Engagement Plan** which shall include at least: 1) Executive Chiefs of Affected Bomas 2) Paramount Head of Affected Payams 3) County and State authorities 4) Road Authorities 5) Health authorities 6) Forest authorities 7) Tourist authorities 8) Contractors 9) SSEC 10) Women Representatives 11) Youth representatives Create **Project Information Centre** for communities	SSEC	ESMD and Contractor	Quarterly basis	45,000	P, C
			Contractor	ESMD and Contractor	Quarterly basis	45,000	P, C
					TOTAL COST	***885,000***	

10 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Environmental monitoring for this project will be undertaken to meet the following objectives:

- to fully comprehend the physical, social and environmental conditions in the project area prior to the implementation of the project;
- to understand the compliance status of the implementation of mitigation measures and other regulatory standards;
- to ensure effectiveness of mitigation measures implemented by contractors as per contractual clauses and obligations;
- to check the effectiveness of mitigation and enhancement measures, implemented by the project, and
- to verify the accuracy of ESIA predictions and assess the emerging and cumulative environmental problems, which could provide timely warning of potential environmental damage.

A more detailed monitoring plan in the form of a fully formulated Environmental Management Plan based on formulated plans/programs/mitigation will be prepared at a later stage.

10.1 Type of monitoring

Monitoring will be done throughout the project life. Apart from external expert monitoring, internal monitoring by the project will be done as well as participatory monitoring involving governmental authorities or other stakeholders. The main types of monitoring to be conducted are described below.

10.1.1 Pre-construction monitoring

SSEC (ESMD) will have the principal responsibility for environmental and social baseline monitoring during the pre-construction phase.
Data and information will be collected on key physical, biological and social aspects in the direct impacted project area and other environmentally sensitive area, and the data provided by ESIA report will be updated.
The primary concern during this phase will be to collect field data needed to enhance the knowledge of baseline conditions. Focus will be on gathering key physical and biological information needed to verify and update the data provided by ESIA process such as river water quality, air quality in project sites, number of trees to be felled, etc.

10.1.2 Construction monitoring

Environmental and social monitoring during project construction will include two major groups of activities:

- Review of the contractor's plans such as 'storage and construction waste management plan', 'domestic waste management plan', 'health and safety plan', 'emergency medical response unit' and other environmental plans. Monitor implementation arrangements, compliance and impacts.
- Systematic observation to check that contract arrangements by contractors, and other agencies such as government, NGO/CBO, etc. are in fact complied with, and that emerging impacts are properly mitigated.

(a) Compliance Monitoring: both compliance monitoring and impact monitoring will be carried out. During construction phase, compliance monitoring will be important and will play bigger role in checking whether recommended mitigation measures and environment management plans have been properly and timely implemented or not. It will determine the overall environmental and social performance of the project.
(b) Impact Monitoring: will examine the effectiveness of the mitigation measures, identify the emerging impacts due to project activities or natural process and develop remedial actions. Impact monitoring will focus on key indicators to assess whether the impacts have been accurately predicted, and whether the mitigation measures are sufficient and effective. The actual impacts caused by the project implementation and the emerging impacts will be closely monitored during the construction period.
Salient features of monitoring physical, biological and socio-economic activities during construction phase are presented in Table 10-1, Table 10-2 and Table 10-3. The annual environmental monitoring report will be incorporated in the Annual Environment Report which would include the status of environment in the project area, emerging and cumulative impacts and remedial tasks implemented.

10.1.3 Operation monitoring

Both compliance and impact monitoring will be carried out during project operation phase. The compliance monitoring will focus on determining if the prescribed mitigation and enhancement measures in the operation phase are being fully and properly carried out by the project.
Impacts of activities implemented during construction phase and operation phase will be monitored at regular intervals. However, the monitoring intensity during the operational phase will be much lower, compared to the construction phase.

10.2 Levels of monitoring

Environmental monitoring for the Project will be carried out at different levels:

- routine monitoring,
- periodic monitoring,
- external monitoring.

10.2.1 Routine monitoring

The scope of routine monitoring of activities and conditions during construction and operation stages by the SSEC (ESMD), the Contractor and/or Subcontractors is to ensure that potential adverse impacts, including but not limited to those that have been identified by this ESIA, are regularly controlled and that mitigation actions are implemented to fully comply with all standards and safeguards. To regularly monitor the activities, the internal organization requires an inspection team with environmental skills or trained personnel.
An Environmental Management and Monitoring Plan for Construction Phase (EMMP-CP) shall be developed to define detailed mitigation and monitoring actions to be implemented during the construction phase of the Project, which defines the roles and responsibilities and institutional arrangements of environmental management. Site Specific Environmental Management and Monitoring Plans (SSEMMP) shall also be prepared and implemented for each of the main construction sites and for other distinct activities that may have environmental impacts. These plans will be part of the contractual obligations for the Contractors and Subcontractors. In addition, an

Environmental Management and Monitoring Plan shall be prepared for the Operations Phase (EMMMP-OP) prior to the commissioning of the Project.
These plans shall provide details of the various actions and measures intended to prevent adverse environmental impacts or, if they cannot be prevented, to mitigate the adverse impacts and details of the monitoring procedures (how and what will be measured or observed, who is responsible for monitoring, and the frequency of such monitoring, etc.).
All the field observation shall be recorded on standard forms and entered into the database to track the status and verify and control non-compliance situations.
The technical details of the monitoring measures shall be included in the ESMMP, SSEMP and Contractor's EMPs, including parameters, methods and sampling locations for the Project environmental aspects.

10.2.2 Periodic monitoring

Periodic monitoring activities shall be carried out by two organization, the Environmental and Social Management Unit (ESMU) of the Government of South Sudan (GoSS) and the Environmental and Social Management Department (ESMD) established by the SSEC.
The ESMU shall assure that the proponent of the project (SSEC), the contractors and the subcontractors comply with the environmental standards and safeguards. The role of the ESMU shall be:

- to coordinate with other national agencies involved in the environmental and social aspects of the Project;
- to carry out inspections and monitoring compliance with the environmental and social measures, standards and safeguards;
- to advise the relevant authorities on environmental and social matters of the Project;
- to represent a liaison between the GoSS, the South Sudanese people and any external organizations concerning environmental and social aspects of the Project;
- to hold public consultations on environmental matters.

The ESMD shall be the ESMU's counterpart and, responsible for all environmental and social obligation of proponent, assure that the Project follows the measures to prevent or mitigate adverse environmental and social impacts in compliance with all the environmental and social standards and safeguards. To effectively manage the environmental and social performance of the Project, the ESMD shall set up an Environmental and Social Management System (ESMS) to process and record all monitoring data, including compliance issues, management decisions and corrective actions taken as:

- ESMP, ESMMP-CP, ESMMP-OP, sub-plans and site plans;
- all site plans as approved by the proponent;
- all communications which have environmental and social implications;
- all environmental and social monitoring reports from ESMD and the contractor's staff;
- quarterly Reports;
- complaints register;
- training materials;

- training attendance registers;
- non-compliance special reports;
- national environmental and social legislation;
- permits, legal documents and authorizing letters;
- monthly site meeting minutes.

10.2.3 External monitoring

An external monitor may be engaged by the GoSS and/or by the Lenders, funded by the proponent, to review the effectiveness of the environmental and social measures carried out by the Project and to ensure compliance with the contractual obligations. Non-conformances or observations, identified during audits, will be reported to the Proponent for implementation and corrective action.
The Proponent shall provide available documentation, information and data requested by the auditor. The external monitor should have international experience in environmental and social auditing and monitoring. The external monitor should be engaged throughout the construction phase and for the first years of operations phase.

10.3 Specific monitoring actions

Table 10-1 details the specific monitoring actions that should be taken on the physical environment, Table 10-2 details the specific monitoring actions on the biological environment, while Table 10-3 details the specific social monitoring actions.

Table 10-1 – Environmental monitoring actions on physical environment

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Erosion of Earth works	Soil erosion status	All construction sites	Continuous and monthly reporting	ESMD / Main Contractor	30,000
	Disposal of septic water	Physical and Chemical Parameters according to national standards (if not available international standards shall apply) including: - pH; - COD; - COD; - BOD; - Total suspended solids; - Total phosphorus; - Total nitrogen; - Total Coliform bacteria; - Oil and grease.	Substation and offices	Continuous control, monthly analysis and reporting	ESMD / Main Contractor	40,000
	Water pollution	Volume of Liquid Waste generated. Physical and Chemical Parameters considering the strictest between national guidelines or IFC EHS guidelines. IFC parameters are listed in the following: - pH; - COD; - COD; - BOD; - Total suspended solids; - Total phosphorus; - Total nitrogen; - Total Coliform bacteria; - Oil and grease.	Construction sites and camp facilities	Monthly and upon complaints from nearby substation and offices	ESMD / Main Contractor	60,000
	Rehabilitation of borrow areas and	Success of revegetation and erosion status/vulnerability	All borrow/pit areas and temporarily acquired land	Continuous	ESMD / Main Contractor	30,000

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
	temporarily acquired land					
	Soil erosion and siltation	Erosion status/vulnerability	All construction sites and access roads	Continuous	ESMD / Main Contractor	30,000
	Management of hazardous and non-hazardous waste, hazardous materials	Ensure waste and materials are treated in accordance with national standards (if not available international standards according to IFC shall apply).	Construction site	Continuous	ESMD / Main Contractor	30,000
	Impacts on air quality	Visual observation of dust generated during construction activities.	All construction sites, camp site, access roads and nearby settlements	Continuous	ESMD / Main Contractor	-
		Measuring concentration of air quality parameters according to East African air specifications (EAS 751:2010), recognized by NEMA: - Particulate matter (PM_{10} and $PM_{2.5}$); - O_2; - CO; - H_2S; - CH_4; - VOC; - SO_2; - CO_2; - NO_2.	All construction sites, camp site, access roads and nearby settlements	Monthly	ESMD / Main Contractor	80,000
		Visual inspections to ensure good standard machinery, equipment and trucks are in place.	All construction sites, camp site, access roads and nearby settlements	Occasionally throughout the construction period and upon complaints	ESMD / Main Contractor	-
	Exceedance of noise levels	Noise level measured using a portable noise meter.	In and around construction sites	Monthly and upon complaints	ESMD / Main Contractor	40,000

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
			and nearby settlement areas	by nearby settlements		
					TOTAL COST	***340,000***

Table 10-2 – Environmental monitoring actions on biological environment

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Impacts on vegetation	- Survey to assess threatened species and habitat distribution and location. - mapping of *Combretum* savanna and *Butyrospermum* savanna. - Assessment of the abundance and distribution of *Oxytenanthera abyssinica*	Areas will be indicated in the Biodiversity Management Plan	Single survey before construction	ESMD / Main Contractor / District Forest Office	5,000
	Impacts on wildlife	Surveys to assess: a. Vultures and other threatened bird species distribution and abundance, roots counts and location, other supplementary feeding stations. b. Bats distribution, diversity and activity levels. c. Human-wildlife conflict	Entire Project Site	Two surveys before construction	ESMD / Main Contractor / District Wildlife Department	20,000
		Number of wild animals and birds affected by traffic accidents involving.	TL and SS Construction sites and vicinity (including the alignment of the access roads	Monthly	ESMD / Main Contractor / District Wildlife Department	Included in the operational costs of ESMD
		Unwanted and illegal activities such as: - On vegetation: logging and poaching with a specific focus on particular areas shall be monitored. If necessary, watchmen will be relocated to vulnerable and sensitive sites. - On wildlife: hunting, poaching, etc. shall be monitored. If necessary, guards may be relocated to vulnerable areas. Monitoring of enforcement of the agreed sanctions for illegal activities.	Entire Project Site	Continuous	ESMD / Main Contractor / District Forest Office / District Wildlife Department	40,000
Operation	Loss of resident avifauna (collisions,	Number and location of mortality/injured birds identified / affected & species of carcass found including whole carcass, decomposed, partial carcass, etc.	Transmission line corridor and its surroundings	Monthly	ESMD / ESMU	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
	barrier effect & displacement)					
	Residual impacts after construction to design further mitigation measures	Surveys to assess: a. Birds distribution, diversity and abundance. b. Vultures and other threatened bird species distribution and abundance, roots counts and location, other supplementary feeding stations. c. Bats distribution, diversity and activity levels.	Entire Project Site	Twice per year (in dry and wet season) for five years, after project completion	ESMD / ESMU	100,000
					TOTAL COST	***165,000***

Table 10-3 – Social monitoring actions

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
Pre-construction and construction	Land Acquisition	– Performance monitoring against timetable (Public meetings held; Census, assets inventories, assessments, and socioeconomic studies completed; Grievance redress procedures in place and functioning; Compensation payments disbursed; Housing lots allocated; Housing and related infrastructure completed; Relocation of people completed; Income restoration and development activities initiated; Monitoring and evaluation reports submitted). – Impact monitoring such as livelihood restoration against the baseline Assessment of PAP satisfaction	Acquired Areas	– Quarterly Basis for performance monitoring. – Semiannual basis for impact monitoring	SSEC	Included in RAP Costs
	Equity in local employment benefits / minimize social conflicts.	– Disclosure of contractor recruitment plan at Site offices and to Chiefs of Affected Villages – Percentage of workers hired from all nearby communities. – Percentage of workers belonging to disadvantage groups – Grievances – Records of specialized training for local staff provided by contractor. – Certificates from contractor issued to employees (copied to SSEC) detailing training received / new skills acquired while employed.	Project area and affected villages	Quarterly Basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Labor grievance mechanism	– Established of grievance mechanism shall be documented. – Complaints log and resolution action must be recorded.		On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Protecting the workforce	– Regular weekly work hours, rest periods, lunch, etc. – Overtime limits and exceptions.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
		– Hour averaging minimum wage. – Overtime requirements and conditions. Labour contract provisions. – Social system payment liability. – Annual leave – Laws to protect disadvantaged workers. Severance pays. – Number and frequency of accidents. – Number and frequency of near misses. – Cases of illness due to working conditions. – Copy of training certificates.				
	Maintain the wellbeing of workers living in camps	– Worker camps audit reports as per CHECKLIST ON WORKERS' ACCOMMODATION (IFC Workers Accommodation Standards 2009) – corrective measures and action plan, – Photographs demonstrating corrective measures implemented.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Labor and Community Health and Safety – Sexual Transmittable Diseases – Vector Borne Diseases – Respiratory Disease	– Number of STIs treated. – Attendance list of induction meetings and HSE induction material which raises malaria, dengue and other VBD or STD awareness and preventative measures. – number of TBs treated	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Community Grievance Mechanism	– Documented grievance mechanism established. – Maintenance of complaints log and resolution process.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
	Occupational and community Health and Safety	– Contractor HS internal audits and statistics. – Records of accidents and near misses. – Record of illness, diseases. – Record of grievances. – Record of emergencies. – Informal feedback on effectiveness of Occupational and Community HS plan.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Restrict access to sites, especially hazardous areas	Provision / review of the following documentation: – Description / photographs of fencing / signage around site perimeter. – Contractors to provide SSEC with CV and training certification of security personnel proposed as per contract requirements. – Site registry identification system.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Occupational and community Health and Safety Minimize traffic hazard within community	– Road Safety Plan documentation including identification of maximum speed limits for site and access routes. – Requirement for contractor program of monitoring – Reporting of accidents and statistics inclusive in HS performance records. – Community training on safety – Signs for local communities – Document traffic safety sessions and maintain session schedule. – Maintain attendance register.	Project area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Local Market distortion Avoid distortion of local food prices and necessities due to	– Pre-project and project local market prices for food, services and entertainment. – No. of vulnerable groups in comparison to the pre-project level. – Income level and living standard conditions in comparison to pre-project level.	Local Markets	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD

Project phase	Issue	Parameters	Location	Frequency	Responsibility	Cost (USD)
	influx of workers and followers					
	Vulnerable Groups GBV	– Safety Audits through key informant interviews, FGD – N and Records of the awareness Trainings – Men & Boys Self-Assessment Form – Awareness Raising – No. of qualified experts involved in the management and follow up of issues related to GBV – GRM log – No. of cases registered or reported by Health care providers	Project Area	On monthly basis	SSEC (ESMD)	Included in the operational costs of ESMD
	Cultural Heritage	Reporting / notification of finds to the Archaeological Heritage Office	Project area	On monthly basis	Contractor	-
	Cultural Heritage/tombs	– Records from Chance Finding Procedures – Photographs of findings – Remediation measures adopted – Payment completion – Relocation completion – Records of meeting	Construction site / excavation sites	Pre displacement and post displacement	SSEC (ESMD)	Included in the operational costs of ESMD
	Stakeholder Engagement	– Records of public meetings, FGD, meeting with authorities, meeting with workers and community, dissemination of information.	Project area	Quarterly Basis	Contractor / SSEC (ESMD)	Included in the operational costs of ESMD
	Security Social Conflicts	– No. of accidents, violence, strikes, brutal death – Way of dispute solution – Interviews with key informants – Evidence of training of security staff on Voluntary Principles on Security and Human Rights (VPSHR)	Project area	On monthly basis	Contractor / SSEC (ESMD)	Included in the operational costs of ESMD
					TOTAL COST	-

11 BUDGET AND SCHEDULE

In this chapter an indicative budget is presented for the environmental and social mitigation, management and monitoring measures of the project impacts of the South-Sudanese stretch of the Uganda-South Sudan Interconnection.
The Project costs for all infrastructures necessary for the full operation of the South-Sudanese part of the new Uganda – South Sudan interconnection is reported here below.

Table 11-1 – Cost estimation - Total CAPEX for South Sudan – reference case

Item	Cost (kUS$)
400 kV AC Double circuit line	83,440
Extension of Karuma S/S	-
Extension of Olwiyo S/S	-
Bibia S/S	-
Juba S/S	52,850
Rural electrification	1,200
Consultancy Supervision Services	7,975
Regional coordination & monitoring	798
Contingencies	13,629
Total	**159,892**

Each table below specifies the environmental or social management or monitoring action and the schedule, detailing during which phase of project implementation (construction or operation) the relevant measure shall apply.
The budget has been evaluated considering the following components:

- Estimated program budget for the various Environmental Management activities relevant to the physical environment to be conducted under the Environmental Management Plan as mentioned in chapter 9 that were estimated during construction phase and operation phase (see Table 11-2).

Table 11-2 – Cost Budget for the management activities relevant to the impacts on physical environment

ITEM	Project phase	US$
Climate	Construction and Operation	5,000
Soil erosion and sediment control	Construction and Operation	100,000
Water and soil pollution control	Construction and Operation	100,000
Waste management	Construction	50,000
Air pollution	Construction	200,000
Noise and Vibration	Construction	200,000
Land use (revegetation)	Construction	50,000
TOTAL		**705,000**

- Estimated program budget for the various Environmental Management activities relevant to the biological environment to be conducted under the Environmental Management Plan as mentioned in chapter 9 that were estimated during construction phase and operation phase (see Table 11-3).

Table 11-3 – Budget for the management activities relevant to the impacts on biological environment

ITEM	Project phase	US$
Vegetation clearing	Construction and Operation	200,000
Biodiversity management	Construction	200,000
Traffic management	Construction	10,000
Bird diverters	Construction	600,000
TOTAL		**1,010,000**

- Estimated program budget for the various Social Management activities relevant to the social environment to be conducted under the Social Management Plan as mentioned in chapter 9 that were estimated during construction phase and operation phase (see Table 11-4).

Table 11-4– Budget for the management activities relevant to the impacts on social environment

ITEM	Project phase	US$
Employment equity	Construction and Operation	200,000
Labor grievance mechanism	Construction and Operation	100,000
Protection of the workforce	Construction and Operation	20,000
Workers' bell being in the camps	Construction	30,000
Control of STDs among workers	Construction	30,000
Control of respiratory diseases among workers	Construction	30,000
Control of vector borne among workers	Construction	30,000
Community Grievance Redress Mechanism	Construction and Operation	100,000
Restricted access	Construction and Operation	20,000
Traffic Management Plan	Construction and Operation	30,000
Traffic safety sessions	Construction and Operation	30,000
Security Management Plan	Construction and Operation	20,000
GBV and CAE	Construction and Operation	45,000
Child Labor Management	Construction and Operation	100,000
Chance finds procedure	Construction	10,000
Stakeholder Engagement Plan	Construction	90,000
TOTAL		**885,000**

- Estimated program budget for the various Environmental Monitoring activities relevant to the physical environment to be conducted under the Environmental Monitoring Plan as mentioned in chapter 10 that were estimated during construction phase and operation phase (see Table 11-5).

Table 11-5 – Budget for the monitoring activities relevant to the impacts on physical environment

ITEM	Project phase	US$
Erosion of Earth works	Construction and Operation	30,000
Disposal of septic water	Construction and Operation	40,000
Water pollution	Construction and Operation	60,000
Rehabilitation of borrow areas and temporarily acquired land	Construction	30,000
Soil erosion and siltation	Construction	30,000
Management of hazardous and non-hazardous waste, hazardous materials	Construction	30,000
Air quality		80,000
Exceedance of noise levels	Construction	40,000
TOTAL		**340,000**

- Estimated program budget for the various Environmental Monitoring activities relevant to the biological environment to be conducted under the Environmental Monitoring Plan as mentioned in chapters 10 that were estimated during construction phase and operation phase (see Table 11-6).

Table 11-6 – Budget for the monitoring activities relevant to the impacts on biological environment

ITEM	Project phase	US$
Assessment of threatened species and habitat distribution and location.	Construction	5,000
Assessment of vultures and other threatened birds, bats and human-wildlife conflict	Construction	20,000
Illegal logging, hunting and poaching	Construction	40,000
Assessment of birds, vultures and bats distribution, diversity and activity levels.	Operation	100,000
TOTAL		**165,000**

In the following Table 11-7 the overall summary of the environmental costs to mitigate, manage and monitor all the impacts considered in this study is given. In this table also 10% contingency costs are also considered.

Table 11-7 – Environmental and Social Budget Summary

ITEM	US$
Physical environment management measures	705,000
Biological environment management measures	1,010,000
Social environment management measures	885,000
Overall management measures	**2,600,000**
Physical environment monitoring measures	340,000
Biological environment monitoring measures	165,000
Social monitoring measures (included in operational cost of ESMD)	-
Overall monitoring measures	**505,000**
Operational Cost of ESMD	**300,000**
Total	**3,405,000**
Contingencies (10%)	340,500
GRAND TOTAL	**3,745,500**

(*) Resettlement Action Plan (RAP) costs are excluded from this ESMP budget

The overall environmental and social cost of project implementation represent the 2.3% of the project development costs (159,892,000 US$).

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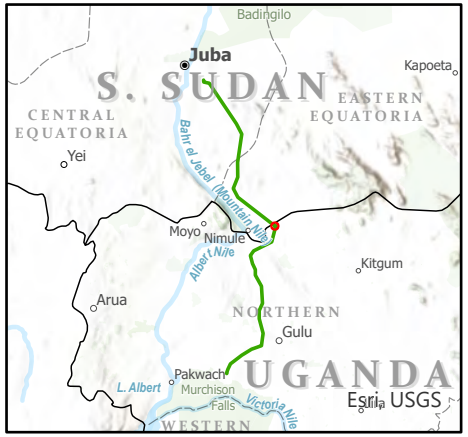
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13 ANNEX 1: CARTOGRAPHY OF THE PROJECT AREA OF INFLUENCE





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

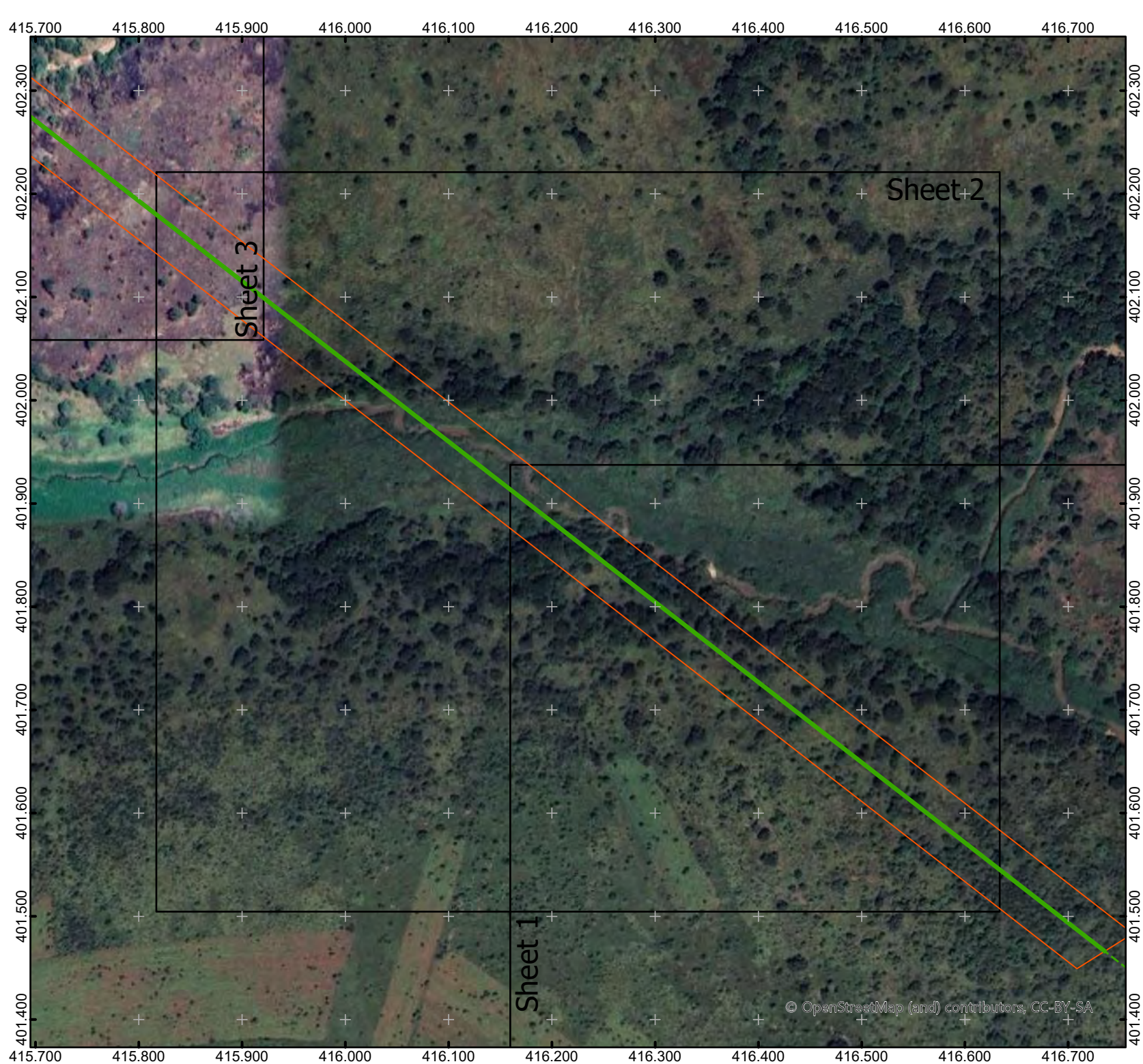
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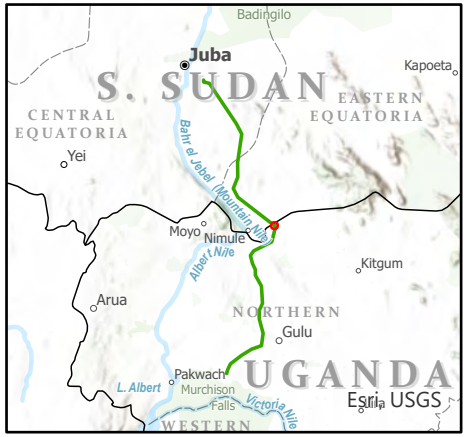
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

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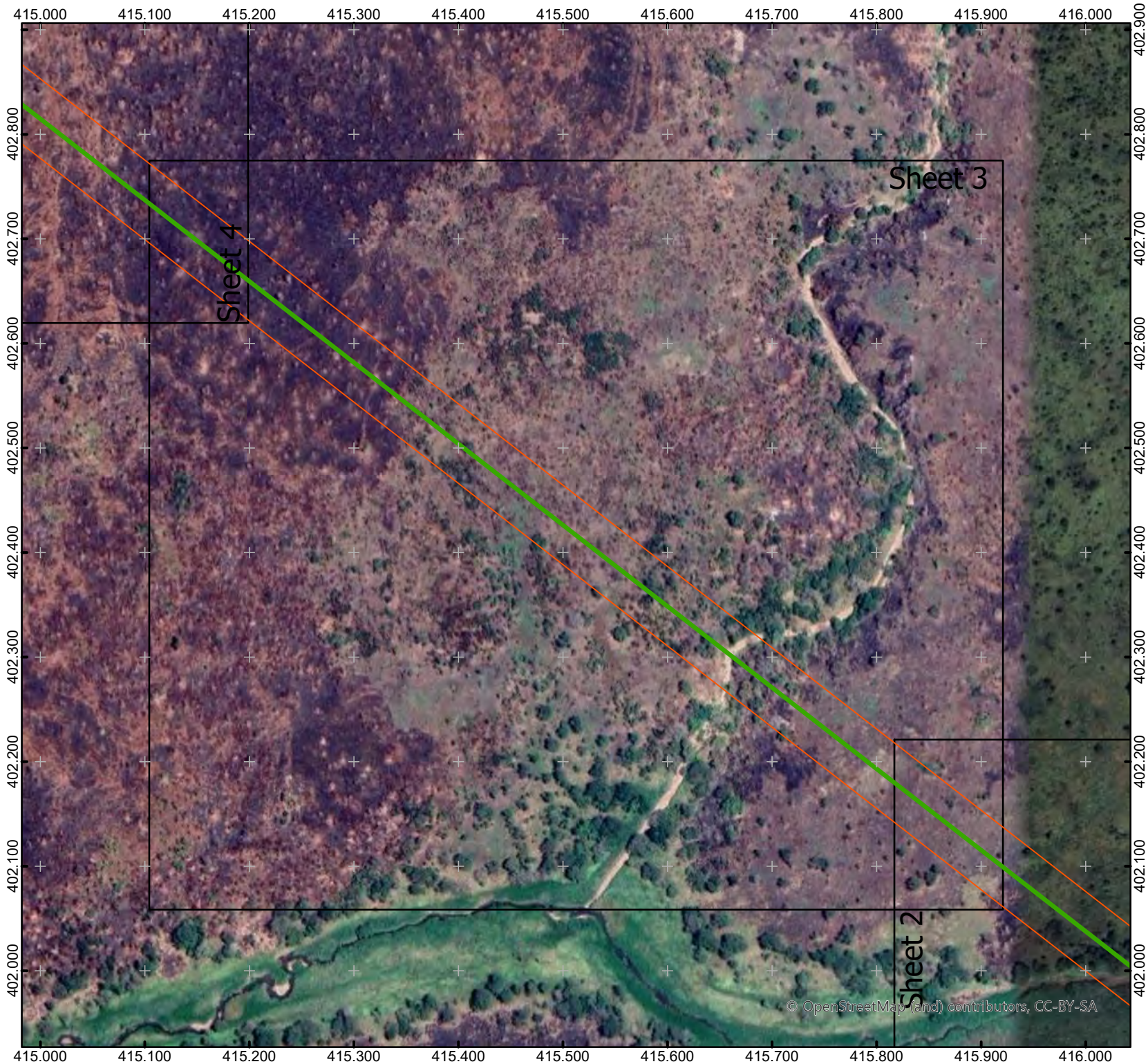
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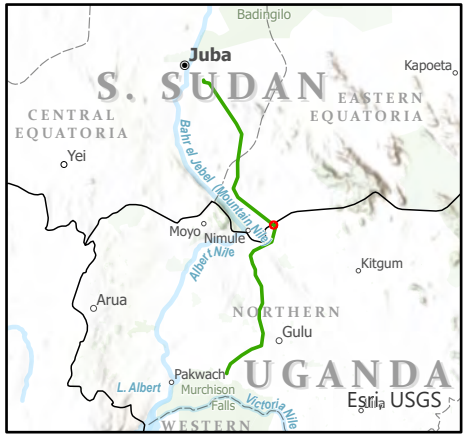
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South Sudan

Size A4

Scale 1:5.000





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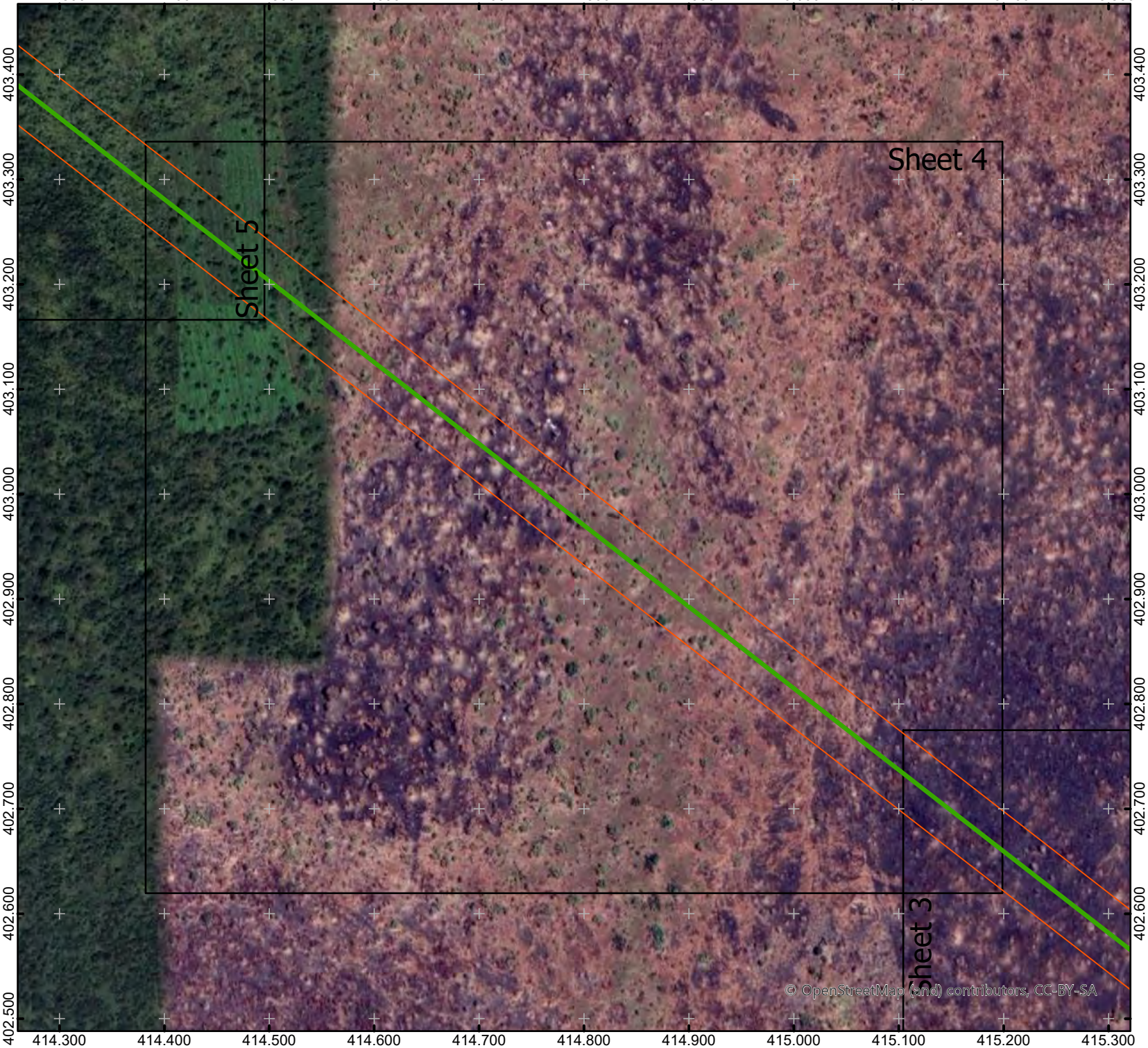
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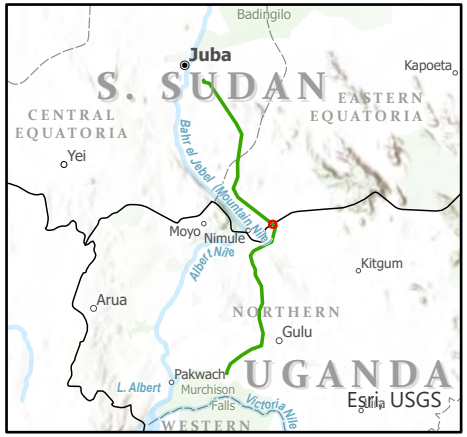
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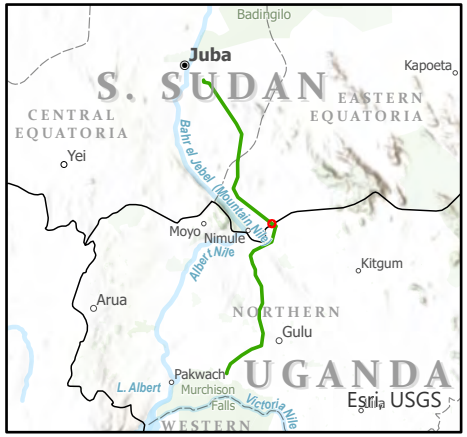
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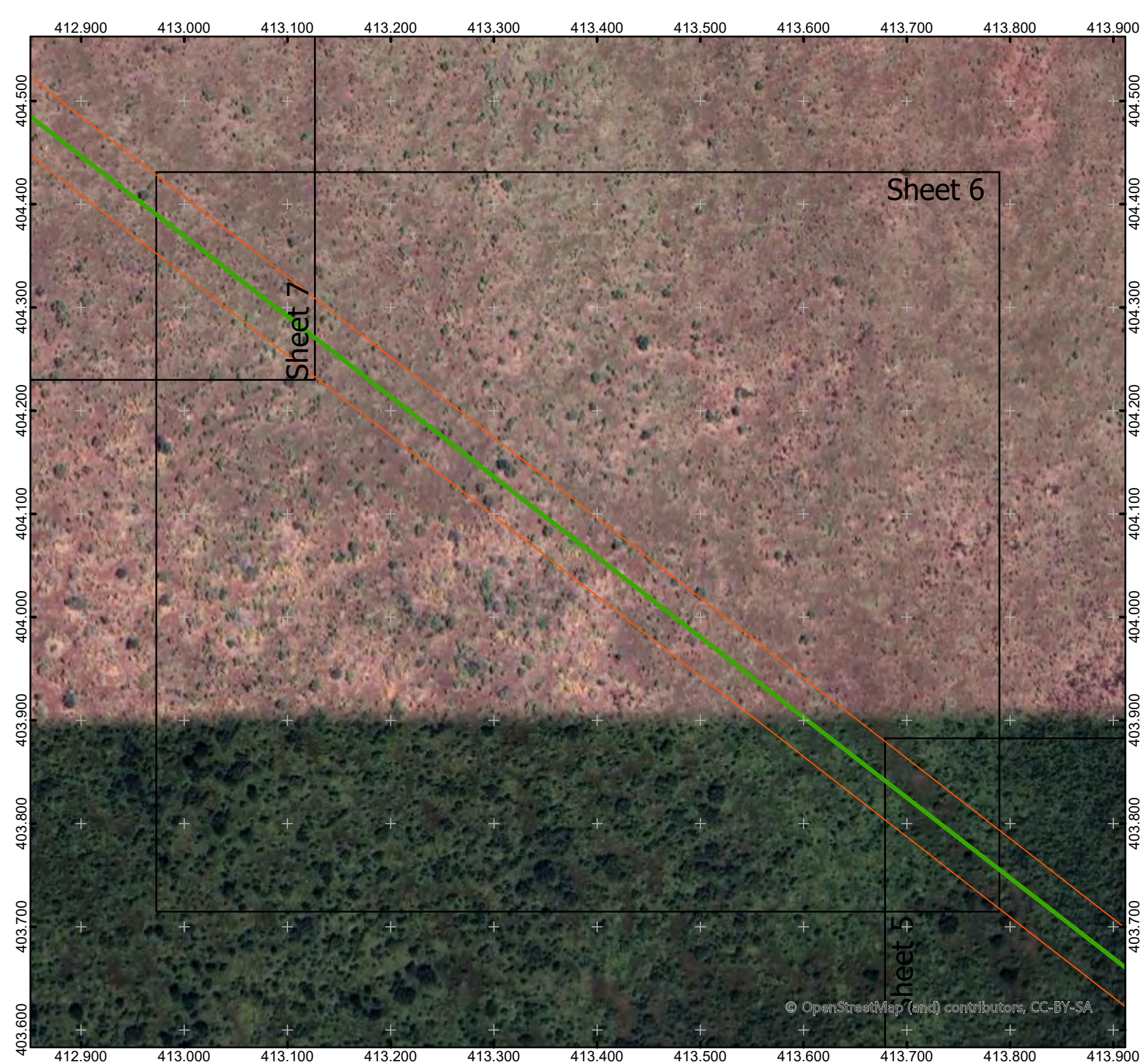
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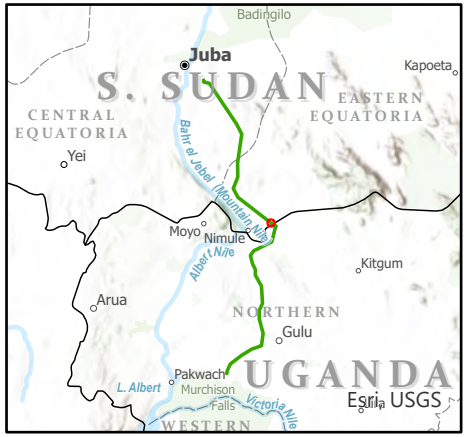
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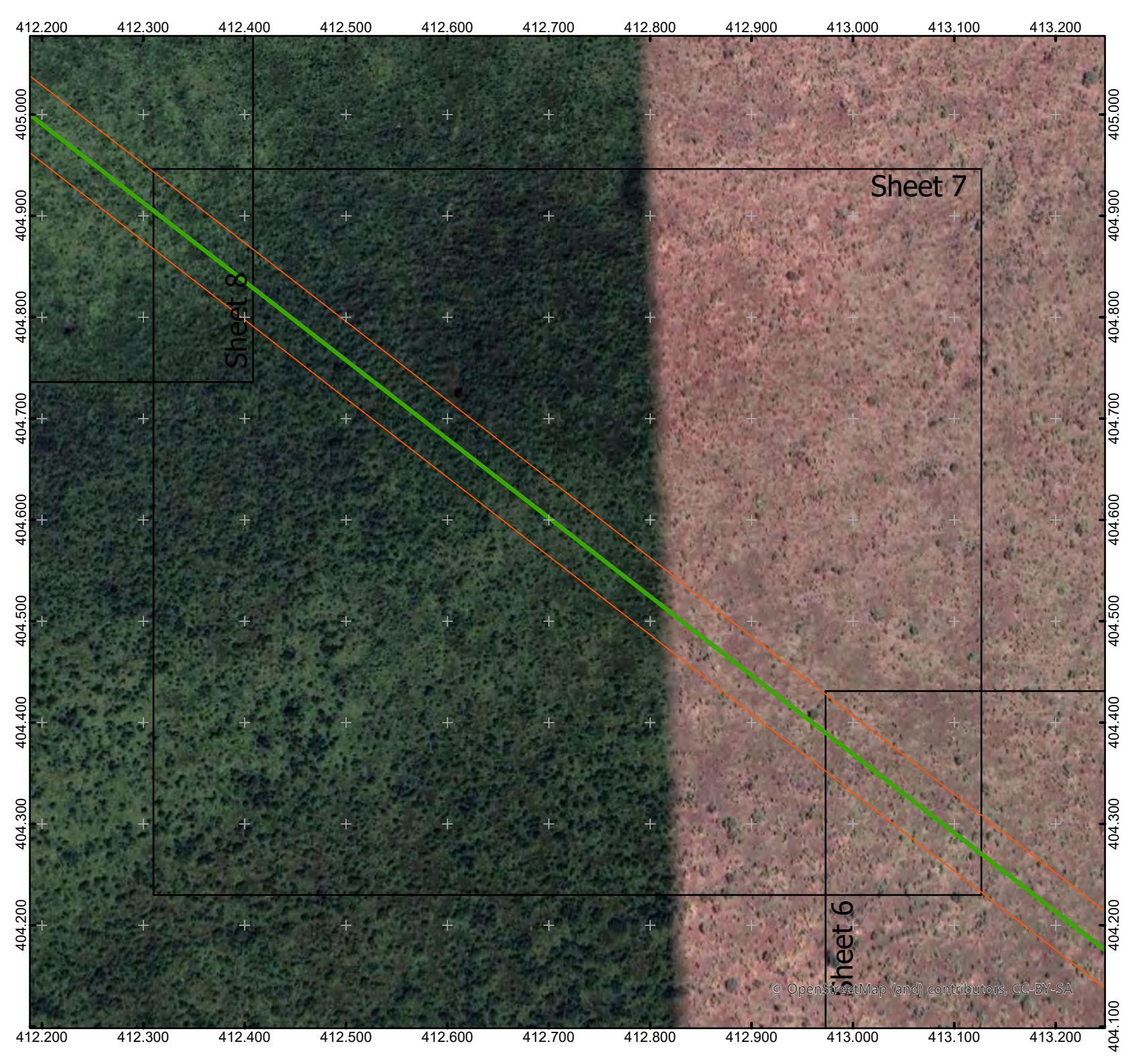
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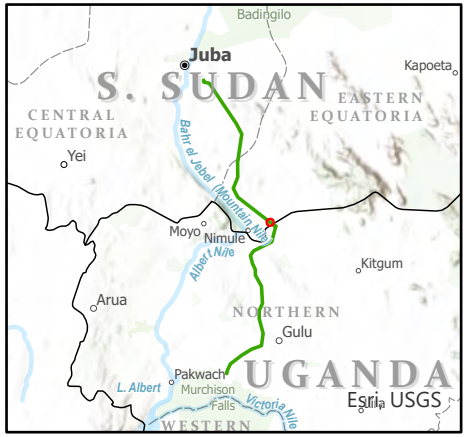
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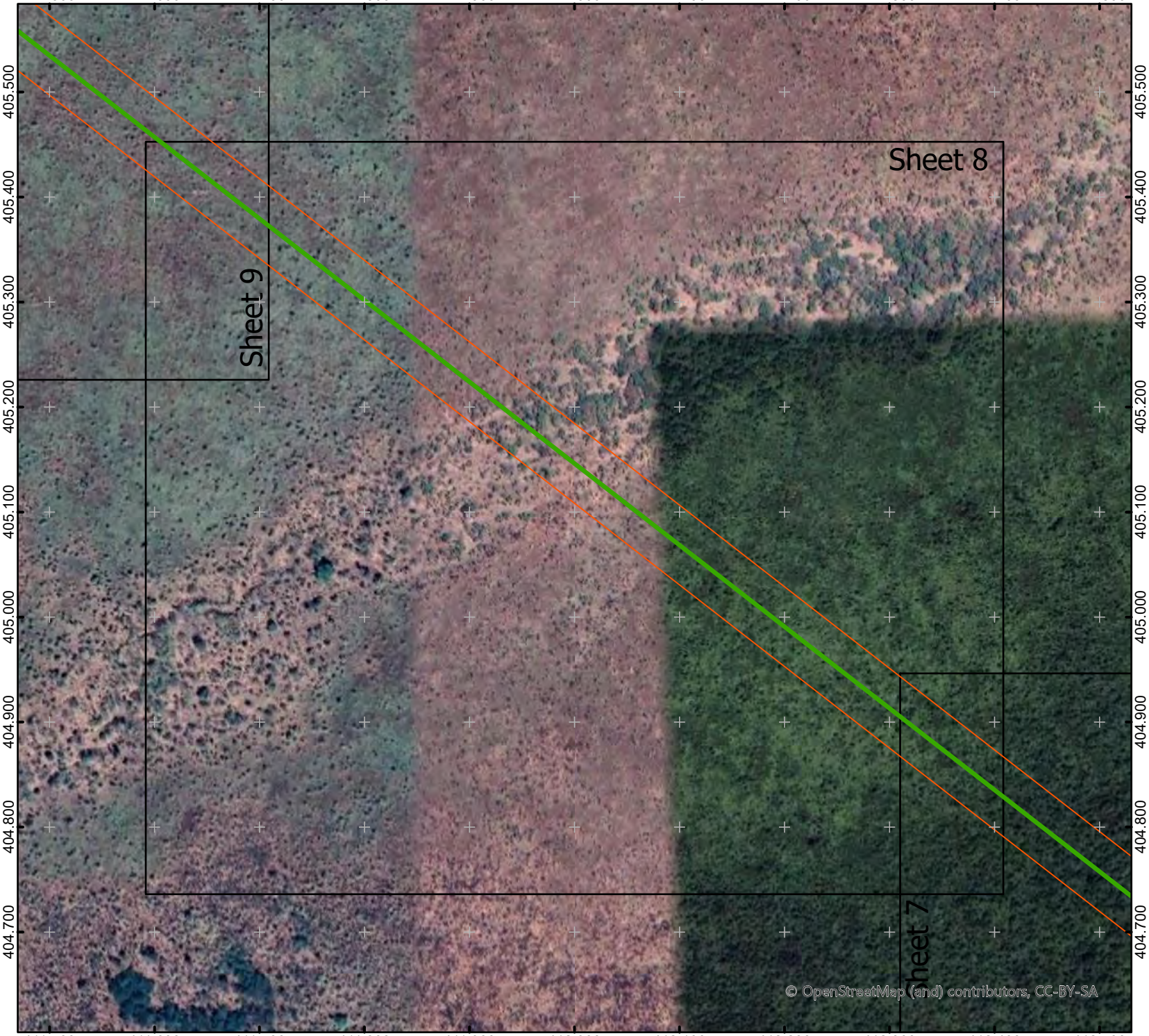
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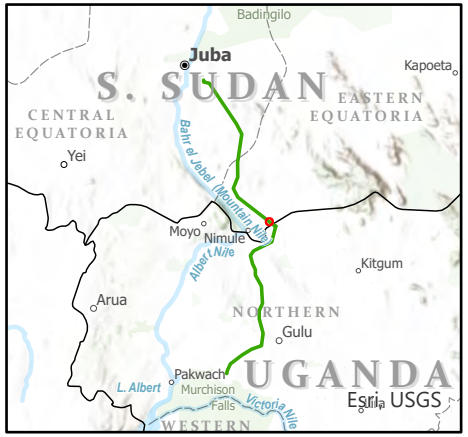
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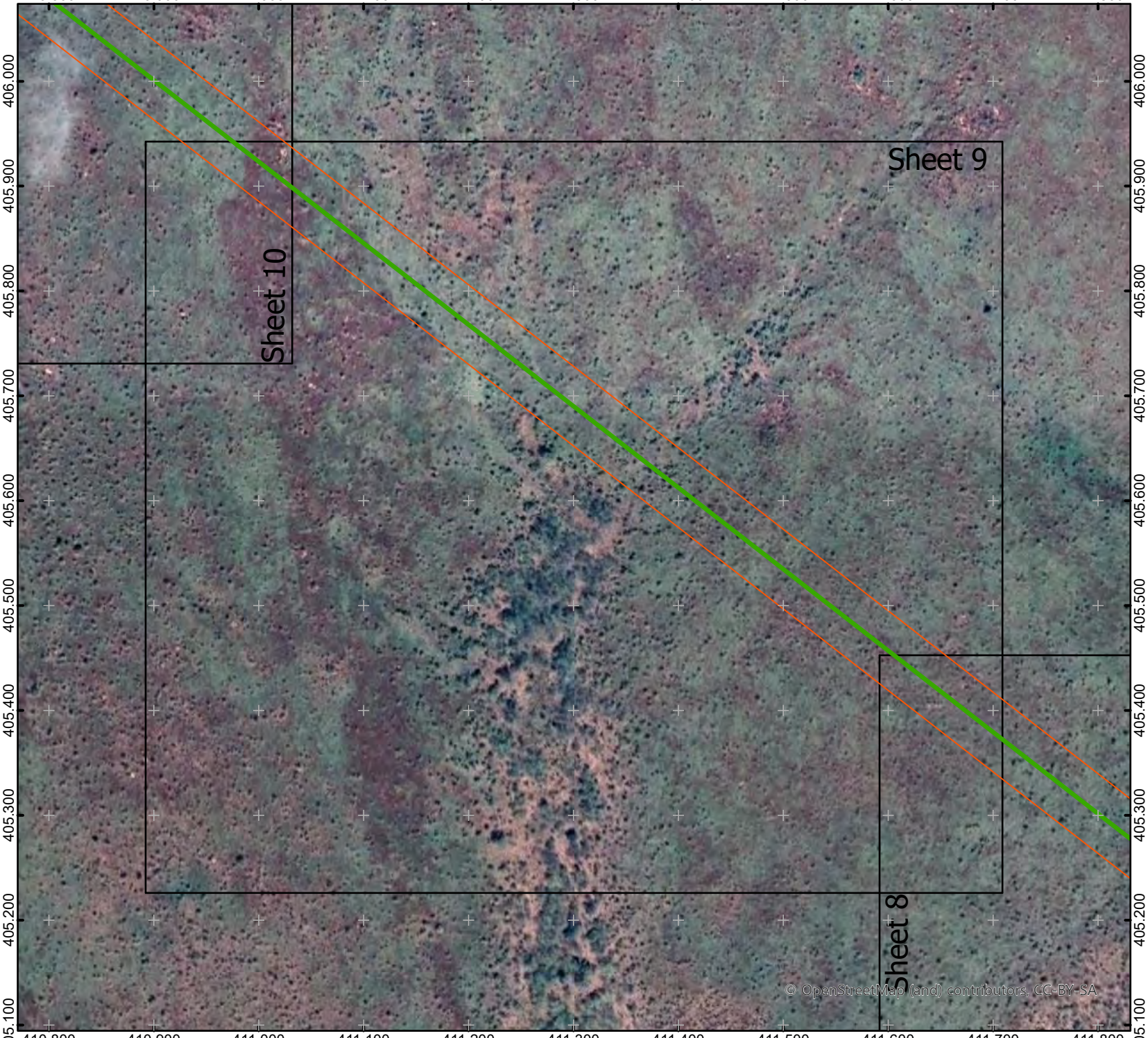
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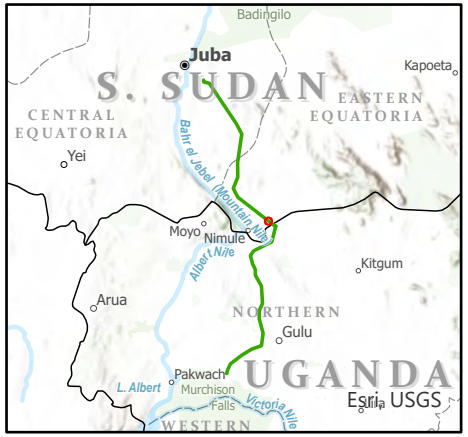
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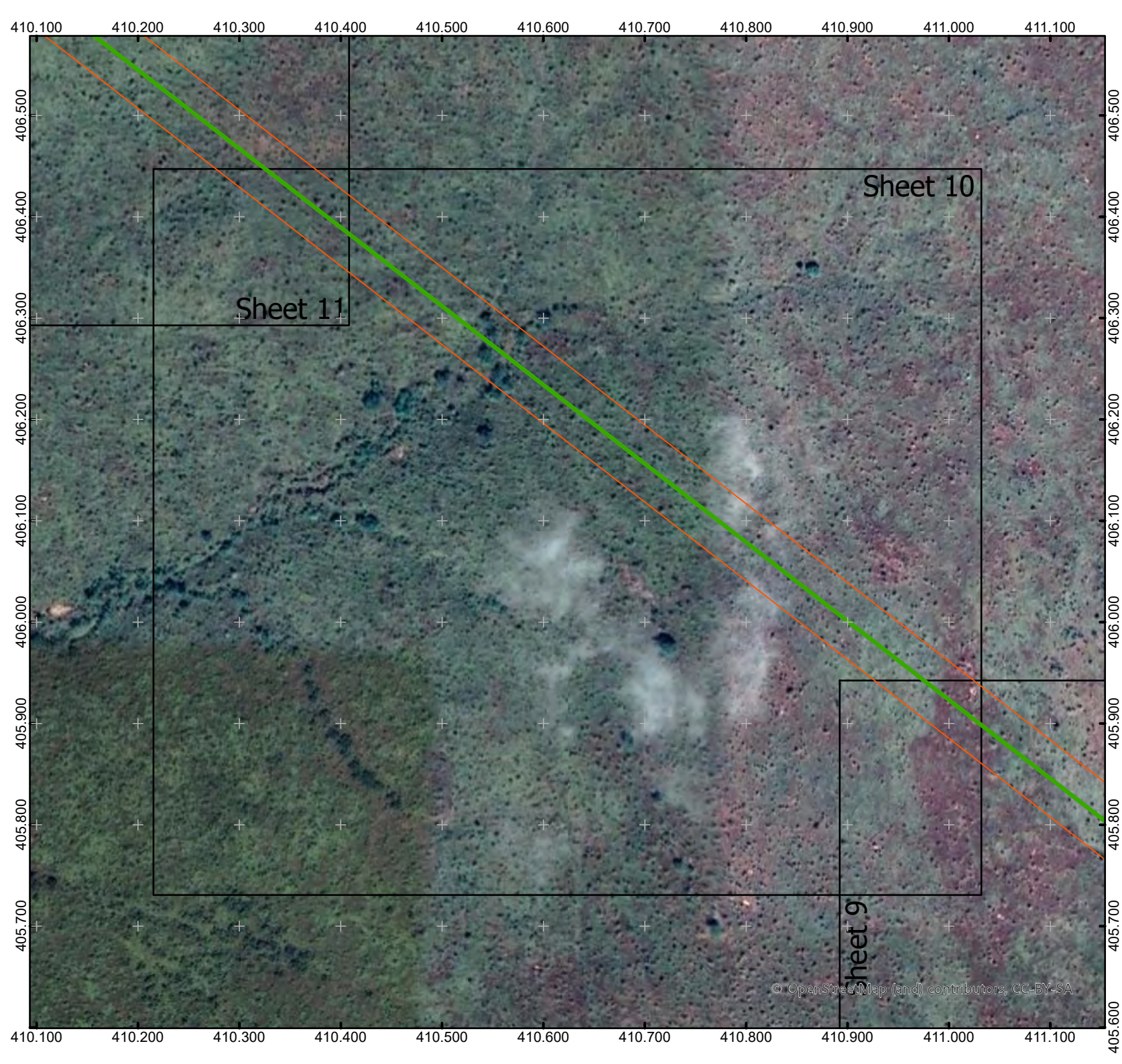
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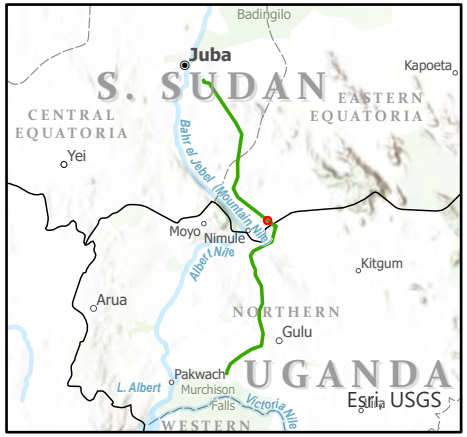
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South Sudan

Size A4

Scale 1:5.000





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- Proposed transmission line (Uganda section)
- Direct Area of Influence

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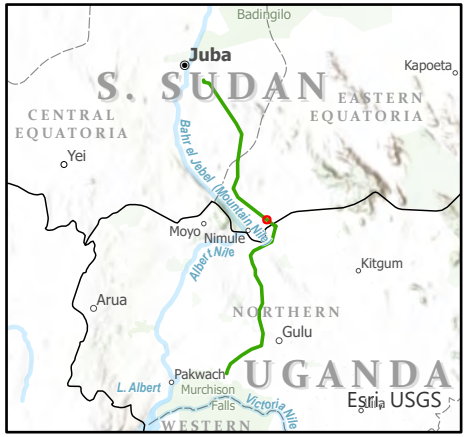
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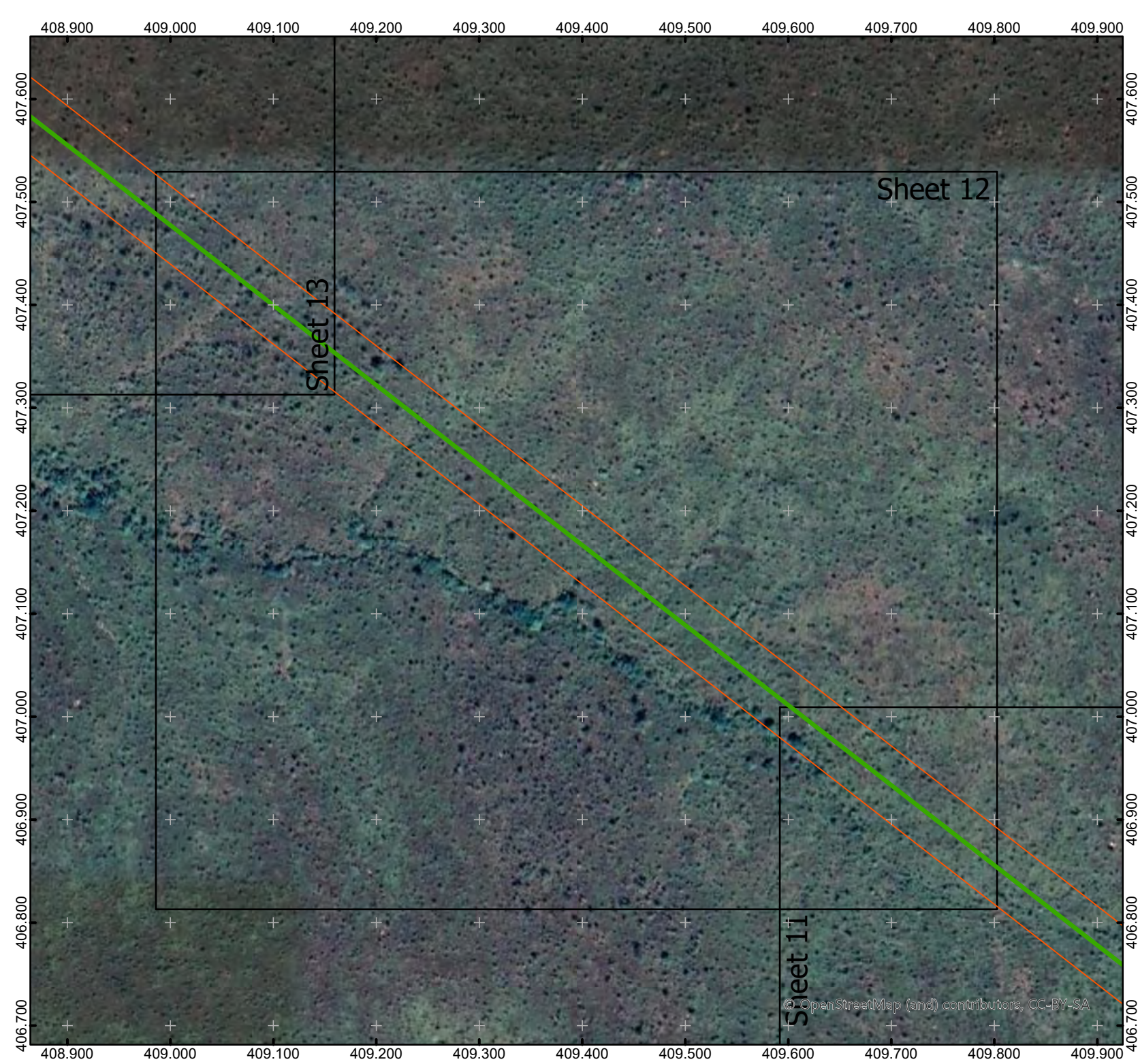
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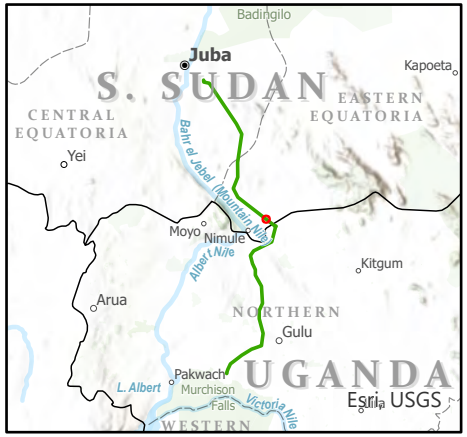
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- Proposed transmission line (Uganda section)
- Direct Area of Influence

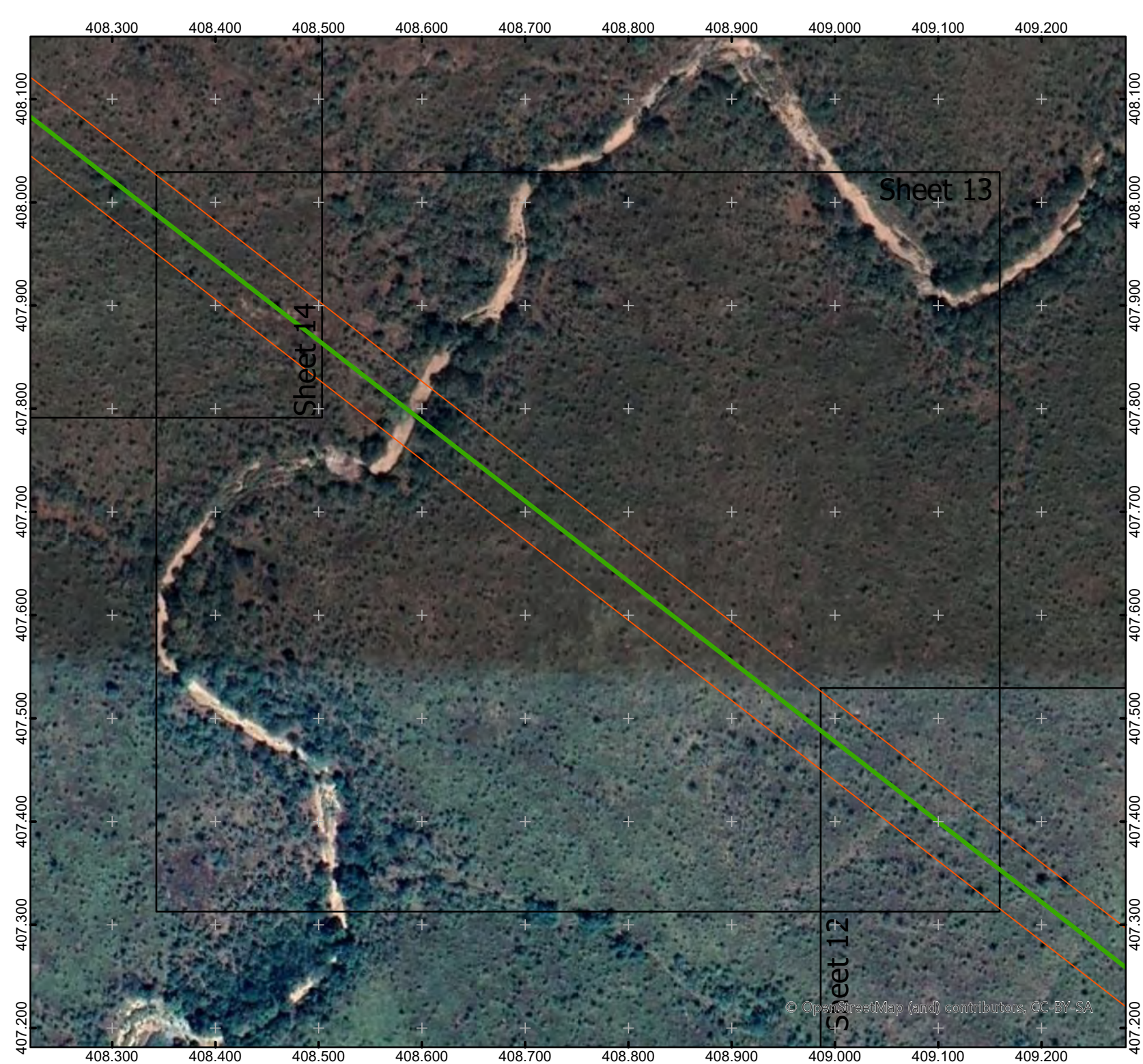
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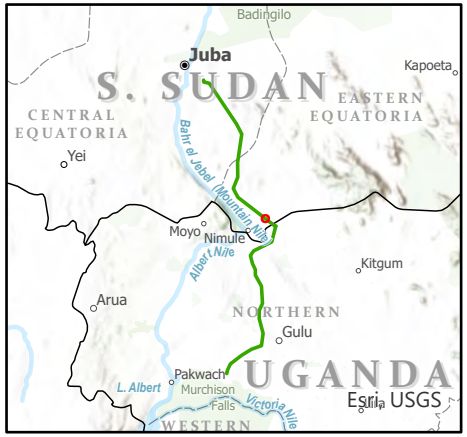
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

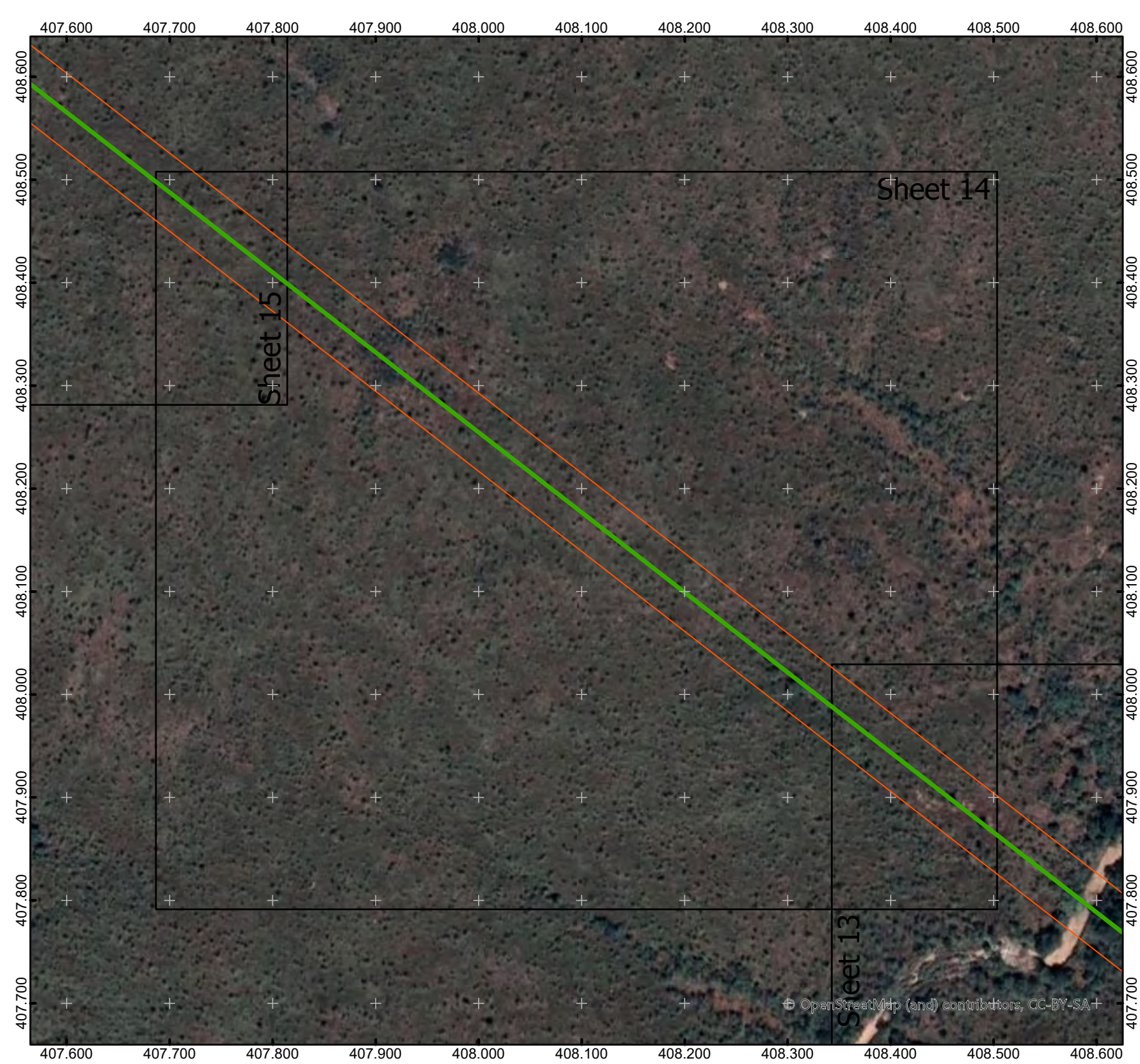
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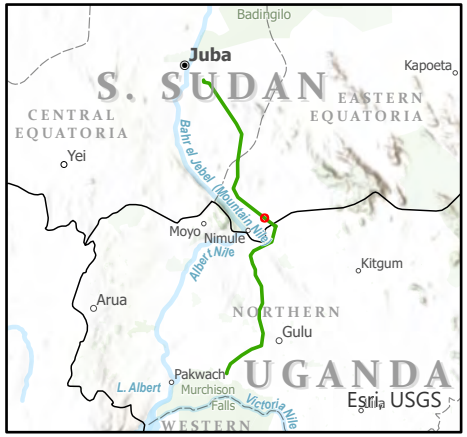
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

0 0,2 Kilometers

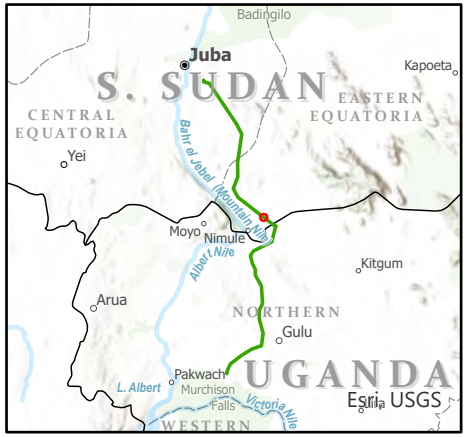
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





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- Direct Area of Influence

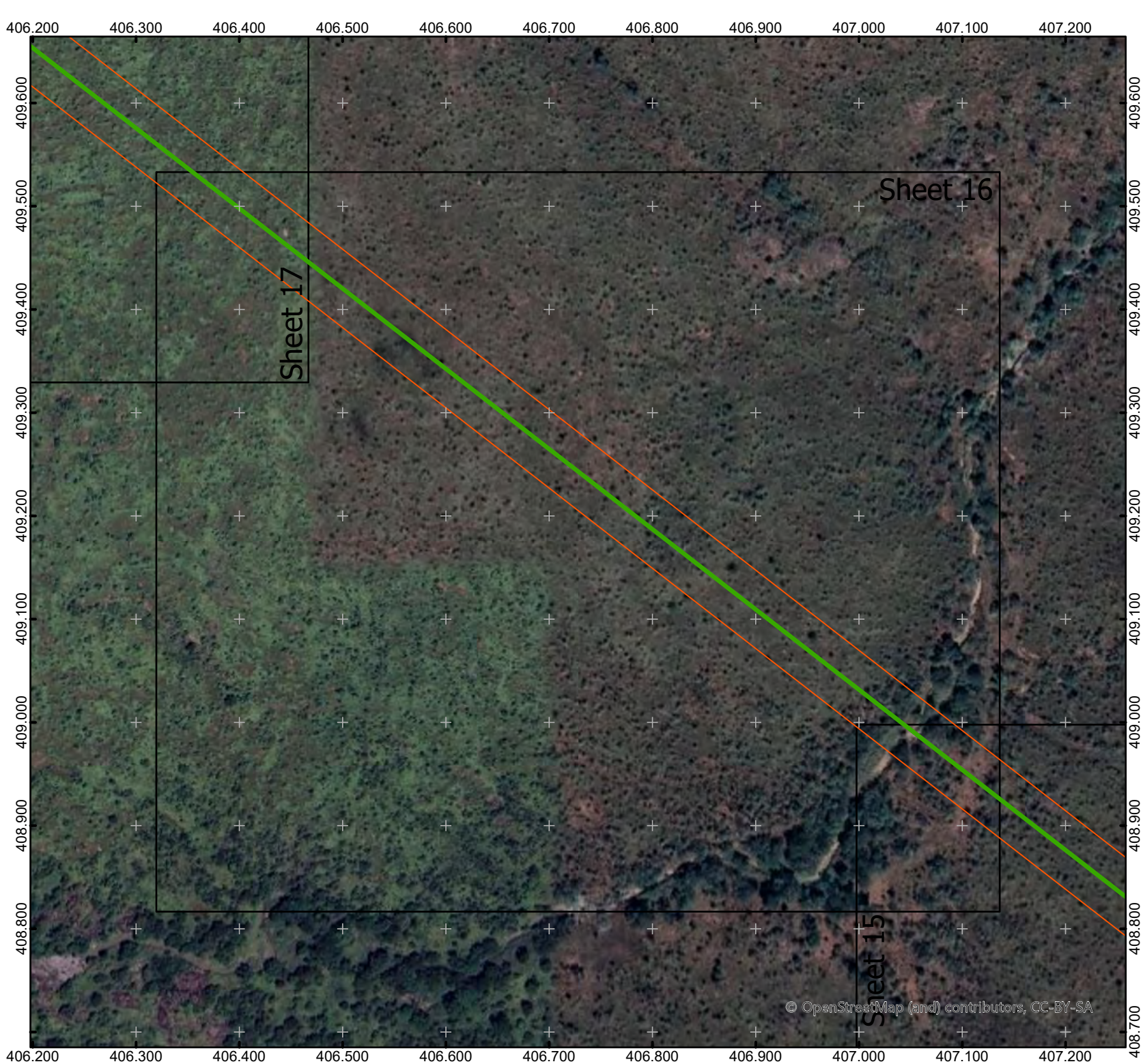
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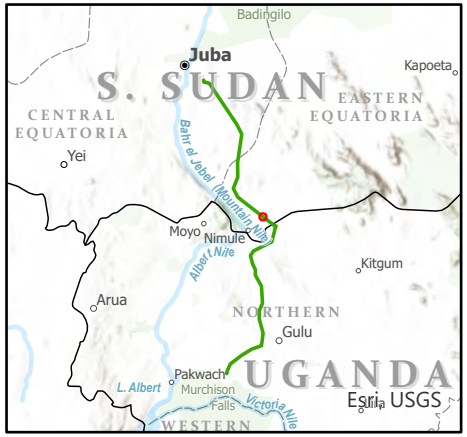
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Direct Area of Influence

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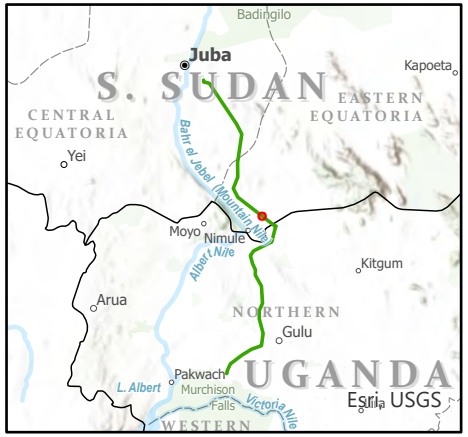
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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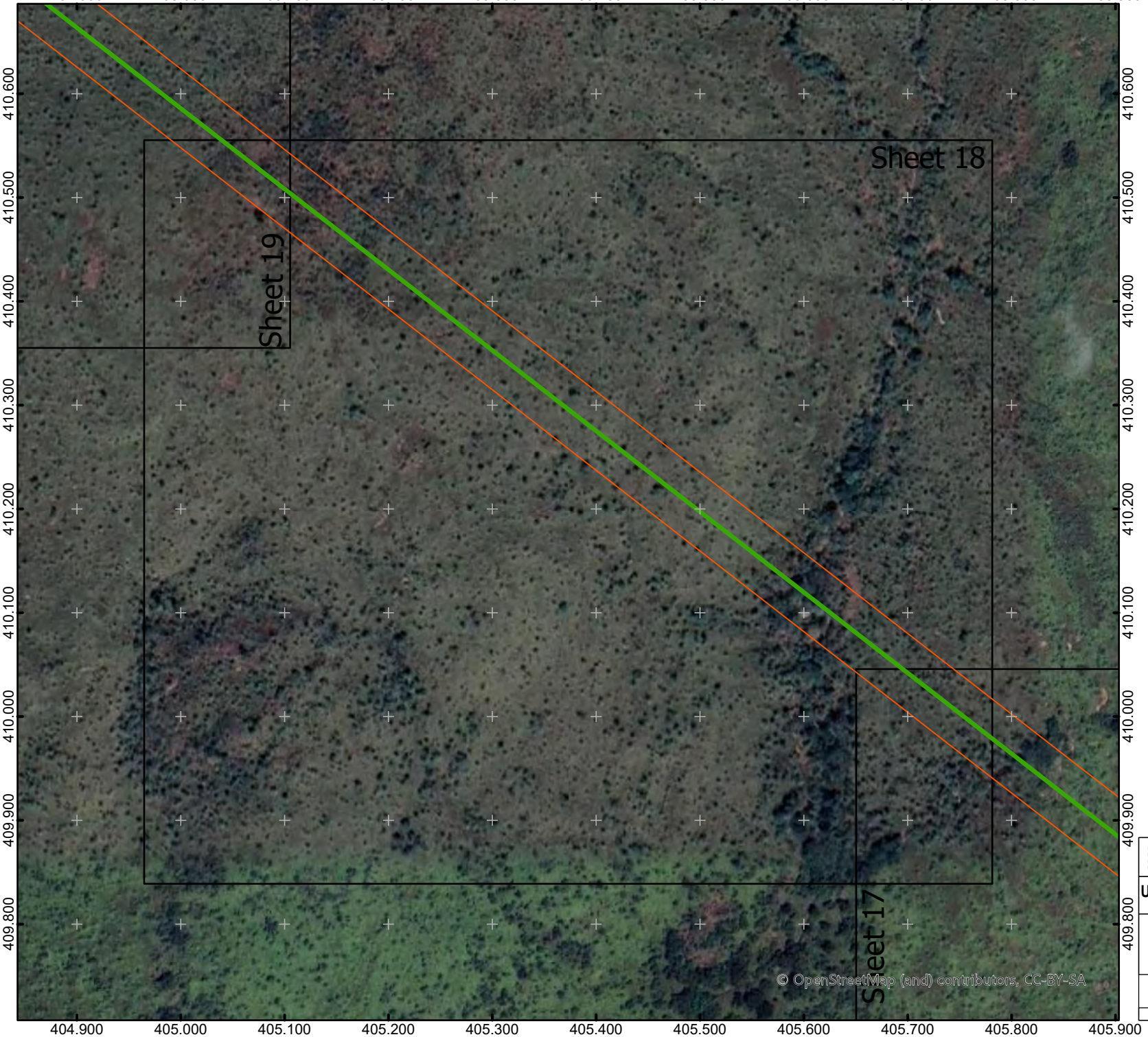
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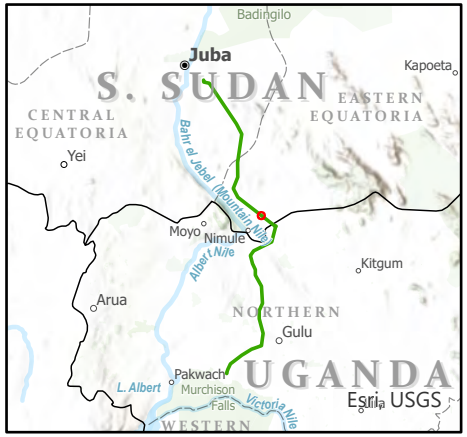
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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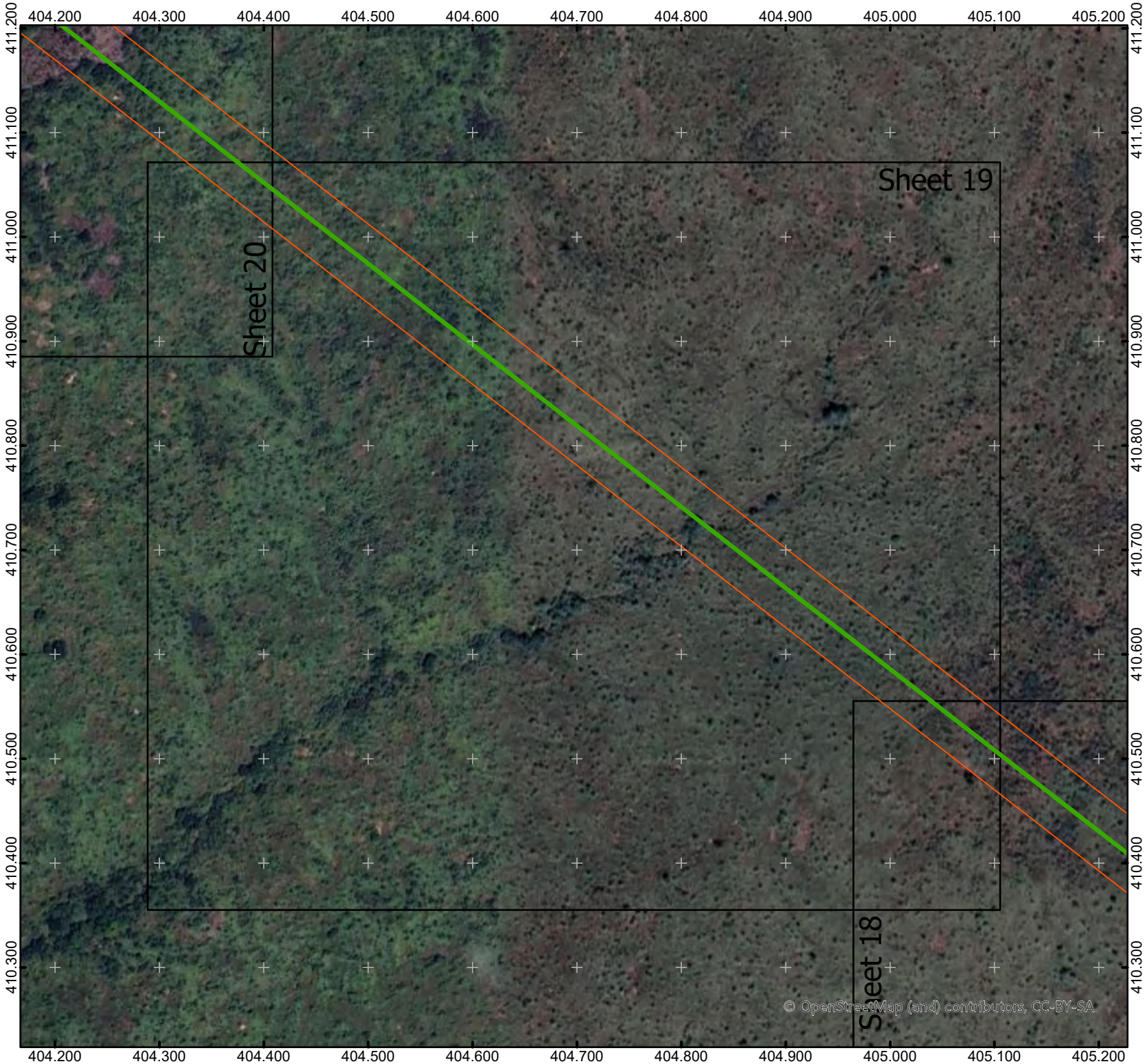
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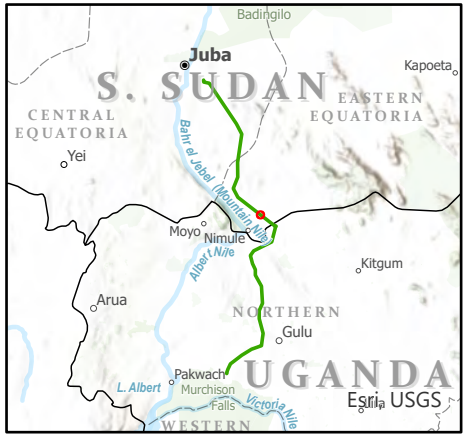
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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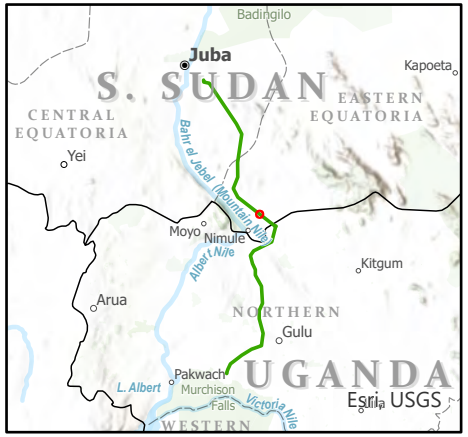
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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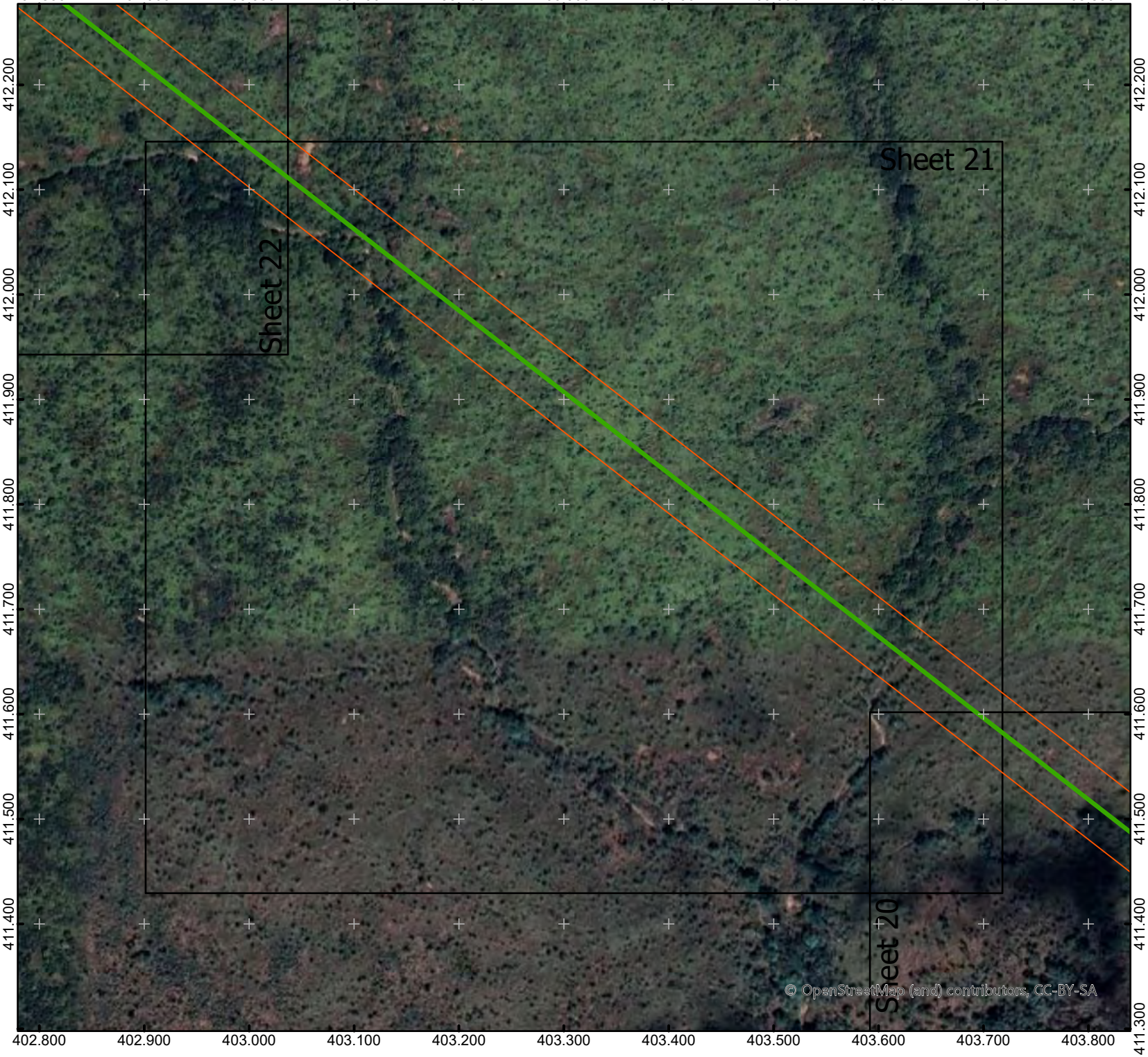
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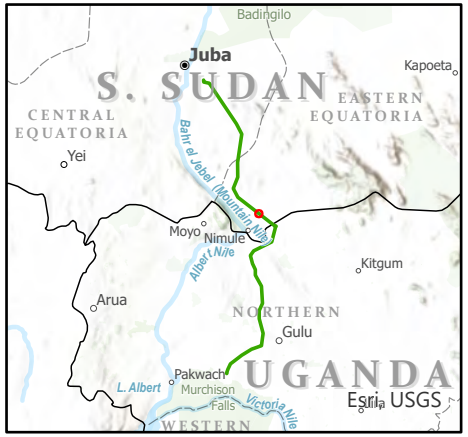
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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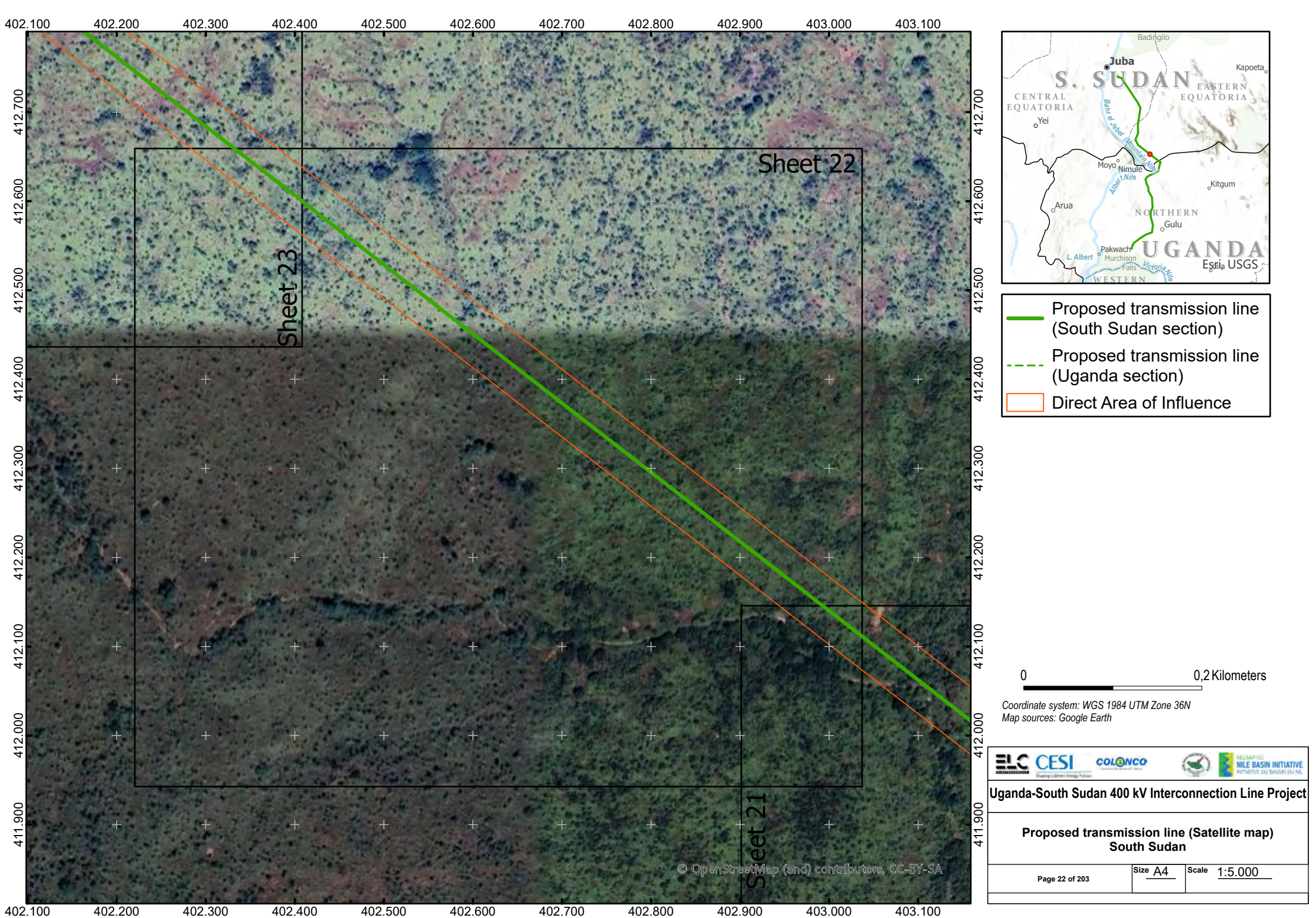
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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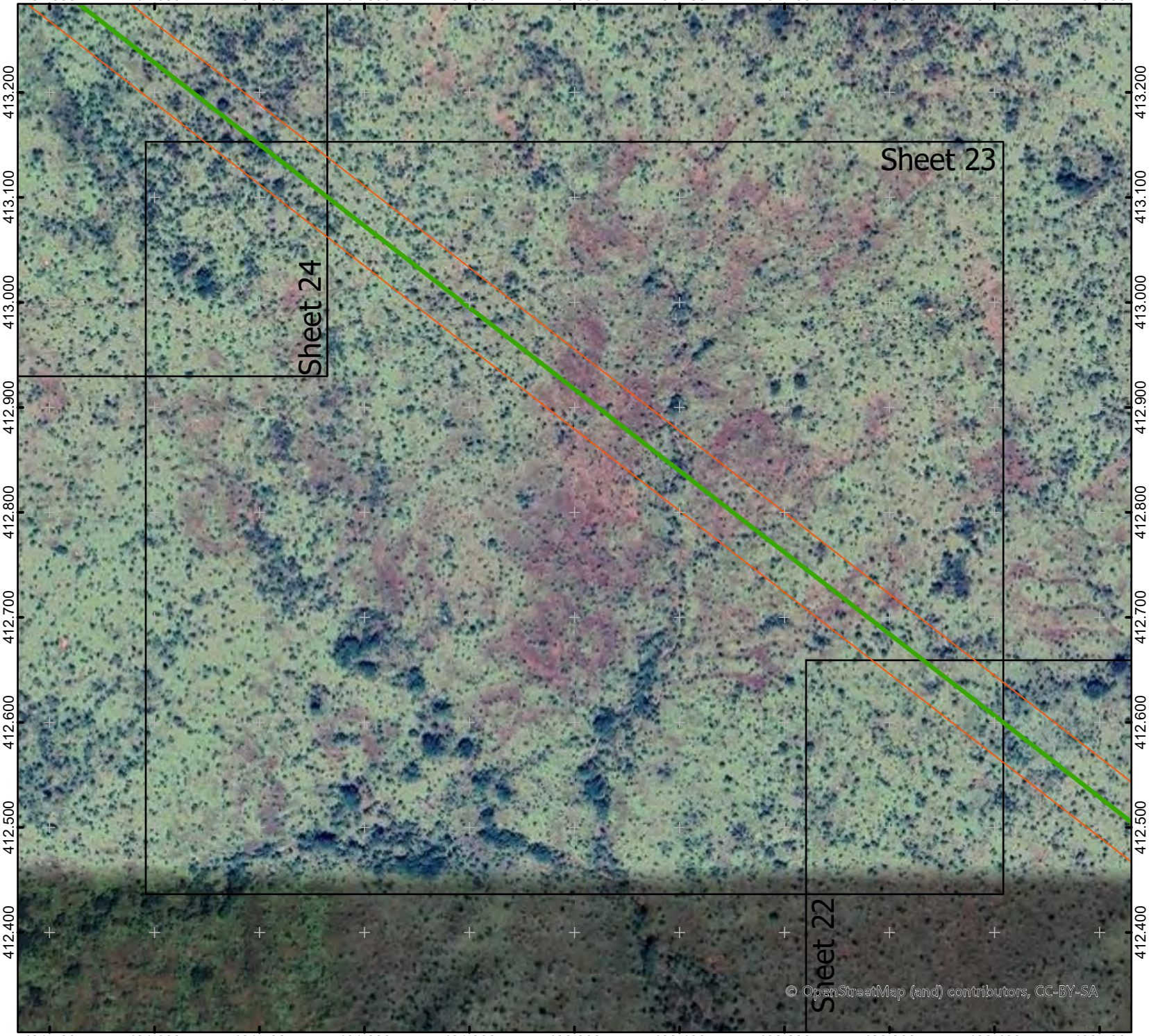
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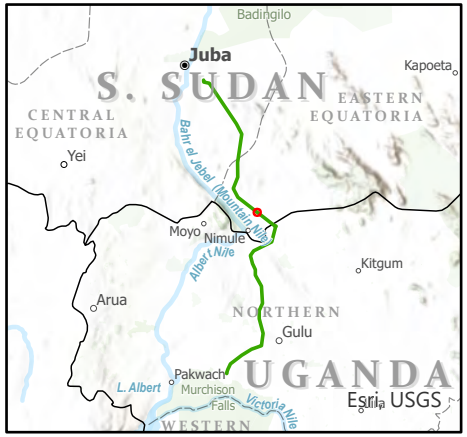
Coordinate system: WGS 1984 UTM Zone 36N
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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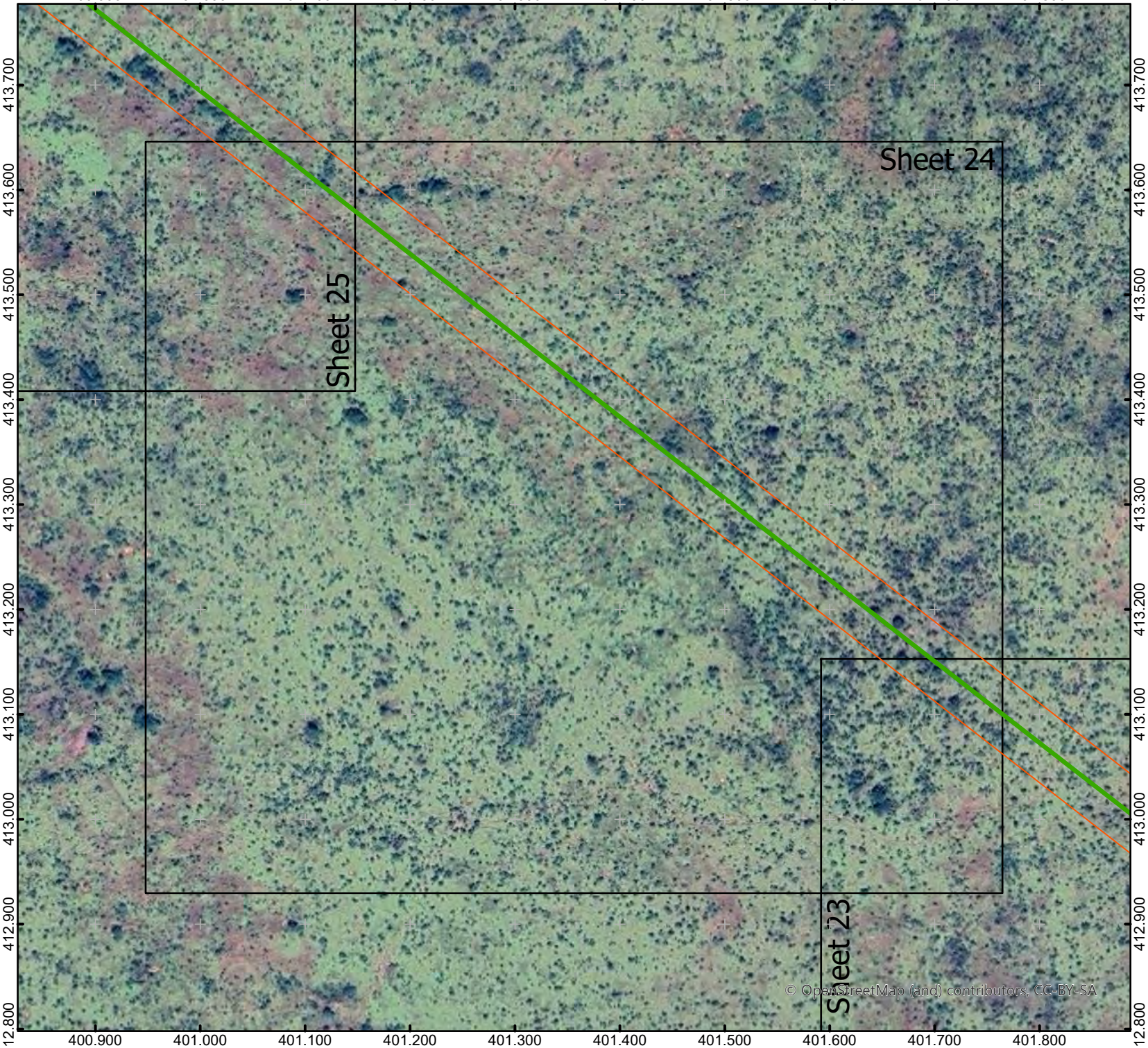
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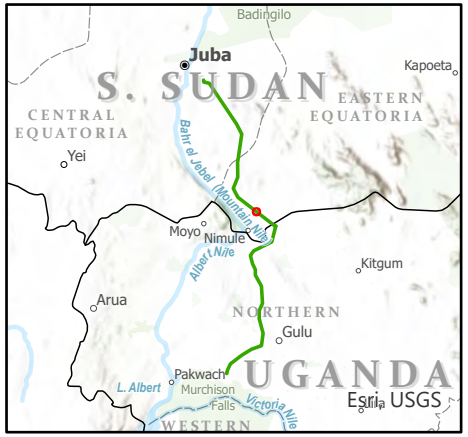
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

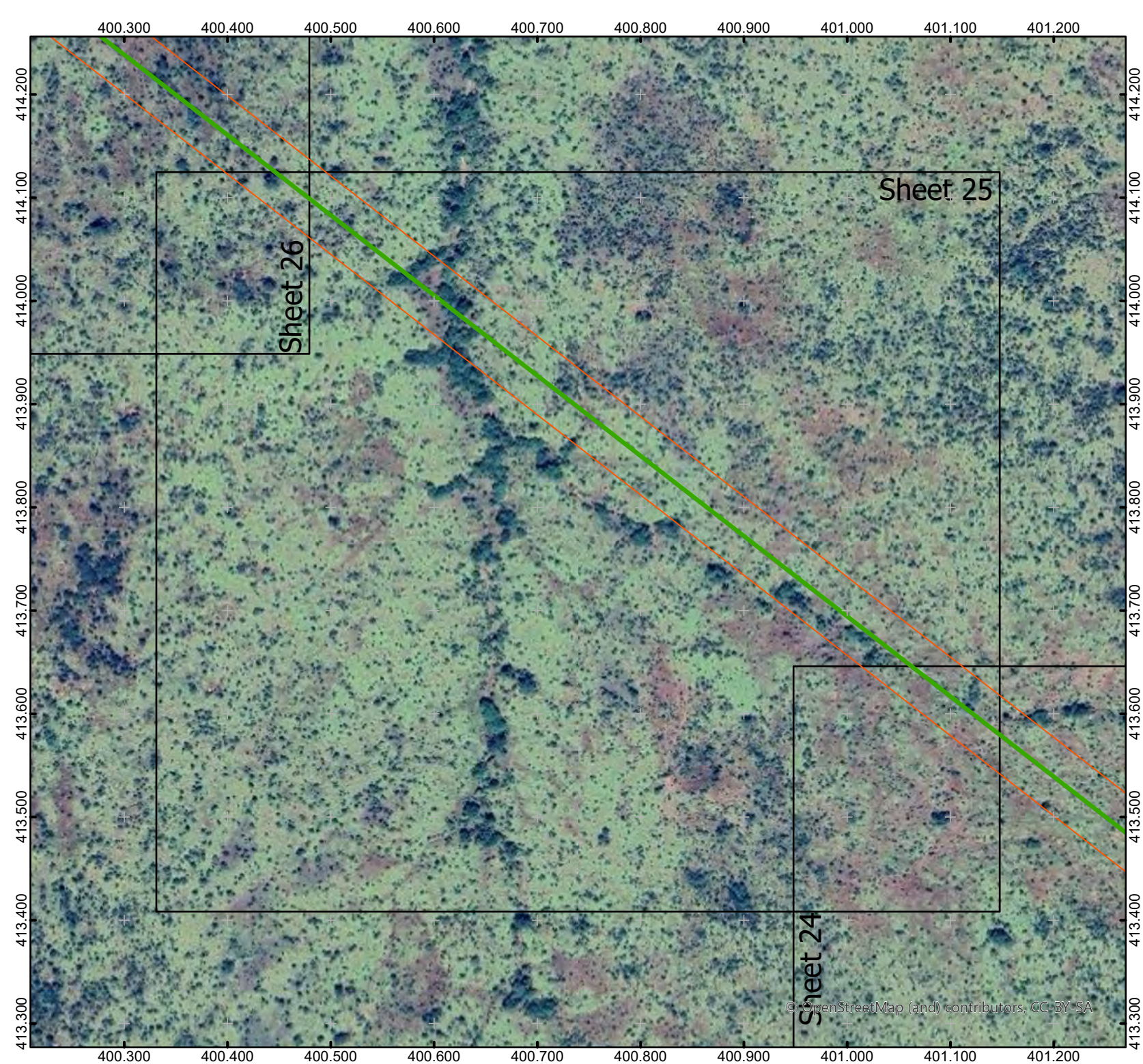
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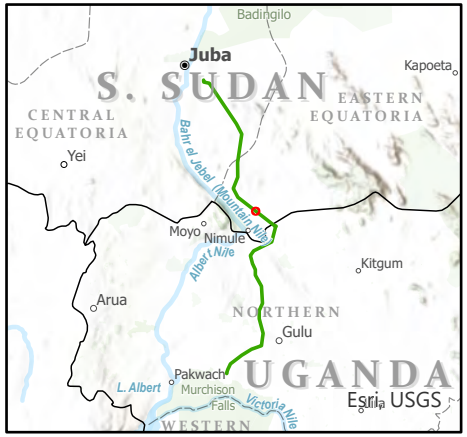
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

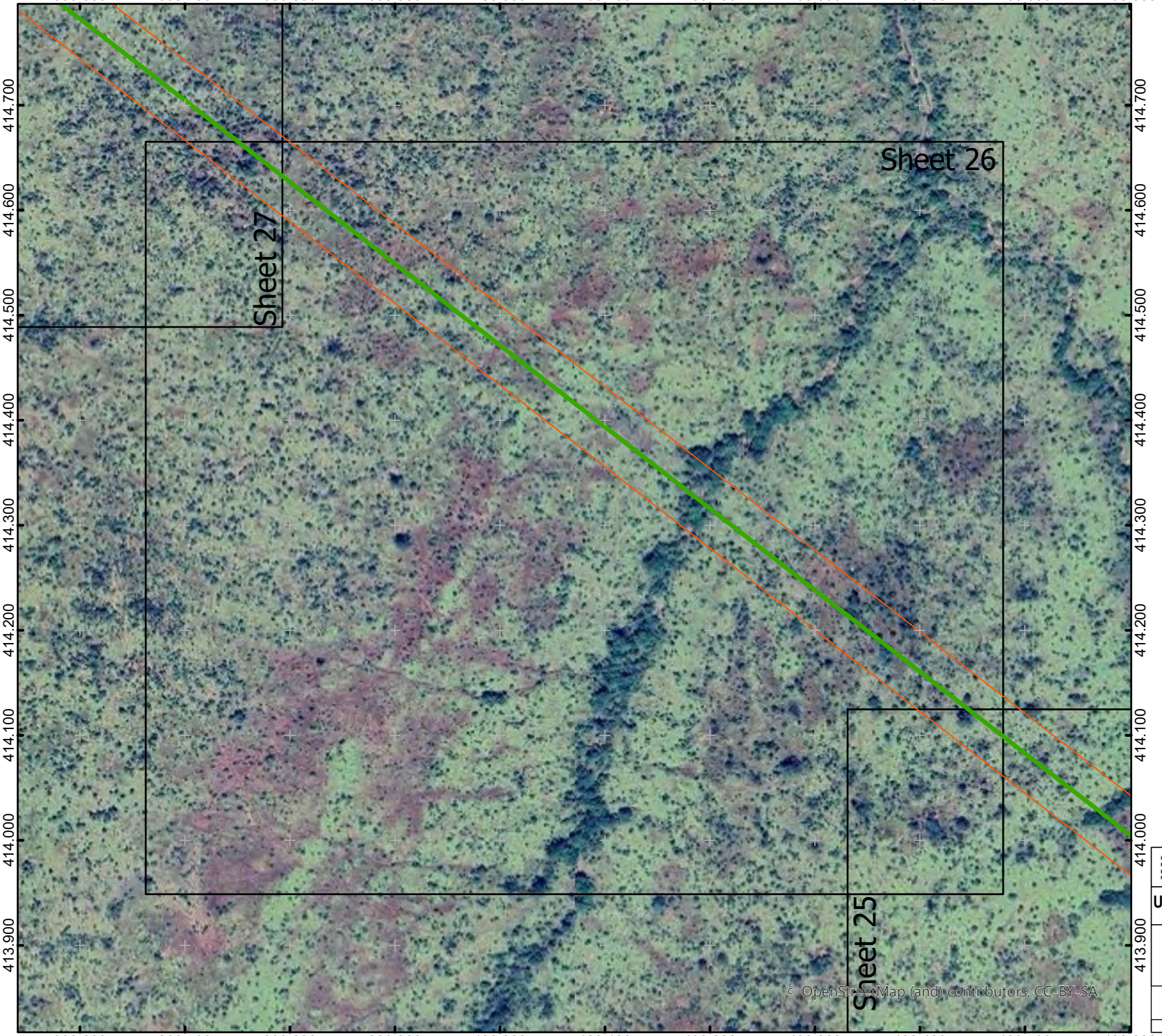
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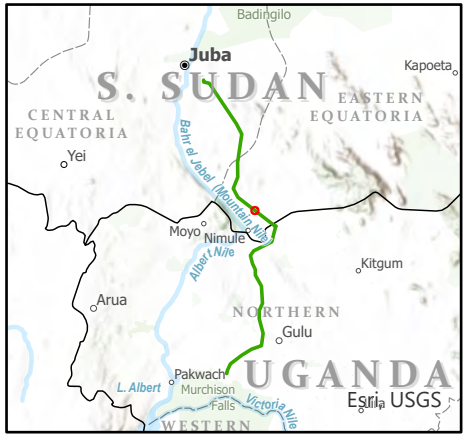
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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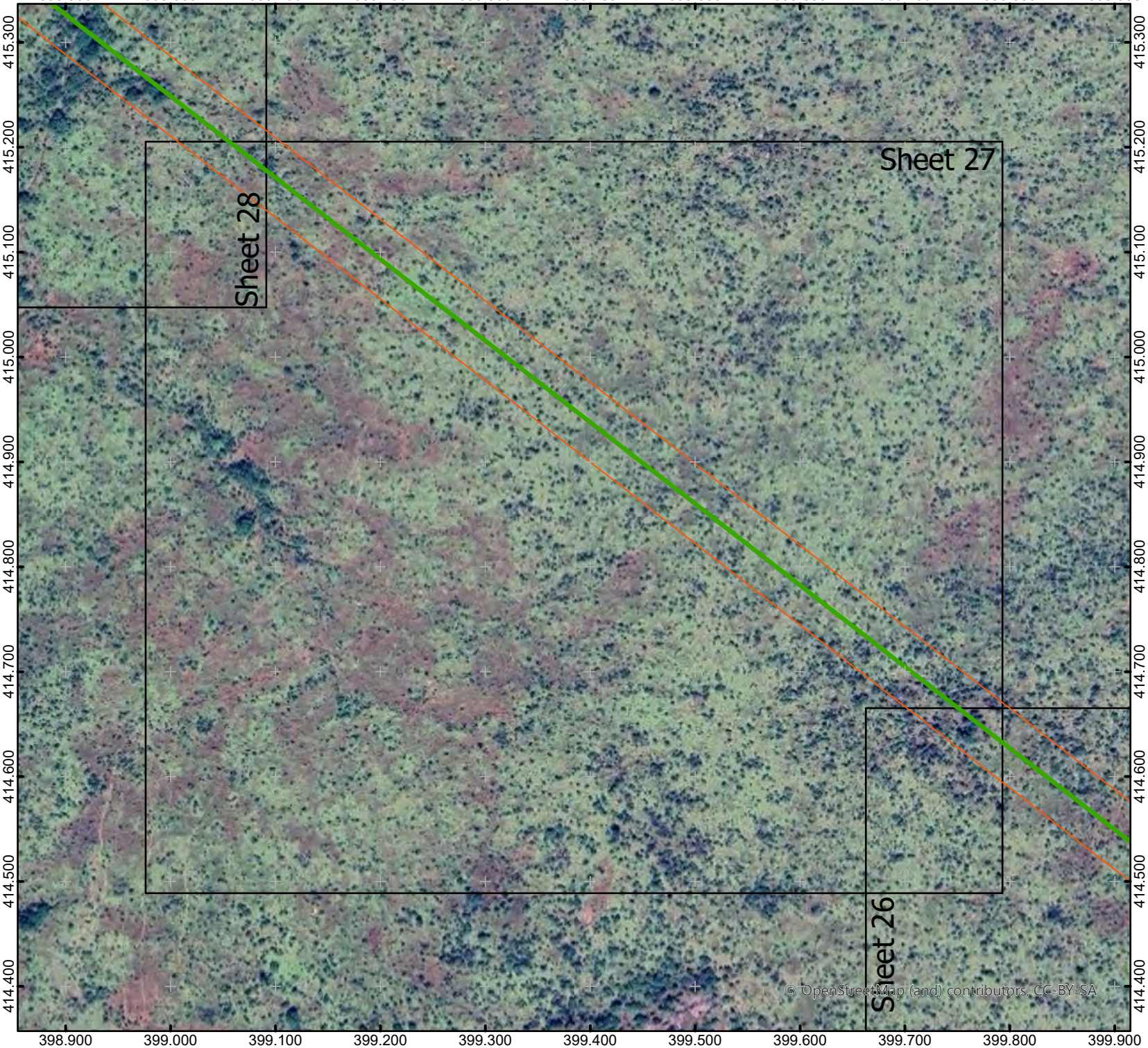
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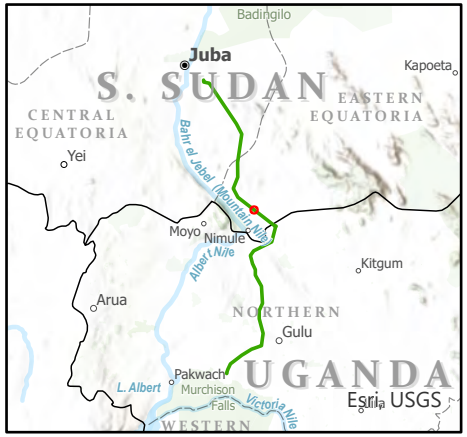
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

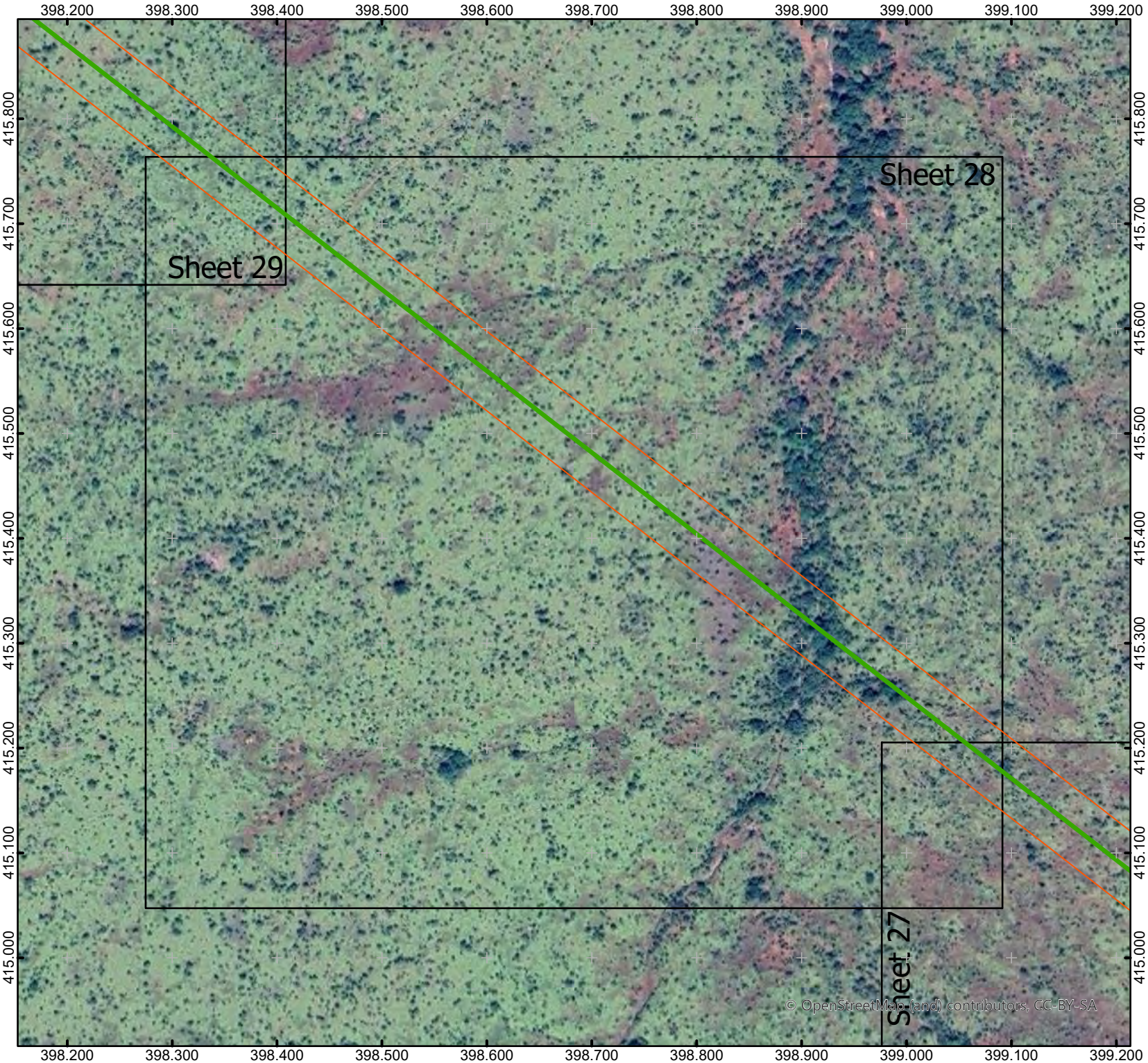
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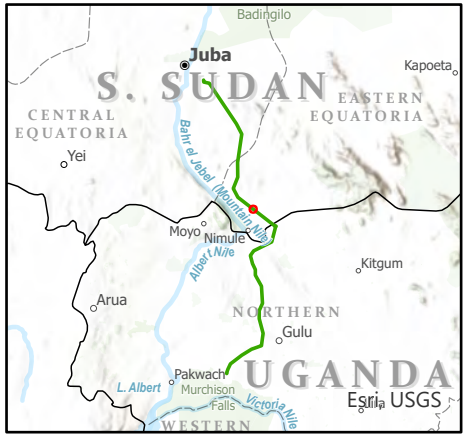
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

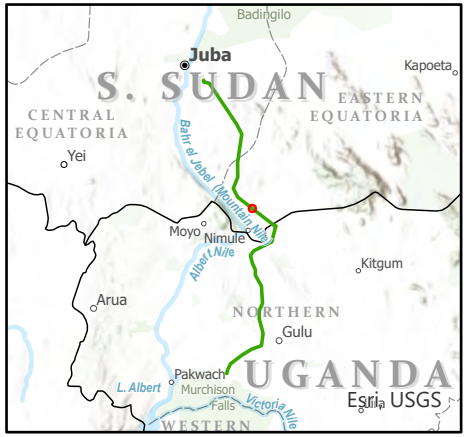
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Uganda-South Sudan 400 kV Interconnection Line Project

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South Sudan

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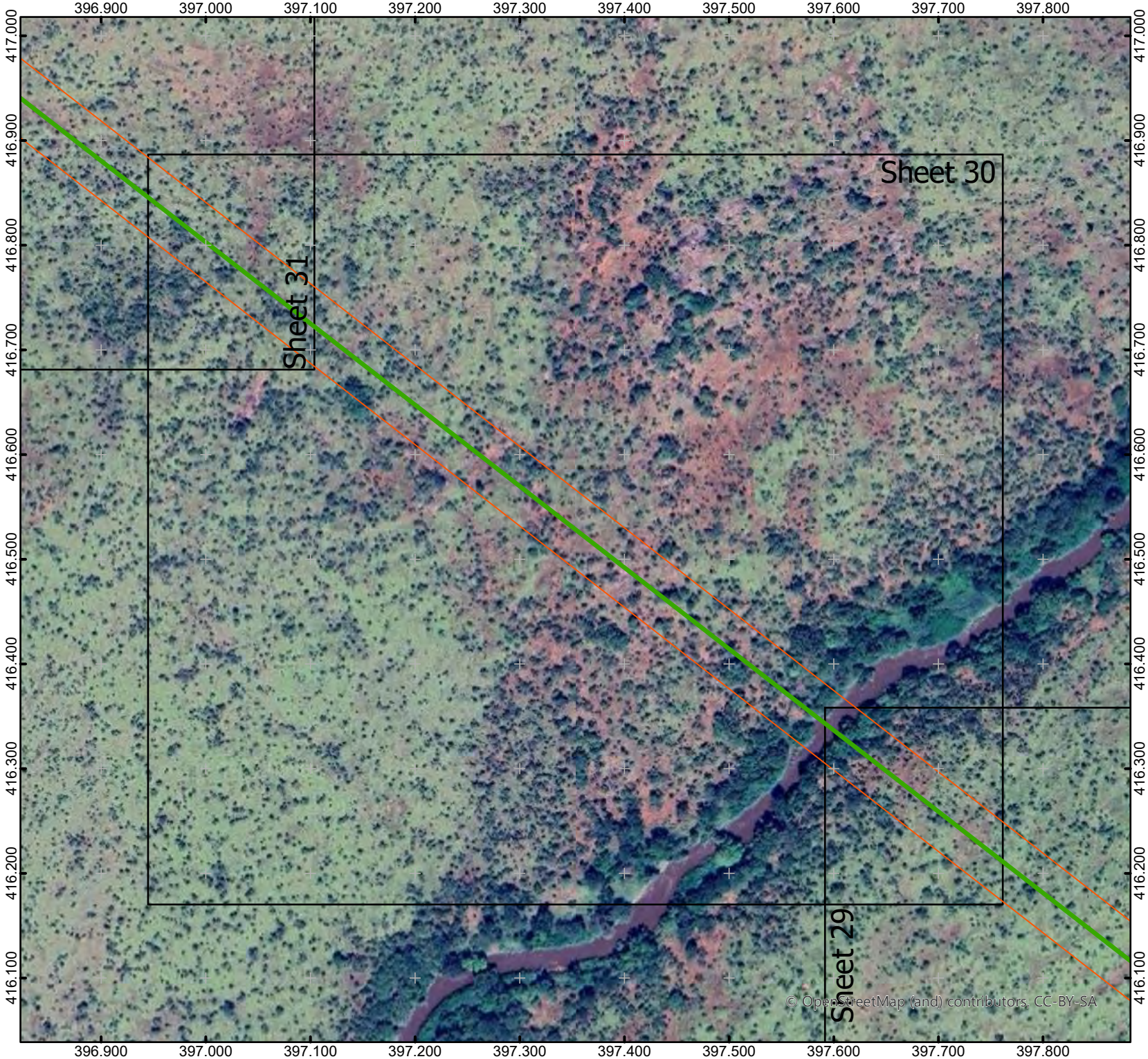
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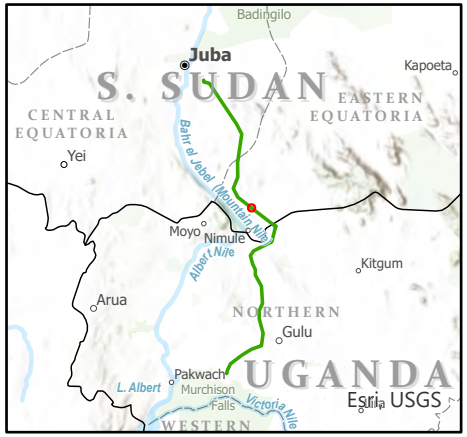
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

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Direct Area of Influence

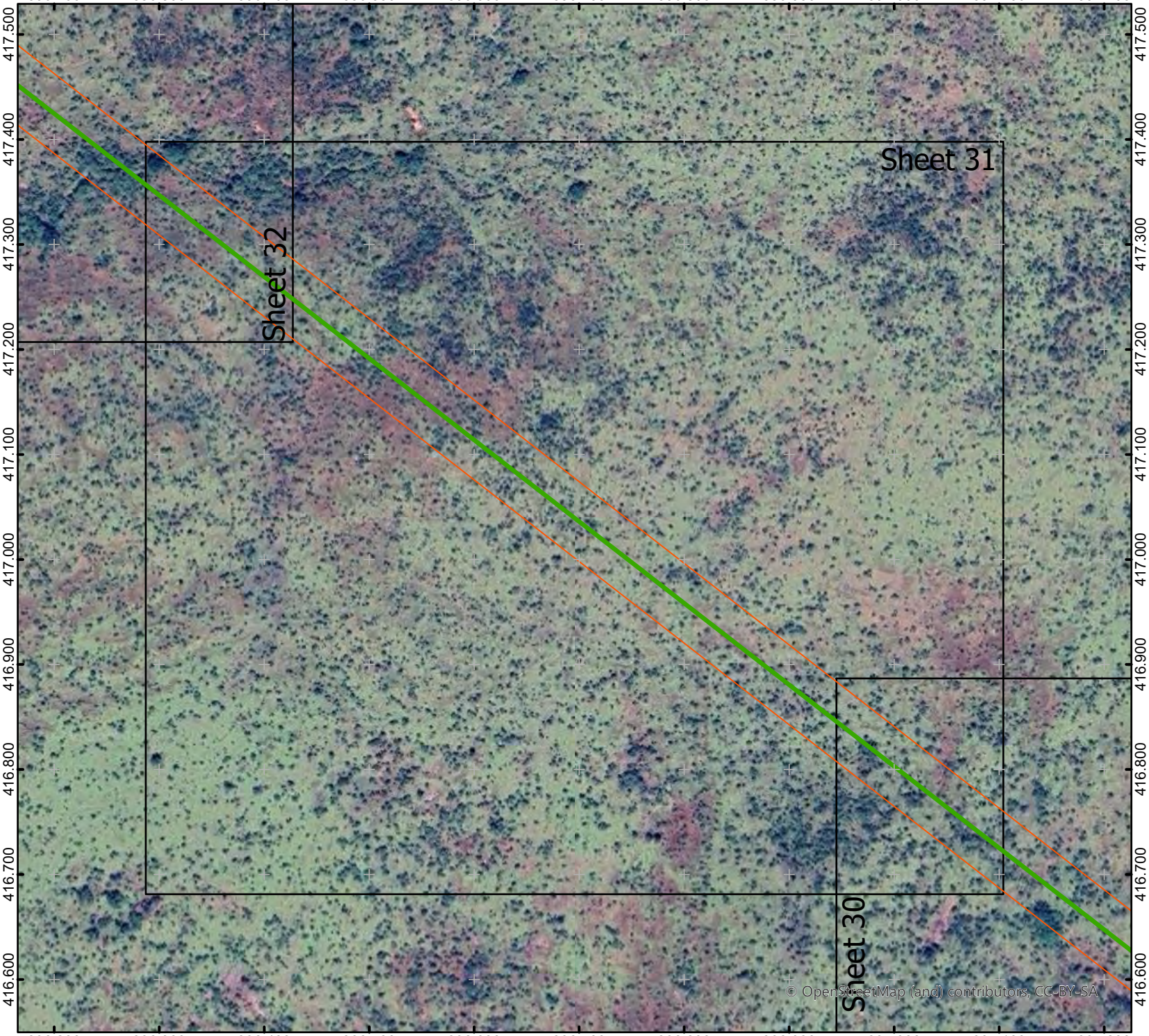
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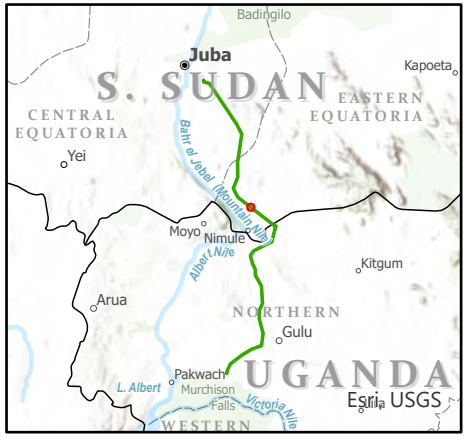
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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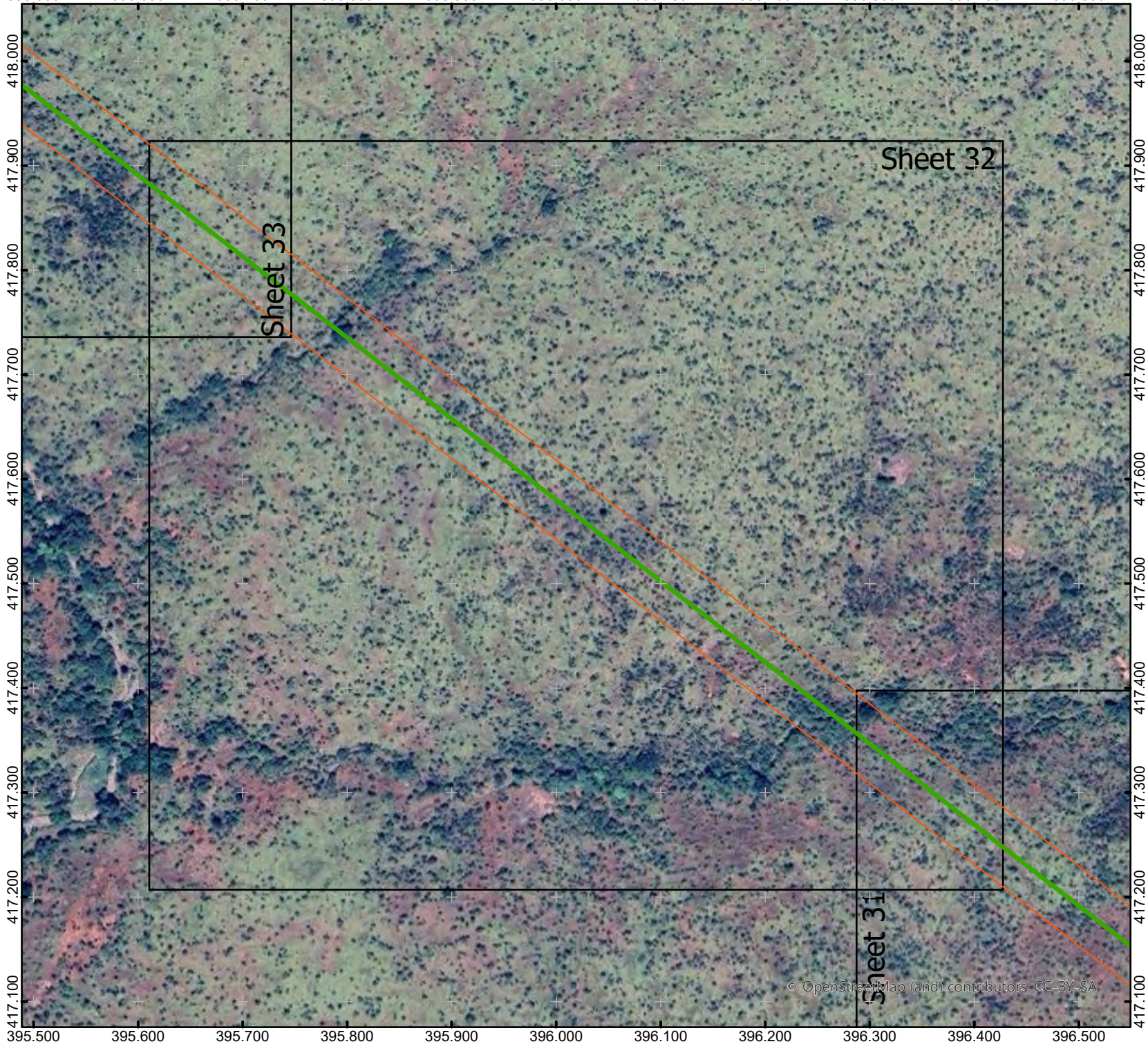
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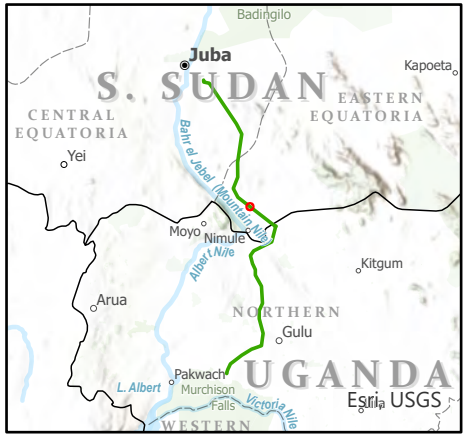
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Uganda-South Sudan 400 kV Interconnection Line Project

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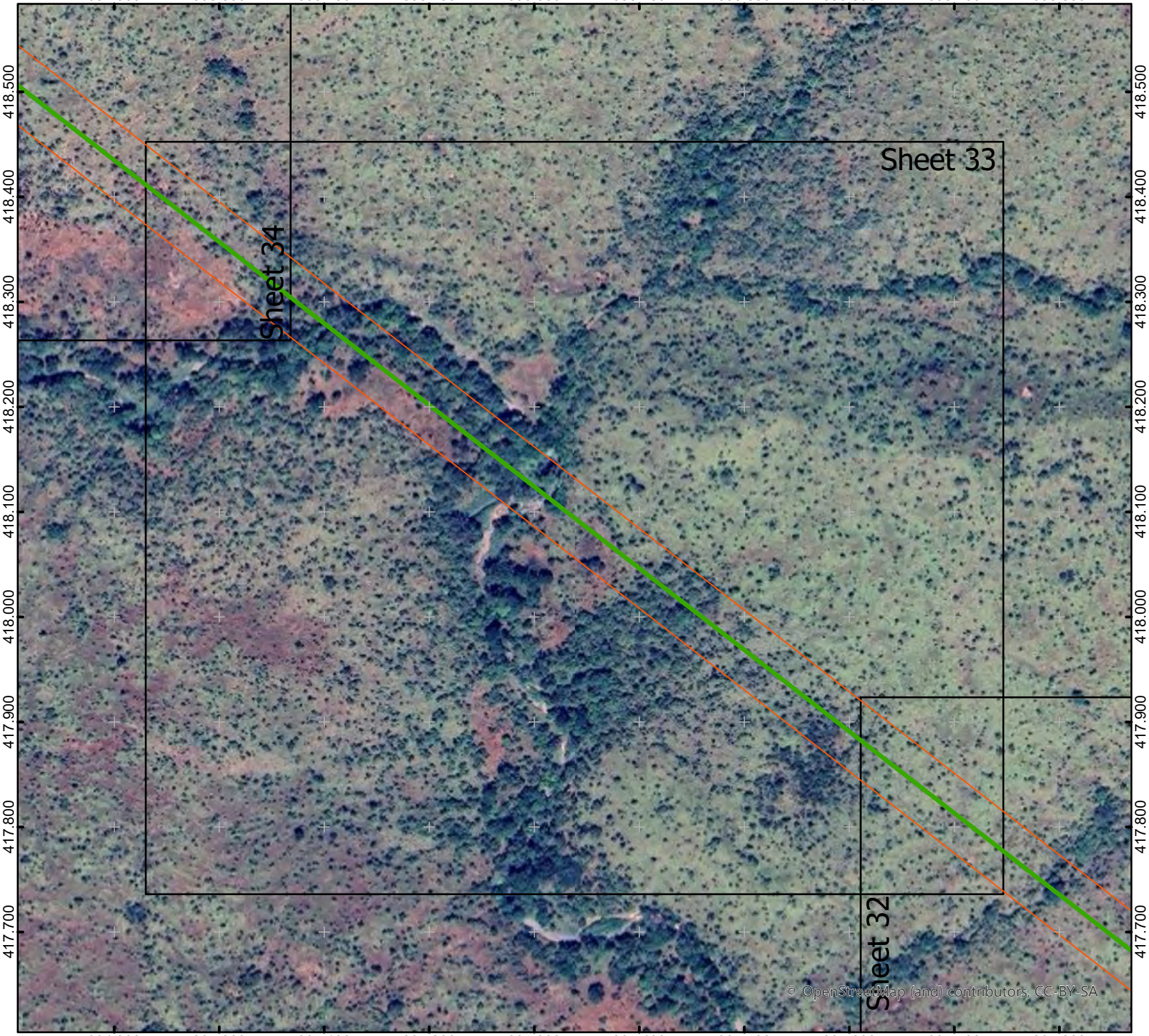
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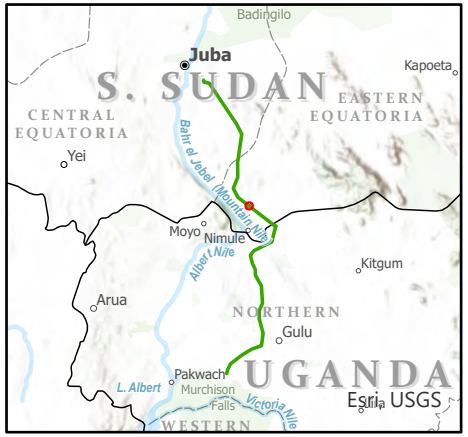
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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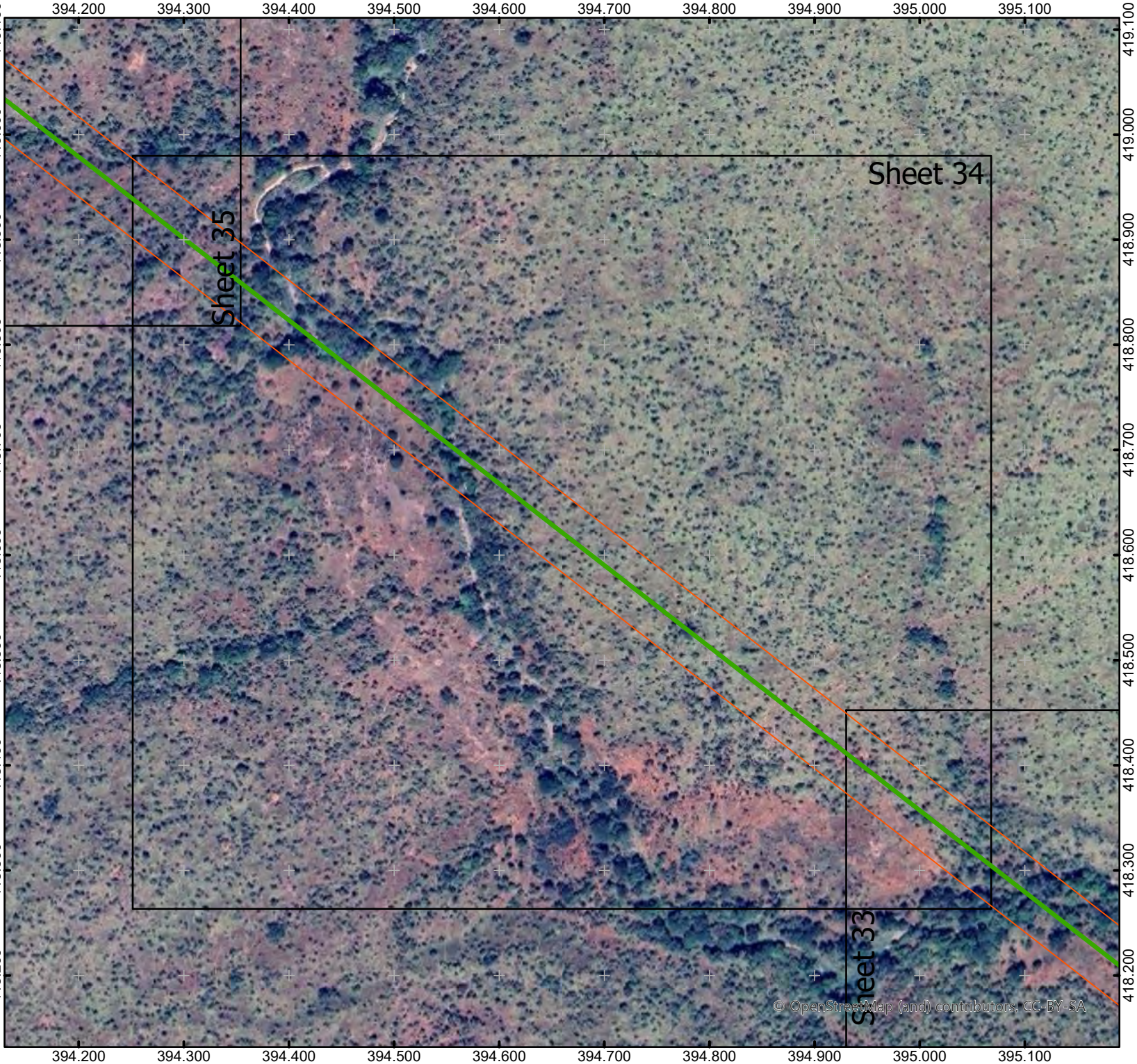
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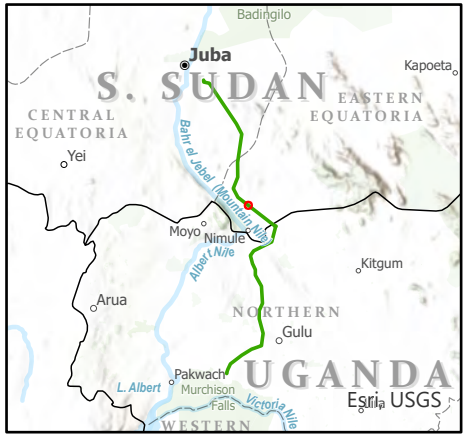
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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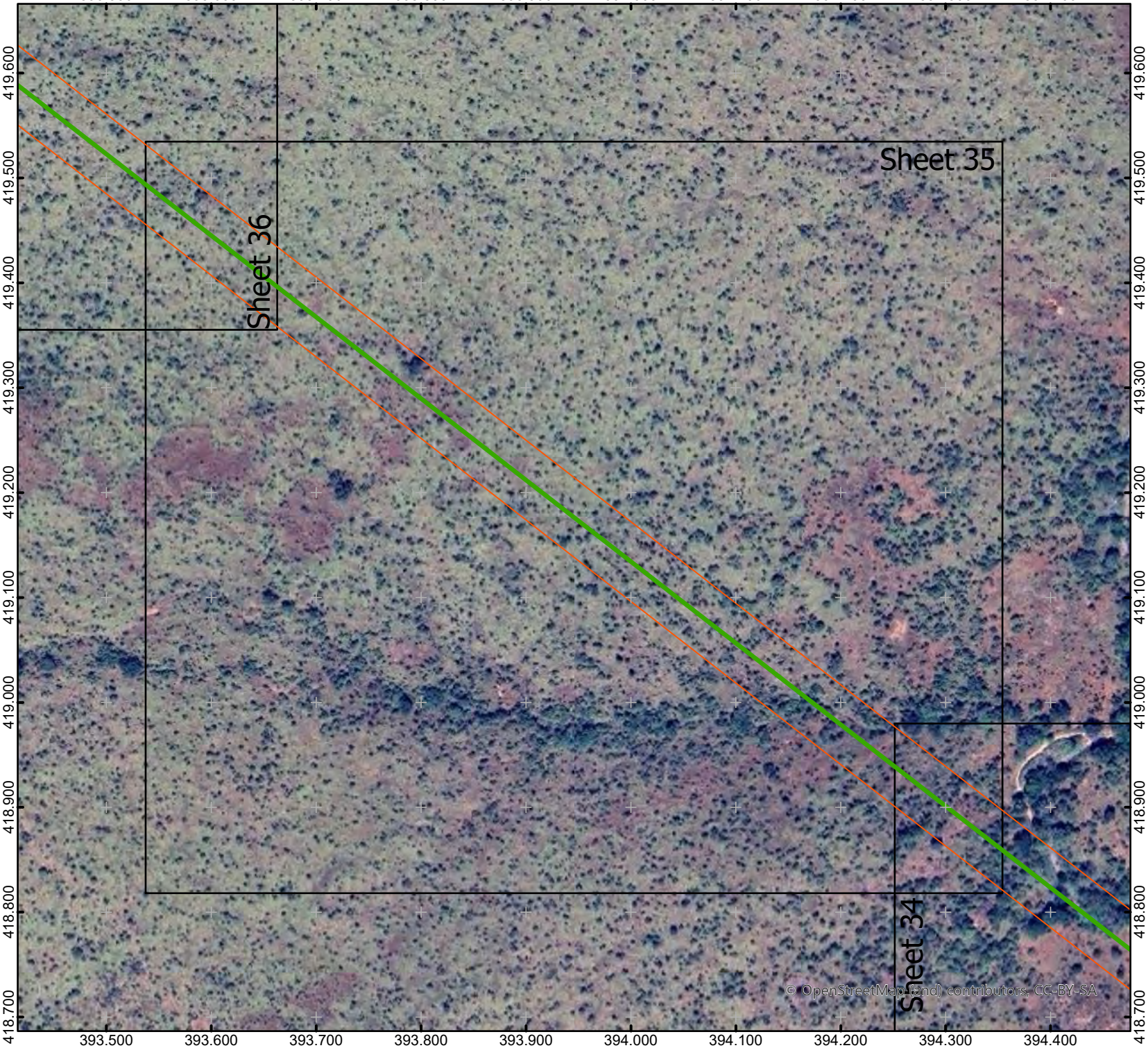
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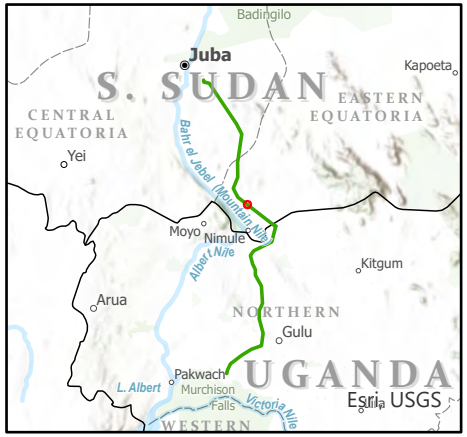
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Uganda-South Sudan 400 kV Interconnection Line Project

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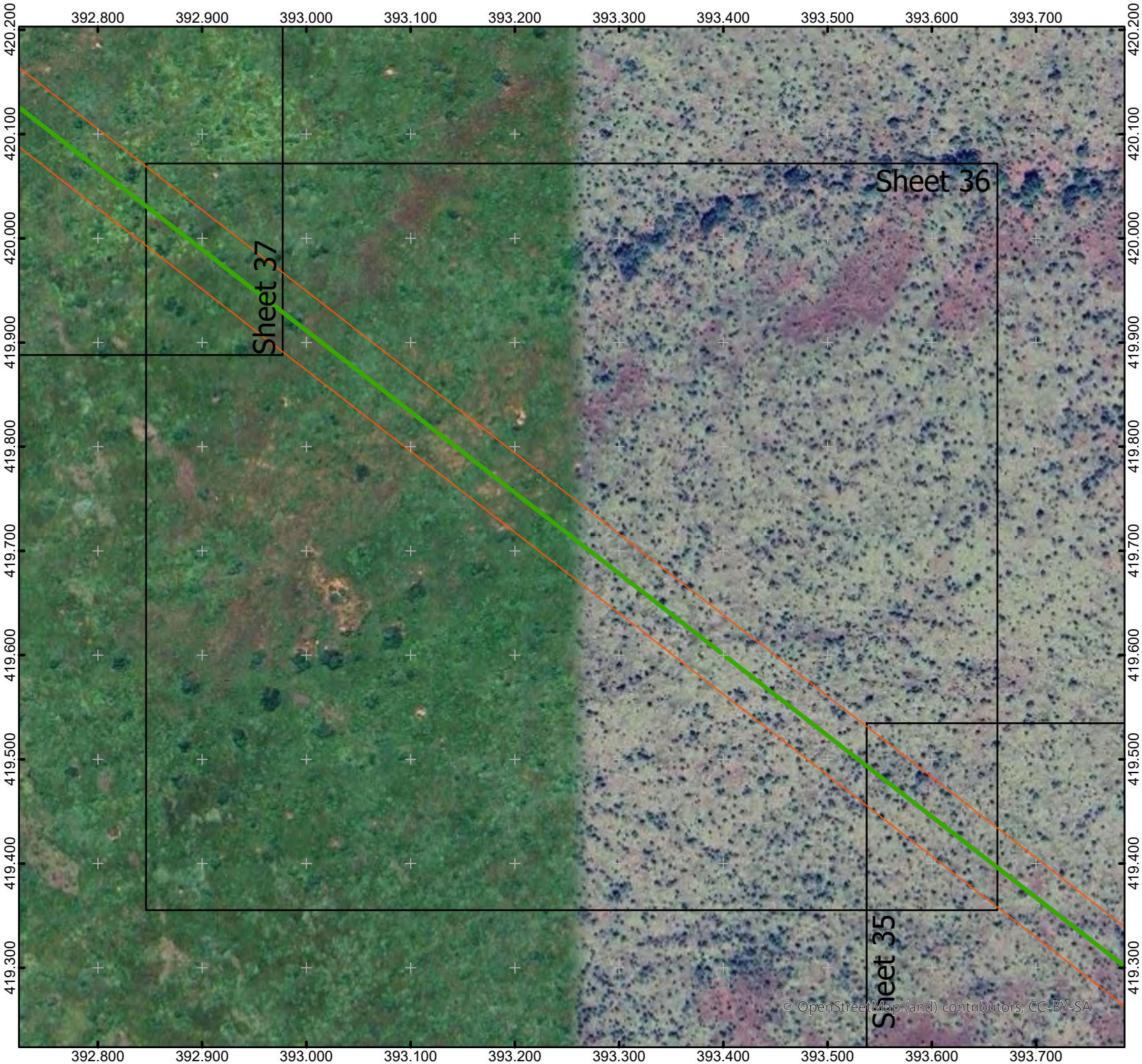
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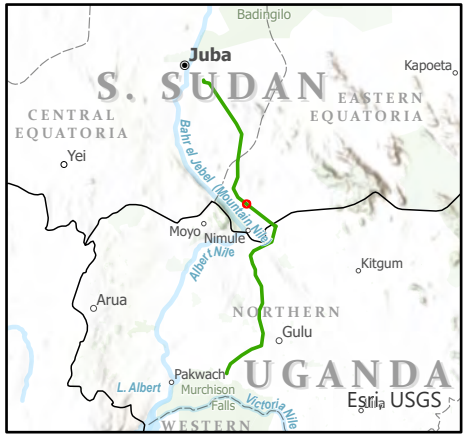
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

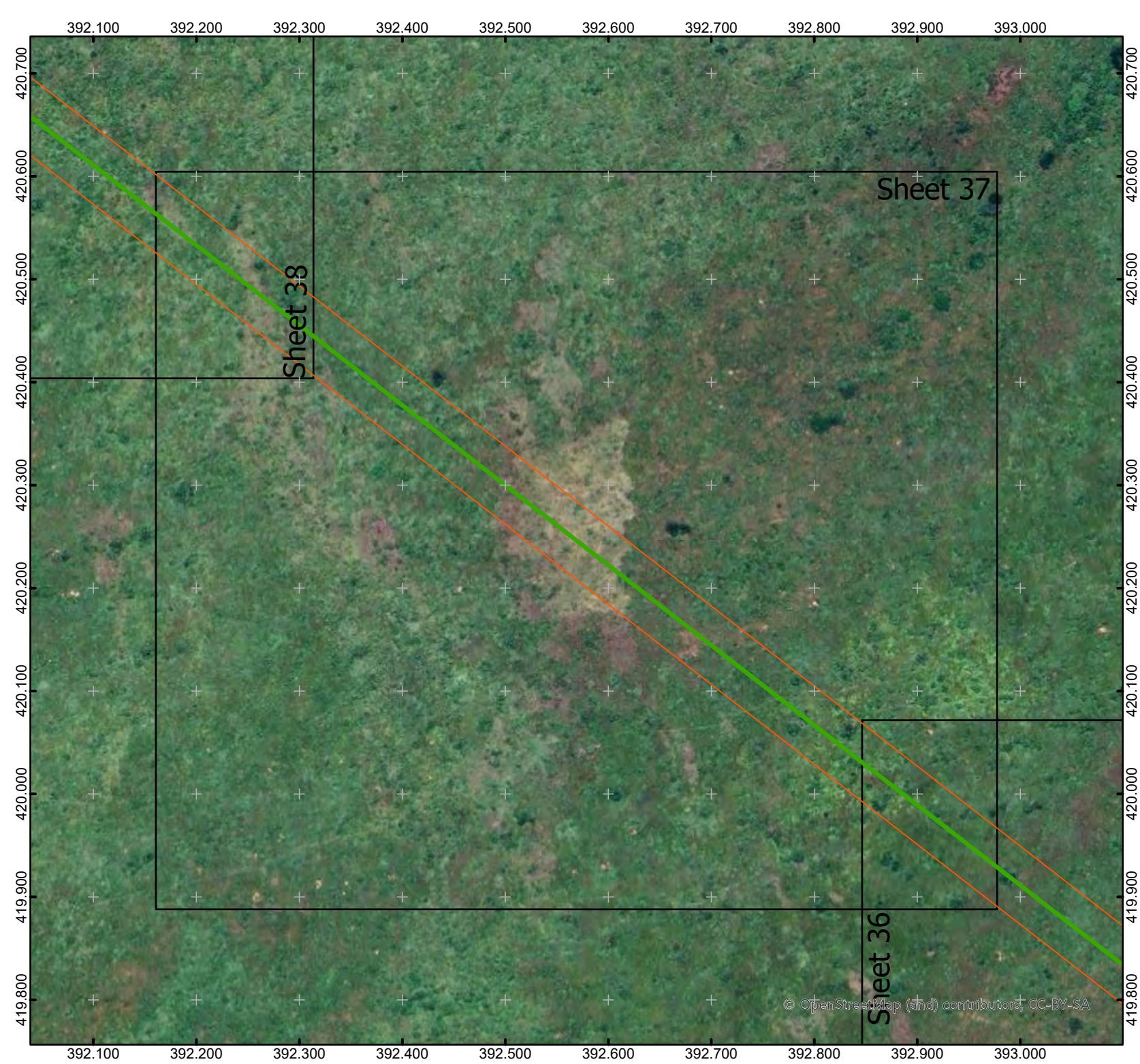
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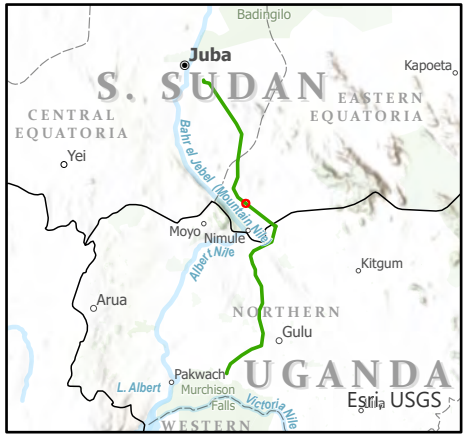
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

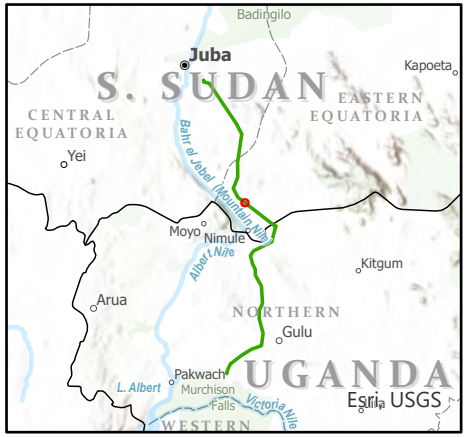
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

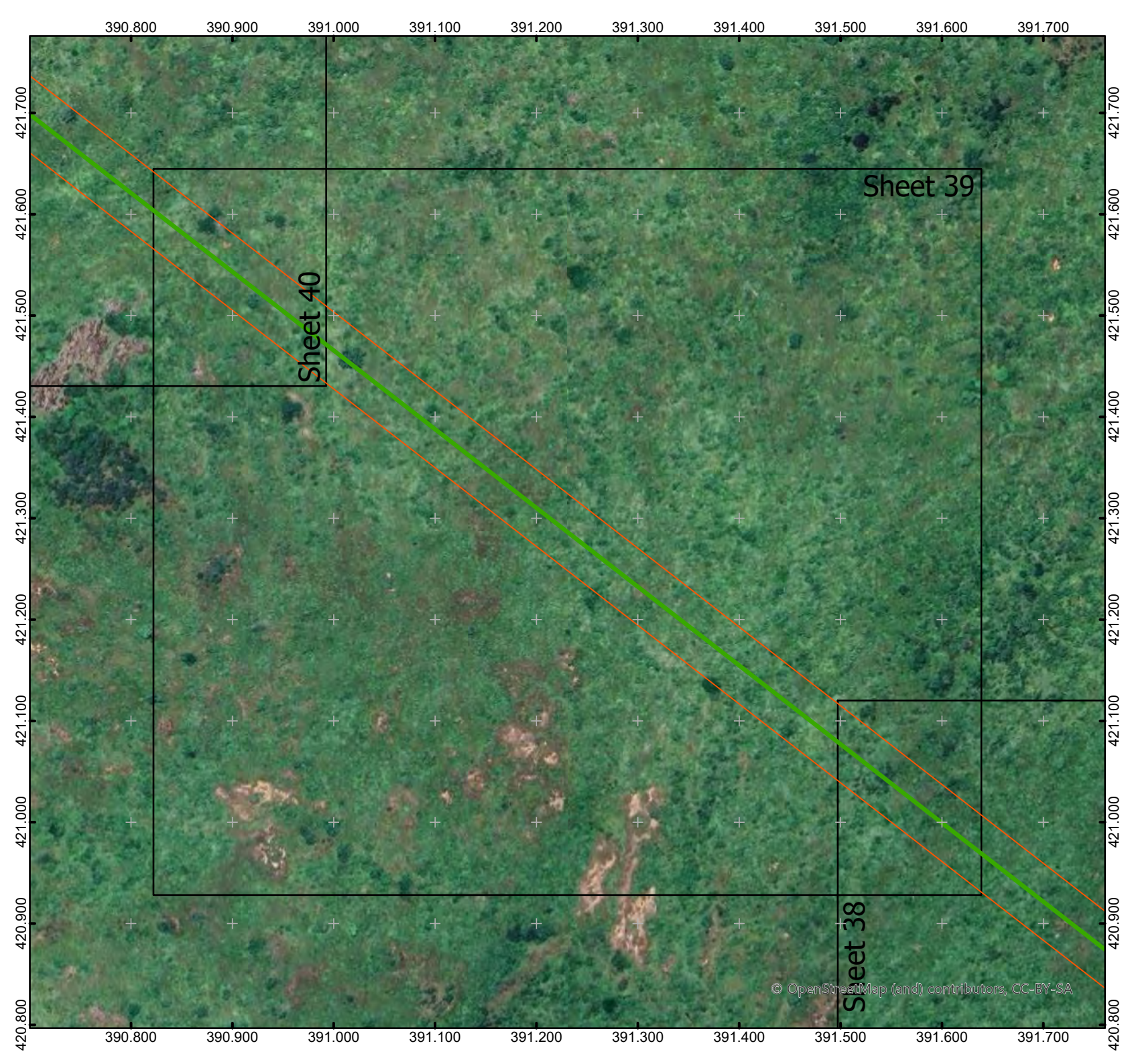
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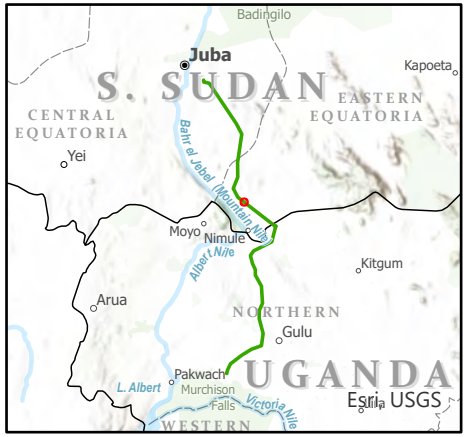
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

0 0,2 Kilometers

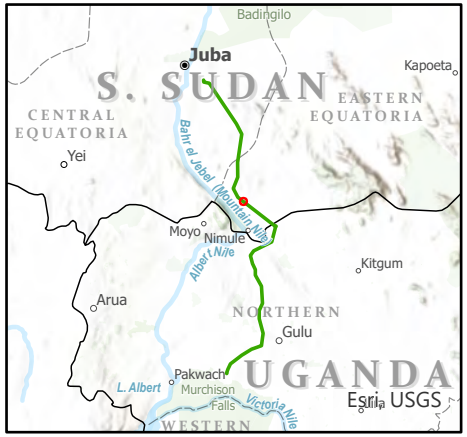
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

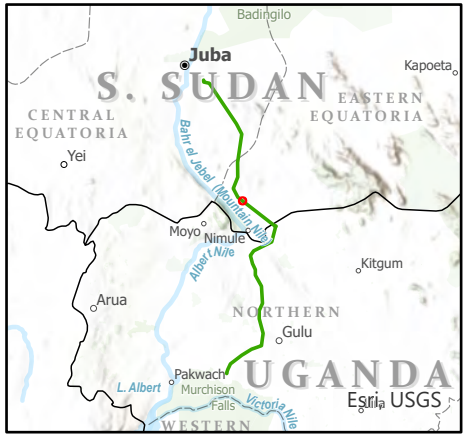
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

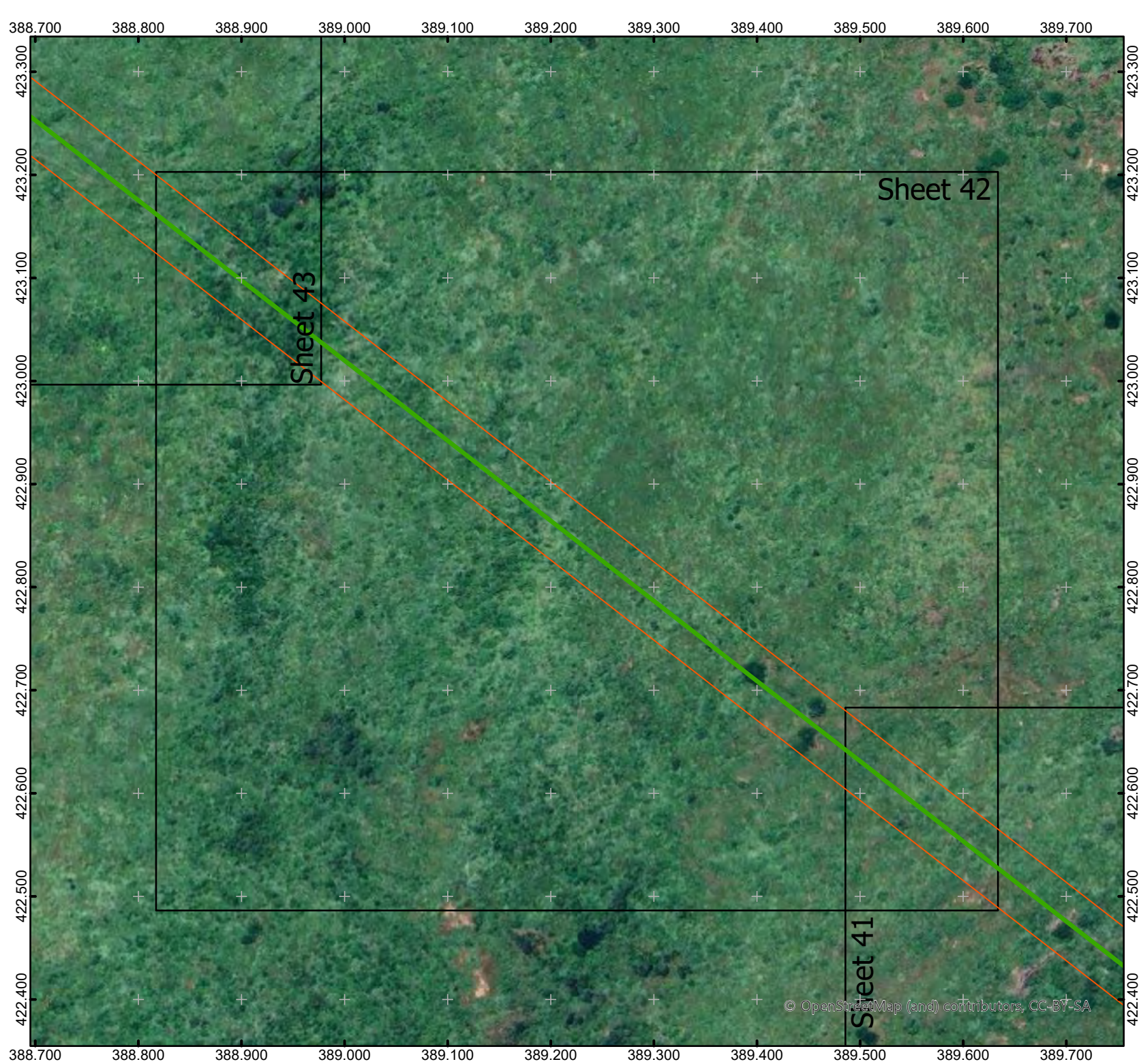
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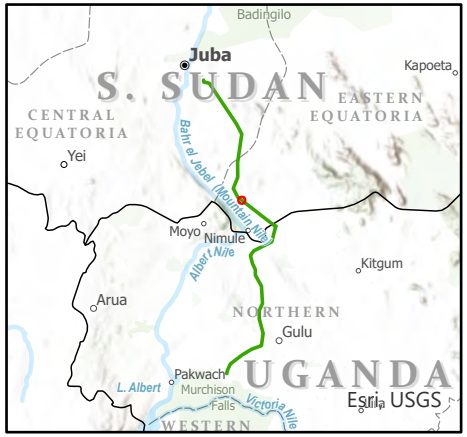
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

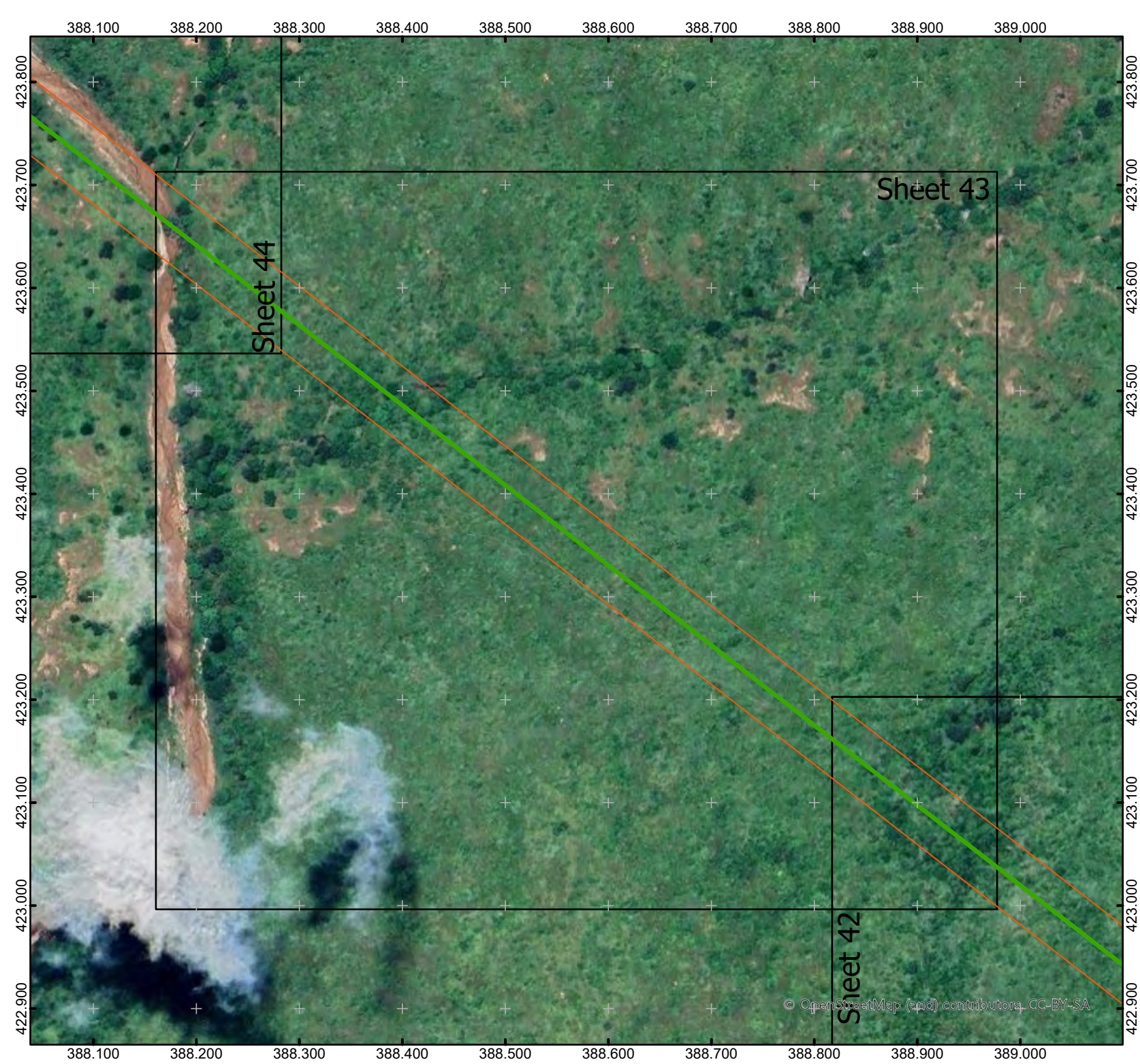
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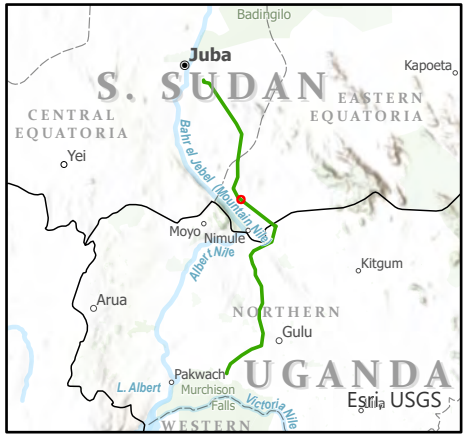
Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4

Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

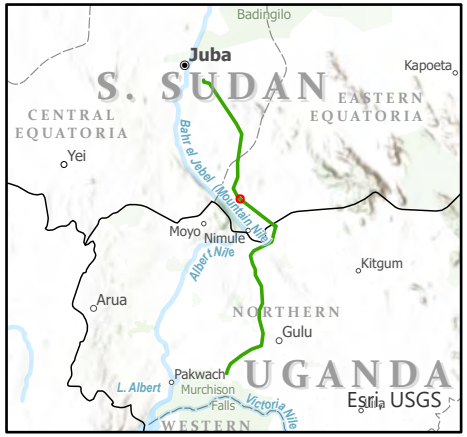
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Proposed transmission line (Uganda section)
- Direct Area of Influence

0 0,2 Kilometers

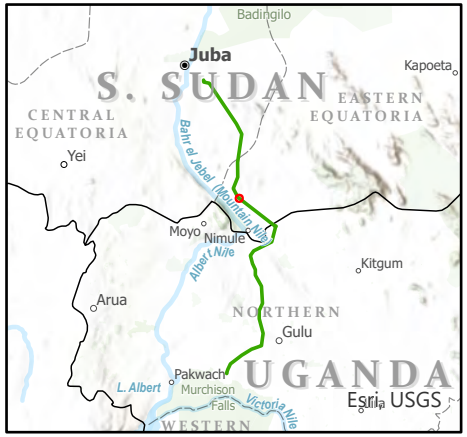
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

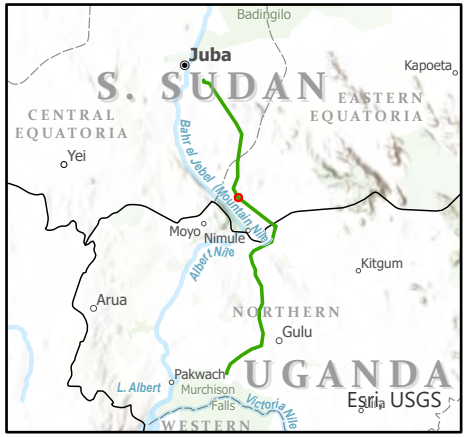
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Proposed transmission line (Uganda section)

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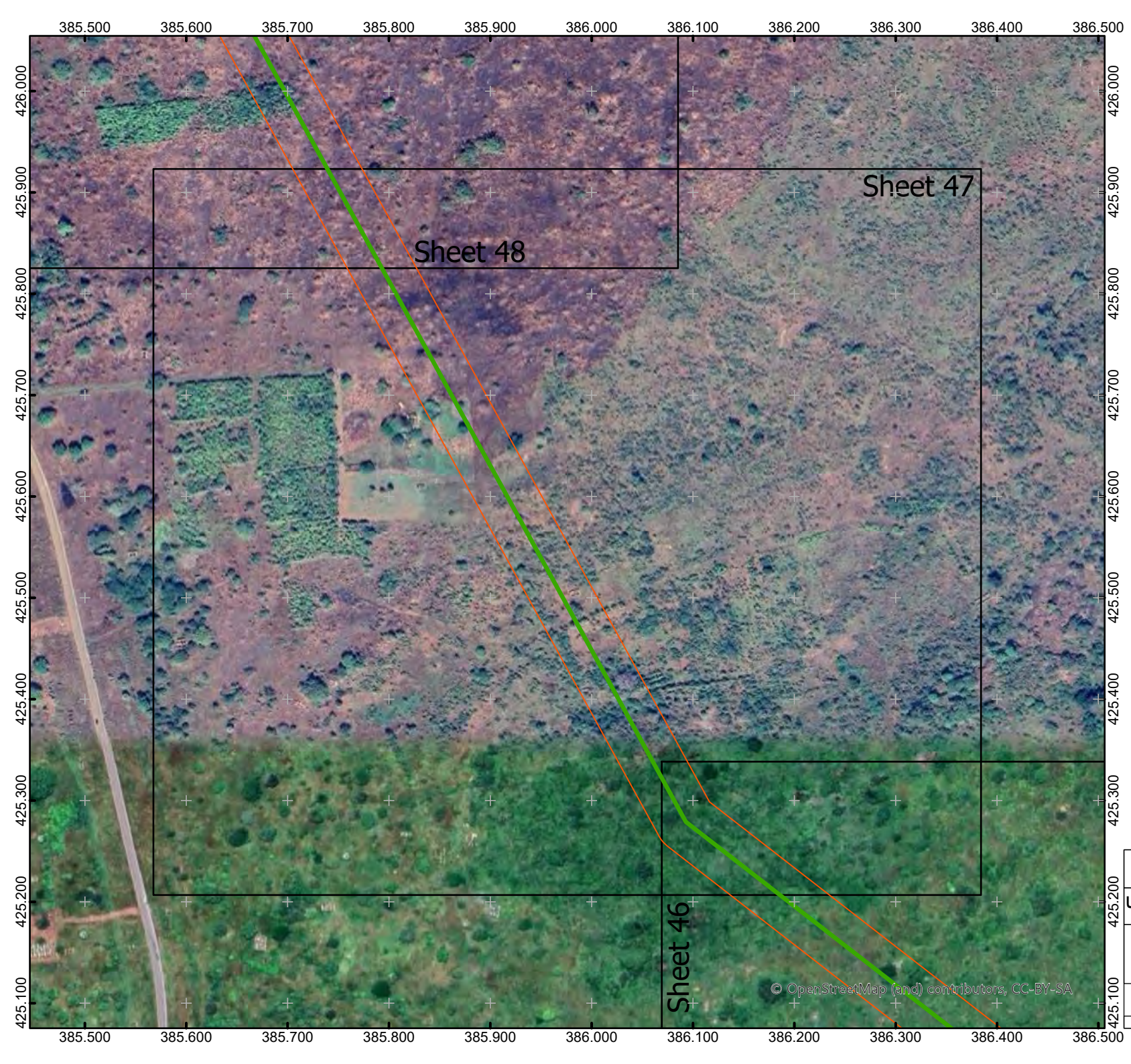
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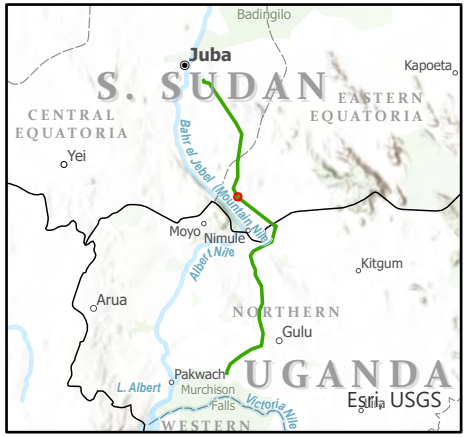
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Proposed transmission line (Uganda section)

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0 0,2 Kilometers

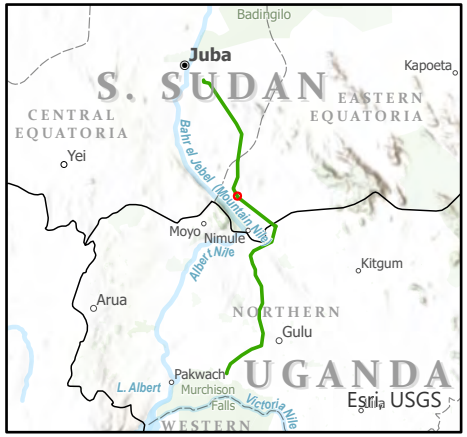
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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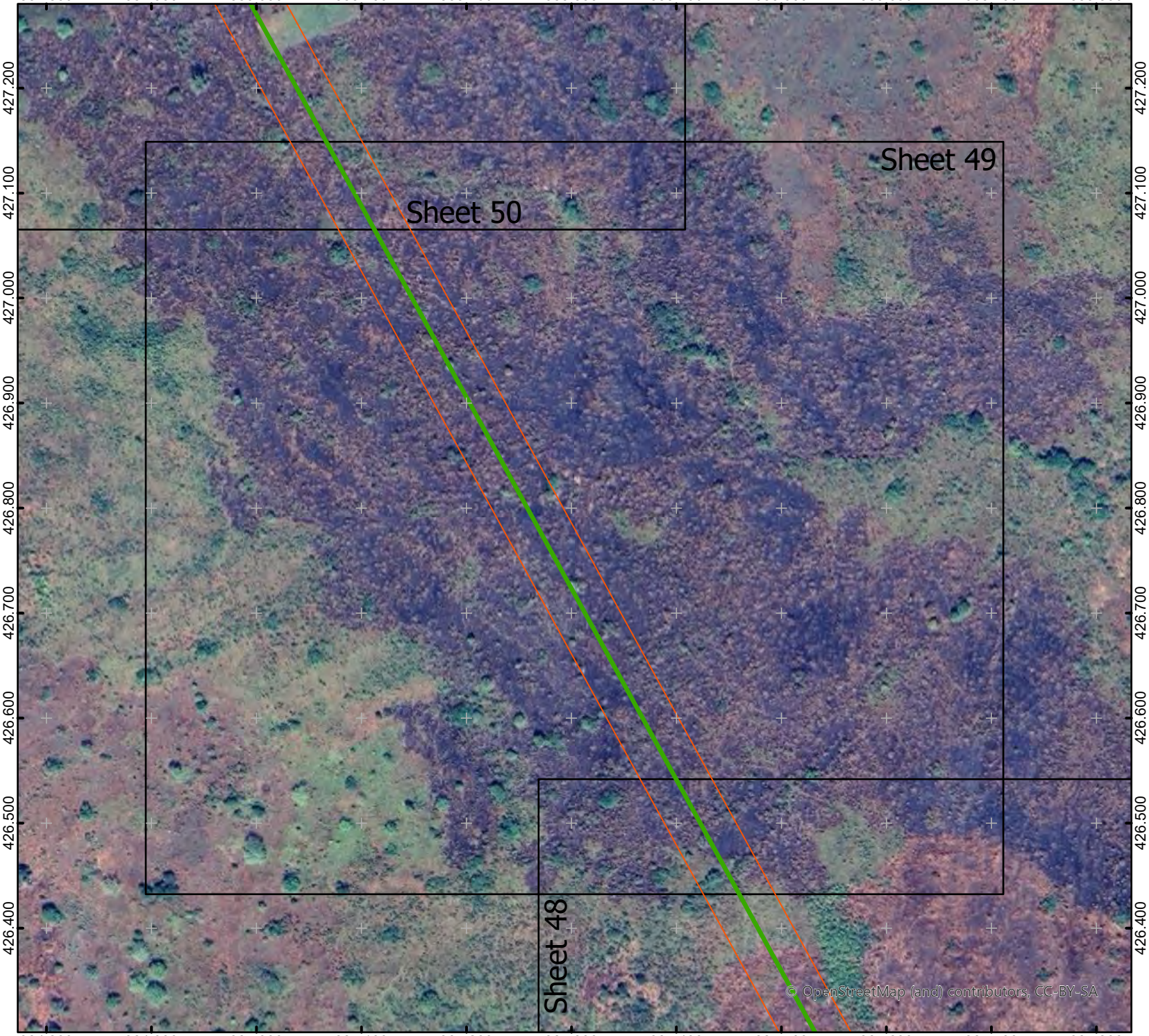
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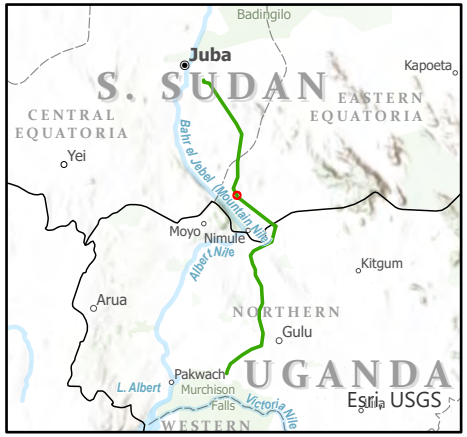
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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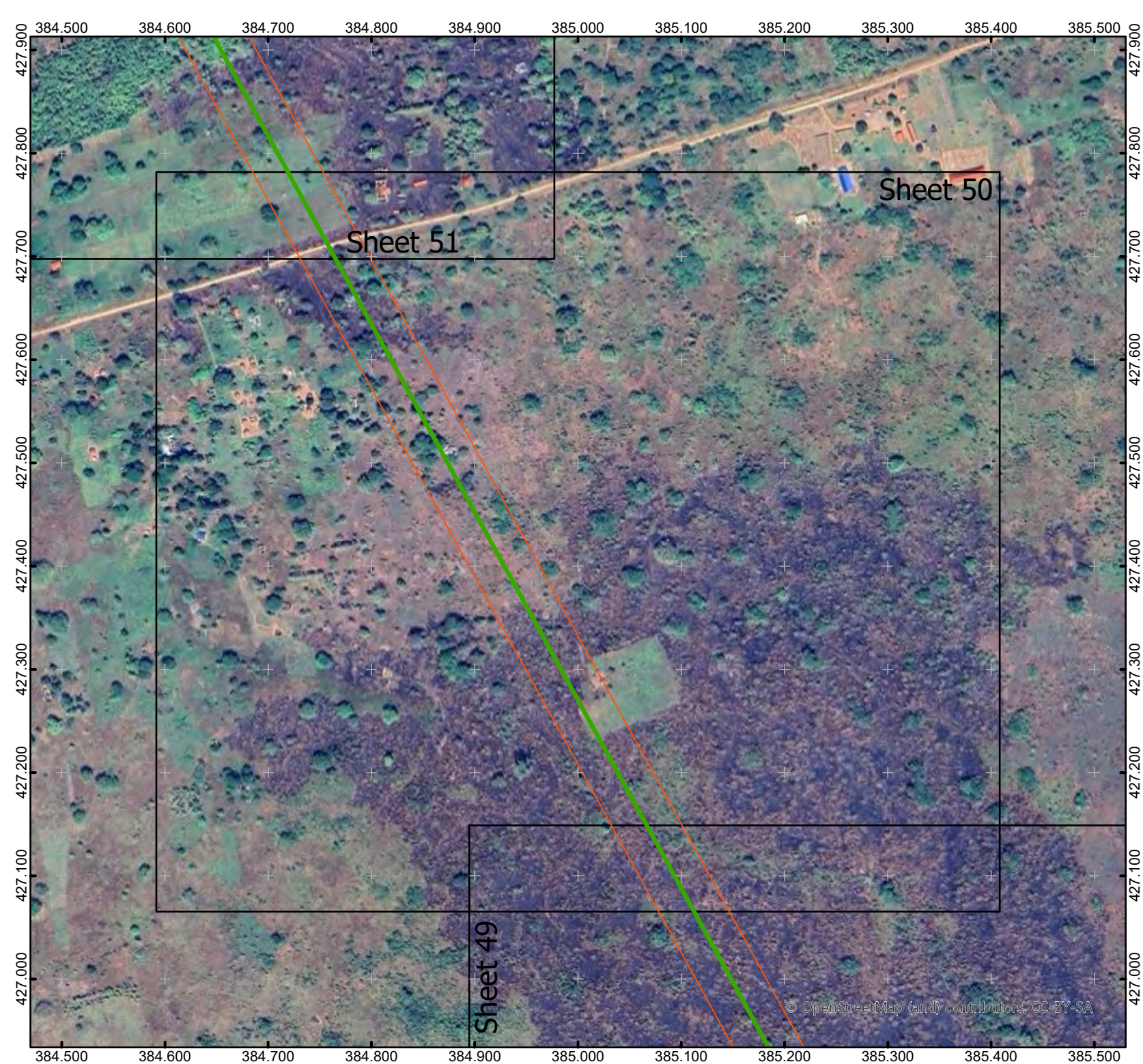
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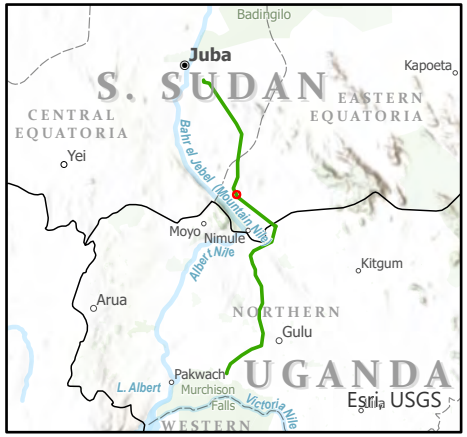
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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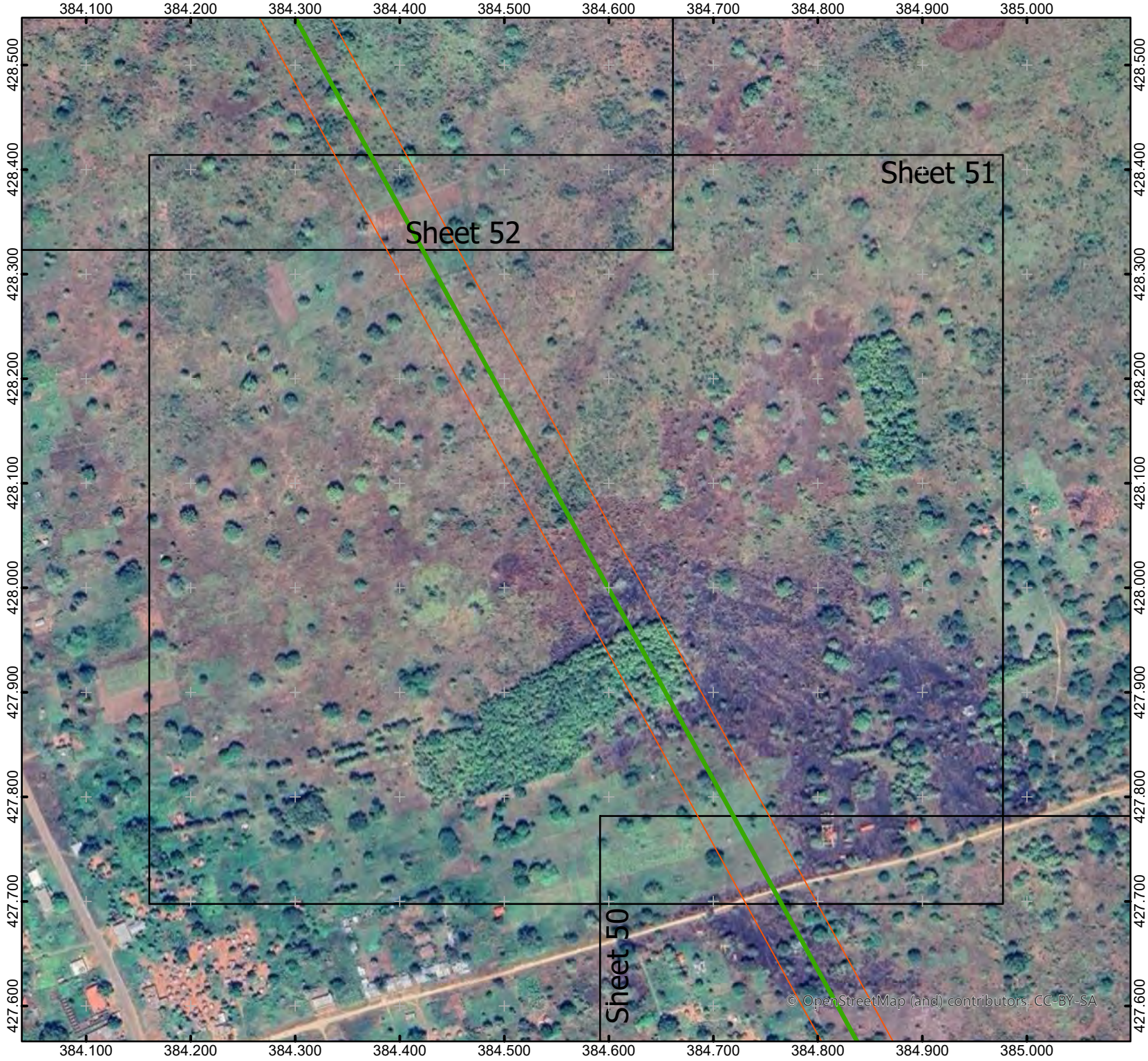
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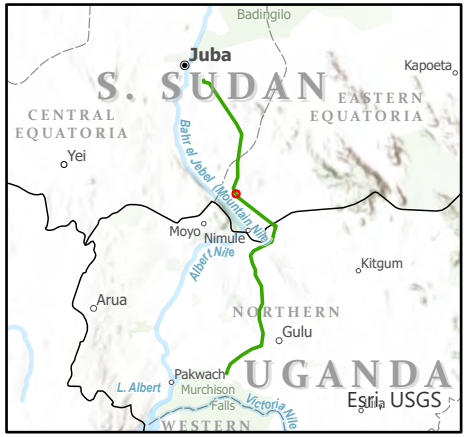
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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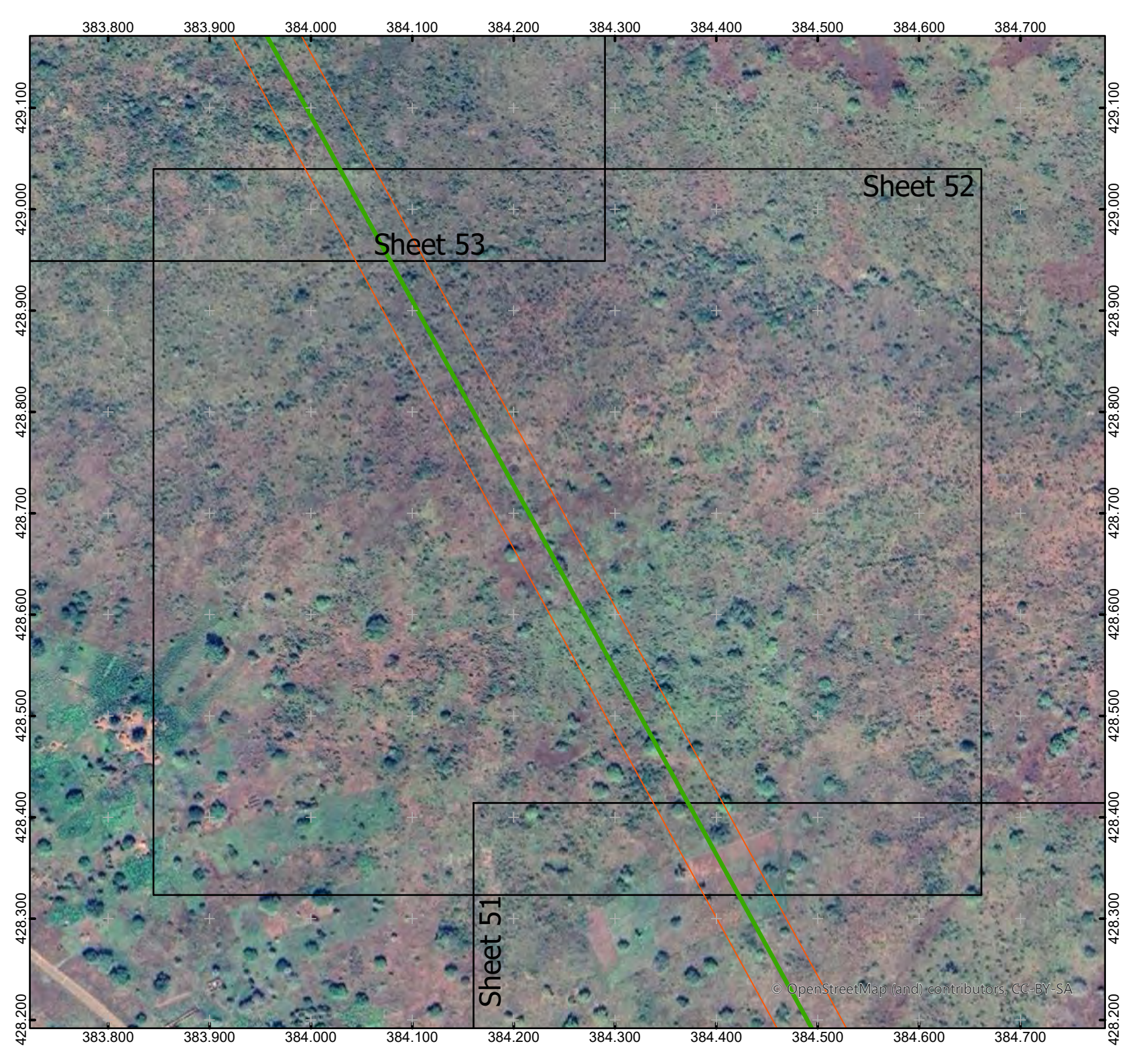
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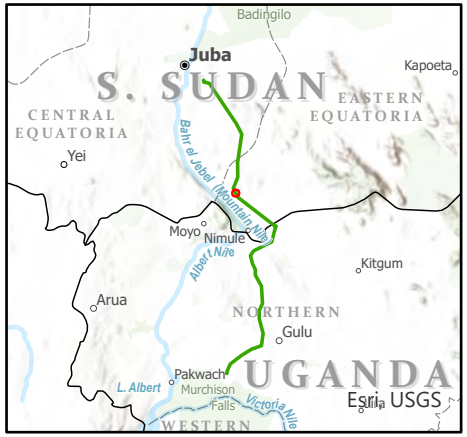
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Proposed transmission line (South Sudan section)

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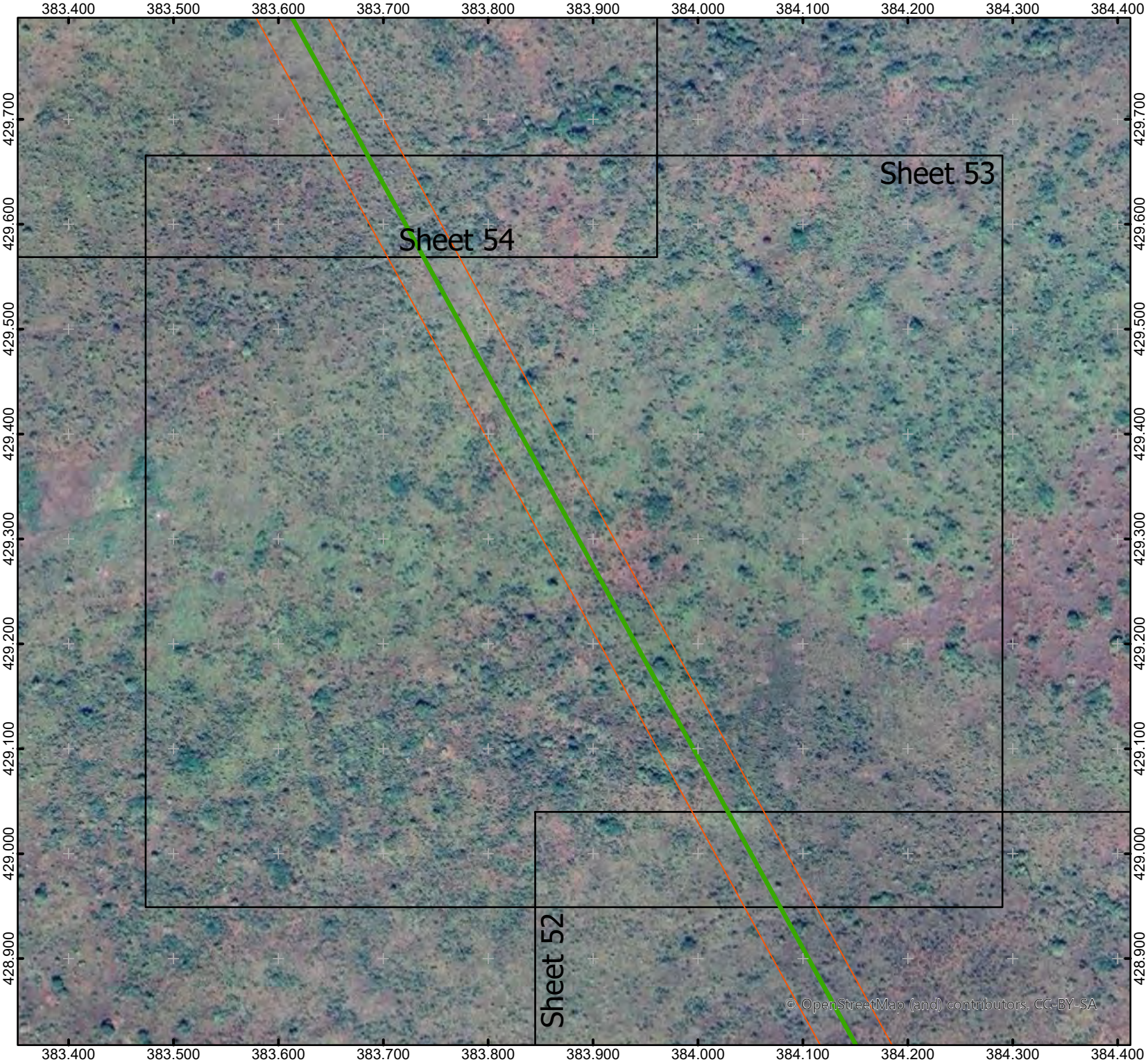
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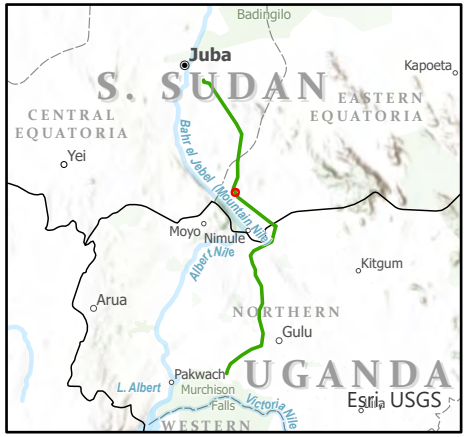
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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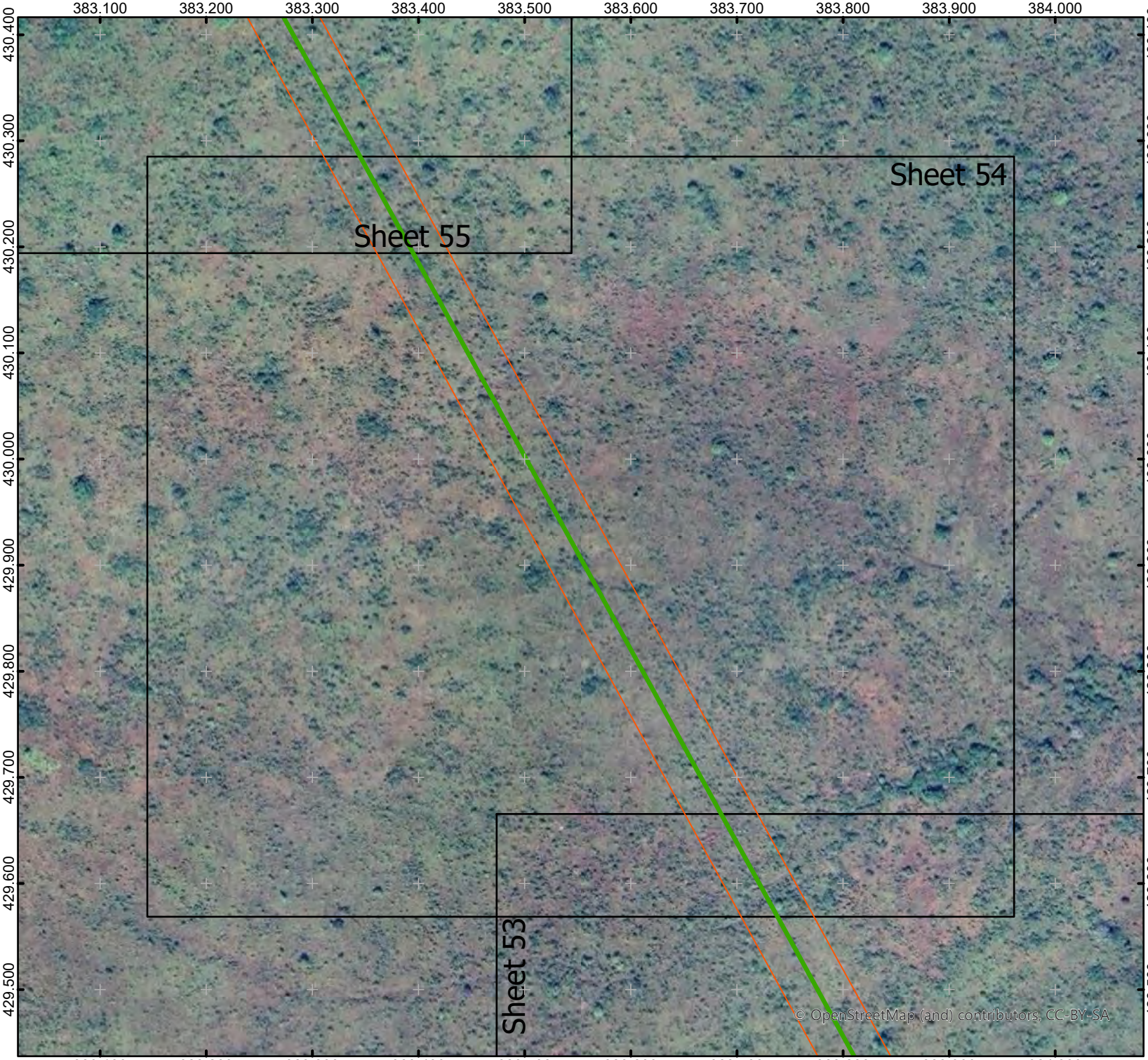
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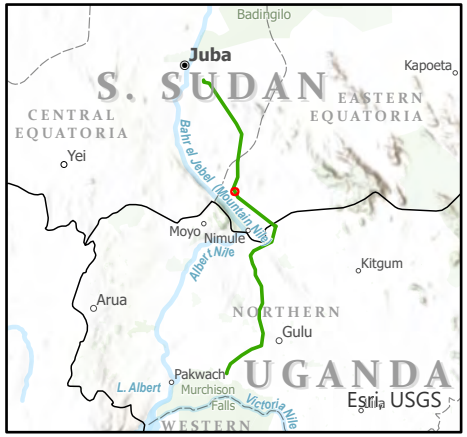
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

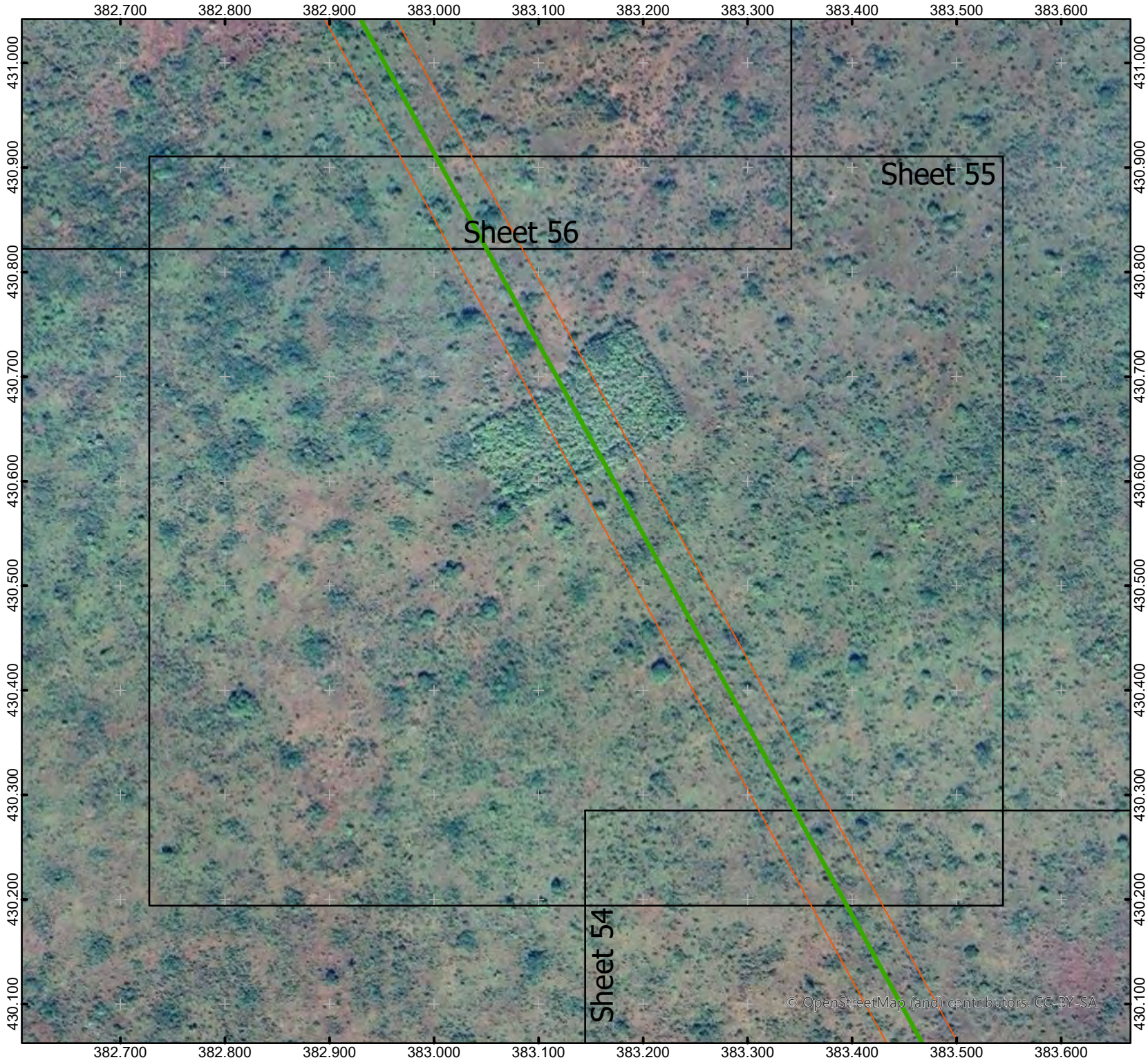
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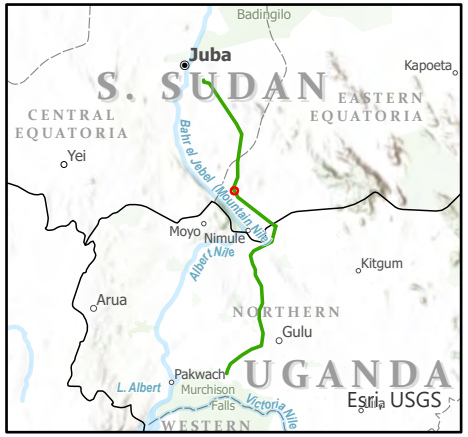
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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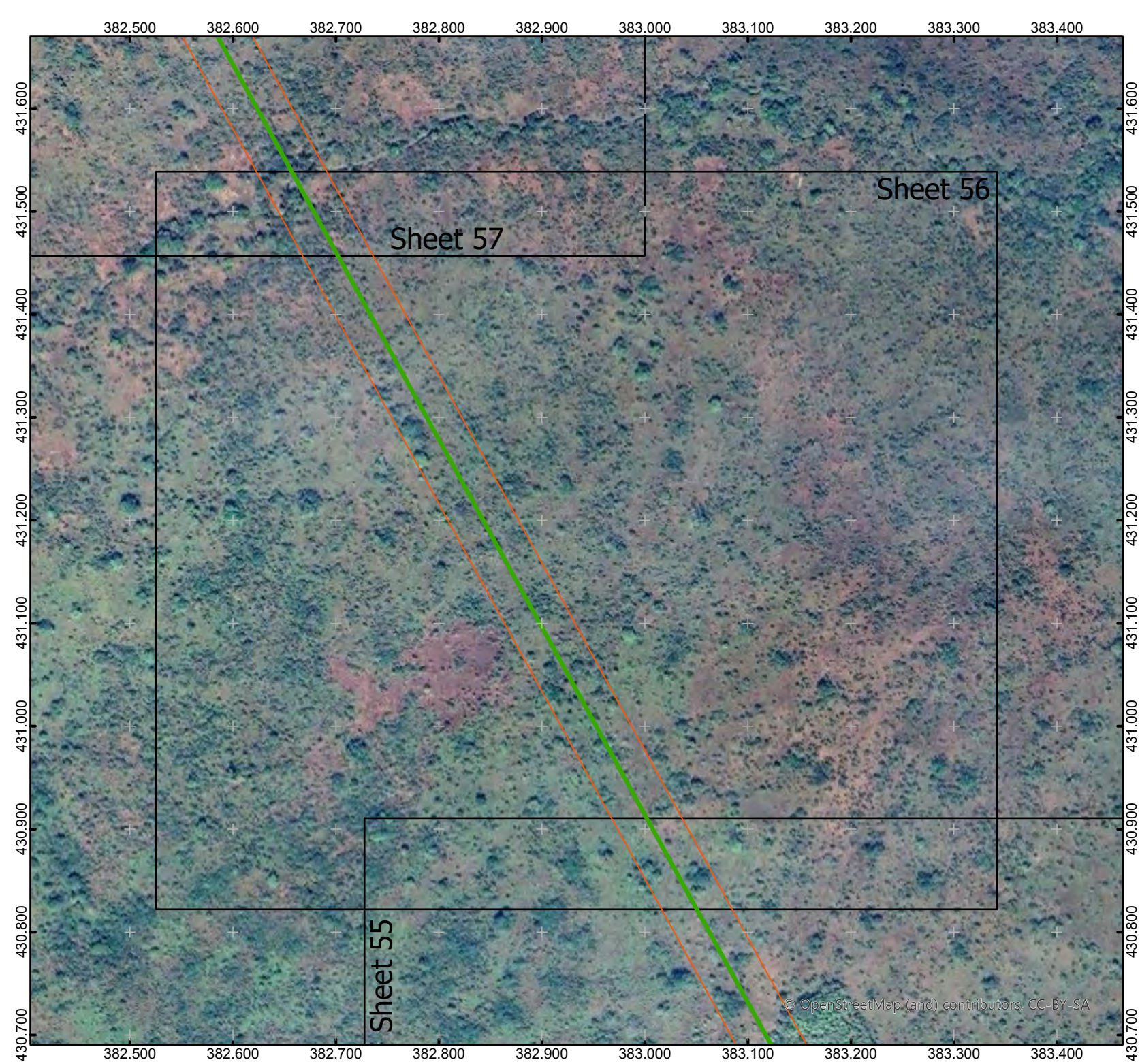
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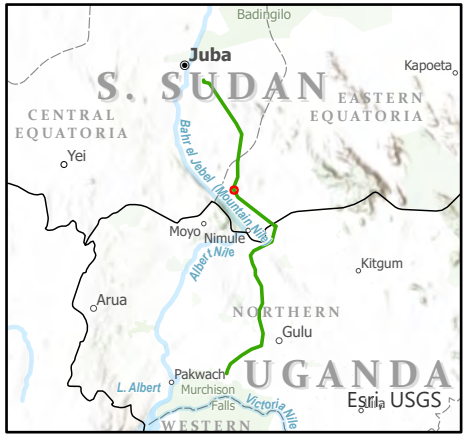
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Proposed transmission line (South Sudan section)

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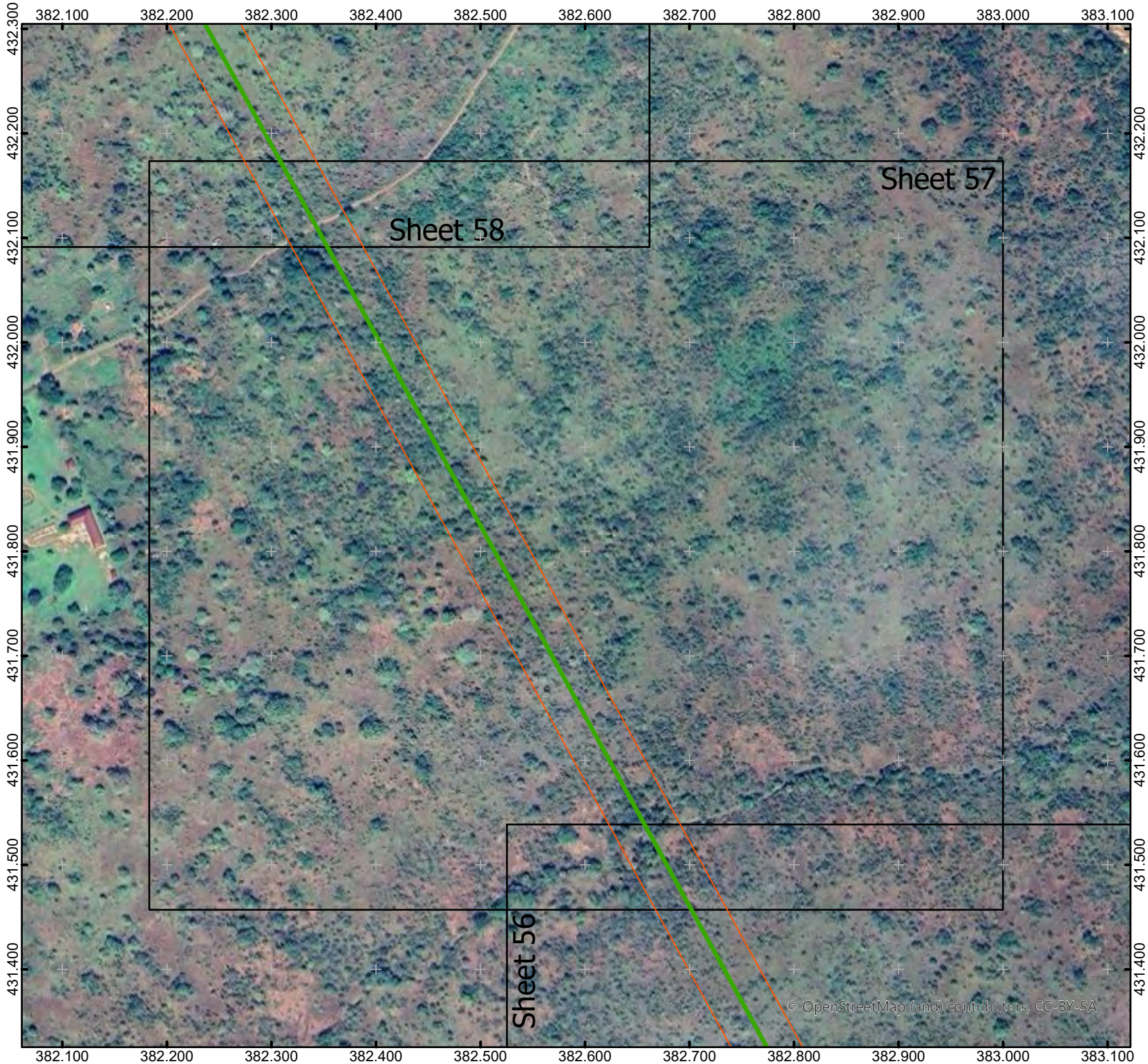
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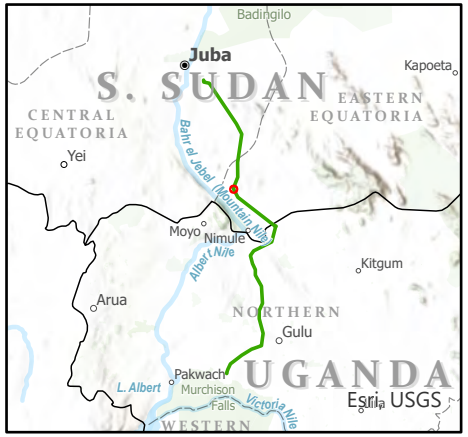
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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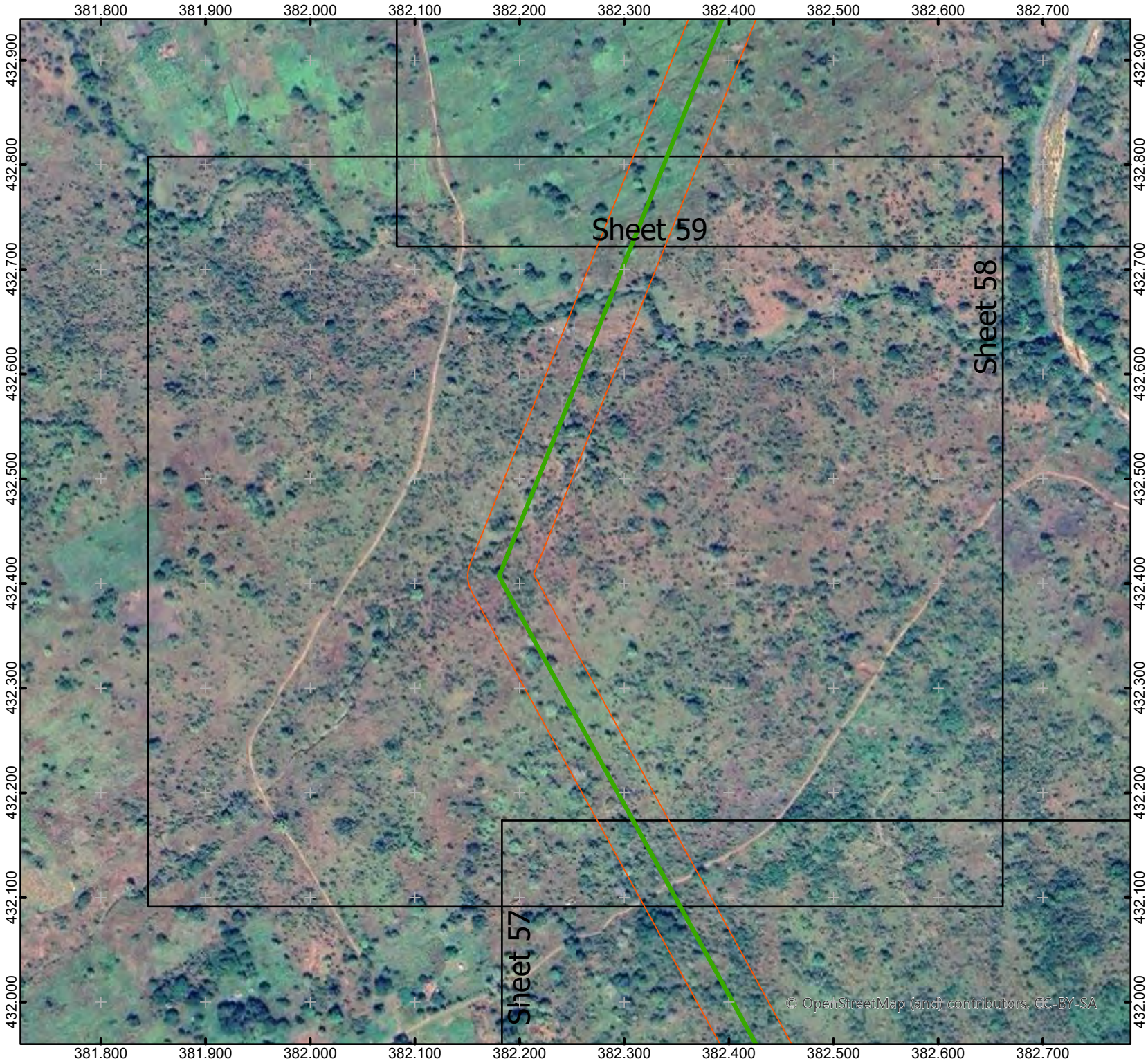
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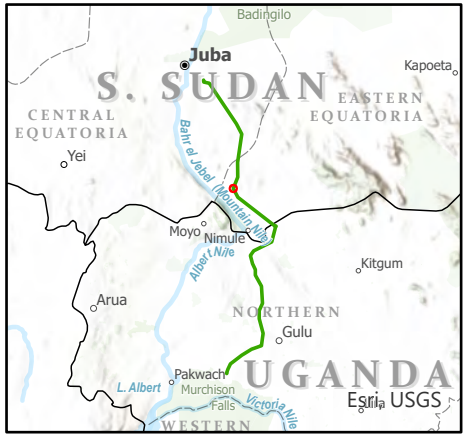
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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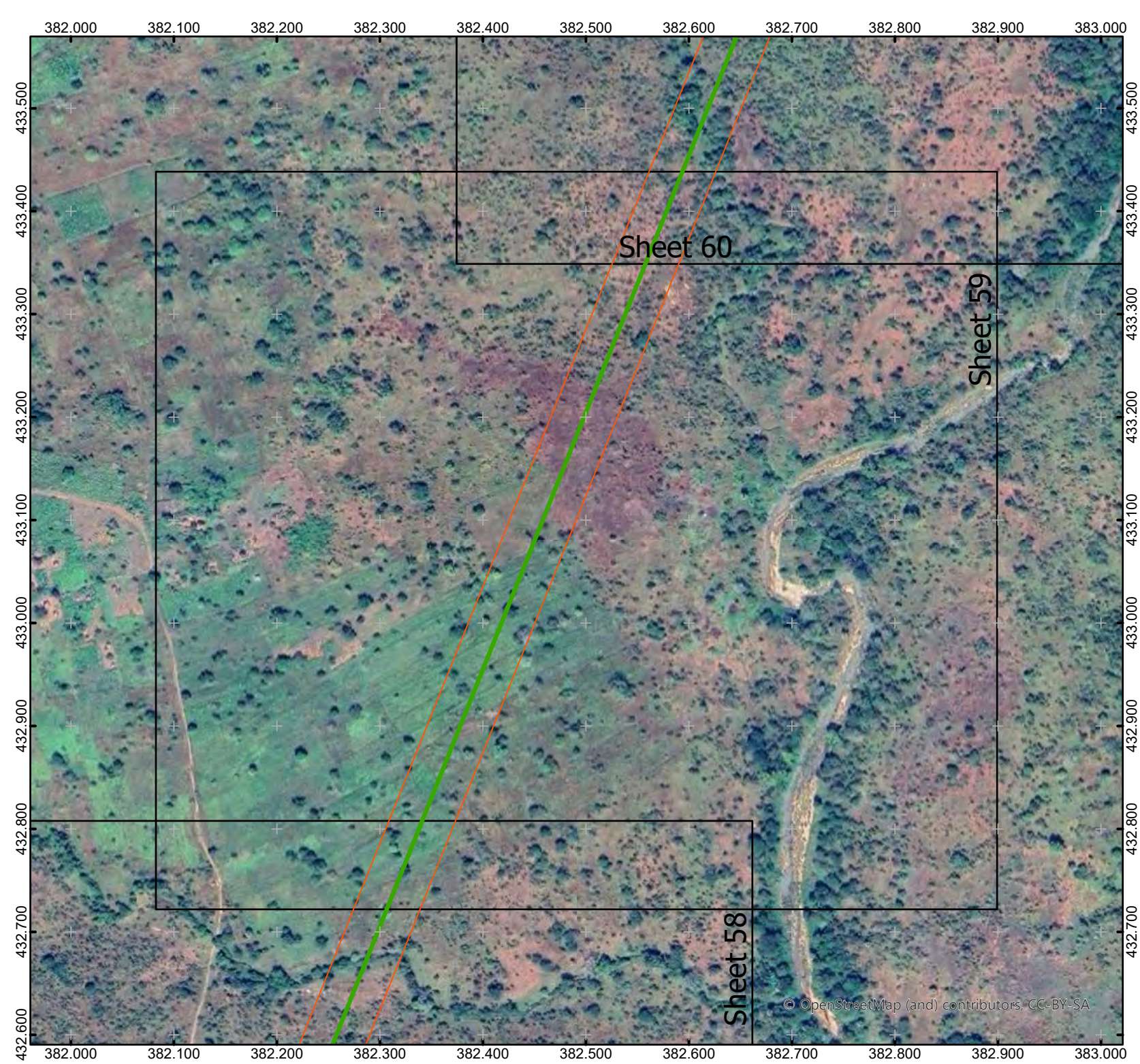
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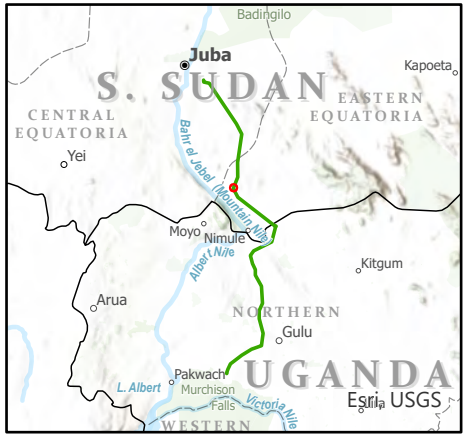
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

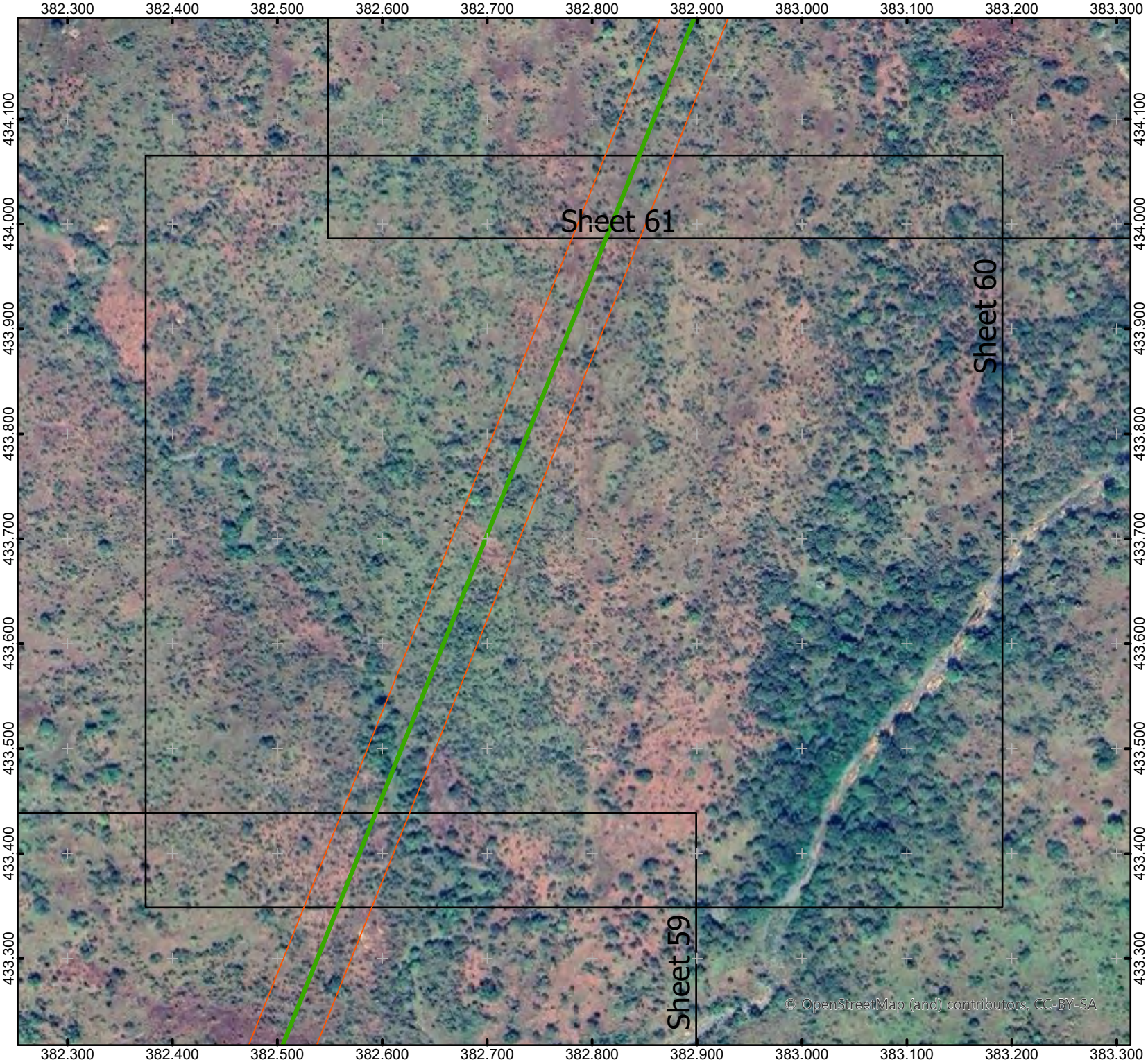
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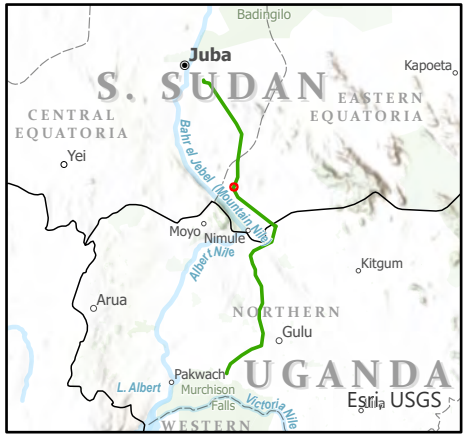
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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Proposed transmission line (South Sudan section)

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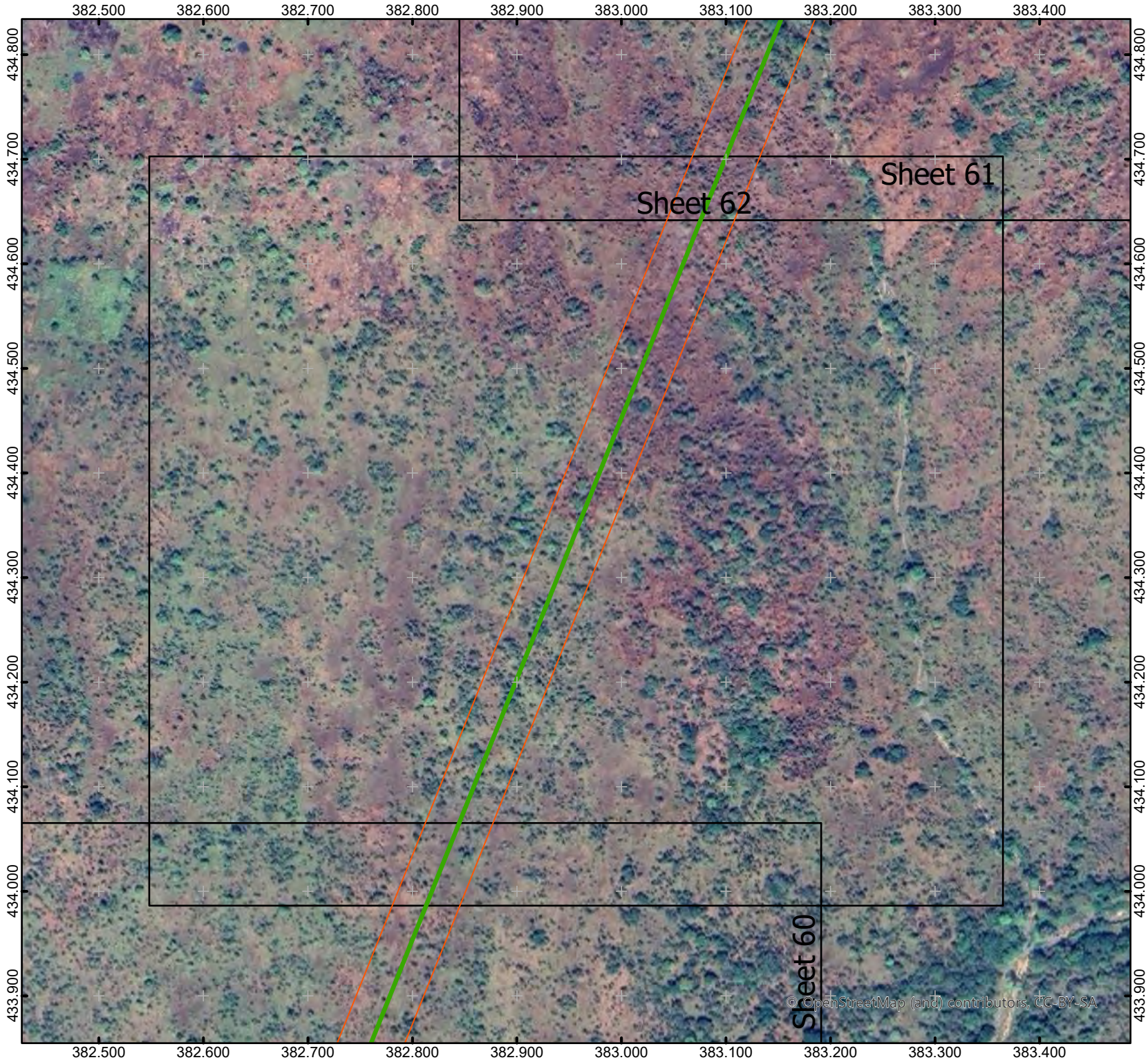
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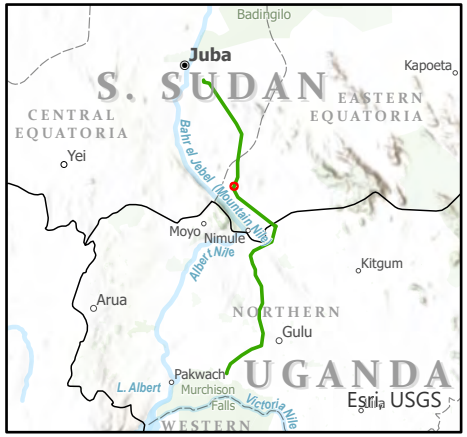
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Uganda-South Sudan 400 kV Interconnection Line Project

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- Proposed transmission line (Uganda section)
- Direct Area of Influence

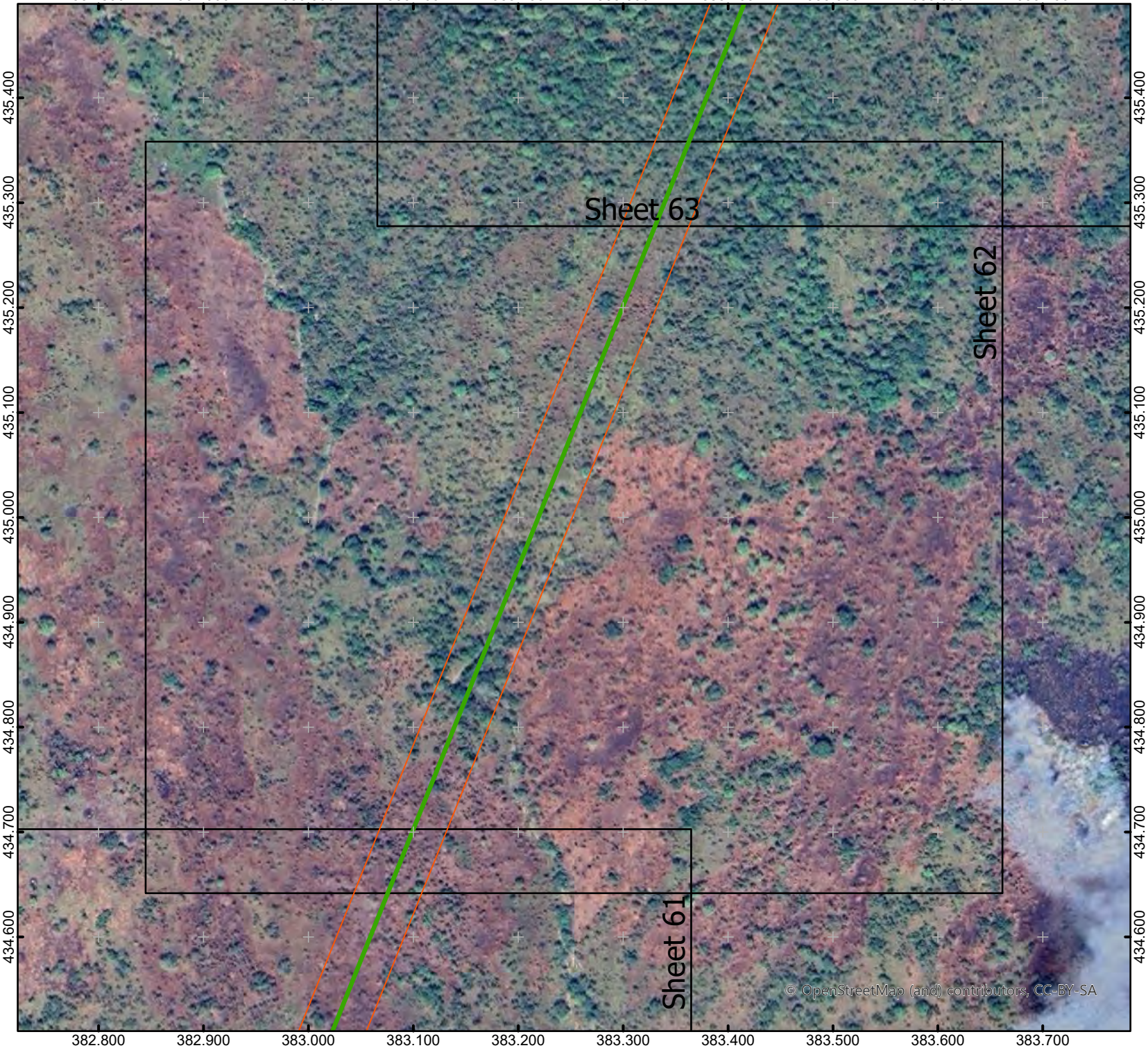
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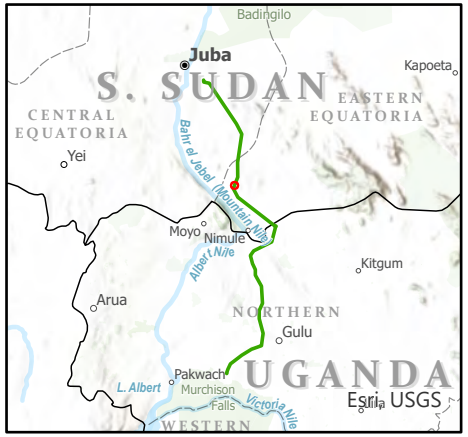
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

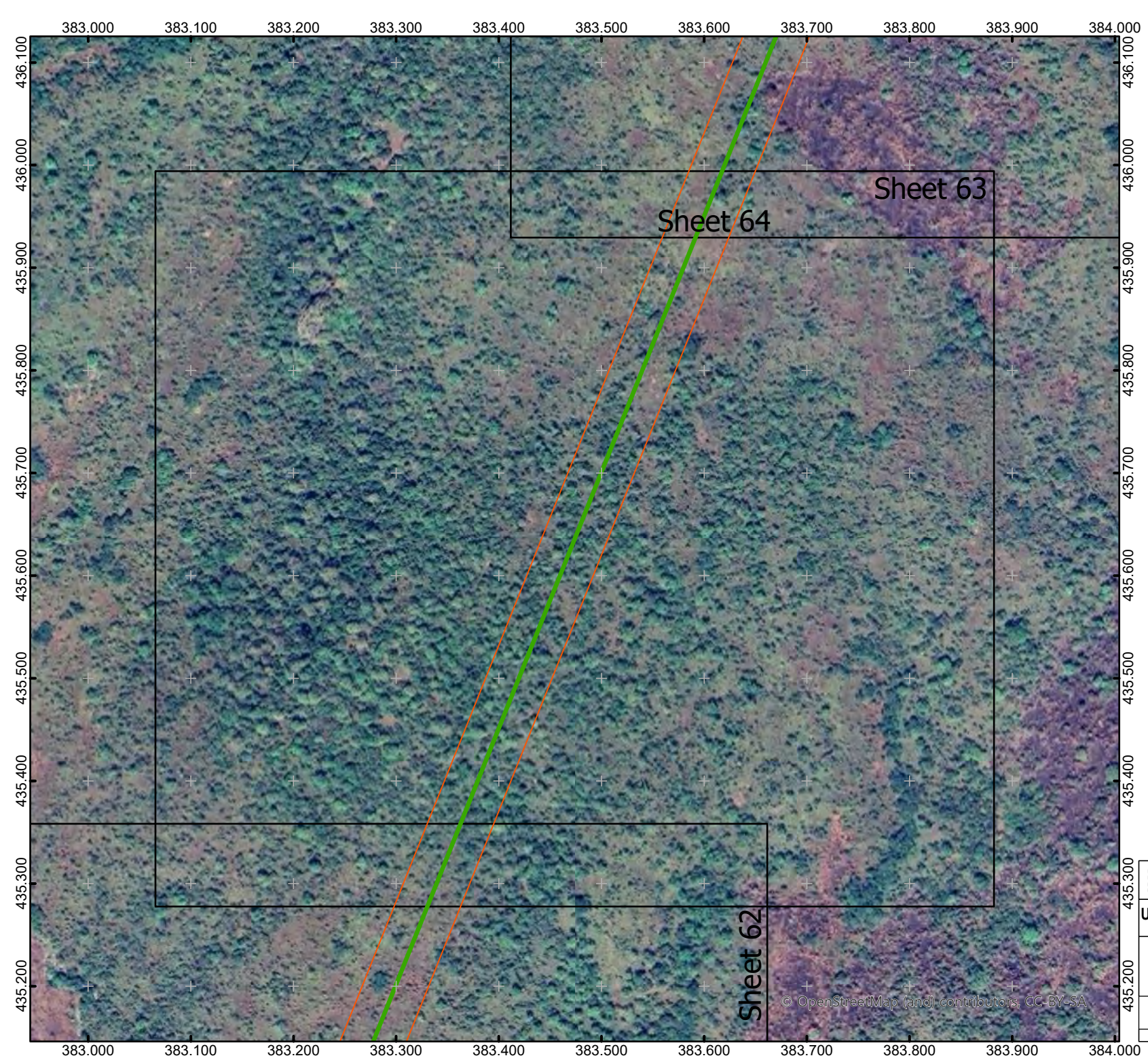
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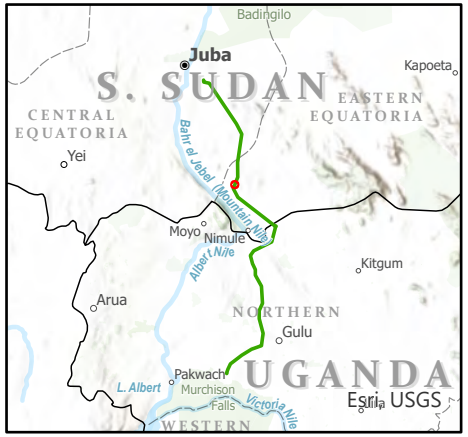
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

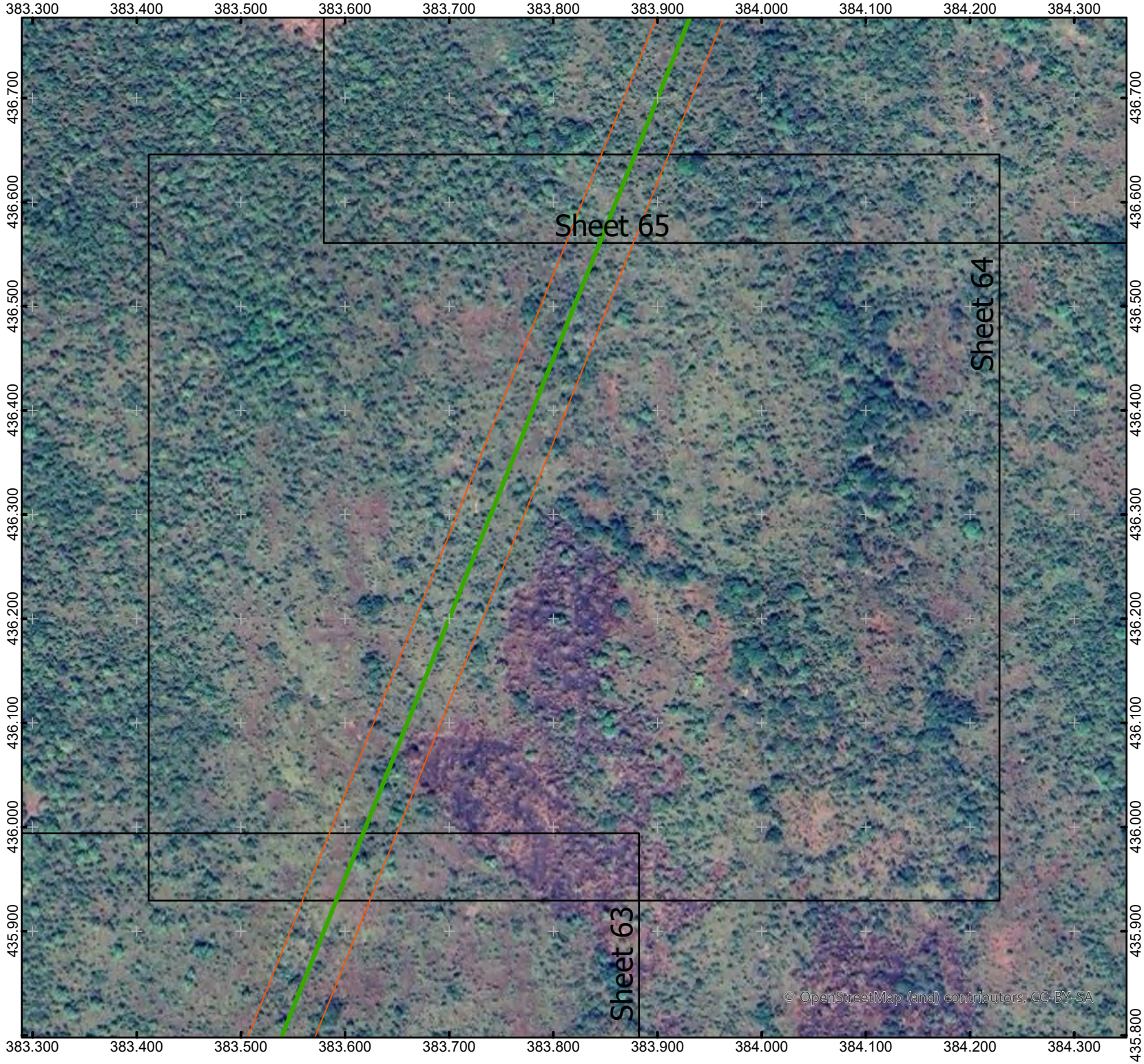
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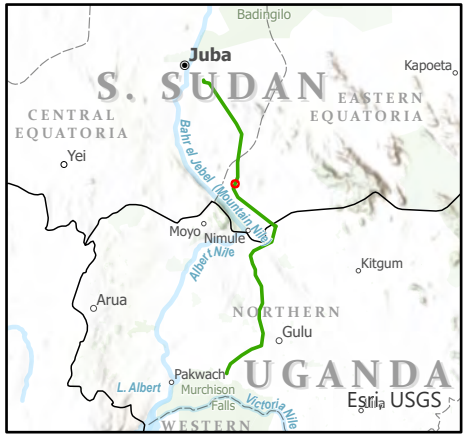
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





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- Proposed transmission line (Uganda section)
- Direct Area of Influence

0 0,2 Kilometers

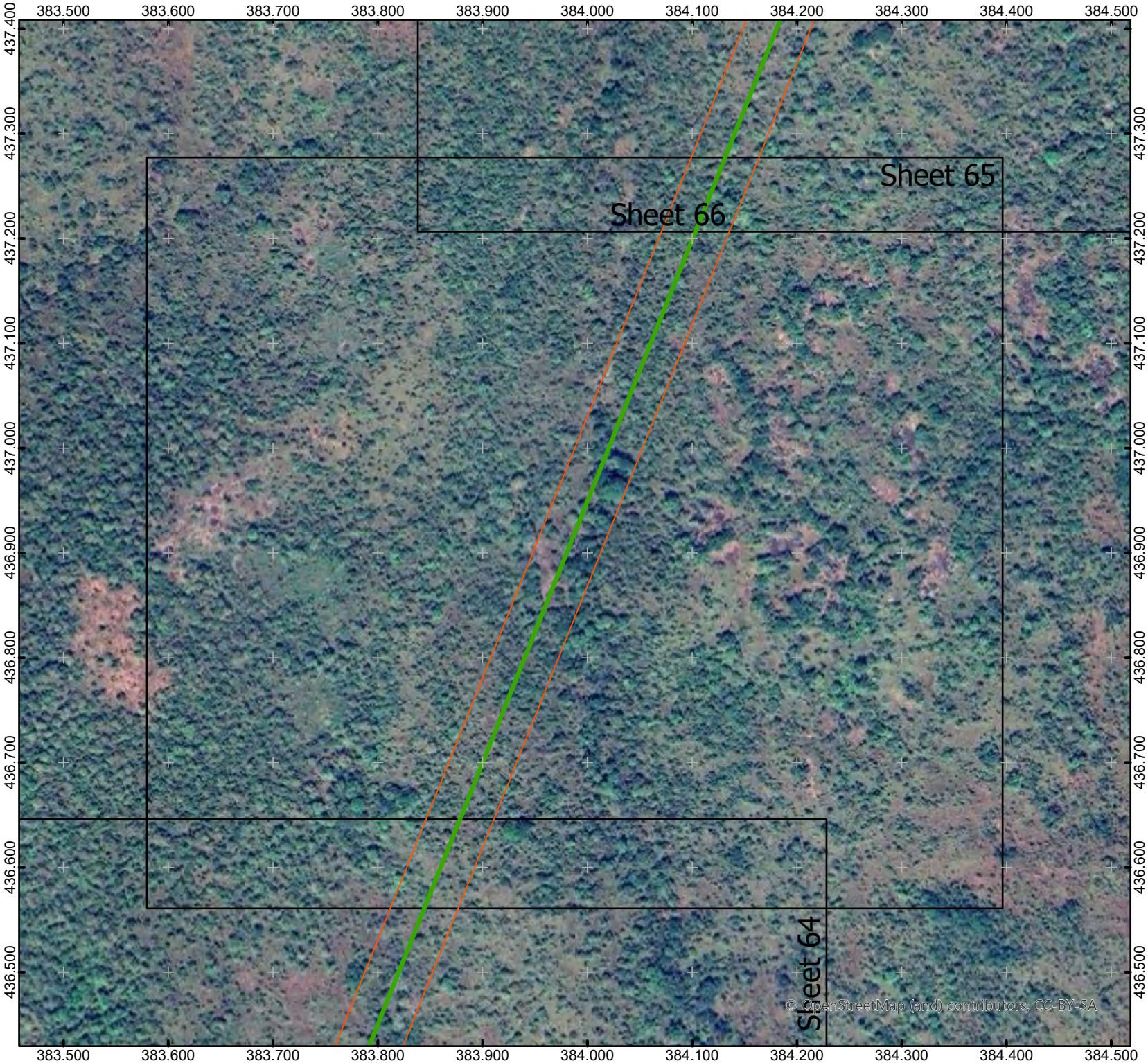
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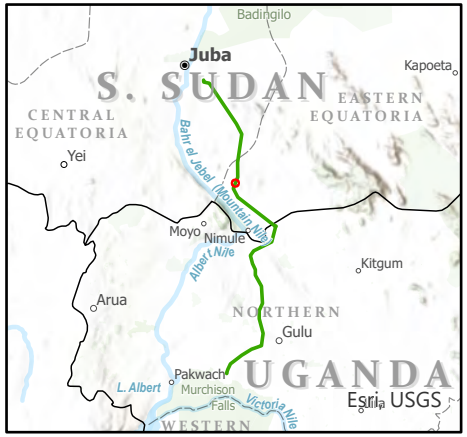
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

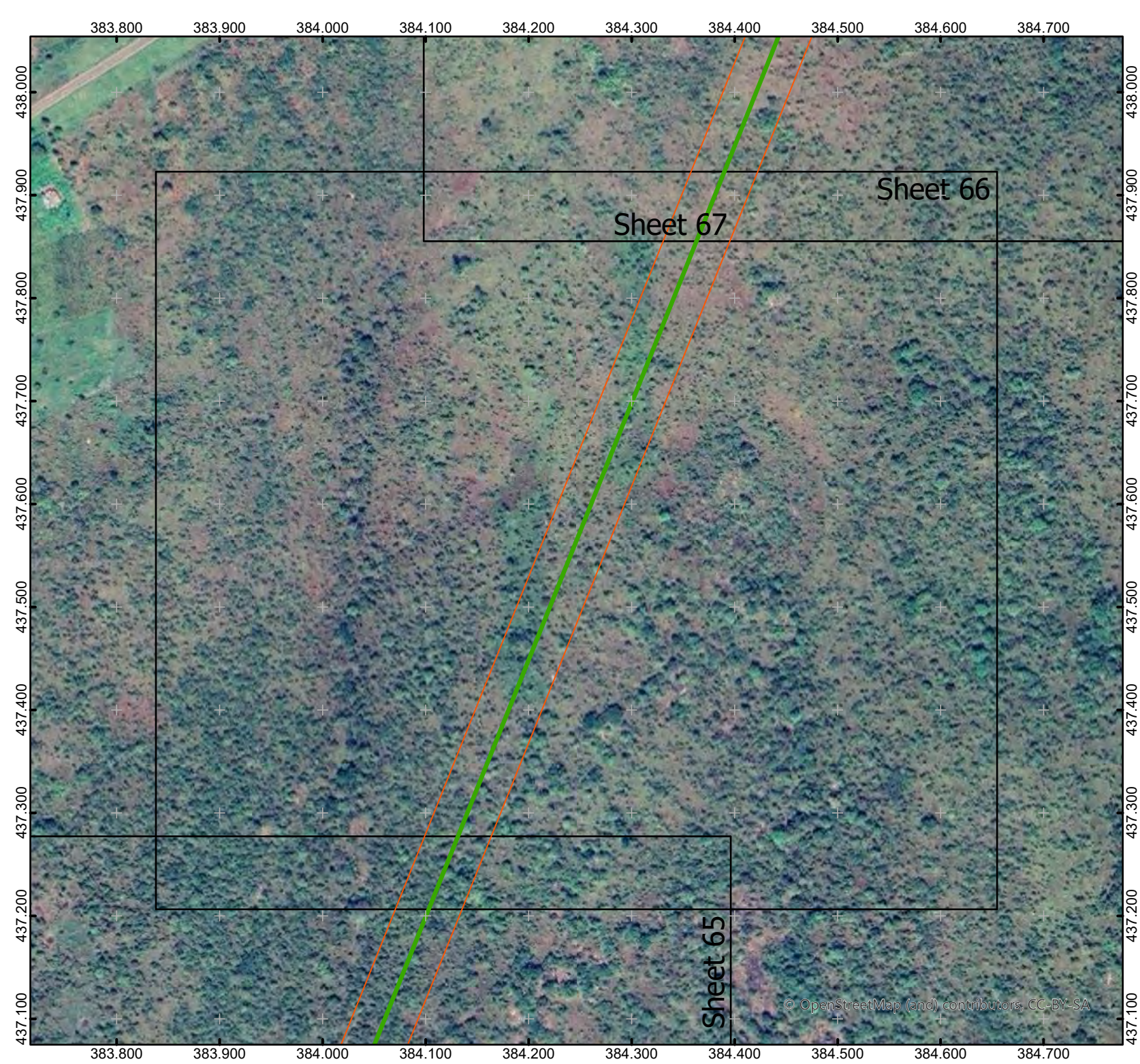
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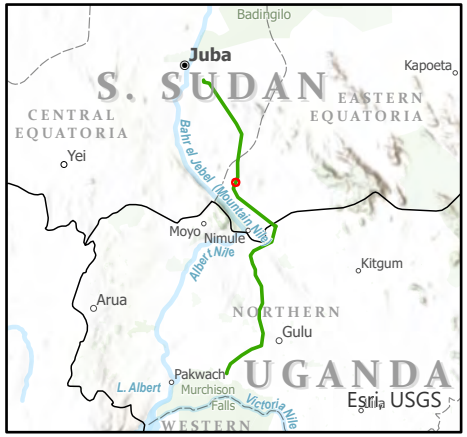
Coordinate system: WGS 1984 UTM Zone 36N
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Direct Area of Influence

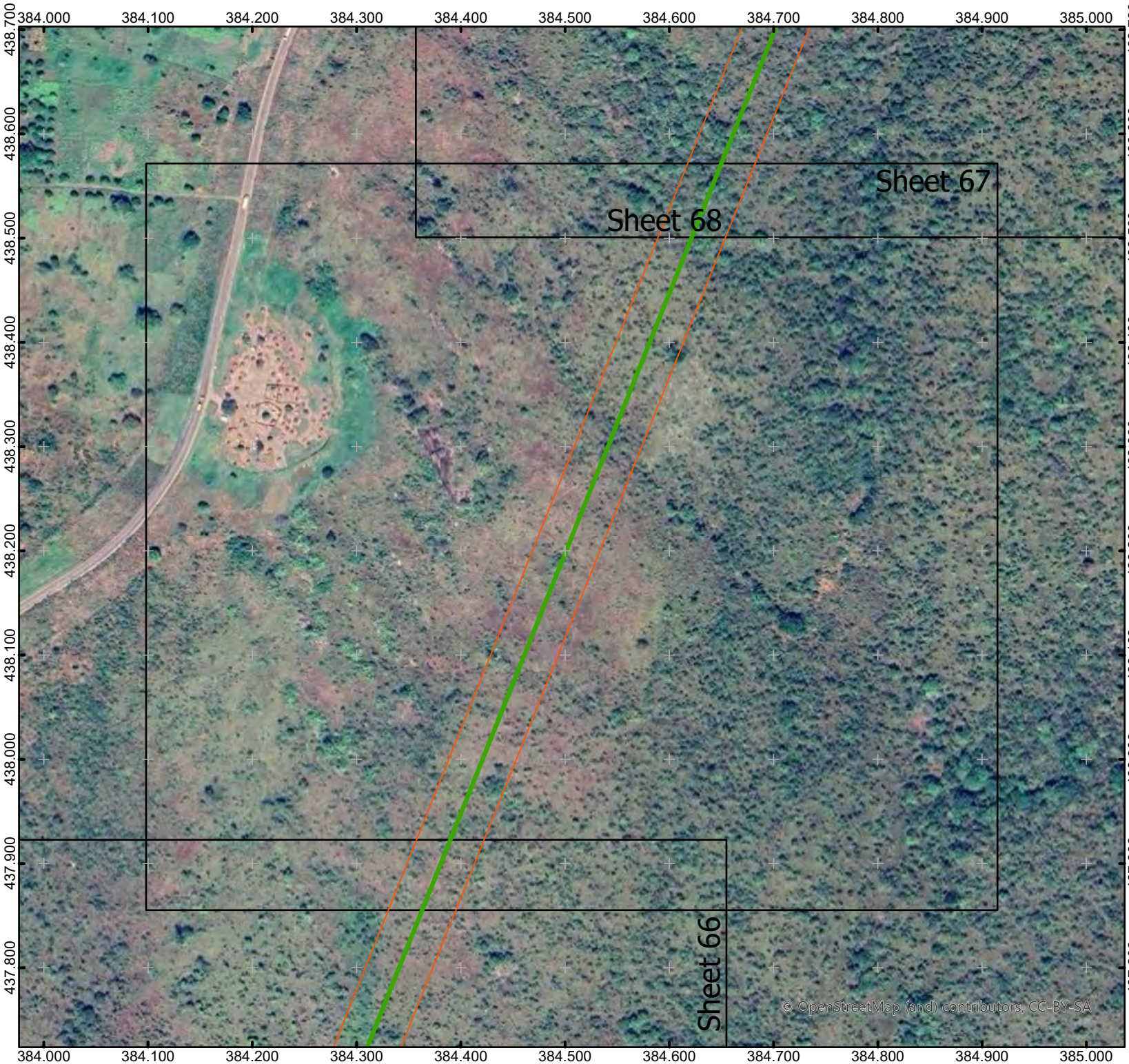
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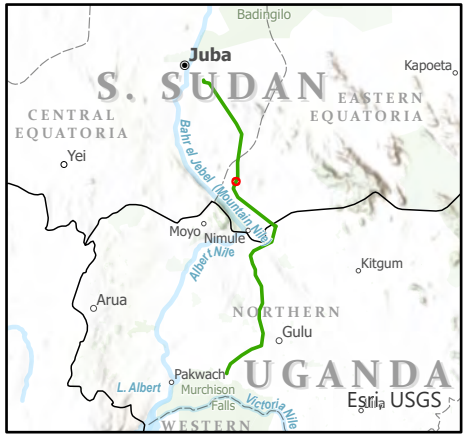
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Direct Area of Influence

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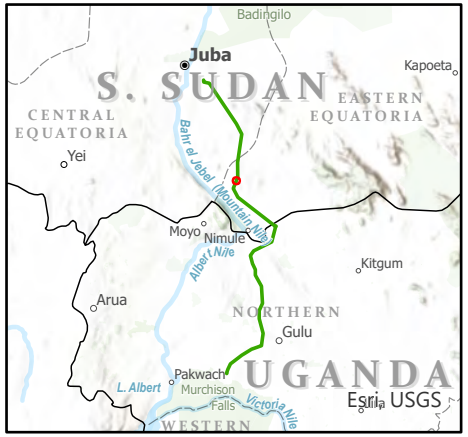
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

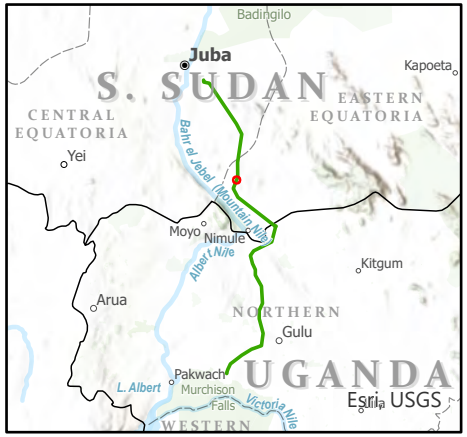
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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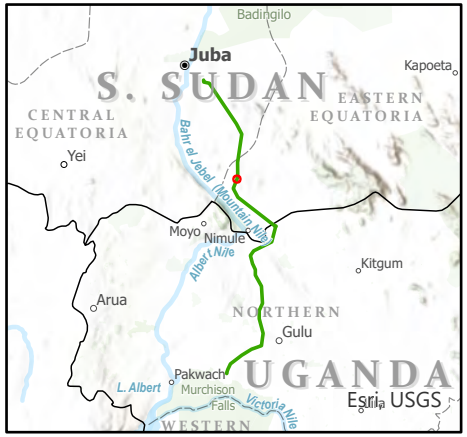
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

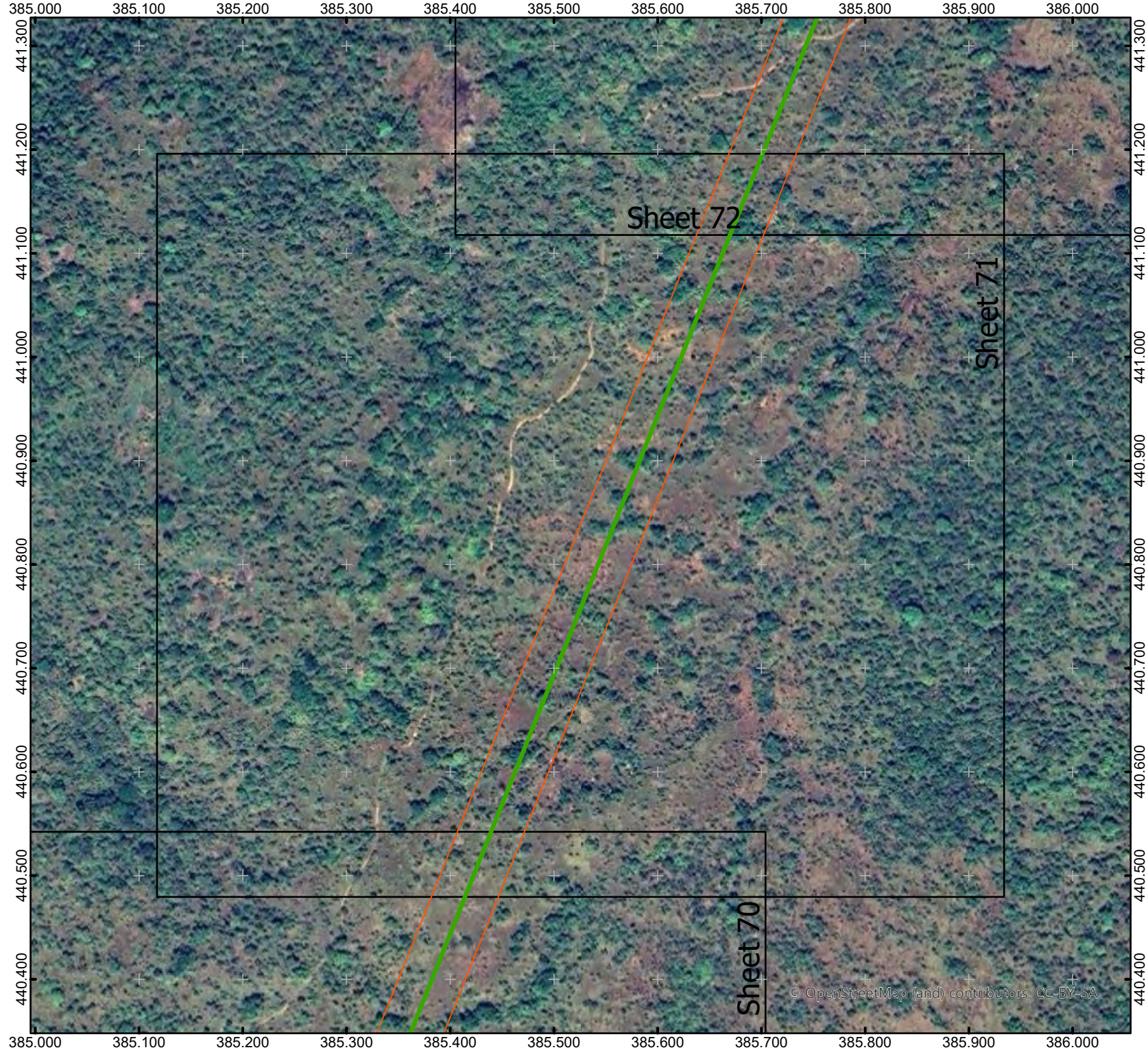
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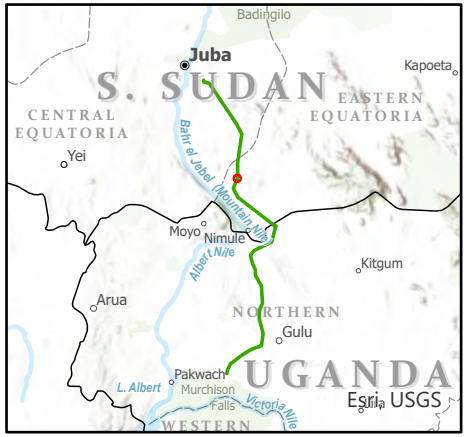
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





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Proposed transmission line (Uganda section)

Direct Area of Influence

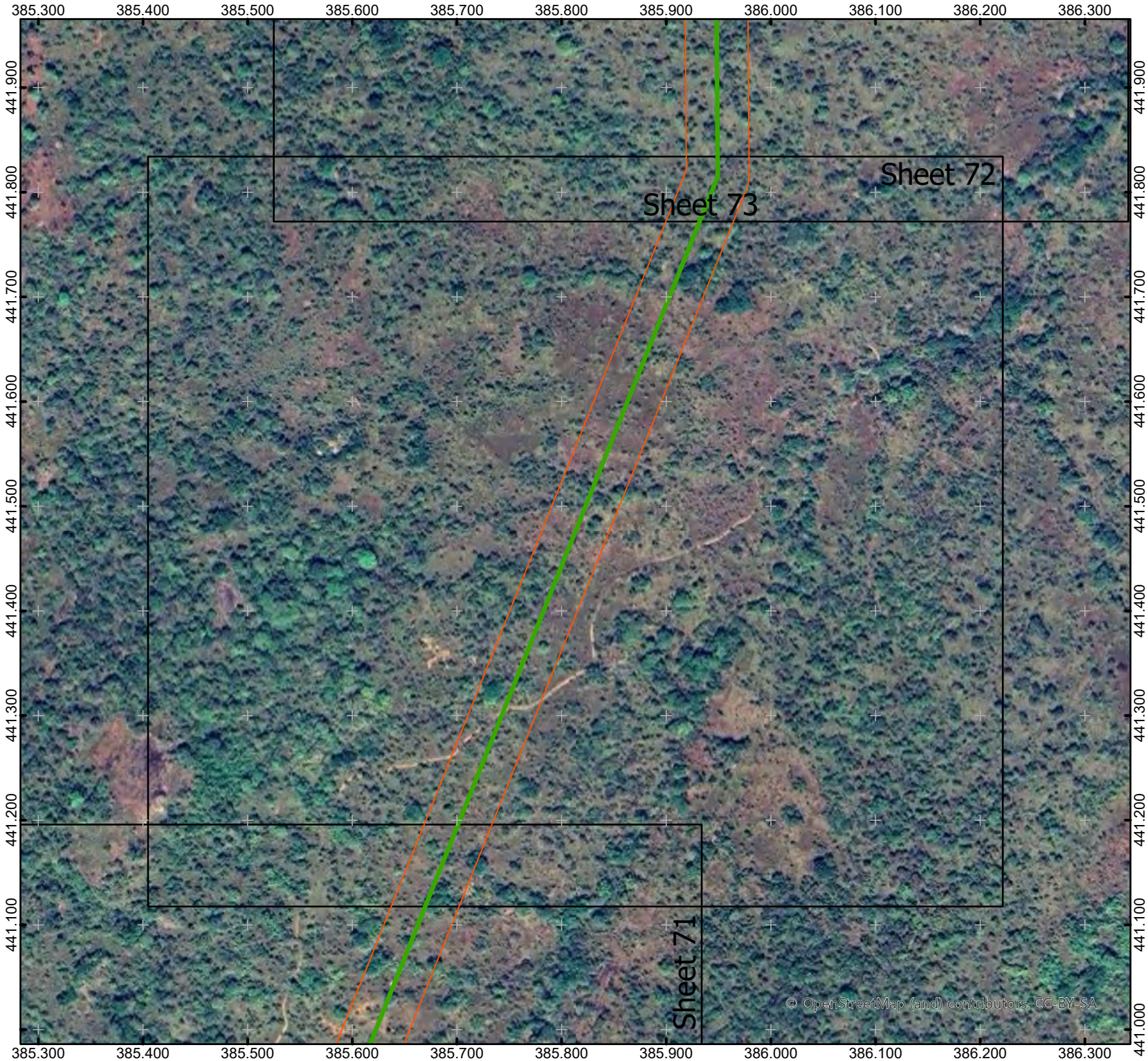
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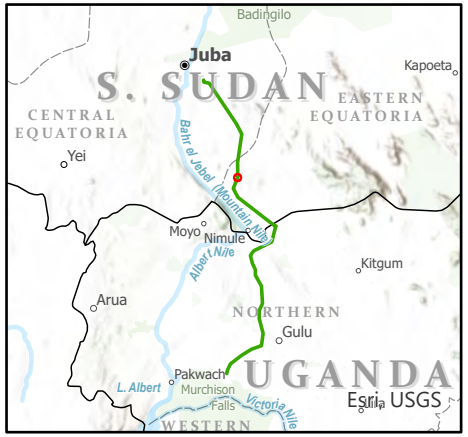
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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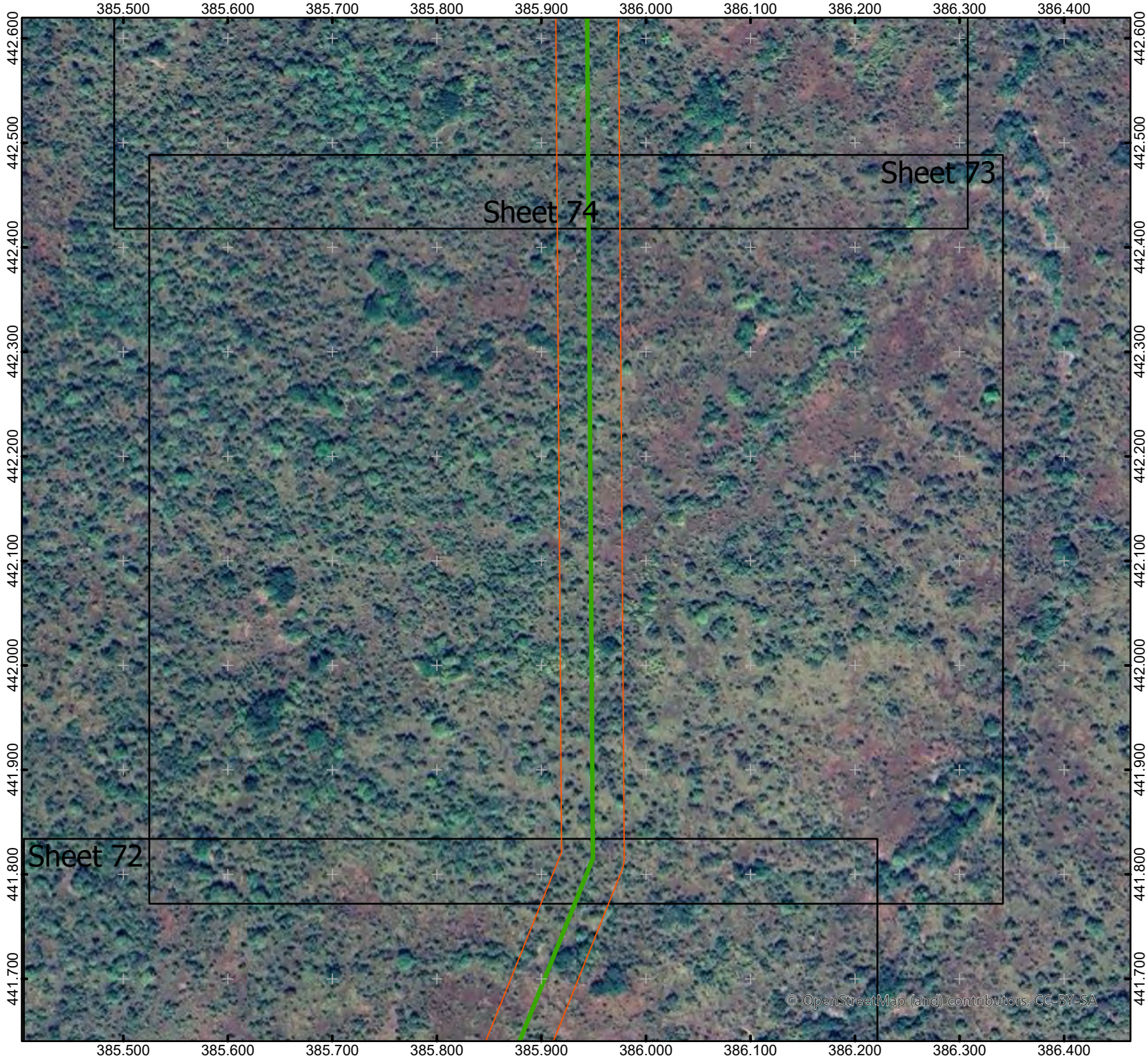
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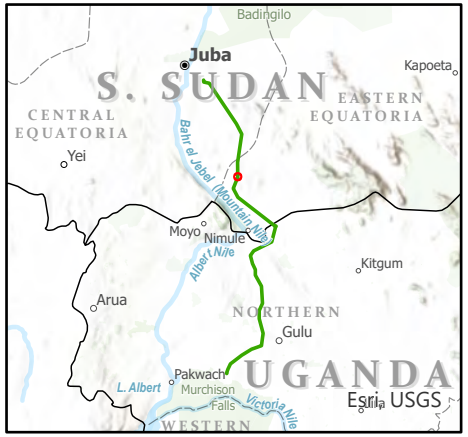
Coordinate system: WGS 1984 UTM Zone 36N
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

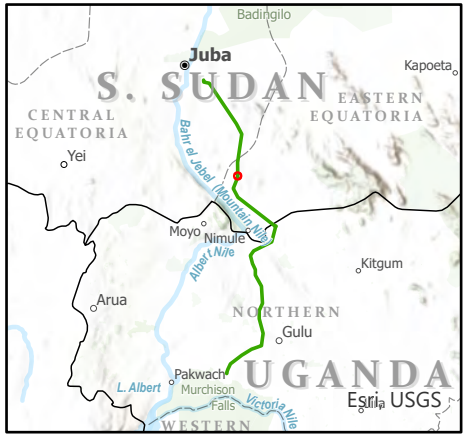
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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0 0,2 Kilometers

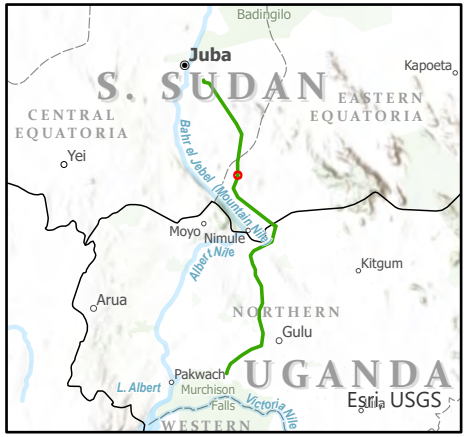
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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0 0,2 Kilometers

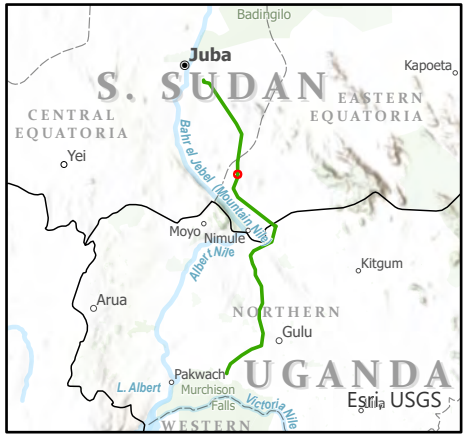
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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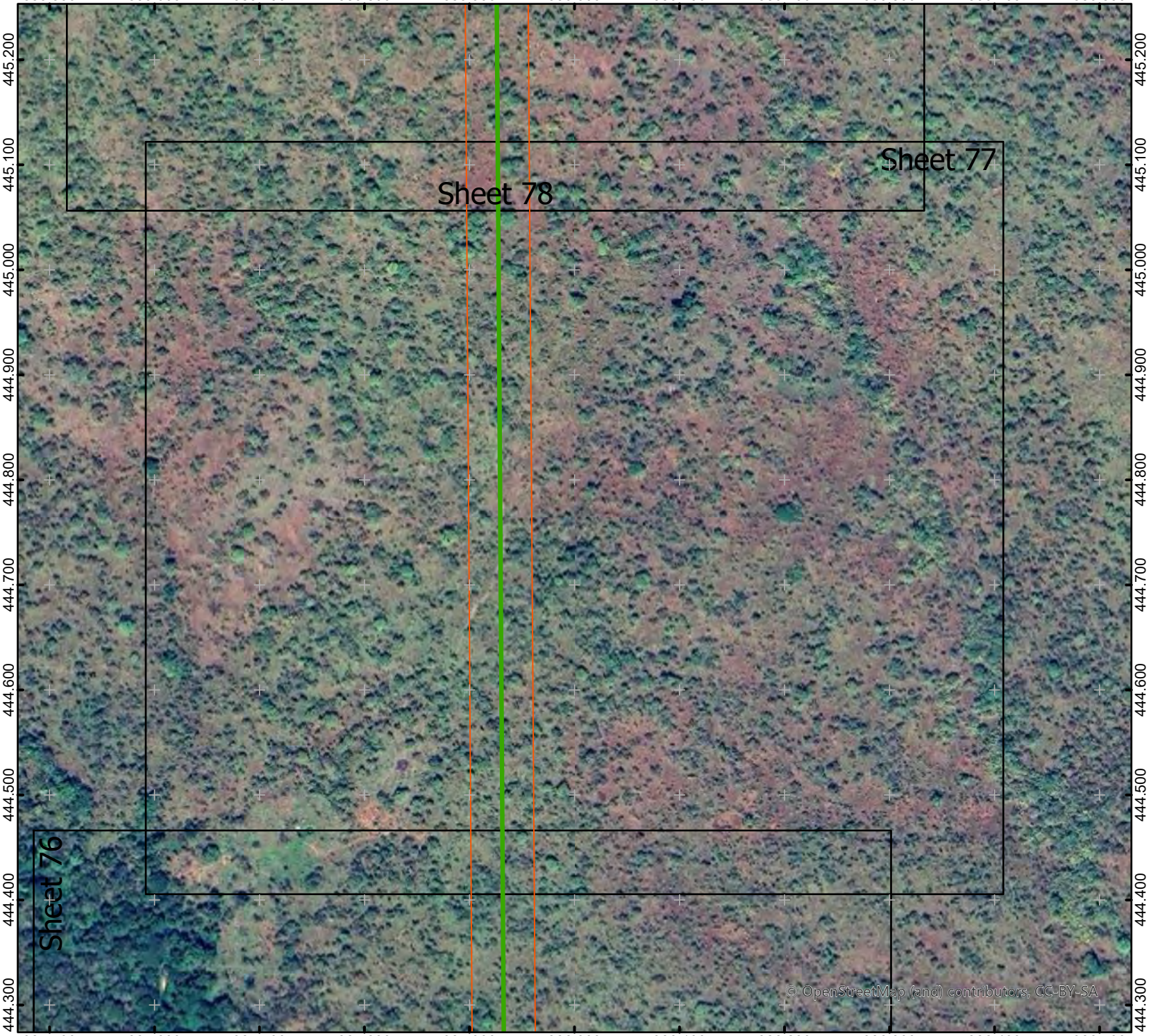
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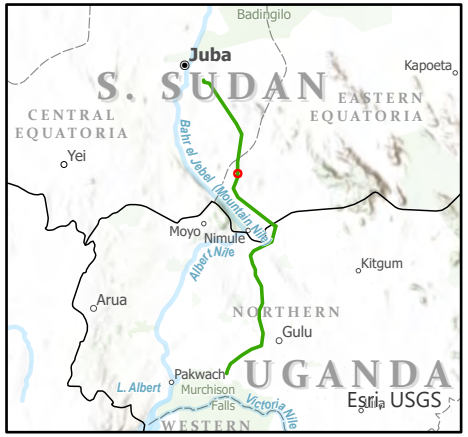
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





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Proposed transmission line (Uganda section)

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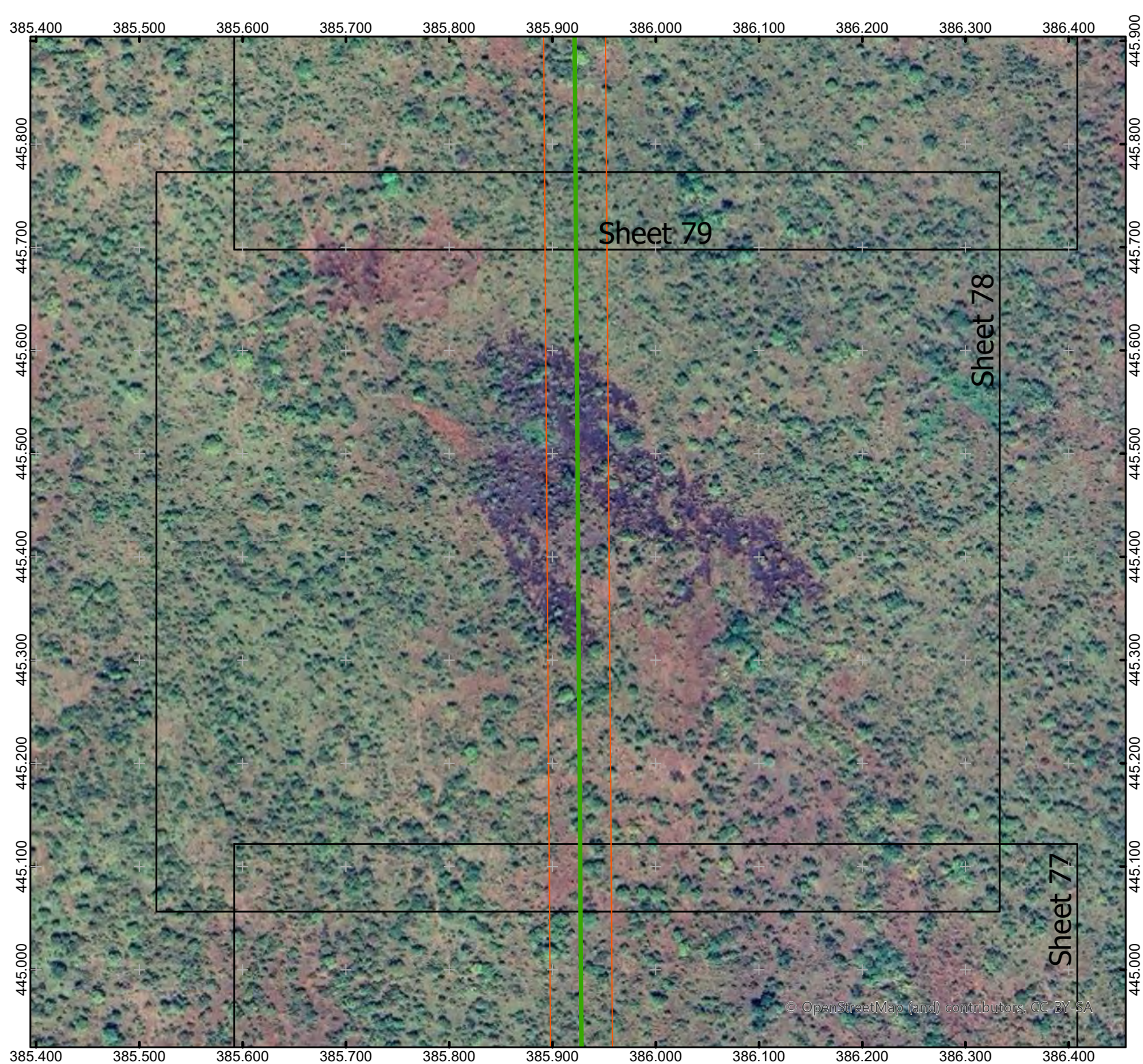
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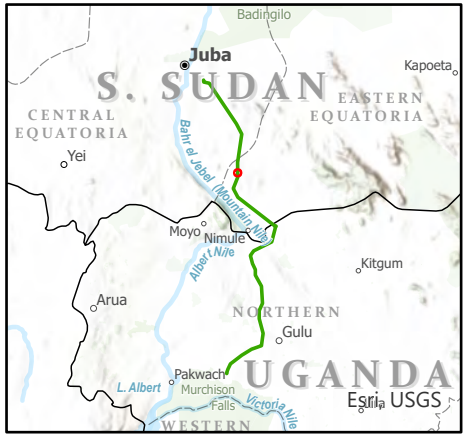
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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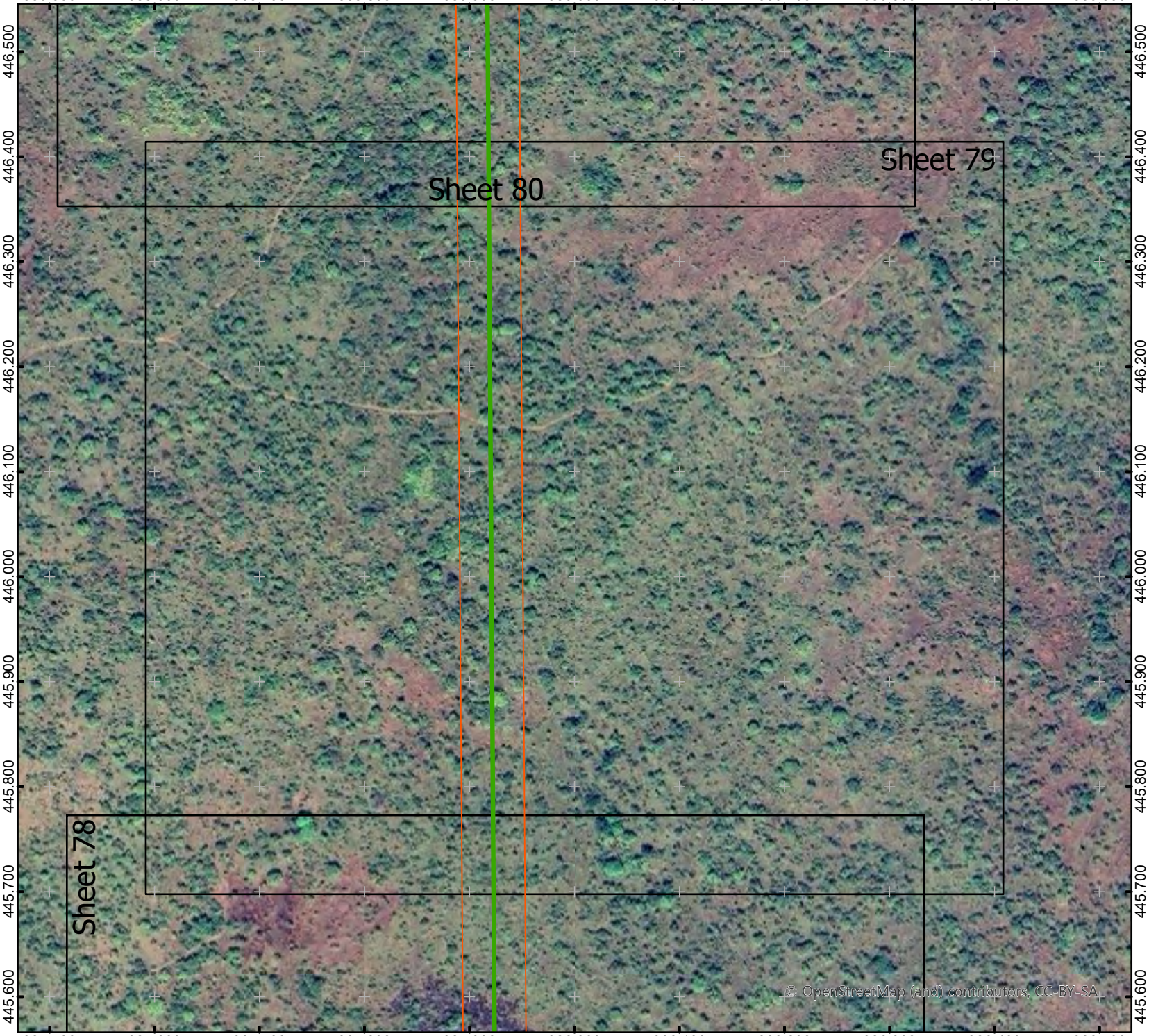
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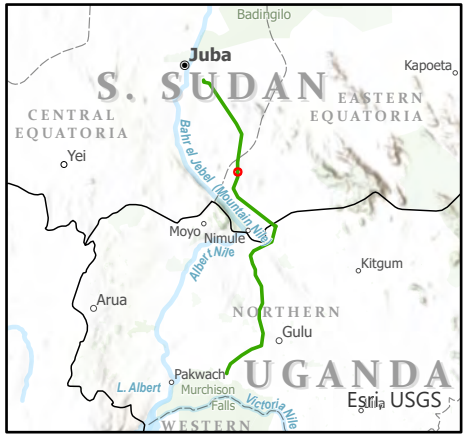
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

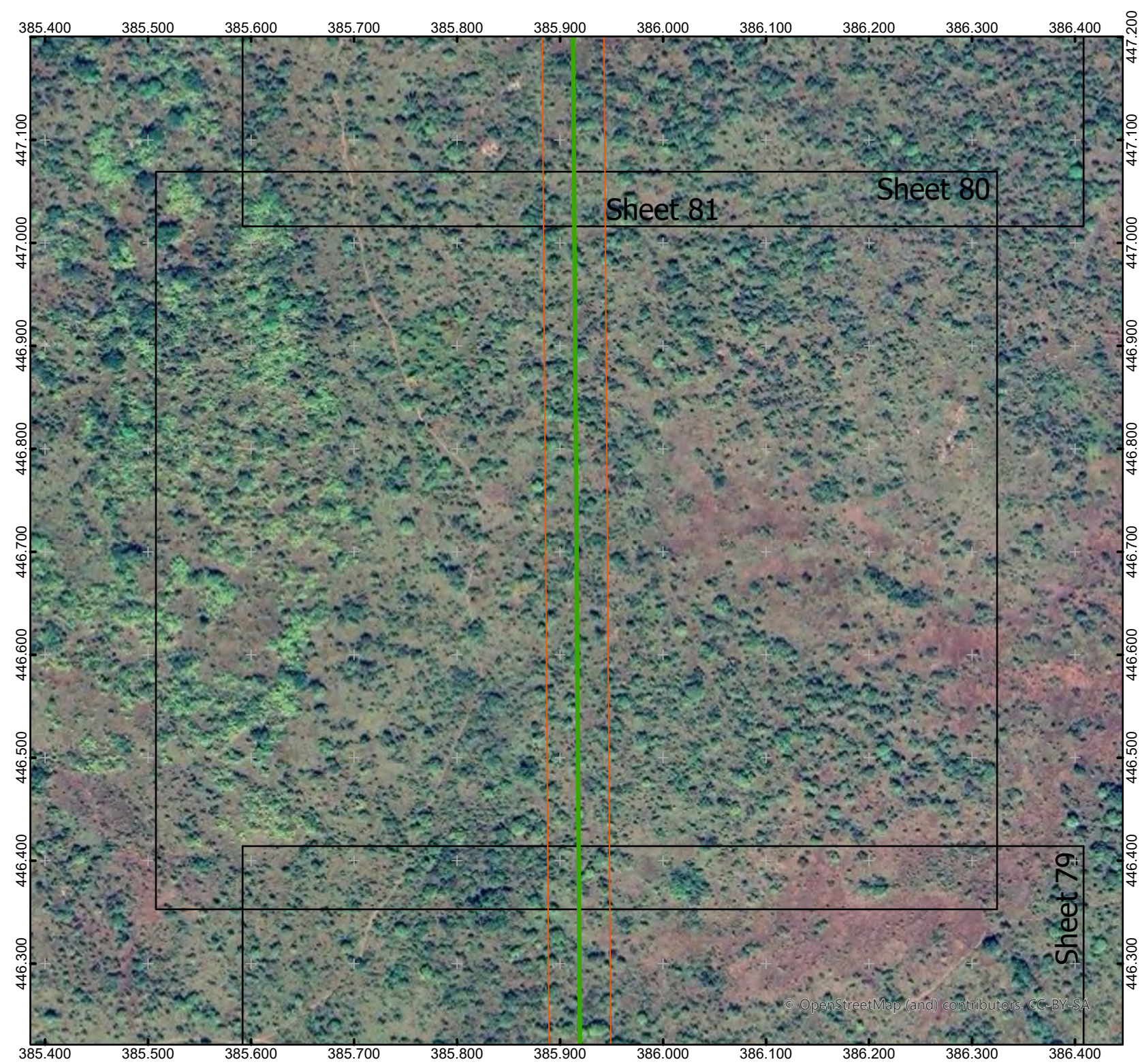
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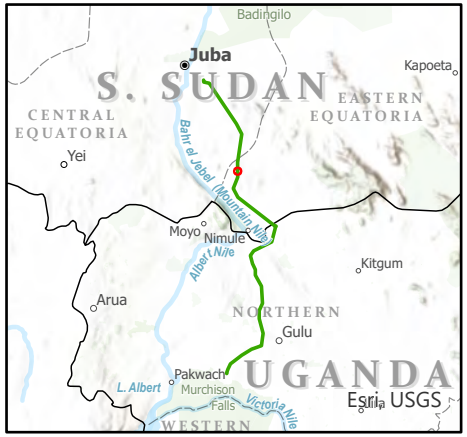
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

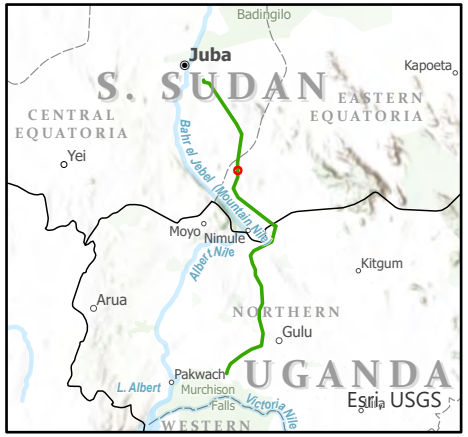
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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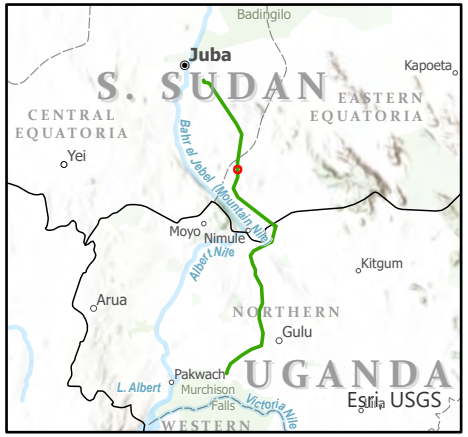
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Uganda-South Sudan 400 kV Interconnection Line Project

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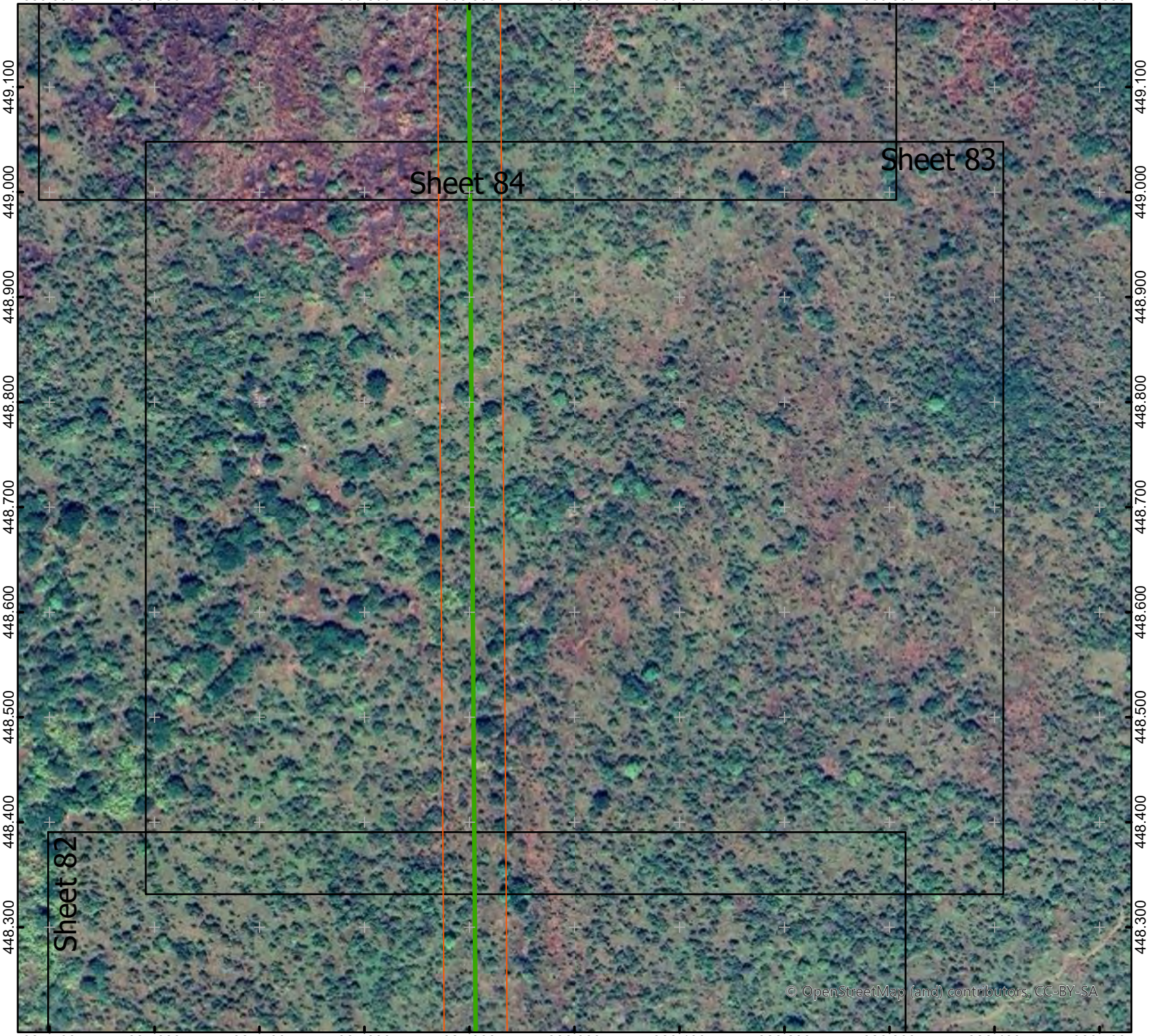
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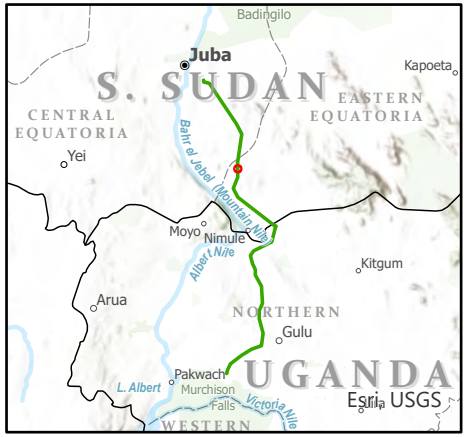
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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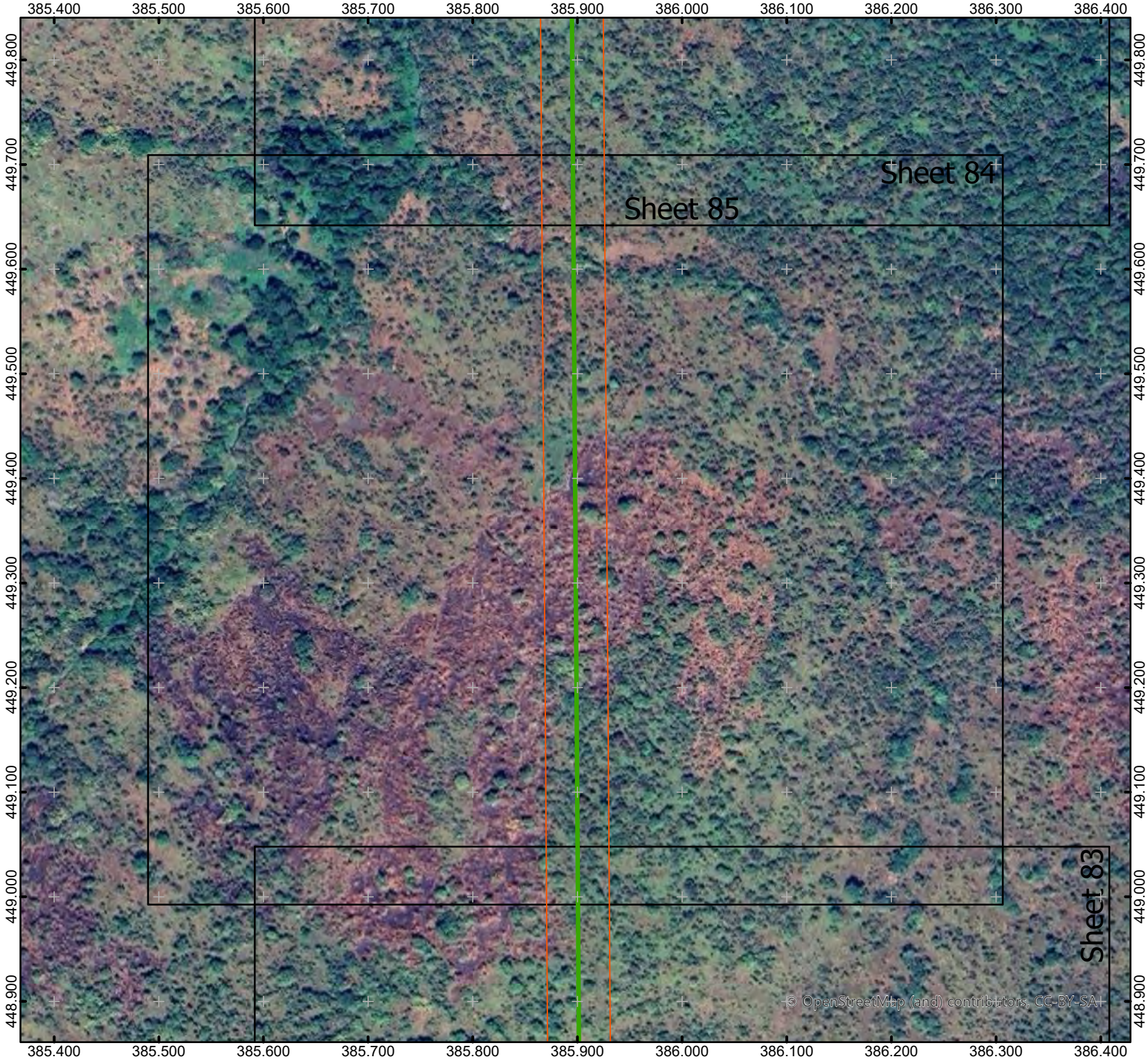
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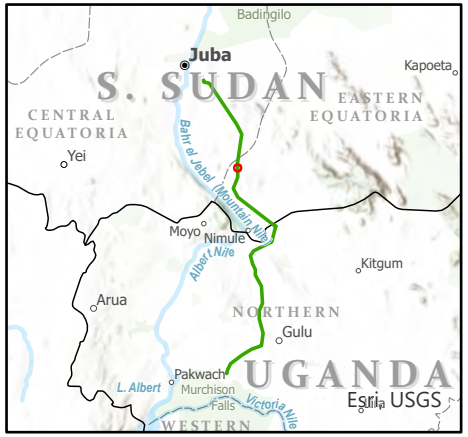
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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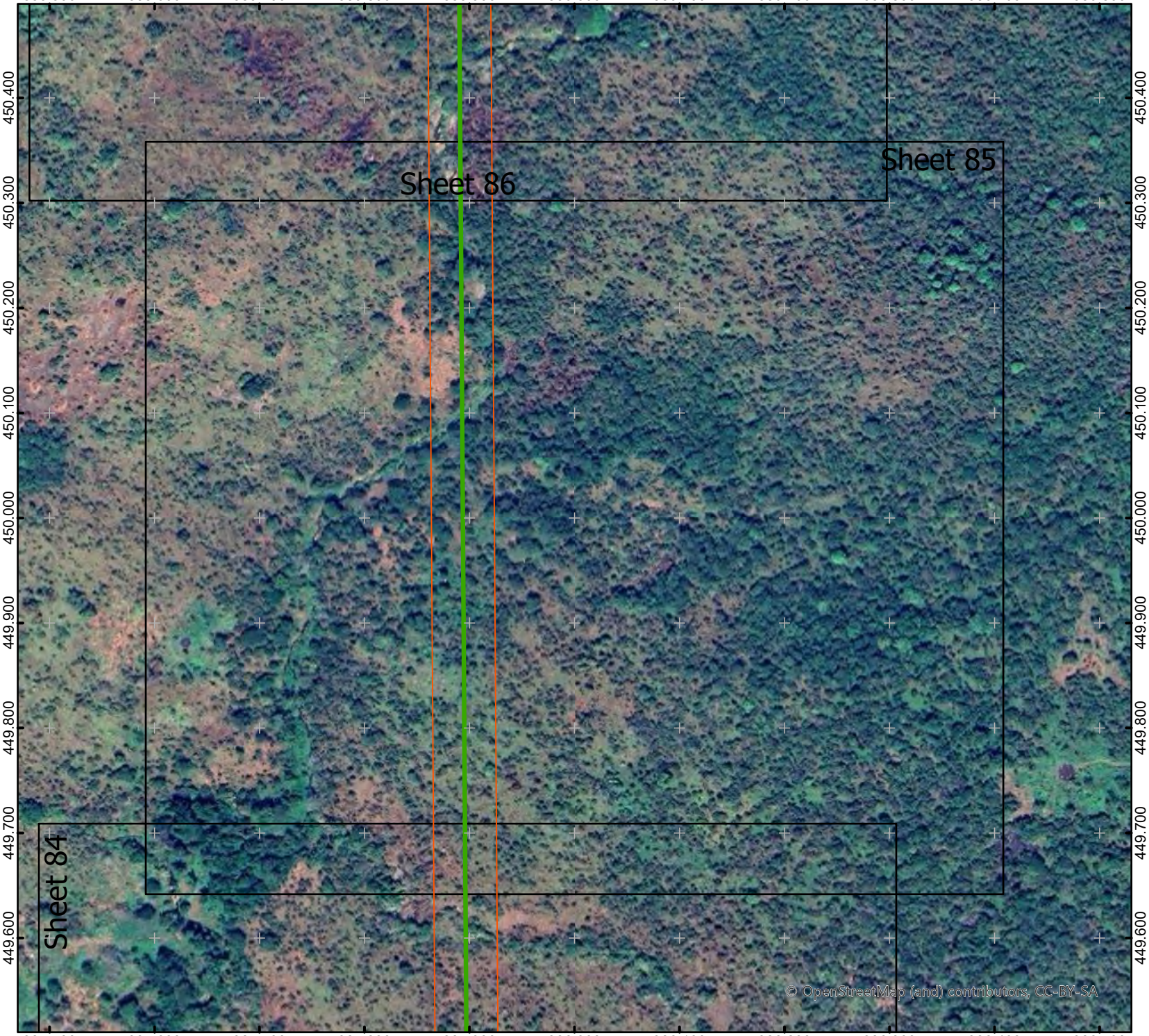
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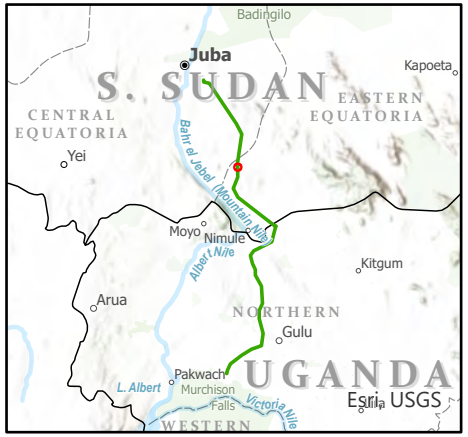
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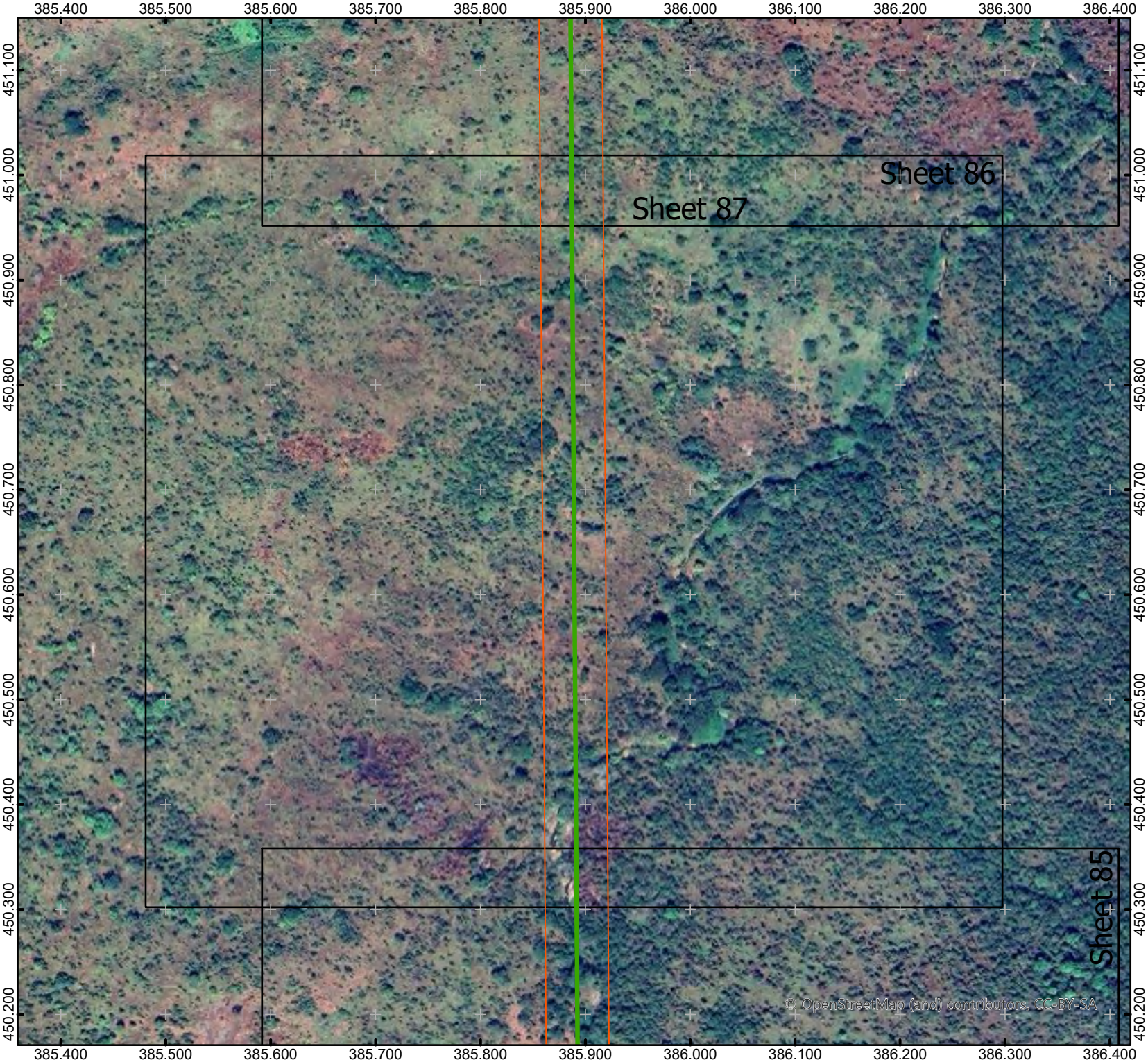
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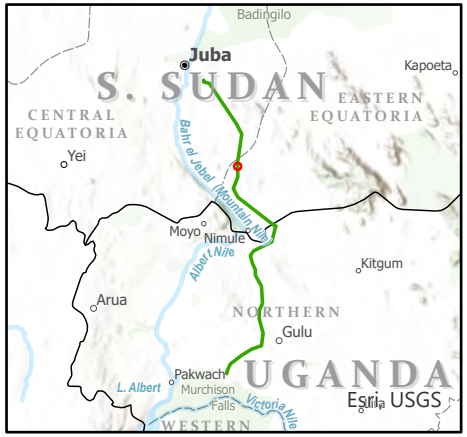
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Direct Area of Influence

0 0,2 Kilometers

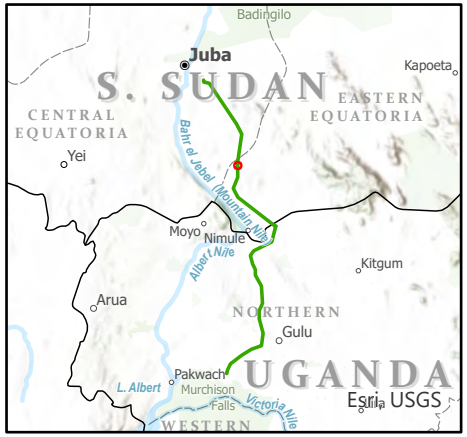
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

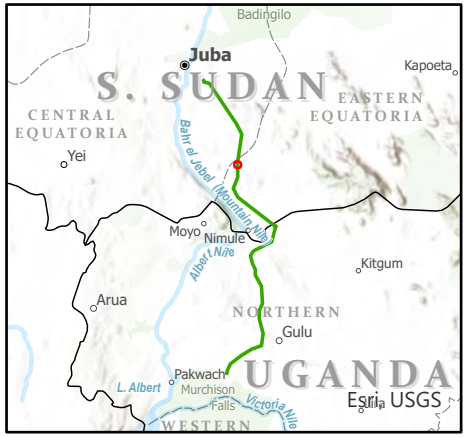
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Proposed transmission line (Uganda section)
- Direct Area of Influence

0 0,2 Kilometers

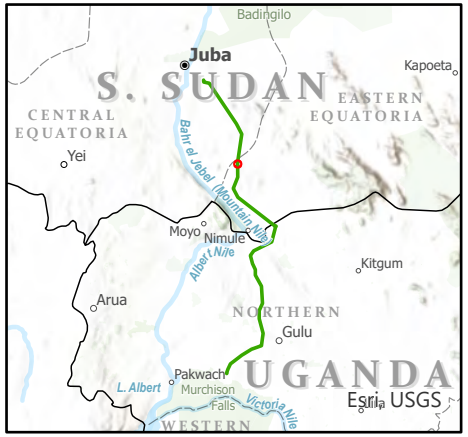
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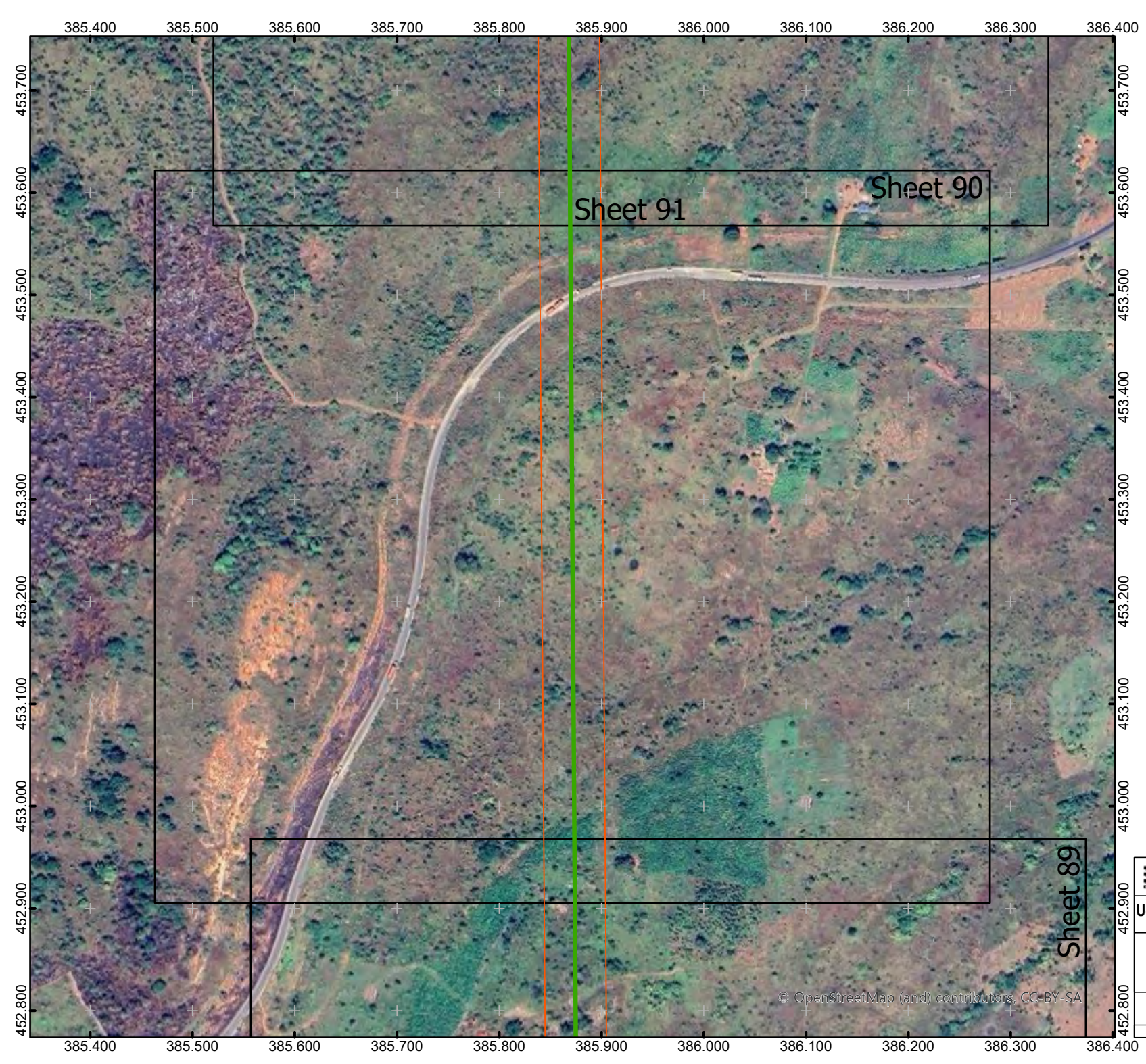
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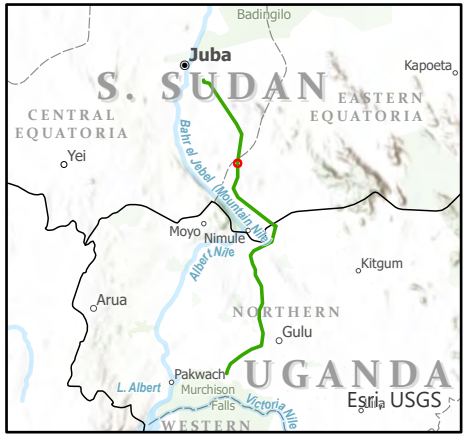
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Proposed transmission line (Satellite map)
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Proposed transmission line (Uganda section)

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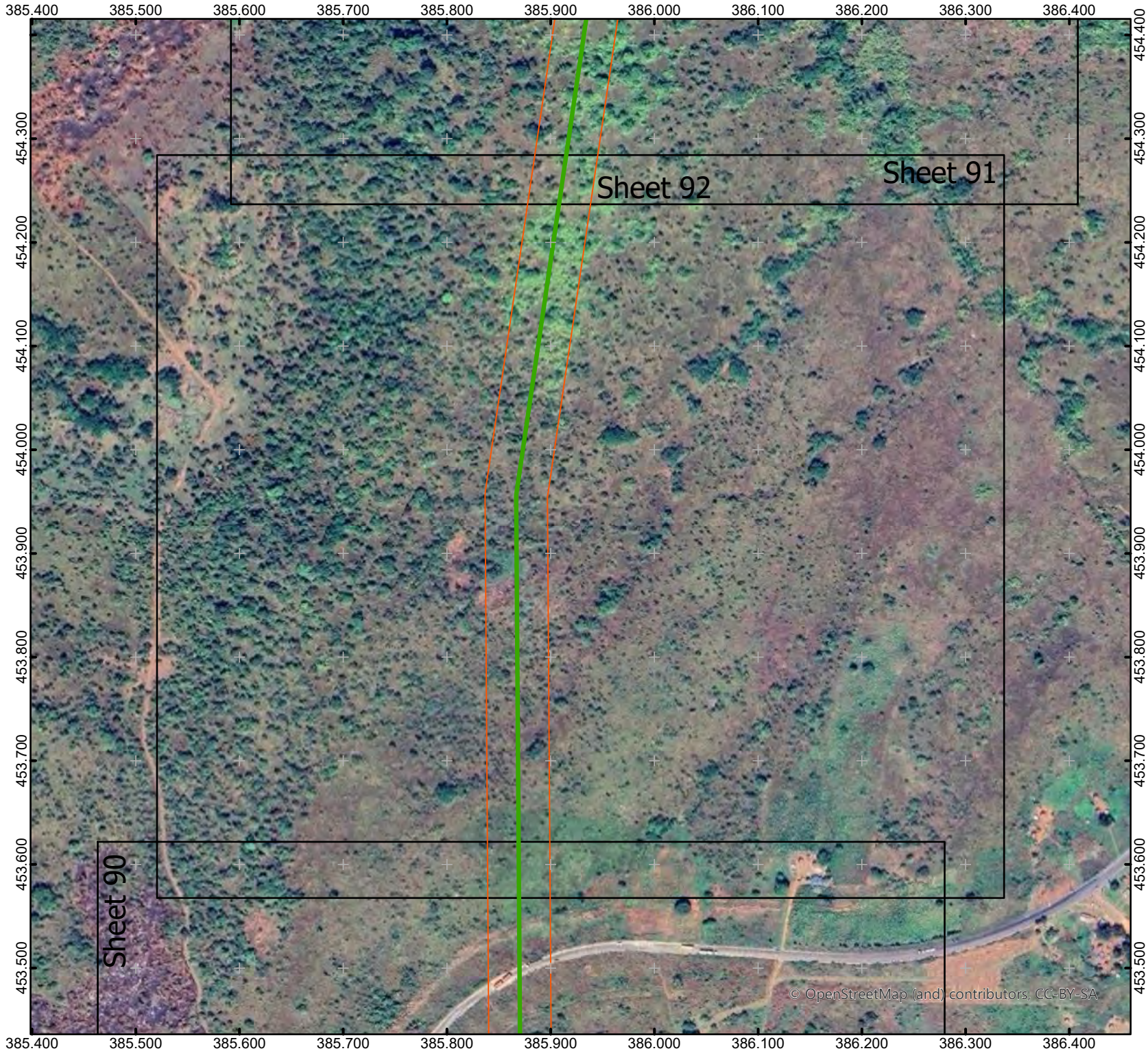
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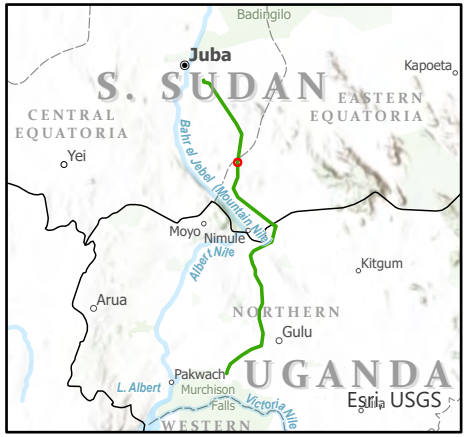
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Proposed transmission line (Uganda section)

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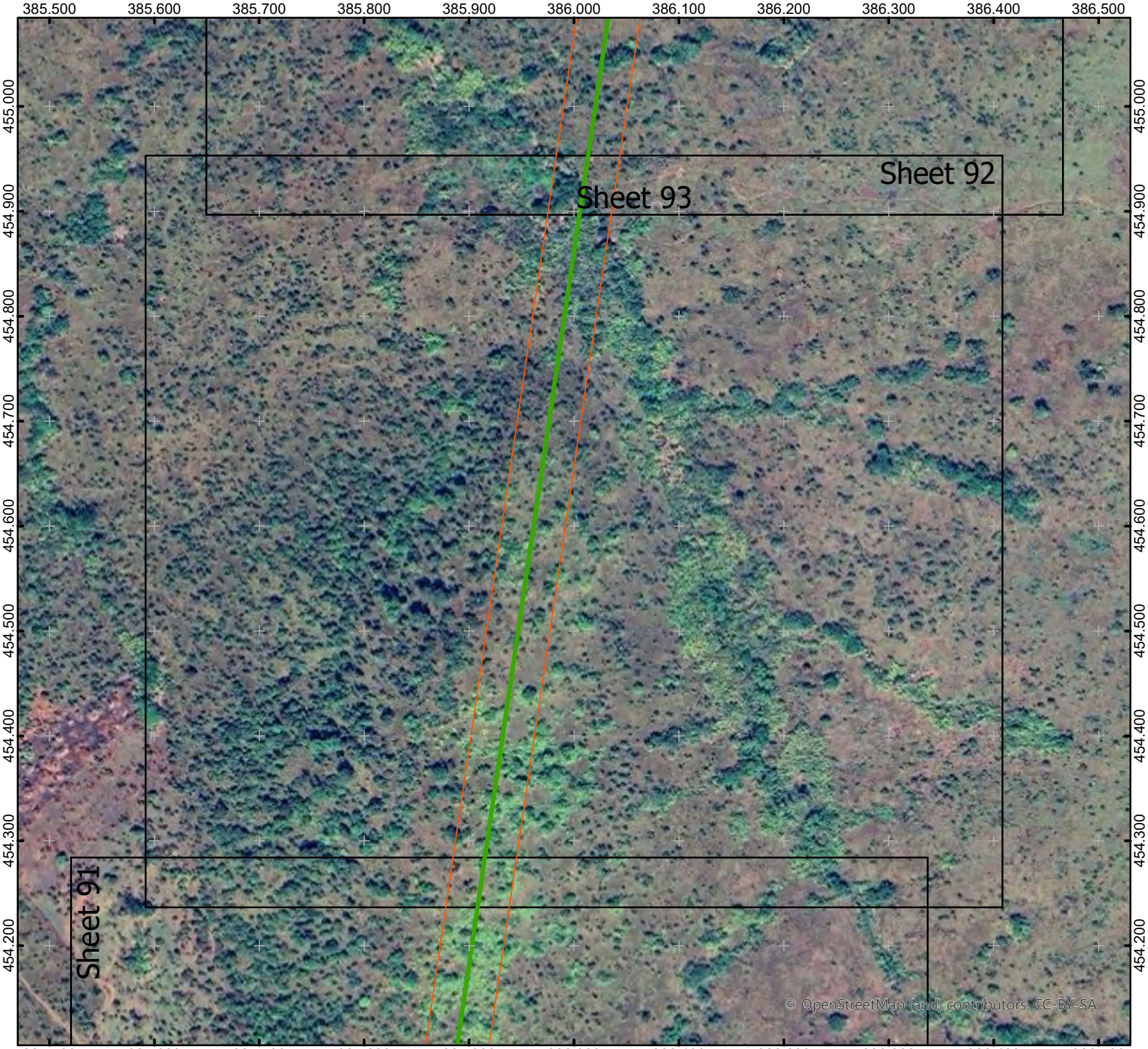
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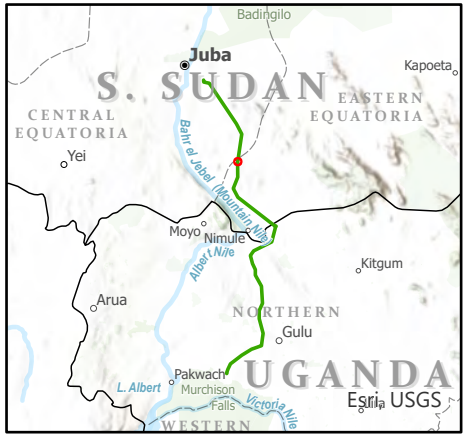
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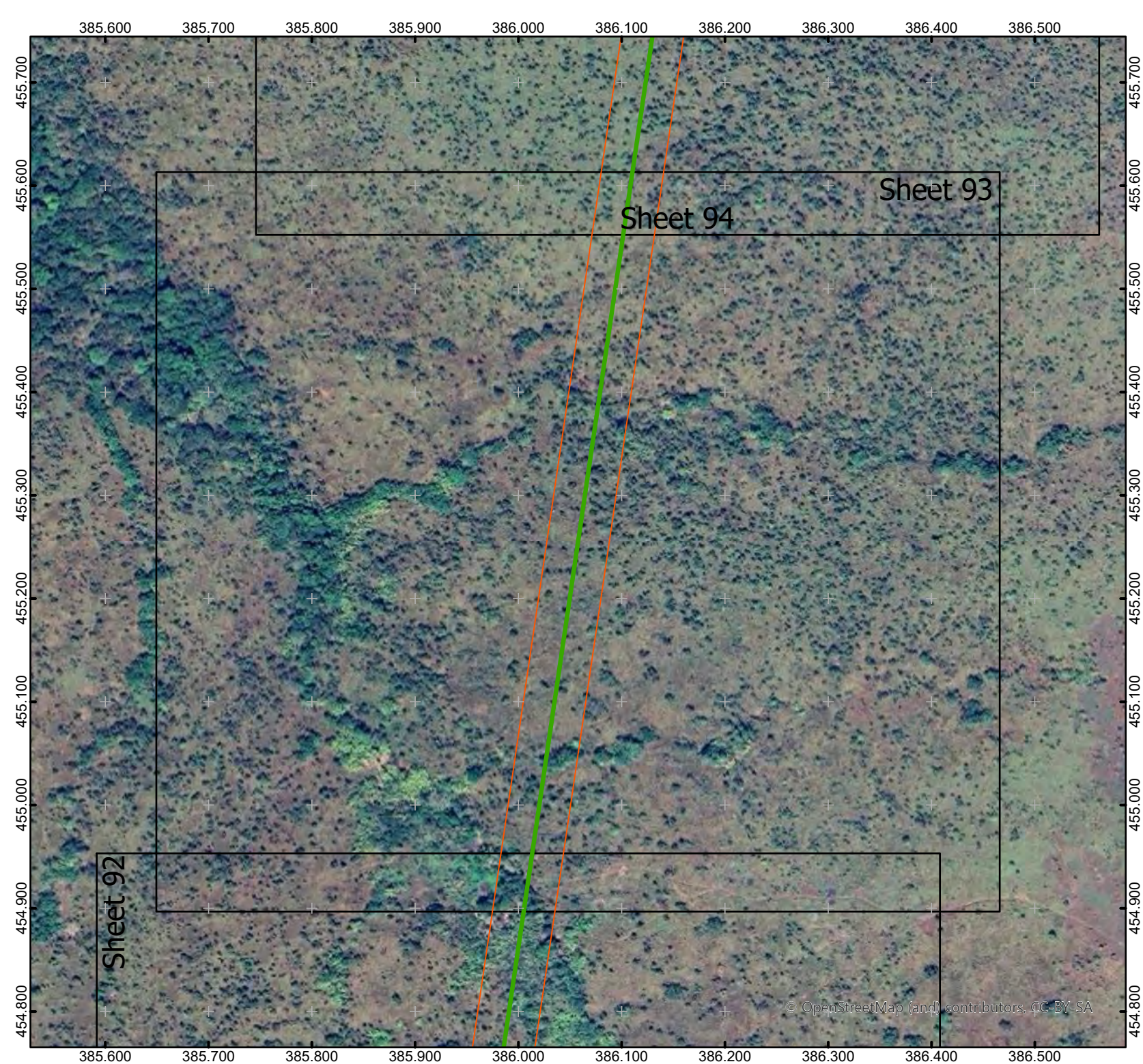
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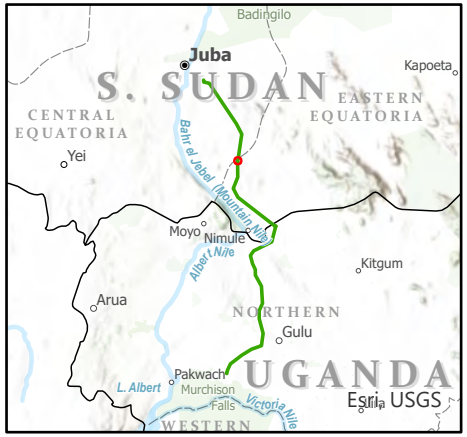
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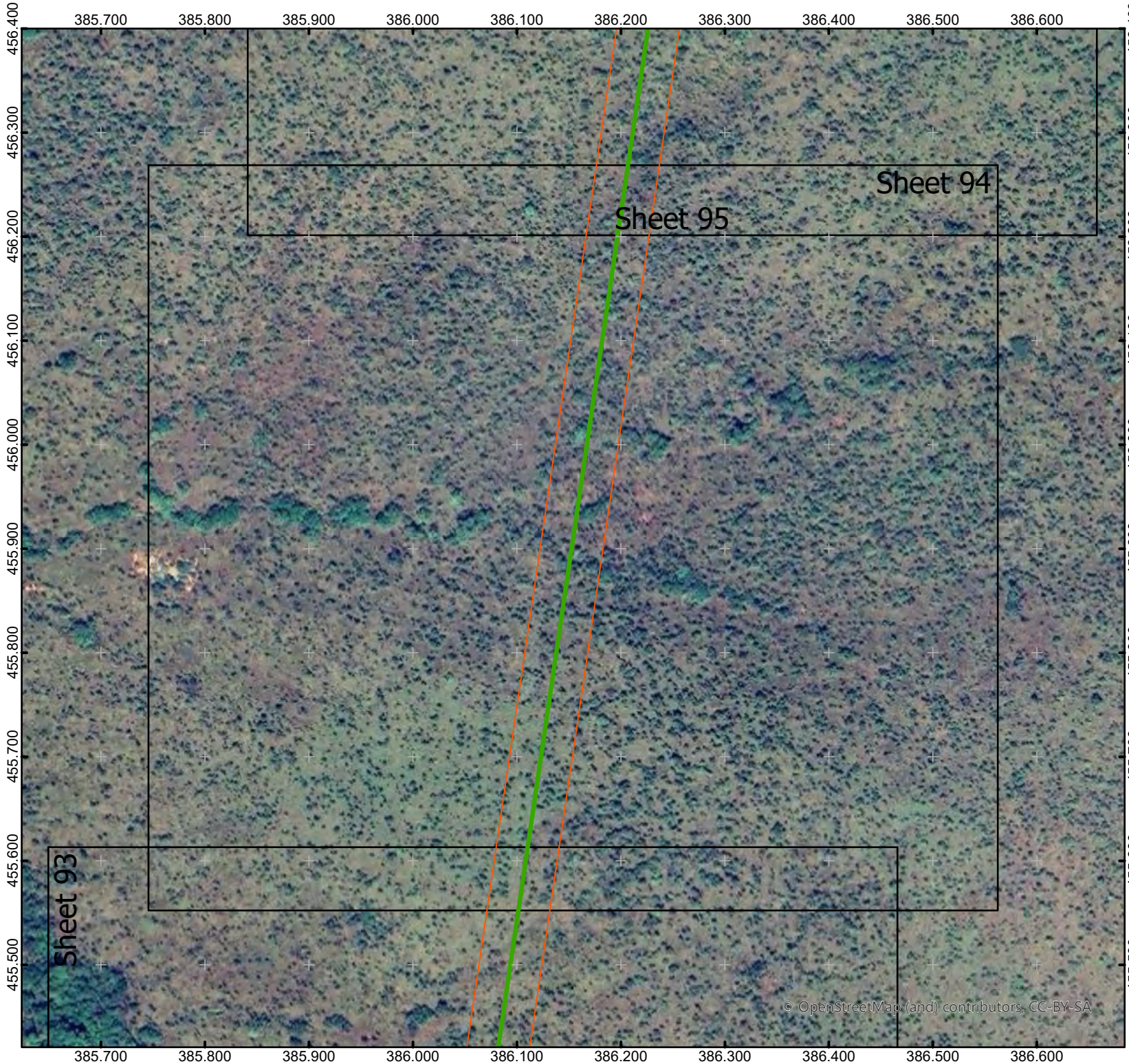
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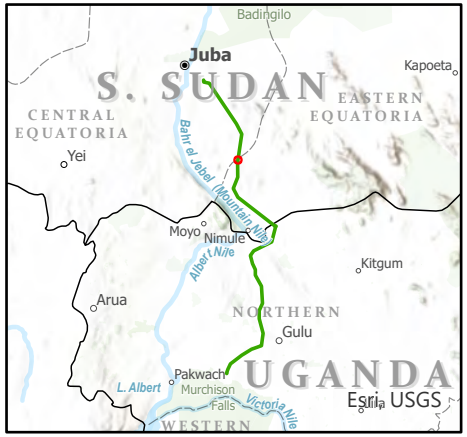
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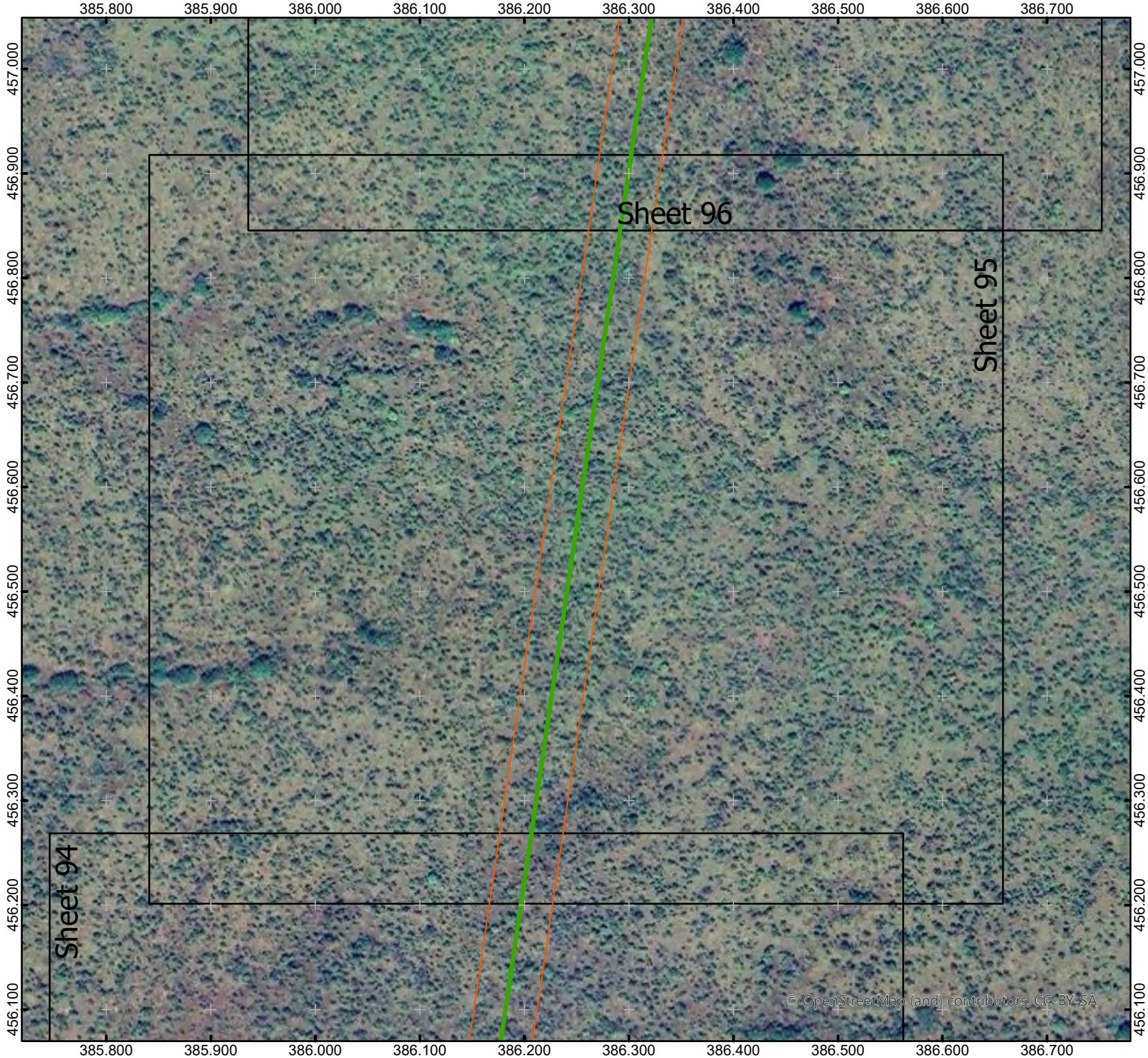
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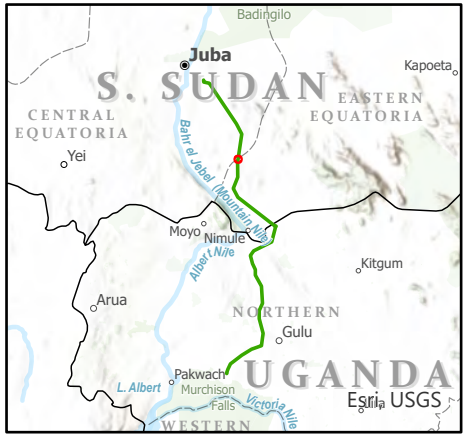
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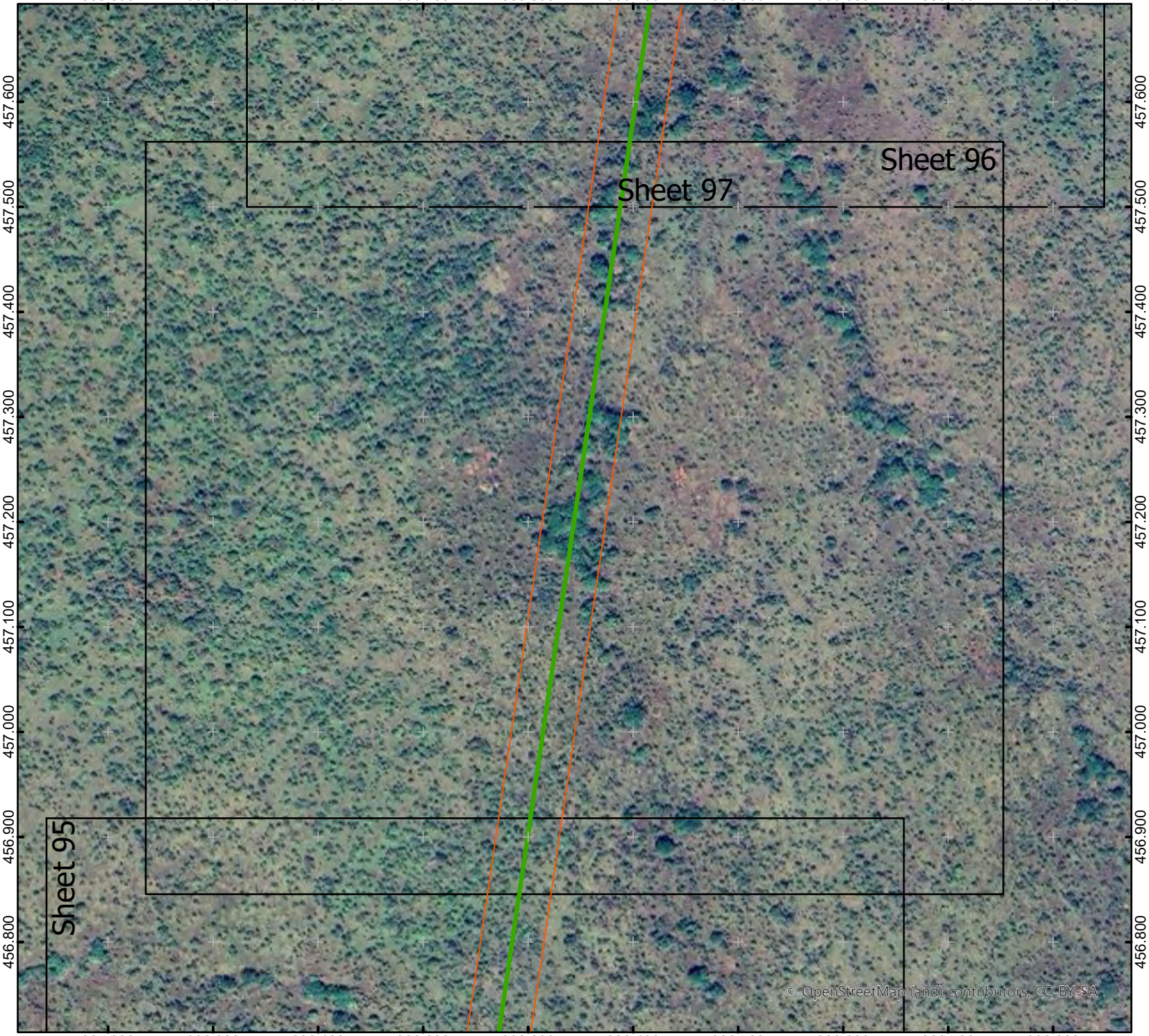
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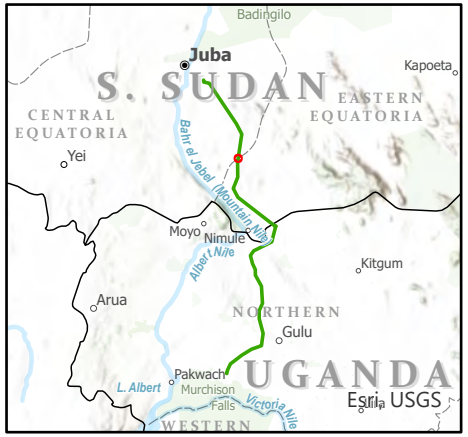
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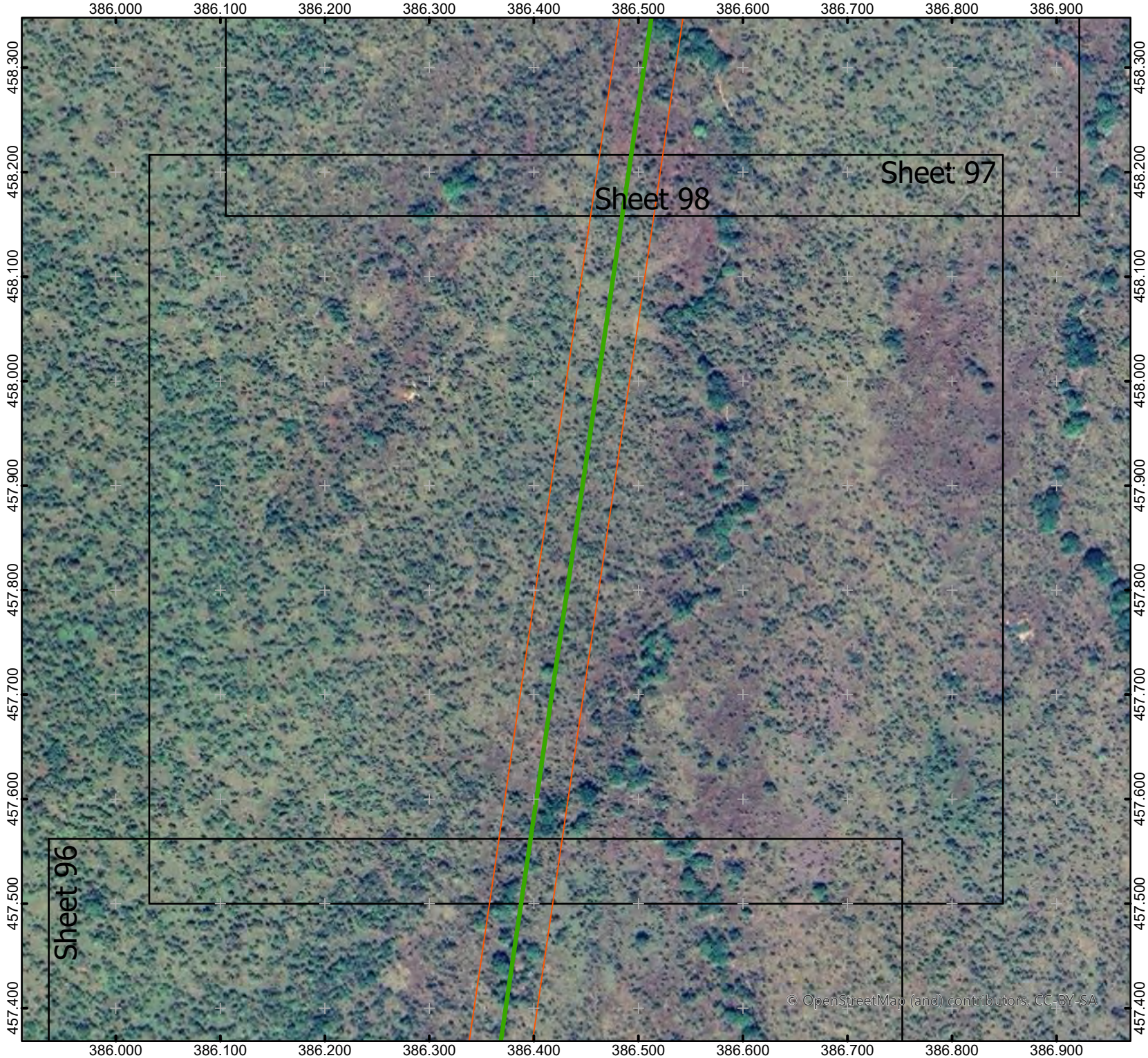
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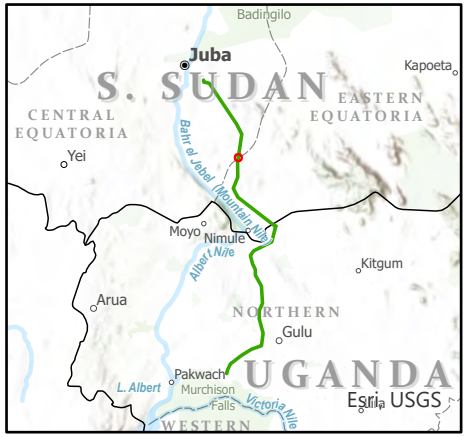
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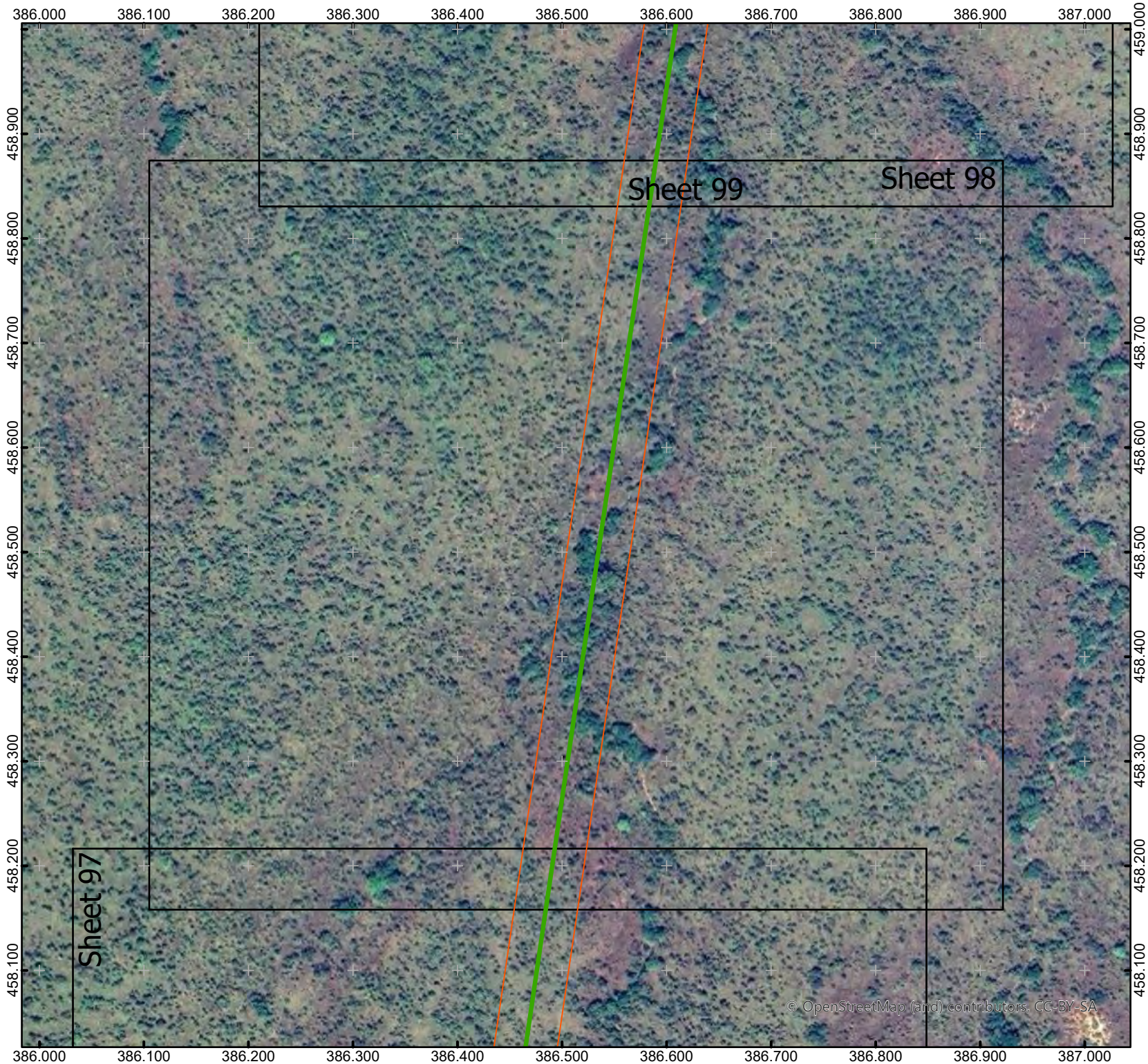
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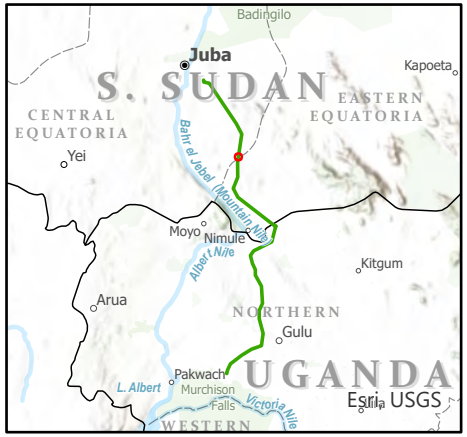
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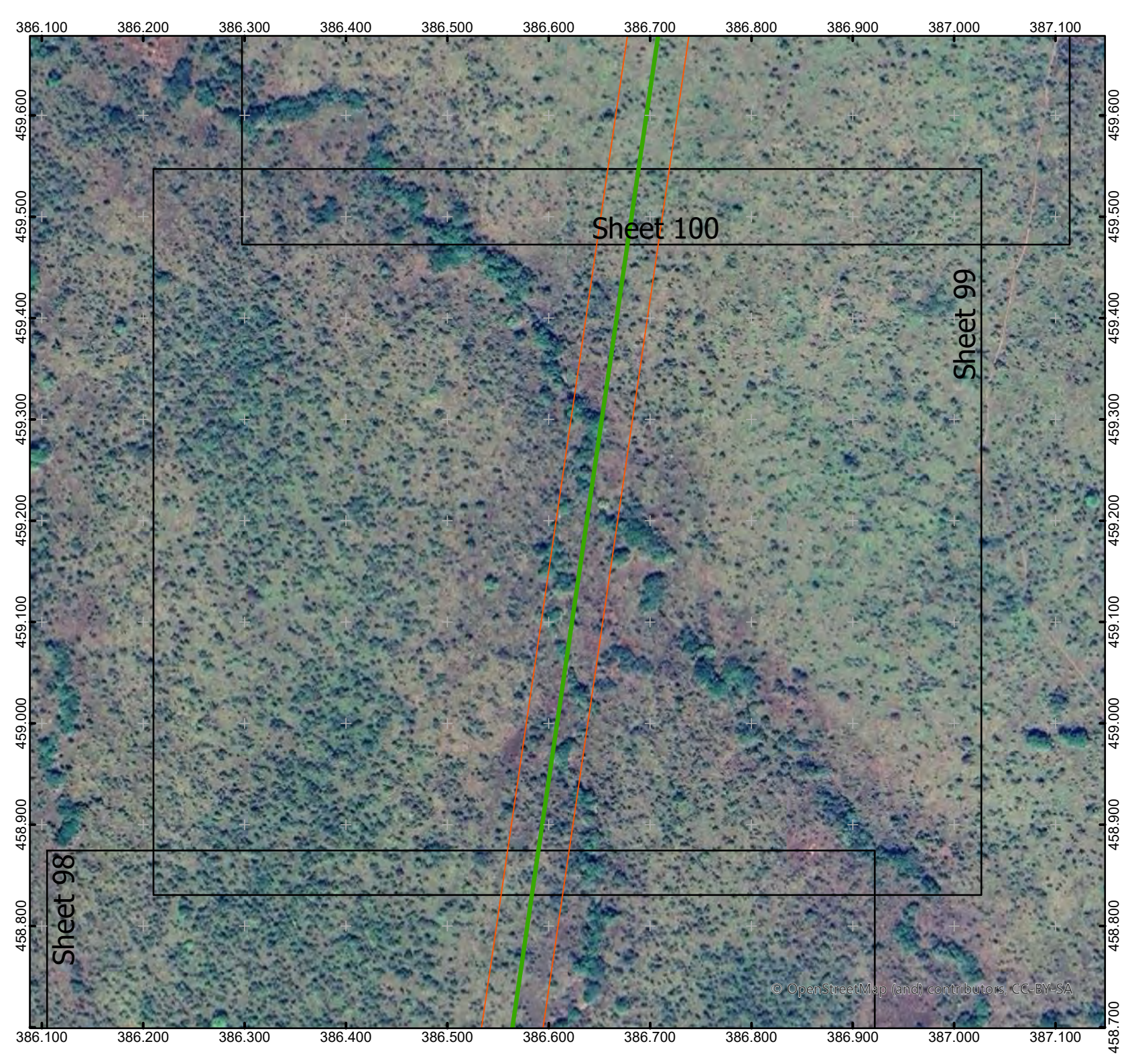
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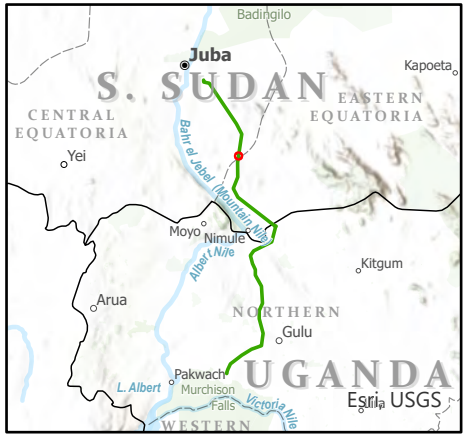
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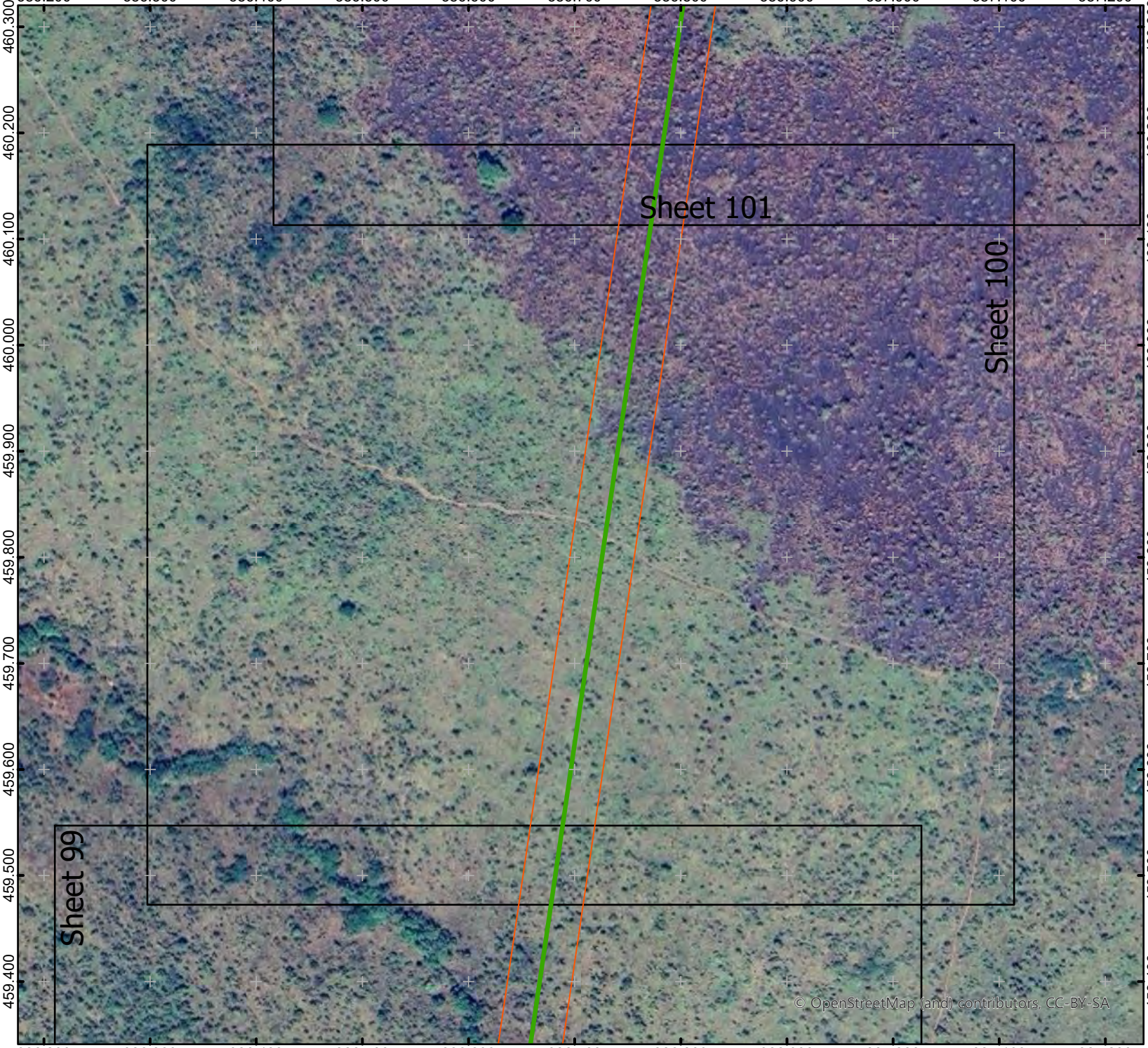
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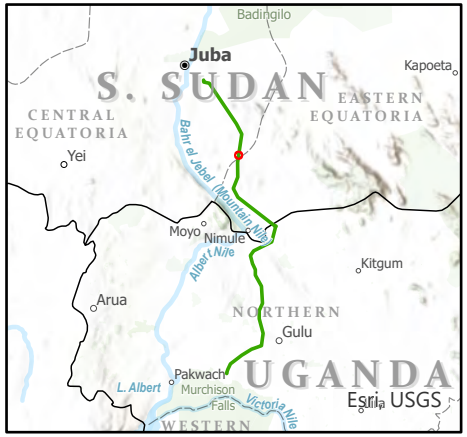
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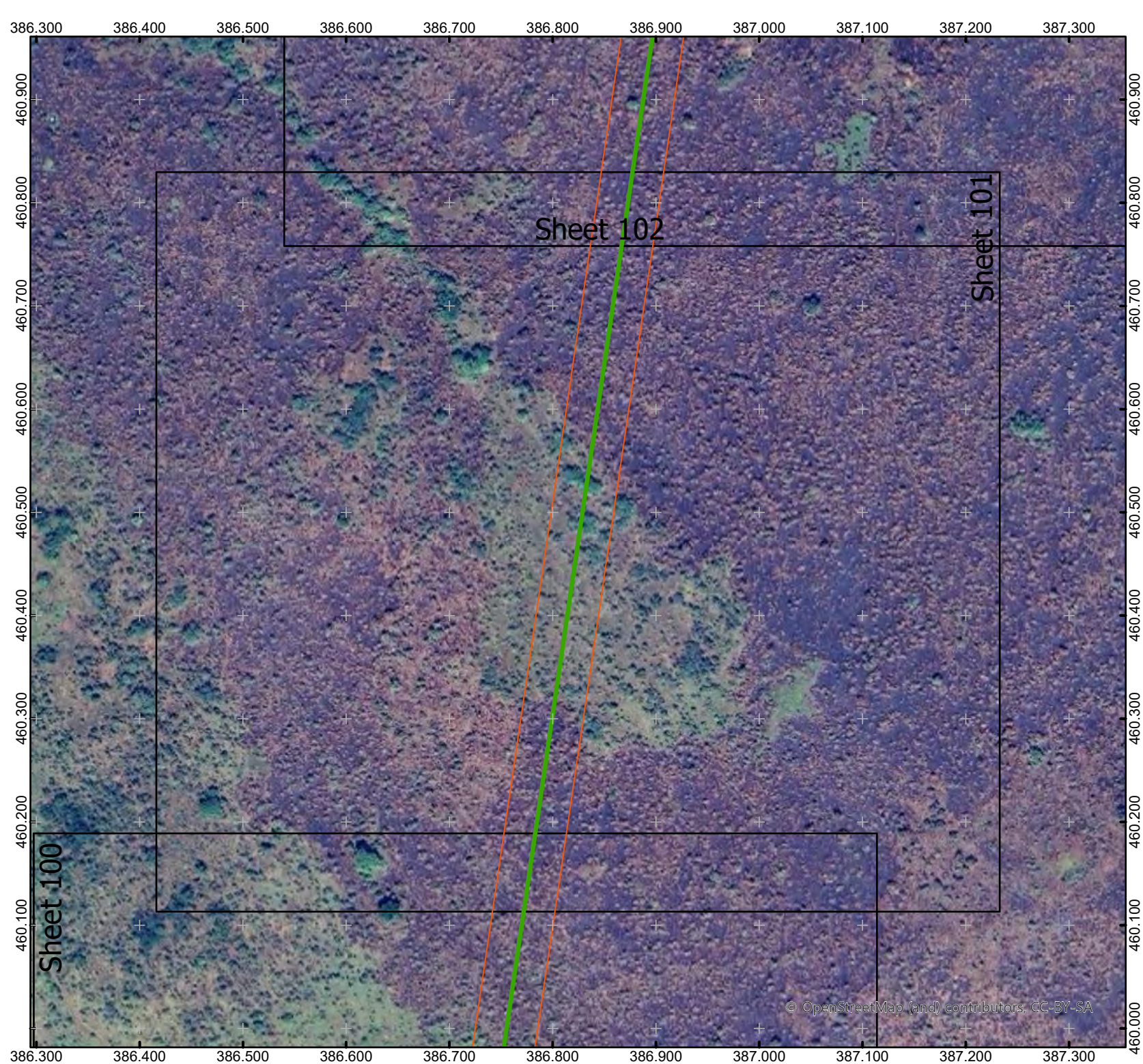
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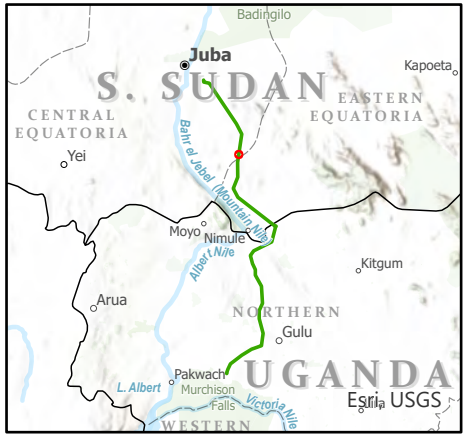
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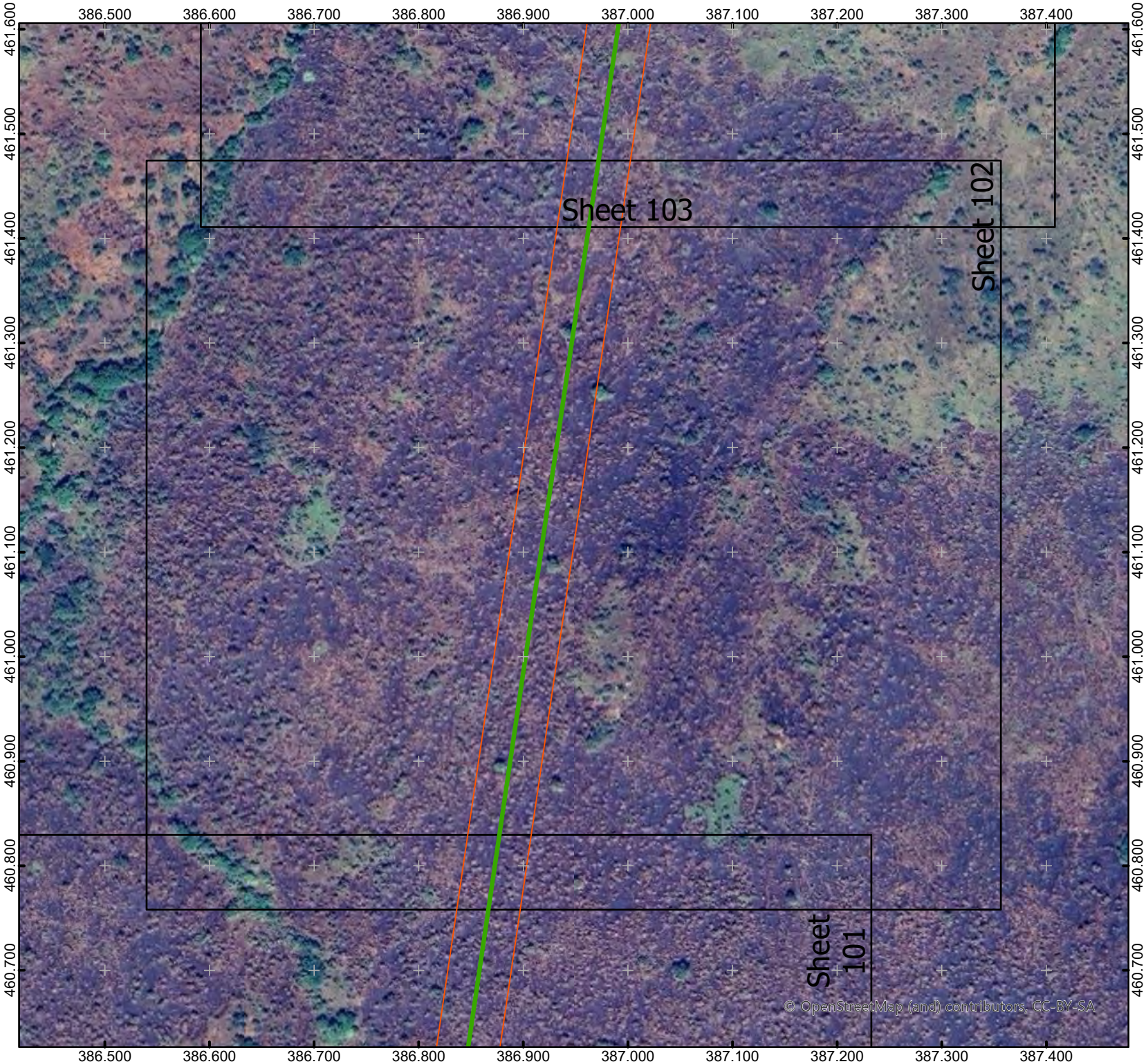
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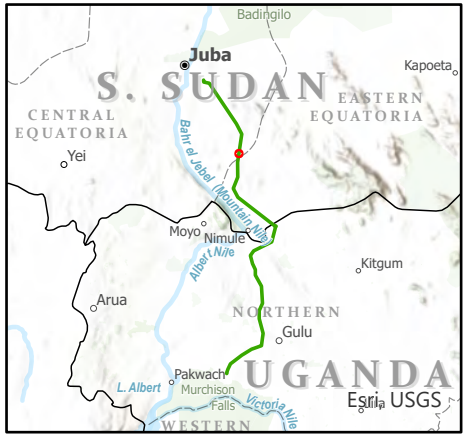
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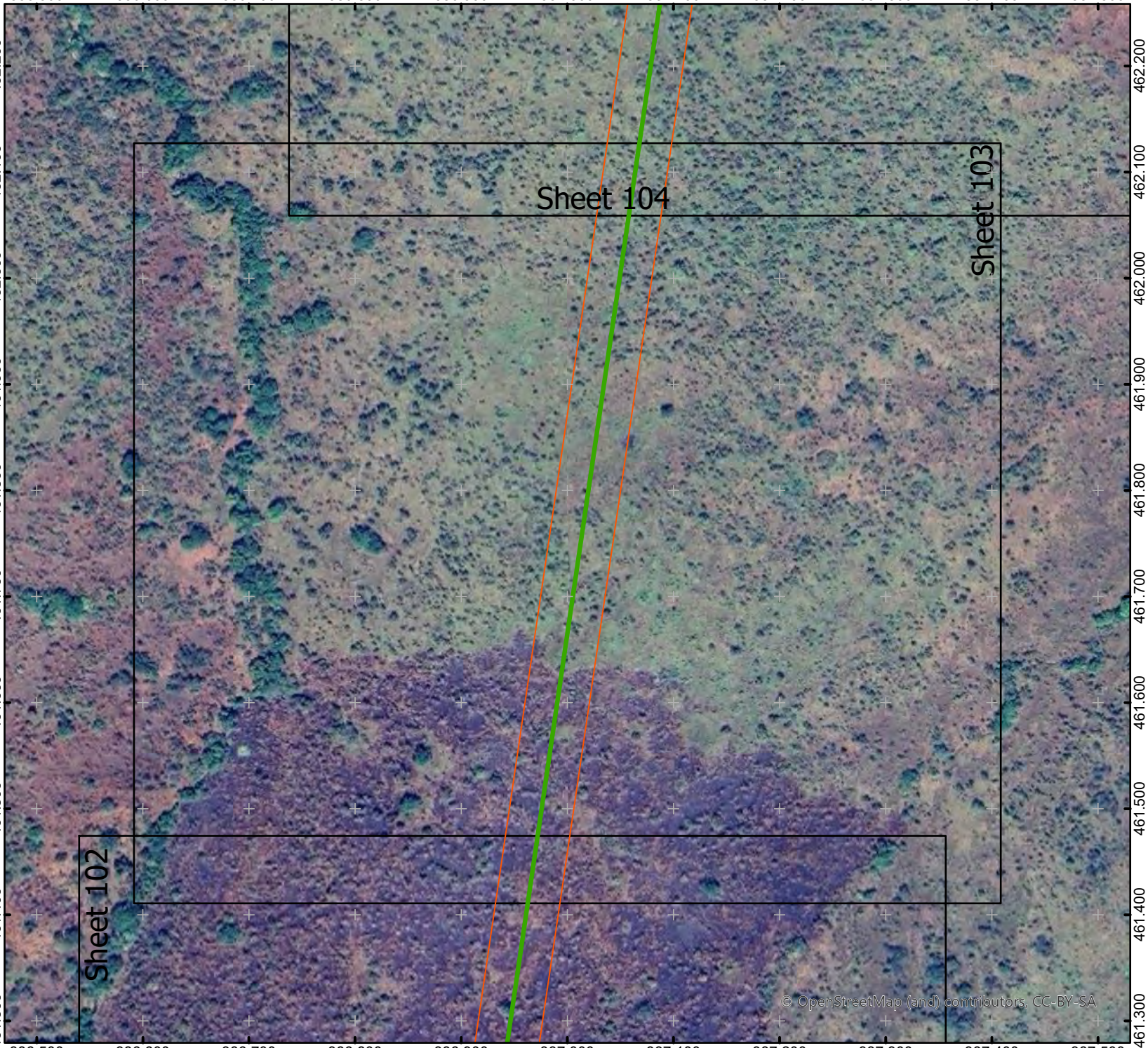
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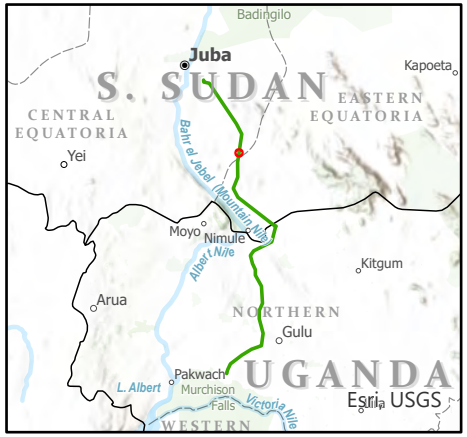
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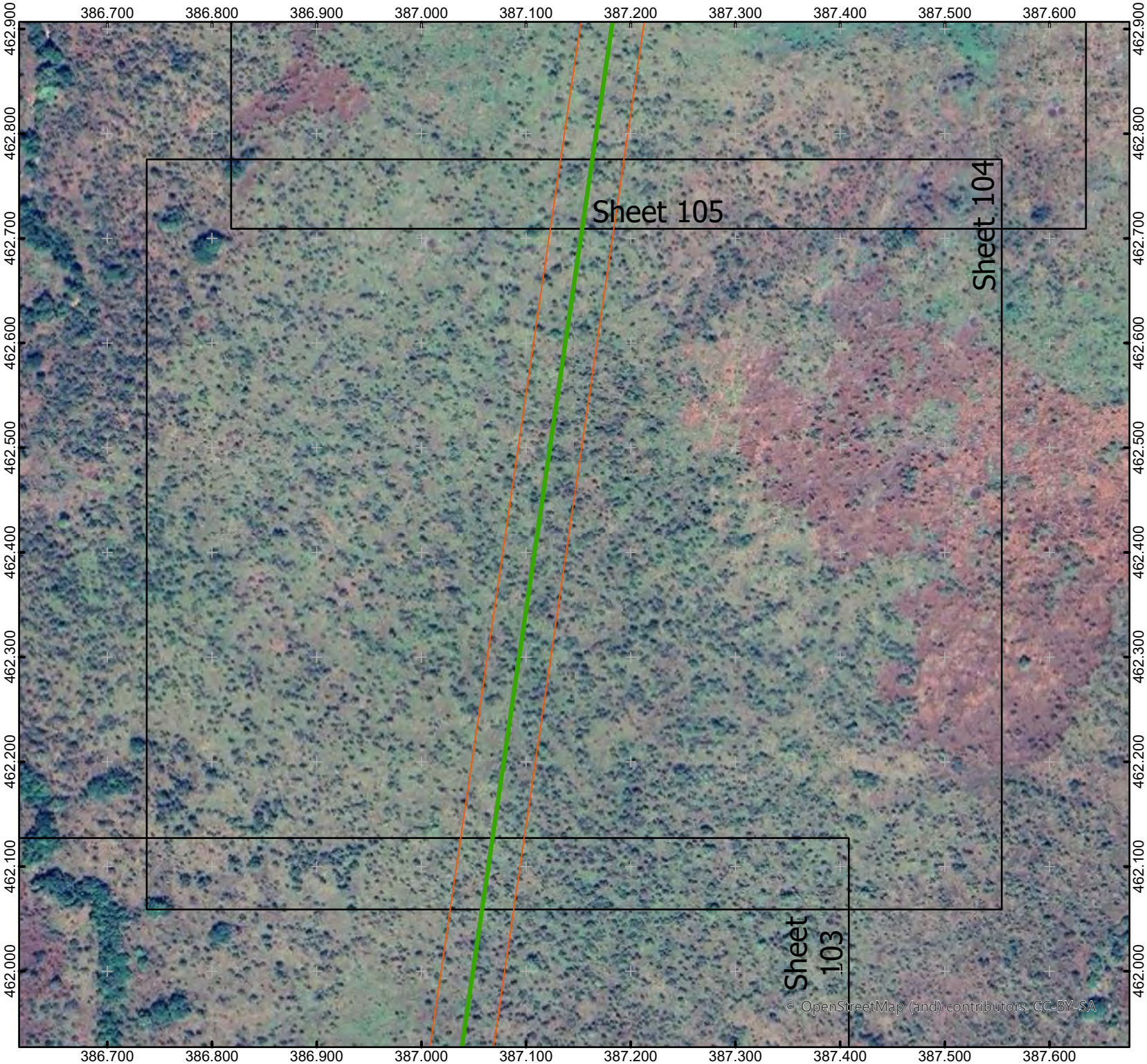
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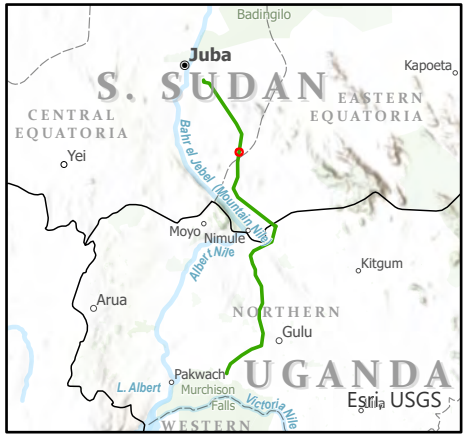
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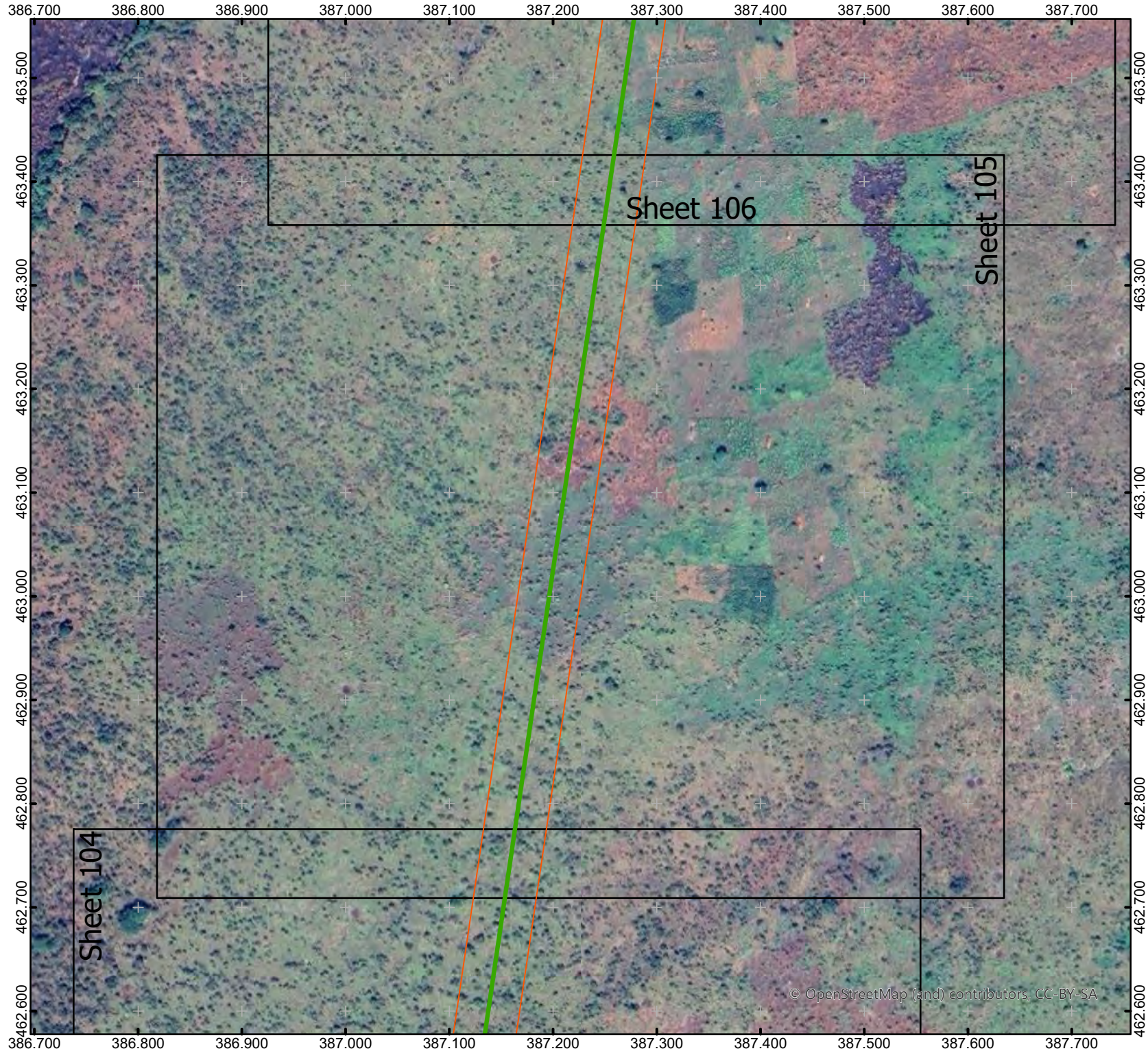
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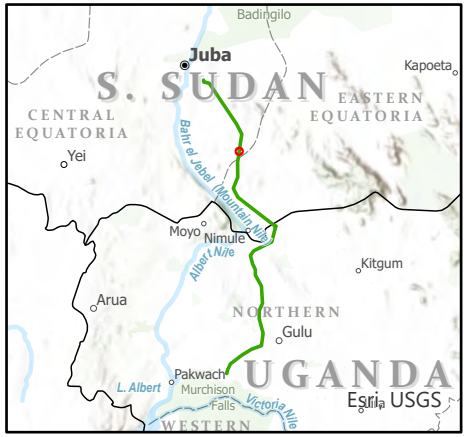
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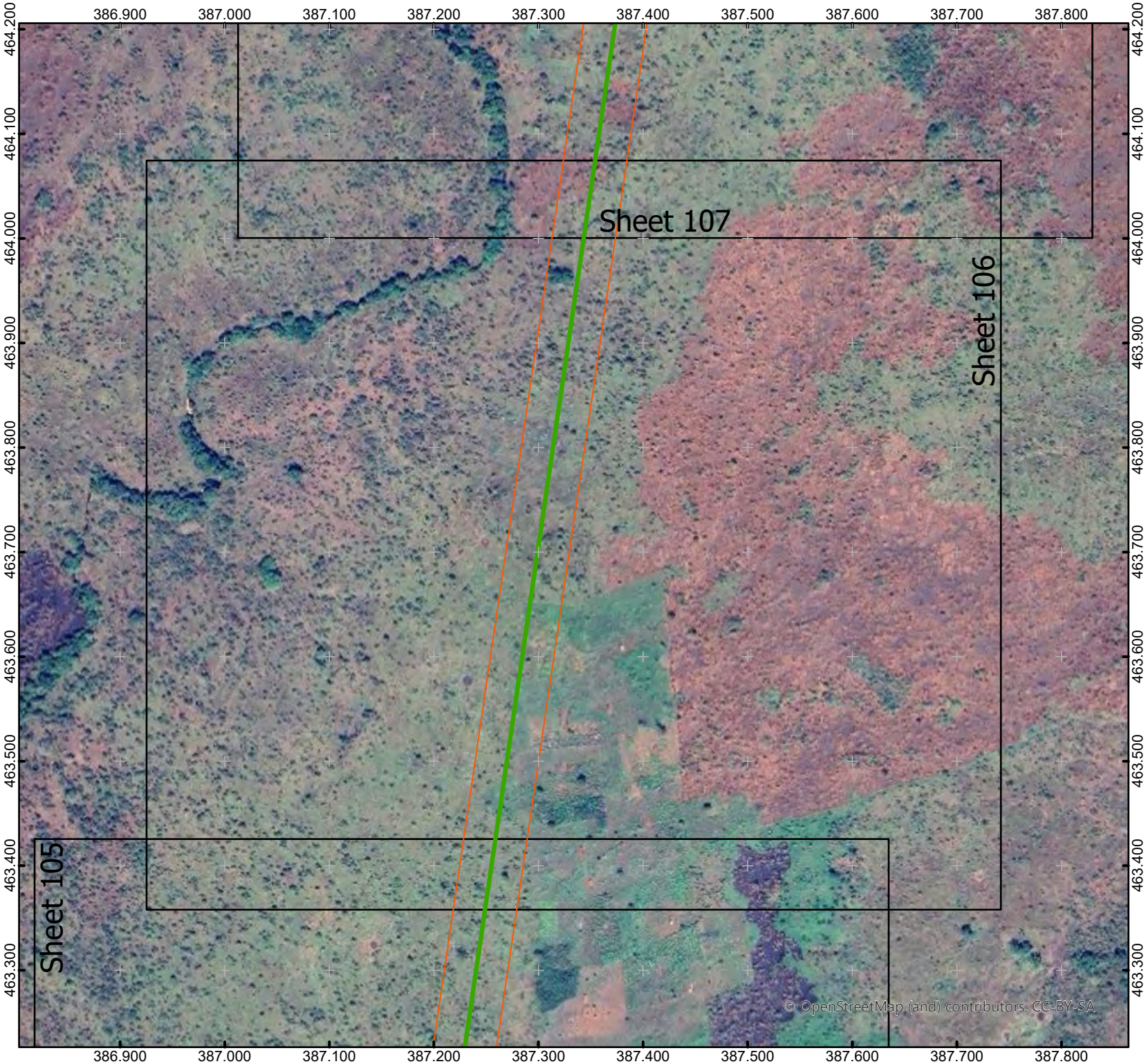
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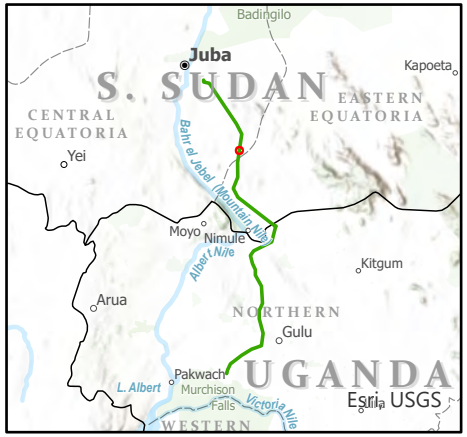
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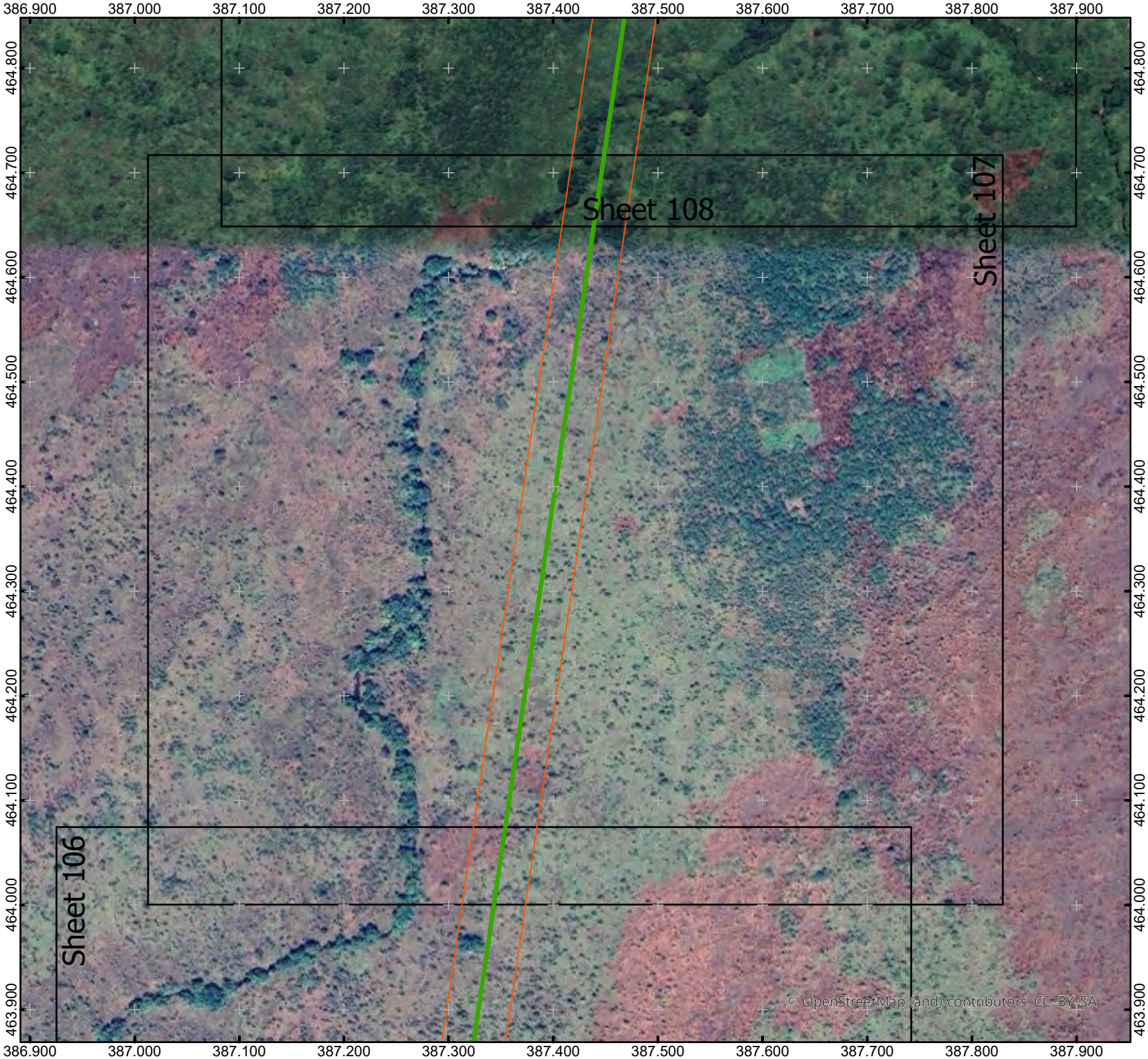
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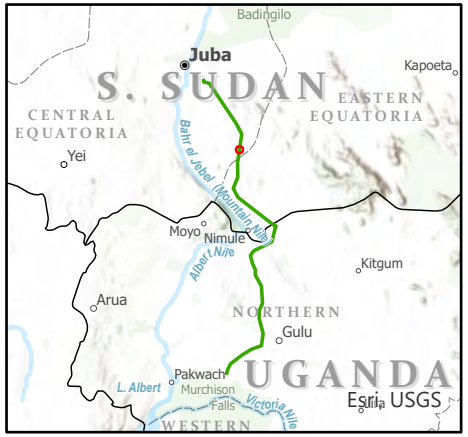
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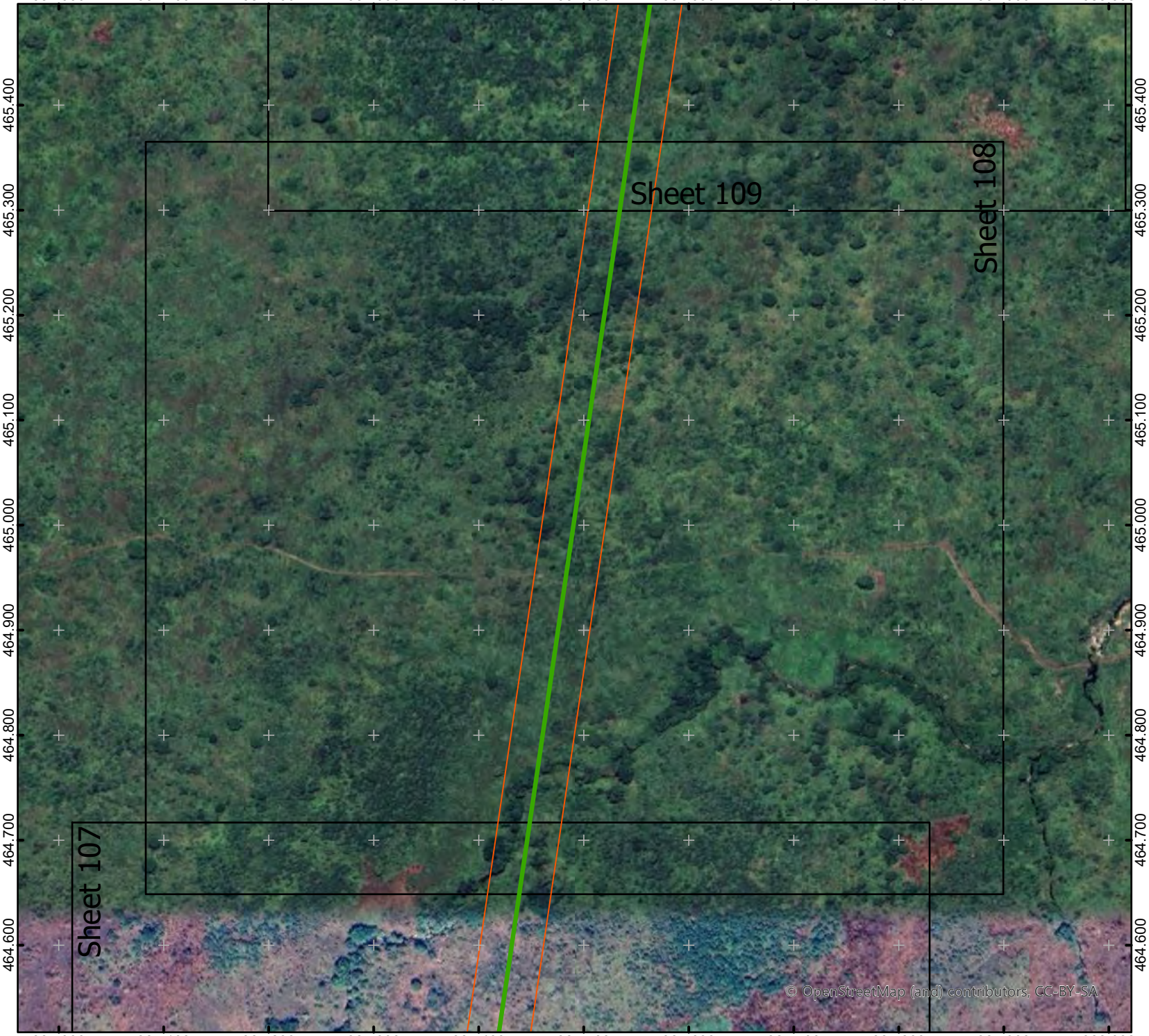
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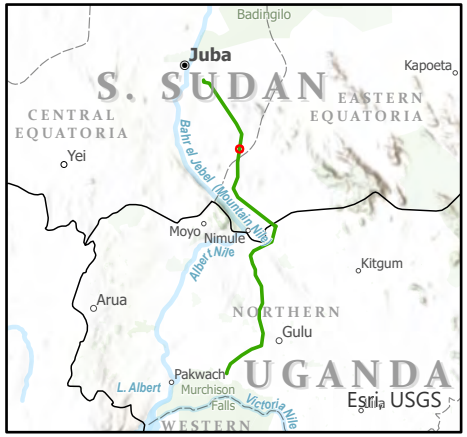
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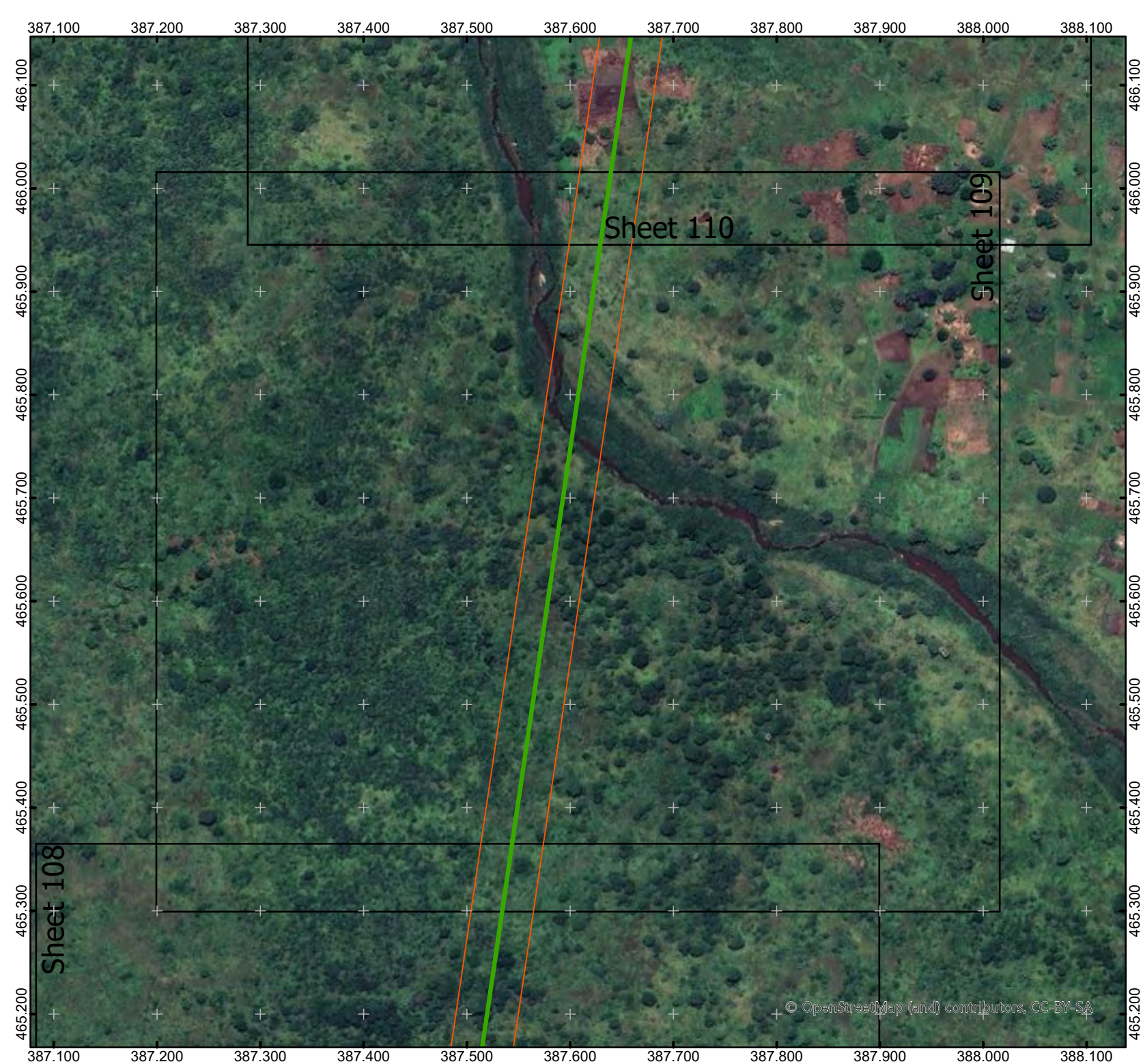
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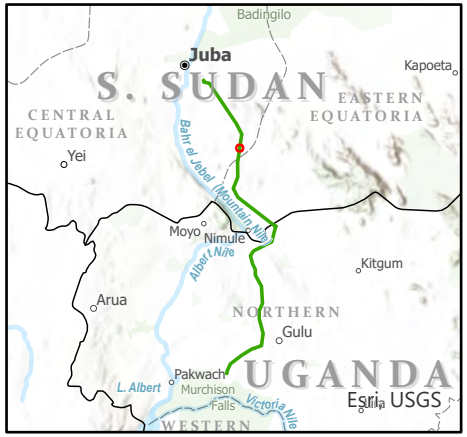
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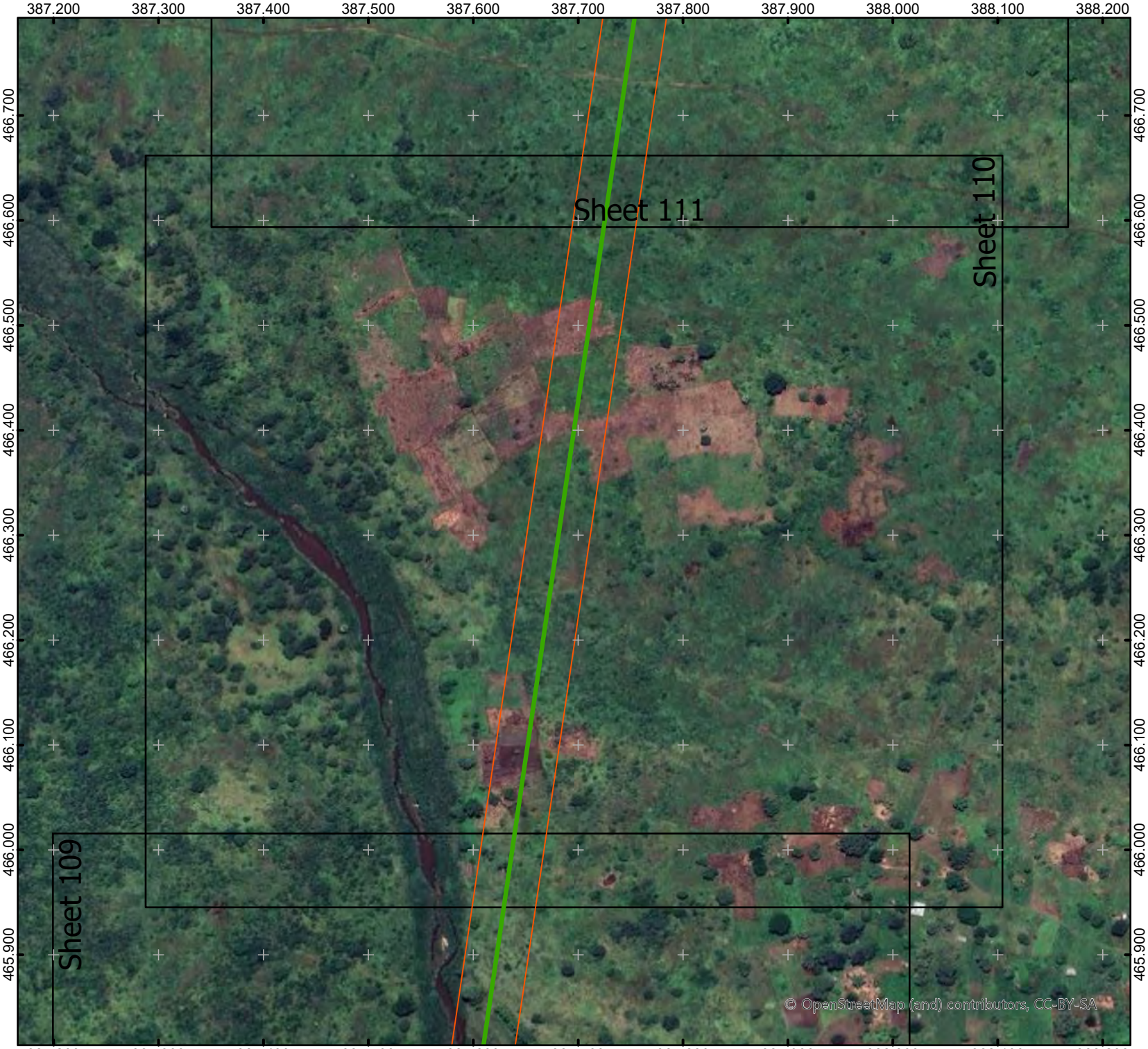
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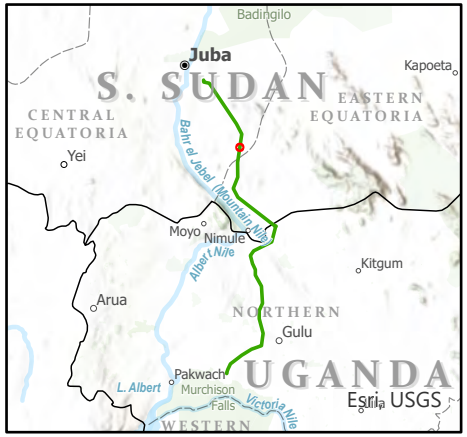
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

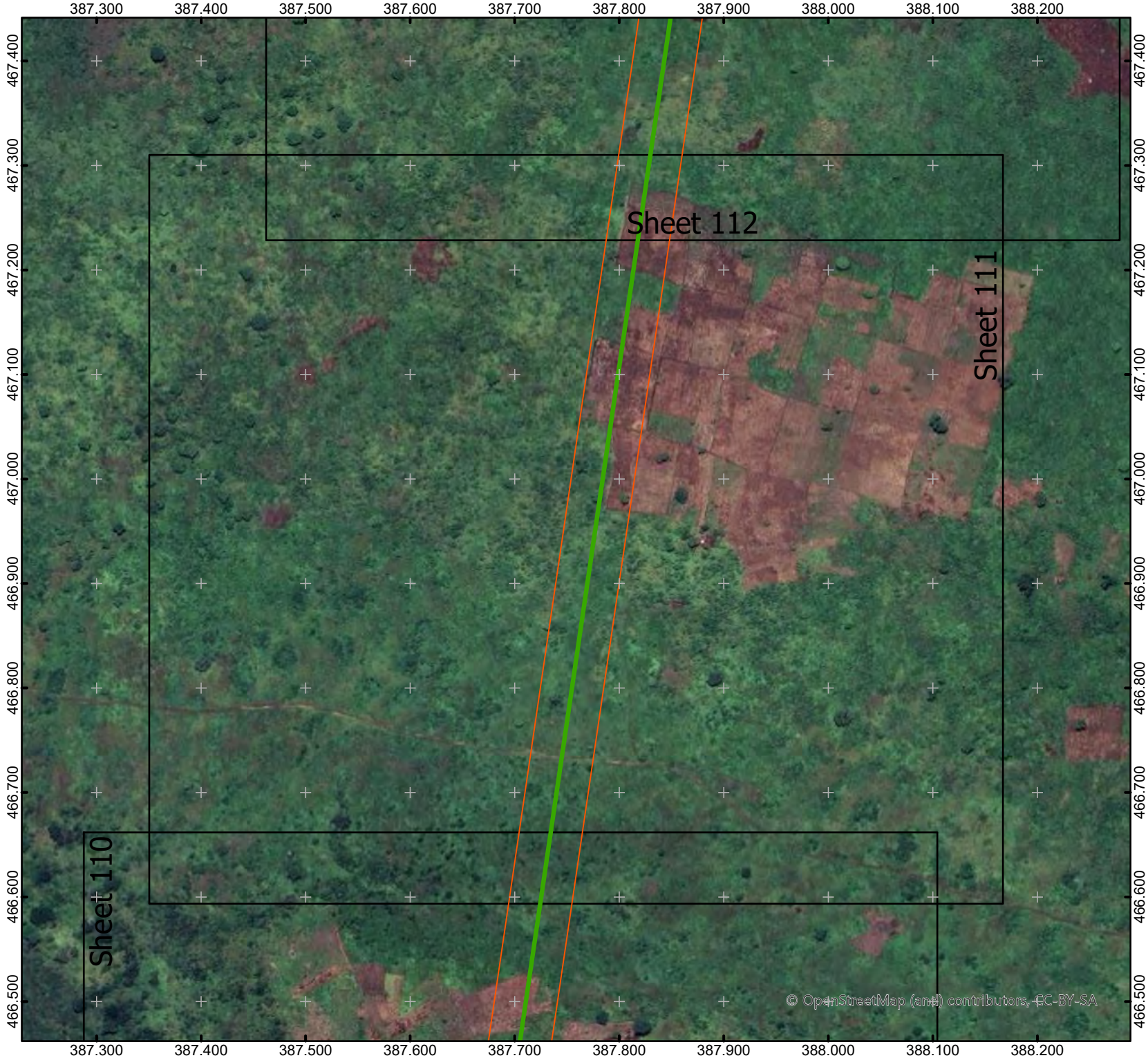
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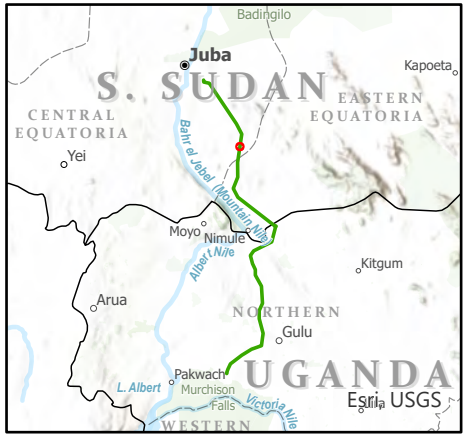
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

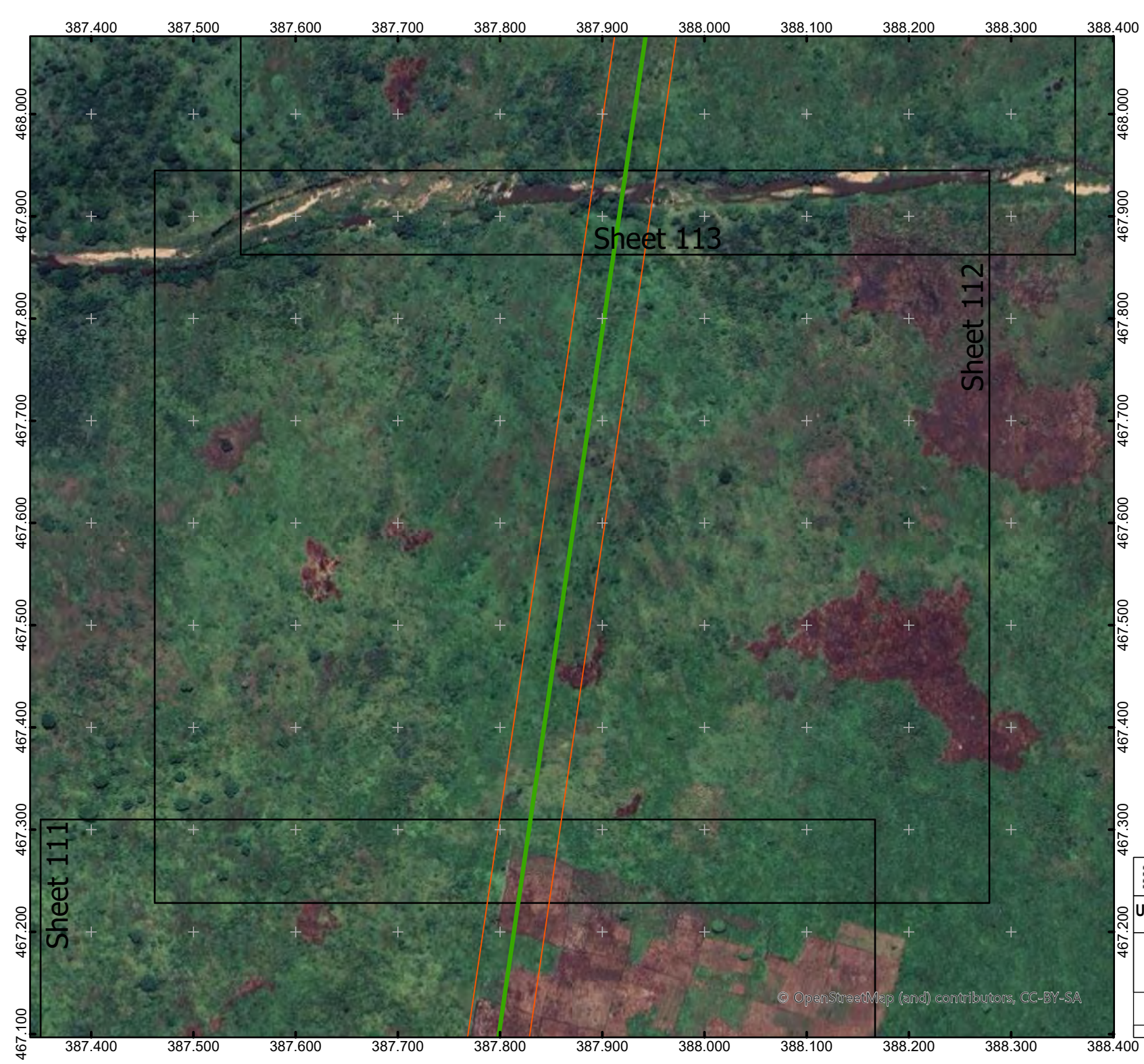
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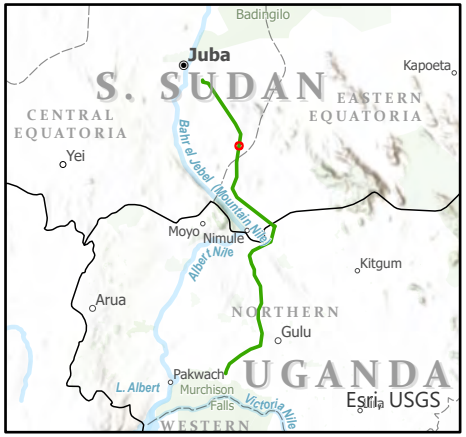
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Proposed transmission line (Uganda section)
- Direct Area of Influence

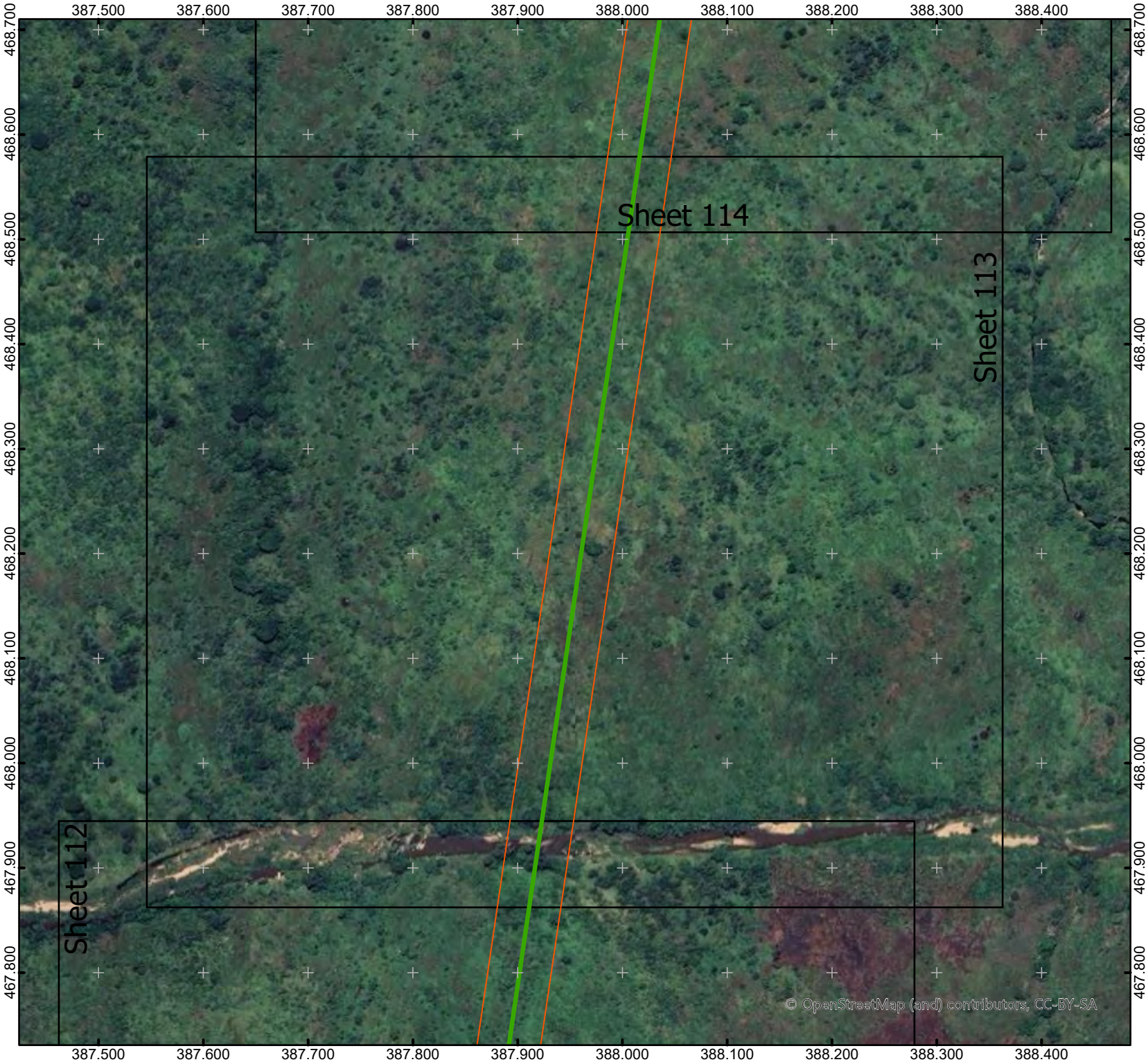
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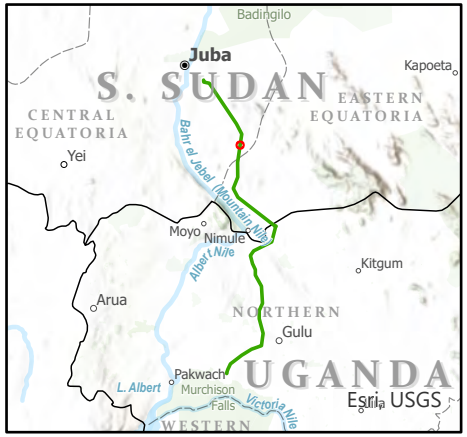
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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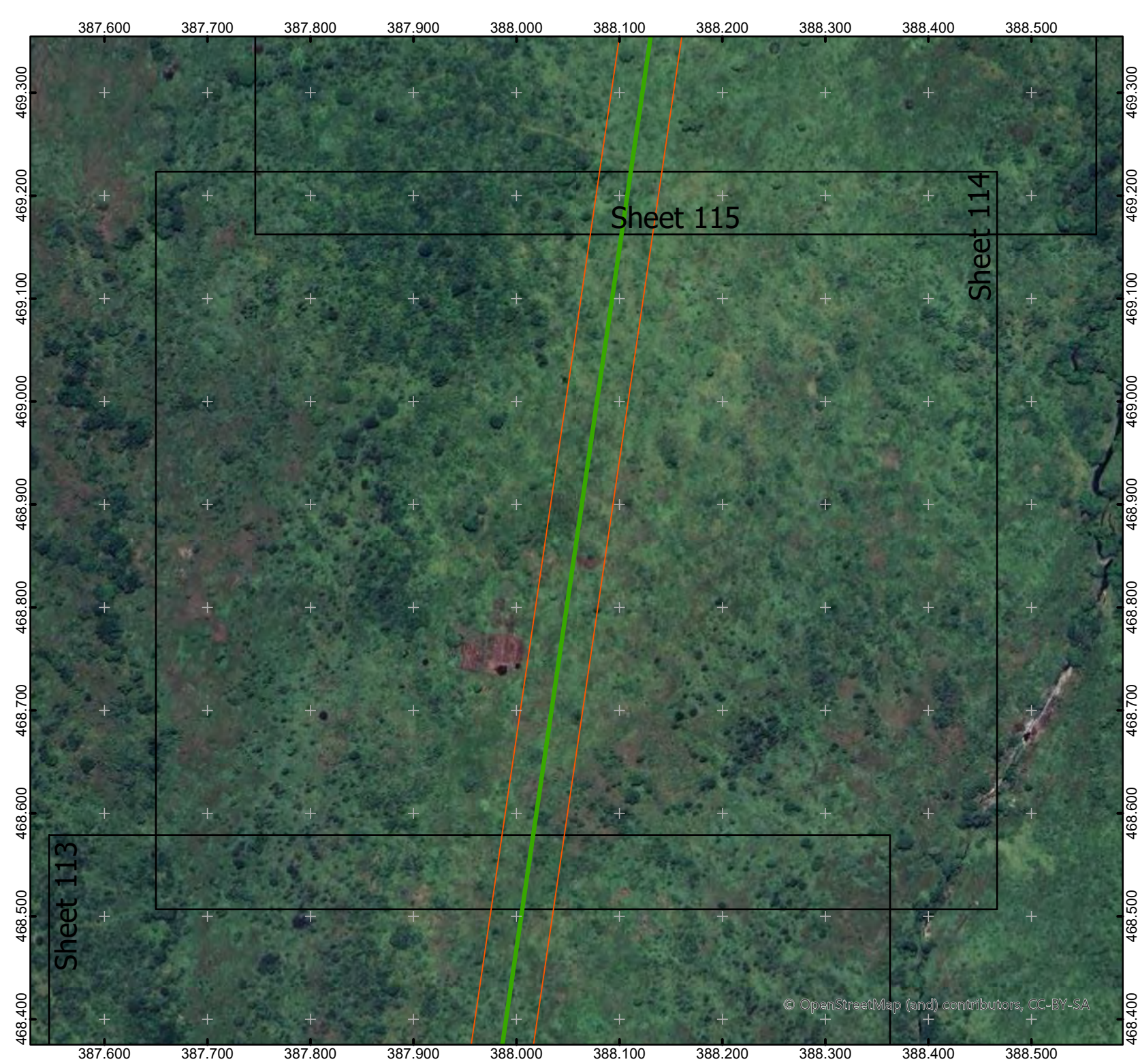
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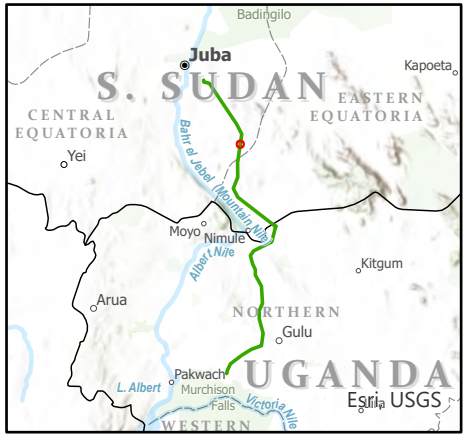
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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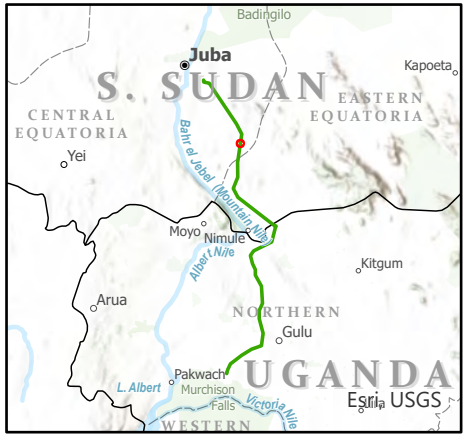
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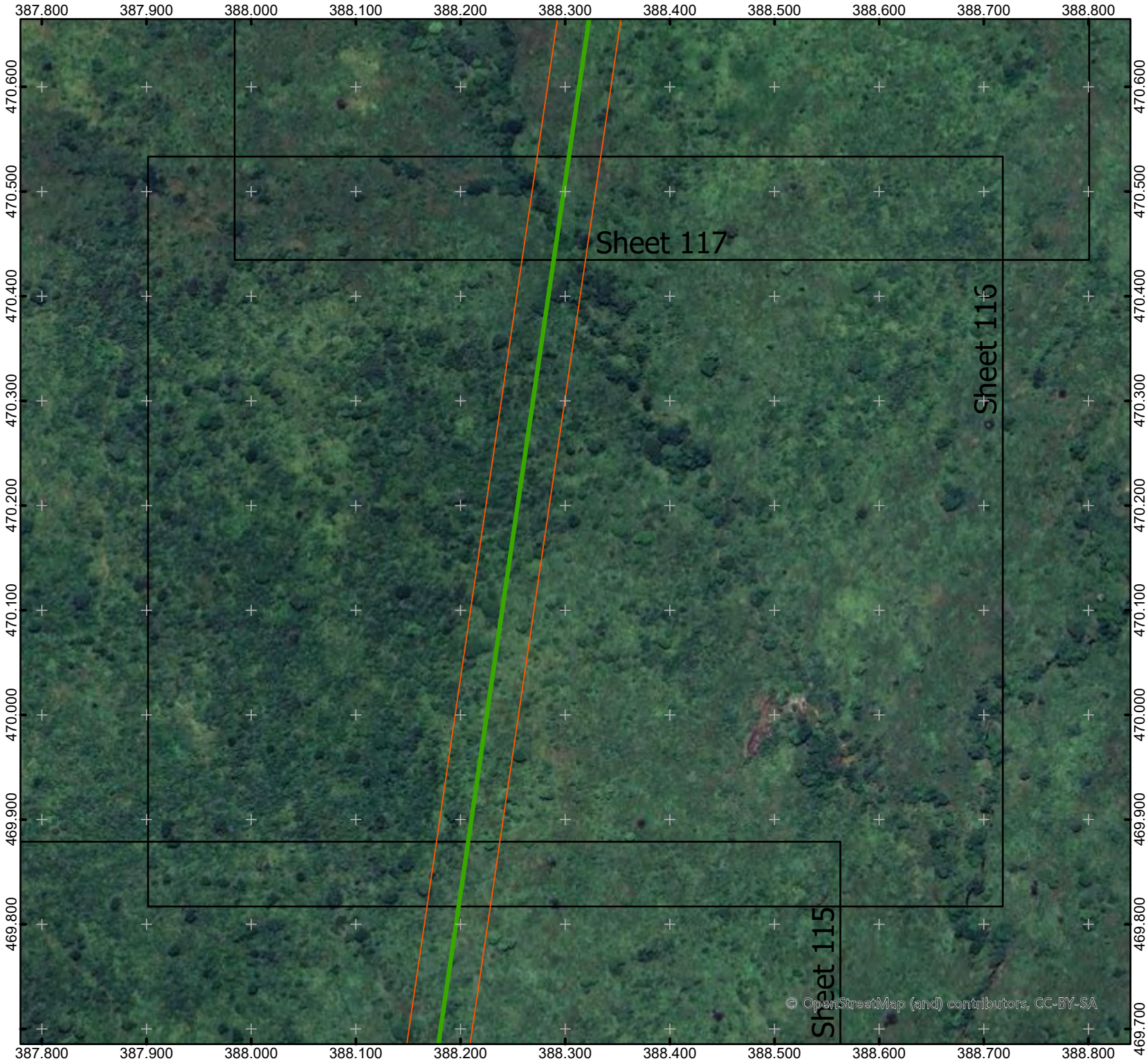
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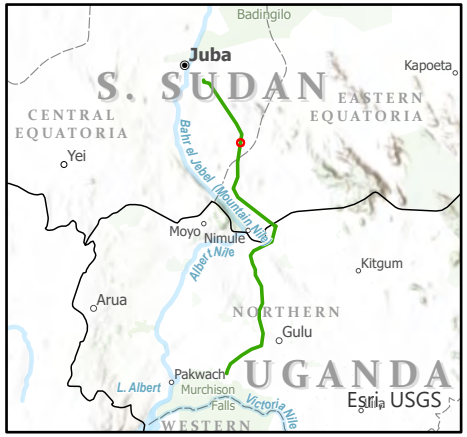
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

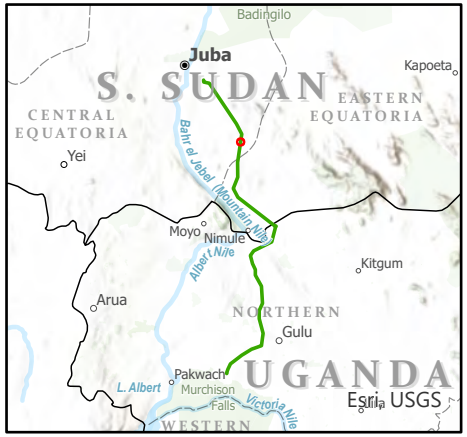
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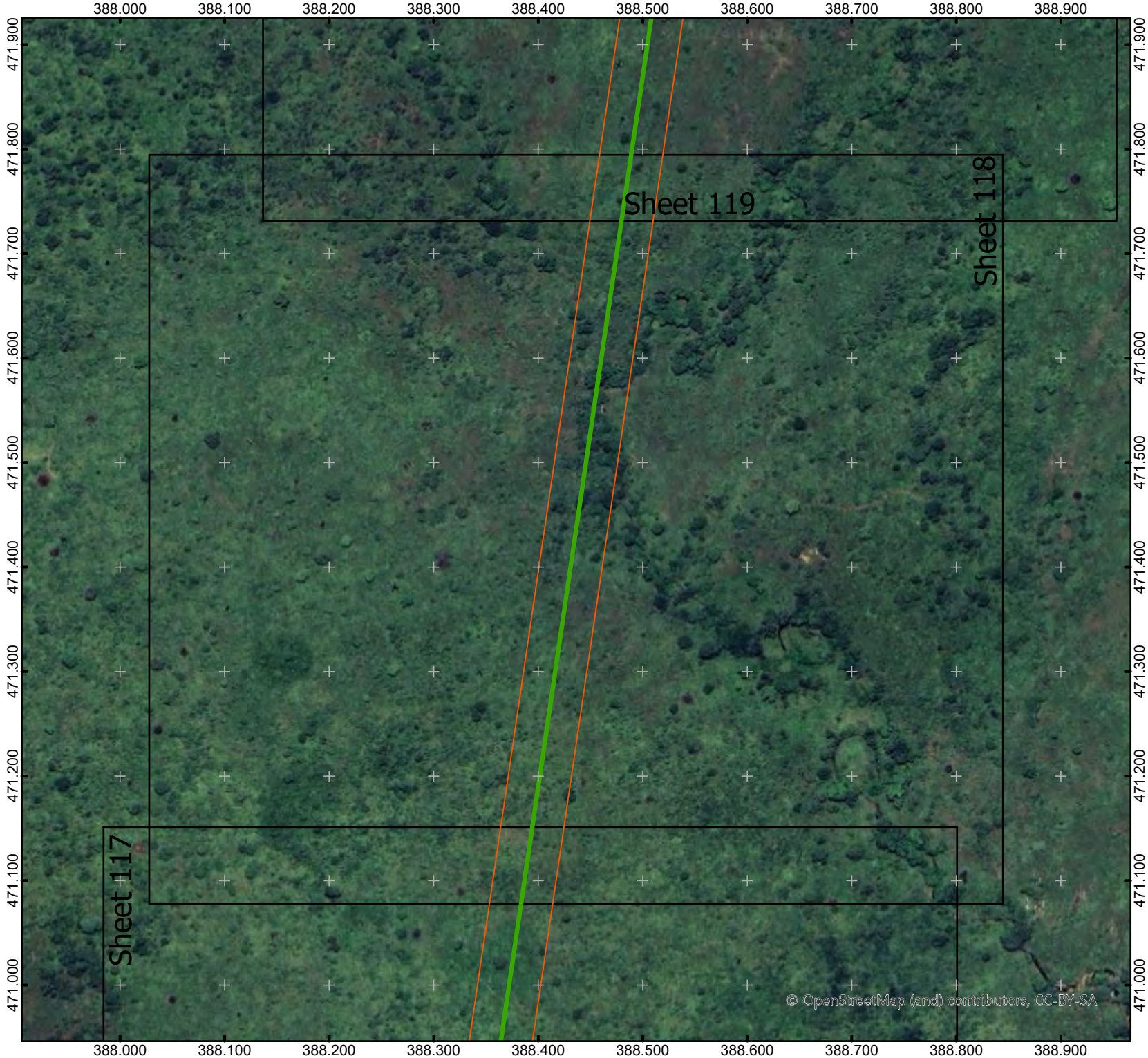
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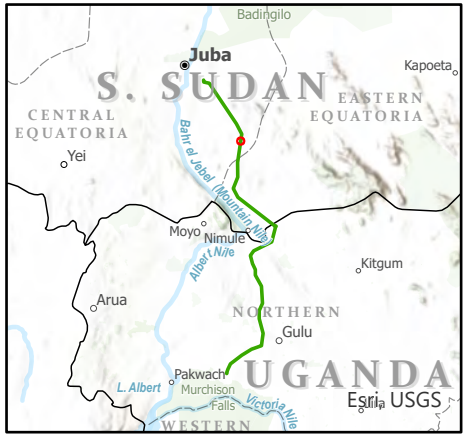
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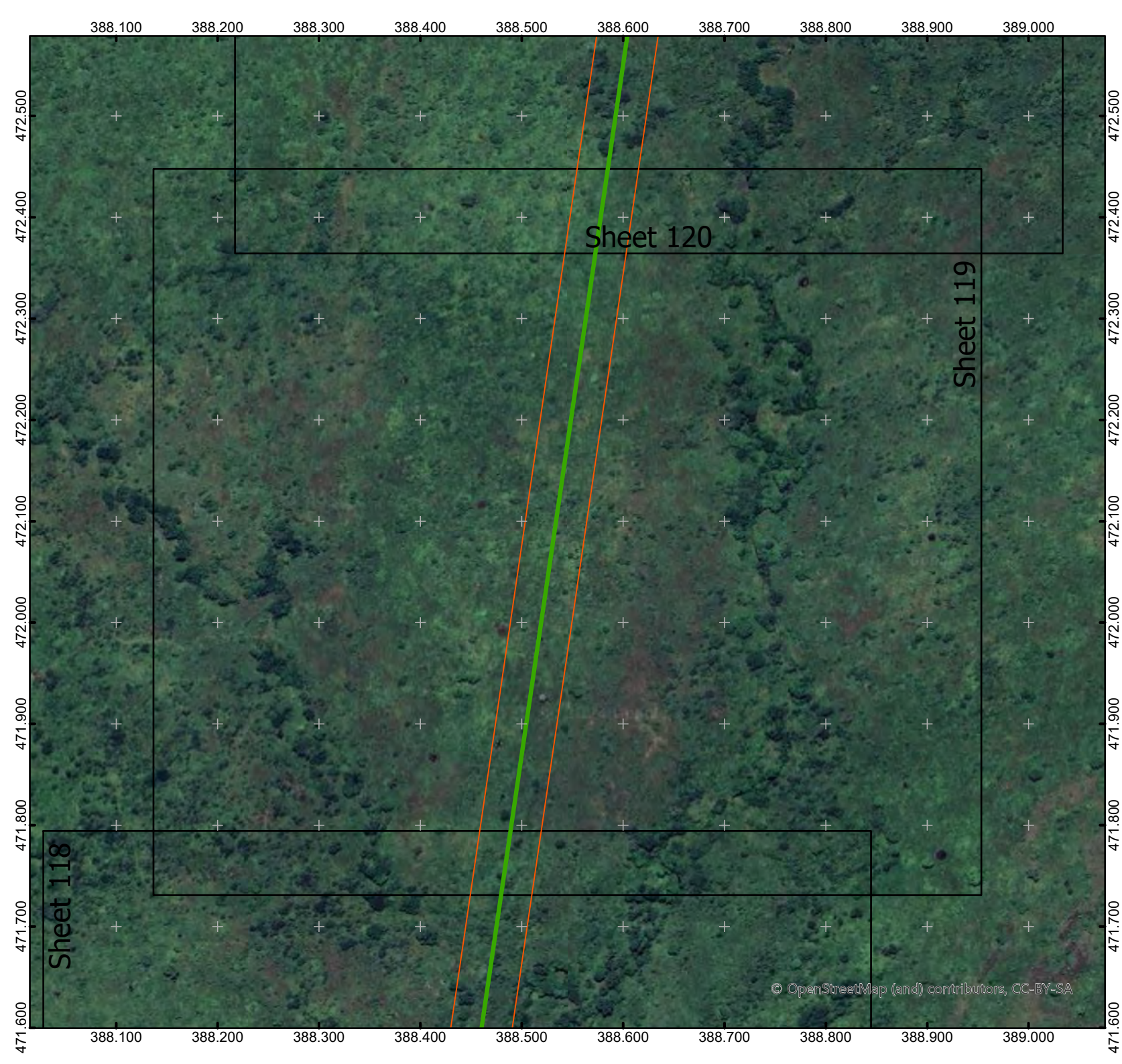
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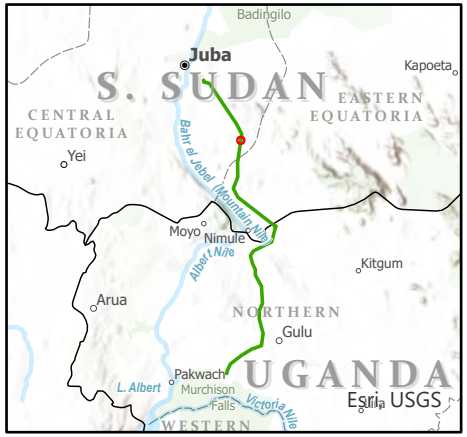
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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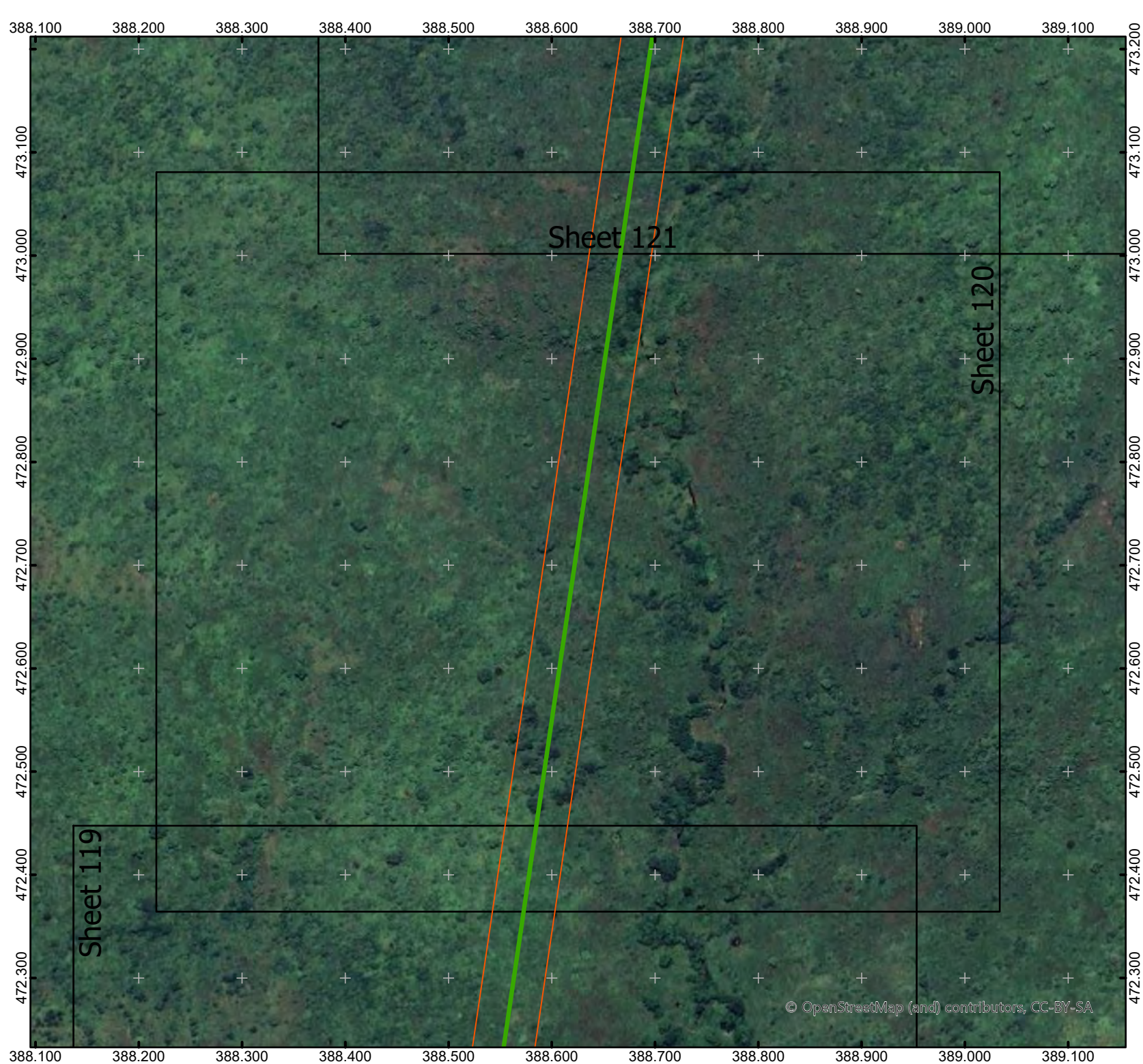
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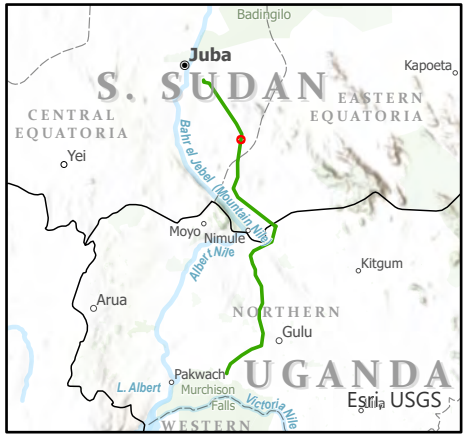
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Map sources: Google Earth

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Proposed transmission line (Satellite map)
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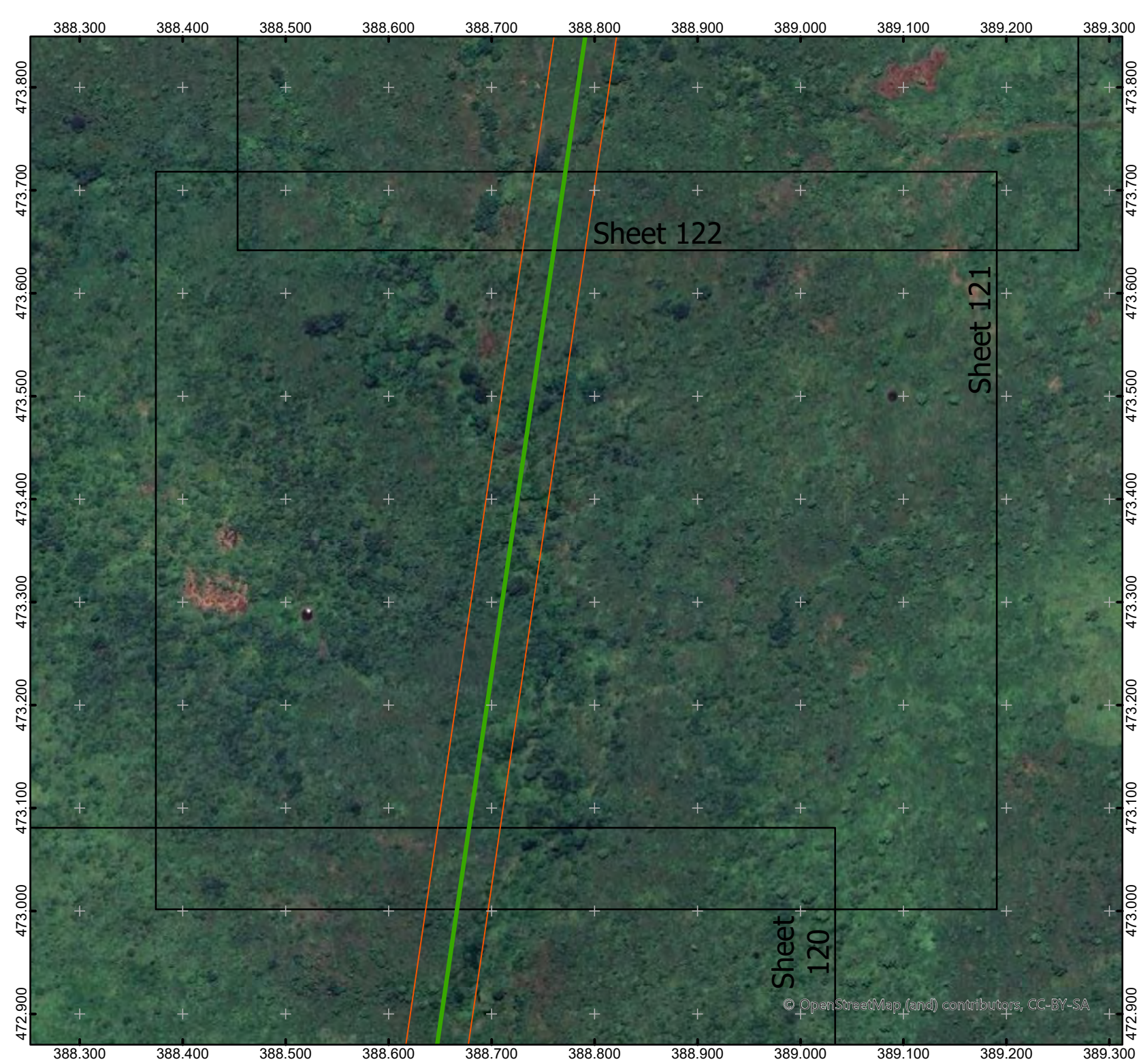
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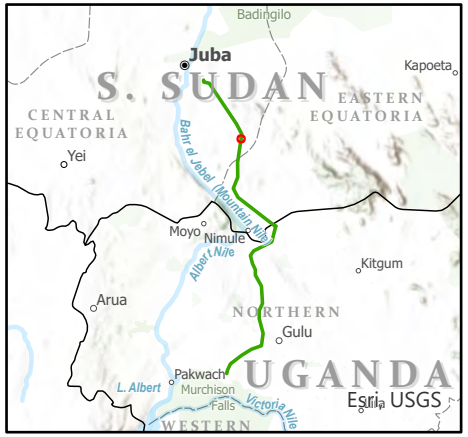
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Uganda-South Sudan 400 kV Interconnection Line Project

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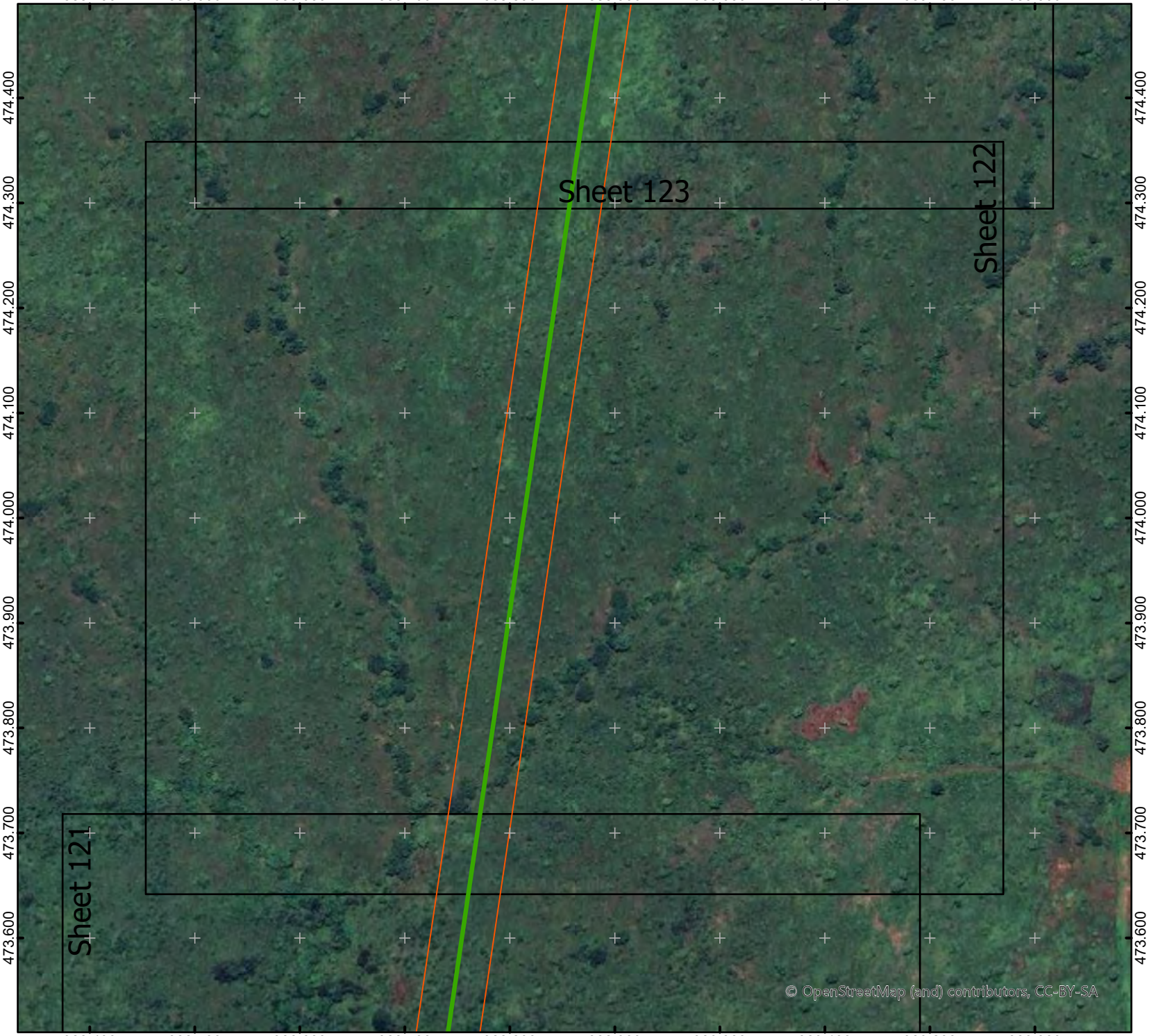
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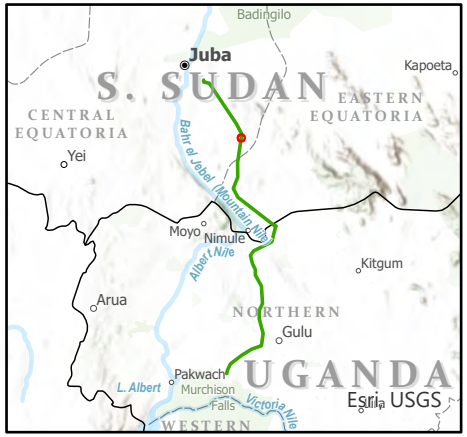
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Uganda-South Sudan 400 kV Interconnection Line Project

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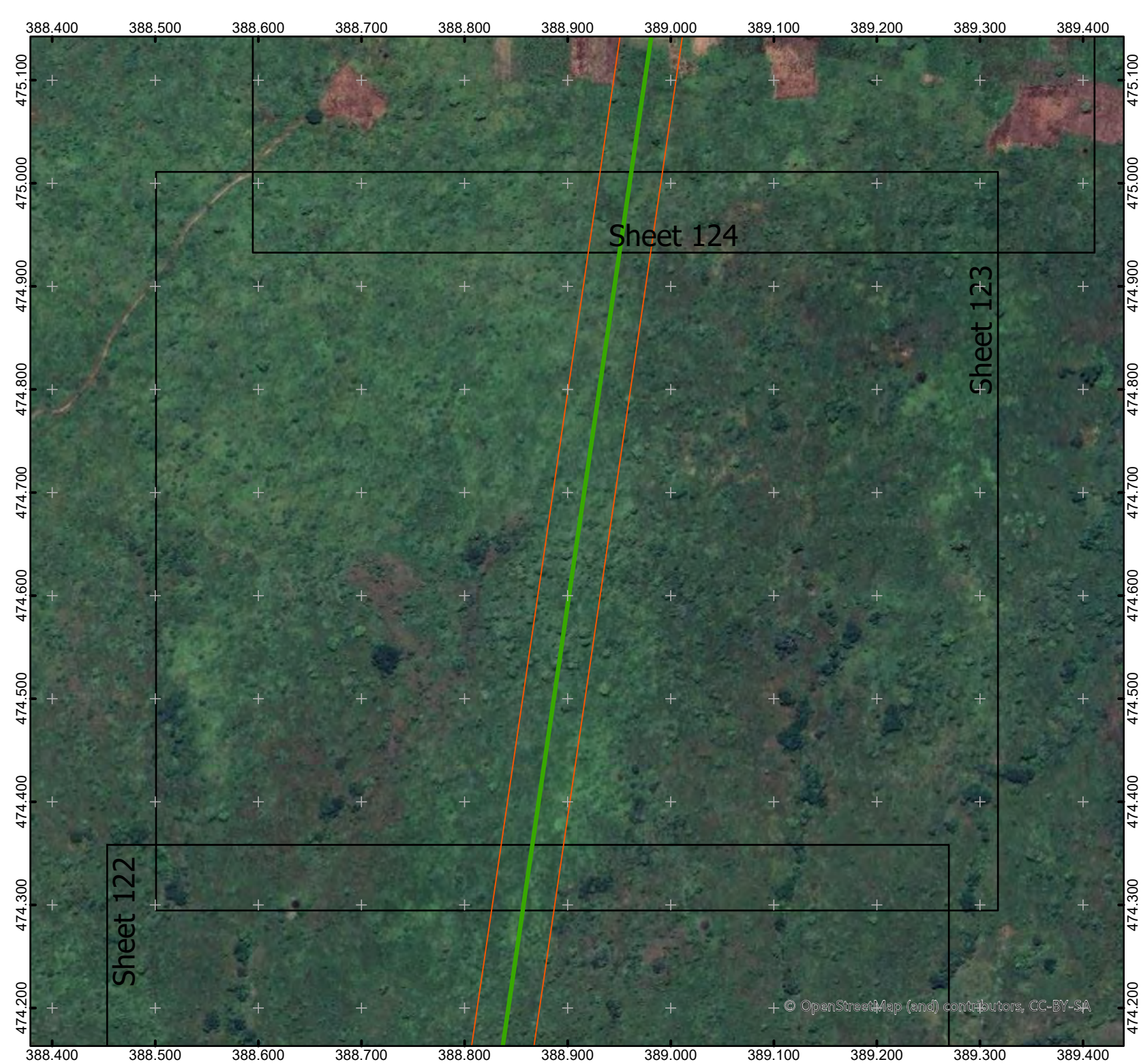
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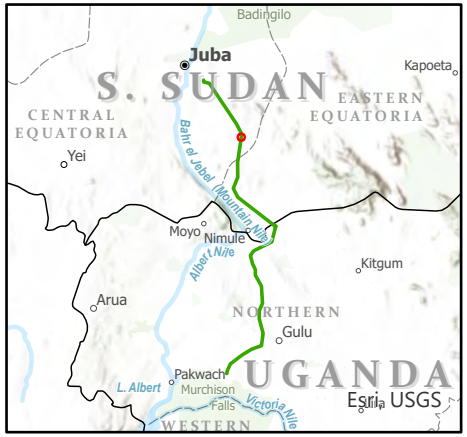
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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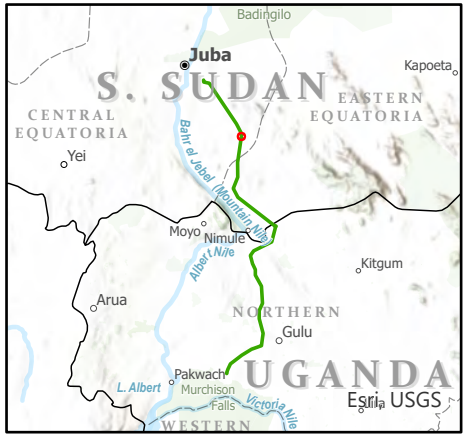
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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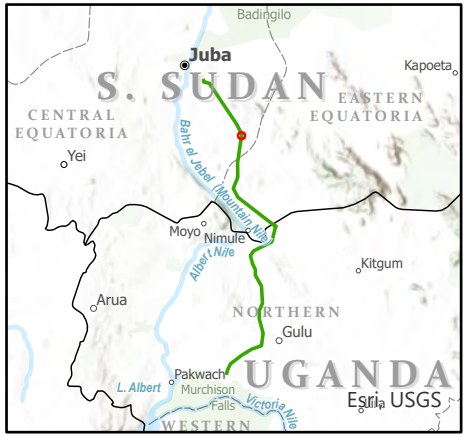
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Uganda-South Sudan 400 kV Interconnection Line Project

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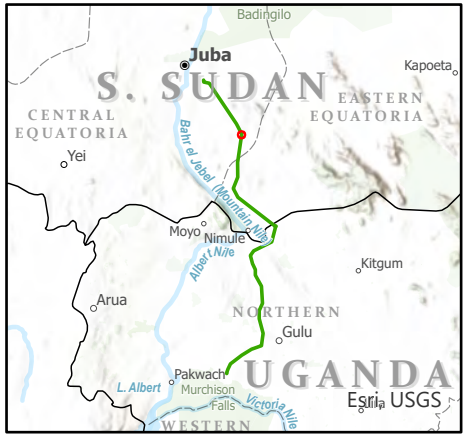
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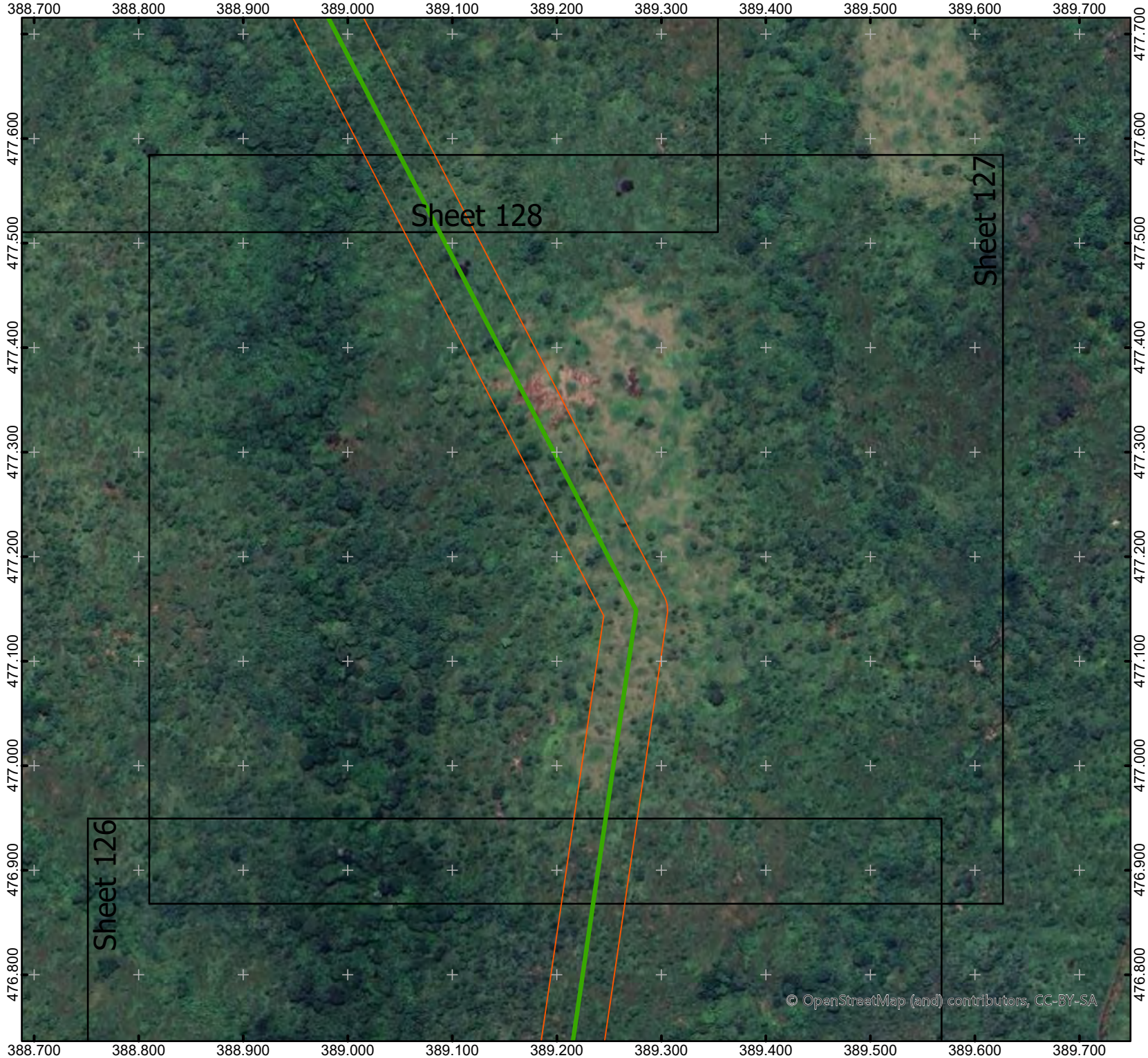
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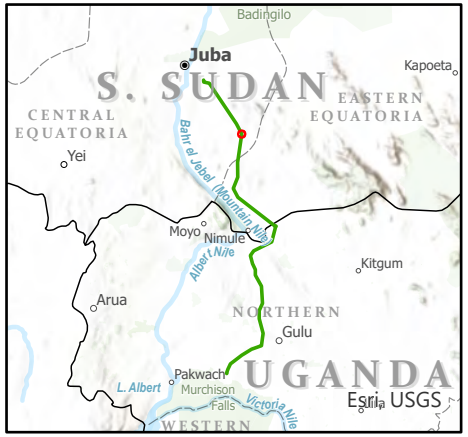
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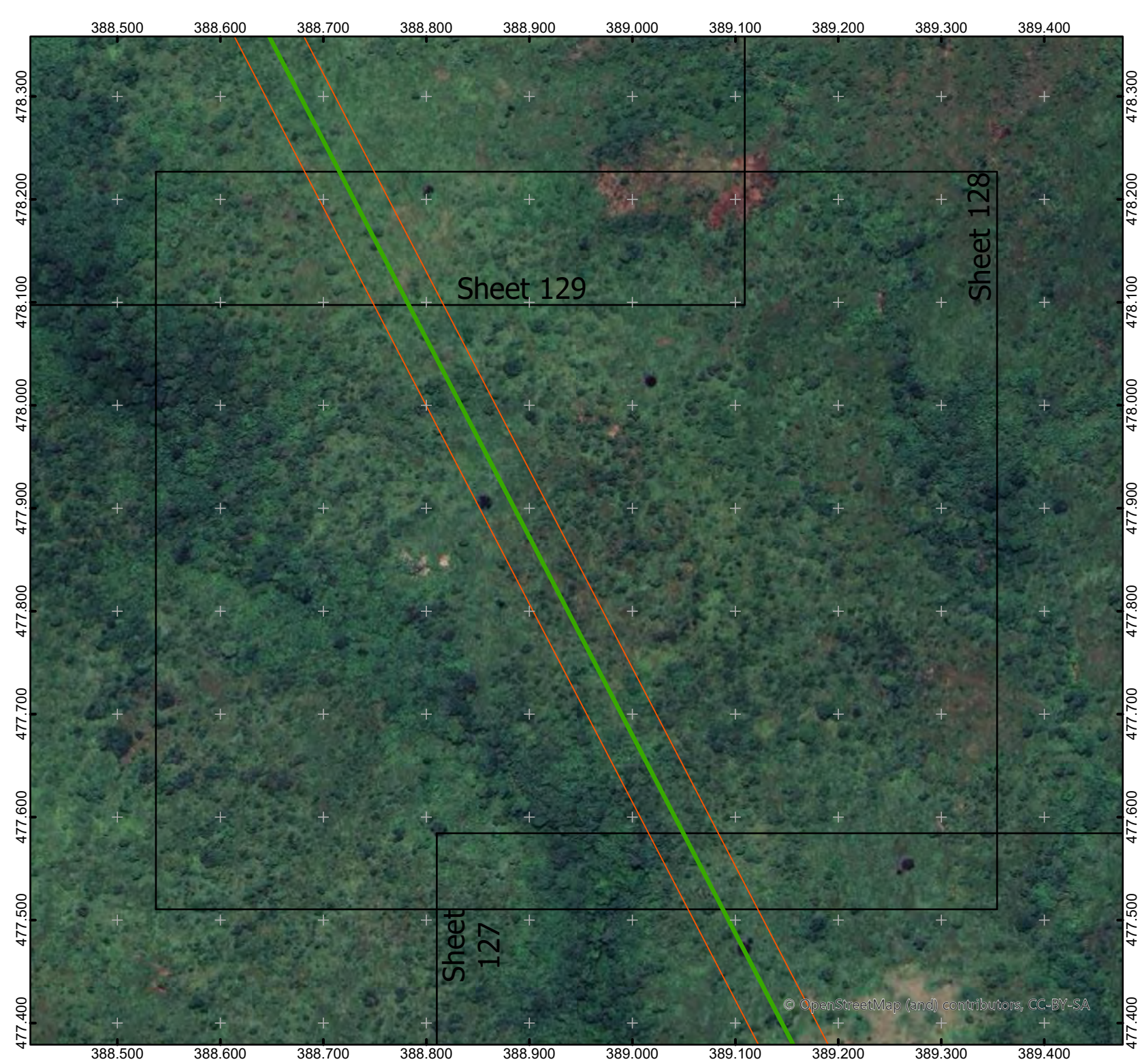
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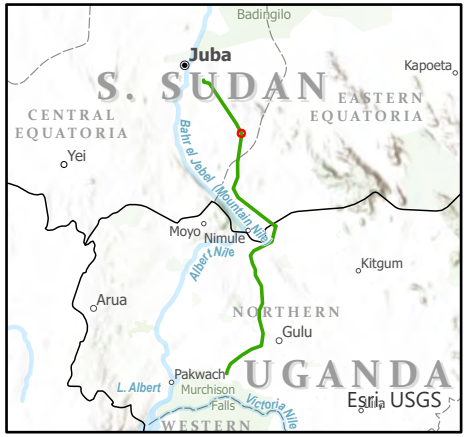
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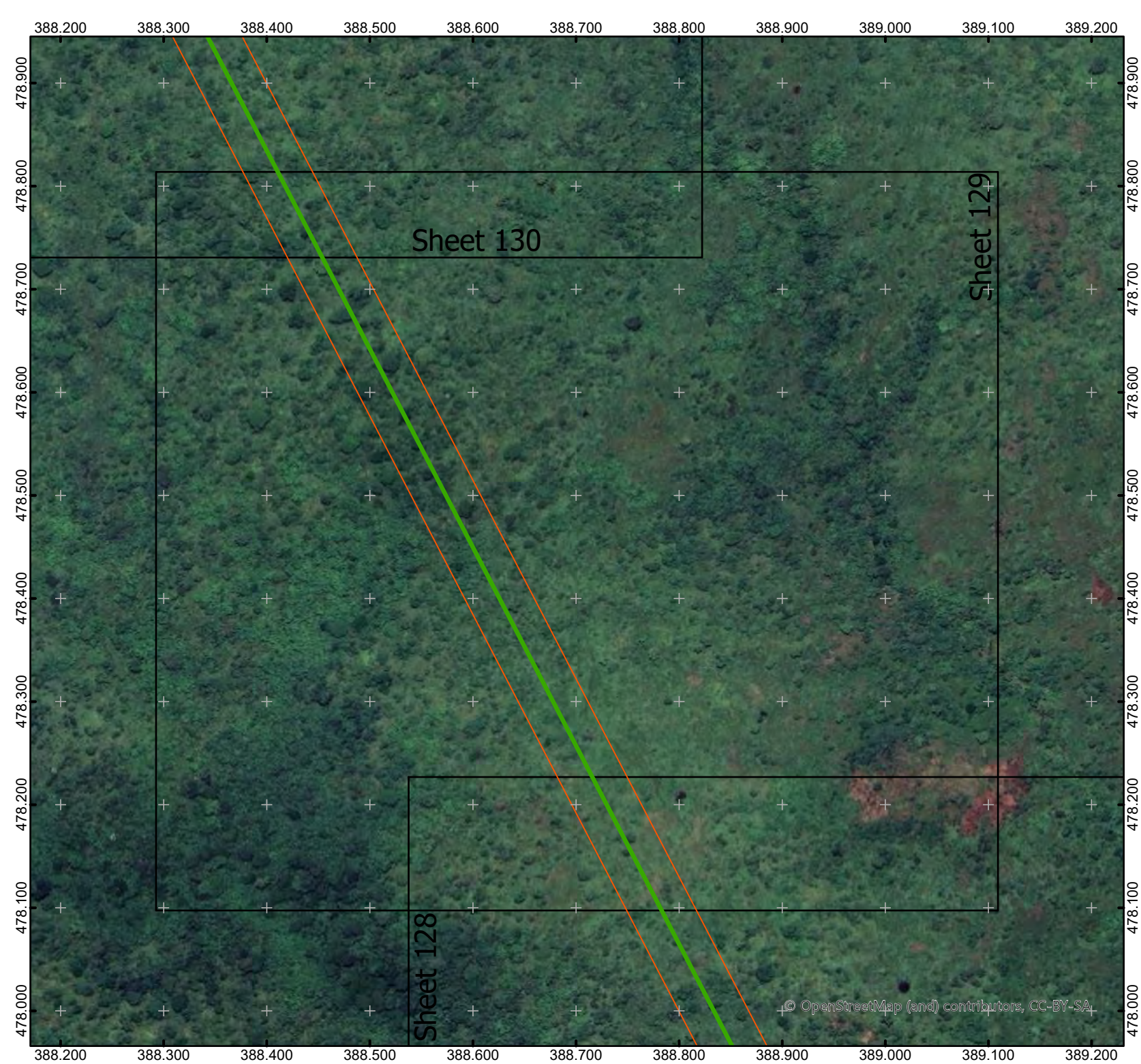
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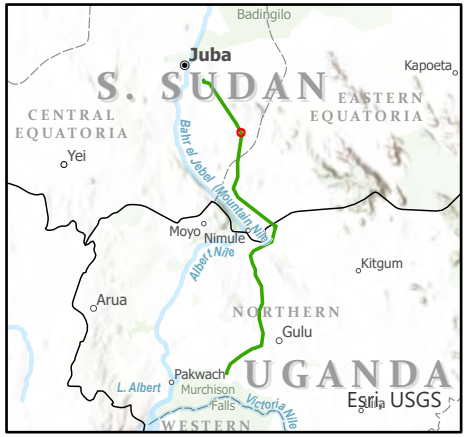
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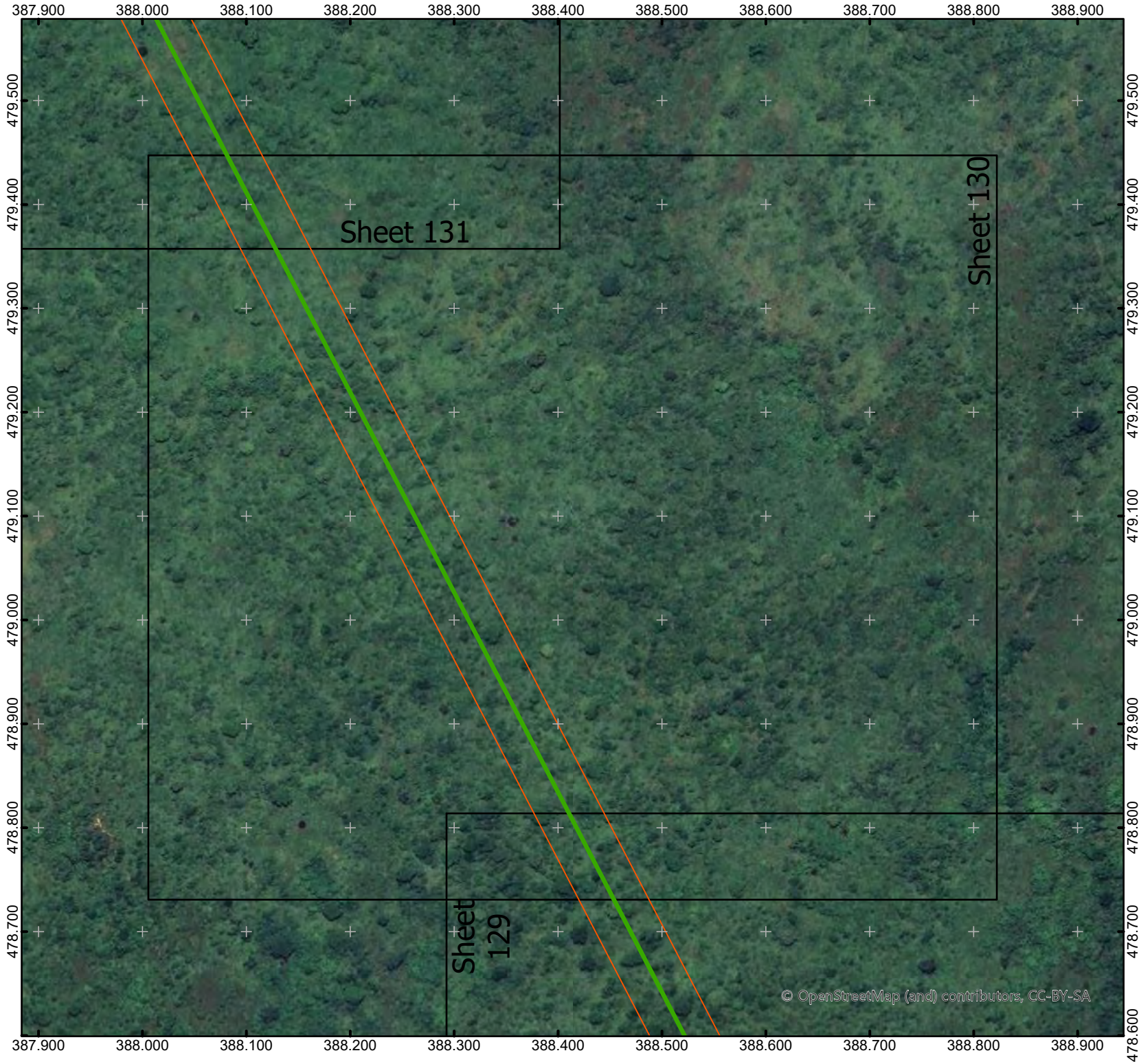
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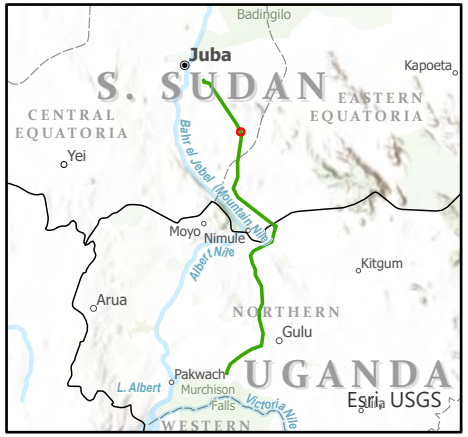
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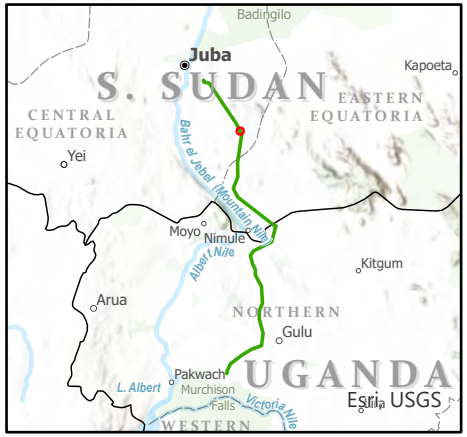
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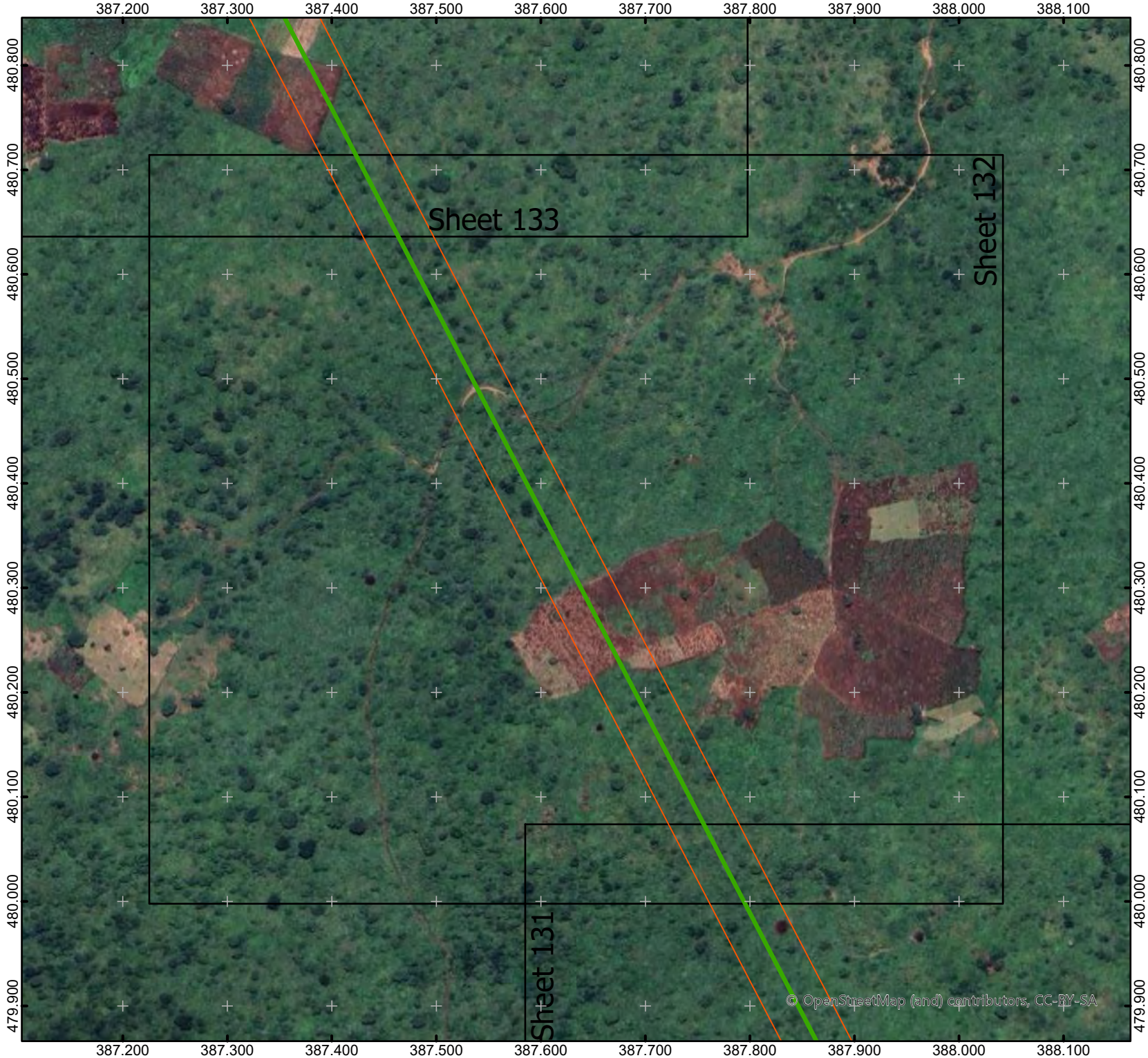
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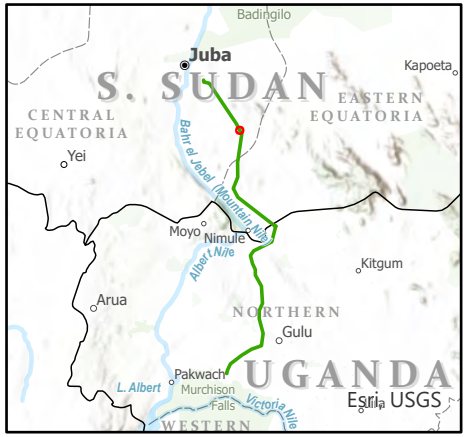
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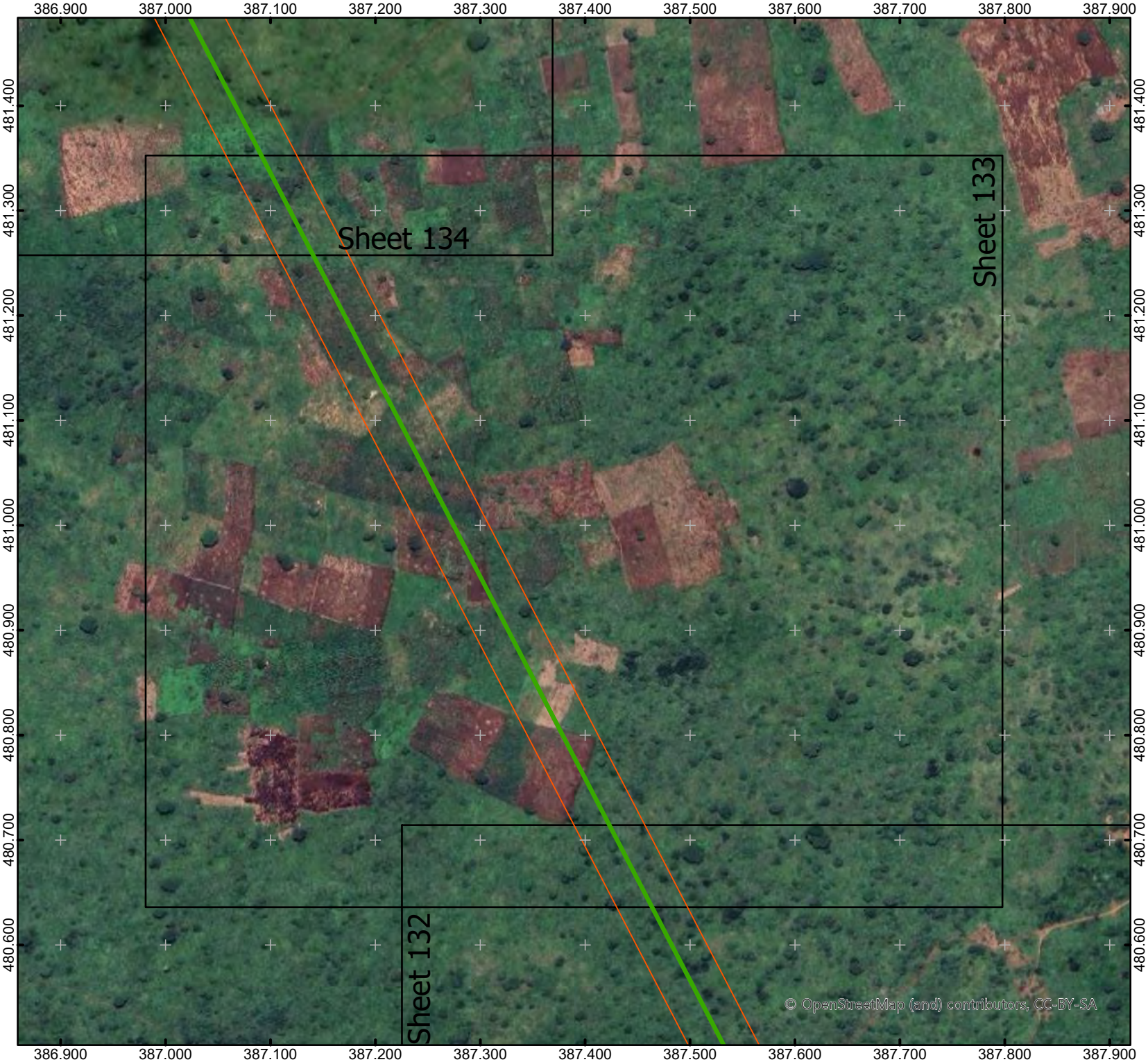
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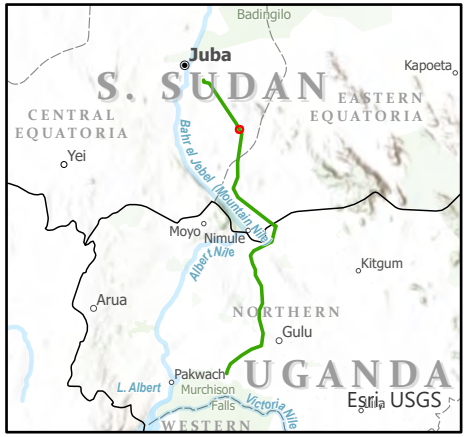
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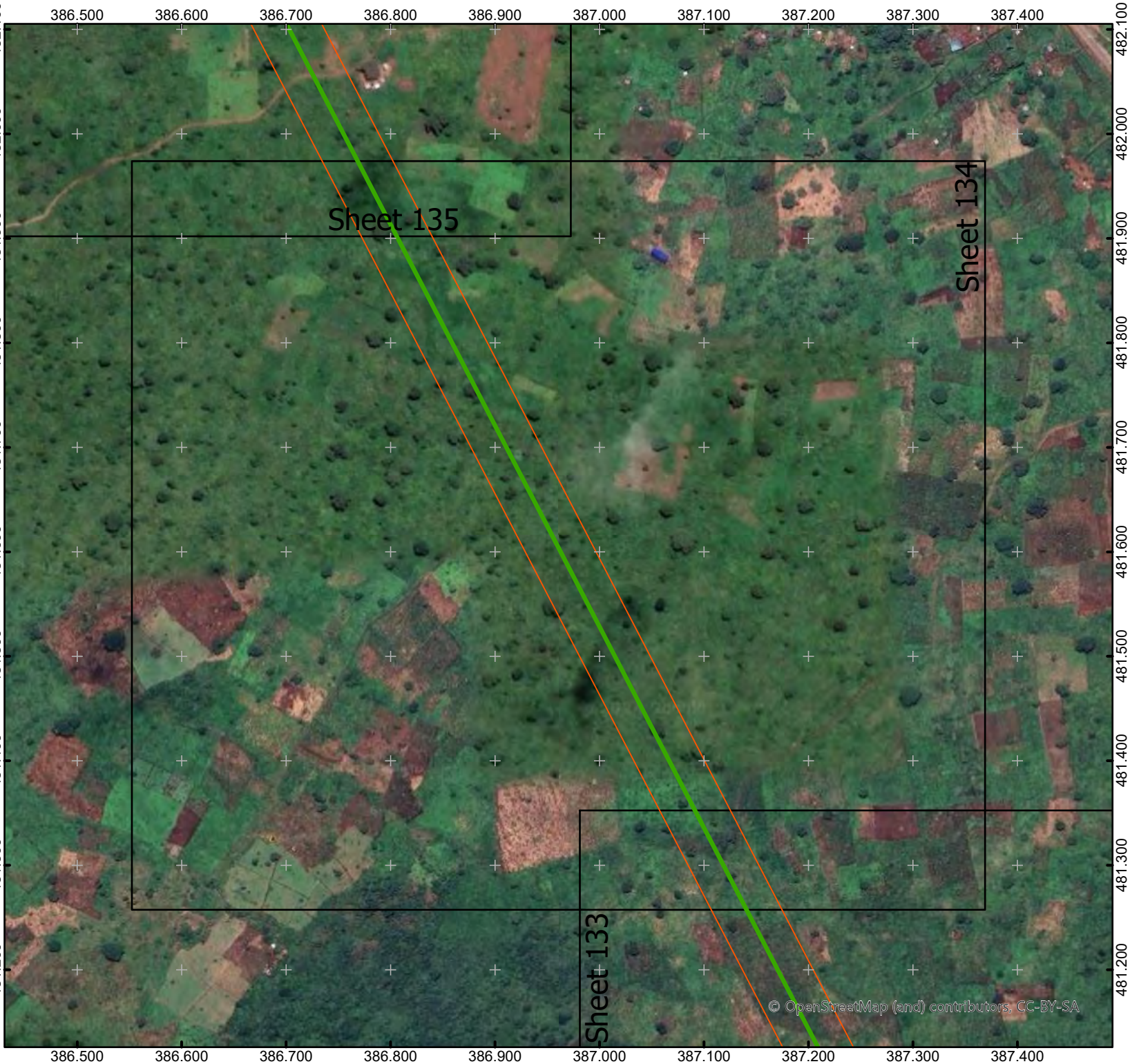
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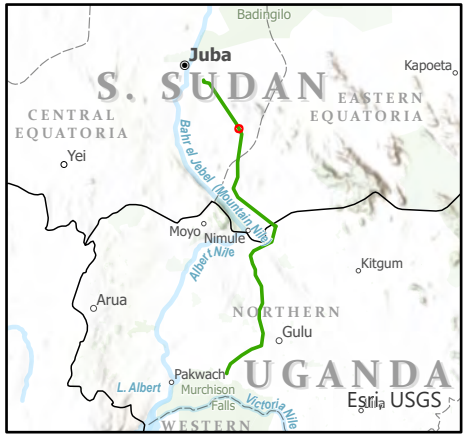
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

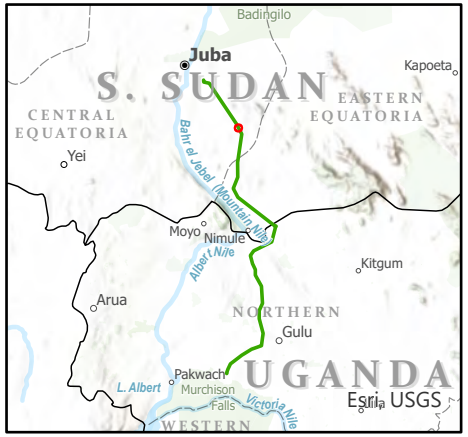
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

0 0,2 Kilometers

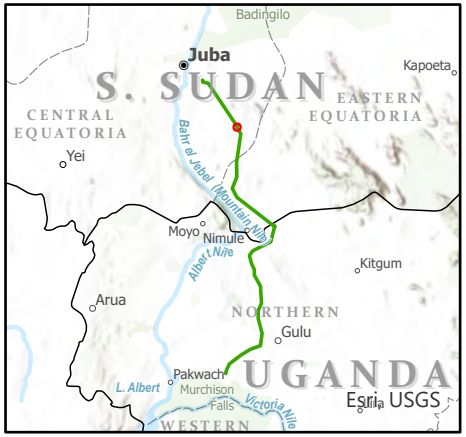
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Proposed transmission line (Uganda section)
- Direct Area of Influence

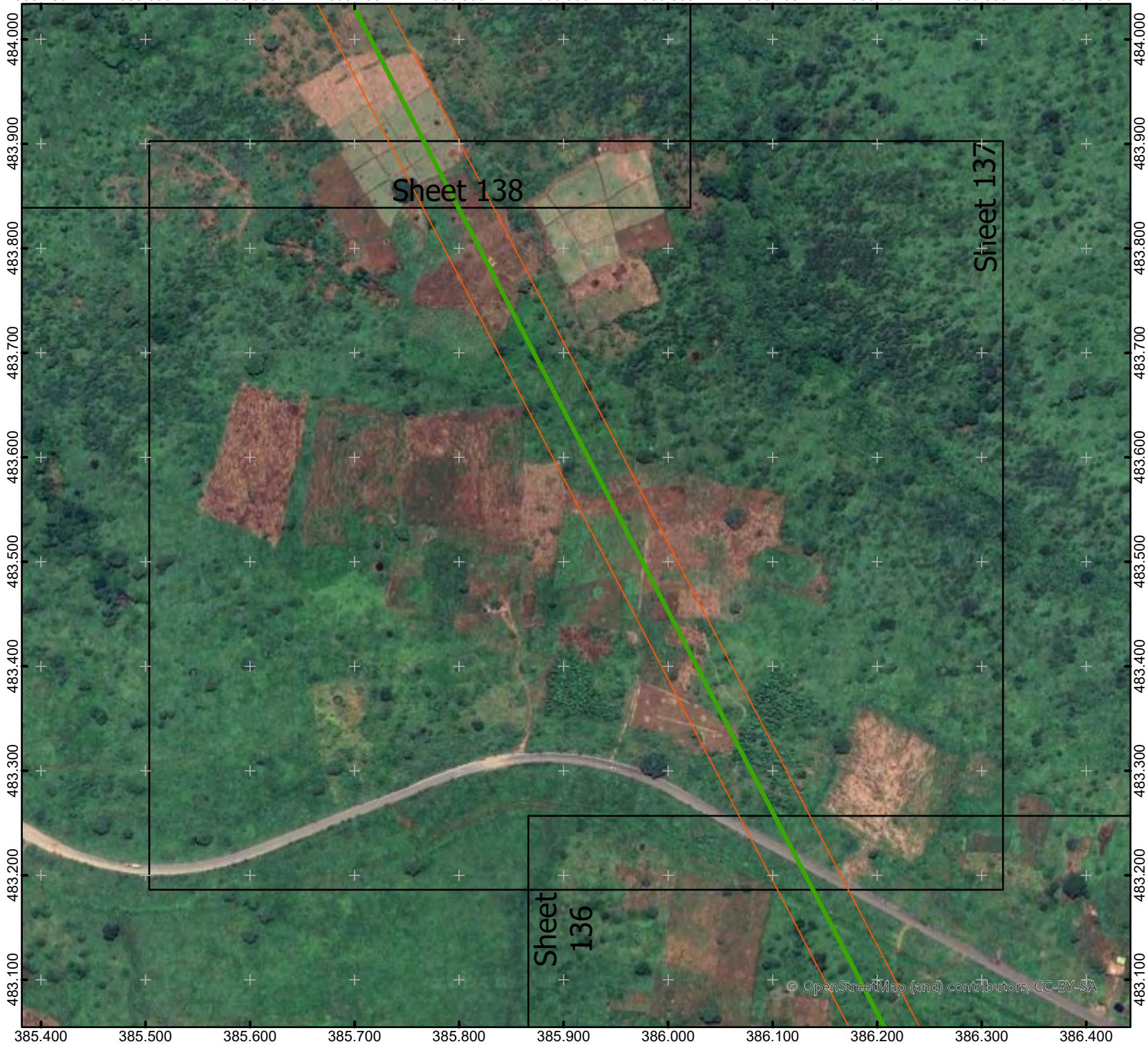
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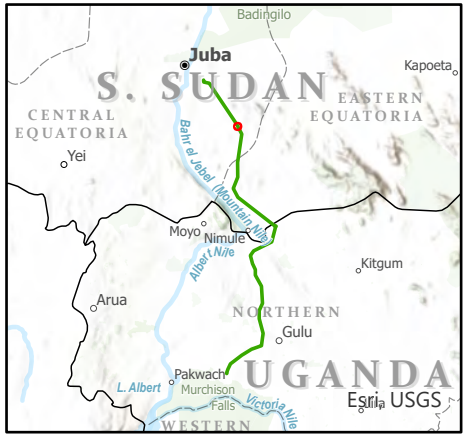
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Proposed transmission line (Uganda section)
- Direct Area of Influence

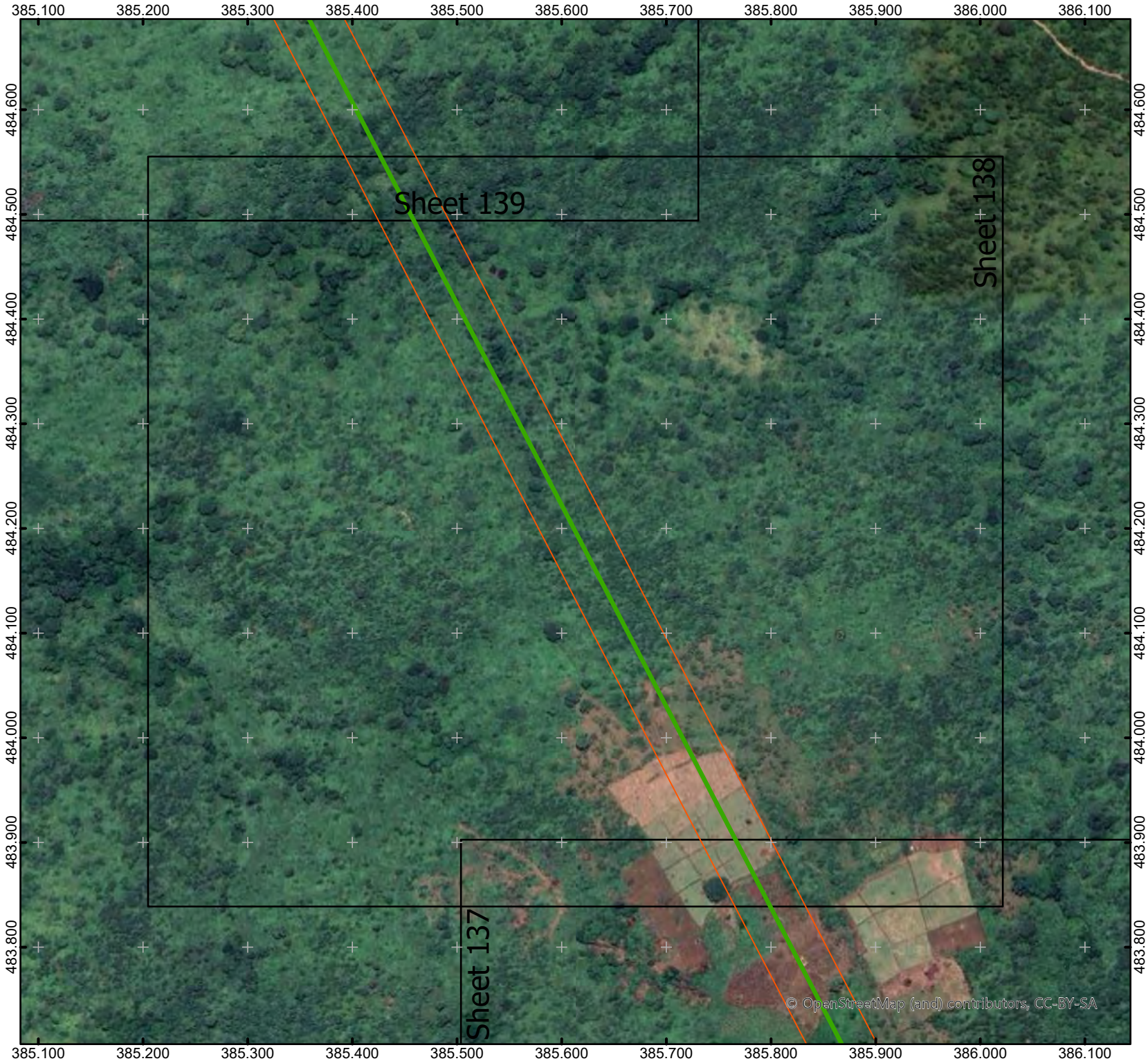
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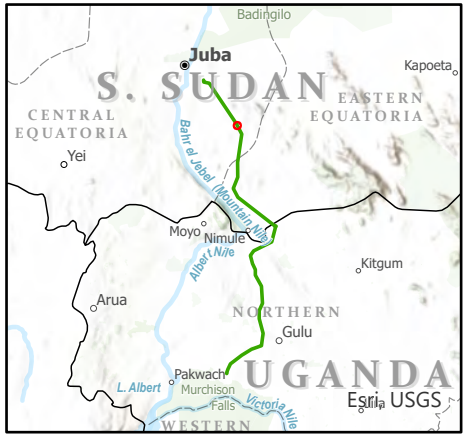
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Proposed transmission line (Uganda section)
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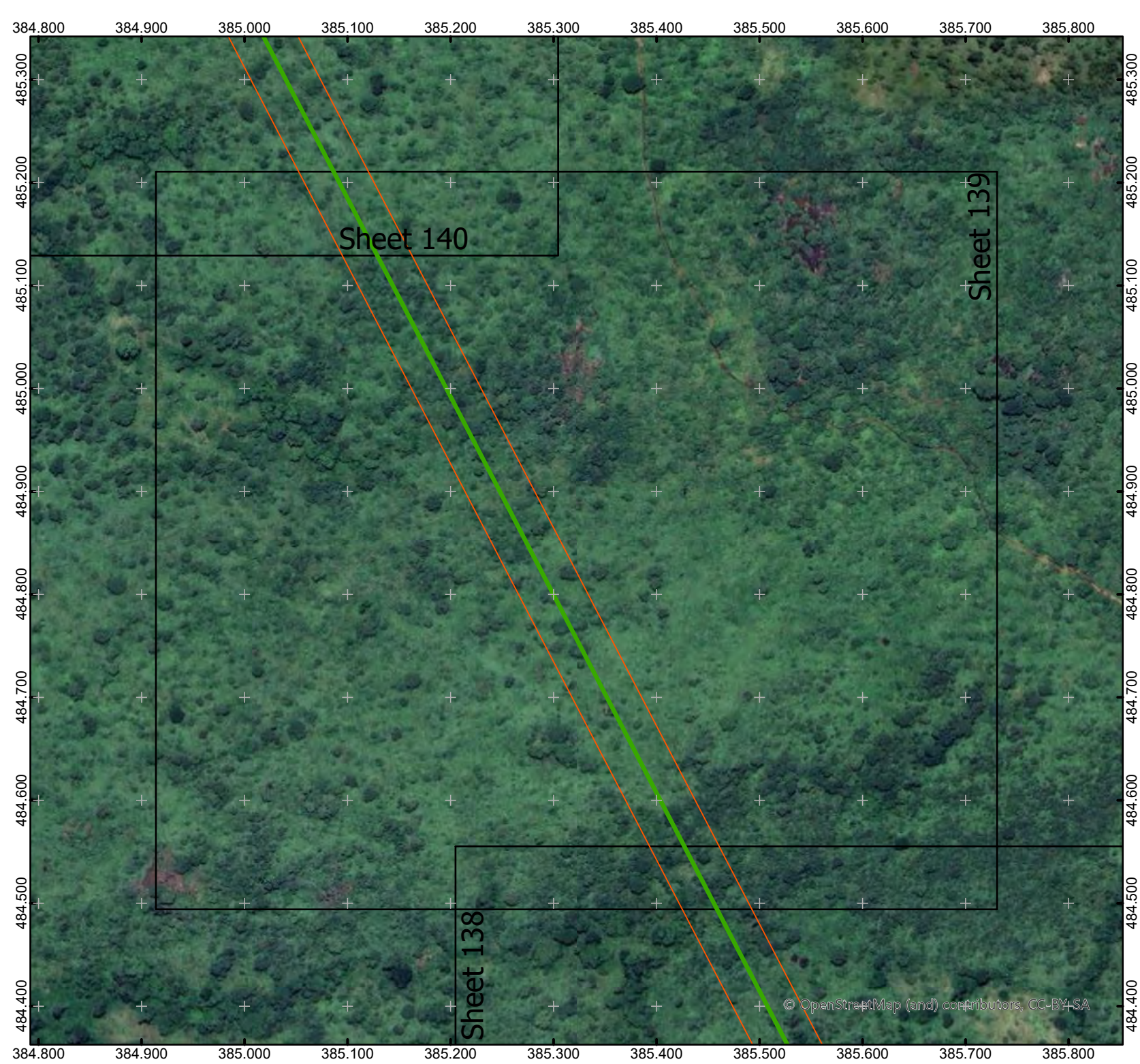
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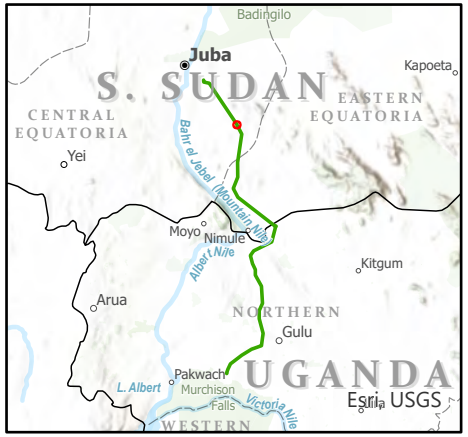
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

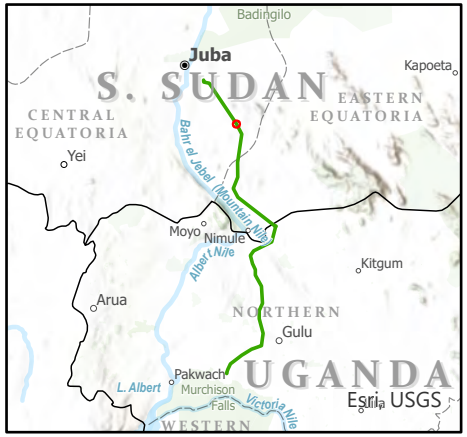
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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- Proposed transmission line (Uganda section)
- Direct Area of Influence

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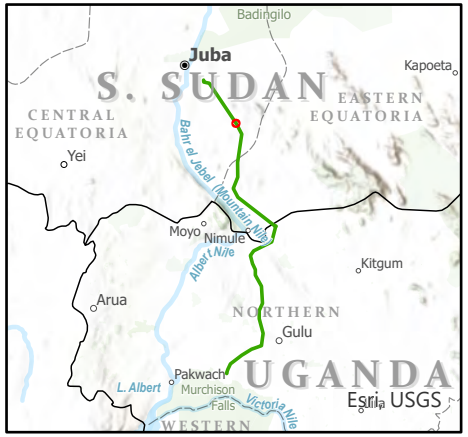
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

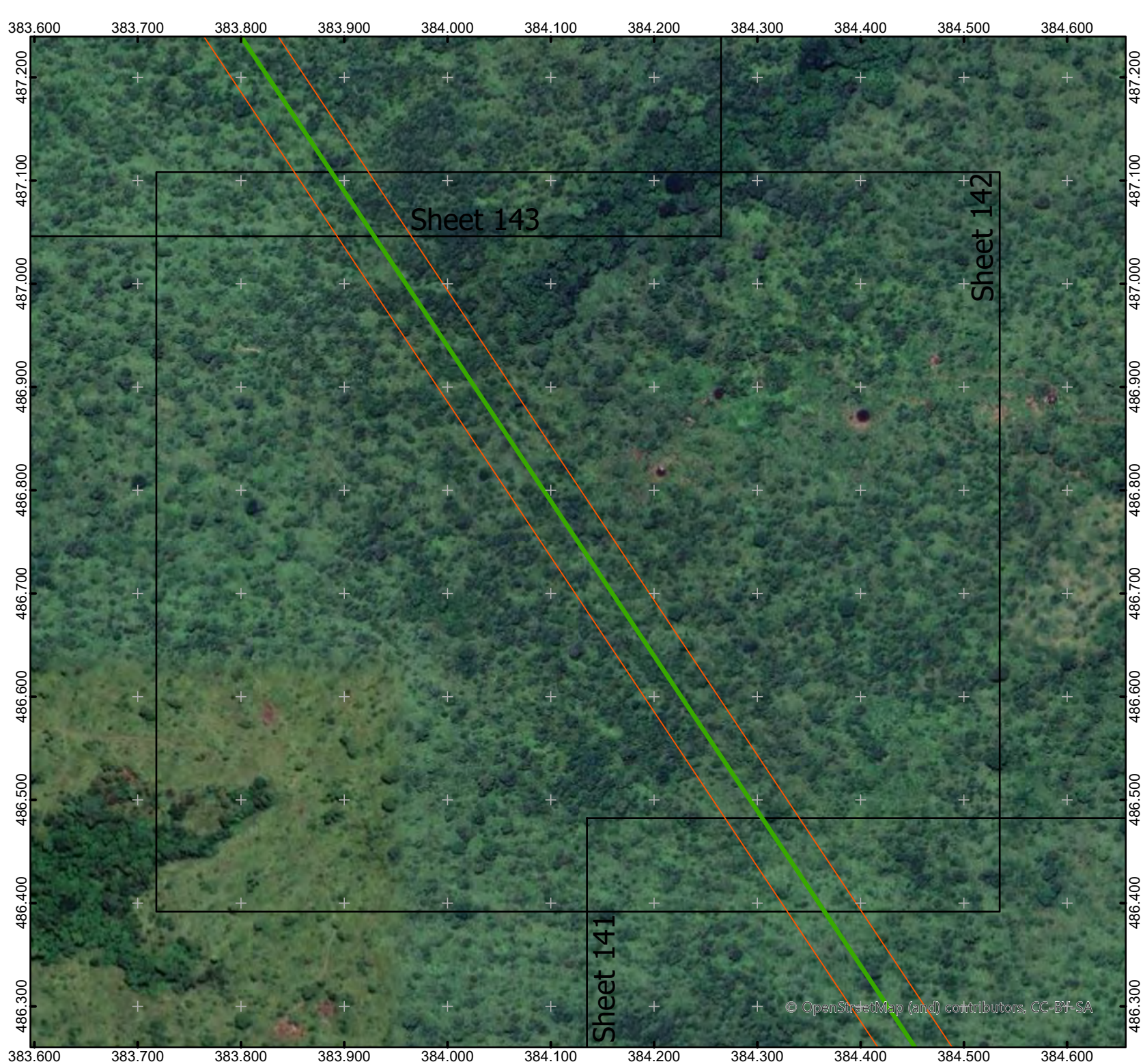
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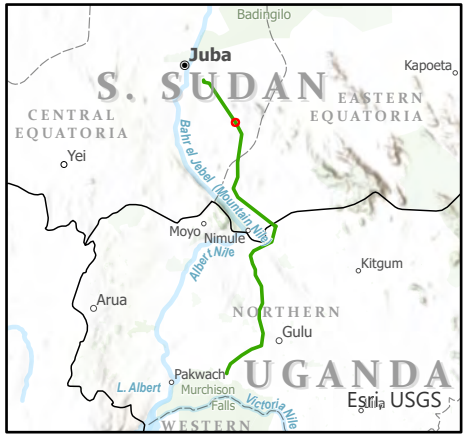
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Direct Area of Influence

0 0,2 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

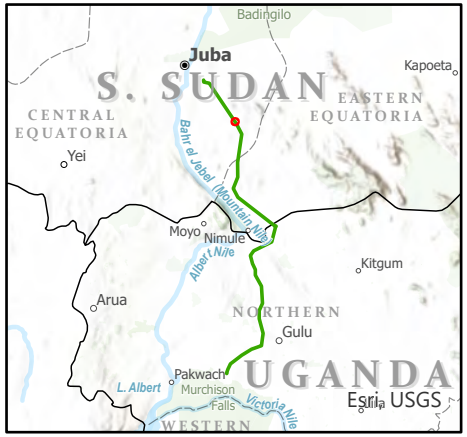
Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4

Scale 1:5.000





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- Proposed transmission line (Uganda section)
- Direct Area of Influence

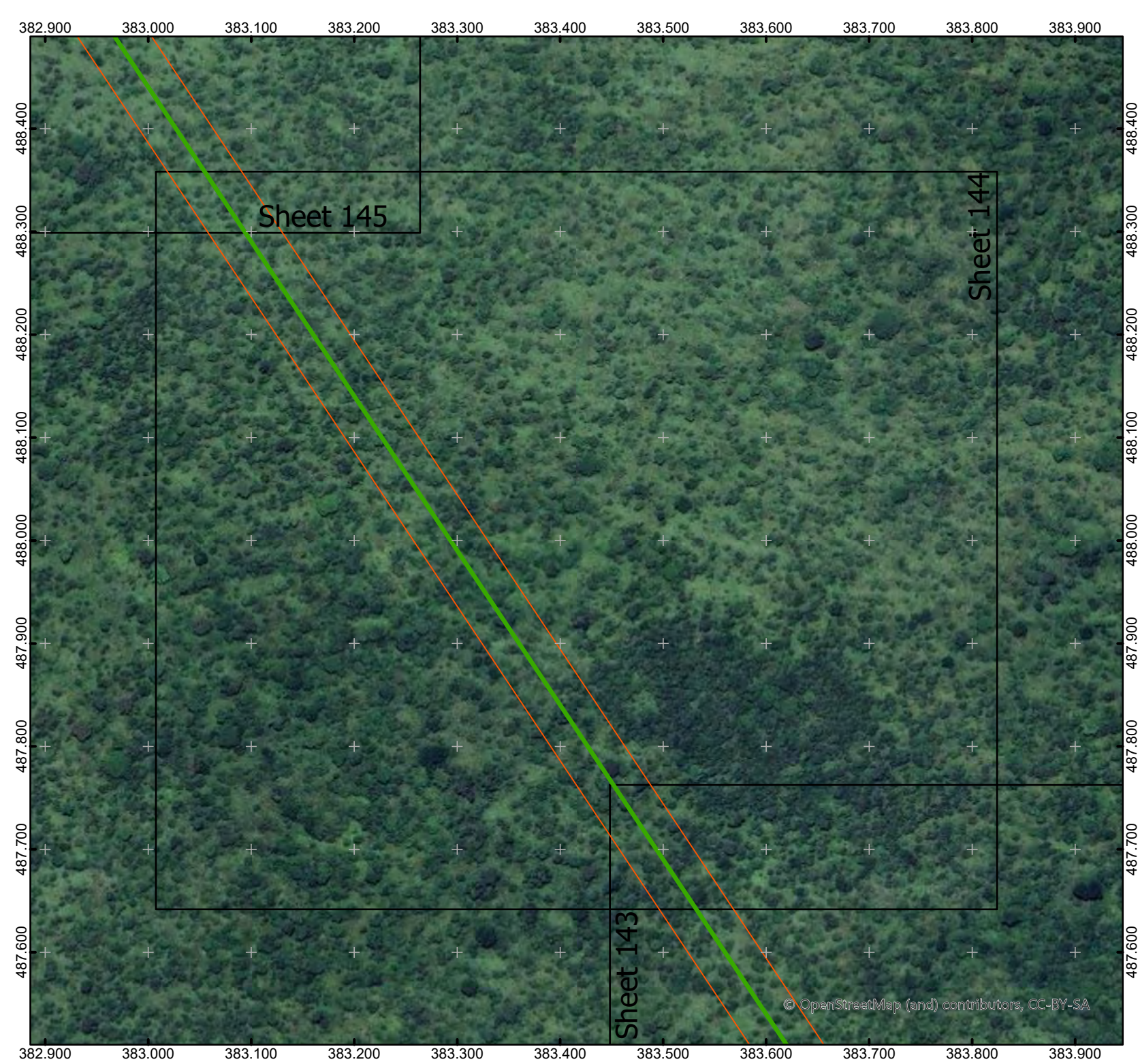
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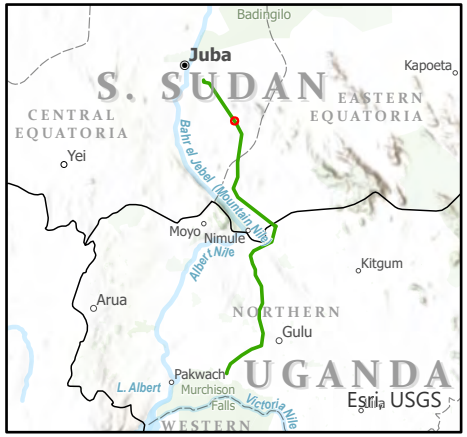
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

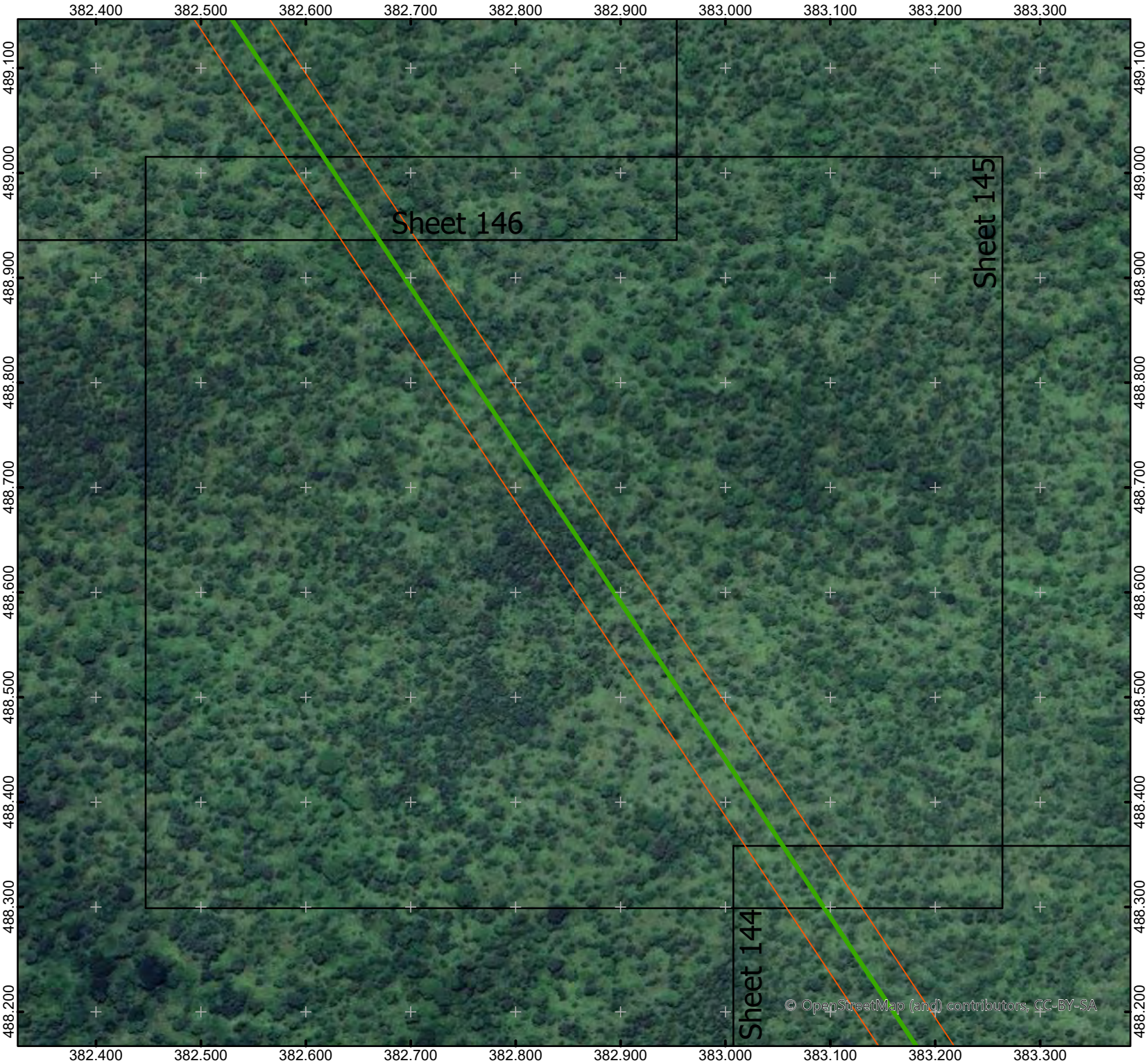
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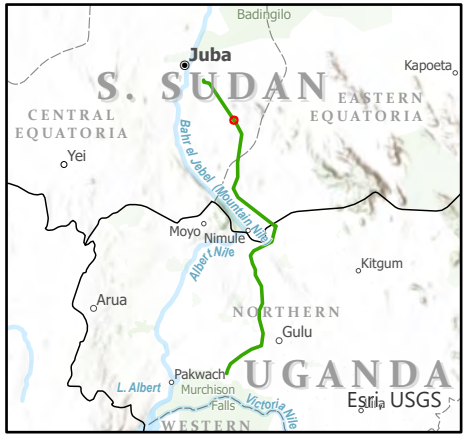
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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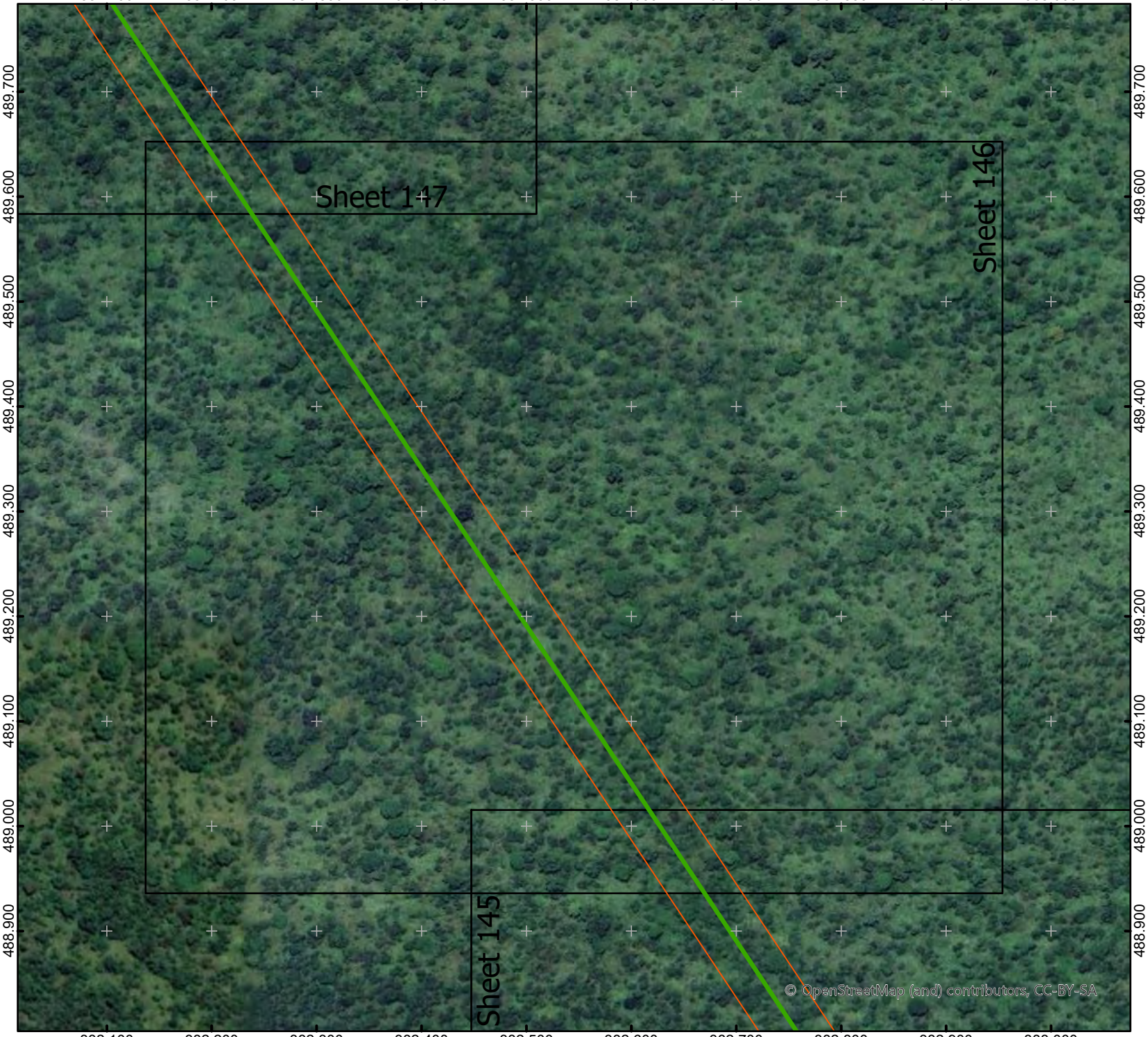
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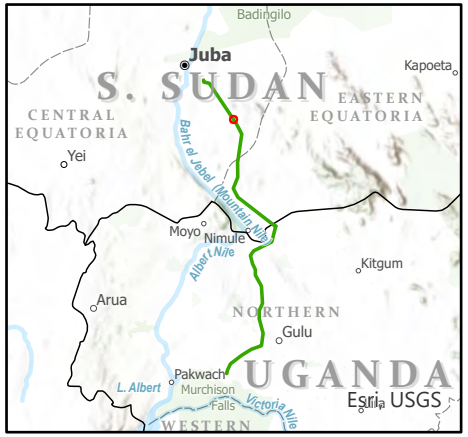
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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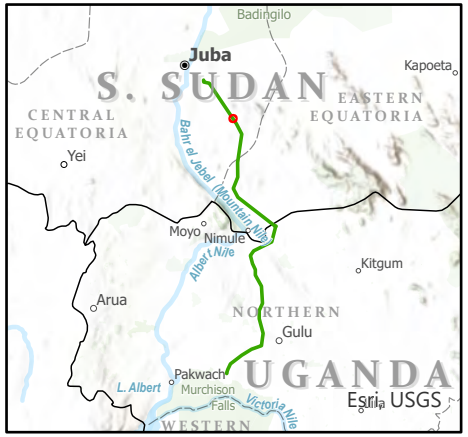
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Uganda-South Sudan 400 kV Interconnection Line Project

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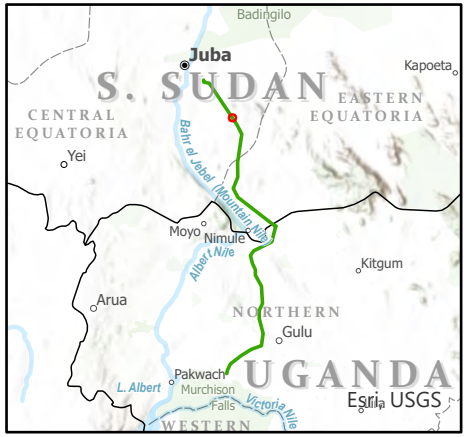
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Uganda-South Sudan 400 kV Interconnection Line Project

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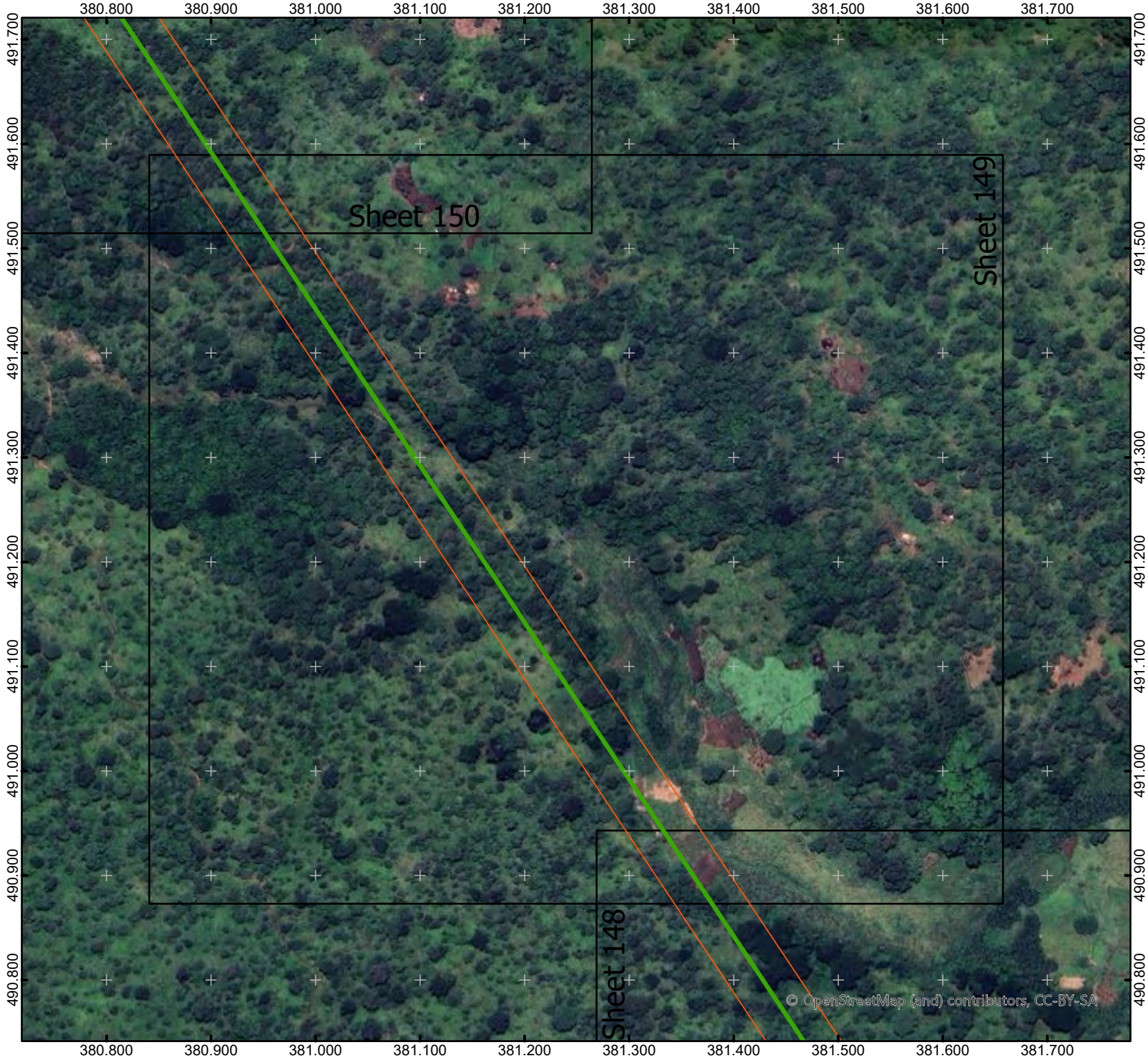
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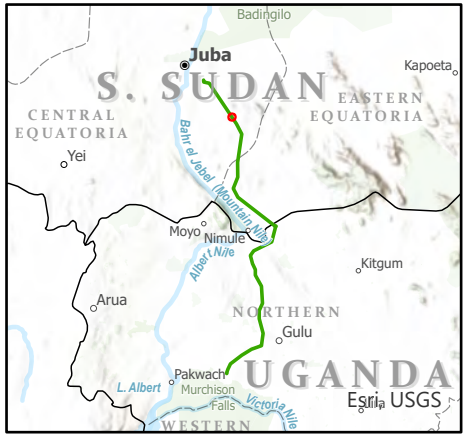
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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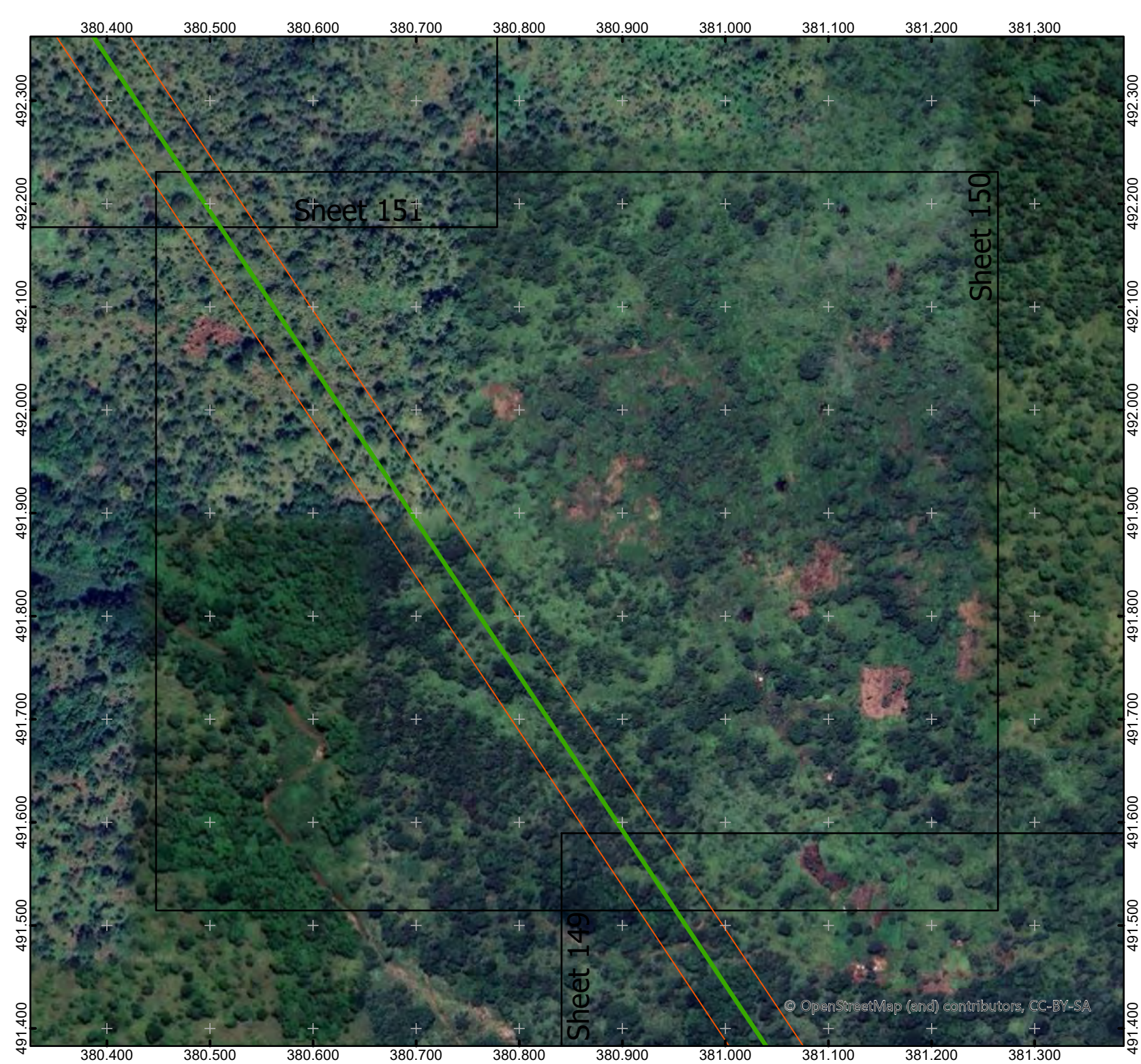
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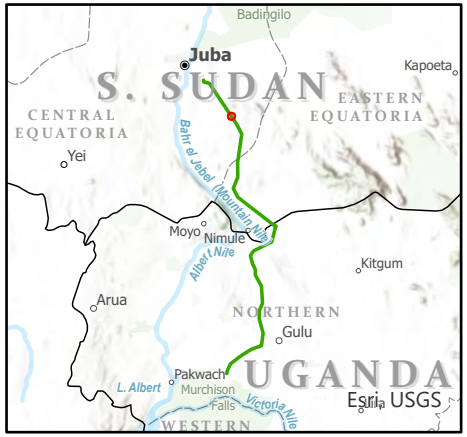
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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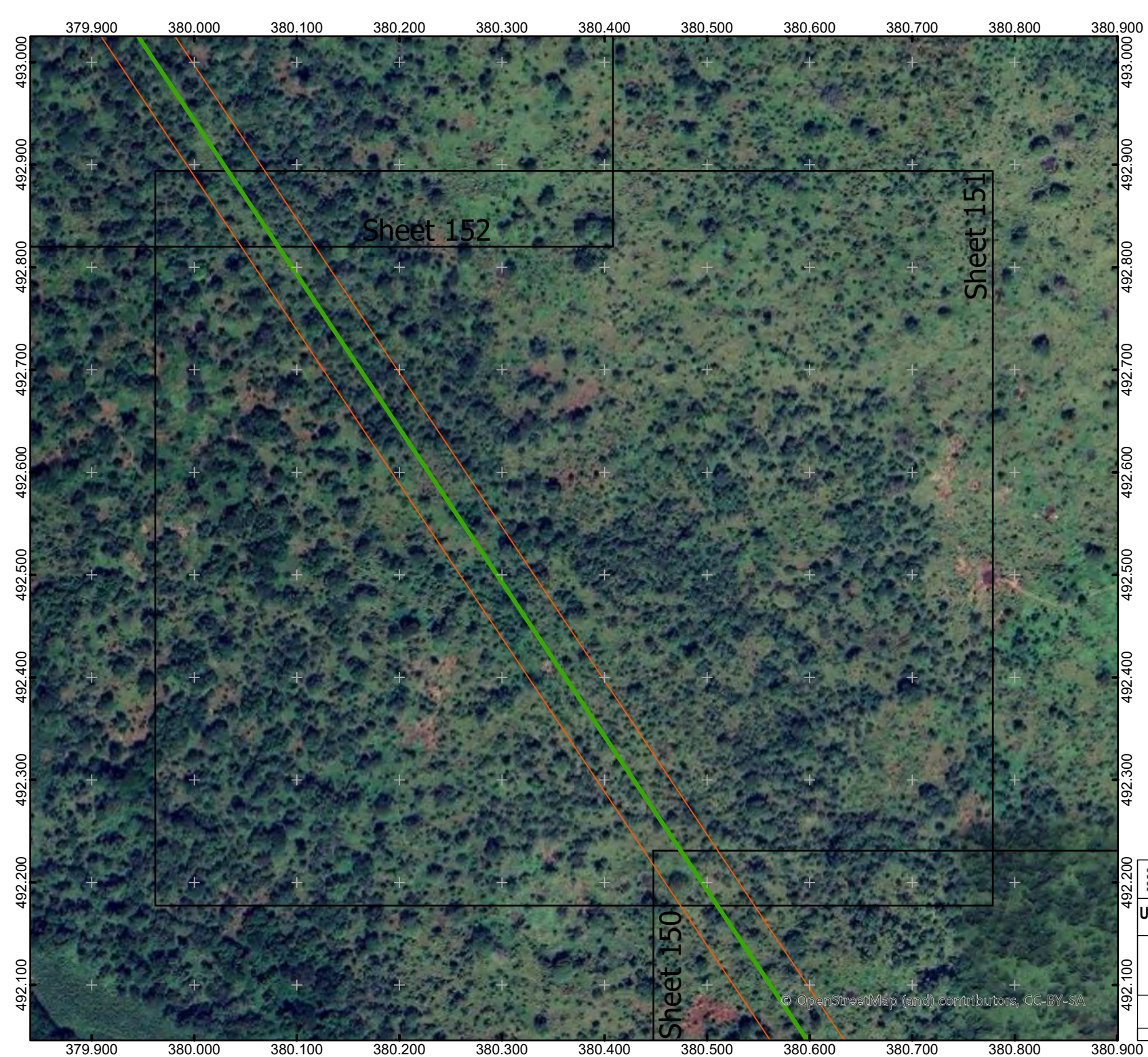
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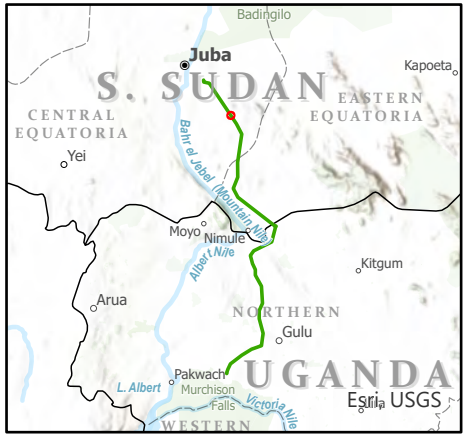
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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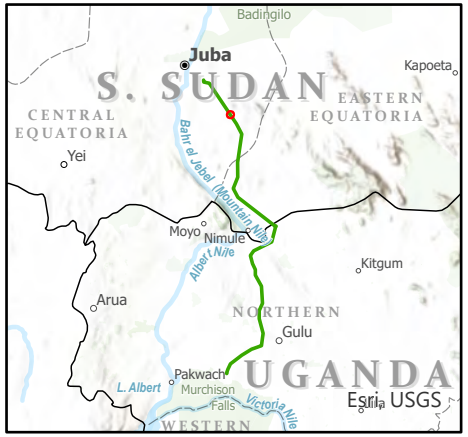
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

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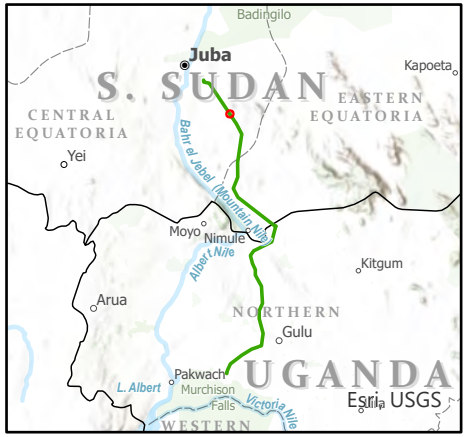
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Uganda-South Sudan 400 kV Interconnection Line Project

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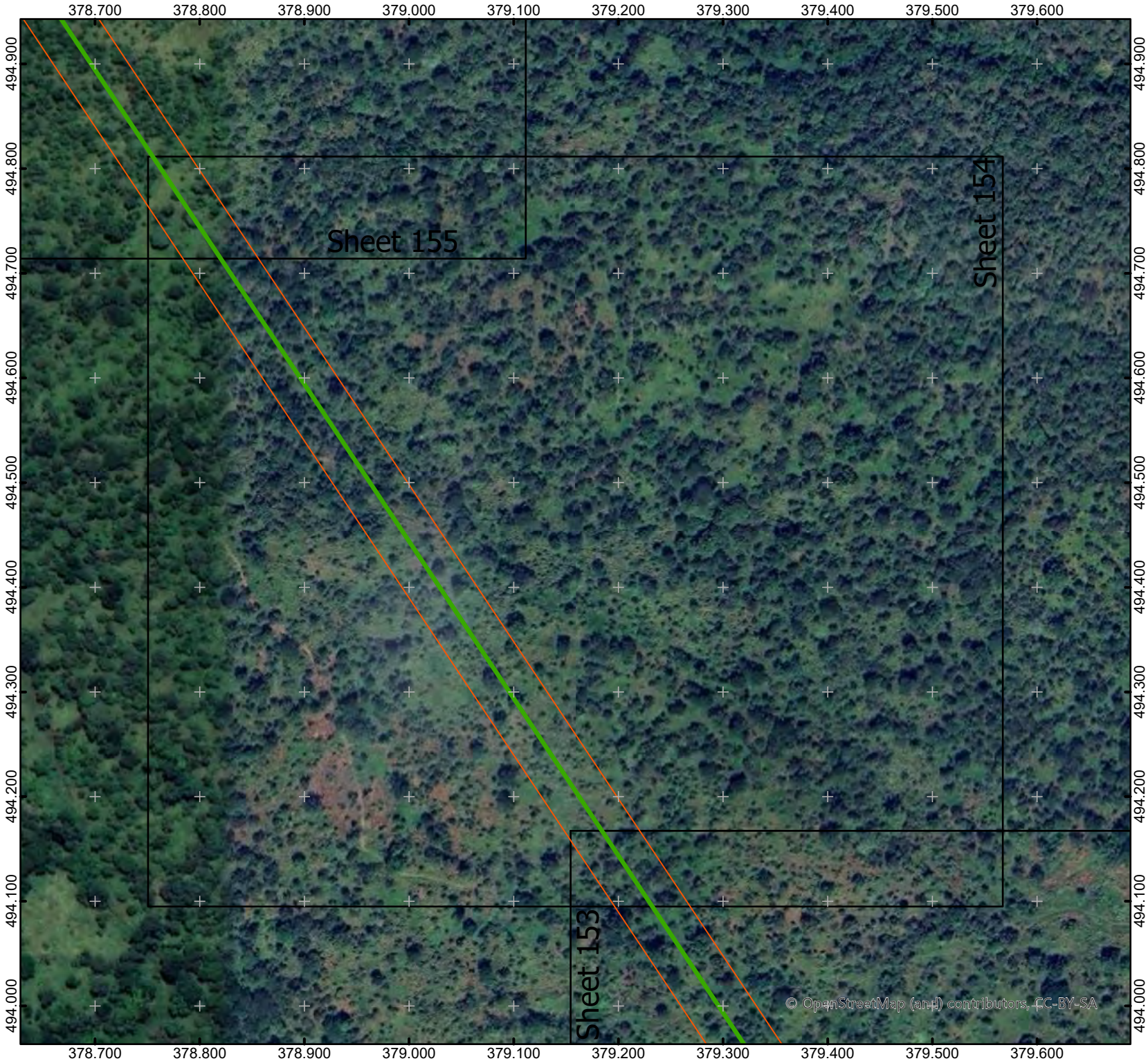
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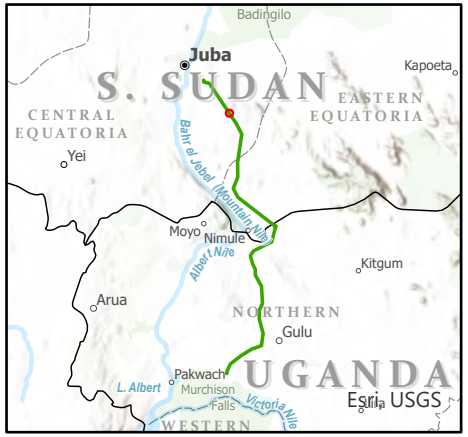
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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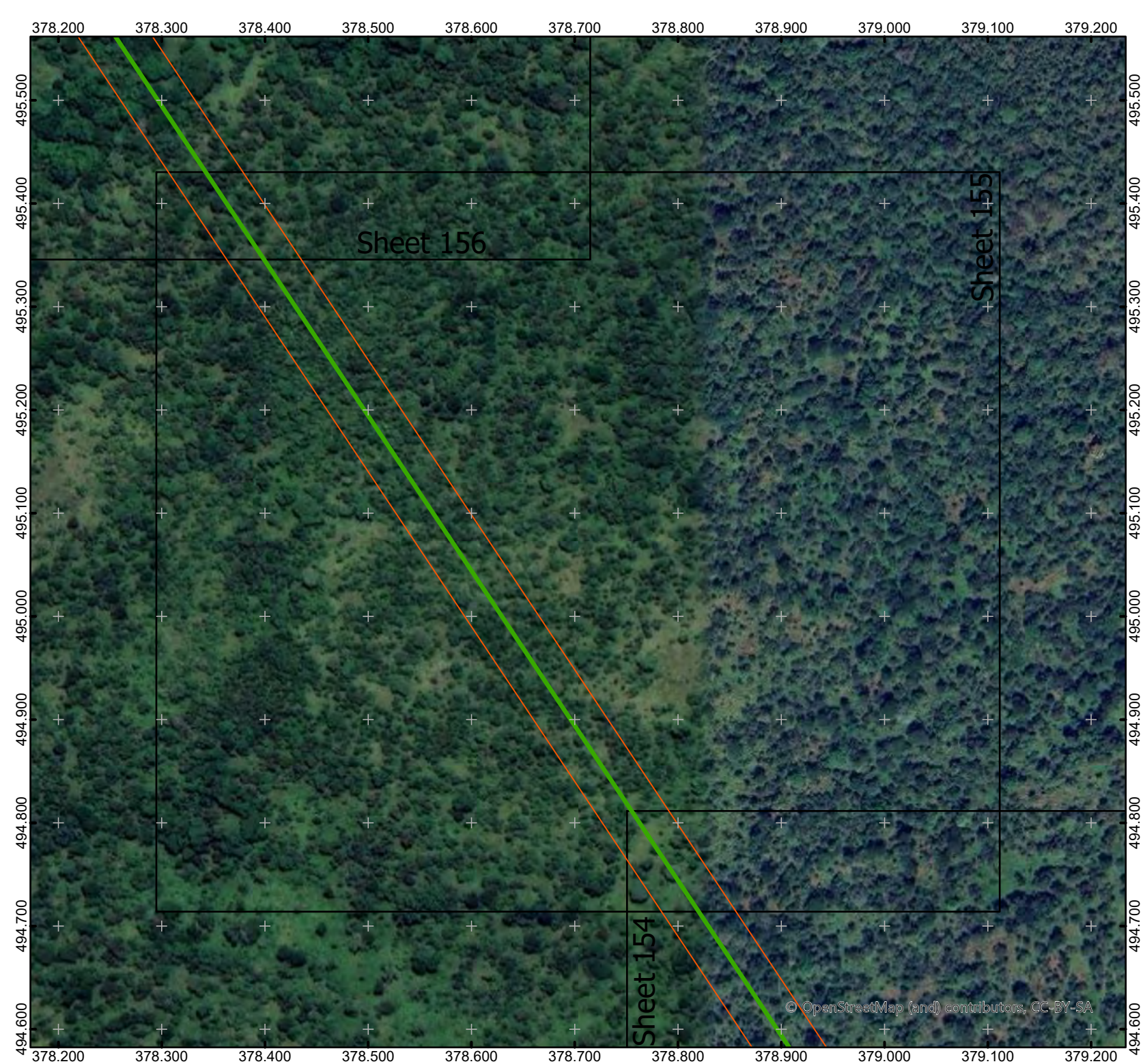
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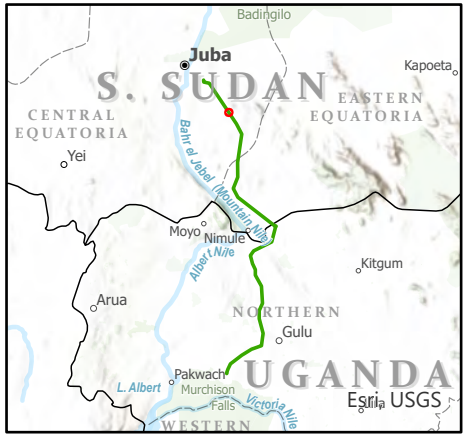
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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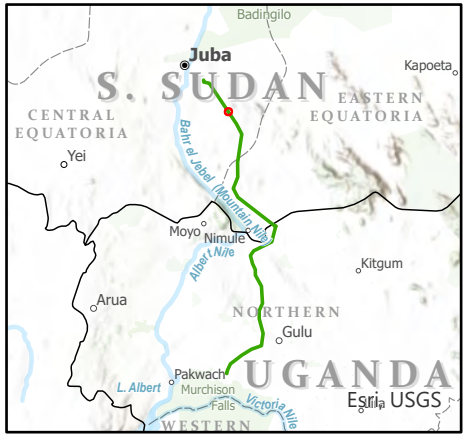
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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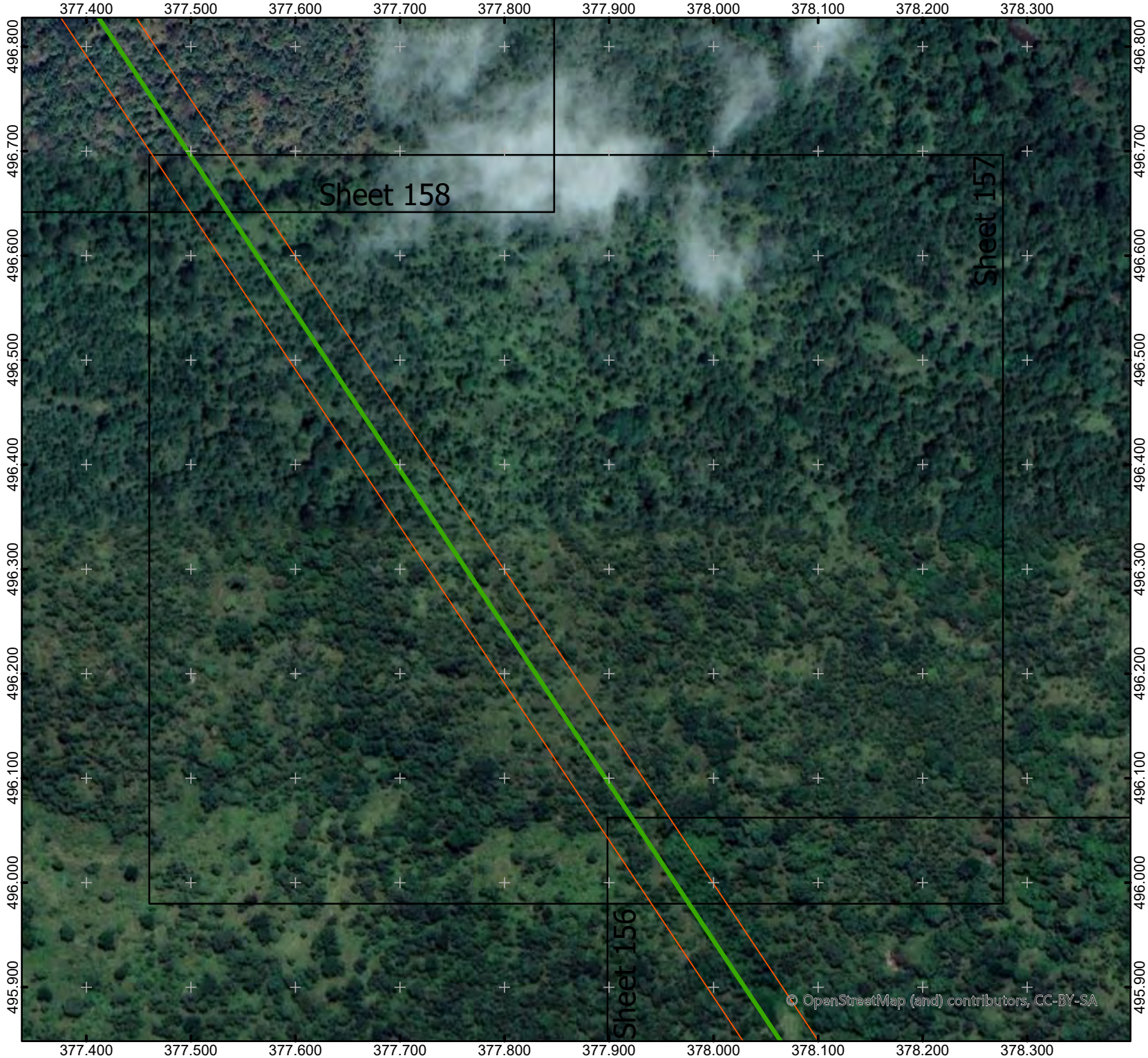
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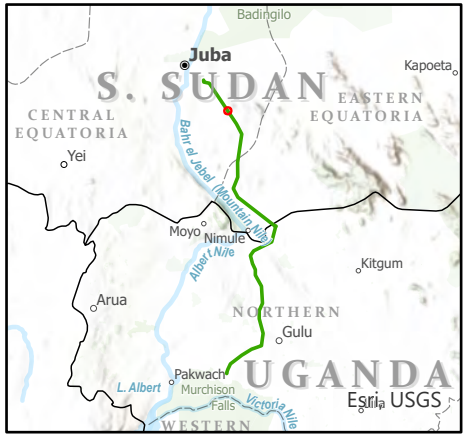
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





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0 0,2 Kilometers

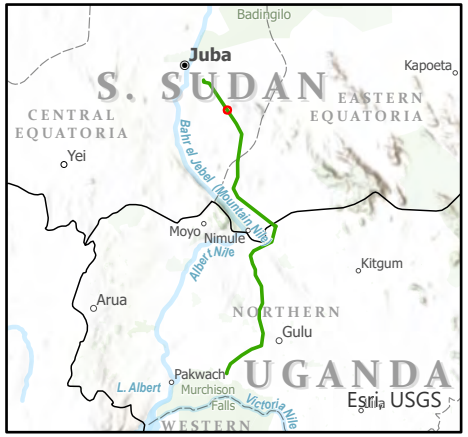
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

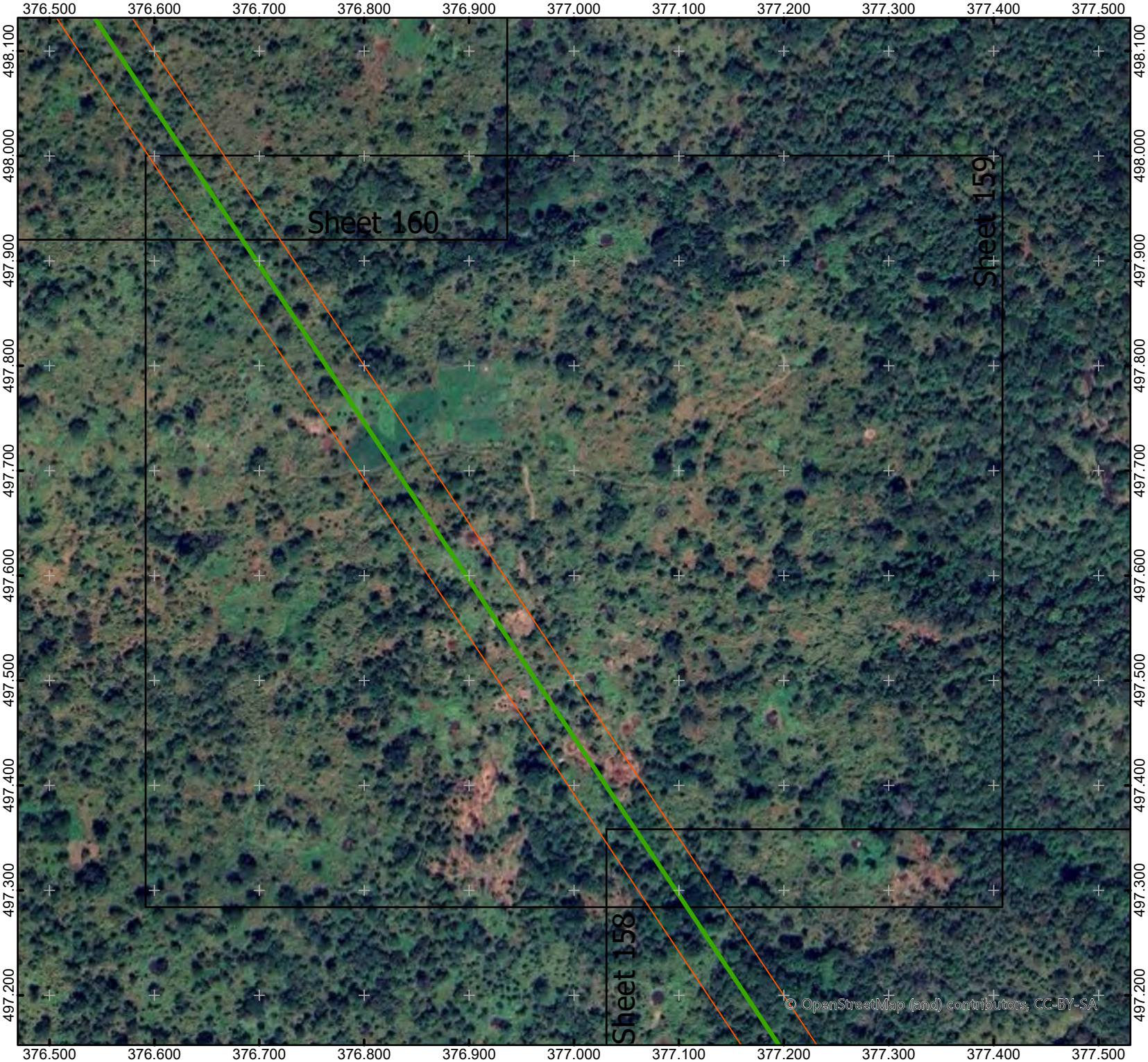
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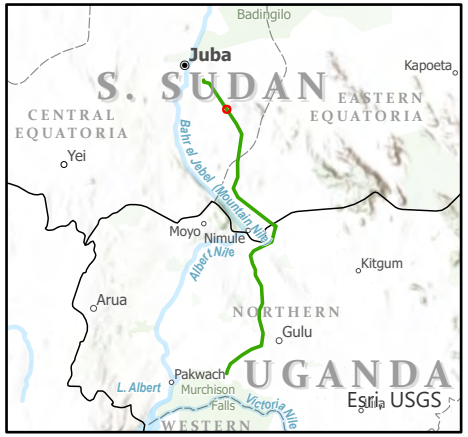
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

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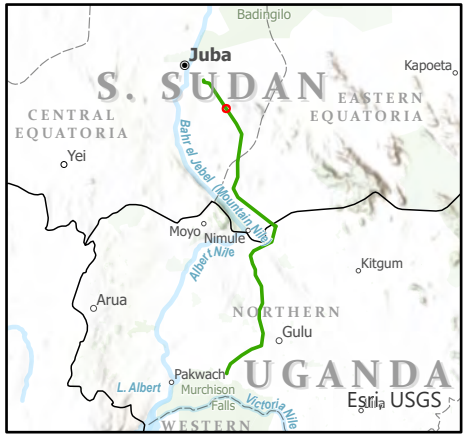
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

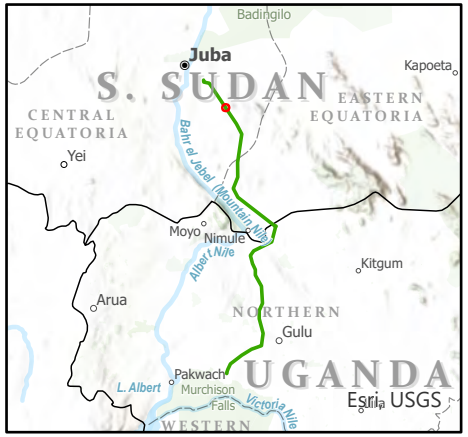
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





- Proposed transmission line (South Sudan section)
- Proposed transmission line (Uganda section)
- Direct Area of Influence

0 0,2 Kilometers

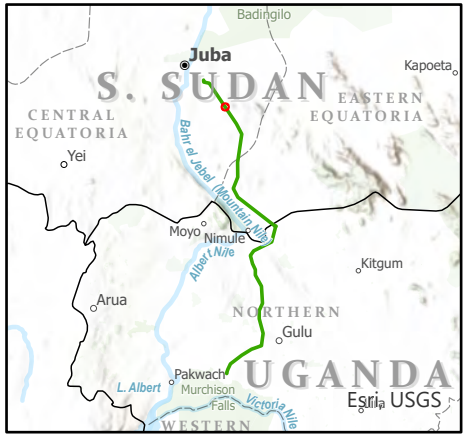
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

0 0,2 Kilometers

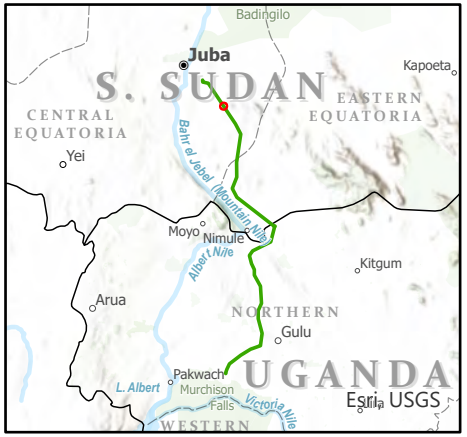
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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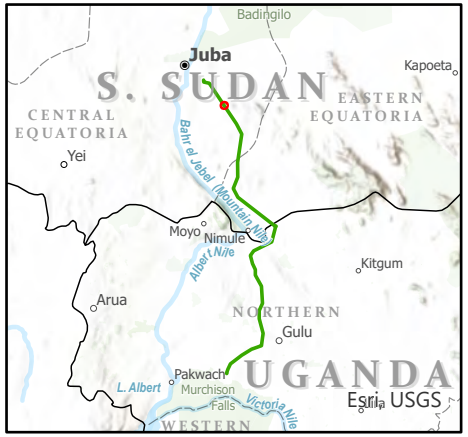
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

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Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Google Earth

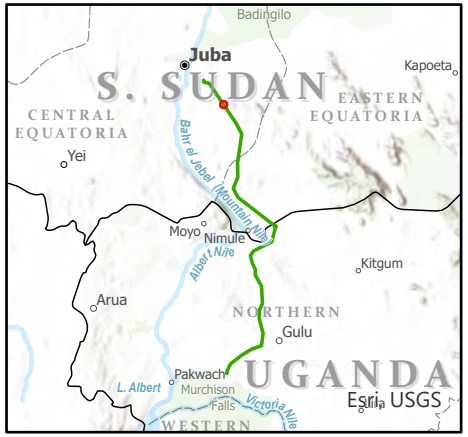
Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4

Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

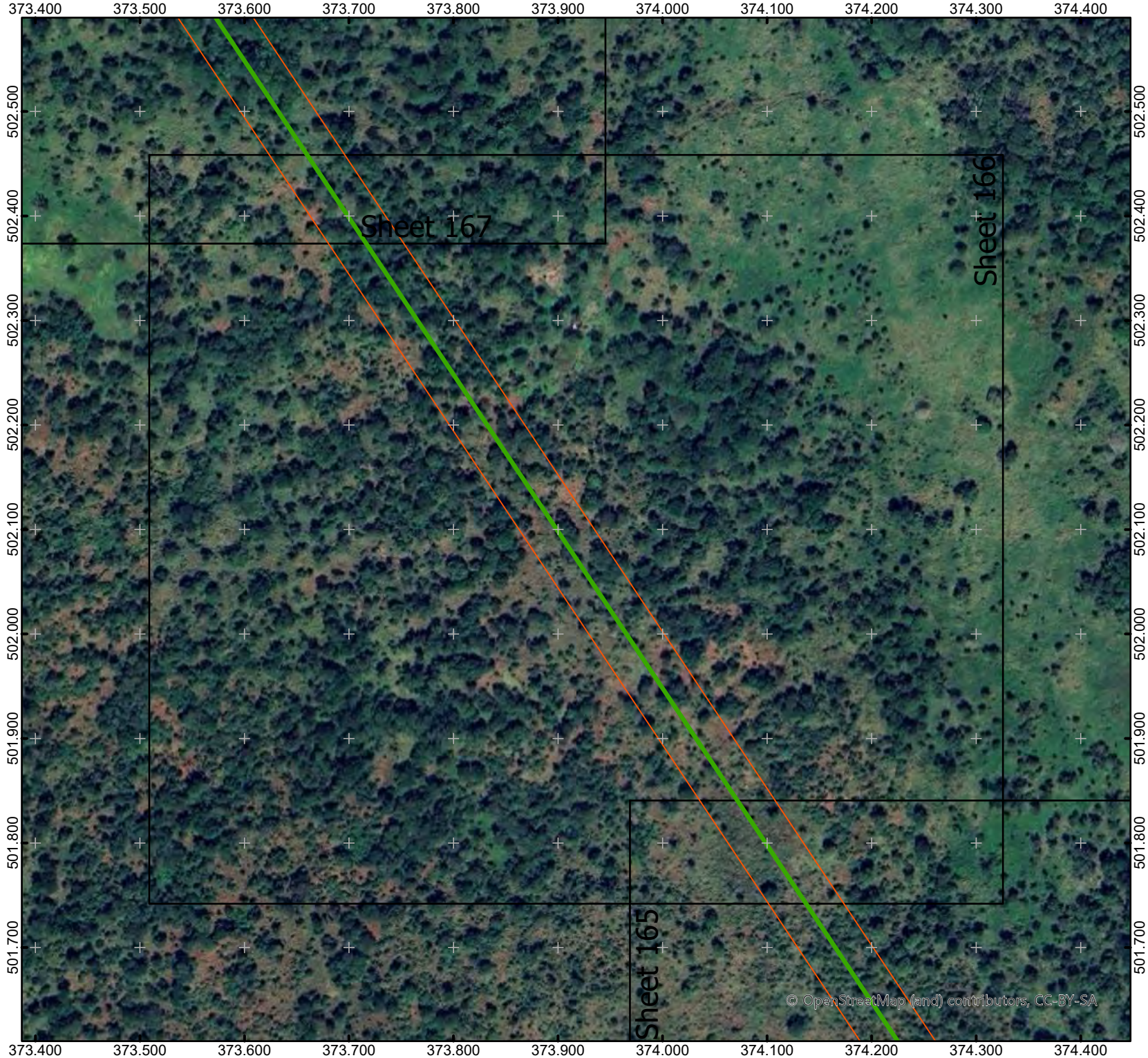
0 0,2 Kilometers

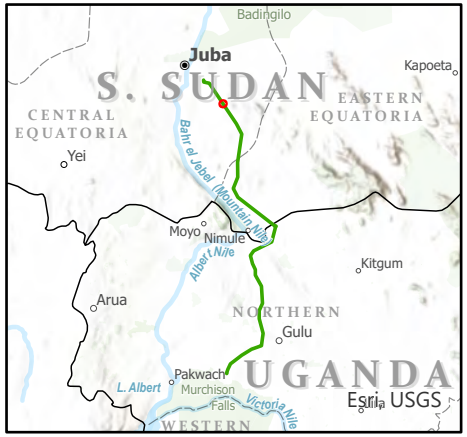
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Uganda-South Sudan 400 kV Interconnection Line Project

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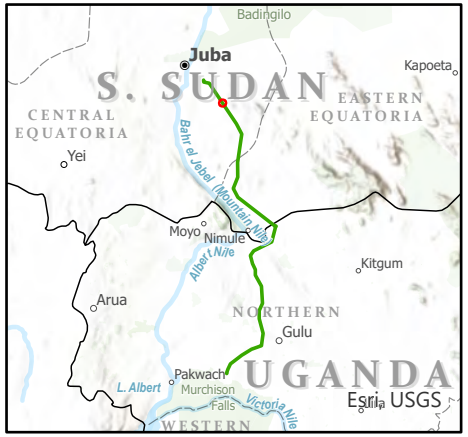
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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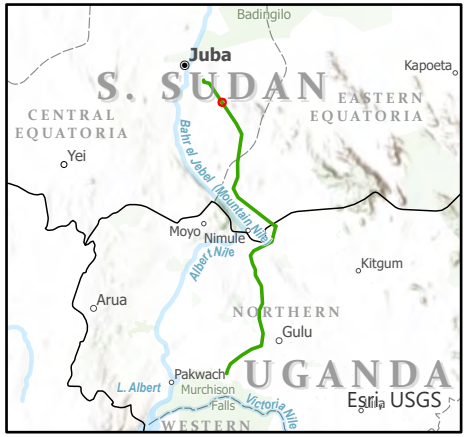
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Uganda-South Sudan 400 kV Interconnection Line Project

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South Sudan

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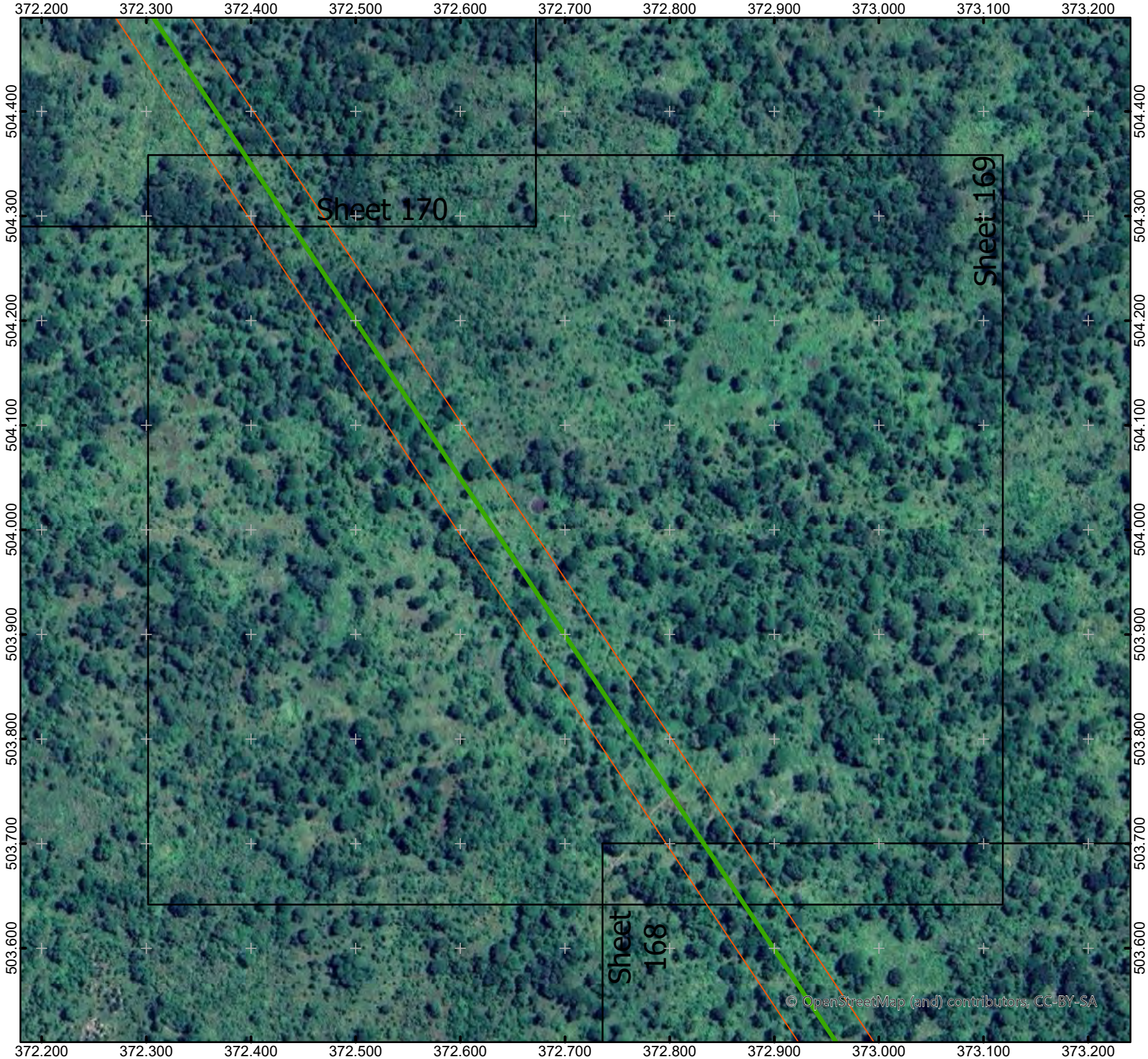
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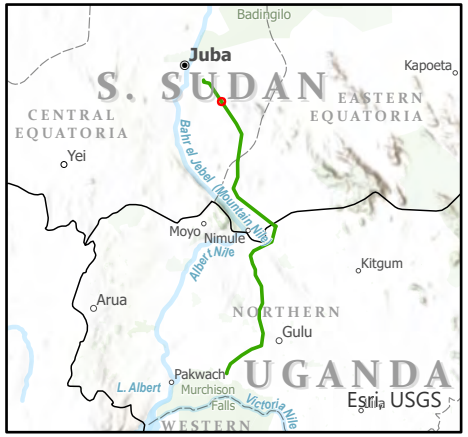
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Uganda-South Sudan 400 kV Interconnection Line Project

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South Sudan

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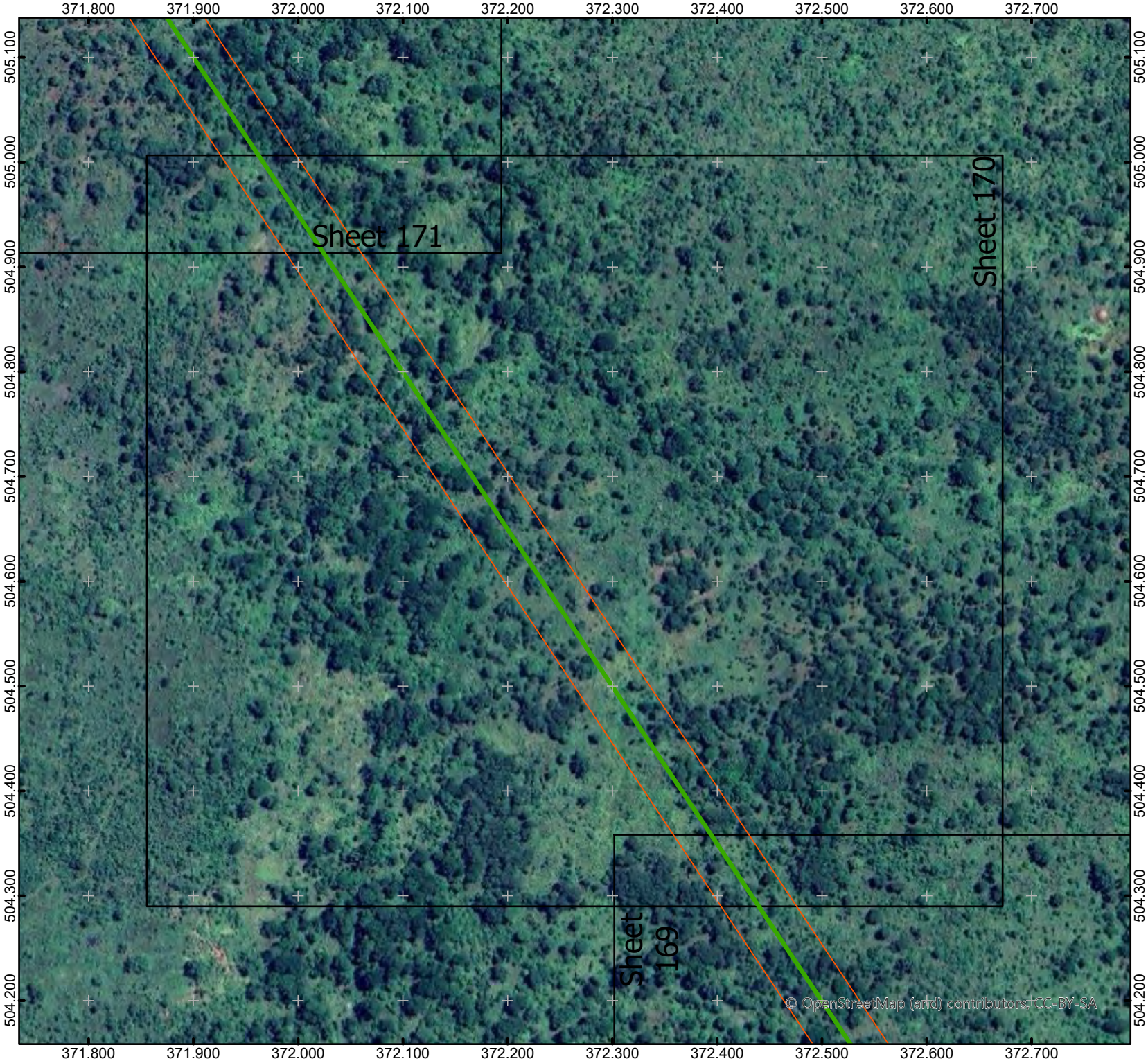
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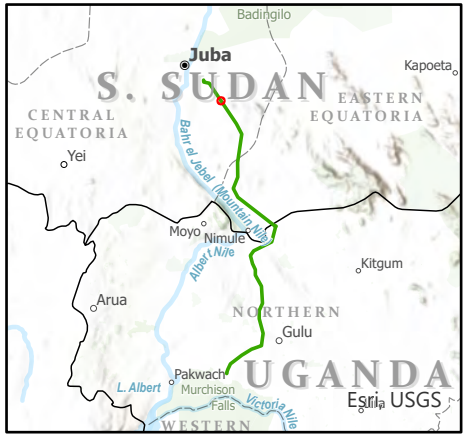
Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4

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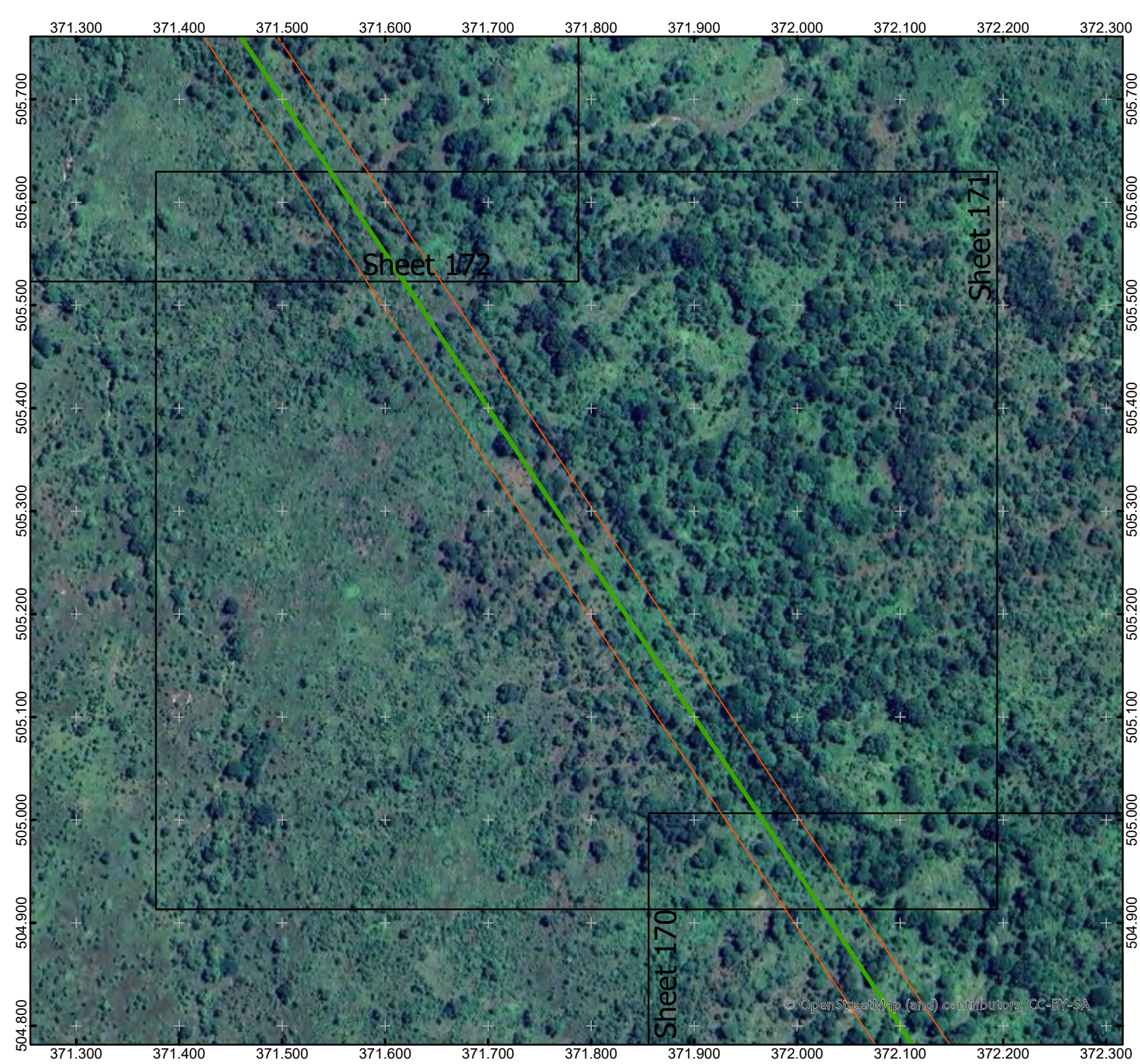
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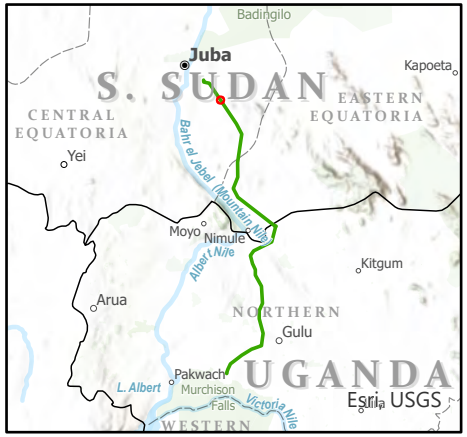
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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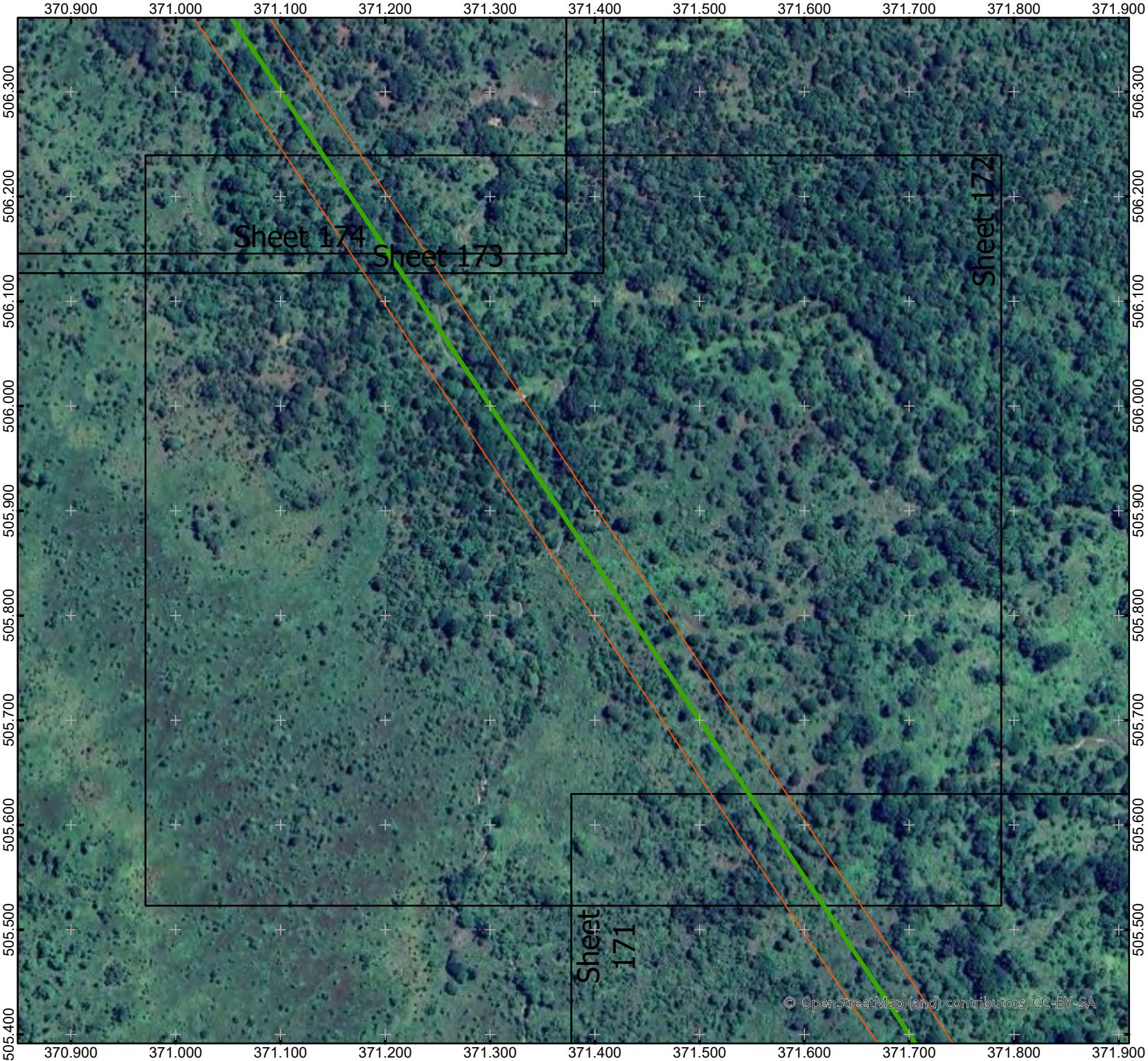
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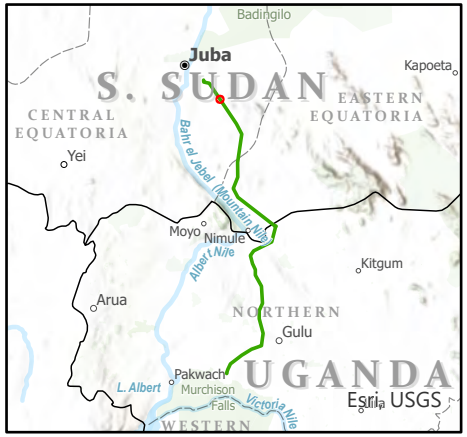
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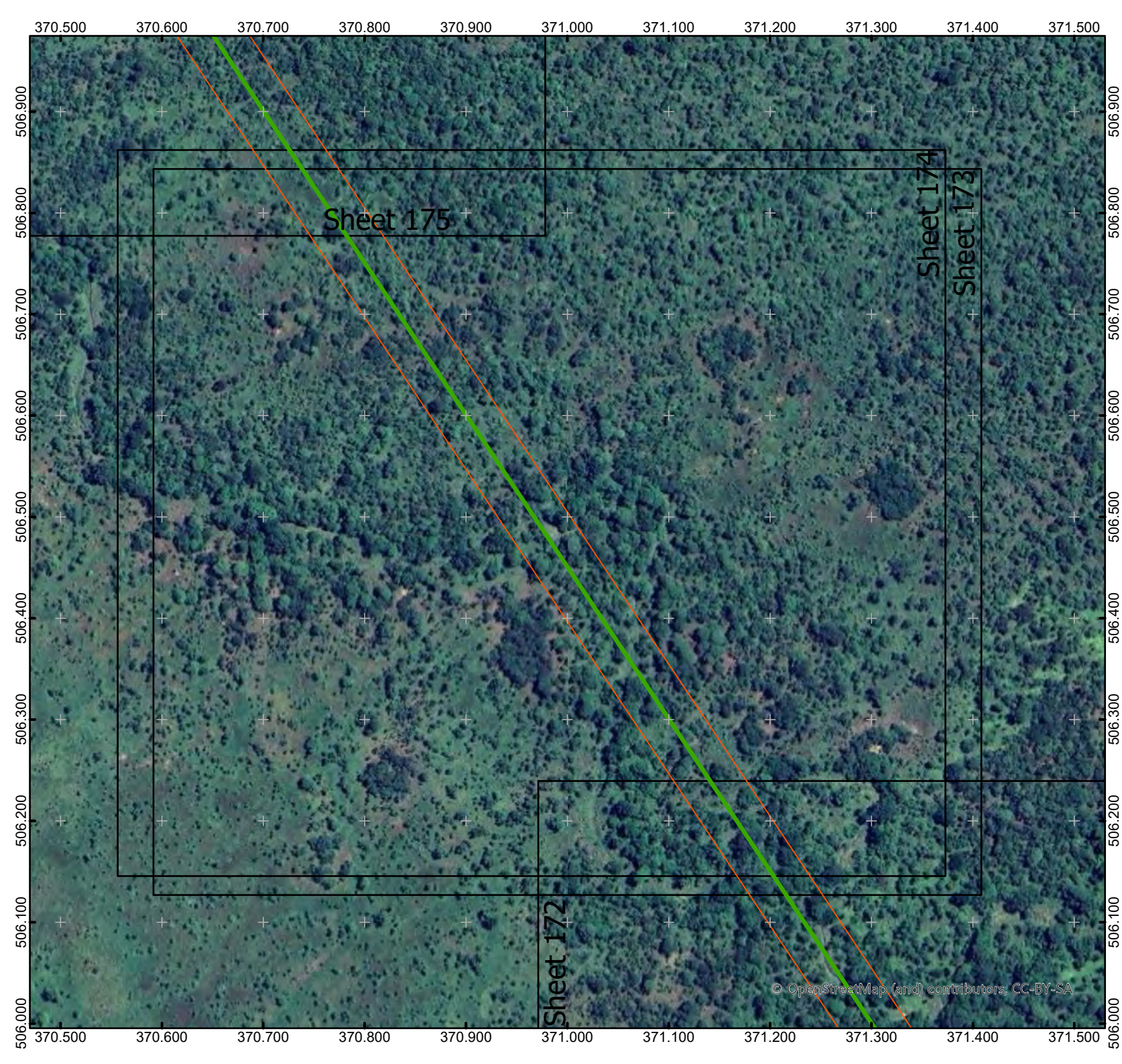
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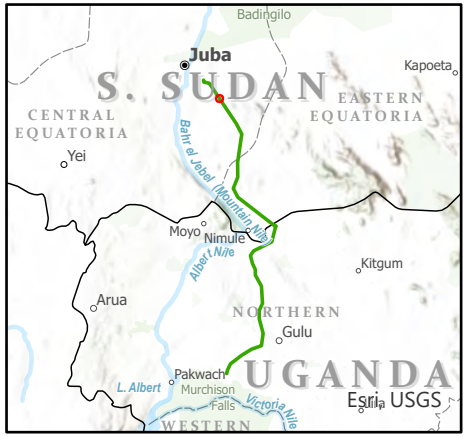
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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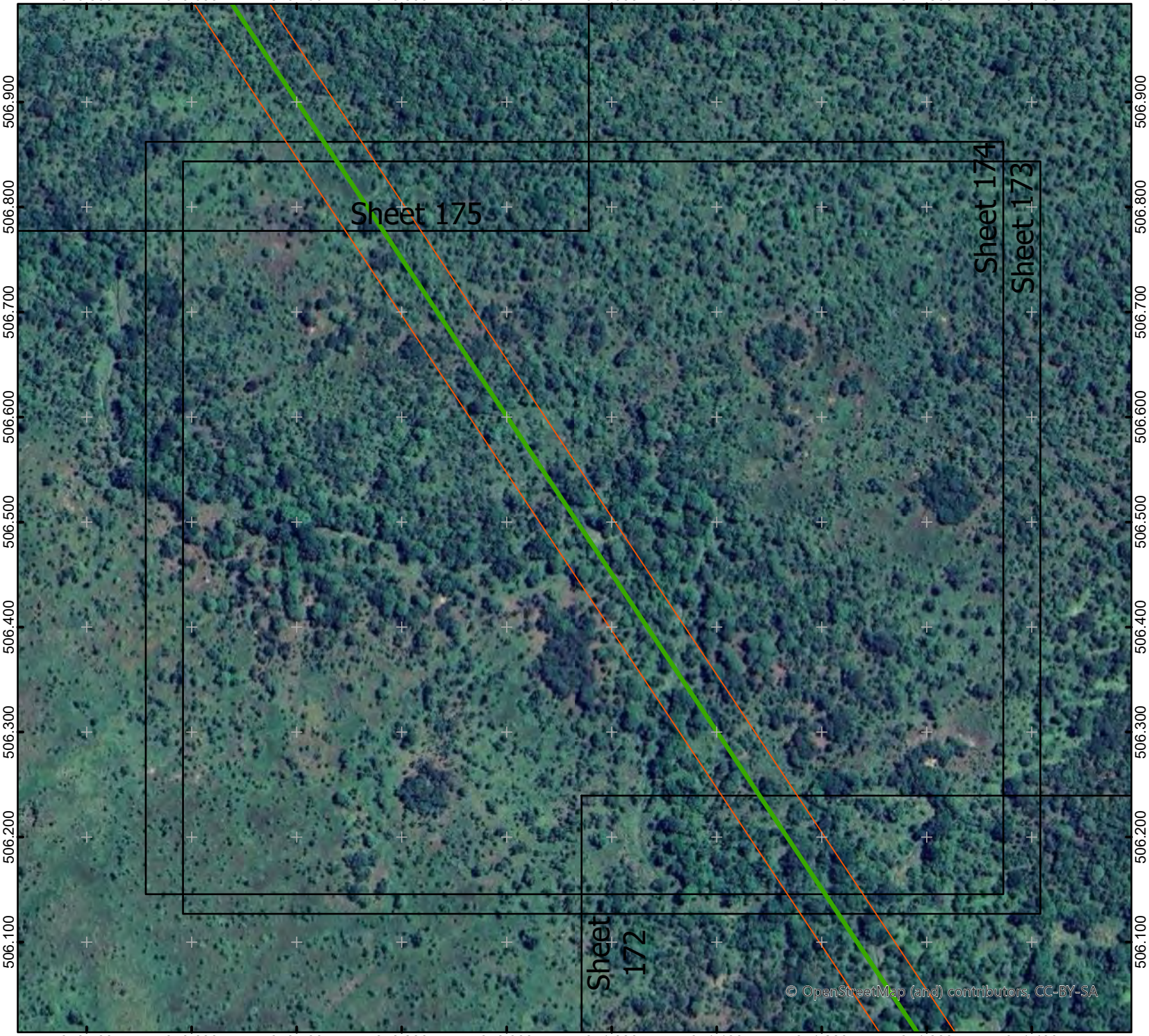
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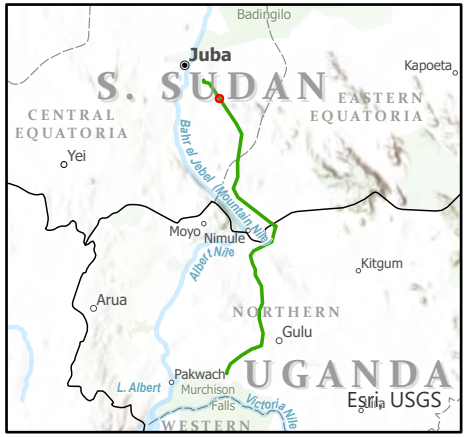
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

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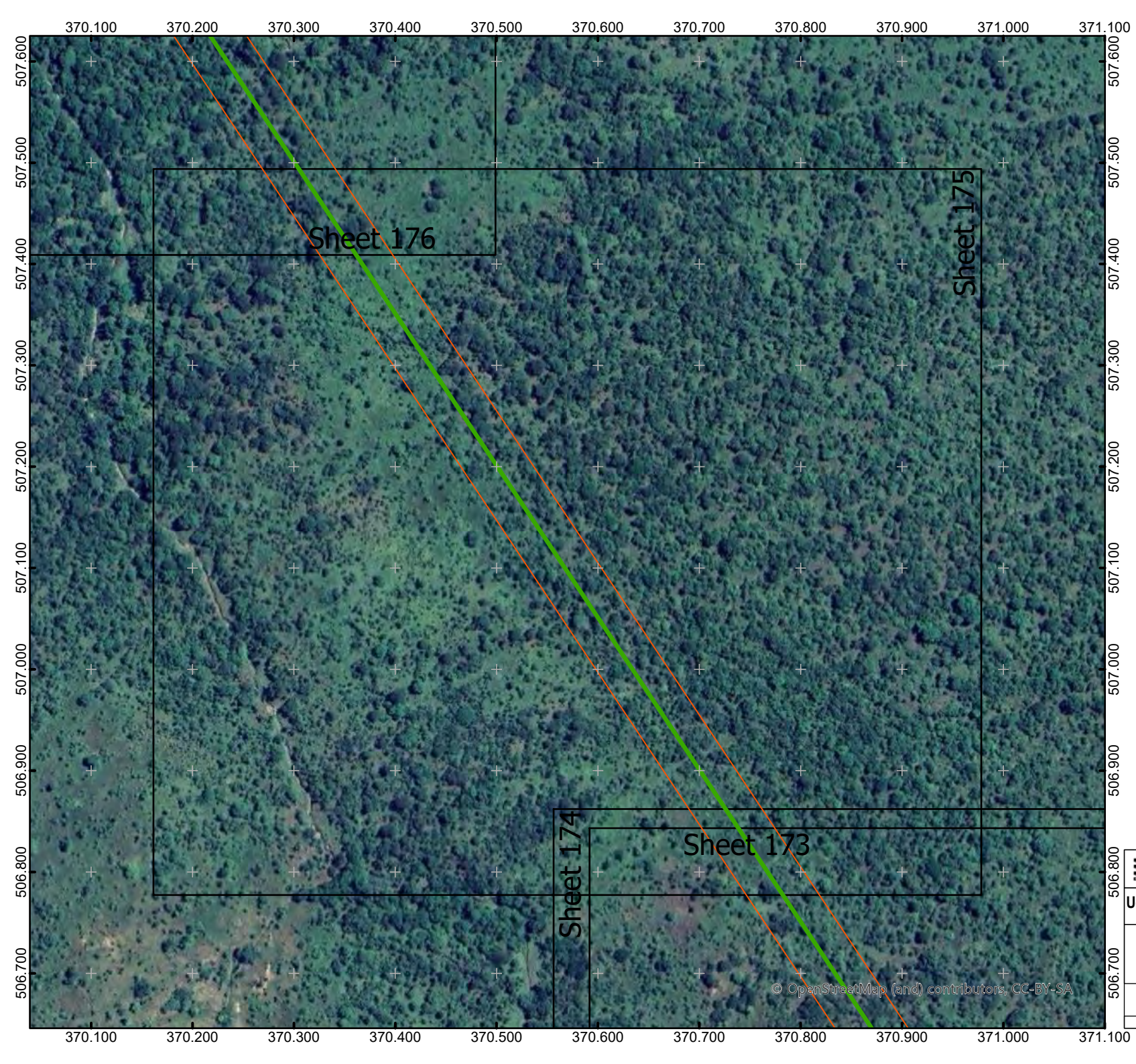
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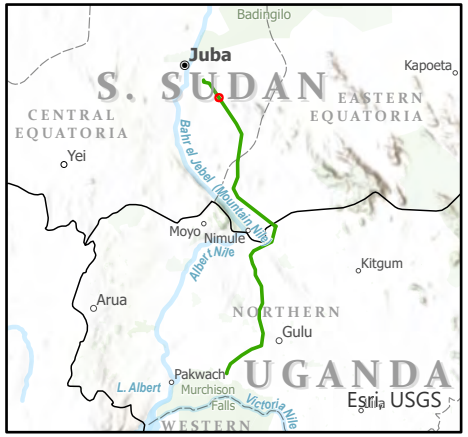
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Uganda-South Sudan 400 kV Interconnection Line Project

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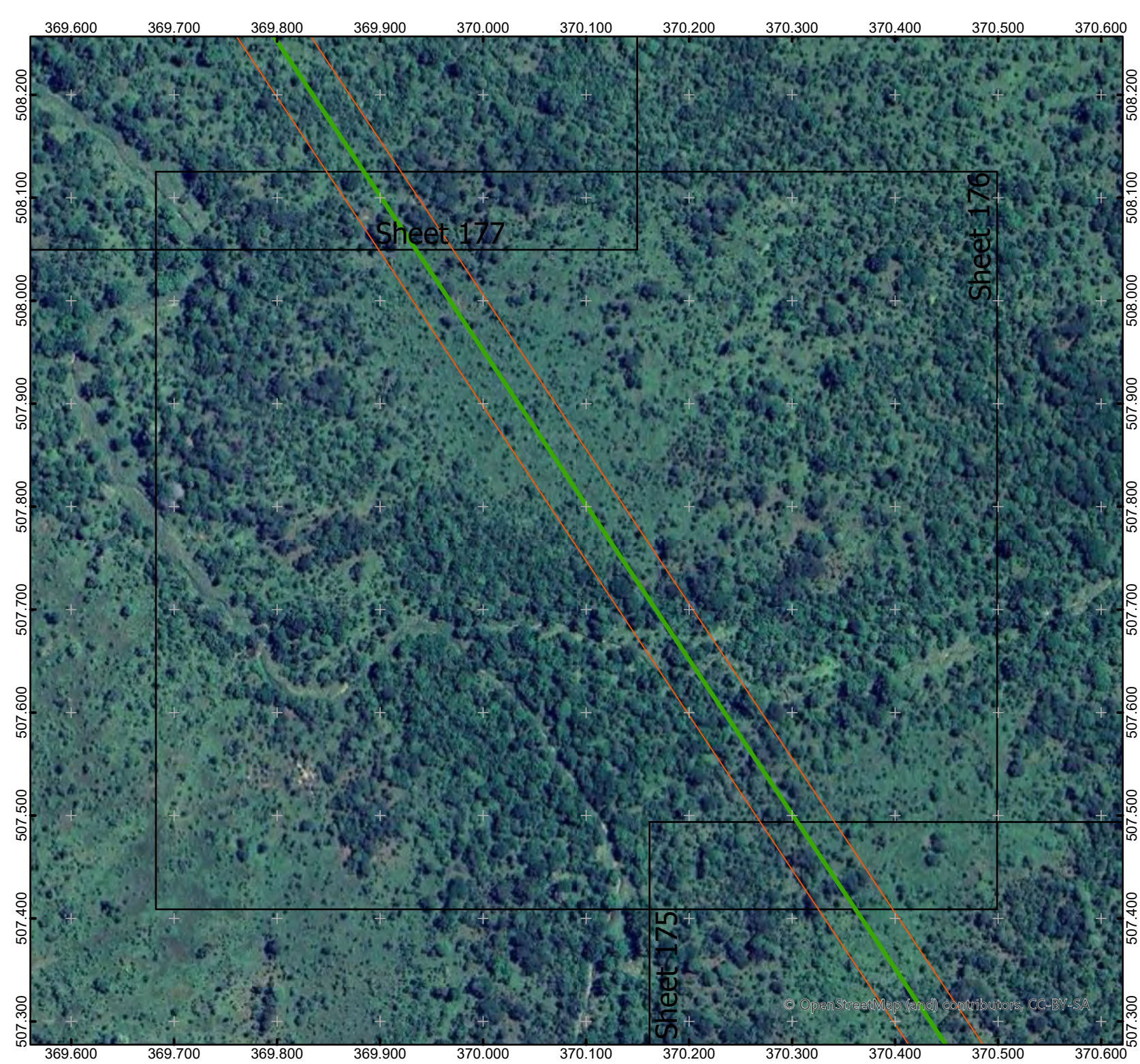
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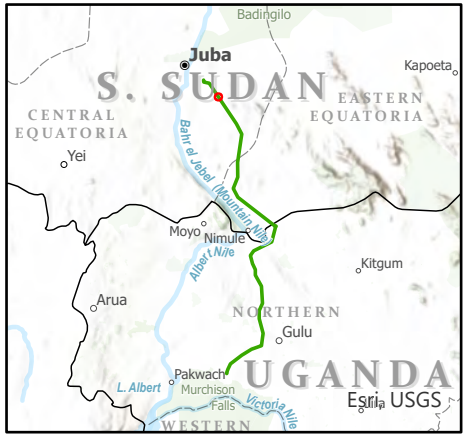
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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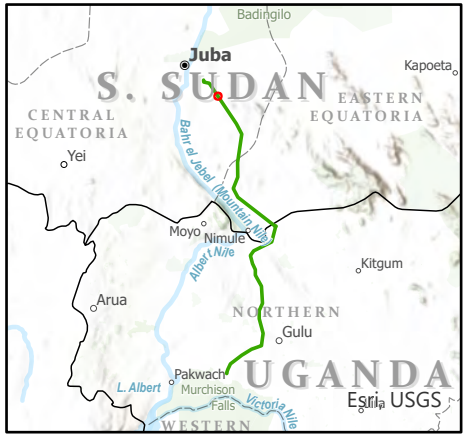
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Uganda-South Sudan 400 kV Interconnection Line Project

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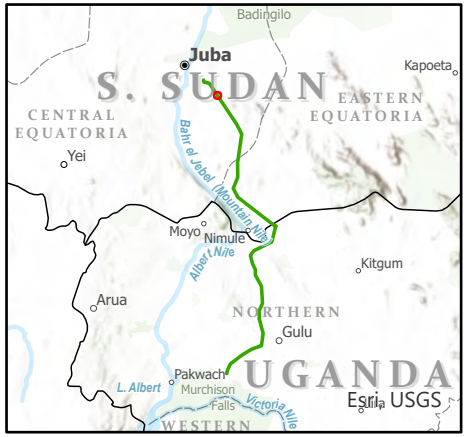
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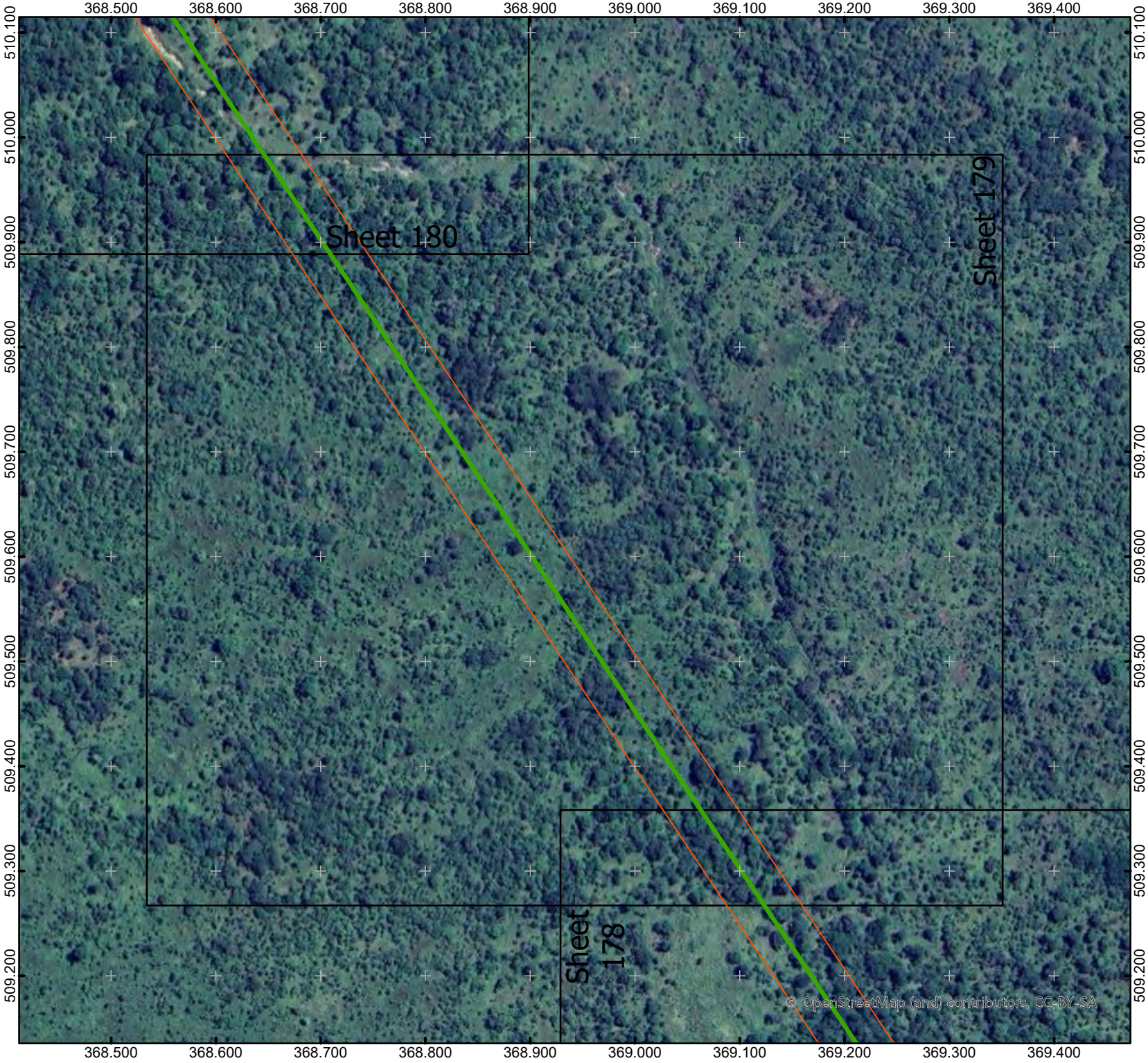
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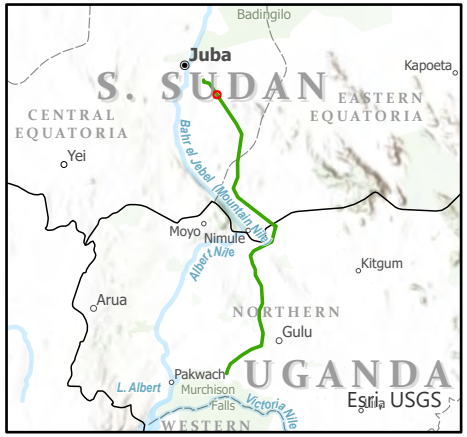
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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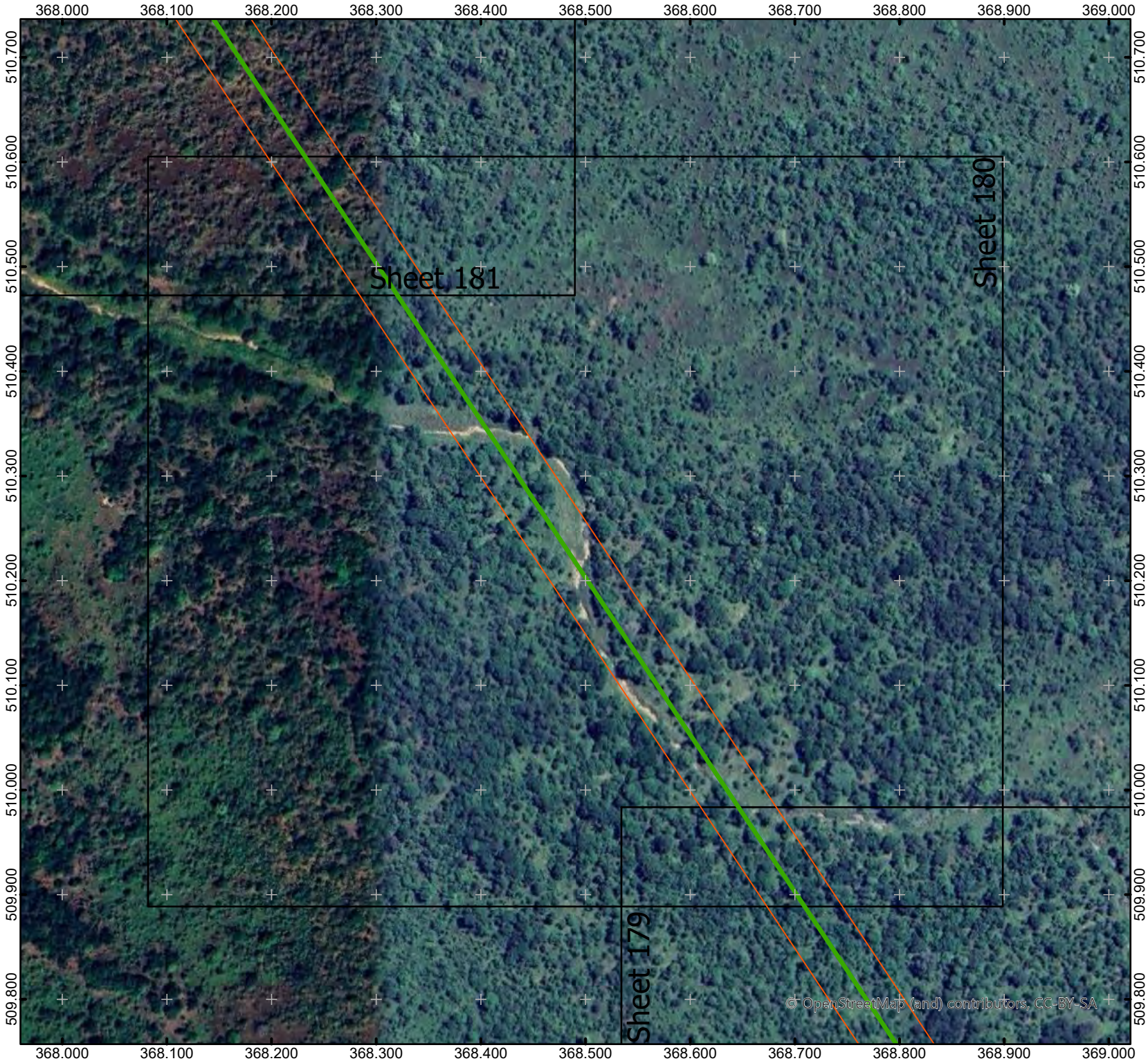
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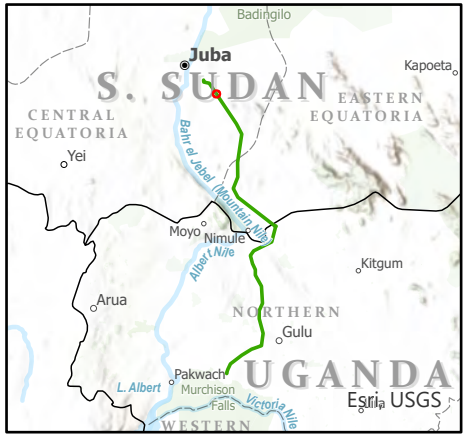
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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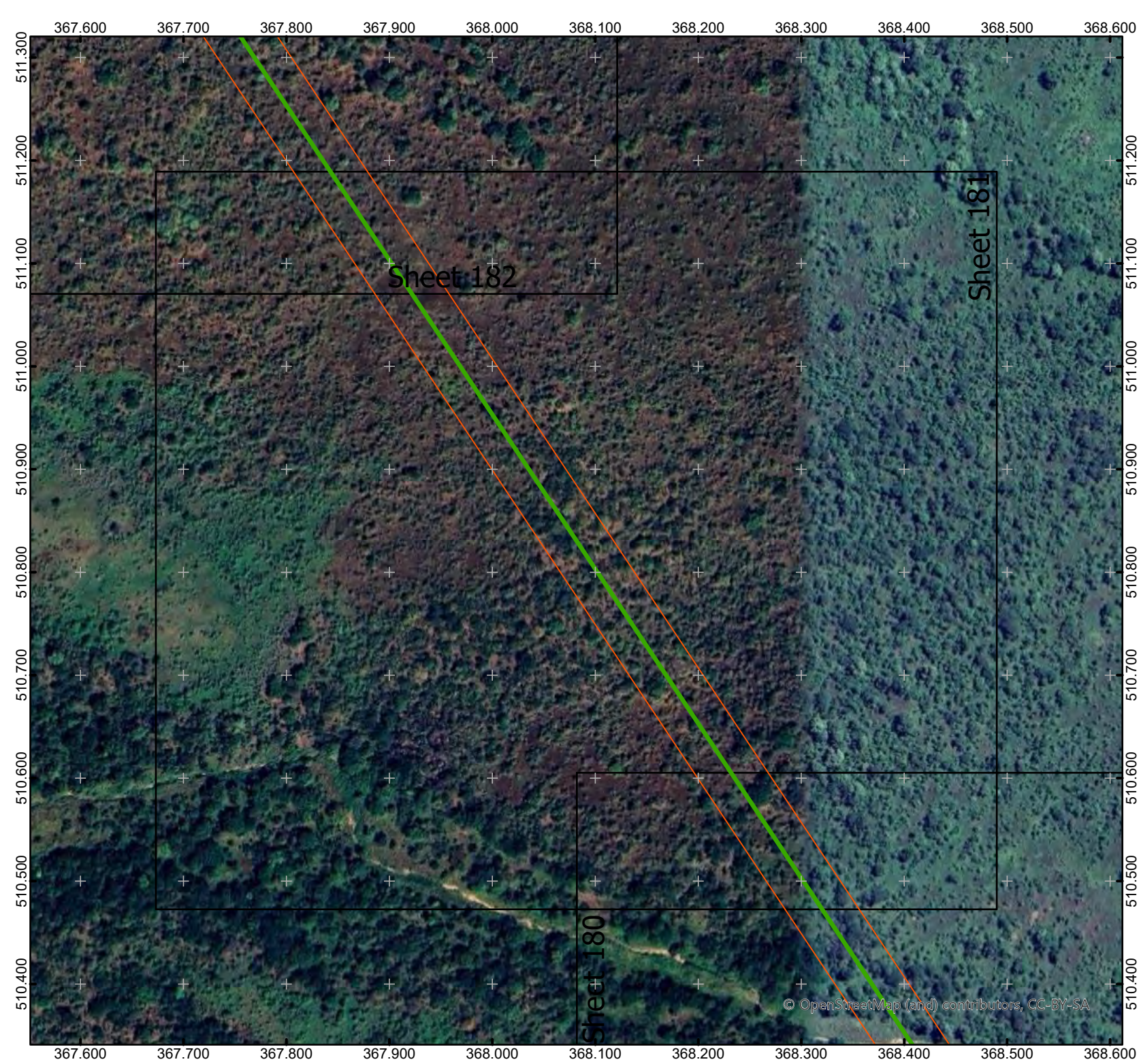
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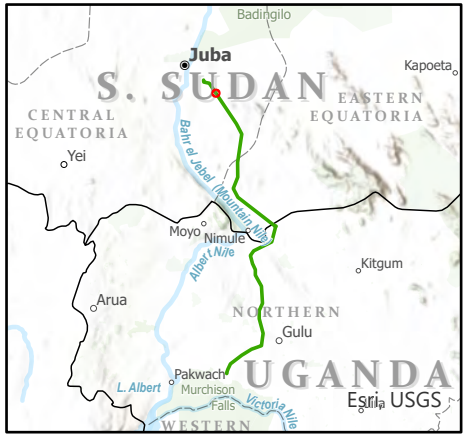
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Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
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Proposed transmission line (Uganda section)

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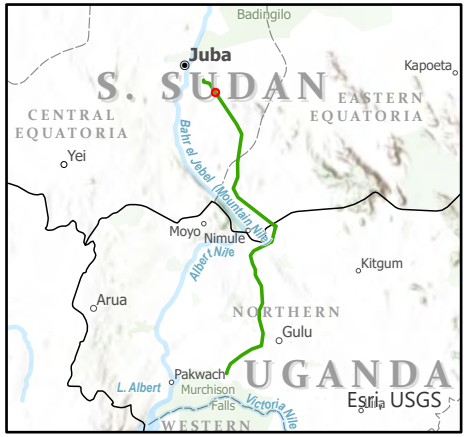
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Proposed transmission line (Satellite map)
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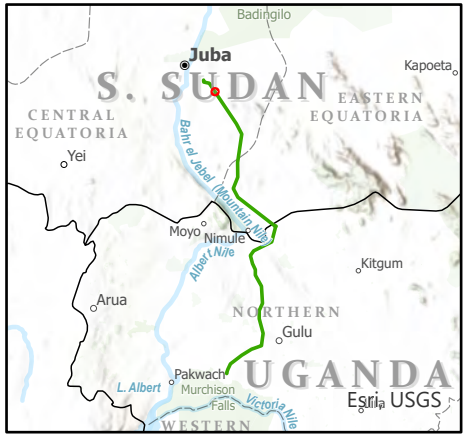
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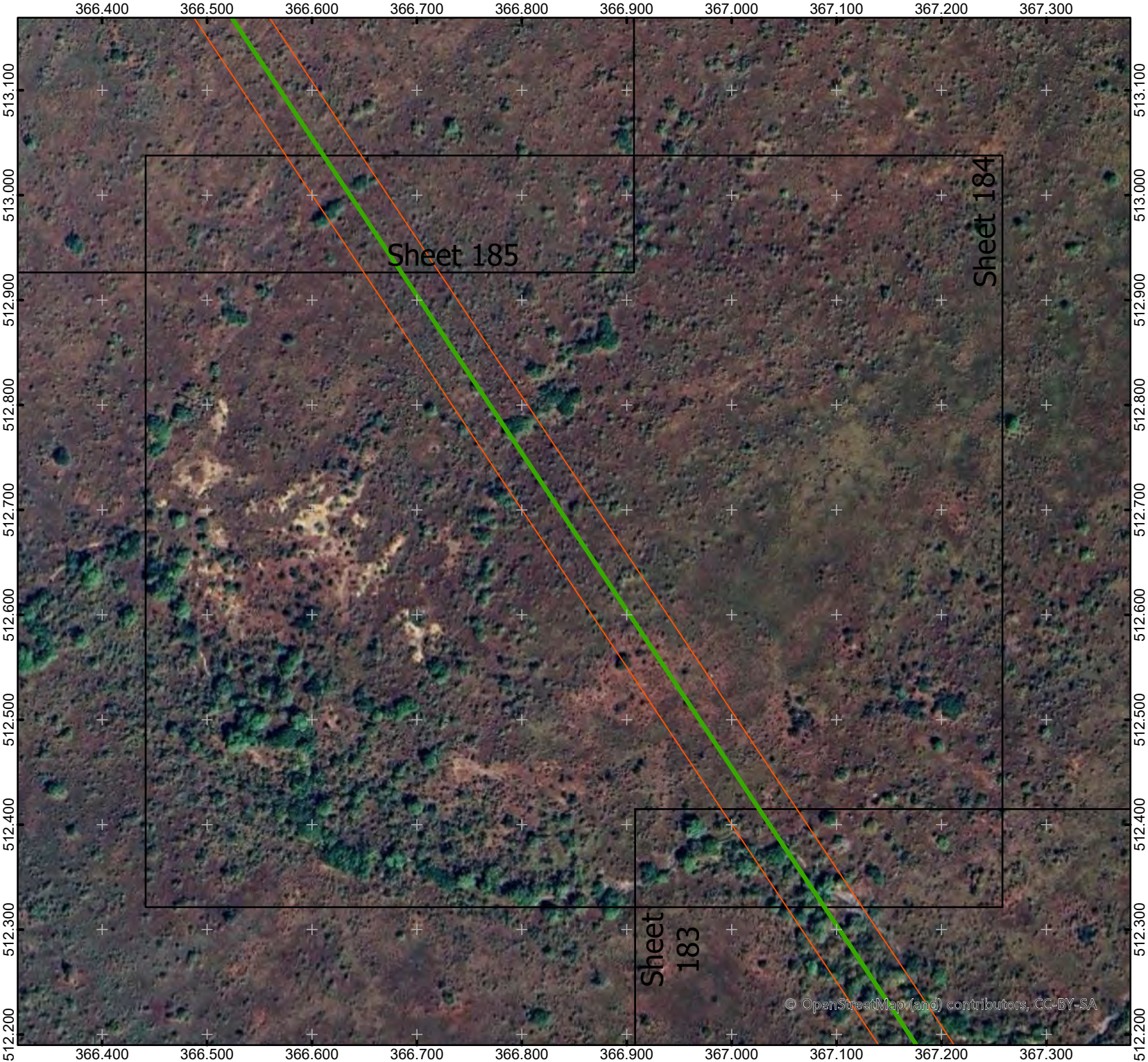
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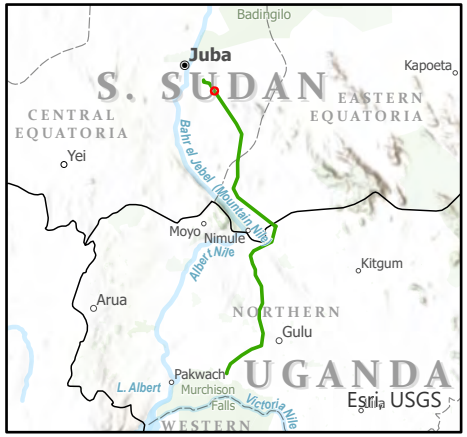
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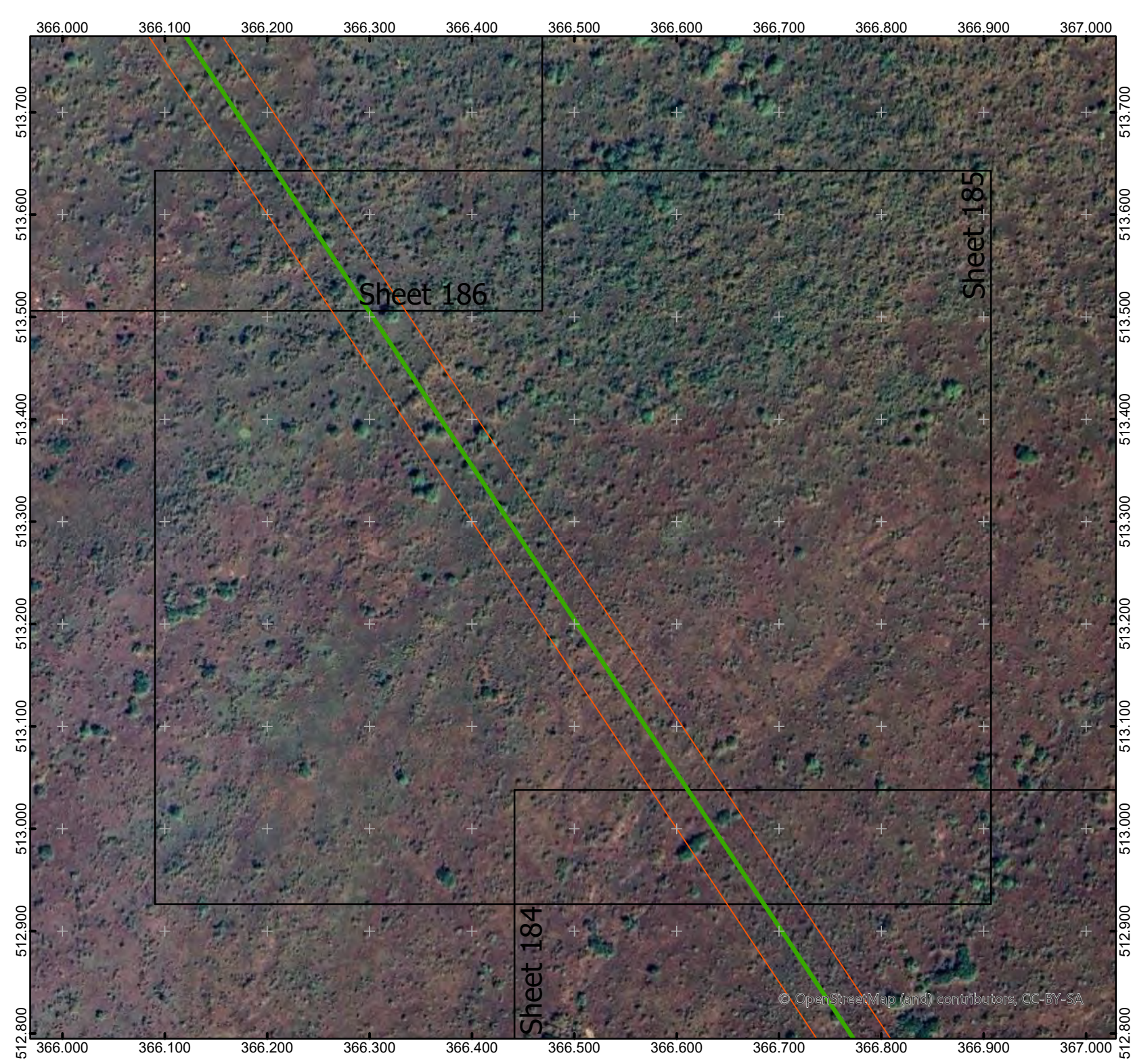
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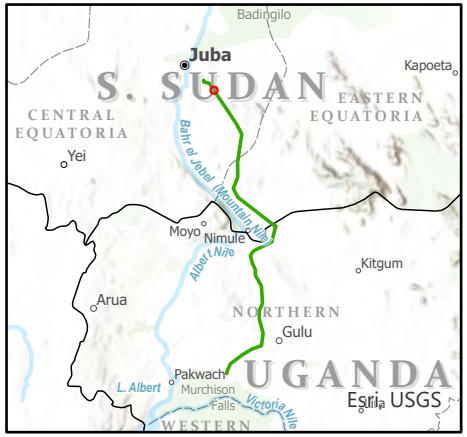
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Proposed transmission line (Satellite map)
South Sudan

Size A4

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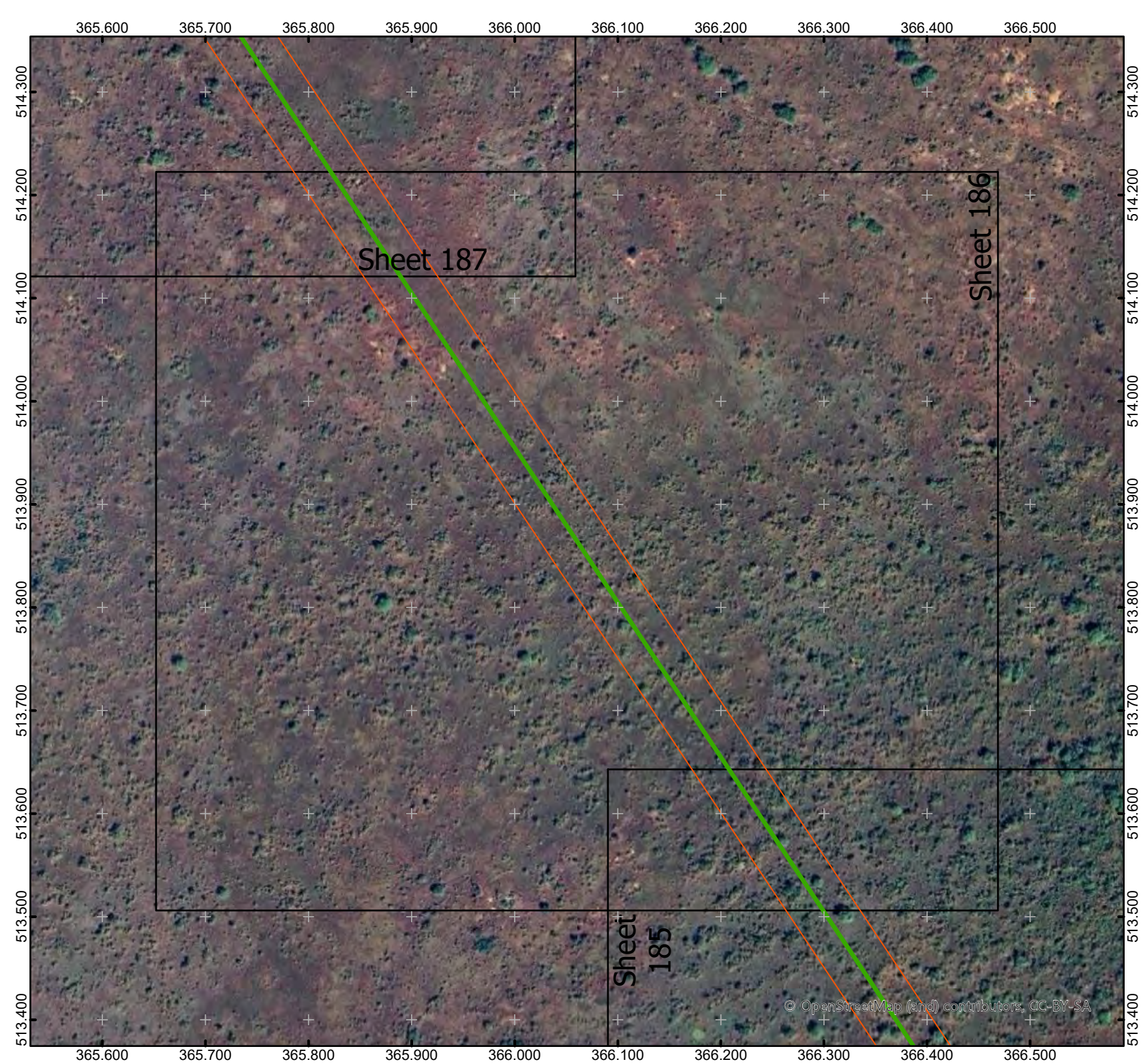
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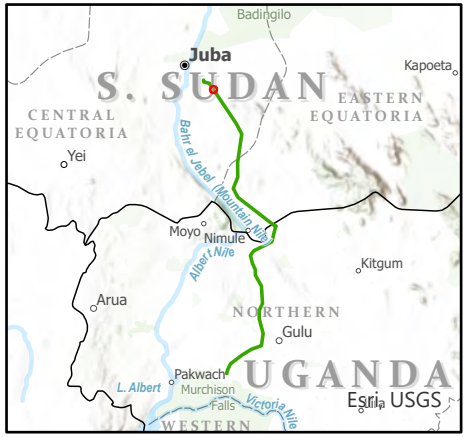
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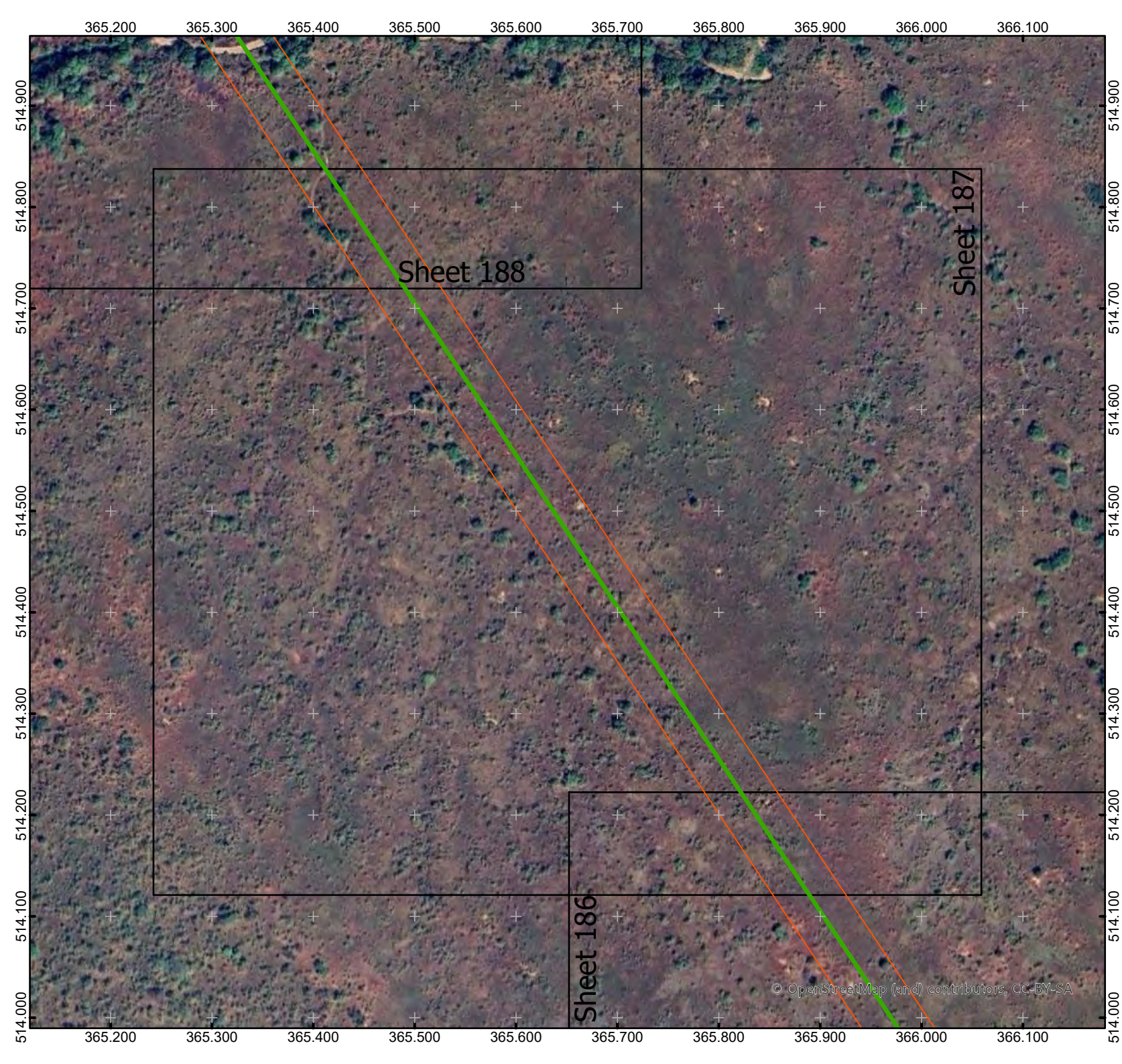
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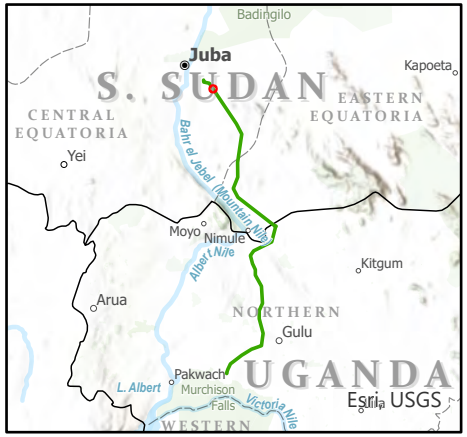
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Map sources: Google Earth

Uganda-South Sudan 400 kV Interconnection Line Project

Proposed transmission line (Satellite map)
South Sudan

Size A4 Scale 1:5.000





Proposed transmission line (South Sudan section)

Proposed transmission line (Uganda section)

Direct Area of Influence

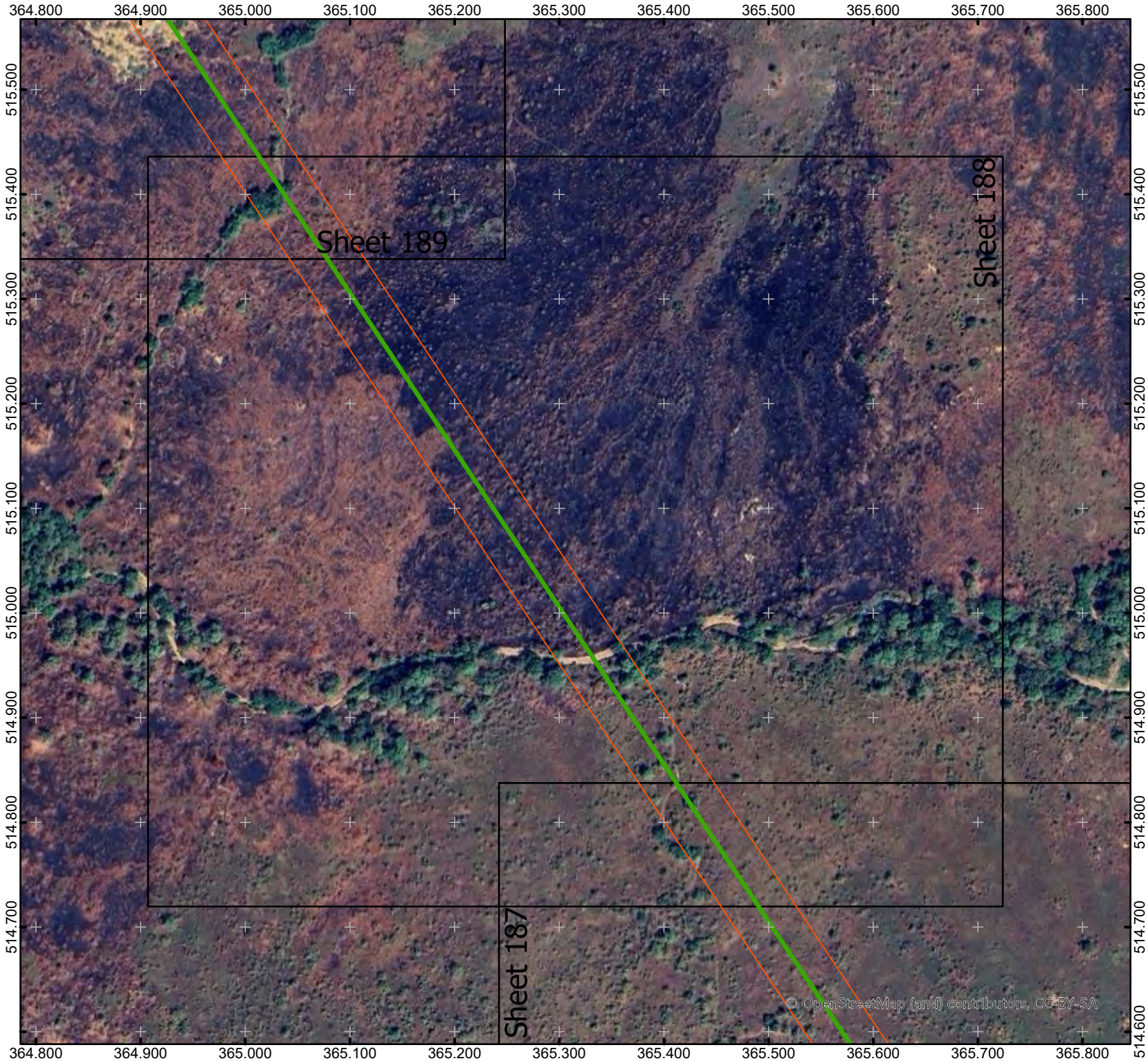
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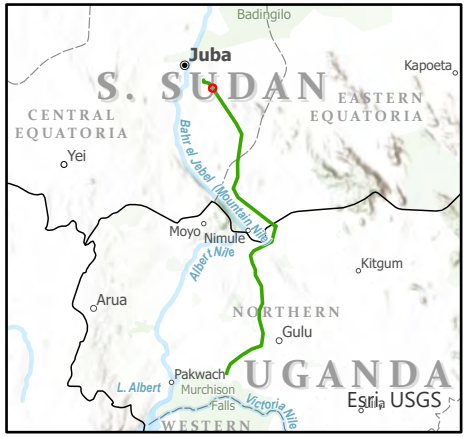
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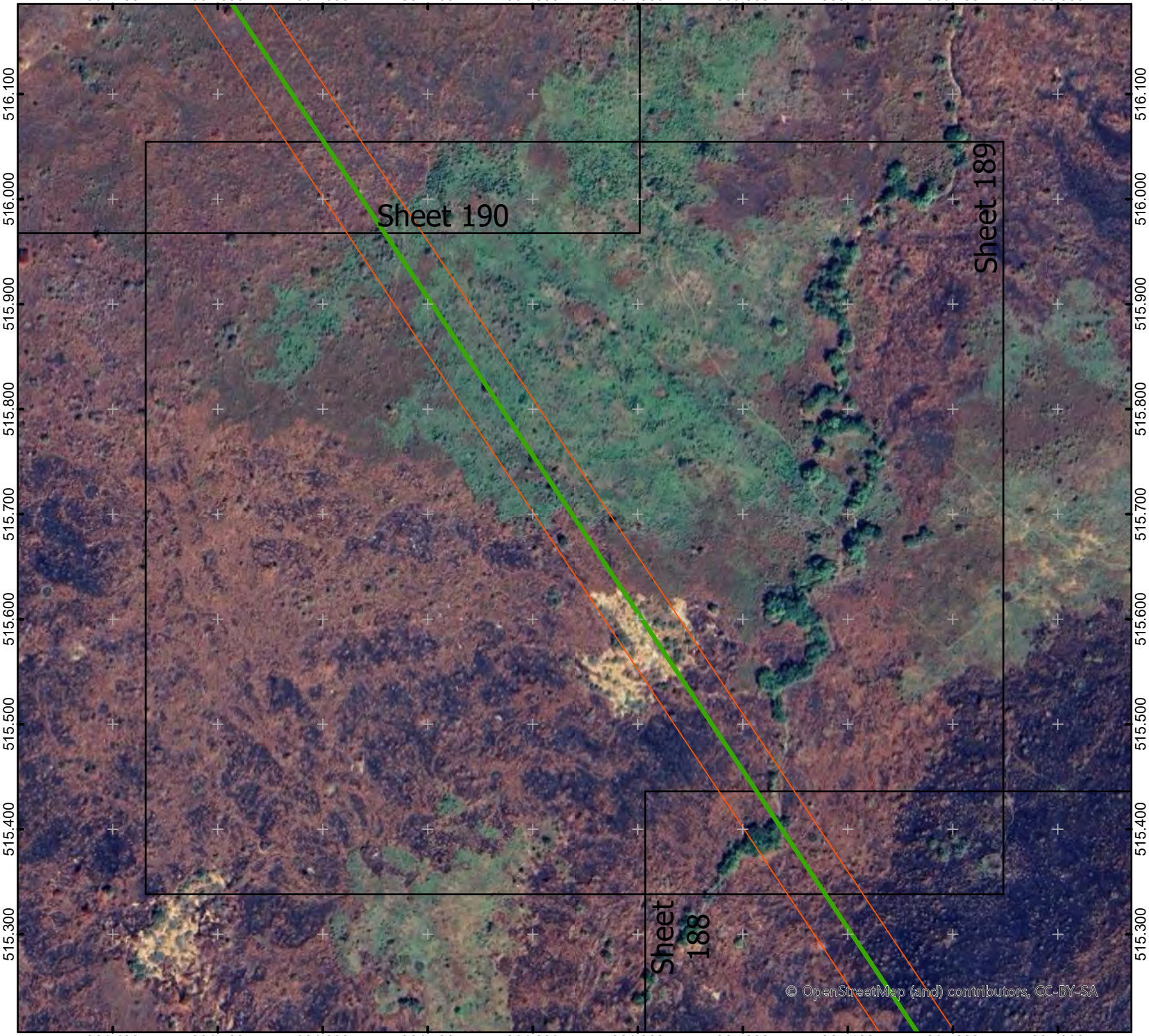
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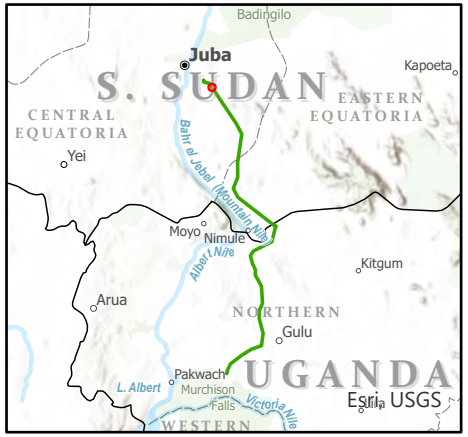
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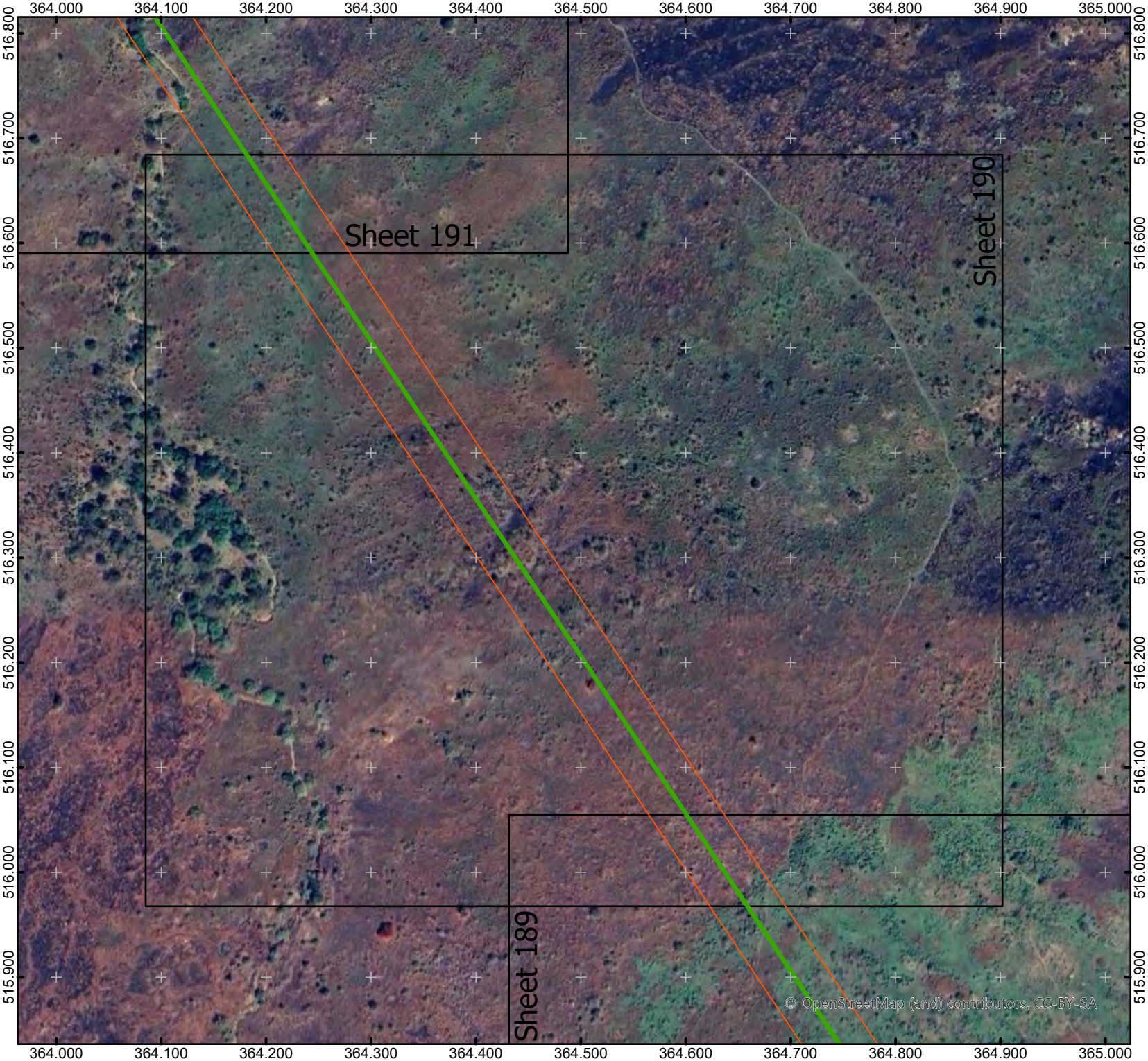
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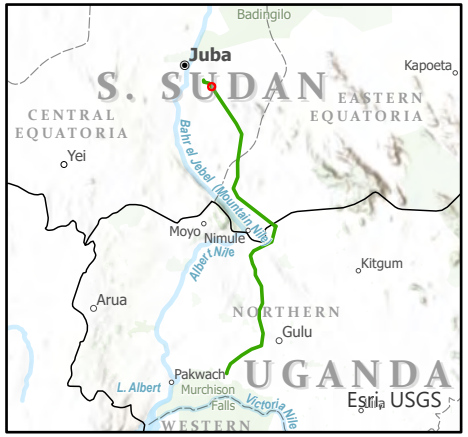
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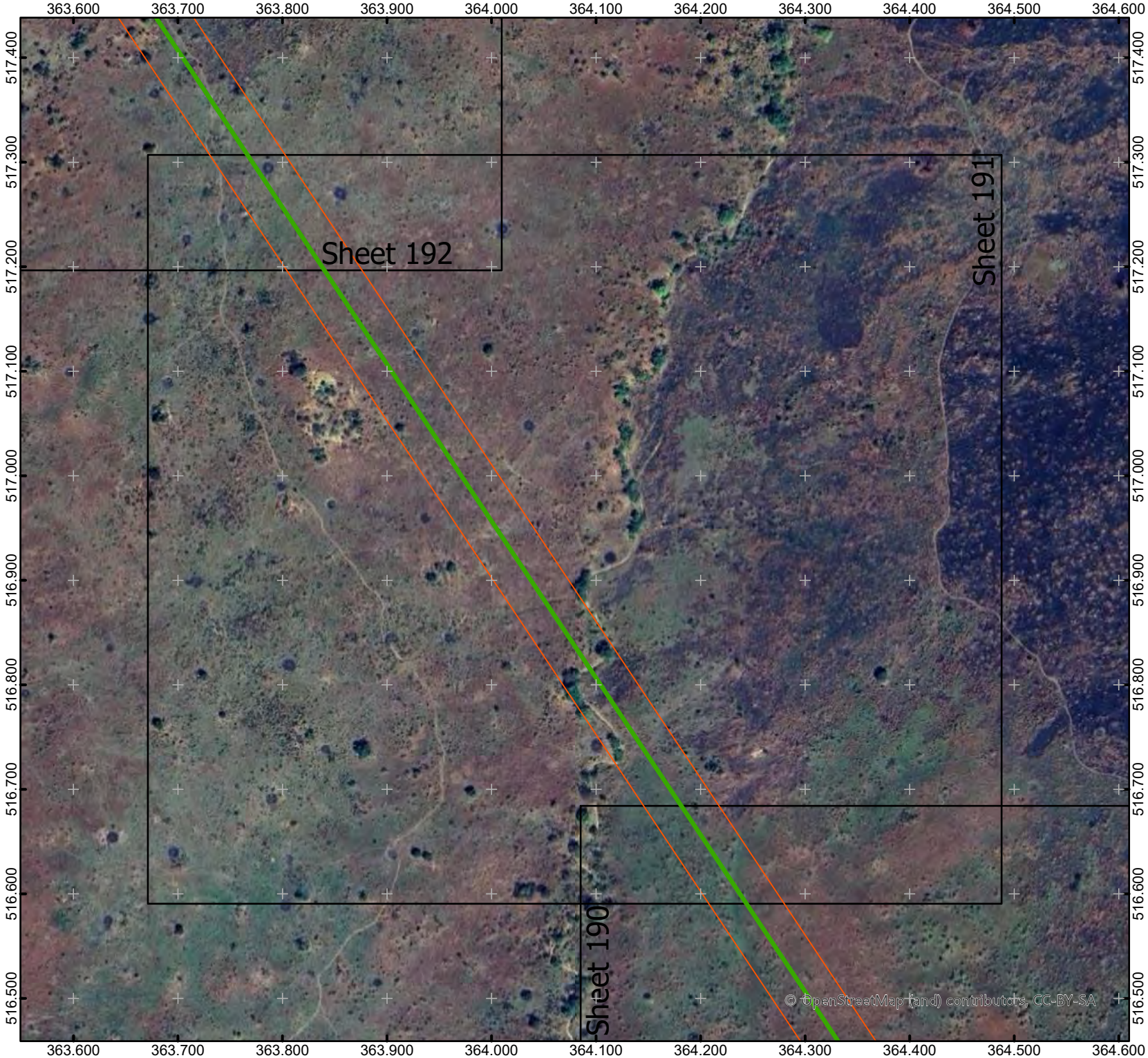
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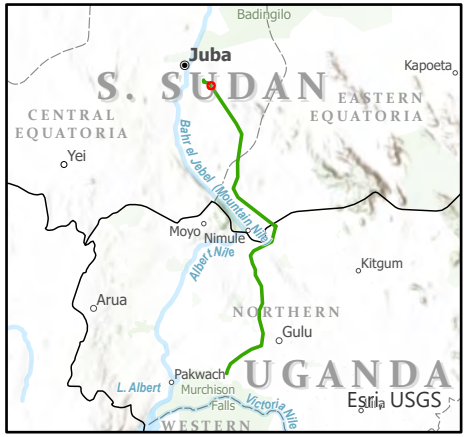
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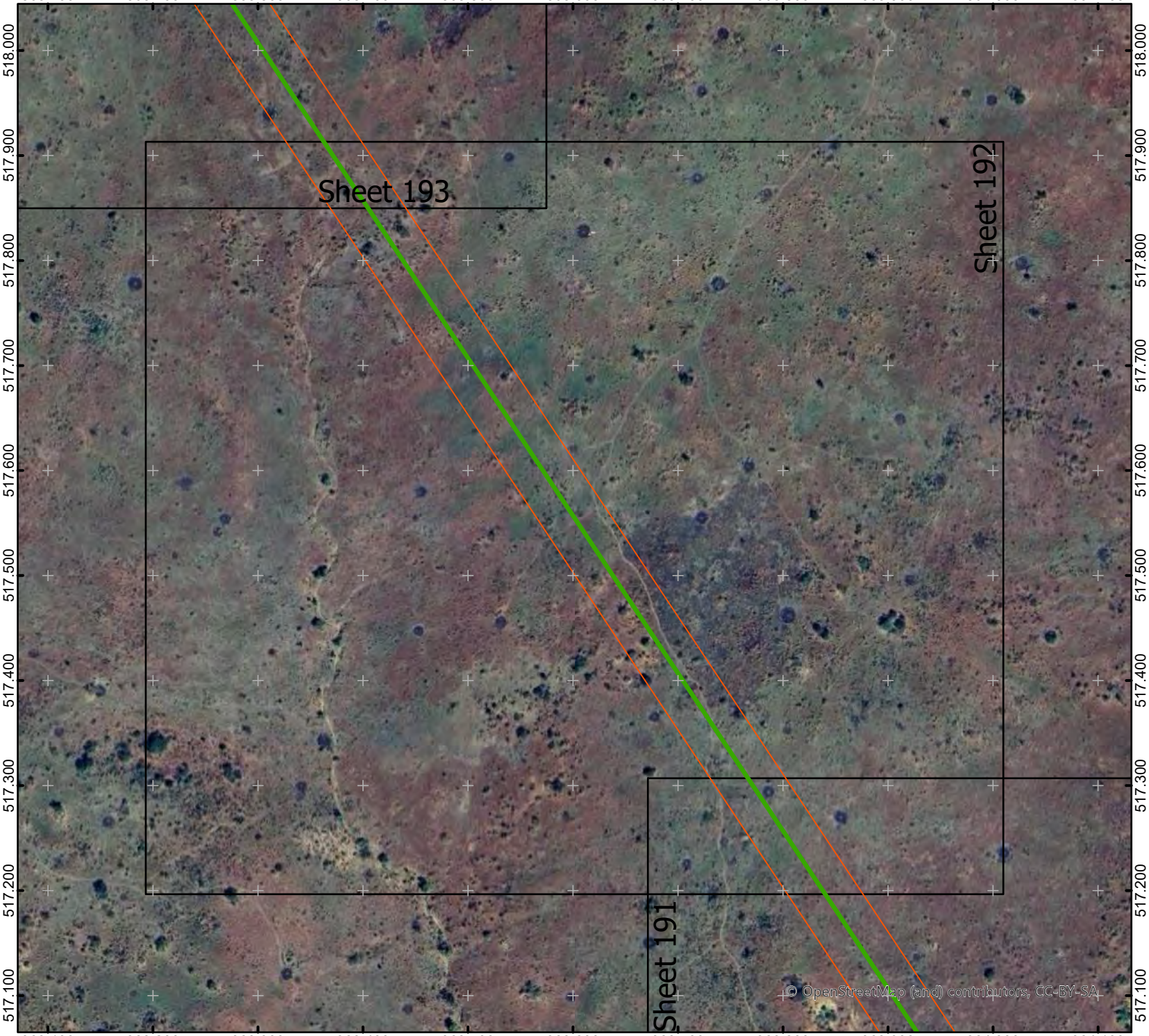
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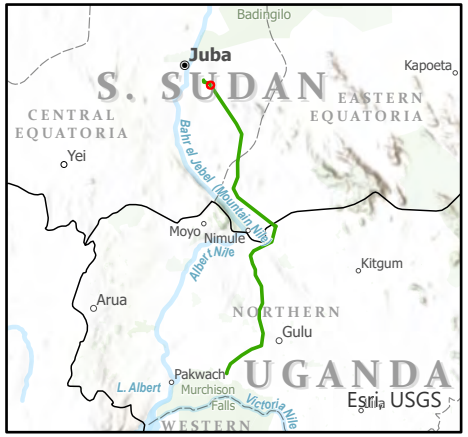
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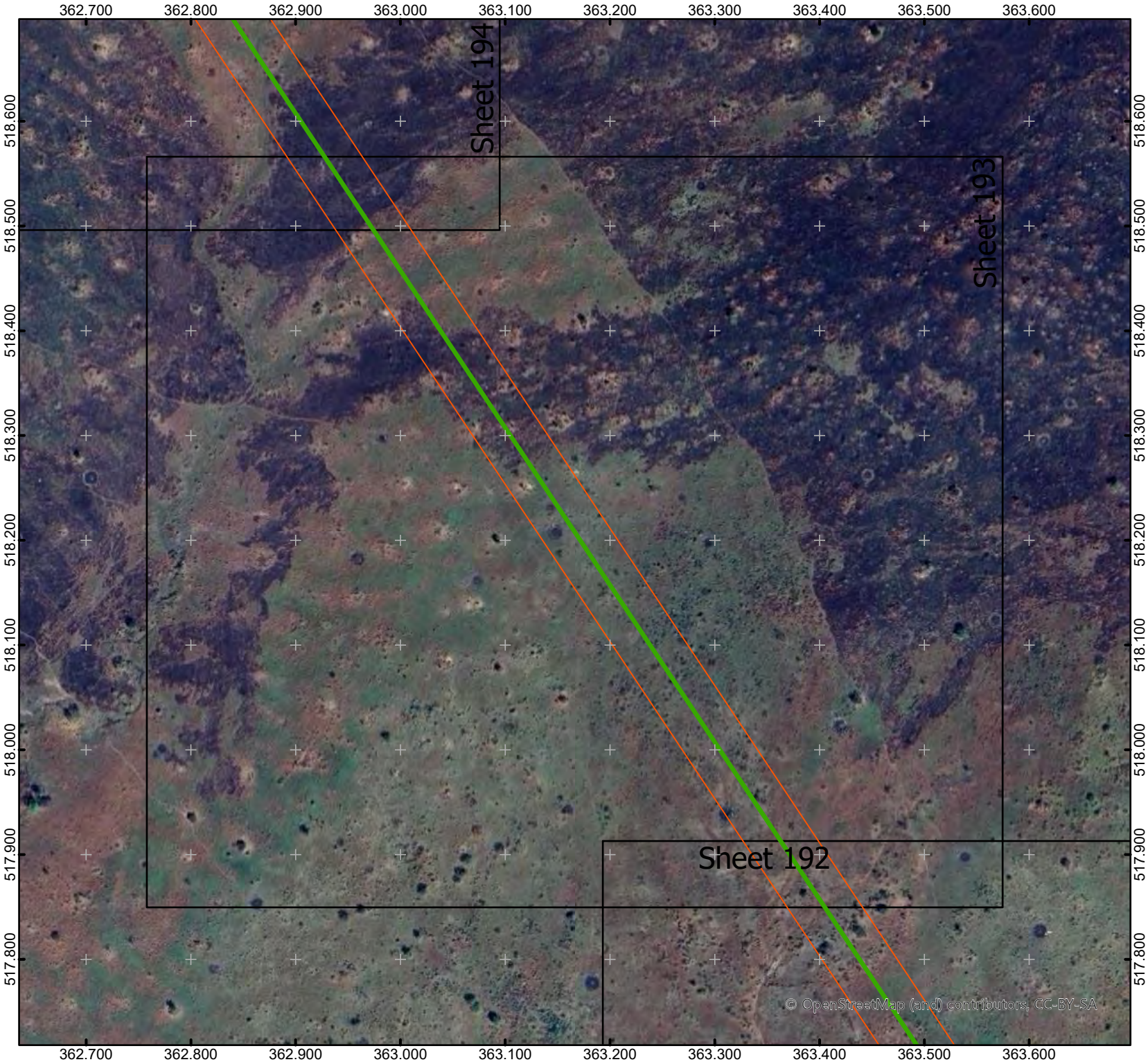
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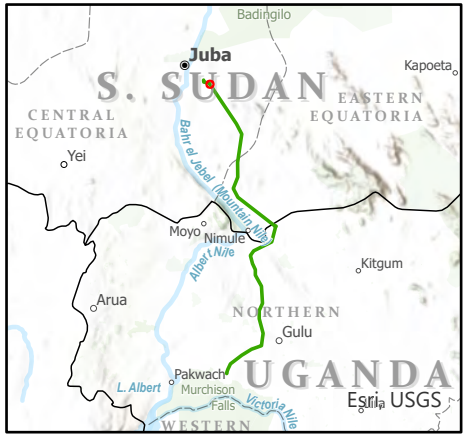
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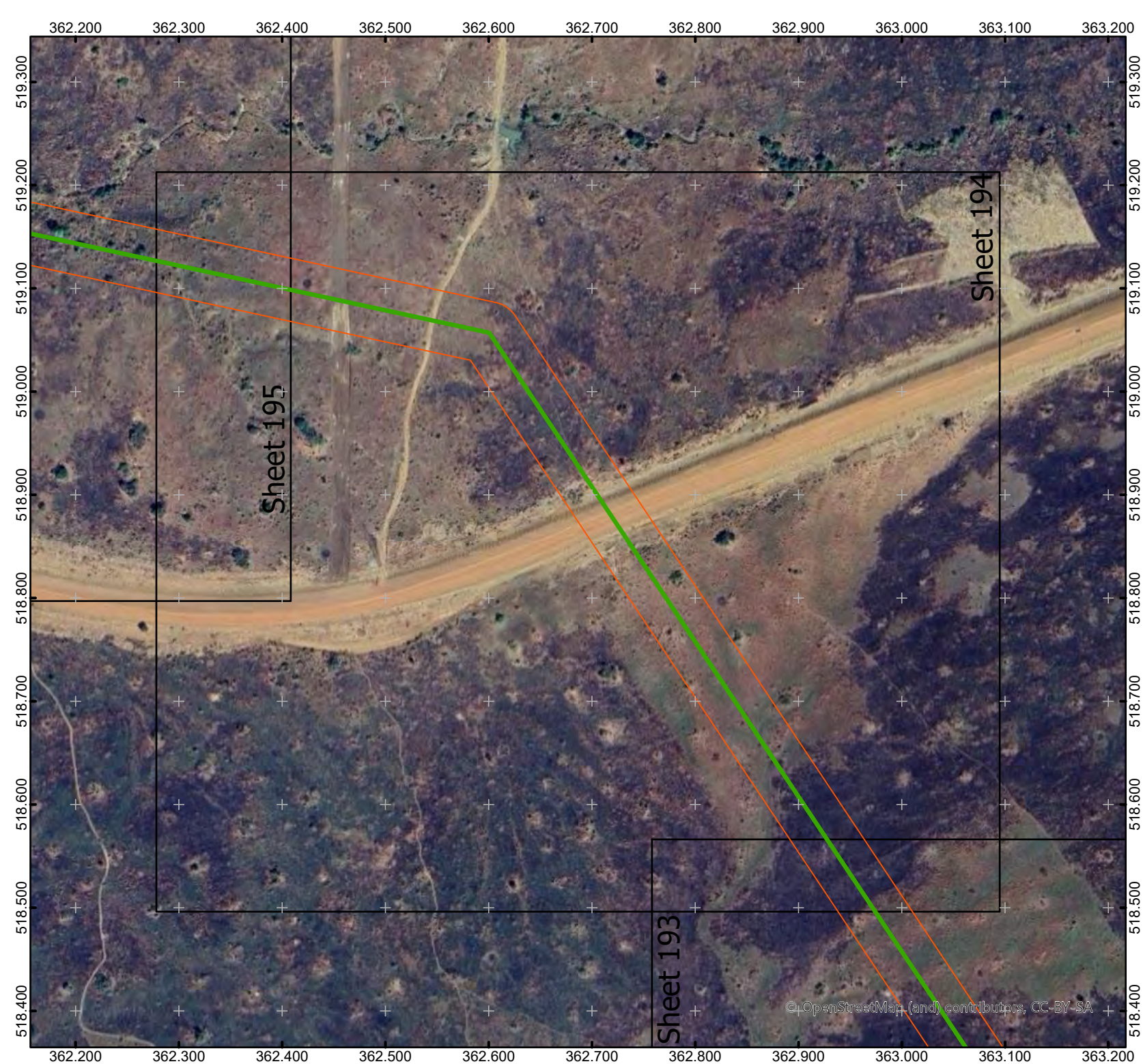
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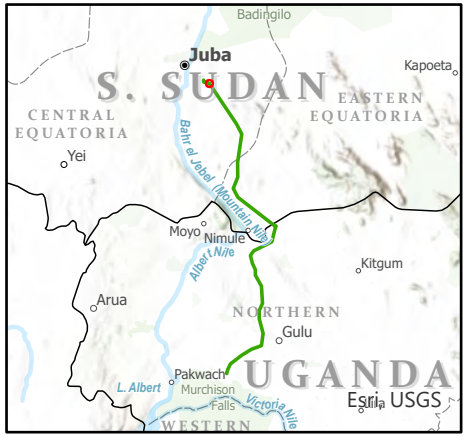
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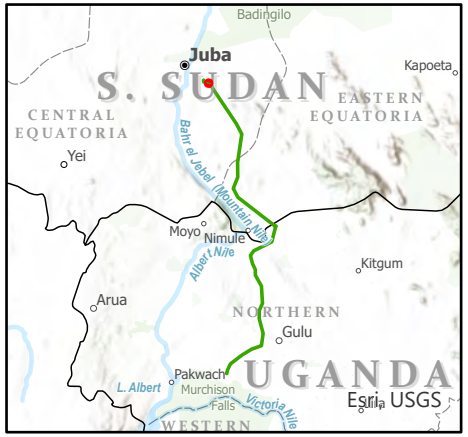
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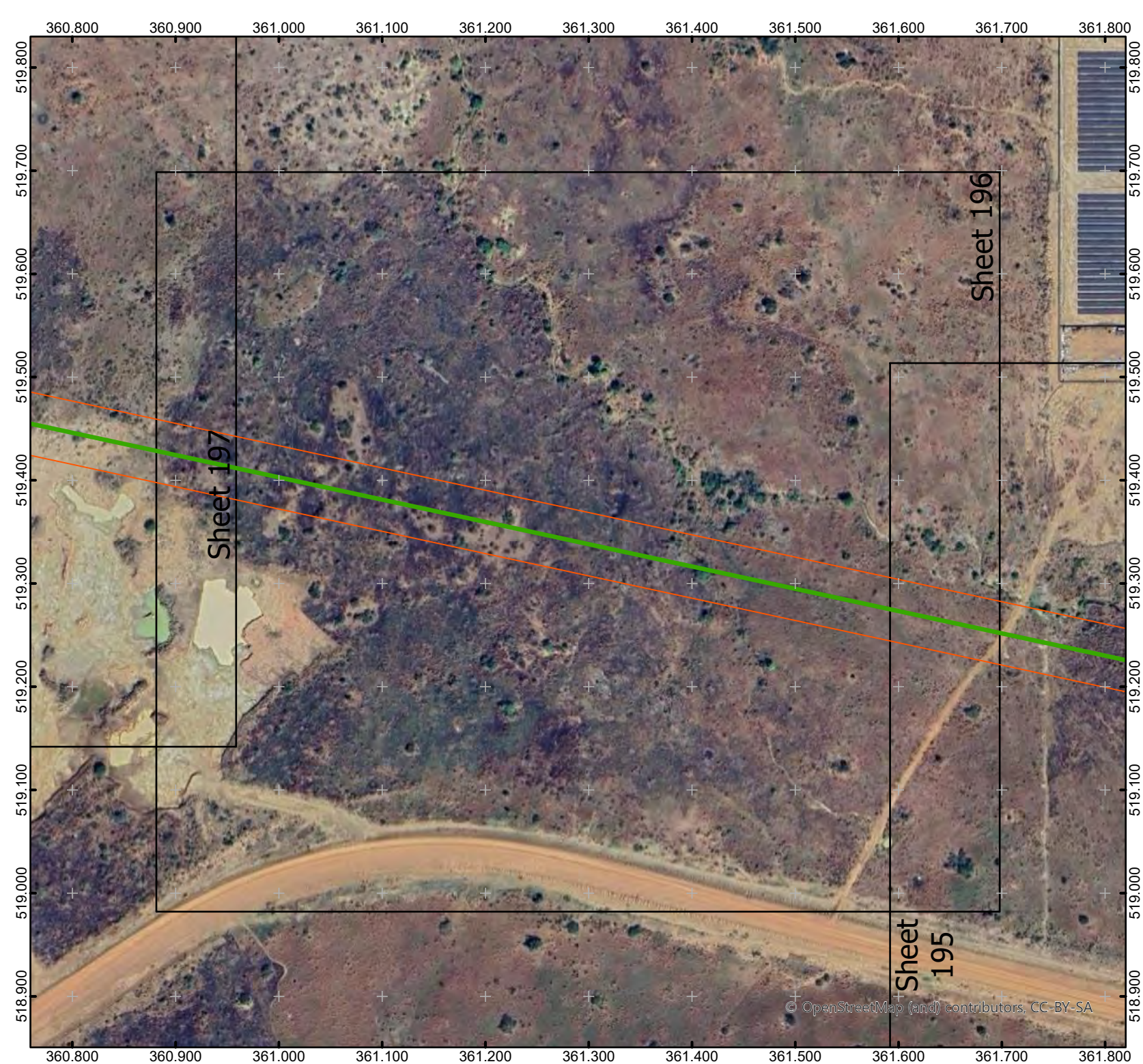
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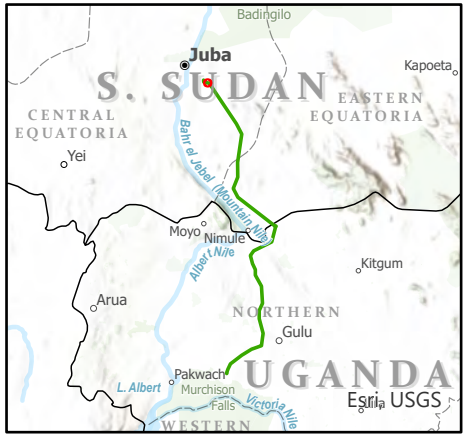
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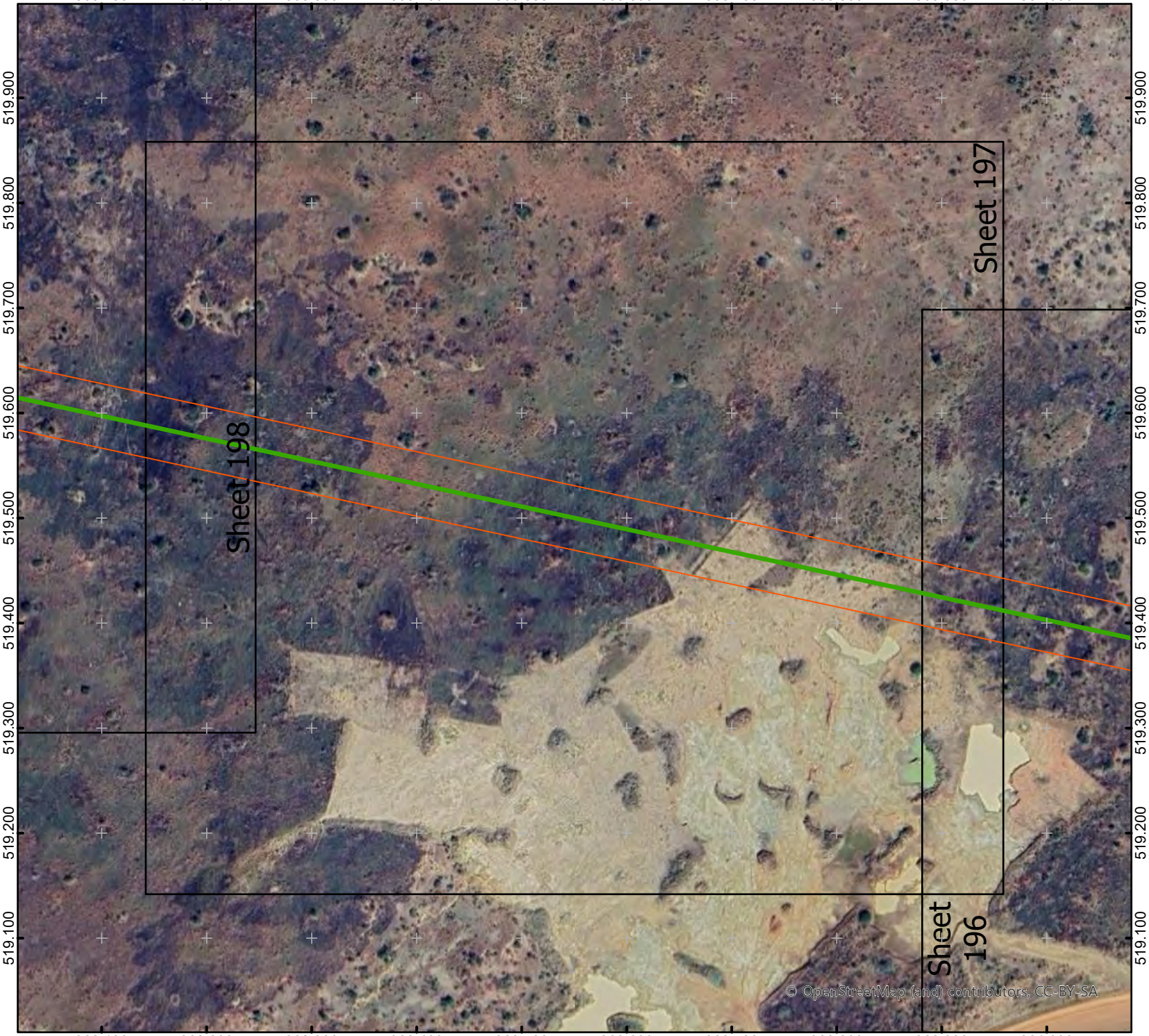
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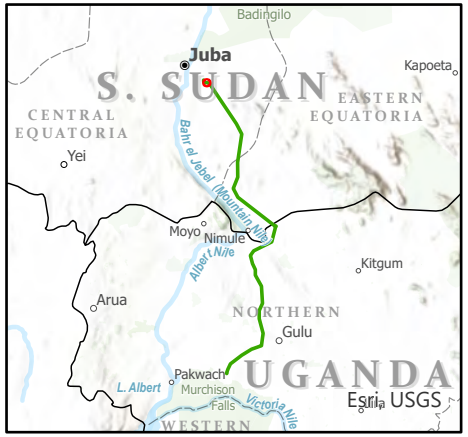
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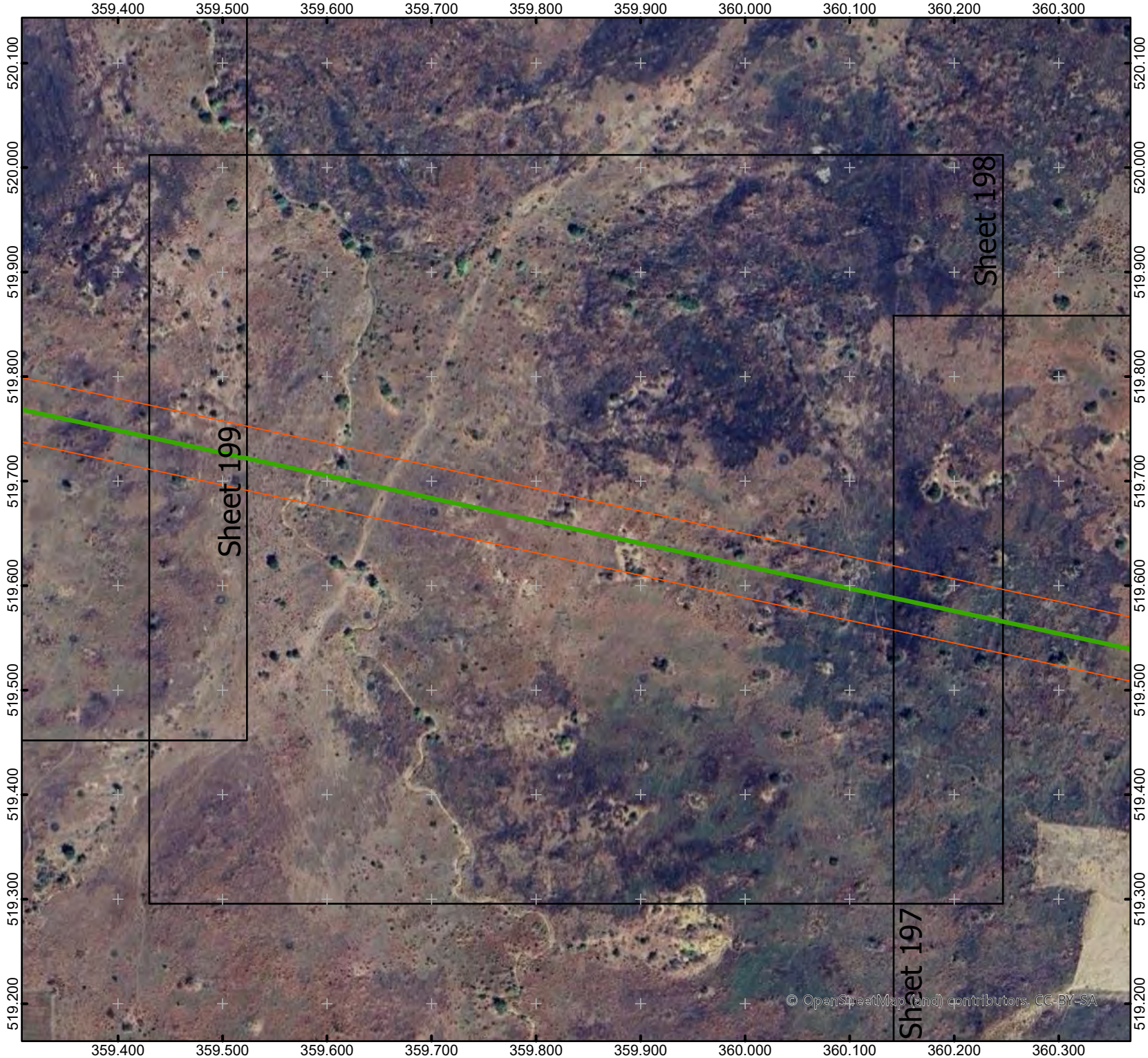
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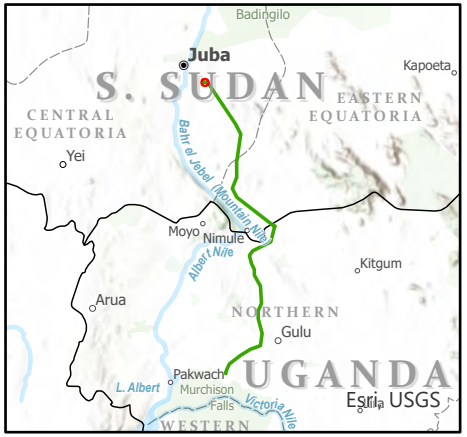
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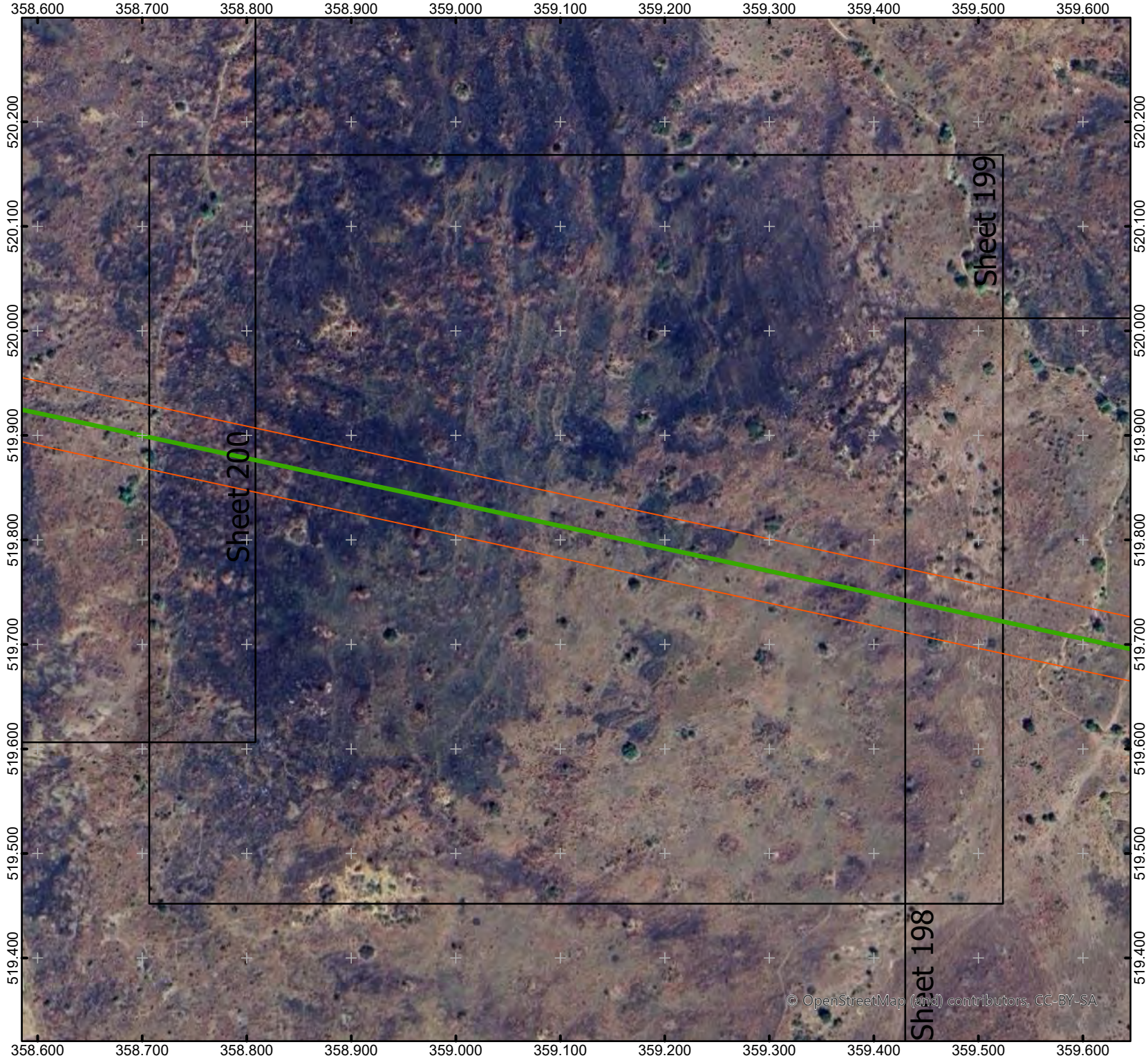
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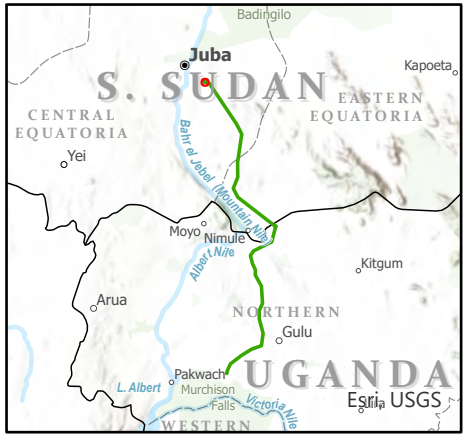
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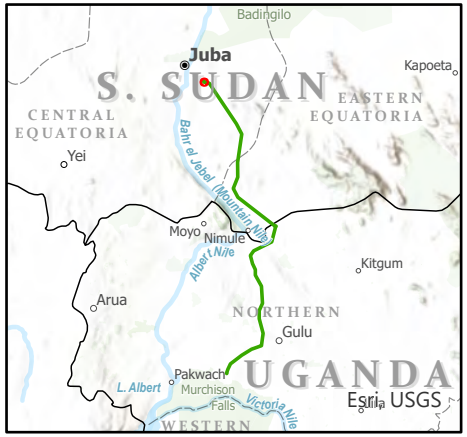
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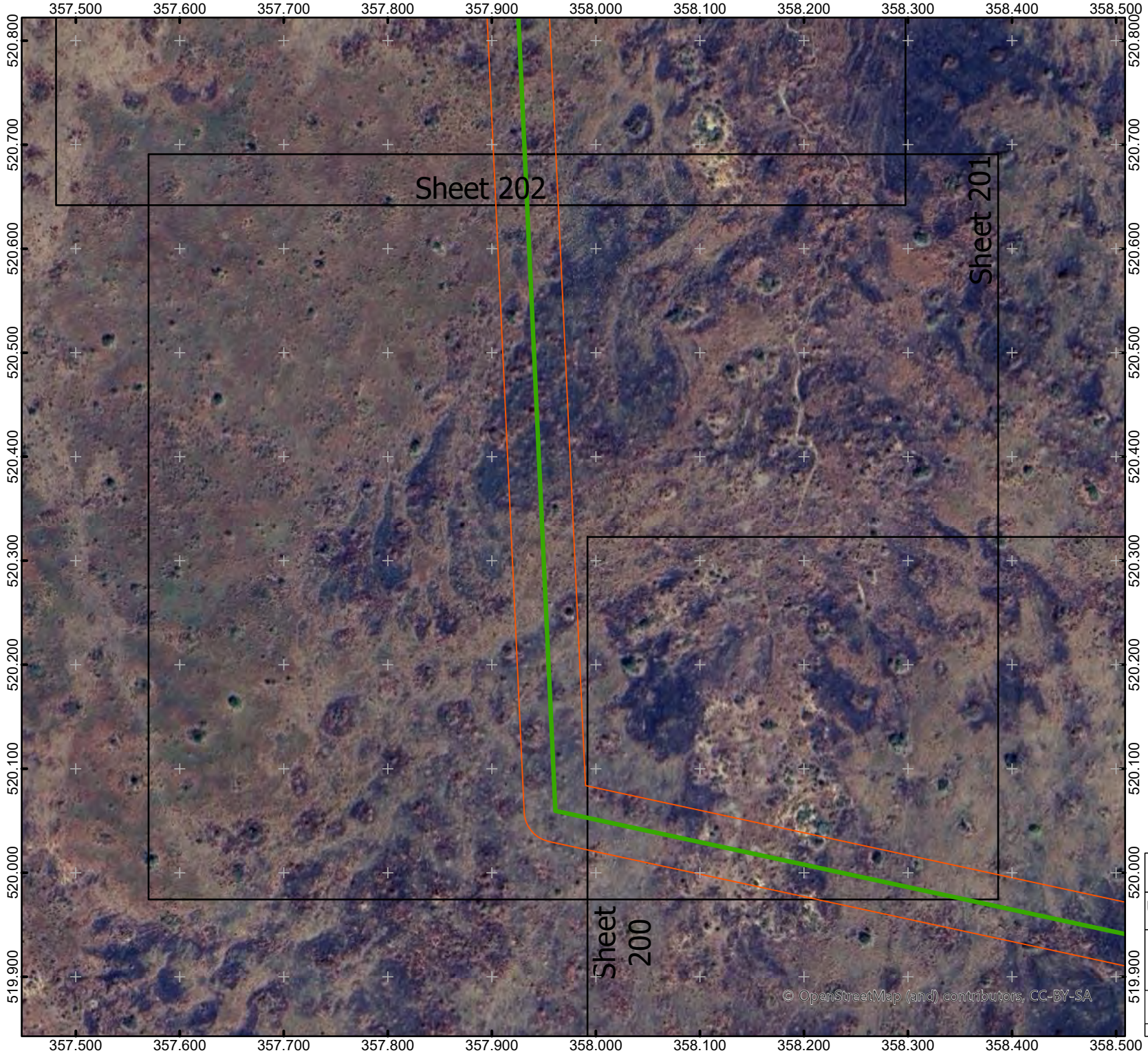
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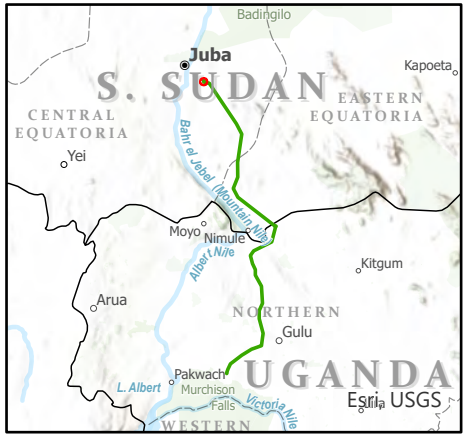
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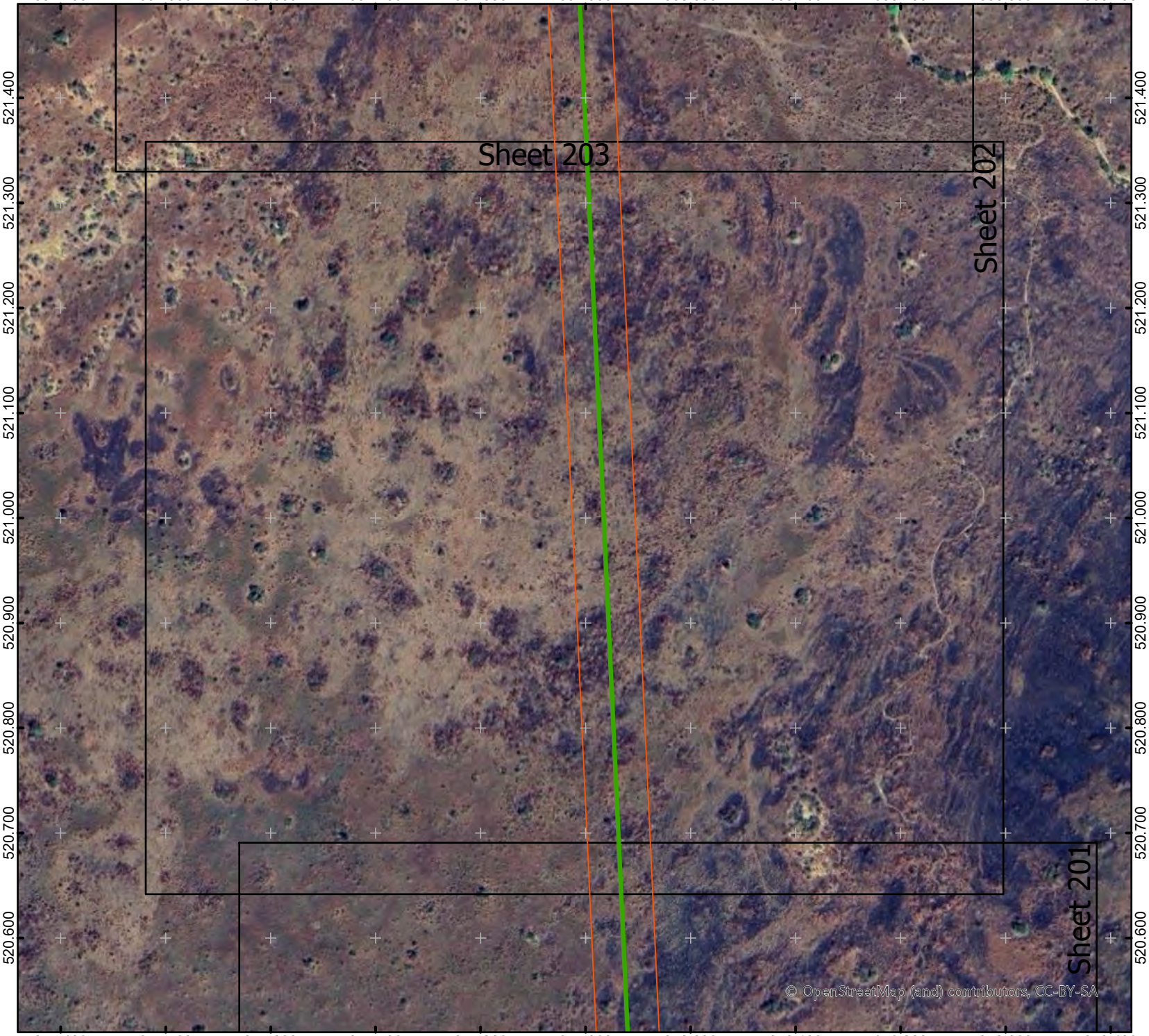
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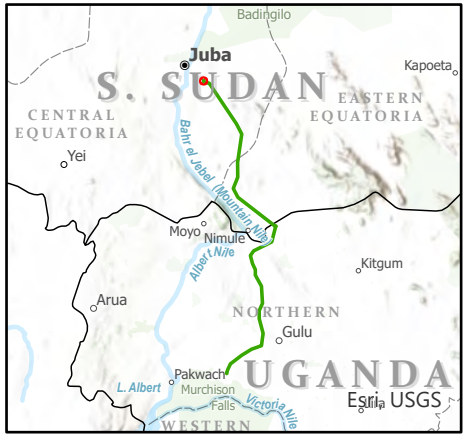
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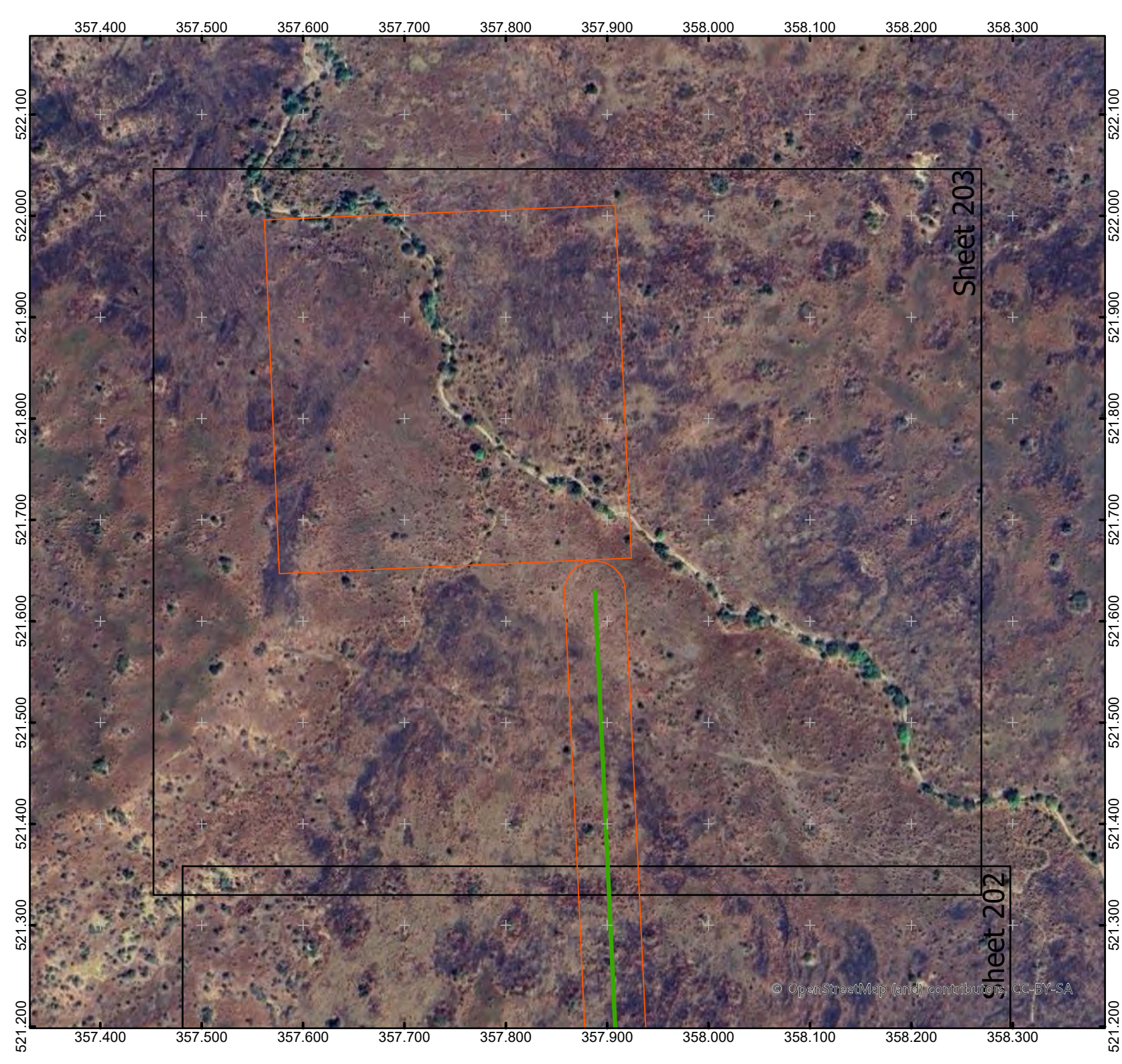
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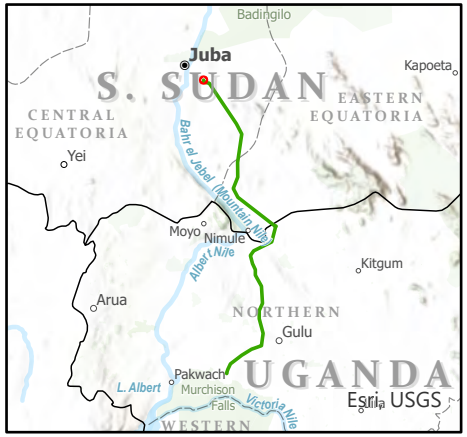
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14 ANNEX 2: ESIA SURVEY TERMS OF REFERENCE

Methodology for biodiversity data collection

In order to prepare a complete and comprehensive ESIA report, it is necessary to consult various sources of data and information. For the biological and ecological aspects, primary and secondary data will be used to assess potential impacts of the project implementation. Primary data consists of field data collection on species, habitats and ecosystems in the proposed project areas. Secondary data includes reviews of previous studies and research conducted in or near the proposed project area, previous reports from accredited sources, available national or international documentation, open access data analysis from scientifically recognised sources.

Consultations

Consultations with various stakeholders to obtain baseline information on biodiversity knowledge and to consider different aspects of the project's potential impacts will be carried out during the ESIA process. Consultations with the key project stakeholders including the project proponent, community members, government departments and relevant parastatals and NGOs that are active in the project area. The consultations will be hold during meeting and through questionnaires. The aim of these consultations from an environmental perspective is to:

- Identify the main natural resources used by local communities (e.g. medicinal plants, timber and non-timber products, etc.);
- Identify the main conflicts and/or problems related to the interaction between the human dimension and nature (e.g. human-wildlife conflict, diseases, etc.);
- Identify the main threats to ecosystems and biodiversity already present in the proposed project area (e.g. overexploitation of natural resources, illegal hunting, etc.);
- Assess how the proposed project could affect each stakeholder

Different consultations with key stakeholders at different level are planned:

- The **Ministry of Environment**
- The **Ministry of Wildlife and Tourism**
- **South Sudan National Wildlife Service** (SSWS)
- **Nimule National Park**
- **Badingilo National Park**
- **African Parks** (NGO); The African Parks is a non-profit conservation organisation that takes on the complete responsibility for the rehabilitation and long-term management of national parks in partnership with governments and local communities in Africa. The NGO currently manage several National Parks and other protected area, including Badingilo National Park.
- **South Sudan Nature Conservation** (SSNCO, NGO) is an educational and non-profit Organization in South Sudan, registered to protect the environment.

Preliminary screening of the TL route via Remote Sensing (RS) analysis

Prior to the plan field inspection and data collection activities, RS analysis will be utilized to establish a clear overview of the whole project area, natural resources, land cover and human settlements.
Sentinel-2 Level 2A (bottom of atmosphere) multispectral images will be used (but not only from this satellite, other than these products will be used -Landsat, Modis, Prisma, etc, based on the specificity of the sites and on the required spatial map resolution required) downloaded from Copernicus Open Access Hub. The images will be processed using SNAP-ESA Sentinel Application Platform to select the bands of interest (depending on the thematic maps required) resampling them all to 10 m x 10 m spatial pixel resolution using, as an example, bilinear interpolation. Due to the security sensitivity of the areas the

satellite images will play a significant role in minimizing the risks of the field operations and avoid dispersive data collections. Specifically, RS imagery will serve as the basis for the automated classification of multi-temporal Sentinel-2 imagery using random forest classifier and existing land cover/use databases as the source of training samples. In this way, Land Use maps will be developed and compared in space and in time and used to explore natural resources as well as human settlements in the area. Along with the land use map, RS images will be used to produce habitat and diversity maps: mapping habitats for a large area is a complex and time consuming task and require the integration of many information related to the structure and composition of occurring plant communities and the characteristics of the environment including the definition of topographic, climatic, chemical-physical variables as well as of those disturbance factors that can influence the composition, the stability and the functionality of the habitat. The method used for habitat classification has a great influence on the accuracy of the results. In order to define habitat maps for the project area, and depending on the available data, two approaches will be tested and considered as alternatives: in the unsupervised classification (clustering), RS image pixels will be grouped into clusters based on their spectral characteristics, with no prior knowledge of the number and type of classes. Supervised classification, on the other hand, will use information classes defined as input (prior knowledge or acquired in the field) to the algorithm, and thus a training sample is required to formulate a model of spectral separability of classes.

Field Surveys

Field surveys will be dedicated mainly to assess presence and distribution of the species present in the proposed project area. The target biological groups are plants, mammals, birds, herptiles (reptiles and amphibians) and arthropods. Different sampling methods will be applied to collect baseline data of each taxonomic group.

The sampling design will be developed to assess the status of species and communities in all ecosystems present along the transmission line corridor and at the substation site, which mainly include savannah, grassland and forest habitats. A minimum of 20 plots/transects will be required for each habitat and these will be proportional to the extent along the transmission line route; for example, if the savannah extent is higher compared to the other habitats, more than 20 plots/transects will be required. A special attention will be given to the wetlands and riverine habitats due to their importance and sensitive nature. Permission from the South Sudan National Wildlife Service (SSWS) is required for field activities

Forest, Habitat, Vegetation and Flora

Occurrence, types and extent of vegetation and habitat categories along the TL will be initially determined thank to Remote Sensing data, as discussed above. Following this first phase, obtained data will be verified in the field when precise and accurate data are not already available. The workflow will follow these procedures: Sentinel-2 satellite images will be downloaded by the Copernicus ESA service, and used to build a multi-temporal dataset. These images will be processed to obtain monthly layers of vegetation indices (VI) and compute the associated spectral heterogeneity. The same steps will be repeated after aggregating monthly images into seasonal composites, producing seasonal layers of VIs and spectral heterogeneity indices and layers of multi-seasonal heterogeneity indices. The remotely-sensed variables will be combined in different ways, producing a total of temporal configurations to use as input for image classifications:

1) monthly (vegetation and spectral heterogeneity indices – one layer per index per month);
2) seasonal (vegetation and spectral heterogeneity indices – one layer per index per season);

3) multi-temporal monthly (multi-monthly spectral heterogeneity indices – one layer per index per year);
4) multi-temporal seasonal (multi-seasonal spectral heterogeneity indices – one layer per index per year).

For each of these temporal configurations, a separate Random Forest classification will be realized, first with the complete set of input layers and then with a subset obtained by variable selection procedure; in each case, the number of habitat classes will be first set to a high number of classes and then reduced to a minimum set of categories.

Field surveys will be done when no secondary data are available at all and to determine the accuracy and predictive power of the realized habitat and vegetation classes obtained via RS. Habitats, vegetation and plants present along the TL will be identified and eventually manually mapped on the field. In a first phase, habitats will be identified as vegetation types. A high level of detail will be achieved, if possible, and vegetation types will be identified as associations. In a second phase, some habitat types will be aggregated into coarse classes more suited for satellite remote sensing, based on their structural-physiognomic and ecological characteristics. For the collection of the above defined measures (habitat and vegetation types), and to have a clearer and quantitative idea of plant diversity associated to identified habitat, a probabilistic sampling design will be adopted: it will be based on a hierarchical stratified random sampling. Once the extent of the area to be sampled will be defined along the proposed right of way of the Transmission lines, an adequate regular grid will be created in the GIS environment and overlayed with the whole TL route: this will represent the first hierarchical level of the sampling design. The second hierarchical sampling level will be defined using the homogeneous strata defined by the habitat/vegetation/land use classification procedures obtained via RS as described before. Sampling points will be selected in these strata based on their accessibility (close to road) and a subset of them randomly selected to be inspected (in order to guarantee their representativeness and avoid subjectivity).

Forest and vegetation field sampling methods

In the field, a team of local surveyors with experience in plant identification and in plant ecology will be involved. Surveyors will be instructed with training on the field and with reference materials by the international experts.

Along the TL, a set of sampling units will be selected, hierchically distributed within homogeneous forest or vegetation classes identified by RS analysis. Sampling units will be located with a high-precision GPS. If the structure and condition of the area will allow, a plot of varying dimension (based on the vegetation type and structure) will be materialized on the ground and vegetation and plant species identities will be sampled. Alternatively, a transect walk will be realized, its length carefully recorded. The complete inventory of plant species occurring in each sampling unit or transect will be recorded, along with the percentage coverage of each species (%, visual estimate). Along with plant occurrences, a set of environmental variables will be collected to provide detailed information on factors related with the variation of species richness and composition, as well as the impact of human activities on the vegetation and forest characteristics. Among these, the following will have a particular importance in data analysis and will be used to validate habitat and vegetation classification maps:

- X and Y Coordinates;
- Elevation;
- Slope;
- Aspect;

- Litter Cover (%);
- Bare Soil Cover (%);
- Total cover of the tree layer (A layer, up to 5 meters height);
- Total cover of the shrub layer (B layer, from 0.5m to 5m);
- Total cover of the herbaceous layer (C layer, lower than 0.5m);
- Human activities in or close the sampling point;
- A complete description of the habitat characteristics.

Wildlife field data collection

Linear transects along the proposed transmission line route will be used for wildlife data collection. All direct and indirect animal presence will be recorded and georeferenced, including direct and indirect observations such as burrows, pugmarks/footprints, dropping/pellets, ground digging and uprooting, tree scratching and marking, remains (skin, fur, feathers, bones, horns/antlers and carcasses), nests, holes and burrows, etc. Birds species will be detected through vantage points located along the proposed transmission line route, while herptiles through Visual Encounter Survey (VES). All sampling points, plots and transects will be georeferenced using Global Positioning System (GPS) and characterized based on vegetation and landscape features. The checklist of wildlife species is presented in Annex 3.

Opportunistic Encounters

All opportunistic data, i.e., those made outside the sampling effort, occurred within or in the surrounding proposed project area will be recorded. This will help to complete the checklist of species.

Methodology for social data collection

The assessment methodology is centered on fieldwork and combines several quantitative and qualitative tools. Guidelines for interviews and focus groups are prepared based on the review of available literature on key issues, and the analysis of the context of intervention.

The overall approach of the assessment looks at historic and contemporary practices of land tenure and property rights in the project area, in order to identify ongoing changes and then to determine factors influencing them. It will be important to consider whereas land rights formalization following land acquisition plans affects land rights negotiation, and to highlight other intended and unintended project's impacts to be discussed during Focus Group Discussions (FGG) and Key Informant Interviews (KII) and validated with local leaders following field enquiry. The assessment will be organized as follows.

During a preliminary phase of document review, the main objective is to have a clear understanding of context of the project and ongoing processes related to land tenure; formulate the research questions to carry out the assessment; collect the necessary documents; discuss the internal procedures with implementing partners; identify the stakeholders to be contacted; and organize the schedule of field visits. During this phase, available quantitative data will be consulted and specific evaluation tools (questionnaires, semi-structured interview outline) will be prepared.

Regarding the documents needed for the assessment, it will be important to consult:

1. information concerning existing land registries or pilot projects on land mapping processes in Eastern and Central Equatoria
2. available accounts of land claims and strategic legal cases of land allocation for medium and large-scale investments in Greater Equatoria
3. list of local bodies and organizations working on land issues in the project area

Quantitative data will be collected through a household survey administered by the local enumerators using a Household Survey Questionnaire, while qualitative data will be collected through discussions with strategic actors and different project stakeholders. Focus groups and semi-structures interviews will be translated from local languages to English by independent interpreters. Sampling of the villages to be visited as well as the groups and household interviews and focus groups will be done prior to the start of the field data collection.

The study will be conducted using a Participatory approach known as PIA (Participatory Impact Assessment) and reflecting the principles inspiring PRA approaches and tools. A local collaborator will be recruited on site to participate in the field mission. The collaborator will be trained on project assessment using participative methodologies, and will be involved in translating interviews when necessary, and in daily debriefing. Support from local partners will be needed to facilitate travel arrangements, to mobilize local communities and other stakeholders (local authorities, operational partners), and to plan the various field meetings.

The fieldwork and local surveys will be supervised by the assessment coordinator, in order to ensure a consistent approach to the enquiry. Discussion groups will be organized in order to stimulate debate and record comments and feedback. Local teams will be provided with recording equipment as well as notebooks for recording discussion groups.

The assessment will look at the capacity of the Power Interconnection Project to support an integral, inclusive and sustainable approach to rural development. Questionnaires, interviews, and focus groups will be used to understand the social and economic impact of the Power Interconnection Project on local livelihoods. In particular, the capacity of the project to support local population will be assessed taking into account the forms of vulnerability of marginalized groups such as IDPs and returnees, women and youth, and the impact on socio-economic inequalities of other factors such as local land tenure policies, the seasonality of productive activities, mobility practices, and regional migration flows.

Key Questions

The assessment methodology and tools aim at answering to the following questions:

KQ1: what are the formal and informal land tenure regimes in the project area?

The Land Act of 2009 introduced the distinction between public, private and communal land, but these categories often overlap in practice. The survey will consider the diversity of land tenure systems, and adapt the evaluation of project's impact accordingly.

KQ2: what is the impact of land rights formalization in a context of land acquisition plans at regional scale?

Formal land titles coexist with customary law and informal practices to allocate and manage land rights. The land survey and titling process may facilitate the transfer of land from customary to private ownership, and needs to avoid the risk to trigger conflict over contested resources.

KQ3: what are the local practices of land governance in a context of migration and return of displaced populations?

In the Equatorian States, the return and resettlement of displaced population resulted in conflicting land claims. The survey will acknowledge local practices to secure land and contest acquisition plans, and provide guidelines to negotiate land rights with different stakeholders.

KQ4: What are the good practices in anticipating and settling lend-related disputes in the project area?

Local communities rely on self-help mechanisms and informal arrangements to settle land disputes. The survey will pay attention to these practices in order to identify the best approach to introduce compensation measures.

Defining the project boundaries

Participatory mapping is a useful visualization method to use at the beginning of the assessment to define the geographical boundary of the affected communities. In agropastoral areas, these maps should also include the furthest places where people go to graze their animals. Examples of maps include:

- natural resource maps
- migrations and IDP maps (existing/foreseen)
- opportunities and service maps
- livestock mobility and grazing maps
- conflict maps
- market maps

These tools are useful also because they allow both literate and non-literate people to contribute to the assessment.

Similarly, participatory tools can be used to define the project boundaries in time. A timeline allows to capture major historical events in the community as perceived by the community themselves. This approach is particularly adapted to the South Sudanese context, given the successive waves of migrations and internal displacements, and the impact of these long-term processes on land occupation. The participatory maps exercises will also consider seasonal patterns of land use and occupation

15 ANNEX 3: CHECKLIST OF WILDLIFE SPECIES

Table 15-1 - Complete checklist of mammal species present in the 50km buffer around the project area.

N	Family	Scientific name	Seasonality	Red List category	Trend
1	BATHYERGIDAE	*Fukomys ochraceocinereus*	Resident	LC	Unknown
2	**BOVIDAE**	***Redunca fulvorufula***	**Resident**	**EN**	**Decreasing**
3	BOVIDAE	*Philantomba monticola*	Resident	LC	Decreasing
4	BOVIDAE	*Cephalophus weynsi*	Resident	LC	Decreasing
5	BOVIDAE	*Eudorcas albonotata*	Resident	LC	Stable
6	**BOVIDAE**	***Hippotragus equinus***	**Resident**	**LC**	**Decreasing**
7	**BOVIDAE**	***Kobus ellipsiprymnus***	**Resident**	**LC**	**Decreasing**
8	BOVIDAE	*Kobus kob*	Resident	LC	Decreasing
9	BOVIDAE	*Madoqua guentheri*	Resident	LC	Stable
10	BOVIDAE	*Oreotragus oreotragus*	Resident	LC	Stable
11	BOVIDAE	*Ourebia ourebi*	Resident	LC	Decreasing
12	BOVIDAE	*Redunca redunca*	Resident	LC	Decreasing
13	BOVIDAE	*Sylvicapra grimmia*	Resident	LC	Decreasing
14	**BOVIDAE**	***Tragelaphus spekii***	**Resident**	**LC**	**Decreasing**
15	BOVIDAE	*Tragelaphus scriptus*	Resident	LC	Stable
16	**BOVIDAE**	***Tragelaphus oryx***	**Resident**	**LC**	**Stable**
17	**BOVIDAE**	***Alcelaphus buselaphus***	**Resident**	**LC**	**Decreasing**
18	**BOVIDAE**	***Syncerus caffer***	**Resident**	**NT**	**Decreasing**
19	**CANIDAE**	***Lycaon pictus***	**Resident**	**EN**	**Decreasing**
20	CANIDAE	*Canis mesomelas*	Resident	LC	Stable
21	CANIDAE	*Otocyon megalotis*	Resident	LC	Stable
22	CANIDAE	*Canis adustus*	Resident	LC	Stable
23	CANIDAE	*Canis lupaster*	Resident	LC	Decreasing
24	**CERCOPITHECIDAE**	***Colobus guereza***	**Resident**	**LC**	**Decreasing**
25	CERCOPITHECIDAE	*Cercopithecus neglectus*	Resident	LC	Unknown
26	CERCOPITHECIDAE	*Papio anubis*	Resident	LC	Stable
27	CERCOPITHECIDAE	*Chlorocebus tantalus*	Resident	LC	Stable
28	CERCOPITHECIDAE	*Cercopithecus mitis*	Resident	LC	Decreasing
29	CERCOPITHECIDAE	*Chlorocebus aethiops*	Resident	LC	Decreasing
30	CERCOPITHECIDAE	*Erythrocebus patas*	Resident	NT	Decreasing
31	**ELEPHANTIDAE**	***Loxodonta africana***	**Resident**	**EN**	**Decreasing**
32	EMBALLONURIDAE	*Taphozous hamiltoni*	Resident	DD	Unknown
33	EMBALLONURIDAE	*Coleura afra*	Resident	LC	Unknown
34	EMBALLONURIDAE	*Taphozous nudiventris*	Resident	LC	Stable
35	EMBALLONURIDAE	*Taphozous mauritianus*	Resident	LC	Unknown
36	EMBALLONURIDAE	*Taphozous perforatus*	Resident	LC	Stable
37	ERINACEIDAE	*Atelerix albiventris*	Resident	LC	Stable
38	**FELIDAE**	***Caracal caracal***	**Resident**	**LC**	**Unknown**
39	FELIDAE	*Felis lybica*	Resident	LC	Unknown

40	FELIDAE	*Leptailurus serval*	Resident	LC	Stable
41	**FELIDAE**	***Acinonyx jubatus***	**Resident**	**VU**	**Decreasing**
42	**FELIDAE**	***Panthera pardus***	**Resident**	**VU**	**Decreasing**
43	GALAGIDAE	*Galago senegalensis*	Resident	LC	Decreasing
44	**GIRAFFIDAE**	***Giraffa camelopardalis***	**Resident**	**VU**	**Decreasing**
45	GLIRIDAE	*Graphiurus microtis*	Resident	LC	Unknown
46	GLIRIDAE	*Graphiurus kelleni*	Resident	LC	Unknown
47	HERPESTIDAE	*Dologale dybowskii*	Resident	DD	Unknown
48	HERPESTIDAE	*Atilax paludinosus*	Resident	LC	Decreasing
49	HERPESTIDAE	*Herpestes sanguineus*	Resident	LC	Stable
50	HERPESTIDAE	*Herpestes ichneumon*	Resident	LC	Stable
51	HERPESTIDAE	*Ichneumia albicauda*	Resident	LC	Stable
52	HERPESTIDAE	*Mungos mungo*	Resident	LC	Stable
53	**HIPPOPOTAMIDAE**	***Hippopotamus amphibius***	**Resident**	**VU**	**Stable**
54	HIPPOSIDERIDAE	*Hipposideros cyclops*	Resident	LC	Decreasing
55	HIPPOSIDERIDAE	*Hipposideros abae*	Resident	LC	Unknown
56	HIPPOSIDERIDAE	*Hipposideros ruber*	Resident	LC	Unknown
57	**HOMINIDAE**	***Pan troglodytes***	**Resident**	**EN**	**Decreasing**
58	HYAENIDAE	*Crocuta crocuta*	Resident	LC	Decreasing
59	**HYAENIDAE**	***Proteles cristata***	**Resident**	**LC**	**Stable**
60	**HYAENIDAE**	***Hyaena hyaena***	**Resident**	**NT**	**Decreasing**
61	HYSTRICIDAE	*Atherurus africanus*	Resident	LC	Unknown
62	LEPORIDAE	*Lepus capensis*	Resident	LC	Decreasing
63	LEPORIDAE	*Poelagus marjorita*	Resident	LC	Decreasing
64	LEPORIDAE	*Lepus victoriae*	Resident	LC	Stable
65	MACROSCELIDIDAE	*Elephantulus fuscipes*	Resident	DD	Unknown
66	MACROSCELIDIDAE	*Elephantulus rufescens*	Resident	LC	Stable
67	**MANIDAE**	***Phataginus tricuspis***	**Resident**	**EN**	**Decreasing**
68	**MANIDAE**	***Smutsia temminckii***	**Resident**	**VU**	**Decreasing**
69	MEGADERMATIDAE	*Lavia frons*	Resident	LC	Stable
70	MEGADERMATIDAE	*Cardioderma cor*	Resident	LC	Unknown
71	MINIOPTERIDAE	*Miniopterus natalensis*	Resident	LC	Unknown
72	MOLOSSIDAE	*Tadarida ventralis*	Resident	DD	Unknown
73	MOLOSSIDAE	*Chaerephon pumilus*	Resident	LC	Unknown
74	MOLOSSIDAE	*Chaerephon major*	Resident	LC	Stable
75	MOLOSSIDAE	*Chaerephon chapini*	Resident	LC	Unknown
76	MOLOSSIDAE	*Chaerephon bivittatus*	Resident	LC	Stable
77	MOLOSSIDAE	*Chaerephon bemmeleni*	Resident	LC	Unknown
78	MOLOSSIDAE	*Chaerephon ansorgei*	Resident	LC	Stable
79	MOLOSSIDAE	*Chaerephon aloysiisabaudiae*	Resident	LC	Decreasing
80	MOLOSSIDAE	*Platymops setiger*	Resident	LC	Unknown
81	MOLOSSIDAE	*Mops condylurus*	Resident	LC	Unknown
82	MOLOSSIDAE	*Mops demonstrator*	Resident	LC	Decreasing

83	MOLOSSIDAE	*Mops midas*	Resident	LC	Decreasing
84	MOLOSSIDAE	*Mops nanulus*	Resident	LC	Unknown
85	MOLOSSIDAE	*Otomops martiensseni*	Resident	NT	Decreasing
86	MURIDAE	*Uranomys ruddi*	Resident	LC	Decreasing
87	MURIDAE	*Mus musculoides*	Presence Uncertain	LC	Unknown
88	MURIDAE	*Gerbilliscus validus*	Resident	LC	Stable
89	MURIDAE	*Gerbilliscus kempi*	Resident	LC	Unknown
90	MURIDAE	*Acomys wilsoni*	Resident	LC	Stable
91	MURIDAE	*Acomys cineraceus*	Resident	LC	Stable
92	MURIDAE	*Acomys percivali*	Resident	LC	Stable
93	MURIDAE	*Aethomys hindei*	Resident	LC	Unknown
94	MURIDAE	*Arvicanthis niloticus*	Resident	LC	Unknown
95	MURIDAE	*Colomys goslingi*	Resident	LC	Stable
96	MURIDAE	*Dasymys incomtus*	Resident	LC	Unknown
97	MURIDAE	*Grammomys ibeanus*	Resident	LC	Unknown
98	MURIDAE	*Grammomys macmillani*	Resident	LC	Unknown
99	MURIDAE	*Lemniscomys macculus*	Resident	LC	Stable
100	MURIDAE	*Lophuromys sikapusi*	Resident	LC	Unknown
101	MURIDAE	*Mastomys erythroleucus*	Resident	LC	Stable
102	MURIDAE	*Mastomys natalensis*	Resident	LC	Stable
103	MURIDAE	*Mus minutoides*	Resident	LC	Stable
104	MURIDAE	*Oenomys hypoxanthus*	Resident	LC	Stable
105	MURIDAE	*Praomys jacksoni*	Resident	LC	Stable
106	MURIDAE	*Gerbilliscus robustus*	Resident	LC	Stable
107	MURIDAE	*Taterillus emini*	Resident	LC	Unknown
108	MURIDAE	*Zelotomys hildegardeae*	Resident	LC	Stable
109	MURIDAE	*Lemniscomys zebra*	Resident	LC	Stable
110	MURIDAE	*Mylomys dybowskii*	Resident	LC	Unknown
111	MURIDAE	*Myomyscus brockmani*	Resident	LC	Stable
112	MURIDAE	*Lemniscomys striatus*	Resident	LC	Increasing
113	MUSTELIDAE	*Mellivora capensis*	Resident	LC	Decreasing
114	MUSTELIDAE	*Ictonyx striatus*	Resident	LC	Stable
115	MUSTELIDAE	*Aonyx capensis*	Resident	NT	Decreasing
116	MUSTELIDAE	*Hydrictis maculicollis*	Resident	NT	Decreasing
117	NANDINIIDAE	*Nandinia binotata*	Resident	LC	Unknown
118	NESOMYIDAE	*Steatomys parvus*	Resident	LC	Stable
119	NESOMYIDAE	*Dendromus melanotis*	Resident	LC	Stable
120	NESOMYIDAE	*Cricetomys gambianus*	Resident	LC	Stable
121	NYCTERIDAE	*Nycteris hispida*	Resident	LC	Stable
122	NYCTERIDAE	*Nycteris macrotis*	Resident	LC	Unknown
123	NYCTERIDAE	*Nycteris thebaica*	Resident	LC	Unknown
124	NYCTERIDAE	*Nycteris arge*	Resident	LC	Stable
125	ORYCTEROPODIDAE	*Orycteropus afer*	Resident	LC	Unknown

126	**PROCAVIIDAE**	***Dendrohyrax dorsalis***	**Resident**	**LC**	**Unknown**
127	**PROCAVIIDAE**	***Heterohyrax brucei***	**Resident**	**LC**	**Unknown**
128	PROCAVIIDAE	*Procavia capensis*	Resident	LC	Stable
129	PTEROPODIDAE	*Rousettus aegyptiacus*	Resident	LC	Stable
130	PTEROPODIDAE	*Lissonycteris angolensis*	Resident	LC	Decreasing
131	PTEROPODIDAE	*Epomophorus labiatus*	Resident	LC	Stable
132	PTEROPODIDAE	*Micropteropus pusillus*	Resident	LC	Stable
133	PTEROPODIDAE	*Eidolon helvum*	Resident	NT	Decreasing
134	RHINOCEROTIDAE	*Ceratotherium simum*	Extant & Assisted Colonisation (resident)	NT	Decreasing
135	RHINOLOPHIDAE	*Rhinolophus landeri*	Resident	LC	Unknown
136	RHINOLOPHIDAE	*Rhinolophus eloquens*	Resident	LC	Unknown
137	RHINOLOPHIDAE	*Rhinolophus hildebrandtii*	Resident	LC	Unknown
138	RHINOLOPHIDAE	*Rhinolophus fumigatus*	Resident	LC	Unknown
139	RHINOLOPHIDAE	*Rhinolophus clivosus*	Resident	LC	Unknown
140	RHINOLOPHIDAE	*Rhinolophus simulator*	Resident	LC	Decreasing
141	SCIURIDAE	*Heliosciurus gambianus*	Resident	LC	Unknown
142	SCIURIDAE	*Xerus erythropus*	Resident	LC	Stable
143	SORICIDAE	*Suncus megalura*	Resident	LC	Unknown
144	SORICIDAE	*Crocidura turba*	Resident	LC	Unknown
145	SORICIDAE	*Crocidura fuscomurina*	Resident	LC	Unknown
146	SORICIDAE	*Crocidura hildegardeae*	Resident	LC	Unknown
147	SORICIDAE	*Crocidura jacksoni*	Resident	LC	Stable
148	SORICIDAE	*Crocidura nigrofusca*	Resident	LC	Unknown
149	SORICIDAE	*Crocidura olivieri*	Resident	LC	Unknown
150	SORICIDAE	*Crocidura parvipes*	Resident	LC	Stable
151	SORICIDAE	*Crocidura roosevelti*	Resident	LC	Unknown
152	SUIDAE	*Potamochoerus larvatus*	Resident	LC	Stable
153	SUIDAE	*Phacochoerus africanus*	Resident	LC	Decreasing
154	THRYONOMYIDAE	*Thryonomys gregorianus*	Resident	LC	Unknown
155	THRYONOMYIDAE	*Thryonomys swinderianus*	Resident	LC	Unknown
156	VESPERTILIONIDAE	*Neoromicia helios*	Resident	DD	Unknown
157	VESPERTILIONIDAE	*Kerivoula lanosa*	Resident	LC	Unknown
158	VESPERTILIONIDAE	*Scotoecus hirundo*	Resident	LC	Unknown
159	VESPERTILIONIDAE	*Scotophilus dinganii*	Resident	LC	Unknown
160	VESPERTILIONIDAE	*Scotophilus leucogaster*	Resident	LC	Unknown
161	VESPERTILIONIDAE	*Pipistrellus hesperidus*	Resident	LC	Unknown
162	VESPERTILIONIDAE	*Neoromicia somalica*	Resident	LC	Unknown
163	VESPERTILIONIDAE	*Neoromicia tenuipinnis*	Resident	LC	Unknown
164	VESPERTILIONIDAE	*Neoromicia zuluensis*	Resident	LC	Unknown
165	VESPERTILIONIDAE	*Neoromicia nana*	Resident	LC	Unknown
166	VESPERTILIONIDAE	*Neoromicia rendalli*	Resident	LC	Unknown
167	VESPERTILIONIDAE	*Neoromicia capensis*	Resident	LC	Stable
168	VESPERTILIONIDAE	*Neoromicia guineensis*	Resident	LC	Unknown

169	VESPERTILIONIDAE	*Myotis welwitschii*	Resident	LC	Unknown
170	VESPERTILIONIDAE	*Glauconycteris variegata*	Resident	LC	Unknown
171	VESPERTILIONIDAE	*Mimetillus moloneyi*	Resident	LC	Unknown
172	VESPERTILIONIDAE	*Pipistrellus rueppellii*	Resident	LC	Unknown
173	VESPERTILIONIDAE	*Pipistrellus rusticus*	Resident	LC	Unknown
174	VIVERRIDAE	*Genetta genetta*	Resident	LC	Stable
175	VIVERRIDAE	*Genetta maculata*	Resident	LC	Unknown
176	VIVERRIDAE	*Genetta servalina*	Resident	LC	Unknown
177	VIVERRIDAE	*Civettictis civetta*	Resident	LC	Unknown

Table 15-2 - Complete checklist of reptile species present in the 50km buffer around the project area.

N	Family	Scientific name	Seasonality	Red List category	Trend
1	AGAMIDAE	*Agama doriae*	Resident	LC	Stable
2	AGAMIDAE	*Agama finchi*	Resident	LC	Unknown
3	ATRACTASPIDIDAE	*Aparallactus lunulatus*	Resident	LC	Unknown
4	ATRACTASPIDIDAE	*Atractaspis irregularis*	Resident	LC	Decreasing
5	ATRACTASPIDIDAE	*Atractaspis fallax*	Resident	LC	Unknown
6	ATRACTASPIDIDAE	*Chilorhinophis butleri*	Resident	LC	Unknown
7	CHAMAELEONIDAE	*Chamaeleo laevigatus*	Resident	LC	Stable
8	CHAMAELEONIDAE	*Trioceros bitaeniatus*	Resident	LC	Stable
9	CHAMAELEONIDAE	*Trioceros ellioti*	Resident	LC	Unknown
10	CHAMAELEONIDAE	*Chamaeleo dilepis*	Resident	LC	Stable
11	COLUBRIDAE	*Dasypeltis scabra*	Resident	LC	Unknown
12	COLUBRIDAE	*Meizodon semiornatus*	Resident	LC	Unknown
13	COLUBRIDAE	*Philothamnus semivariegatus*	Resident	LC	Unknown
14	COLUBRIDAE	*Crotaphopeltis hotamboeia*	Resident	LC	Stable
15	COLUBRIDAE	*Dasypeltis atra*	Resident	LC	Unknown
16	COLUBRIDAE	*Dasypeltis confusa*	Resident	LC	Stable
17	COLUBRIDAE	*Meizodon regularis*	Resident	LC	Unknown
18	COLUBRIDAE	*Philothamnus heterolepidotus*	Resident	LC	Unknown
19	COLUBRIDAE	*Scaphiophis albopunctatus*	Resident	LC	Unknown
20	COLUBRIDAE	*Thelotornis kirtlandii*	Resident	LC	Unknown
21	COLUBRIDAE	*Toxicodryas blandingii*	Resident	LC	Unknown
22	COLUBRIDAE	*Dispholidus typus*	Resident	LC	Stable
23	COLUBRIDAE	*Platyceps florulentus*	Resident	LC	Unknown
24	COLUBRIDAE	*Philothamnus bequaerti*	Resident	LC	Unknown
25	COLUBRIDAE	*Philothamnus angolensis*	Resident	LC	Unknown
26	COLUBRIDAE	*Thrasops jacksonii*	Resident	LC	Unknown
27	COLUBRIDAE	*Telescopus obtusus*	Resident	LC	Stable
28	ELAPIDAE	*Naja haje*	Resident	LC	Decreasing
29	ELAPIDAE	*Dendroaspis jamesoni*	Resident	LC	Stable

30	ELAPIDAE	*Elapsoidea laticincta*	Resident	LC	Unknown
31	ELAPIDAE	*Naja nigricollis*	Resident	LC	Unknown
32	ELAPIDAE	*Dendroaspis polylepis*	Resident	LC	Stable
33	ELAPIDAE	*Naja subfulva*	Resident	LC	Stable
34	GEKKONIDAE	*Hemidactylus mabouia*	Resident	LC	Stable
35	GEKKONIDAE	*Hemidactylus angulatus*	Resident	LC	Stable
36	GEKKONIDAE	*Cnemaspis dickersonae*	Resident	LC	Unknown
37	GERRHOSAURIDAE	*Broadleysaurus major*	Resident	LC	Unknown
38	GRAYIIDAE	*Grayia smithii*	Resident	LC	Stable
39	LACERTIDAE	*Adolfus africanus*	Resident	LC	Stable
40	LAMPROPHIIDAE	*Boaedon fuliginosus*	Resident	LC	Stable
41	LAMPROPHIIDAE	*Lycophidion capense*	Resident	LC	Unknown
42	LAMPROPHIIDAE	*Bothrophthalmus lineatus*	Resident	LC	Unknown
43	LAMPROPHIIDAE	*Mehelya stenopthalmus*	Resident	LC	Unknown
44	LAMPROPHIIDAE	*Lycophidion depressirostre*	Resident	LC	Unknown
45	LAMPROPHIIDAE	*Lycophidion ornatum*	Resident	LC	Unknown
46	LAMPROPHIIDAE	*Limaformosa savorgnani*	Resident	LC	Unknown
47	LEPTOTYPHLOPIDAE	*Leptotyphlops emini*	Resident	LC	Unknown
48	LEPTOTYPHLOPIDAE	*Myriopholis braccianii*	Resident	LC	Unknown
49	NATRICIDAE	*Natriciteres olivacea*	Resident	LC	Unknown
50	PROSYMNIDAE	*Prosymna greigerti*	Resident	LC	Unknown
51	PROSYMNIDAE	*Prosymna ambigua*	Resident	LC	Unknown
52	PSAMMOPHIIDAE	*Psammophis rukwae*	Resident	LC	Unknown
53	PSAMMOPHIIDAE	*Hemirhagerrhis nototaenia*	Resident	LC	Unknown
54	PSAMMOPHIIDAE	*Psammophis lineatus*	Resident	LC	Stable
55	PSAMMOPHIIDAE	*Psammophis sudanensis*	Resident	LC	Unknown
56	PSAMMOPHIIDAE	*Rhamphiophis oxyrhynchus*	Resident	LC	Unknown
57	PSAMMOPHIIDAE	*Rhamphiophis rostratus*	Resident	LC	Stable
58	PSAMMOPHIIDAE	*Rhamphiophis rubropunctatus*	Resident	LC	Unknown
59	**PYTHONIDAE**	***Python sebae***	**Resident**	**NT**	**Decreasing**
60	**PYTHONIDAE**	***Python regius***	**Resident**	**NT**	**Decreasing**
61	SCINCIDAE	*Trachylepis quinquetaeniata*	Resident	LC	Stable
62	SCINCIDAE	*Trachylepis striata*	Resident	LC	Unknown
63	SCINCIDAE	*Mochlus afer*	Resident	LC	Stable
64	SCINCIDAE	*Trachylepis maculilabris*	Resident	LC	Stable
65	SCINCIDAE	*Trachylepis megalura*	Resident	LC	Unknown
66	SCINCIDAE	*Leptosiaphos aloysiisabaudiae*	Resident	LC	Unknown
67	**TESTUDINIDAE**	***Stigmochelys pardalis***	**Resident**	**LC**	**Unknown**
68	TRIONYCHIDAE	*Cyclanorbis elegans*	Resident	CR	Decreasing
69	TRIONYCHIDAE	*Cyclanorbis senegalensis*	Resident	VU	Decreasing
70	**TRIONYCHIDAE**	***Trionyx triunguis***	**Resident**	**VU**	**Decreasing**
71	TYPHLOPIDAE	*Afrotyphlops lineolatus*	Resident	LC	Unknown
72	TYPHLOPIDAE	*Afrotyphlops punctatus*	Resident	LC	Unknown

73	TYPHLOPIDAE	*Letheobia toritensis*	Resident	LC	Unknown
74	TYPHLOPIDAE	*Afrotyphlops brevis*	Resident	LC	Unknown
75	VARANIDAE	*Varanus niloticus*	Resident	LC	Stable
76	VARANIDAE	*Varanus exanthematicus*	Resident	LC	Unknown
77	**VIPERIDAE**	***Bitis arietans***	**Resident**	**LC**	**Stable**
78	VIPERIDAE	*Bitis gabonica*	Resident	VU	Decreasing
79	VIPERIDAE	*Causus lichtensteinii*	Resident	LC	Stable
80	VIPERIDAE	*Causus maculatus*	Resident	LC	Stable
81	VIPERIDAE	*Causus resimus*	Resident	LC	Stable
82	VIPERIDAE	*Causus rhombeatus*	Resident	LC	Stable

Table 15-3 - Complete checklist of amphibians species present in the 50km buffer around the project area.

N	Family	Scientific name	Seasonality	Red List category	Trend
1	BUFONIDAE	*Sclerophrys pusilla*	Resident	LC	Stable
2	BUFONIDAE	*Sclerophrys regularis*	Resident	LC	Stable
3	BUFONIDAE	*Sclerophrys steindachneri*	Resident	LC	Unknown
4	DICROGLOSSIDAE	*Hoplobatrachus occipitalis*	Resident	LC	Stable
5	HEMISOTIDAE	*Hemisus marmoratus*	Resident	LC	Unknown
6	HYPEROLIIDAE	*Kassina senegalensis*	Resident	LC	Unknown
7	HYPEROLIIDAE	*Afrixalus quadrivittatus*	Resident	LC	Unknown
8	HYPEROLIIDAE	*Hyperolius balfouri*	Resident	LC	Unknown
9	HYPEROLIIDAE	*Hyperolius kivuensis*	Resident	LC	Unknown
10	HYPEROLIIDAE	*Hyperolius papyri*	Resident	DD	Unknown
11	HYPEROLIIDAE	*Hyperolius viridiflavus*	Resident	LC	Unknown
12	PHRYNOBATRACHIDAE	*Phrynobatrachus natalensis*	Resident	LC	Stable
13	PHRYNOBATRACHIDAE	*Phrynobatrachus perpalmatus*	Resident	LC	Unknown
14	PIPIDAE	*Xenopus victorianus*	Resident	LC	Increasing
15	PIPIDAE	*Xenopus fischbergi*	Resident	LC	Stable
16	PTYCHADENIDAE	*Hildebrandtia ornata*	Resident	LC	Unknown
17	PTYCHADENIDAE	*Ptychadena oxyrhynchus*	Resident	LC	Stable
18	PTYCHADENIDAE	*Ptychadena pumilio*	Resident	LC	Unknown
19	PTYCHADENIDAE	*Ptychadena schillukorum*	Resident	LC	Unknown
20	PTYCHADENIDAE	*Ptychadena tellinii*	Resident	LC	Unknown
21	PTYCHADENIDAE	*Ptychadena nilotica*	Resident	LC	Stable
22	PTYCHADENIDAE	*Ptychadena anchietae*	Resident	LC	Unknown
23	RANIDAE	*Amnirana galamensis*	Resident	LC	Unknown

Table 15-4 - Complete checklist of arthropods species present in the 50km buffer around the project area.

N	Family	Scientific name	Seasonality	Red List category	Trend
1	ACRIDIDAE	*Acrotylus patruelis*	Resident	LC	Unknown

2	ACRIDIDAE	*Coryphosima stenoptera*	Resident	LC	Unknown
3	AESHNIDAE	*Anax ephippiger*	Resident	LC	Unknown
4	AESHNIDAE	*Anax imperator*	Resident	LC	Stable
5	AESHNIDAE	*Anax tristis*	Resident	LC	Unknown
6	AESHNIDAE	*Gynacantha nigeriensis*	Resident	LC	Unknown
7	ARANEIDAE	*Nephilingis cruentata*	Resident	LC	Decreasing
8	ARANEIDAE	*Nephila constricta*	Resident	LC	Unknown
9	ARANEIDAE	*Trichonephila fenestrata*	Resident	LC	Stable
10	ARANEIDAE	*Trichonephila senegalensis*	Resident	LC	Stable
11	ARANEIDAE	*Nephila turneri*	Resident	LC	Unknown
12	CALOPTERYGIDAE	*Phaon iridipennis*	Resident	LC	Unknown
13	CHLOROCYPHIDAE	*Chlorocypha curta*	Resident	LC	Unknown
14	CHLOROCYPHIDAE	*Platycypha caligata*	Resident	LC	Unknown
15	COENAGRIONIDAE	*Africallagma subtile*	Resident	LC	Unknown
16	COENAGRIONIDAE	*Agriocnemis exilis*	Resident	LC	Unknown
17	COENAGRIONIDAE	*Agriocnemis gratiosa*	Resident	LC	Unknown
18	COENAGRIONIDAE	*Agriocnemis inversa*	Resident	LC	Unknown
19	COENAGRIONIDAE	*Agriocnemis zerafica*	Resident	LC	Unknown
20	COENAGRIONIDAE	*Azuragrion nigridorsum*	Resident	LC	Unknown
21	COENAGRIONIDAE	*Ceriagrion bakeri*	Resident	LC	Unknown
22	COENAGRIONIDAE	*Ceriagrion glabrum*	Resident	LC	Stable
23	COENAGRIONIDAE	*Ceriagrion kordofanicum*	Resident	LC	Unknown
24	COENAGRIONIDAE	*Ceriagrion suave*	Resident	LC	Unknown
25	COENAGRIONIDAE	*Ischnura senegalensis*	Resident	LC	Stable
26	COENAGRIONIDAE	*Pseudagrion hamoni*	Resident	LC	Unknown
27	COENAGRIONIDAE	*Pseudagrion kersteni*	Resident	LC	Unknown
28	COENAGRIONIDAE	*Pseudagrion torridum*	Resident	LC	Unknown
29	COENAGRIONIDAE	*Pseudagrion massaicum*	Resident	LC	Unknown
30	COENAGRIONIDAE	*Pseudagrion melanicterum*	Resident	LC	Unknown
31	COENAGRIONIDAE	*Pseudagrion niloticum*	Resident	LC	Unknown
32	COENAGRIONIDAE	*Pseudagrion nubicum*	Resident	LC	Unknown
33	COENAGRIONIDAE	*Pseudagrion salisburyense*	Resident	LC	Unknown
34	COENAGRIONIDAE	*Pseudagrion sjoestedti*	Resident	LC	Unknown
35	COENAGRIONIDAE	*Pseudagrion sudanicum*	Resident	LC	Unknown
36	DYTISCIDAE	*Copelatus peridinus*	Resident	LC	Unknown
37	DYTISCIDAE	*Copelatus pulchellus*	Resident	LC	Unknown
38	GOMPHIDAE	*Crenigomphus renei*	Resident	LC	Unknown
39	GOMPHIDAE	*Gomphidia bredoi*	Resident	LC	Unknown
40	GOMPHIDAE	*Ictinogomphus ferox*	Resident	LC	Stable
41	GOMPHIDAE	*Neurogomphus featheri*	Resident	LC	Unknown
42	GOMPHIDAE	*Notogomphus dorsalis*	Resident	LC	Unknown
43	GOMPHIDAE	*Paragomphus cognatus*	Resident	LC	Unknown
44	HESPERIIDAE	*Andronymus caesar*	Resident	LC	Unknown

45	HESPERIIDAE	*Eretis umbra*	Resident	LC	Unknown
46	LESTIDAE	*Lestes pallidus*	Resident	LC	Unknown
47	LESTIDAE	*Lestes ictericus*	Resident	LC	Unknown
48	LESTIDAE	*Lestes plagiatus*	Resident	LC	Unknown
49	LIBELLULIDAE	*Zygonoides fraseri*	Resident	LC	Unknown
50	LIBELLULIDAE	*Orthetrum angustiventre*	Resident	LC	Unknown
51	LIBELLULIDAE	*Acisoma variegatum*	Resident	LC	Unknown
52	LIBELLULIDAE	*Pantala flavescens*	Resident	LC	Stable
53	LIBELLULIDAE	*Tramea limbata*	Resident	LC	Unknown
54	LIBELLULIDAE	*Tholymis tillarga*	Resident	LC	Unknown
55	LIBELLULIDAE	*Aethiothemis solitaria*	Resident	LC	Unknown
56	LIBELLULIDAE	*Aethriamanta rezia*	Resident	LC	Unknown
57	LIBELLULIDAE	*Atoconeura kenya*	Resident	LC	Unknown
58	LIBELLULIDAE	*Crocothemis erythraea*	Resident	LC	Increasing
59	LIBELLULIDAE	*Diplacodes lefebvrii*	Resident	LC	Stable
60	LIBELLULIDAE	*Orthetrum abbotti*	Resident	LC	Unknown
61	LIBELLULIDAE	*Orthetrum chrysostigma*	Resident	LC	Stable
62	LIBELLULIDAE	*Orthetrum julia*	Resident	LC	Unknown
63	LIBELLULIDAE	*Orthetrum trinacria*	Resident	LC	Unknown
64	LIBELLULIDAE	*Rhyothemis semihyalina*	Resident	LC	Unknown
65	LIBELLULIDAE	*Tramea basilaris*	Resident	LC	Unknown
66	LIBELLULIDAE	*Trithemis annulata*	Resident	LC	Increasing
67	LIBELLULIDAE	*Trithemis arteriosa*	Resident	LC	Stable
68	LIBELLULIDAE	*Trithemis furva*	Resident	LC	Unknown
69	LIBELLULIDAE	*Trithemis kirbyi*	Resident	LC	Increasing
70	LIBELLULIDAE	*Urothemis edwardsii*	Resident	LC	Stable
71	LIBELLULIDAE	*Zygonyx torridus*	Resident	LC	Unknown
72	LIBELLULIDAE	*Diplacodes luminans*	Resident	LC	Unknown
73	LIBELLULIDAE	*Brachythemis impartita*	Resident	LC	Unknown
74	LIBELLULIDAE	*Brachythemis lacustris*	Resident	LC	Unknown
75	LIBELLULIDAE	*Brachythemis leucosticta*	Resident	LC	Unknown
76	LIBELLULIDAE	*Bradinopyga strachani*	Resident	LC	Unknown
77	LIBELLULIDAE	*Chalcostephia flavifrons*	Resident	LC	Unknown
78	LIBELLULIDAE	*Crocothemis sanguinolenta*	Resident	LC	Unknown
79	LIBELLULIDAE	*Crocothemis divisa*	Resident	LC	Unknown
80	LIBELLULIDAE	*Diplacodes deminuta*	Resident	LC	Unknown
81	LIBELLULIDAE	*Hadrothemis defecta*	Resident	LC	Unknown
82	LIBELLULIDAE	*Hemistigma albipunctum*	Resident	LC	Unknown
83	LIBELLULIDAE	*Olpogastra lugubris*	Resident	LC	Unknown
84	LIBELLULIDAE	*Orthetrum brachiale*	Resident	LC	Unknown
85	LIBELLULIDAE	*Orthetrum hintzi*	Resident	LC	Unknown
86	LIBELLULIDAE	*Orthetrum microstigma*	Resident	LC	Unknown
87	LIBELLULIDAE	*Orthetrum monardi*	Resident	LC	Unknown

88	LIBELLULIDAE	*Orthetrum stemmale*	Resident	LC	Unknown
89	LIBELLULIDAE	*Palpopleura portia*	Resident	LC	Unknown
90	LIBELLULIDAE	*Rhyothemis fenestrina*	Resident	LC	Unknown
91	LIBELLULIDAE	*Tetrathemis polleni*	Resident	LC	Unknown
92	LIBELLULIDAE	*Trithemis aconita*	Resident	LC	Unknown
93	LIBELLULIDAE	*Trithemis dichroa*	Resident	LC	Unknown
94	LIBELLULIDAE	*Trithemis hecate*	Resident	LC	Unknown
95	LIBELLULIDAE	*Trithemis imitata*	Resident	LC	Unknown
96	LIBELLULIDAE	*Trithemis integra*	Resident	LC	Unknown
97	LIBELLULIDAE	*Trithemis pruinata*	Resident	LC	Unknown
98	LIBELLULIDAE	*Trithemis stictica*	Resident	LC	Unknown
99	LIBELLULIDAE	*Trithemis werneri*	Resident	LC	Unknown
100	LIBELLULIDAE	*Trithetrum navasi*	Resident	LC	Unknown
101	LIBELLULIDAE	*Urothemis assignata*	Resident	LC	Unknown
102	LIBELLULIDAE	*Zygonyx natalensis*	Resident	LC	Unknown
103	LYCAENIDAE	*Eicochrysops messapus*	Resident	LC	Unknown
104	LYCAENIDAE	*Cacyreus fracta*	Resident	LC	Unknown
105	LYCAENIDAE	*Leptomyrina gorgias*	Resident	LC	Unknown
106	LYCAENIDAE	*Anthene dulcis*	Resident	LC	Unknown
107	LYCAENIDAE	*Iolaus mimosae*	Resident	LC	Unknown
108	LYCAENIDAE	*Uranothauma nubifer*	Resident	LC	Unknown
109	LYCAENIDAE	*Tuxentius melaena*	Resident	LC	Unknown
110	MACROMIIDAE	*Phyllomacromia africana*	Resident	LC	Unknown
111	MACROMIIDAE	*Phyllomacromia kimminsi*	Resident	LC	Unknown
112	MACROMIIDAE	*Phyllomacromia overlaeti*	Resident	LC	Unknown
113	MACROMIIDAE	*Phyllomacromia pseudafricana*	Resident	LC	Unknown
114	MACROMIIDAE	*Phyllomacromia sylvatica*	Resident	LC	Unknown
115	NYMPHALIDAE	*Vanessa cardui*	Resident	LC	Unknown
116	NYMPHALIDAE	*Ypthima condamini*	Resident	LC	Unknown
117	NYMPHALIDAE	*Phalanta eurytis*	Resident	LC	Unknown
118	PAPILIONIDAE	*Papilio echerioides*	Resident	LC	Unknown
119	PAPILIONIDAE	*Graphium angolanus*	Resident	LC	Unknown
120	PAPILIONIDAE	*Graphium leonidas*	Resident	LC	Unknown
121	PAPILIONIDAE	*Graphium policenes*	Resident	LC	Unknown
122	PAPILIONIDAE	*Papilio dardanus*	Resident	LC	Unknown
123	PAPILIONIDAE	*Papilio demodocus*	Resident	LC	Unknown
124	PAPILIONIDAE	*Papilio nireus*	Resident	LC	Unknown
125	PAPILIONIDAE	*Graphium antheus*	Resident	LC	Unknown
126	PLATYCNEMIDIDAE	*Elattoneura nigra*	Resident	LC	Unknown
127	PLATYCNEMIDIDAE	*Allocnemis nigripes*	Resident	LC	Unknown
128	PLATYCNEMIDIDAE	*Elattoneura glauca*	Resident	LC	Unknown
129	PLATYCNEMIDIDAE	*Mesocnemis singularis*	Resident	LC	Unknown
130	SCARABAEIDAE	*Onitis robustus*	Resident	LC	Unknown

131	SCARABAEIDAE	*Cyptochirus ambiguus*	Resident	LC	Unknown
132	TETRIGIDAE	*Paratettix asbenensis*	Resident	LC	Unknown
133	TETTIGONIIDAE	*Eulioptera reticulata*	Resident	LC	Unknown
134	TETTIGONIIDAE	*Eulioptera spinulosa*	Resident	LC	Unknown
135	TETTIGONIIDAE	*Plangia graminea*	Resident	LC	Unknown
136	TETTIGONIIDAE	*Ruspolia ampla*	Resident	LC	Unknown
137	TRIDACTYLIDAE	*Afrotridactylus usambaricus*	Resident	LC	Unknown
138	TRIGONIDIIDAE	*Pteronemobius monochromus*	Resident	DD	Unknown

Table 15-5 - Complete checklist of birds species present in the 50km buffer around the project area.

N	Family	Scientific name	Seasonality	Red List category	Trend
1	**ACCIPITRIDAE**	***Gyps africanus***	**Resident**	**CR**	**Decreasing**
2	**ACCIPITRIDAE**	***Gyps rueppelli***	**Resident**	**CR**	**Decreasing**
3	**ACCIPITRIDAE**	***Necrosyrtes monachus***	**Resident**	**CR**	**Decreasing**
4	**ACCIPITRIDAE**	***Trigonoceps occipitalis***	**Resident**	**CR**	**Decreasing**
5	**ACCIPITRIDAE**	***Polemaetus bellicosus***	**Resident**	**EN**	**Decreasing**
6	**ACCIPITRIDAE**	***Terathopius ecaudatus***	**Resident**	**EN**	**Decreasing**
7	**ACCIPITRIDAE**	***Torgos tracheliotos***	**Resident**	**EN**	**Decreasing**
8	**ACCIPITRIDAE**	***Aquila nipalensis***	**Non-breeding**	**EN**	**Decreasing**
9	ACCIPITRIDAE	*Circaetus cinerascens*	Resident	LC	Decreasing
10	ACCIPITRIDAE	*Circus ranivorus*	Resident	LC	Decreasing
11	ACCIPITRIDAE	*Polyboroides typus*	Resident	LC	Stable
12	ACCIPITRIDAE	*Kaupifalco monogrammicus*	Resident	LC	Stable
13	ACCIPITRIDAE	*Melierax metabates*	Resident	LC	Stable
14	ACCIPITRIDAE	*Micronisus gabar*	Resident	LC	Stable
15	ACCIPITRIDAE	*Accipiter minullus*	Resident	LC	Stable
16	ACCIPITRIDAE	*Accipiter rufiventris*	Resident	LC	Increasing
17	ACCIPITRIDAE	*Aquila spilogaster*	Resident	LC	Decreasing
18	ACCIPITRIDAE	*Lophaetus occipitalis*	Resident	LC	Increasing
19	ACCIPITRIDAE	*Accipiter toussenelii*	Resident	LC	Decreasing
20	ACCIPITRIDAE	*Buteo augur*	Resident	LC	Stable
21	ACCIPITRIDAE	*Gypohierax angolensis*	Resident	LC	Stable
22	ACCIPITRIDAE	*Haliaeetus vocifer*	Resident	LC	Stable
23	ACCIPITRIDAE	*Milvus aegyptius*	Resident	LC	Decreasing
24	ACCIPITRIDAE	*Accipiter badius*	Resident	LC	Stable
25	ACCIPITRIDAE	*Accipiter brevipes*	Non-breeding	LC	Stable
26	ACCIPITRIDAE	*Hieraaetus ayresii*	Resident	LC	Decreasing
27	ACCIPITRIDAE	*Circus pygargus*	Non-breeding	LC	Decreasing
28	ACCIPITRIDAE	*Aviceda cuculoides*	Resident	LC	Stable
29	ACCIPITRIDAE	*Butastur rufipennis*	Non-breeding	LC	Decreasing
30	ACCIPITRIDAE	*Buteo auguralis*	Resident	LC	Stable

31	ACCIPITRIDAE	*Circaetus cinereus*	Resident	LC	Decreasing
32	ACCIPITRIDAE	*Circus aeruginosus*	Non-breeding	LC	Stable
33	ACCIPITRIDAE	*Clanga pomarina*	Non-breeding	LC	Stable
34	ACCIPITRIDAE	*Hieraaetus pennatus*	Non-breeding	LC	Stable
35	ACCIPITRIDAE	*Hieraaetus wahlbergi*	Resident	LC	Stable
36	ACCIPITRIDAE	*Milvus migrans*	Non-breeding	LC	Stable
37	ACCIPITRIDAE	*Buteo buteo*	Non-breeding	LC	Increasing
38	ACCIPITRIDAE	*Pernis apivorus*	Non-breeding	LC	Stable
39	ACCIPITRIDAE	*Gypaetus barbatus*	Resident	NT	Decreasing
40	ACCIPITRIDAE	*Circus macrourus*	Non-breeding	NT	Decreasing
41	ACCIPITRIDAE	*Buteo oreophilus*	Resident	NT	Decreasing
42	**ACCIPITRIDAE**	***Aquila rapax***	**Resident**	**VU**	**Decreasing**
43	**ACROCEPHALIDAE**	***Acrocephalus griseldis***	**Passage**	**EN**	**Stable**
44	ACROCEPHALIDAE	*Acrocephalus schoenobaenus*	Non-breeding	LC	Stable
45	ACROCEPHALIDAE	*Acrocephalus gracilirostris*	Resident	LC	Stable
46	ACROCEPHALIDAE	*Iduna natalensis*	Resident	LC	Stable
47	ACROCEPHALIDAE	*Iduna similis*	Resident	LC	Stable
48	ACROCEPHALIDAE	*Hippolais icterina*	Passage	LC	Decreasing
49	ACROCEPHALIDAE	*Acrocephalus arundinaceus*	Passage	LC	Decreasing
50	ACROCEPHALIDAE	*Acrocephalus rufescens*	Resident	LC	Stable
51	ACROCEPHALIDAE	*Acrocephalus scirpaceus*	Resident	LC	Stable
52	ACROCEPHALIDAE	*Iduna pallida*	Non-breeding	LC	Stable
53	ALAUDIDAE	*Mirafra hypermetra*	Resident	LC	Stable
54	ALAUDIDAE	*Pinarocorys erythropygia*	Breeding	LC	Stable
55	ALAUDIDAE	*Galerida modesta*	Resident	LC	Stable
56	ALAUDIDAE	*Mirafra javanica*	Resident	LC	Stable
57	ALAUDIDAE	*Mirafra rufocinnamomea*	Resident	LC	Decreasing
58	ALCEDINIDAE	*Ispidina picta*	Resident	LC	Stable
59	ALCEDINIDAE	*Halcyon leucocephala*	Resident	LC	Stable
60	ALCEDINIDAE	*Halcyon senegalensis*	Resident	LC	Stable
61	ALCEDINIDAE	*Halcyon malimbica*	Resident	LC	Decreasing
62	ALCEDINIDAE	*Halcyon chelicuti*	Resident	LC	Stable
63	ALCEDINIDAE	*Megaceryle maxima*	Resident	LC	Decreasing
64	ALCEDINIDAE	*Corythornis cristatus*	Resident	LC	Stable
65	ALCEDINIDAE	*Ceryle rudis*	Resident	LC	Unknown
66	ANATIDAE	*Aythya fuligula*	Non-breeding	LC	Stable
67	ANATIDAE	*Spatula querquedula*	Non-breeding	LC	Decreasing
68	ANATIDAE	*Dendrocygna bicolor*	Resident	LC	Decreasing
69	ANATIDAE	*Dendrocygna viduata*	Resident	LC	Increasing
70	ANATIDAE	*Thalassornis leuconotus*	Resident	LC	Decreasing
71	ANATIDAE	*Plectropterus gambensis*	Resident	LC	Increasing
72	ANATIDAE	*Nettapus auritus*	Resident	LC	Decreasing
73	ANATIDAE	*Anas sparsa*	Resident	LC	Decreasing

74	ANATIDAE	*Anas undulata*	Resident	LC	Stable
75	ANATIDAE	*Anas erythrorhyncha*	Resident	LC	Decreasing
76	ANATIDAE	*Spatula hottentota*	Resident	LC	Decreasing
77	ANATIDAE	*Netta erythrophthalma*	Resident	LC	Decreasing
78	ANATIDAE	*Sarkidiornis melanotos*	Resident	LC	Decreasing
79	ANATIDAE	*Mareca penelope*	Non-breeding	LC	Decreasing
80	ANATIDAE	*Alopochen aegyptiaca*	Resident	LC	Decreasing
81	ANATIDAE	*Spatula clypeata*	Non-breeding	LC	Decreasing
82	ANATIDAE	*Anas acuta*	Non-breeding	LC	Decreasing
83	ANATIDAE	*Anas crecca*	Non-breeding	LC	Unknown
84	**ANATIDAE**	***Aythya ferina***	**Non-breeding**	**VU**	**Decreasing**
85	ANHINGIDAE	*Anhinga rufa*	Resident	LC	Decreasing
86	APODIDAE	*Tachymarptis melba*	Resident	LC	Stable
87	APODIDAE	*Apus apus*	Passage	LC	Stable
88	APODIDAE	*Apus affinis*	Resident	LC	Increasing
89	APODIDAE	*Apus caffer*	Resident	LC	Increasing
90	APODIDAE	*Cypsiurus parvus*	Resident	LC	Increasing
91	ARDEIDAE	*Egretta garzetta*	Resident	LC	Increasing
92	ARDEIDAE	*Egretta ardesiaca*	Resident	LC	Stable
93	ARDEIDAE	*Ardea melanocephala*	Resident	LC	Increasing
94	ARDEIDAE	*Ardea goliath*	Resident	LC	Stable
95	ARDEIDAE	*Ixobrychus sturmii*	Resident	LC	Unknown
96	ARDEIDAE	*Ardea brachyrhyncha*	Resident	LC	Decreasing
97	ARDEIDAE	*Ardeola ralloides*	Resident	LC	Unknown
98	ARDEIDAE	*Ardea cinerea*	Resident	LC	Unknown
99	ARDEIDAE	*Ardea purpurea*	Resident	LC	Decreasing
100	ARDEIDAE	*Ardea alba*	Resident	LC	Unknown
101	ARDEIDAE	*Bubulcus ibis*	Resident	LC	Increasing
102	ARDEIDAE	*Ixobrychus minutus*	Resident	LC	Decreasing
103	ARDEIDAE	*Nycticorax nycticorax*	Resident	LC	Decreasing
104	ARDEIDAE	*Butorides striata*	Resident	LC	Stable
105	**BALAENICIPITIDAE**	***Balaeniceps rex***	**Resident**	**VU**	**Decreasing**
106	BUCEROTIDAE	*Tockus flavirostris*	Resident	LC	Decreasing
107	BUCEROTIDAE	*Lophoceros nasutus*	Resident	LC	Stable
108	BUCEROTIDAE	*Ceratogymna atrata*	Resident	LC	Decreasing
109	BUCEROTIDAE	*Tockus erythrorhynchus*	Resident	LC	Stable
110	BUCEROTIDAE	*Lophoceros fasciatus*	Resident	LC	Unknown
111	BUCEROTIDAE	*Bycanistes subcylindricus*	Resident	LC	Unknown
112	**BUCEROTIDAE**	***Bucorvus abyssinicus***	**Resident**	**VU**	**Decreasing**
113	BUPHAGIDAE	*Buphagus africanus*	Resident	LC	Decreasing
114	BUPHAGIDAE	*Buphagus erythrorynchus*	Resident	LC	Decreasing
115	BURHINIDAE	*Burhinus senegalensis*	Resident	LC	Unknown
116	BURHINIDAE	*Burhinus capensis*	Resident	LC	Stable

117	BURHINIDAE	*Burhinus oedicnemus*	Non-breeding	LC	Decreasing
118	CAMPEPHAGIDAE	*Ceblepyris pectoralis*	Resident	LC	Decreasing
119	CAMPEPHAGIDAE	*Campephaga flava*	Resident	LC	Stable
120	CAMPEPHAGIDAE	*Campephaga quiscalina*	Resident	LC	Decreasing
121	CAMPEPHAGIDAE	*Campephaga phoenicea*	Resident	LC	Stable
122	CAPRIMULGIDAE	*Caprimulgus europaeus*	Passage	LC	Decreasing
123	CAPRIMULGIDAE	*Caprimulgus natalensis*	Resident	LC	Decreasing
124	CAPRIMULGIDAE	*Caprimulgus inornatus*	Non-breeding	LC	Stable
125	CAPRIMULGIDAE	*Caprimulgus stellatus*	Resident	LC	Stable
126	CAPRIMULGIDAE	*Caprimulgus tristigma*	Resident	LC	Stable
127	CAPRIMULGIDAE	*Caprimulgus climacurus*	Resident	LC	Stable
128	CAPRIMULGIDAE	*Caprimulgus clarus*	Resident	LC	Stable
129	CAPRIMULGIDAE	*Caprimulgus longipennis*	breeding	LC	Stable
130	CAPRIMULGIDAE	*Caprimulgus poliocephalus*	Resident	LC	Stable
131	CAPRIMULGIDAE	*Caprimulgus vexillarius*	Non-breeding	LC	Stable
132	CHARADRIIDAE	*Vanellus spinosus*	Resident	LC	Increasing
133	CHARADRIIDAE	*Charadrius pecuarius*	Resident	LC	Unknown
134	CHARADRIIDAE	*Vanellus crassirostris*	Resident	LC	Unknown
135	CHARADRIIDAE	*Vanellus tectus*	Resident	LC	Unknown
136	CHARADRIIDAE	*Vanellus senegallus*	Resident	LC	Stable
137	CHARADRIIDAE	*Vanellus lugubris*	Resident	LC	Unknown
138	CHARADRIIDAE	*Charadrius tricollaris*	Resident	LC	Unknown
139	CHARADRIIDAE	*Charadrius asiaticus*	Non-breeding	LC	Decreasing
140	CHARADRIIDAE	*Charadrius dubius*	Non-breeding	LC	Stable
141	CHARADRIIDAE	*Charadrius hiaticula*	Non-breeding	LC	Decreasing
142	CICONIIDAE	*Ciconia ciconia*	Non-breeding	LC	Increasing
143	CICONIIDAE	*Mycteria ibis*	Resident	LC	Decreasing
144	CICONIIDAE	*Ciconia abdimii*	Non-breeding	LC	Decreasing
145	CICONIIDAE	*Ephippiorhynchus senegalensis*	Resident	LC	Decreasing
146	CICONIIDAE	*Leptoptilos crumenifer*	Resident	LC	Increasing
147	CICONIIDAE	*Ciconia microscelis*	Resident	LC	Stable
148	CICONIIDAE	*Ciconia nigra*	Non-breeding	LC	Unknown
149	CICONIIDAE	*Anastomus lamelligerus*	Resident	LC	Stable
150	CISTICOLIDAE	*Cisticola erythrops*	Resident	LC	Stable
151	CISTICOLIDAE	*Cisticola cantans*	Resident	LC	Stable
152	CISTICOLIDAE	*Cisticola lateralis*	Resident	LC	Stable
153	CISTICOLIDAE	*Cisticola aberrans*	Resident	LC	Stable
154	CISTICOLIDAE	*Cisticola chiniana*	Resident	LC	Stable
155	CISTICOLIDAE	*Cisticola ruficeps*	Resident	LC	Stable
156	CISTICOLIDAE	*Cisticola troglodytes*	Resident	LC	Stable
157	CISTICOLIDAE	*Cisticola ayresii*	Resident	LC	Decreasing
158	CISTICOLIDAE	*Prinia subflava*	Resident	LC	Stable
159	CISTICOLIDAE	*Schistolais leucopogon*	Resident	LC	Stable

160	CISTICOLIDAE	*Prinia erythroptera*	Resident	LC	Stable
161	CISTICOLIDAE	*Drymocichla incana*	Resident	LC	Stable
162	CISTICOLIDAE	*Camaroptera brachyura*	Resident	LC	Increasing
163	CISTICOLIDAE	*Phyllolais pulchella*	Resident	LC	Stable
164	CISTICOLIDAE	*Cisticola juncidis*	Resident	LC	Increasing
165	CISTICOLIDAE	*Apalis rufogularis*	Resident	LC	Stable
166	CISTICOLIDAE	*Eremomela icteropygialis*	Resident	LC	Stable
167	CISTICOLIDAE	*Eremomela canescens*	Resident	LC	Stable
168	CISTICOLIDAE	*Eremomela badiceps*	Resident	LC	Stable
169	CISTICOLIDAE	*Apalis jacksoni*	Resident	LC	Stable
170	CISTICOLIDAE	*Apalis cinerea*	Resident	LC	Stable
171	CISTICOLIDAE	*Eminia lepida*	Resident	LC	Stable
172	CISTICOLIDAE	*Cisticola marginatus*	Resident	LC	Stable
173	CISTICOLIDAE	*Cisticola natalensis*	Resident	LC	Stable
174	CISTICOLIDAE	*Cisticola brachypterus*	Resident	LC	Stable
175	COLIIDAE	*Colius striatus*	Resident	LC	Increasing
176	COLIIDAE	*Urocolius macrourus*	Resident	LC	Decreasing
177	COLUMBIDAE	*Columba arquatrix*	Resident	LC	Decreasing
178	COLUMBIDAE	*Streptopelia lugens*	Resident	LC	Stable
179	COLUMBIDAE	*Streptopelia decipiens*	Resident	LC	Stable
180	COLUMBIDAE	*Streptopelia vinacea*	Resident	LC	Stable
181	COLUMBIDAE	*Streptopelia semitorquata*	Resident	LC	Increasing
182	COLUMBIDAE	*Turtur abyssinicus*	Resident	LC	Stable
183	COLUMBIDAE	*Turtur afer*	Resident	LC	Stable
184	COLUMBIDAE	*Turtur tympanistria*	Resident	LC	Stable
185	COLUMBIDAE	*Treron waalia*	Resident	LC	Decreasing
186	COLUMBIDAE	*Treron calvus*	Resident	LC	Decreasing
187	COLUMBIDAE	*Columba guinea*	Resident	LC	Stable
188	COLUMBIDAE	*Columba unicincta*	Resident	LC	Decreasing
189	COLUMBIDAE	*Columba delegorguei*	Resident	LC	Decreasing
190	COLUMBIDAE	*Spilopelia senegalensis*	Resident	LC	Stable
191	COLUMBIDAE	*Streptopelia capicola*	Resident	LC	Increasing
192	COLUMBIDAE	*Oena capensis*	Non-breeding	LC	Increasing
193	CORACIIDAE	*Coracias abyssinicus*	Resident	LC	Increasing
194	CORACIIDAE	*Coracias naevius*	Resident	LC	Decreasing
195	CORACIIDAE	*Coracias cyanogaster*	Resident	LC	Decreasing
196	CORACIIDAE	*Eurystomus glaucurus*	Resident	LC	Stable
197	CORACIIDAE	*Coracias garrulus*	Non-breeding	LC	Decreasing
198	CORVIDAE	*Corvus capensis*	Resident	LC	Increasing
199	CORVIDAE	*Ptilostomus afer*	Resident	LC	Stable
200	CORVIDAE	*Corvus albus*	Resident	LC	Stable
201	CUCULIDAE	*Clamator jacobinus*	Resident	LC	Stable
202	CUCULIDAE	*Clamator levaillantii*	Non-breeding	LC	Stable

203	CUCULIDAE	*Cuculus solitarius*	Resident	LC	Stable
204	CUCULIDAE	*Cuculus gularis*	Resident	LC	Stable
205	CUCULIDAE	*Chrysococcyx klaas*	Resident	LC	Stable
206	CUCULIDAE	*Chrysococcyx caprius*	Resident	LC	Stable
207	CUCULIDAE	*Centropus grillii*	Resident	LC	Stable
208	CUCULIDAE	*Centropus monachus*	Resident	LC	Stable
209	CUCULIDAE	*Centropus senegalensis*	Resident	LC	Stable
210	CUCULIDAE	*Centropus superciliosus*	Resident	LC	Stable
211	CUCULIDAE	*Cuculus clamosus*	Resident	LC	Stable
212	CUCULIDAE	*Chrysococcyx cupreus*	Resident	LC	Stable
213	CUCULIDAE	*Cuculus canorus*	Non-breeding	LC	Decreasing
214	CUCULIDAE	*Clamator glandarius*	Resident	LC	Stable
215	DICRURIDAE	*Dicrurus adsimilis*	Resident	LC	Stable
216	ELANIDAE	*Elanus caeruleus*	Resident	LC	Stable
217	EMBERIZIDAE	*Emberiza tahapisi*	Resident	LC	Stable
218	EMBERIZIDAE	*Emberiza flaviventris*	Resident	LC	Stable
219	EMBERIZIDAE	*Emberiza affinis*	Resident	LC	Stable
220	EMBERIZIDAE	*Emberiza cabanisi*	Resident	LC	Stable
221	ESTRILDIDAE	*Nesocharis capistrata*	Resident	LC	Stable
222	ESTRILDIDAE	*Pytilia phoenicoptera*	Resident	LC	Stable
223	ESTRILDIDAE	*Spermophaga ruficapilla*	Resident	LC	Stable
224	ESTRILDIDAE	*Clytospiza monteiri*	Resident	LC	Stable
225	ESTRILDIDAE	*Lagonosticta rufopicta*	Resident	LC	Stable
226	ESTRILDIDAE	*Lagonosticta rara*	Resident	LC	Stable
227	ESTRILDIDAE	*Granatina ianthinogaster*	Resident	LC	Stable
228	ESTRILDIDAE	*Estrilda paludicola*	Resident	LC	Stable
229	ESTRILDIDAE	*Estrilda rhodopyga*	Resident	LC	Stable
230	ESTRILDIDAE	*Estrilda nonnula*	Resident	LC	Stable
231	ESTRILDIDAE	*Estrilda charmosyna*	Resident	LC	Stable
232	ESTRILDIDAE	*Odontospiza griseicapilla*	Resident	LC	Stable
233	ESTRILDIDAE	*Spermestes cucullata*	Resident	LC	Stable
234	ESTRILDIDAE	*Amadina fasciata*	Resident	LC	Stable
235	ESTRILDIDAE	*Coccopygia quartinia*	Resident	LC	Stable
236	ESTRILDIDAE	*Lagonosticta nigricollis*	Resident	LC	Stable
237	ESTRILDIDAE	*Estrilda erythronotos*	Resident	LC	Stable
238	ESTRILDIDAE	*Lagonosticta rubricata*	Resident	LC	Stable
239	ESTRILDIDAE	*Spermestes bicolor*	Resident	LC	Stable
240	ESTRILDIDAE	*Pytilia melba*	Resident	LC	Stable
241	ESTRILDIDAE	*Cryptospiza salvadorii*	Resident	LC	Stable
242	ESTRILDIDAE	*Euschistospiza dybowskii*	Resident	LC	Stable
243	ESTRILDIDAE	*Estrilda troglodytes*	Resident	LC	Stable
244	ESTRILDIDAE	*Estrilda astrild*	Resident	LC	Stable
245	ESTRILDIDAE	*Amandava subflava*	Resident	LC	Stable

246	ESTRILDIDAE	*Euodice cantans*	Resident	LC	Stable
247	ESTRILDIDAE	*Nigrita canicapillus*	Resident	LC	Stable
248	ESTRILDIDAE	*Pytilia afra*	Resident	LC	Stable
249	ESTRILDIDAE	*Mandingoa nitidula*	Resident	LC	Stable
250	ESTRILDIDAE	*Pyrenestes ostrinus*	Resident	LC	Stable
251	ESTRILDIDAE	*Lagonosticta senegala*	Resident	LC	Stable
252	ESTRILDIDAE	*Uraeginthus bengalus*	Resident	LC	Stable
253	ESTRILDIDAE	*Spermestes fringilloides*	Resident	LC	Stable
254	ESTRILDIDAE	*Ortygospiza atricollis*	Resident	LC	Stable
255	FALCONIDAE	*Polihierax semitorquatus*	Resident	LC	Stable
256	FALCONIDAE	*Falco ardosiaceus*	Resident	LC	Stable
257	FALCONIDAE	*Falco ruficollis*	Resident	LC	Decreasing
258	FALCONIDAE	*Falco alopex*	Resident	LC	Stable
259	FALCONIDAE	*Falco biarmicus*	Resident	LC	Decreasing
260	FALCONIDAE	*Falco cuvierii*	Resident	LC	Decreasing
261	FALCONIDAE	*Falco naumanni*	Non-breeding	LC	Stable
262	FALCONIDAE	*Falco peregrinus*	Non-breeding	LC	Increasing
263	FALCONIDAE	*Falco subbuteo*	Non-breeding	LC	Decreasing
264	FALCONIDAE	*Falco tinnunculus*	Resident	LC	Decreasing
265	**FALCONIDAE**	***Falco vespertinus***	**Passage**	**VU**	**Decreasing**
266	FRINGILLIDAE	*Crithagra leucopygia*	Resident	LC	Stable
267	FRINGILLIDAE	*Crithagra mozambica*	Resident	LC	Decreasing
268	FRINGILLIDAE	*Linurgus olivaceus*	Resident	LC	Stable
269	GLAREOLIDAE	*Rhinoptilus chalcopterus*	Resident	LC	Stable
270	GLAREOLIDAE	*Rhinoptilus cinctus*	Resident	LC	Stable
271	GLAREOLIDAE	*Cursorius temminckii*	Resident	LC	Stable
272	GLAREOLIDAE	*Glareola nuchalis*	Resident	LC	Decreasing
273	GLAREOLIDAE	*Glareola pratincola*	Non-breeding	LC	Decreasing
274	GLAREOLIDAE	*Glareola nordmanni*	Passage	NT	Decreasing
275	**GRUIDAE**	***Balearica pavonina***	**Resident**	**VU**	**Decreasing**
276	HELIORNITHIDAE	*Podica senegalensis*	Resident	LC	Decreasing
277	HIRUNDINIDAE	*Riparia paludicola*	Resident	LC	Decreasing
278	HIRUNDINIDAE	*Hirundo aethiopica*	Resident	LC	Increasing
279	HIRUNDINIDAE	*Hirundo smithii*	Resident	LC	Increasing
280	HIRUNDINIDAE	*Cecropis senegalensis*	Resident	LC	Increasing
281	HIRUNDINIDAE	*Psalidoprocne albiceps*	Resident	LC	Stable
282	HIRUNDINIDAE	*Ptyonoprogne rufigula*	Resident	LC	Stable
283	HIRUNDINIDAE	*Cecropis abyssinica*	Resident	LC	Increasing
284	HIRUNDINIDAE	*Cecropis daurica*	Resident	LC	Stable
285	HIRUNDINIDAE	*Pseudhirundo griseopyga*	Resident	LC	Stable
286	HIRUNDINIDAE	*Psalidoprocne pristoptera*	Resident	LC	Decreasing
287	HIRUNDINIDAE	*Delichon urbicum*	Non-breeding	LC	Decreasing
288	HIRUNDINIDAE	*Cecropis semirufa*	Resident	LC	Increasing

289	HIRUNDINIDAE	*Hirundo rustica*	Non-breeding	LC	Decreasing
290	HIRUNDINIDAE	*Riparia riparia*	Non-breeding	LC	Decreasing
291	HIRUNDINIDAE	*Neophedina cincta*	Resident	LC	Increasing
292	INDICATORIDAE	*Indicator maculatus*	Resident	LC	Decreasing
293	INDICATORIDAE	*Indicator variegatus*	Resident	LC	Stable
294	INDICATORIDAE	*Indicator indicator*	Resident	LC	Increasing
295	INDICATORIDAE	*Indicator minor*	Resident	LC	Stable
296	INDICATORIDAE	*Indicator exilis*	Resident	LC	Unknown
297	INDICATORIDAE	*Prodotiscus insignis*	Resident	LC	Decreasing
298	JACANIDAE	*Actophilornis africanus*	Resident	LC	Stable
299	LANIIDAE	*Lanius isabellinus*	Non-breeding	LC	Stable
300	LANIIDAE	*Lanius excubitoroides*	Resident	LC	Stable
301	LANIIDAE	*Lanius collaris*	Resident	LC	Increasing
302	LANIIDAE	*Lanius corvinus*	Resident	LC	Unknown
303	LANIIDAE	*Eurocephalus ruppelli*	Resident	LC	Stable
304	LANIIDAE	*Lanius phoenicuroides*	Non-breeding	LC	Stable
305	LANIIDAE	*Lanius collurio*	Non-breeding	LC	Decreasing
306	LANIIDAE	*Lanius gubernator*	Resident	LC	Stable
307	LANIIDAE	*Lanius senator*	Non-breeding	NT	Decreasing
308	LARIDAE	*Chlidonias leucopterus*	Non-breeding	LC	Stable
309	LARIDAE	*Chlidonias hybrida*	Non-breeding	LC	Stable
310	LARIDAE	*Larus cirrocephalus*	Resident	LC	Stable
311	LARIDAE	*Gelochelidon nilotica*	Non-breeding	LC	Decreasing
312	LARIDAE	*Hydroprogne caspia*	Non-breeding	LC	Increasing
313	LARIDAE	*Rynchops flavirostris*	Passage	LC	Decreasing
314	LARIDAE	*Larus fuscus*	Non-breeding	LC	Increasing
315	LEIOTRICHIDAE	*Argya rubiginosa*	Resident	LC	Stable
316	LEIOTRICHIDAE	*Turdoides tenebrosa*	Resident	LC	Decreasing
317	LEIOTRICHIDAE	*Turdoides plebejus*	Resident	LC	Stable
318	LOCUSTELLIDAE	*Bradypterus cinnamomeus*	Resident	LC	Stable
319	LOCUSTELLIDAE	*Locustella fluviatilis*	Passage	LC	Decreasing
320	LOCUSTELLIDAE	*Bradypterus centralis*	Resident	LC	Stable
321	LYBIIDAE	*Pogoniulus bilineatus*	Resident	LC	Stable
322	LYBIIDAE	*Pogoniulus chrysoconus*	Resident	LC	Stable
323	LYBIIDAE	*Pogoniulus pusillus*	Resident	LC	Stable
324	LYBIIDAE	*Tricholaema diadematа*	Resident	LC	Stable
325	LYBIIDAE	*Tricholaema lacrymosa*	Resident	LC	Stable
326	LYBIIDAE	*Lybius vieilloti*	Resident	LC	Unknown
327	LYBIIDAE	*Lybius guifsobalito*	Resident	LC	Increasing
328	LYBIIDAE	*Pogonornis bidentatus*	Resident	LC	Stable
329	LYBIIDAE	*Pogonornis rolleti*	Resident	LC	Decreasing
330	LYBIIDAE	*Trachyphonus erythrocephalus*	Resident	LC	Stable
331	LYBIIDAE	*Trachylaemus purpuratus*	Resident	LC	Decreasing

332	LYBIIDAE	*Trachyphonus darnaudii*	Resident	LC	Stable
333	LYBIIDAE	*Gymnobucco cinereiceps*	Resident	LC	Decreasing
334	LYBIIDAE	*Lybius leucocephalus*	Resident	LC	Stable
335	MACROSPHENIDAE	*Melocichla mentalis*	Resident	LC	Stable
336	MACROSPHENIDAE	*Sylvietta virens*	Resident	LC	Stable
337	MACROSPHENIDAE	*Sylvietta brachyura*	Resident	LC	Stable
338	MALACONOTIDAE	*Dryoscopus gambensis*	Resident	LC	Stable
339	MALACONOTIDAE	*Dryoscopus angolensis*	Resident	LC	Stable
340	MALACONOTIDAE	*Tchagra australis*	Resident	LC	Stable
341	MALACONOTIDAE	*Laniarius luehderi*	Resident	LC	Stable
342	MALACONOTIDAE	*Laniarius aethiopicus*	Resident	LC	Stable
343	MALACONOTIDAE	*Laniarius erythrogaster*	Resident	LC	Stable
344	MALACONOTIDAE	*Chlorophoneus sulfureopectus*	Resident	LC	Stable
345	MALACONOTIDAE	*Malaconotus blanchoti*	Resident	LC	Increasing
346	MALACONOTIDAE	*Nilaus afer*	Resident	LC	Stable
347	MALACONOTIDAE	*Tchagra senegalus*	Resident	LC	Stable
348	MALACONOTIDAE	*Bocagia minuta*	Resident	LC	Decreasing
349	MEROPIDAE	*Merops bulocki*	Resident	LC	Stable
350	MEROPIDAE	*Merops pusillus*	Resident	LC	Decreasing
351	MEROPIDAE	*Merops oreobates*	Resident	LC	Unknown
352	MEROPIDAE	*Merops hirundineus*	Resident	LC	Stable
353	MEROPIDAE	*Merops albicollis*	Non-breeding	LC	Stable
354	MEROPIDAE	*Merops superciliosus*	Resident	LC	Stable
355	MEROPIDAE	*Merops nubicus*	Resident	LC	Decreasing
356	MEROPIDAE	*Merops viridissimus*	Resident	LC	Increasing
357	MEROPIDAE	*Merops persicus*	Non-breeding	LC	Stable
358	MONARCHIDAE	*Trochocercus nitens*	Resident	LC	Decreasing
359	MONARCHIDAE	*Terpsiphone viridis*	Resident	LC	Stable
360	MOTACILLIDAE	*Tmetothylacus tenellus*	Resident	LC	Stable
361	MOTACILLIDAE	*Macronyx croceus*	Resident	LC	Stable
362	MOTACILLIDAE	*Motacilla cinerea*	Non-breeding	LC	Stable
363	MOTACILLIDAE	*Anthus cinnamomeus*	Resident	LC	Stable
364	MOTACILLIDAE	*Anthus leucophrys*	Resident	LC	Stable
365	MOTACILLIDAE	*Anthus trivialis*	Non-breeding	LC	Decreasing
366	MOTACILLIDAE	*Motacilla aguimp*	Resident	LC	Stable
367	MOTACILLIDAE	*Anthus cervinus*	Non-breeding	LC	Stable
368	MOTACILLIDAE	*Motacilla alba*	Non-breeding	LC	Stable
369	MOTACILLIDAE	*Motacilla flava*	Non-breeding	LC	Decreasing
370	MUSCICAPIDAE	*Saxicola rubetra*	Non-breeding	LC	Decreasing
371	MUSCICAPIDAE	*Oenanthe pleschanka*	Non-breeding	LC	Stable
372	MUSCICAPIDAE	*Oenanthe isabellina*	Non-breeding	LC	Stable
373	MUSCICAPIDAE	*Monticola rufocinereus*	Resident	LC	Stable
374	MUSCICAPIDAE	*Agricola pallidus*	Resident	LC	Stable

375	MUSCICAPIDAE	*Bradornis microrhynchus*	Resident	LC	Stable
376	MUSCICAPIDAE	*Melaenornis fischeri*	Resident	LC	Stable
377	MUSCICAPIDAE	*Melaenornis edolioides*	Resident	LC	Stable
378	MUSCICAPIDAE	*Muscicapa adusta*	Resident	LC	Decreasing
379	MUSCICAPIDAE	*Fraseria caerulescens*	Resident	LC	Stable
380	MUSCICAPIDAE	*Pogonocichla stellata*	Resident	LC	Decreasing
381	MUSCICAPIDAE	*Sheppardia aequatorialis*	Resident	LC	Decreasing
382	MUSCICAPIDAE	*Cossypha heuglini*	Resident	LC	Stable
383	MUSCICAPIDAE	*Cossypha natalensis*	Resident	LC	Stable
384	MUSCICAPIDAE	*Cossypha niveicapilla*	Resident	LC	Stable
385	MUSCICAPIDAE	*Cercotrichas leucophrys*	Resident	LC	Stable
386	MUSCICAPIDAE	*Myrmecocichla nigra*	Resident	LC	Stable
387	MUSCICAPIDAE	*Oenanthe albifrons*	Resident	LC	Stable
388	MUSCICAPIDAE	*Sheppardia polioptera*	Resident	LC	Decreasing
389	MUSCICAPIDAE	*Luscinia megarhynchos*	Non-breeding	LC	Stable
390	MUSCICAPIDAE	*Monticola saxatilis*	Non-breeding	LC	Decreasing
391	MUSCICAPIDAE	*Ficedula semitorquata*	Non-breeding	LC	Decreasing
392	MUSCICAPIDAE	*Cichladusa guttata*	Resident	LC	Stable
393	MUSCICAPIDAE	*Chamaetylas poliocephala*	Resident	LC	Decreasing
394	MUSCICAPIDAE	*Fraseria plumbea*	Resident	LC	Stable
395	MUSCICAPIDAE	*Cossypha cyanocampter*	Resident	LC	Decreasing
396	MUSCICAPIDAE	*Empidornis semipartitus*	Resident	LC	Stable
397	MUSCICAPIDAE	*Muscicapa gambagae*	Resident	LC	Stable
398	MUSCICAPIDAE	*Muscicapa aquatica*	Resident	LC	Stable
399	MUSCICAPIDAE	*Oenanthe heuglinii*	Resident	LC	Stable
400	MUSCICAPIDAE	*Thamnolaea cinnamomeiventris*	Resident	LC	Stable
401	MUSCICAPIDAE	*Oenanthe oenanthe*	Non-breeding	LC	Decreasing
402	MUSCICAPIDAE	*Dessonornis caffer*	Resident	LC	Stable
403	MUSCICAPIDAE	*Ficedula albicollis*	Passage	LC	Increasing
404	MUSCICAPIDAE	*Muscicapa striata*	Passage	LC	Decreasing
405	MUSCICAPIDAE	*Phoenicurus phoenicurus*	Non-breeding	LC	Increasing
406	MUSCICAPIDAE	*Saxicola torquatus*	Resident	LC	Stable
407	MUSOPHAGIDAE	*Tauraco schuettii*	Resident	LC	Stable
408	MUSOPHAGIDAE	*Tauraco leucolophus*	Resident	LC	Stable
409	MUSOPHAGIDAE	*Musophaga rossae*	Resident	LC	Stable
410	MUSOPHAGIDAE	*Criniferoides leucogaster*	Resident	LC	Stable
411	MUSOPHAGIDAE	*Crinifer zonurus*	Resident	LC	Stable
412	MUSOPHAGIDAE	*Corythaeola cristata*	Resident	LC	Stable
413	NECTARINIIDAE	*Anthreptes longuemarei*	Resident	LC	Stable
414	NECTARINIIDAE	*Anthreptes orientalis*	Resident	LC	Stable
415	NECTARINIIDAE	*Hedydipna collaris*	Resident	LC	Stable
416	NECTARINIIDAE	*Cyanomitra verticalis*	Resident	LC	Stable
417	NECTARINIIDAE	*Chalcomitra amethystina*	Resident	LC	Stable

418	NECTARINIIDAE	*Chalcomitra rubescens*	Resident	LC	Stable
419	NECTARINIIDAE	*Cinnyris osea*	Resident	LC	Stable
420	NECTARINIIDAE	*Cinnyris reichenowi*	Resident	LC	Stable
421	NECTARINIIDAE	*Cinnyris pulchellus*	Resident	LC	Stable
422	NECTARINIIDAE	*Anthreptes tephrolaemus*	Resident	LC	Stable
423	NECTARINIIDAE	*Hedydipna platura*	Resident	LC	Stable
424	NECTARINIIDAE	*Cyanomitra olivacea*	Resident	LC	Stable
425	NECTARINIIDAE	*Chalcomitra senegalensis*	Resident	LC	Stable
426	NECTARINIIDAE	*Cinnyris cupreus*	Resident	LC	Stable
427	NECTARINIIDAE	*Cinnyris erythrocercus*	Resident	LC	Stable
428	NUMIDIDAE	*Guttera verreauxi*	Resident	LC	Stable
429	NUMIDIDAE	*Numida meleagris*	Resident	LC	Stable
430	ODONTOPHORIDAE	*Ptilopachus petrosus*	Resident	LC	Stable
431	ORIOLIDAE	*Oriolus larvatus*	Resident	LC	Increasing
432	ORIOLIDAE	*Oriolus oriolus*	Passage	LC	Stable
433	ORIOLIDAE	*Oriolus auratus*	Non-breeding	LC	Decreasing
434	ORIOLIDAE	*Oriolus nigripennis*	Resident	LC	Stable
435	OTIDIDAE	*Lissotis melanogaster*	Resident	LC	Decreasing
436	OTIDIDAE	*Neotis denhami*	Resident	NT	Decreasing
437	OTIDIDAE	*Ardeotis arabs*	Resident	NT	Decreasing
438	PANDIONIDAE	*Pandion haliaetus*	Non-breeding	LC	Increasing
439	PARIDAE	*Melaniparus funereus*	Resident	LC	Decreasing
440	PARIDAE	*Melaniparus guineensis*	Resident	LC	Stable
441	PASSERIDAE	*Gymnoris dentata*	Resident	LC	Stable
442	PASSERIDAE	*Passer griseus*	Resident	LC	Stable
443	PASSERIDAE	*Passer eminibey*	Resident	LC	Stable
444	PASSERIDAE	*Passer shelleyi*	Resident	LC	Stable
445	PELECANIDAE	*Pelecanus rufescens*	Resident	LC	Stable
446	PELECANIDAE	*Pelecanus onocrotalus*	Non-breeding	LC	Unknown
447	PELLORNEIDAE	*Illadopsis albipectus*	Resident	LC	Stable
448	PELLORNEIDAE	*Illadopsis fulvescens*	Resident	LC	Stable
449	PHALACROCORACIDAE	*Microcarbo africanus*	Resident	LC	Decreasing
450	PHALACROCORACIDAE	*Phalacrocorax carbo*	Resident	LC	Increasing
451	PHASIANIDAE	*Ortygornis sephaena*	Resident	LC	Stable
452	PHASIANIDAE	*Scleroptila gutturalis*	Resident	LC	Stable
453	PHASIANIDAE	*Pternistis clappertoni*	Resident	LC	Decreasing
454	PHASIANIDAE	*Pternistis icterorhynchus*	Resident	LC	Stable
455	PHASIANIDAE	*Pternistis squamatus*	Resident	LC	Decreasing
456	PHASIANIDAE	*Pternistis leucoscepus*	Resident	LC	Decreasing
457	PHASIANIDAE	*Coturnix delegorguei*	Resident	LC	Stable
458	PHASIANIDAE	*Synoicus adansonii*	Resident	LC	Stable
459	PHASIANIDAE	*Coturnix coturnix*	Resident	LC	Decreasing
460	PHOENICULIDAE	*Phoeniculus purpureus*	Resident	LC	Decreasing

461	PHOENICULIDAE	*Phoeniculus bollei*	Resident	LC	Decreasing
462	PHOENICULIDAE	*Rhinopomastus aterrimus*	Resident	LC	Decreasing
463	PHOENICULIDAE	*Rhinopomastus minor*	Resident	LC	Decreasing
464	PHYLLOSCOPIDAE	*Phylloscopus trochilus*	Passage	LC	Decreasing
465	PHYLLOSCOPIDAE	*Phylloscopus sibilatrix*	Non-breeding	LC	Decreasing
466	PHYLLOSCOPIDAE	*Phylloscopus umbrovirens*	Resident	LC	Stable
467	PHYLLOSCOPIDAE	*Phylloscopus collybita*	Non-breeding	LC	Increasing
468	PICIDAE	*Campethera punctuligera*	Resident	LC	Stable
469	PICIDAE	*Campethera abingoni*	Resident	LC	Stable
470	PICIDAE	*Pardipicus caroli*	Resident	LC	Decreasing
471	PICIDAE	*Dendropicos poecilolaemus*	Resident	LC	Stable
472	PICIDAE	*Dendropicos fuscescens*	Resident	LC	Stable
473	PICIDAE	*Dendropicos namaquus*	Resident	LC	Stable
474	PICIDAE	*Dendropicos obsoletus*	Resident	LC	Stable
475	PICIDAE	*Dendropicos goertae*	Resident	LC	Stable
476	PICIDAE	*Jynx torquilla*	Non-breeding	LC	Decreasing
477	PLATYSTEIRIDAE	*Batis molitor*	Resident	LC	Stable
478	PLATYSTEIRIDAE	*Batis orientalis*	Resident	LC	Stable
479	PLATYSTEIRIDAE	*Platysteira cyanea*	Resident	LC	Stable
480	PLATYSTEIRIDAE	*Dyaphorophyia castanea*	Resident	LC	Stable
481	PLATYSTEIRIDAE	*Dyaphorophyia jamesoni*	Resident	LC	Stable
482	PLATYSTEIRIDAE	*Batis erlangeri*	Resident	LC	Decreasing
483	PLOCEIDAE	*Plocepasser mahali*	Resident	LC	Stable
484	PLOCEIDAE	*Plocepasser superciliosus*	Resident	LC	Stable
485	PLOCEIDAE	*Pseudonigrita arnaudi*	Resident	LC	Stable
486	PLOCEIDAE	*Ploceus baglafecht*	Resident	LC	Stable
487	PLOCEIDAE	*Ploceus ocularis*	Resident	LC	Stable
488	PLOCEIDAE	*Ploceus heuglini*	Resident	LC	Stable
489	PLOCEIDAE	*Ploceus taeniopterus*	Resident	LC	Stable
490	PLOCEIDAE	*Ploceus badius*	Resident	LC	Stable
491	PLOCEIDAE	*Ploceus superciliosus*	Resident	LC	Stable
492	PLOCEIDAE	*Quelea erythrops*	Resident	LC	Stable
493	PLOCEIDAE	*Euplectes hordeaceus*	Resident	LC	Stable
494	PLOCEIDAE	*Euplectes macroura*	Resident	LC	Stable
495	PLOCEIDAE	*Euplectes albonotatus*	Resident	LC	Stable
496	PLOCEIDAE	*Euplectes ardens*	Resident	LC	Stable
497	PLOCEIDAE	*Anaplectes leuconotos*	Resident	LC	Stable
498	PLOCEIDAE	*Ploceus melanocephalus*	Resident	LC	Stable
499	PLOCEIDAE	*Sporopipes frontalis*	Resident	LC	Stable
500	PLOCEIDAE	*Ploceus intermedius*	Resident	LC	Stable
501	PLOCEIDAE	*Dinemellia dinemelli*	Resident	LC	Stable
502	PLOCEIDAE	*Euplectes afer*	Resident	LC	Stable
503	PLOCEIDAE	*Euplectes franciscanus*	Resident	LC	Stable

504	PLOCEIDAE	*Euplectes axillaris*	Resident	LC	Stable
505	PLOCEIDAE	*Amblyospiza albifrons*	Resident	LC	Stable
506	PLOCEIDAE	*Ploceus luteolus*	Resident	LC	Stable
507	PLOCEIDAE	*Ploceus melanogaster*	Resident	LC	Decreasing
508	PLOCEIDAE	*Ploceus vitellinus*	Resident	LC	Stable
509	PLOCEIDAE	*Ploceus cucullatus*	Resident	LC	Stable
510	PLOCEIDAE	*Ploceus jacksoni*	Resident	LC	Stable
511	PLOCEIDAE	*Ploceus bicolor*	Resident	LC	Stable
512	PLOCEIDAE	*Malimbus rubricollis*	Resident	LC	Stable
513	PLOCEIDAE	*Quelea cardinalis*	Resident	LC	Stable
514	PLOCEIDAE	*Quelea quelea*	Resident	LC	Stable
515	PLUVIANIDAE	*Pluvianus aegyptius*	Resident	LC	Decreasing
516	PODICIPEDIDAE	*Tachybaptus ruficollis*	Resident	LC	Decreasing
517	PSITTACIDAE	*Poicephalus meyeri*	Resident	LC	Stable
518	PSITTACIDAE	*Agapornis pullarius*	Resident	LC	Decreasing
519	PSITTACIDAE	*Alexandrinus krameri*	Resident	LC	Increasing
520	PTEROCLIDAE	*Pterocles quadricinctus*	Resident	LC	Stable
521	PYCNONOTIDAE	*Eurillas curvirostris*	Resident	LC	Stable
522	PYCNONOTIDAE	*Stelgidillas gracilirostris*	Resident	LC	Stable
523	PYCNONOTIDAE	*Chlorocichla laetissima*	Resident	LC	Stable
524	PYCNONOTIDAE	*Phyllastrephus strepitans*	Resident	LC	Decreasing
525	PYCNONOTIDAE	*Phyllastrephus hypochloris*	Resident	LC	Stable
526	PYCNONOTIDAE	*Phyllastrephus albigularis*	Resident	LC	Stable
527	PYCNONOTIDAE	*Bleda syndactylus*	Resident	LC	Stable
528	PYCNONOTIDAE	*Atimastillas flavigula*	Resident	LC	Stable
529	PYCNONOTIDAE	*Eurillas latirostris*	Resident	LC	Stable
530	PYCNONOTIDAE	*Baeopogon indicator*	Resident	LC	Stable
531	PYCNONOTIDAE	*Pycnonotus barbatus*	Resident	LC	Increasing
532	PYCNONOTIDAE	*Pyrrhurus scandens*	Resident	LC	Stable
533	PYCNONOTIDAE	*Phyllastrephus cabanisi*	Resident	LC	Stable
534	RALLIDAE	*Crex crex*	Passage	LC	Stable
535	RALLIDAE	*Porzana porzana*	Non-breeding	LC	Stable
536	RALLIDAE	*Sarothrura elegans*	Resident	LC	Stable
537	RALLIDAE	*Sarothrura affinis*	Resident	LC	Decreasing
538	RALLIDAE	*Crex egregia*	Resident	LC	Stable
539	RALLIDAE	*Zapornia flavirostra*	Resident	LC	Unknown
540	RALLIDAE	*Porphyrio alleni*	Resident	LC	Decreasing
541	RALLIDAE	*Paragallinula angulata*	Resident	LC	Unknown
542	RECURVIROSTRIDAE	*Himantopus himantopus*	Resident	LC	Increasing
543	RECURVIROSTRIDAE	*Recurvirostra avosetta*	Resident	LC	Unknown
544	REMIZIDAE	*Anthoscopus musculus*	Resident	LC	Stable
545	REMIZIDAE	*Anthoscopus parvulus*	Resident	LC	Stable
546	ROSTRATULIDAE	*Rostratula benghalensis*	Resident	LC	Decreasing

547	SAGITTARIIDAE	*Sagittarius serpentarius*	Resident	EN	Decreasing
548	SCOLOPACIDAE	*Numenius phaeopus*	Non-breeding	LC	Decreasing
549	SCOLOPACIDAE	*Calidris pugnax*	Non-breeding	LC	Decreasing
550	SCOLOPACIDAE	*Lymnocryptes minimus*	Non-breeding	LC	Stable
551	SCOLOPACIDAE	*Actitis hypoleucos*	Non-breeding	LC	Decreasing
552	SCOLOPACIDAE	*Tringa ochropus*	Non-breeding	LC	Increasing
553	SCOLOPACIDAE	*Tringa erythropus*	Non-breeding	LC	Stable
554	SCOLOPACIDAE	*Tringa nebularia*	Non-breeding	LC	Stable
555	SCOLOPACIDAE	*Tringa glareola*	Non-breeding	LC	Stable
556	SCOLOPACIDAE	*Tringa stagnatilis*	Non-breeding	LC	Decreasing
557	SCOLOPACIDAE	*Calidris minuta*	Non-breeding	LC	Increasing
558	SCOLOPACIDAE	*Calidris temminckii*	Non-breeding	LC	Unknown
559	SCOLOPACIDAE	*Gallinago gallinago*	Non-breeding	LC	Decreasing
560	SCOLOPACIDAE	*Limosa limosa*	Non-breeding	NT	Decreasing
561	SCOLOPACIDAE	*Gallinago media*	Non-breeding	NT	Decreasing
562	SCOPIDAE	*Scopus umbretta*	Resident	LC	Stable
563	SCOTOCERCIDAE	*Hylia prasina*	Resident	LC	Stable
564	STENOSTIRIDAE	*Elminia longicauda*	Resident	LC	Stable
565	STRIGIDAE	*Bubo lacteus*	Resident	LC	Stable
566	STRIGIDAE	*Strix woodfordii*	Resident	LC	Stable
567	STRIGIDAE	*Glaucidium perlatum*	Resident	LC	Stable
568	STRIGIDAE	*Bubo cinerascens*	Resident	LC	Stable
569	STRIGIDAE	*Ptilopsis leucotis*	Resident	LC	Stable
570	STRIGIDAE	*Otus senegalensis*	Resident	LC	Stable
571	STRIGIDAE	*Scotopelia peli*	Resident	LC	Decreasing
572	STRIGIDAE	*Asio capensis*	Resident	LC	Stable
573	STRIGIDAE	*Otus scops*	Non-breeding	LC	Decreasing
574	STURNIDAE	*Poeoptera stuhlmanni*	Resident	LC	Decreasing
575	STURNIDAE	*Onychognathus walleri*	Resident	LC	Decreasing
576	STURNIDAE	*Lamprotornis chalcurus*	Resident	LC	Stable
577	STURNIDAE	*Lamprotornis purpuroptera*	Resident	LC	Unknown
578	STURNIDAE	*Creatophora cinerea*	Resident	LC	Stable
579	STURNIDAE	*Lamprotornis chloropterus*	Resident	LC	Stable
580	STURNIDAE	*Lamprotornis superbus*	Resident	LC	Unknown
581	STURNIDAE	*Onychognathus morio*	Resident	LC	Increasing
582	STURNIDAE	*Pholia sharpii*	Resident	LC	Decreasing
583	STURNIDAE	*Cinnyricinclus leucogaster*	Resident	LC	Decreasing
584	STURNIDAE	*Lamprotornis purpureus*	Resident	LC	Stable
585	SYLVIIDAE	*Sylvia atricapilla*	Non-breeding	LC	Increasing
586	SYLVIIDAE	*Sylvia borin*	Passage	LC	Decreasing
587	SYLVIIDAE	*Sylvia abyssinica*	Resident	LC	Decreasing
588	SYLVIIDAE	*Curruca communis*	Non-breeding	LC	Increasing
589	THRESKIORNITHIDAE	*Bostrychia hagedash*	Resident	LC	Increasing

590	THRESKIORNITHIDAE	*Platalea alba*	Resident	LC	Stable
591	THRESKIORNITHIDAE	*Threskiornis aethiopicus*	Resident	LC	Stable
592	THRESKIORNITHIDAE	*Plegadis falcinellus*	Resident	LC	Decreasing
593	TROGONIDAE	*Apaloderma narina*	Resident	LC	Stable
594	TURDIDAE	*Turdus pelios*	Resident	LC	Unknown
595	TURDIDAE	*Geokichla piaggiae*	Resident	LC	Decreasing
596	**TURDIDAE**	***Geokichla guttata***	**Resident**	**VU**	**Decreasing**
597	TURNICIDAE	*Turnix sylvaticus*	Resident	LC	Decreasing
598	TYTONIDAE	*Tyto alba*	Resident	LC	Stable
599	UPUPIDAE	*Upupa epops*	Resident	LC	Decreasing
600	VANGIDAE	*Prionops plumatus*	Resident	LC	Stable
601	VANGIDAE	*Megabyas flammulatus*	Resident	LC	Decreasing
602	VIDUIDAE	*Vidua fischeri*	Resident	LC	Stable
603	VIDUIDAE	*Vidua interjecta*	Resident	LC	Stable
604	VIDUIDAE	*Anomalospiza imberbis*	Resident	LC	Stable
605	VIDUIDAE	*Vidua chalybeata*	Resident	LC	Stable
606	VIDUIDAE	*Vidua raricola*	Resident	LC	Stable
607	VIDUIDAE	*Vidua wilsoni*	Resident	LC	Stable
608	VIDUIDAE	*Vidua paradisaea*	Resident	LC	Stable
609	ZOSTEROPIDAE	*Zosterops senegalensis*	Resident	LC	Stable

16 ANNEX 4: POVERTY ANALYSIS

Electricity plays a central role in all aspects of human welfare and economic growth, including access to water, agricultural productivity, health care, education, job creation, climate change and environmental sustainability. Globally, in 2021 access to electricity grew by an annual average of 0.7 percentage points between 2010 and 2021, rising from 84 percent of the world's population to 91 percent. However still 675 million people do not have access to electricity, the vast majority live in SSA. In fact in 2021, 567 million people in sub-Saharan Africa did not have access to electricity, accounting for more than 80% of the global population without access. The access deficit in the region stayed almost the same as in 2010.

This lack of access to sustainable electricity supply forces some to pay high prices for poor quality substitutes or go without electricity all together. Lack of access to electricity does not only impose significant constraints on the provision of social services, but it also impedes economic growth, damages human health, increases vulnerability to climate change and traps many in abject poverty (UNDP 2009).

The ultimate goal of the project is regional integration by improving the livelihood of the people as well as the quality of the socioeconomic development environment for South Sudan through increased availability and affordability of electricity supply. The purpose of the Project is to improve access to electricity in South Sudan and Northern Uganda through increased cross-border sharing of power and to provide reliable power supply to the environs of the project. Outputs of the preparatory activities would enable the NELSAP, South Sudan and Uganda to take the necessary steps to have the transmission line constructed.

The proposed 400 kV AC Over Head Transmission Line from Olwiyo to Bibia in Uganda, Nimule (which is at the Uganda/South Sudan Border) and Juba in South Sudan is an important additional network to facilitate regional integration of electricity networks and facilitate power trade. This transmission line will finally connect to Olwiyo substation in Northern Uganda (which is already on going under the initiative of the Uganda Government).

Among the specific objective of the project there are two point that refer to the enhancement of livelihood, namely:

- Facilitate of rural electrification and improvement in the standard of living for the population in the project areas.
- Provide a stable power supply to the South Sudan around the Capital Juba and the Ugandan communities near the border in order to improve businesses for social and economic development of the project area.
- Poverty reduction and Improvement in the standard of living by providing electricity needed for health, education, clean water and communication infrastructures.

The project contributes primarily to three Sustainable Development Goals (SDG), touching also other goals as side effects:

SDG 1_End poverty in all its forms everywhere and
SDG 7_Ensure access to affordable, reliable, sustainable and modern energy for all
SDG 9_Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation



1. Objectives

The objective is to analyse the development impact of the project and its impact on poverty reduction and to undertake the following tasks: a) assess the likely development impact on economic activity for each individual country, b) prepare a socioeconomic and poverty profile of potential project beneficiaries in each country

2. Electricity Supply and Demand in the Country

In South Sudan there is no interconnected national grid and the electricity is delivered by a little number of isolated mini grids mainly located in the State capitals such as Juba, Malakal, Wau and Renk. Although the potential of hydro generation, the power generation is from expensive diesel generation and the supply is limited to a few towns.

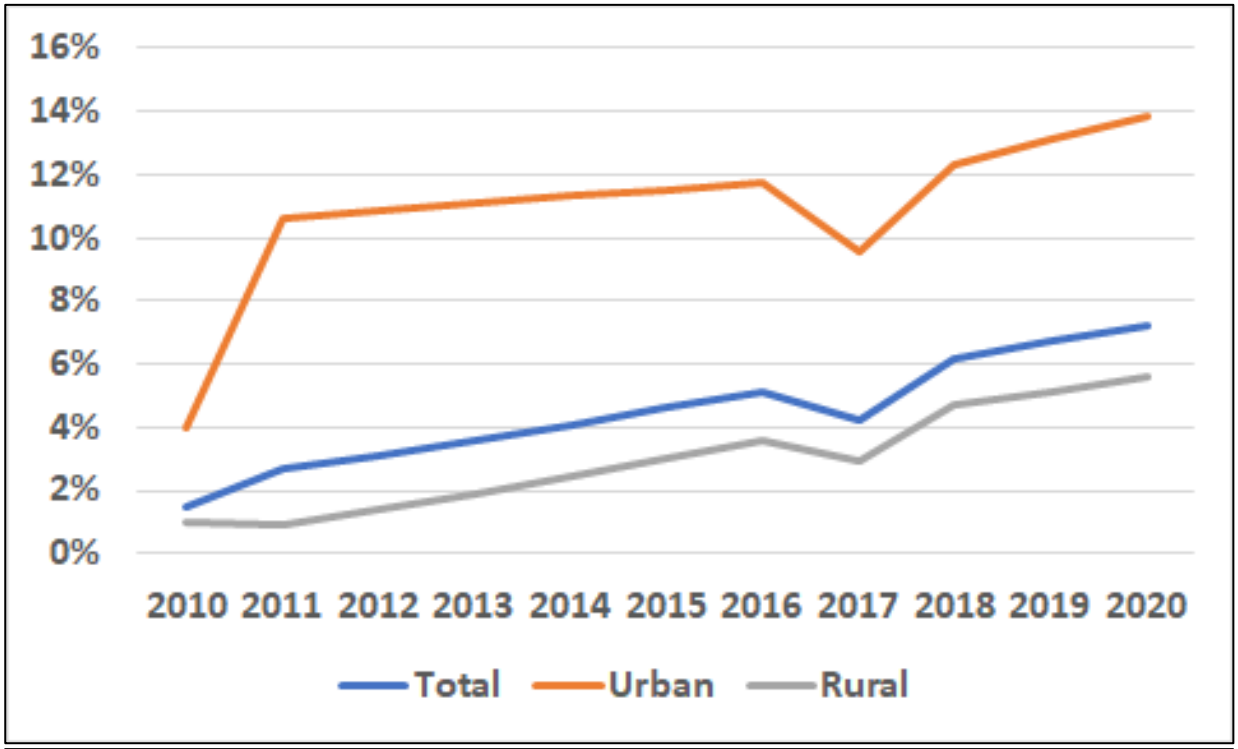
The installed generation capacity is still very low and way below that which has been installed in other Eastern African regional countries. For lighting and cooking, the population in his majority makes use of fuelwood, charcoal and grass for lighting and cooking; only about 14% of the population is using petroleum products and only close to 4% of the population uses electricity.
The current demand in SSEC's supply areas is much higher than the power utility can provide. The supply gap has forced the businesses and high-class households to meet their supply deficit from own generation. Despite the abundance of sources for electricity generation (hydro and oil), the present power supply by SSEC is limited to three state capitals (Juba, Malakal and Wau) and Renk town.
The current generation mix is made up entirely of thermal sources (mainly diesel), with a total installed generation capacity of approximately 141MW (compared to GoSS demand estimates of over 300MW). A large part of this capacity is non-operational, serves the country's oil fields and for these reasons is largely unavailable to the public (the capacity currently serving the public is estimated to be less than 70MW, around half of which concentrated in Juba).
There is no inter-connected grid system in South Sudan. Although the government has indicated plans to develop a national grid, no studies have yet been conducted on these lines[29]. In any case, South Sudan's low population density and large size limits the technical and economic viability of developing a nation-wide grid, and more distributed or isolated systems might offer a higher return on investment and lower technical complexity in the near-term.
Information about the electricity access can be obtained by the WB public database and are resumed in Table 16-1.

Table 16-1 – Electricity Access – Source: WB

Year	Electricity access(%)		
	Urban	Rural	Total
2010	4.00%	0.96%	1.50%
2011	10.58%	0.95%	2.68%
2012	10.84%	1.42%	3.14%
2013	11.08%	1.92%	3.61%
2014	11.32%	2.44%	4.10%
2015	11.55%	2.99%	4.60%
2016	11.77%	3.55%	5.12%
2017	9.60%	2.90%	4.20%
2018	12.29%	4.68%	6.17%
2019	13.12%	5.11%	6.71%
2020	13.87%	5.56%	7.24%

[29] South Sudan's low population density and large size limits the technical and economic viability of developing a nation-wide grid

According to the data of reported in the table and figure above, in the year 2020 the total access rate in South Sudan was 7.24 % (3.61% in 2013), 13.87% urban (11.08% in 2013) and 5.56% rural (1.92% in 2013). This access rate ranks among the lowest in SSA and neighbouring countries as showed by the figure below.



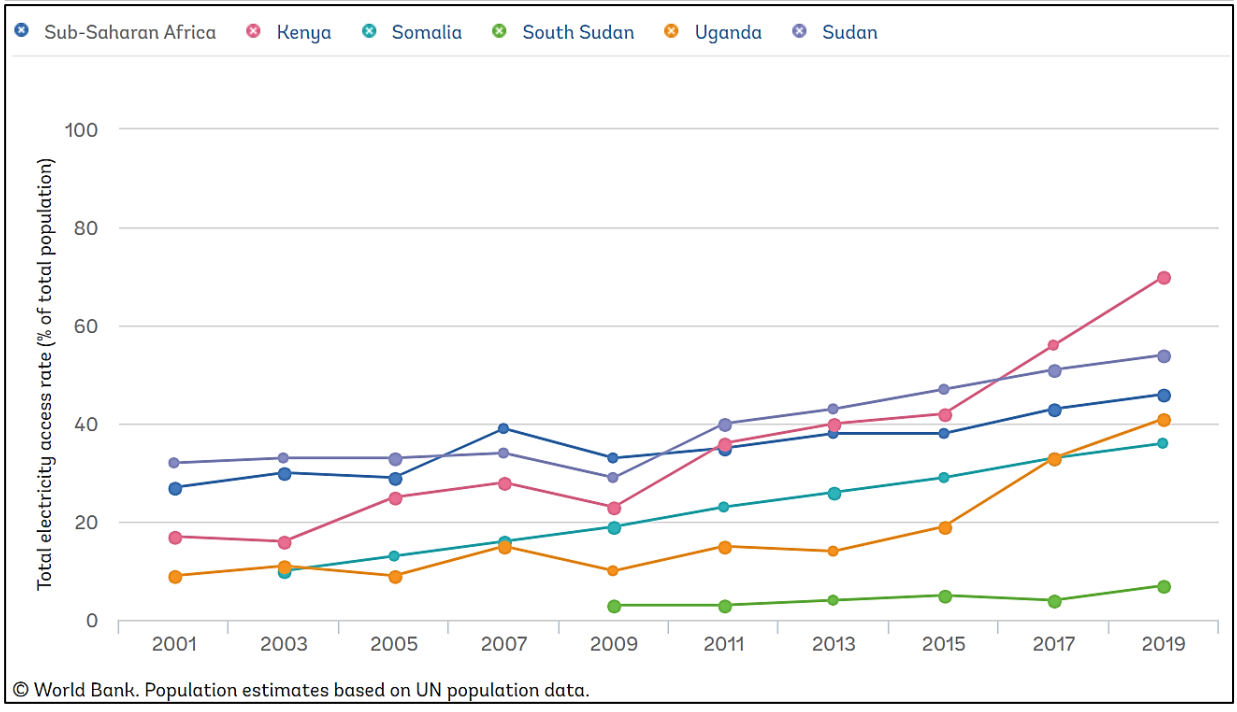


Figure 16-1 – Change in electricity access rate in South Sudan and neighboring countries (2001 – 2019)

South Sudan's average annual per capita electricity consumption is 41kWh (2018), which is much lower than the 124kWh SSA (excluding South Africa) average in the same year. It is also substantially less than in neighboring countries such as Kenya (172kWh), Sudan (328kWh), DR Congo (91kWh), Ethiopia (83kWh), and Uganda (83kWh), as shown in the following figure.

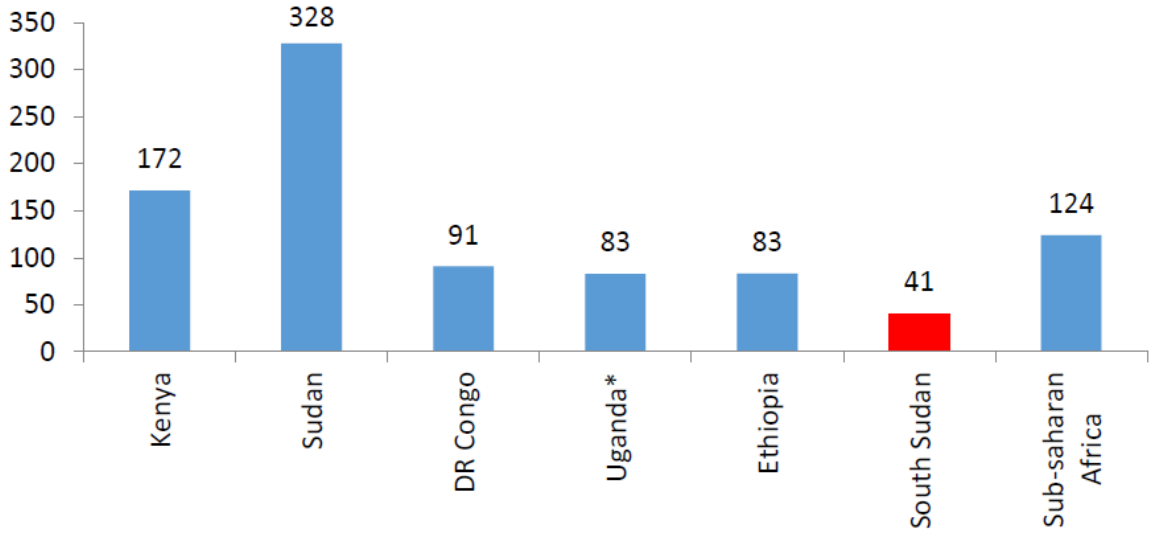


Figure 16-2 – Per capita electricity consumption (Units in kWh) in South Sudan, neighboring countries, and SSA.

The analysis of these data (and other coming from other sources) shows that South Sudan's economic performance has been volatile since independence, with an economy highly dependent on its oil sector, which in 2011 accounted for 62% of GDP and was the country's sole exporter. Oil production was halted in 2012 while negotiations over oil-transfer tariffs were being carried out with Sudan. Since then, production and exports have been recovering gradually and the contribution of non-oil sectors to GDP has been declining since 2012. The economic impacts of the COVID-19 pandemic on South Sudan have been profound. Falling global oil prices and lower oil demand reduced government revenues Historical data about the population, coming from the WB database, show a slow increase in the last years.

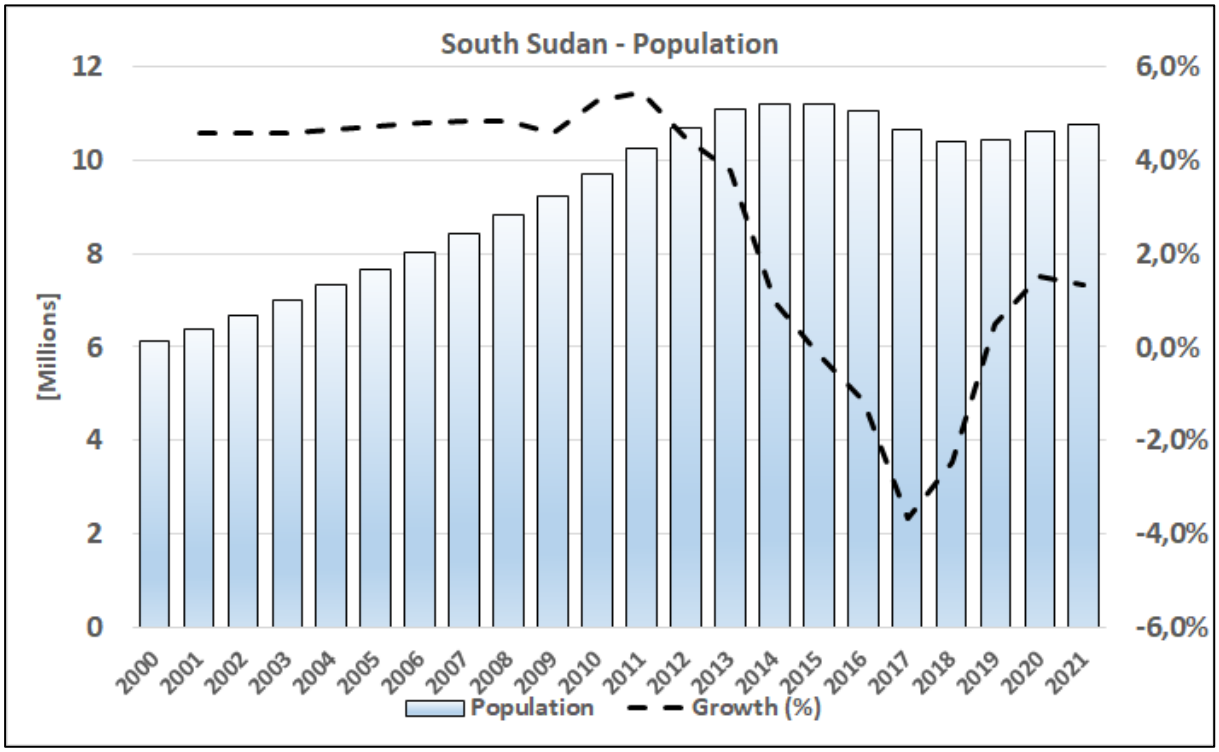


Figure 16-3 – Historical and estimated data of Population – Source World Bank

The demand forecast described in the feasibility study covers the period 2020-2040 and is based on a previous report , *"Provision of Electricity and Rural Energy: South Sudan: An Infrastructure Action Plan (2011)"* .

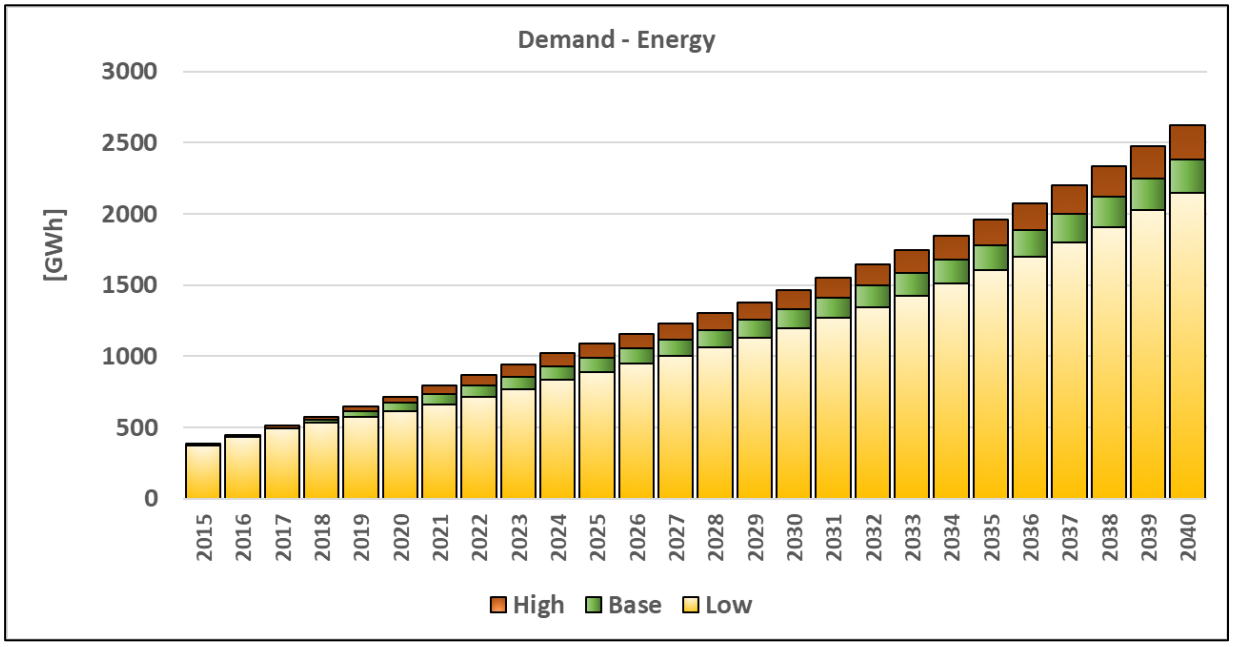


Figure 16-4 – South Sudan Historical and Energy Demand Forecast (2020-2040)

The amounts of the electricity reported in the tables below are the ones that will be required by the South Sudan in the future (internal consumption, including losses). The determination of the

energy/power exchange with neighboring countries is one of the subjects of the next steps of the Study (review of the generation transmission plan and demand-supply analysis).

Scenario	Item	2028	2033	2038	2043	2048
Low	Demand (GWh)	1,297	2,682	5,552	9,511	12,288
	Peak (MW)	206	425	880	1,508	1,939
Base	Demand (GWh)	1,379	2,949	6,800	11,985	15,333
	Peak (MW)	219	468	1,078	1,900	2,431
High	Demand (GWh)	1,464	3,241	8,169	14,500	19,192
	Peak (MW)	232	514	1,295	2,331	3,043

3. Development Impacts on Economic Activities

1st year of operation, 2028

2028 is the first year of operation of the proposed interconnection. While the transmission system of Uganda is in a more mature phase, the transmission system of South Sudan is basically starting from scratch and in 2028 only the city of Juba is expected to be connected to the national grid. Thus, the load that can be reached by the interconnection with Bibia and Olwiyo is only the load of the capital.

The major advantage that the interconnection is expected to give to the South Sudanese network is the availability of clean energy coming from the hydropower plants of Uganda that can replace the old and unreliable diesel generators installed in the capital. This will increase the reliability of supply of the load erasing the risk of Energy Not Supplied (ENS) and it avoids the need of burning fuel.

Indeed, presently South Sudan's electrical infrastructure comprises a city electrical grid in Juba, as well as a handful of other localized grid systems in the other state capitals, supplemented by many thousands of diesel generators used at the household level and by businesses and large institutions. After the CPA, the GoSS purchased new generators to power the Juba city grid, but these generators broke down in 2012 and were rendered inoperable due to the lack of spare parts and fuel, leading to the shutdown of the power station and city grid in Juba in 2015.50 After a renovation, electricity production for the Juba grid resumed in 2019. South Sudan's electricity sector is almost entirely reliant on diesel, which powers household generators, the Juba city grid, and almost everything else in between. Despite being a major oil producer, South Sudan at present lacks the capability to refine diesel from domestically produced oil, and therefore all diesel used in the country has to be imported. For these reasons, South Sudan continues to rely on imported diesel to run its generators and meet its other energy needs.

In addition, as supposed also during the deterministic analysis, the interconnection is exploited only in one direction from Uganda to South Sudan. This representation of the power exchanged across the interconnection confirms that there is no power flowing from South Sudan to Uganda due to the limited generation installed capacity in South Sudan.

Evolution of national transmission structures, 2033

According to the Transmission expansion Plan of South Sudan, in 2033 the national transmission infrastructure begins its evolution reaching the major cities of the neighbouring regions close to Juba as also other major villages of Central Equatorial. Thus, the load demand that now the interconnection is

able to supply increases even if the northern part of the country is developing independently from the southern part.

On the other hand, from the generation standpoint, in addition to the connection of local PV plants that now are no more isolated from the main network, the biggest addition to the South Sudanese generation fleet is given by the operation of the Grand Fula hydropower plant. Even if it operates only partially with respect to its complete installed capacity, its introduction changes significantly the situation from the supply-demand standpoint.

The energy flowing across the intended interconnection is significantly affected by Grand Fula: firstly the total energy exchanged between the two countries is lower in 2033 than in 2028. This is given by the fact that now the load of South Sudan is fed primarily not by the Ugandan hydropower plants but from the power plant of Grand Fula. Therefore, the need to import power from Uganda decreases.

Furthermore, at the same time, another important benefit associated to the presence of Grand Fula can be observed: compared to the situation in 2028, now in 2033 South Sudan is able to export part of its energy to Uganda. The amount is very limited in particular if compared to the amount of energy coming from Uganda to South Sudan, but it is a first sign of the potential role that the hydropower plants of South Sudan can play in the long-term period.

Conclusion of national transmission structures, 2038

Year 2038 is a very significant year since, based on the transmission expansion plan, is the first of the 5-target years where the national transmission infrastructure of South Sudan is finally completed and the capital and major cities of all the regions are interconnected together.

Thus, it is the first year where the probabilistic analysis is performed considering South Sudan as a whole network system with a developed transmission infrastructure which internally is still radial, but it is meshed and interconnected with the neighbouring countries.

In fact, in addition to the proposed interconnection between Juba and Bibia, in 2038 two new interconnections are considered to be in operation and both connect South Sudan to Ethiopia:

- the first one is a 220kV double circuit transmission line between Gambela and Malakal. Actually, it is expected to be in service since 2033 but it is considered to be influenced by the interconnection under study only starting from 2038 since it can be exploited by the southern part of the country only when the northern part of the country is reached by the national transmission infrastructure.
- The second one is the new 400kV double circuit transmission link between Juba and Teppi that, together with the 220kV double circuit link in the north of the country, is able to increase the Net Transfer Capacity (NTC) between these two countries up to 1000MW.

The significant evolution of the transmission system of South Sudan, together with the conclusion of Grand Fula hydropower plant, represents an important step in the evolution of the country paving the way to the possibility of South Sudan to export the power produced by its own hydropower plants to the neighbouring countries acting as a hub for the energy exchanged in the area.

This is confirmed by the amount of energy exchanged across the interconnection between South Sudan and Uganda as reported in Table 16-2: in 2038, as firstly proposed by the deterministic analysis, Uganda starts to be affected by a deficit of power due to the evolution of its internal load and this leads to the import of power coming from South Sudan and beyond, as for example from Ethiopia that has a lot of

hydropower plants. The need of Uganda to import power from South Sudan when its own generation is not enough increases the amount of energy flowing across the interconnection which is significantly higher than the total transit in the previous two target years.

Table 16-2 - Amount of energy exchanged between Uganda and South Sudan and country losses in year 2038

Energy exchanged and losses between Uganda and South Sudan in 2038	
Total energy exchanged [GWh]	2364.51
Energy flowing from Uganda to South Sudan	919.63
Energy flowing from South Sudan to Uganda	1444.88
Losses for the whole interconnection [GWh]	22.20
South Sudan Losses [GWh]	
WITH interconnection	66.17
WITHOUT interconnection	54.26

It is worth underlining that not only the total energy exchanged is increased more than five times with respect to year 2033, thanks both to the conclusion of Grand Fula and the presence of the two interconnections with Ethiopia, but also that roughly 60% of the total energy flowing through the interconnection goes from South Sudan to Uganda. Moreover, it is possible to observe that the interconnection is saturated at its maximum power of 1000 MW and it is important to underline that this condition happens when South Sudan is exporting towards Uganda.

Already in 2038, vast majority of the country is connected to the national transmission infrastructure specifically the major cities and villages are all interconnected together. Thus, beyond 2038, the scope of the transmission expansion plan is twofold: firstly, minor cities, in particular in the north-western area, should be reached by the nation grid in order to increase the electricity share and secondly, the network has to be strengthened with backup corridors in order to increase the security of supply in case of contingencies.
Furthermore, in 2043 another interconnection is expected to be in operation this time with Kenya, another important country in the area due to its generation fleet. This interconnection strengths the area increasing the possibility of power exchange between South Sudan, Uganda, Ethiopia and Kenya.

From the generation point of view, due to the expected increase in the load demand and the presence of interconnection links between the neighbouring countries as just discussed, in 2043 the first stage of the second major hydro power project is expected to be in operation thanks to the construction of power plant of Bedden downstream to Grand Fula.

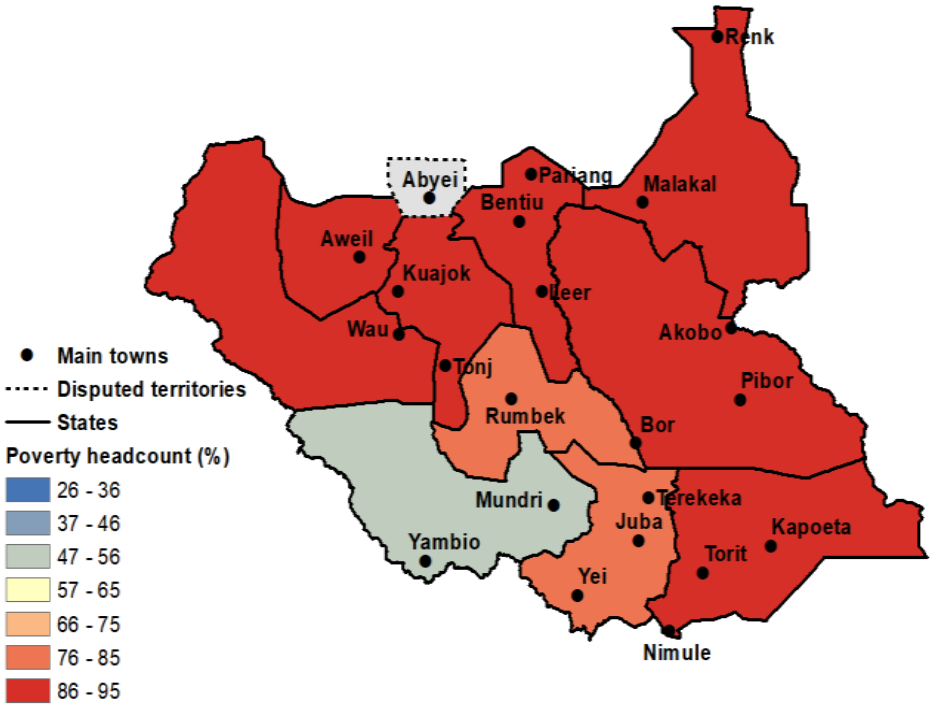
Year 2048 is the last target year of the analysis and, as anticipated before, from the transmission point of view the most remarkable project that is expected to be completed during the 5-year interval between 2043 and 2048 is the conclusion of the 220kV backup backbone.
In addition to the 400kV corridor between Juba and Malakal, the final configuration of the 220kV transmission system of South Sudan is able to connect the south portion of the country to the northern part creating a mesh system that is capable of increasing the security of supply especially in case of contingencies on the 400kV network.
For South Sudan, this represents a huge step towards a more reliable and mature transmission system infrastructure closing the gap with the more advanced transmission network of the neighbouring countries such as the one of Uganda.

Also from the generation standpoint, year 2048 is a very significant deadline: all the four major hydropower projects of South Sudan are expected to be fully in operation thanks to the conclusion of the power plant of Bedden but also to the construction of the last two hydropower sites of Lakki and Shukoli, both located downstream with respect to Grand Fula.
The realization of these two power plants has an important impact on the generation fleet of the country because now South Sudan has more than 2300MW of installed power coming from hydropower plants and the energy produced by the four power plants can feed the national demand, but it can also be exported through the different interconnections to the neighbouring countries.

Socioeconomic and poverty profile of potential project beneficiaries

The project beneficiaries can be divided into four main categories: a) people form Juba, b) direct consumers of electricity (households, commercial and industrial consumers), c) people benefitting indirectly from the services and d) people living in the direct impact zone. The first group will rely on long terms on more stable and clean electricity, while the second will benefit on indirect benefit of better-quality services such as schools, hospitals, trade centers etc. The third group will benefit on short terms from the induced commercial activities that will flourish with the coming contractors (i.e. casual labor, supply of services as food, canteen, laundry, driving etc.…)

In order to understand the condition of the beneficiaries it is necessary to have an understanding of the wellbeing of people living in the interested area two sources can be used: World Bank South Sudan Poverty Assessment: 2009–2017[30]. According to the report the poverty headcount – measuring the proportion of the population living under the international poverty line of US$1.90 PPP (2011) – was equal to 82 percent in 2016, placing South Sudan among the poorest countries in the world.



[30] The Impact of Conflict and Shocks on PovertySouth Sudan Poverty Assessment 2017, June 2018

Figure 16-5 Poverty head count South Sudan, WB 2017

Rural Areas

THE Poverty in South Sudan highlights the severe rural poverty driven by a lack of access to services, infrastructure, and opportunities beyond basic agriculture. Over 85% of South Sudan's 12 million people live in rural areas, where poverty is much higher than in urban regions. Rural households depend heavily on their agricultural production, making them highly vulnerable to falling below the poverty line with any small economic shock. Infrastructure is predominantly urban, with only 3% of households using electricity in 2016, and improved sanitation being extremely limited—13% overall, with only 5% in rural areas. Despite a higher rate of access to improved drinking water (70%), the country's overall access to basic services ranks among the lowest in Sub-Saharan Africa

City of Juba

Since gaining independence in 2010, South Sudan's urban population has steadily increased, reaching 20.2% of the total population by 2020. From 2010 to 2020, the urban population grew at an average annual rate of 3.4%, with the total urban population estimated at 2.75 million in 2020 and projected to reach 4.16 million by 2030. Juba, the largest city, accounted for 14.7% of the urban population in 2020, with its population projected to grow from 403,000 in 2020 to 617,000 by 2030. However, many urban dwellers live in slums and informal settlements, lacking basic services, infrastructure, and steady livelihood opportunities

According to UN-Habitat data, the share of slum households in urban areas is quite high in South Sudan, with nearly all the urban households (97.3 %) living in slum conditions in 2018.[31]

A slum household is defined as a group of individuals living under the same roof lacking one or more of the following conditions: access to improved water, access to improved sanitation, sufficient living area, housing durability, and security of tenure[32].

Project benefits

Developing an economic analysis that includes the interconnection of rural areas implies the quantification of economic benefits associated with the increase availability and reliability of electricity-related services in rural areas. In fact, the interconnection of rural areas brings not just a reduction of energy costs (e.g. the switch from kerosene lamps to electric bulbs or the switch from diesel generation to grid), but it also increases the quantity and quality of many electricity-related services (electric lighting is better in terms of luminosity than other options), their availability (lumen/hours increase), while reducing negative effects of less advanced energy sources (e.g. smoke, smell and noise).

The increase in quality and quantity of these services brings an increase in people's utility: better lighting means that children can study at night or that people feel safer walking around the village. Increased energy availability means that people can use refrigerators, can use a TV or PC, and so on and so forth. In terms of economic activities in rural areas, electrification allows for increased productivity. For instance, cheaper water pumping and storage of fresh produce increase the value of agricultural activities. Therefore, electricity enables a wide range of services that increase people's well-being[33].

[31] Juba Settlement and Facilities Distribution Profile, mapping report 2021. UN HABITAT

[33] Source: Meier, P., Peter, V., Barnes, D. F., Bogach, S. V., & Farchy, D. (2010). Peru: National survey of rural household energy use



Below, we provide few examples on the benefit that will be induced by the Project

Lighting: Its value may be evaluated in terms of quality (measured in Lumen-Flux provided by a fluorescent lamp with respect to a candle) or in terms of reliability (being connected to the grid means having a continuous provision of the service). Moreover, together with an improved service, the dweller will enjoy an increase in real income due to the lower cost of the service and higher efficiency.

Education: energy access allows schools to be equipped with modern technologies, providing a better service. Schools can benefit from the use of appliances such as computers, printers, and copying machines and water and clean cooking

Communication and entertainment: With the advent of cheaper energy access, television is more accessible to consumers. Their value may be estimated by the increase time of usage. Grid electricity also makes easier charging mobile phones easing communication and empowering rural businesses.

Productivity: businesses are empowered through the timesaving resulting from the use of electrical appliances. For example, it allows to operate at lower costs larger machines that are required for agro-processing and producing trade, both sectors with a significant value adding potential in rural areas.

Health: Improvements in health levels are a consequence of a multitude of factors. For instance, the possibility to operate water pumps allows an increase in hygienic standards; the reduced use of kerosene lamps, instead, reduces respiratory illnesses, relieving private and public healthcare. As reported by other studies in similar conditions connection to the grid can enhance the use of computers, printers, and copying machines, but also autoclaves, kettles and boilers. Other use of devices such as microscopes, fridges, freezers, and radio call antenna can guaranteed with grid connection, instead of generators as it happens.

Thus, it is fundamental to take all these benefits into account when performing a cost benefit analysis that includes rural areas. This can be possible if and only if we can forecast how household will change their behaviour once they have electricity from the grid. As a general rule, these benefits can be measured with the consumer surplus approach that is is defined as the difference between the amount consumers are willing to pay and the amount they actually pay for a product or service. Willingness to pay accounts for all the benefits that will be enjoyed from the product or service in question. For example, the benefits of lighting service may include longer study hours, better indoor air quality, ability to socialize in the evening, and extended working hours. In short, consumer surplus covers the benefits captured by consumers above what they are willing to pay.

17 ANNEX 5: CLIMATE CHANGE ASSESSMENT

REDUCTION OF CARBON SEQUESTRATION AND STORAGE CAPACITY

Introduction

Carbon sequestration and storage (C) is perhaps the most widely recognized Ecosystem Service (ES) and certainly the most quantified among the so-called regulation and maintenance ES (MA 2005, Haines & Potschin 2013). Ecosystems have the ability to regulate the global climate by exchanging greenhouse gases such as carbon dioxide (CO_2) with the atmosphere. Forests, grasslands, wetlands, and other ecosystems store carbon (C) in plant biomass and soil (referred to as "carbon pools") as a result of ongoing photosynthetic processes, sequestering CO_2 from the atmosphere where it acts as a greenhouse gas contributing to global warming (EEA, 2020). This Ecosystem Service is commonly measured using two indicators: sequestered C and stored C. It represents a dynamic measure of "ES flow," which intersects the supply of a service produced by ecosystems with the demand required by humans (Burkhard, 2017). In the case of C sequestration, it is assumed that all of the ES supply (i.e., the provision of a service by a particular ecosystem regardless of its use) is absorbed by the demand (the need for ES by society), so the total globally sequestered C corresponds to the flow of climate regulation benefits reaching our societies. Carbon storage, on the other hand, refers to the total amount of C stored in each pool measured at a given time (Mg C ha^{-1}). In this case, it is a simpler, static measure, corresponding to the overall result of a lengthy process of C sequestration. Here, the C stored in ecosystems is interpreted as "potential ES" and is quantified by assuming that the C returns to the atmosphere in the form of CO_2. This second indicator is commonly used to assess the effects of land management on C sequestration and storage ES. In other words, disturbing or modifying ecosystems that provide this ES through fires, pollutants, or more commonly through land use or land cover change can result in the release of large amounts of CO_2. Conversely, other land management changes such as reforestation or alternative agricultural practices can lead to increased CO_2 storage capacity.

Application of the transferable modelling frameworks

Among the most modern and reproducible methodologies for quantifying and mapping ES are the so-called "transferable modeling frameworks" (Burkhard, 2017). These methods propose a standardized quantification approach implemented in software, tools, and libraries to easily quantify multiple ES. The Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST) spatially explicit modeling tool (Tallis et al. 2008, http://invest.ecoinformatics.org/) has been used to estimate and map carbon storage ES in the study area defined with respect to a 100-meter buffer from the Transmission Line RoW (see below). The InVEST Carbon Storage model uses a land use map and data on C stored in 4 pools (aboveground biomass, belowground biomass, soil, and dead organic matter) to estimate the total amount of accumulated C in a given ecosystem. Aboveground biomass includes the live biomass of plants above the soil (trunk, roots, branches, leaves...), belowground biomass includes plant root systems, while soil organic matter is the largest terrestrial C pool and includes decomposing organic matter along with soil microorganisms. Finally, dead organic matter includes litter and dead wood, both fallen and standing. The model aggregates the quantities of carbon from these pools depending on the land use or land cover category and produces maps of stored C for each pool and overall accumulation. Data on C expressed as tons of C per hectare (Mg C ha^{-1}) in aboveground and belowground biomass, soil, and dead organic matter were obtained from numerous bibliographic sources and European and international inventories.

Specification of the adopted model

In the 100m buffer study area (along the transmission line) the latest (2019) Land Use map was retrieved through Copernicus at https://lcviewer.vito.be/download. The mas is realised at 100 m spatial resolution upscaling Sentinel II 10x10 m resolution, with a three classification levels with class definitions according to the UN-FAO's Land Cover Classification System (LCCS) scheme (Buchhorn et al. 2019, Figure 5). Such layer is developed from PROBA-V satellite observations and organized into millions of Sentinel-2 equivalent tiles of 110x110km (with UTM projection). All Sentinel II images have been radiometrically and atmospherically corrected (sen2cor algorithm) to ensure accurate reflectance values for subsequent analysis. Machine learning algorithm (random forest) was used to classify land cover types in each image. This step involves training the algorithm with labelled data and then applying it to classify the entire image. Values of C stocked in aboveground biomass, belowground biomass, in soil and in litter biomass expressed in ton C ha^{-1} were attributed according to multiple literature sources (see in the reference list). A Biomass - C conversion factor of 0.47 was adopted from IPCC (2006) Guidelines for national greenhouse gas inventories," Intergovernmental Panel on Climate Change (IPCC), Agriculture, Forestry and other land use (AFLOLU), Institute for Global Environmental. Values are referred to Tropical dry IPCC climate zone. A 0 value of biomass was attributed to Cultivated and managed vegetation/agriculture. Due to the relatively small amount of litter in non-forest area a 0 value of C was attributed to Shrubland, Herbaceous vegetation and cultivated lands (Table 17-1). The impact simulation assumes forest (116, 124, 126) and shrubland (20) is converted to herbaceous vegetation (30).

Table 17-1: Values of C used for the calculation of the components associated to specific land-use carbon stock pools

Copernicus Land use code	Land use description	C aboveground (ton ha^{-1})	C belowground (ton ha^{-1})	C soil (ton ha^{-1})	C litter (ton ha^{-1})	Ratio	Total
20	Shrubland	22.75 (a)	46.41	19.00 (c)	0.00	2.04 (b)	**88.16**
30	Herbaceous vegetation	1.08 (d)	1.71	19.00 (c)	0.00	1.58 (b)	**21.79**
40	Cultivated and managed vegetation/agriculture	0.00	0.00	19.00 (c)	0.00	/	**19.00**
50	Urban / built up	0.00	0.00	0.00	0.00	/	**0.00**
116	Closed forest, unknown	32.85 (e)	10.91	19.00 (c)	2.10 (g)	0.33 (f)	**64.86**
124	Open forest, deciduous broad leaf	32.85 (e)	10.91	19.00 (c)	2.10 (g)	0.33 (f)	**64.86**
126	Open forest, unknown	32.85 (e)	10.91	19.00 (c)	2.10 (g)	0.33 (f)	**64.86**

Results

The presented findings represent changes observed within a 100-meter buffer zone surrounding the projected transmission line route. It's crucial to note that the analysis assumes a significant transformation scenario, where forests (classes 116, 124, 126) and shrublands (class 20) are converted into grasslands (class 30) along the RoW. This assumption serves as a comparison model for potential

impacts, emphasizing the importance of understanding the potential outcomes of such conversions. The data reveals substantial alterations in carbon stocks, with a notable decrease observed post-impact. Prior to the simulated impact, the total carbon stock was substantial, amounting to 58,620.56 tons across various carbon pools (Table 17-2). However, post-impact assessments demonstrate a significant reduction in total carbon stock, which decreased to 25,583.81 tons.

Table 17-2: Sum of C stock for C pool type in the study area, pre and post impact

Area	C_above (ton C)	C_below (ton C)	C_soil (ton C)	C_litter (ton C)	Total C (ton C)
Pre impact	24993.47	23215.34	23066.00	1033.19	72308.03
Post impact	1301.40	2060.55	23066.00	0	26427.95

This decline is particularly evident in aboveground and belowground carbon pools, indicating a considerable loss of carbon. Statistical analysis highlights the magnitude of these changes, with mean carbon levels declining from 58.03 to 21.21 tons per hectare post-impact (Table 17-3,Table 17-4), reflecting increased variability in carbon levels across the study area. It's essential to recognize that these results underscore the potential environmental consequences of land use changes and emphasize the importance of implementing effective mitigation measures. The application of the described mitigation strategies can help minimize the adverse effects of such changes, supporting ecosystem resilience and sustainability in the region.

Table 17-3: Total C stock statistics, pre and post impact

Area	Total C (ton C)	Mean C (ton C ha^{-1})	Median C (ton C ha^{-1})	SD C (ton C ha^{-1})	Min C (ton C ha^{-1})	Max C (ton C ha^{-1})
Pre impact	72308.03	58.03	27.33	0	88.16	72308.03
Post impact	26427.95	21.21	3.45	0	21.79	26427.95

Table 17-4: Total C change

Total C change (ton C)	Mean C change (ton C ha^{-1})	Median C change (ton C ha^{-1})	SD C change (ton C ha^{-1})	Min C change (ton C ha^{-1})	Max C change (ton C ha^{-1})
45880.08	36.82	26.31	0	66.37	45880.08

At the global level, the mitigation potential of reducing deforestation and forest degradation is estimated to range from 1.41 to 7.98 $GtCO_2e\ yr^{-1}$ over the period 2020-2050 (IPCC 2019). This global strategy not only holds significant promise for climate mitigation but also presents opportunities for climate-water-sustainability synergies. By preserving primary and old secondary forests, it is possible to bolster carbon sequestration efforts while simultaneously supporting healthy water cycles, protecting biodiversity, and enhancing the resilience of local communities and urban areas. These forests play a pivotal role as carbon sinks and regulators of regional water cycles and climatic patterns (e.g., Luyssaert et al. 2018; Luyssaert et al. 2008). Studies have shown that natural forests can be up to six times more effective at carbon storage than agroforestry and up to forty times more effective than tree plantations per unit area until 2100 (Lewis et al. 2019). However, there are growing concerns regarding increased carbon losses

attributed to drought-induced tree mortality and subsequent carbon sink saturation in tropical forests (Hubau et al. 2020; Green et al. 2019).

References

(a in table) IPCC LULUCF (2019) Vol.4, Tab. 4.7
(b in table) IPCC LULUCF (2003) Annex Table 3A.1.8
(c in table) IPCC LULUCF (2019) Vol. 4, Tab. 2.3 (low activity clay)
(d in table) IPCC LULUCF (2003) Table 3.4.2
(e in table) IPCC LULUCF (2019) Vol.4, Tab. 4.7
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REDUCTION OF CARBON DIOXIDE EMISSIONS ASSOCIATED TO THE PROJECT

The assessment of the reduction of greenhouse gases (GHG) emissions due to the implementation of the interconnection project is taken from the Feasibility Study.
The benefits of the Project are evaluated thanks to the probabilistic simulations of two identical models, one with the presence of the interconnection and a second one without the presence of the interconnection. In this evaluation, all the prospective benefits coming from the avoided use of conventional thermal units and more in general associated to the burning of fuel and the associated costs of fuel are reported in Table 17-5.
Specifically, the two indexes that were chosen to emphasize the benefits associated to the proposed interconnection coming from the dispatchable thermal units are:

- the productions coming from conventional thermal units installed in South Sudan and the expected reduction in the case with the interconnection;
- the CO_2 emission generated by the conventional power units that have to burn fuel in order to produce electricity.

Table 17-5 - Benefits coming from the reduction of thermal production and CO_2 emission in South Sudan

Year	2028	2029	2030	2031	2032	2033	2038	2043	2048
Thermal production and costs									
WITH interconnection	0	*0*	*0*	*0*	*0*	0	973.69	2677.34	2736.24
WITHOUT interconnection	414.78	*507.59*	*607.63*	*691.01*	*745.99*	0	783.52	3004.67	2717.72
reduction [GWh]	**414.78**	***507.59***	***607.63***	***691.01***	***745.99***	**0.00**	**-190.17**	**327.33**	**-18.52**
Production Cost [$/MWh]	167.40	*167.40*	*167.40*	*167.40*	*167.40*	0	146.90	53.10	52.70
Benefit [M$]	**69.43**	***84.97***	***101.72***	***115.67***	***124.88***	**0.00**	**-27.94**	**17.38**	**-0.98**
CO_2 emission									
WITH interconnection	0	*0*	*0*	*0*	*0*	0	683.53	947.22	968.06
WITHOUT interconnection	332.77	*407.23*	*487.49*	*554.38*	*598.50*	0	550.03	1063.03	961.51
reduction [kton]	**332.77**	***407.23***	***487.49***	***554.38***	***598.50***	**0**	**-133.50**	**115.81**	**-6.55**
Valorization of CO_2 [$/ton]	1.25	*1.25*	*1.25*	*1.25*	*1.25*	1.25	1.25	1.25	1.25
Benefits [M$]	**0.42**	***0.51***	***0.61***	***0.69***	***0.75***	**0.00**	**-0.17**	**0.14**	**-0.01**

Dispatchable production, CO_2 reduction and fuel costs
From year 2028 to 2032 the benefits coming from the reduction of the energy produced by thermal generating units, and the associated avoided CO_2 emissions, increase progressively because with the interconnection towards Uganda there is no need to use the costly and unreliable diesel generators of South Sudan since it is possible to import all the energy needed to feed the load from Uganda thanks to its excess of hydropower production.
On the contrary, without the proposed interconnection, South Sudan needs to use the diesel generators installed in the country to supply its local demand, which increases following the load demand forecast, and the diesel generators have to follow the demand when they are capable of doing it.

In 2033, the southern part of South Sudan is not expected to install new thermal power plants. On the contrary, the existing diesel generating units are decommissioned as soon as the Grand Fula hydropower plant starts to be in service. Thus, in 2033 no benefit associated to the reduction of thermal production is recorded. The other target years basically reflect the expected behavior with only 2038 that slightly differs because of the limited load demand if compared to the must-run production of the thermal units necessary for the stability and security of the system.

Marginal production costs are obtained using data of Table 17-6 and Table 17-7 that report the fuel costs for the different types of commodities involved for the 5-target years and the performance data of the generation mix of existing and future thermal power plants.
These data come both from international publications and outlooks (as reported in [1] and [2]) and international sources like ENTSO-E and World Bank datasets.

Table 17-6 - Fuel costs of the different commodities considered in the power system under study

Fuel costs of the different commodities [$/GJ]					
Year / Commodities	2028	2033	2038	2043	2048
Natural Gas	6.83	6.88	7.03	7.11	7.04
Diesel	14.6	15.35	16.37	17.01	17.76
Heavy Oil	12.8	13.5	14.4	15.04	15.8

Table 17-7 - Main characteristics of the different technologies considered in the power system under study

Main characteristics of the different technologies of thermal units					
Technology	Efficiency [%]	CO2 emission [kg/GJ]	Variable O&M costs [$/MWh]	Minimum time ON [hours]	Minimum time OFF [hours]
Future CCGT units	0.58	57	1.9	2	2
Actual Diesel	0.35	78	1.3	1	1
Actual Thermal	0.35	78	3.9	3	3
Future thermal running on heavy oil (only South Sudan)	0.4	78	3.9	3	3

The quantification of the economic benefit for the country of CO_2 reduction is assumed to be equal to the expected value of certified emissions reductions (CERs). Based on the Consultant's reviews of literature sources ([3] and [4]), the current price of CERs has been assumed 1.25 US$/ton CO_2.

References

[1] World Energy Outlook 2023, IEA, October 2023
[2] U.S. Energy Information Administration, EIA, March 2023
[3] UNFCCC papers, https://unfccc.int/documents
[4] The Clean Energy Regulator" of the Government of Australia https://www.cleanenergyregulator.gov.au/

BALANCE OF CARBON EMISSIONS ASSOCIATED TO THE PROJECT

The balance is performed considering:

- The reduction of total carbon stock capacity, due to vegetation clearance for the project implementation, which amounts to 45,880.08 ton C;
- The amount of avoided CO_2 emissions in South Sudan during the first year of service of the Interconnection project (2028), equal to 332.77 kton CO_2

The avoided carbon dioxide and carbon emissions are detailed in Table 17-8. The quantity of carbon associated to avoided CO_2 emission is estimated considering the share of carbon atomic weight ($C \approx 12$ g mol^{-1}) on the molecular mass of carbon dioxide ($CO_2 \approx 44$ g mol^{-1}).

The balance with reduction of carbon sequestration capacity is shown in the graph below (Figure 17-1).

Table 17-8 - Benefits coming from the reduction of CO_2 emission in South Sudan

Year	2028	2029	2030	2031	2032	2033	2038	2043	2048
					CO_2 emission				
WITH interconnection	0	*0*	*0*	*0*	*0*	0	683.53	947.22	968.06
WITHOUT interconnection	332.77	*407.23*	*487.49*	*554.38*	*598.50*	0	550.03	1063.03	961.51
Reduction CO_2 [kton]	**332.77**	***407.23***	***487.49***	***554.38***	***598.50***	**0**	**-133.50**	**115.81**	**-6.55**
Reduction C [ton]	***90,755.45***	***111,062.73***	***132,951.82***	***151,194.55***	***163,227.27***	***0.00***	***-36,409.09***	***31,584.55***	***-1,786.36***

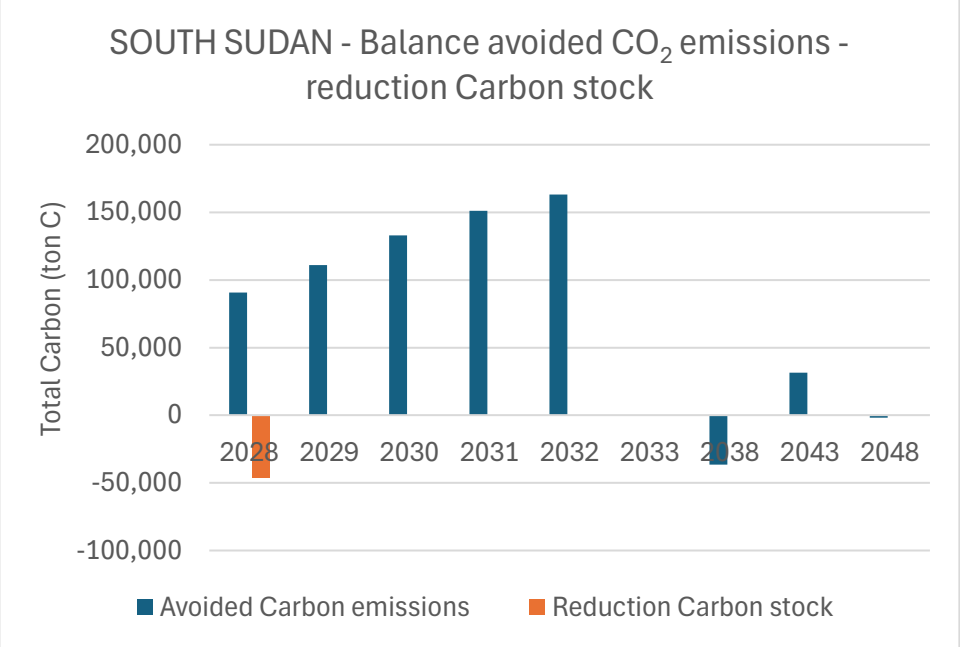


Figure 17-1 – Balance between reduction of carbon emissions associated to the project and reduction of carbon stock capacity in South Sudan

Hence, the avoided carbon emission in South Sudan during 2028 is equal to 90,755.45 ton C. This avoided carbon emission is higher than the loss of carbon sequestration capacity due to project implementation

(45,880.08 ton C), therefore the carbon balance associated to the Interconnection project is definitely positive (90,755.45 – 45,880.08 = 44,875.37 ton C) and will have an overall beneficial impact on climate change.

It is underlined that this balance is limited to the first year of service of the interconnection (2028). Observing the increase of load demand foreseen in the first 5 years of project operation (2028-2032), the amount of avoided carbon emission in South Sudan grows accordingly and thus the project beneficial impact on climate change become even more positive.
The trend is the following years changes and becomes neutral. The existing diesel generating units are decommissioned as soon as the hydropower plant of Grand Fula starts to be in service (2033). Therefore, in 2033 no benefit associated to the reduction of thermal production is recorded. The other following target years basically reflect the expected behavior, with only 2038 that slightly differs because of the limited load demand if compared to the must-run production of the new generation thermal units (CCGT plants) necessary for the stability and security of the system.

It is underlined that the carbon balance does not consider, on the conservative side, the expected partial restoration of lost biomass after project completion, since the growth of trees below 1.8 m will be allowed in the wayleave.

The overall carbon balance for South Sudan is judged positive and beneficial against climate change, especially in the short-time period.

EFFECTS OF CLIMATE CHANGE AND VARIABILITY ON THE PLANNED PROJECT

Current climate change situation in South Sudan

The Government of South Sudan stated the following information about climate change and projections in the country in its *Initial National Communication to the United Nations Framework Convention on Climate Change* of 2018.
South Sudan's diverse climate is intricately influenced by the annual movements of the Intertropical Convergence Zone. From the hot and arid landscapes of the southeast, bordering Kenya, to the temperate climates of the southern highlands, the country experiences a semi-humid climate.
South Sudan is experiencing warmer and drier weather patterns due to shifting climatic conditions. This has led to increased evapotranspiration and more frequent droughts. Since 1980, there has been a significant decrease in rainfall levels and a rapid rise in air temperatures. This warming trend is exacerbating dry conditions during what were once considered normal years, and it is happening at a rate two and a half times faster than the global average.
General Circulation Models (GCMs) show that South Sudan's annual mean temperatures have consistently increased since the 1960s. In the past 30 years, South Sudan has been one of the fastest-warming regions globally, with temperature increases of up to 0.4°C per decade.

The country experiences monsoon rains from June to September, which marks the extended rainy season. However, the southernmost region typically encounters only two distinct peaks within this timeframe. Annual rainfall across the nation varies widely, ranging from as low as 200 mm to as high as 2,200 mm. The regions bordering the Central African Republic, the Democratic Republic of the Congo, and Uganda experience the highest levels of rainfall throughout the year. However, the amount of rainfall varies significantly from year to year and from location to location. South Sudan receives the majority of its precipitation during the rainy season, which lasts from June to September, and is crucial for sustaining agriculture and livestock. The Nile River and its tributaries often experience flooding during August and September, affecting several regions in South Sudan, including Jonglei, Unity, Upper Nile, Warrap, and Northern Bahr el Ghazal, as well as parts of Western and Eastern Equatoria.
Historical data from the Climatic Research Unit (CRU) TS3.22 data set for the period between the 1970s and 2000s do not show major decadal changes in rainfall. However, a 10 to 20 per cent decline in rains and increased variability in the amount and timing of rainfall from year to year and from region to region since the mid-1970s have been reported. For South Sudan, the most notable change is in the June–August season, with increased rainfall.

The erratic seasonal patterns of precipitation, mostly manifested in both widespread and localized droughts and floods, have a huge environmental and social impact. These widespread weather events are a result of either above or below normal rainfall across the country, while localized events are caused by concentrated above or below normal rainfall in a certain region. Intensification of flood and drought episodes – as shown by the following observed extreme weather events – are a clear reflection of a changing climate.

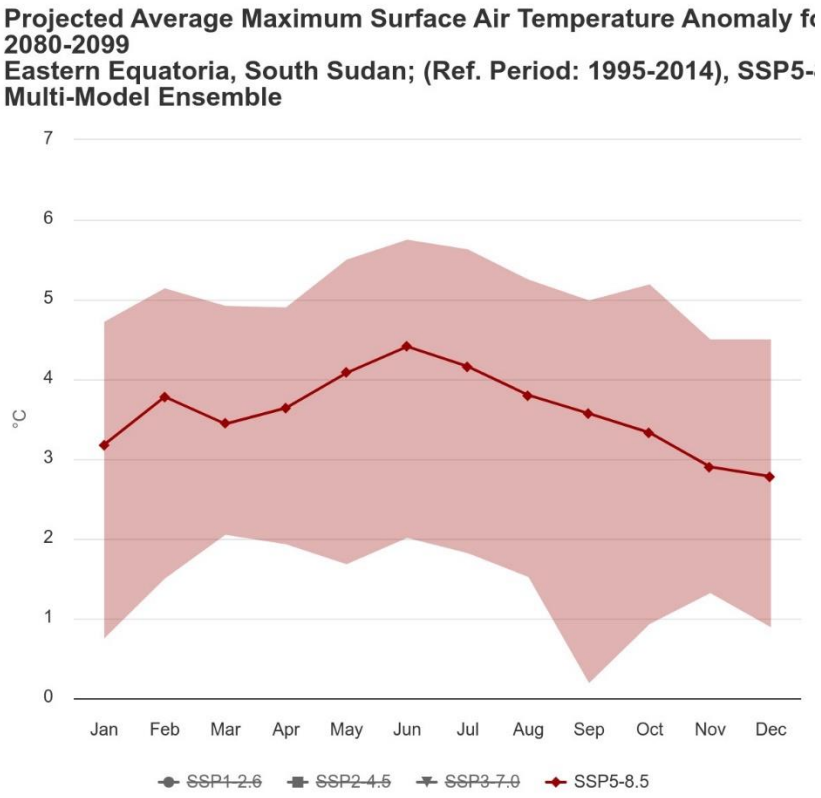
- There is an increased incidence of droughts, which have become more frequent in South Sudan. Notable ones occurred in 1989, 1990, 1997, 1998, 2000, 2008–2009, 2010–2011, 2014 and 2017.
- Flooding frequency has increased in recent decades in South Sudan. For example, floods occurred in 1962–1965, 1978–1979, 1988, 1994, 1996, 1998, 1999, 2006, 2007, 2013, 2014 and 2015. These were major floods in 1988 and 2013, while 1996 and 2007 witnessed flood incidences of relatively high intensities.

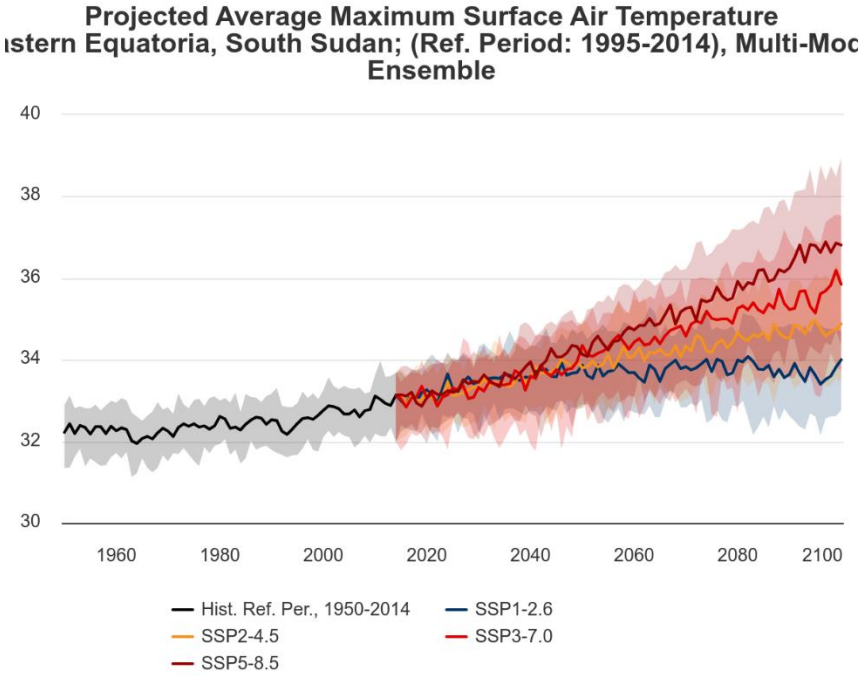
- Floods and droughts occurring within the same season have become widespread, with droughts happening earlier in the season (around May/June) and floods occurring later (around August/September).
- Flash floods often occur when the Nile River and its tributaries overflow during August and September. Flooding is common in low-lying areas, particularly in areas close to the Sudd Wetland and White Nile River – leading to crop and livestock losses. Flooding in South Sudan has become more frequent in the last two decades.
- Floods are becoming severe and take longer to recede.
- The 1988 floods affected nearly the entire country. Between August and November 2013, floods affected about 150,000 people, destroying crops, property and infrastructure. The Government of South Sudan declared the country a disaster zone in October 2013 after seven of the country's 10 regions were heavily flooded.
- Flooding in July–August 2014 resulted in deaths, over 40,000 people being displaced, property being destroyed and a widespread malaria epidemic.
- In September 2015, flooding displaced 2,000–3,000 households.

The future of climate change in Project area

Analysis of climate change data from the World Bank Group's *Climate Change Knowledge Portal* has allowed to understand future climate projections in the Project area (Eastern and Central Equatoria states of South Sudan). Climate projection data is modeled data from the global climate model compilations of the Coupled Model Inter-comparison Projects (CMIPs), overseen by the World Climate Research Program. Data presented is CMIP6, derived from the Sixth phase of the CMIPs. The CMIPs form the data foundation of the IPCC Assessment Reports.
The scenario approach is used to characterize the range of plausible climate futures and to illustrate the consequences of different pathways (policy choices, technological changes, etc). CMIP6 introduced the Shared Socio-economic Pathways (SSPs). The SSPs represent possible societal development and policy paths for meeting designated radiative forcing by the end of the century. CMIP6 includes scenarios with high and very high GHG emissions (SSP3-7.0 and SSP5-8.5) and CO2 emissions that roughly double from current levels by 2100 and 2050, respectively, scenarios with intermediate GHG emissions (SSP2-4.5) and CO2 emissions remaining around current levels until the middle of the century, and scenarios with very low and low GHG emissions and CO2 emissions declining to net zero around or after 2050, followed by varying levels of net negative CO2 emissions (SSP1-1.9 and SSP1-2.6).

TEMPERATURES
The most relevant temperature variables are average maximum surface air temperature and anomalies until year 2100, using the period 1995-2014 as reference. Data presented in following are referred to Eastern Equatoria state.



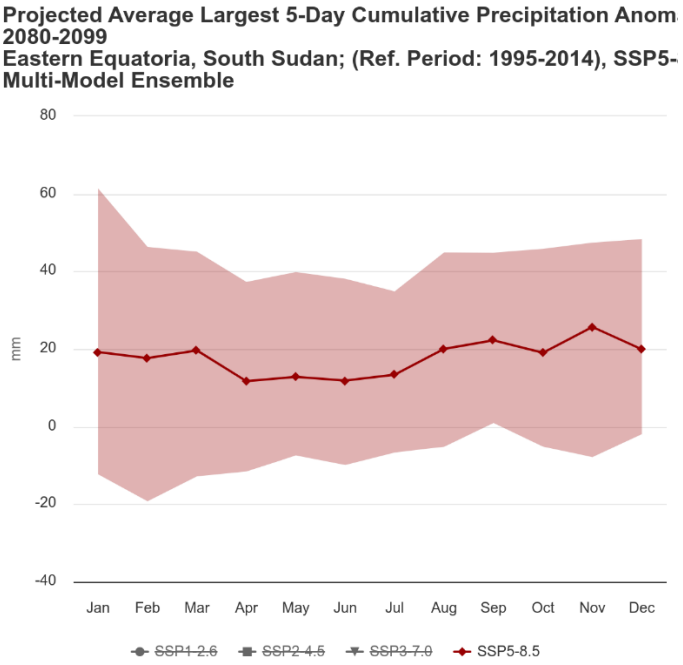


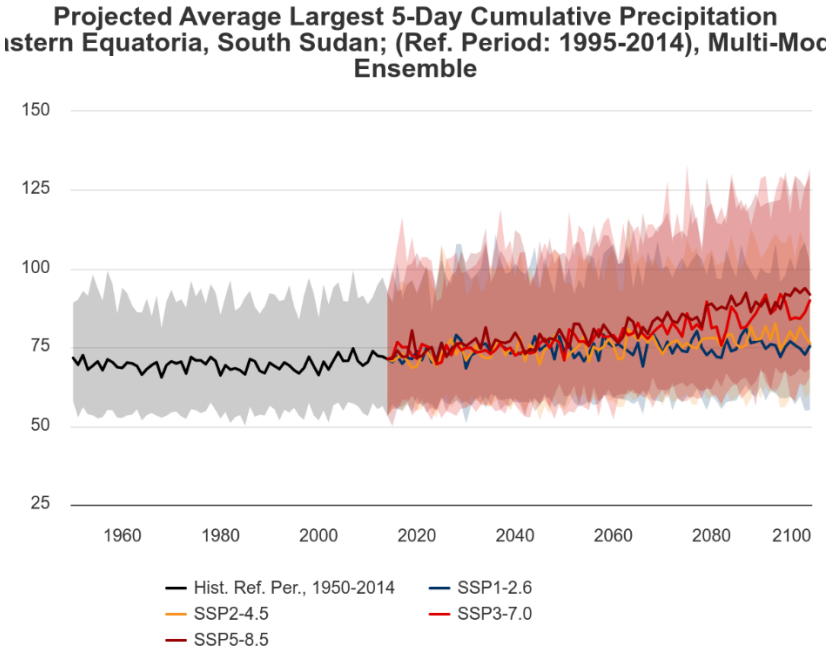
The high-emission scenario (IPCC SSP5-8.5) shows how the average maximum temperatures at the end of the century could reach 37°C, about 4.5°C more than in the reference period.

All projections agree that South Sudan will get warmer by 2060, with lower increases in the south. By 2060, warming is projected to range from 1.5°C to 3.1°C during August to between 1.1°C and 2.1°C during January.[115] General Circulation Models (GCMs) indicate that the annual mean temperatures in South Sudan have risen since the 1960s. The GCMs indicate that the mean annual temperature is projected to increase by 1°C from 2020 values by 2060.[116] Temperatures are projected to increase by 0.6–1.7°C by the 2030s and by 1.1–3.1°C by the 2060s compared with the 1961–1990 GCM baseline. Projections suggest that the number of days and nights that are considered 'cold' in the current climate will become very rare.

PRECIPITATION

The relevant variables relevant variables related to precipitation are the extreme events such as the average of the largest 5-day cumulative precipitation values and anomalies until year 2100, using the period 1995-2014 as reference. Data presented in following are referred to Eastern Equatoria state.





The high-emission scenario (IPCC SSP5-8.5) shows how the largest 5-day cumulative precipitation at the end of the century could reach 90mm, about 25mm more than in the reference period.
While there is no consensus on the direction of change in rainfall in most projections, the current increased variability of rains, in terms of onset, duration and totals, is likely to continue.

Conclusions

Changing climatic conditions in South Sudan are significantly impacting the region's rainfall and temperature patterns, leading to irregular seasonal precipitation. GCM predictions indicate that rainfall patterns in South Sudan may intensify during most seasons from 2011 to 2030. These changes could have severe consequences for the environment and the livelihoods of households across the nation. Notable impacts include increased events of droughts and heightened flooding. Additionally, there is a growing trend of experiencing both floods and droughts within the same season, with droughts occurring earlier and floods later than usual, particularly around May/June and August/September, respectively. Moreover, flooding has become more severe, especially in the northern part of the country, with floodwaters taking longer to recede.

GCM models predict that mean annual temperatures will rise by 1°C by 2060 compared to 2020 values. Due to temperature changes, the resulting hotter climate will amplify drought effects in South Sudan.
Any observed warming of more than 1°C is equivalent to a further decrease of 10-20% in rainfall. Reduced and variable rainfall may lead to more flooding as rains become unpredictable and inconsistent in volume. This is already being observed in several parts of the country.
South Sudan is particularly vulnerable to the effects of climate change because its population is heavily dependent on climate-sensitive industries, such as rain-fed agriculture, for their livelihoods and food security. Climate change is predicted to affect not only agriculture but also the energy, tourism, water, and health sectors.

As a consequence of this climate change framework, the 400 kV Interconnection project could be subject to the negative effects of increased natural hazards, in particular flooding and hydrogeological risks. Focusing on these aspects, it is underlined that the transmission line route crosses some rivers, especially close to the border with Uganda: it is worth to mention Nyimur and Ateppi rivers, both tributaries of Achwa river, and Kit river, tributary of White Nile.

It is considered unlikely that climate change would have a significant effect on the Interconnection project. However, some events exacerbated by climate change could affect the transmission line under some circumstances. Such events could include:

- Floods and flash floods: although the line will cross several rivers, damage from floods is unlikely. To cope with this risk, tower foundations shall be properly designed and will not be located inside or close to any rivers or waterways.
- Landslides and mudslides: rainfall induced landslides and mudslides could occur, but project design will evaluate such risk and avoid such areas or foundations and towers shall be designed with a safety factor that would lead to resistance to major damage from all but the most severe slides.
- Wind: extreme winds may cause line breakage or even tower failure. However, the project design will consider maximum expected winds in towers and line's design.

18 ANNEX 6: SUB PLANS

SUB PLANS FOR MANAGEMENT AND MONITORING

To minimize the negative environmental and social impacts from the project, specific preliminary plans have been prepared as guidelines. The following plans shall guide and support during implementation and management during construction and operation.

SP01: Erosion and Sediment Control Management Plan
SP02: Water and Soil Pollution Management Plan
SP03: Air pollution and Dust Management Plan
SP04: Noise and Vibration Management Plan
SP05: Waste Management Plan
SP06: Hazardous Material Management
SP07: Vegetation Clearing Management Plan
SP08: Biodiversity Management Plan
SP09: Traffic Management Plan
SP10: Cultural Heritage Management Plan
SP11: Occupational Health and Safety Management Plan
SP12: Community Health and Safety Management Plan
SP13: Stakeholders Engagement Management Plan
SP14: Local Employment Management Plan
SP15: Contractor Management Plan
SP16: Labor Influx Management Plan
SP17: Security Management Plan
SP18: GBV / SEA / CAE Plan

The Contractor shall prepare detailed Site-Specific Management and Monitoring Plans for the implementation and monitoring of the above listed plans.

The Data Sheets on the following pages describe each of the required Sub-Plans. They serve as a basis for the Contractor who will have to prepare his own EH&S plans not necessarily limited to the 16 points above.

These Plans shall be prepared by the Contractor in the early stages of construction site development, and they shall be approved by the Project Owner, because they need to be in place and functional before main works start.

It is important to include this EMMP in the Tender Documents, to make sure that the Contractor knows EH&S requirements in detail.

SP01: Erosion and Sediment Control Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	Construction site, Excavation material, earth movements, spoil disposal areas, roads
Environmental aspect	Sediment pollution of waterways, landslides
Description of Impact	Soil erosion might result from construction activities where the vegetation cover is removed. Main soil erosion will result from excavation. Soil erosion and landslides may occur along the access roads, during the construction period, particularly in the rainy season.
Affected Activities	Clearing of vegetation. Spoil disposal area. Temporary stockpiles. Use of access roads by construction vehicles.
Consequence	Destroying bottom species habitat, blocking sunlight of newly established vegetation, reducing photosynthesis, carrying attached mass of pollutants such as heavy metals. Damaging aquatic life. Damaging roads by landslides. Blocking of drainage channels and pipes.
Management and Measure	Minimize the erosion and sediment impact with good management and appropriate practices. Working in erosion sensitive areas shall be restricted only to dry season. Undertake earthworks strictly within marked areas, avoiding soil disturbance beyond these areas. Erodible construction stockpile shall be at least 30 m from drainage lines or water way. Stockpiles shall be stabilized. In windy conditions, the stockpiles shall be covered or watered to prevent to generate excessive dust. Steep slopes shall be avoided and stabilized, compacted and strengthened with appropriate drainage systems. The erosion and sediment controls shall be installed as early as possible after the commencement of vegetation clearance. Sediment controls such as sediment trap and silt fences shall be installed with adequate capacity. Sediment collection devices (including sediment basins, silt fences and sediment traps) shall be emptied when the capacity of the collection pool reach of 50%. Monitoring shall be conducted to inspect erosion and sediment control facilities to ensure protection and maintenance. Preserve the existing vegetation as much as possible to reduce the runoff flow velocities.

	Re-vegetation shall take place as soon as possible, after vegetation clearing or excavation, where applicable. Discharged water from excavation or drilling shall not be discharged directly into natural water source but shall pass through sediment traps.
Monitoring	Visual observation of steep slopes, excavation areas, and areas where the vegetation has been cleared.
Period of Implementation	Starting when construction starts, ending by completion of construction and re-vegetation works.
Frequency	Weekly visual observation and TSS monitoring during dry season and more frequent during wet season.
Training	Training for inspection of erosion and sediment control facilities.
Facilities, Equipment, Material and Supply	Analytical equipment and material
Compliance	South Sudan Water Quality Guidelines for the Protection of Aquatic Ecosystem and IFC EHS guidelines on Ambient Water Quality

SP02: Water and Soil Pollution Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase and Operation Phase
Place	Construction site, Substations, Workshops, Canteen
Environmental aspect	Water Quality, Health
Description of Impact	Deterioration of the surface water and groundwater quality when discharging the polluted wastewater without appropriate treatment. Health effects from polluted supply and drinking water.
Affected Activities	Effects on water resources in the areas used by the construction activities such as workshops, painting, construction works, substations, etc. Surface water and groundwater contamination at waste disposal areas. Discharged effluent from batching plants. Erosion and sediment pollution of waterways during earthworks and site disturbance. Pollution of waterway by BOD, fecal Coliform, oil, grease, etc. at the substation. Lack of access to clean water and sanitation.
Consequence	Negative impact on aquatic life and on human health. Contamination of soil and water sources.
Management and Measure	Reasonable treatment shall be implemented to reach the targets of the South Sudanese National Environmental Standard. The water treatment systems must be adequately sized and structurally capable to treat water for consumption as well as wastewater. Surface wastewater in the workshop and construction areas Water from all construction sites and particularly the one coming from the workshop area must be collected, treated and filtered with grease trap before discharge. Sewage wastewater Waste water from substations construction sites must be collected and treated in septic tanks before discharge. Sewage from portable toilets must be collected in portable containers and treated before discharge. Canteen wastewater must be filtered with grease trap before discharge. Drinking water and supply water Drinking and supply water must comply with South-Sudanese standards for Drinking Water Quality.

Monitoring	Visual observation of treatment facilities, repair area, re-fueling area and practice, storage area for hazardous substances such as waste engine oil, transformers oil, grease, and hydraulic oil. Water quality monitoring shall begin as soon as project construction start, to control the quality of discharged water to waterways. Continuous monitoring of drinking water quality at the points of consumption. Effluent water monitoring program shall be routinely conducted and sampling locations, parameters specified in national or international standards shall be identified. Water quality needs to be monitored at each location where wastewater (treated water) discharges into natural surface water. Monitoring locations shall be located within 50m upstream and downstream of the relevant discharge point, where practical. If more than two discharge points are located within less than 100m of each other, only one upstream and one downstream monitoring location shall be required. Based on the results of water quality monitoring, the project developer shall be notified immediately in case of a condition that could cause harm to humans or the environment.
Period of Implementation	Starting when construction starts, continues during operation phase for the substations
Frequency	As shown in SP02-1: Schedule of Water Quality Monitoring Requirements
Training	Training in inspection of wastewater treatment including wastewater operation and maintenance. Training of drinking and supply water treatment operations including chlorine residual monitoring. Training of water sampling and basic water quality analysis. Provision of introduction and regular training for environmental and health awareness to all workers.
Facilities, Equipment, Material and Supply	Treatment plants and equipment to achieve the management and water monitoring.
Compliance	The stricter among South-Sudanese National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

Table SP02 -1: Schedule of Water Quality Monitoring Requirements

Location	Parameters	Frequency
Upstream and downstream of storm water discharged outlets at all construction sites	Temperature	Monthly
	pH	
	Dissolved oxygen (DO)	
	Biological Oxygen Demand (BOD5)	
	Total Suspended solids (TSS)	
	Total and Total Dissolved Phosphorous	
	Oil and Grease	
	Faecal coliforms	
Working areas where vehicle or machinery maintenance are located within 200m of a drainage channel	Temperature	Monthly
	pH	
	Dissolved oxygen (DO)	
	Suspended solids (SS)	
	Oil and Grease	
Discharge of sewage treatment plant	Temperature	Monthly
	pH	
	Dissolved oxygen (DO)	
	Biological Oxygen Demand (BOD5)	
	Total Suspended solids (TSS)	
	Total Dissolved solids (TDS)	
	Total Phosphorous (TP)	
	Total Kjeldahl Nitrogen (TKN)	
	Nitrate Nitrogen (NO3)	
	Oil and Grease	
	Faecal Coliforms	
Drinking water	Temperature	Monthly
	pH	
	Colour	
	Taste and Odor	
	Turbidity	
	Electrical Conductivity	Every 3 months
	Total Suspended solids (TSS)	
	Total Dissolved solids (TDS)	
	Total Hardness	
	Chlorines Residual	Daily (to define Chlorine Dose)
	Total Coliform Bacteria	Monthly
	Faecal Coliforms Bacteria	Monthly
	E-coli Bacteria	Monthly
	Sulphate	Every 3 months

SP03: Air Pollution and Dust Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	Construction site, Excavation, Blasting, Roads, Spoil disposal sites.
Environmental aspect	Air quality and health
Description of Impact	Drilling, blasting, loading, hauling, conveying rocks, crushing and transporting the final product are all activities which generate dust. Dust and other particle pollution by construction activities can negatively impact the health and the quality of life of people working on and living close to the sites.
Affected activities	Construction machinery and transporting of material. Activities from crushing and batching plant. Vehicle movements on unpaved roads. Uncontrolled waste burning. Excavation activities, especially in the dry season.
Consequence	Negative impact on air quality and health of workforce
Management and Measure	Spraying water on unpaved roads and stockpiles, especially at hot, dry and windy weather conditions. Limiting the spread of dust through enclosures for transport and crusher, wet drilling, automatic sprinklers at strategic points, etc. Impose an appropriate reduced speed limit at project site. Re-scheduling activities and operations with excessive dust emissions to reduce negative impacts. Meteorological monitoring for wind direction and wind speed may also be required to facilitate interpretation of the monitoring and mitigation procedure. No uncontrolled burning of waste. Adequately maintain vehicles and machinery. Use of effective PPE, in particular anti-pollution masks or N95 masks which eliminate up to almost 90% of the PM2.5 particles (Surgical Mask are unable to stop the PM10 and PM2.5 particles).
Monitoring	Visual observation for dust emission. Ambient air quality monitoring and particulate monitoring.
Period of Implementation	Starting when construction preparation works starts, ending by completion of construction and re-vegetation works.
Training	Training on heavy vehicle driving, loading and unloading. Awareness raising and enforcing the use of appropriate PPE (masks, etc.) at high-risk particle areas. Training on inspection of dust emission including wastewater operation and maintenance. Training on particle sampling and particle analyzing.
Facilities, Equipment, Material and Supply	Equipment for particle monitoring (handheld). Analytical equipment and material.
Compliance	The stricter among South-Sudanese National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

SP04: Noise and Vibration Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	Construction site, Excavation, Blasting, Spoil disposal sites, Roads.
Environmental aspect	Noise and health
Description of Impact	The most significant noise and vibration impacts are from construction and transportation activities. The three main sources are (i) noise related to the construction activities (vehicles, machines), (ii) heavy duty traffic, and (iii) blasting activities.
Affected Activities	Construction machinery and delivering of material. Activities from batching plant. Excavation and blasting.
Consequence	Annoyance and health impacts of construction workforce. Potential of noise nuisance and vibration to local communities and wildlife in the project area.
Management and Measure	Constructors should be aware not to carry out noisy work at nighttime hours. Provide and used of PPE (ear protectors) when exposed to excessive noise (noise level and noise duration). Using hearing protection for exposure that equals or exceeds 80 dB(A). Maintain vehicles and stationary equipment in good working order. Installation of noise mufflers on all engines. Use of explosives only during daylight hours and avoid any intensive noise works during nighttime. Blasting activities should be announced and communicated in advance. Prohibit close access to blasting sites during blasting activities.
Monitoring	Institutional responsibilities: Contractor Noise monitoring to address noise in the workplace.
Period of Implementation	Starting when construction preparatory works starts, ending by completion of construction.
Training	Training and awareness raising related to noise and vibrations. Training employees in the proper use of PPE (ear protection)
Facilities, Equipment, Material and Supply	Field observation and handheld noise monitor equipment
Compliance	The stricter among South-Sudanese National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

SP05: Waste Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase and Operation Phase
Place	Construction site, substations, workshops.
Environmental aspect	Environment, groundwater, and health and safety impacts
Description of Impact	Waste generated from the construction activities may cause impacts to the environment and human health. Disposal costs need to be balanced against environmental impact. Inappropriate landfills may deteriorate the soil, contaminate the groundwater environment and lead to formation of GHGs. Incineration reduces the solid mass of the original waste by 80-85% but may cause undesired air pollution. The most sustainable approach for waste management is to reduce, reuse, and recycle.
Affected Activities	Inappropriate waste disposal planning and management
Consequence	Contamination of surface water and groundwater by spilling or leaking storage, transportation, and disposal of waste. Health impacts from inappropriate (hazardous) waste disposal. Air pollution during incineration or inappropriate waste landfill installation. Vectors attraction and pathogens
Characteristics	Management depends on the type of waste generated: Non-Hazardous waste: any garbage including domestic and construction waste The latter consists of unwanted material produced directly or incidentally by the construction activities. Most of the construction solid waste are (i) wood, (ii) concrete, (iii) bricks, and (iv) metal. Hazardous waste Potentially harmful to environment and health. Can be liquids, solids, semi-solid. Soil contaminated by fuel or oil shall be managed as hazardous waste. Some have a long-term latency due to bioaccumulation, or carcinogenic or mutagenic effects. Chemical waste used oil and grease, batteries and electronic equipment, paint and solvents are categories of hazardous waste. Batteries shall be recycled by specialized external companies or authorities. Further information on Solid Waste Classification shown in Table SP05-1
Management and Measure	Waste management and collection must follow the relevant regulations. Different types of solid waste shall be separated and disposed separately according to the environmental guidelines. Provide adequate garbage bins for different types of waste (organic, non-organic, and hazardous). Waste bins and containers shall be marked clearly with “non-hazardous waste” (dry waste or wet waste) and “hazardous waste” for waste separation and sorting. Open dumping and open burning must be forbidden and waste reduction enhanced by the triple R strategy (reduce, reuse, and recycle waste). Any waste unable to be reused or recycled shall be disposed at an appropriate facility according to its type.

	Adequate and appropriate Personal Protective Equipment (PPE) shall be used at waste related activities. Non-Hazardous waste All non-hazardous waste shall be collected and taken to a Waste Segregation Center. Organic waste shall be separated and composted. Combustible waste shall be separated and shall be burned in appropriate incinerators. Ash and other residues from the incinerators shall be considered hazardous waste. Bottom ashes are taken to the hazardous waste landfill to avoid any risk related to remaining heavy metals or biohazards. Construction waste Construction waste shall be separated and reused if possible before disposal at the construction waste landfill. Non-reusable and non-recyclable construction waste shall be disposed at an authorized waste landfill. Hazardous waste Hazardous waste shall be collected and taken to the Waste Segregation Center. Non-combustible hazardous waste shall be disposed at the hazardous waste landfill according to appropriate best practices and at least 200 m away from any waterways (streams and river). Oil contaminated water shall be sent through an oil separator before being treated. Batteries are considered hazardous waste and shall be collected separately and forwarded to an appropriate recycling facility. Used oil shall be stored in closed drums and in a secure closed storage building before being transferred to appropriate treatment facilities outside of the project area. There shall be no sources of ignition permitted within 50m of the perimeter of the storage area. Hazardous waste disposal and storage areas must be appropriately labeled in relevant languages and with symbols. Containers must be adequately labeled with “hazardous waste” in local language and English and with symbols. Hazardous waste must be stored and disposed in the most suitable manner to minimize the impact to the environment. Spill kits and absorbents must be available in all areas with hazardous waste (storage area, workshops, etc.).
Monitoring	Proper waste management must be regularly monitored to address and ensure that arising issues are identified and handled properly.
Period of Implementation	From construction start until the operation phase
Training	Awareness raising and instructing workers and project stakeholders about appropriate measures related to waste: reduce, reuse, recycle, separation. Training of employees on appropriate waste segregation. All workers responsible for hazardous waste handling shall receive appropriate waste management training including Spillage Response Training.

Facilities, Equipment, Material and Supply	Spill kits and absorbents must be made available in all areas where hazardous waste is handled (storage area, workshop, etc.).
Compliance	The stricter among South-Sudanese National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

Table SP05-1: Solid Waste Classification and Separation Guidelines

A: Non-Hazardous Waste	**B: Hazardous Waste**
Group A1: Recycle or reusable Plastic bottle (except any toxic or chemical product containers) Recyclable Metal Cardboard Glass Aluminium beverage can Clean paper and One side used A4 paper Recyclable Machinery parts Rubber Waste Tires Other recyclable construction debris	Group B1: Hazardous Waste High Acids or High Alkalis waste Sediment from the batching and cement productions Solvent Chemical Batteries Used oil Empty Fuel drums, oil drums, and other any toxic or chemical product containers e.g. chemicals, paint, oil, solvents. Bottom ash from the incinerations Paint and paint waste Spill clean-up waste Insulation material Hydraulic fluid Soil contaminated with hazardous material Waste from grease traps Other waste with unknown composition
Group A2: Organic waste or biodegradable Vegetable scraps Food waste Wet Vegetation debris (unable to burn) Other biological waste	
Group A3: Combustible Solid (Unrecyclable) Pallets Unrecyclable wood Household waste Plastic or used plastic bag	
Group A4: Construction Metal. Wood Concrete	
*Any Non-Hazardous Waste mixed/contaminated with Hazardous waste, will be classified as Hazardous waste.	

SP06: Hazardous Material Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction and operation phases
Place	Construction site, workshops, storage
Environmental aspect	Soil, water, groundwater and health& safety
Description of Impact	Hazardous material may cause environmental impact, injury or death. The procedures and practices of handling, storage, transportation, removal and disposal of all hazardous materials shall be managed appropriately. When hazardous material is no longer usable for its purpose and is intended for disposal, it keeps its hazardous properties.
Affected Activities	Spillages or leakages of hazardous material (during use or storage). Inappropriate waste disposal planning and management. The major hazardous substances and material likely to be used during construction and operation activities are: Petroleum products such as oils, fuels and lubricants Concrete admixture Paint and solvents Explosives Herbicides, pesticides Acidic chemicals Contaminated waste materials Flocculants Adhesive
Consequence	Contamination of surface water and groundwater from spills or leaks during use, storage, transportation, and disposal. Environmental and health impacts from inappropriate hazardous waste handling.
Management and Measure	Pest Management Plan shall be prepared to prevent and minimize potential impact to health and environment. Any oil contaminated waste will be considered hazardous waste and disposed appropriately. Fuel and lubricants must be stored away from waterways, in tight containers placed on sealed surfaces. Vehicles maintenance must be away from waterways and in specifically allocated sites (workshops) on impermeable flooring such as concrete floor to prevent contamination of soil and water. All workshops shall be equipped with appropriate oil separators. The storage and handling of used oil must be in appropriate tanks or containers which must be labelled appropriately such as “Used Oil” in relevant languages and symbols. Waste oil shall be disposed or recycled appropriately. Hazardous materials shall be stored in suitable storage locations with appropriate labeling in relevant languages and with symbols. Containers with hazardous material or chemicals must be labelled with: “Hazardous Material”, date of storage, exact scientific and brand name and

	physical state (gas, solid, liquid), hazardous character (corrosive, toxic, reactive, ignitable), danger to user (poison, burning, etc.) Hazardous materials must be used, stored and disposed in a manner which minimizes negative impacts to the environment and according to the Material Safety Data Sheet. Store hazardous materials above flood level in sealed containers. Information of all hazardous materials movements from storage and to waste disposal sites shall be registered. There shall be no sources of ignition permitted within 50m of the perimeter of the storage area and labelled "Hazardous Material Storage Area" and "No Smoking" labels and posters shall be placed wherever fuel is handled or stored in both Local language and English. Spill kits and absorbents must be made available at handling and storage areas. Any spillage must be retained and cleaned as soon as practicable as possible. Store facilities including workshop have impermeable flooring where wash water, sludge and spills can be drained and collected for proper disposal. Used oil and other hazardous waste shall be provided with drainage leading to the oil separator or treatment facilities before discharged. Dumping of any contaminated material into the environment is prohibited. Transportation procedures must be prepared according to international accepted standards. Each storage container should be labelled with the necessary precaution information and signs. Storage facilities shall be locked and the access limited to authorize staff only. Explosive material shall be stored in the protected facilities e.g. underground or bund wall. Explosives shall be labelled with appropriate signs and the explosives storage area with "Explosive Storage Area" and "No Smoking" labels and posters. Labelling must be in relevant languages (Local Language and English). For any movement of explosives, the quantity and type of explosives and the name of the user and date shall be registered and recorded. Adequate fire-fighting equipment shall be available in the explosives and hazardous material storage facilities. Discharge of oil or chemical contaminated water into the environment is prohibited. Personal protective equipment (PPE) including emergency eyewash and shower stations shall be made available and be enforced to use.
Monitoring	Proper waste management must be regularly monitored to address and ensure that any issue is identified and handled properly. Frequent visual observation of containers, labels, collection register, etc.
Period of Implementation	From construction start until the operation phase

Training	Instruct workers and relevant people on appropriate measures such as minimization of spill and to raise the awareness. All workers responsible for hazardous waste handling shall receive appropriate waste management training including spillage response training, safe operating procedures, safe work practices, emergency procedures.
Facilities, Equipment, Material and Supply	Spill kits and absorbents must be in all locations where hazardous materials are handled and stored.
Compliance	The stricter among South-Sudanese National Environmental Standard or International Environmental Standard (IFC EHS Guidelines)

SP07: Vegetation Clearing Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	All construction areas
Environmental aspect	Flora, terrestrial and aquatic fauna, erosion, air pollution by greenhouse gases
Description of Impact	Vegetation clearing may lead to habitat reduction, biomass reduction and expansion of project's carbon footprint.
Affected Activities	Inappropriate vegetation clearing. Using of herbicides, pesticides. Fire risk from uncontrolled burning (in dry season). Safety risk of the tree cutting and falling.
Consequence	Greenhouse gas emission and habitats' shrinking
Management and Measure	The use of herbicides and chemical substances are prohibited for vegetation clearing. A benchmark (clear disclosure of the biomass right of way clearing extension) shall be marked prior to the clearing activities. Only selected and marked trees shall be cut. Cutting activities and extension shall be monitored. Endangered tree species shall be clearly marked, recorded and moved, if possible. Provide appropriate PPE to the biomass clearing workers and train/ instruct them on the proper use of chainsaws and appropriate cutting techniques. Fire control zones around the clearing area shall be established, if required, to prevent uncontrolled burning.
Monitoring	Visual site inspection, verify the compliance with the specific Biomass Clearing Plan.
Period of Implementation	Starting when right of way clearing starts, ending by completion of project.
Training	Instruct workers and relevant people on appropriate cutting and burning techniques. All workers responsible for biomass clearing shall receive appropriate cutting training including safety operation procedures.

SP08: Biodiversity Management Plan

INFORMATION REQUIRED	DETAILS
Developer	SSEC / Contractor
Project Phase	Construction and Operation Phase
Place	Entire project area.
Environmental aspect	To minimize the impact and degradation of habitat, wildlife and aquatic species.
Description of Impact	Biodiversity Management Plan shall be prepared to prevent and minimize potential negative impact to the flora and fauna by the project activities.
Affected Activities	The entire project area.
Consequence	Disturbance to fauna and flora species.
Management and Measure	Establish and enforce rules for workers to prohibit hunting, fishing, and wood cutting. Develop and implement a comprehensive bio-monitoring program. The monitoring results must be sufficient to establish a robust baseline and to identify the change caused by project activities. The biomass clearing plan shall clearly avoid over-clearing.
Monitoring	Visual site inspection, verify the compliance according to the biodiversity management plan. Site surveys including counting of species.
Period of Implementation	Starting when construction starts, ending 5 years after operation started.
Training	Raise awareness of the importance to protect threatened species and not to trade, poach, or hunt them.
Facilities, Equipment, Material and Supply	Survey equipment and interviews.

SP09: Traffic Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction and Operation Phase
Place	Access road
Environmental aspect	Air pollution, health and safety risks
Description of Impact	Emission of air pollution resulting from the material and personnel transport. Hazards to property, injury and fatalities to worker or people. The transportations may impact the local circulation networks such as slower traffic due to heavy loads.
Affected Activities	Transportation, vehicle movement, loading and unloading
Consequence	Traffic accident, dust emission, air pollution
Management and Measure	Further Traffic Management Plan shall be developed and implemented (speed limits, load limits, training, routes to follow, avoidance of sensitive areas, regular maintenance). Security as needed to prevent unauthorized access to the project locations. Only registered vehicles shall be used in the dam construction areas. Erosion control must be implemented along the access roads. Make best efforts to always keep public roads accessible. Any closures (transport of large equipment) shall be notified in advance the relevant authorities. Dirt roads in the construction area shall be regularly sprayed with water to reduce dust generation in accordance with SP03: Air Pollution and Dust Control. Proper engineering design of access roads. In high slope areas adequate erosion control and drainage system shall be installed. Adequate signs, warnings, barriers and sufficient lighting to prevent accidents shall be installed and maintained. All traffic signs must be in a relevant language (English, Indonesian and local language) and contain symbols if possible. Community Health and Safety training shall be carried out. Safety training dedicated to children shall be carried out. Maintenance program for access roads shall be implemented before rainy season. Traffic and freight of hazardous goods (flammable hazardous petroleum products) must follow applicable rules and regulations. Traffic management through daily fleet management to avoid accidents. Enforce maximum load restrictions. Regular inspections of vehicles and project fleet. No driving allowed under the influence of drugs or alcohol. Speed limits shall be applied to minimize dust emission and risk of accidents. Vehicles exhaust and noise shall follow South-Sudanese standards.

Monitoring	Internal monitoring by the contractor and supervision of contractor's performance by the project owner's environmental staff. Traffic Management plan shall be monitored daily to avoid congestion and minimize accident risks. Survey road and traffic conditions. Visual observation. Recording of road accidents. Drugs and alcohol checks.
Period of Implementation	During construction (starting at first traffic activity) and operation
Training	Training for drivers of trucks, cars, etc. and registration of training attendance. Awareness safety training among communities and children.

SP10: Cultural Heritage Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Construction Phase
Place	Project construction
Environmental aspect	Cultural heritage and social impact
Description of Impact	Cultural and Natural Heritage might be destroyed by the excavation, construction.
Affected Activities	Excavations works.
Consequence	Cultural and natural heritage loss.
Characteristics	The Cultural Heritage shall be defined as Remains and objects left by previous human inhabitants such as shrines, graveyards, burial sites. Natural heritage includes flora and fauna such as rare conservation species, canyons, caves, waterfalls.
Management and Measure	Construction activity shall be immediately stopped if potential cultural heritage is identified. Requirement to report to the relevant local authority. The contractor shall be allowed to continue work only after official notification. Work shall proceed only after clearance by cultural and archaeological authorities such as Department of National Heritage and local GON organization. Develop a Cultural Heritage Management Plan (CHMP) to protect local cultural heritage from the adverse impacts of project activities. Archaeological survey shall be conducted before the construction commencement. A Chance find procedure mechanism for construction activities shall be developed before construction activities start (guidelines are included in this section). Provision of grievance mechanism with multiple communication channels that allows them to express concerns without risking punishment or retribution.
Monitoring	Approve documentation and interviews with governmental agencies, site managers, the village committee and selected households. Ensure that the project activities do not impact religious sites, cultural property and common property resources.
Period of Implementation	Starting when construction starts until operation
Training	Construction workers shall be trained in identifying potential heritage sites and items and appropriate reporting.
Compliance	Cultural Heritage Management Plan (CHMP), Labour Force Management Plan (LFMP), Chance finds Procedure.

Chance Finding Procedure

The chance find procedure is a project-specific procedure that outlines actions required if previously unknown heritage resources, particularly archaeological resources, are encountered during project construction or operation.

The procedure is applicable to all activities conducted by the personnel, including contractors, that have the potential to uncover a heritage item/site. The procedure details the actions to be taken when a previously unidentified and potential heritage item/site is found during construction activities. Procedure outlines the roles and responsibilities and the response times required from both project staff, and any relevant heritage authority.

All personnel, especially those working on earth movements and excavations, are to be inducted on the identification of potential heritage items/sites and the relevant actions for them with regards to this procedure during the Project induction and regular toolbox talks.

Stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained;
Immediately notify a foreman. The foreman will then notify the Construction Manager and the Environment Officer (EO)/Environmental Manager (EM);
Record details in Incident Report and take photos of the find;
Delineate the discovered site or area; secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be arranged until the responsible local authorities take over;
Preliminary evaluation of the findings by archaeologists. The archaeologist must make a rapid assessment of the site or find to determine its importance. Based on this assessment the appropriate strategy can be implemented. The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage such as aesthetic, historic, scientific or research, social and economic values of the find;
Sites of minor significance (such as isolated or unclear features, and isolated finds) should be recorded immediately by the archaeologist, thus causing a minimum disruption to the work schedule of the Contractor. The results of all archaeological work must be reported to the Ministry/Agency, once completed.
In case of significant find the Agency/Ministry (Agency for Protection of National Heritage or Archaeological Research Centre, hereinafter referred to as Heritage team) should be informed immediately and in writing within 7 days from the find (ref.law on heritage protection).
The onsite archaeologist provides the Heritage team with photos, other information as relevant for identification and assessment of the significance of heritage items.
The Ministry must investigate the fact e response in writing.
Decisions on how to handle the finding shall be taken by the responsible authorities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archaeological importance) conservation, preservation, restoration and salvage;
Construction works could resume only after permission is granted from the responsible authorities.

SP11 -12: Occupational and Community Health and Safety Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Communities and Workers Health and Safety
Description of Impact	Accidents, Fatal Accidents, Near Misses, Spread of Diseases, Decrease of quality of life
Affected Activities	All related works activities
Consequence	Social Unrest, Slowdown or stop of works, Impacts on quality of life, Reputational Consequences
Management and Measure	Provision to guarantee a safe and healthy work environment, considering inherent risks in the specific sector and specific classes of hazards in the work areas, including physical, chemical, biological, and radiological hazards. provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; training of workers; documentation and reporting of occupational accidents, diseases, and incidents; Emergency prevention, preparedness, and response arrangements. Appropriate fencing / signage at site entrance. Appointment of site security personnel. Road safety measures. First aid and medical assistance. HS measure at community level. Workers' accommodation shall follow international best practices such as ILO recommendation, guidance note by IFC and the EBRD from 2009 on Workers' accommodation Systematically planned and participatory hygiene promotion campaigns can reduce water, sanitation and hygiene (WASH)-related diseases in camps. Hygiene promotion campaigns focus on addressing the riskiest practices for diarrheal disease transmission through safe disposal of excreta, effective handwashing and reduction of household drinking water contamination. Inform workers and community of risks, infectious and all communicable diseases and protection to minimize risk of infection to workers and communities and provision of awareness and prevention briefings. Include requirements for case-finding and treatment of curable STIs, social marketing of condoms, peer educators' program, condom distribution, and Voluntary Counselling & Testing (VCT) targeting PACs. Implement and evaluate quarterly (this activity shall be planned in conformity to Health Regulation at District Level) Prevent spread of respiratory disease, including the production of epidemics that can pass back and forth between the project and the community.

	Communicate with local-level TB-control program coordinator to initiate case finding, treatment, and follow-up with family members and others living within the same housing compound as workers diagnosed with active TB. Distribute of mask to prevent from dust in the villages most impacted by the air pollution Provision of Mosquito nets and repellent Training on good practices and behavior to minimize the risks These activities shall be planned in conformity to Health Regulation at District Level Hiring on full time basis a nurse, a medical doctor and ESHS managers Install clinic for emergencies and provide at least one ambulance available at site full time
Monitoring	Worker camps audit reports as per CHECKLIST ON WORKERS' ACCOMMODATION (Annex 1 of guidance note by IFC on Workers' accommodation) Photographs demonstrating corrective measures implemented. Number of STIs treated Attendance list of induction meetings and HSE induction material which raises malaria, dengue and other VBD or STD awareness and preventative measures. Number of TBs treated Contractor HS internal audits and statistics. Records of accidents and near misses. Record of illness, diseases. Record of grievances. Record of emergencies. Informal feedback on effectiveness of Occupational and Community HS plan. Description / photographs of fencing / signage around site perimeter. Contractors to provide PLN with CV and training certification of security personnel proposed as per contract requirements. Site registry identification system.
Period of Implementation	Submit the plan before the mobilization phase
Frequency	Quarterly Basis
Training	HSE trainings for community and workers First Aid - Firefighting- other as per working activities
Facilities, Equipment, Material and Supply	PPE as per project activities, First aid kits, firefighting systems, warning systems, Ambulance, Lodging, Canteen, HS facilities, Sanitary facilities (men and women separated),
Compliance	National Standards, ILO Standards, ILO conventions ratified by Government of South Sudan, Guidance note by IFC.

SP13: Stakeholders Engagement Management Plan

INFORMATION REQUIRED	DETAILS
Developer	SSEC
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Management of Project Stakeholders Relation
Description of Impact	Social Unrest, Friction with Local Authorities, Delay in Authorization Processes
Affected Activities	All construction works activities
Consequence	Stop or slowdown of construction works
Management and Measure	Describe regulatory, lender, company, and/or other requirements for consultation and disclosure Develop a Stakeholders Map and a Stakeholder Engagement Matrix including at least Villages Heads Traditional Leaders District Road Authorities Health authorities Forest authorities Contractors SSEC Women Representatives Youth representatives Directly affected Households Vulnerable Groups Identification of key stakeholders potentially involved in the management of project GBV, their capacity and potential roles and responsibilities Define a communication plan with periodic meeting with stakeholders to integrate the Stakeholder Engagement with the Project Cycle detailing which information will be disclosed and the periodicity of the external reports. Define communication tools and languages, including local dialects, where necessary Describe resources and responsibilities for implementing stakeholder engagement activities detailing the number and qualification of staff necessary Describe how stakeholder engagement activities will be incorporated into a company's management system Create Project Information Centre for affected communities Include Project Grievances Redress Mechanism, specifying the methods to disseminate it and the responsibilities for managing it. Define a Budget
Monitoring	Compliance Monitoring through Records of public meetings, FGD, meeting with authorities, meeting with workers and community, dissemination of information.

	Participatory monitoring through the involvement of affected stakeholders in scientific sampling methods and analysis observations by affected parties, triangulated to strengthen validation group discussions on the success of mitigation or benefit measures and/or on how to manage new issues that have arisen
Period of Implementation	All the project Phases
Frequency	Not less than one in a Month
Training	Capacity-building and training programs to enable project-affected people or local organizations to acquire the technical skills necessary to participate in effective implementation programs and monitoring
Facilities, Equipment, Material and Supply	Dissemination tools
Compliance	Project Disclosure Policy, National Standards and IFC Stakeholder Engagement Good Practice Note

SP14: Local Employment Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Employment
Description of Impact	Short and Medium Terms Employment
Affected Activities	All activities
Consequence	Social Unrest Abuse of local work force Decrease of workers wellbeing
Management and Measure	Work with the procurement team to ensure that contracts with (sub) contractors and agencies follow national law in the country of operation, with company codes of conduct and policies, and with ILO, AfDB guidelines. Develop an action plan in cooperation with SSEC and local authorities to prioritize recruitment among affected communities indicating manpower needs, time schedule and provision of training. Define a procedure to keep track of directly affected people hired by the consultant in cooperation with SSEC using a shared affect households records/database distributed by SSEC and local authorities. Develop a Human Resources Policy in compliance with SSEC related policy guaranteeing at least freedom of association and collective bargaining; prohibit the hiring of underage workers, as defined in relevant ILO Conventions; prohibit recruitment, use and practices of forced labor and child labor; prohibit discrimination in hiring practices or pay; provide fair and favourable working conditions as per contract terms and make sure that conditions are transparent and understood by workers prior to recruitment; avoid excessive recruitment or transportation fees, or to keep identity documents or working papers; guarantee freedom of movement in and out of the workplace and workforce accommodation; guarantee wages as per industry standards/minimum wage; guarantee access to workforce grievance mechanisms; guarantee provision of sufficient rest periods and rest days to avoid fatigue; guarantee safe and healthy work place conditions; guarantee provision of food and water for drinking and sanitation; guarantee working conditions and accommodation standards; guarantee provision of appropriate personal protective equipment Adopt a Worker Accommodation Management Plan AS PER guidance note by IFC on Workers' accommodation. Develop a workers' grievances mechanism, a workers' code of conducts and GBV action plan.

	Contractually require all (sub)contractors to adhere to Contractor and SSEC Human Resources Policy, workers grievances mechanism, a workers' code of conducts and GBV action plan, Community and Occupational HS Plan
Monitoring	Consult the Contractors and Subcontractors employment logs, verify against national and international standards working hours, leave, salary, health and safety condition, lodge arrangements. Interviews with key informants Record of meetings and communication to workers Gender breakdown of local workforce employed by contractor and subcontractors
Period of Implementation	Pre - Construction – Construction – Operation
Frequency	Quarterly Basis
Training	HS training general and specifics as per plans' needs,
Facilities, Equipment, Material and Supply	PPE, Lodging, HS facilities, Sanitary facilities, Canteen Provide separate facilities for women
Compliance	Project ESMP and related policies, standards, laws.

SP15: Contractor Management Plan

INFORMATION REQUIRED	DETAILS
Developer	SSEC
Project Phase	Pre-Construction – Construction
Place	Entire Project Area
Social aspect	The CMP highlights all responsibilities, requirements and work statements that are expected of the contractors and how they will be delivered to the beneficiary. The contract management plan will consist of procuring, tracking and managing contracts to ensure all contractual obligations are fulfilled, including those related to environmental, social health and safety safeguards. The Contractors themselves will be required to develop their own detailed environmental, social health and safety management plans/action plans as per Project ESMP, which will reflect the commitments in this CMP and which demonstrate how they will meet these commitments.
Description of Impact	Environmental damages, decrease of wellbeing and social impacts due to non-compliance to Project ESMP, national regulations and international standards,
Affected Activities	All the activities
Consequence	Increase pf costs, slow down of construction activities, social unrest, etc.
Management and Measure	Define the Contractors' and Subcontractors' engagement and management processes, procedures and systems used; define roles and responsibilities for Contractors and its Subcontractors, as well as the relationship and cooperation between all parties, with regards to all Project activities; outline the applicable Project Standards relevant to the Contractors and its Subcontractors; set out the processes to ensure the implementation, by the Contractors and its Subcontractors, of all requirements, project commitments, conditions, methods (work statement for the construction phases), and procedures applicable to them, intended to assure the execution of the Project; define training requirements; establish a Grievance Mechanism about other Construction Environmental and Social Management Plans; define monitoring and reporting procedures, including Key Performance Indicators (KPIs), to monitor the performance of the Contractors and its Subcontractors; Define intervention procedures, i. e. the way will liaise to sort out any issues, namely related with non-compliance and/or environmental and social performance. contractors' environmental, social, cultural heritage management of contractors
Monitoring	On time delivery of contractually obligated deliverables as per mutually agreed plans Deliverables uploaded to knowledge system according to agreed timeframe. Supporting/ working documents uploaded (Templates, weekly status reports, minutes of meetings, training manual, project progress etc.)

	Number of ESHS people proposed, rejected or replaced due to performance issues or not meeting the expectations. Number of non-compliances registered
Period of Implementation	Pre-Construction – Construction
Frequency	Quarterly Basis
Training	As per plan indications
Facilities, Equipment, Material and Supply	NA
Compliance	SSEC Policies and AfD standards, Project ESMP related provision, BD

SP16: Labor Influx Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction
Place	Entire Project Area
Social aspect	Community Relations
Description of Impact	Social Conflicts
Affected Activities	All activities
Consequence	Social Unrest Violence Decrease of community well being
Management and Measure	Employ local workers to reduce labour influx, avoid child labour as per ILO regulations Define numbers of expected incoming workers and where they would come from (non-local, national, foreign, rural, urban). Propose accommodation options for workers. Propose mode of transport from point of origin, and between worker camp(s) and work site(s). Assess Likelihood that family members accompany workers (visiting, resident). Identify formal and informal service providers, including businesses and individuals aiming to provide goods and services to the project, contractors, sub-contractors, and workers. Consider National and International legislation on employment of workers relevant to project (migrant workers, minimum age, disability, etc.). Country- and sector-specific considerations, including coverage and enforcement of legislation. Screening worker influx for communicable disease and providing treatment, as appropriate, to reduce exposure to local population Vaccinating workers against common and endemic (locally prevalent) diseases
Monitoring	Supporting/ working documents uploaded (Templates, weekly status reports, minutes of meetings, training manual, project progress etc.) Grievances raise by community or workers N of penalties Conflicts reported
Period of Implementation	Pre - Construction – Construction
Frequency	Quarterly Basis
Compliance	Project ESMP and related policies, standards, laws.

SP17: Security Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Internal and external risk to the security
Description of Impact	Damages to the project
Affected Activities	All activities
Consequence	Social Unrest Violence Decrease of community well being
Management and Measure	Address: Internal Risks as illegal, unethical, or inappropriate behaviour of project personnel or those directly affiliated with it, such as employee theft, workplace violence, and labor unrest, potentially with associated sabotage). External Risks as those caused by the actions of people outside the project who seek to take advantage of opportunities presented by the development and operation of the project, such as common criminal activity; disruption of the project for economic, political, or social objectives; and other deliberate actions that have a negative impact on the effective, efficient, and safe operation of the project. In extreme cases, these could include terrorism, banditry, inter/intra community conflicts, armed insurgency, coups, or war. The plan shall indicate: Risk description Likelihood of the risk occurring Impact if the risk occurs Severity Rating based on impact & likelihood. Responsibility (Person who will manage the risk). Mitigating action Contingent action (Action to be taken if the risk happens)
Monitoring	
Period of Implementation	Pre - Construction – Construction
Frequency	Quarterly Basis
Compliance	Project ESMP and related policies, standards, laws.

SP18: GBV / SEA / CAE Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Place	Entire Project Area
Social aspect	Community Wellbeing
Description of Impact	Sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. A large influx of male labor may also lead to an increase in exploitative sexual relationships and human trafficking whereby women and girls are forced into sex work.
Affected Activities	All activities
Consequence	Permanent health and psychological damages of victims of abuse
Management and Measure	Contractors are required to have sexual harassment policies and Worker's Code of Conduct. It is recommended that Codes of Conduct include specific prohibitions against SEA, including prohibition of sexual activities with children, defined as anyone younger than 18. This standard must hold even when national standards, laws and policies have a younger age of consent. Worker Code of Conduct shall be translated in local language(s) The Contractor is obliged to create and maintain an environment which prevents gender-based violence (GBV), sexual abuse exploitation (SEA), child abuse/exploitation (CAE) issues, and where the unacceptability of GBV and actions against children are clearly communicated to all those engaged on the project. Complains on GBV and CAE episodes shall be channelized through the Project Grievances Redress Mechanism, it should state in simple, up-front language that perpetrators will be sanctioned. System of sanctions must be put in place that will unambiguously reflect the project's commitment to a violence-free workplace. Standardized training against sexual harassment and GBV should be part of on-boarding procedures for all contractor's employees at site Develop a "child labour monitoring" system, a three-person team of community members (such as a school teacher, mothers' club member or retired policeman) are given training in how to monitor child labour. They then periodically visit places where children are likely to be working. If they find a child, they report the case to a specially constituted community committee, as well as to the labour inspector or local government authority for follow-up. Depending on the child's situation, the committee will recommend a course of action, Protecting older children in or at risk of hazardous work offering comprehensive packages of training and services to facilitate the transition from school to decent work (skills, apprenticeships, vocational training, job counselling, enterprise development, financing) Raising awareness among employers of productivity gains to be achieved through improvement of working conditions to a level that is safe for young people to work.

	Establishing joint worker-employer safety committees, safety representatives and connections to workers' organizations to provide support for young people in the work environment. Ensuring regular inspection of enterprises regarding workplace conditions and adherence to minimum age restrictions Training frontline health-care providers to detect and document occupational injuries, illnesses of children, GBV and CAE Define Roles and Responsibilities Define a management and consultations schedule
Monitoring	Safety Audits through key informant interviews, FGD N and Records of the awareness Trainings Men & Boys Self-Assessment Form – Awareness Raising N of qualified experts involved in the management and follow up of issues related to GBV/CAE/SAE GRM log Records of community monitoring N of cases registered or reported by Health care providers
Period of Implementation	All project phases
Frequency	On quarterly Basis
Training	Awareness training for workers GBV/CAE/Child labor Monitoring training for inspectors selected from community, health providers etc.
Facilities, Equipment, Material and Supply	As per plan needs
Compliance	National Legislation, AfDB and IFC Standards

19 ANNEX 7: SEP AND CONSULTATION RECORDS

Stakeholder Engagement Plan (SEP)

Stakeholder identification and analysis

The analysis of the stakeholders has identified three main actors: Institutional Stakeholder, Customary Stakeholders, Project Affected People.

INSTITUTIONAL STAKEHOLDERS

The Land Act and the Local Government Act are the main frameworks on land reform in South Sudan. According to the CPA, South Sudan was supposed to institute the South Sudan Land Commission (SSLC), which would be decentralised to the lower levels of the government (states, counties, payams, and bomas) in the following way: each state was to have a state land commission (SLC), each SLC was to be decentralised to a county land authority (CLA), each CLA to a payam land council (PLC), and each PLC to a boma land administration (BLA)[34].

Until 2017, only Jonglei and the three states of Equatoria (Eastern, Central, and Western Equatoria) managed to institute state land commissions. However, none of those commissions devolved their duties to the county authority, then to the payam land council, then to the boma land administration. In Nimule, land is primarily administered by a Land Board presided over by community leaders and the Town Council.

At institutional level, the South Sudan Land Commission (SSLC) was established in 2005 to provide leadership on many land-related issues, but as an independent commission without representation in the Council of Ministers, the SSLC does not have the mandate to execute the reforms called for in the Land Act. To address this gap, the 2013 Land Policy proposed the creation of a new position of Deputy Minister of Lands in the RSS Ministry of Lands, Housing and Physical Planning. The Deputy Minister would be responsible for promoting the reforms and fostering greater coherence among land governance institutions at all levels[35].

At the lower administrative levels, counties, payams, and bomas, are respectively headed by paramount, head, and executive chiefs who act as local government officials. Only paramount and head chiefs are included into government's payroll.

Prominent actors in dispute resolution related to land grabbing are the state-level Ministry of Physical Infrastructure, the statutory courts, traditional authorities, and county, payam or boma officials.

County land authorities are expected to engage in diverse activities, including the holding and allocation of public land, facilitating registration, supporting land surveys, and advising traditional authorities and communities on land tenure and rights.

CUSTOMARY STAKEHOLDERS

In South Sudan, just four percent of national land is titled with physical deeds according to available figures[36], and customary tenure systems are the most prevalent means. The Land Act reinforces

[34] Africa Spectrum, 2017.
[35] South Sudan Law Society, 2014.
[36] CSRF 2018.

government recognition of customary land tenure: 'Customary land rights including those held in common shall have equal force and effect in law with freehold or leasehold rights' (S. 8 (6)). It also sets, in S. 11(2) broad parameters for defining community land, to include:

- Land lawfully registered in the name of group representatives under section 57 of this Act or any other law for the time being in force;
- Land lawfully held, managed, or used by specific community as community forests, cultivation, grazing areas, shrines, and any other purposes recognized by Law;
- Land lawfully transferred to a specific community by any process of law; and
- Any other land declared to be community land by law.

It also cements the rights of traditional authorities "within a specific community… [to]… allocate customary land rights for residential, agricultural, forestry, and grazing purposes" (S15 (1)). Traditional authorities can allocate land subject to consultation with the community and must inform the County Land Authority or Payam Land Council. S. 16 (1) stipulated that an allocated customary right to land can be cancelled by Traditional Authorities on behalf of the community if:

- The holder of the right fails to observe any condition or restriction attached to the right under customary law and practices, this Act and regulations;
- The land is being used predominantly for a purpose not sanctioned under customary law and practices; or
- On any other ground as may be prescribed by customary practices, this Act or any other law.

Nevertheless, a lack of clear implementing policies and regulations has undermined many of these provisions. The influence of traditional role over land issues is stronger in rural areas, where county authorities and courts cannot intervene easily.

Available literature provides examples of customary land governance in Yei River, one of the counties of Central Equatoria state bordering with Uganda. Demographically, the Kakwa forms the majority ethnic group in this county, so local governance practices are commonly based on Kakwa traditional practices. Historical leadership in Yei was based on a group of stakeholders (*monye menu* - land custodian, *matat kudu* - chief of the rain, *katokelanit* - traditional healer, and *matat lo galaka* chief of the ranch), each tasked with a specific aspect of governance.

Some of these practices and traditional roles are still relevant today. For example, a *menu* is still the basic territorial unit owned by a clan, and *monye menu* is tasked with land administration on behalf of the landowning clan.

Traditional chiefs can also be involved in mobilizing communities against investments and land leases that are perceived as inconsistent with community's interests. For example, in Goja Boma of Otogo Payam (Yei River County, Central Equatoria State), local elders mobilized communities to stop the lease of 210 hectares for a period of 10 years because the legitimate authorities were not involved in the consultation process.

In the changing institutional context characterizing South Sudan, the land acquisition process is poorly structured and there is little clarity on the applicable procedures. Investment agreements are signed at all levels of government, irrespective of the size of the landholding.

Use of eminent domain (a legal action by the state to expropriate land or property for public use, with compensation) is a problem for community-owned land in South Sudan. The government can expropriate

land for use if investment activity 'reflect[s] an important interest for the community' and 'contribute[s] economically and socially to the development of the local community' (Land Act S.63).

Rarely are affected communities consulted in any meaningful manner, and many rural communities are sidelined in decision-making concerning community land allocation to outsiders. Available literature presents several poor practices with regards to community consultation on large investments. For example, in a 2019 survey carried out among 677 households in Nimule, Torit, Wau and Yei, 68% of respondents that had their property expropriated said they were not consulted beforehand, and 85% said that they did not receive compensation[37].

Where consultations with communities are often neglected by the government and investor, some disputes have already begun to surface.

Communities that are aware of deals that have been made without their approval, tend to use whatever means are at their disposal to contest the land acquisition. Often, communities will leverage their local networks to political leaders to argue for a more inclusive approach, though instances of court action have been documented as well.

This is the case of the Bari group in Juba and surrounding rural areas. Bari leaders used the CPA's protection of 'community' land rights to advance their claims as an ethnic community and in doing so to preserve the authority of traditional institutions. Thus, a Bari Community Association was constituted - a civic association led by elites from the ranks of the military, state and local government, religious organizations, and other community leaders - to release land to the Central Equatoria State government provided that 'good policies' were out in place to protect the people whose land was surrendered.

The Association delivered a list of conditions for land allocation to the CES government. It included a guarantee that the community would be given a third of all plots made from land acquired from Bari sub-chieftaincies, 10 per cent of revenues from the lease of land (as well as annual tax proceeds from leased land), and assurances that at the end of the lease, and provided the lessee did not want to extend his arrangements, the land and its fixed assets would revert to Bari ownership.

The State Council of Traditional Authorities (or COTA) is a necessary institution for accountability of the customary system, and should be included into the consultation process as well. It can play a role in holding land authorities and other government actors accountable in respecting customary land tenure, establishing local land consultative bodies for chiefs/payams and monitoring land related decisions[38].

DIRECTLY AFFECTED PARTIES

The parties directly affected by the project are the villages located near the construction sites as per in these categories the key stakeholder in each village is: Head of Village; Informal/customary leader; Women Group, Children, Landowners, Sharecroppers etc.

[37] South Sudan Law Society, 2019.
[38] Norwegian Refugee Council, 2012.

Affected administrative bodies

State	County	Payama
Central Equatoria	Juba	Gondokoro
Central Equatoria	Juba	Lokiliri
Central Equatoria	Juba	Lobonok
Eastern Equatoria	Magwi	Pageri
Eastern Equatoria	Magwi	Mugali

A. INDIRECTLY AFFECTED PARTIES

Other villages located outside the project area could be indirectly impacted by the heavy traffic and induced activities. To be identified in later stages, now no parties are indirectly impacted.

B. OTHER INTERESTED PARTIES

Government Bodies

The administrative authorities and technical offices will be part of consultation and disclosure activities due to their role in the decision making and monitoring purposes. The list below shows the main public institutions that will be involved in the engagement plan.

- Ministry of Interior
- Minister of Lands in the RSS Ministry of Lands, Housing and Physical Planning
- South Sudan Land Commission (SSLC)
- Central and Eastern Equatoria States
- Central and Eastern Equatoria Land Commissions
- Juba and Magwi Counties
- Paramount head of Affected Payamas (Gondokoro, Lokiri, Lobonok, Pageri, Mugali etc)
- Executive Chiefs of Affected Bomas
- Nimule Community Leaders and Town Council
- Juba Town Council

Project Proponent

The project proponent is responsible for planning and development stage. This institution has responsibility to establish Transmission Line Development Plan. The proponent shall guide the implementation of the Environmental and Social Management measures during construction and operation phase at corporate level through a dedicated Chief Executive Officer responsible of the Project.

Project Implementation Consultant

The Project Consultant is represented by an association of international engineering firms with the scope to assist and support the proponent in all relevant fields for the realisation and implementation of the Transmission Line including but not limited to design, ESIA and RAP Studies.

Contractors

The Project Contractors will be selected through competitive bidding. They will be responsible to apply all the environmental mitigation measures that will be described in the ESIA and any additional land acquisition according to this RAP.

C. DISADVANTAGED/VULNERABLE GROUPS

Vulnerable people are distinct groups of people who might suffer more or face the risk of being further marginalized due to the project and specifically include: i) households that are headed by women, ii) household heads with disabilities, iii) households falling under the regional poverty line, and iv) elderly household heads. These specific groups will be reached during the consultation phase through the selection of representatives who can take the role of spokesperson and facilitators. For vulnerable groups to participate in project activities, they need to be invited to consultation activities with appropriate assistance according to the actual needs.

Summary of project stakeholder needs

Stakeholder group	Key Issues	Language needs	Preferred notification means	Specific needs
Villages	Directly affected people impacted by land taking. Possible problem related to land acquisitions and disturbance during the construction	Official language and Local Language	Written information, radio	Timing for meeting in conformity with PAPs working schedule
Women Groups	Gender Based Violence during construction, needs of jobs during the project.	Official language and Local Language	Visit with translator and gender expert	Child care for meetings—late afternoon preferred timing
Vulnerable groups	Presence of child households' heads and child labour	Official language and Local Language	Visit with translator and gender expert	Assistance for disable people
Institutional stakeholders: District and Villages Authorities	Key role in the disclosure of information, security management and mediation with project affected people	Official language	Letter	Introduction letter
Contractors and Sub Contractors	Specific disclosure of project social and environmental risk and management measures	English	Formal letter and meetings with SSEC ESMD experts	Periodic meeting with experts

Stakeholder Engagement Program

This section presents the purpose and timing of stakeholder engagement program through a framework for the entire project life cycle.

Two matrices for the stakeholder engagement planning are hereunder presented: one for consultation and one for disclosure. Both are subdivided in project phases: F=Feasibility DS=Detailed Design PC/M=Pre-Construction/Mobilization C=Construction.

They have been included as living document to be populated during each step of the project implementation both for ESIA and for RAP. The SEP will be included in the ESIA and it be populated up to the full ESIA and full RAP Reports with the implemented consultations. General indication will be provided in the matrices for the construction and operational phase for what concerns Contractor's obligations.

ESIA Consultations during Feasibility

ESIA Consultations	Method	Stakeholder	Period	Implementing Agency
ROUND 1				
During site reconnaissance Project presentation and collection of information	**KI INTERVIEWS**	Ministry of Energy and Dams South Sudan Electric Corporation (SSEC) Ministry of Environment and Forestry Ministry of Wildlife Conservation and Tourism Nimule National Park	**October 2023**	Consultant
ROUND 2				
During baseline data collection Collection of data and information on habitat, ecosystem services, wildlife, human and wildlife conflicts.	**KI INTERVIEWS CHECKLIST**	Executive Chiefs of Affected Bomas and other key informants at local level	**January/February 2024**	Consultant

ESIA Consultations during Construction

ESIA Consultations	Method	Stakeholder	Construction Phase	Implementing Agency
Set up of Security Committee	Meetings	UECTL, SSEC, Lenders, South Sudan and Uganda Ministry of interior	Pre construction phase	UETCL and SSEC
Project kick off, schedule and impacts	Meetings	Authorities, PAPs and Communities	2026	SSEC
Labor influx and Community Health and Safety (induction training)	Community meetings And radio announcement	PAPs and Communities	Before mobilization	Each Contractor and Sub Contractor
Periodic meeting on ESHS (SUBPLANS as per ESMP)	Community/ schools meetings And radio announcement	PAPs and Communities	Every month after mobilization and when necessary, as described in the Contractors Sub Plans	Each Contractor and Sub Contractor
Periodic FGDs of GRM	KII and FGDs	COMMUNTIES, PAPs, WORKERS, GRM Committee	Every month	SSEC

ESIA Consultations	Method	Stakeholder	Construction Phase	Implementing Agency
Effectiveness of compensation measures and livelihood restoration	KII and FGDs	COMMUNTIES, PAPs, WORKERS	Every month the first year of construction and every 4 months from second	SSEC

ESIA Information Disclosure Program

F=Feasibility DS=Detailed Design PC/M=Pre-Construction/Mobilization

ESIA Disclosure Process	Method	Stakeholder	F/DS	PC/M	Implementing Agency
Disclosure of Draft ESIA	**Presentation**	Affected Counties and State Ministries Paramount Head of Affected Payamas Executive Chiefs of Affected Bomas	March 2024	na	SSES
Disclosure of Draft ESIA	**Presentation**	Ministry of Energy and Dams Ministry of Environment and Forestry Ministry of Wildlife Conservation and Tourism	March 2024	na	SSEC
Disclosure of Approved ESIA	**Non-technical Summary**	Paramount Head of Affected Payamas Executive Chiefs of Affected Bomas	March 2024	na	SSEC
Disclosure of Approved ESIA	**Full Report**	Affected Counties and State Ministries Ministry of Energy and Dams Ministry of Environment and Forestry Ministry of Wildlife Conservation and Tourism	-	2025	SSEC
Disclosure of Approved ESIA and ESMP	**Non-technical Summary**	Paramount Head of Affected Payamas Executive Chiefs of Affected Bomas s	-	2025	SSEC

RAP Consultation during feasibility

RAP Consultations	Method	Stakeholder	Period	Implementing Agency
ROUND 1				
classification of the value of land by use, classification of the Land properties, land title certificates issues, customary land, cadastral maps, grievances handling, land for returnees. Means of communications.	**KI INTERVIEWS** **CHECKIST**	Minister of Lands in the RSS Ministry of Lands, Housing and Physical Planning South Sudan Land Commission (SSLC) Central and Eastern Equatoria States Central and Eastern Equatoria Land Commissions	JULY 2023	Consultant
classification of the value of land by use, classification of the Land properties, land title certificates issues, customary land, cadastral maps, grievances handling. Means of communication.	**KI INTERVIEWS** **CHECKIST**	Juba and Magwi Counties Nimule Community Leaders and Town Council Juba Town Council	JULY 2023	- Consultant

RAP Consultations	Method	Stakeholder	Period	Implementing Agency
ROUND 2				
CENSUS AND LAND SURVEY CUT OFF DATE	**HH Questionnaire with opening and closing consultations.**	All affected land holder along the right of way	JANUARY 2024	- Consultant
COMMUNITIES SOCIAL PROFILE	**KI INTERVIEWS and FGDs**	Affected people from Bomas and respective Chiefs	JANUARY 2024	Consultant
ROUND 3				
Land for land or Cash option Identification of alternative land	**FGD and Meetings (2 rounds)**	DIRECTLY AFFECTED PAPs and CUSTOAMRY LEADERS	FIRST HALF OF 2025	SSEC/ RAP IMPLEMENTATION CONSULTANT

RAP Consultations	Method	Stakeholder	Period	Implementing Agency
AFFECTED APAYAMS	**COMMUNITIES NEEDS ASSESSMENT** **MARKET ASSESSMENT** **DEFINTION OF MAIN COMMUNTIY RPIORITIES IN TERMS OF EDUCATION, HEALTH, AND LIVELIHOOD** **At least 2 rounds of meetings, one for the study one for the presentation of the results**	Land Agency, Ministry of Health, Education, Infrastructures and Finance and Economic development of Central and Eastern Equatoria States Payam of Gondokoro, Lokiliri, Lobonok, Pageri, Mugali	FIRST HALF OF 2025	SSEC/ RAP IMPLEMENTATION CONSULTANT
AFFECTED COMMUNTIIES	**25 FGDS and Household Questionnaires**	Communtities of Gondokoro, Lokiliri, Lobonok, Pageri, Mugali women, youths, mixed group, farmers, herders, traders	FIRST HALF OF 2025	SSEC/ RAP IMPLEMENTATION CONSULTANT

RAP Consultations	Method	Stakeholder	Period	Implementing Agency
HUMANITARIAN AID AND SOCIAL DEVELOPMENT ACTORS	**KII on existing social development projects and launched programs** **At least 2 rounds of meetings**	Local Association and International NGOs	FIRST HALF OF 2025	SSEC/ RAP IMPLEMENTATION CONSULTANT
Land for land or Cash option Identification of alternative land	**FGD and Meetings (2 rounds)**	DIRECTLY AFFECTED PAPs and CUSTIOAMRY LEADERS	FIRST HALF OF 2025	SSEC/ RAP IMPLEMENTATION CONSULTANT
HUMANITARIAN AID AND SOCIAL DEVELOPMENT ACTORS	**KII on existing project and launched programs**	local association and international NGO	FIRST HALF OF 2025	SSEC/ RAP IMPLEMENTATION CONSULTANT

RAP Information Disclosure Program

F=Feasibility DS=Detailed Design PC/M=Pre-Construction/Mobilization

RAP Disclosure Process	Method	Stakeholder	F	DS	PC/M	Implementing Agency
PROJECT STUDIES ANNOUCEMENT CENSUS /CUT OFF DATES	**Information through sub district and villages to affected peoples**	Directly interested Parties Other interested Parties	1st announcement on February 2024 during census 2nd announcement And after the formal Approval of RAP Brief by MLHUD			SSEC
Disclosure of Draft RAP	**PIB (Public Information Booklet, bulletin on board in every sub districts/villages)** Collection of written comments via booklet and presentation of answer to AP representatives selected by the communities	Directly interested Parties Other interested Parties		2024 (After approval of MLHUD)		SSEC

RAP Disclosure Process	Method	Stakeholder	F	DS	PC/M	Implementing Agency
Disclosure of draft Community Plan	**Meetings and public hearings** Collection of written comments via booklet and presentation of answer to AP representatives selected by the communities	Directly interested Parties Other interested Parties			2025	SSEC
Payment Notification	**Letter and Meeting**	Directly interested Parties Other interested Parties			2025	SSEC
Displacement Notification	**Letter and Meeting**	Directly interested Parties			2025	SSEC

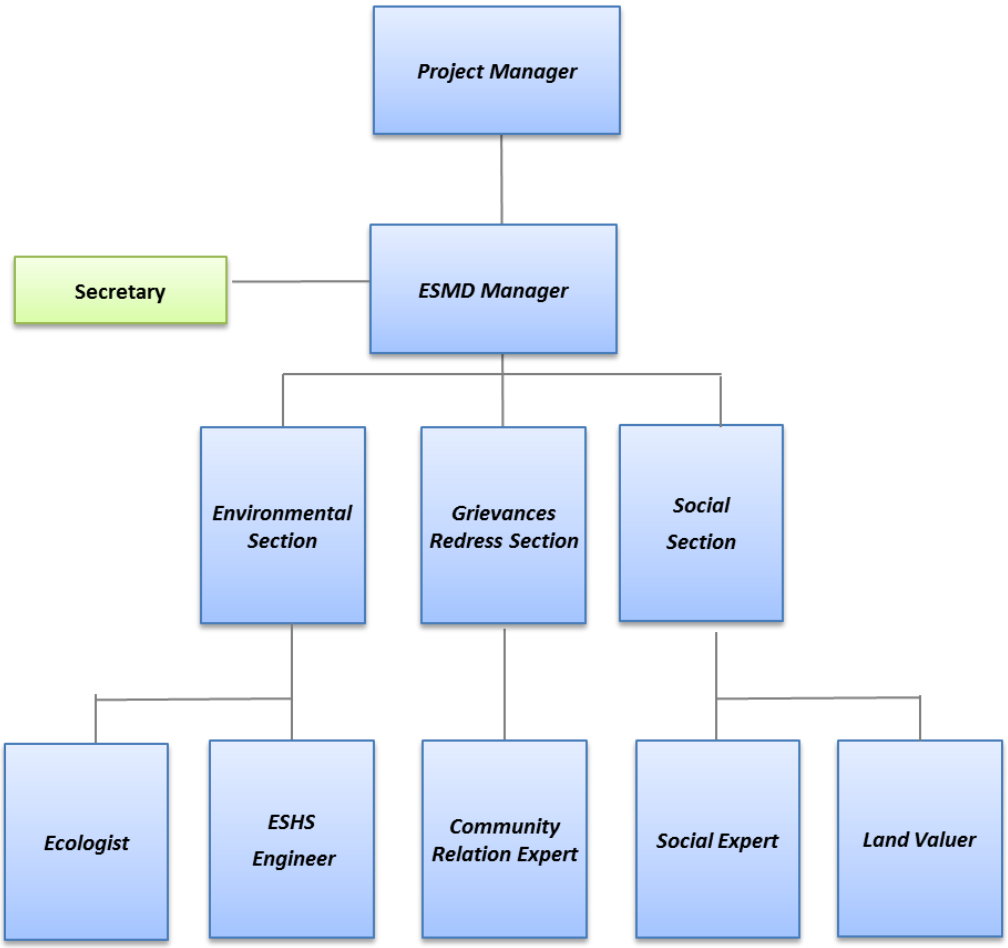
Resources and Responsibilities for implementing stakeholder engagement activities

An Environmental and Social Management Division (ESMD) within the project structure will actively liaison with the concerned stakeholders and Government of South Sudan agencies to assure a smooth implementation of the plans. Different parties to be involved directly and indirectly for environmental management of the proposed project components include among others:

Donor Agencies;

- Project Management Unit of SSEC;
- Supervising Engineers for SSEC implementation;
- Construction Contractor; and
- Regional and Local level political and governmental institutions, Community-based Organizations (CBOs), etc.
- Directly Affected Parties

The ESMD will have three sections namely Environmental Section, Grievance Section and Social Section. Environmental Section will be responsible for implementing physical and biological mitigation and enhancement programs and relevant monitoring activities, as well as compliance monitoring of programs implemented by the contractors as per contractual agreement. Social Section will work on land acquisition and compensation, resettlement and rehabilitation, community development, livelihood programs, health related programs, etc. and relevant monitoring of social programs implemented by the project and compliance monitoring of programs implemented by the contractors as per contractual agreement. ESM social section is in charge to develop this SEP and use it as living document throughout all the project construction and operation phase.



At the same time the contractor shall provide its own Stakeholder Engagement Sub-Plan, which shall be developed in compliance with ESMP standards and with all the other Contractors Sub Plans, listed here below.

- SP01: Erosion and Sediment Control Management Plan
- SP02: Water and Soil Pollution Control Management Plan
- SP03: Air pollution and Dust Management Plan
- SP04: Noise and Vibration Management Plan
- SP05: Waste Management Plan
- SP06: Hazardous Material Management Plan
- SP07: Vegetation Clearing Management Plan
- SP08: Biodiversity Management Plan
- SP09: Traffic Management Plan
- SP10: Cultural Heritage Management Plan
- SP11: Occupational Health and Safety Management Plan

- SP12: Community Health and Safety Management Plan
- *SP13: Stakeholders Engagement Management Plan*
- SP14: Local Employment Management Plan
- SP15: Contractor Management Plan
- SP16: Labor Influx Management Plan
- SP17: Security Management Plan
- SP18: GBV/SEA/CAE

The guidelines for Sub Plan Stakeholders Engagement Management Plan are reported in the following box and extracted from the ESMP

INFORMATION REQUIRED	DETAILS
Developer	Both SSEC and Contractor respectively
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Management of Project Stakeholders Relation
Description of Impact	Social Unrest, Friction with Local Authorities, Delay in Authorization Processes
Affected Activities	All construction works activities
Consequence	Stop or slowdown of construction works
Management and Measure	Describe regulatory, lender, company, and/or other requirements for consultation and disclosure Develop a Stakeholders Map and a Stakeholder Engagement Matrix including at least ▪ Villages Heads ▪ Traditional Leaders ▪ District Authorities ▪ Road Authorities ▪ Health authorities ▪ Forest authorities

INFORMATION REQUIRED	DETAILS
	▪ Contractors ▪ SSEC ▪ Women Representatives ▪ Youth representatives ▪ Directly affected Households ▪ Vulnerable Groups Identification of key stakeholders potentially involved in the management of project GBV, their capacity and potential roles and responsibilities Define a communication plan with periodic meeting with stakeholders to integrate the Stakeholder Engagement with the Project Cycle detailing which information will be disclosed and the periodicity of the external reports. Define communication tools and languages, including local dialects, where necessary Describe resources and responsibilities for implementing stakeholder engagement activities detailing the number and qualification of staff necessary Describe how stakeholder engagement activities will be incorporated into a company's management system Create Project Information Centre for affected communities Include Project Grievances Redress Mechanism, specifying the methods to disseminate it and the responsibilities for managing it. Define a Budget
Monitoring	Compliance Monitoring through records of public meetings, FGD, meeting with authorities, meeting with workers and community, dissemination of information. Participatory monitoring through the involvement of affected stakeholders in scientific sampling methods and analysis

INFORMATION REQUIRED	DETAILS
	observations by affected parties, triangulated to strengthen validation group discussions on the success of mitigation or benefit measures and/or on how to manage new issues that have arisen
Period of Implementation	All the project Phases
Frequency	Not less than one in a Month
Training	Capacity-building and training programs to enable project-affected people or local organizations to acquire the technical skills necessary to participate in effective implementation programs and monitoring
Facilities, Equipment, Material and Supply	Dissemination tools
Compliance	Project Disclosure Policy, National Standards and IFC Stakeholder Engagement Good Practice Note

Social component	Target Population	Mitigation Enhancement	Responsibility		Monitoring Frequency	Costs	Phase: Constr. (C) Oper. (O)
			Mitigation	Monitoring			
Stakeholder Engagement	Affected authorities from Village to Parish and County level	Develop a Stakeholder Engagement Plan which shall include at least: Chiefs of Affected Parishes and Villages Road Authorities Health authorities Forest authorities Tourist authorities Contractors UETCL Women Representatives Youth representatives Create Project Information Centre for communities	SSEC	ESMD and Contractor	Quarterly basis	45,000	P, C
			Contractor	ESMD and Contractor	Quarterly basis	45,000	P, C

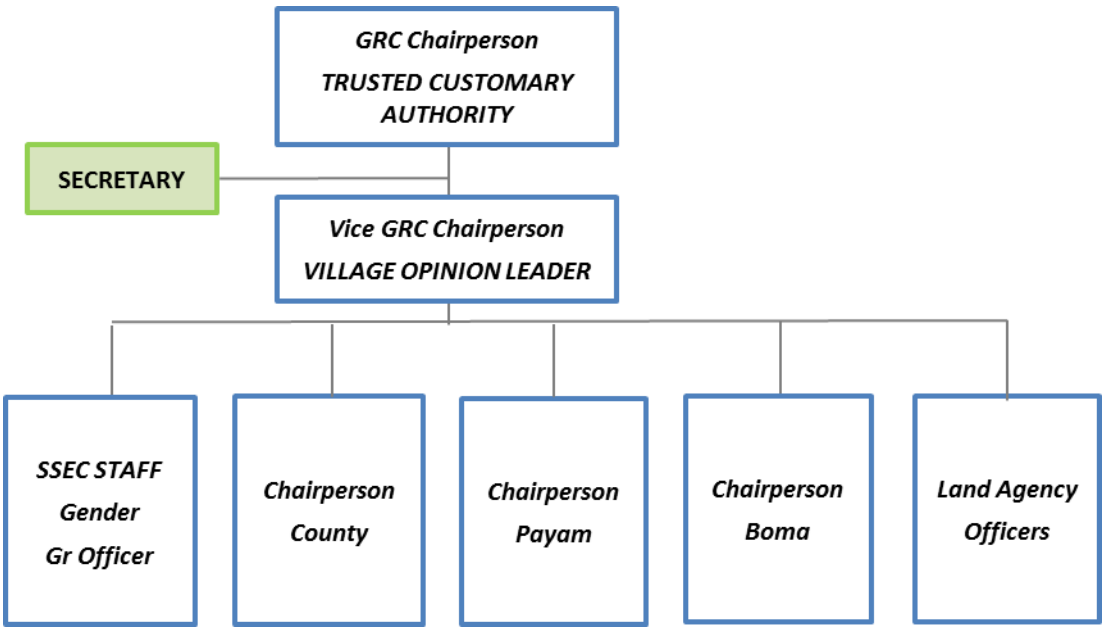
Grievances Redress Mechanism

This subsection describes the GRM that SSEC will put in place for all the activities under the Employer's responsibility. At the same time the Contractors will have their own GRM in place for what concerns Contractor's human resources and any damage caused to the surrounding communities and properties throughout all Project phases, as defined in the Bidding Documents.

As described before, in rural areas of Greater Equatoria states, the effects of the statutory or formal system are less pronounced, and jurisdiction on all subjects remains in the hands of the customary authorities. Available literature shows that in 61% of the cases of land grabbing involving IDPs, the individual concerned tried to negotiate directly with the person occupying their land. Self-help mechanisms and informal arrangements remain the first choice to settle land disputes, as capability to appeal to an institution responsible for land registration or to reach mediation or arbitration services to clarify land ownership issues is very weak.

For this reason, it is necessary for the project to set up a Grievances Redress Committee that includes SSEC, customary authorities, formal authorities, and trained grievances officers, and at least one grievances officer experienced in gender, in order to receipt, assess and address grievances in a coordinated system.

The Committee shall have funds to regularly meet and operate on the field during all the RAP process and project implementation.



The complaints related to any aspect of the land acquisition process will be handled through fair negotiations in order to reach an acceptable resolution. All complaints will be documented and kept with SSEC. The project authority will ensure that funds are delivered on time to the implementing

partners for timely payment of compensation and preparation and implementation of social activities, as applicable. The compensation issues and rehabilitation measures will be completed before beginning of major construction works. The PAPs/AHs and community will be exempted from all administrative fees incurred, pursuant to the grievance redress procedures except for cases filed in court

The grievance redress mechanism recommended to manage land acquisition related issues is described below:

A) **Disclosure of the Mechanism to Community** – once designed and approved the mechanism shall be disclosed in a culturally appropriate manner in the local language and format that is understandable to all community groups. The disclosure will be implemented through public meetings with local authorities, and through meetings in schools and meeting with women groups, involving Customary Institutions in the process as participants.

B) **Receive and Recording** – Grievances will be received by the Committee. The grievances can be filed through grievances offices directly or by phone. A dedicated channel for GBV grievances will be set through the appointment of one grievances officer with experience in gender. They shall be captured in a logbook, classified, and reported to the Committee. The complainant shall receive an acknowledgment of receipt of the grievance within a prescribed and reasonable timeframe, preferably in writing. Keeping a record of those who lodged grievances helps to know who and where the vulnerable and most affected persons by project activities are. Therefore, data such as gender, age and location is also recorded, which assists in understanding the grievances better. Most importantly, the project shall recognize that those who register grievances must be protected and, therefore, handles grievances with the highest level of confidentiality; complainants are free to remain anonymous and should feel free to give as little personal information as they wish. While there is no formal minimum requirement for submitting a grievance, to enable effective review and management, the project prefers that any stakeholder who submits a complaint to include the following information:

   - Name(s) of the complainant(s);
   - Information on whether the identity of the complainant should be kept confidential or can be disclosed to relevant individuals/structures during the investigation process;
   - Contact details (geographical location, telephone number, e-mail ...);

   Even without individual or personal detail, the Project will follow up and solve each grievance.

C) **Categorize grievances** – Having received and registered a complaint, the next step is to establish the eligibility of the complaint. The following criteria should be used to assess and verify eligibility:

   - The issue falls within the scope of the GRM
   - The complainant is anonymous or identifiable with a name and contact details provided
   - The complainant is affected the project
   - The grievance is clear

- The complaint has a direct relationship to the project or activity; and
- All the mandatory preliminary information is available.

The purpose of this step is to ensure that the issue being raised is relevant to the project. If the grievance is not eligible, the complainant will immediately be given the reasons. On the other hand, a decision on eligibility is only meant to trigger an initial assessment and response. It is not an admission that the organization has caused an impact, or a commitment to provide the complainant with any specific form of redress. The assessment at this step will also enhance decision-making as to whether the complaint should be directed to a different entity.

As a result of the assessment, the grievance will be assigned to one of the four categories

- CATEGORY 0: Complaints that are not related to the project;
- CATEGORY 1: Queries, comments, and suggestions;
- CATEGORY 2: Complaints and concerns, which are not criminal in nature or do not require the involvement of police. Concerns and complaints about land acquisition or livelihood restoration, environmental damages, nuisance impacts such as noise or dust, waste management, risks to public safety.
- CATEGORY 3: Complaints and concerns that involve allegations that require investigation or intervention by the police or other law enforcement authorities. Any grievance which involves loss of life, child abuse, rape, defilement, child sacrifice, sexual harassment, or any violence against children.

If the grievances fall under categories 1, 2 or 3 they can be further classified:

SURVEY GRIEVANCES: Grievances may arise at the design stage, such as where some communities feel they were not offered enough information about the objectives of the exercise. In such situations, the SSEC shall be notified to prepare an appropriate response.

SOCIAL GRIEVANCES - social-related grievances may arise at any stage of the project management cycle as a result of inadequate consultation, sensitization, and or disruption of social setups by migrant workers. There are also situations when social grievances arise out of unrealistic expectations. When these kinds of impacts arise, the project related experts shall be notified to assess the grievance and take appropriate remedial measures.

RESETTLEMENT GRIEVANCES: Resettlement, Land Acquisition, and Compensation Related Grievances. The grievances are mainly caused by inadequate consultation and sensitization; delayed release of compensation packages or delayed return of land titles to Project Affected Persons. The process involves a lot of interaction with people during the implementation of (a) RAP implementation, the (b) land and asset inventories, (c) land valuations and verifications, (d) disbursement and during a final land take.

D) **Review and Investigate** – In this phase, the grievances will be classified into basic categories.

In general, Category 0 grievances will involve verification that the stakeholder is satisfied with the response. If the grievance involves another project or an institutional issue, the complainant should

be referred there accordingly. Category 1 grievances will involve confirming receipt of the positive feedback and informing the relevant technical staff within SSEC. Regarding category 2 grievances, verification, investigation, negotiation, mediation or arbitration, coordination with appropriate authorities, making decisions, proposing resolutions, as well as the implementation of agreed actions, will involve a thorough assessment and getting back to the complainant for more information in case it is required. A grievance which falls in category 3 shall be logged and escalated to police without any delay. If grievances include more than one issue, the Grievance Officer will make sure that all issues are reviewed and addressed at the same time to avoid any delays.

To ensure the investigation is fair, trackable and thorough each step and agreed action shall be documented with related evidence

E) **Develop Resolution and Respond** – A range of proposed resolutions will be recommended based on the investigation result. The proposed resolution shall be agreed and accepted by both parties (the Project and also the complainant). The project will follow the steps of the grievance's resolution. Hence, following the above principle the Grievance Redress Mechanism (GRM) will be established to allow project affected persons/households (PAPs/AHs) to appeal any disagreeable decisions, practices and activities arising from compensation for land and assets. The PAPs/AHs will be made fully aware of their rights and the procedures. The PAPs/AHs will have access to both locally constructed grievances redress committees specified and formal courts of appeal system. Under the latter system every PAP/AH can appeal to the court if they feel that they are not compensated appropriately.

The process of developing resolution and response can be articulated in three steps

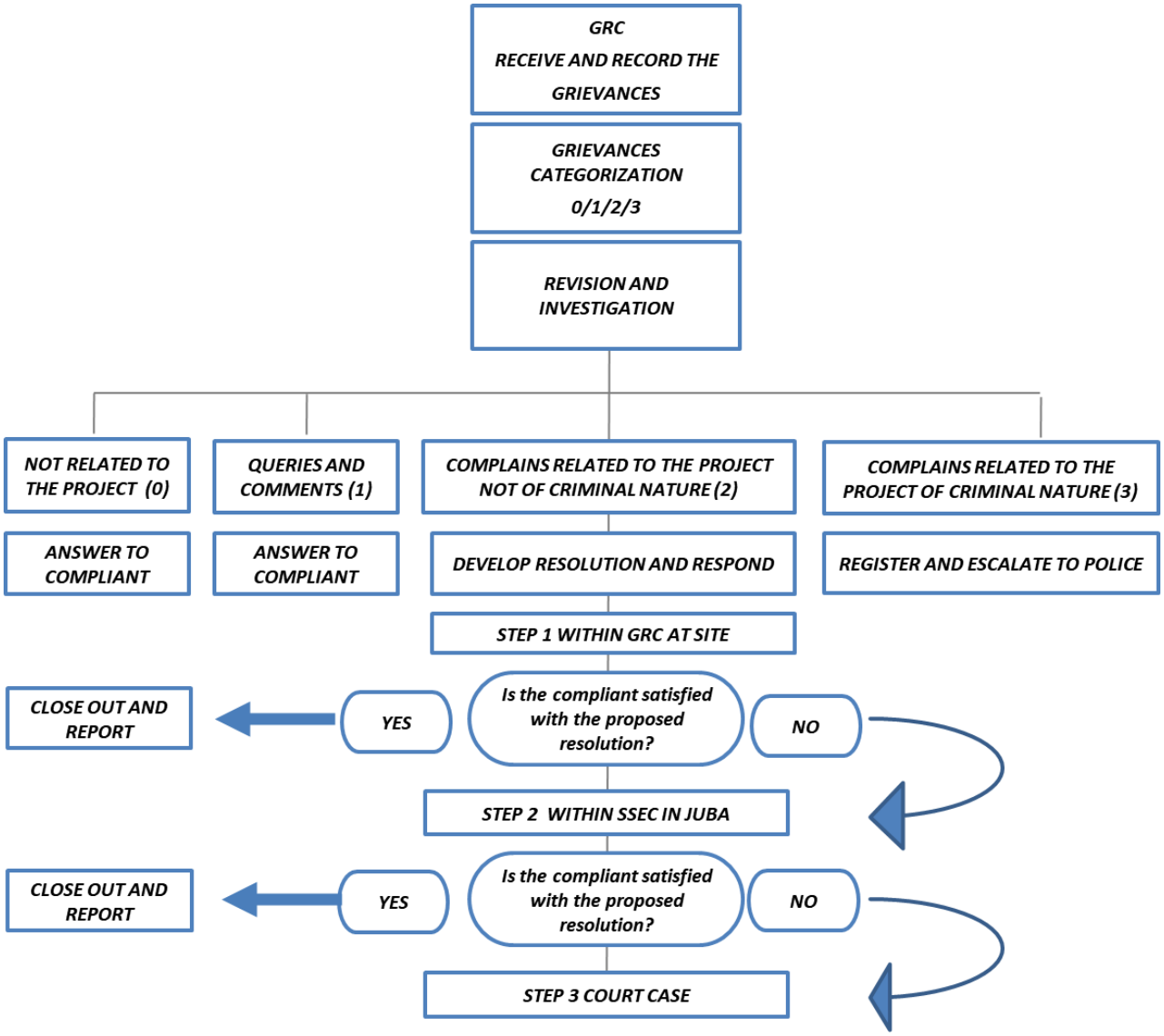
Step 1: Complaints of APs/AHs and community on any aspect of compensation, relocation, or unaddressed losses of private and community property shall in first instance be settled verbally or in written form in the field-based project office. The complaint can be discussed in a meeting between the PAPs/AHs, the Village Leader, the grievance redress committee (GRC). The GRC will be the main responsible to be in close contact with all affected people and public and hear, record, and formally file their complaints in the registers on a regular basis. The Team will resolve the issues at the field level in close coordination with APs within 15 days and two meetings of the received of the grievances. If the complaint remained unresolved at field level the GRC will forward the complaint to the second level of GRM.

Step 2: if the grievances are not solved at the local level within 15 days, the GRC will take over the case lodging the grievances to the SSEC Division at Headquarters in Juba, the APs PAP/HHs and community may produce documents to support their grievances. SSEC will made field observation and discuss the issues with concerned Authorities and APs/HHs. Those issues thus brought to SSEC will be resolved within 30days and two meetings from the date of the complaint received.

Step 3: If the PAPs/HHs and local community are not satisfied with the decision or in absence of any response of its representatives, within 30 days of the complaint, the PAPs/AHs and community may submit its case to the district court. The decision of the court will be acceptable to both Parties.

Though there are 3 stages of GRM mentioned here, the APs/AHs will have full rights to approach to the appropriate Courts of law with their grievances at any stages of the process.

F) **Close Out and Reporting** - If the solution is not accepted by the complainant, the Project will conduct further consultation with the complainant to obtain more detailed clarification on the issues with the aim of agreeing upon a mutual solution. Should the complainants agree and accept the provided resolution, the Project will record the agreement in a Grievance Resolution Minutes Form and update the Grievance Log. All documentation will be stored in one central place for easy management. The fulfilment of agreements, satisfaction of complainants, and number of complaints received shall be monitored over the land acquisition process as this data will be required as part of the external monitoring for the lenders


GRC
RECEIVE AND RECORD THE
GRIEVANCES
GRIEVANCES
CATEGORIZATION
0/1/2/3
REVISION AND
INVESTIGATION
NOT RELATED TO THE PROJECT (0)
QUERIES AND COMMENTS (1)
COMPLAINS RELATED TO THE PROJECT NOT OF CRIMINAL NATURE (2)
COMPLAINS RELATED TO THE PROJECT OF CRIMINAL NATURE (3)
ANSWER TO COMPLIANT
ANSWER TO COMPLIANT
DEVELOP RESOLUTION AND RESPOND
REGISTER AND ESCALATE TO POLICE
STEP 1 WITHIN GRC AT SITE
CLOSE OUT AND REPORT
YES
Is the compliant satisfied with the proposed resolution?
NO
STEP 2 WITHIN SSEC IN JUBA
CLOSE OUT AND REPORT
YES
Is the compliant satisfied with the proposed resolution?
NO
STEP 3 COURT CASE

Summary of Consultations

During this study the consultation process was structured on two rounds of meetings, the first with district authorities and environmental authorities to verify the critical aspect of the project alternatives. The sectorial experts met the different officers after a formal introduction of SSEC. This round was essential to gain all the contacts of the key stakeholders at local level. A second round was organized during the census survey, from district, sub county and village level to share information about the project and organize the meeting with affected PAPs. The target villages are those crossed buy the project. Through the support of village leaders, meeting with PAPs were carried out. Meeting was conducted with two days' notice by the village leader, the meetings were carried out with the help of translators. During the meeting the concept were presented through posters and maps.

During the first two consultation phases, field activities were hampered by a very fragile security situation near the border with South Sudan. These difficulties relate to the section of the power line route through Lamwo district territory. In the next stages of the project, it will therefore be essential to ensure the direct involvement of other institutional actors, starting with the Minister of the Interior. The objective will be the creation of a coordination unit or ad hoc committee including, UETCL, SSEC and Lenders focusing on security issues, to be activated in cooperation with other interested ministers or departments, to follow the process of activities on the ground and ensure the presence of security personnel. One of the priorities of this unit will be to facilitate the coordination of efforts to secure census and field construction operations in the cross-border areas, to ensure that adequate funds are made available for this purpose, and to ensure that the communities living in these regions on both sides of the border are informed of the ongoing activities and involved in the project activities through awareness-raising campaigns and other initiatives as deemed appropriat

Summary of the 1st round of consultations

For what concerns land acquisition, the social consultant travelled to South Sudan from 16th to 27th July in order to engage various stakeholders and discuss matters relating to acquisition of land and landed assets in the Republic of South Sudan. The mission included visits in Juba (Central Equatoria State), Torit and Magwi (Eastern Equatoria State). The following organizations / offices were engaged for the purpose of the study:

- South Sudan Electricity Corporation;
- Ministry of Lands, Housing and Urban development;
- State Ministry of Housing, Lands and Urban Utilities;
- South Sudan Land Commission;
- Department of Natural Resources, University of Juba;
- Deputy Governor, Eastern Equatorial State;
- State Ministry of Housing, Land and Public Utilities;
- County Commission of Magwi;
- County Commission of Juba.

The field mission allowed to assess the stakeholders' roles and capacities, as well as institutional and organizational arrangements. It also provided field observations that have been compared with the desk study on the South Sudanese legal and policy framework. The study findings will feed into a tentative workplan for the next consultation phases and provide guidelines to support local institutions in implementing the RAP and land acquisition campaigns.

For what concerns environmental issues, the 1st round of consultations with stakeholders (Ministries of Electricity, Environment and Forestry, and Wildlife Conservation and Tourism) was carried out in concomitance of the site reconnaissance survey from October 4th to Sunday October 8th, 2023. The stakeholder consultation and the site reconnaissance survey were done to have a glimpse of the environment of the areas along the three proposed transmission routes.
Stakeholder consultations were done cordially with the responsible and knowledgeable people at the aforementioned ministries, face to face or through phone conversations.
The mission included visits at the following sites: proposed substations, Lokiliri, Lobonok, Pageri (Opari and Moli) and Mugali.
The following organizations / offices were engaged in the consultations:

- Ministry of Energy and Dams and South Sudan Electricity Cooperation (SSEC)
- Ministry of Environment and Forestry
- Ministry of Wildlife Conservation and Tourism
- Nimule National Park

The field mission allowed to present the project at the stakeholders and start the communication for the future baseline data collection.

The main findings are resumed in the following tables. The detailed Minutes of Meetings are provided in Annex 6.

Table 19-1 – Main findings of the 1st round of RAP consultations

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
18/07/23, Juba (Central Equatoria State)	South Sudan national ministry of lands housing and urban development	The Ministry has a role of supervisory, registration and policy making in relation to land acquisition for government projects. It forms the link of National land Commission representation to the Council of Ministers.	Concerning land acquisition, valuation and compensation, all private land is allotted as leases by the national Government or County. Most of the land along the project foot print is community land. However, some of the community land is demarcated even though title documents are not issued. To date, there is only one valuer in the National Government who doubles up as the undersecretary and with a background in engineering. A registry of land parcels surveyed and allocated exists, but a cadastre-based land information system is still under development.	SS_MOM_01
19/07/23 Juba (Central Equatoria State)	South Sudan Central Equatorial State, Ministry of Lands Housing and Urban Development	Within the Ministry, critical to land acquisition and valuation is the directorate of survey and Directorate of Land administration and Town planning.	The state implements national laws but has a central equatorial state constitution that guides its operation, which is also a domestication of the Southern Sudan Transitional Constitution. To date, there is a lack of coordination and standardized procedures in evaluating the worthy of assets for compensation purposes. The national Land Commission is represented at the state level with an advisory role just as it does with the National Government Ministry of Lands.	SS_MOM_02
21/07/23 Juba (Central Equatoria State)	Juba University, Deputy Dean in The Faculty of Natural Sources And Environment	To date, the State employs professional surveyors to carry out assessment of value of land for the purpose of taxation. The university of Juba trains land professionals in land use course as well as integrated natural resources management.	Possible land related conflict along the proposed transmission corridor have been identified as follows: between Dinka displaced groups, Mundari herders and CES communities around Juba and close to seasonal wet lands; among Bari community in Gondokoro and Lobonok area; in Mangalla and other payams in Juba outskirts on the east side of White Nile. In Torit, trees varieties such as Mahorgany and Kaya are used in traditional medicine and have cultural significance to local communities. The transmission corridor should avoid traversing in those areas.	SS_MOM_03

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
24/07/23 Torit (Easter Equatoria State)	East Equatorial State Administration-Deputy Governor & Hon. State Minister for Housing, Land & Utilities	Within the minister for Housing, land & Utilities, the Directorate of Mapping and Town Planning and Directorate of Survey are the technical arms involved in land acquisition, valuation and compensation.	The process of acquisition of community land by the state involve the following steps: 5. The Minister in charge of lands makes a written request to the community members/ landlords/ occupiers for a meeting to discuss about their land; 6. An agreement is reached between the community and the state; 7. The minister establishes a committee which includes officers from the technical directorates of Mapping & Town planning, survey and user directorate. This committee will be charged with survey and planning of the land for the use. The community representatives supervise the process; 8. After allocation leases are prepared and registered in the judiciary.	SS_MOM_04
25/07/23 Magwi (Easter Equatoria State)	County Commissioner And Executive Director Of Magwi County, Eastern Equatoria State		Concerning the proposed process of land acquisition, the South Sudanese Electric Corporation will write to the Governors who will mark the request to Minister in charge of lands to guide the process/ SSECO will then draw a MOU and submit to Minister who will present it to the to the council of state ministers for approval before drafting the final agreement. Drafting of MOU will take approximately from 3 to 6 months. The process of implementation of acquisition will take approximately 2-3 months to complete.	SS_MOM_05
26/07/23 Juba	South Sudan Land Commission	A body providing support to State and local government and advises on the process of land acquisition and compensation. Has offices at national level and at state level.	Land related dispute are likely to occur in sections where pastoralist communities reside, or where key resources are located. Hot spots to carry out accurate consultations have been identified as follows: Lobonok area due to existing connections between local population and government representatives Mungali area due to possible conflicts involving Madi tribes and returnees who might claim land rights and challenge land acquisition if consultation are not conducted properly.	SS_MOM_06

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
			Gondokoro Island due to possible dispute over farms and small public facilities.	

Table 19-2 – Main findings of the 1st round of environmental consultations.

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
04/10/23, Juba (Central Equatoria State)	South Sudan Ministry of Wildlife Conservation and Tourism (MWCT)	Develop and execute legislation, regulations, policies and strategies for the protection and management of Southern Sudan's wildlife resources and protected areas; Demarcate protected areas and build infrastructure in and around parks and reserves.	Following the explanation of the purpose of the mission and the project, the General Director of the MWCT has provided the permits for the ecological surveys. The Ministry of Wildlife Conservation and Tourism stressed the need to take note of presence of critical wildlife habitats for birds and other wildlife species and elephant crossing areas.	Annex 7 – Site mission report
04/10/23, Juba (Central Equatoria State)	Ministry of Energy and Dams / South Sudan Electricity Corporation	The Ministry of Energy and Dams is in charge of the energy sector. The South Sudan Electricity Corporation (SSEC) is in charge of generation and transmission and the sale of electricity to distributors.	Ministry of Energy / South Sudan Electricity Corporation asked for the environmental perspective of the proposed substations, one of which happen to be closed to the green line option.	Annex 7 – Site mission report
04/10/23, Juba (Central Equatoria State)	Ministry of Environment and Forestry	The Ministry Environment and Forestry is mandated with the Protection and conservation of the environment as well as ensuring sustainable utilization of the environmental resource base to meet the needs of both the present and future generations.	The Ministry of Environment and Forestry emphasized the need for following Environmental Impact Assessment procedures in South Sudan and the submission of the EIA report for the construction of the ETL path in an environmentally sustainable way.	Annex 7 – Site mission report

Date and place	Stakeholder group	Characteristics	Key Issues discussed	Minute of Meeting (Annexes)
07/10/23, Nimule (Eastern Equatoria State)	Nimule National Park	Nimule National Park is located in the extreme south of the country on the border with Uganda.	Description of the project to the Chief Warden of Nimule National Park in order to collect information on the habitats in the area.	Annex 7 – Site mission report

Consultation lead by Dr. Thomas Lado

A meeting was held with the Lolubo communities of Jebelin, Lokiliri Payam, Juba County, Central Equatorial State, to inform them about the ongoing biodiversity data collection along the proposed transmission line. The meeting was led by Dr Thomas Lado and included team members such as Okumu Clement, the driver, and the security team leader. Community participants included the chief, deputy chief, youth representatives and other members. The purpose of the meeting was to inform the community about the biodiversity survey and the proposed transmission line project, and to seek their support for the survey activities. During the discussions, the community provided insights into the security challenges in the forest area and advised the team on how to address these concerns. Despite the security issues, the community expressed their appreciation for being approached and pledged their support for the project, emphasising their desire to be involved in any activities on their land. The team reciprocated the appreciation and assured the community of their cooperation, emphasising the importance of cooperation to the success of the project and the need for continued engagement in the future.

Summary of 2nd round of Consultation

The team conducted Focus Group Discussions with local leaders and the affected community in Aru Boma of Lokiliri Payam (Central Equatoria State) on 08/02/24, and in Pageri Payam, Magwi County of Eastern on 09/02/2024. A socio-economic questionnaire was also used.

During these meetings, the team briefed the local community about the project and more specifically on the following issues:

- Description of the project, indicating the purpose, the scope and benefits to the country and the individual project affected persons
- The land survey activities
- The collection and purpose of socio-economic survey in the project area

Compensation and Valuation of assets within the project area. Local leaders facilitated the organization of these meetings who were translated in local language. The affected communities were given the possibility to raise their concerns and ask for information about land expropriation and compensation process. The results of these meetings allowed to outline socio-economic profiles, local livelihoods of PAPs and to have an overview of risk dynamics of most vulnerable groups. Below is a summary of key issues discussed during the focus groups.

Issue	Remarks
Livelihoods and vulnerable groups	In the project area, local livelihoods are mainly based on crop farming (maily maize, cassava, sweet potato), small scale business, selling fire wood and cutting grass. Youth are engaged in complementary seasonal activities such as riding Boda Boda, making charcoal and hunting animals in the bush. Agricultural production varies greatly depending on seasonal rainfall. beyond ecological variability, patterns of vulnerability may depend on other factors such as tensions with neighboring communities. At this regard, FGDs participants mentioned conflicts with herders who may destroy crops. In Pageri Payam of Juba County, farmers are not keeping cattle because of the risk of looting by neighbors' groups.
Land rights	It is difficult to valuate median increase of land value during the past five years because of customary tenure and informal ownership, land being in most of the cases not demarcated. Nevertheless, in all the visited payams there is a clear difference in value between customary land (used for residential purpose and different economic activities such as agriculture production, charcoal production) and parcels only used as agricultural land. Lokiliri payam, Juba County is mainly inhabited by the Ulubu tribe. Other ethnic groups like Achuli, Lokoya are found in this locality, and are using land for both agricultural and residential purpose. In Pageri payam of Magwi county, Madi tribe is the only represented ethnic group. These communities experienced land expropriation and compensation related to previous projects and construction works. Land allocation to returnees is done through consultation between local community, chiefs, elders, and land lords. According to local informants, returnees have already their own customary land. Concerning conflicting land rights, a dispute between Ulubu tribe and Achuli tribe has been reported in the area called Nyolo.

Issue	Remarks
	Among the visited communities, women are reported to have the right to own the land.
Displacement and returnees	Cases of people displaced from their land by conflict with cattle herders and gradually coming back have been reported. In Lokiliri payam of Juba County, there are members of Lokoya and Achuli tribes coming from Amei Boma and Edemo Boma. In Mageri payam of Magwi county, many returnees coming from Uganda are found. According to FGDs, it is possible to allocate land in advance to anticipate the relocation of future arrivals, even if this can trigger tensions over conflicting land rights. This is the case in Nyangua Boma, Arapi Boma and Amoria Mountain.
Grievances and traditional mechanisms for disputes resolution	Land disputes are usually settled by chiefs' councils, while the State Government is accountable for bordering disputes. Consultations are led by Land Commissioners. Sometimes, religious or church leaders may be involved in land negotiations and dispute resolution. These procedures are reported to be accessible to each and every individual, without any discrimination or bias mentioned during FGDs. In Mageri payam of Magwi county, consultation for land disputes is only customary. There are no examples of cases removed from the chiefs and customary system to reach the formal court system.

During sensitization meetings, the project affected persons (PAPs) raised a number of concerns relating to the project timelines, compensation and assets' valuation. In many cases, they expressed their fears about compensation by the SS Government due to previous experiences. Also, the meaning of cutoff date and procedures to ensure community participation in assets' valuation were matters of concern to the locals. An overview of the key issues raised during the meetings are listed in the following table.

State	County	Payam and boma	Date	Stakeholder group	attendance	Key issues discussed	Minute of M (annexes)
Central Equatoria State	Juba County	Lokiliri Payam, Aru Boma	9/02/24	PAPs and local leaders	---	Many PAPs raised their concern about compensation for perennial crops and trees (such a tree locally know as "Tik") that can be harvested several time and give yields for a long time. The consultant informed that these assets will be compensated at market rates at the time of destruction during field activities. Also, the valuer will consider the category and type of plants and trees during computations of value. Nevertheless, some of the PAPs were not satisfied and further consultations will be organized on this issue. During the meeting, a women considered that PAPs are not compensated equally depending on their status and wealth. Her comments brought the consultant to clarify valuation and compensation measures, and to point out the importance of the socio-economic survey. One of the PAPs was anxious of possible impacts of the transmission line on the ecological system, such as the increase of thunder storms. The consultant reminded that and EIA is being carried out to identify any environmental effects and provide mitigation measures. During FGDs, PAPs were expecting details on compensation rates for different areas such as	SS_MoM_1

State	County	Payam and boma	Date	Stakeholder group	attendance	Key issues discussed	Minute of M (annexes)
						parcels where pylons will be constructed. The consultant clarified the different phases of the consultation and the specific role of land valuer in this process.	
Eastern Equatoria State	Magwi County	Pageri Payam	8/02/24	PAPs and local leaders	27 PAPS	During the discussion, PAPs asked about validation of assets inventory with specific reference to size and ownership status of land. The consultant explained that the verification is done by the project affected person together with local leaders that were involved in the consultation with the survey team. A recurrent question raised by PAPs concerned project's impact on farmers' livelihood, and the possibility to keep on cultivating their land. The meeting allowed to clarify the project timelines and reasons for possible delays. The consultant explained that according to SSEC, the design phase is supposed to be completed by May 2024. PAPs were worried about valuation rates and government's engagement in paying compensation. The consultant explained that the valuation of assets is availed by local communities during participatory meetings and FGDs. Also, the consultant reminded that the project is funded by AfDB, and that the government agreed to adopt the policies of the bank that require compensation	SS_MoM_2

State	County	Payam and boma	Date	Stakeholder group	attendance	Key issues discussed	Minute of M (annexes)
						in order to avail access of the corridor for construction. The provisions of the financier is that compensation should be before construction. This applies mainly due to structures to allow the PAP relocate. Concerning destroyed assets, the consultant explained that these were recorded during inspection. The owner or representative was required to sign in order to indicate that the inspection occurs in his/her presence or representative. The consultant explained that the cut-off date will be communicated to the authorities. The discussion allowed to clarify how this date applies to existing building and structures and other types of assets.	

1st ROUND

1st ROUND OF CONSULTATIONS: MINUTES OF MEETINGS			
Date and place	**Stakeholder group**	**Characteristics**	**MOM**
18/07/23, Juba (Central Equatoria State)	South Sudan national ministry of lands housing and urban development	The Ministry has a role of supervisory, registration and policy making in relation to land acquisition for government projects. It forms the link of National land Commission representation to the Council of Ministers.	SS_MOM_01
19/07/23 Juba (Central Equatoria State)	South Sudan Central Equatorial State, Ministry of Lands Housing and Urban Development	Within the Ministry, critical to land acquisition and valuation is the directorate of survey and Directorate of Land administration and Town planning.	SS_MOM_02
21/07/23 Juba (Central Equatoria State)	Juba University, Deputy Dean in The Faculty of Natural Sources And Environment	To date, the State employs professional surveyors to carry out assessment of value of land for the purpose of taxation. The university of Juba trains land professionals in land use course as well as integrated natural resources management.	SS_MOM_03
24/07/23 Torit (Easter Equatoria State)	East Equatorial State Administration- Deputy Governor & Hon. State Minister for Housing, Land & Utilities	Within the minister for Housing, land & Utilities, the Directorate of Mapping and Town Planning and Directorate of Survey are the technical arms involved in land acquisition, valuation and compensation.	SS_MOM_04
25/07/23 Magwi (Easter Equatoria State)	County Commissioner and Executive Director of Magwi County, Eastern Equatoria State		SS_MOM_05
26/07/23 Juba	South Sudan Land Commission	A body providing support to State and local government and advises on the process of land acquisition and compensation. Has offices at national level and at state level.	SS_MOM_06

SS_MOM_01

DAY 1 REPORT 18 JULY 2023 MEETING WITH SOUTH SUDAN NATIONAL MINISTRY OF LANDS HOUSING AND URBAN DEVELOPMENT-AT THE OFFICE OF THE UNDERSECRETARY

Present:

1. Eng. Louis Kwot Akolith-Undersecretary
2. Eng. Michael Aringo- Director planning and Projects
3. Joel Ombati -Consultant

Discussions were conducted around the organizational structure and the role of the ministry in relation to land acquisition, valuation and compensation

1. ORGANIZATIONAL STRUCTURE-The undersecretary informed the meeting that the ministry has got 8 No. directorates, 7 No. being technical and one is Administration and Finance. The seven technical directorates include: - 1. Housing, 2. Urban Sanitation, 3. Research and Policy, 4. Survey, 5. Urban development, 6. Lands and 7. Projects. He further explained the role of each directorate in brief allowing the consultant to identify critical directorates in the proposed projects as; Lands, Survey and Projects.

2. ROLE OF THE MINISTRY- We found out that the ministry has roles of supervisory, registration and policy making in relation to land acquisition for government projects such as the electricity transmission project.

3. LAND TENURE-There are three land tenure systems in Southern Sudan; Private, Community and Public. All private land is allotted as leases by the national Government or County. Most of the land along the project foot print is community land as opposed to private land. However, even some of the community land is demarcated even though title documents are not issued.

4. RESPONSIBILITY OF ACQUISTION AND COMPENSATION- The responsibility of management of acquisition and compensation lies in the various organizations as follows: -

    a. Negotiation with Communities on Communal land- The state directorate of lands at the state or special administrative unit; Communities are majorly compensated with projects serving the community and in some few instances cash compensation where land is demarcated.
    b. National Land Commission- It is the body that manages the process of land acquisition and compensation in an efficient and effective manner; The commission has offices at national level and at state level. Standard forms of application by the project component are not established.
    c. Supervision and Policy making-The National ministry of Lands, Housing and Urban development is charged with this responsibility in addition to coordination

of land sector for government projects; The ministry also forms the link of National land Commission representation to the Council of Ministers.

5. VALUATION OF LAND AND ASSETS-The valuation is carried out jointly between National and States for compensation purposes. It was however observed that there is only one valuer in the National Government who doubles up as the undersecretary and with a background in engineering.

6. EXPERIENCE IN HANDLING SIMILAR PROJECTS-There is limited experience in handling similar projects in Southern Sudan. The 400KV electricity transmission project is the first to be undertaken by the country. The land acquisition, valuation and compensation in this project will form a basis for future projects.

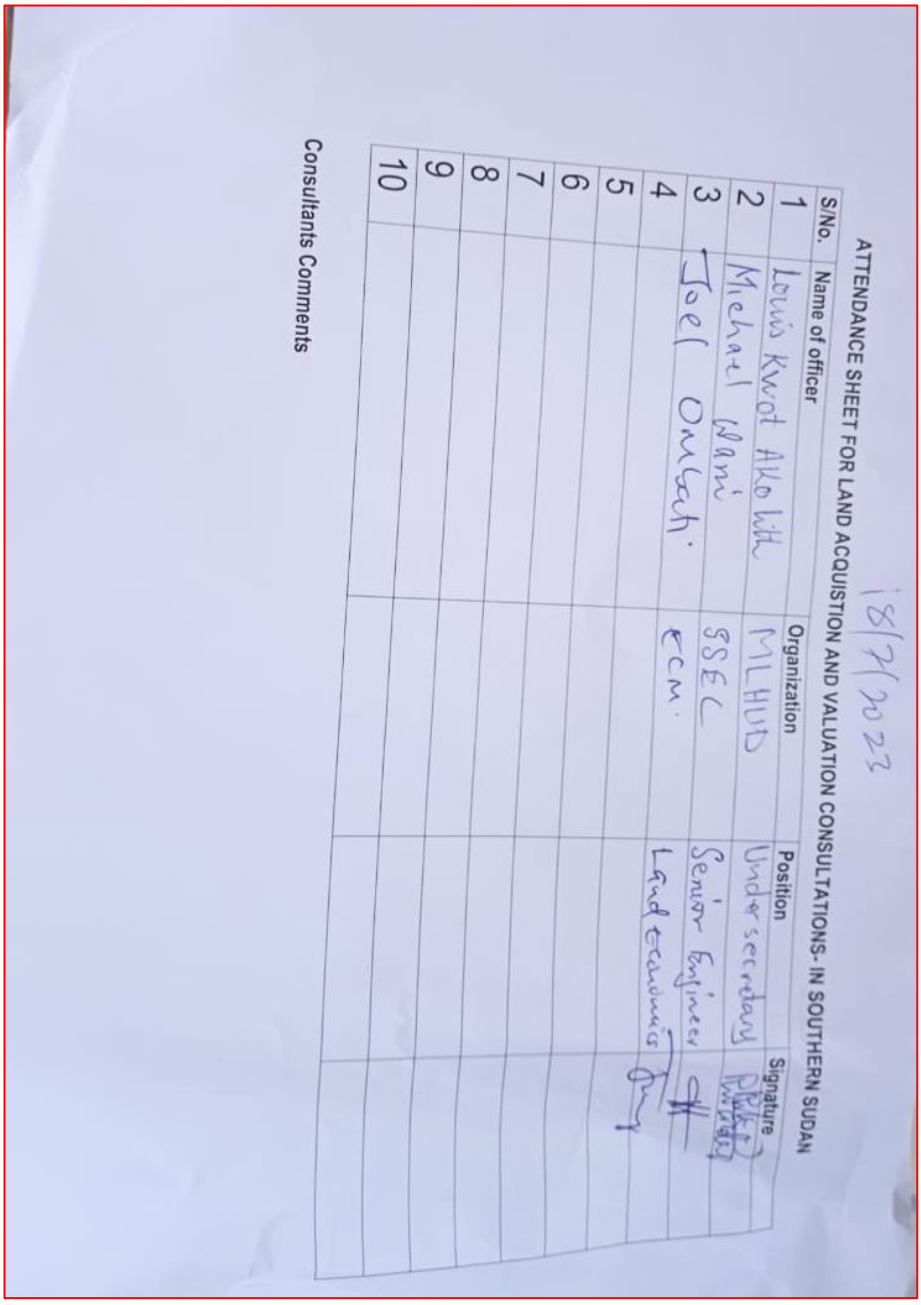
7. HANDLING OF RETURNEES-There is no clear direction as to how to handle returnees but the ministry informed the meeting that each case is treated separately since the displaced Sudaneese who fled the country know where their homes were. In cases where there is conflict the communities handle conflicts of such nature and not government.

8. COMPENSATION MATRIX-The ministry is not aware of any compensation matrix for similar projects.

9. EXISTENCE OF REGISTRY AND CADASTRE- A registry of land parcels surveyed and allocated exists; Previously the registry was operating under judiciary but a decision by a council of ministers transferred the functions to the Ministry of lands, Housing and Urban Development. A cadastre based land information system is under development to allow linkages between survey and registration data.

10. LEGAL AND POLICY DOCUMENTS- Land management is undertaken with a Land Act that is said to be outdated. However, a Land policy is under preparation and is soon being taken for cabinet approval in the next one month; This policy will guide the amendment of the land Act in tandem with current affairs.

11. AOB- The undersecretary will forward both the Southern Sudan Constitution and the land Act to
    the consultant within a day; Also forward a copy of unapproved National land policy within two weeks from today to the consultant.
    -The consultant was requested to advise on the format of the valuation report to the undersecretary as soon as practicable.
    -Agreed to meet Director Lands in the next two days since he is out of the country for official duties; This will help shade some light to the consultant on the role of the directorate in acquisition and compensation.



ATTENDANCE SHEET FOR LAND ACQUISTION AND VALUATION CONSULTATIONS- IN SOUTHERN SUDAN

18/7/2023

S/No.	Name of officer	Organization	Position	Signature
1	Louis Kwot Akolwil	MLHUD	Undersecretary	
2	Michael Wani	SSEC	Senior Engineer	
3	Joel Onkoth.	ECM.	Land economics	
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Consultants Comments

SS_MOM_02

DAY 3 REPORT 19 JULY 2023 MEETING WITH SOUTH SUDAN CENTRAL EQUATORIAL STESL MINISTRY OF LANDS HOUSING AND URBAN DEVELOPMENT-AT THE OFFICE OF THE STATE MINISTER

Present:

4. Hon. Frederick Lako Raymond-Minister
5. Eng. Dominic Pitya Ladu- Director Administration and Finance
6. Michael Wani -Snr. Engineer SSEC
7. Joel Ombati -Consultant

Discussions were conducted around the organizational structure and the program for the next days.

12. ORGANIZATIONAL STRUCTURE-The minister informed the meeting that the ministry has got 6 No. directorates, 5 No. being technical and one is Administration and Finance. The five technical directorates include: - 1. Housing & Construction, 2. Lands administration and town Planning 3. Survey, 4. Rural Water and Sanitation, 5. Public Utilities. Critical to land acquisition and valuation is the directorate of survey and Directorate of Land administration and Town planning.

13. ROLE OF THE STATE- The state is the implementing authority of land laws and policies enacted by the national Government. The state domesticates the national laws passed by parliament at the state level. The state has a central equatorial state constitution that guides its operation which is also a domestication of the Southern Sudan Transitional Constitution. The role of land management is vested in the state including acquisition, valuation and compensation. Southern Sudan land Commission is represented at the state with an advisory role just as it does with the National Government Ministry of Lands. We found out that the ministry has roles of supervisory, registration and policy making in relation to land acquisition for government projects such as the electricity transmission project.

14. LAND TENURE-There are three land tenure systems in Southern Sudan; Private, Community and Public. All private land is allotted as leases by the state Government or County. Most of the land along the project foot print is community land as opposed to private land. However even some of the community land is demarcated even though title documents are not issued.

15. RESPONSIBILITY OF ACQUISTION AND COMPENSATION- The responsibility of management of acquisition and compensation lies in the various organizations as follows: -

a. Negotiation with Communities on Communal land- The state directorate of lands at the state or special administrative unit; Communities are majorly compensated with projects serving the community and in some few instances cash compensation where land is demarcated. It is the responsibility of the state to value, negotiate and compensate for the assets acquired.
b. National Land Commission- It is the body that advises on the process of land acquisition and compensation in an efficient and effective manner; The commission has offices at national level and at state level. Standard forms of application by the project component are not established. This to be confirmed by SSLC when we meet.
c. Supervision and Policy making-The National ministry of Lands, Housing and Urban development is charged with this responsibility in addition to coordination of land sector for government projects; The ministry also forms the link of National land Commission representation to the Council of Ministers.

16. VALUATION OF LAND AND ASSETS-The valuation is carried out by the state for compensation purposes. It was however observed that there are no valuers but the worthy of assets are estimated by the various sector leaders as follows:-
    a. Trees- Department of Forestry;
    b. Crops- Department of agriculture;
    c. Buildings & Structures- Engineers from Housing directorate;
    d. Graves-Estimate of facilitation and support done by the local authorities i.e counties;
    e. Cultural Sites/ Shrines- Are not considered in Southern Sudan;

17. EXPERIENCE IN HANDLING SIMILAR PROJECTS-There is limited experience in handling similar projects in Southern Sudan. The 400KV electricity transmission project is the first to be undertaken by the country. The land acquisition, valuation and compensation in this project will form a basis for future projects. They have been involved in road projects and the state has acquired land for the purpose.

18. HANDLING OF RETURNEES-There is no clear direction as to how to handle returnees but the ministry informed the meeting that each case is treated separately since the displaced Sudaneese who fled the country know where their homes were. In cases where there is conflict the communities handle conflicts of such nature and not government.

19. COMPENSATION MATRIX-The state is not aware of any compensation matrix for similar projects.

20. EXISTENCE OF REGISTRY AND CADASTRE- A registry of land parcels surveyed and allocated exists; Previously the registry was operating under judiciary but a decision by

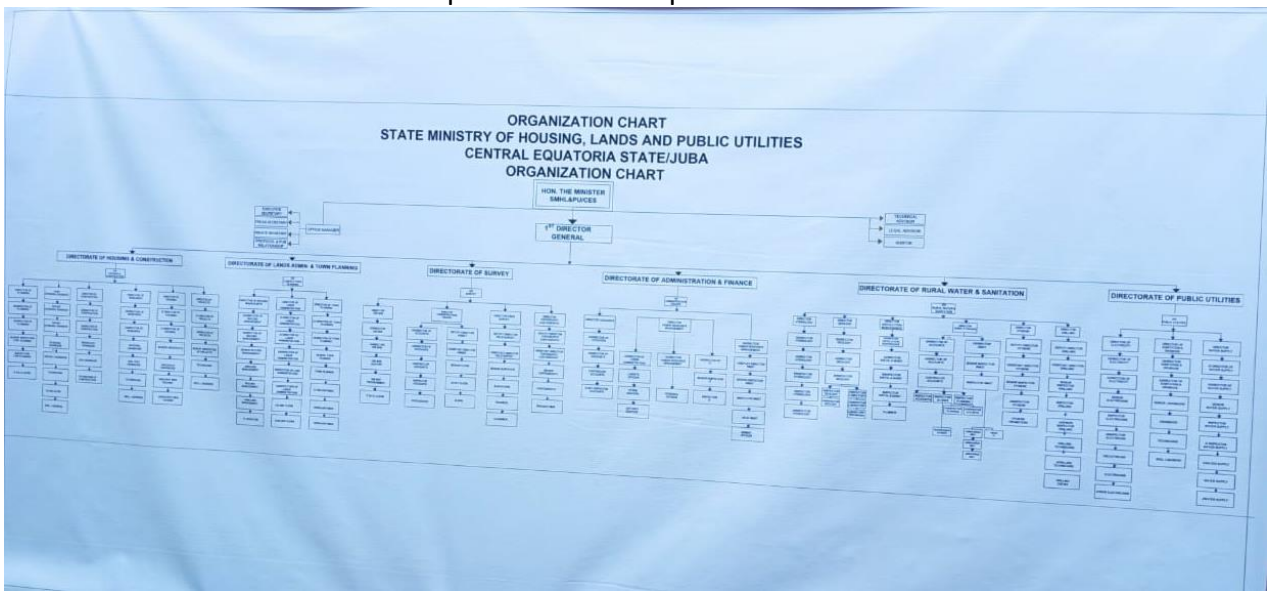
a council of ministers transferred the functions to the Ministry of lands, Housing and Urban Development. A cadastre based land information system is under development to allow linkages between survey and registration data.

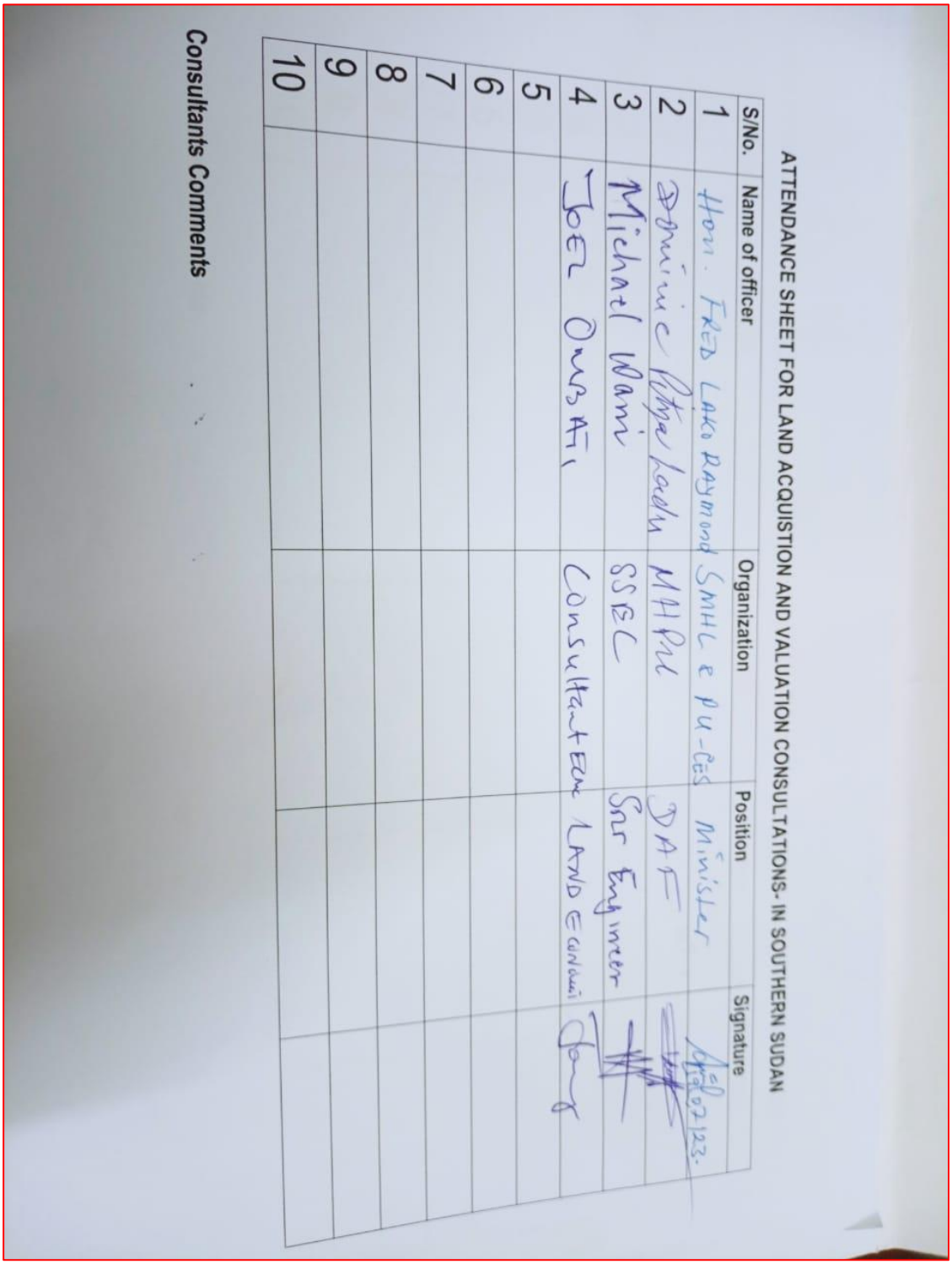
21. LEGAL AND POLICY DOCUMENTS- Land management is undertaken with a Land Act that is said to be outdated. However, a Land policy is under preparation and is soon being taken for cabinet approval in the next one month; This policy will guide the amendment of the land Act in tandem with current affairs. The state is also developing a state land act in line with the existing national law. The state land is also management as per the state constition
22. AOB- The undersecretary will forward both the Southern Sudan Constitution and the land Act to

    the consultant within a day; Also forward a copy of unapproved National land policy within two weeks from today to the consultant.

    -The consultant was requested to advise on the format of the valuation report to the undersecretary as soon as practicable.

    -Agreed to meet Director Lands in the next two days since he is out of the country for official duties; This will help shade some light to the consultant on the role of the directorate in acquisition and compensation.





ATTENDANCE SHEET FOR LAND ACQUISTION AND VALUATION CONSULTATIONS- IN SOUTHERN SUDAN

S/No.	Name of officer	Organization	Position	Signature
1	Hon. Fred Lako Raymond	SMHL & PU-CES	Minister	
2	Dominic Peter Lado	MHPU	DAF	
3	Michael Wani	SSEC	Snr Engineer	
4	Joel Ongati	Consultant ECL	Land Economist	
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Consultants Comments



SS_MOM_03

DAY 5 REPORT 21 JULY 2023 MEETING WITH SOUTH THOMAS LADO-JUBA UNIVERSITY DEPUTY DEAN IN THE FACULTY OF NATURAL SOURCES AND ENVIRONMENT

Present:

8. Thomas Francis Lado-Lecturer/ EIA Consultant
9. Joel Ombati -Land Economist (Consultant)

Discussions were conducted around the natural resources valuation and determinants for compensation:-

23. ORGANIZATIONAL STRUCTURE-The local government structure allows for management of land with the highest authority being the PAYAMAS Executive officer, followed by the chief, assistant chief and clan elders. The chief is elected by locals and is paid remuneration by the local government. In determining a land dispute, the chief consults, the clan elders. Clan elders are allocated various responsibilities such as those in charge of land and water resources

24. VALUATION ROLE OF THE STATE - The state is carries out assessment of value of land for the purposes of taxation. Those who value for the state are mainly professional surveyors employed by the state. The university of Juba trains land professionals in land use course as well as integrated natural resources management.

25. POSSIBLE LAND RELATED DISPUTE-Along the proposed transmission corridor there is likely to be land disputes in the following identified hot spots:-

    a. Dingas community around Juba-These are migrants from the upper Nile state. They are associated with the ruling governor and are perceived as the main perpetrators of land grabbing in Juba;
    b. Mondani-Have their origin in central equatorial state but move a lot with their cattle to various states. In their movement they traverse to the wester of sudan and clash over wet claims;
    c. Bari community is the Gondokoro and Lobonok area.
    d. Land disputes are expected in the East and West of Juba, Mangala area and where there are natural parks. Also likely to be in Namley and Surrounding areas . In these areas people allocated land and deforested the area

26. EXISTENCE OF CULTURALLY SENSITIVE SITES-There exists cultural sites in Torit and mountains that are sensitive areas identified by the communities. The government in most cases ignores cultural sites which have cultural significance to the local communities. Big trees such as Mahorgany and Kaya are significant culturally for the communities. Destruction of the same will be associated with any calamity that befalls the community.

Endengered tree species especially in the Eastern Equatorial state are known by environmentalist. Medicinal trees and trees where birds nest are significant and if possible the transmission corridor should avoid traversing in those areas.

SS_MOM_04

DAY 6 REPORT 24 JULY 2023 MEETING WITH EAST EQUATORIAL STATE ADMNISTRATION-DEPUTY GOVERNOR & HON. STATE MINISTER FOR HOUSING, LAND & UTILITIESS

Present:

10. Mary A. Lodiro-Deputy Governor
11. Hon. Luka Charles-State Minister for Housing, Land & Utilities
12. Joel Ombati -Land Economist (Consultant)

Discussions were conducted around the administration of land including acquisition, valuation and compensation as follows: -

27. ORGANIZATIONAL STRUCTURE-The state of eastern equatorial government structure allows for management of land with the highest authority being the Minister for Housing, Lands and Utilities. The minister as the authority is assisted with the Director General and has five directorates reporting to his office as follows: - Directorate of Administration and Finance, Directorate of Survey, Directorate of Mapping and Town Planning, Directorate of Electricity and Directorate of Water. The Directorate of Mapping and Town Planning and Directorate of Survey are the technical arms involved in land acquisition, valuation and compensation.

28. ROLE OF THE STATE IN ACQUISTION AND COMPENSATION- Most of the land likely to be traversed by the 400KV transmission project comprise of community land. The process of acquisition of community land by the state involve the following steps:-

    a. Minister in charge of lands makes written request to the community members/ landlords/ occupiers for a meeting to discuss about their land;
    b. Meeting held to discuss the request indicating the purpose in which the land is required and an agreement is reached between the community and the state;
    c. The minister establishes a committee which includes officers from the technical directorates of Mapping & Town planning, survey and user directorate. This committee will be charged with survey and planning of the land for the use. The community representatives are important in supervising the process;
    d. Consideration in practice in the state has been an allocation of 60 percent of the parcels to the community for development and 40 percent for Government;
    e. After allocation leases are prepared and registered in the judiciary.

29. PROPOSED PROCESS FOR ACQUISTION OF SSECO

    (i) SSECO should write to the Governor requesting for land for the 400KV transmission line who will mark the request to Minister in charge of lands to guide the process;

(ii) The minister will forward the request to a technical verification team who will review and forward to the economic cluster of the state before giving SSECO a go ahead to proceed in the engagements;

(iii) SSECO will draw a memorandum of understanding (MOU) with the state indicating the description of the project, methodology of implementations, support required from the state, costs associated and financing of the project among other details;

(iv) The minister for lands will present the MOU to the council of state ministers for approval;

(v) After approval the MOU will be subjected to the legal advisors of both the state and the corporation before drafting the final agreement.

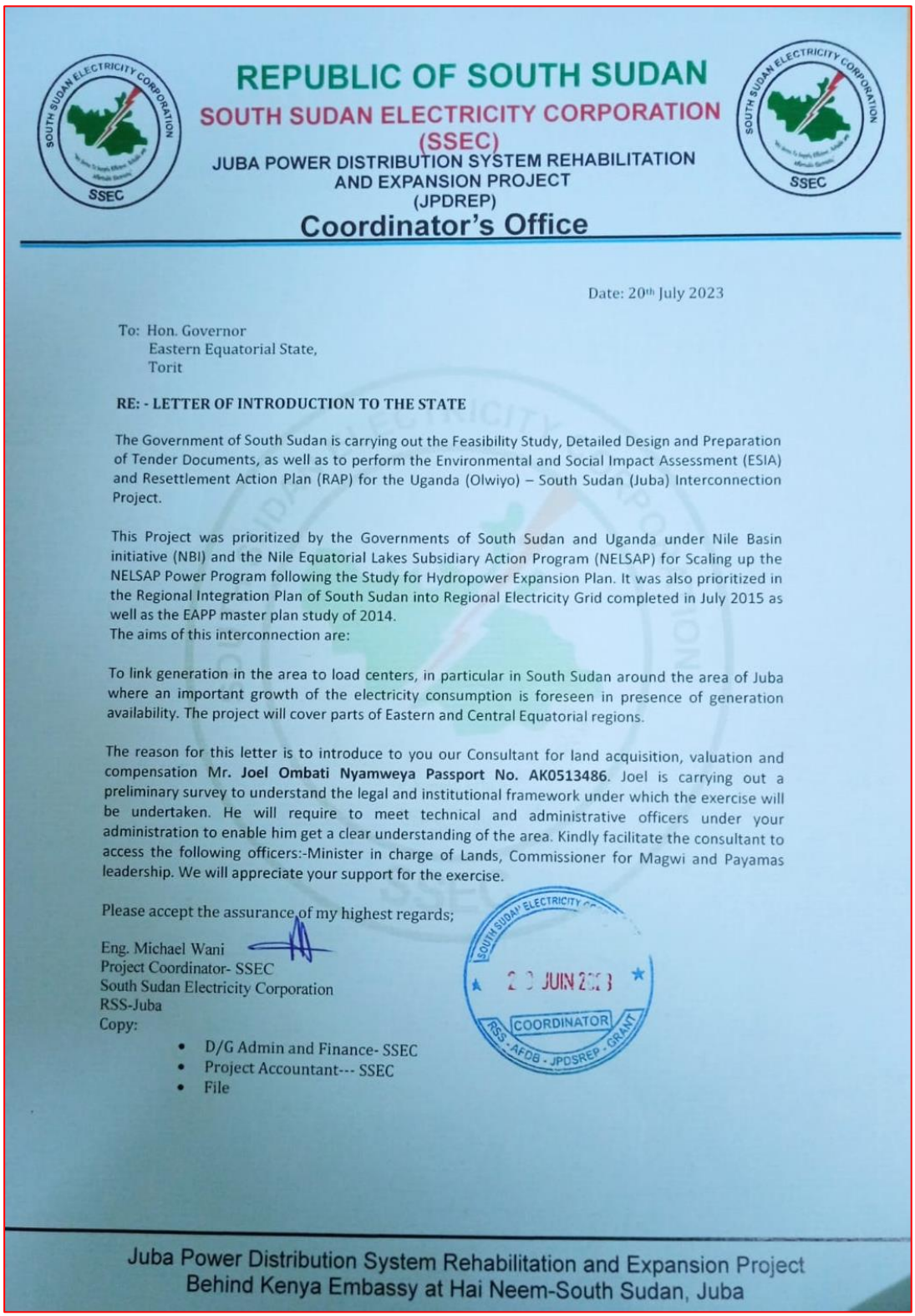
(vi) Implementation of MOU by respective offices involved and in our case the ministry in charge of lands will commence the process of acquisition for the project

NB. THE PROCESS OF ENTERRING INTO AN MOU WILL TAKE APPROXIMATELY 5-6 MONTHS BUT CAN BE ACCELERATED TO TAKE EVEN 3 MONTHS. THE PROCESS OF IMPLEMENTATION OF ACQUISITION WILL TAKE APPROXIMATELY 2-3 MONTHS TO COMPLETE

30. POSSIBLE LAND RELATED DISPUTE-Along the proposed transmission corridor the dispute likely to occur relates to the allotment of the 60 percent plots amongst the community members.

31. EXISTENCE OF CULTURALLY SENSITIVE SITES-There exists cultural sites but in most cases government acquisition overrides the interests of culture. The minister has not come up with projects falling on grave sites and as a state they haven't handled the same.

NB. Relevant National Government Ministries and Agencies should in copy of all communication relating to the acquisition for policy guidance and advise.



REPUBLIC OF SOUTH SUDAN

SOUTH SUDAN ELECTRICITY CORPORATION (SSEC)

JUBA POWER DISTRIBUTION SYSTEM REHABILITATION AND EXPANSION PROJECT (JPDREP)

Coordinator's Office

Date: 20th July 2023

To: Hon. Governor
Eastern Equatorial State,
Torit

RE: - LETTER OF INTRODUCTION TO THE STATE

The Government of South Sudan is carrying out the Feasibility Study, Detailed Design and Preparation of Tender Documents, as well as to perform the Environmental and Social Impact Assessment (ESIA) and Resettlement Action Plan (RAP) for the Uganda (Olwiyo) – South Sudan (Juba) Interconnection Project.

This Project was prioritized by the Governments of South Sudan and Uganda under Nile Basin initiative (NBI) and the Nile Equatorial Lakes Subsidiary Action Program (NELSAP) for Scaling up the NELSAP Power Program following the Study for Hydropower Expansion Plan. It was also prioritized in the Regional Integration Plan of South Sudan into Regional Electricity Grid completed in July 2015 as well as the EAPP master plan study of 2014.
The aims of this interconnection are:

To link generation in the area to load centers, in particular in South Sudan around the area of Juba where an important growth of the electricity consumption is foreseen in presence of generation availability. The project will cover parts of Eastern and Central Equatorial regions.

The reason for this letter is to introduce to you our Consultant for land acquisition, valuation and compensation **Mr. Joel Ombati Nyamweya Passport No. AK0513486**. Joel is carrying out a preliminary survey to understand the legal and institutional framework under which the exercise will be undertaken. He will require to meet technical and administrative officers under your administration to enable him get a clear understanding of the area. Kindly facilitate the consultant to access the following officers:-Minister in charge of Lands, Commissioner for Magwi and Payamas leadership. We will appreciate your support for the exercise.

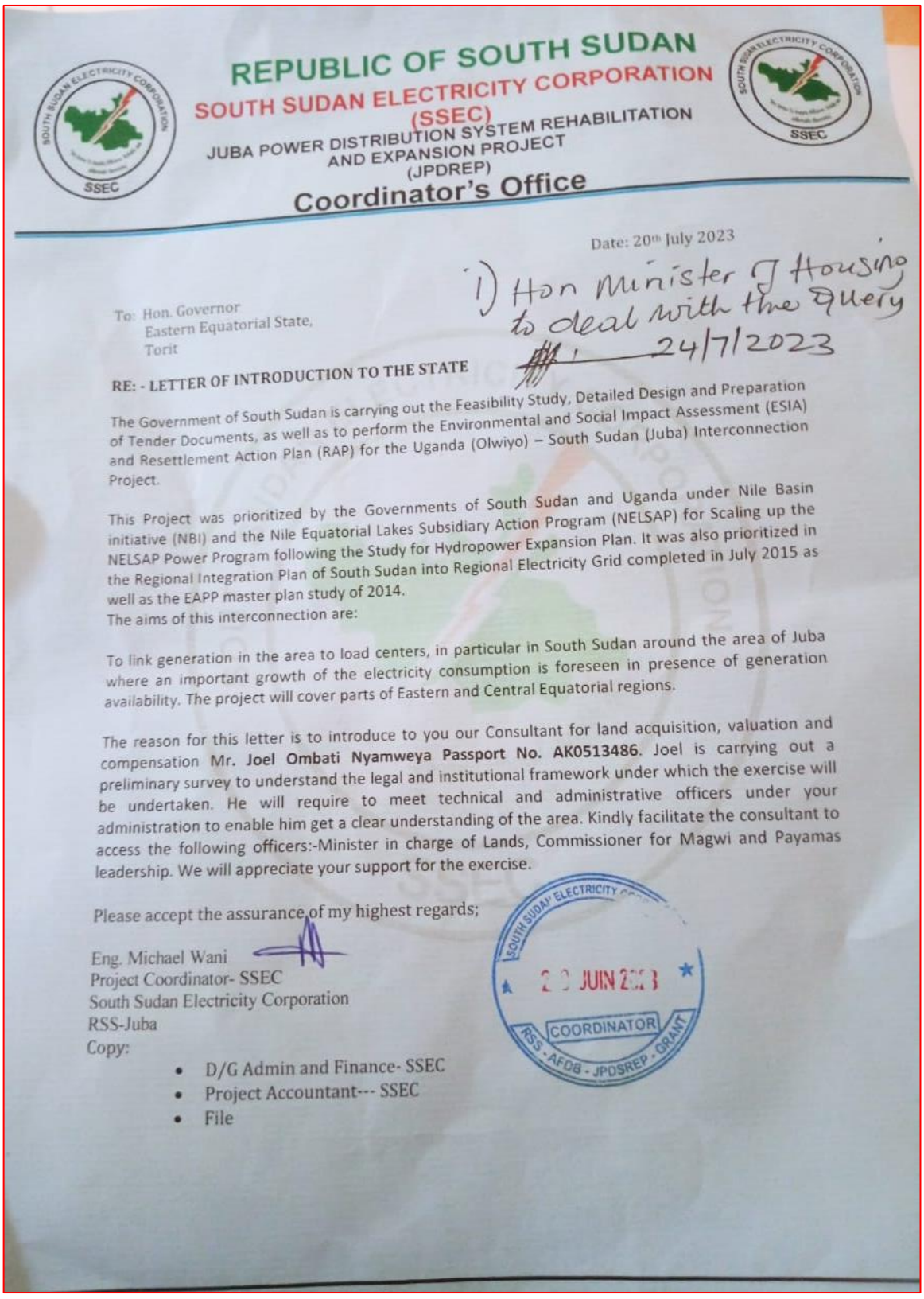
Please accept the assurance of my highest regards;

Eng. Michael Wani
Project Coordinator- SSEC
South Sudan Electricity Corporation
RSS-Juba
Copy:

- D/G Admin and Finance- SSEC
- Project Accountant--- SSEC
- File

SOUTH SUDAN ELECTRICITY CORPORATION
JUIN 2023
COORDINATOR
RSS - AFDB - JPDSREP - GRANT

Juba Power Distribution System Rehabilitation and Expansion Project
Behind Kenya Embassy at Hai Neem-South Sudan, Juba



REPUBLIC OF SOUTH SUDAN
SOUTH SUDAN ELECTRICITY CORPORATION
(SSEC)
JUBA POWER DISTRIBUTION SYSTEM REHABILITATION AND EXPANSION PROJECT
(JPDREP)
Coordinator's Office

Date: 20th July 2023

1) Hon Minister of Housing to deal with the Query 24/7/2023

To: Hon. Governor
Eastern Equatorial State,
Torit

RE: - LETTER OF INTRODUCTION TO THE STATE

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Eng. Michael Wani
Project Coordinator- SSEC
South Sudan Electricity Corporation
RSS-Juba

SOUTH SUDAN ELECTRICITY ... JUIN 2023 COORDINATOR RSS - AFDB - JPDSREP - GRANT

Copy:

- D/G Admin and Finance- SSEC
- Project Accountant--- SSEC
- File



SS_MOM_05

DAY 7 REPORT 25 JULY 2023 MEETING WITH COUNTY COMMISSIONER OF MAGWI AND EXECUTIVE DIRECTOR

Present:

13. Hon. Otto David Renson- County Commissiore, Magwi
14. Mr. Olack David Olympis- Local Government Executive Officer
15. Joel Ombati -Land Economist (Consultant)

Discussions were conducted around the administration of land including acquisition, valuation and compensation as follows: -

32. ORGANIZATIONAL STRUCTURE-The county commission of Magwi is headed by the County Commissioner who is appointed by the Governor of eastern equatorial state. The county is a local government with the administrative and judicial arms. The Commissioner is assisted administratively with the Executive director (who is the Head of Payams & Civil service). In handling disputes the commissioner is assisted by the office of the paramount chief. Below the executive director are 7 technical directorates and one administrative and finance directorate. In the lower hierarchies are Head Chief who supervises the Boma chiefs and subchiefs in the respective order who handle both administrative and judicial duties.
33. two arms of government dmnistrative overnment structure allows for management of land with the highest authority being the Minister for Housing, Lands and Utilities. The minister as the authority is assisted with the Director General and has five directorates reporting to his office as follows: - Directorate of Administration and Finance, Directorate of Survey, Directorate of Mapping and Town Planning, Directorate of Electricity and Directorate of Water. The Directorate of Mapping and Town Planning and Directorate of Survey are the technical arms involved in land acquisition, valuation and compensation.

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    b. Meeting held to discuss the request indicating the purpose in which the land is required and an agreement is reached between the community and the state;
    c. The minister establishes a committee which includes officers from the technical directorates of Mapping & Town planning, survey and user directorate. This committee will be charged with survey and planning of the land for the use. The community representatives are important in supervising the process;

d. Consideration in practice in the state has been an allocation of 60 percent of the parcels to the community for development and 40 percent for Government;
e. After allocation leases are prepared and registered in the judiciary.

35. PROPOSED PROCESS FOR ACQUISTION OF SSECO

(vii) SSECO should write to the Governor requesting for land for the 400KV transmission line who will mark the request to Minister in charge of lands to guide the process;

(viii) The minister will forward the request to a technical verification team who will review and forward to the economic cluster of the state before giving SSECO a go ahead to proceed in the engagements;

(ix) SSECO will draw a memorandum of understanding (MOU) with the state indicating the description of the project, methodology of implementations, support required from the state, costs associated and financing of the project among other details;

(x) The minister for lands will present the MOU to the council of state ministers for approval;

(xi) After approval the MOU will be subjected to the legal advisors of both the state and the corporation before drafting the final agreement.

(xii) Implementation of MOU by respective offices involved and in our case the ministry in charge of lands will commence the process of acquisition for the project

NB. THE PROCESS OF ENTERRING INTO AN MOU WILL TAKE APPROXIMATELY 5-6 MONTHS BUT CAN BE ACCELERATED TO TAKE EVEN 3 MONTHS. THE PROCESS OF IMPLEMENTATION OF ACQUISITION WILL TAKE APPROXIMATELY 2-3 MONTHS TO COMPLETE

36. POSSIBLE LAND RELATED DISPUTE-Along the proposed transmission corridor the dispute likely to occur relates to the allotment of the 60 percent plots amongst the community members.

37. EXISTENCE OF CULTURALLY SENSITIVE SITES-There exists cultural sites but in most cases government acquisition overrides the interests of culture. The minister has not come up with projects falling on grave sites and as a state they haven't handled the same.

NB. Relevant National Government Ministries and Agencies should in copy of all communication relating to the acquisition for policy guidance and advise.

SS_MOM_06

DAY 8 REPORT 26 JULY 2023 MEETING WITH SOUTH SUDAN LAND COMMISSION-AT OLYMPIC COMMITTEE BUILDING IN JUBA

Present:

16. Robert Ladu Luki-Chairperson South Sudan Land Commission
17. Joel Ombati -Land Economist (Consultant)

Discussions were conducted around the administration of land including acquisition, valuation and compensation as follows: -

38. ORGANIZATIONAL STRUCTURE-The South Sudan Land Commission has got 5 No. commissioners who form the commission and a Chief Executive Officer to deal with staff matters. The Commission is headed by a chairperson who is appointed by the president, there is a deputy and three other commissioners in charge of Finance and Administration, Coordination and Staff affairs. The CEO is the head of the secretariat and reporting to the CEO are various directorates as follows: -Finance and Administration, Policy and Research, Land & Survey, Human Resources, Coordination.
39. MANDATE OF THE COMMISSION-The commission is charged with the following responsibilities: -
    a. Advising of all levels of Government on matters relating to land;
    b. Arbitrate land conflicts at the option of contending parties;
    c. Recommend land reforms in relation with laws and policies;
    d. Carry research related to land;
    e. Any other duty assigned by any level of government.

40. PROPOSED PROCESS FOR ACQUISTION OF SSECO

    Most of the land likely to be traversed by the 400KV transmission project comprise of community land. The process of acquisition of community land by is the responsibility of the state and local government. The commission can only come in if they have been invited to advise.

    SSECO are free as a government body to seek advise on the acquisition of land for the electricity transmission project and are not bound by the advise of the land commission.

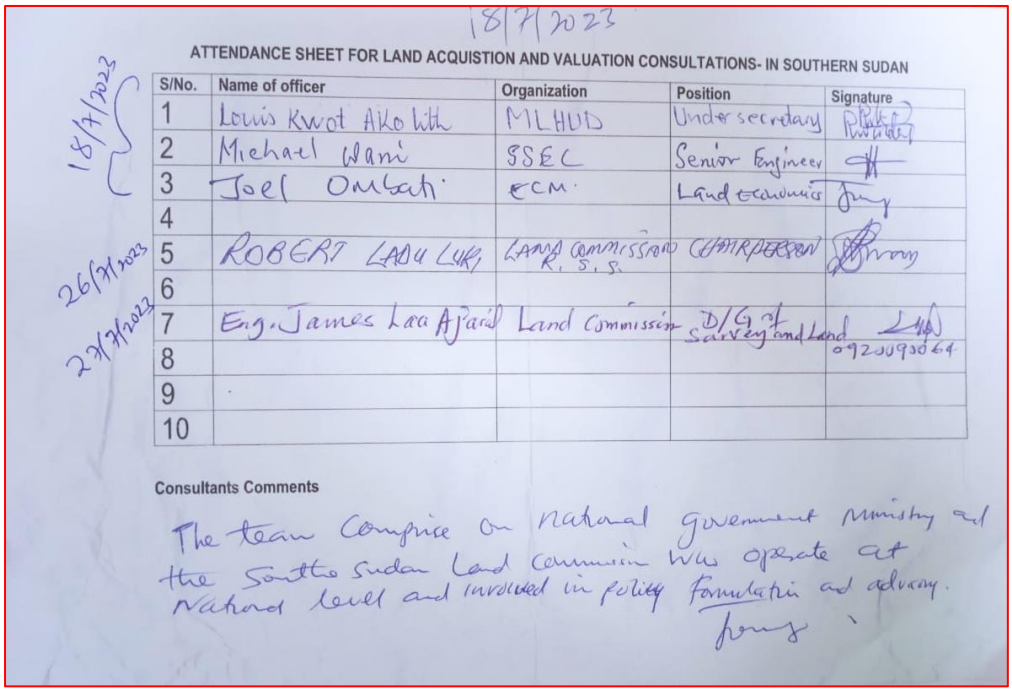
41. VALUATION AND COMPENSATION- The commission observed that there is no objective way of ascertaining the value of lost assets. This has not been necessary in South Sudan since no major land acquisition projects have been done in the past.

42. POSSIBLE LAND RELATED DISPUTE-Along the proposed transmission corridor the dispute likely in sections where pastoralist communities reside and less disputes for agrarian communities. Lobonok area is identified as hot spot if consultations are not carried out widely due to their relationship with the vice-president in charge of economic cluster. Mungali area could experience conflict with madi tribe who have well educated people and ran away from the area during clashes. Some of them are yet to come back. In this

area we expect returnees who may challenge the acquisition if not well conducted. Gondokoro Island is also a spot where dispute is expected over farms and small public facilities.

43. EXISTENCE OF CULTURALLY SENSITIVE SITES-There exists cultural sites which cannot be ignored. The landlords are able to identify these sensitive areas and this is well pronounced to the North of Juba

Appendices



18/7/2023

ATTENDANCE SHEET FOR LAND ACQUISTION AND VALUATION CONSULTATIONS- IN SOUTHERN SUDAN

S/No.	Name of officer	Organization	Position	Signature
1	Louis Kwot Akolith	MLHUD	Under secretary	
2	Michael Wani	SSEC	Senior Engineer	
3	Joel Ombati	ECM	Land Economist	
4				
5	ROBERT LADU LUKI	LAND COMMISSION R.S.S.	CHAIRPERSON	
6				
7	Eng. James Laa Ajarid	Land Commission	D/G of Survey and Land	0922099064
8				
9				
10				

18/7/2023
26/7/2023
23/7/2023

Consultants Comments

The team Comprise on National government Ministry and the South Sudan Land Commission who operate at National level and involved in policy formulation and advisory.

2ND ROUND

SS_MoM_1

REPORT ON SENSITIZATION MEETING AT ARU JUCNTION -CENTRAL EQUATORIAL STATE CONDUCTED ON THE 9TH OF FEBRUARY 2024

1. **Present**

- Attached list of Attendance

2. **Introduction**

- The Ministry of Energy and Dams engineer introduced the survey and sensitization team, while the Executive chief of the Aru Boma introduced the local community leadership and project affected persons.
- The Land economist Introduced the project as follows: -
    - That the countries within the Nile Basin Initiative and Eastern Africa Power Pool (EAPP) are building their interconnected electricity networks.
    - That the project "Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection" is an important additional asset to facilitate regional integration of electricity networks and facilitate power trade.
    - That the proposed transmission line includes a first section in South Sudan from Juba to Nimule/Elegu (at the Uganda/South Sudan Border) which is estimated to cover a distance of 160 km, and a second section in Uganda from Nimule/Elegu (close to Bibia) and Olwiyo, with an estimated length of 150 km.
    - That the ultimate goal of the project is regional integration by improving the livelihood of the people as well as the quality of the socioeconomic development environment for South Sudan and Uganda through increased availability and affordability of electricity supply.
    - That the purpose of the Project is to improve access to electricity in South Sudan and Northern Uganda through increased cross-border sharing of power. Outputs of the preparatory activities would enable the NELSAP, the South Sudanese and the Ugandan involved stakeholders to take the necessary steps to have the transmission line constructed.
    - That the required scope of work in the South Sudan section is summarized as below:
        - 400 kV, 170 km Uganda Border (Nimule) - Juba (Gumbo) Power Transmission Line with optical fibre
        - Construction of the new Gumbo substation 400/132/33kV in Juba

3. **Land survey**

The Surveyor informed the attendants how the land survey team conducted the exercise as follows:

- That the team using coordinates provided by the design team that determined the route and corridor of the project inspected the route.

- That a team of surveyors who inspected used the GPS RTK equipment to set control points and identify the angle points (AP) and using the coordinates from the design team the team inspected the areas affected by the proposed electricity transmission line.
- That local persons who have good knowledge about the area accompanied the survey team to identify owners of assets within the 60 M electricity transmission corridor as proposed by the design team.
- That farms, houses and other assets were picked within the corridor and will be plotted to enable the land economist compute valuation for compensation purposes.

4. Social Survey

The social surveyor

- The social Surveyor explained to the attendants how the form is filled and the information needed including PAPs signature.
- The attendants were informed that a socioeconomic survey report was necessary to establish the social set up and need for affected communities.
- The social survey questionnaire will be answered individually by the affected person or his/her representative and should be factual as much as possible
- Another survey will be conducted by social groups (FGD) to establish the specific needs and basic information for the groups identified

5. Compensation

The land economist informed the attendants as follows: -

- That compensation is one of the mitigation measures against project affected parties to cushion them against the negative impacts which must come with all projects of this nature
- That compensation is an insurance like support to allow a larger community benefit by the project that impacts negatively to your assets
- That compensation will be looked at in three way:
    - Asset replacement,
    - Monetary
    - Both Monetary & Asset replacement
- That compensation or facilitation as others call it is done by project proponent and in our case, it is the South Sudan Electricity Corporation
- That all public bodies who carry out projects must get an objective way of assessing the likely losses and appropriate methods of compensation.

6. Valuation

The land economist informed the attendants that: -

- Valuation is an objective way of assessing the worthy of an asset that is for exchange among two interested parties.
- The Valuer must not have interest in the transaction but if he or she has must declare it in advance and qualify his report
- The valuer is trained and qualified to assess the worthy of the assets based on the available information both local and international

a. Valuation is not a science but an art of finding the attitudes of people in relation to their highest benefit for assets such as; Land, Buildings, Trees, Crops and Grazing Grounds and Water points

- That under the Transitional Constitution of the Republic of South Sudan 2011, the people of South Sudan own all the country's land and its usage is regulated by the government in accordance with the Constitution and Law. The applicable laws in this case are: the Constitution of South Sudan 2011, the Land Act of 2009 and the Local Government Act of 2009. The Land Act was formulated during the Interim Constitution of Southern Sudan, before the enactment of the Transitional Constitution.
- That RAP shall be implemented also in conformity with African Development Bank Operational Policy OS2 which provides among other things that: -
    - *Affected people are compensated for all their losses at full replacement costs before their actual move; before land and related assets are taken; and, if the project is implemented in phases, before project activities begin for each particular phase*
    - *The borrower or client gives preference to land-based resettlement strategies and as a matter of priority offers land-to-land compensation and/ or compensation-in-kind in lieu of cash compensation where feasible; further, the borrower or client clearly explains to affected people that cash compensation very often leads to rapid impoverishment.*
    - *Particular attention is given to ensuring that the interests of both women and men and of the elderly and the handicapped are taken into account when formulating and implementing compensation packages, resettlement assistance measures and livelihood improvement measures.*

7. Compensation Eligibility

The land Economist informed the attendants that: -

- PAP eligibility criteria used for purposes of the RAP are meant to respect both national legislation and AfDBOS2 requirements. Any household meeting one or many of the following criteria will be eligible:
    - having land within the project wayleave and/or RoW
    - having developments / structures on the land within the project wayleave and/or RoW
    - having annual crops or trees within the project wayleave and/or RoW
    - having crops that are accidentally damaged during the valuation and survey exercises,
    - being affected during the fine tuning of the RoW and construction phase

8. PAP and Local Community Concerns

Name of Person	Concern	Response	Remarks
Tom John	How do you compensate perennial crops and trees that give yields for a long time	All plants will be compensated at market rates but as at the time of destruction during field activities. The valuer will consider the category and type during computations of value.	Unsatisfied- Need further consultations
Thomas	What happens for 60M corridor of land taken and how are we going to be compensated	The land is not taken except where the pylons will be constructed. The wayleave only provides a restricted user of the land to only plannting crops and not tall trees more than 3M high and construction of structures. The government only compensates the restriction.	Not Satisfied but allowed for further consultations
Severio	How do you compensate trees values like Tik which can be harvested several times	The trees will be compensated at market rate considering its production potential	Satisfied
Augustine	Why are we not compensated equally	The role of government is equity whoch does not mean equal but just and fair compensation	Satisfied
Amin Alfred	Is the 60 M corridor land taken forever Why are you not clearing the whole bush	The 60M corridor is still your land but only restricted to carry out activities that will not impact negatively on the electricity transmission	Satisfied

Name of Person	Concern	Response	Remarks
		The whole bush cannot be cleared at the same time due to environmental issues and the nature of construction which is done in stages	
Yusuf	Are the transmission lines not likely to cause increase Thunder storms	The line has no effect on Thunder but an EIA is being carried out to identify any environmental effects and provide mitigation measures.	Satisfied
Onyango	How much are we going to be compensated and more especially on pylon areas	The computation for compensation has not been done and will be done by a qualified valuer who will add 15% disturbance allowance on the market value	Satisfied

Prepared by Field Team:

1. Eng. Ruai Mabil- Land Surveyor and team leader
2. Vlr. Joel Ombati- Land Economist
3. Mr. Edward Forensio- Social Surveyor

SS_MoM_2

REPORT ON SENSITIZATION MEETING AT PAGERI-EASTERN EQUATORIAL STATE CONDUCTED ON THE 8TH OF FEBRUARY 2024

1. **Present**

- Attached list of Attendance

2. **Introduction**

- The MED and Dams engineer introduced the survey and sensitization team and while the Executive chief introduced the local community leadership and project affected persons.
- The Land economist Introduced the project as follows: -
    - That the countries within the Nile Basin Initiative and Eastern Africa Power Pool (EAPP) are building their interconnected electricity networks.
    - That the project "Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection" is an important additional asset to facilitate regional integration of electricity networks and facilitate power trade.
    - That the proposed transmission line includes a first section in South Sudan from Juba to Nimule/Elegu (at the Uganda/South Sudan Border) which is estimated to cover a distance of 160 km, and a second section in Uganda from Nimule/Elegu (close to Bibia) and Olwiyo, with an estimated length of 150 km.
    - That the ultimate goal of the project is regional integration by improving the livelihood of the people as well as the quality of the socioeconomic development environment for South Sudan and Uganda through increased availability and affordability of electricity supply.
    - That the purpose of the Project is to improve access to electricity in South Sudan and Northern Uganda through increased cross-border sharing of power. Outputs of the preparatory activities would enable the NELSAP, the South Sudanese and the Ugandan involved stakeholders to take the necessary steps to have the transmission line constructed.
    - That the required scope of work in the South Sudan section is summarized as below:
        - 400 kV, 170 km Uganda Border (Nimule) - Juba (Gumbo) Power Transmission Line with optical fiber
        - Construction of the new Gumbo substation 400/132/33kV in Juba

3. **Land survey**

The Surveyor informed the attendants how the land survey team conducted the exercise as follows:

- That the team using coordinates provided by the design team that determined the route and corridor of the project inspected the route.
- That a team of surveyors who inspected used the RTK equipment to set control points and identify the angle points (AP) and using the coordinates from the design team the team inspected the areas affected by the proposed electricity transmission line.
- That local persons who have good knowledge about the area accompanied the survey team to identify owners of assets within the 60 M electricity transmission corridor as proposed by the design team.

- That farms, houses and other assets were picked within the corridor and will be plotted to enable the land economist compute valuation for compensation purposes.

4. Social Survey

The social surveyor

- The attendants were informed that a socioeconomic survey report was necessary to establish the social set up and need for affected communities.
- The social survey questionnaire will be answered individually by the affected person or his/her representative and should be factual as much as possible
- Another survey will be conducted by social groups (FGD) to establish the specific needs and basic information for the groups identified

5. Compensation

The land economist informed the attendants as follows: -

- That compensation is one of the mitigation measures against project affected parties to cushion them against the negative impacts which must come with all projects of this nature
- That compensation is an insurance like support to allow a larger community benefit by the project that impacts negatively to your assets
- That compensation will be looked at in three way:
    - Asset replacement,
    - Monetary
    - Both Monetary & Asset replacement
- That compensation or facilitation as others call it is done by project proponent and in our case it is the South Sudan Electricity Corporation
- That all public bodies who carry out projects must get an objective way of assessing the likely losses and appropriate methods of compensation.

6. Valuation

The land economist informed the attendants that: -

- Valuation is an objective way of assessing the worthy of an asset that is for exchange among two interested parties.
- The Valuer must not have interest in the transaction but if he or she has must declare it in advance and qualify his report
- The valuer is trained and qualified to assess the worthy of the assets based on the available information both local and international
    b. Valuation is not a science but an art of finding the attitudes of people in relation to their highest benefit for assets such as; Land, Buildings, Trees, Crops and Grazing Grounds and Water points
- That under the Transitional Constitution of the Republic of South Sudan 2011, the people of South Sudan own all the country's land and its usage is regulated by the government in accordance with the Constitution and Law. The applicable laws in this case are: the Constitution of South Sudan 2011, the Land Act of 2009 and the Local Government Act of 2009. The Land Act was formulated during the Interim Constitution of Southern Sudan, before the enactment of the Transitional Constitution.
- That RAP shall be implemented also in conformity with African Development Bank Operational Policy OS2 which provides among other things that:

- *Affected people are compensated for all their losses at full replacement costs before their actual move; before land and related assets are taken; and, if the project is implemented in phases, before project activities begin for each particular phase*
- *The borrower or client gives preference to land-based resettlement strategies and as a matter of priority offers land-to-land compensation and/ or compensation-in-kind in lieu of cash compensation where feasible; further, the borrower or client clearly explains to affected people that cash compensation very often leads to rapid impoverishment.*
- *Particular attention is given to ensuring that the interests of both women and men and of the elderly and the handicapped are taken into account when formulating and implementing compensation packages, resettlement assistance measures and livelihood improvement measures.*

7. Compensation Eligibility

The land Economist informed the attendants that: -

- PAP eligibility criteria used for purposes of the RAP are meant to respect both national legislation and AfDBOS2 requirements. Any household meeting one or many of the following criteria will be eligible:
  - having land within the project wayleave and/or RoW
  - having developments / structures on the land within the project wayleave and/or RoW
  - having annual crops or trees within the project wayleave and/or RoW
  - having crops that are accidentally damaged during the valuation and survey exercises,
  - being affected during the fine tuning of the RoW and construction phase

8. PAP and Local Community Concerns

Name of Person	Concern	Response	Remarks
Madi	How do you compensate planted trees within the corridor	Trees will be compensated at market rates but as at the time of destruction during field activities. They will be paid once the engineer identifies as going to be destroyed to allow construction.	Unstasfied- Need further consultations
Felix	Who verified the size and ownership of assets	The verification was done by the project affected person as well as the local	Satisfied

Name of Person	Concern	Response	Remarks
		leaders who walked with the survey team	
Tabal Mark	What are the project timelines	The project timelines are unclear but according SSEC all the design is supposed to be completed by May 2024	Satisfied
Benson Hillary	How have the local people participated in coming up with values	Some information on valuation of assets is availed by locals and also during participatory meetings such as this.	Satisfied
Moja James	Can you assure us that we will be compensated by Government this time round	The project is funded by AfDB and the government has agreed to adopt the policies of the bank that requires compensation in order to avail access of the corridor for construction	Satisfied
Agnes Polikare	How were destroyed assets registered and why do we sign	Destroyed assets are recorded during inspection and the owner or representative signs to indicate that the inspection occurs in his/her presence or representative	Satisfied
Kugamba Bosco	Can we have compensation before construction	The provisions of the financier is that compensation should be before construction. This applies mainly due to structures to allow the PAP relocate	Satisfied
David Wani	Is central government forcing the project on local leaders? How will the affected part be treated?	Central government will provide policy direction and local governments are	Satisfied

Name of Person	Concern	Response	Remarks
		mainly implementors of government policy	
Tombe	For how long do we continue cultivating	The affected persons are allowed to continue cultivating until such a time when the corporation will communicate	Satisfied
Eng. Adrapkwo George	How do we treat the owner of land	The local authorities will be required to agree whether they replace the lost land with additional land to the pap or offer cash compensation for the loss	Satisfied but allowed for further consultation with authorities
Samuel	What is the cutoff date	Cut off date will be communicated to the authorities and it is going to be sooner for buildings and structures within the electricity corridor	Satisfied

Prepared by Field Team:

4. Eng. Ruai Mabil- Land Surveyor and team leader
5. Vlr. Joel Ombati- Land Economist
6. Mr. Edward Forensio- Social Surveyor

Report about FGD at Aru Boma, Lokiliri Payam, Juba County of Central Equatoria State

On date 09/02/2024, the team was conduct the Focus Group Discussion with the community of Aru Boma of Lokiliri Payam.
The team was brief them about the project and they were appreciated the project.
Below is the Questions and answers of the FGD:-

- **Livelihoods and Vulnerable groups:-**

1. What are the main economic activities practiced in this area?
    - *The main economic are Farming crops, selling small Shops, making Charcoal and cutting Bamboos.*
2. What are the seasonal variations? Discuss with the whole group.
    - *The seasonal variation is differed depend on rain and sometimes the herders destroyed our crops.*
3. What is the important of livestock and cattle mobility for your community?
    - *Our community are not keeping cattle because our neighbors are disturbs us by looting them.*
4. What are the economic activities women are mostly involved in?
    - *Farming crops, small scale business, selling fire wood and cutting grass.*
5. What are the economic activities women are excluded from?
    - *The women in this area can do any activities.*
6. Can a woman own land independently of her husband or any male relative?
    - *In our community woman have a right to own the land.*
7. What is the economic activities youth is mostly involved in?
    - *The activities of youth are Boda Boda Rider, farming seasonal crops, making charcoal and hunting animals in the bush.*
8. Are there other differences in economic activities and productive specializations (for example between different ethnic groups, or historical residents and new comers) you would like to point out?
    - *No, here the people are equal*.

- **Land Right:-**

9. What is the median increase of Land value during the past five (05) years? Discuss with the whole group.

- *No selling land because our area is not demarcated.*

10. What are the types of land ownership practiced in this area? Consider differences in ownership depending on land uses (Residential, agricultural land, grazing land and other uses).
    - *The types of our land are Customary Land and Agricultural Land.*
11. What are the most represented ethnic group in this area?
    - *Ulubu tribe is the owner of this area.*
12. Do different ethnic groups share the same arrangements regulating land ownership?
    - *Yes, in our area we have some ethnic groups like Achuli, Lokoya with us and they gave them land for agriculture and resident.*
13. What is the evidence used to prove land ownership in case formal land titles are not available?
    - *It is our Customary Land, ancestral land and inheriting.*
14. In case of Land expropriation, were you consulted and compensated?
    - *Yes, they were consultation and compensation happen when some company came and broke our hill.*
15. How compensation measures vary according to the land use (i.e. hunting ground, grazing land, agricultural land and other uses?
    - *No, the commercial land is high varies.*

❖ **Displacement and returnees**:-

16. Are there internally displaced persons (IDPs, returnees) residing in this Payam?
    - *Yes, we have people from Edemo Boma, Achuli tribe from Amei Boma and Lokoya tribe.*
17. Did this area experience new displacements or arrivals/returnees during the five (05) years? Please provide details.
    - *Yes, people displaced from their land by cattle herders and they coming back gradually.*
18. Is it possible to allocate land in advance to anticipate the relocation of future arrivals? Please provide example.
    - *They have already own customary land.*

19. How resettlement areas are identified and allocated?

    - *The people who affected can relocated to another place through consultation between local community, chiefs, elders, and land lord to allocate the land.*

20. Are there land parcels with conflicting rights between different users or groups? What are the areas where these tensions are most common?

    - *Yes, for example the area called **Nyolo**, there was dispute between Ulubu tribe and Achuli tribe.*

❖ **<u>Grievances and traditional mechanisms for land disputes resolution:</u>**-

21. In case of land issue or conflicting land claims, what are the accountable body or institution to settle the disputes?

    - *The accountable body is Chiefs councils are to solve internal dispute and the bordering dispute is the State Government is the one solves it.*

22. How does the customary consultation process actually work in this area?

    - *The customary consultation is start from Commissioners down to Chiefs Councils.*

23. Is it possible to remove cases from the chiefs and customary system to reach the formal court system (the county land authority or county court)? Please provide example.

    - *Yes, they remove from chief to paramount chief to the county court but has never happened here in our area. .*

24. Alongside local leaders or traditional chiefs, are there other actors who can be involved in land negotiations and disputes resolution?

    - *Sometime, they involve religious or church leaders.*

25. Is it possible for each and every member of this community to claim their land rights through customary authorities, or are restrictions in accessing these mechanisms for dispute resolution?

    - *Yes, is possible.*

Here are the pictures of the Aru Boma of Lokiliri Payam People who are attend the FGD on date 09/02/2024.











Report about FGD of the FGD at Pageri Payam, Magwi County of Eastern

Equatoria State

On date 08/02/2024, the team conducted a sensitization and participation meeting with local leaders and with the affected community of Aru Boma of Lokiliri Payam. The meeting was attended by 28 people as shown in the attached attendance sheet.

The team briefed the local community about the project and more specifically dwelt on the following: -

1. Description of the project -Indicating the purpose, the scope and benefits to the country and the individual project affected persons
2. The land survey activities undertaken and would be undertaken prior and after project implementation
3. The collection and purpose of socio-economic survey being undertaken in the project area;
4. Compensation and Valuation of assets affected within the project area

The project affected persons (paps) raised a number of concerns relating to the project timelines, compensation and valuation that will ensures equity and fears about compensation by the SS Government due to previous experiences. Also, the concern on cutoff date and contnituos public participation during the project timelines was a matter of concern to the locals.

Focused Group Discussions

The field team then held three Focussed group discussions teams including Women, Youth and elders.

Below are the responses from the interview questions from the teams: -

- **Livelihoods and Vulnerable groups: -**

26. What are the main economic activities practiced in this area?
    - *The main economic activities in this area are farming of food crops, selling grass, cutting fire wood, making charcoal.*
27. What are the seasonal variations? Discuss with the whole group.
    - *The seasonal variation is differed depend on rain, sometime the rain is not enough which resulting the production is to be low.*
28. What is the important of livestock and cattle mobility for your community?
    - *Our community are farmers therefore cattle are not important to us as a community of Pageri.*
29. What are the economic activities women are mostly involved in?
    - *Farming crops such as Maize, Cassava, selling grass and fire wood.*
30. What are the economic activities women are excluded from?
    - *The women in this area can do any activities if they have capacity.*

31. Can a woman own land independently of her husband or any male relative?

    - *In our community woman have a right to own the land.*

32. What is the economic activities youth is mostly involved in?

    - *The activities of youth are farming seasonal crops such as Maize, cassava, sweet potato, making charcoal, construction, selling clothes, selling food items in small shops and making burn bricks.*

33. Are there other differences in economic activities and productive specializations (for example between different ethnic groups, or historical residents and new comers) you would like to point out?

    - *No, in our area here the people are equal no differences among us and another ethnics group.*

❖ **Land Rights:**

34. What is the median increase of Land value during the past five (05) years? Discuss with the whole group.

    - *The land is customary no selling except some few areas which are renting by network companies.*

35. What are the types of land ownership practiced in this area? Consider differences in ownership depending on land uses (Residential, agricultural land, grazing land and other uses).

    - *The types of our land are Customary Land and Agricultural Land.*

36. What are the most represented ethnic group in this area?

    - *Madi tribe is the only one represented ethnic group.*

37. Do different ethnic groups share the same arrangements regulating land ownership?

    - *Not applicable in this area.*

38. What is the evidence used to prove land ownership in case formal land titles are not available?

    - *That Land is our Customary Land, ancestral land and no documents.*

39. In case of Land expropriation, were you consulted and compensated?

    - *There were some companies like road construction company came and work without any consultation and compensation in our area.*

40. How compensation measures vary according to the land use (i.e. hunting ground, grazing land, agricultural land and other uses?

    - *No applicable here in our area.*

❖ **Displacement and returnees**: -

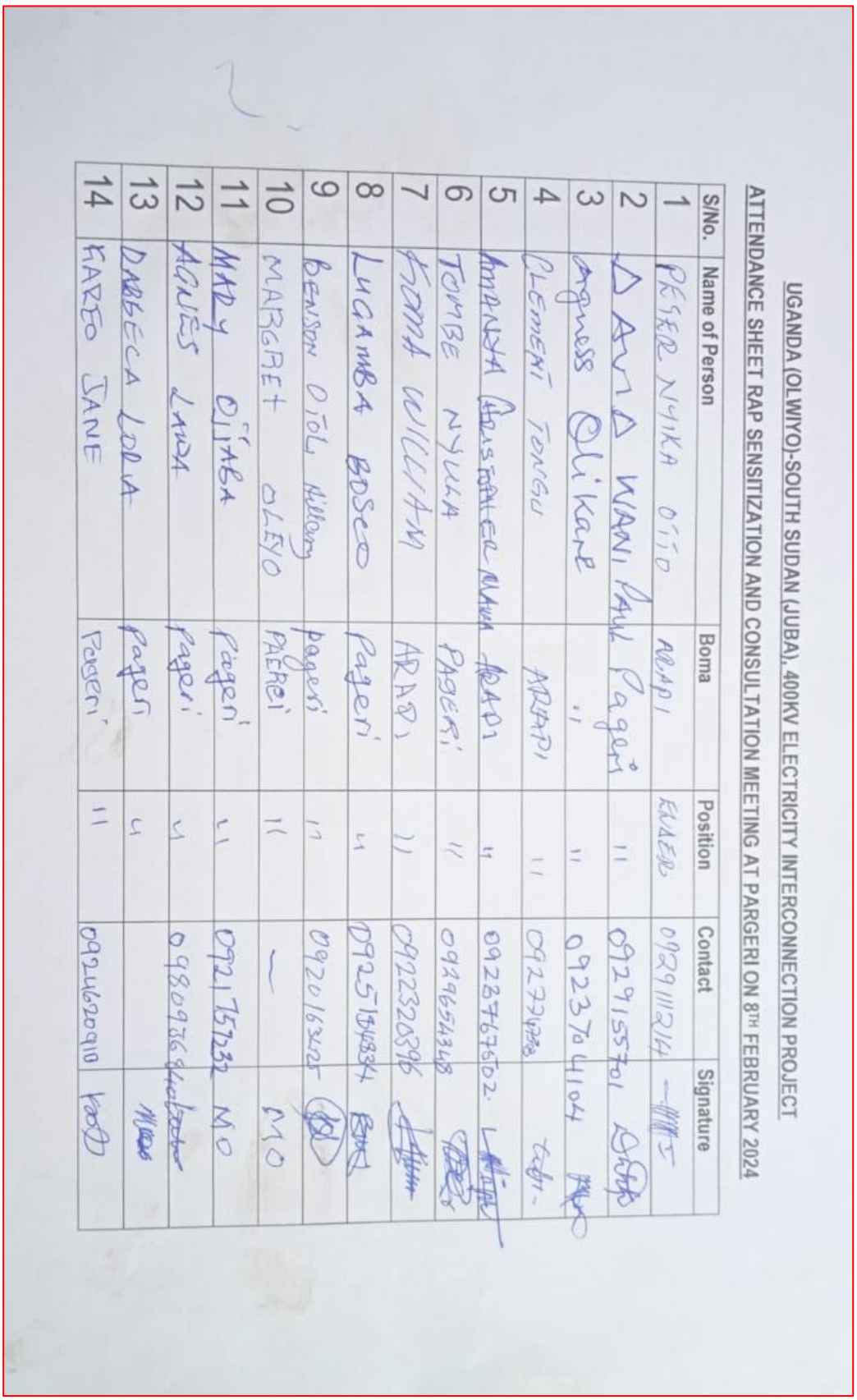
41. Are there internally displaced persons (IDPs, returnees) residing in this Payam?
    - *Yes.*
42. Did this area experience new displacements or arrivals/returnees during the five (05) years? Please provide details.
    - *Yes, we have many returnees coming from Uganda to the area.*
43. Is it possible to allocate land in advance to anticipate the relocation of future arrivals? Please provide example.
    - *Yes.*
44. How resettlement areas are identified and allocated?
    - *The affected people can relocate to another place with the consultation with chief, elders and land lord.*
45. Are there land parcels with conflicting rights between different users or groups? What are the areas where these tensions are most common?
    - *Yes, the areas are in Nyangua Boma, Arapi Boma and Amoria Mountain.*

❖ **Grievances and traditional mechanisms for land disputes resolution:** -

46. In case of land issue or conflicting land claims, what are the accountable body or institution to settle the disputes?
    - *In this case they solve by traditional way, land lord, chiefs councils and elders.*
47. How does the customary consultation process actually work in this area?
    - *The customary consultation process is through Chief councils, Land lord and elders people of this area.*
48. Is it possible to remove cases from the chiefs and customary system to reach the formal court system (the county land authority or county court)? Please provide example.
    - *Not possible to court of justice, never happen in our area.*
49. Alongside local leaders or traditional chiefs, are there other actors who can be involved in land negotiations and disputes resolution?
    - *No, but religious leaders can be involve to some cases.*
50. Is it possible for each and every member of this community to claim their land rights through customary authorities, or are restrictions in accessing these mechanisms for dispute resolution?
    - *Yes, is possible.*

Prepared by Field Team:

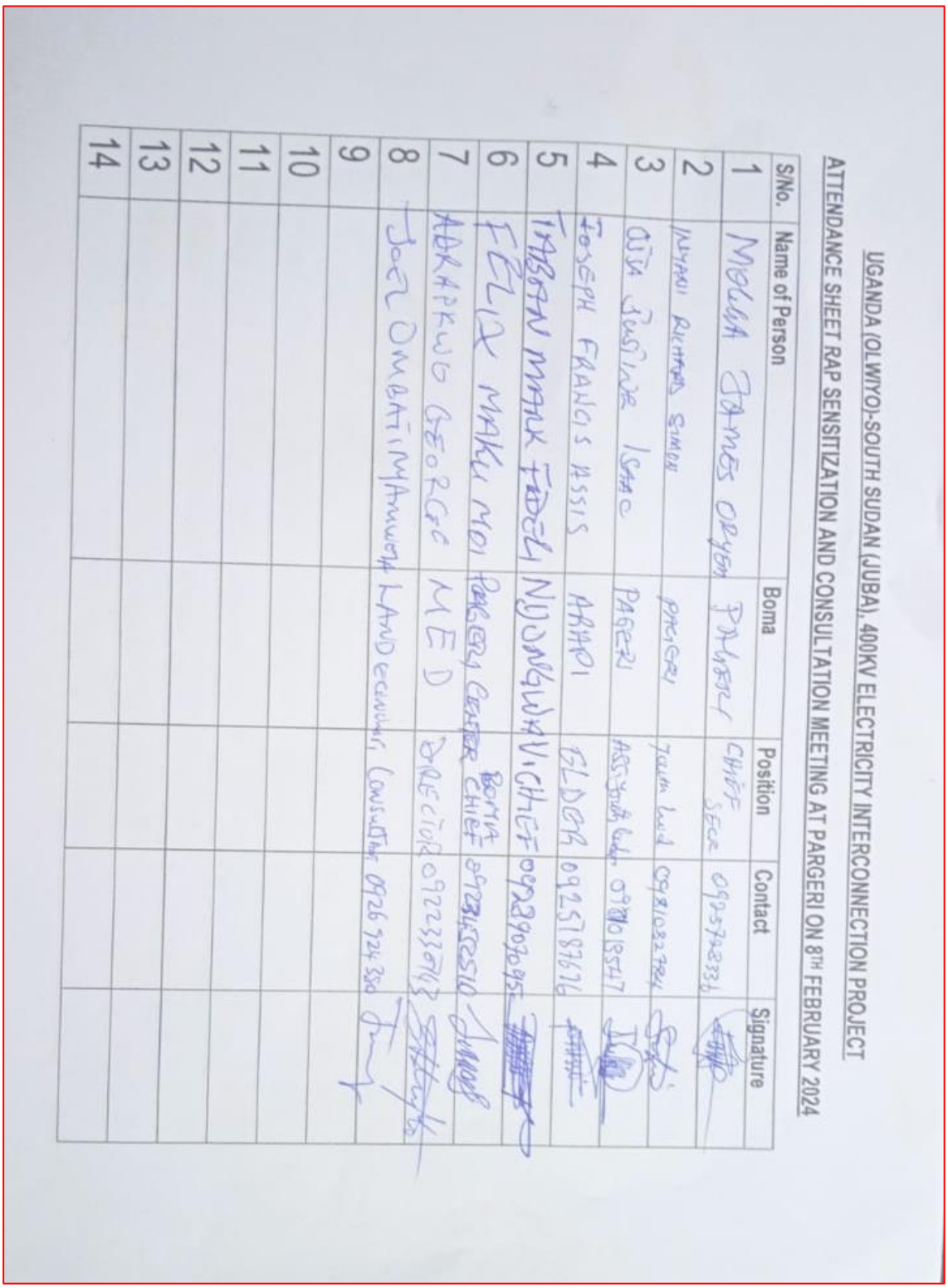
7. Eng. Rau Mabil- Land Surveyor and team leader
8. Vlr. Joel Ombati- Land Economist
9. Mr. Edward Forensio- Social Surveyor



UGANDA (OLWIYO)-SOUTH SUDAN (JUBA), 400KV ELECTRICITY INTERCONNECTION PROJECT

ATTENDANCE SHEET RAP SENSITIZATION AND CONSULTATION MEETING AT PARGERI ON 8TH FEBRUARY 2024

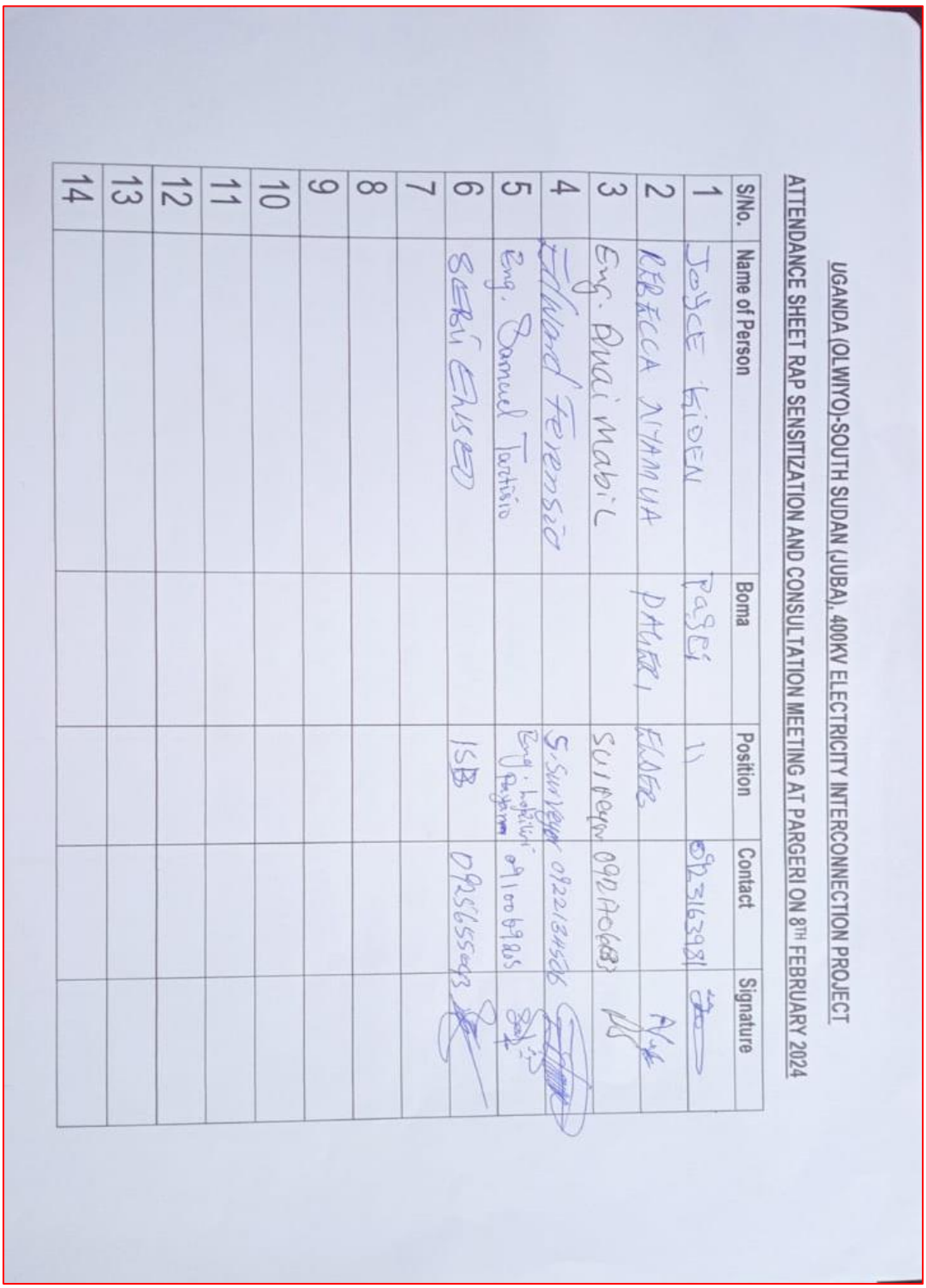
S/No.	Name of Person	Boma	Position	Contact	Signature
1	PESER NYIKA OTTO	ARAPI	EXAEO	0929111214	
2	DAVID KWANI PAUL Pageri	"	"	0929155701	
3	Agness Oli'kane	"	"	0923704104	
4	CLEMENT TONGU	ARAPI	"	0927	
5	AMANYA [illegible] ARAPI	"	"	0928767502	
6	TOMBE NYUKA	PAGERI	"	0929654348	
7	KUMA WILLIAM	ARAPI	"	0922320396	
8	LUGAMBA BOSCO	Pageri	"	0925154834	
9	BENSON OTOL Hillary	Pageri	"	0920162425	
10	MARGRET OLEYO	PAERei	"	—	MO
11	MARY OJARA	Pageri	"	0921757232	MO
12	AGNES LINDA	Pageri	"	0980936	
13	DABBECA LOLA	Pageri	"		
14	KAREO JANE	Pageri	"	0924620910	



UGANDA (OLWIYO)-SOUTH SUDAN (JUBA) 400KV ELECTRICITY INTERCONNECTION PROJECT

ATTENDANCE SHEET RAP SENSITIZATION AND CONSULTATION MEETING AT PARGERI ON 8TH FEBRUARY 2024

S/No.	Name of Person	Boma	Position	Contact	Signature
1	MOSES JAMES OBYON	PARGERI	CHIEF	0925782331	
2	JANAKI RICHARD SIMON	PARGERI			
3	OJA JUSTINE ISAAC	PARGERI	Youth Leader	0981082784	
4	JOSEPH FRANCIS ASSIS	ARAPOI	ASSISTANT CHIEF	0978018547	
5	TABAN MARK FADEL	NJOMGWA	ELDER	0925787176	
6	FELIX MAKU MOI	PARGERI CENTER	BOMA CHIEF	0923907095	
7	ADKAPKWO GEORGE	MED	DIRECTOR	0922330763	
8	JOEL OMBATI MWANUNA	LAND economist	Consultant	0926 724 380	
9					
10					
11					
12					
13					
14					



UGANDA (OLWIYO)-SOUTH SUDAN (JUBA), 400KV ELECTRICITY INTERCONNECTION PROJECT

ATTENDANCE SHEET RAP SENSITIZATION AND CONSULTATION MEETING AT PARGERI ON 8TH FEBRUARY 2024

S/No.	Name of Person	Boma	Position	Contact	Signature
1	Joyce Kiden	Pageri	LC1	0782316398	
2	Rebecca Nyamua	Pageri	Elder		
3	Eng. Ruai Mabil		SCU Progr	0911040403	
4	Edward Ferensio		S. Surveyor	0922130526	
5	Eng. Samuel Tachio		Eng. Logistics Projects	0911006985	
6	Sabi Enos	ISB		0925655493	
7					
8					
9					
10					
11					
12					
13					
14					

Here are the pictures of the Pageri Payam People who are attend the FGD on date 08/02/2024.





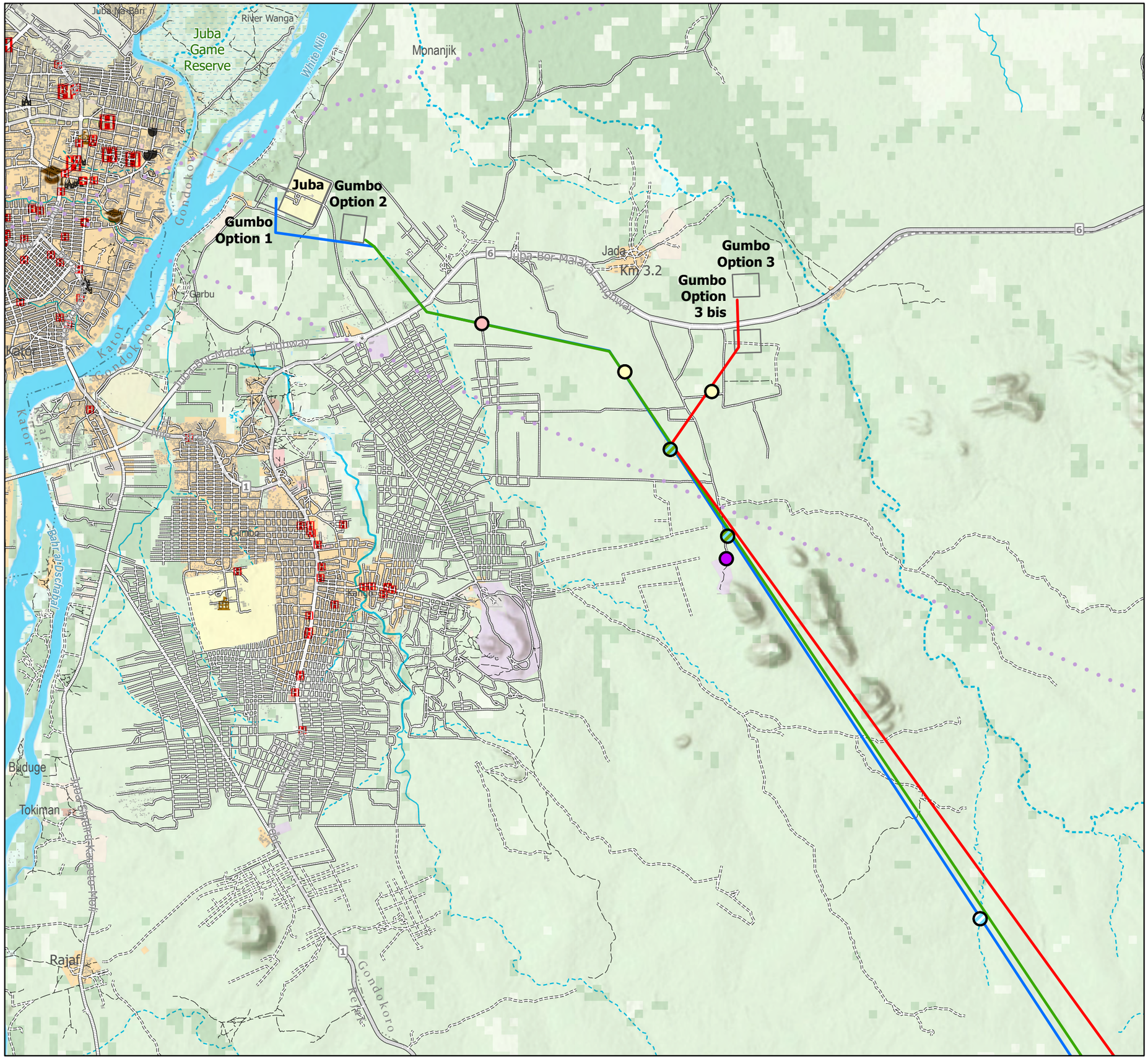


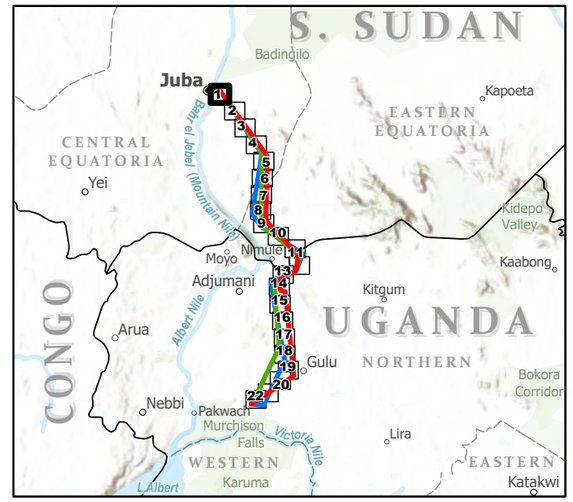






20 ANNEX 8: MAP OF LINE ALTERNATIVES





Borders
- Level 3

WDPA Protected areas
- Other categories

Routes
- Option 1
- Option 2 / SMEC
- Option 3

National power grid
- Planned

Points of interest
- Periurban area
- Industrial area
- Cultivated area
- Seasonal river
- Wetland

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest
- wetland

Land use (OSM)
- residential
- education
- construction
- commercial
- industrial
- farmyard
- cemetery
- military
- quarry
- farmland
- meadow
- forest
- reservoir
- Other

Points of interest (OSM)
- hospital
- clinic
- pharmacy
- university
- college
- primary
- school
- place of worship
- water point
- police station

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
0	Issue for comments	25/05/2023			

ELC ENVIRONMENTAL · CESI Shaping a Better Energy Future · COLENCO · NELSAP-CU NILE BASIN INITIATIVE INITIATIVE DU BASSIN DU NIL

Uganda-South Sudan 400 kV Interconnection Line Project

Consulting Services for -----

General Layout
South Sudan - Sheet 1

1799-

Size A3

Scale 1:50,000

360,000

520,000

Gondokoro
Lokiliri

Juba – Kapoeta

2

Najeleda

Lokiliri
Rejaf

1

Juba – Arapi – Hospital

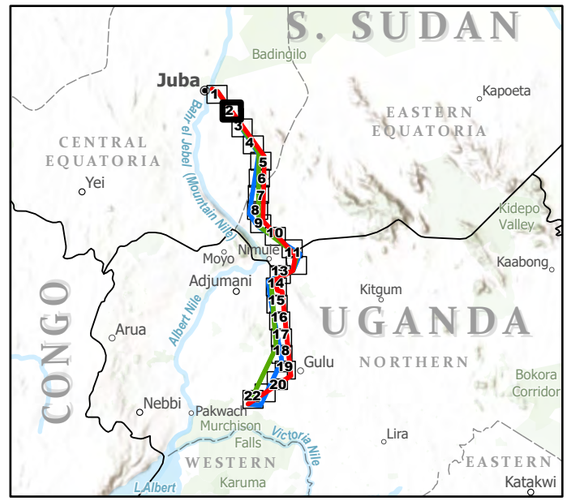
Leiforo

Tengworo

Rejaf
Lobonok

Lokiliri
Lobonok

360,000



Borders
- Level 3

Routes
- Option 1
- Option 2 / SMEC
- Option 3

National power grid
- Planned

Points of interest
- River
- Seasonal river

Copernicus land cover
- urbanized
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential
- commercial

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
0	Issue for comments	25/05/2023			

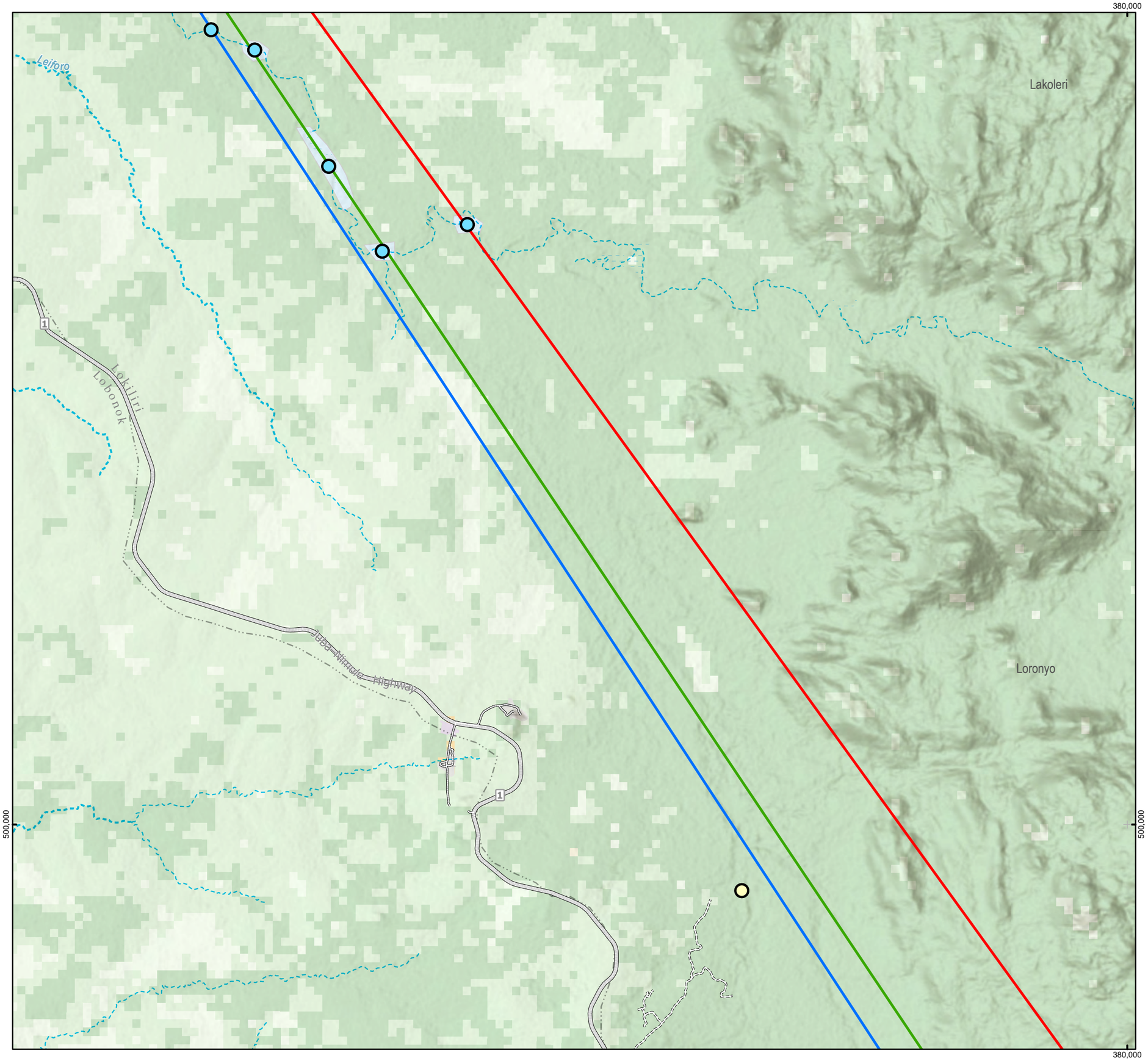
ELC Electroconsult · CESI Shaping a better Energy Future · COLENCO · NELSAP-CU NILE BASIN INITIATIVE INITIATIVE DU BASSIN DU NIL

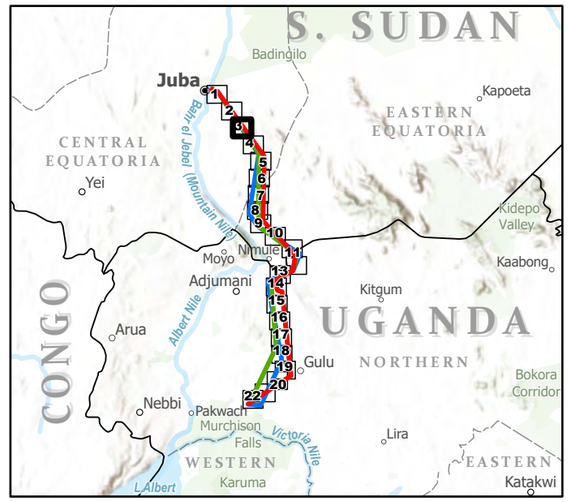
Uganda-South Sudan 400 kV Interconnection Line Project

Consulting Services for -----

General Layout
South Sudan - Sheet 2

1799-	Size A3	Scale 1:50,000





Borders
- Level 3

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Cultivated area
- River

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- industrial
- quarry

DRAFT

0 1 2 3 Kilometers

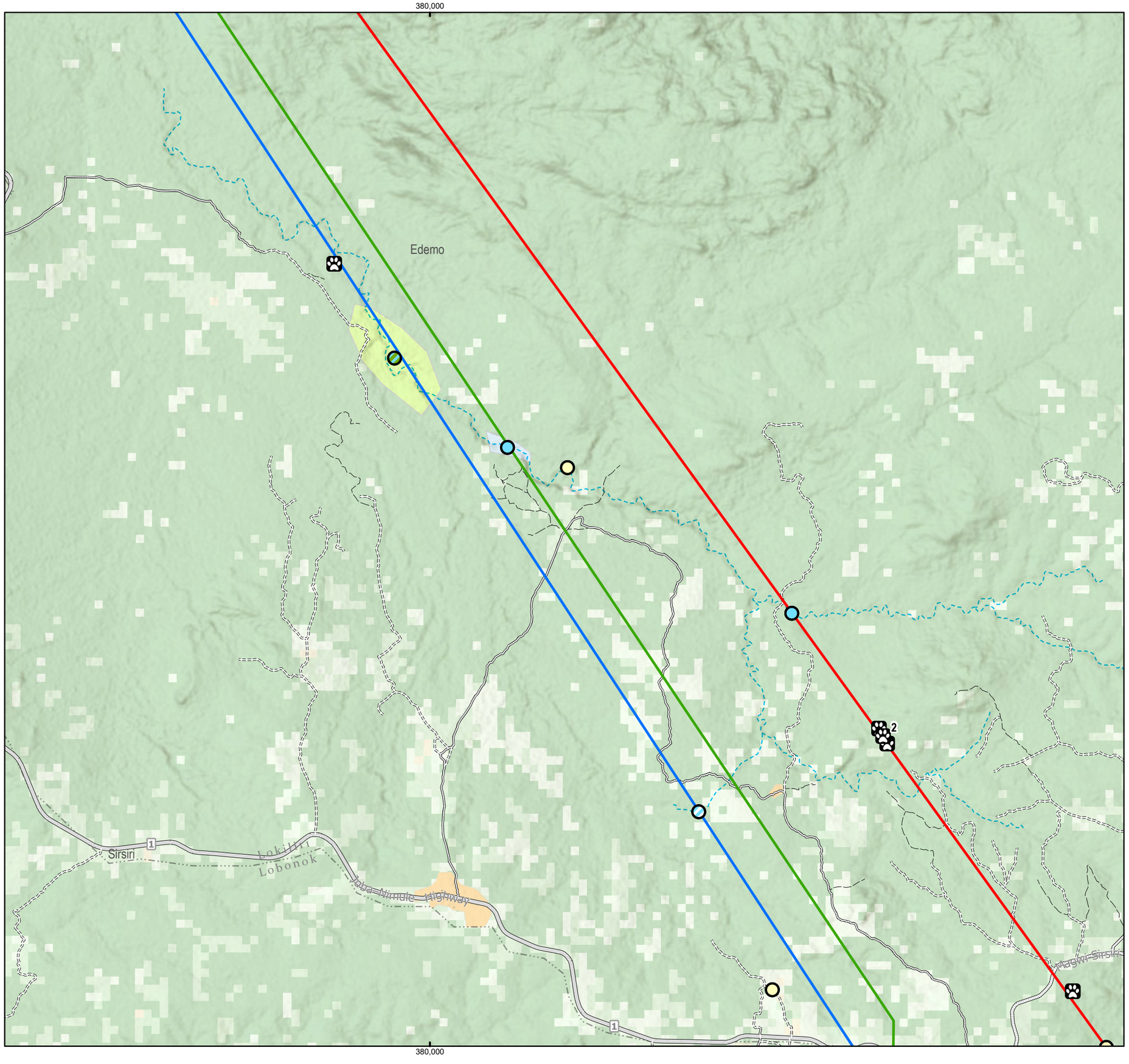
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

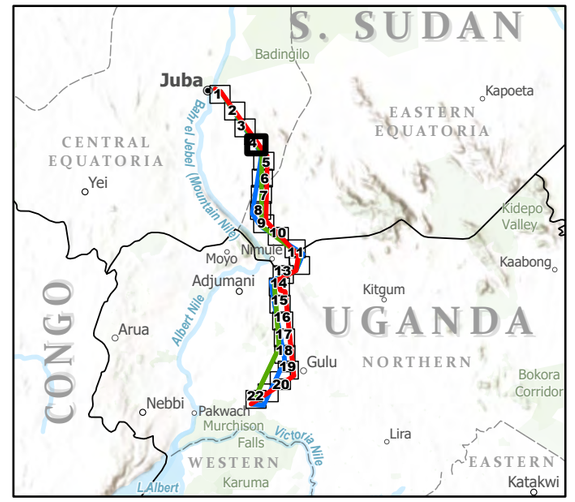
Rev	Description	Date	Drawn	Checked	Approved
0	Issue for comments	25/05/2023			

Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
South Sudan - Sheet 3

1799-	Size A3	Scale 1:50,000





Borders
- Level 3

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Cultivated area
- Animals enclosure
- River
- Seasonal river
- Wetland

Copernicus land cover
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

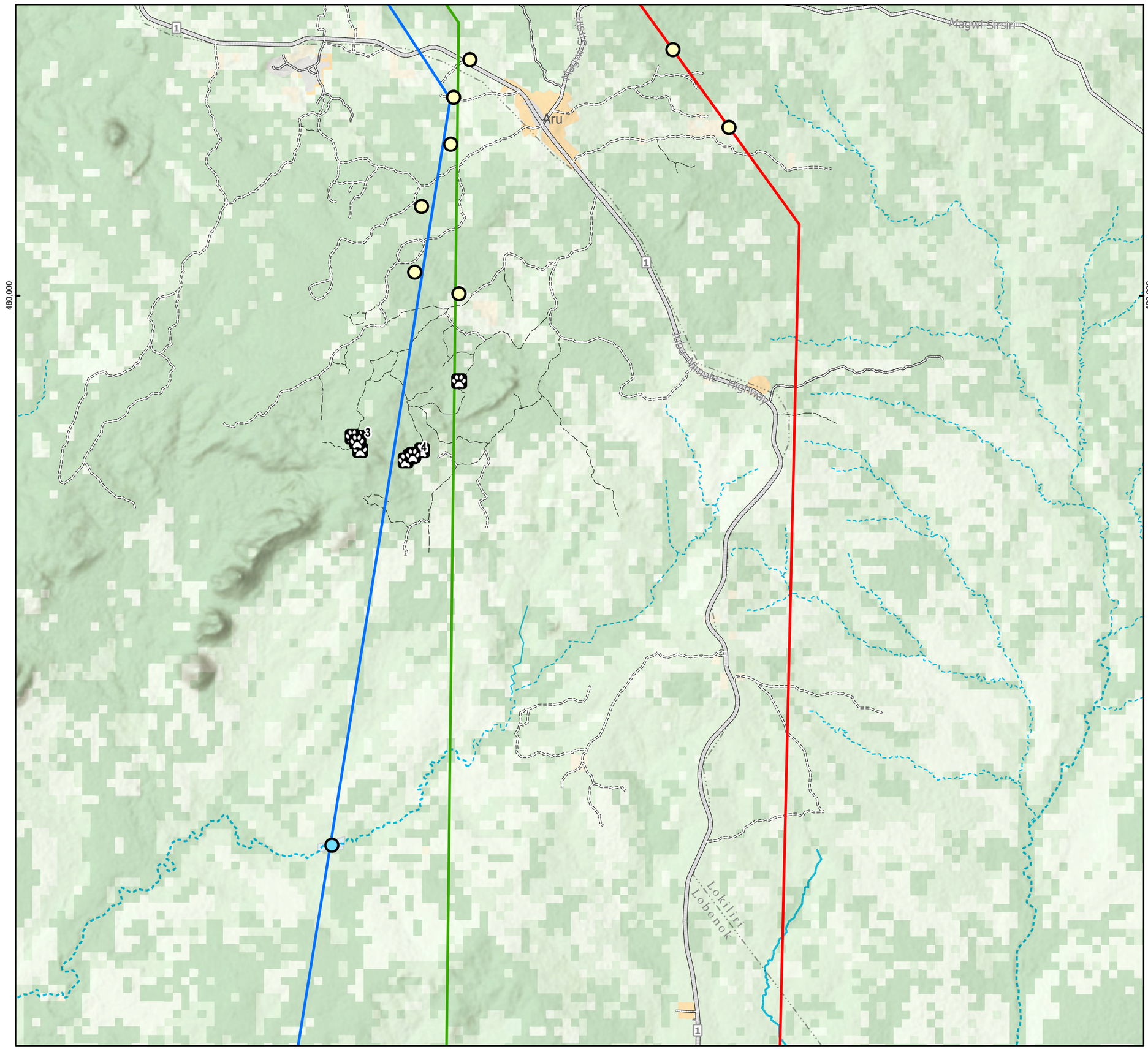
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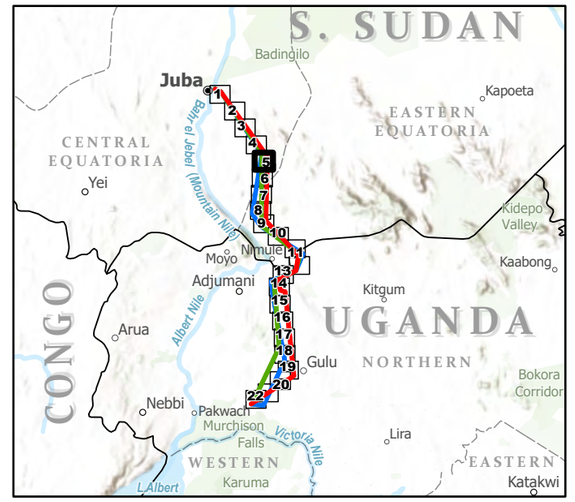
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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
South Sudan - Sheet 4

1799-	Size A3	Scale 1:50,000





Borders
- Level 3

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Cultivated area
- Animals enclosure
- River

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential
- quarry
- Other

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
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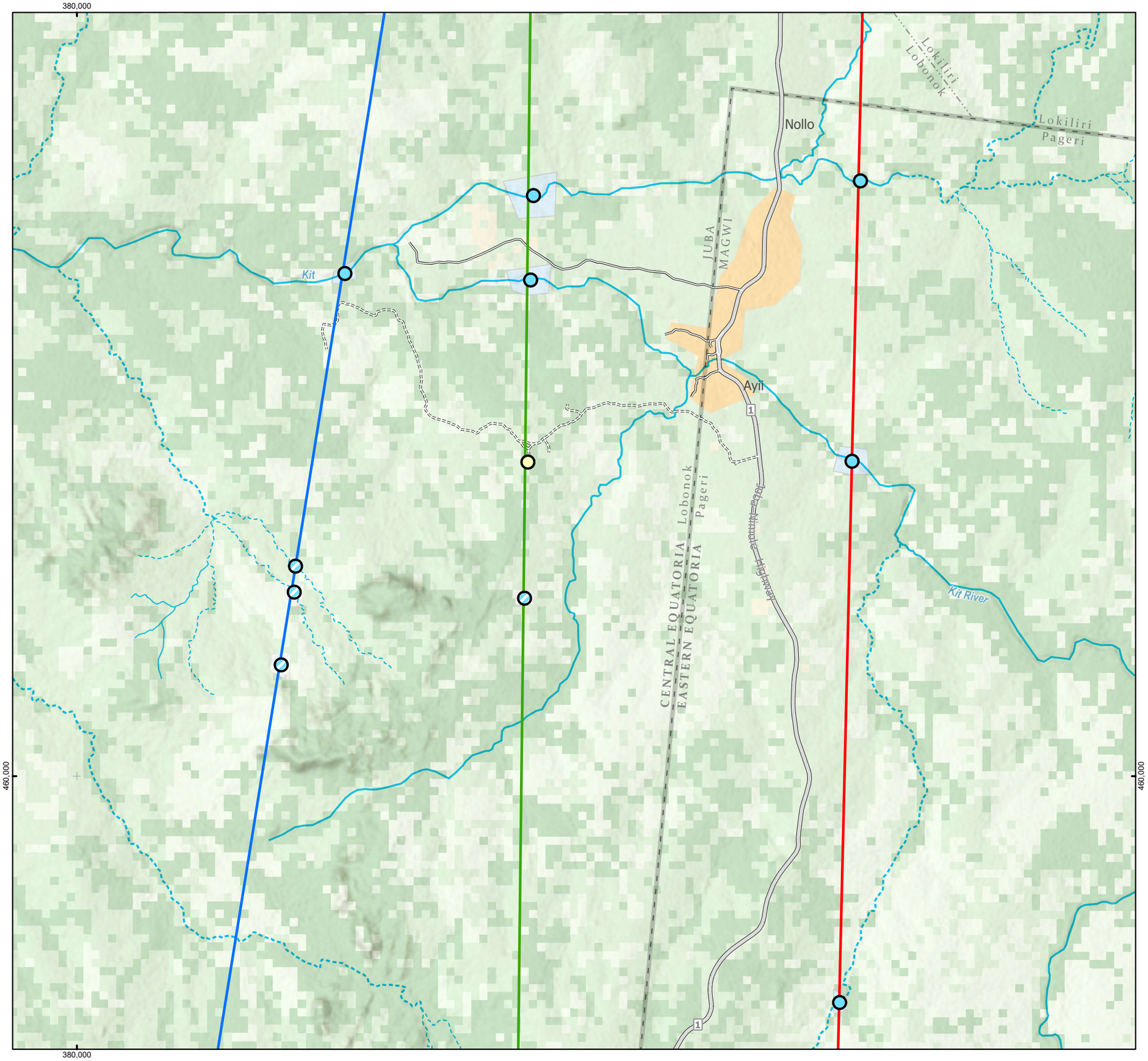
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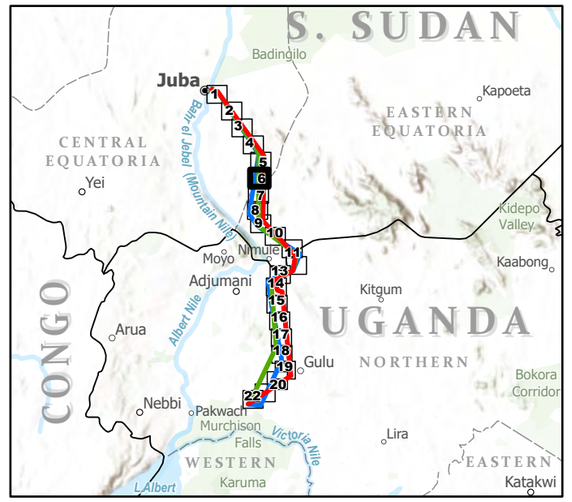
Uganda-South Sudan 400 kV Interconnection Line Project

Consulting Services for -----

General Layout
South Sudan - Sheet 5

1799-	Size A3	Scale 1:50,000





Borders
- State border
- Level 3

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Cultivated area
- River
- Seasonal river

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential

DRAFT

0 1 2 3 Kilometers

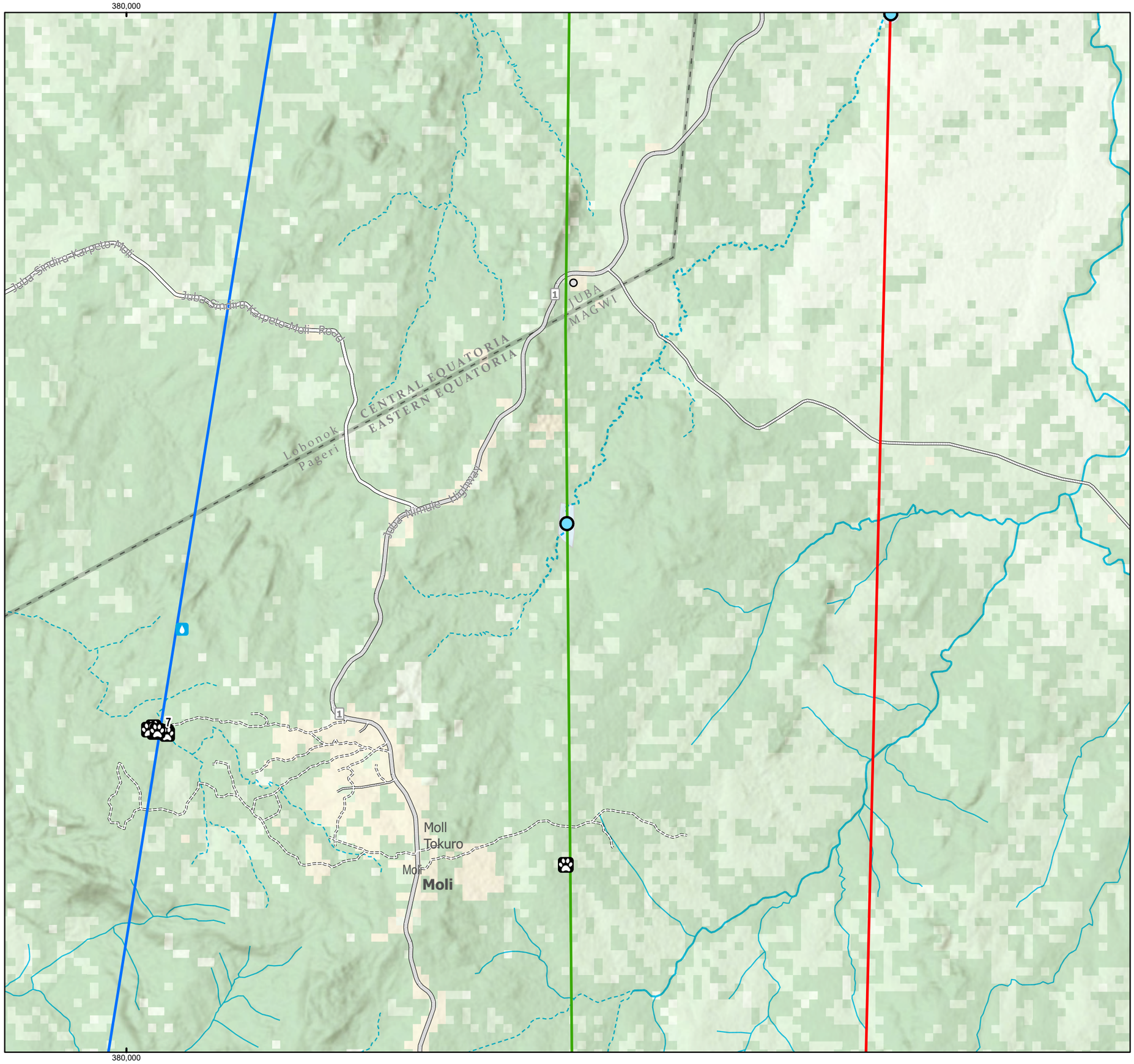
Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

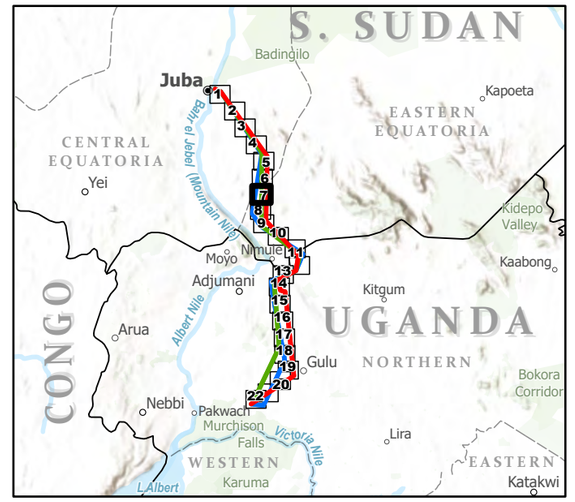
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0	Issue for comments	25/05/2023			

Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
South Sudan - Sheet 6

1799-	Size A3	Scale 1:50,000





Borders

- State border

Routes

- Option 1
- Option 2 / SMEC
- Option 3

Points of interest

- Settlement
- Water point
- Animals enclosure
- River

Copernicus land cover

- cultivated
- herbaceous
- shrubs
- forest
- water point

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

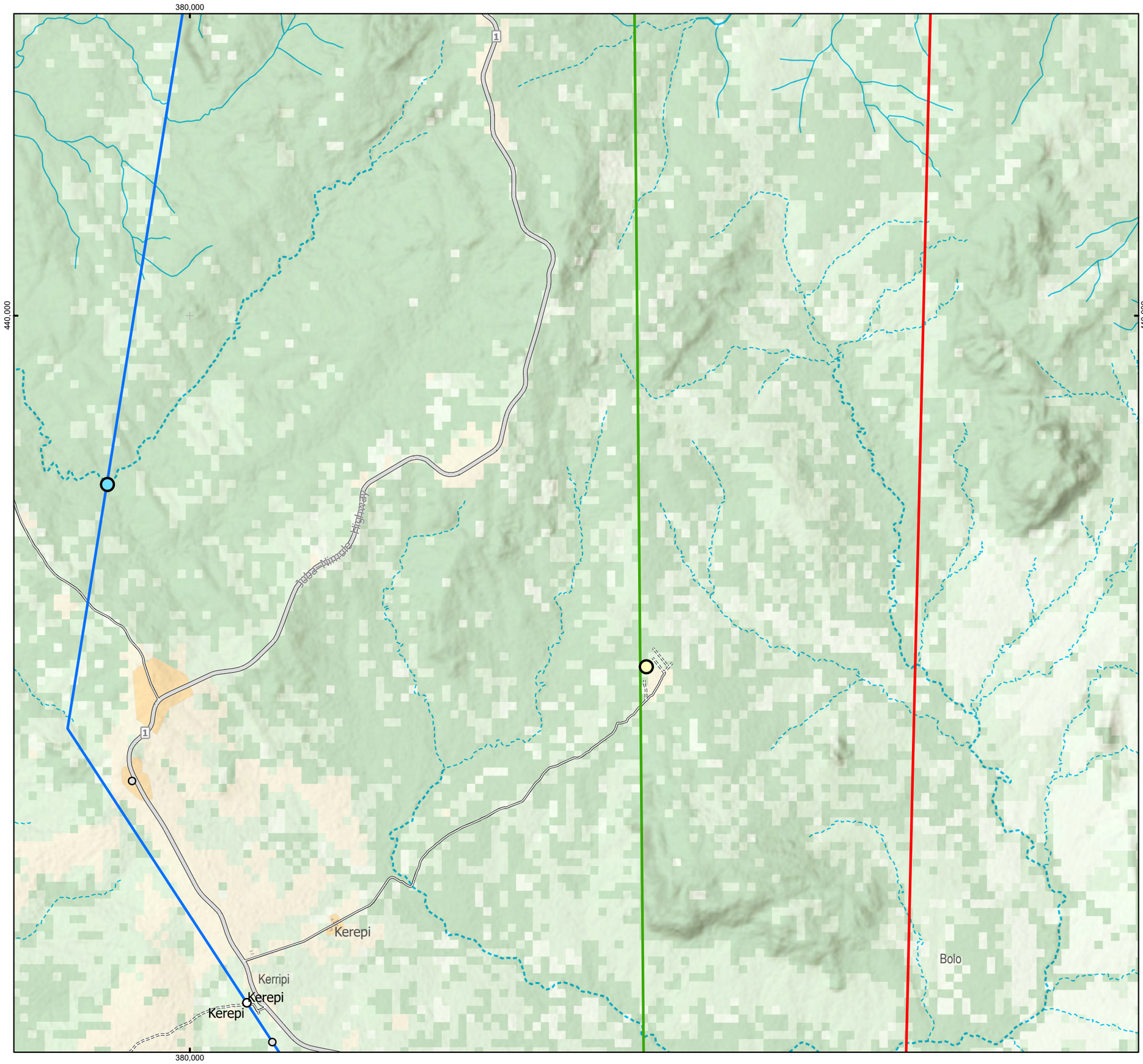
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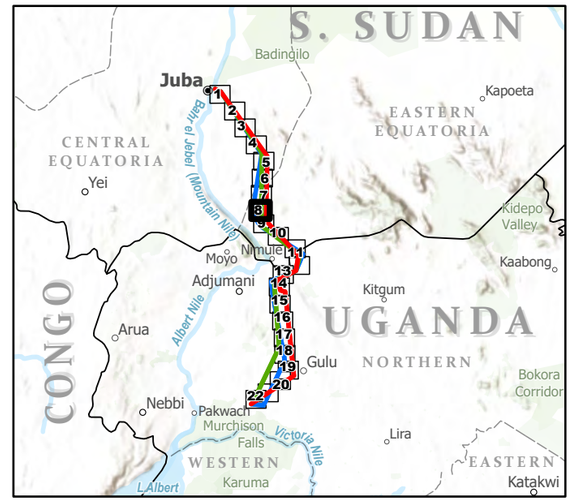
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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
South Sudan - Sheet 7

1799-	Size A3	Scale 1:50,000





Routes

- Option 1
- Option 2 / SMEC
- Option 3

Points of interest

- Village
- Settlement
- Cultivated area
- River

Copernicus land cover

- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)

- residential

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

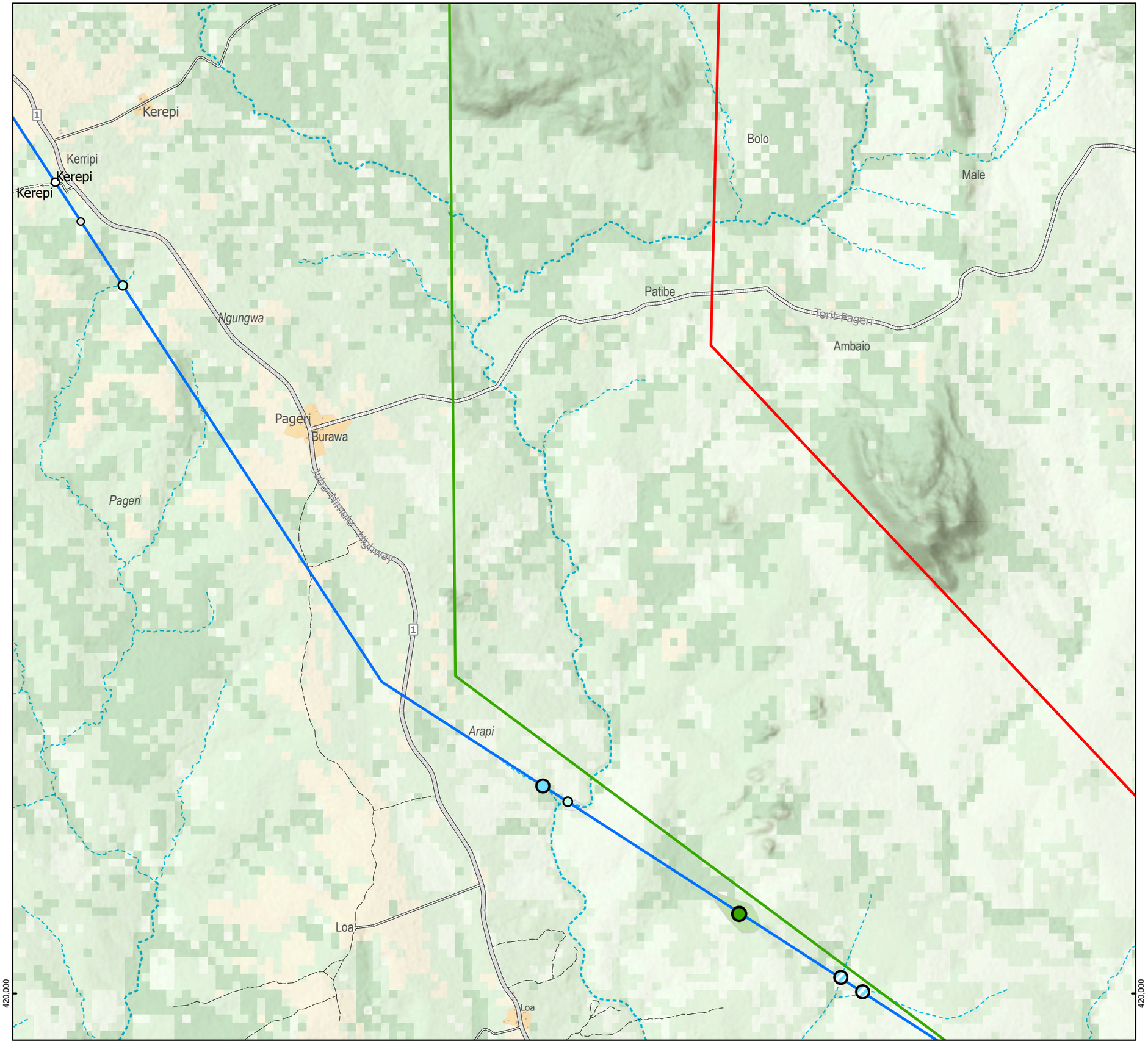
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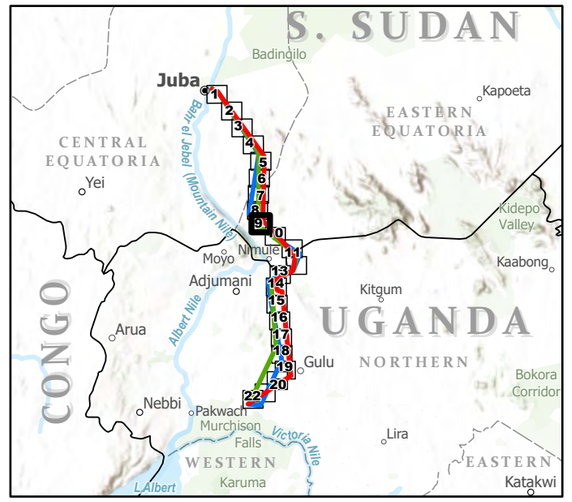
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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
South Sudan - Sheet 8

1799-	Size A3	Scale 1:50,000





Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Village
- Settlement
- River
- Seasonal river
- Stream
- Forest

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
0	Issue for comments	25/05/2023			

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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
South Sudan - Sheet 9

1799-	Size A3	Scale 1:50,000

400,000

420,000

Lokai

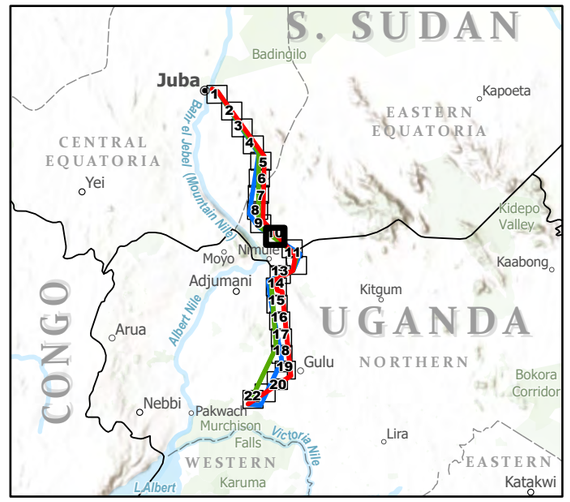
Tindiliti

Achwa

Pageri

Nimule

400,000



Borders

Level 3

Routes

Option 1

Option 2 / SMEC

Option 3

Points of interest

River

Seasonal river

Copernicus land cover

herbaceous

shrubs

forest

wetland

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

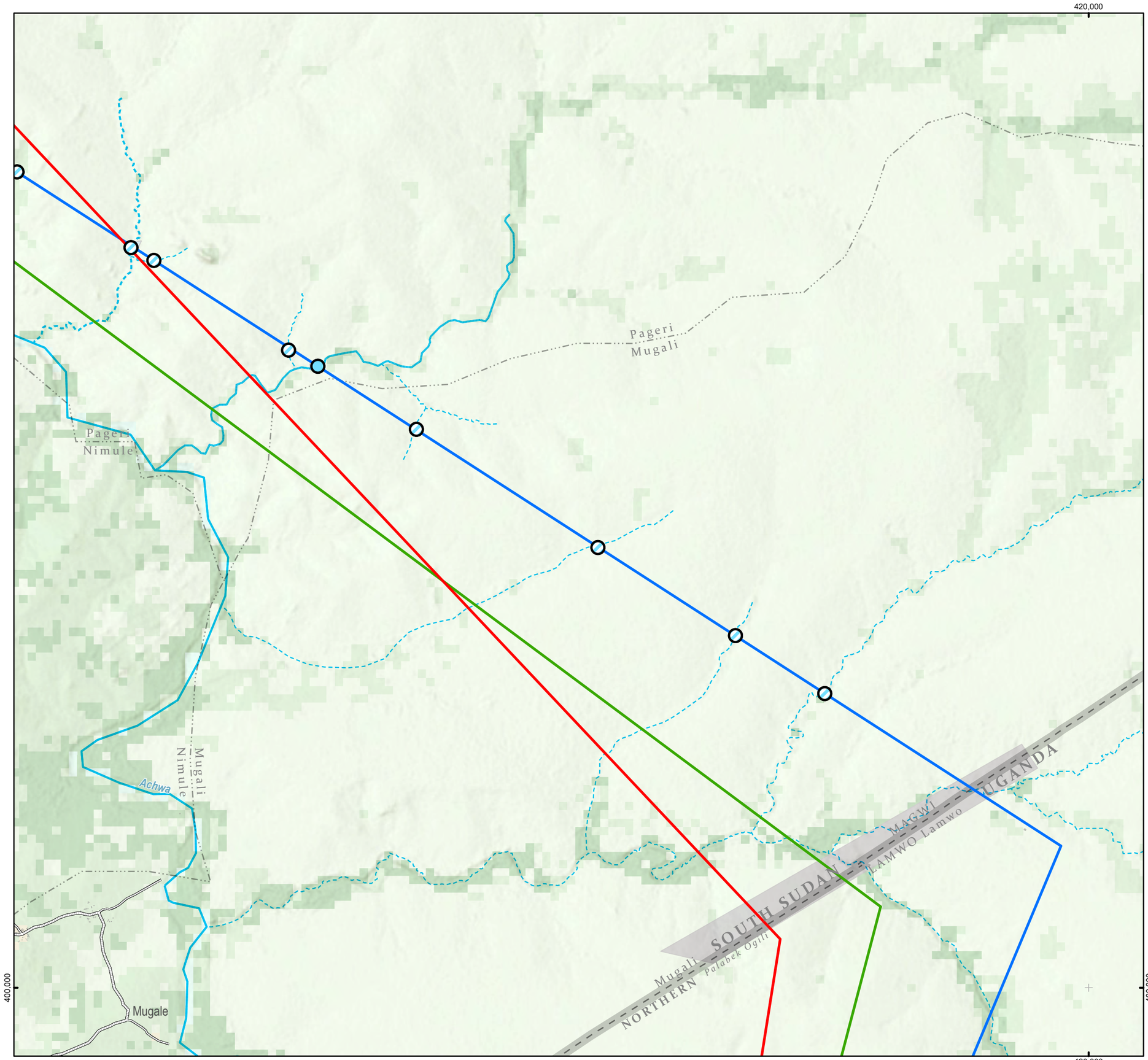
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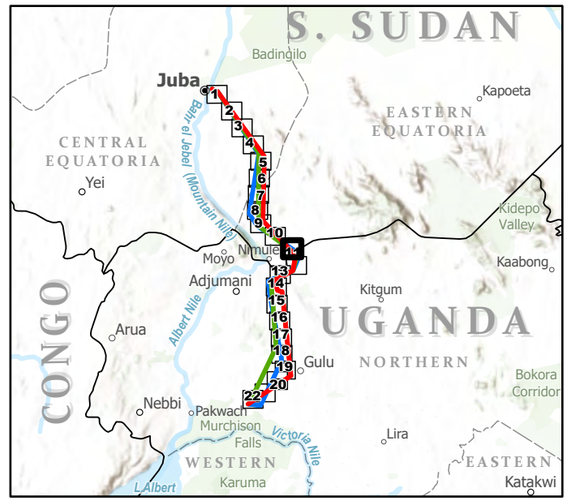
Uganda-South Sudan 400 kV Interconnection Line Project

Consulting Services for -----

General Layout
South Sudan - Sheet 10

1799-	Size A3	Scale 1:50,000





Borders
- National border
- Level 3

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- River
- Seasonal river

Copernicus land cover
- cultivated
- herbaceous
- shrubs
- forest
- wetland

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
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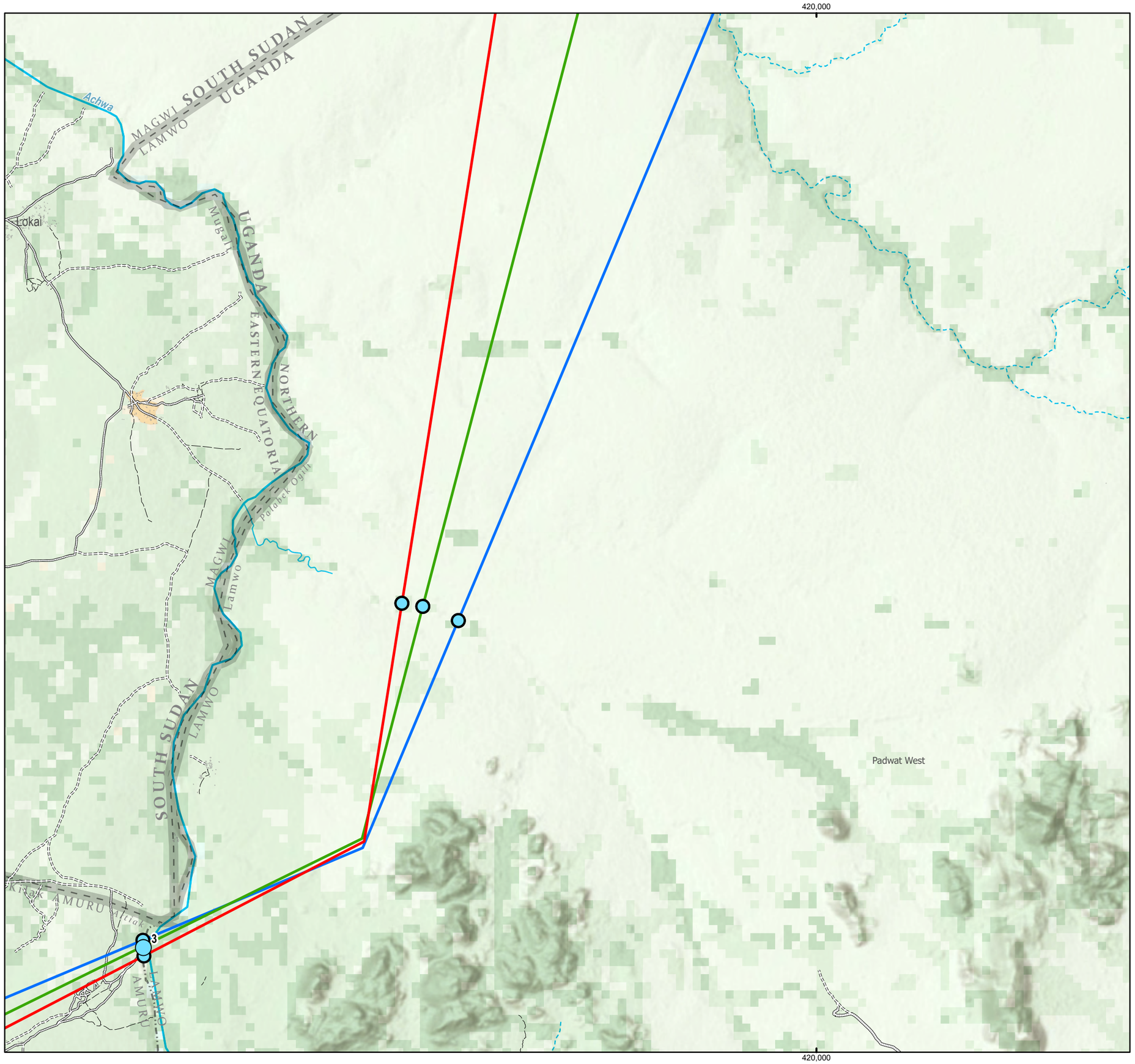
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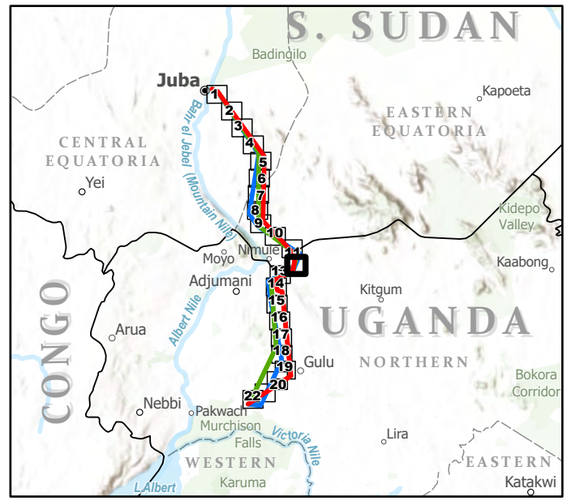
Uganda-South Sudan 400 kV Interconnection Line Project

Consulting Services for -----

General Layout
South Sudan - Sheet 11

1799-	Size A3	Scale 1:50,000





Borders
- National border
- Level 2

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- River

Copernicus land cover
- cultivated
- herbaceous
- shrubs
- forest
- wetland

Land use (OSM)
- residential

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

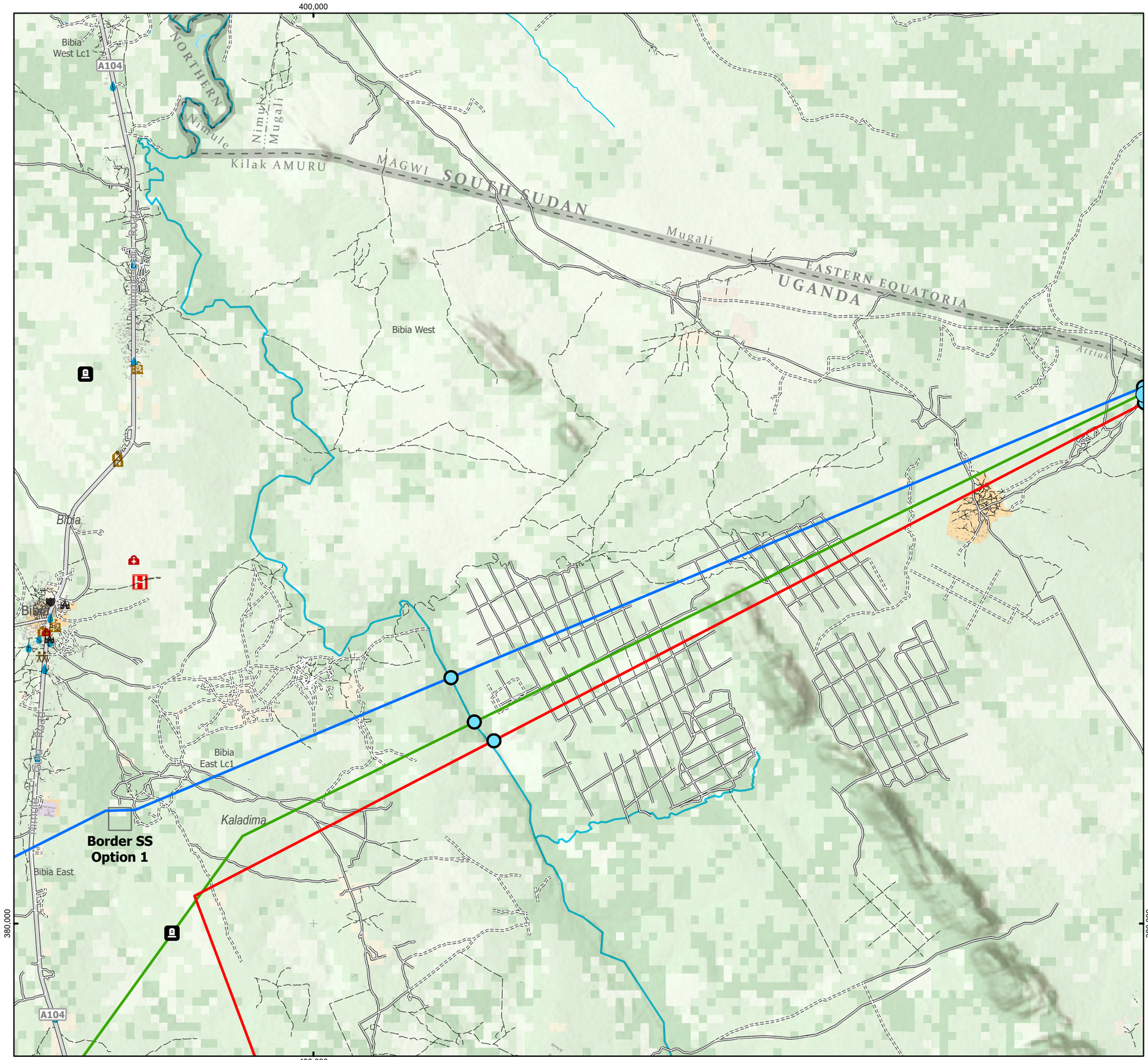
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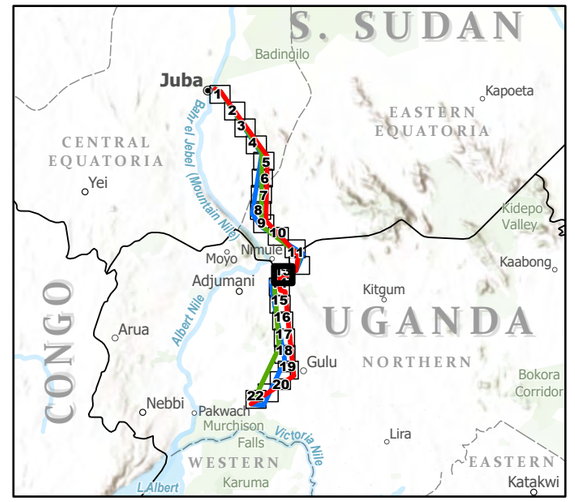
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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
South Sudan - Sheet 12

1799-	Size A3	Scale 1:50,000





Borders
- National border
- Level 2
- Level 3

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Burial site
- River

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential
- industrial
- farmyard
- farmland
- meadow
- Other

Points of interest (OSM)
- hospital
- doctors
- primary
- kindergarten
- nursery
- place of worship
- water point
- community centre
- police station

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
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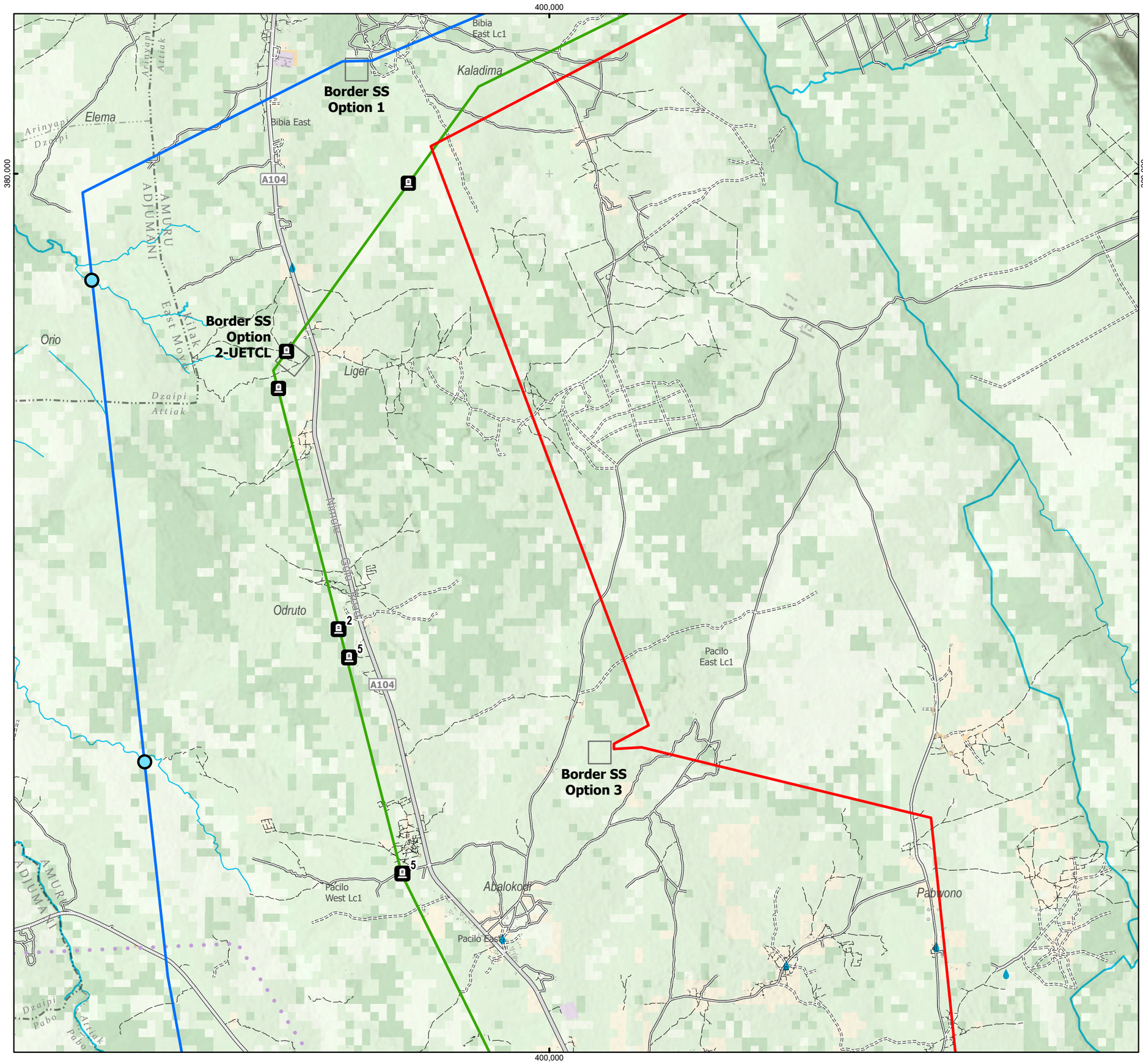
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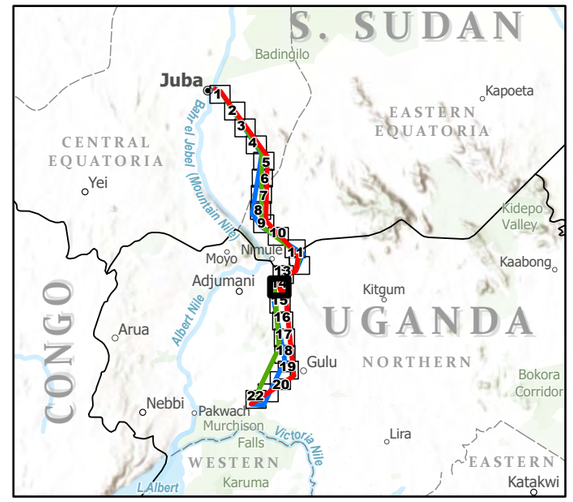
Uganda-South Sudan 400 kV Interconnection Line Project

Consulting Services for -----

General Layout
South Sudan - Sheet 13

1799-	Size A3	Scale 1:50,000





Borders
- Level 2
- Level 4

Routes
- Option 1
- Option 2 / SMEC
- Option 3

National power grid
- Planned

Points of interest
- Burial site
- River

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential
- industrial
- farmland
- water point

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

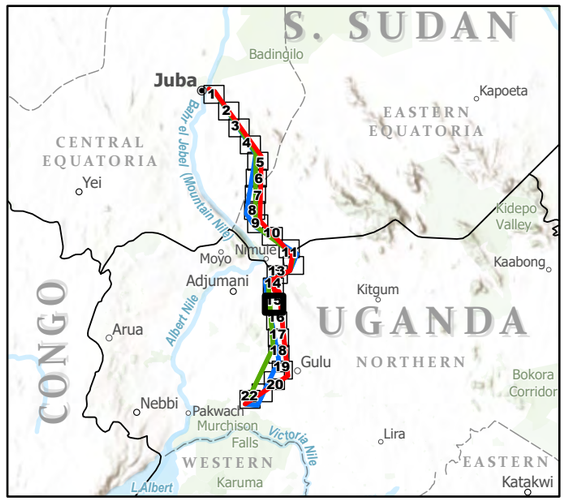
General Layout
Uganda - Sheet 14

1800-	Size A3	Scale 1:50,000

400,000

360,000

Pacilo
A104
Agoro Lc1
Agoro
Muruli
Pacilo West
Agoro
Pogo
Acupere
Kal West
Parwaca
Pabwono Lc1
Atiak
Pabwono
Lukulia
Kal West Lc1
Kal East Lc1
Atiak
A104
Pupwonya North
Pupwonya North Lc1
Karuku
Pupwonya South
Ceri Lc1
Ceri
Pawko
A104



Borders
- Level 4

Routes
- Option 1
- Option 2 / SMEC
- Option 3

National power grid
- Planned

Points of interest
- Burial site
- River
- Wetland

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest
- wetland

Land use (OSM)
- residential
- commercial
- industrial
- quarry
- farmland

Points of interest (OSM)
- hospital
- doctors
- upper secondary
- secondary
- primary
- school
- kindergarten
- nursery
- place of worship
- water point
- community centre
- police station
- post office

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

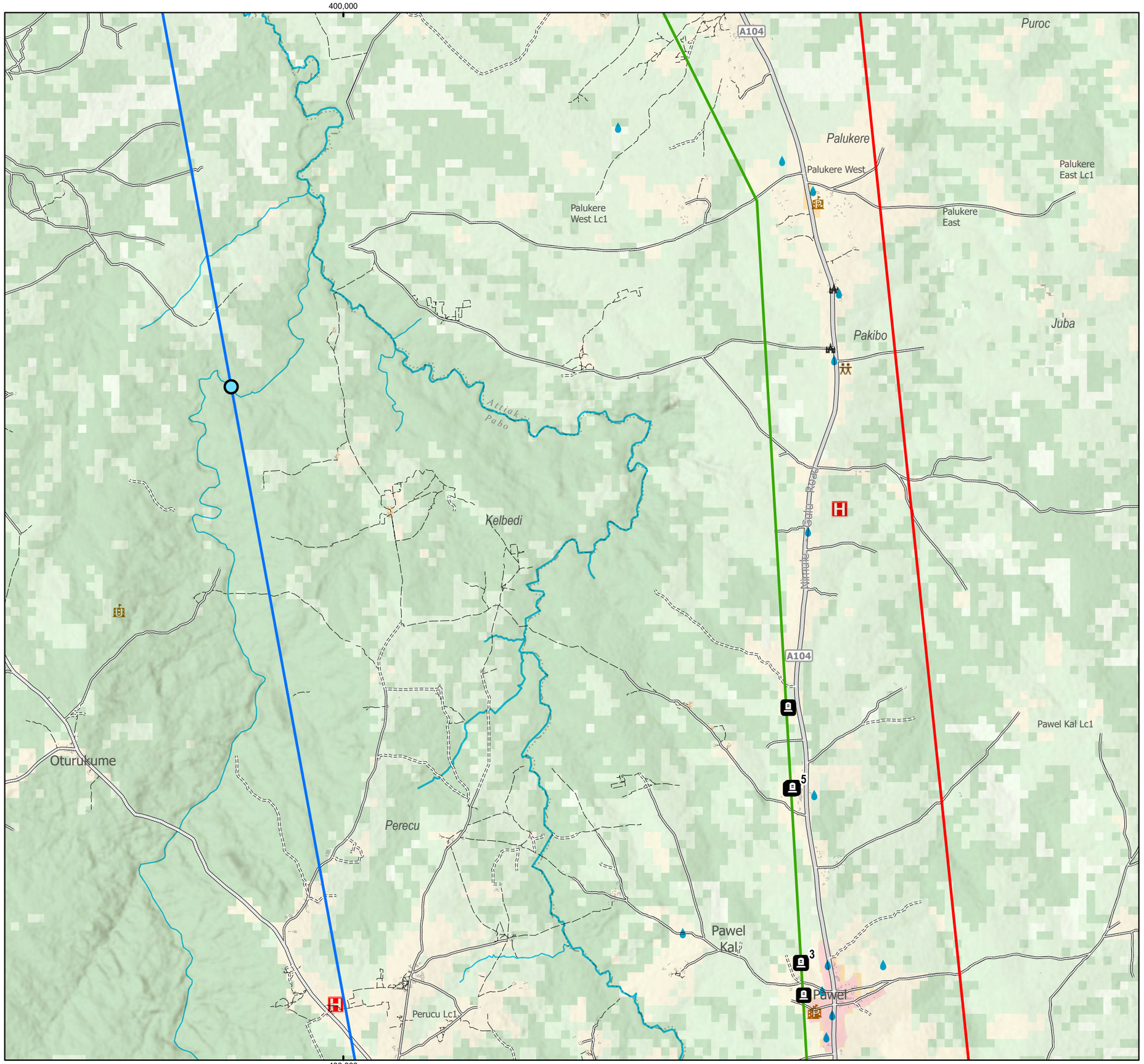
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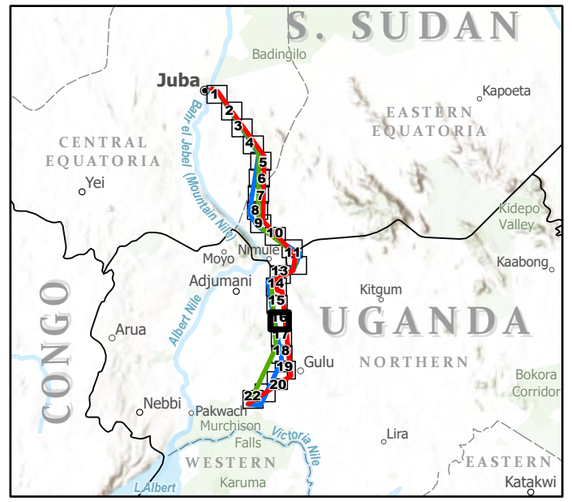
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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
Uganda - Sheet 15

1800-	Size A3	Scale 1:50,000





Borders
- Level 4

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Burial site
- River

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential
- commercial

Points of interest (OSM)
- hospital
- upper secondary
- primary
- place of worship
- water point
- community centre

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
0	Issue for comments	25/05/2023			

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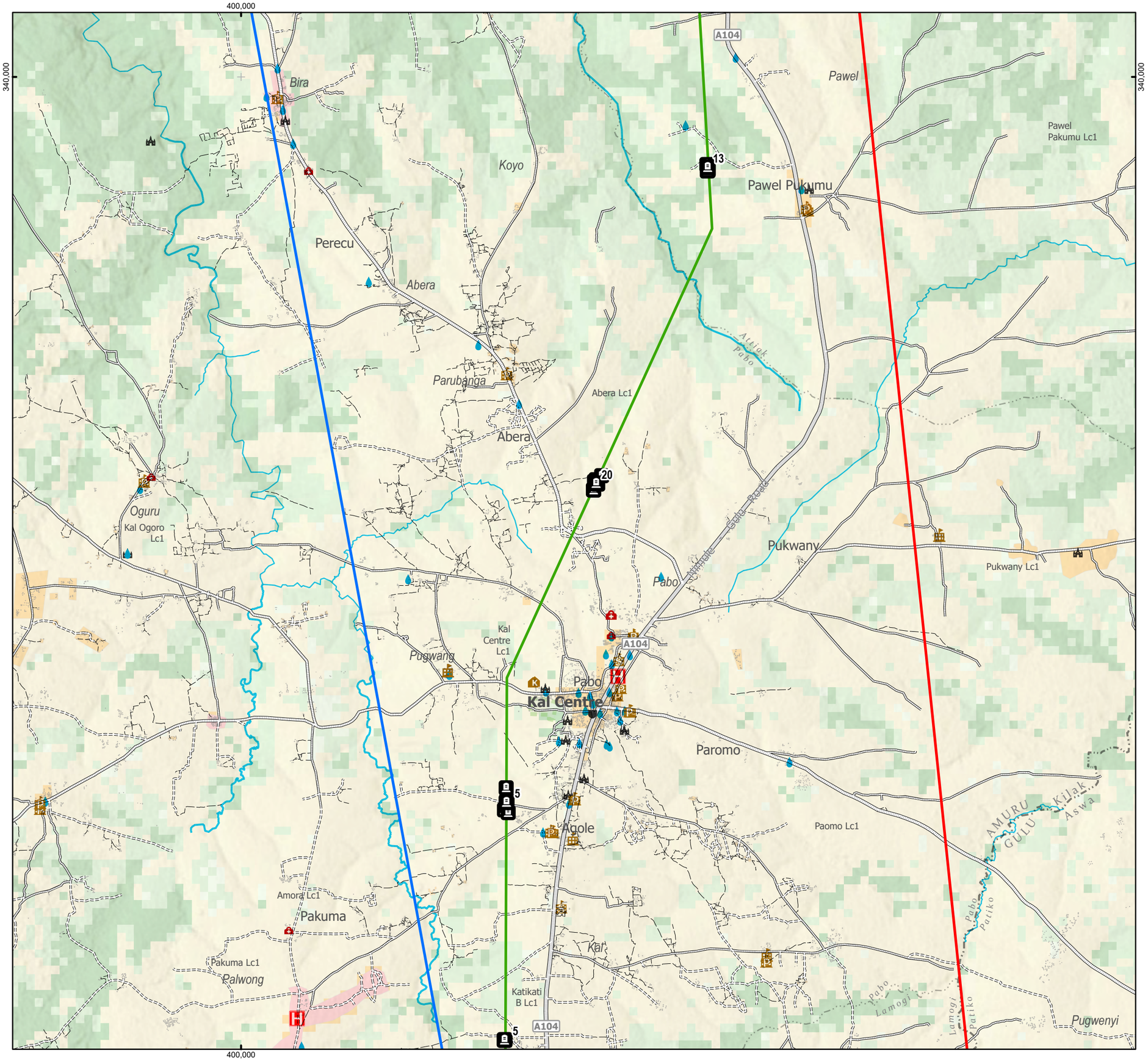
Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

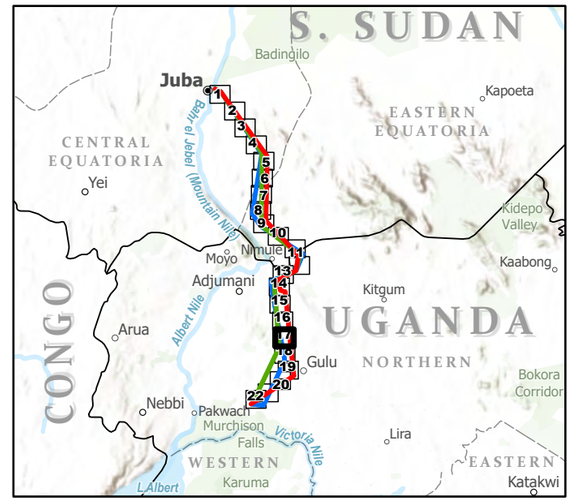
General Layout
Uganda - Sheet 16

1800-

Size A3

Scale 1:50,000





Borders
- Level 2
- Level 4

WDPA Protected areas
- Other categories

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Burial site

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential
- commercial
- farmland

Points of interest (OSM)
- hospital
- doctors
- secondary
- primary
- school
- kindergarten
- place of worship
- water point
- police station

DRAFT

0 1 2 3 Kilometers

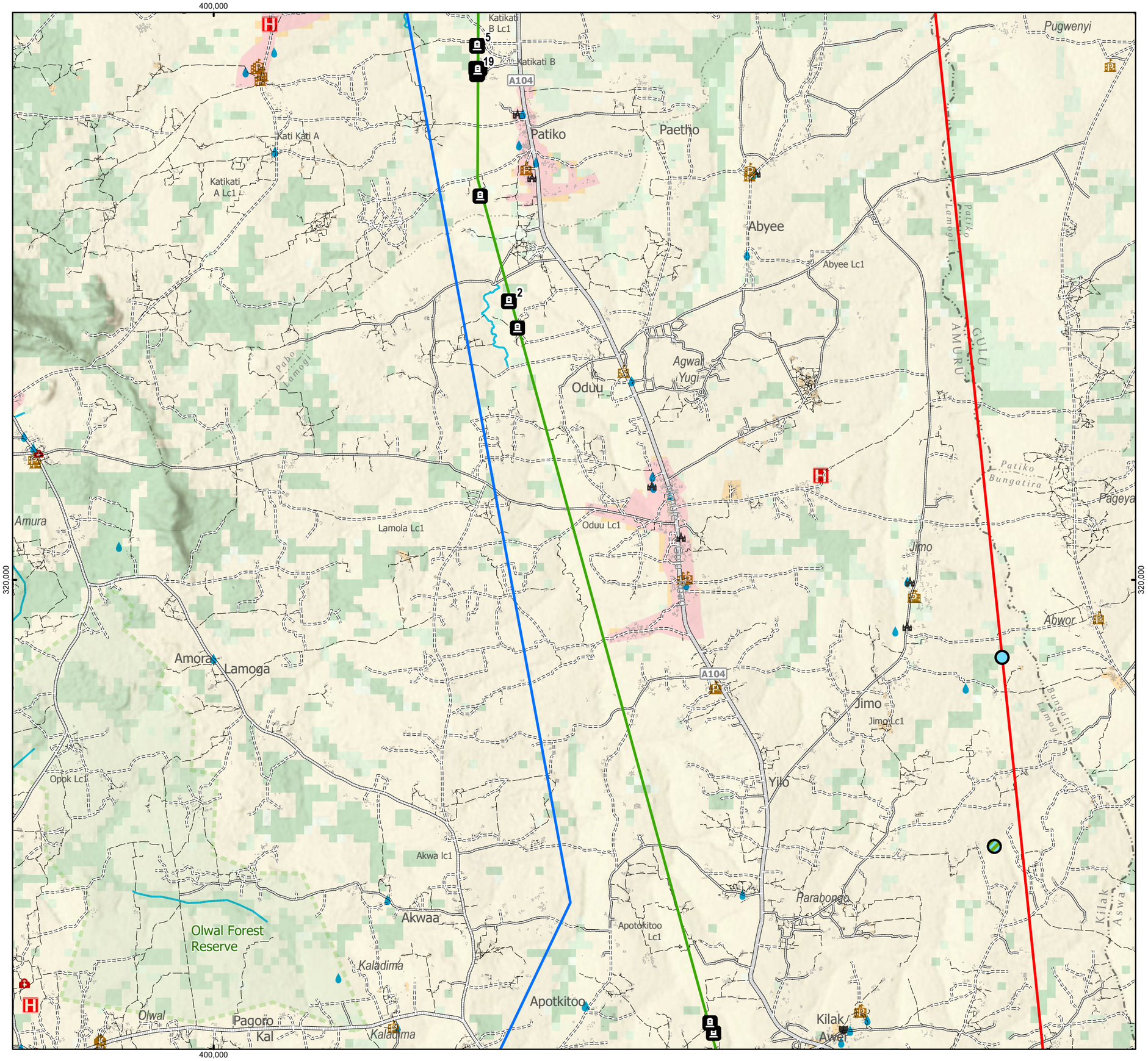
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Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

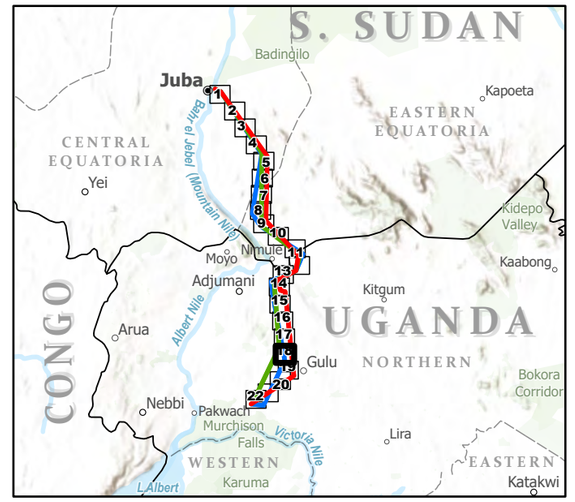
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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
Uganda - Sheet 17

1800-	Size A3	Scale 1:50,000





Borders
- Level 2
- Level 4

WDPA Protected areas
- Other categories

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Burial site
- River
- Wetland

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential
- commercial
- farmland

Points of interest (OSM)
- hospital
- doctors
- secondary
- primary
- school
- kindergarten
- nursery
- place of worship
- water point
- community centre
- police station

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

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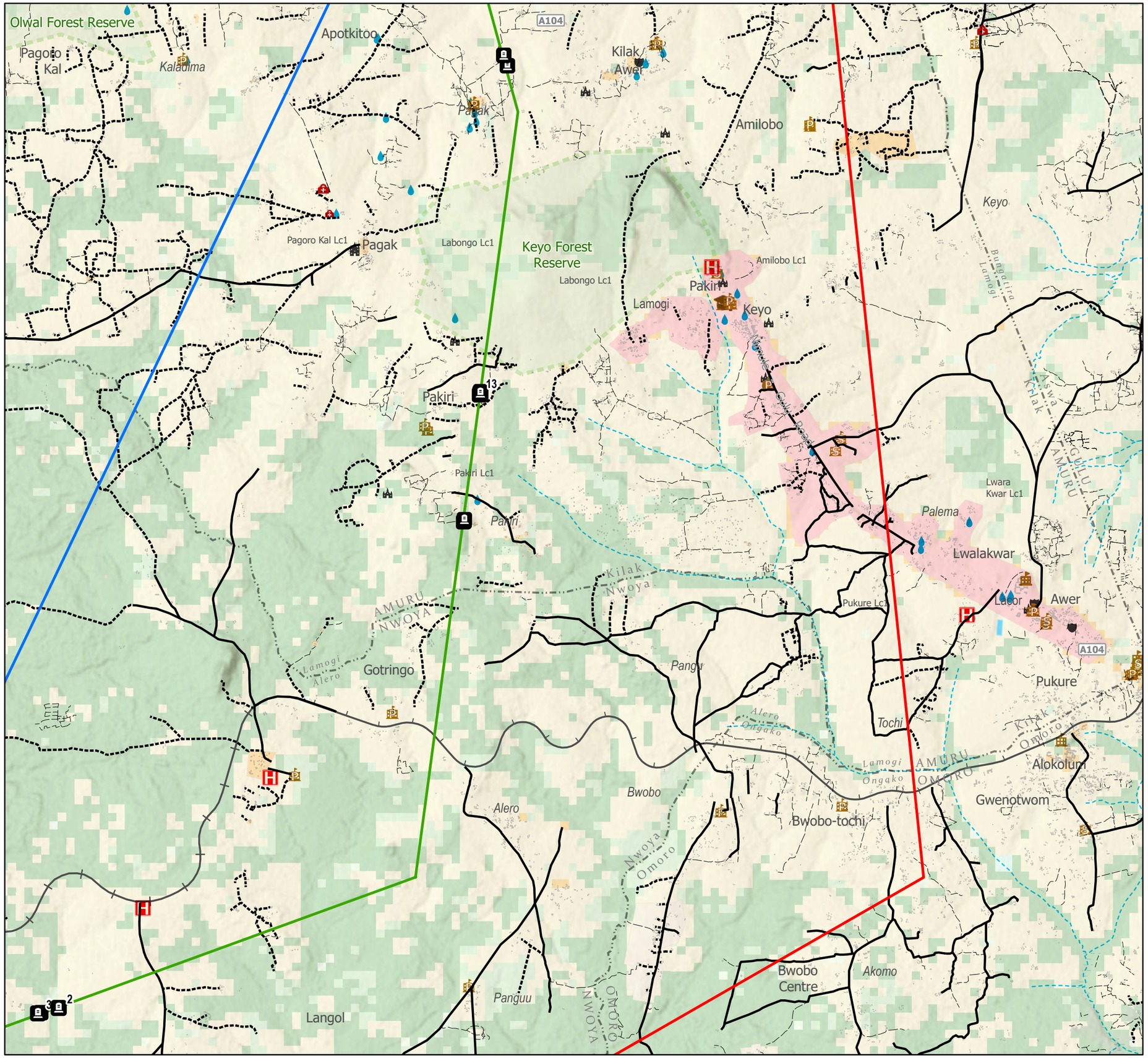
Uganda-South Sudan 400 kV Interconnection Line Project
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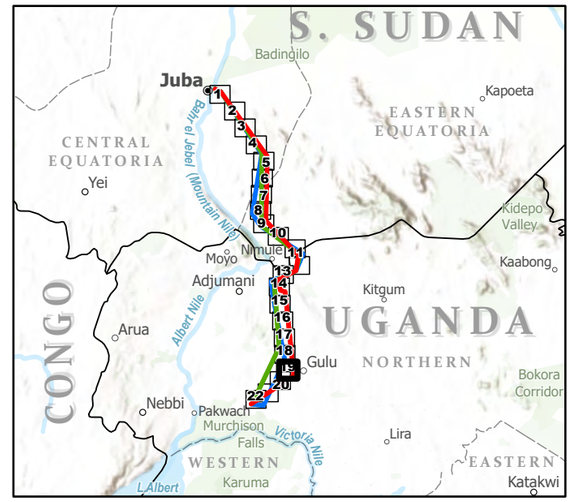
General Layout
Uganda - Sheet 18

1800-

Size A3

Scale 1:50,000





Borders
- Level 2

WDPA Protected areas
- Other categories

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Burial site

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest
- wetland

Land use (OSM)
- residential
- commercial
- farmland
- orchard
- forest
- reservoir

Points of interest (OSM)
- hospital
- doctors
- college
- upper secondary
- secondary
- primary
- school
- place of worship
- water point
- police station

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
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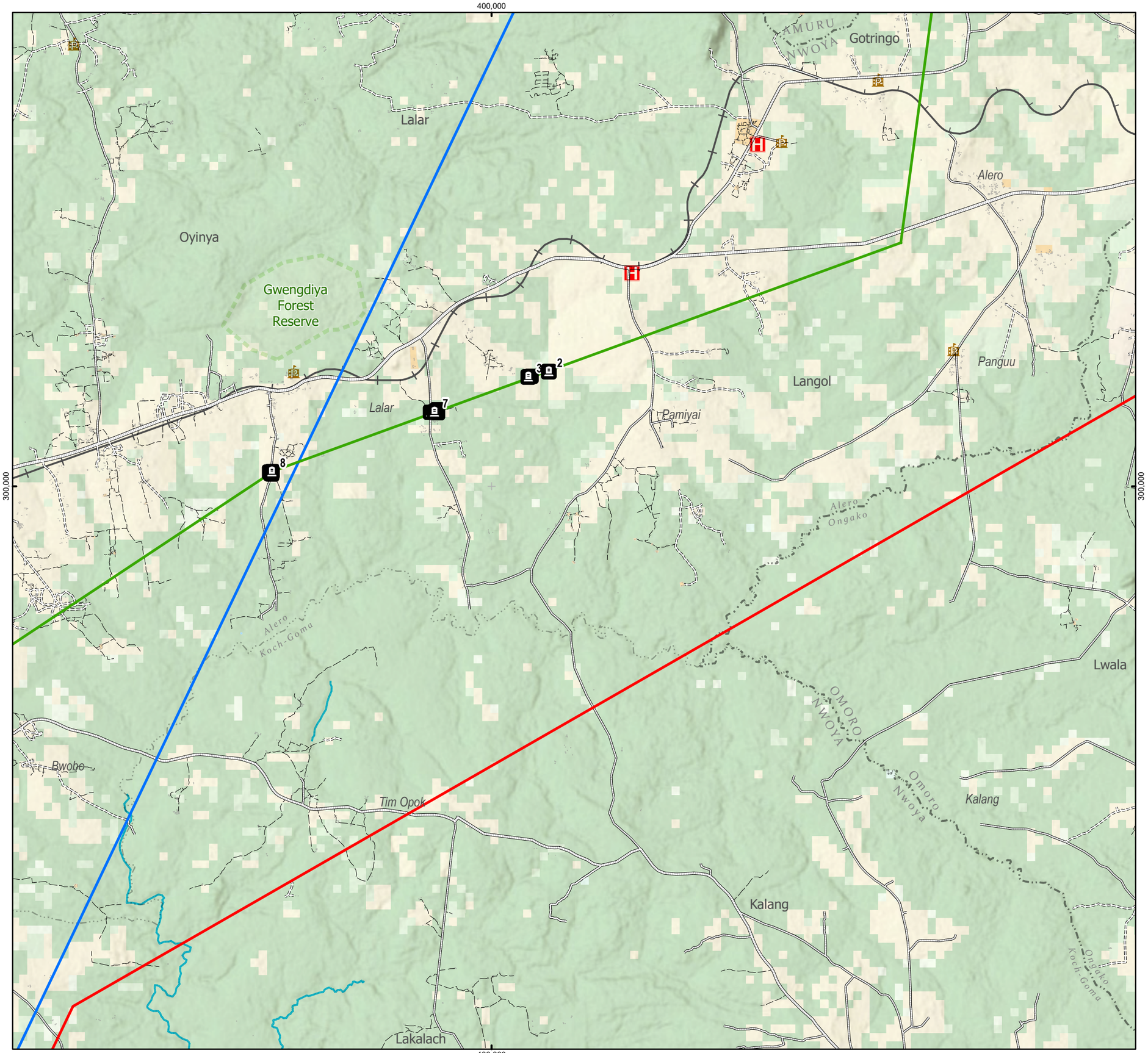
Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

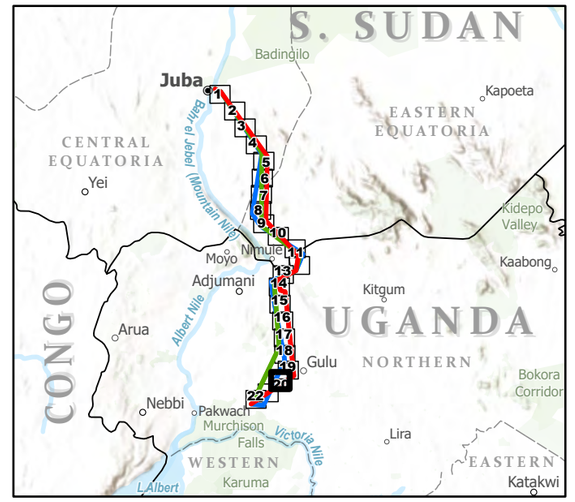
General Layout
Uganda - Sheet 19

1800-

Size A3

Scale 1:50,000





Borders
- Level 2
- Level 4

WDPA Protected areas
- Other categories

Routes
- Option 1
- Option 2 / SMEC
- Option 3

Points of interest
- Burial site

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest
- wetland

Land use (OSM)
- residential
- farmland

Points of interest (OSM)
- hospital
- primary

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
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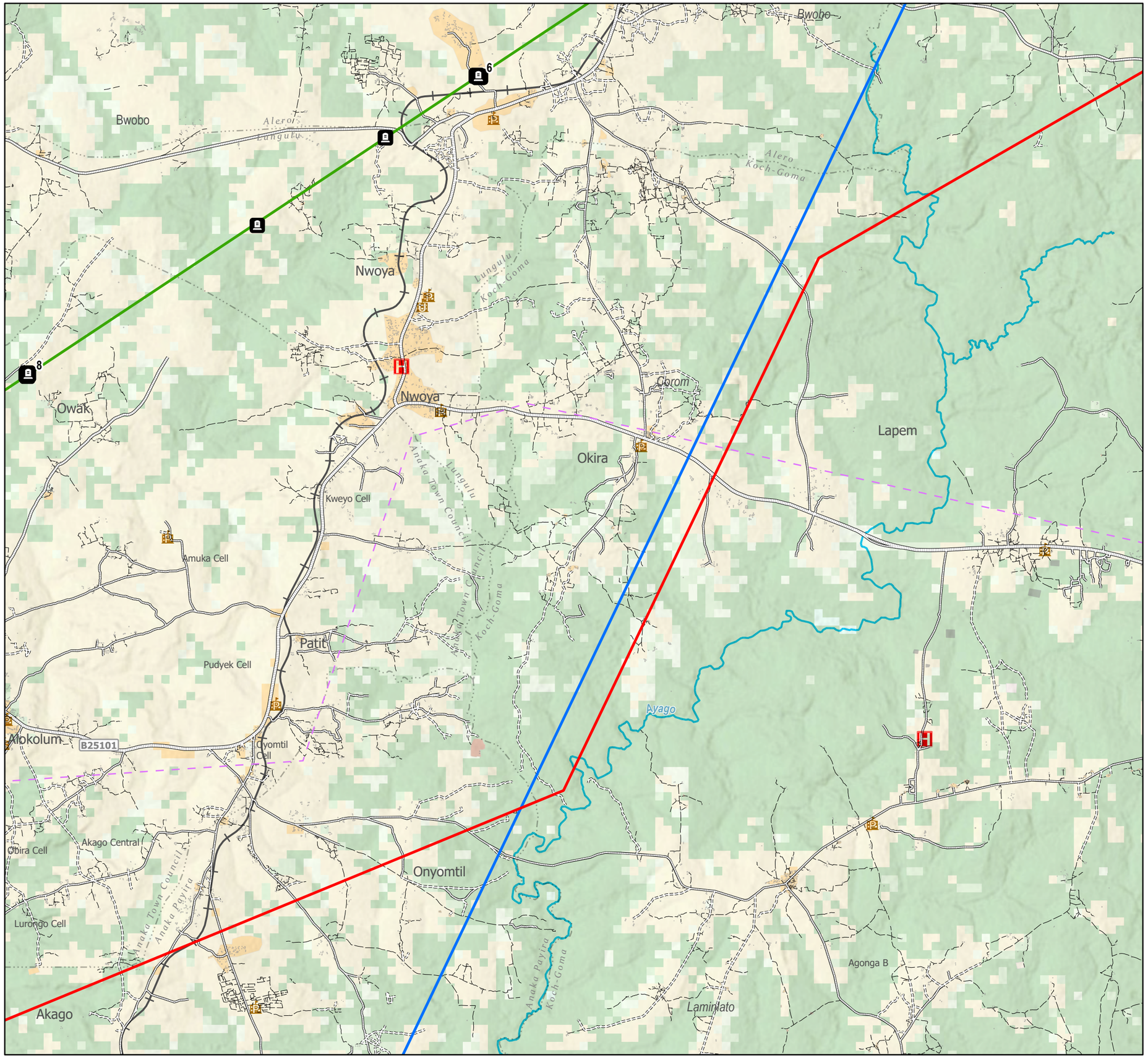
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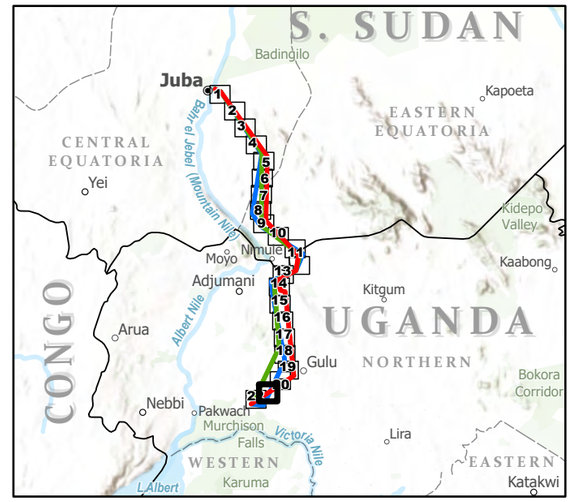
Uganda-South Sudan 400 kV Interconnection Line Project

Consulting Services for -----

General Layout
Uganda - Sheet 20

1800-	Size A3	Scale 1:50,000





Borders
- Level 4

Routes
- Option 1
- Option 2 / SMEC
- Option 3

National power grid
- Under construction

Points of interest
- Burial site

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest
- wetland

Land use (OSM)
- residential
- farmyard
- military
- farmland

Points of interest (OSM)
- hospital
- upper secondary
- secondary
- primary

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
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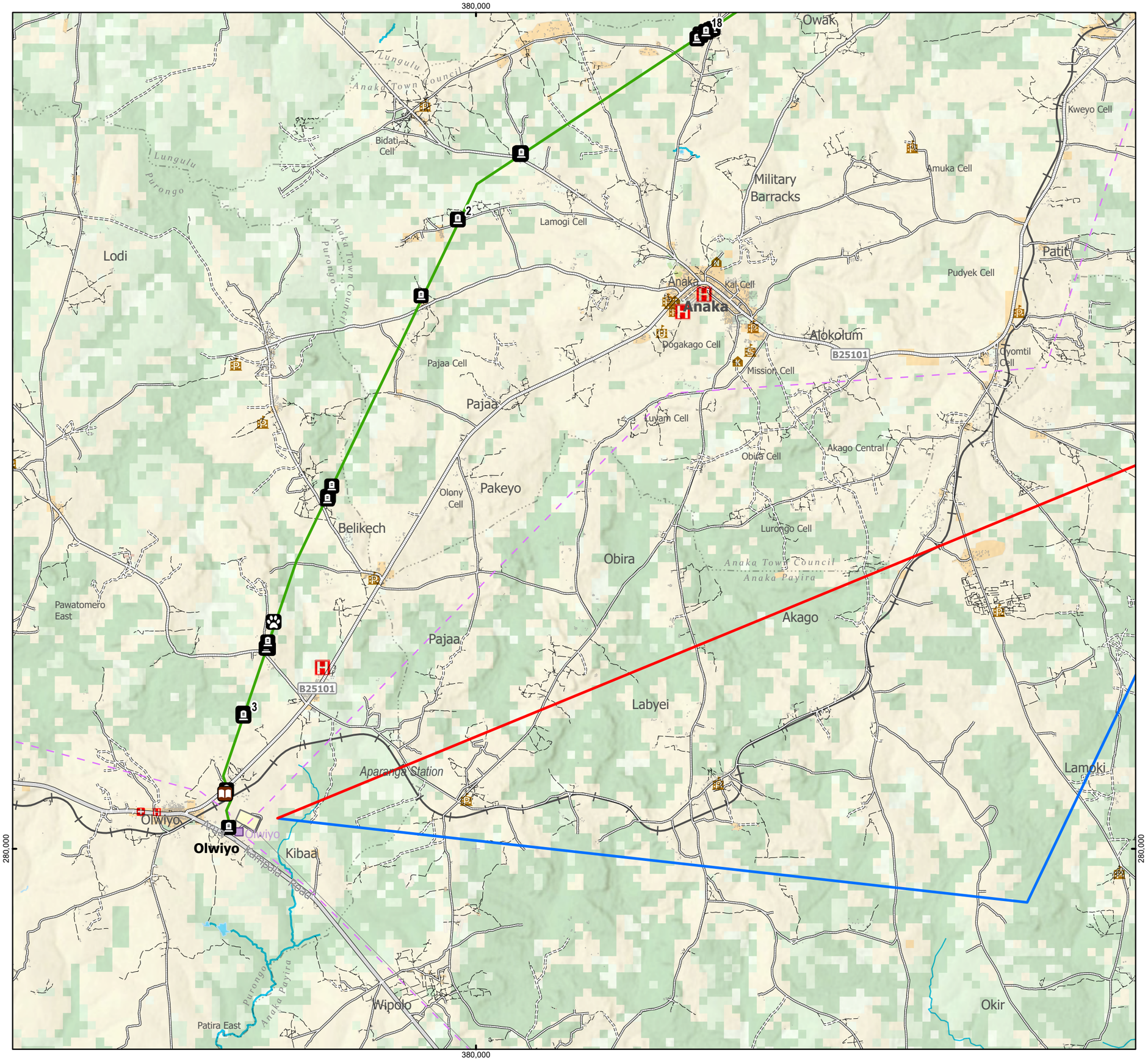
ELC Electroconsult · CESI Shaping a Better Energy Future · COLENCO · NELSAP-CU NILE BASIN INITIATIVE INITIATIVE DU BASSIN DU NIL

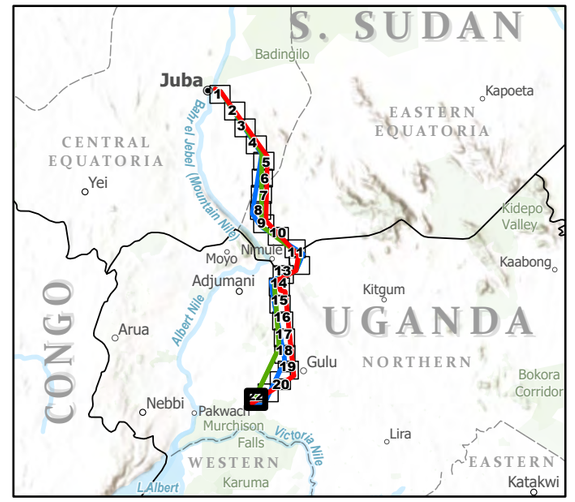
Uganda-South Sudan 400 kV Interconnection Line Project

Consulting Services for -----

General Layout
Uganda - Sheet 21

1800-	Size A3	Scale 1:50,000





Borders
- Level 4

WDPA Protected areas
- Other categories

Routes
- Option 1
- Option 2 / SMEC
- Option 3

National power grid
- Under construction

Points of interest
- Cultural site
- Burial site
- Animals enclosure

Copernicus land cover
- urbanized
- cultivated
- herbaceous
- shrubs
- forest

Land use (OSM)
- residential
- farmyard
- farmland

Points of interest (OSM)
- hospital
- clinic
- pharmacy
- upper secondary
- secondary
- primary
- kindergarten
- nursery

DRAFT

0 1 2 3 Kilometers

Coordinate system: WGS 1984 UTM Zone 36N
Map sources: Esri, NASA, NGA, USGS; Esri, USGS; OCHA; OpenStreetMap; UNEP-WCMC and IUCN (2023); Copernicus land cover

Rev	Description	Date	Drawn	Checked	Approved
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Uganda-South Sudan 400 kV Interconnection Line Project
Consulting Services for -----

General Layout
Uganda - Sheet 22

1800-	Size A3	Scale 1:50,000

22 ANNEX 9: FLORA AND WILDLIFE REPORTS (2024)

REPORT OF THE WILDLIFE SURVEY ALONG THE UGANDA-SOUTH SUDAN ELECTRIC TRANSMISSION LINE INTERCONNECTION

BY

THOMAS FRANCIS LADO

February, 2024

1. INTRODUCTION

Wildlife species are sensitive to changes in their environments. Thus many of which serve as indicators of habitat change. In most cases such changes tend affect them negatively thereby allowing the impact of developmental projects such as the Uganda-South Sudan Electrical Transmission Line on the environment and wildlife to be assessed.

Objectives of the Study

Generally this study intended to establish baseline condition for wildlife species (Mammals, birds, herpeto-fauna and arthropods especially endangered species and habitats). Specifically, this aimed to;

1. Determine species richness, diversity and distribution of mammals, birds, herpeto-fauna and arthropods along the proposed path of the line.

2. Identify rare and endangered species of mammals, birds, herpeto-fauna and arthropods along the proposed path of the line.

3. Determine biodiversity Hotspots and Sensitive Areas of mammals, birds, herpeto-fauna and arthropods along the proposed path of the line.

2. METHODOLOGY

2.1 The Site of the Study

The 163 km green-coloured optimal route selected (Fig. 1), passes through two States. The Central Equatoria and Eastern Equatoria States. The survey was undertaken along this proposed path. The habitat along this route is mainly made of savanna and patches of forest at various states of degradation sometimes interspersed by pockets of crop fields. 2. Locals in some instances were employed to assist and serve as a guide.

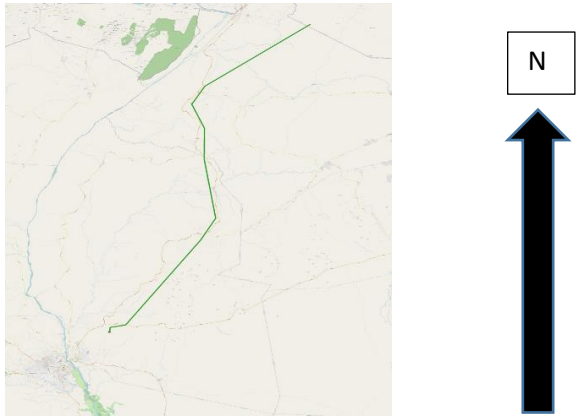


Figure 1: The selected green-coloured optimal route for the 163 km Electric Transmission Line

2.2 Sampling design and data collection

Transects and point counts methods were used to study wildlife along the transmission line. A total of 15 500m by 200m transects were used to collect information on presence of mammals, herpeto-fauna and arthropods. Within each of the 500m by 200m transect mammal, reptile, and arthropod species were identified based on signs of their tracks, burrows and scats or direct observation where applicable, and then an estimate of their abundance was made and noted down. In addition, for bird's presence and diversity, a 100m circular plot or point was located within each transect. At each point, birds were identified and their abundance as well as status assessed and noted down. For each transect and site the geographical coordinates were recorded using a GPS. Furthermore, noise level and weather condition at each transect site was recorded. Also at each transect site, site condition such as agricultural activity was assessed (Tab. 1).

Tab 1: Characteristics of Sampling sites/ transects and point counts for wildlife and bird species

Date	Transect	Location	Latitude	Longitude	Noise degree (in aac.)	Cloud cover	Rain	Wind
29.01.2024	T1	Nesitu substation	4° 43' 06 N	31° 43' 08 E	20240129174343	0-33%	No	Light
02.02.2024	T2	Nesitu	4° 41' 24 N	31° 45' 51 E	20240202181958	0-33%	No	Light
03.02.2024	T3	Siriri	4° 38' 49 N	31° 47' 35 E	20240203110416	0-33%	No	Light
	T4	Afodo-Checheri (Ngerjebe)	4° 33' 00 N	31° 51' 27 E	20240203153958	0-33%	No	Light
04.02.2024	T5	Near Aru-junction	4° 22' 06 N	31° 58' 30 E	20240204124629	0-33%	No	Light
	T6	Aru-junction (Camp)	4° 20' 44 N	31° 59' 12 E	20240204163145	0-33%	No	Light
	T7	Aru-junction2 (Camp)	4° 18' 12 N	32° 00' 01 E	20240204180742	0-33%	No	Light
05.02.2024	T8	Nyolo	4° 15' 15 N	31° 59' 33 E	20240205102857	0-33%	No	Light
	T9	Ayii	4° 12' 20 N	31° 59' 10 E	20240205132139	0-33%	No	Light
	T10	Kit2_Amee-junction	4° 06' 16 N	31° 58' 18 E	20240205152027	0-33%	No	Light
06.02.2024	T11	Moli Tokuro	4° 01' 58 N	31° 58' 20 E	20240206114854	0-33%	No	Light
	T12	Borangole	3° 57' 49 N	31° 57' 34 E	20240206133429	0-33%	No	Light
	T13	Kiripi	3° 54' 31 N	31° 56' 24 E	20240206153515	0-33%	No	Light
	T14	Pageri	3° 52' 18 N	31° 57' 37 E	20240206153515	0-33%	No	Light
07.02.2024	T15	Loa	3°51'03 N	31°58' E	20240207110639	0-33%	No	Light

2.3 Data Analysis

Species richness for aforementioned taxonomic groups separately was expressed as the number of species identified The software programme Estimate S was used to calculate Shannon diversity index for mammals and birds. In addition the same software was used to generate rarefaction curves mammals and birds each separate to estimate the expected number of species if sampling were complete. Presence of species in each transect site was used to determine the abundance and distribution of mammals and birds. The IUCN red list data was used to assess the conservation status of each species.

3 RESULTS

3.1 Species diversity and distribution of mammals

A total of 16 mammal species were recorded across the 15 transects and sites. The estimated Shannon diversity index was 2.48. However rarefaction curve put the number of species at 20 (Fig. 2)

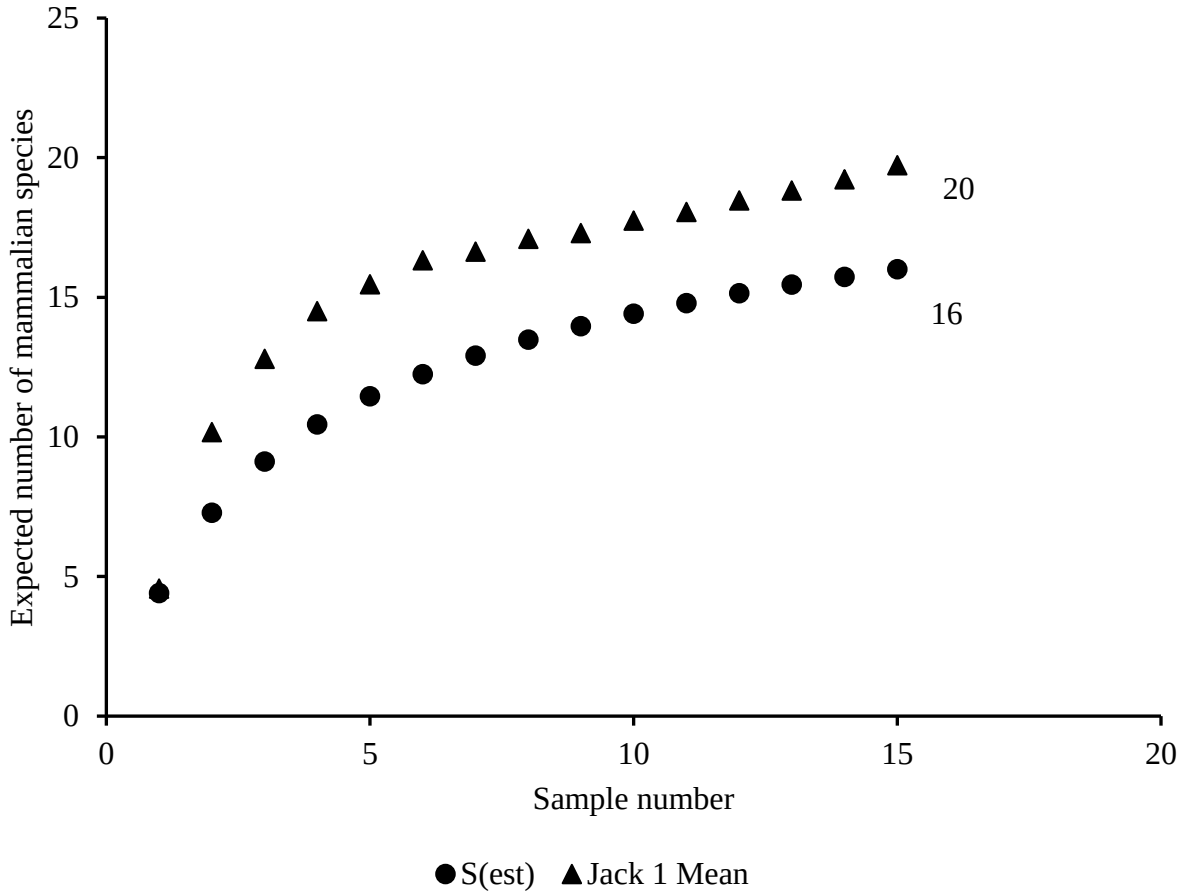


Figure 2: Rarefaction curve of expected number of mammal species in the study area

The most abundant species were *Sylvicapra grimmia, Lepus microtis, Tragelaphus scriptus, Cryptomys ochraceocinerus* and *Hystrix cristata*. Out of the 16 mammal species observed, 8 species were observed in transect7 (Aru-junction2), followed by transects4 (Afodo-Checheri,_Ngerjebe) and 11 (Moli Tukuro) each with 7 species, and transect12 (Borangole) with 6 species (see Tab. 1; Tab. 2). Two species were near threatened *Eidolon helvum* and *Loxodonta africana.*

Table 2: Mammal Species Richness Abundance Distribution IUCN Category

Scientific name	Abundance	Distribution across habitats															IUCN category
		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	
Sylvicapra grimmia	A	3	0	2	2	0	3	3	0	0	0	0	4	0	5	4	LC
Lepus microtis	A	3	0	5	0	3	0	3	0	3	3	0	3	0	3	0	LC
Taterillus emini	O	3	3	0	0	0	0	4	0	0	0	0	0	0	0	0	LC
Cricetomys gambianus	C	3	3	0	4	0	0	4	0	0	2	3	0	0	3	0	LC
Phacochoerus africanus	R	0	0	0	2	0	0	0	0	0	0	3	0	0	0	0	LC
Thryonomys gregorianus	O	0	0	0	4	0	5	0	0	0	0	0	0	0	0	0	LC
Syncerus caffer caffer	R	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	LC
Tragelaphus scriptus	A	0	0	0	3	0	0	3	3	0	0	4	4	4	0	5	LC
Papio anubis	C	0	0	0	4	0	0	0	0	0	3	0	0	0	0	2	LC
Mastomys sp.	F	0	0	0	0	4	5	4	0	3	0	0	0	0	0	0	LC
Cryptomys ochraceocinerus	A	0	0	0	0	0	4	4	4	0	0	4	4	3	0	3	LC
Hystrix cristata	A	0	0	0	0	0	4	4	0	4	4	0	3	3	3	3	LC
Manis temminckii	R	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	LR
Xerus erythropus	R	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	LC
Eidolon helvum	R	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	NT
Loxodonta africana	R	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	NT

Least concern (LC), Lower risk (LR), and Near threatened (NT) according to the IUCN Red List.

3.2 Species diversity and distribution of birds

A total of 42 bird species were recorded across the 15 transects and sites. The estimated Shannon diversity index was 2.83. However rarefaction curve put the number of species at 61 thereby suggesting sampling was incomplete (Fig. 3)

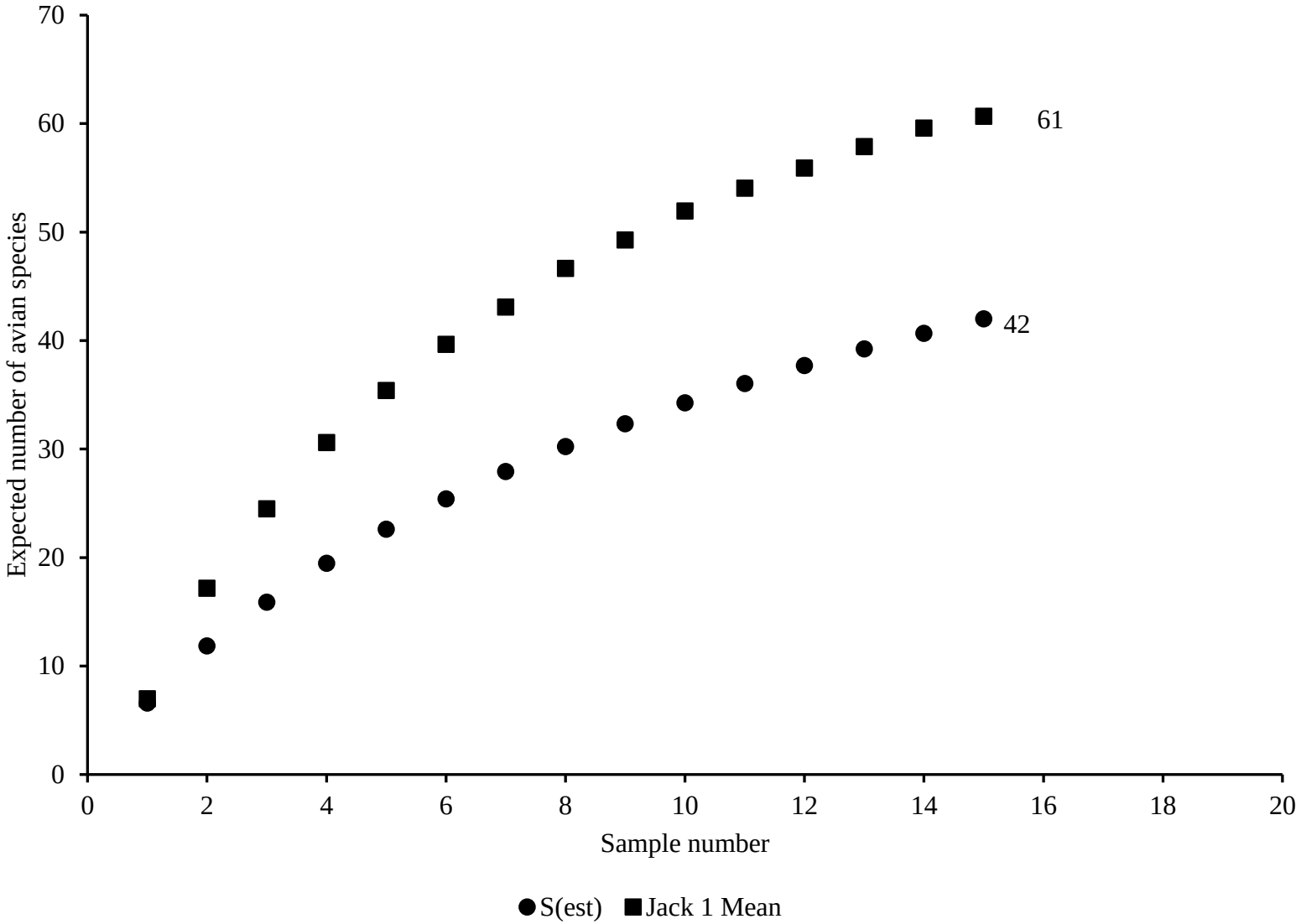


Figure 3: Rarefaction curve of expected number of bird species in the study area

The most abundant bird species were *Ploceus cucullatus*, *Pyncnonotus barbatus*, and *Alcedo cristata* with 165, 55 and 50 individuals respectively. Three Palearctic migrant species *Oenanthe oenanthe* recorded in transect2 (Nesitu) and transect3 (Siriri), *Oriolus oriolus* observed in transect3 (Siriri) and *Lanius senator* recorded in transect12 (Borangole) used the study area as a stopover. *Cryptomys ochraceocinerus* and *Hystrix cristata*. Out of the 42 bird species observed, most species (11) were observed in transect8 (Nyolo area), followed by transects6 (Aru-junction) and transect14 (Pageri) each with 9 species, and transect5 (near Aru-junction) and transect13 (Kiripi) each with 8 species. No endangered birds were observed in the study area (Table 3).

Table 3: Avian species abundance and distribution across habitats in the study area

	Abundance	Distribution across habitats															Status	IUCN category
Scientific name		H 1	H 2	H 3	H 4	H 5	H 6	H 7	H 8	H 9	H 10	H 11	H 12	H 13	H 14	H 15		
Streptopelia vinacea	33	3	1	2	0	12	5	3	0	0	0	0	0	2	5	0	Resident	LC
Cinnyris pulchellus	17	1	1	0	0	1	0	0	2	2	10	0	0	0	0	0	Resident	LC
Oenanthe oenanthe	**3**	**0**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**Migrant**	**LC**
Pyncnonotus barbatus	55	0	0	6	0	4	15	2	11	6	0	0	3	0	3	5	Resident	LC
Oriolus oriolus	**3**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**Migrant**	**LC**
Merops nubicus	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	Resident	LC
Lybius rubifacies	4	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	Resident	LC
Laniarius erythrogaster	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	Resident	LC
Alcedo cristata	50	0	0	0	50	0	0	0	0	0	0	0	0	0	0	0	Resident	LC
Cisticola chiniana	5	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	Resident	LC
Turtur abyssinicus	7	0	0	0	2	0	3	0	0	0	0	0	0	0	0	2	Resident	LC
Ploceus cucullatus	165	0	0	0	80	0	50	0	0	0	15	0	0	0	20	0	Resident	LC
Cisticola brachypterus	13	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	Resident	LC
Halcyon leucocephala	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	Resident	LC
Tchagara senegalus	10	2	0	0	0	2	2	1	0	0	2	0	1	0	0	0	Resident	LC
Tockus erythroynchus	6	0	0	0	0	2	0	0	0	0	0	0	1	3	0	0	Resident	LC
Turdoides plebejus	38	0	0	0	0	6	0	0	5	8	0	0	8	8	3	0	Resident	LC
Uraeginthus bengalus	16	0	0	0	0	0	8	0	0	0	8	0	0	0	0	0	Resident	LC
Ardea melanocephala	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	Resident	LC
Colius striatus	30	0	0	0	0	0	20	0	10	0	0	0	0	0	0	0	Resident	LC
Cisticola erythrops	8	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	Resident	LC
Lamprotornis caudatus	6	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	Resident	LC
Crinifer zonurus	4	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	Resident	LC
Turaco leucolophus	10	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	Resident	LC
Treron waalia	7	0	0	0	0	0	0	0	5	0	0	0	0	0	2	0	Resident	LC
Cisticola ruficeps	17	0	0	0	0	0	0	0	2	0	0	3	6	6	0	0	Resident	LC
Ispidina picta	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	Resident	LC
Dicrurus adsimilis	4	0	0	0	0	0	0	0	2	1	1	0	0	0	0	0	Resident	LC
Numida meleagris	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	Resident	LC
Cisticola sp.	4	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	Resident	LC

Polyboroides typus	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	Resident	LC
Milvus aegyptius	6	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0	Resident	LC
Ptermistis squamatus	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	Resident	LC
Lanius senator	***35***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**0**	**0**	**0**	**Migrant**	**LC**
Spermestes cucullata	27	7	0	0	0	0	0	0	0	0	0	0	7	0	13	0	Resident	LC
Lagonosticta senegala	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	Resident	LC
Dendropicos goertae	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Resident	LC
Batis molitor	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Resident	LC
Laniarius aethiopicus	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Resident	LC
Myrmecochla nigra	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	Resident	LC
Cisticola lateralis	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	Resident	LC
Chalcomitra amethystina	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Resident	LC

3.3 Species diversity and distribution of reptiles and arthropods

A total of five reptile observed in the area 2 snake species, and 3 lizard species a skink Eurepes sp. and two Agama sp1. And Agama sp2. Different species of grasshoppers, crickets and butterflies were also seen but not photographed.

4. LIMITATIONS OF THE STUDY

The study was done for seven days due to issues beyond control and as such some sites could not be visited. Ideally sampling should have been done for two weeks work or at over both seasons dry and wet not just dry season alone.



Scanned by TapScanner



Scanned by TapScanner













NOISE - NORMAL 20240207110639

Transects wildlife

Name & surname	Thomas Lado	Date	07.02.2024
Weather (circle)	Cloud cover: 0-33% / 33-66% / 66-100%; Rain: no rain / drizzle / rain; Wind: no wind / light wind / strong wind	Macrohabitat type	Savanna
		Time start	9:18 am
		Time end	10:18 am
Location	Loa	Transect ID	WL Loa - T1
GPS coordinates (lat.lon)	8°51'03 N	31°58 E.	Photo taken? (circle): Yes / No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Bushbuck	A			F	
Common duiker	C			F	✓ F
Bragina	F			F	
Mole rat	F			F	
Otto Baboon	O			VO	

NOTES: * - Butterflies
- Crickets
- Grasshoppers

NOISE - NORMAL - 20240206153515

Transects wildlife

Name & surname	Thomas Lado			Date	06.02.2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	(0-33%)	(no rain)	no wind				
	33-66%	drizzle	(light wind)	Time start	3:40 pm	Time end	4:40 pm
	66-100%	rain	strong wind				
Location	Pageri		Transect ID	WL-Pageri-T4	Photo taken? (circle)		
GPS coordinates (lat,lon)	3°52'18 N		31°57'37 E		(Yes)	No	

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Idnicka	A			F	
Porcupine	C			F	
~~Ht~~	F		F		
hare	F			VO	

NOISE – NORMAL 20240206153515

Transects wildlife

Name & surname	Thomas Lado	Date	06.02.2024
Weather (circle): Cloud cover: (0-33%) / 33-66% / 66-100%; Rain: (no rain) / drizzle / rain; Wind: no wind / (light wind) / strong wind		Macrohabitat type	Savanna
		Time start	1:30 pm
		Time end	2:50 pm
Location	Kinépi	Transect ID	WL Kinépi – T3
GPS coordinates (lat.lon)	3°57'31 N	31°56'24 E	Photo taken? (circle): (Yes) / No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Bushbuck	C			F	
Porcupine	F			F	
Mole rat	F			F	

NOTES: * Elephant tracks seen. * Giraffe tracks seen, observed walking.

* - Butterflies
- Crickets
- Grasshoppers

Bongole NOISE – NORMAL 2024020613342 9

Transects wildlife

Name & surname	Thomas Lodu	Date	06.02.2024

Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	0-33%	no rain	no wind				
	(33-66%)	drizzle	light wind	Time start	11:50 am	Time end	12:50 pm
	66-100%	rain	strong wind				

Location	Borongole Moki-Tokyo	Transect ID	LS_MokiTokyo_T2	Photo taken? (circle)	
GPS coordinates (lat.lon)	3°57'49 N	31°57'34 E		Yes	No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Bushbuck	C			F	
Hare	F			F	
Lynx	R				✓ F
Duiker	C	F			
Molerat	C		F		
Porcupine	F			F	

NOTES: * Butterflies
Midges

NOISE - NORMAL 2024 02 06 11 48 54

Transects wildlife

Name & surname	Thomas Lado	Date	06-02-2024

Weather (circle)	Cloud cover	Rain	Wind
	0-33%	no rain	no wind
	33-66%	drizzle	light wind
	66-100%	rain	strong wind

Macrohabitat type	Savanna		
Time start	10:05 am	Time end	11:05 am
Location	Mola-Tokyo	Transect ID	WR_MolaTokyoB-T1
GPS coordinates (lat.lon)	4°01'58 N	31°58'20 E	Photo taken? (circle): Yes / No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Pangolin	C	—		F	
Warthog	F	F			
Bushbuck	C			F	
Mola rat	C		VO		
Striped Squirrel	F				VF
Montane rat	F		F		

NOTES: * Fresh settlement + farms
x. Antelopes

Nest - Animal = 20240205 152027

Bird populations survey - Point Count

Name & surname	Thomas Lado			Date	05-02-2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	1:37 pm	Time end	2:37
	66-100%	rain	strong wind				
Location	Kit2 - Aneej Jade			Point ID – Transect ID	Wau KitzAneej-T3	Photo taken? (circle)	Yes / No
GPS coordinates (lat.lon)	4° 06'16 N			31°58'18 E			

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Praying	F	F	F	
Marabou	F	P		
Abyssinian hoopoe	F	—	F	
Black Bee eater	F	—	—	✓F

NOTES:

* - Wood collection
- Charcoal production
- Praying - Kasuwa
* - Butterflies
- Grasshopper
- Beetles
- Mantis
* Cricket

BREEDING CODES	
1=presence in breeding habitat	5=evidence of nesting (nest, carrying food, distraction, alarm...)
2=singing male or other breeding sound	6=newly fledged juvenile (+ accompanying adults)
3=pair in breeding habitat	F=flying high over
4=territory (2 breeding obs. 1 week apart)	P=non-breeder using habitat

Noise - Normal = 20240205132139

Transects wildlife

Name & surname	Thomas Ludo			Date	05-02-2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	11:38 am	Time end	12:38 pm
	66-100%	rain	strong wind				
Location	Ayii		Transect ID	Wb Ayii - T2		Photo taken? (circle)	
GPS coordinates (lat,lon)	4°12'20 N		31°59'10 E			Yes	No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Porcupine	C	F		C	—
Monkey sp	P	F	—	—	—
African tree hare	E	—	—	F	—
Porcupine etc					

NOTES: X - Count of ...
- Many small-sized trees
- Termite mounds
- ...

NOISE – NORMAL = 2024 02 05 1028 57

Transects wildlife

Name & surname	Thomas Lado			Date	05-02-2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	0-33%	(no rain)	no wind				
	(33-66%)	drizzle	(light wind)	Time start	8:35am	Time end	7:55am
	66-100%	rain	strong wind				
Location	Nyolo		Transect ID	WL Nyolo-T1	Photo taken? (circle)		
GPS coordinates (lat.lon)	4°15'15 N		31°59'33 E		(Yes)	No	

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Mole rat	C	–	F	–	–
Porcupine	F	F	F	–	–
Bushbuck	F	–	–	F	–
Shrub hyrax					
Agama Sp.					

NOTES:

* – Farms, tree felling & charcoal production

** – Crickets.

– Grasshoppers

– Butterflies

NOISE-NORMAL = 20240[illegible]1807 42

Transects wildlife

Name & surname	Thomas Ledo	Date	04.03.2024

Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	(0-33%)	no rain	no wind				
	33-66%	drizzle	light wind	Time start	4:20pm	Time end	5:20pm
	66-100%	rain	strong wind				

Location	Farm - Tomatoes	Transect ID	ML Lake Area - T3	Photo taken? (circle)	
GPS coordinates (lat,lon)	4°18'12 N	32°00'07 E		(Yes)	No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Mole rat	C	F	F	F	—
Grasshopper	F	—	—	F	—
Rodent rats	C	F	F	—	—
Porcupine	F	—	—	F	—
Reedbuck	F	—	—	F	—
Mice - Rare	F	—	—	F	—
Unidentified Snakes (Unidentified)	O	F	—	—	—
Common Duiker	F	—	—	F	—
Agama Lizard sp.	C	—	—	—	F ✓

NOTES: - Farms - Sorghum

- Rodent rats from Mole rat and chemical spraying

Noise Level/Animal = 20240207163145

Transects wildlife

Name & surname	Thomas Ladu	Date	04.02.2024

Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna – Farms		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	14:45 pm	Time end	15:45 pm
	66-100%	rain	strong wind				

Location	Arua – Junction	Transect ID	NLSEE-Anji-T2	Photo taken? (circle)	
GPS coordinates (lat.lon)	4°20'44 N	31°59'12 E		Yes	No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Cane rat	A			F	
Common duicker	F			O	
Mastomys rat	A		F	—	
Mole rat	C		F	—	
Porcupine	C	F	F	F	
Pouched rat					

NOTES: * - Honey bees, butterflies, grasshopper ** - Farming in the area.
- Cockatoo

Transects wildlife

Name & surname	Thomas Lado	Date	04/02/2024

Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Wooded grassland (Savanna)/Farms + guinea
	(0-33%)	(no rain)	no wind		
	33-66%	drizzle	(light wind)	Time start	11:10 am
	66-100%	rain	strong wind	Time end	12:10 pm

Location	Near Aba-Junction	Transect ID	NAJ-T1	Photo taken? (circle)	
GPS coordinates (lat.lon)	4°22'06 N	31°58'80 E		(Yes)	No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
African Savanna hare	F	–	–	F	–
Marabou stork	C	–	F	–	–

NOTES:

* - Wooded grassland, pockets of grasslands, burnt areas & charred ma
- Termite mounts,
- Farms
- quessing

NOISE- NORMAL - 20240302153958

Transects wildlife

Name & surname	Thomas Lado			Date	03.02.2024
Weather (circle)	Cloud cover: (0-33%) / 33-66% / 66-100%	Rain: (no rain) / drizzle / rain	Wind: no wind / (light wind) / strong wind	Macrohabitat type	Forest - Woodland Savanna
				Time start	2:20 pm
				Time end	3:20 pm
Location	Afodo - Checheri	Transect ID		Lok-Ng-Afodo2	Photo taken? (circle): (Yes) / No
GPS coordinates (lat.lon)	4°33'00 N	31°51'27 E			

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
~~Common duiker~~	P	–	–	O	–
~~common warthog~~	O	F	O	–	–
Cane rat	C	F	–	–	–
Male Rats	C	–	F	–	–
~~Painted Reedbuck~~ rat	O	–	–	VO	–
~~Male~~ Buffalo	O	VO	–	–	–
Bushbuck	F	–	–	F	–
Olive Baboon	C	F	–	–	F ✓
Mastomy rat					

NOTES: *H_2O sample from Migun stream
Python - salt-dry + meat
Ngangfebe - Bamen - Afodo - Checheri area

** - Tall trees / pockets of forest along a stream
- Tree felling.

*** Butterflies
Crickets.
Grasshoppers

Note = Normal [illegible]

Transects wildlife

Name & surname	Thomas Lado			Date	03.02.2024
Weather (circle)	Cloud cover: (0-33%) / 33-66% / 66-100%	Rain: (no rain) / drizzle / rain	Wind: (no wind) / (light wind) / strong wind	Macrohabitat type	SAVANNA
				Time start	9:28 am
				Time end	10:20 am
Location	Simri-Lokiji	Transect ID	Slot 1	Photo taken? (circle)	Yes / (No)
GPS coordinates (lat.lon)	4°38'49 N	31° 47'35 E			

Fill with: **F** if Fresh (1-2 days), **O** if Old (3 days to 1 week), **VO** if Very Old (> 1 week)

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Guinea duiker	O			O	—
African hare	A			O	—

NOTES: * - Butterflies — Burnt area with many small trees
- Grasshoppers
- Beetles — Charcoal production taking place = like ours

AEOISE:-NORMAL=20240202181958

Transects wildlife

Name & surname	Thomas Ladu			Date	02-02-2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	4:45	Time end	5:45
	66-100%	rain	strong wind				
Location	Nearest South 60 & 2 km to Lw Uelu			Transect ID	OMSPS2	Photo taken? (circle)	
GPS coordinates (lat.lon)	4°41'24 N		31°45'51 E.			Yes	No

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (> 1 week)					
Multimammate rat	F		VO		

NOTES:

* - Burnt area with many small stem trees.
- Charcoal production & tree felling observed = Human agent.
- Patches of grasses.
- Very few big size trees.

NOISE- NORMAL = 2024012917 43

Transects wildlife

Name & surname	THOMAS LADO			Date	29.01.2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	SAVANNA		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	4:15PM	Time end	5:15PM
	66-100%	rain	strong wind				
Location	NESTLE SUBSTATION		Transect ID	INSS4T		Photo taken? (circle)	
GPS coordinates (lat,lon)	2088480.082N	357663.26275E			Yes	No	

Species	Abundance	Tracks	Burrow	Scats	Direct observation or other
Fill with: F if Fresh (1-2 days), O if Old (3 days to 1 week), VO if Very Old (>1 week)					
Common duiker	3(F)	F	—	F	—
African Savanna hare	F	●	—	O	—
Varanid/Monitor lizard - road kill	●O	—	—	—	Direct observation

NOTES:
* - HUMAN ACTIVITY IN AREA WAS QUITE VISIBLE. MAINLY TREE FELLING AND CHARCOAL MAKING.
- DOMINANT HABITAT - COMBRETUM INTERSPERSED PATCHES OF COMBRETUM PATERNIFERA. SMALL SIZED TREES
- TALL TREES OF KHAYA SENEGALENSIS ALONG THE DRY STREAM.

- NO H_2O SAMPLE COLLECTED AS THE STREAM WAS DRY.
- Habitat type runs along the entire length of the transect.

* - Crickets
- Grasshoppers
- Butterflies

Noise - normal 20240207 110639.

Bird populations survey - Point Count

Name & surname	Thomas Laalu			Date	27-02-2024
Weather (circle)	Cloud cover: (0-33%) / 33-66% / 66-100%	Rain: (no rain) / drizzle / rain	Wind: no wind / (light wind) / strong wind	Macrohabitat type	Savanna vegetation
				Time start: 9:18a	Time end: 10:18 am
Location	Lab		Point ID – Transect ID	Birds T1	Photo taken? (circle) Yes / No
GPS coordinates (lat.lon)	3°51'03 N		31°58 E		

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Brown Babbler	7	1		
Scarlet chested sunbird	1	1		
Common bulbul	5	1		
black billed wood dove	2	1		

NOTES:

BREEDING CODES	
1=presence in breeding habitat	5=evidence of nesting (nest, carrying food, distraction, alarm...)
2=singing male or other breeding sound	6=newly fledged juvenile (+ accompanying adults)
3=pair in breeding habitat	F=flying high over
4=territory (2 breeding obs. 1 week apart)	P=non-breeder using habitat

Noise_normal_20240206153515

Bird populations survey - Point Count

Name & surname	Thomas Kadu	Date	06-02-2023
Weather (circle): Cloud cover: (0-33%) / 33-66% / 66-100%	Rain: (no rain) / drizzle / rain	Wind: no wind / (light wind) / strong wind	Macrohabitat type: Savanna
Location: Pagari	Point ID – Transect ID: T4	Time start: 3:40 pm	Time end: 3:40 pm
GPS coordinates (lat.lon): 3°52'18 N	31°57'37 E	Photo taken? (circle): Yes / No	

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
BTree Green Pigeon	2	1		
Common bulbul	5	1		
Northern Plantain Eater	1	1		
Bronze Mannikin	>13	1		✓
Cisticola ssp.	2	5		
Village weaver	>20	5		
Vinaceous dove	5	5		
Whistling Cisticola	3	1		✓

NOTES:

Title - normal = 20240206153515

Bird populations survey - Point Count

Name & surname	Thomas Kaelu			Date	06-02-2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savana		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	12:50 pm	Time end	2:50 pm
	66-100%	rain	strong wind				
Location	Korepi			Point ID – Transect ID	T2	Photo taken? (circle)	
GPS coordinates (lat.lon)	3°54'31 N			31°56'24 E		Yes	No

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Common bulbul	3	1		
Red Headed Cisticola	6	1		
Tchagara	1	F		
Helmeted Shrike	35	1		✓
Manakin	7	5		
Brown Babbler	8	1		✓
Horn bill	2			✓

NOTES:

Noise normal 2024 02 06 13 34 29

Bird populations survey - Point Count

Name & surname	Thomas Kadu	Date	06-02-2023

Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	(0-33%)	(no rain)	no wind				
	33-66%	drizzle	(light wind)	Time start	11:51 am	Time end	12:51 pm
	66-100%	rain	strong wind				

Location	Borongole	Point ID – Transect ID	T3	Photo taken? (circle)	
GPS coordinates (lat.lon)	3°57'49 N	31°57'34 E		Yes	No

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Common bulbul	03	1		
fire finch	02	1		
Horn bill	02	1		✓
Vinaceous dove	02	1		✓
Brown babbler	07	1		
African grey woodpecker	1	1		
Chinspot Batis	1	1		
Tropical Boubou	1	1		
Sooty chat	1	1		

NOTES:

Noise - Normal 20240206 11 48 54

Bird populations survey - Point Count

Name & surname	Thomas Lady	Date	06 - 02 - 2023

Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	~~Wo~~ Savanna.		
	0-33% ✓	no rain ✓	no wind				
	33-66%	drizzle	light wind ✓	Time start	10 05 am	Time end	11 · 05 am
	66-100%	rain	strong wind				

Location	Mbi - Tikum	Point ID – Transect ID	T_1	Photo taken? (circle)	
GPS coordinates (lat.lon)	4°01'58 N	31°58'20 E		Yes	No

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Spurfowl	2	1		
Eurasia golden oriole	1			✓
Rupel starling	4	F		✓
Red headed cisticola	3	5		

NOTES:

Noise - Normal 20240205152027

Bird populations survey - Point Count

Name & surname	Thomas Lady			Date	05/02/2023
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna
	0-33%	no rain	no wind		
	33-66%	drizzle	light wind	Time start	9:35 am
	66-100%	rain	strong wind	Time end	2:37
Location	Kit-2		Point ID – Transect ID	T1.	Photo taken? (circle) Yes / No
GPS coordinates (lat.lon)	4°06'16 N		31°58'18 E		

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Plantain Eater	2	1		
Turaco.	10	1		
Babbler	5			
Common bulbul	08			
Green pigeon	05	F		
Pistricola (Red headed)	02	5		
Common bulbul	03	2		
Beautiful sunbird	02	1		
King fisher	07	F		
Common Drongo	02	3		
Helmeted Guinea fowl	04	1		
Mouse birds	10	1		

NOTES:

NOTE - Normal = 20240205132139

Bird populations survey - Point Count

Name & surname	Thomas Lady			Date	05/02/2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	11:40 am	Time end	12:40 am
	66-100%	rain	strong wind				
Location	Ayii		Point ID – Transect ID	T2		Photo taken? (circle)	
GPS coordinates (lat.lon)	4°12'20 E		31°59'10 E			(Yes)	No

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
N-plaintain Eater	1	F		
common bulbul	2	1		
" "	4	f		
Beautiful Sun bird	2	1		
Cisticola ssp.	2	1		
African Harrier Hawk	1	1		
Brown Babbler	8	1		
Fork tailed drongo	1	1		

NOTES:

BREEDING CODES

1=presence in breeding habitat	5=evidence of nesting (nest, carrying food, distraction, alarm...)
2=singing male or other breeding sound	6=newly fledged juvenile (+ accompanying adults)

Noise Levels - Annual = 20240205102857

Bird populations survey - Point Count

Name & surname	Thomas Lady			Date	05/02/2024
Weather (circle)	Cloud cover: 0-33% ✓ / 33-66% / 66-100%	Rain: no rain ✓ / drizzle / rain	Wind: no wind / light wind ✓ / strong wind	Macrohabitat type	Savanna
				Time start	8:35 am
				Time end	9:35 am
Location	Nyoro		Point ID – Transect ID	T3	Photo taken? (circle): Yes / No
GPS coordinates (lat.lon)	4° 15' 15 N		31° 59' 33 E		

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Weaver bird (village)	15	1		
Yellow billed kite	03	1		
Common bulbul	08	1		
Tchagara	02	1		
Red cheeked Cordon blue	10	1		
Beautiful fun bird	02	1		
Barbet (black headed)	02	1		
Common brongo	02	1		

NOTES:

IMG20240204150742 - Normal

Bird populations survey - Point Count

Name & surname	Thomas Ladu			Date	04/02/2024
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna
	0-33%	no rain	no wind		
	33-66%	drizzle	light wind	Time start	4:20 pm
	66-100%	rain	strong wind	Time end	5:21 pm
Location	Aru Junction	Point ID – Transect ID		07	Photo taken? (circle)
GPS coordinates (lat.lon)	4°18'12 N		32°00'01 E		Yes / No

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Vinaceous dove	03	1	80 m	
Red-faced cuticola	04	1	~50 m	
Tchagara	01	1	~70 m	
Common bulbul	02	F		
Rappel Starlings	06	F		

NOTES:

BREEDING CODES	
1=presence in breeding habitat	5=evidence of nesting (nest, carrying food, distraction, alarm...)
2=singing male or other breeding sound	6=newly fledged juvenile (+ accompanying adults)
3=pair in breeding habitat	F=flying high over
4=territory (2 breeding obs. 1 week apart)	P=non-breeder using habitat

Note = Normal 20240204163145

Bird populations survey - Point Count

Name & surname	Thomas Lodu			Date	04/02/2024		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savannah		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start		Time end	
	66-100%	rain	strong wind				
Location	Arua Jun 2.	Point ID – Transect ID			Photo taken? (circle)		
GPS coordinates (lat.lon)	4°20'44 N	31°59'12 E.			Yes	No	

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Common Bulbul.	4	1		
Sun bird				
Cistricola	13	1		
Vinaceous dove	04	F		✓
King fisher (gray headed)	01	1		
Tchagara	02	1		
Hornbill	02	1		
Brown Babbler	06	II		
V. dove.	08.	1		

NOTES:

BREEDING CODES	
1=presence in breeding habitat	5=evidence of nesting (nest, carrying food, distraction, alarm...)
2=singing male or other breeding sound	6=newly fledged juvenile (+ accompanying adults)

Mouse Lewis - normal = 20240204 1B 07 42

Bird populations survey - Point Count

Name & surname	Thomas Lady			Date	04/02/2024
Weather (circle)	Cloud cover: 0-33% / 33-66% / 66-100%	Rain: no rain / drizzle / rain	Wind: no wind / light wind / strong wind	Macrohabitat type	Savana (Farms)
				Time start	Time end
Location	Near Ani	Point ID – Transect ID	T~	Photo taken? (circle)	Yes / No
GPS coordinates (lat.lon)	4°22'06 N	31°58'30 E			

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Common Bulbul	15	1	∠20	
Village weaver	>50	1	∠25m	
Red check Cordon blue	08	1		
Golcath Heron	01	1		
Ymaceus dove	05	1		
Black bill wood dove	03	1		
Mouse birds	>20	1		

NOTES:

BREEDING CODES

Noise - Normal 20240302153958

Bird populations survey - Point Count

Name & surname					Date	03/02/2024	
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Forest - Wooded savanna		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	2:20pm	Time end	3:20 pm
	66-100%	rain	strong wind				
Location	Afordo		Point ID – Transect ID		03	Photo taken? (circle)	
GPS coordinates (lat.lon)	4°33'00 N		31°51'27 E			Yes	No

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Northern Wheatear	1	P	20 m	
Ximeceous dove	7	3	30m	
Common Bulbul	6	1		
Eurasian Golden Oriole	2	P	100	
Northern Carmine Bee eater	2	P		
Black bellied Barbet	2	3		

NOTES:

BREEDING CODES	
1=presence in breeding habitat	5=evidence of nesting (nest, carrying food, distraction, alarm...)
2=singing male or other breeding sound	6=newly fledged juvenile (+ accompanying adults)
3=pair in breeding habitat	F=flying high over
4=territory (2 breeding obs. 1 week apart)	P=non-breeder using habitat

Noise = Normal = 20240203110416

Bird populations survey - Point Count

Name & surname	Thomas Laalu	Date	03.02.2024

Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	SAVANNA		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	9:20 am	Time end	10:20 am
	66-100%	rain	strong wind				

Location	Chedrani Siriyiri	Point ID – Transect ID	~~Station~~ T1	Photo taken? (circle)	Yes ✓ / No
GPS coordinates (lat.lon)	4°38'49 N	31°47'35 E			

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Gonolek	2	I		
Abdim Stork.	>50	F		
King fisher		F		
Eastcola (Rattling) sp	5	I		
Black Billed wood dove	2	I		
Village Weavers	>80	I		

NOTES:

Noise-Normal = 20240202181958

Bird populations survey - Point Count

Name & surname	Thomas Ladu			Date	02/02/2023		
Weather (circle)	Cloud cover	Rain	Wind	Macrohabitat type	Savanna		
	0-33%	no rain	no wind				
	33-66%	drizzle	light wind	Time start	4:45	Time end	5:45
	66-100%	rain	strong wind				
Location	Nesuti		Point ID – Transect ID	T2		Photo taken? (circle)	
GPS coordinates (lat.lon)	4°41'24 N		31°45'51 E			Yes ✓	No

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Northern Wheatear	2	D		
Blue cheek	2			

NOTES:

BREEDING CODES

1=presence in breeding habitat	5=evidence of nesting (nest, carrying food, distraction, alarm...)
2=singing male or other breeding sound	6=newly fledged juvenile (+ accompanying adults)
3=pair in breeding habitat	F=flying high over
4=territory (2 breeding obs. 1 week apart)	

NOISE-NORMAL = 20240129174343

Bird populations survey - Point Count

Name & surname	THOMAS LADO	Date	29.01.2024

Weather (circle)	Cloud cover	Rain	Wind
	(0-33%)	(no rain)	no wind
	33-66%	drizzle	(light wind)
	66-100%	rain	strong wind

Macrohabitat type	SAVANNA		
Time start	4:15 PM	Time end	5:15PM
Location	NESTLE SUBSTATION	Point ID – Transect ID	NSS44P1
Photo taken? (circle)	(Yes)	No	
GPS coordinates (lat.lon)	2088480.082N	357663.26275E	

Species (within 100 m radius)	Abundance	Breeding code	Distance (m.)	Ind. outs. 100m radius
Vinaceous dove	2	3	50 m	—
Vinaceous dove	1	F	"	—
Beautiful Sunbird	1	—	60	—

NOTES:

SAME AS FOR THE WILDLIFE TRANSECT.

Field report on Vegetation survey on proposed transmission line along Juba and Nimule road

Prepared by Okumu Clement Ilario Aliku

12/02/2024

Introduction

This report cover vegetation data collection conducted along the proposed transmission line Juba-Nimule road between 29/01/2024 and 07/2024. The survey took 6 days for data collection in the field. The survey covered two administrative counties namely Juba county, Lokiliri payam (Nsitu,Jebelin,Nyolo),Lobonk payam (Kit II),and Magwi county pageri payam (Ame junction,Moli (Moli Tokuro,Moli Auefuni),Kerepi (Borongole),Pageri and Arapi as detail in data sheet. The field activities faced challenges by delay in the arrangement for security escorts for the field activities which caused time constraints for timely data collection and as such the proposed 30 transects is not achieved and 15 transect survey were conducted.

Method

The methods used during vegetation data collection involved transect surveys, to systematically assess plant species along the proposed transmission line .During the selection of the location of the transect, several factors were considered to determine the location of the transects. First careful consideration was given to accessibility factors. This is because some areas along the transmission line is not accessible due insecurity and land mine risk. Additional consideration is given to habitat diversity, with special attention to sensitive habitats such as wetlands and riverine areas.

Before any transit is located, the communities and security personals along Juba –Nimule road is consulted for the safety of the area and as such the interval between the transect is not systematically equal to 2km as proposed early in the

methodology. The intervals between the transect varied due to the acessisibilty factors.

During data collection each transect was situated area near proposed transmission line proximity to the road to facilitate ease of implementation. At least 15 linear transects of 500 M was surveyed during data collection with 15 vegetation plots stationed at the beginning of each transects.

Activities

Vegetation plot sampling: Vegetation plot of 10x10M were positioned at the starting point of each 500M transects and vegetation data were collected in the plots. These include species name, DBH and High for trees, habit, abundance (% cover of the 10x10 m plot) and the use of the plants by locals were recorded on the data sheet. The species were identified with the help of field guide for trees and shrubs in the area. The species which failed to be identified in the field is referred to further identification in the lab. During species identification two consideration are made, woody plants less than 6 meters in height and plant with multi-stems are considered a shrub their DBH and height were not measured while woody plants with defined stem and height more than 6 meters were considered to be trees, their DBH and height were measured.

The percentage cover of within the plot is estimated by the use of standardized cover classes to estimate the abundance of species. The DBH and height of the trees were measured using diameter tape and height stick for small trees graduated in meters. The height of tall trees were estimated. The local communities along the Nimule-Juba highway are consulted for the uses of the trees by the local.

Transect Survey: In addition to vegetation plot, observation along the transect line was conducted by moving along the transect collecting data on plants, recording their habitat, any other environmental factors through observation and

this allow all Plant Species along the transect to be recorded while making observation: This includes trees, shrubs, grass and herbaceous species encountered along transect. When the precise location of each plant species may not be feasible, their presence and abundance were estimated within transect.

Abundance: The abundance of species within each plot along the transect were also estimated using standardized abundance classes

Main Habitat and Dominant Species: Moving along transect, observations were made regarding the macro-habitat, any dominant species and land use within each transect were all recorded on the data sheet while taking the photos.

GPS coordinate and location of the place were also recorded on the data sheet to allow easy identification of the place. The table 1 below summarised the plant species that were recorded during the data collection in the field.

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Table 1.Species detected along the proposed transmission line

S/No	Scientific name	Local name	IUCN category	Use by the community	Importance to the Environment	Remarks
01	Acacia Senegal	Hashab-Arabic,Orokopi-madi,Gum Arabic tree English	Least concern	Gum arabic	Shelter, fodder, nesting and soil fertility	The species abundant is not facing serious threaten
02	Acacia sieberiana	Asa-madi	Least concern	Firewood, construction	Nesting, fodder	The species abundant is not facing serious threaten
03	Acacia hokii	Oli-madi	Least concern	Firewood	Nesting, fodder	The species abundant is not facing serious threaten
04	Acacia polyacantha	Morogilo-madi	Least concern	Firewood, construction, medicine	Fodder,shelter,nesting	The species abundant is not facing serious threaten
08	Annona senegalesis	Africana custard app,English) ,(mvolo,madi)	Vulnerable	Fruits eaten	shade	The species is facing less threat in wild
09	Afzelia africana	)African maghony English),(Meli madi)	Vulnerable	Charcoal, firewood, construction	Shade, fodder	The species is facing less threat in wild
10	Alibizia glaberima	Ajimeli-Madi	Least concern	Firewood,caharcol, construction	shade	Facing threat from charcoal and tinber
11	Albizia coriaria	Oyo/Fofo-Madi	Least concern	Firewood, bark used for fishing, medicine	shade	The species abundant is not facing serious threaten

14	Burkea africana	Gili-madi	vulnerable	Firewood,	shade	The species not abundant, also facing less threat in wild
15	Boscisa salicifolia	Isebi-madi	Least concern	Firewood, construction	shade	No abundant and no facing serious threat
16	Borassus aethiopum	Itu-madi	Least concern	Fruit eaten, making canoes, construction	Fruits eaten by species like monkey elephant	Abundant and Facing less threat in the wild, protected by community
17	Combertum glutinosum	Mayi,madi	Least concern	Firewood, charcoal, construction, medicine		Abundant but facing serious threat from charcoal production
18	Combertum molle	Luceri	Least concern	Firewood, charcoal, construction	shade	Abundant but facing serious threat from charcoal production
19	Combertum hartmannianum	mayi	Vulnerable	Firewood, charcoal, construction, medicine	shade	Abundant species but facing lthreat from charcoal production in wild
20	Combertum collinum	Otubi/Itubi,madi	Abundant	Firewood, charcoal, construction, medicine	shade	Abundant, the species is facing serious threat due charcoal production
21	Combretum molle	Velvet bushwillow-English,Luceri-Madi	Least concern	Firewood, charcoal, construction	shade	Abundant, the species is facing serious threat due charcoal production
22	Carissa edulis/Carissa spinarum	Blackberry-English/Uba-Madi	Endangered	Fruits eaten	shade	The species facing high risk of extinction in the near future

23	Dalbergia melnoxylon	African black wood english,Poyi-madi	Near threatened	Construction, making walking sticks	Cover for animals	The species facing medium extinction threat in the wild
24	Daniellia oliveri	Masa-madi	Least concern	construction	Leaves brosed by animals,shade,and fruits eaten by animals	Abundant facing last risk
25	Diospyros mespiliformis	ackalberry, African ebony English/Dumu-madi	Least concern	Fruits eaten, construction	Fruits eaten by birds,animals	Abundant facing less risk, protected by community
30	Ficus platyphylla	(Jumerz,abuleben Arabic),(Boko,madi)	Least concern	Firewood	Fruits eaten by birds and animals,shade	Abundant facing less risk
31	Ficus papulifolia	(Jumeriz Arabic),(Boko,ago)	Least concern	Firewood	Fruits eaten by birds ,animals and shade	Abundant facing least rosk
32	Ficus sycomorus	(Gemeriz,Arabic),(Eleu,madi)	Least concern	Firewood, fruits eaten	Fruits eaten by birds, and other animals, nesting and resting	Abundant facing less risk
33	Ficus glumosa	Iyu-madi	Least concern	Firewood, fruits eaten	Fruits eaten by birds and other animals, Nesting, and resting	Abundant Facing less risk
34	Ficus ingens	Rikrike-Madi,red leaves fig-English	Least concern	Firewood, fruits eaten	Fruits eaten by birds and other animals,	Abundant facing less risk

					Nesting, and resting	
41	Grewia mollis	Enzo/inju-madi	Least concern	Firewood, fruits eaten, construction	Fruits eaten by birds and other animals	Abundant facing less risk
42	Holoptelea grandis	Muta/Ruta-madi	Least concern	Firewood, construction	Resting for birds	Facing least risk
44	Kigelia africana	(Abu shudur Arabic), (Loduu madi),sausage tree-English	Least concern	Local medicine,	Foliage, fruits for animals, Flowers attractive for birds, and resting for animals	Facing least risk
46	Khaya senegalensis	Erie/eriago-madi	Vulnerable	Firewood, local medicine, construction, for fishing by poisoning	Nesting and shade	The species is facing serious threat in wild due wood extraction
47	Lonchocarphus laxifloirus	Melemele-madi	Least concern	Firewood, construction, leaves for conducting blessing	Fodder for wild animals	Abundant facing less risk in the wild
55	Oxytenanthera abyssinica	Ordra-madi,Gana Arabic,Bamboo-English	Critically Endangered species	Construction	Covers for births and other animal for resting	The species is facing high risk in the wild due to over extraction
56	Piliostigma reticulatum	(maaba,madi),(karub Arabic)	Least concern	Local medicine, making arrows, construction	Resting for animal, animal feeding on fruits and birds perching on the tree	The species is not facing risk

58	Pesudocedrela Kotscchyi-	Ala-madi	Least concern	Construction, firewood ,medicine	Shade for resting and fodder	The species facing less risk
59	Parinari curatellifolia	Adzili/Obo-madi	Least concern	Construction ,firewood	Shade for resting	The species facing less risk
60	Prosopis africana	Zingili/Gili-madi	Least concern	Construction, firewood	Fruits eaten by animals	The species facing less risk
63	Strychnos spinosa	Lombo/Kolomboro	Least concern	Fruits eaten, firewood, construction	Fruits eaten by animals	The species facing less risk
64	Stereospermum kunthianum	Lope/Lupe-madi	Least concern	Firewood, construction	Flowers useful for birds	The species facing less risk
65	Selerocarya birrea	Lanyumu/Kalimo-madi,Marula English	Least concern	Fruits eaten, firewood	Fruits eaten by animals, shade for resting	The species facing less risk
66	Sarcocephalus latifolius	Lago/Lugo-madi	Data deficit	Fruits eaten, local medicine	Fruits eat by animals and birds, cover for animals and birds	The species facing less risk
70	Tamarindus indica	Arideb-arabic,Iti-madi ,Tamarind-English	Least concern	Fruits eaten, firewood, construction	Fruits eaten by animals, resting	The species facing less risk
75	Vitex doniana	African black plum/chocolate berry-English,Lenvi/ledu	Least concern	Fruits eaten, firewood, construction	Fruits eaten by animals, Birds,fodders,shade	The species facing less risk
76	Vitellaria paradoxa	Awa-madi,kawa-muru,Kumuro-Bari,Waa-Acholi and Rak Dinka	Vulnerable	Fruits eaten, firewood, charcoal	Fruits eaten by animals,	The species facing high risk due to over extraction

					Birds, shade for resting	
77	Ximenia americana	Icho/Ichu-Madi	Least concern	Fruits eaten, firewood	Fruits eaten by birds ,animals	The species facing less risk
78	Ziziphus spins christi	Lenyu-madi	Least concern	Fruits eaten, firewood tools handle ,construction	Fruits eaten by birds, animal and nesting	The species facing less risk
79	Ziziphus abyssinica	Lenyu ago-Madi	Least concern	Fruits eaten, firewood tools handle construction	Fruits eaten by birds, animals and nesting	The species facing less risk
80	Diospyros mespiliformis	Jackalberry eng,African ebony English),Duumu madi	Least concern	Fruits eaten, firewood, construction	Fruits eaten by birds, animals	The species facing less risk
81	Gardenia lutea	Graden lady-English,Iroro-Madi	Least concern	Medicine		Facing least risk
82	Calotropis procera	Apple of Sodom,Sodom apple,rubber bark-English	Least concern	Medicine		Facing less risk
83	Sansevieria trifasciata	Snake plant,Viper bowsting hemp-English	Least concern	Medicine		Very small herb which is abundant in the wild
83	Balanites aegypthieca	Deset date-English,heglig/lolob-Arabic,Lugba-madi	Least concern	Fruits eaten, oil from nut and medicine,fuelwwood	Fruits eaten by birds ,animals	Abundant, facing less threat

Vegetation Transect fied form-01	
Species name	**Number estimated**
Combertum glutinosum	6
Comberttum hartmnnianum	1
Ximenia americana	1
Grewia mollis	2
Acacia hokii	3
Delbergia melnoxylon	1
Zizphus spina christi	2
Khaya senegalensis	1
Sterculia uren	1
Combertum molle	4
Combertum collinum	2

Vegetation transect form-02	
Species name	**number estimated**
Combertum glutinosum	9
Combertum molle	4
Combertum collinum	3
Sterculia uren	4
Grewia mollis	4
Acacia polyancanth	3
Zizphus spina christi	1
Acacia hokii	4
Calotropis procera	1

Vegetation transect field form-03	
Species name	**Number estimated**
Combertum collinum	7
Combertum molle	3
Combertum glutinosum	1
Acacia hokii	4
Vitellaria paradoxa	1
Khaya sengalensis	1
Albizia coraria	3
Delbergia melnoxylon	1
Afezlia africana	2
Acacia sieberiana	2
Sterculia uren	4
Tamarinda indica	1
Balanites aegyptheca	3
Zizphus spina christi	1

Vegetation transect field form-04	
Name of species	**number estimated**
Combertum glutinosum	10
Grewia mollis	3
Acacia sieberiana	7
Parinari curallifolia	5
Acacia acacia polycantha	4
Acacia hokii	3
Combertum molle	5
Ficus sycomorus	5
Ficus ovata	2
Zizphus spina christi	3
Zizphus abyssinica	1
Gardenia lutea	1
Albizia glaberima	2
Annona senegalensis	2
Diospyros mespiliformis	1
Ficus ingens	1
Vitellaria paradoxa	3

Vegetation transect field form-5	
species name	**numner estimated**
Combertum Collinum	7
Gerwia mollis	4
Combertum gultinosum	5
Erythrina abysinica	5
Streculia uren	3
Ficus sycomorus	1
Ficus ovata	1
Vitellaria paradoxa	1
Pinus radiata	1

Vegetation transect field form-06	
Species name	**number estimated**
Lonchocarpus laxflirus	7
Vitellaria paradoxa	2
Combretum molle	3
Albizia coriaria	5
Annona senegalensis	2
Acacia hokii	4
Grewia mollis	3
Combretum glutinosum	5
Combertum collinum	5
Ficus glumosa	1
Acacia sieberiana	4

Vegetation transect field form-07	
Species Name	**number estimated**

Vegetation transect field form-08	
Species Name	**number estimated**

Combertum collinum	10
Pesudocedrela kotsycchyi	2
Combertum hartmannianum	3
Acacia sieberiana	6
Lonchocarpus laxifoirus	4
Combertum molle	3
Bosisa salicifolia	2
Combertum glutinosum	8
Piliostigma thonningii	2
Vitellaria paradoxa	3
Zizphus spina christi	4
Khaya senegalensis	1
Ficus platyphalla	1
Parinari euratellifolia	3
Sterculia urena	5
Diospyros mesopiliformis	2
Sarcocephalus latifolius	3

Combertum glutinosum	8
Combertum molle	3
Combertum collinum	4
Grewia mollis	4
pilliostigma reticulatum	3
Burkeam africana	2
Boscia salicifolia	3
Ximenia americana	4
streculia uren	6
Gradenia lutea	2
Carissa edulis	1
Diospyros mespiliformis	2

Vegetation transect field form-09	
Species name	**Number estimated**
Acacia hokii	12
Acacia polyacantha	5
Grewia mollis	3
Ximenia amaricana	2
Combertum collinum	3
sterculia uren	3
Vitellaria paradoxa	1
Acacia seyal	3
Acacia sieberiana	6

Vegetation transect field form-10	
Species Name	**Number estimated**
Commbertum collinum	9
Albizia coriaria	5
Commbertum molle	6
Albizia glaberima	4
Streculia uren	7
Vitellaria paradoxia	3
Tamarinda indica	1
annona senegalensis	2
Zizphus spina christi	1
Zizphus abyssinica	2
Khaya seneaglensis	2
Ficus sycomorus	1
Gradenia lutea	2
Afezlia africana	3

Vegetation field data form-11	
Species name	**Number estimated**
Vitellaria paradoxa	23
Grewia bicolor	2
Combertum molle	1
Combertum collinum	3
Combertum glutinosum	4
Lonchocarphus laxifoirus	2
Gradenia lutea	2
Vitex doniana	1
Oxtenanthera abyssinica	Clustered

Vegetation field data form-12	
Species name	**Number estimated**
Combertum glutinosum	8
Oxytenanthera abyssinica	Clustered
Albizia coriaria	3
Sterculia uren	5
Parinaria curatellifolia	1
Piliostigma reticulatum	3
Acacia polycantha	4
Lonehocarplus laxifolia	3
Tamarinda indica	1
Vitex doniana	1
Albizia glaberima	2
Pesudocedrela kotscchyi	2
Acacia hokii	4

Grewia mollis	5
Khaya senegalensis	2
Holoptelea grandis	2
Gradenia lutea	3

Vegetation field data form-13	
Species name	**Number of estimated**
Ficus sycomorus	7
Acacia polycantha	5
Pesadocedrela kotcchyi	2
Tamarinda indica	2
Acacia hokii	5
Khaya seneglensis	1
piliostigma reticulatum	4
Lonchicarpus laxifoinus	3
Brossus aethipum	2
Ximernia americana	4
Streculia uren	3
Combertum collinum	5
Combertum glutinosum	3

Vegetation field data form-14	
Species name	**Number estimated**
Ficus sycomorus	5
Acacia sieberiana	3
Acaca polycantha	4
Acacia hokii	4
Acacia senegal	1
Lonchocarphus laxifloius	1
Miospyros mospiliformis	1
Zizphus spina christi	2
Tectona grandis	1
Eucalyptus camndulensis	2
Zizphus abyssinica	2
Gamlena arobaria	1
Ficus ovata	1
Ficus papalifolia	1
Mangifera indica	1
Casia seimea	2
Tamarinda indica	1

Vegetation field data form-15	
Species name	**Number estimated**
Combertum collinum	7
Acacia hokii	4
Ximenia americana	5
acacia sieberiana	2
Lonchocarphus laxifloius	3
Zizphus spina christi	4
Gamlena aroboria	1
Zizphus abyssinica	3
Ficus ovata	1
Ficus papalifolia	1
Miospyros mespiliformis	1
Brossus aethipum	2
Tamarinda indica	1
Cpombertum glutinosum	4
Casia siemea	2
maytenus senegalensis	3

Vegetation plot

Name & surname	Okumu Alik	**Date**	29/01/2024
Plot ID - Transect ID	0101	**Macrohabitat type**	Savanna
Location	Nesitu - LCES	**Time start**	4.26 pm
Time end	4.59 pm		
GPS coordinates (lat.lon)	N04.72123° E031.71796°	**Photo taken?** (circle)	Yes ✓ / No
Land use type:	Natural Condition		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Combretum molle	Shrub	25%			firewood, charcoal Construction	Abundant
(2) Combretum gultinosum	Shrub				firewood, charcoal Construction	Abundant
(3) Combretum hartmannianum	Shrub				firewood, charcoal Construction	Abundant
(4) Ximenia Americana	Shrub				fruits eaten when ripe	Less

Notes: Nesitu - Lokiliri payam Central Equatoria State. (LCES)
The dominant species at this location is Combretum gultinosum. interpersed by Hyparrhenia filibendula and Hyparrhenia grasses. The trees are cut and all are in Sapling State - The grasses are also burnt.

Vegetation plot

Name & surname	Okumu Aliku		**Date**	02/02/2024	
Plot ID - Transect ID	0202	**Macrohabitat type**	Savanna		
Location	Nesitu-LCES	**Time start**	4:50 pm	**Time end**	5:57 pm
GPS coordinates (lat.lon)	N 04.69271°, E 031.362671°		**Photo taken?** (circle)	Yes ✓ / No	
Land use type:	Natural Condition				

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Combertum glutinosum	Shrub	50%			Firewood, charcoal pole for construction	Abundant
(2) Combertum molle	Shrub				firewood, charcoal pole for construction	Abundant
(4) Combertum Collinum	Shrub				firewood, charcoal pole for construction - medicine, ~~food~~ as incense	Abundant
(5) Sterculia Cinerea	tree		0.21 m	6 m	gum burn ~~as incense~~	Less
(6) Albizia Coriaria	tree		0.18 m	6 m	medicine pole for construction	Less

Notes: Nisitu-Lokiliri payam Central Equatoria State (LCES)
The dominate Species is Combertum glutinosum.
other species along the transect include Dalbergia melanoxylon, Grewia bicolor, Combertum molle, Acacia Sebericana and

Vegetation plot

Name & surname	Olcuma Alilee	**Date**	03/02/2024
Plot ID - Transect ID	0303	**Macrohabitat type**	Savanna
Location	LCES	**Time start**	9:33Am
Time end	10:35Am		
GPS coordinates (lat.lon)	N04°69271°E031.78798	**Photo taken?** (circle)	Yes ✓ / No
Land use type:	Natural Condition		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Combretum Collinum	tree	10%	0.11m	6.0m	Firewood Charcoal pole for Construction	Abundant
(2) Combretum molle	Shrub				firewood, charcoal pole for Construction	Abundant
(3) Combretum glutinosum	Shrub				Firewood, charcoal pole	Abundant

Notes:
The trees are cut are at Sapling Stage. The dominant species is Combretum Collinum. Other tree species detected along the transect are Vitellaria paradoxa, Khaya senegalensis, Albizia coriaria, Dalbergia melanoxylon interposed with grass species Hyparrhenia filipendula and Hyparrhenia rufa.

Vegetation plot

Name & surname	Olcumu Alicu	Date	03/02/2024
Plot ID - Transect ID	0404	Macrohabitat type	forest
Location	Jebelin_L CES	Time start	2:28pm
Time end	3:58pm		
GPS coordinates (lat.lon)	N04.55281°, E031.85662°	Photo taken? (circle)	Yes ✓ / No
Land use type:	Natural Condition		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Grewia mollis	tree	85%	0.17m	7.0m	Construction firewood/fruit eaten	medium tree Abundant
(2) Acacia ~~Seb~~ Seberiana	tree		0.41m	12m	firewood Construction	medium tree Abundant
(3) Combretum glutinosum	tree		0.07m	6m	Firewood, charcoal Construction	medium tree Abundant
(4) Combretum glutinosum	tree		0.22m	9m	Firewood, charcoal Construction	medium tree abundant
(5) parinari curallifolia	tree		1.06m	22m	Construction	big tree abundant
6) parinari curallifolia	tree		0.25	8m	Construction	medium tree abundant

Notes: Location: Jebelin lokiliri payam Central Equatoria State
The dominant tree in the plot is Combretum glutinosum. Other species detected along the transect include Combretum molle, Acacia polyacantha, Acacia hockii, Combretum collinum, Ficus sycomorus, Ficus ovata, Sclerocarya birrea etc.
The forest is intact.

Vegetation plot

Name & surname	Okumu Alfred		**Date**	04/02/2024	
Plot ID - Transect ID	0505	**Macrohabitat type**	Savanna		
Location	Arr- LCES	**Time start**	11:07Am	**Time end**	12:10pm
GPS coordinates (lat.lon)	N04.36817°, E031.97518°		**Photo taken?** (circle)	Yes ✓ / No	
Land use type:	Agricultural land				

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Grewia Mollis	Shrub	25%			firewood, Charcoal, Construction, fruit eaten	Sapling Abundant
(2) Combretum Collinum	Shrub				firewood, charcoal, Construction	Sapling Stage.
(3) Erythrina abyssinica	tree		0.21m	8m	firewood	medium tree.

Notes: Location: Arll Junction Lolciliri Playam Central Equatoria State. The dominant species is Combretum collinum. Other tree species detected along transect include; Combretum glutinosum, Viteralia paradoxa, Ficus ovata, Ficus platyphylla interpersed with Hyparrhenia filipendula and Hyparrhenia rufa. most of the trees are cut for agricultural field.

Vegetation plot

Name & surname	Okumu Aliku		**Date**	04/02/2024	
Plot ID - Transect ID	0606	**Macrohabitat type**	~~Savanna~~ Forest		
Location	Arua Fosta mangat LCFS	**Time start**	2:46	**Time end**	3:57pm
GPS coordinates (lat.lon)	N04°34552° E031.98691°			**Photo taken?** (circle)	Yes ✓ / No
Land use type:	~~Modified~~ Natural Conditions				

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Ficus glumosa	tree	75%	~~7~~ 0.32m	7m	Fruit eaten	medium tree less.
(2) Lonchocarpus Laxifloirus	tree		0.12m	6m	building materials for blessing tools handle	Abundant small tree
(3) Acacia holcii	tree		0.31m	6.5m		small tree abundant
(4) Lonchocarpus laxifloirus	tree		0.38m	~~8.5~~m	building materials blessing tool handle	small tree abundant
(5) Combretum glutinosum	tree		0.21m	9m	fire wood, charcol, pole	Small tree abundant
(6) Grewia bicolor	tree		0.12m	6.0m	building materials fire wood, fruit eaten.	small tree less
(7) ~~La~~Lonchocarpus laxifloirus	tree		~~0.13~~ 0.13	6.0m	blessing tool handle building materials	small tree abundant
~~8 Albizia~~						

Notes: Arua Fosta mangat Lilicilivi pugum Central Equatoria State. The dominant tree here is Lonchocarpus laxifloirus. Other species along the transect include: Vilkeria paradoxa Combretum molle, Albizia Coriaria, Annona Senegalensis Acacia holcii interpersed with Hyprrhenia filipendula and Hyprrhenia rufa.

Vegetation plot

Name & surname	Olcema Alice	Date	04/02/2024
Plot ID - Transect ID	0707	Macrohabitat type	~~Savanna~~ forest
Location	Nyolo-Lolciliri CES	Time start	4:25pm
Time end	6:36 pm		
GPS coordinates (lat.lon)	N04.30459°, E032.00064°	Photo taken? (circle)	Yes ✓ / No
Land use type:	Natural Condition		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Pseudocedrela Kotschyi	tree	75%	0.133m	6.2	medicine, firewood Construction	medium tree, less
(2) Combretum Kantmannianum	Shrub				firewood, charcoal Construction	Sapling Stage.
(3) Combretum Collinum	Shrub				firewood, charcoal	Sapling Stage - Abundant
(4) Acacia Sebriana	Shrub				firewood Construction	Sapling Abundant
(5) Lonchocarpus laxifoinus	tree		0.12m	6.0m	Conducting blessing tool handles, pole	Small tree Abundant
(6) Acacia Sebriana	tree		0.13m	6.5m	firewood Construction	medium tree abundant
(7) Combretum molle	tree		0.32	9.0m	firewood, charcoal Construction	Small tree less.
(8) Boscisa Salicifolia	~~tree~~		0.14m	6.4m	firewood, charcoal Construction	Small tree, less
(9) Combretum Collinum	tree		0.26m	6.8m	firewood, charcoal Construction	Small tree ~~less~~ abundant
(10) Combretum Collinum	tree		0.20m	6.2m	firewood, charcoal Construction	Small tree Abundant

Notes: Nyolo-Lolciliri payam Central Equatoria State
the dominant specie is Combretum Collinum. Other species detected along the transect include piliostigma thonningii, Ximenia americana, Vitellaria paradoxia Ziziphus spina christi

Vegetation plot

Name & surname	Okumu Aliku		**Date**	05/02/2024	
Plot ID - Transect ID	0808	**Macrohabitat type**	Savanna		
Location	Ngolo: LCES	**Time start**	8.40m	**Time end**	9:47Am
GPS coordinates (lat.lon)	N04.25646° E031.99333°			**Photo taken?** (circle)	Yes ✓ / No
Land use type:	N Cultural Condition				

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Combretum glutinosum	Shrub	55%			firewood, charcoal, Construction	Less than 6m Sampling Abundant
(2) Combretum hartmannianum	Shrub				firewood, charcoal, Construction	Less than 6m Sapling Abundant
(3) Combretum molle	Shrub				firewood, charcoal, Construction	Less than 6 m Sampling Abundant
(4) Combretum collinum	Shrub				firewood, charcoal, Construction	Less than 6 m Sampling Abundant
(4) Grewia mollis	Shrub				firewood, rope, Construction fruits eaten	Less than 6 m Sapling
(4) piliostigma reticulatum	Shrub				pole, for Construction medicine	Less than 6m Sampling

Notes: Ngolo, Lolciliri payam Central equatoria State.
The dominant Spiece is Combretum glutinosum. Other Species detected along transects include Burkea africana, Boscia salicifolia, Kimenia americana, Sterculia tragacantha interpersed with hyparrhenia rufa, hyperthelia dissoluta.
- trees are cut and sell one in sapling State and the place is bushy

Vegetation plot

Name & surname	Okumu Alilu	**Date**	05/02/2024
Plot ID - Transect ID	0909	**Macrohabitat type**	Savanna
Location	Kit II LOCES	**Time start**	11:38Am
Time end	12:21pm		
GPS coordinates (lat.lon)	N04.20575° E031.98608°	**Photo taken?** (circle)	Yes ✓ / No
Land use type:	Natural Condition		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
① Acacia polyacantha	Shrub	10%			Firewood, Construction	Less than 6m sampling, Abundant
(2) Acacia holcii	Shrub				Fire wood	Less than 6m Sapling, Abundant
(3) Grewia mollis	Shrub				building material, firewood, fruits eaten	Less than 6m Sapling
(4) Ximenia americana	Shrub				Firewood, fruits eaten	Less than 6m Sapling
(5) Combretum collinum	Shrub				Firewood, charcoal Construction	Less than 6m Sapling
(6) Lesuertia mollis	Shrub				Firewood, charcoal Construction	Less than 6m Sapling
(7) Streculia thren	tree		0.21m	7m	burnt as ~~incense~~ insense, fruit/seed eaten.	Small tree.

Notes: Kite II, Lobong payam Central Equatoria State. The dominant specie is acacia ~~polyacantha~~ ~~poly~~ holcii interpersed with. The trees are clean cut and are in sapling stage. The place is burn and the other specie like herbs can not be identify.

Vegetation plot

Name & surname	Okumu Alilu	**Date**	05/02/2024
Plot ID - Transect ID	1010	**Macrohabitat type**	Savanna
Location	Ame Junction (APMEES)	**Time start**	1:36 pm
Time end	2:56 pm		
GPS coordinates (lat.lon)	N04.10479°, E031.97167°	**Photo taken?** (circle)	Yes ✓ / No
Land use type:	Natural condition		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Albizia coriaria	tree	75%	0.42 m	9 m	medicine, Construction	Small tree
(2) Combretum molle	tree		0.15	6 m	firewood, charcoal, Construction	Small tree
(3) Grewia mollis	Shrub				Firewood, fruits eaten, construction	less than 6 m sapling
(4) Combretum collinum	tree		0.20 m	6 m	Firewood, charcoal, Construction	Small tree.
(5) Combretum glutinosum	Shrub					less than 6m sapling
(6) Combretum hartmannianum	tree		0.14m	6.2 m	Firewood, charcoal, Construction	Small tree
(7) Albizia coriaria	tree		0.11 m	6.3 m	medicine, fishing, Construction	Small tree

Notes: Ame junction pageri payam, Magwi county, Eastern Equatoria State (APMEES)
The dominant species is Combretum collinum. Other species detected include: Ziziphus spina christi, Ziziphus Abyssinica, Ximenia americana, Acacia Senegalensis, Vitellaria paradoxa interposed with the grasses of Hyparrhenia filipendula

Vegetation plot

Name & surname	Okumu Aliku		**Date**	06/02/2024	
Plot ID - Transect ID	1111	**Macrohabitat type**	Forest		
Location	Moli Tokuro - MpEES	**Time start**	10:04 Am	**Time end**	11:05 Am
GPS coordinates (lat.lon)	N 04.03626° E 031.97234°			**Photo taken?** (circle)	Yes ✓ / No
Land use type:	Natural Condition				

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Vitellaria paradoxia	tree	75%	0.23m	8.0m	Fruit Eaten & Shea oil	Small tree Abundant
(2) Vitellaria paradoxa	tree		0.12m	6.5m	Fruit eaten Shea oil	Abundant Small tree
(3) Vitellaria paradoxa	tree		0.17m	7.0m	Fruit eaten Shea oil	Small tree Abundant
(4) Vitellaria paradoxa	tree		0.43m	12m	Fruits eaten Shea oil	~~Medium~~ tree Abundant
(5) Vitellaria paradoxa	tree		0.23m	9.0m	Fruit Eaten Shea oil	Small tree Abundant
(6) Grewia bicolor	Shrub				Fruit eaten Construction	less than 6m Sapling
(7) Combretum Molle	Shrub				Firewood Charcoal Construction	less than 6m Sapling
(8) Combretum Collinum	shrub				Firewood, charcoal Construction	less than 6m Sapling
(9) Combretum glutinosum	Shrub					Less than 6m Sapling
(10) Lonchocarpus laxifloiuus	Shrub					less than 6m Sapling
Oxyfenanthera abyssinica	Shrub					Abundant

Notes: Moli Tokuro pageri payam, magwi County Eastern Equatoria State.
The dominant species is Vitellaria paradoxa, they are intact
The tree species are not cut because it is protected by the community using customary law as it is source of livelihood during shortage food using fruits and shea oil from nuts

Vegetation plot

Name & surname	Okuma Alilu		**Date**	06/02/2024	
Plot ID - Transect ID	1212	**Macrohabitat type**	Savanna		
Location	Moli Aufani-PMEES	**Time start**	11:45pm	**Time end**	12:45pm
GPS coordinates (lat.lon)	N03.96482°, E031.95999°			**Photo taken?** (circle)	Yes ✓ / No
Land use type:	Natural Condition				

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Combertum glutinosum	tree	65%	0.26m	7.5m	Firewood, Charcoal Construction	Small tree Abundant
(2) Oxytenanthera Abyssinica	Shrub				Construction	Abundant
(3) Albizia Coriaria	tree		0.29m	8.0m	medicine, Construction	Small tree
(4) Sterculia Urens	tree		0.29m	8.2m	gum burn for incense	Small tree.
(5) parinari Curatellifolia			0.14m 0.11m	6.0m	Firewood Construction	Small tree
(6) piliostigma reticulatum	Shrub				firewood, medicine Construction	Less than 6m sapling
(7) Acacia polyacantha	Shrub				firewood, Construction	Less than 6m sapling

Notes: Moli Aufani, pugeri payam, Magwi County Eastern Equatoria State. The dominant species is Combertum glutinosum. Other species detected along transect include: Grewia mollis, Khaya Senegalensis, Holoptelea grandis, Lonchocarpus laxiflorus, Tamarindus indica, Vitex doniana, Albizia glaberima, pesudocedrela kotschyi

Vegetation plot

Name & surname	Okumu Aliku	Date	06/02/2024
Plot ID - Transect ID	13 13	Macrohabitat type	Savanna
Location	Kerepi Borongole pMEES	Time start	1:58 pm
Time end	2:53 pm		
GPS coordinates (lat.lon)	N03.91069°, E031.93925°	Photo taken? (circle)	Yes ✓ / No
Land use type:	Natural Condition		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Ficus Sycomorus	tree	65%	0.54 ~~0.61m~~	13 m	firewood	medium tree
(2) Ficus Sycomorus	tree		0.61 m	15 M	firewood	medium tree
(3) Pesudocedrela Kotschyi	Shrub				firewood Construction	less than 6m sapling
(4) Acacia polycantha	Shrub				firewood Construction	less than 6m Sapling
(5) Tamarind indica	Shrub				firewood, fruits for juice	less than 6m Sapling
(6) Acacia hockii	Shrub				firewood Construction	less than 6m Sapling
(7) Khaya Senegalensis	tree		0.14m	8m	firewood, medicine Construction	Small tree

Notes: Kerepi Borongole pageri payam, magwi County Eastern Equatoria State. The dominant species is ficus sycomorus. Other species encountered along transect include piliostigma reticulatum Brosus ethipum, Ficus ingens, Lonchocarphus laxifoinus interpersed by Hyparrhenia filipendula, Hyparrhenia rufa, Hyperthelia dissoluta.

Vegetation plot

Name & surname	Okumu Alicu	**Date**	08/02/2024
Plot ID - Transect ID	1414	**Macrohabitat type**	Savanna
Location	pageri-MEES	**Time start**	3.43 pm
Time end	4:53 pm		
GPS coordinates (lat.lon)	N03.87063° E031.96139°	**Photo taken?** (circle)	Yes ✓ / No
Land use type:	Residental		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Ficus Sycomorus	tree		0.65m	18m	Fire wood	big tree
(2) Acacia Seberiana	tree		0.18m	7m	Firewood Construction	small tree
(3) Tectona grandis	tree		0.21m	10m	Construction	Exotic
(4) Lonchocarphus laxifloinus	Shrub				Firewood, tool, handle Conducting blessing	less than 6m Sapling
(5) pesudocedrela Kotschyi	Shrub				Firewood, tools handle, Construction	less than 6m Sapling
(6) Acacia polycantha	Shrub				Firewood Comstruction	less than 6m Sapling
(7) Combertum hartmannianum	Shrub				Firewood, charcol Construction	less than 6m Sapling

Notes: pageri Magwi County Eastern Equatoria State'
The dominant species is Ficus Sycomorus. other tree species detected along the transect include Khaya Senegalensis, Eucalyptus Camaldulensis, Azandetic indica, mangofera indica

Vegetation plot

Name & surname	Okumu Alilca	Date	07/02/2024
Plot ID - Transect ID	1515	Macrohabitat type	Savanna
Location	Arupi-PMTEES	Time start	9:25Am
Time end	10:36Am		
GPS coordinates (lat.lon)	N03.85291° E031.97079°	Photo taken? (circle)	Yes ✓ / No
Land use type:	Natural Condition		

Species	Habit	% cover	DBH (for trees)	Height (for trees)	Use by the community/Economic/ Medicinal/Cultural	Comments
(1) Acacia hollii	Shrub				Fuelwood, Construction	Less than 6m Sapling
(2) Grewia mollis	Shrub				Fruits eaten, Construction	Less than 6m Sapling
(3) Ximenia americana	Shrub				Fruits eaten, Fuelwood	Less than 6m Sapling
(4) Combretum Collinum	Shrub				Firewood, Charcoal, Construction	Less than 6m Sapling
(5) Acacia Sieberiana	tree		0.13m	6m	Firewood, Construction	Small tree
(6) Lonchocarpus laxifloirus	tree		0.14m	6.2m	Firewood, Construction	Small tree

Notes: Arupi, pugeripayum, magwi county eastern equatoria State (Arupi-PMTEES). The dominant species is Combretum Collinum, they are clear cut and Sapling Stage. Other species include miospyros mespiliformis, Ziziphus spina christi, techoma grandis, Gamanda aroboria, Ziziphus abyssinica, Ficus ovata, Ficus pupalifolia

Vegetation Plot-0101						
Specie Name	Habit	Cover	DBH for Tree	Height for Tree	Uses by the community	Comments
Combertum molle	Shrub	25%			Frirewood,charcoal,consturction	Abundant
Combertum glutinosum	Shrub				Frirewood,charcoal,consturction	Abundant
Combertum hartmannianum	Shrub				Frirewood,charcoal,consturction	Abundant
Ximenia americana	Shrub				Fruits eaten when	less
Vegetation polt-0202						
Speices name	Habit	Cover	DBH for tree	Height for tree	Uses by the community	Comments
Combertum glutinosum	shrub	50%			Firewood,charcoal,construction	Abundant
Combertum molle	shrub				Firewood,charcoal,construction	Abundant
Combertum collinum	shrub				firewood,charcoal,construction, medicine	Abundant
Sterculia uren	tree		0.21m	6m	gum burn as incense	less
Albizia coriaria	tree		0.18m	6m	Medicine,constrution	less
Vegetation plot-0303						
Species Name	Habit	Cover	DBH for tree	Height for tree	Uses by the community	Commments
Combertum collinum	shrub	10%	0.11m	6.0m	Firewood ,charcoal,construction	Abundant
Combertum molle	shrub				Firewood ,charcoal,construction	Abundant
Combertum glutinosum	shrub				Firewood ,charcoal,construction	Abundant
Vegetation plot-0404						
Species name	Habit	Cover	DBH for tree	Height for tree	Uses by the community	Comment
Grewia molllis	tree	85%	0.17m	7.0m	Firewood,construction,fruits eaten	Medium tree,Aundant
Acacia siebarana	tree		0.41m	12m	Firewood,construction	Medium tree,Aundant

Combertum glutinosum	tree		0.07m	6m	Firewood,charcoal,construction	Medium tree,Aundant
Combertum glutinosum	tree		0.22m	9m	Construction,firewood,charcoal	Medium tree,Aundant
Pariari curallifolia	tree		1.06m	22m	Firewood,construction	big tree abundant
Pariari curallifolia	tree		0.25m	8m	Firewood ,construction	Medium tree,Aundant
Vegetation plot 0505						
Name of the species	Habit	Cover	DBH for tree	Height for tree	Uses by the community	Comments
Grewia mollis	shrub	25%			Firewood,construction,fruits eaten	Sapling-Abundant
Combertum collinum	shrub				Firewood,construction,charcoal	Sapling
Erthrina abyssinica	shrub				Firewood	Sapling
Vegetation plot 0606						
Species name	Habit	Cover	DBH for tree	Height for tree	Uses by the community	Comments
Ficus glumosa	tree	75%	0.32m	7.0m	Fruits eaten,firewood	medium tree-less
Lonchocarpus laxifoinus	tree		0.12m	6.0m	construction,for conducting blessing,tools handle	small tree-abundant
Acacia hokii	tree		0.31m	6.5m	Firewood,Construction	small tree-abundant
Lonchocarpus laxifoinus	tree		0.33m	8.5m	construction,for conducting blessing,tools handle	small tree-abundant
Combertum glutinosum	tree		0.21m	7.0m	Firewood,Construction,Charcoal	small tree-abundant
Grewia bicolor	tree		0.12m	6.0m	Construction,fruits eaten,firewood	small tree-less
Lonchocarpus laxifoinus	tree		0.13m	6.0m	Construction,conducting blessing,tools handle	small tree-abundant
Vegetation plot-0707						
Species name	Habit	Cover	DBH for tree	Height for tree	Uses by the community	Comments
Pesudocedrela kotscchyi	tree	75%	0.13m	6.2m	Medicine,firewood construction	Medium tree ,less

Combertun hartmanninum	shrub				Firewood,charcoal,construction	sapling,abundant
Combertun collinum	shrub				Firewood,charcoal,construction	sapling,abundant
Acacia sieberiana	shrub				Firewood,construction	sapling,abundant
Lonchocarphus laxifonius	tree		0.12m	6.0m	Conducting blessing,tools handle,construction	small tree abundant
Acacia sieberiana	tree		0.13m	6.5m	Firewood construction	medium tree ,abundant
Combertum molle	tree		0.32m	9.0m	Firewood, construction,charcoal	small tree abundant
Boscisa salicifolia	tree		0.14m	6.4m	Firewood,charcoal,construction	small tree less
Combertum collinum	tree		0.26m	6.8m	Firewood,charcoal,construction	small tree-abunadant
Combertum collinum	tree		0.20m	6.2m	Firewood,charcoal,construction	small tree abundant
Vegetation plot 0808						
Species name	Habit	Cover	DBH for tree	Height for tree	Uses by the community	Comments
Combertum glutinosum	shrub	55%			Firewood,construction ,charcoal	Less than 6 m sapling-abundant
Combertum hartmannianum	shrub				Firewood,construction ,charcoal	Less than 6 m sapling-abundant
Combertum collinum	shrub				Firewood,construction ,charcoal	Less than 6 m sapling-abundant
Grewia mollis	shrub				Firewood,fruits eaten ,construction	less than 6 m sapling-abundant
Piliostigma reticulatum	shrub				Construction,medicine	Less than 6 m sapling-abundant
Vegetation plot 0909						
Species name	Habit	Cover	DBH for tree	Height for tree	Use by community	Comments
Acacia polycantha	shrub	10%			Firewood,costruction	Less that 6 m sapling
Acacia hokii	shrub				Firewood	Less that 6 m sapling
Grewia mollis	shrub				Firewood ,Fruits eaten,construction	Less that 6 m sapling
Ximernia americana	shrub				Firewood ,Fruits eaten	Less that 6 m sapling
Combertum collinum	shrub				Firewood,charcoal,construction	Less that 6 m sapling

Combertum molle	shrub				Firewood,charcoal,construction	Less that 6 m sapling
Sterculia uren	shrub		0.21m	7m	Burn as incense, fruits eaten	small tree
Vegetation Plot-1010						
Species name	Habit	Cover	DBH for tree	Height for tree	Use by community	Comments
Albizia coriaria	tree	75%	0.42m	9m	Medicine,construction,fishing by poisioning	Small tree
Combertum molle	tree		0.15m	6.3m	Firewood,charcoal,construction	Small tree
Grewia mollis	shrub				Firewood,construction,fruit eaten	Less than 6m sapling
Combertum collinum	tree		0.20m	6.0m	Firewood,charcoal,construction	Small tree
Combertum glutinosum	shrub				Firewood,construction,charcoal	Less than 6m sapling
Combertum hartmannianum	tree		0.14m	6.2m	Firewood,charcoal,construction	Small tree
Abizia cariaria	tree		0.11m	6.3m	Firewood,medicine,construction, fishing by poisoning	Small tree
Vegetation plot -1111						
Species name	Habit	Cover	DBH for tree	Height for tree	Use by the community	comments
Vittellaria paradoxa	tree	75%	0.23m	8.0m	Fruits eaten,shea oil	Small tree-abundant
Vittellaria paradoxa	tree		0.12m	6.5m	Fruits eaten,shea oil	Small tree-abundant
Vittellaria paradoxa	tree		0.17m	7.0m	Fruits eaten,shea oil	Small tree-abundant
Vittellaria paradoxa	tree		0.43m	12m	Fruits eaten,shea oil	medium tree-abundant
Vittellaria paradoxa	tree		0.23m	9.0m	Fruits eaten,shea oil	Small tree-abundant
Grewia bicolor	shrub				Construction,fruits eaten,firewood	less that 6m sapling
Combertum molle	shrub				Firewood,charcoal,construction	less that 6m sapling
Combertum collinum	shrub				Firewood,charcoal,construction	less that 6m sapling
Combertum glutinosum	shrub				FIrewood,charcoal,construction	less that 6m sapling
Lonchocarphus laxiflirus	shrub				Firewood,construction,conductin g blessing ,tools handle	less that 6m sapling

Oxytenanthera abyssinica	herbiceaus				Construction	Herbeacus species-abundant
Vegetation plot-1212						
Species name	Habit	Cover	DBH for tree	Height for tree	Use by the community	Comments
Combertum glutinosum	tree	65%	0.26m	7.5m	Firewwood,charcoal,construction	Small tree,abundant
Oxytenanthera abyssinica	Herbeacus				Construction	herbeacus -abundant
Ablizia coriaria	tree		0.29m	8.0m	Medicine,construction	Small tree,abundant
Sterculia uren	tree		0.29m	8.2m	Gumm burnt are incense,firewwod	Small tree,abundant
Parinari curatellifolia	tree		0.14m	6.0m	Firewwood,construction,medicin e	Small tree,abundant
Piliostigma reticulatum	shrub				Firewood,medicine,construction	less than 6m sapling
Acacaia polycantha	shrub				Fierwood ,construction	less than 6m sapling
Vegetation plot-1313						
Species name	Habit	Cover	DBH for tree	Height for tree	Use by the community	Comment
Ficus sycomorus	tree	65%	0.54m	13m	Firewood	medium tre-abundant
Ficus sycomorus	tree		0.61m	15m	Firewood	medium tre-abundant
Pesudocedrela kotscchyi	shrub				Firewood,construction	less than 6m sapling
Acacia polycantha	shrub				Firewood,construction	less than 6m sapling
Tamerinda indica	shrub				Firewood,fruits eaten	less than 6m sapling
Acacia hokii	shrub				Firewood,construction	less than 6m sapling
Khaya sengalesis	tree		0.14m	8m	Firewoodmedicine,construction	small tree
Vegetation plot-1414						
Species name	Habit	cover	DBH for tree	Height for tree	Uses by the community	comments
Ficus sycomorus	tree	60%	0.65m	18m	Firewood	Big tree

Acacaia sieberiana	tree		0.18m	7m	Firewood,construction	small tree
Tectona grandis	tree		0.21m	10m	Firewood,construction	exotic tree
Lonchocarphus laxifloirus	shrub				Firewood ,conducting blessing,tools handle,medicine	less than 6m sapling
Pesudocedrela kotscchyi	shrub				Firewood,construction,tools handle	less than 6m sapling
Acacaia polycantha	shrub				Firewood,construction	less than 6m sapling
Combertum hatmannianum	shrub				Firewood,charcoal,construction	less than 6m sapling
Vegetation plot-1515						
Species name	Habit	Cover	DBH for tree	Height for tree	use by community	comments
Acacia hokii	shrub	50%			Firewood,construction	less than 6 m sapling
Grewia mollis	shrub				Fruits eaten,construction	less than 6 m sapling
Ximenia americana	shrub				Fruits eaten	less than 6 m sapling
Combertum collinum	shrub				Firewood,construction,charcoal	less than 6 m sapling
Acacia sieberiana	tree		0.13m	6.0m	Firewood,construction	small tree
Lonchocarpus laxifoirus	tree		0.14m	6.2m	Firewood,construction	small tree

23 ANNEX 10: RECONNAISANCE SITE VISIT REPORT

REPORT OF THE PRELIMINARY STUDY (STAKEHOLDERS ENGAGEMENT AND SITE RECONNAISSANCE SURVEY) OF UGANDA-SOUTH SUDAN ELECTRIC TRANSMISSION LINE INTERCONNECTION

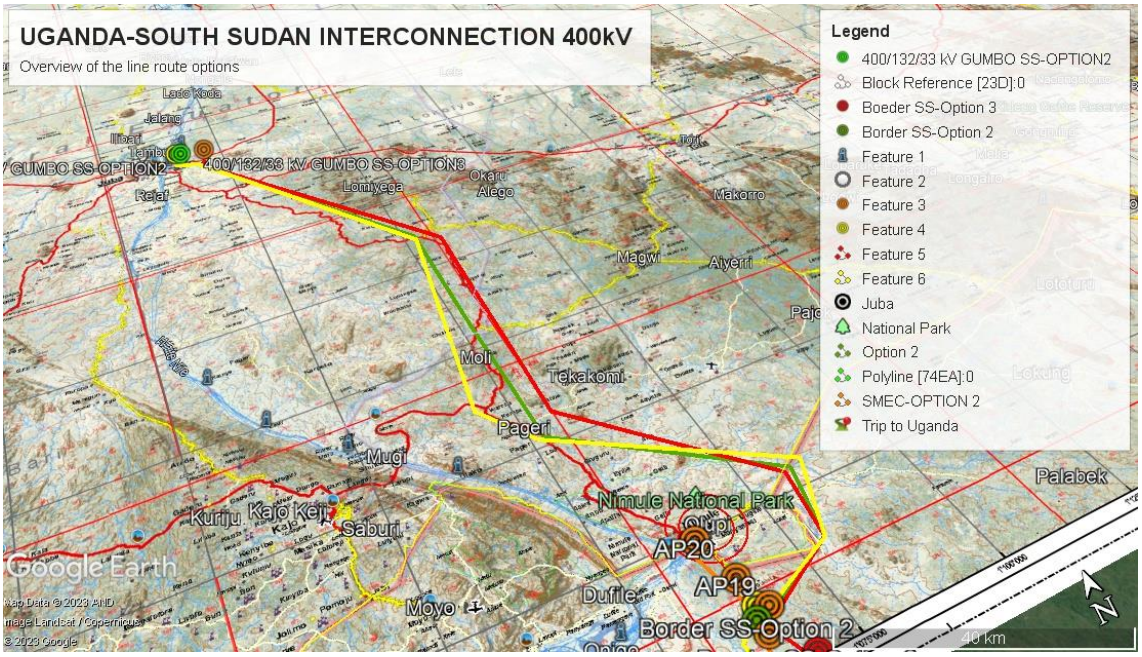
BY

THOMAS FRANCIS LADO

OCTOBER, 2023

1. Introduction

Consultations with the stakeholders (Ministries of Electricity, Environment and Forestry, and Wildlife Conservation and Tourism) was carried out both before and after the commencement of the site reconnaissance survey of the Uganda-South Sudan Electric Transmission Line. The site reconnaissance survey of the Uganda-South Sudan Electric Transmission Line was done from Wednesday October 4th to Sunday October 8th, 2023. The stakeholder consultation and the site reconnaissance survey were done to have a glimpse of the environment of the areas along the three proposed transmission routes Red, Green and Yellow with the Green line option being our target. It was undertaken in anticipation of a ground survey to be done in preparation for an Environmental Impact Assessment. The survey team comprised the driver of the van, Lawrence Maviri and Thomas F. Lado. The transmission line mainly passes through Central and Eastern Equatoria States.



2. Objective of preliminary study

The objective of the preliminary study were two-fold;

I. Conduct a stakeholder consultation with responsible people at the Ministries of Electricity, Environment and Forestry, and Wildlife Conservation and Tourism.

II. Undertake a site reconnaissance survey to scan the biological environment including ecologically important or sensitive habitats, migration routes of wildlife and roosting sites for birds especially raptors e. g. vultures as well as wetlands and water sources at the following sites;

a. Proposed substations.
b. Lokiliri.
c. Lobonok.
d. Pageri (Opari and Moli)).

e. Mugali.

3. Methods

Stakeholder consultations were done cordially with the responsible and knowledgeable people at the aforementioned ministries. These were done in concomitance with the reconnaissance surveys face to face or through phone conversations. I had a conversation with the Coordinator of the ETL Project working the South Sudan Electricity Cooperation, responsible people dealing with Biodiversity issues at the Ministry of Environment and Forestry, and with officers at the Ministry of Wildlife Conservation and Tourism as well as with the Chief Warden of Nimule National Park.

With respect to the reconnaissance survey, a traverses line or unmarked route along Juba-Nimule road while tracking the position of the proposed substations and the movement of the three proposed transmission lines was used to attain information on the biological environment. At each of the targeted areas (proposed substations, Lokiliri, Lobonok, Pageri (Opari and Moli) and Mugali) images of and information on ecologically important or sensitive habitats, wildlife species or sign, migration routes of wildlife and roosting sites for birds especially raptors e. g. vultures as well as wetlands and water sources were collected using smart phones equipped with location data.

4. Results

Stakeholder engagement

Ministry of Energy / South Sudan Electricity Corporation asked for the environmental perspective of the proposed substations.

Ministry of Environment and Forestry emphasized on the need for following Environmental Impact Assessment Procedures in South Sudan, submission of a report for the construction of the ETL in an environmentally sustainable way.

Ministry of Wildlife Conservation and Tourism stressed the need to take note of critical wildlife habitats for birds and other wildlife species and elephant crossing areas.

Biological environment

Proposed substation three falls in an area characterized by high concentration of borassus palm and a seasonal stream which can serve as important area for birds, especially raptors with vultures sighted and an important dry season water source for antelopes wandering outside Badingilo National Park (figure below). Besides the area is prone to flooding.



Lokiliri payam has important habitat for wildlife (figure below). Monkeys were seen strolling in the area, however they were far away to be photographed.



In Lobonok payam the green line passes nearby a thick forested area (figure below).



It was in Pageri payam that the first elephant crossing was indicated (figure below).



In Moli boma another elephant crossing was found. It was characterized by the presence of a pile of dung (figure below).



In Mugali payam, although we were informed by the villagers that the place was usually raided by elephants, unfortunately we could not find any elephant dung or footprint. It was here that the green line was running a few kilometers down a river (figure below).



In Opari boma, the green line moves over to the right hand side when driving from Nimule to Opari (figure below). Here we were informed of elephant crossing though we didn't find dung or foot prints of elephant.



Recommendations for future surveys

1. Use a four wheel-drive van, preferably a Toyota Land Cruiser.
2. Employ locals to assist with cutting through a path and serving as a guide.
3. Get a security clearance from the National Security. Contact the authority at Payam or Boma level including the village chief.
4. Conduct a ground survey of the aforementioned areas wherever and whenever possible.

24 ANNEX 11: NON-TECHNICAL SUMMARY

Uganda (Olwiyo) – South Sudan (Juba) 400 kV Power Interconnection Project

ELECTROCONSULT

CESI
Shaping a Better Energy Future

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Innovation for sustainable future

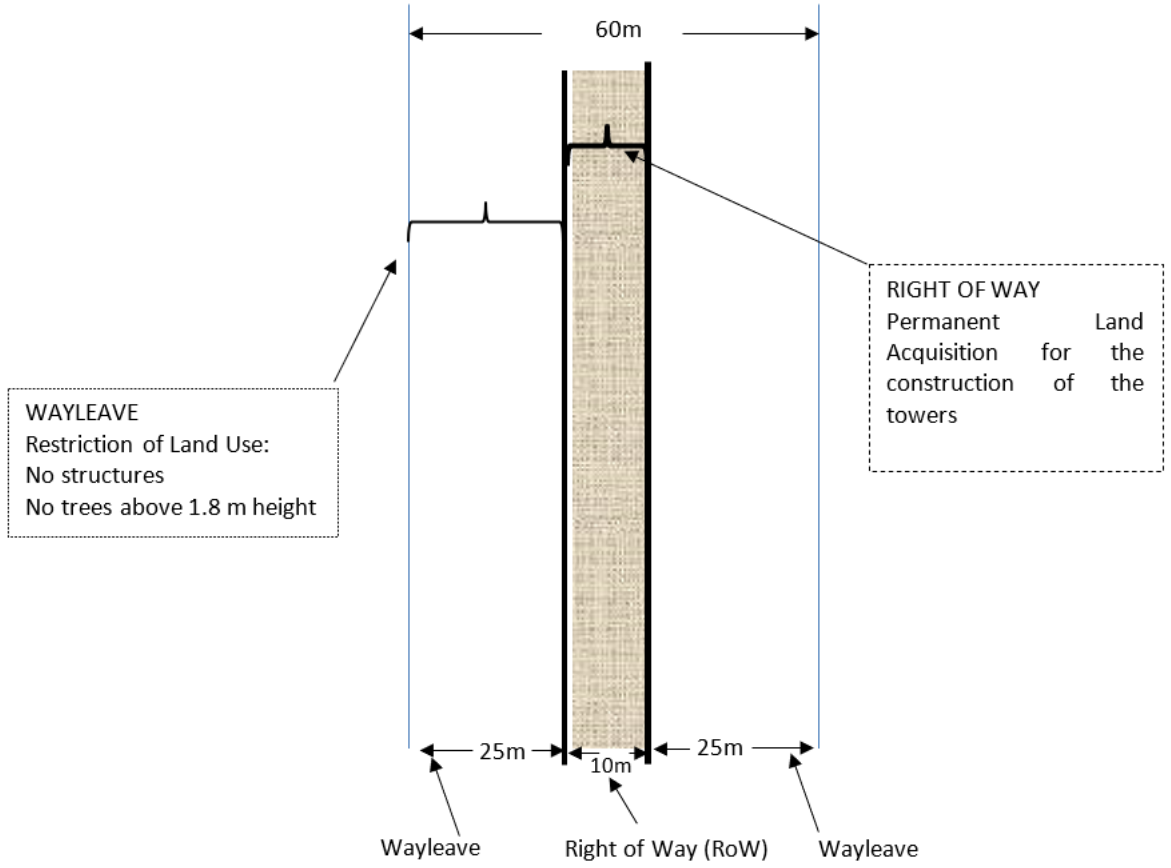
SOUTH SUDAN ELECTRICITY CORPORATION
SSEC

UGANDA ELECTRICITY TRANSMISSION COMPANY LTD

NELSAP-CU
NILE BASIN INITIATIVE
INITIATIVE DU BASSIN DU NIL

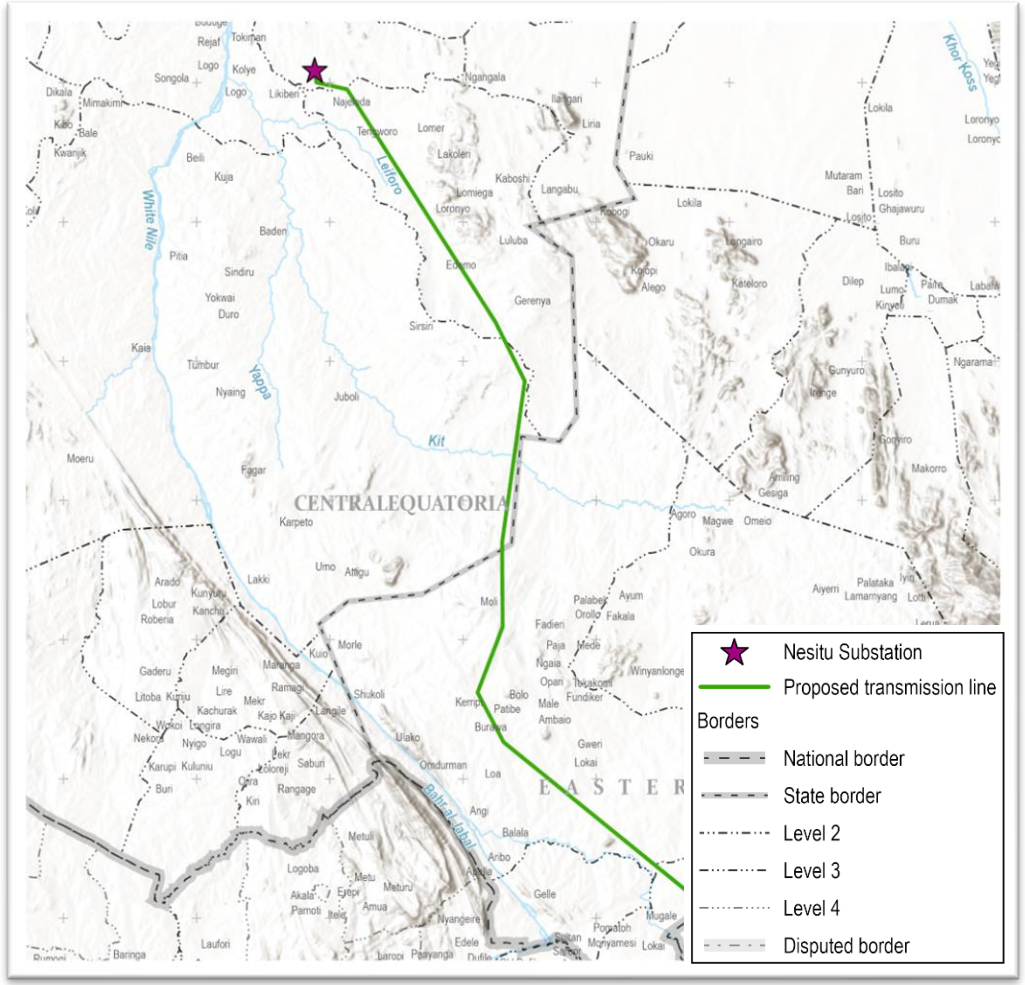
The Project

- The Uganda-South Sudan 400 kV Power Interconnection Project aims to improve the standard of living for both countries' populations. By enabling regional power sharing and grid interconnection, this project will bring electricity to rural areas, improve living standards, and boost economic development.
- The transmission line corridor will adhere to Ugandan regulations, which require a total width of 60 meters for the 400 kV Overhead Transmission Line (OTL). This comprises a 10-meter RoW and an additional 25 meters of wayleave on each side. The RoW must be clear of human settlements and tall trees that could interfere with the conductors. Cultivation within the wayleave is permitted, but crops must be limited to a maximum height of 1.8 meters (6 feet).



The Project

- The proposed 400 kV transmission line stretches approximately 149 km in South Sudan. It bypasses Nimule National Park near the border with Uganda and roughly follows the Juba-Nimule Highway (A43) through Juba and Magwi counties.
- In preparation for the design, consultants held preliminary discussions with local authorities and environmental and cultural institutes along the transmission line route. These discussions helped consultants identify environmentally sensitive areas, potential social and economic impacts on communities, and cultural sites of importance. By incorporating this feedback, the consultants were able to significantly optimize the route, minimizing its impact on settlements, important water sources, natural reserves, and places of historical and cultural significance to local communities.



Construction Activities

- Line construction follows a defined process. After preliminary surveys and determining the line route, activities like RoW acquisition, detailed line surveys, and soil surveys are conducted. Once a contract is awarded, it will detail specific construction phases such as clearing vegetation, line pegging, foundation excavation and construction, tower erection, and line stringing. Within the 60-meter wide corridor, the center line and the boundaries of the RoW will be established. The construction itself will involve several phases, including clearing vegetation, erecting towers, stringing conductors, installing equipment, constructing the new Nesitu substation, and finally cleaning up and re-vegetating the area.



Construction Activities

CLEARING

- It is a common practice to clear the entire RoW before line construction can commence. Trees, scrub, and undergrowth vegetation will be cleared prior to the commencement of construction works. This practice is necessary to ensure sufficient clearance for construction and to maintain a safe distance between the conductor and the ground. It also facilitates maintenance of the line should repairs be required.

FOUNDATION

- During detailed line surveys, line pegging is carried out to determine tower spacing, followed by foundation spot excavation. Foundation excavation is followed by foundation construction and a concrete curing period (usually 21 days) before tower erection can commence. Tower structures may be assembled horizontally on the ground and set in place by a crane. Alternatively, the structure can be assembled vertically one piece at a time at its location. Substation equipment is erected and assembled in a similar manner.

CONDUCTOR STRINGING

- Once the structure is erected, a pilot wire is strung first. Then, a stringing vehicle (such as a tractor or equivalent) pulls the conductor and overhead shield wires through pulleys attached to the insulators. These wires are then connected to the insulators using hand tools.

LAND ACQUISITION

- The responsibility for acquiring land for tower footprints rests with the Local Authorities. The RoW width, according to Ugandan regulations, is 60 m. Local authorities will handle any specific compensation measures required by local laws for lands crossed by the transmission corridor. Additionally, compensation will be provided for the loss of annual and perennial crops during construction, considering the time necessary for the land to recover its production capacity.

Impact Assessment

An environmental and social impact assessment (ESIA) has been conducted to identify and mitigate potential impacts on the physical, biological and social environment.

PHYSICAL ENVIRONMENT

Negative impacts during the construction phase:

- **Climate:** project construction will cause minimal climate impact. There will be some greenhouse gas emissions from vehicles and equipment, but these are expected to be very low and won't significantly affect global climate change. While clearing vegetation will remove some carbon storage capacity, the impacted area is relatively small and considered low-sensitivity. Overall, the project's impact on climate is considered negligible.
- **Geology & Soils**: Land clearing and excavations for the project have a low risk of impacting the area's geology and soil. The main concerns are erosion and topsoil loss, which can be mitigated through proper drainage, soil management plans, and revegetation efforts. Overall, the impact is expected to be negligible.
- **Hydrogeology, Groundwater & Surface Water Resources**: Despite construction activities near water bodies, the project is unlikely to significantly impact water quality. Land clearing and vehicle movement may increase turbidity in nearby streams, but proper soil management plans and revegetation efforts will minimize this impact. The risk of accidental spills contaminating water is also considered low, and can be further mitigated through proper storage and handling of materials. Overall, the project's impact on surface and groundwater resources is expected to be negligible.
- **Air Quality:** While construction will create some dust and exhaust fumes, the impact is expected to be minimal. Dust will be controlled through measures like watering down roads and stockpiles. Vehicle and equipment maintenance will help minimize exhaust emissions. The project is unlikely to significantly affect air quality in the area.
- **Noise and Vibration**: During construction, there will be some temporary increase in noise and vibration from equipment and traffic. However, noise levels in the area are already low, and construction will be restricted to daytime hours. With proper equipment maintenance, the impact on nearby communities and wildlife is expected to be minimal.
- **Waste Production**: Construction will generate some waste, but this will be carefully managed. Contractors will have plans to recycle, store, and dispose of waste properly, following best practices. Overall, the impact of waste production is expected to be minimal.

Negative impacts during the operation phase:

- **Visual and Aesthetic Impact**: The presence of OTL will permanently alter the landscape, especially in rural areas. This impact is considered high and cannot be mitigated.
- **Water Resources**: The project will have a negligible impact on groundwater recharge due to the small area of impervious surfaces created.
- **Noise**: Noise from the OTL during operation is expected to be negligible due to the rural location and weather-dependent nature.
- **Electromagnetic fields** (EMFs): The project adheres to international guidelines for EMF exposure, and any health risks are considered extremely low.

Impact Assessment

An environmental and social impact assessment (ESIA) has been conducted to identify and mitigate potential impacts on the physical, biological and social environment.

BIOLOGICAL ENVIRONMENT

Negative impacts during the construction phase:

- **Agricultural Lands:** Construction of the OTL will disrupt agricultural activities in several ways. Farm equipment movement will be hindered, soil compaction and damage from structures is likely, and irrigation may be affected. Construction activities like excavation and improper erosion control can also reduce crop yields in the long term. Careful planning and mitigation strategies are crucial to minimize these impacts and ensure the continued viability of farms in the area.
- **Threatened/Vulnerable Species and Protected Areas**: Construction of the transmission line could disrupt or destroy habitat for endangered/vulnerable species in the area, particularly within or near Important Bird and Biodiversity Areas (IBAs) crossed by the project footprint.
- **Invasive Species**: Building the OTL might spread invasive plants. Construction disrupts the soil and allows these unwanted species to hitch a ride on equipment, potentially harming nearby ecosystems.
- **Wetlands**: Building the OTL can damage wetlands in several ways. Vehicles and equipment can crush vegetation, compact soil, and stir up sediment, harming aquatic life. Forest clearing can permanently change the habitat and introduce invasive plants. Careful planning to minimize these disturbances is crucial to protect wetlands along the route.
- **Woodlands:** Building the OTL will cut through forests, fragmenting them and making wildlife more vulnerable. This also creates opportunities for invasive plants and diseases to harm the remaining woodlands. Careful planning is needed to minimize forest loss and protect these habitats.
- **Other Impacts**: Construction may open up forests to unwanted access and illegal activities. Clearing vegetation can harm wildlife habitats and increase soil erosion. Increased human presence near the power line might also disturb wildlife and contribute to conflicts. Careful planning is crucial to minimize these impacts.

Negative impacts during the operation phase:

- **Agricultural Lands**: Even after construction, the power line will affect nearby farms. Windbreaks may need to be removed, increasing soil erosion and making farms more susceptible to weeds and pests. Careful planning to minimize windbreak removal and implementing good land management practices are crucial to protect farmland.
- **Invasive Species**: Maintenance activities like mowing could spread invasive plants if proper controls are not implemented.
- **Bird and Bat Collisions**: The OTL poses a collision and electrocution risk to birds and potentially bats. To minimize this impact, bird diverters will be installed along the entire transmission line.
- **Illegal Hunting**: Easier access due to the power line might increase illegal hunting and endanger wildlife.
- **Habitat Fragmentation**: Clearing vegetation for the line will fragment wildlife habitat, making it harder for animals to move around and find resources.
- **Human Disturbance**: Maintenance activities and increased human presence near the line could disrupt wildlife behavior.
- **Land Use Changes**: Farms may lose windbreaks, increasing soil erosion and pest problems.

Impact Assessment

An environmental and social impact assessment (ESIA) has been conducted to identify and mitigate potential impacts on the physical, biological and social environment.

SOCIAL ENVIRONMENT

Negative impacts during the construction phase:

- **Physical Displacement:** Land acquisition for the transmission line will have a negligible impact as it mostly affects abandoned structures and a small portion of agricultural land.
- **Economic Displacement**: Loss of income from acquired land is minimal and temporary for most people. The project will provide agricultural assistance to affected communities.
- **Cultural Resources**: Minor impact on a few graves and a valuable tree. Mitigation measures will minimize this impact.
- **Disturbance**: Noise, air pollution, and traffic from construction will disrupt nearby communities for a limited time. This is a low impact due to the temporary nature but requires mitigation to minimize inconvenience.
- **Land Use**: Construction activities will temporarily occupy land for storage and staging areas. There may also be minor, temporary impacts on land due to wire stringing. Access to some areas may be limited during construction. This will be temporary and only affect small areas at a time.
- **Sexual Harassment:** An influx of male workers could increase the risk of sexual harassment and exploitation. This is a high-risk impact due to the region's history and requires strong preventative measures.
- **Social Conflicts**: Land disputes and cultural differences between workers and communities could lead to social conflict. This is a medium risk that can be mitigated through good communication and grievance mechanisms.
- **Disease**: The influx of workers could increase the spread of sexually transmitted diseases and malaria. This is a medium-high risk but can be effectively managed with proper health and safety protocols.
- **Child Labour**: There is a high risk that children could be employed in construction activities. This is a severe impact requiring strong measures to prevent child labor.

Negative impacts during the operation phase:

- **Disturbance**: Noise, air pollution, and traffic from maintenance activities may cause temporary inconvenience to nearby communities. However, this impact is negligible compared to construction.
- **Land Use**: Land use will be permanently restricted within the power line corridor. Forests and orchards will be impacted the most as trees will be removed and their height will be limited.

Impact Assessment

An environmental and social impact assessment (ESIA) has been conducted to identify and mitigate potential impacts on the physical, biological and social environment.

PHYSICAL ENVIRONMENT

Potential positive impacts during the operation phase:

- **Reduced Greenhouse Gas Emissions**: The project is expected to increase reliance on cleaner hydropower in South Sudan by reducing dependence on fossil fuels; potentially decrease deforestation for firewood in rural areas with access to electricity; contribute to regional and global efforts to reduce greenhouse gas emissions. This is a positive impact with high significance due to its long-term benefits and contribution to climate change goals.

SOCIAL ENVIRONMENT

Positive impacts during the construction phase:

- **Employment:** The project will create temporary job opportunities for local people during construction, providing income in a region with high poverty levels. This impact is positive but limited due to the temporary nature of the jobs.
- **Small Businesses**: Construction may create opportunities for small businesses to cater to the needs of construction workers, boosting the local economy.

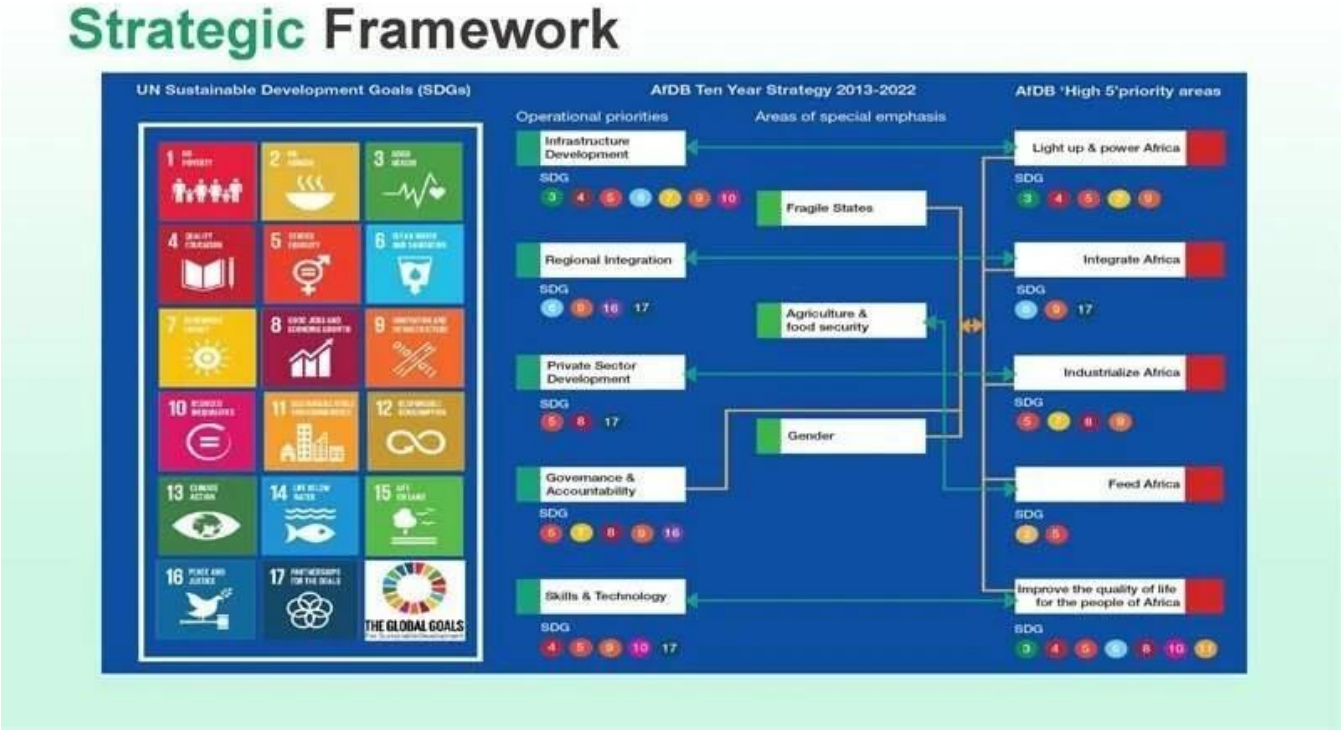
Positive impacts during the operation phase:

- **Rural Electrification**: The project will bring reliable electricity to communities and businesses in a region with limited access to power. This will have a long-term, positive impact on various aspects of life (e.g., security, education, communication and entertainment, business productivity, health).

25 ANNEX 12: GENDER EQUALITY

INTRODUCTION

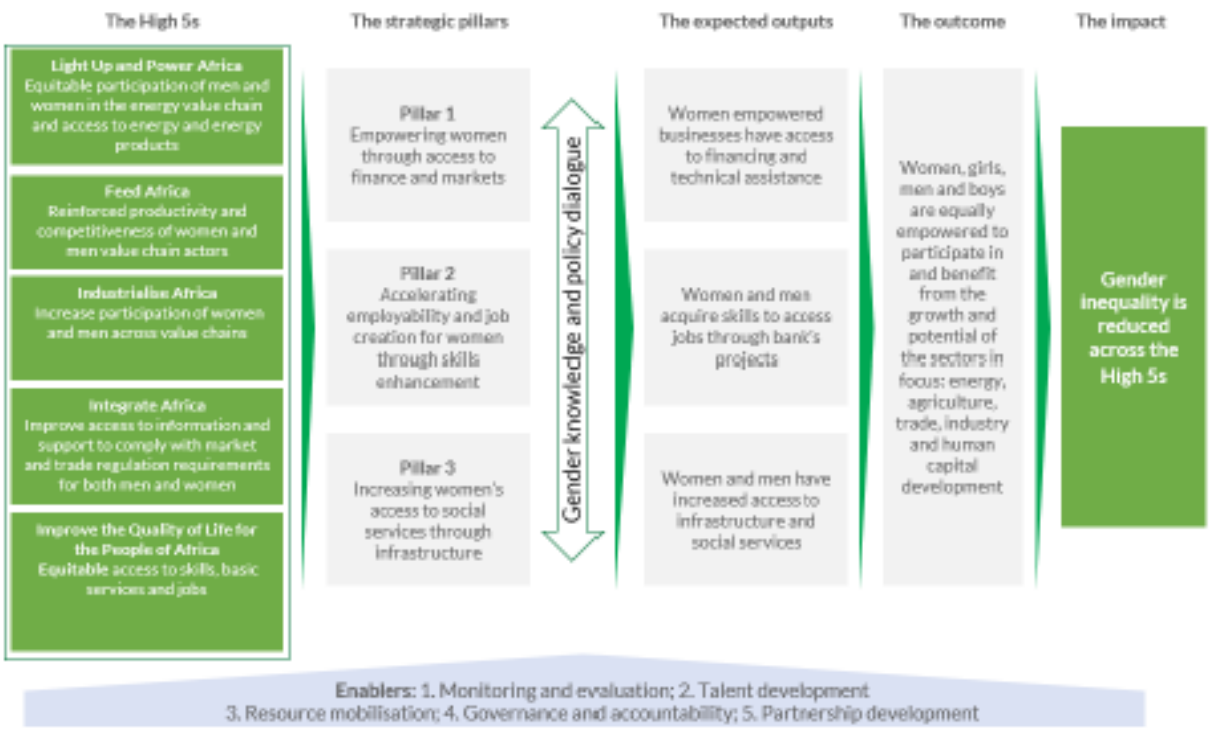
The African Development Bank's High 5 priority areas are intended to support African countries' achievement of the SDGS. They are: Feed Africa; Light up Africa; Industrialise Africa; Integrate Africa; and Improve the Quality of Life for the people of Africa.



The Bank like other international development institutions recognises that gender equality and women and girls' empowerment is not only a critical human rights issue for women and girls, it is a prerequisite for the achievement of broader development goals, effective humanitarian response and sustainable peace and security. Therefore, due to the persistent challenges that hinder women's economic empowerment in Africa, the Bank has increasingly focused on mainstreaming gender in its operations to ensure gender equality and women and girl's empowerment at regional and national levels. Over the years, the Bank has demonstrated its commitment to promote gender equality and women and girls' empowerment in Africa through various policy frameworks and institutional mechanisms.

The Gender Strategy 2021-2025 aims to strengthen the Bank's commitment to do more to address the above challenges and push forward gender equality and women and girls' empowerment in Africa. The Bank will do so focusing on three pillars:

- Empowering women through access to finance and markets;
- Accelerating employability and job creation for women through skills enhancement;
- Increasing women's access to social services through infrastructure.



SOUTH SUDAN LAWS

South Sudan has legislation that addresses GBV, including the 2008 Child Act and the 2012 Penal Code, which criminalize various forms of violence against women and children. Despite the existence of laws, challenges persist in enforcing them effectively. This includes inadequate resources for law enforcement agencies, limited access to justice for survivors, and cultural barriers that discourage reporting of GBV cases. The Transitional Constitution of South Sudan also guarantees the rights of women and prohibits discrimination based on gender.

Child Act, South Sudan 2008

2008 Child Act of South Sudan primarily focuses on the protection and welfare of children, its provisions have important implications for addressing gender issues, particularly concerning the rights and well-being of girls. The Child Act includes provisions aimed at protecting children, regardless of gender, from various forms of harm, including physical, emotional, and sexual abuse. These protections are crucial for both boys and girls but are particularly relevant for addressing gender-based violence against girls. By promoting gender equality, protecting girls from harm, and ensuring equal opportunities for all children, the Act contributes to efforts to build a more inclusive and just society in South Sudan. The Act prohibits harmful traditional practices that disproportionately affect girls, such as female genital mutilation (FGM) and child marriage. By explicitly prohibiting these practices, the legislation contributes to efforts to promote gender equality and protect the rights of girls.

Penal Code, South Sudan 2011

The Penal Code of South Sudan, enacted in 2008 and amended in 2011, contains provisions relevant to gender-based violence (GBV) and crimes against women. The Penal Code stipulates penalties for perpetrators of GBV, including imprisonment and fines. The severity of the punishment may vary

depending on the nature and gravity of the offense, with more severe penalties for aggravated forms of violence. Overall, the Penal Code of South Sudan contains important provisions for addressing GBV and crimes against women. However, continued efforts are needed to strengthen enforcement mechanisms, raise awareness about women's rights, and promote gender equality to effectively combat GBV in the country.

APPLICABLE POLICIES

The South Sudan National Gender Policy, 2012

The goal of achieving gender equality in South Sudan is anchored in the country's Transitional Constitution and guided by a vision of equality as an inalienable right for all women, men and children, and gender equality as a human right. The goal of this policy is to ensure that gender equality is an integral part of all laws, policies, programs and activities of all South Sudan's public institutions, the private sector and civil society to achieve equality in the cultural, social, political and economic spheres in South Sudan. Gender related concerns such as Gender Based Violence, sexual harassment, gender discrimination among others that may be associated with the development of the project should be addressed in line with the policy to ensure that the project objectives/desired benefits are attained.

NBI Gender mainstreaming Policy and Guidelines, 2012

The purpose of the NBI gender mainstreaming Policy and Strategy is to achieve gender equality and women's empowerment in all NBI policies, strategies, processes, programs and projects through capacity building, rationalization and harmonization, research, resource mobilization, partnership development and advocacy. Guiding principles for the implementation of the
NBI Gender mainstreaming Policy and Strategy: a) Gender Equality and non-discrimination: Working towards equity and justice by ensuring that everyone irrespective of sex, age, race, color, ethnicity, class and religion has an equal opportunity to express and utilize her/his potential;
b) Gender mainstreaming: Considering gender concerns systematically from planning through implementation strategies and programs to outcomes;
c) Inclusiveness: this policy stresses paying attention to special needs and the disadvantaged groups;
d) Partnership and collaboration of all stakeholders at all levels;
e) Sensitivity to socio-cultural diversity in the Nile Basin region.

The strategy forms an integral part of projects activities and aims at providing a view of the gender goals and to facilitate a process of learning and increased capacity to analyse and mainstream gender in the course of the work.

East African Community (EAC) Gender Policy, 2018

This Policy provides a framework, intended to accelerate the realization of gender equality, fairness between men and women, non-discrimination, and fundamental rights in East Africa. The Policy framework is a tool to facilitate the advancement of East Africa's political and social economic integration, guarantee that gender issues are included in the East African Community agenda, accelerate gender mainstreaming, contribute to higher living standards, and enhance the efforts exerted by the East African people to play their rightful role in a globalizing world. The EAC is committed to increase access to affordable energy for men and women to increase economic development and improve

standards of living. Gender, Energy and Lighting is a priority action area of the Gender policy, and the commitment of increasing access to energy for men and women is expressed in the Project.

The IGAD Regional Gender Equality Strategy (2023-2030)

The IGAD Gender Equality Strategy sets the strategic framework for priority interventions areas of the implementation of IGAD's Vision 2050 and builds on several ongoing programs established to develop resilient ecosystems and economic growth. The gender strategy outlines an approach that intends to translate IGAD's commitments to gender equality, inclusion, and empowerment into demonstrable results and impacts. The priorities of the strategy include:

- Increase women's participation in sustainable management of natural resources, resilience building, food, and nutrition security;
- Advance gender equality in regional trade and economic integration;
- Increase equitable access to health and basic social services for gender transformation;
- Increase the participation of women in peace building and conflict management and protect women living in situations of conflict;
- Advance efforts to eliminate all forms of violence against all women and girls in public and private spheres, including trafficking, sexual exploitation, and all other forms of exploitation;
- Strengthen IGAD's institutional capacity for leadership and coordination of Gender Equality and Women's Empowerment interventions

The Project aims to promote gender equality in regional trade and economic integration by improving energy accessibility in remote areas. This will enable women to start new trades at a local level or connect existing ones to the rest of the country. Availability of energy will also improve the access of women to technology, education, and health.

The African Development Bank Group Gender Strategy (2021-2025)

The African Development Bank has made gender equality and women central to its activities through developing and implementing strategies that integrate women's concerns into the Bank's internal and external operations and engagement. The Gender Strategy 2021-2025 will prioritize the need to reduce gender inequalities across Africa by increasing access to finance and technical assistance, enhancing technical skills and gender-responsive infrastructure. In recognition of the opportunity to further enhance gender equality and women and girl's empowerment on the continent, the Bank, through its High 5s, intends to accelerate the continent's economic and social transformation. The 5s are: Light up and Power Africa, Feed Africa, Industrialize Africa, Integrate Africa, Improve the Quality of Life for the People of Africa.

In a country such as Uganda and South Sudan, where gender inequalities are prevalent, this Project will provide women in relatively isolated areas with access to electricity. This resource will contribute to the development of their local businesses and economy, ensuring a higher level of security. The Project is placed into the first High 5, Light up and Power Africa, with the aim of empowering women increasing access to social services through infrastructure and creating job opportunities.

PROFILE OF DIRECT AFFECTED HOUSEHOLDS

South Sudan is experiencing the worst humanitarian crisis since its independence. This is attributable to recurring floods, droughts and other extreme weather conditions fueled by climate change, a deepening economic crisis, and sub-national and politically motivated conflicts.

Furthermore, the increasing costs of fuel and staple foods continue to exacerbate vulnerabilities. Significant internal and cross-border displacement has further strained scarce resources, livelihoods and basic services and has increased protection risks and intercommunal tensions.

South Sudan was ranked 187th of 189 countries in the 2019 Gender Inequality Index (UNDP, HDR overview 2019 p.25), with especially low scores on educational attainment and political representation for women and girls. Several underlying factors drive gender inequalities in South Sudan, such as discriminatory social norms and traditional practices, women's lack of access to and control over resources, and greater insecurity and violence during the civil war.

In the project affected area the following figures have been found in terms of Female Households and elderly Households. Nevertheless, the living conditions of all affected Households in terms of access to services and income level is extremely poor therefore all the Households are to be considered vulnerable. All the AHs are above 18 years old, and no disable people have been found.

HHs above 60 years old

PAP CODE	GENDER
ARU 0017	Male

Female HHs

PAP CODE	GENDER
ARA 0011	Female
ARA 0012	Female
ARA 0014	Female
ARU 0013	Female
ARU 0019	Female
ARU 0021	Female
ARU 0022	Female

South Sudan has one of the highest rates of gender-based violence (GBV) in the world. Women and girls often face sexual violence, including rape, abduction, and forced marriage. The ongoing conflict exacerbates these issues, with armed groups frequently perpetrating violence against women. Women and girls in Eastern and Central Equatoria, as in many conflict zones, are vulnerable to various forms of gender-based violence, including sexual violence, domestic abuse, and forced marriage. The breakdown of law and order, as well as the prevalence of armed groups, increases the risk of such violence.

Despite efforts to improve access to education, girls in South Sudan still face significant barriers to schooling. Factors such as poverty, early marriage, cultural beliefs, and insecurity contribute to low school enrollment and high dropout rates among girls. Women in South Sudan often lack access to adequate healthcare services, particularly in rural areas. Maternal mortality rates are among the highest globally, largely due to limited access to maternal healthcare, skilled birth attendants, and emergency obstetric care. Child marriage is prevalent in South Sudan, with a significant proportion of girls married off before the age of 18. Early marriage not only deprives girls of education and opportunities but also exposes them to increased health risks and perpetuates the cycle of poverty.

IMPACTS

Employment and Income

Positive opportunities for PAPs and communities can be in the form of temporary employment, as casual labour, cooking, and cleaning services It is expected that some jobs will be available during construction of the power transmission line for the local population, mainly as casual workers. However, these employment opportunities are expected to be temporary and benefit the community in the short term only. There will be a moderately positive impact on employment, since limited number of people are likely to be employed. Nevertheless, it is a good opportunity in consideration of the poverty level in the region.

Small business opportunities

As for job opportunities, small business can raise during the construction phase, for all what concern the provision of services like the sale of food and other consumable goods to workers from other parts of the country and abroad.

Sexual Harassment

Large influx of male labor may also lead to an increase in exploitative sexual relationships and human trafficking whereby women and girls are forced into sex work. The impact will be continuous during all the project construction and it will have a local extension, the intensity is considered high since the Acholi Region is one of the areas with the highest rates of physical and sexual violence on women and men. For two decades, the region was severely affected by conflict. According to different studies, these communities experienced sexual and physical violence at the hands of the insurgents, through abduction of children as sex slaves or as child soldiers, and indiscriminate mutilation and murders. Engaging with communities, traditional leaders, and religious leaders is crucial to challenge harmful cultural norms and promote gender equality. Awareness-raising campaigns can help change attitudes towards GBV and encourage reporting of incidents. Sensitivity therefore is considered high as well and the impact irreversible, nevertheless still manageable through prevention and proper awareness training, workers code of conducts and effective GRM.

Increase of social conflicts

The risk of social conflicts in the project area can be triggered either by land conflicts or by the influx of workers with different lifestyles or cultural backgrounds on the host community, in particular issues such as religious or other cultural proscriptions, local traditions and community structure and the relationship between men, women and youths. During the first two consultation phases, field activities were hampered by a very fragile security situation near the border with Uganda. In the next stages of the

project, it will therefore be essential to ensure the direct involvement of other institutional actors, starting with the Minister of the Interior. The objective will be the creation of a coordination unit or ad hoc committee including, UETCL, SSEC and Lenders focusing on security issues, to be activated in cooperation with other interested ministers or departments, to follow the process of activities on the ground and ensure the presence of security personnel.

Increase of STD and VBD

As reported in the baseline chapter, Uganda's population of 47 million has always been heavily impacted by illness and disease, with communicable diseases accounting for over 50% of deaths in the country. Malaria, tuberculosis (TB) and HIV/AIDS are three of the top diseases impacting Uganda and are among the leading causes of death. In consideration of the actual situation, the influx of workers from abroad or form other parts of Uganda can increase the transmission of HIV and TB through contact with local communities, while poor management of water resources in camp or construction sited could increase the spread of malaria mosquitos. The community of the project is well aware on the risk and prevention practices of these diseases though awareness campaigns conducted by the Government and NGOs. Hence, the impact has been considered medium highly sensitive, irreversible. Nevertheless, mitigation effectiveness has been considered high, because with an Occupational and Community Health and Safety in place the risk can be extremely reduced and managed.

Child Labor
The country's 2008 census found that 45.6 per cent of children aged 10—14 was engaged in work, with 60.2 per cent of them in agriculture. Nearly all street children in Juba are involved in some form of child labour. UNICEF describes child labour as 'endemic' to South Sudan[39]. Labour is found in many economic sectors and predominantly in the agricultural sector. While in the construction sector child labor is found in activities such as building and transporting materials, rock breaking, making bricks, gold mining[40] A Contractor will require local workforce for casual labour and in consideration of this trend the potential risk for the project to increase child labour is high and the impact highly frequent, highly intense and irreversible. Construction works, or quarry activities are considered as heavy work that can compromise the development of children, therefore also the residual impact remain high.

MITIGATION MEASURES

The project has defined mitigation measures that cover the needs of women and that are extracted from the main ESMP and consider the following aspects
Engage with local communities, including women's groups and leaders, throughout the project lifecycle. Consultation processes should be inclusive, transparent, and participatory, ensuring that women's voices are heard, their concerns are addressed, and their priorities are considered in decision-making.
Empower women with knowledge, skills, and resources to participate meaningfully in decision-making processes related to transmission line projects. Provide capacity-building initiatives, training programs, and educational opportunities that enhance women's understanding of their rights, opportunities, and responsibilities.
Provide support for alternative livelihoods and income-generating activities for women affected by the project. This includes vocational training, access to credit and markets, support for entrepreneurship, and investment in women-led businesses and cooperatives.

[39] UNICEF, Situation Assessment of Children and Women in South Sudan. 2015
[40] 2018 FINDINGS ON THE WORST FORMS OF CHILD LABOR

Ensure that women have secure land tenure rights and are adequately compensated for any land acquisition or right-of-way encroachment associated with transmission line construction. Transparent and equitable compensation mechanisms should consider women's contributions to land-based activities and their specific needs.

Implement measures to protect women's health and safety during the construction and operation of transmission lines. This includes adherence to safety standards, mitigation of environmental impacts, monitoring of electromagnetic fields (EMF) exposure, and provision of healthcare services for affected communities.

Establish social protection programs and support services that address the needs of women and vulnerable groups impacted by transmission line projects. This may include access to healthcare, counseling, legal assistance, psychosocial support, and mechanisms for reporting and addressing gender-based violence and other grievances.

Regularly monitor and evaluate the gender impacts of transmission line projects to assess progress, identify gaps, and make informed adjustments. Collect sex-disaggregated data, conduct gender-sensitive indicators, and engage in participatory monitoring and evaluation processes involving women and other stakeholders

Component	Target	Mitigation and Enhancement	Responsibility		Costs (USD)	Phase: Constr. (C) Oper. (O)
Resettlement	All affected households	Compensation for the loss of land and livelihood restoration though training and assistance	-	ESMD	200,000	C
Labor Equity in local employment benefits/minimize social conflicts	All National and international workers, included labor from nearby communities	Develop Project Human Resource Policy which includes provision: ▪ to prioritize local employment considering available skills in accordance with Local Authorities/Village leaders and UETCL, ▪ to promote non-discrimination and equal opportunities, ▪ Include women in the hiring and training process ▪ to provide additional specialized training to local workforce in skills required by contractor (i.e. administrator, driving etc.).	Contractor	ESMD	200,000	C
Labor Labor grievance mechanism	All National and international workers, included labor from nearby communities	Develop Project Grievances Mechanism for labor: ▪ Complaint from worker about unfair treatment or unsafe living or working condition; ▪ Grievance policies and mechanism must be developed and disclosed.	Contractor	ESMD	100,000	C
Security social conflict	Villages of the Project Area	▪ Prepare a Security Management Plan with provisions for respect of Voluntary Principles on Security and Human Rights (VPSHR) and manage the influx of workers and followers through a Labor Influx Management Plan ▪ Harmonize the above plans with: ▪ Local Employment Plan ▪ Workers Code of Conduct ▪ GBV/CAE/SEA plan, Occupational and Community Health and Safety plan ▪ Establish continuous communication with Key stakeholders and traditional leaders. ▪ Train foreign workers on local culture and traditions	Contractor	Contractor and ESMD	20,000	C
Vulnerable Groups	Villages of the Project Area	▪ GBV and CAE ▪ Contractors are required to have sexual harassment policies and Worker's Code of Conduct. It is recommended that Codes of Conduct include specific prohibitions against SEA, including prohibition of sexual activities with children, defined as	Contractor	ESMD	45,000	C

Component	Target	Mitigation and Enhancement	Responsibility		Costs (USD)	Phase: Constr. (C) Oper. (O)
		anyone younger than 18. This standard must hold even when national standards, laws and policies have a younger age of consent. ▪ Worker Code of Conduct shall be translated in local language(s) ▪ The Contractor is obliged to create and maintain an environment which prevents gender-based violence (GBV) and child abuse/exploitation (CAE) issues, and where the unacceptability of GBV and actions against children are clearly communicated to all those engaged on the project. ▪ Complains on GBV and CAE episodes shall be channelized through the Project Grievances Redress Mechanism, it should state in simple, up-front language that perpetrators will be sanctioned. System of sanctions must be put in place that will unambiguously reflect the project's commitment to a violence-free workplace. ▪ Standardized training against sexual harassment and GBV should be part of on-boarding procedures for all contractor's employees at site.				
Stakeholder Engagement	Affected authorities from Village to Parish and County level	Develop a Stakeholder Engagement Plan which shall include at least: Chiefs of Affected Parishes and Villages Road Authorities Health authorities Forest authorities Tourist authorities Contractors UETCL Women Representatives Youth representatives Create Project Information Centre for communities	SSEC	ESMD and Contractor	45,000	P, C
			Contractor	ESMD and Contractor	45,000	P, C

SP14: Local Employment Management Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Project Phase	Pre-Construction – Construction – Operation
Place	Entire Project Area
Social aspect	Employment
Description of Impact	Short and Medium Terms Employment
Affected Activities	All activities
Consequence	Social Unrest Abuse of local work force Decrease of workers wellbeing
Management and Measure	Work with the procurement team to ensure that contracts with (sub) contractors and agencies follow national law in the country of operation, with company codes of conduct and policies, and with ILO, AfDB guidelines. Develop an action plan in cooperation with UETCL and local authorities to prioritize recruitment among affected communities indicating human resources needs, time schedule and provision of training. Directly affected women shall be taken into consideration in the definition of human resources needed for the project development Define a procedure to keep track of directly affected people hired by the consultant in cooperation with UETCL using a shared affect households records/database distributed by UETCL and local authorities. Develop a Human Resources Policy in compliance with UETCL related policy guaranteeing at least Give equal job opportunities freedom of association and collective bargaining; prohibit the hiring of underage workers, as defined in relevant ILO Conventions; prohibit recruitment, use and practices of forced labor and child labor; prohibit discrimination in hiring practices or pay; provide fair and favorable working conditions as per contract terms and make sure that conditions are transparent and understood by workers prior to recruitment; avoid excessive recruitment or transportation fees, or to keep identity documents or working papers; guarantee freedom of movement in and out of the workplace and workforce accommodation; guarantee wages as per industry standards/minimum wage; guarantee access to workforce grievance mechanisms; guarantee provision of sufficient rest periods and rest days to avoid fatigue; guarantee safe and healthy work place conditions; guarantee provision of food and water for drinking and sanitation; guarantee working conditions and accommodation standards; guarantee provision of appropriate personal protective equipment

INFORMATION REQUIRED	DETAILS
	Adopt a Worker Accommodation Management Plan AS PER guidance note by IFC on Workers' accommodation. Separate accommodation and toilets for women. Develop a workers' grievances mechanism, a workers' code of conducts and GBV action plan. Contractually require all (sub)contractors to adhere to Contractor and UETCL Human Resources Policy, workers grievances mechanism, a workers' code of conducts and GBV action plan, Community and Occupational HS Plan
Monitoring	Consult the Contractors and Subcontractors employment logs, verify against national and international standards working hours, leave, salary, health and safety condition, lodge arrangements. Interviews with key informants Record of meetings and communication to workers Gender breakdown of local workforce employed by contractor and subcontractors
Period of Implementation	Pre - Construction – Construction – Operation
Frequency	Quarterly Basis
Training	HS training general and specifics as per plans' needs,
Facilities, Equipment, Material and Supply	PPE, Lodging, HS facilities, Sanitary facilities, Canteen Provide separate facilities for women
Compliance	Project ESMP and related policies, standards, laws.

SP18: GBV / SEA / CAE Plan

INFORMATION REQUIRED	DETAILS
Developer	Each Contractor and Subcontractor
Place	Entire Project Area
Social aspect	Community Wellbeing
Description of Impact	Sexual harassment of women and girls, exploitative sexual relations, and illicit sexual relations with minors from the local community. A large influx of male labor may also lead to an increase in exploitative sexual relationships and human trafficking whereby women and girls are forced into sex work.
Affected Activities	All activities
Consequence	Permanent health and psychological damages of victims of abuse
Management and Measure	Contractors are required to have sexual harassment policies and Worker's Code of Conduct. It is recommended that Codes of Conduct include specific prohibitions against SEA, including prohibition of sexual activities with children, defined as anyone younger than 18. This standard must hold even when national standards, laws and policies have a younger age of consent. Worker Code of Conduct shall be translated in local language(s) The Contractor is obliged to create and maintain an environment which prevents gender-based violence (GBV), sexual abuse exploitation (SEA), child abuse/exploitation (CAE) issues, and where the unacceptability of GBV and actions against children are clearly communicated to all those engaged on the project. Complains on GBV and CAE episodes shall be channelized through the Project Grievances Redress Mechanism, it should state in simple, up-front language that perpetrators will be sanctioned. System of sanctions must be put in place that will unambiguously reflect the project's commitment to a violence-free workplace. Standardized training against sexual harassment and GBV should be part of on-boarding procedures for all contractor's employees at site Develop a "child labour monitoring" system, a three-person team of community members (such as a school teacher, mothers' club member or retired policeman) are given training in how to monitor child labour. They then periodically visit places where children are likely to be working. If they find a child, they report the case to a specially constituted community committee, as well as to the labour inspector or local government authority for follow-up. Depending on the child's situation, the committee will recommend a course of action, Protecting older children in or at risk of hazardous work offering comprehensive packages of training and services to facilitate the transition from school to decent work (skills, apprenticeships, vocational training, job counselling, enterprise development, financing) Raising awareness among employers of productivity gains to be achieved through improvement of working conditions to a level that is safe for young people to work.

INFORMATION REQUIRED	DETAILS
	Establishing joint worker-employer safety committees, safety representatives and connections to workers' organizations to provide support for young people in the work environment. Ensuring regular inspection of enterprises regarding workplace conditions and adherence to minimum age restrictions Training frontline health-care providers to detect and document occupational injuries, illnesses of children, GBV and CAE Define Roles and Responsibilities Define a management and consultations schedule
Monitoring	Safety Audits through key informant interviews, FGD N and Records of the awareness Trainings Men & Boys Self-Assessment Form – Awareness Raising N of qualified experts involved in the management and follow up of issues related to GBV/CAE/SAE GRM log Records of community monitoring N of cases registered or reported by Health care providers
Period of Implementation	All project phases
Frequency	On quarterly Basis
Training	Awareness training for workers GBV/CAE/Child labor Monitoring training for inspectors selected from community, health providers etc.
Facilities, Equipment, Material and Supply	As per plan needs
Compliance	National Legislation, AfDB and IFC Standards