

# BUJAGALI HYDROPOWER PROJECT SUITE OF DOCUMENTS



## Bujagali Hydropower Project Executive Summary



### Hydropower Facility EIA



### Transmission System EIS



#### Technical Appendices



#### Resettlement and Community Development Action Plan (RCDAP)



#### Technical Appendices

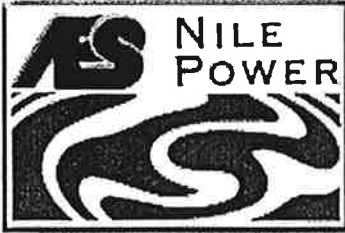


#### Resettlement Action Plan (RAP)

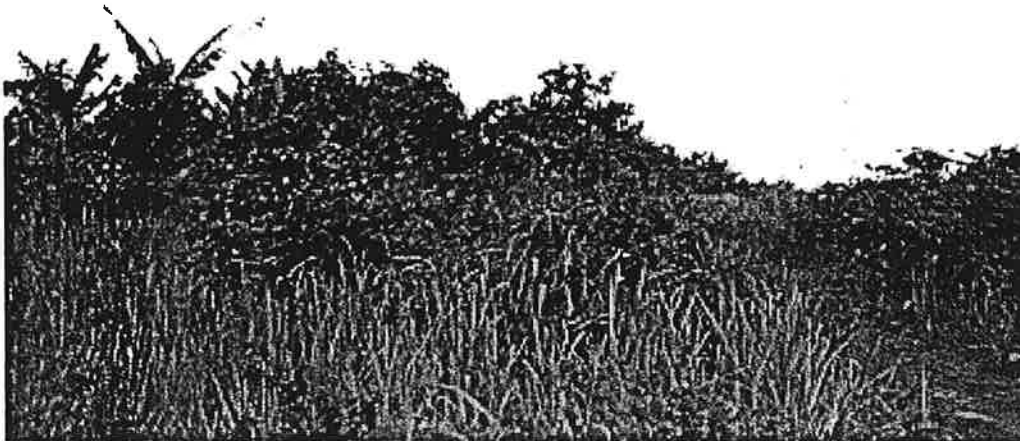
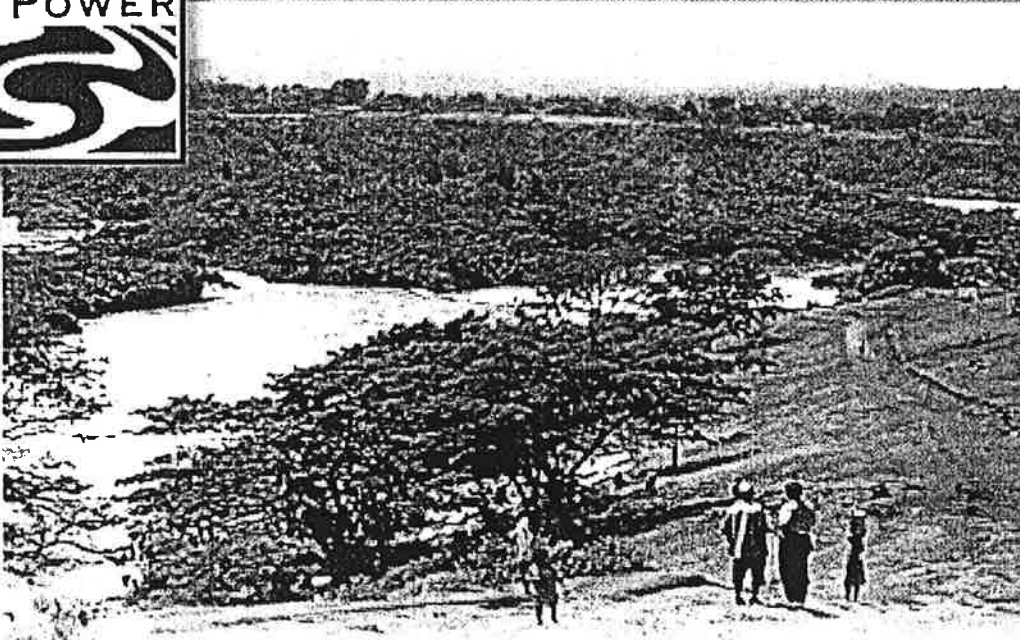
The complete Bujagali Project EIA consists of 7 documents

Bujagali Hydropower Project  
**EXECUTIVE SUMMARY**  
Uganda

Prepared for:



Richmond, UK



Prepared by:

March, 2001



ESG International Inc.  
Guelph, Canada

**Atkins**  
Epsom, UK

# BUJAGALI HYDROPOWER PROJECT SUITE OF DOCUMENTS



## Bujagali Hydropower Project Executive Summary



### Hydropower Facility EIA



### Transmission System EIS



#### Technical Appendices



#### Resettlement and Community Development Action Plan (RCDAP)



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#### Resettlement Action Plan (RAP)

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## Appendix A

Table A-1: General Responsibilities for Environmental Mitigation Measures
Table A-2: General Responsibilities for Environmental Monitoring Measures

# Glossary

AC	Asphaltic concrete	H&SMP	Health and Safety Management Plan	PCDP	Public Consultation and Disclosure Plan
AESNP	AES Nile Power	HVAC	Heating, Ventilation and Air Conditioning	PM <sub>10</sub>	Dust with an aerodynamic diameter of less than 10 microns ( $\mu\text{m}$ )
AfDB	African Development Bank	IA	Impact Assessment	PoE	Panel of Experts
ASTM	American Standard for Testing of Materials	IBRD	International Bank of Reconstruction and Development	PPA	Power Purchase Agreement
BEC	Bujagali EPC Consortium	IDA	International Development Association	ppb	parts per billion
BDSP	Bujagali Dam Safety Panel	IFC	International Finance Corporation	PSCP	Pollutant Spill Contingency Plan
CDAP	Community Development Action Plan	JITDA	Jinjatourism Development Association	PSOC	Private Sector Operation Committee
CFR	Central Forest Reserve	LC	Local Council (ranging from [village] to LC5 [district])	Q	Water flow in $\text{m}^3/\text{sec}$
CIO	Community Information Officer	LC1	[village] to LC5 [district]	RAP	Resettlement Action Plan
CMO	Change Management Objectives	LFR	Local Forest Reserve	RCDAP	Resettlement and Community Development Action Plan
CPMP	Cultural Property Management Plan	IUCN	International Union for the Conservation of Nature	RDC	Resident District Commissioner
DAO	District Agricultural Officer	LAC	Limits of Acceptable Change	RUWASA	Rural Water and Sanitation Project
dBL <sub>Aeq</sub>	Energy Equivalent Sound Level in Decibels, A-weighted	LV	Low Voltage	SEO	Site Environmental Officer
DCS	Distributed Control System	LVFO	Lake Victoria Fisheries Organisation	SOP	Setting-out Point
DEO	District Environmental Officer	mASL	metres above sea level	SR	Social Responsibility
DFID	Department for International Development (UK)	MDE	Maximum Design Earthquake	STD	Sexually-transmitted diseases
DHO	District Health Officer	MFL	Maximum Flood Level	TCU	True Colour Unit
DLB	District Land Board	MFNP	Murchison Falls National Park	ToRs	Terms of Reference
DMU	Dispensary and Maternity Unit	MoH	Ministry of Health	TMP	Traffic Management Plan
D/s	Downstream	MOL	Minimum Operating Level	TSC	Timed Species Count
DWD	Directorate of Water Development	MSL	Mean Sea Level	TSS	Total Suspended Solids
EA	Environmental Assessment	MRF	Minimum Residual Flow	UEB	Uganda Electricity Board
EAP	Environmental Action Plan	MTWA	Ministry of Tourism, Wildlife and Antiquities	UEMP	UEB Transmission System Environmental Mitigation Plan
EH&S	Environmental, Health and Safety	MUIENR	Makerere University Institute of Environment and Natural Resources	UEMoP	UEB Transmission System Environmental Monitoring Plan
EIA	Environmental Impact Assessment	MW	Megawatt	$\mu\text{g}$	Microgram
EIS	Environmental Impact Statement	NARO	National Agriculture Research Organisation	$\mu\text{S}$	Micro Siemens
EMoP	Environmental Monitoring Plan	NEMA	National Environment Management Authority	UIA	Uganda Investment Authority
EMP	Environmental Mitigation Plan	NGO	Non-Governmental Organisation	ULC	Ugandan Land Commission
EPC	Engineer, Procure, Construct	NRE	Nile River Explorers Ltd.	UMA	Uganda Manufacturers Association
ERA	Electricity Regulatory Authority	NTU	Nephelometric Turbidity Units	UNBS	Uganda National Bureau of Standards
ERP	Environmental Review Panel	NWSC	National Water and Sewerage Corporation	UNCCI	Uganda National Chamber of Commerce and Industry
EU	European Union	ODs	Operational Directives	USh	Ugandan Shillings
FAO	Food and Agriculture Organisation (of United Nations)	OPD	Out-Patient Department	UTB	Uganda Tourism Board
FD	Forest Department	OPs	Operational Policies	UWA	Uganda Wildlife Authority
FIRRI	Fisheries Resources Research Institute (formerly known as Fisheries Research Institute)	OPSD	Operational Private Sector Department	VCU	Vector Control Unit
FSL	Full Supply Level	PAP	Project-Affected Person	WB	World Bank
GDP	Gross Domestic Product			WCD	World Commission on Dams
GoU	Government of Uganda			WMP	Waste Management Plan
GWh	GigaWatt hours			WRAP	Water Resources Assessment Programme
HEP	Hydro-Electric Power			WWR	White water rafting

# Foreword

This is the Executive Summary of the environmental impact assessment (EIA) for the Bujagali hydropower project and its associated transmission facilities being submitted to the World Bank Group and the African Development Bank. This volume provides a non-technical synopsis of the environmental and social assessment documentation for the entire project.

This Executive Summary also provides a “roadmap” to the accompanying technical documentation being submitted to the World Bank Group and the African Development Bank by the project sponsor, AES Nile Power (AESNP). That technical documentation is presented in six volumes.

One set of three documents relates to the Bujagali project’s hydropower facility:

- the Environmental Impact Assessment (EIA);
- the Technical Appendices to the EIA; and,
- the Resettlement and Community Development Action Plan (RCDAP).

Another set of three documents relates to the Bujagali project’s transmission system:<sup>1</sup>

- the Environmental Impact Statement (EIS);
- the Technical Appendices to the EIS; and,
- the Resettlement Action Plan (RAP).

The Bujagali project’s EIA submission to the World Bank Group and the African Development Bank includes all seven volumes, as illustrated in Figure ES-1.

**Bujagali Project  
Environmental Assessment  
Executive Summary**

**Hydropower  
Facility  
Environmental  
Assessment**

Environmental Impact Assessment (EIA) for Hydropower Facility

Technical Appendices for Hydropower Facility EIA

Resettlement and Community Development Action Plan for Hydropower Facility

**Transmission  
System  
Environmental  
Assessment**

Environmental Impact Statement (EIS) for Transmission System

Technical Appendices for Transmission System EIS

Resettlement Action Plan for Transmission System

Figure ES-1 Suite of Environmental Documentation for Bujagali Project

<sup>1</sup>The transmission system documentation is, for the most part, the same as that submitted to the Ugandan National Environmental Management Authority (NEMA) in December 2000. Details of the changes made to the documentation between December 2000 and the present submission are available from AESNP.



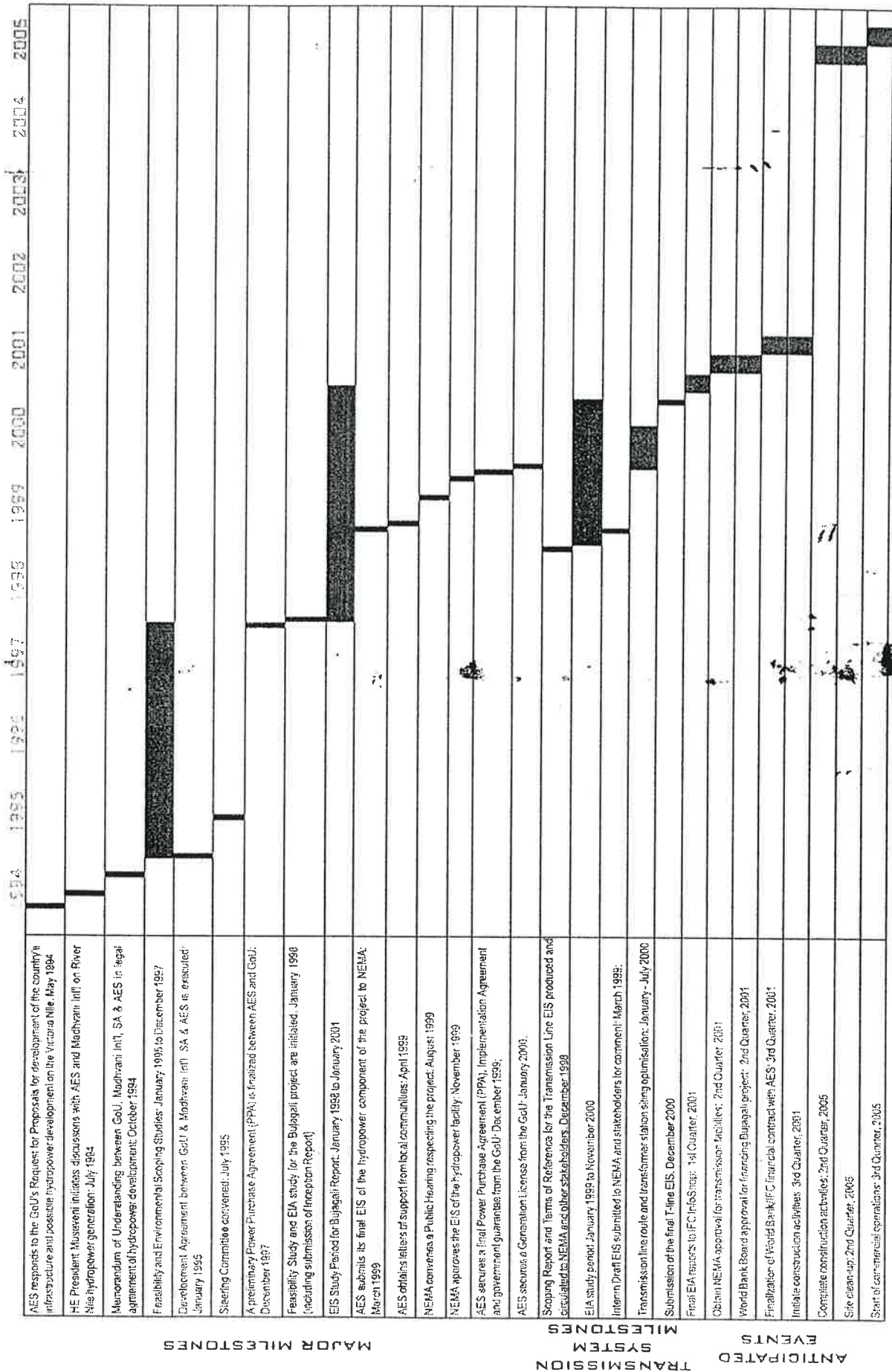


Figure ES-3 Bujagali Project Schedule

WB?

Regulatory EIA

curement and construction contractor for both the hydropower facility and the transmission system components of the Bujagali project. This choice reflected the previous track record of BEC's component companies on similar projects, as well as BEC's commitment to environmentally sustainable construction practices. The structure of the BEC is shown in Figure ES-4.

BEC, including its member companies, contractors and sub-contractors, will be governed by the environmental and social policies and procedures of Skanska International (Sweden),

which are the most stringent of any of BEC's participating companies, and are outlined in detail in the EIA.

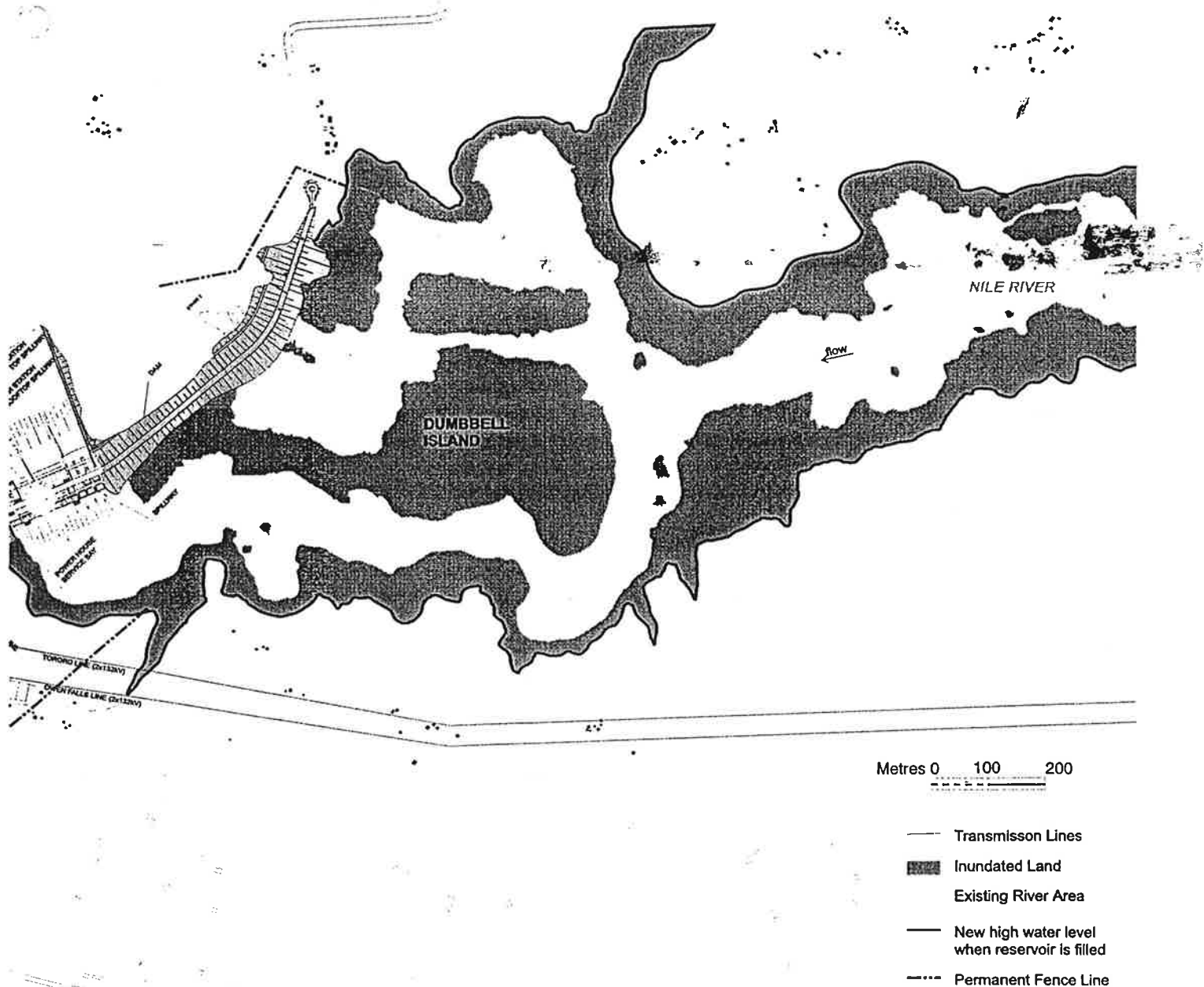
Potential lenders of funds to the Bujagali project include the International Development Association (IDA) and the International Finance Corporation (IFC) of the World Bank Group; the African Development Bank (AfDB); and other private sector sources, including West LB.

From an environmental and social perspective, the major regulatory requirements for the Bujagali project are

those of the Government of Uganda, the World Bank Group and the African Development Bank. The EIA documentation provides the details of AESNP's commitment to comply fully with these environmental and social requirements.

Key contributors to the production of the Bujagali EIA include the following:

- WS Atkins International, EIA consultants;
- Frederic Giovannetti, Resettlement and Compensation consultant;



\* Wayleave through Mabira, Kifu and Namyoya FR's will be limited to 35m as a mitigation measure. However, compensation will be based on a 40m wayleave.

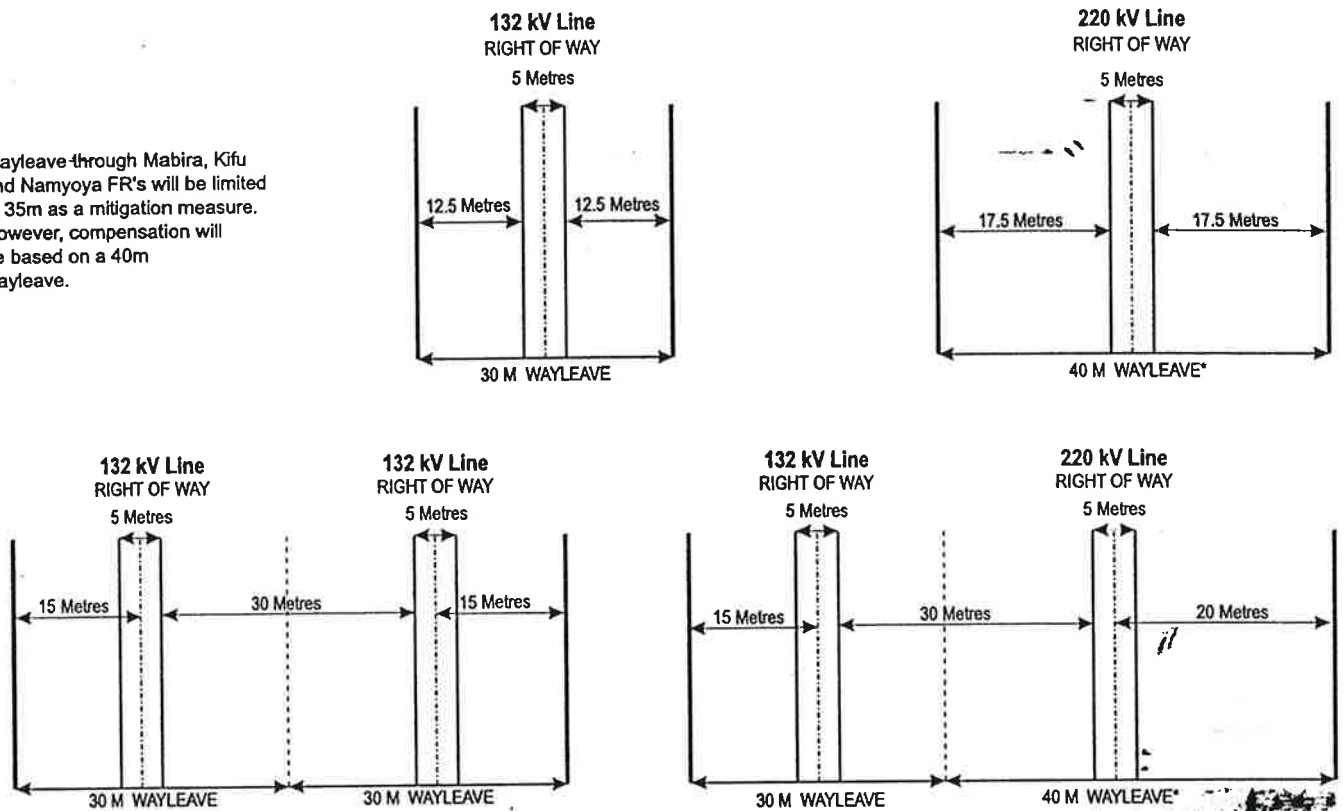


Figure ES-7 7 R.O.W. and Wayleave Requirements for 132kV and 220kV Transmission Lines

Transmission System

In order to evacuate power from the Bujagali hydropower facility, AESNP has agreed to construct the following:

- a 220 kV / 132 kV switchyard on the west bank of the Victoria Nile adjacent to the Dumbbell Island hydropower facility;
- two, parallel, double-circuit 132 kV lines (one 4.5 km and one 5 km) running south from the Bujagali switchyard to the existing Owen Falls-Tororo line. The Owen Falls-Tororo line will be severed in two places and reconnected to the Ugandan grid, via the new lines, through the new switchyard at Bujagali;
- a new 220 kV transmission line from the Bujagali switchyard to a new substation at Kawanda, north of Kampala (length 70.5 km);

- a new substation and 220 kV / 132 kV switchyard at Kawanda; and,
- a new 132 kV line from the Kawanda substation to the existing 132 kV substation at Mutundwe in southern Kampala (length – 17.5 km). Internal improvements (i.e. new bay and switching gear) at Mutundwe substation to accommodate this new 132 kV line will also be required.

All of the above-noted bullet points constitute the Bujagali project's "transmission system" which AES is seeking approval for. Figure ES-6 shows the major components of the transmission facilities to be constructed for the Bujagali project.

A total of 381 hectares of land will be affected by the Bujagali transmission system. The transmission system's use of land falls into three major categories:

- i) Transmission line wayleaves;
- ii) Transmission line rights-of-way; and,
- iii) Lands acquired for the Kawanda substation.

The transmission line wayleave is a strip of land 30 m to 40 m in width, depending on the configuration and voltage of the transmission line. Certain encumbrances will be placed on these lands. For example, people will be prohibited from living within the wayleave and any trees or crops within the wayleave will be limited to less than 1.8 m in height. However, wayleave lands will remain under the ownership of their present owners and can be cultivated subject to the 1.8 m height restriction. The wayleave requirements total 326 hectares of land.

A right-of-way, 5 m in width and approximately in the centre of the wayleave, is to be kept clear of both

planning, and optimisation of the project.

Consultations with people who might need to be resettled as a result of the project were among the more significant consultation activities to be carried out by AESNP and its consultants. The work involved detailed interviews with individuals, families and communities who might be physically relocated or economically affected by the development of the project. These studies and surveys provided the baseline data needed to determine the kinds and amounts of compensation to be paid to project-affected people.

AESNP's EIA consultants, WS Atkins International, attempted the first land valuation exercise on the Bujagali project in the directly affected communities in 1998. The work was subsequently found to be flawed, resulting in exaggerated compensation packages being identified for crops and land. When AESNP first proposed that this exercise would need to be re-done, local people were very upset. However, through ongoing negotiations with local people, and a transparent and accountable valuation process undertaken in 1999 and 2000, AESNP believes it has been able to rectify this situation. The second round of consultations and surveys was carried out by AESNP staff directly and provides the basis for the Resettlement Action Plans that are found in the accompanying EIA documentation.

AESNP has made a commitment to ongoing consultation with stakeholder groups, including responding to issues raised, as an integral part of its work on the Bujagali project. An independent "witness NGO" has been retained to oversee the ongoing public liaison activities of AESNP, especially in relation to the compensation and resettlement activities. The details of AESNP's public consultation commitments are provided in the Public Consultation and Disclosure plans found in the accompanying EIA documenta-

tion for each of the hydropower facility and transmission system components of the project.

### Disclosure of Information

The major regulatory and lending agencies associated with the Bujagali project each have their own requirements for the public disclosure of project information. Though the details vary by institution, they generally focus on environmental, social, and health and safety information gathered during the EIA process. In summary, they require disclosure of information such as the terms of reference for studies, drafts of EIA reports, final reports (often including summaries of the major findings in local languages), and project commitments to optimisation, mitigation and monitoring of project impacts, as appropriate. Deadlines and schedules for release of such information and the locations and form in which they are to be made available are also specified in some instances.

AESNP has committed to meeting the public disclosure requirements of the agencies associated with the Bujagali project's regulatory review and approval. Specifically, AESNP has and will continue to comply with the disclosure requirements of NEMA, IDA and IFC (World Bank Group), and the African Development Bank. The details of these disclosure requirements and commitments are specified in the accompanying EIA documentation.

### The Panel of Experts

A Panel of Experts was established in late 1997 following a recommendation from the World Bank Group that AESNP should fund, and receive advice from, independent environmental and social specialists who would review the Bujagali project. This Panel of Experts made six trips to Uganda between February 1998 and March 2000. It wrote six reports on its observations and public and agency consultation activities and made recommendations

on how the Bujagali project should proceed. These reports are reproduced in their entirety on the AES Nile Power website ([www.bujagali.com](http://www.bujagali.com)).

The Panel of Experts consulted with a broad cross-section of stakeholders regarding the Bujagali project, reviewing environmental and social issues related to both the transmission and hydropower generation components of the project. Many of the results they obtained were similar to those obtained by AESNP and its consultants. On their sixth visit to Uganda in March 2000, the Panel convened a NGO Forum in Kampala. They, like AESNP, found that most of the comments were positive, urging that the project proceed quickly because of the need for electricity in Uganda.

### Management of Environmental and Social Impacts

The accompanying EIA documentation includes detailed Environmental Action Plans (EAPs) for the Bujagali project. Key components of the EAPs are:

- environmental and social management policies and systems;
- mitigation plans, procedures, and programmes;
- monitoring activities;
- implementation responsibilities, schedules, and cost estimates; and
- plans for integrating the EAPs within the overall development plan for the project.

AESNP will be responsible for implementing the higher-level, project-related mitigation measures such as the resettlement action plan, and for operations-related mitigation measures. BEC, the EPC contractor for the project, is responsible for implementing the majority of the day-to-day, construction-related environmental mitigation and monitoring measures specified in the EAPs.

## Key project impacts

- Effects on managed and protected areas (e.g., forest reserves and wildlife sanctuaries);
- Effects on tourism, whitewater rafting and aesthetics; *to local supply*
- Effects on the aquatic environment (including fisheries productivity in the new reservoir);
- Effects on public health (including HIV/AIDS and electromagnetic radiation)
- Cumulative effects; and,
- Community and developmental benefits of project development.

In addition to these "key project issues," numerous construction-related effects (e.g., noise, dust, traffic) have also been identified. For all project-related effects, AESNP has developed detailed mitigation measures to manage these effects and an environmental action plan (EAP) outlining how, when, by whom, and with what budget(s) these mitigation measures will be carried out. Chapters 7 and 8 of the main EIA documents for both the Bujagali hydropower facility and the transmission system provide details of these mitigation measures and EAPs, respectively. Summaries of this information also appear in chapters 7 and 8 of this Executive Summary.

As part of the EAPs, AESNP has also developed a suite of action plans directed specifically at management of social, cultural and community effects, including:

- The Hydropower Facility Resettlement Action Plan;
- The Transmission System Resettlement Action Plan;
- The Hydropower Facility Cultural Property Management Plan; and,
- The Hydropower Facility Community Development Action Plan.

Moreover, BEC, in its Project Plan, has developed detailed plans on how it will address such issues as waste management, traffic movement and quarry operations and restoration.

## The Bujagali Project's Hydropower Efficiency Ratios

World Bank Environment Group staff has developed a tool for the comparative analysis of the efficiency of large dams. This tool uses the two key criteria of hectares flooded per MW of power generated and number of oustees<sup>2</sup> per MW generated. When these two values are known for a proposed dam, they can be plotted on a graph for comparison with other large dams.

In Figure ES-8, the Bujagali project's efficiency ratios have been graphed relative to other large dams around the world. Overall, Bujagali compares very favourably on the criteria of ha flooded/MW generated and number of oustees/MW generated. The project falls towards the "best" end of the graph. *more of 2 parameters*

## Key Project Benefits

*can it match?*  
The Bujagali project will provide many benefits at the national, regional and community levels. In addition to the resettlement and compensation package that each directly affected person will receive, AESNP is committed to providing community and developmental benefits in a sustainable manner.

The key macro-economic benefits to Uganda anticipated from the project are:

- Reduced electricity rationing and associated costs;
- Increased investment and national income;
- Increased export revenues;
- Increased capability for future development of the electricity sector;
- Increased capability to implement rural electrification programmes; and,
- Lower energy costs to the consumer.

The key regional and community benefits expected from the Bujagali project include:

- Employment: AESNP will actively and preferentially employ local people for project construction;
- Improved health care, water supply and educational facilities in the eight project-affected villages near the proposed hydropower facility;
- Increased access to electricity: AESNP will provide step-down transformers to the eight project-affected villages near the hydropower facility;
- Improved market facilities in villages adjacent to the hydropower facility;
- Improved fisheries: the reservoir created by the Bujagali project is anticipated to increase the harvestable protein biomass from this stretch of the Victoria Nile;
- Employment training and financial services for project-affected persons;
- New funding and strategies for tourism development in the Jinja area; and,
- New community resource centres.

All of the above project benefits are discussed in greater detail in the EIA documentation and specifically in the Community Development Action Plan. *negative effects*

## The Project in Context

A number of developmental and policy initiatives, which are non-regulatory in nature, provide background and context for the assessment of the Bujagali project. They include:

- the Nile Basin Initiative;
- ongoing World Bank Group and African Development Bank activities in Uganda;
- studies of the Victoria Nile region and its development potential; and,
- the World Commission on Dams.

<sup>2</sup>"oustees" means physically displaced persons resulting from a project's construction.

# The Path To The Project

The range of alternatives that was examined by AESNP in the development of the Bujagali project was extensive and included:

- Alternative power generation technologies;
- Alternative hydropower development sites on the Victoria Nile;
- Alternative hydropower development configurations at Bujagali; and,
- Various transmission system alternatives.

## Alternative Power Generation Technologies for Uganda

Various studies on the alternatives for electricity generation and supply in Uganda have been completed over the past five years including assessments by Kennedy and Donkin in 1997, *Electricité de France* (EdF) in 1998, *Acres International* in 1999, and ESMAP in 1999. From these studies, the alternatives that have been examined that could provide electricity to Uganda over the next 20 years include:

- wind power;
- geothermal power;
- solar energy;
- small scale hydroelectric development;
- biomass (i.e. the production of electricity from living organisms or their wastes);
- co-generation facilities (i.e. the production of electricity from the by-products of other industrial or electrical generating operations);
- thermal power plants;

- large scale hydroelectric development; and,
- electricity demand management measures which negate or reduce the need for the above-noted types of projects by bringing more efficiency to the national system.

The conclusions from the above-noted reports were:

- there is little potential for wind-generated electricity, especially to contribute to the national network, as Uganda is not favoured with a windy climate;
- geothermal energy resources may provide up to 450 MW of power, but reserves are largely unexplored and cannot realistically be expected to contribute to the national network within the next ten years;
- solar, small hydro and biomass generation technologies are very useful and particularly suited to off-grid customers and in the advancement of Uganda's rural electrification, as demonstrated by recent experiences in neighbouring Kenya. Both the World Bank and the African Development Bank are investing in Ugandan programmes to this end. However, these small-scale, decentralised technologies cannot provide a sufficient supply of electricity at competitive prices to the Ugandan national network to satisfy the country's large, and growing, demand for electricity;
- there is growing potential for co-generation of electricity in Uganda, as demonstrated by the Kakira Sugar Works' recently constructed co-generation facility that contributes 10 MW to the national

network. Given that there is a forecasted 520 MW deficit by 2020 in Uganda, however, electricity production from co-generation will not be sufficient to satisfy this demand;

- demand management measures in Uganda are highly desirable and very cost-efficient, potentially returning as much as 30 MW to the national network through the repair of the country's faulty electrical distribution facilities. The African Development Bank is presently financing a project that is aimed at achieving these savings;
- thermal generation of power using fossil fuels (e.g. coal, oil, natural gas) could generate sufficient supplies of electricity to satisfy Uganda's present demand, but these fossil fuels would need to be imported, dramatically increasing the purchase price of electricity to grid-fed customers. There are also no existing oil and natural gas pipelines in the country, meaning that all transport of fossil fuels would need to be by truck and/or ship.

Large-scale hydroelectric power development, therefore, emerges as the most viable way forward for Uganda in the short-medium term, providing the electricity needed at an affordable price. The Victoria Nile is the primary hydrological resource available in Uganda capable of meeting these two objectives.

## Alternative Hydropower Development Sites on the Victoria Nile

Six potential hydropower development sites have been identified on the

Table ES-1: Summary of Comparative Impacts of Karuma, Kalagala and Bujagali Projects (from WS Atkins, 1999)

Impact	Karumua	Kalagala	Bujagali
<b>1 Beneficial Impacts</b>			
Energy: Installed Capability	100 MW	500MW	250 MW
Employment opportunities	During construction	During Construction	During construction
Services and infrastructure	Regional improvement	Regional improvement	Regional improvement
Public Health	No significant impact	Reduced risk of onchocerciasis	Reduced risk of onchocerciasis
Fisheries	No significant impact	Potential for lake fishery	Potential for lake fishery
Water birds	No significant impact	Increase in open water habitat	Increase in open water habitat
<b>2 Adverse Impacts: (A) Construction and Reservoir Filling</b>			
Reservoir are excluding river (ha)	No reservoir	1200-1300	250
Land take requirements (ha)	300	1330	270
Estimated permanent land take	50	1300	265
Number of oustees	200	4130	500
KW/land area inundated	No inundation	385	960
KW/number of oustees	500	121	480
Air quality	Deterioration in rural area and Karuma village	Deterioration in rural area and Kangulumira village	Deterioration in rural area
Water quality	Deterioration downstream	Deterioration downstream	Deterioration downstream
Noise and vibration	Impact in rural area and Karuma village	Impact in rural area and Kangulumira village	Impact in rural area
Erosion and sedimentation	Increased short term risk	Increased short term risk	Increased short term risk
Terrestrial ecology	Loss of small area of riverine forest. Site is located in Controlled Hunting Area, and adjacent to Karuma Sector of MFNP	Important loss of 330 ha of gazetted forest reserve Loss of 44 ha of breeding habitat for water birds on Nile islands	No loss of forest vegetation Loss of 27 ha of breeding habitat for water birds on Nile islands ↳ compensation (?)
Aquatic ecology	Reduction in fish biomass in Nile downstream of site		
Social issues	Pressure on limited services	Pressure on limited services	Pressure on limited services, but mitigated by proximity to Jinja
Access	Loss of access to traditional soil water and wood resources in 300 ha direct impact area	Loss of access to agricultural land area of some 30 ha	Loss of access to agricultural land area of some 20 ha
Transmission lines	80 km to Lira and 90 km Masindi	24 km to Owen Falls and 70 km Owen Falls to Kampala	8 km to Owen Falls and 70 km Owen Falls to Kampala
<b>2 Adverse Impacts: (B) During Operation</b>			
River regime	No effect on Nile regime downstream of Karuma Falls Dramatic reduction in flow over 3 km reach and Karuma Falls	No effect on Nile regime downstream of Kalagala Flooding of Kalagala, Busowoko and Buyala Falls	No effect on Nile regime downstream of Dumbbell Island Flooding of Bujagali Falls
Water quality	No impact	Medium term deterioration after filling	Short term deterioration after filling
Terrestrial ecology	Local effect on riverine forest due to reduction of mist zone at Falls	No direct impact but regional development may lead to further encroachment into Mabira Forest Reserve	No direct impact, but regional development may lead to further encroachment into Mabira Forest Reserve
Aquatic ecology	Change in composition of fish communities in 3 km reach, and significant impact on ecology of this reach	Potential for water weed growth and de-oxygenation in reservoir area outside main Nile channel	No significant impact
Disease vectors	No significant impact	Increase in snail vectors of schistosomiasis in reservoir area	Increase in snail vectors of schistosomiasis in reservoir area
Public health	No significant impact	Increase in risk of schistosomiasis in 1900 ha reservoir area	Increase in risk of schistosomiasis in 430 ha reservoir area
Cultural heritage	No significant impact	No significant impact	Flooding of Bujagali shrines
Tourism and visual amenity	Significant reduction of visual amenity of Karuma Falls	Loss of aesthetic value of Kalagala, Busowoko and Buyala Falls Loss of whitewater rafting opportunity over 15 km reach of Nile below Dumbbell Island	Loss of aesthetic value of Bujagali Falls Loss of whitewater rafting opportunity over 2.5 km reach from Bujagali Falls to Dumbbell Island

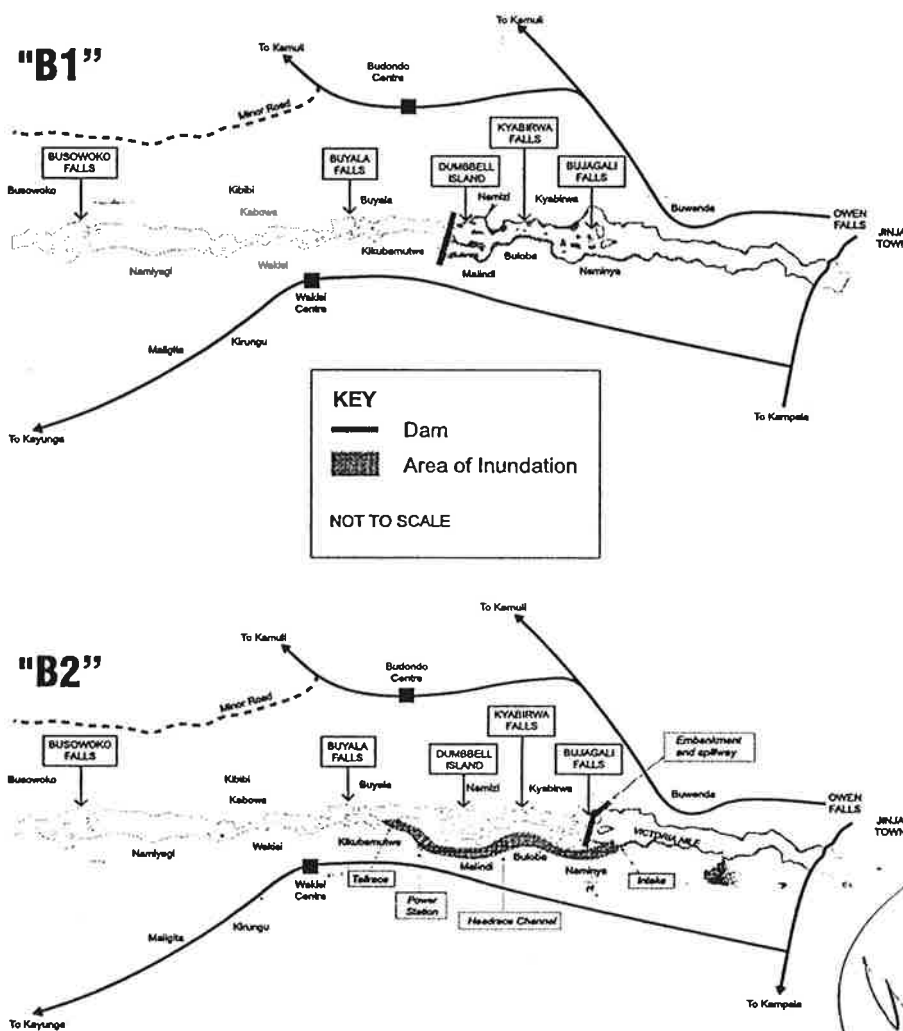


Figure ES-11 Alternative Configurations at Dumbbell Island

The primary transmission line corridor routing alternatives connecting Bujagali to Kawanda that were considered were: a route roughly parallel to the existing 132 kV “northern” route between Owen Falls and Kampala, and one roughly parallel to the existing 132 kV “DANIDA line” corridor between Owen Falls and Lugogo substation in southeastern Kampala.

The northern route was preferred as impacts on settlement and property are lower, it is shorter, and it does not require any crossing of existing transmission lines. Moreover, the capacity of the southern corridor system was considered difficult, if not impossible, to expand as both the substation and transmission line facilities were considered to be at capacity in the current locations. From an overall system design perspective, the northern route also provides UEB with greater flexibility for future system expansion, when compared to the southern route. In its independent assessment of the transmission line routes, the Panel of Experts, in its fourth report, concluded that AESNP had selected the most appropriate transmission line route. Full details of the route selection process are provided in the Transmission System EIS.

between the new substation at Kawanda and the existing Mutundwe substation in Kampala, and between the switchyard at the hydropower facility and Owen Falls via a tie-in to the existing 132 kV Owen Falls-Tororo line. Figure ES-12 provides a schematic of the preferred transmission system relative to the existing transmission infrastructure in the country; detailed mapping is provided in the Transmission System EIS.

technical criteria to identify the potential key impacts of the alternative corridors considered and, from these, select a preferred alternative. This process also involved consultations with UEB, the eventual owner and operator of the transmission system. From these consultations, UEB advised AESNP that the Bujagali transmission system should:

- use existing transmission corridors as much as possible to reduce impacts;
- enable future system expansion to northern Uganda; and,
- minimise the number of crossings of existing transmission facilities and other utilities.

In addition, a number of alternative configurations for the transmission system were investigated for their feasibility in reducing and/or mitigating potential environmental and social impacts associated with the preferred route. These investigations included utilising different tower configurations to reduce wayleaves in Forest Reserves, relocating the new wayleave(s) relative to existing corridors, reducing the width of wayleaves in Forest Reserves, and constructing the system using helicopters to reduce road traffic accidents.

**Alternative Transmission Line Corridors and Configurations**

AESNP and its consultants completed an alternatives analysis for the Bujagali project’s transmission lines using a range of social, environmental and

**Substation Site Alternatives**

Under the planned transmission system configuration for the Bujagali pro-



# Project Description

The Bujagali project consists of a hydropower facility and associated reservoir, as well as a high voltage electrical transmission system to evacuate the power generated by the hydropower facility. A detailed description of these facilities is found in the Hydropower Facility EIA and the Transmission System EIS, respectively. The following sections summarise the key features of the project components.

## The Hydropower Facility

The hydropower facility is located at Dumbbell Island, 8 km north of the Owen Falls power station on the Victoria Nile in Uganda (see Figure ES-2). The facility will consist of a 250 MW power station housing five bays for 50 MW vertical Kaplan turbines with an associated 30 m high dam, reservoir and spillway works. The hydropower facility's dam will be located across the downstream end of Dumbbell Island, with the powerhouse and spillway located in the western channel of the Victoria Nile. Permanent access to the hydropower facility will be from the Jinja to Kayunga road on the west bank, about 8 km north of Owen Falls Dam. The power station area will be fenced on both sides of the river. The general configuration of the Bujagali hydropower facility is shown in Figure ES-5. More detailed diagrams are contained in the Hydropower Facility EIA.

Dumbbell Island is favourable as a hydropower facility site because:

- it has steep banks which afford good abutments and reduce the land take area;

- it has a channel wide enough for the possible future addition of peaking units; and,
- as an island, it facilitates the construction of cofferdams during temporary works and allows for an overall shorter construction period.

The hydropower facility's dam will impound a reservoir with a surface area of 388 ha at Full Supply Level; 308 ha of this area is comprised of the Victoria Nile River and 80 ha will be newly inundated land. Full Supply Level is 1111.5 metres above sea level. An additional 45 ha of permanent land take for the project facilities will also be required. A temporary land take of 113 ha (for rock quarries, temporary access roads, cofferdam construction etc.) will also be needed to facilitate project construction. Figure ES-14 shows the extent of permanent and temporary land takes associated with the hydropower facility.

## Power Station

The Bujagali power station is designed as an integrated structure, combining:

- a flap gate and open chute spillway in its upper part;
- a power intake structure in its lower upstream part;
- an open-air powerhouse in its lower downstream part; and,
- emergency spillways.

The power station will comprise five unit bays, each with its own power intake, trash racks and double flap gates. Operational stoplogs will be provided for temporary closing of the intakes for maintenance. Kaplan turbines will be housed within four of the five unit bays; a fifth turbine may be placed in

the remaining bay, at the discretion of UEB, at some point in the future. 220 kV cable conductors will connect the turbines' step-up transformers to the switchyard. On the power station's eastern side, there will be a low-level outlet spillway structure. On its western side, the power station will have a gravity-type retaining wall (which will accommodate storage space for the power intake stoplogs) in its upstream part, and the powerhouse service bay in its downstream part.

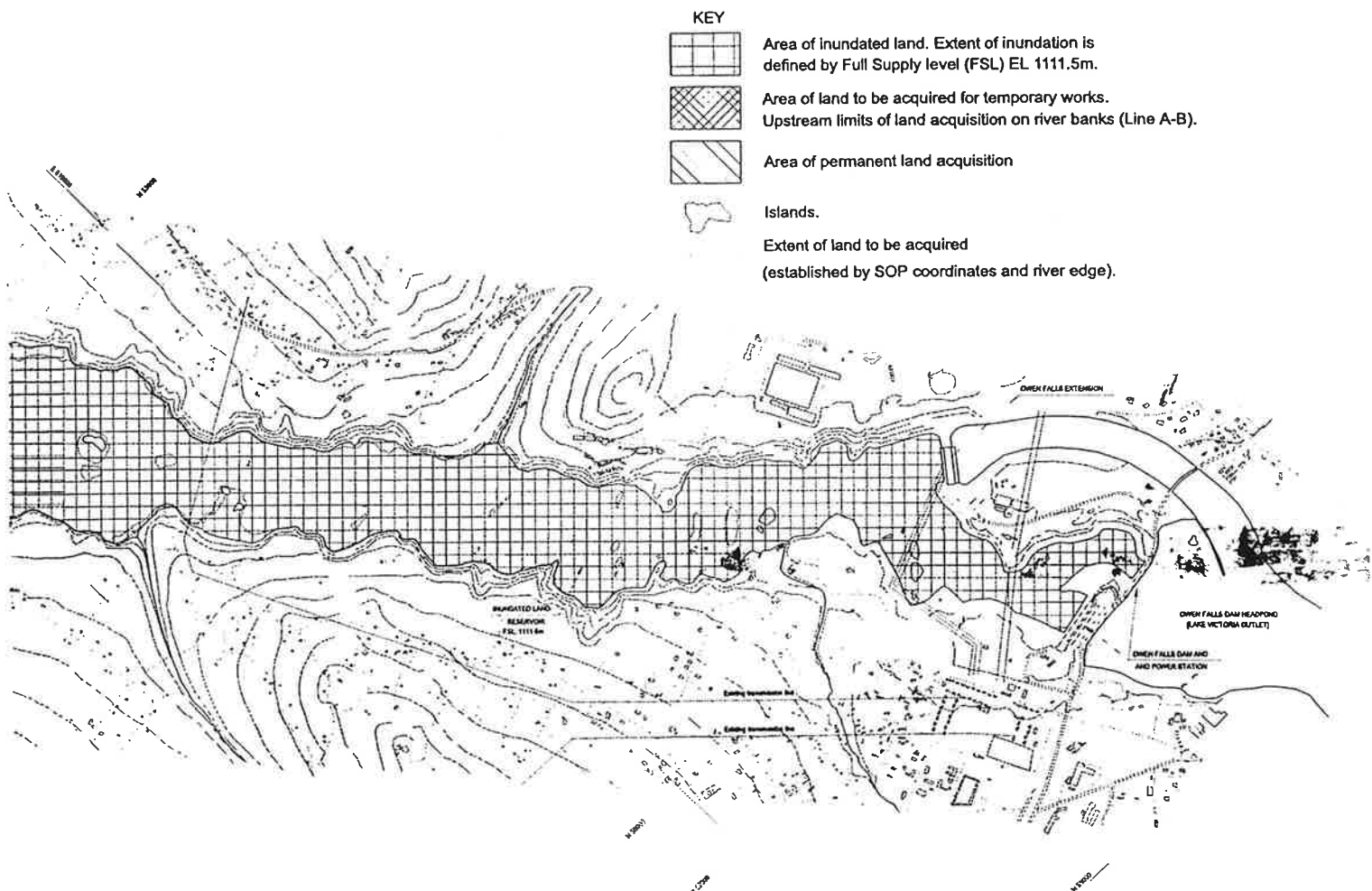
Spillways are incorporated into the project design to accommodate a variety of flow conditions in the Victoria Nile. A gated, concrete chute spillway on top of the powerhouse, using flap gates and radial gates, is designed to discharge the maximum flood of 4,500 m<sup>3</sup>/sec. Under less extreme conditions, the flap gates will act as "the main spillway" for flows up to 1,500 m<sup>3</sup>/sec.

Additional power station facilities include:

- A separate building accommodating the workshop and stores, to be located on the western bank, downstream from the dam; and,
- An emergency generator to be housed in a separate building, immediately downstream of the powerhouse service bay.

## Dam and Reservoir

An asphaltic concrete (AC) core dam is the preferred dam type as it is stronger and less expensive than an earthfill dam and can be constructed during the rainy season. A rockfill embankment will protect the asphalt core and a layer of riprap will protect the up-



**Ancillary Works**

Ancillary works associated with the Bujagali hydropower facility will include the following:

- an electrical transmission switchyard on the west bank;
- a fish passageway, required by NEMA in its conditions of approval;
- approximately 6.7 km of new access roads, tracks and parking areas;

- security perimeter fences on both embankments;
- a gate house on the main access road; and,
- on-site water treatment and sewage disposal plants.

**Construction of the Hydropower Facility**

The hydropower facility will be constructed in two phases. Phase 1 will entail the construction of the entire civil engineering works together with

installation of four 50 MW units to provide a capacity of 200 MW. Phase 2, entailing the installation of the final 50 MW unit, is dependent on UEB's decision. An additional generator bay will be constructed by AESNP to provide the option of installing a fifth turbine at a later date, should UEB choose to exercise this option. This would bring the hydropower facility's capacity to 250 MW.

During Phase 1, there will be two stages of temporary works, shown

graphically in Figure ES-15. On-site asphalt batching, concrete batching and rock crushing plants, as well as rock quarries and stockpile areas, will all be needed during Phase 1 of the hydropower facility's construction. These are also shown in Figure ES-15.

During the Stage 1 temporary works, the river will be diverted through the eastern channel at Dumbbell Island by construction of cofferdams at the upstream and downstream ends of the western channel. The upper cofferdam will be placed at the neck of the falls, while the lower cofferdam will be placed at the downstream end of Dumbbell Island, near the confluence of the two river channels. The cofferdams will be constructed by tipping boulders and rocks into the river; the permeability of the cofferdam will be controlled by the use of an impervious soil blanket. The area between the upper and lower cofferdams will be de-watered to allow for construction of the dam, the power station, services bay, control building, west bank abutment works and the main and emergency spillways.

During the Stage 2 temporary works, the Stage 1 cofferdams will be removed and the western channel will be reopened to allow water to pass through the newly constructed power station's spillway. The material recovered from the Stage 1 cofferdams will be used to construct the Stage 2 cofferdams in the eastern channel at the upstream and downstream ends of Dumbbell Island. This will close off the eastern river channel, and the entire river flow will then pass through the main spillway gates and the temporary diversion chute. Following de-watering in the eastern channel, the final eastern section of the dam will be constructed and east bank abutment works finalised.

Upon completion of the Stage 2 works, the temporary chute will be closed with a permanent concrete slab wall, which will allow space for a fish pass to be constructed, if this is identified as

necessary by studies that were ongoing at the time of writing. At the completion of construction of the eastern portion of the dam, the Stage 2 cofferdams will be removed using backhoe excavators.

The hydropower facility's construction process can be broken down into a number of distinct components, with time given in months as follows:

- Mobilisation (including establishment of roads, quarries and site facilities): M1 to M9;
- Diversion works: M4 to M6 (Stage 1 diversion) and M32 to M33 (Stage 2 diversion);
- Power station construction: M1 to M42 (assuming only 4 turbines installed);
- Spillway construction: M11 to M32;
- Tailwater excavation: M13 to M18;
- Dam construction: M12 to M41;
- Switchyard construction: M1 to M34; and,
- Commissioning: M42 to M48.

The total construction time for the development will be approximately 4 years.

#### Hydropower Facility Operations

Upon commissioning of the project, BEC will hand over the operations and maintenance to AESNP. BEC shall provide an Operating Manual for the hydropower facility to AESNP upon handover of the completed hydropower complex. Operating instructions shall detail all normal starting up, running and shutting down procedures, as well as emergency operating procedures and any precautions recommended to prevent deterioration of the hydropower facility during periods of non-operation.

The term of the Power Purchase Agreement (PPA) is for 30 years, after which time ownership of the facility will be transferred from AESNP to the Ugandan government. The facility

will be operated in accordance with the generating dispatch requirements of UEB or its successor organisation. The operation of the hydropower facility will entail the following activities:

- spillway and turbine operations;
- water treatment plant operations;
- sewage disposal;
- solid waste management and hazardous materials management;
- monitoring and maintenance; and,
- staffing and training.

During the operational phase, approximately 29 full time staff will be required on site. Accommodation for skilled and unskilled workers will be in Jinja, with the workers bussed to the site.

#### Decommissioning of the Hydropower Facility

Typically, the physical life of hydropower facilities is 60-100 years. It would be very unusual for AESNP to decommission the Bujagali project in the thirty years it owns the project, as the facility would have only operated for one third of its design life. However, assuming that this is required at Bujagali, closure, decommissioning and making the dam safe is a relatively simple procedure. The procedure depends on whether it is required to remove all traces of the dam or simply to make the project inherently safe.

To make the dam inherently safe, it would be necessary to open the spillway bottom gates first and remove or leave the radial gates and flap gates in the open position to allow water to flow unregulated. The natural flow of the water would flow through the wide-open gates and the power station could then be left in place.

Alternatively, for complete removal of the facility, a step-by-step reversal of the construction procedure would need to be carried out. Cofferdams would be constructed to redirect the

# Legal And Regulatory Requirements

Environmental approvals for the construction and operation of hydropower and electrical transmission projects in Uganda fall under the jurisdiction of the National Environment Management Authority (NEMA). This EIA has been prepared to address the environmental and social review requirements of NEMA, as well as those of AESNP's prospective lenders. The EIA discusses, and demonstrates compliance with, the applicable legislative and regulatory requirements of the Government of Uganda, and the policies, procedures and guidelines of the World Bank Group and the African Development Bank (AfDB), two key prospective lenders for the project.

The statutory and regulatory requirements of Uganda, and the policies, procedures and guidelines of the World Bank Group and AfDB are summarised below. Full details of the requirements are found in Chapter 2 in each of the Hydropower Facility EIA and Transmission System EIS.

## Ugandan Requirements

NEMA administers the EIA process in Uganda (shown in Figure ES-16), as set out in the National Environmental Management Statute and its regulations. AESNP has complied with the EIA and procedural and documentation requirements of NEMA, with the March 1999 submission of the Hydropower Facility EIS and the December 2000 submission of the Transmission system EIS. AESNP has also

addressed the balance of laws and regulations applicable to the project, as listed below and detailed in the EIA documentation:

- The Constitution of the Republic of Uganda, 1995;
- Investment Code (No.1/91);
- The Electricity Act, 1999;
- The Water Statute, 1995 and its regulations;
- The Rivers Act, CAP 347;
- The Land Act, 1998;
- The Town and Country Planning Act, CAP 30;
- The Wildlife Statute, 1996;
- The Local Government Act, No.1/1997;
- The Forests Act CAP 246 ; and,
- The Riparian Agreements respecting the River Nile.

## World Bank Group Requirements

The contents of the EIA report have been designed to meet the documentation requirements of two members of the World Bank Group: the International Development Association (IDA) and the International Finance Corporation (IFC). AESNP has also undertaken an EIA process that has complied with the procedural requirements of the IDA and IFC.

Environmental and social reviews undertaken by the World Bank Group are guided by a hierarchy of requirements that include:

- Environmental and social "safeguard" policies;
- Specific guidelines developed primarily by industrial sector; and,
- Other guidance and reference documents.

These exist within a framework of review, appraisal and decision-making procedures that differ somewhat among the different component institutions of the WBG. The policies and procedures of the IDA and IFC are described in detail in the EIA report. The primary World Bank Group reference documents that were utilised in the preparation of the EIA were:

- Procedure for Environmental and Social Review of Projects (IFC, 1998);
- Guidance for Preparation of a Public Consultation and Disclosure Plan (IFC, 1998);
- Occupational Health and Safety Guidelines (IFC, 1998);
- Guidance for Preparation of a Resettlement Plan (World Bank, 1998);
- World Bank Operational Manual (World Bank Group); and
- Pollution Prevention and Abatement Handbook (World Bank Group, 1998).

Table ES-2 provides an overview of the IFC/World Bank Safeguard Policies pertinent to the Bujagali project.

Table ES-2: World Bank Group and IFC Safeguard Policies - An Overview

Safeguard Policy	Summary Of Provisions
OP 4.01, Environmental Assessment (EA)	<p>States that all projects proposed for World Bank Group funding require EA review/analysis to ensure that they are environmentally and socially sound/sustainable.</p> <p>An EA evaluates a project's potential environmental risks and impacts; examines project alternatives; identifies ways of preventing, minimising, mitigating or compensating for adverse environmental impacts and enhancing positive impacts.</p> <p>EA considers: the natural environment (air, water and land); human health and safety; social aspects (involuntary resettlement, cultural property); and, trans-boundary and global environmental aspects.</p> <p>Various instruments are used to perform the EA depending on the complexity of the project: an Environmental Impact Assessment (EIA), an environmental audit, a hazard or risk assessment, and/or an Environmental Action Plan (EAP).</p> <p>Projects are categorised based on environmental significance. Category 'A' projects require a full EIA undertaken by independent EA experts.</p> <p>Category A projects must prepare a Public Consultation and Disclosure Programme (PCDP) and an Environmental Action Plan (EAP). Project sponsor must consult project-affected groups and local NGOs at least twice: before ToRs for EA are finalised and once a draft EA report is prepared.</p> <p>During project implementation, the project sponsor reports on compliance with (a) measures as agreed upon with IFC including implementation of an EAP; (b) status of mitigative measures; and (c) the findings of monitoring programs.</p>
OP 4.04, Natural Habitats	<p>Aims to promote and support natural habitat conservation, protection, maintenance, rehabilitation, and improved land use</p> <p>The World Bank Group does not support projects that involve significant conversion or degradation of critical natural habitats</p> <p>Where impact to natural habitats is inevitable, there is an opportunity to identify an 'offset' as compensation</p>
OP 4.09, Pest Management	<p>Supports the use of biological or environmental control methods rather than the use of pesticides</p> <p>If pesticides are required, the policy sets forth the criteria for their use</p>
OP 4.10, Indigenous Peoples (World Bank) OD 4.20, Indigenous Peoples (IFC)	<p>IFC Operational Policy 4.10 is forthcoming; projects must comply with OD 4.20, <i>Indigenous Peoples</i> in the interim.</p> <p>Policy aims to ensure that indigenous people benefit from development projects and are unaffected by potentially adverse effects</p> <p>If Indigenous people are affected by project development, project sponsor must develop an Indigenous Peoples Development Plan</p>
OP 4.11, Cultural Property (World Bank) OPN 11.03, Cultural Property (IFC)	<p>Operational Policy 4.11 is forthcoming; projects must comply with OPN 11.03, <i>Cultural Property</i> in the interim.</p> <p>Policy aims to assist in the preservation, protection, and enhancement of cultural properties and to avoid their elimination.</p> <p>If there is any question of cultural property in the area, a brief reconnaissance survey should be undertaken.</p> <p>"Cultural property" definition includes unique natural environmental features (canyons, waterfalls) with cultural values</p>
OP 4.12, Involuntary Resettlement (World Bank) OD 4.30, Involuntary Resettlement (IFC)	<p>Operational Policy 4.12 is forthcoming; projects must comply with OD 4.30, <i>Involuntary Resettlement</i> in the interim.</p> <p>Aims to avoid or minimise the involuntary resettlement of people required for projects</p> <p>Applied wherever land, housing, or other resources are taken involuntarily from people</p> <p>Sets out procedures for baseline studies, impact analyses and mitigation plans for affected people</p> <p>Project sponsors must implement a Resettlement Action Plan (RAP), as specified in the annex</p> <p>RAP must address both physical resettlement and economic effects of displacement</p>
OP 4.36, Forestry	<p>Aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty, and encourage economic development</p>
OP 4.37, Safety of Dams	<p>Dams over 15 m must be reviewed by a panel of three or more independent experts</p> <p>Must have detailed plans and periodic safety inspections</p> <p>Dams must be designed and constructed by experienced and competent professionals</p> <p><i>Dam Safety Panel / Vol in / L-05</i></p>
OP 7.50, Projects on International Waterways	<p>Sets forth required agreements and notifications regarding projects situated on international waterways</p> <p>Projects on international waterways must either have agreements or arrangements between the beneficiary state and other riparians, a positive response (i.e. consent, no objection, support) to the beneficiary state or a confirmation that the project will not harm their interests.</p> <p><i>/ N.I.</i></p>
OP 7.60, Projects in Disputed Areas (World Bank)	<p>The World Bank Group may proceed with a project in a disputed area if the governments concerned agree that, pending the settlement of the dispute, the project proposed for country A should go forward without prejudice to the claims of country B</p> <p>The World Bank Group must be assured that the other claimant to the disputed area does not object to the project, or that the project is not harmful to the other claimant's interests.</p>
Statement on Forced Labour and Harmful Child Labour (IFC)	<p>IFC will not support projects that used forced or harmful child labour</p> <p>Forced labour consists of all work or service, not voluntarily performed, that is exacted from an individual under threat of force/ penalty</p> <p>Harmful child labour consists of the employment of children that is economically exploitative, or is likely to be hazardous to, or interfere with, the child's education, or to be harmful to the child's health, or physical, mental, spiritual, moral, or social development</p>
Policy on Disclosure of Information (IFC)	<p>Sets out IFC policy on disclosure of information, minimum requirements for public consultation and describes materials which the public has right of access to</p> <p>Public consultation required at least two times for Category A projects: during the setting of project terms of reference in the scoping stage and during the review of the draft EA</p> <p>Project sponsors are required to make project information publicly available in local languages at or near the location of project for all Category A and B projects</p>

- A fisheries study summarising quarterly fisheries research reports (FIRRI, 2001);
- Socio-economic survey of potentially affected villages (1999-2000); and,
- Background data collection on wind speed and direction (Ugandan Department of Meteorology, 2000).

Several of these studies are included as part of the Technical Appendices to the EIA documentation. All of them are referenced bibliographically in the Hydropower Facility EIA and the Transmission System EIS. The balance of this section provides a brief narrative of the key baseline conditions.

### Existing Biophysical Conditions

Within the project area, the Victoria Nile is located within a deeply incised, steeply sloped valley. The river varies in width from 200 to 600 m, and drops over 20 m in a series of rapids between the Owen Falls power station and Dumbell Island. The area is considered to exhibit a moderate potential earthquake risk for hydropower development.

Since 1954, water flow in the Victoria Nile has been controlled by the Owen

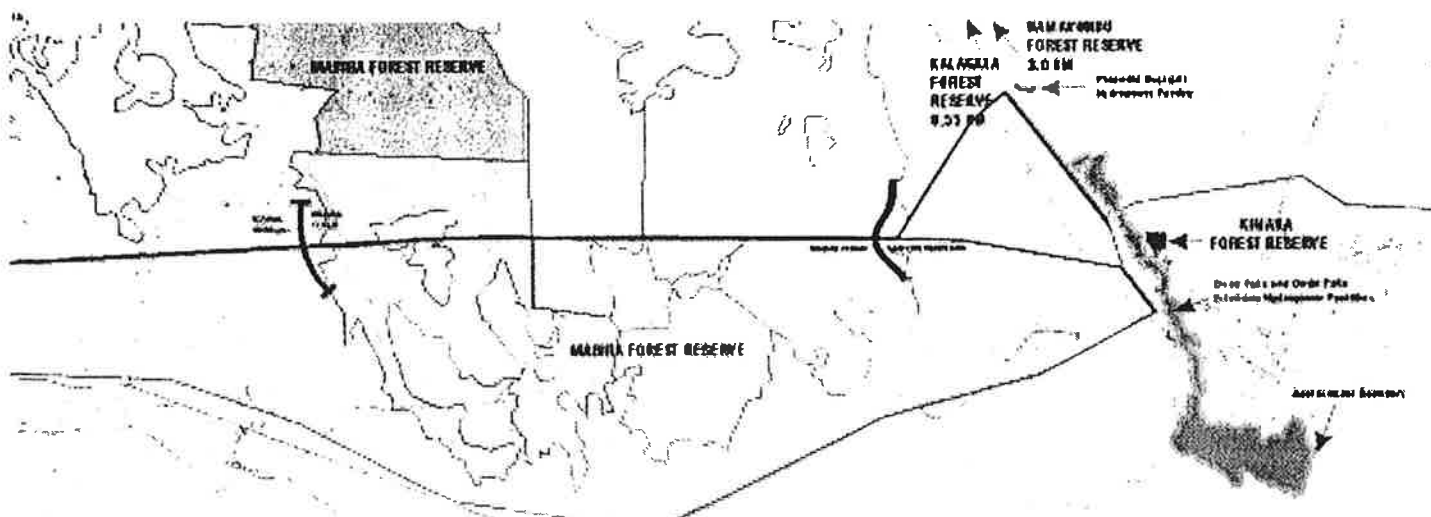
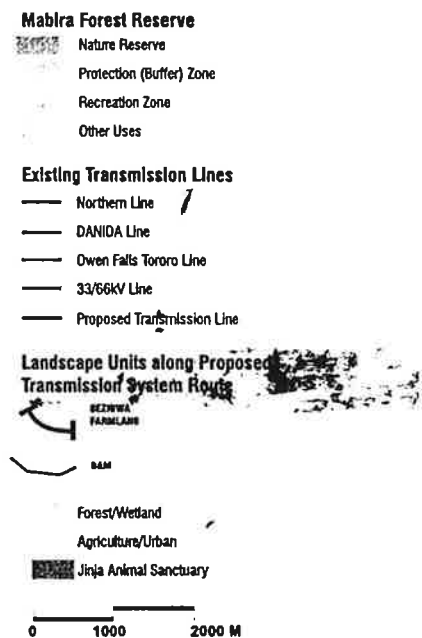
Falls (and now Owen Falls Extension) Power Station. Water flow from the dams has been constrained to match the natural outflows from the lake that existed prior to the dams' construction using an internationally "agreed curve." Water quality in the river is believed to be acceptable for drinking, and good for aquatic life, although nutrient levels have increased in recent years.

The Victoria Nile supports a diversity of aquatic life including plants, phyto and zooplankton, invertebrates, and fish. Key invertebrates to consider from a human-health perspective are vectors of tropical diseases. These are as follows:

- Snails transmitting schistosomiasis are not present in the river as they are not adapted to fast-flowing riverine conditions. The river also provides limited habitat for mosquito vectors of malaria, as they generally require stagnant pools of water for breeding. Nearby Lake Victoria provides extensive habitat for both snails and mosquitoes.
- River blindness (Onchocerciasis) is transmitted by blood-sucking *Simulium damnosum* flies, which breed in well oxygenated, rapidly flowing water. Suitable breeding

sites occur along the river and control measures consisting of DDT doping were initiated around 1950. The species has been eradicated since 1975.

- Sleeping sickness (trypanosomiasis) is transmitted by the Tsetse fly. Suitable breeding habitat can be found in the forested areas located along the river, as well as in forested locations throughout the hydropower and transmission system area.



# Public Consultation And Disclosure

AESNP has undertaken its public consultation and disclosure (PCD) activities for the Bujagali project with the intent of fully complying with NEMA, World Bank Group (IFC and IDA) and AfDB requirements regarding public consultation and disclosure. The EIA provides a detailed description of the key consultation requirements and AESNP's activities in this regard.

## AESNP Public Consultation Activities: An Overview

Figure ES-18 lists the PCD activities that have been undertaken by AESNP in relation to the major milestones of the Bujagali project's development. Figure ES-18 also presents the PCD activities planned for the future.

AESNP has used culturally sensitive methods for carrying out its public consultation activities for the Bujagali project, including:

- use of local languages in verbal and written communications with stakeholders;
- use of figures and illustrations for communicating with illiterate stakeholders; and,
- scheduling consultations at times and locations most convenient for stakeholders.

### Methods of Public Consultation

The public consultation and disclosure processes for the hydropower facility and transmission system components of the Bujagali project were undertaken separately. However, the same methodologies and principles were fol-

Table ES-3: Types of Consultees and Frequency of Consultations

Consultee Type	Times Consulted
1. Local residents from the affected areas	315
2. Representatives of cultural institutions and leaderships	49
3. National coverage radio, print media and television	130
4. Local government	265
5. The Government of Uganda	113
6. Stakeholders	155
7. Environmentalists/NGOs	91
8. Lenders	31
9. Others	132

lowed for both. The methods of information dissemination and consultation, presented below, were used during the course of the public consultation programme for both the hydropower facility and the transmission system components of the Bujagali project. For any given consultation activity, a method best suited to the situation was selected, taking into consideration the diversity and number of participants involved, their general level of literacy, and the extent to which they would be affected by the project.

Methods of public consultation that were applied over the course of project planning included:

- targeted briefing;
- displays and exhibitions;
- project progress reports and newsletters;
- advertising;
- interviews with key people;
- site visits;
- informal at-home meetings;
- surveys; and,

- focus group discussions

Consultation activities by AESNP and its consultants have been extensive and have involved local affected people and businesses, local and international NGOs, governmental agencies, and other interested parties. Figure ES-19 shows the locations of the villages where consultation activities were undertaken. Table ES-3 lists the types of parties consulted and the number of times they were consulted over the course of the project. For the hydropower component, 35 AESNP employees, Government of Uganda representatives and AESNP sub-contractors carried out a 10-month exercise of daily consultations with directly affected stakeholders. A similar 5-month programme was completed for the transmission system. These more *ad hoc* consultations are not included in the data presented in Table ES-3.

In addition, particularly at the hydropower development site, AESNP has assigned a dedicated community

I.L. NGOs

information officer (CIO) to each affected village. The CIO's job is to disseminate information to, and gather information/respond to questions from, directly affected stakeholders. The AESNP offices in Jinja and Kampala also have been, and continue to be, open daily to respond to queries from any stakeholder or interested party. Village dwellers frequently visited the closest AESNP office when they had a question or concern about the project and are encouraged to continue to do so.

AESNP's official website for the project ([www.bujagali.com](http://www.bujagali.com)) also disseminates information about the project and includes a provision for public feedback. This site will be maintained until the operational phase of the project. Thereafter, information about the Bujagali project will be available on the AES Corporation web site ([www.aesc.com](http://www.aesc.com)).

### Consultation Results and Project Responses

AESNP undertook the foregoing public consultation activities to understand the concerns, priorities and opinions of the directly and indirectly affected stakeholders related to the Bujagali project. The information was used by AESNP to design the project and its mitigation measures in response to the issues raised.

Compensation and resettlement have been the issues of greatest concern during consultation, with timeliness and transparency of the process being of prime importance. AESNP has worked with the communities and government to develop compensation packages that respond to the individual needs of each affected person. The compensation is set out in detail in the Resettlement and Community Development Action Plan (RCDAP) for the hydropower component and the Resettlement Action Plan (RAP) for the transmission component.

There is some opposition to the Bujagali project, especially amongst international NGOs. Consultations in Uganda, however, indicated that the majority of directly and indirectly affected stakeholders support the project. A survey of opinions of the Ugandan NGO community undertaken by Steadman Research in April 2000 confirmed this, with 96% of those canvassed being in support of the project. The Panel of Experts, formed to review the project, consulted with a broad cross-section of stakeholders regarding the Bujagali project and discussed environmental issues related to both the transmission and generation components of the project. Many of the results they obtained were similar to those obtained by AESNP. During their final visit to Uganda in March 2000, the Panel convened an NGO Forum in Kampala. The Panel, like AESNP, found that most of the comments were positive, urging AESNP and the environmental establishment to expedite the project because of the need for electricity in Uganda.

Other issues resulting from consultations that have been raised and which are addressed in the EIA documentation include, in no particular order:

- assisting in opening bank accounts for the citizens affected so they can effectively deal with AESNP compensation;
- labour being imported from the outside can be detrimental to local economies;
- desire for AESNP to assist in identifying alternative income sources, loan arrangements/ financing for affected people;
- transparency of the project;
- effects of electromagnetic fields generated by the power lines;
- ensuring the power produced meets the national demand before being exported;
- potential loss of tourism;
- provision of new electricity and water services;
- loss of wildlife habitat;

- potential disruption to culture and spirits; and,
- public health implications of the project, including an increase in HIV/AIDS.

Project responses to each of these issues are summarised in Chapters 7 and 8 of this document and presented in detail in Chapters 7 and 8 of the Hydropower Facility EIA and the Transmission System EIS.

### Parallel Consultation Activities

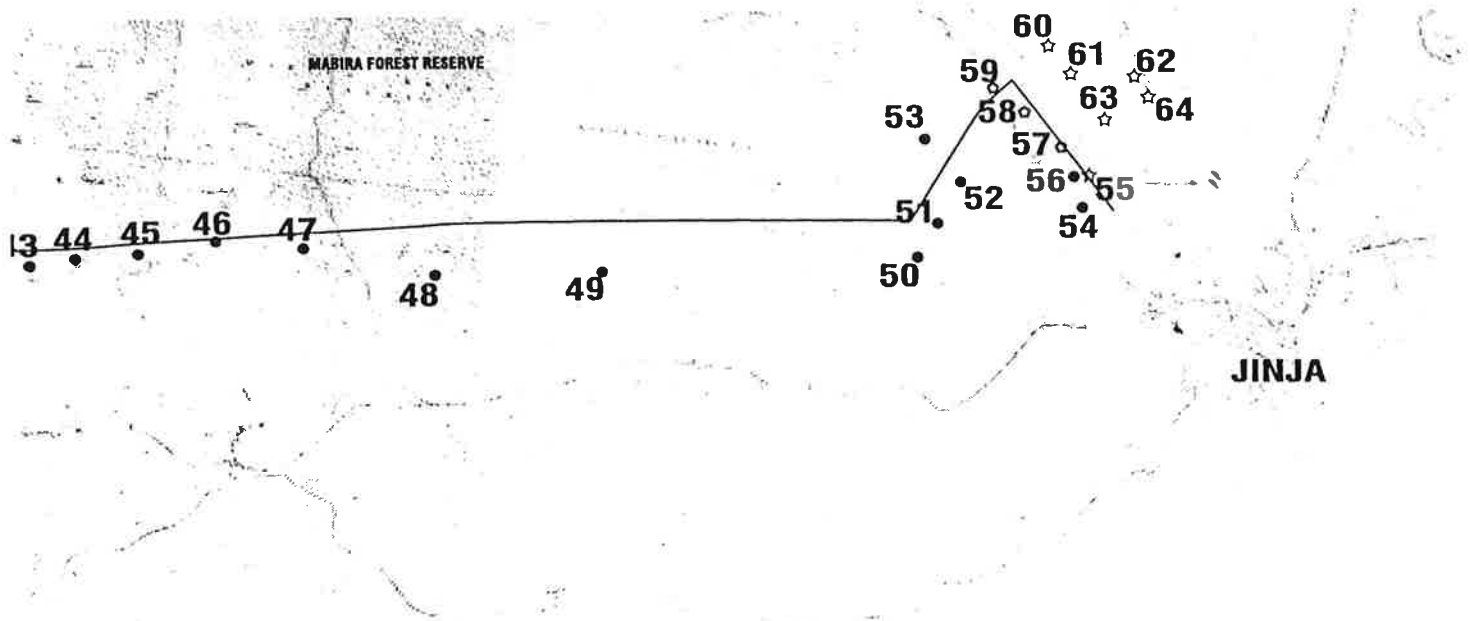
While AESNP was undertaking its planning and development of the Bujagali project, IFC was considering what the basin-wide implications of hydropower development were going to be in the Victoria Nile. It was aware that Bujagali, Kalagala and Karuma were all potential projects that it could be approached to finance and that the potential for cumulative effects arising from development of these projects could be significant. As a potential financier for such projects, IFC commissioned two studies in 1999 to address this broader question. Results of the studies and their respective public consultation activities and results are detailed in Chapter 6 of the Hydropower Facility EIA.

A final parallel consultation activity undertaken that was related to the Bujagali project was the December 2000 African and Middle East consultations held in Cairo, Egypt by the World Commission on Dams (WCD). There, the Save Bujagali Crusade expressed its opposition to the Bujagali project on environmental and cultural grounds.

### Public Disclosure

AESNP has taken the necessary steps to comply with all NEMA, WBG and AfDB requirements for public disclosure of the EIA. Throughout project planning, AESNP has made copies of key reports available both in Uganda





### Future Public Consultation and Disclosure Commitments

Apart from the above-noted requirements for public disclosure of project information, AESNP has also committed itself to the following public disclosure and accountability procedures following project approval:

- During the construction phase of the project, AESNP's contractors will proactively, through local authorities, disseminate information regarding construction activities, in order to maintain public dialogue;
- AESNP will provide Community Liaison Officers to ensure that problems are dealt with efficiently and effectively. Any aggrieved person can bring forth their grievance at any time to the AESNP office at the project site or its offices in Jinja and Kampala. Grievance resolution mechanisms will involve both traditional approaches, as well as judicial recourse; and,
- AESNP will fund a "Witness NGO" to observe the compensation/ resettlement process independently throughout the duration of the pro-

ject, so as to verify the compliance of AESNP with the RCDAP and RAP. The witness NGO will attempt immediate settlement of problems, wherever possible, before implementing grievance resolution procedures.

Throughout both the construction and operational phases of the project, AESNP will provide project-affected people with legal counsel and banking training as part of the RCDAP and RAP. AESNP will continue to liaise directly with all affected stakeholders and by means of a steering group consisting of representatives of project-affected people from both banks of the Nile, AESNP Community Information Officers, and Construction Officers. AESNP is committed under the RCDAP to maintain a team in Uganda for five years after construction to ensure mitigation and community development obligations are carried out. Furthermore, the AESNP site office, visitor centre and the Jinja and the Kampala offices will remain open.

AESNP has taken, and will continue to take, action to ensure the RCDAP

and RAP and other mitigative actions are adequately implemented, and that stakeholder concerns continue to be addressed. The Public Consultation and Disclosure Plan, found in the respective appendices for the hydropower facility and transmission system components of this EIA, details how this will be done in the project phases to come.

RAP process is designed to ensure that project-affected persons are better off, or at least no worse off, following resettlement.

The RAPs set out compensation and resettlement packages based upon the census conducted by AESNP in 2000 to identify households having interests (i.e. land, income-generating activities) affected by the project. Any household identified as having interests affected by the project is eligible for a resettlement and compensation package proportionate to the level of impact, regardless of land tenure regime (formal or customary, ownership or tenancy). The compensation and resettlement process provides a range of options from which households can choose. The process itself will be overseen by a witness NGO and includes provision of legal advice to households, as required.

Households who decide not to resettle, or who are not eligible to resettle, will receive cash compensation for their land, perennial crops, and buildings. All compensations are calculated according to Ugandan laws, with an uplift from AESNP, as required, to meet WB/IFC requirements. According to Ugandan law, compensation need not be provided for businesses to relocate. The 6-month notice to vacate is intended to provide people with adequate lead-time to re-establish their business.

### Project Land Requirements

Land required for the construction and operation of the hydropower facility totals 238 ha and falls within two categories: permanent land take and temporary land take. Permanent land take totals 125 ha and is broken down as follows:

- 45 ha of land that will not be inundated, but is needed for project facilities; and,
- 80 ha of land that will be inundated by the project reservoir.

Temporary land take, which will become available for local people to use again once construction is completed and the lands are rehabilitated, totals 113 ha and is broken down as follows:

- 106.1 ha on the west bank of the Nile; and,
- 6.9 ha on the east bank.

The Bujagali Project (via the Uganda Land Commission) will compensate people with respect to the hydropower facility for a total of 223.8 ha, based upon the socio-economic survey conducted in 2000. There is a slight difference of approximately 14 ha between the total amount of land required for the project, and the amount of compensation to be paid to landowners. This difference is attributable to communal paths, roads and streams within the project-affected area that are not individually owned.

For the transmission system, the total surface of affected lands is 381 hectares, with the following distribution:

- 4.7 hectares of land will be acquired from their present owners for the location of the Kawanda substation;
- 50 hectares of land are to be encumbered (no buildings, no agriculture) as a result of the 5 m wide right of way requirements for the transmission lines; and,
- The remaining land (approximately 326 hectares) is to be encumbered (no buildings, limitation of 1.8 m on crop height) as a result of the variable (30-40 m width depending upon location) wayleave requirements for the transmission lines.

### Compensation

AESNP will pay compensation for lost assets of project-affected people, including:

- Landowners who lose land, crops and/or buildings (residential or otherwise);

- Tenants who lose land, crops and buildings; and,
- Sharecroppers (licensees) who lose crops. Usually, sharecroppers will not lose residential buildings since they are not allowed to reside on plots where crops are shared with the owner.

Compensation and resettlement within the project-affected areas depends upon several different scenarios of land tenure and the degree of effect that the hydropower facility and the transmission system will have. These scenarios are illustrated in Figures ES-20 and ES-21, respectively. Resettlement and compensation packages have been adapted to each of these situations for discussion and negotiation with landowners. //

### Project-Affected Persons (PAPs)

A number of categories of persons affected by the project are recognized in the RAPs prepared for this project. They include:

- Displaced persons
  - Physically displaced
  - Economically displaced
- Project-affected persons (total)

Based on detailed counts and surveys carried out by AESNP in 2000 on a plot-by-plot basis, the numbers of affected persons are:

- Physically displaced:
  - Hydropower facility: 714 individuals in 101 households
  - Transmission system: 1,522 individuals in 326 households
- Total project-affected persons:
  - Hydropower facility: 8,700 individuals in 1,288 households
  - Transmission system: 5,796 individuals in 1,183 households

The RAPs provide detailed explanations of how these numbers were determined; how the compensation and

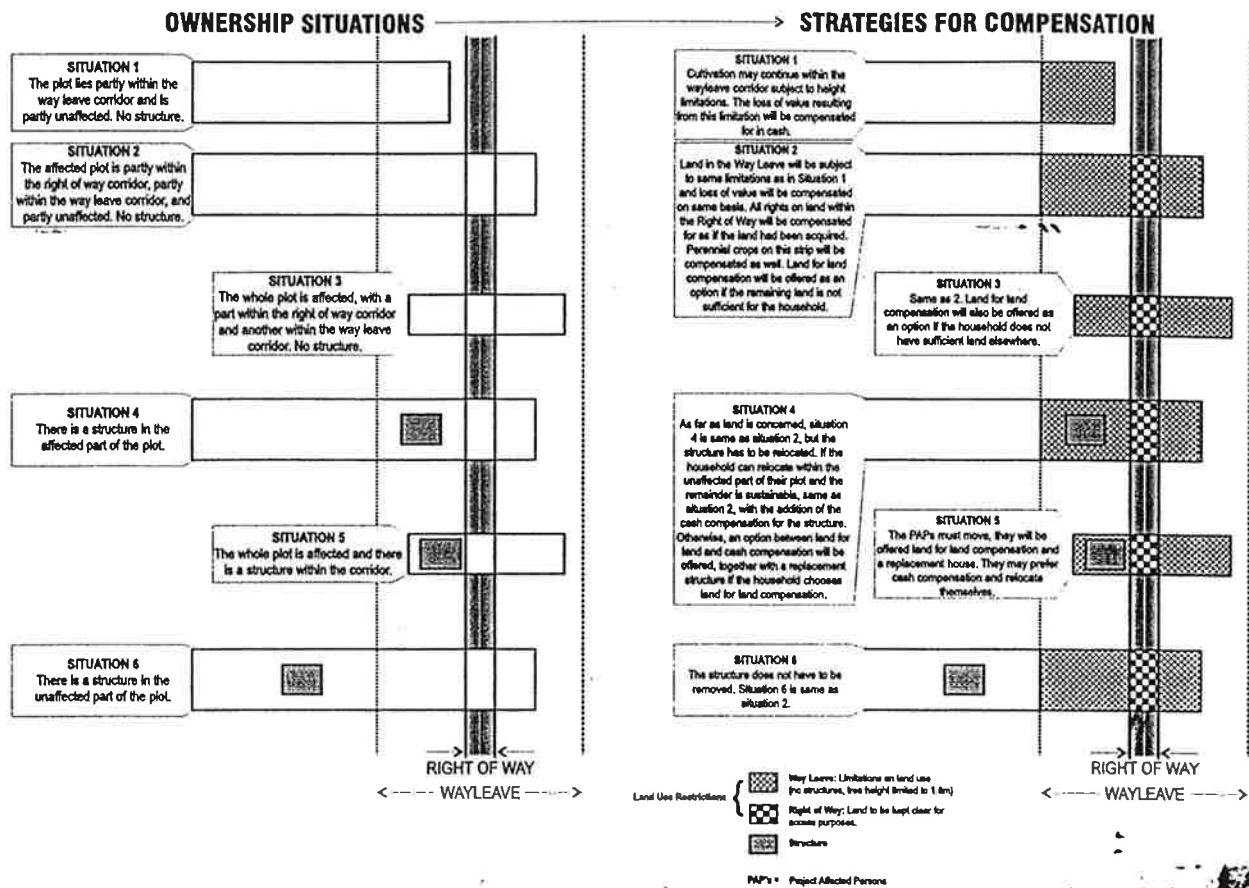


Figure ES-21 Range of Ownership Situations Encountered and Strategies for Compensation for the Bujagali Transmission System

A full resettlement package will be offered to affected landowners who will need to relocate. The package includes:

- A plot within the resettlement area. The plot will be similar in size to the present affected person's plot, and be of similar or better agricultural potential;
- Provision of a replacement house, based upon a model developed in Uganda by the NGO "Habitat for Humanity", including a corrugated iron roof, a concrete floor, and a ventilated pit latrine;
- Agricultural inputs such as seeds, seedlings and fertilizers;
- Cash compensation for the value of lost perennial crops (taking into consideration length of time until re-establishment);
- A disturbance allowance of 15% if notice to vacate is 6 months or more, 30% if notice to vacate is less than 6 months; and,

- Cash compensation for the cost of the actual move.

For the transmission system, which, as a linear facility, will have little impact on communities as such, no group resettlement is anticipated. Replacement lands will be identified by AESNP in the neighbourhood of affected households. For this reason, no impact on "host communities" is expected, as no group relocation will occur.

Effects on Land

The EIA documentation has identified a number of effects on land, including:

- the riparian strip along the River Nile;
- terrestrial habitats to be inundated, including islands in the river;
- agricultural lands affected by both the hydropower facility and along the transmission system route; and,

- lands used for quarrying and other borrow areas.

Riparian Strip Along the River Nile

The land between Full Supply Level (1111.5 m MSL) and the 1116 m contour will be managed by AESNP for the 30-year operating concession period. The socio-economic surveys carried out in 1998-2000 indicated that a large proportion of this land is currently under cultivation for cash crops, including land with very steep slopes, some of which has been recently planted in anticipation of financial compensation from the Bujagali project.

Mitigation measures that AESNP will implement include planting native and medicinal tree species in areas of the riparian strip between the FSL (1111.5 MSL) and the 1116 m contour that are currently bare or planted with cash and/or subsistence crops, in order to

## Effects on Water

The EIAs have identified a number of effects on water, aquatic habitats and organisms, with a primary focus on the Victoria Nile. They include:

- hydrology and hydrogeology;
- water quality;
- impacts on aquatic ecology and fisheries;
- impacts on human access to water; and,
- impacts to the Lubigi Swamp.

## Hydrology and Hydrogeology

Outside of the immediate diversion area (i.e., the vicinity of Dumbbell Island), the flow of the Nile during the construction phase will remain governed by the operating regime of the Owen Falls dams. The diversion of the west channel of the Nile River at Dumbbell Island into the east channel during the first stage of construction will result in higher water levels and increased flow velocities in the channel of the river that flows on the east side of Dumbbell Island.

The operation of the Bujagali power station will permit the fluctuating flows from Owen Falls to be re-regulated to achieve more constant flow downstream, should this be required. Due to its minimal storage capacity, the Bujagali scheme will have negligible impacts on flows in the Nile.

The daily fluctuation of the reservoir levels is expected to be in the order of 2 m at the dam face, based on the daily water level fluctuations that already occur in the upper reaches of the Nile from the Owen Falls power station and the Owen Falls Extension's operations. Thus, the situation after construction of the Bujagali project is not expected to differ greatly from the existing conditions and water fluctuations in the reservoir are not expected to result in a significant negative impact.

## Water Quality

The main impact on water quality in the Nile during the construction phase is the anticipated increase in suspended solids in the river as a result of cofferdam construction and erosion of the banks of the river channels by the higher velocity flows during diversion. A desktop modelling study showed a maximum elevation in suspended solids concentration immediately downstream of the site to be 33 mg/l. As baseline levels are generally low, it was concluded that in-channel suspended solids concentration would not approach the critical 80 mg/l level for aquatic species. Therefore, no significant impact of suspended sediment load to aquatic species is anticipated.

Three possible 'streams' of contaminated water from the site are identified as follows:

- Foul water, from the site sewerage system;
- 'Process water' such as the excess from concrete batching and washing; and,
- Surface and seepage water run-off from the site.

BEC has outlined proposals to treat these streams in order to achieve an effluent quality that complies with Ugandan national standards and WBG guidelines for discharge of effluent to water or land.

## Impacts on Aquatic Ecology and Fisheries

AESNP commissioned the Jinja Fisheries Resources Research Institute (FIRRI) to carry out a series of field surveys of aquatic ecology, fish and fisheries in the vicinity of the Bujagali project. FIRRI recognised five microhabitat types in the Upper Victoria Nile, identified the main fish taxa associated with each, and identified whether each microhabitat would be expected to change as a result of the hydropower facility.

FIRRI also estimated the overall fisheries yield of the reservoir at approximately 8.1 tonnes/year, which is slightly greater (3%) than the current estimated yield of this section of the river. This increase is solely attributable to the increased surface area of the reservoir and the concomitant habitat it adds. Owen Falls is an existing barrier to migration. However, the FIRRI studies indicate that migratory species continue to exist in the Victoria Nile despite the presence of the Owen Falls dam. For these reasons, no specific mitigation measures are proposed to address impacts on fish resources. However, a monitoring program will be implemented to confirm the accuracy of these predictions, and remedial action will be taken in consultation with private and institutional stakeholders, should this be necessary.

## Human Access to Water

The findings of the socio-economic surveys undertaken by AESNP indicate that the majority of households in the project area collect water from the River Nile. Therefore, the river represents the most important source of water for drinking, washing, bathing, and other domestic uses.

The Stage 1 diversion works will isolate a section of the western river channel approximately 2 km in length, which will impede access to water by residents of the west bank. During the Stage 2 diversion works, an approximate 1 km length of the eastern river channel will be isolated, thus restricting access to water for residents of the east bank. See Figure ES-15 for details of these temporary works. AESNP will provide potable water to all of the 8 directly affected villages. BEC has outlined a number of provisions for restricting access to the river, including fencing, providing alternative access points and traffic control.

Filling of the reservoir will result in the loss of access to existing fish landing

## Other Air Emissions

Emissions from internal combustion engines such as heavy equipment and portable electrical generators will be controlled by requiring all equipment to be in good running condition. Any effects on air quality from this type of equipment will be localised and of short duration. Emission of greenhouse gases from the reservoir, and as a result of construction of the project, are expected to be 250 times less than if the same amount of energy were to be generated by combustion of fossil fuels in a thermal power plant facility.

## Noise

Analysis of noise for both the transmission system and the hydropower facility focused on the construction period. In both cases, no significant changes in noise levels are expected as a result of operation of the proposed facilities.

The draft Ugandan noise standards permit a maximum general construction noise level of 75 dBL<sub>Aeq</sub> during the day (06:00-22:00 hours) and 65 dBL<sub>Aeq</sub> at night (22:00-06:00 hours). However, these limits make no reference to the duration or size of the construction project. It may be assumed that the type of building project for which these limits were developed typically had 'noisy' periods of 6 months. The "equal-energy principle" was applied to derive a project applicable limit for the hydropower facility of about 66 dBL<sub>Aeq</sub> (day time) and 57 dBL<sub>Aeq</sub> (night time).

Construction noise at five representative locations in the vicinity of the works for the hydropower facility was estimated based on the likely numbers and type of plant and machinery to be used during the various stages of construction. The five sampling locations were:

A Namizi, on the east bank of the river, about 830 m from the powerhouse;

B Kikubamutwe, on the west bank of the river, about 550 m from the powerhouse;

C Malindi, on the left bank of the river, about 360 m from the powerhouse;

D Malindi, in the vicinity of the state highway, about 730 m from the powerhouse; and,

E Kyabirwa, on the east bank of the river, about 1230 m from the powerhouse.

General construction noise levels in the extreme western outskirts of Namizi (Location A) will be below 60 dBL<sub>Aeq</sub>. Properties clustered around the north western end of the Kyabirwa Falls Road (location E) will experience noise levels typically in the mid 50s dBL<sub>Aeq</sub>, as will those in the area of Malindi, more remote from the hydropower facility site (location D). The closest properties to the construction works, typified by locations B and C in the eastern areas of Kikubamutwe and Malindi, respectively, will have noise levels generally in the mid 50s to low 60s dBL<sub>Aeq</sub>. In addition to the noise from these more general construction activities, there will be intermittent, generally higher, noise levels due to the operation of rock drills used to make the charge holes for rock blasting and subsequent removal. Quarrying and rock excavation may require up to about 2 or 3 blasts per day, primarily in the main quarry area on the west bank and at the southern end of Dumbbell Island.

Some drilling and blasting is also likely to be needed during the excavations for the powerhouse and spillway foundations and during the west bank abutment works. As the drill and blasting method of rock removal is being used only as a construction tool, the size and number of charges in any one blast are likely to be limited. The noise from blasting is therefore expected to be at a comparatively low level and heard as a

series of low frequency "thuds" or "rumbles" in the background. It is unlikely to achieve the maximum intermittent noise level outlined in the draft national noise standards.

Traffic noise level changes adjacent to the project access roads are not considered acoustically significant, as the resulting daily traffic flows will not increase a considerable amount above the existing baseline conditions. A complaints procedure will be put in place to identify significant nuisance noise effects. The change management processes set in the Environmental Action Plan will be used to modify operations, as necessary, to address noise issues.

With the exception of the Kawanda Substation, construction of the transmission system will be short term at any one location. Standard noise mitigation measures, including: restrictions of night time activities; relocation of equipment; scheduling noisy activities to avoid noise-sensitive periods at the school adjacent to the Kawanda Substation; repair of faulty machinery or vehicles; and, using screens, bunds, casings or temporary buildings to deflect or absorb noise are considered sufficient to address any noise issues.

## Effects on Access Roads and Traffic

Surveys were completed to determine the existing traffic volumes and road conditions along the access routes that will take most of the traffic generated during construction of the hydropower facility. Traffic for construction of the transmission system will be comparatively light, and, with the exception of Kawanda substation, not concentrated in any one area for a long time. Standard traffic management measures will be applied to control the minor effects of increased traffic along the transmission system. At Kawanda, special measures, including a separation barrier and crossing guards, will be used on



Figure ES-22 Location of Rapids

Effects on Tourism, Whitewater Rafting and Aesthetics

Development of the Bujagali hydropower facility has the potential to affect a number of tourism, ecotourism and recreational activities around Bujagali Falls and the revenues these activities generate. Portions of the transmission system also have the potential to have impact on aesthetics.

Whitewater Rafting, Ecotourism and General Tourism

Development of the Bujagali hydropower facility will result in the inundation of Bujagali Falls and preclude whitewater rafting (WWR) on Bujagali Falls and on the rapids upstream of Dumbbell Island. A promotional brochure of one of the WWR companies operating in the project area, showing the Victoria Nile rapids the company takes its customers to, is shown in Figure ES-22. Development of the Bujagali hydropower facility will also affect present-day tourist sites along the river such as the Bujagali Falls and the Kyabirwa Falls picnic sites.

Due to the types of impacts presented above and the potential of the project to compromise the "source of the Nile" area as a tourism destination in Uganda, AESNP commissioned Duncan Garrick International to conduct a Tourism Impact Assessment of the Bujagali project in 1998. They concluded that the Bujagali project is expected to have a serious effect on WWR, as presented in Table ES-4, but not compromise the industry as a whole, as the majority of rapids used for WWR (including 3 of the 4 "Class 5" rapids - the most exciting) are downstream of Dumbbell Island. Effects of the Bujagali Project on other identified tourism features are considered to be either minor or neutral. The economic effects on tourism are summarised in Table ES-5.

city. In response to a World Bank Group initiative to the Government of Uganda that that the Kalagala Falls Central Forest Reserve (CFR) area might be appropriate for consideration in establishing and maintaining an ecologically similar protected area, AESNP commissioned a survey of Kalagala Falls CFR, including its legal history and present vegetative cover.

Kalagala Falls CFR is contiguous with (though across the River Nile from) the Nile Bank CFR and was originally treated as one reserve. The reserve was divided for administrative pur-

poses as the reserve falls within two districts. In line with the World Bank Group initiative, AESNP has agreed in principle to assist in the future eco-tourism development of the Kalagala CFR being considered by the Forest Department. The details of AESNP's involvement are the subject of ongoing discussions with the Forest Department at the time of writing this EIA. For a summary of the status of these and related cultural properties issues, refer to Section 7.2.8 below.

Table ES-5: Economic Implications of the Bujagali Project in the Tourism Sector

Stakeholder/Affected Groups	Significant Impacts and Comments	Estimated Financial Impact Positive/Negative - US\$
1. White Water Rafting Companies: Adrift/Nile River Explorers	Loss of 'main sell', high profile, day trip product	Negative Adrift Potential Lost Revenue Stream: US\$80,000 p.a. Nile River Explorers Potential Lost Revenue Stream: US\$45,000 p.a.
2. WWR – Local Employees	Loss of earnings (higher than national average); truck operator and drivers	Negative Net Loss US\$50-75,000 p.a.
3. Bujagali Falls Picnic Site (Operator: Mr Raj Shah)	Loss of income from Adrift White Water Rafting company (10 per cent of sales) No loss of public access	Negative Potential Lost Revenue Stream: US\$30,000
4. Recreational users of river	None	Neutral
5. MADA Hotel Construction	Plans and construction envisaged Bujagali project. Rise in water levels will potentially benefit hotel property by bringing water level closer to hotel buildings. Vista will be altered but not negatively.	Positive
6. Kyabirwa 'Nature Resort'	No current construction (site only).	Positive
7. Jinja hostels, campsites, local businesses	Hostels and campsites main beneficiaries of tourist overnights for white water rafting. Main loser 'Explorers Backpackers Hostel'	Minor 'Explorers Backpackers Hostel' to close anyway. @ US\$5 per person per night, net current revenues estimated <US\$10,000 p.a.
8. Jinja Hotels	Relatively few WWR tourists stay in hotels	Minor
9. Kampala hostels	Backpackers Hostel and other budget hostels/accommodation likely to experience minor fall in business	Minor
10. Overland Tour Operators and Drivers	Loss of commissions	Negative Any losses 'normal business risk'

Source: Duncan Garrick International, 1998

aesthetic effects of the transmission system include:

- straight line runs will be maximised so that the need for angle towers, which have a more negative visual impact due to their heavier construction, is minimised;
- where possible, the transmission route is located immediately adjacent to, and parallel to, an existing 132 kV line, in order to limit effects to an already disturbed area;
- new towers will be constructed adjacent to existing towers, when possible, to minimise visual clutter;
- existing tracks will be used for construction and maintenance operations as much as possible;
- where a transmission line runs across ridges, the access track will run off or across the line as it climbs the slopes, in order to avoid accentuating the route of the transmis-

sion line, especially where lines are parallel;

- new sub-stations will be designed to limit the amount of major earthworks required, and to ensure sufficient space is left to create a vegetative buffer around the main built elements;
- lighting schemes for the sub-stations will be designed so that they do not create intrusive glare when seen from outside; and,

all temporary construction works, such as borrow pits and contractor's yards, will be restored upon completion.

#### Ecologically Protected Areas

AESNP has studied the possibility of facilitating ecotourism developments in the Kalagala Falls CFR as a potential means of offsetting the environmental and social impacts of the

project's construction and operation. Options identified by the Forest Department to develop the reserve into an ecotourism site include cycling paths, hiking trails and campsites.

The potential role for AESNP in this offset could include enrichment planting in the Forest Reserve, improvements in access to the reserve or improvements in access to the river for future WWR activities, as deemed appropriate by the Forest Department. As previously noted, AESNP has agreed in principle to continuing discussions with the Forest Department and the WBG, as appropriate, on its role in the future management of the Kalagala CFR and/or any other ecologically similar area that might be considered as an offset to the effects of the Bujagali project.

ment of Antiquities, who will advise on measures to be taken to ensure their preservation.

### Effects on Public Health

This section examines concerns for public health that might be caused, or exacerbated by, the Bujagali project, including sexually transmitted diseases (STDs), vector-borne diseases, impacts on available health care facilities in the project area and the effects of electromagnetic fields from the project's transmission lines.

#### Sexually Transmitted Diseases (STDs)

The spread of HIV/AIDS and other STDs was identified as a key public health issue in the public consultations and in the First Report of the Panel of Experts. Concern was expressed that the already high prevalence of HIV found in Uganda could be exacerbated by construction workers, truck drivers and prostitutes attracted to worker camps.

AESNP and BEC are committed to measures that will reduce the risk of an increase in STDs as a result of the project. For this reason, the following human resource management policies have been adopted:

- No construction camp will be erected at the project site;
- Unskilled labourers will be recruited preferentially from the local population, and particularly from the villages affected by the project. Therefore, these workers will remain resident in their homes, reducing the need for accommodation for single male unskilled workers;
- BEC will operate busses from Jinja, and along the east and west banks of the Nile to the construction site at every shift change;
- Skilled expatriate workers (approximately 400 in number) will be housed at the existing camp in Jinja,

which was previously used for workers on the Owen Falls Extension project. This camp contains accommodation for both single workers and married workers with their families. Integration of this worker population within the wider Jinja community will reduce the risk of the camp becoming a focus for sex worker activity;

- An STD awareness program will be part of the training package for all workers; and,
- Condoms will be made available to workers via the site clinic.

#### Vector-borne Diseases

Impoundments in narrow, steep-sided valleys, such as at Bujagali, create significantly fewer vector breeding sites when compared with impoundments with extensive, shallow shorelines. Due to the inundation of islands near Bujagali, there will be a 34% reduction (at Full Supply Level) in the length of shoreline available for vector habitat. In addition, daily fluctuations of water levels within the reservoir will strand vectors, including mosquito larvae and snails, and expose both the vectors (adults and egg masses) and potential breeding sites to the drying effects of the sun. These factors all mitigate against significant increases in vector breeding success.

Schistosomiasis (bilharzia) is a disease transmitted by snail vectors that require slow moving water and matted aquatic vegetation. While most of the new reservoir will have a significant current, there will be backwaters where currents are slow. AESNP will clear trees and shrubs from the reservoir area before inundation and will remove potential anchorages for weed mats that could be used as breeding sites for snails. Once the reservoir is filled, there will be regular monitoring for development of snail colonies, with particular attention to slow moving backwaters, areas of water hyacinth or Nile cabbage colonies, and areas where there is likely to be human water con-

tact. Where necessary, floating vegetation will be eradicated by manual removal and disposal to land (e.g. as fertilizer), as is currently carried out at the Owen Falls dam.

Onchocerciasis (river blindness) is a disease transmitted by a black fly vector, *Simulium damnosum*. This species has been eradicated in the Upper Victoria Nile, and, as a consequence, onchocerciasis is not a problem in the area at present. Re-invasion by *Simulium* flies, as a result of the Bujagali project, is considered unlikely. Rapid fluctuations in river level during operation will alternately expose and drown potential natural breeding sites, making breeding and establishment of a viable population very unlikely.

Malaria, transmitted by the Anophales mosquito, is already hyper-endemic in the project area and there are unlikely to be any significant changes in incidence within the local community resulting from the Bujagali project. However, a potentially serious situation applies to those without immunity (such as expatriate workers from non-malarious areas). Adequate protection will be made available to all expatriate workers in the form of chemoprophylaxis, screening of accommodation, spraying the inside of houses with residual insecticide and bed nets impregnated with insecticide.

Trypanosomiasis (sleeping sickness), transmitted by the Tsetse fly, is no longer considered to be a problem in the area and the Bujagali project is unlikely to result in any change to this situation. Rift Valley Fever is similarly not considered to be a problem, although active surveillance of the disease along the Uganda-Kenya border will continue.

#### Electric and Magnetic Fields

The electrical transmission lines for the Bujagali project will be designed to ensure that the strengths of the elec-



ture growth of the system without the need to construct an additional line.

## Community, Developmental and Economic Benefits

The Bujagali project will result in many community benefits at the national, regional and community levels. In addition to the resettlement and compensation package that each directly affected person will receive, AESNP is committed to providing community benefits in a sustainable manner by means of the Community Development Action Plan.

It is part of the AES Corporate policy to interact with the communities that play host to the company's facilities. As part of AESNP's Operation and Maintenance budget, they will put aside a sum of money each year for Social Responsibility (SR) activities. SR activities are ongoing throughout the life of the project, in response to communities putting forward suggestions on an ad hoc basis. For the Bujagali project, US\$10.2 million over 35 years has been committed to community-generated, sustainable community development projects. The areas that will benefit from the SR Programme are mainly Wakisi Sub-County on the west bank of the Nile in the project-affected area and Budondo Sub-County on the east bank, although projects concerning Jinja town and around the Kawanda transformer station are also being considered.

### Community Development Strategy

Several regional and community level benefits are expected to occur as a result of the Bujagali project. The key areas where benefits are expected to occur are as follows (refer to the RCDAP for full details):

- **Health Care Facilities:** AESNP is committed to strengthening health facilities on both the east and west

bank of the Nile, so that the wider project-affected population near the hydropower facility can enjoy improved health care services. Consequently, services offered at the existing Budondo Dispensary and Maternity Unit on the east bank will be strengthened, and a new clinic on the west bank will be constructed.

- **Employment:** It is expected that a minimum of 10% of the unskilled workforce for the construction phase of the hydropower facility will originate from the affected villages. This phase will employ 600-1500 people at the peak period. Similarly, for the transmission system, 250 unskilled labourers will be required for the construction of the transmission lines and Kawanda station, hiring for which will be done preferentially in project-affected areas. AESNP will also pursue an apprenticeship programme with BEC so that job skills can be learned and potentially used during the project's operational phase. A commercial area employing about 50 persons will be created in the vicinity of the contractor's base in the dam area to facilitate independent entrepreneurs wishing to provide services and sell goods to construction workers.
- **Access to Water:** AESNP will contribute to the establishment of modern water schemes in the area. Community-level borehole facilities are proposed for all 8 affected villages. The boreholes will be developed in conjunction with the World Bank National Water Project for rehabilitation of small rural water and sanitation schemes. The implementation of this project will have positive impacts on general public health and will make the task of water collection easier and less time-consuming to women and children who are generally in charge of it.
- **Access to Electricity** AESNP is consulting with the Rural Electrification Department within the

Uganda Electricity Board in order to improve the conditions of access to electricity within the project-affected area. AESNP will:

- pay for and install a transformer in Kyabirwa and Malindi villages (these villages were not included in the UEB/Japan International Cooperation Agency Rural Electrification Project which is currently being implemented);
- AESNP will not pay for the cost of any individual connection or any electricity bill. Support from AESNP will be limited to covering initial capital costs, while individuals or communities will manage all connections and consumption costs; and,
- provide low voltage line extensions into the 8 affected villages of Bujagali, Ivunamba, Kyabirwa, Namizi, Naminya, Buloba, Malindi and Kikubamutwe.

Since it is not technically and economically feasible to extend the low voltage network so that it can ultimately serve all households within the 8 affected villages, AESNP reviewed alternatives to those households that will not be served by the low voltage network. With electricity being available in the vicinity, a battery recharge installation appears to be the best, cheapest and most reliable/sustainable way to provide electricity to off-grid households. Experience elsewhere in Africa has shown that there is no interest in developing this kind of service as a community-managed organisation. Therefore, AESNP's role in developing off-grid power services will be minimal and will include technical assistance (selection of equipment, management training) to those individuals who are interested in developing such a business, and support in accessing credit.

# Environmental Action Plan (EAP)

Environmental Action Plans (EAPs) have been prepared for both the hydropower facility and the transmission system that identify the responsibilities, schedules and budgets of the environmental and social management measures to be implemented for development of the Bujagali project. This information is presented in detailed GANTT charts in both the Hydropower Facility EIA and the Transmission System EIS. Tables summarising this information are presented in Appendix A of this document. The EAPs will be modified by AESNP over the life of the project, as appropriate, to reflect changing environmental laws, regulations, standards, and technologies.

The following principles were used to guide the preparation of the EAPs:

- focus on occupational health, safety, and environment risk prevention;
- conformity with relevant standards, codes, and practices in the application of safe technologies;
- all activities will be performed in a safe and effective manner and all equipment will be maintained in good operating condition for the protection of the health and safety of all persons and to conserve the environment and property;
- all necessary precautions will be taken to control, remove, or otherwise correct any leaks and/or spills of hazardous materials, or other health and safety hazards; and,
- construction of the hydropower facility and transmission system will

meet relevant international standards that ensure sufficient technical levels of safety.

## EAP Organisation, Responsibilities and Independent Monitoring

AESNP is the Bujagali project sponsor and, as such, has ultimate responsibility for the design and construction of the transmission system and design, construction and operation of the hydropower facility. A joint venture company, known as the Bujagali EPC Consortium (BEC), will construct the transmission system and hydropower facility on a turnkey engineer, procure and construct basis.

Upon completion of construction, ownership of the transmission system will be transferred to UEB or its successor organisation. UEB will then be solely responsible for the operation of the system. As a result of this arrangement, the EAP for the transmission system focuses on the construction phase only, although it does include provisions for environmental management following handover of the transmission system to UEB, such as strengthening the environmental management capabilities of UEB.

AESNP will own and operate the hydropower facility for a 30-year period, at which time ownership and operating responsibility will also be transferred to UEB or its successor organisation. AESNP will continue to meet its social responsibilities for an additional 5 years after the

hydropower facility is handed over to UEB (or its successor). In other words, AESNP's support to community development projects will cover a total of 35 years.

To assist with environmental management, AESNP will appoint an Environmental Review Panel (ERP) from key stakeholders including NEMA, community members, technical representatives, the witness NGO and BEC representatives. The ERP will meet regularly to:

- review internal environmental reports;
- discuss significant issues as they arise;
- make decisions about modifications to mitigation and monitoring needs and requirements; and,
- advise on external reporting of issues, as required.

During construction, BEC will be governed by the environmental policies and procedures of Skanska International Civil Engineering (Sweden), which are the most stringent of any of BEC's participating companies. All higher-level, project-related mitigation measures such as implementation of the RAPs will be directly handled by AESNP.

## Change Management Process

During the implementation of the project, changes may be required to address unforeseen or unexpected conditions or situations. A change management process will be applied to

- reporting results of mitigation and monitoring activities to NEMA, the lenders and other applicable parties.

### BEC Component Plans

BEC will be governed by the existing environmental policies and management systems of Skanska International Civil Engineering. Skanska is certified under ISO 14001, and BEC will operate an Environmental Management System that complies with this standard, as per the contract between AESNP and BEC.

BEC's Project Plan will be comprised of a set of method statements covering all aspects of construction and environmental management. A preliminary draft of the Project Plan is appended to both the Hydropower Facility EIA and the Transmission System EIS. The entire plan and its components are currently under preparation, and will be complete before the commencement of construction. The project plan will include, among other things, the following procedures or plans.

#### Hydropower Facility Environmental Mitigation Plan (EMP) and UEB Transmission System Environmental Mitigation Plan (UEMP)

Prior to the start of construction, BEC will prepare an EMP that will specify the mitigation measures to be implemented by BEC before, during and after construction of the hydropower facility and transmission system, in order to mitigate the potential environmental impacts of the project. These will include all of the construction period mitigative measures set out in the hydropower EIA and transmission system EIS, as well as measures specified in the EPC contract between AESNP and BEC. Elements of the EMP and UEMP that will address environmental issues include:

- A Traffic/Access Management Plan (TMP);

- A Waste Management Plan (WMP); and,
- A Pollutant Spill Contingency Plan (PSCP).

#### Hydropower Facility Environmental Monitoring Plan (EMoP) and UEB Transmission System Environmental Monitoring Plan (UEMoP)

BEC will prepare an EMoP and UEMoP. The EMoP and UEMoP will identify the monitoring objectives and specify the type of monitoring required to achieve the obligations set out in the hydropower EIA and transmission system EIS, as well as the obligations specified in the EPC Contract, and the appropriate locations and equipment to be used. Specifically, the EMoP and UEMoP will identify:

- environmental issues;
- parameters to be monitored;
- monitoring methodology including locations, equipment, frequency etc;
- threshold limits that trigger corrective action;
- reporting procedures; and,
- responsibilities for monitoring within the BEC team.

BEC will monitor the parameters set out in the EMoP and UEMoP to ensure that the performance of the works complies with the threshold limits which trigger intervention, including relevant Ugandan standards (e.g., noise limits), performance standards of key lenders and internal corporate performance standards. AESNP will undertake a detailed compilation and reconciliation of the various standards, revise the EAPs accordingly and re-release the EAPs.

#### Health and Safety Management Procedures

Health and Safety Management procedures will be prepared that address all Ugandan health and safety standards, as well as provisions from the

WBG's Health and Safety guidelines, including:

- workplace noise;
- workplace air quality;
- electrical safety in the workplace;
- working in confined spaces;
- general health and safety; and,
- personnel training.

The procedures will include internal incident tracking and a corrective action programme to prevent recurrence of any incidents that may occur. BEC will be responsible and accountable for the actions of its company and employees. These responsibilities will be incorporated into the contract documents consistent with the recommendations of the EAP.

BEC will designate an appropriately qualified Site Environmental Officer (SEO) acceptable to AESNP and NEMA, who will be responsible for implementation of the measures set out in the EMP and EMoP. The SEO's key responsibilities will include the following:

- ensuring that all environmental protection procedures are followed;
- co-ordination of environmental monitoring of site-related activities in respect of the obligations of BEC's obligations;
- liaison and reporting with the Environmental Manager;
- the monitoring of hazardous substances on-site to ensure that the possibility of accidental release is minimised;
- ensuring, where appropriate, that monitoring equipment required for the execution of the obligations of BEC are calibrated and maintained as required;
- promoting on-site environmental awareness;
- liaison with other businesses and industry; and,
- maintaining an Environmental Management System based on ISO 14001.

**Table A.1 : General Responsibilities for Environmental Mitigation Measures**

Issue	Action/s	Location	Responsibility	Estimated Cost (USD)
Compensation/ Resettlement of PAPs	Implement RAP	Affected properties at Bujagali	AESNP	11 million
		Transmission line route and Kawanda substation site	AESNP	7.8 million
Cultural Property Management	Implement CPMP	Affected villages near Bujagali	AESNP	125,000
Community Development	Implement CDAP	Affected villages near Bujagali	AESNP	1.8 million for hydro component
Environmental Management	Appoint Environmental Manager	To operate from AESNP Jinja/Kampala offices	AESNP	300,000 (5 yrs) for hydro component 10,000 for transmission line component
	Appoint Site Environmental Officer	To operate from Bujagali site office	BEC	Within construction budget
Environmental Review	Form/chair Environmental Review Panel	Meetings at AESNP Jinja office	AESNP	30,000
	Form/chair Forest Management Committee	Meetings at AESNP Jinja office	AESNP	Within ERP budget
	Review annual self-monitoring reports from AESNP	Kampala/ Washington DC	NEMA/JFC	Within EIA/EIS fee
Environmental Reporting	Quarterly construction monitoring reports to Environmental Manager	Jinja	BEC (SEO)	Within SEO salary
	Quarterly monitoring reports to ERP/NEMA and lenders	Jinja	AESNP (Environmental Manager)	Within Environmental Manager's salary
	Submit annual self-monitoring reports to ERP, NEMA and lenders	Jinja/Kampala	AESNP (Environmental Manager)	Within Environmental Manager's salary
Economic and social effects, other than physical and economic displacement	As specified in Chapter 7 <sup>1</sup>	Bujagali site, surrounding villages and Jinja Transmission line route and Kawanda substation	AESNP and BEC (as specified in Chapter 7)	Included in project budget (plus Social Responsibility fund)
Forest habitat/biodiversity	Implement forest offset proposal	Mabira CFR (possibly Kalagala Falls CFR)	AESNP (Forest/Wetland Task Manager)	Ush 227.9 million (USD 1425)
	Enrichment planting	Mabira CFR	AESNP (Forest/Wetland Task Manager)	Ush 282 million. Staged payments within above budget (linked to Environmental Manager confirming that planting and tending of forest sections has occurred)
	Controlled access of roads improved during project	Mabira CFR	BEC and AESNP (Forest/Wetland Task Manager)	Within construction budget

<sup>1</sup> Chapter 7 refers to Chapter 7 of the hydropower facility EIA and Chapter 7 of the transmission system EIS unless noted otherwise

**Table A.1 : General Responsibilities for Environmental Mitigation Measures**

Issue	Action/s	Location	Responsibility	Estimated Cost (USD)
Occupational Health and Safety sites	Chapter 7			
Occupational Health and Safety	As specified in Chapters 5 & 7	Bujagali construction site, public highways, transmission line storage yard (during construction phase only), substations	BEC (H&S Manager)	Within construction budget
	As specified in Chapters 5 & 7	Bujagali power station and switchyard	AESNP	Within operational overheads
HIV/AIDS Mitigation	As specified in Chapter 7	Construction site (clinic) and Jinja expatriate camp (Owen Falls Extension camp)	BEC (H&S Manager)	Within construction budget
Malaria risk to expatriate workers	Make anti-malarials available to expatriate staff	Bujagali construction clinic and Jinja expatriate camp	BEC (Site Doctor)	Within construction budget
Schistosomiasis vector habitat	Clear floating vegetation	Reservoir	AESNP	Within operational budget
Electromagnetic fields (EMFs)	As specified in Chapter 7 of the transmission system EIS	Transmission line route and Kawanda substation site	BEC (SEO)	Within construction budget
Public Safety and Security	As specified in Chapters 5 & 7	Public highways and access roads, transmission line storage yard (during construction phase only), transmission line route, substations	BEC (SEO)	Within construction budget
	As specified in Chapter 7	Access roads and reservoir	AESNP	Within operational budget
Institutional Strengthening (monitoring agencies)	As specified in Chapter 8	Kampala, Mpigi, Mukono and Jinja Districts	AESNP	55,000 for initial assessment specific to hydropower component 50,000 for transmission system component
Institutional Strengthening (Plant and Environmental Management within UEB)	Assess need prior to handover to UEB.	Bujagali HPP site, and UEB Kampala office	AESNP	TBD (funded from Bujagali HPP operating budget)

**Table A.2: General Responsibilities for Environmental Monitoring Measures**

Parameter to be monitored	Reason for monitoring	Monitoring location	Monitoring method	Recommended trigger level	Responsibility for investigation	Responsibility for execution
Water resources	Ensure safe and adequate supply to residents	Alternative water supply	Monitor yield, sample and analysis for bacteri	Yield: in line with LC1 Quality: see NEMA (undated)/WBG standards	AESNP	AESNP
Water level in pit latrines	Ensure sanitary facilities available to residents	All remaining pit latrines within Kikubamurwe, Namizi, Buloba and Wakisi villages	Direct observation, and consultation with property owner	Alternative facilities to be provided by AESNP if latrine no longer safe	AESNP	AESNP
Water quality in aquifer	Ensure safe and adequate supply to residents to NEMA/WBG standards	All remaining wells within Kikubamurwe, Namizi, Buloba and Wakisi villages	Sample and analysis for NEMA/WBG drinking water determinands	Exceedance of NEMA or WBG drinking water standard	AESNP	AESNP
Construction noise, working hours and public complaints	Minimise impact on residents	On site	Record hours of gravel crushing & blasting, and residents' complaints	To be determined by ERP	BEC (SEO)	BEC (SEO via Field Inspector)
Construction noise	Minimise impact on neighbouring residents	15 m from site boundary, or 1 m from nearest affected building if located more than 15 m from site boundary	Instrumental monitoring according to proposed NEMA standard; maintain and review register of residents' complaints	Proposed NEMA standards/WBG standards	BEC (SEO)	BEC (SEO via Field Inspector)
Air quality	Nuisance, potential impacts on health and crops; prevent dust impact near Kawanda site	As for noise monitoring	PM <sub>10</sub> , SO <sub>2</sub> and NO <sub>2</sub> measurement; Instrumental monitoring according to NEMA	Proposed NEMA standards/WBG standards	BEC (SEO)	BEC (SEO via Field Inspector)
Electric and Magnetic Fields (EMFs)	Ensure compliance with international guidelines	Each village along transmission line	Instrumental determination of field strength	ICNIRP standards	BEC	UEB
Communicable diseases	Minimise impact on residents, workers and health facilities	Site clinic	Inspect site clinic records for STD incidence in workers	To be determined by site doctor	AESNP, via District Health Officer (DHO) for Jinja & Mukono	AESNP, via DHO, Jinja & Mukono
Malaria incidence	Minimise impact on expatriate workers and health facilities	Site clinic	Inspect site clinic records for malaria incidence in expatriate workers	To be determined by site doctor	AESNP, via DHO for Jinja & Mukono	AESNP, via DHO, Jinja & Mukono
Solid Waste Management	Minimise environmental impact	Working area of hydro site and transmission lines, plus designated disposal site	Visual inspection	Non-compliance with Waste Management Plan	BEC (SEO)	BEC (SEO via Field Inspector)
Hazard Waste Management	Minimise environmental impact	Working area of site	Monitor storage, handling and procedures for returning to suppliers	Non-compliance with Waste Management Plan	BEC (SEO)	BEC (SEO via Field Inspector)
Traffic Management Plan (TMP)	Resident and worker safety	Site and access roads, laydown areas of transmission lines	Visual inspection of site, visual checks of traffic management and driver behaviour, audit of Traffic Management Plan, including training records	Any sign of non-compliance	BEC (SEO)	BEC (SEO via Field Inspector and, Construction Manager)
Deterioration in public highways; Abnormal loads	Public safety; Damage to highway structures	East and west bank public highways; Portions of highways identified for transporting abnormal loads	Visual inspection and photographs before and after movement of loads	Significant deterioration	BEC (SEO)	BEC (SEO) with relevant District Engineers
Safety of wayleave during construction, including storage and laydown areas	Public and worker safety	Working area of wayleave	Visual inspection	Any non-compliance with measures outlined in Chapter 7 of transmission system EIS and in Project Plan	BEC (SEO)	BEC (SEO via Field Inspector)
Erosion of cut slopes	Long-term agricultural viability/river water quality	Temporary works area	Visual inspection	Significant erosion	BEC (SEO)	BEC (SEO)
Compaction of agricultural soils	Viability of agriculture or forestry post-construction	Temporary works area	Visual inspection and compaction testing	Significant compaction	BEC (SEO)	BEC (SEO)
Reinstatement of wayleave and laydown areas	Erosion control	Wayleave areas where construction activities have ceased	Visual inspection	Any sign of failure to reinstatement at least to grass	AESNP (Environmental Manager)	AESNP (Environmental Manager)
Archaeology	Protection of currently-unknown relics (chance finds)	Excavation areas	Operator training and vigilance, plus ad hoc Dept of Antiquities assistance	None	BEC (SEO)	BEC (SEO)
Tourism	Identify any negative impact on tourism	Jinja	Collect baseline tourist opinion data for Jinja, and re-assess on visit	None	AESNP via UTB	AESNP via UTB