Appendix 5: Soft Component

PREPARATORY SURVEY
FOR
THE PROJECT FOR THE CONSTRUCTION
OF
HYDROPOWER STATION
IN
EXPIRITU SANTO ISLAND

SOFT COMPONENT (TECHNICAL ASSISTANCE) PLAN

October 2020

Japan International Cooperation Agency

NEWJEC Inc.
CTI Engineering International Co,. Ltd.

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1. Background for Planning Soft Component

The Sarakata River hydroelectric power plant of 300kW x 2 units was constructed from 1994 to 1995 and expansion power plant of 600kW x 1 unit was constructed in 2009 as the Japanese Grant project. The Sarakata River hydroelectric power plant of 1,200kW had been contributing to stable power supply as the main power source in Lugenville power system, Santo Island. However, the existing Sarakata River hydroelectric power plant alone could not cover the electricity demand in Santo Island, where daytime peak load reached 1,932kW in 2016. Therefore, power supply in Santo Island had been covered with the diesel power plants which depend on expensive import fuel. The electricity demand has been growing in Santo Island and the future power demand is forecasted to increase surely. So, assuming the present power source mix the dependence on the diesel power plants is expected to grow.

Based on these situations, in order to reduce dependence on import fuel and contribute to climate change measures by further introduction of renewable energy, the Project for the Construction of Hydroelectric power Station in Espiritu Santo Island (hereinafter referred to as "the Project") is planned and examined if it is feasible as a Japanese Grant project.

As a result of site investigation, it was confirmed that 1,000 kW scale hydroelectric power project can be developed in the downstream of the existing Sarakata River hydroelectric power plant

Operation, maintenance and management of power plants and distribution facilities is done by means of consignment contract to private sectors i.e. a concession system under the supervision of DOE, department concerning power generation and distribution in Vanuatu

In the Luganville concession area in Santo, the electricity supply business is managed by Vanuatu Utilities and Infrastructure Limited (VUI) . VUI employees operate and maintain the existing Sarakata River hydroelectric power plant.

Some of the VUI employees, who are in charge of the power plant, participated in the operation and maintenance (O&M) training conducted by the manufacturer and consultant in 1995 during the construction and have been engaged in this power plant. In 2009, expansion of the power plant and a large-scale repair works on open channel and slop protection works were carried out. Every year, accidents of distribution lines and damaged of facilities occurs, but so far there has been no serious accidents resulting in a blackout, and the restoration work has been carried out by VUI employees.

The existing power plant is operated by manual method by experienced operators. Operation and maintenance manuals are not found. They write down hourly operation records and accident summaries in the form prepared by VUI.

Education for new operators are not conducted and successors are not trained.

The new hydroelectric power plant is to be operated from the existing Sarakata river hydroelectric power plant by means of automatic operation and remote control method. Therefore, it is very important to carry out the training to deal with malfunctions, troubles, accidents of facilities, transmission lines and so on. Also, it is necessary to conduct optimum operation of five (5) units of hydroelectric power plants in order to reduce the consumption of diesel fuel. Also, serious accidents can be prevented by conducting daily and weekly patrol of civil facilities, electro-mechanical equipment and transmission line,

2. Objective of Soft Component

VUI, which manages the power supply business under the concession system, shall establish a sustainable management system for proper operation, maintenance and management of the new power

plant, in addition to the optimum operation of the existing Sarakata River power plant. As a result, reduction of electricity fee is to be achieved by maximizing the reduction of the fuel consumption.

3. Achievement of Soft Component

Each outcome is confirmed by the following method, and the report is prepared as deliverable. Specific indicators shall be determined, in consultation with DOE, by the time the soft component is commenced.

a) Establish proper methods for the inspection and maintenance of generation equipment

- Inspection and maintenance manuals are prepared
- Contents of manual are understood and on-the-job training is carried out.
- Operator and maintenance staff understand the work responsibility, work flow and work scope and achieve his work.
- Operator prepares daily operation record, carries out daily inspection and proper operation.
- Maintenance staff conducts maintenance work, prepares maintenance and repair records and carries out proper maintenance management.
- Ledger of facility, spare parts and equipment is prepared and maintained.

b) Establish proper methods for inspection and maintenance of civil facilities

- Inspection and maintenance manual of civil facilities is prepared (including gates, screens and penstock)
- The contents of manual are understood and on-the-job training is carried out.
- Maintenance staff understands the work responsibility, work flow and work scopes and achieve his works.
- Maintenance staff conducts daily inspection, prepares maintenance and repair records and achieve proper maintenance management.

c) Strengthen optimum operation of the existing and the new hydroelectric power plants and strengthen the ability to deal with malfunctions, troubles and accidents.

- Formulate optimum operation scheme of the existing and the new hydroelectric power plant
- On-the-job training by case study is carried out in accordance with optimum operation scheme and it is understood.
- Prepare response manual to deal with accidents and emergencies in generation equipment, transmission line and distribution facility.
- Prepare trouble shooting procedures to deal with accidents and emergencies in generation equipment, transmission line and distribution facility. On-the-job training for each case study is carried out in accordance with the manual and it is

	facilities	
	monitoring of electricity bill and green energy fund and periodic reporting	Check the system and monitoring forms

5. Activity on Soft Component (Input Plan)

To achieve the above-mentioned four (4) accomplishments, the following activities are implemented.

Prior to the conduct of soft component, the Contractor and the manufacturer will provide guidance for the initial operation of facility and equipment and will explanation about the maintenance method.

Soft component shall be carried out in order to support and strengthen the capability of operation, inspection and maintenance of generation equipment, civil facilities transmission line and distribution facility, optimum operation of the existing and new hydroelectric power plants, ability to deal with accidents and emergencies and to establish monitoring system of DOE, to operate a new hydroelectric power plant smoothly, to realize optimum operation of the existing and the new power plant and ensure sustainable operation, maintenance and management.

The manufacture prepares detailed operation and maintenance manual of each equipment. Realization of optimum operation of existing and new power plants response and strengthening of capability in case of accidents and emergency cannot be achieved by using manufacture's manual.

Maintenance to be carried by the VUI staff in the soft component is— daily inspection and minor maintenance works. Large scale overhaul and replacement of major spare parts shall be done by the manufacturer in accordance with the established middle and long term plan. Preventive maintenance system is established to grasp the current condition of generation equipment and facilities.

5.1 Establish proper methods for inspection and maintenance of generation equipment

(1) Target Group:

Operator of power plant and maintenance staff and Electrical engineer (VUI)

(2) Period

In Japan 0.3 month
In Vanuatu 0.23 month (after completion of initial operation and maintenance guidance)

(3) Resource

Japanese consultant

Advisor of Maintenance for generating equipment / Optimum operation: 1 person
In Japan 0.3MM (6 days) and in Vanuatu 0.23MM (7 days)

(4) Work Item and Method

Work Items	Method	day
1) preparation of Inspection and maintenance manuals for generation equipment	Prepared in Japan	6 days
2) On-the-Job Training	OJT of operation by using the manual	2 days

Work Items	Method	day
(OJT) by using the manual		(2 groups)
3) daily operation record	Operator prepares operation record through OJT and as a result of OJT, revision and correction of forms are done	1 day (2 groups)
4) maintenance and repair records	Maintenance staff prepares maintenance and repair records through OJT, and as a result of OJT revision and correction of forms are done	1 day (2 groups)
5) preparation of Ledger of facility, spare parts and equipment	Maintenance staff prepares the ledger through OJT, and as a result of OJT, revision and correction of forms are done	1 day (2 groups)

(5) Output (Kind of Reports and Documents)

Inspection and maintenance manual for generation equipment, daily operation record, maintenance and repair records, Ledger of facility, spare parts and equipment and actual status report

5.2 Establish proper methods for inspection and maintenance of civil facilities

(1) Target Group:

Maintenance staff of power plant (VUI)

(2) Period

In Japan 0.3 month
In Vanuatu 0.3 month (after completion of initial operation and maintenance guidance)

(3) Resource

Japanese consultant

Advisor of Maintenance for civil facilities: 1 person
In Japan 0.3MM (6 days) and In Vanuatu 0.3MM (9days)

(4) Work Item and Method

Work Items	Method	day
1) preparation of Inspection and maintenance manuals for civil facilities	Prepared in Japan	6 days
2) OJT by using manual	Maintenance staff carries out daily inspection of civil structures by using the manual prepared through OJT	2 days
3) daily inspection records	Maintenance staff prepares daily inspection records through OJT, and as a result of OJT, revision and correction of forms are done	2 days
4) maintenance and repair records	Maintenance staff prepares maintenance and repair records through OJT, and as a result of OJT, revision and correction of forms are done	1 day

(5) Output (Kind of Reports and Documents)

Inspection and maintenance manual for civil facilities, daily inspection record, maintenance and repair records and actual status report

5.3 Strengthen optimum operation of the existing and new hydroelectric power plants and strengthen the ability to deal with malfunctions, troubles and accidents

(1) Target Group:

Operator of power plant and maintenance staff and Electrical engineer (VUI)

(2) Period

In Japan 0.3 month for each engineer
In Vanuatu 0.23 month and 0.3 month for the engineers (after completion of initial operation and maintenance guidance)

(3) Resource

Japanese consultant

Advisor of Maintenance for generating equipment / Optimum Operation: 1 person
In Japan 0.3MM (6 days) and in Vanuatu 0.23MM (7 days)

Advisor of Maintenance for transmission line and substation facilities: 1 person
In Japan 0.3MM (6 days) and in Vanuatu 0.3MM (9 days)

(4) Work Item and Method

Work Items	Method	days
1) formulation of optimum operation scheme of existing and new hydroelectric power plants	Check Optimum operation scheme	GE: 3 days (in Japan)
2) application of optimum operation	On-the-job training for each case study is carried out in accordance with optimum operation scheme	GE: 2 days (in site) (2 groups)
3) Prepare response manual in case of accident and emergency	Check the response manual Contact list at the time of equipment fault	GE: 1 day T/L & S/S 6 dats (in Japan)
4) On-the-job training for each case study by using the manual	On-the-job training for each case study is carried out	GE: 2 days T/L & S/S 5 dats (in site) (2 groups)
5) Middle and long term maintenance plan	Overhaul schedule and replacement schedule of major parts are prepared.	GE: 2 days (in Japan) 1 day (in site) (2 groups)

Remarks: activities 1), 2), 5) in charge of Advisor of Optimum operation/ Maintenance for generating equipment
activities 3), 4) in charge of both advisors

(5) Output (Kind of Reports and Documents)

Optimum operation scheme of the existing and new hydroelectric power plants, response manual in case of accident and emergency of generation equipment and transmission line and distribution facility, Contact list at the time of equipment fault and actual status report

5.4 Establishment of Monitoring System

(1) Target Group

DOE staff, URA staff (Utilities Regulatory Authorities)

(2) Period

In Japan 0.3 month for an engineer
In Vanuatu 0.23 month for an engineer (after completion of initial operation and maintenance guidance)

(3) Resource

Japanese consultant

Team Leader/ Advisor for monitoring: 1 person
In Japan 0.3MM (6 days) and in Vanuatu 0.23MM (7 days)

(4) Work Item and Method

Work Items	Method	day
1) Periodic monitoring system for generation equipment, transmission line and distribution facilities	Effective monitoring system and methods for monitoring are to be discussed with the related organization and established. Preparation of monitoring form is supported by OJT.	4 days (in Japan) 3 days (in site)
2) Periodic monitoring of electricity bill and green energy fund	Effective monitoring system and periodic reporting are to be discussed with the related organization and established	2 days (in Japan) 2 days (in site)

(5) Output (Kind of Reports and Documents)

Monitoring form of generation equipment, transmission line and distribution facilities and actual status report

6. Procuring Implementation resources of Soft component

This soft component is to be conducted by 4 experts of Japanese Consultant (Team Leader/ Advisor for optimum operation, Advisor of Optimum operation/ Maintenance for generating equipment, Advisor of Maintenance for transmission line and substation facilities and Advisor of Maintenance for civil facilities. Sub-contact of local resouses is not implemented. The reasons is as follows.

(1) There are no appropriate human resources who satisfy with required technical level.

(2) It is necessary to be carried out by the Japanese consultant who conducted basec design of automatic operation by using remote control from the existing hydroelectric power plant.

(3) It is necessary to arrange several experts of Japanese consultant who conducted design of generating equipment, transmission line and substation facilities and civil facilities of the new hydropower plant.

7. Implementation Schedule of Soft Component

This Project is implemented within a period of 51 months after the conclusion of Exchange of Notes (E/N). Construction period is estimated to be about 43 months including the procurement, construction of facility, transportation of equipment and materials, installation, wet and dry test and trial operation.

Prior to the commencement of construction, E/N, consultant's contract, detailed design, preparation of bidding documents, bidding, bid evaluation, and contractor's contract shall be concluded. Overall implementation schedule and detailed schedule of Soft Component are shown in Table 7.1, and 7.2, respectively.

8. Deliverable of Soft Component

Deliverables of soft component are as listed below

Table 7.1 Deliverable of Soft Component

Items	Time for submission
1. Completion Report	After completion of construction
2. Actual Status Report	After conducting the training(including the result of On-the-Job Training)
3. Inspection and maintenance manuals for generation equipment, transmission line and distribution facility (including daily operation record, maintenance and repair records,	After completion of construction
4. Inspection and maintenance manuals for civil facilities	After completion of construction
5. response manual in case of accidents and emergencies	After completion (including inspection, maintenance record and countermeasure at emergency)
6. Operation scheme of the existing and the new hydroelectric power plant	After completion of construction
7. Periodic Monitoring form of generation equipment, transmission line and distribution facilities	After completion of construction
8. Ledger of Facility and Spare Parts	After completion of construction
9. Middle and Long Term Maintenance Plan (including budget plan)	After completion of construction

9. Obligation of the Implementing Agency at Vanuatu

Target of technical transfer for the soft component is VUI employees. Organization of operation, maintenance and management of two (2) hydroelectric power plants consists of existing ten (10) staff. It is necessary to discuss with VUI whether it required to hire additional / new staff to manage the new hydroelectric power plant.

(a) Operator and maintenance staff required for operation, maintenance and management of the new hydroelectric power plant shall be secured.

(b) Responsible persons such as operator and maintenance staff of VUI and the counterpart at

DOE and the URA staff required for the implementation of soft component shall be secured. Operator, maintenance staff of VUI who get trained in technology shall continuously work at the hydroelectric power plant.

(c) The staff who are second in the line of operation and maintenance of power plant shall be trained.

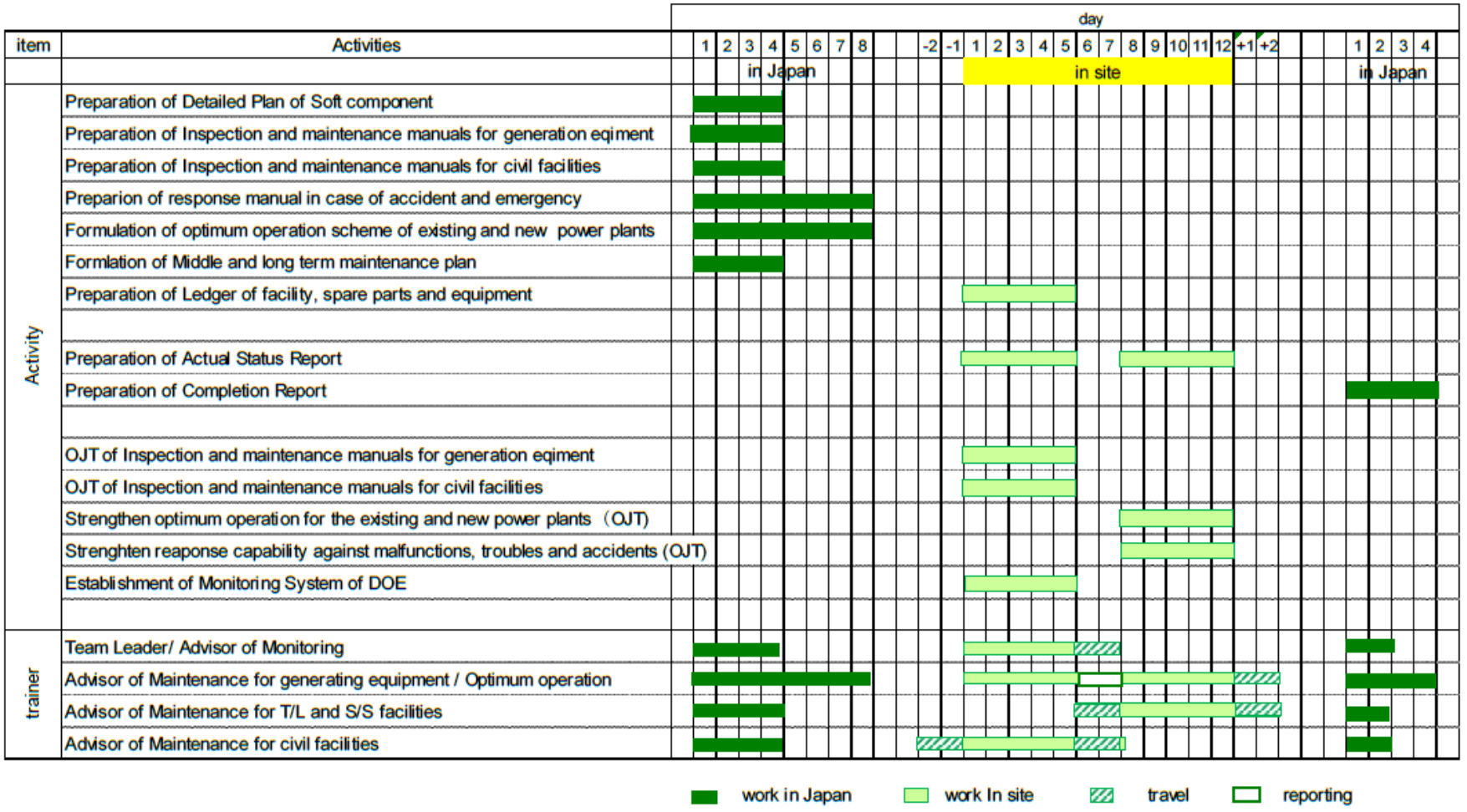
(d) Continuous monitoring system shall be established and the budget shall be secured by DOE

(e) Financial support shall be provided by the government of Vanuatu to deal with large scale accidents, natural disaster, etc.

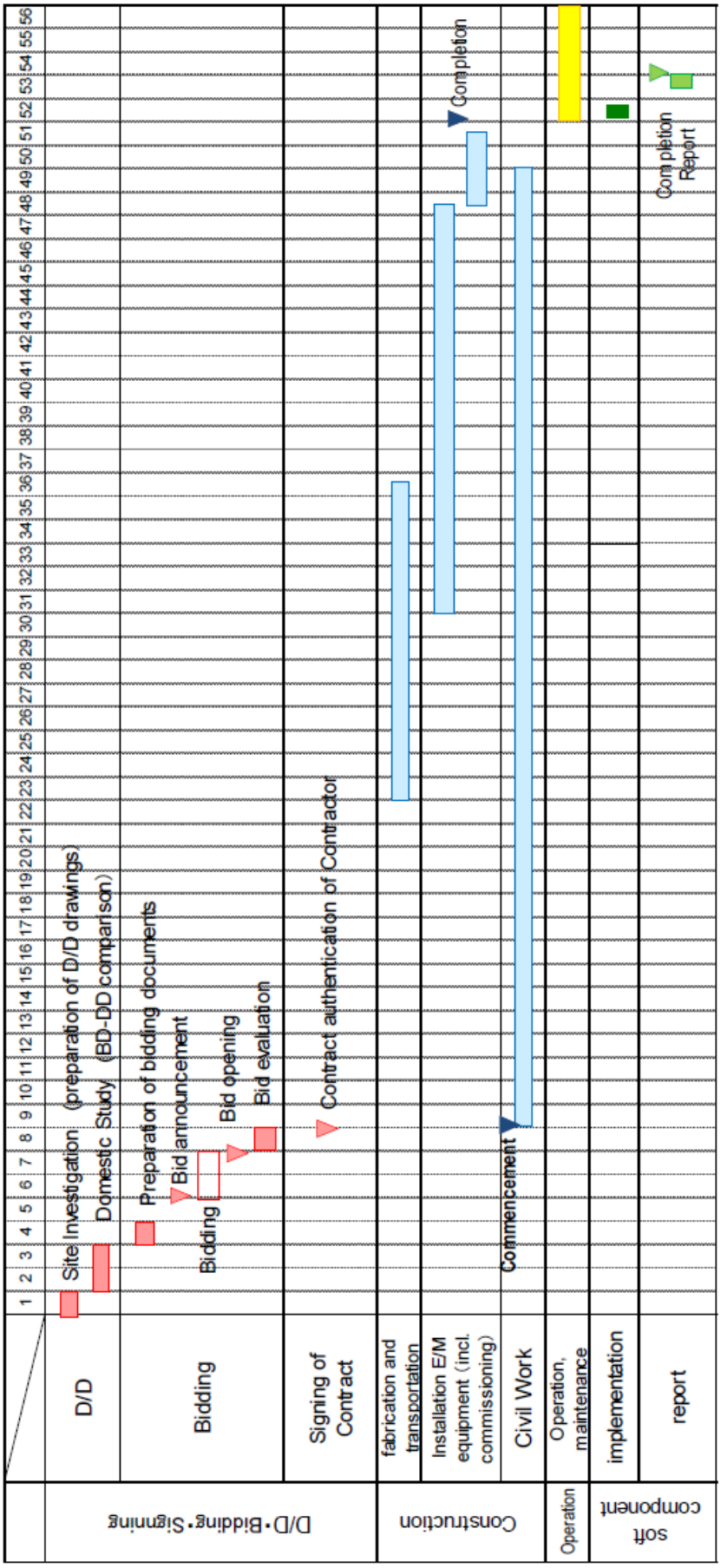
Feasibility of these responsibilities, assumed disincentive and required measures in case of disincentive are summarized in the following table.

	Feasibility for these responsibility	Assumed disincentive	Required measures in case of disincentive
(a)	Secure operators and maintenance staff required for the operation, maintenance and management of the new power station.	It is planned that a total of ten (10) staffs will operate, maintain and manage the new power station. However, they cannot do so due to overwork.	Additional staff
(b)	Operators and maintenance staff who have learned the techniques work continuously	Job change and retirement of the existing operator and maintenance staff	Reflect employment plan of VUI
(c)	Staff who are second in line in the operation and maintenance are trained and developed		Reflect employment plan of VUI
(d)	Establishment of sustainable monitoring system and securement of budget for DOE and URA	Shortage of staff, shortage of budget	Make a schedule in advance in order to solve manpower shortage and secure the budget.
(e)	Large scale accidents, disasters such as hurricanes, earthquakes etc.	During large-scale accidents which causes black out, VUI by itself cannot restore the damaged equipment and facilities.	Financial support from government JICA Follow-up

Detailed Schedule of Soft Component (Draft)



Overall Schedule of Project and Soft Component (Draft)



Appendix 6: List of Aquired Reference Materials and Data

List of Aquired Reference Materials and Data

No.	Data	Organization	Original / Copy	Type	Date
1	Energy Access Project, Interim Report in Draft Format, Volume 1 - Main Report, SMEC International Pty LTD	ADB	Copy	Pdf	May-2014
2	Energy Access Project, Draft Final Report - R0, Volume 3 - Feasibility Study of Sarakata-1 Extension Project, SMEC International Pty LTD	ADB	Copy	Pdf	Aug-2014
3	Annual Technical Report 2009	UNELCO	Copy	Pdf	2009
4	Annual Technical Report 2010	UNELCO	Copy	Pdf	2010
5	Operation data of Sarakata Hydropower Plant and Diesel Plants	VUI	Copy	Excel	2012.2~2018.12
6	S-0001-14 Electricity Safety Standards and Rules	URA	Original / Copy	PDF	December, 2014
7	S-0002-15 Electricity Reliability Standards	URA	Original / Copy	PDF	August, 2018
8	Single Line Diagram	VUI	Original / Copy	PDF	July, 2018
9	VANUATU 2016 POST-PC PAM MINI-CENSUS REPORT Volume 1	Vanuatu National Statistics Office, Ministry of Finance and Economic Management	Copy	PDF	26-Nov-18
10	LAWS OF THE REPUBLIC OF VANUATU, LAND LEASES CAP. 163	Department of Land, Ministry of Land and Natural Resources	Copy	PDF	27-Nov-18
11	LAND ACQUISITION ACT NO. 5 OF 1992 (Amendment) Act No. 34 of 2000	Department of Land, Ministry of Land and Natural Resources	Copy	PDF	27-Nov-18
12	LAND ACQUISITION ACT NO. 5 OF 2017 (Amendment)	Department of Land, Ministry of Land and Natural Resources	Copy	PDF	27-Nov-18
13	REPUBLIC OF VANUATU CUSTOM LAND MANAGEMENT ACT NO. 33 OF 2013	Custom Land Management Northern Provinces Office	Copy	WORD	27-Nov-18
14	REPUBLIC OF VANUATU CUSTOM LAND MANAGEMENT (AMENDMENT) ACT NO. 12 OF 2014	Custom Land Management Northern Provinces Office	Copy	WORD	27-Nov-18
15	REPUBLIC OF VANUATU CONSTITUTION (SIXTH) (AMENDMENT) ACT NO. 27 OF 2013	Custom Land Management Northern Provinces Office	Copy	WORD	5-Jul-05
16	REPUBLIC OF VANUATU LAND ACQUISITION (AMENDMENT) ACT NO. 31 OF 2014	Custom Land Management Northern Provinces Office	Copy	WORD	6-Jul-05
17	REPUBLIC OF VANUATU LAND LEASES (AMENDMENT) ACT NO. 32 OF 2013	Custom Land Management Northern Provinces Office	Copy	WORD	5-Jul-05
18	REPUBLIC OF VANUATU LAND LEASES (AMENDMENT) ACT Act No. 35 Of 2014	Custom Land Management Northern Provinces Office	Copy	WORD	6-Jul-05
19	REPUBLIC OF VANUATU LAND REFORM (AMENDMENT) ACT NO. 31 OF 2013	Custom Land Management Northern Provinces Office	Copy	WORD	5-Jul-05

No.	Data	Organization	Original / Copy	Type	Date
20	REPUBLIC OF VANUATU LAND REFORM (AMENDMENT) ACT NO. 11 OF 2014	Custom Land Management Northern Provinces Office	Copy	WORD	6-Jul-05
21	Waste Management Plan 2017-2021	Waste Management Office, Luganville Municipality	Copy	PDF	-
22	Vanuatu National Leasing Profile: A Preliminary Analysis, Brief Note Volume 7 | Issue 1	World Bank	Copy	PDF	1-May-12
23	Leasing on Epi Island, Vanuatu, Reserch Report	World Bank	Copy	PDF	1-Sep-10
24	Leasing on Tanna Island, Vanuatu, Reserch Report	World Bank	Copy	PDF	1-May-12
25	Nabauk Conservation Area Terrestrial Biodiversity Assessment 19-21July 2011	Department of Geology, Mines and Water Resources	Copy	PDF	July 2011
26	Butmas Conservation Area Terrestrial Biodiversity Assessment 13-15 July 2011	Department of Geology, Mines and Water Resources	Copy	PDF	July 2011
27	Water Resources Management Act No.9 of 2002	GoV	Copy	PDF	26-Jun-05
28	Santo Topographic Map	Department of Lands	Copy	PDF	15-Nov-18

Apppendix7: Others

(1) Local News Papger

Dialogue on 2nd Sarakata Hydro Power Project

JAPAN INTERNAL Cooperation Agency (JICA), an implementing arm of Japanese ODA, commenced discussion with the Department of Energy (DoE) on the 2nd Sarakata Hydro plant last week.

The DoE and JICA signed the Minutes of Discussions on the incoming survey on Friday, 16th November.

These discussions form the basis of a preparatory study that will soon commence.

This includes the scope and schedule of the study.

The Government of Vanuatu aims to shift out of fossil fuel electricity generation and into renewables by 2030 as per stated in the Government's National Sustainable Development Plan (NSDP) and National Energy Road Map (NERM) goals.

The existing Sarakata River hydroelectric power plant of 1,200kW capacity had been contributing to stable power supply and as a main power source in Luganville, Santo.

In 2017, generated power from Sarakata River hydroelectric power plant accounted for 73% down the electricity tariff. However, the electricity demand has been steadily growing in the Island and the future power demand is forecasted to increase significantly, and in order to maximize the use of renewable energy, addition of hydro power is highly anticipated.

To support the mainstreaming of renewable energy supply and reducing dependence on fossil fuel in Pacific Island Countries, the Government of Japan has promoted "Hybrid Island Program" (Program) since 2015 when 7th Pacific Islands Leaders Meeting was held in Iwaki, Fukushima, Japan.

Under the umbrella of the Program, JICA is implementing numbers of cooperation projects all around the Pacific Islands.

The preparatory survey of the 2nd Sarakata hydro power project is conducted as a part of the Program, which has been and will continuously be supporting efficient, stable, and clean energy supply in the Pacific Islands.

The survey is expected to take around 9 to 12

New Parliament Clerk promises to strengthen secretariat

THE NEWLY APPOINTED CLERK OF Parliament, Raymond Manuake, says with a good team working with him, he is planning on strengthening further the parliamentary secretariat to provide service not only to members of parliament but also with the people.

Mr Manuake is not new to the work in the parliament house as he was last employment there before being appointed Vanuatu's head of the diplomatic mission in New Caledonia where he served for 12 years.

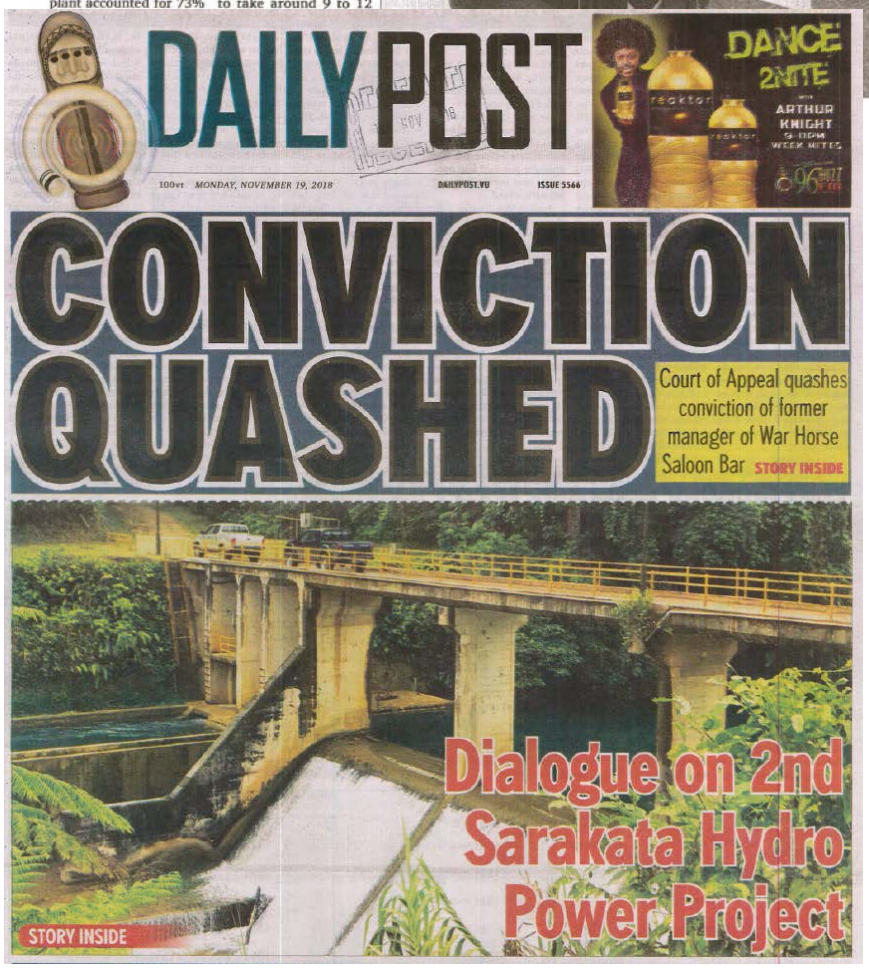
The Second Extra Ordinary Session at the end of this month will be his first parliament sitting as the Clerk of Parliament.

Mr Manuake confirms that two sessions have been summoned.

The first one will commence on November 23 to December 7, which is the Second Extra Ordinary session and the Second Ordinary Session will start in December 9.

Among over 20 Bills that are on the list for discussion during the Ordinary Session is the Appropriation Bill, which is the budget session where parliament will look at the 2019 budget.

Manuake says while parliament gets support from the Vanuatu Government, he also says a lot of support is received from donor partners such as the United Nations Development Programme and the Inter-Parliamentary Union.



ローカル誌 Daily Post の記事
November 19 2018 発行

(2) PEA (Draft)

APPLICATION FOR ENVIRONMENTAL PERMIT

The Department of Environmental Protection and Conservation

Private Mail Bag 9063
Port Vila, Vanuatu
Phone: (678) 5333830/25302/33430
Email:
eia@vanuatu.gov.vu

How to Complete this Application

If you need help to complete this form, please read: Guide to Completing an Environmental Permit Application .

This application form and any supporting information provided with it are for the purpose of enabling an assessment process under the Environmental Protection and Conservation Act and the EIA Regulations.

An assessment must be conducted for any activity that is likely to impact on the environment of Vanuatu and requires any license, permit or approval under any law (e.g. Quarry Permit or Foreshore Development Consent). A list of activities that require an environmental permit is attached to this form.
Your application will not be considered unless you return to the DEPC:

a. This form, completed and signed
b. All relevant attachments and information required
c. An application fee.

No work may commence unless and until written approval is given by the DEPC.

1. Applicant Details

Full Name

Business details
Please Tick
❑ Registered Business (attach your business license)
❑ Other Organization (attach your VFSC certificate)

Organization Name & CT Number (if applicable)

Address

Physical Address

PO Box Address

Contact Details

Tel:	Mobile:	Email:
Website:		

APPLICATION FOR ENVIRONMENTAL PERMIT

2. The Project Proposal

You must give full details of your project and attach the required information. Insufficient or unclear information will delay your application. Please use separate sheet(s) if required to give a full description of your project.

If you need help about completing this form, please read Guide to Completing an Environmental Permit Application.

WHAT IS THE NAME OF YOUR PROJECT?	**PREPARATORY SURVEY FOR THE PROJECT FOR THE CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND**
WHAT IS YOUR PROJECT? *Please describe your project from construction through to operation.* *Include plans and layout of project on the site with your application.* *Use another sheet of paper if required.*	Background: The Sarakata River hydroelectric power plant (total 1,200kW) had been contributing to stable power supply as a main power source in Santo Island. However, the existing plant alone could not cover the electricity demand in Santo Island (daytime peak: 1,932kW). Based on these situations, the Data Collection Survey was conducted by JICA in 2017, which investigated potential of additional power generation in Santo Island. and the Preparatory Survey is conducted to examine feasibility. Purpose: In order to constructe a new hydroelectric power plant and supply electricity to the grid, the survey is being conducted, including design, environmental and social considerations, economic evaluation and implementation plan. Project Description: Construction: 1) Hydroelectric power plant and its related facilities, 2) Transmission line facilities, and 3) Access road. Technical Facilitation including training and formulation. Note: The detailed designs are now under examination through the survey. See Appendix 1 Inception Report.
WHERE IS YOUR PROJECT LOCATED? *Give name of island, area and nearest town or village and other directions.* *Please also include a map clearly showing location in relation to neighbouring properties, coastal or other features etc.* *Photos of the project site are helpful. Google maps can also be used to show location.*	Island: Espiritu Santo Area: Downstream area of the existing Sarakata river hydroelectric power plant including: 1) New transmission line and 2) New access road in east area of Sarakata River. Village: *** See Appendix 2 for supporting materials including a wide area map and focused area.
WHAT IS THE TIMING FOR YOUR PROJECT? *Please advise proposed start date and duration of construction and also the operational life of the development.*	**Construction (including site preparation):** Start Date: December 2020 Duration: 14 months **Operational life:** 50 years or more See Appendix 3 Implementation Schedule
WHAT IS THE LAND STATUS AT THE PROJECT LOCATION? *Please tick box and provide required details. You must include a copy of the land lease. For kastom land, please attach a signed, dated agreement to the proposed project from the kastom owner.*	☒Leased Land Concerned area: See Appendix 4 ☒Customary Land Concerned area: See Appendix 4 Note: Use of the both lands will be agreed thru negotiations during the survey process ❑ In the process of acquiring land
WHAT IS THE TOTAL LAND AREA OF THE PROJECT? *Area to be used by the project.*	Approx. 5 ha (Intake dam: 20m x 20m = 0.04ha, Pipe: 1,500m L x 5m W = 0.75ha, Powerhouse: 30m x 30m = 0.09ha, Access road: 6,200m L x 5m W = 3.1ha, Transmission line: 4,300m L x 2m W = 0.86ha)

APPLICATION FOR ENVIRONMENTAL PERMIT

3. ENVIRONMENTAL IMPACTS

Please complete this section for your project.

For all projects apart from minor projects (see schedule attached), please also fill out the separate form: Supporting Information for an Environmental Permit.

Insufficient or unclear information will delay your application.
If you need help about completing this section please read Guide to Completing an Environmental Permit Application.

WHAT IS THE CURRENT ENVIRONMENT AT THE PROJECT LOCATION? *(such as vegetation cover, fauna, human settlement)* *Is the land already cleared or developed?*	The area covers with scrubs and weeds, and the precious and protected faunal and floral species were not detected in the target area and its neighbours, through the latest survey in 2017. Some endemic species were found but they distribute at wide area in Santo Island. Both side of Sarakata River is covered by bushes and plantation is located in the east area of the River. The water of Sarakata River is used by local people for leisure, and the water in downstream is used for household purposes but not for drinking. Fish can be observed.
WHAT OTHER ACTIVITIES ARE CLOSE TO YOUR PROJECT LOCATION? *(such as neighbouring land uses and developments)* *Please also include these on your location map.*	Agriculture is the main activity in and around the project area, and no developments are found at the moment. Most lands, however, seem to leave untouched or less used. Since the project area plays a role to generate power, it may be said the project area could contribute indirectly to the development in around areas. See Appendix 2 for the location map.
DOES THE PROJECT LOCATION INCLUDE OR IS NEAR TO: *Please tick yes or no. If Yes, please mark on your location map.*	Coast: ❑ Yes ☒ No River or stream, wetland: ☒ Yes ❑ No Cultural sites: ❑ Yes ☒ No Protected areas: ❑ Yes ☒ No
DOES THE PROJECT INVOLVE RESETTLEMENT OF PEOPLE OR BUSINESS ACTIVITIES?	❑ Yes *(Please provide details in the separate form:* **Supporting Information for an Environmental Permit***)* ☒ No
HOW DO YOU PROPOSE TO REDUCE OR AVOID THE ENVIRONMENTAL IMPACTS OF YOUR PROJECT? *Please briefly describe the steps you will take to reduce impacts on the environment from construction through to operation.* *For all projects apart from minor projects listed in the attached schedule, please provide further information on how you will manage environmental impacts in the separate form:* **Supporting Information for an Environmental Permit**.	Major anticipated impacts during construction and operation are as below [Construction phase] Environment 1) Pollution Air pollution, water pollution, noise & vibration, wastes soil contamination, odor, sediment 2) Natural Environment Fauna & flora, fishes, topography 3) Social Environment Land acquisition/ use, water use, landscape, labor condition, accidents [Operation phase] 1) Pollution Noise & vibration See Appendix 5 for a matrix including anticipated impacts and relevant mitigation measures.

(3) TOR of EIA

TERMS OF REFERENCE- ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR SARAKATA HYDRO EXTENSION PROJECT, SANTO

Section 1 – Executive summary

Present a concise, non-technical outline of the proposed project and each chapter of the EIA report. Include the results of impact assessments, the proposed management/mitigation actions, and the conclusions reached.

Section 2 – Table of contents

Section 3 – List of acronyms/abbreviations

Section 4 – Introduction

Provide an overview of the project and the proponent, including information such as:

4.1 Project name, background and general description
4.2 Project purpose and objectives (including environmental performance objectives)
4.3 Profile of project proponent
4.4. Contact details for the proponent/project manager

Section 5 – Policy and legal framework

Outline relevant policies and laws that apply to the project and the approvals that need to be obtained from different government agencies, for instance:

5.1 National, provincial or customary laws and related government approvals
5.2 Industry (Tourism) sector plans, policies or codes of practice (Vanuatu Tourism Accreditation)
5.3 Health, safety, hazard and risk management standards (e.g. DRR and Climate change policies, Building codes)
5.4 Current agreements between government and the proponent (e.g. COM decision)
5.5 The proponent's environmental management and compliance record (proponent's involvement in past development projects and its commitment to environmental management)

Section 6 – Project description and justification

Present a detailed description of the project and provide justification for its development, covering:

6.1 Project details

- Project location, size and layout, including a description of the project's proximity to sensitive and fragile environment and other relevant environmental features and resources (e.g. protected areas, schools, plantations, transport infrastructure, cultural/heritage sites)
- Maps of the project location, surrounding area and project site, illustrating relevant environmental features and resources (e.g. topography, existing land use, settlements, transport infrastructure, cultural/heritage boundaries)
- Project activities (land-based activities during pre- construction , construction and operations stages of the project), details of the scale of the project components (e.g. power plant house, transmission lines, access roads, etc), infrastructure design, including technology and equipment likely to be used, waste treatment, water systems etc.
- Predicted resource and public infrastructure requirements, including rates of extraction or usage (e.g. energy, water, labour, transport, minerals, hazardous materials), and any competition for resources or infrastructure that may occur

with other projects or the neighbouring community
- Predicted type and quantity of waste outputs (e.g. liquid and solid wastes, gas/air emissions)
- Implementation schedule, with key steps and tasks (e.g. timeline for construction, operation, decommissioning, rehabilitation, closure), and expected project lifespan
- Project cost estimates and funding sources

6.2 Analysis of alternatives
- Alternative project sites, designs, technologies, timelines; including alternatives that address environmental hazards and reduce environmental impacts
- Advantages and disadvantages of alternatives (e.g. cost, availability of technology)
- Explanation for choice of preferred options particularly if the preferred options create greater environmental impacts than alternatives.

6.3 Project benefits
- Benefits accruing to the local area, island, country, region (e.g. new physical infrastructure, employment/livelihood opportunities, improved standards of living)
- Project relevance in the light of existing provincial or national development and/or future development plans (e.g. National Sustainable Development Plan (NSDP))
- The need for the project in the context of Vanuatu's development

Section 7 – Description of the baseline environment

Detail baseline (i.e. current or existing) environmental conditions relevant to the hydro power extension project, power plant house, transmission lines, access roads, to develop awareness and understanding of important environmental features, patterns and trends; to support identification of potential impacts of the project on the environment (section 8) and to assist with the formulation of impact mitigation measures.

In detailing the baseline environment it is important to state what is known or unknown, what assumptions have been made, and how reliable the data/information is. Studies or surveys undertaken by the proponent, their consultant, or third party researchers, should be adequately detailed and referenced (section 13).

Where relevant, the following aspects of the environment should be described:

7.1 Climate (e.g. temperature, rainfall, flooding, drought, winds, extreme weather events)

7.2 Topography, geology and soils (e.g. significant landscape features and characteristics; landscape gradient or slope; land capability and availability; seismic characteristics and earthquake; areas vulnerable to landslides, rock fall, erosion)

7.3 Land tenure, zoning and use underlying and surrounding the project (e.g., agriculture, sensitive habitat, community reserve, village settlement, cemetery, schools)

7.4 Water (e.g. surface and groundwater; areas vulnerable to flooding, storm surges)

7.5 Air (e.g. existing sources of air emissions, ambient air quality)

7.6 Noise (e.g. baseline noise levels and noise pollution)

7.7 Plant life (e.g. plant species and communities within the project and surrounding area; native, endemic, threatened, invasive or culturally-significant species; areas subject to previous habitat clearing or disturbance)

7.8 Animal life (e.g. animal species and communities within the project and surrounding area; native, endemic, threatened, migratory, invasive or culturally-significant species; habitat within and adjacent to the project area suitable for species of

conservation significance)

7.9 Human communities (e.g. residential areas; population, infrastructure; cultural traditions; landscape and visual amenity)

7.10 Local and national economy (e.g. skills, livelihoods and employment; economic and business conditions; major sectors and industries)

7.11 Social/cultural resources and heritage (e.g. objects or sites of social/cultural significance, tabu ples etc.)

Section 8 – Impact assessment

8.1 Assess and describe potential impacts of the hydro power extension project on the environment. The impact assessment should detail negative and positive; immediate, short-term and long-term; unavoidable, irreversible and reversible impacts. In conducting the impact assessment give consideration to:

- all relevant aspects of the environment (section 7, description of the existing environment) and how they are likely *to be changed or affected by the project*, either directly or indirectly. This should include assessment of how the project may exacerbate environmental hazards and environmental change processes (e.g. release of greenhouse gas emissions, contributing to climate change)
- the nature of changes or affects, including negative consequences and/or expected benefits
- over what area, or on what scale, changes or affects are likely to take place
- changes or affects that will arise at different stages of the project (e.g. during pre-construction, construction, operation, decommissioning and closure)

8.2 Assess and describe potential impacts of the environment on the project e.g. all relevant environmental hazards (cyclones, landslides, earthquakes) and environmental change processes

Explain the methods used for impact assessment, site or field-based surveys, or review of existing similar situations or previous studies.

In detailing impacts it is important to acknowledge what is known or unknown, what assumptions have been made, how reliable the data and analyses are, and whether any information deficiencies or uncertainties have influenced the conclusions reached.

Section 9 – Cumulative impacts

Examine the project in the context of previous, existing and reasonably foreseeable future developments. This will help to ensure that the project's potential impacts are not considered in isolation and that cumulative impacts are identified as far as possible.

Cumulative impact assessment can include an evaluation of changes in:

1.1 Social and community dynamics (e.g. size of human population, traffic volumes, other social issues)
1.2 Economic conditions (e.g. industry development, job opportunities, cost of living)
1.3 Developments and activities within proximity of project site in the future

Section 10 – Environmental Management and Monitoring Plan (EMMP)

Provide a Environmental Management and Monitoring Plan (EMMP), including a detailed discussion of the mitigation measures that can be feasibly undertaken, and explain how

these mitigation measures will address or reduce the anticipated negative impacts.

The EMMP should cover all phases of the project, from construction through to operation, decommissioning, closure and post-closure (where relevant).

Recommended topics to be included in the EMMP document:

10.1 Environmental performance objectives for the project
10.2 The proponent's environmental management monitoring framework, i.e. who will have responsibility for overseeing the EMMP, the implementation of different mitigation measures, incident response, environmental monitoring and reporting
10.3 Specialised management plans (e.g. a waste (solid & liquid) management plan, a water management plan, an erosion and sediment control plan, a disaster management plan,)
10.4 A detailed monitoring plan, including performance criteria for measuring the extent of environmental impacts, and/or the success of mitigation measures; and for ensuring early detection of impacts. Monitoring should cover impacts of the project on the environment
10.5 Environmental management expectations and requirements to be placed on project contractors (Contractor's environmental management plan)
10.6 The names of the government agencies the proponent will report their project activity outcomes and monitoring results to
10.7 Staffing and equipment requirements, allocated budget, and any training programmes or capacity development necessary to ensure successful EMMP implementation
10.8 A process for responding to unanticipated or emergency incidents
10.9 A process for managing and responding to stakeholder concerns or complaints
10.10 Compensation measures for affected parties for impacts that cannot be mitigated or adequately managed

It is advisable to cross-reference different elements of the EMMP to relevant text in the EIA report. The EMMP can be in table format for clarity of users.

Section 11 –Neighbouring community, land/resource owner and wider stakeholder consultation

Supply details of consultation activities, including:

11.1 How the neighbouring community, land/resource owners and other stakeholders have been identified
11.2 Meetings, workshops or other forms of consultation held to date, or to be organised in the future
11.3 The outcomes of consultation, including issues and concerns raised by different groups or affected parties
11.4 Proposals for addressing issues and concerns raised, and for keeping the neighbouring community, land/resource owners and other stakeholders informed of project activities

Section 12 – Conclusions and recommendations

Present the main conclusions of the EIA report and the proponent's suggested recommendations for progressing their project, including key environmental management and mitigation measures that should be undertaken.

Section 13 – Disclosure of consultants

State the names and contact details of all consultants responsible for preparing the EIA report, and the services or work they completed.

Section 14 – References

Appropriately reference all information sources that have been used or consulted during EIA report preparation (e.g. using the Harvard referencing system).

Section 15 – Appendices

Include appendices that support the main text and that do not contain unnecessary information. Appendices may present:

- Relevant environmental studies and reports
- Detailed technical information including detail designs and plans
- A table listing how the TOR have been addressed, cross-referenced to relevant sections of the EIA report
- A table listing environmental mitigation/management commitments made by the proponent
- Evidence of project support/approvals from Government, provincial, community and landowners
- List of those consulted and their views
- Other relevant information (lease documents etc...)

This technical information and any supporting reports may be bound in a separate volume of appendices for ease of production and assessment by regulators.

GENERAL ADVICE FOR EIA REPORT PREPARATION

- The EIA report should be based on a level of analysis and detail that reflects the significance of the project's potential environmental impacts, and that allows government and interested stakeholders to clearly understand the project's likely environmental consequences
- Information provided in the report should be objective, clear and easily understood by the general reader
- Different sections of the TOR may be combined or re-ordered, if this helps to present information in a clear and logical manner
- Maps, plans and diagrams should be prepared using an appropriate scale, resolution and clarity
- Technical jargon should be avoided or accompanied by a clear, understandable explanation
- Cross-referencing should be used to avoid unnecessary duplication of text
- Spatial data presented in the report should be provided to government as importable Geographic Information System shape files

(4) Minutes of Stakeholder Meeting

Minutes of Stakeholder Meeting

Outline of the Stakeholder Meetings

No.	Date	Venue	Main topics
1	20 November 2018	Sanma Province Chamber	Explanation of project and agreement of site survey
2	05 December 2018	Sanma Province Chamber	Explanation of site survey progress and confirmation of land issue
3	17 June 2019	Natoto Village	Explanation of environmental and social survey
4	16 December 2020	Sanma Province Chamber	Explanation of results of the environmental and social survey and confirmation of acceptance of the project

(1) 1st Stakeholder Meeting : November 20, 2018 @Sanma Province Chamber

GOVERNMENT OF THE
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**DEPARTMENT OF
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Consultation meeting with Central Santo Land Owners – 2nd Phase of Sarakata Hydro Preparatory Survey

Date:	20 November 2018	**Time:**	10:00 – 12:30 hrs
Venue:	Sanma Province Chamber, Luganville, Santo		
Attendees:	Matthew Tasale (DoE), Manses Fatdal (Dept of Lands Santo), Benuel Tabi (Dept of Lands Santo), Prosper Buletare (A/SG Sanma province), Maurice (CTF survey), Ler (CTF Survey), Antoine (CTF Survey), Takao Saruhashi (NewJEC_JICA contractor), Nauko Yoshinari (NewJEC_JICA contractor), Yuichi Sano (NewJEC_JICA contractor), Kasso Kalmet (VUI), Land owners/claimants (see section below on the names)		

Background:

The Department of Energy (DoE) of Vanuatu and the Japan International Cooperation Agency (JICA), have commenced on the second phase of the Sarakata Hydro plant.

A preparatory study will be conducted by JICA with assistance from DoE, other related Government agencies and the Vanuatu Utilities Infrastructure (VUI). The aim of the Preparatory Survey is to provide a basic document necessary for the appraisal of the Project by the Government of Japan (GoJ) and JICA.

The Preparatory study involves, technical contractors conducting topographic, geological and hydrographical survey of the proposed site downstream of the existing Sarakata power station.

In light of these preparatory activities, concerned land owners/chiefs need to be made aware of these developments in their land.

On Friday 16th November 2018, a consultation meeting invitation letter was served to 12 custom owners/chiefs at their respected locations. See annex 1a, of a sample letter served to the custom owners/chiefs and annex 1b of the log book recording receipt of letter.

Land owner/claimant Attendees:

Land owners/claimants served with Consultation meeting invitation letter	Land owners/claimants present in meeting
1. Family Toserkite (Samansen area)	Erick Toserkite
2. Family Bensive Tosu (Fanafo area)	Sakias Tosu
3. Family Tangis (Fanafo village)	Newman Tangis
4. Family Jeffrey Sul (Monix hill)	Absent
5. Family Franky Stevens (Fanafo village)	Franky Steven
6. Family Tari Buluk (Fanafo village)	*Chief Tari Buluk
7. Family Mathias (Sarakata)	Absent
8. Family Loi (Sabi Area)	Absent
9. Family Rukon Perei (Fanafo area)	Var Rukon Perei
10. PRV Representative (Fanafo area)	**Absent
11. Chief Victor (Beleru)	Chief Victor
12. Leron(Trief) Family (Nambauk)	John Trief
	***Solomon Sar

*Attended but did not write his name on the Land Department Consent form
** Lessee
*** Land claimant not served with letter but attended

See annex 2, copy of the Department of Lands consent form, confirming the land owner/claimants (representatives) presence in the consultation meeting.

Agenda:

Awareness to concerned land owners on the Preparatory Survey works of the Sarakata Hydro phase two.

Presentation:

The awareness was conducted by the Government through the DoE. See Annex 3 a copy of the presentation slide.

Discussions and Outcome:

Eight (8) out of the twelve (12) land owner/claimant (representatives) including one lessee presented with consultation meeting letter were present at the meeting.

The awareness was understandable to all, that the project was still at preparatory stage and outcome of the preparatory survey will determine the realization of the Sarakata Hydro project phase two.

All the land owners/claimants present gave their consent on works of the preparatory survey to commence.

Family Bensive Tosu, raised concern on an agreement between the Government and the family in 2005 regarding the existing Hydro station. A copy of the agreement was handed to DoE representative for DoE to respond accordingly.

Discussions extended to local labour support to the contractors during the preparatory survey. It was agreed for a committee to be set-up by the land owners/claimants which will oversee the recruitment of local labourers to assist the contractors. A committee was set up straight after the meeting and below are the names of the committee members.

SARAKATA HYDRO PHASE TWO COMMITTEE	
Name	**Contact**
Newman Tangis	5337850
Solomon Emil	
Philimon Loe	
Sakias Tosu	5334677
John Trief	

Annex 1a

GOVERNMENT OF THE
REPUBLIC OF VANUATU

**DEPARTMENT OF
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Your Ref:
Votre Ref:

Our Ref:
Notre Ref:

Date: 16th November 2018

Family Bensive
Fanafo Village
Central Santo

Dear Bensive,

Subject: Consultation meeting blo Survey study lo Sarakata Hydro second stage

Me stap write follem bigfala toktok lo subject antap.

Government through lo Department blo Energy emi appreciatem bigwan presence blo you lo meeting ia blo mekem awareness lo survey study blo second stage blo Sarakata Hydro power plant.

Bae meeting blo yumi emi stap lo:

Ples – Sanma Province Headquarters
Day – Tuesday 20th November 2018
Time – 10:00 am

Me talem thank you lo understanding blo yu mo highly appreciate sapos wan representative blo family emi save present lo meeting.

Thank you tumas.

David Gibson
Acting Director
Department blo Energy

Cc: Secretary General, Sanma Province
Cc: Santo Lands Department
Cc: Area Admininstrator, Fanafo Canal
Cc: Provincial Planner, Sanma Province

Annex 1b

Annex 2

REPUBLIQUE DU VANUATU
MINISTERE DES TERRES

REPUBLIC OF VANUATU
MINISTRY OF LANDS

DEPARTMENT OF LANDS, LANDS SURVEY AND LAND RECORDS
Private Mail Bag 9095, Port Vila, Vanuatu
Telephone: (678) 22602
Fax: (678) 27709

Department Of Lands Consent Form
Ref #: ____/2020/17 _____

CONSENT FORM

This form is prescribed pursuant to section 54(2) of the Custom Land Management Act No. 33 of 2013 which relates to the rights of the disputing custom land owners. The disputing custom owners must give their consent before the Minister of Lands may sign as lessor on a new lease. This Form is applicable only to new or fresh leases.

1. Title: [illegible]
2. Lessor: [illegible]
3. Intended Lessee: [illegible]
4. Lease type: [illegible]

The table below shows the records by which consent of the disputing custom owners is sought for the Minister to sign as lessor on new leases. This table includes the names of the disputing custom land owners, place in which the consent was sought and given, signature of disputing custom land owners, date of consent and other comments.

Name	Venue	Signature	Date	Other Comments
	[illegible]		[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]
	[illegible]		[illegible]	[illegible]

Name of Officer facilitating to obtain consent on behalf of the Minister

Page 6 of 9

REPUBLIQUE DU VANUATU

MINISTERE DES TERRES

REPUBLIC OF VANUATU

MINISTRY OF LANDS

DEPARTMENT OF LANDS, LANDS SURVEY AND LAND RECORDS
Private Mail Bag 9090, Port Vila, Vanuatu
Telephone: (678) [illegible]
Fax: (678) [illegible]

Department Of Lands Consent Form
Ref #:__________

CONSENT FORM

This form is prescribed pursuant to section 54(2) of the Custom Land Management Act No. 33 of 2013 which relates to the rights of the disputing custom land owners. The disputing custom owners must give their consent before the Minister of Lands may sign as lessor on a new lease. This Form is applicable only to new or fresh leases.

1. Title: [illegible]
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3. Intended Lessee: [illegible]
4. Lease type: [illegible]

The table below shows the records by which consent of the disputing custom owners is sought for the Minister to sign as lessor on new leases. This table includes the names of the disputing custom land owners, place in which the consent was sought and given, signature of disputing custom land owners, date of consent and other comments.

Name	Venue	Signature	Date	Other Comments
	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]		
	[illegible]	[illegible]		
	[illegible]	[illegible]		

Name of Officer facilitating to obtain consent on behalf of the Minister

Page 7 of 9

Position: Land Officer

Signature

Date and Time: 20/11/18 : 10.38

Place: SANMA PROVINCE

Name of Witness:

Signature:

Date and Time:

Place:

Annex 3

1


2


3


4


5


6


7


8

9

(2) 2nd Stakeholder Meeting : December 5, 2018 @Sanma Province Chamber

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**DEPARTMENT OF
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Second Consultation meeting with Central Santo Land Owners – 2nd Phase of Sarakata Hydro Preparatory Survey

Date:	5 December 2018	**Time:**	09:00 – 11:00 hrs
Venue:	Sanma Province Chamber, Luganville, Santo		
Attendees:	Matthew Tasale (DoE), Manses Fatdal (Dept of Lands Santo), Barthelemy M. Helene (URA Santo), Matthew Walter (A/SG Sanma province / PSC Office), Tommy Kalfau (Physical Planner, Sanma Province)), Graham Lele (CLMO Santo), Johnson Vuti (Sanma Province), Takao Saruhashi (NewJEC_JICA contractor), Nauko Yoshinari (NewJEC_JICA contractor), Kasso Kalmet (VUI), Land owners/claimants (see section below on the names)		

Background:

This second consultation meeting follows on from the first consultation meeting on 20th November 2018, conducted by the Department of Energy with the Central Santo land owners regarding the commencement of the preparatory survey of phase 2 of the Sarakata hydro.

Meeting invitation was sent to the landowners/claimants through the Hydro committee established at the first consultation meeting.

Following the first consultation with the land owners/claimants, JICA contractor, NewJec, and its subcontractors performed a survey on the proposed area that the second phase of the Sarakata Hydro is intended to be constructed.

The outcome of the survey presented the actual site locations for the power house, dam, headrace channel, head race, penstock and the transmission lines to the main road. See annex 1 of the map.

The purpose of the second consultation meeting is to communicate this new information to the landowners.

Land owner/claimant Attendees:

Land owners/claimants present in meeting
Erick Toserkite Thomas
Sakias Tosu
Newman Tangis
John Trief

See annex 2, the attendance list.

Agenda:

Awareness to concerned land owners on the Sarakata hydo phase 2 facility site location identified by the preparatory Survey works.

Presentation:

The awareness was conducted by the Government through the DoE. See Annex 3, a copy of the presentation slide. Two new slides added to the previous slides of the first consultation to differentiate to the landowners/claimants the assumed hydro facility sites per desktop survey to the actual sites identified after the field survey.

Discussions and Outcome:

The meeting explained that the second consultation meeting is not the last, as there will be more survey to be conducted in 2019 which will entail more consultations.

The second consultation was specifically to communicate the location of the Hydro facilities identified during the preliminary survey works.

It was communicated, that from the survey it became clear that most of the interested land to be used for the Hydro falls under the PRV plantation existing lease but which will be confirmed through a survey plan which is the next step forward.

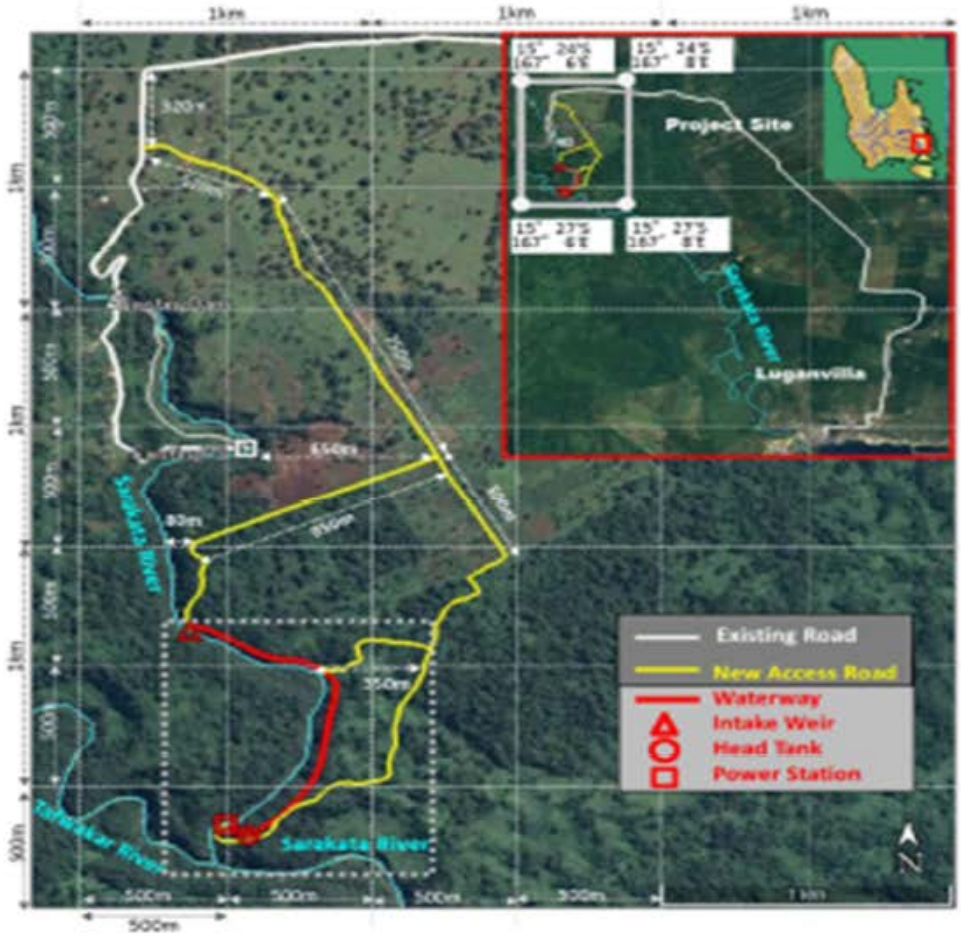
The representative of the four land owners present in the meeting appreciated the works carried out so far, moreover, that new findings from the field survey could be shared to them. They also appreciated that all communications to landowners was channeled through the committee.

The Hydro landowner committee had a separate meeting after the consultation meeting to appoint member for the executive positions. See below table the names and positions.

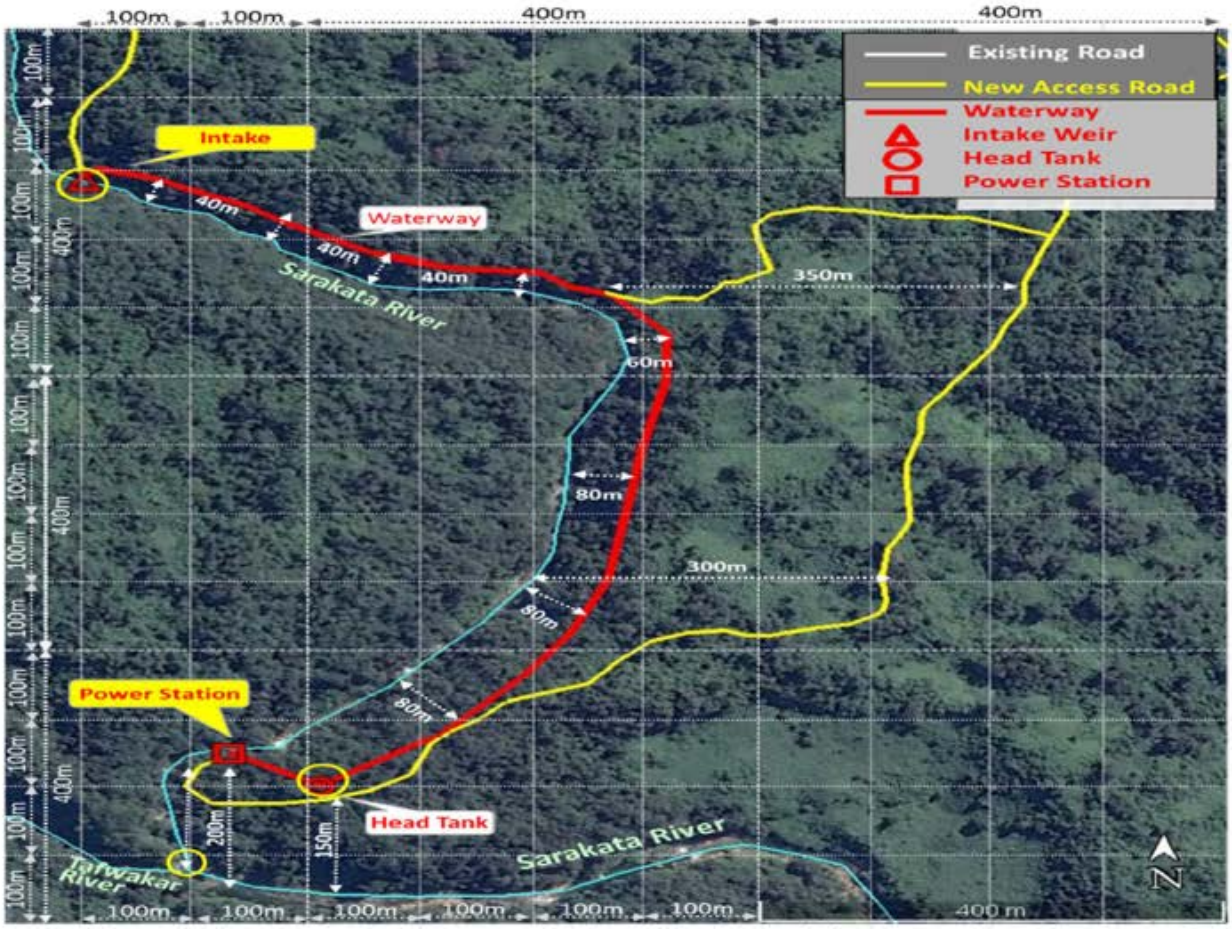
SARAKATA HYDRO PHASE TWO COMMITTEE		
Name	**Executive Position**	**Contact**
Newman Tangis	Secretary	5337857
Solomon Emil	Member	
Philimon Loe	Member	
Sakias Tosu	Chairman	5334677

John Trief	Vice Secretary	
Erick Toserkite Thomas	Vice Chairman	5445768

Annex 1



The planning layouts are preliminary, which will be changed during Studies to be proceed.
The values of distances shown on this map are approximate values.



The planning layouts are preliminary, which will be changed during Studies to be proceed.
The values of distances shown on this map are approximate values.

Annexe 2

Annex 3

(3) 3rd Stakeholder Meeting : June 17, 2019 @ Natoto Village

MINUTES OF MEETING

Project Title: Preparatory Survey for the Sarakata Hydropower Plant, Espiritu Santo, Republic of Vanuatu- Environmental and Social Impact Assessments		
Purpose: Stakeholders Consultation	**Meeting No**: 1 Venue: Natoto Village Nakamal (above existing Sarakata Hydropower Plant	**Date**: 17 June 2019
Attendance: Sakias Tosu (Chairman, Landowners Representative),Vira, Chief Bensiu Tosu, Talai Tosu (Amos), Jerry, Simo Tosu, Pierrot Tosu,Niahensley, Kristiong, Allan Tosu, Ben, Christopher, Allan Aru, Nikson, Loga Berryaruaru, Antril, Remy Tosu, Consultants: Ernest Bani and Angus Bani	**Apologies:** None	
Proceedings: The Meeting commenced with an opening prayer by Talai Tosu. Chief Bensiu welcomed the consultants and the members of the community to the meeting and reiterated the importance of the project to the people of Natoto Village, Fanafo, Luganville and Sanma Province. He referred to the existing hydropower project that when consultations were held, it was a challenge as people did not know then what a hydropower plant is and what benefits would be derived from its operations. And now that the people have lived and enjoyed the benefits provided by the hydropower plant, it is in their interest to ensure that the proposed project is implemented. He continued by saying that his people fully support the proposed project.		

Item	Description	Action	Date Required
1	**Landuse**: Part of the proposed land is leased title (Title No, 04/2613/003) to David Russet and part is custom land. In the lease agreement, the lessors have the right to fish and bath in the natural waterways. The Chief said that this has been an on-going activity of the villagers even after the existing hydro power plant was constructed.	The Vanuatu Government (DoE/MoCC & MoL) is responsible for sorting out the land issue	Before any physical work commenced at the proposed project site
2	**Fishing Grounds:** Sakaria Tosu, Chairman of landowners representative raised some concerns about damages to fishing grounds, soil erosion	Issues to be highlighted in EIA and SIA reports as part of the Environmental Management Plan	During construction phase

	upstream and decrease in water level. He said if the proposed project could consider the existing impacts the community is facing and try to avoid similar impacts during construction phase		
3	**Secret Sites**: There were no secret sites reported for the proposed project area	During clearing of sites for the project, any sites identified by the contractor must be reported to the Vanuatu Cultural Centre.	During construction phase
4	**Water Supply**: Talai Amos (Tosu) has expressed concern about water supply for the community around the project site. He queried about whether the project would be able to provide water supply to the community. Currently they have to walk down to the existing power house to fetch water and do their washing.	For government's consideration	Vanuatu government (DoE/MoCC, DGMMWR & MoL) to consider options and report back to the villagers
5.	**Quarry Permit**: The landowners have indicated that there is land available for quarry for base course of development structure. They are prepared to provide quarry materials provided that they have an approved Quarry Permit and License from the Department of Geology, Mines, Minerals and Water Resources (DGMMWR)	Any land owner interested in supplying quarry materials for access roads and the overall project components must apply for a quarry permit	Interested land owners should apply to the DGMMWR now before physical works commence at the site
6.	**Water Permit**: In accordance with the Water Resources Management Act, a Water Permit will be required by the contractor of the project.	The contractor for the proposed project will be responsible for applying for a Water Permit	The contractor for the proposed project will be responsible for applying for a Water Permit for use of water from the river from the DGMMWR
7	**Communication/Information**: It has been agreed that any information concerning the proposed hydropower project must be communicated through the committee established with representatives of all land owning groups.	National and Provincial Governments, project proponent, consultants must all liaise with the committee established with representatives of all land owning groups,	At all level of consultations and discussions from now until the project approval, construction and operation phase.

8	**AOB**	Next Stakeholders workshop will be confirmed by consultants	EIS/SIA Consultants to confirm date of next stakeholders consultation.

(4) 4th Stakeholder Meeting : December 16, 2020 @ Sanma Province Chamber

MINUTES OF 4TH CONSULTATION MEETING

4th Consultation Meeting

For

Environment Impact Assessment (EIA)

&

Social Impact Assessment (SIA)

PREPARATORY SURVEY ON THE PROJECT FOR THE CONSTRUCTION OF HYRDOPOWER STATION IN ESPIRITU SANTO ISLAND

December 2020

Department of Energy

Japan International Cooperation Agency – JICA

4th Consultation Meeting for Environmental Impact Assessment (EIA) & Social Impact Assessment (SIA

Date: 16th December 2020
Venue: Sanma Provincial Headquarter Chamber, Luganville, Santo
Time: 10:40 am

This was the 4th and last Consultation Meeting held with the representatives of the landowners, the community leaders, the Government and the Provincial Government representatives on the proposed project for the construction of hydropower plant in Santo island. The purpose of this consultation was to report on the EIA and SIA findings and Land Acquisition process and status.

The list of meeting attendants is given at the end of the minutes.

A. Prayer and Introduction: By DOE (Matthew Tasale)

- It was noted that due to the Covid'19, the progress of the project works had slowed down.
- During the 3rd consultation it was informed in that meeting that an EIA & SIA will be conducted. And today is the presentation of the findings of the environmental and social assessments.

B. Introduction of the Agenda: By DOE (Matthew Tasale)

1. Objectives of Today's Meeting
2. Outline of the Project
   (1) Basic Design
   (2) General Construction Works
   (3) Past Consultation
3. Result of the Environmental Impact Assessment (EIA)
4. Outline of the Land Acquisition Plan
5. Questions & Answers and Open Forum

C. Objectives of the Meeting: By DOE (Matthew Tasale)

1. Explain the outline of the New Sarakata Hydropower Project and the implementation schedule
2. Share the results of the EIA and SIA survey
3. Encourage the participation in the pre-construction stage for the acceptance of the project

D. Outline of the Project (Basic design): By DOE (Matthew Tasale)

Mr Tasale took the meeting through:

1. The Basic design of the project
2. The main facilities of the project

3. The access route
4. The transmission line
5. The general construction works
6. The results of the past consultations (1st, 2nd, & 3rd consultations)

After DOE taking the lead in the above features of the project, the Department of Environment, Protection & Conservation (DEPC) presented the findings of the EIA and the SIA in the meeting.

E. Result of the Environmental Impact Assessment (EIA) and the Social Impact Assessment (SIA): By DEPC (Ms Julie Vatu)

Before going through the results of the EIA & SIA, Ms Vatu made these remarks:

- Mr Ernest Bani was the main person that conducted these assessments but due to his passing away, she came in as the Environmental Impact Assessment Officer (EIAO) of the DEPC to present the results that have been identified.
    - She then went through the results of the EIA & SIA

1. Result of EIA evaluation (Pollution)
2. Mitigation measures (Pollution)
3. Environmental Management & Monitoring Plan (Pollution)
4. Result of EIA evaluation (Natural)
5. Mitigation Measures (Natural)
6. Environmental Management & Monitoring Plan (Natural)
7. Result of evaluation (Social Environment)
8. Result of the evaluation (others – such as working conditions, accidents & global warming)
9. Mitigation measures (Social Environment & Other)
10. Environmental Management & Monitoring Plan (Social Environment & Other)

F. Outline of the Land Acquisition Plan: BY DOE (Matthew Tasale)

The DOE led the meeting on the outline of the land acquisition plan.

1. Outline of the Land Acquisition plan (land acquisition, lease from PRV & easement)
2. Summary of the progress. It was noted that the land acquisition process has reached only Schedule 3. To proceed further to Schedule 4, it will need proper survey plan of the project site subject to completing the detailed design.
3. Types of Loss and Compensation Coverage
4. Grievance and Complaints Redress Mechanism (GRM)
5. Land Acquisition Plan Schedule

G. Questions & Answers And Open Forum

After the presentation of the EIA & SIA results by DOE and DEPC, the meeting was opened to hear questions, opinions, comments and ideas from the people present in the meeting.

H. Questions, Opinions, Comments & Ideas: Open Forum

1. The Project
    - The representatives of the land owners present including the representative of Sanma Provincial Government fully supported the project and want to see that it is implemented according to plan, to take into consideration the EIA & SIA findings and their environmental concerns.

2. Environment (Pollution, Natural, Social)
    - The representatives of the land owners expressed their concerns about the damage to the environment and want to see that they are compensated for these adequately.
        - The DEPC officer explained that during the project construction they will have in place the Environmental Management & Monitoring Plan which they will regularly use to monitor the project construction. This EIA and SIA study is to address their concerns.
        - During the construction there will be negative impacts to the plants and animals in the project area but these will be restricted only inside the construction area.
        - EIA study has shown that there's no existence of vulnerable animal, bird and fish species inside the construction area. However if any vulnerable species are identified on site during construction, they will be safely remove and place elsewhere

- Valuable trees inside the construction area will be compensated according to their market values

3. Land Acquisition (Compensation)
    - The concerns of the land owners and their desires should be put inside the conditions of the land acquisition
    - The representatives of the land owners want the Government to identify the rightful land owners for the land that the project will be located in.

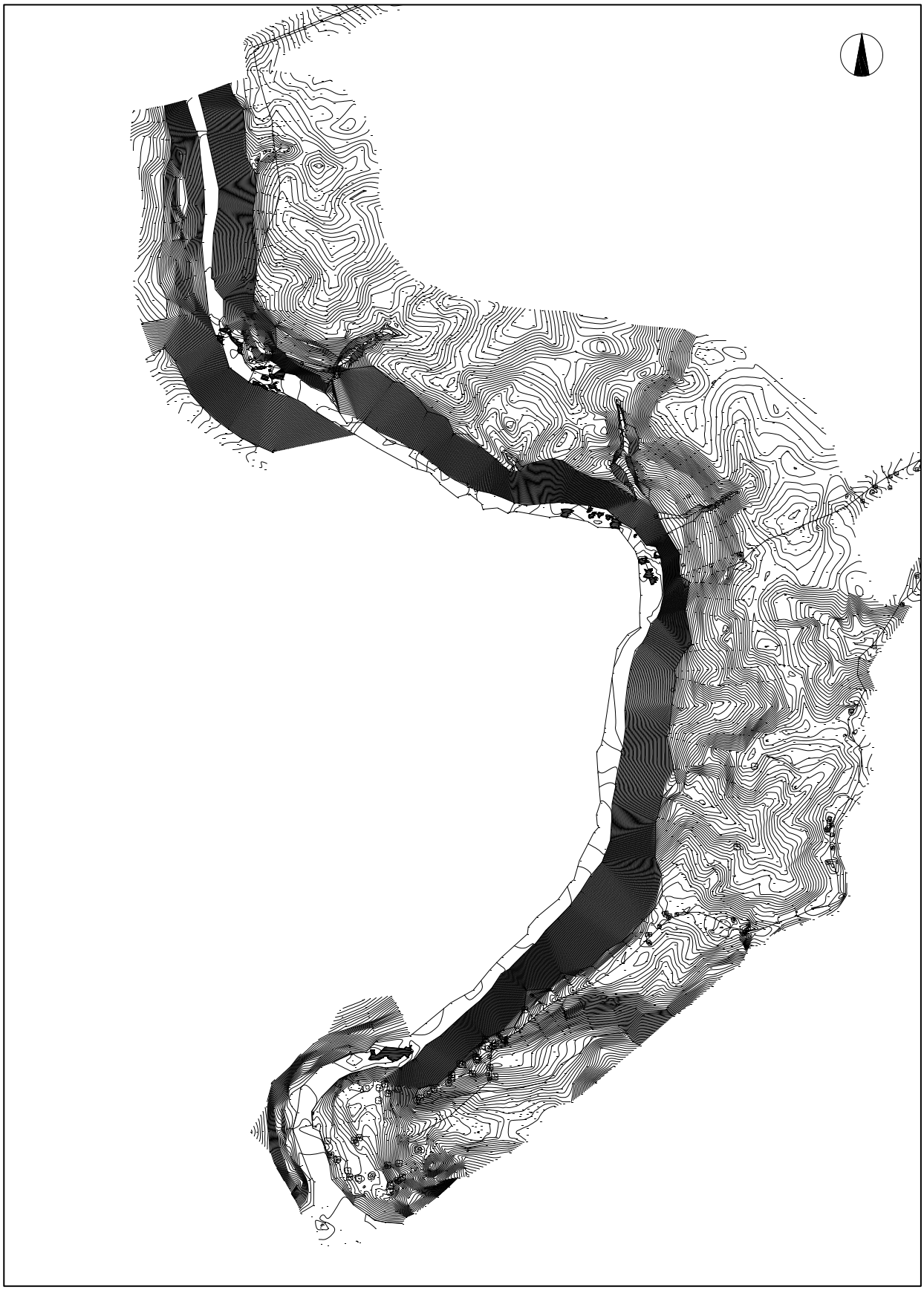
4. Others
    - The representatives of the land owners want to have a meeting of understanding with the Government and the Project Contractors before the construction begins
    - The land owners want to have a meeting of understanding with the Government before the operation of the new power plant

I. Attendees of the 4th Consultation Meeting

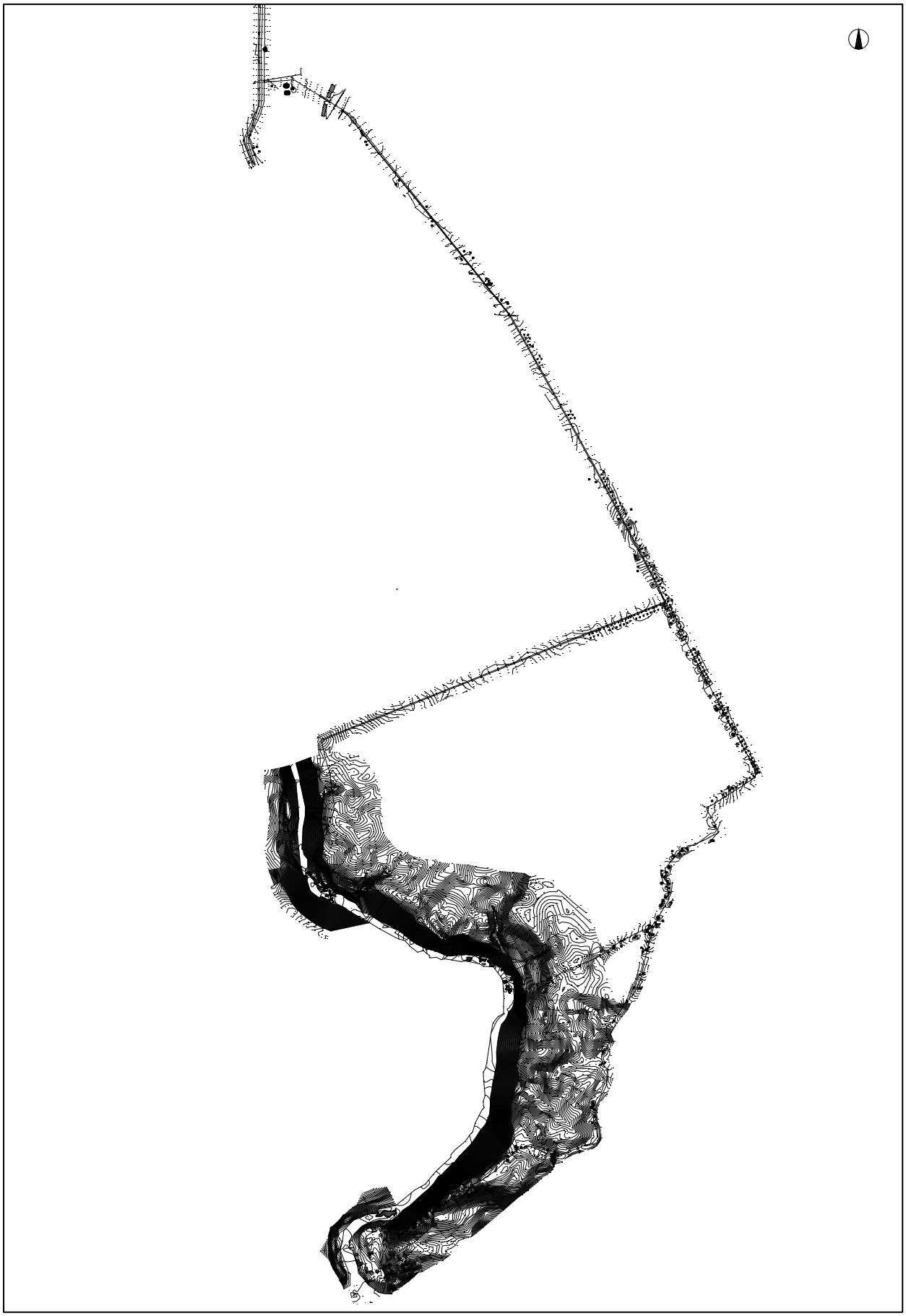
	Name	Title (Responsibility)	Village or Office	Contact (Mobile/Address)
1	Sackias Tosu	Custom Owner Rep (also Sanma Province elected Councillor)	Fanafo village	
2	Jeffery Sul	Custom Owner Rep (also Sanma Province elected Councillor)	Fanafo Monexil village	
3	Newman Tangis	Custom Owner Rep	Fanafo village	
4	Leo Moli	NewJec Local Consultant	Port Vila	
5	Tommy K. Wnele	Senior Planner	Sanma Province	
6	Erick		Jubilee	
7	Tom Loy		Chapuis (Shapi)	
8	Didier Joel	Consumer Officer	URA Luganville	
9	Benuel Tabi	Lands Officer	DoL Luganville	
10	Julie Vatu	EIA Officer	DEPC	
11	Matthew Tasale	Manager Electrification	DOE	

END OF MEETING: 12:25 pm

(5) Topographic survey results

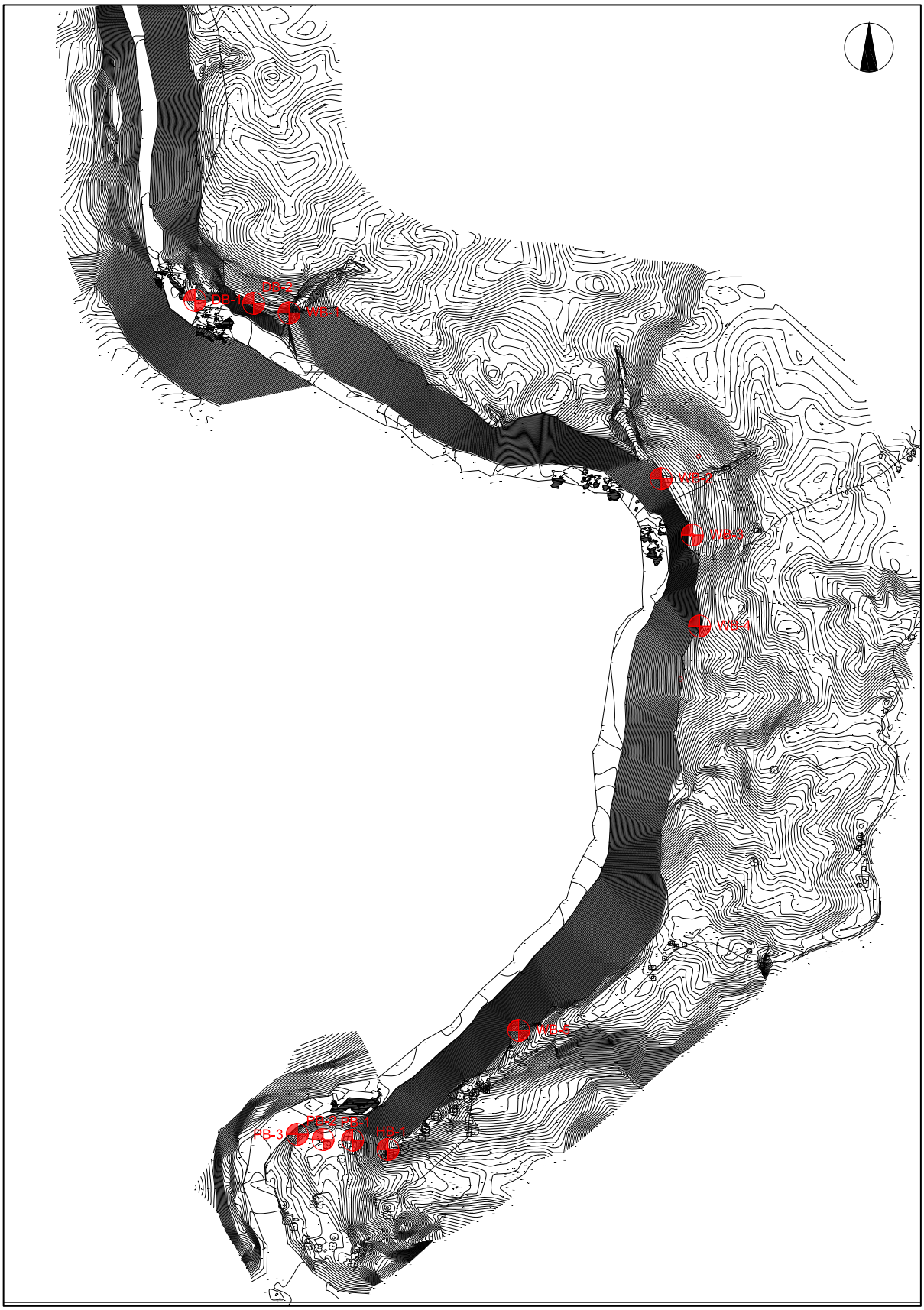


Topographic map (Hydroelectric power site)



Topographic map (Access road)

(6) Results of Geological Investigations

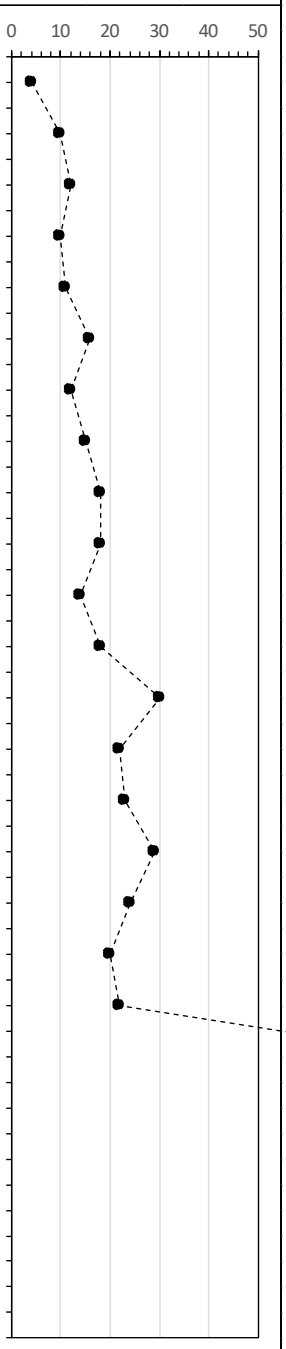


Locartion Map of boring holes

DB-2

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND								
Borehole No.	DB-2	Location	DESILTING BASIN			Coordinate	X =	726741.37	
Elevation(m):	127.51	GWL(m):	-13.00			(UTM, WGS84)	Y =	8292493.43	

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0.0 - 1.5m: Residual soil Clay mixing gravels, dark brown colored.	1	2	2	4	4
2		Dep.1.5 -10.0m: Soft coral limestone (high weathered) Coarse sand mixing with limestone fragments, pale brownish white.	4	5	5	10	10
3			4	6	6	12	12
4			4	5	12	17	10
5			3	5	6	11	11
6			5	7	9	16	16
7			5	6	6	12	12
8			6	7	8	15	15
9			7	9	9	18	18
10			11	9	9	18	18
11			7	16	15	31	14
12			5	9	9	18	18
13			14	16	14	30	30
14			10	10	12	22	22
15			7	9	14	23	23
16			10	13	16	29	29
17			7	10	14	24	24
18			9	9	11	20	20
19			8	8	14	22	22
20			10	50/14		50/14	88
21		Dep.20.0 -25.5m: Stiff coral limestone Coarse sand mixing with limestone fragments, pale greenish gray.	17	30	50/3	50/18	83
22			50/9			50/9	167
23			50/12			50/12	125
24			50/11			50/11	136
25			50/14			50/14	88
26		END OF BOREHOLE AT 25.5 METERS IN DEPTH					
27							
28							
29							
30							



Graph of N-Value Variation with depth

WB-1

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND				
Borehole No.	WB-1	Location	HEADRACE CONDUIT	Coordinate	X = 726777.81
Elevation(m):	121.43	GWL(m):	None	(UTM, WGS84)	Y = 8292483.67

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0.0 - 1.5m: Residual soil Clay mixing gravels, dark brown colored.	3	3	3	6	6
2		Dep.1.5 -10.0m: Soft coral limestone (high weathered) Coarse sand mixing with limestone fragments, pale brownish white.	4	4	4	8	8
3			5	5	6	11	11
4			5	7	8	15	15
5			5	4	6	10	10
6			7	11	8	19	16
7			4	8	6	14	14
8			5	7	7	14	14
9			5	7	7	14	14
10			5	7	10	17	17
11		END OF BOREHOLE AT 10.5 METERS IN DEPTH					
12							
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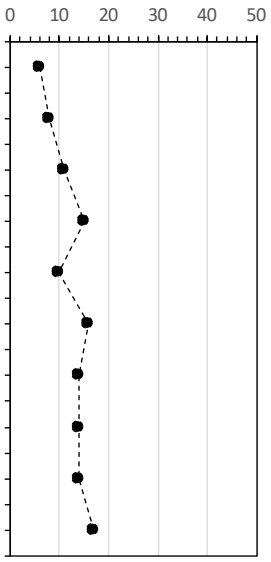
Graph of N-Value Variation with depth



WB-2

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND						
Borehole No.	WB-2	Location	HEADRACE CONDUIT	Coordinate	X =	727159.05	
Elevation(m):	117.06	GWL(m):	-2.00	(UTM, WGS84)	Y =	8292313.85	

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0.0 - 1.5m: Residual soil (highly weathered coral limestone Clay mixing gravels, brownish white.	3	3	6	9	9
2		Dep.1.5 -10.0m: Soft coral limestone (high - moderately weathered) Coarse sand mixing with limestone fragments, pale grayish white.	5	7	5	12	12
3			6	9	10	19	19
4			5	5	9	14	14
5			6	10	7	17	17
6			6	7	13	20	14
7			5	7	12	19	14
8			5	6	8	14	14
9			9	8	17	25	16
10			6	11	14	25	25
11		END OF BOREHOLE AT 10.5 METERS IN DEPTH					
12							
13							
14							
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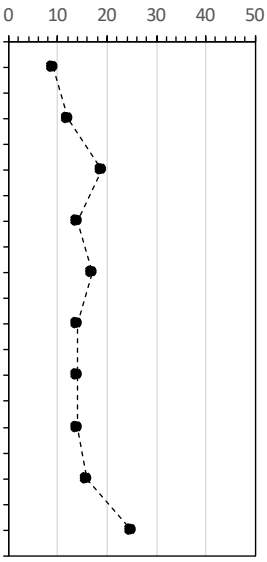
30							

Graph of N-Value Variation with depth



WB-3

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND				
Borehole No.	WB-3	Location	HEADRACE CONDUIT	Coordinate	X = 727191.07
Elevation(m):	122.32	GWL(m):	-3.60	(UTM, WGS84)	Y = 8292108.85

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0.0 - 2.0m: Residual soil (highly weathered coral limestone Silt mixing gravel and sand, brownish yellow.					
2			3	4	7	11	11
3		Dep.2.0 -10.0m: Soft coral limestone (high - moderately weathered) subangular - subround sand of coral limestone flour with gravel of 3cm max sized, pale gray - whitish gray.	4	7	8	15	15
4			4	6	9	15	15
5			5	7	9	16	16
6			7	11	14	25	25
7			10	11	16	27	27
8			10	12	12	24	24
9			5	9	12	21	21
10			3	4	4	8	8
11		END OF BOREHOLE AT 10.5 METERS IN DEPTH	6	8	9	17	17
12							
13							
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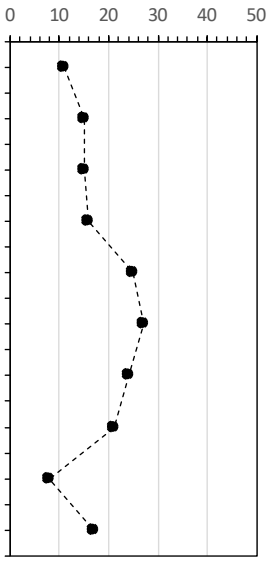
Graph of N-Value Variation with depth



WB-4

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND							
Borehole No.	WB-4	Location	HEADRACE CONDUIT		Coordinate	X =	727198.51	
Elevation(m):	136.50	GWL(m):	-3.60		(UTM, WGS84)	Y =	8292162.70	

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value	Graph of N-Value Variation with depth
0								0 10 20 30 40 50
1		Dep.0.0 -10.0m: Soft coral limestone (high - moderately weathered) subangular - subround coarse sand of coral limestone with gravel of 4cm max sized, pale brown - brownish white.						
2			5	6	5	11	11	
3			4	7	8	15	15	
4			5	5	8	13	13	
5			13	5	6	11	11	
6			3	4	4	8	8	
7			3	3	4	7	7	
8			3	5	9	14	14	
9			3	3	5	8	8	
10			2	3	4	7	7	
11		END OF BOREHOLE AT 10.5 METERS IN DEPTH	3	4	6	10	10	
12								
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WB-5

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND				
Borehole No.	WB-5	Location	HEADRACE CONDUIT	Coordinate	X = 727013.12
Elevation(m):	128.36	GWL(m):	None	(UTM, WGS84)	Y = 8291748.56

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0.0 -10.0m: Soft coral limestone (high - moderately weathered) subangular gravel-sand mixtures, pale brownish white.	6	8	13	21	16
2			4	5	5	10	10
3			5	8	7	15	15
4			9	7	9	16	16
5			11	20	21	41	41
6			10	29	14	43	28
7			8	8	7	15	15
8			13	32	12	44	24
9			15	11	16	27	27
10			33	16	24	40	40
11		END OF BOREHOLE AT 10.5 METERS IN DEPTH					
12							
13							
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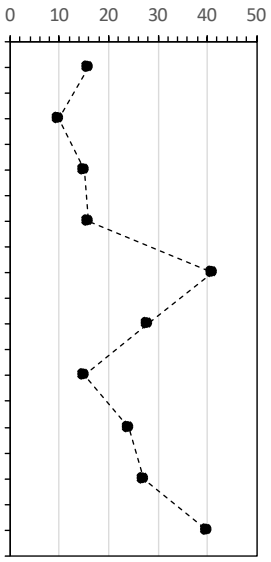
Graph of N-Value Variation with depth



HB-1

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND								
Borehole No.	HB-1	Location	HEADTANK		Coordinate	X =	726879.16		
Elevation(m):	110.94	GWL(m):	-15.00		(UTM, WGS84)	Y =	8291626.51		

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.1.3 - 7.3m: Soft coral limestone (high weathered) Coarse sand mixing with limestone fragments, pale brownish white.	7	5	8	15	15
2			20	23	19	42	42
3			9	14	20	34	34
4			12	17	23	40	40
5			8	10	11	22	22
6			10	11	8	19	19
7			5	8	12	20	20
8		Dep.7.0 - 8.5m: Coarse sand, pale brownish yellow, well sorted.	6	6	9	15	15
9		Dep.9.0 - 10.5m: Soft coral limestone (high weathered) Coarse sand mixing with limestone fragments, pale brownish white.	11	7	8	15	15
10			6	11	17	28	28
11			9	9	13	22	22
12		Dep.11.0 - 19.0m: Medium coarse to fine sand, with 15 - 20% coral limestone gravel, pale brownish yellow - white, partially including shell fossils.	6	3	20	23	12
13			8	8	10	18	18
14		Dep.19.0 - 19.5m: Gravelly sand of coral limestone, pale brownish white.	5	7	7	14	14
15			7	11	15	26	26
16		Dep.19.5 - 20.5m: Silty sand, partially including limestone fragments, pale brownish white.	8	13	16	29	29
17			6	9	16	25	25
18			7	10	13	23	23
19			6	7	9	15	15
20			6	9	9	18	18
21		END OF BOREHOLE AT 20.5 METERS IN DEPTH					
22							
23							
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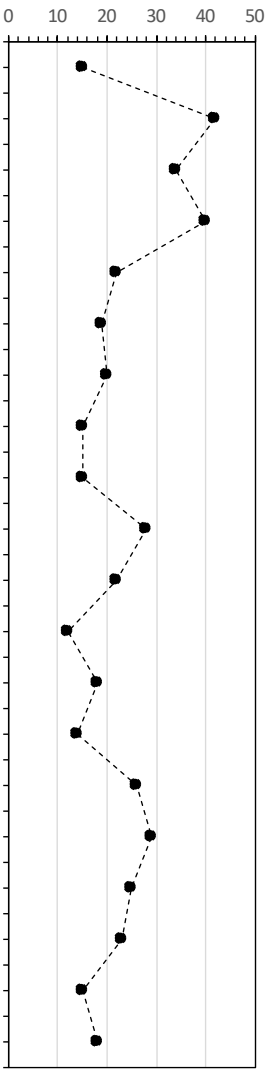
Graph of N-Value Variation with depth



PB-1

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND							
Borehole No.	PB-1	Location	PENSTOCK		Coordinate	X =	726842.85	
Elevation(m):	82.4	GWL(m):	-2.00		(UTM, WGS84)	Y =	8291636.00	

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0.0 - 1.3m: Residual soil, Clay, dark brown colored.	3	3	4	7	7
2		Dep.1.3 - 7.3m: Soft coral limestone (high weathered) Coarse sand mixing with limestone fragments, pale brownish white.	4	7	9	16	16
3			3	5	7	12	12
4		Dep.2.3-3.5m: High contents of clayey particles.	2	5	8	13	13
5			6	9	6	15	15
6		Dep. 3.5 - 4.0m: A boulder of hard limestone.	5	7	7	14	14
7			12	11	18	29	29
8		Dep.7.3 - 12.0m: sea-shore deposits without coral limestone.	3	3	5	8	8
9		Dep.7.3 - 7.5m: Old soil (dark brown colored clay).	7	7	9	16	16
10		Dep.8.0 - 9.0m, 11.0 - 12.0m: Coarse sand, pale yellowish.	9	12	16	28	28
11		Dep.9.0 - 11.0m: Sandy silt, dark greensih gray.	5	5	6	11	11
12			33	50/5		50/5	300
13		Dep. 12.0 - 13.0m: Sandy silt, dark greenish gray, mixing with shell fossils.	12	16	28	44	44
14		Dep.13.0 - 15.5m: Siltstone, greenish gray, mixing with shell fossils.	15	22	26	48	48
15			12	20	30/13	50/28	54
16		END OF BOREHOLE AT 15.5 METERS IN DEPTH					
17							
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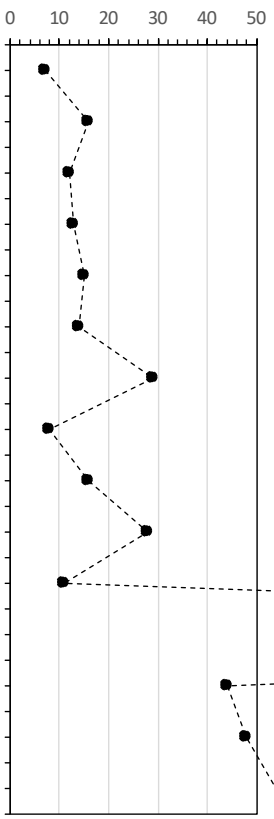
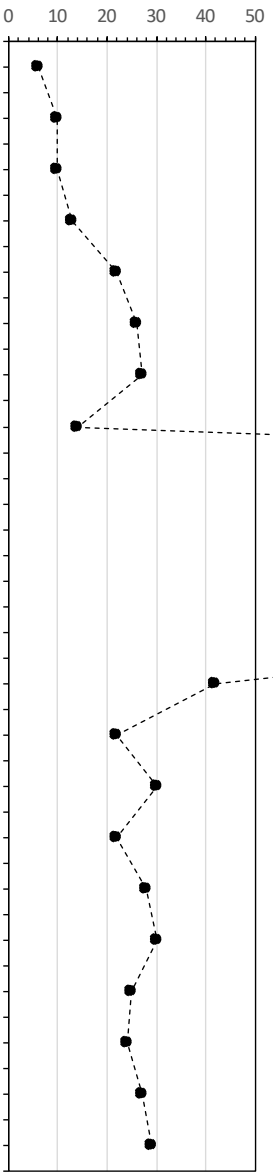
Graph of N-Value Variation with depth



PB-2

Borehole No.	PB-2	Location	POWERHOUSE	Coordinate	X =	726812.55
Elevation(m):	79.10	GWL(m):	-3.80	(UTM, WGS84)	Y =	8291636.61

Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0 - 3.0m: Debris flow deposit, subangular gravel of limesotne fragments mixing with clay, brown colored.					
2			3	20	12	32	6
3			5	50/4		50/4	10
4		Dep.3.0 - 4.0m: Hard coral limestone (a boulder).					10
5		Dep.4.0 - 5.0m: Gravelly limestone, brownish yellow.	5	6	7	13	13
6		Dep.5.0 - 9.5m: Sandy siltstone mixing with limestone fragments, dark greenish gray.	6	10	12	22	22
7			4	11	15	26	26
8		Dep.9.5 - 10.0m: Gravelly coral limestone.	10	13	14	27	27
9			6	6	8	14	14
10			13	50/5		50/5	300
11		Dep.10.0 - 13.0m: Sandy siltstone mixing with limestone fragments, pale greenish gray.	4	17	33/10	50/25	60
12			21	50/7		50/7	214
13		Dep.13.0 - 22.5m: Massive siltstone without gravel, dark greenish gray.	19	50/11		50/11	136
14			11	17	25	42	42
15			10	10	12	22	22
16			9	12	18	30	30
17			8	10	12	22	22
18			11	13	15	28	28
19			10	12	18	30	30
20			9	12	13	25	25
21			9	9	15	24	24
22			11	13	14	27	27
23		END OF BOREHOLE AT 22.5 METERS IN DEPTH	8	12	17	29	29
24							
25							
26							
27							
28							
29							
30							

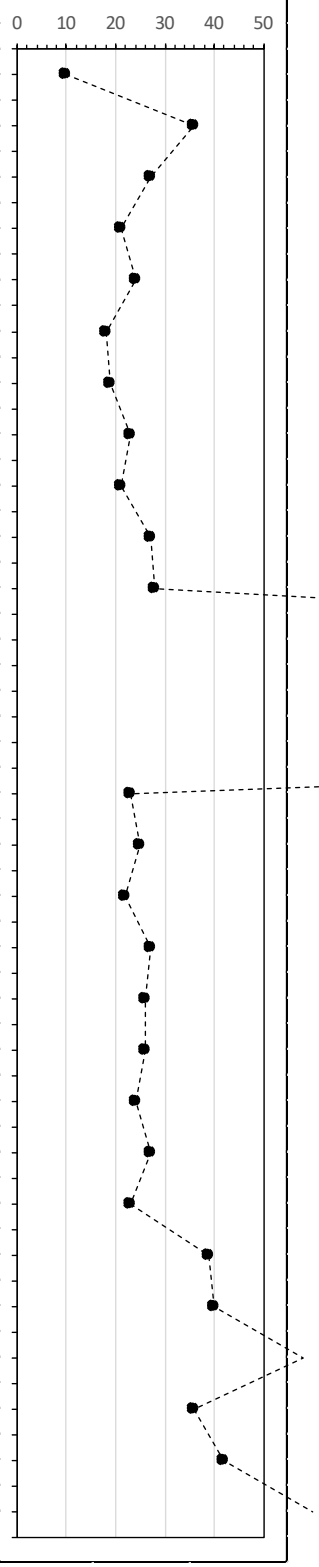


PB-3

Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND							
Borehole No.	PB-3	Location	TAILRACE		Coordinate	X =	726786.14	
Elevation(m):	73.26	GWL(m):	-0.70		(UTM, WGS84)	Y =	8291641.93	

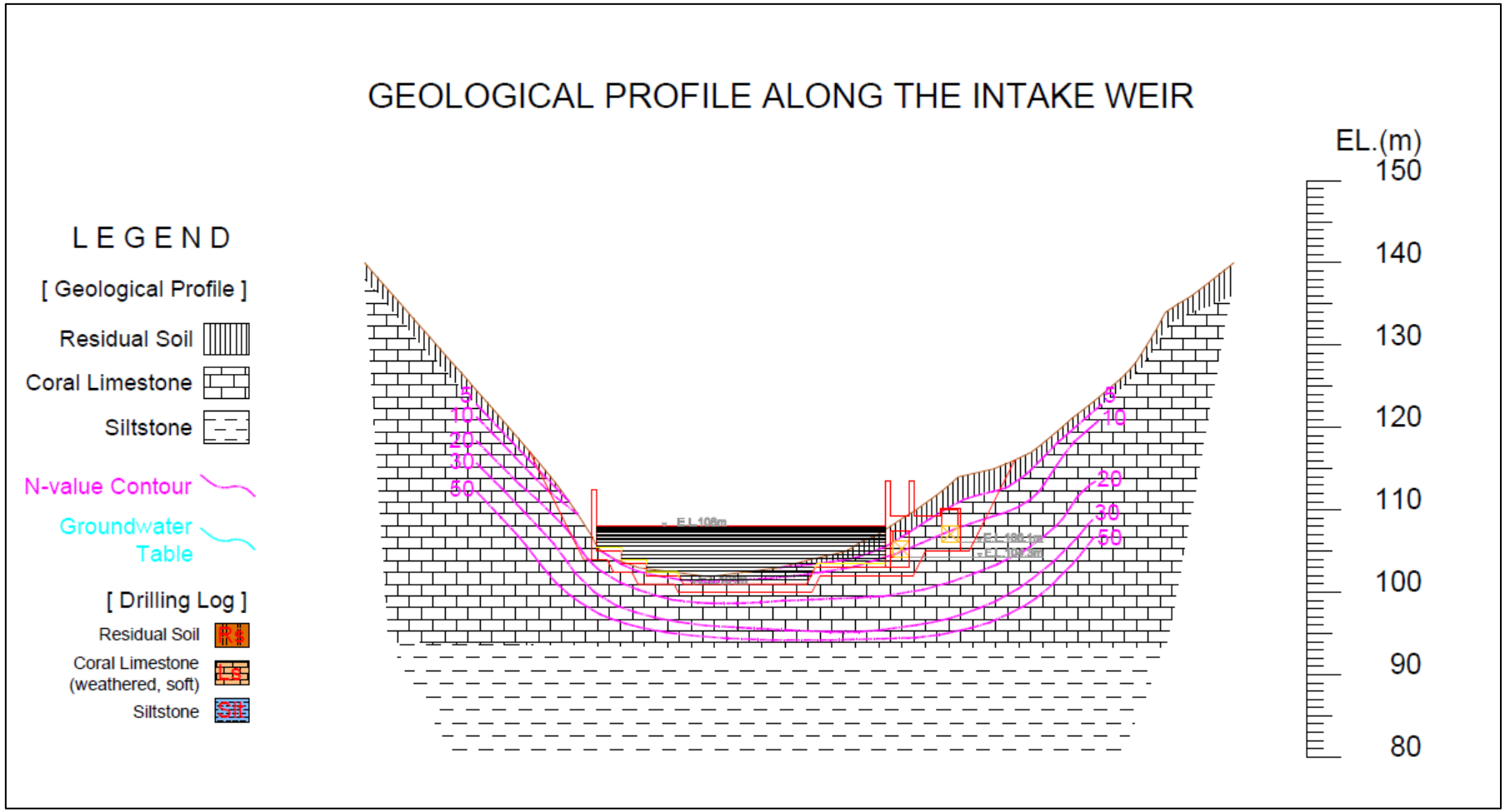
Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0.0 -2.5m: Soft coral limestone (high weathered) Coarse sand mixing with limestone fragments, pale brownish white.					
2			2	3	7	10	10
			18	23	27/5	50/20	36
3		Dep.2.5 - 12.0m: Siltstone, pale greenish grey, stiff.					
			6	9	18	27	27
4			5	8	13	21	21
5			7	10	14	24	24
6			6	9	9	18	18
7			7	9	10	19	19
8			7	11	12	23	23
9			5	7	14	21	21
10			10	12	15	27	27
11			9	13	15	28	28
12			21	50/7		50/7	214
13		Dep.12.0 - 14.5m: Hard coral limestone mixing with silt matrix, pale greenish gray.	50/11			50/11	136
14			50/4			50/4	300
15		Dep.15.0 - 26.0m: Siltstone, greenish gray, mixing with shell fossils.	8	8	15	23	23
16			9	10	15	25	25
17			10	10	12	22	22
18			10	12	15	27	27
19			12	13	13	26	26
20			10	12	14	26	26
21			9	9	15	24	24
22			9	11	16	27	27
23			8	10	13	23	23
24			10	17	22	39	39
25			6	18	22	40	40
26			13	22	28/11	50/26	58
27		Dep.26.0 - 29.5m: Sandy siltstone, dark greenish gray, mixing with shell fossils and limestone fragments. Very stiff - Hard.	11	16	20	36	36
28			10	15	27	42	42
29			19	32	18/10	50/25	60
30		END OF BOREHOLE AT 29.5 METERS IN DEPTH					

Graph of N-Value Variation with depth

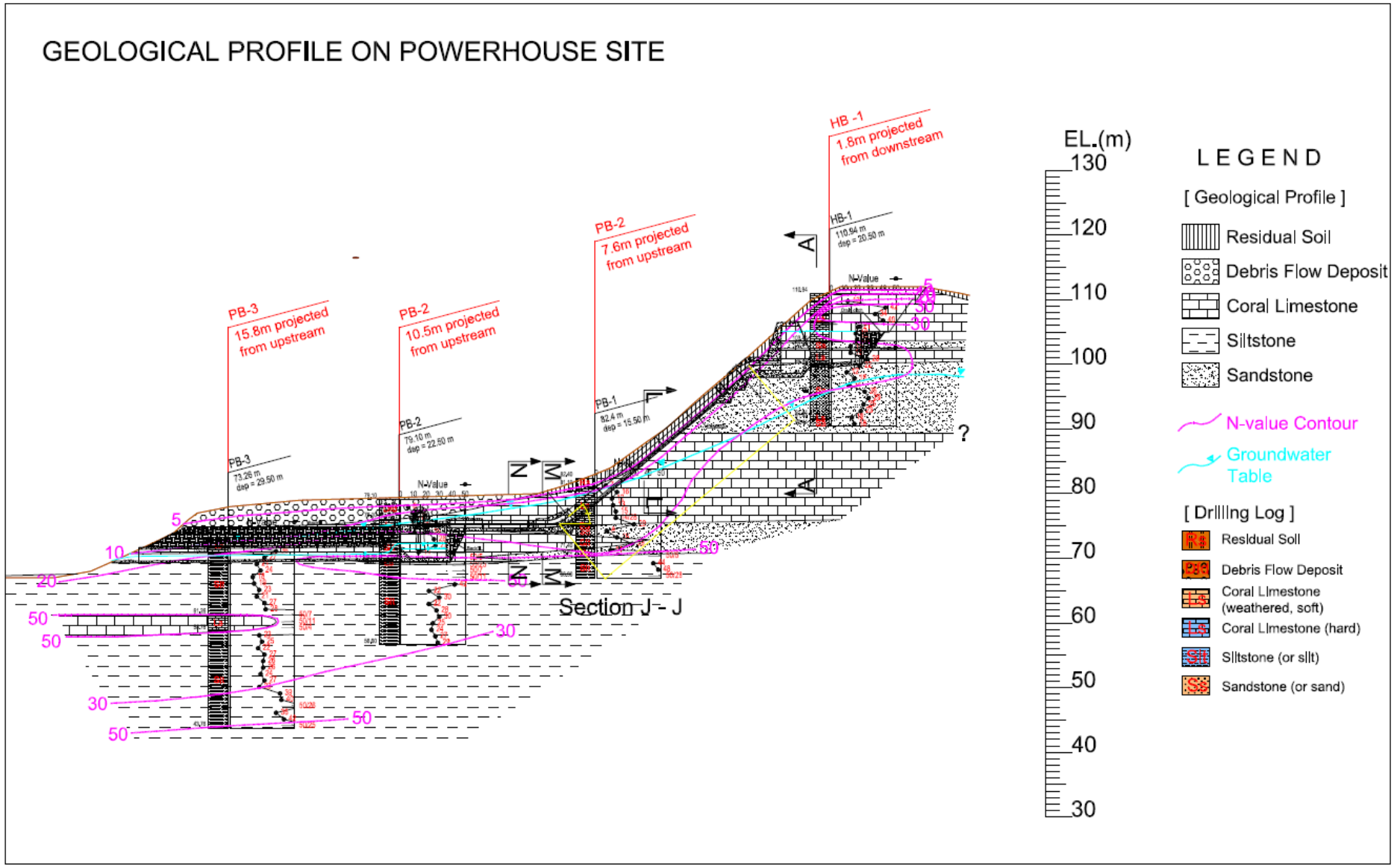


Summary of Laboratory Test Results

Borehole No.	Sample No.	Depth(m)		Water Contents (%)	Atterberg Limit		Plasticity Index, PI (%)	Specific Gravity, Gs	Grain Size Analysis (%)						SPT N value (Modified)	Soil Color	USCS	Soil Description
					Liquid Limit, LL (%)	Plastic Limit, PL (%)			Gravel (>4.75mm)	Sand			Silt (<0.075mm)	Clay (<0.005mm)				
		From	To							Coarse (<4.75mm)	Medium (<2.00mm)	Fine (<0.475mm)						
DB-1	SS-5	5.00	5.50	17.7	NP	NP	NP	2.64	43	11	15	8	16	6	18	pale whitish brown	GM	Silty GRAVEL with sand
DB-1	SS-10	10.00	10.50	19.0	-	-	-	2.67	40	11	13	7	19	10	26	pale brownish white	GC	Clayey GRAVEL with sand
DB-1	SS-15	15.00	15.50	32.1	36.4	25.8	10.6	2.66	5	0	1	16	69	8	136	plae greenish gray	ML	SILT with sand
DB-2	SS-10	10.00	10.50	16.3	NP	NP	NP	2.61	32	13	24	11	15	5	18	pale brownish white	SM	Silty SAND with gravel
DB-2	SS-21	21.00	21.50	20.8	NP	NP	NP	2.65	16	18	19	10	28	9	83	pale greenish gray	SM	Silty SAND with gravel
PB-1	SS-3	3.00	3.50	30.4	NP	NP	NP	2.54	29	9	7	10	37	8	12	yellowish brown	GM	Silty GRAVEL with sand
PB-1	SS-5	5.00	5.50	9.5	NP	NP	NP	2.63	42	24	22	6	6		15	whitish brown	SW-SM	Well graded SAND with silt and gravel
PB-1	SS-10	10.00	10.50	34.5	NP	NP	NP	2.50	4	1	3	28	59	6	28	greenish gray	ML	Sandy SILT
PB-2	SS-10	10.00	10.50	28.9	35.4	24.8	10.6	2.69	0	1	3	10	76	10	60	plae grayish green	ML	SILT
PB-2	SS-14	14.00	14.50	34.2	-	-	-	2.64	0	1	1	3	66	29	22	pale grayish green	ML	Silty CLAY
PB-2	SS-22	22.00	22.50	35.7	39.3	26.3	13.0	2.61	1	0	0	3	75	20	29	pale grayish green	ML	SILT
PB-3	SS-3	3.00	3.50	33.8	-	-	-	2.54	0	0	2	4	79	14	27	greenish gray	ML	Silty CLAY
PB-3	SS-6	6.00	6.50	30.5	51.9	29.4	22.5	2.46	0	0	1	2	76	21	18	pale greenish gray	MH	SILT
HB-1	SS-3	3.00	3.50	10.0	NP	NP	NP	2.62	22	15	21	11	23	8	34	pale brownish white	SM	Silty SAND with gravel
HB-1	SS-8	8.00	8.50	12.5	NP	NP	NP	2.61	7	4	38	43	8		15	pale brownish white	SP-SM	Poorly graded SAND with silt
HB-1	SS-11	11.00	11.50	14.1	NP	NP	NP	2.62	1	12	70	7	10		22	pale brownish white	SP-SM	Poorly graded SAND with silt
WB-1	SS-9	9.00	9.50	10.8	-	-	-	2.61	52	14	15	6	13		14	very pale brownish white	GC	Clayey GRAVEL with sand
WB-2	SS-8	8.00	8.50	23.3	34.7	19.8	14.9	2.64	17	13	24	12	21	12	14	pale grayish white	SC	Clayey SAND with gravel
WB-3	SS-9	9.00	9.50	22.0	NP	NP	NP	2.62	39	10	17	8	18	9	8	pale whitish gray	GM	Silty GRAVEL with sand
WB-4	SS-9	9.00	9.50	27.2	-	-	-	2.57	42	13	15	7	16	8	7	pale brown	GC	Clayey GRAVEL with sand
WB-5	SS-7	7.00	7.50	11.3	-	-	-	2.64	46	13	14	9	14	4	15	brownish white	GC	Clayey GRAVEL with sand



Geological Cross Section of Intake Weir



Geological Cross Section of Head tanl ~ Penstock ~ Powerhouse ~ Tailrace