資料 5：ソフトコンポーネント計画

バヌアツ国
サント島における水力発電施設整備計画
準備調査

ソフトコンポーネント計画書

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株式会社　ニュージェック
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1. ソフトコンポーネントを計画する背景

無償資金協力で 1994～1995 年に 600kW （300kW x 2 ユニット）と 2009 年に 600kW のサラカタ水力発電所の設置、増設を支援した。建設された総設備容量 1,200kW の既設サラカタ川水力発電所はサント島の主要電源として安定的な電力供給に貢献してきた。しかし 2016 年には日中のピーク電力が 1,932kW に達し、ピーク時の対応等のため、輸入燃料に依存したディーゼル発電の稼働が増えている。今後も、同島における電力需要の伸びは平均年率 3.3 %であり、今後も需要の増加が見込まれており、ディーゼル発電に対する依存が拡大することが見込まれる。

このような状況を踏まえ、再生可能エネルギーの一層の導入により輸入燃料への依存を軽減し、電力料金の低減を図るとともに、気候変動対策にも貢献するため、サント島水力発電施設建設計画（以下、「本事業」）に対する無償資金協力での支援の検討を行うものである。現地調査の結果、既設サラカタ発電所の下流において、ターゲット出力の 1,000kW 規模の水力発電所の計画が可能であることを確認した。

本計画は、既設サラカタ水力発電所（1,200kW）の下流に新設水力発電所（1,000kW）を建設する計画である。新設発電所は、既設発電所から遠隔制御し、自動運転を行うシステムが導入される計画である。2 箇所の水力発電所の計 5 台の水車発電機をより最適に運用し、ディーゼル発電機の焚き減らし効果を最大限図ることが求められる。

ルーガンビル系統においては、2 箇所の水力発電所の電源が大部分を占めることになり、水力発電所の故障、不具合等が一旦生じると、大規模な停電が生じることになる。また、2 箇所の水力発電所で発電された電力は、現在 20kV 1 回線の送電線で市内変電所に送られており、送電線事故が生じた場合、2 箇所の水力発電からの電力は送電出来なくなり、大規模な停電が生じることになる。
バックアップ電源としてのディーゼル発電はスタンバイしているが、水力発電所の停止期間が長期になると、ディーゼル燃料の消費が増え、発電コストが高くなる。

このように、系統の主要電源となっている 2 箇所の水力発電所と送電線は、非常に重要な設備であり、事故、不具合の発生時には、迅速で、適切な処置、復旧が求められる。また、予防保全のための日常点検、保守管理を行ない事故、故障等のリスクを極力減らすことが重要である。

バヌアツの発電や配電に係る電力事業の所轄機関は DOE の監督の下に、民間企業への委託契約により運営、維持管理が行われている。

サント島のルーガンビルコンセッション地域においては、コンセッション契約により、Vanuatu Utilities and Infrastructure Limited[1]（以下、「VUI」と言う）が電力事業を担っている。同地域のサラカタ水力発電所は VUI 職員により、運営、維持管理がされている。

VUI 発電所職員の中には、1995 年の無償協力事業建設時にメーカー及びコンサルタントから、運転、維持管理の指導を受けた者が残っており約 25 年間にわたり発電所に勤務している。2009 年には、発電所の増設及び水路の大規模な補修工事が行われた。毎年、配電線の事故、サイクロンによる施設の破損等は生じているが、これまで発電停止に到るような大きな事故は発生しておらず、VUI 職員が復旧工事にあたっている。

既存水力発電所は、手動運転が基本であり、ベテランの運転員が経験に基づいて運転している。発電施設に関しては運転、維持管理マニュアルは整備されておらず、VUI の管理台帳に運転記録、事故記録等を記載し、報告する仕組みである。
VUI による若手運転員に対する教育は行われておらず、後継者が育成されていない。

現在、既設水力発電所の運転・保守体制は 2 人 1 組で、1 日 8 時間毎 3 グループ交代制であり、1 グループは取水口の清掃・伐採等の業務を行う日勤作業、もう 1 グループは休暇としている。グループ数の合計は 5 グループで計 10 人となり、守衛が 1 人である。したがって、発電所に勤務している人数の合計は 11 人となっている。全員が地元の村の出身者である。なお、VUI の組織には発電に携わっている電気、機械技術者がおり、ソフトコンポーネントに参加してもらうことが必要である。

事業運営を規制する側への協力に加えて、運転保守の実務を行う主体に対しても能力強化をすることで、保守や事故対応等を適切に行うことが出来、リスク低減につながるとともに、事業効果の持続性確保出来ること、さらに、VUI への委託は 20 年と長期に亙るため、技術移転の効果は長期間に亙って発現出来ることが期待できる。

2. ソフトコンポーネントの目標

コンセッション契約により、電力事業を担っている VUI が、新設水力発電所を持続的かつ、適正に運転、維持・管理し、既設サラカタ水力発電所と最適運用を行って、ディーゼル発電所の焚き減らし効果を最大限達成することで、電気料金の低減を達成することである。

[1] バヌアツ政府と VUI のコンセッション契約は、2019 年 6 月から 2040 年（20 年間）までとなっている。契約完了に伴い、入札が実施される予定です。現在は、ルーガンビルを含む 4 つコンセッション地域では、電力事業者が発電、送電、配電、供給、顧客サービスまでの一連の電力サービス事業を行っており、電力事業者による電力サービス事業は永続的に継続される見込みです。

3. ソフトコンポーネントの成果

上記の目標が達成された場合の成果は以下の通りである。

① 適正な新設発電設備の運転及び保守管理方法が確立される。
- 発電設備維持管理マニュアルが整備される。
- マニュアルに基づき、手順、内容を理解し、実践訓練（On-the-Job-Training）が行われる。
- 運転及び保守要員が業務分担（内容）、業務フロー、責任範囲を理解し、業務を遂行している。
- 運転要員が運転記録を運転日誌に記録し、適正な運転を行っている。
- 保守要員が日常点検を行い、保守記録、補修記録を記載し、適正な保守管理を行っている。
- 設備、予備品、備品台帳が作成され整備される。

② 適正な土木設備の保守管理方法が確立される。
- 土木設備維持管理マニュアルが整備される。（ゲート、スクリーン、水圧鉄管を含む。
- マニュアルに基づき、手順、内容を理解し、実践訓練（On-the-Job-Training）が行われる。
- 保守要員が業務分担（内容）、業務フロー、責任範囲を理解し、業務を遂行している。
- 保守要員が日常点検を行い、保守記録、補修記録を記載し、適正な保守管理を行っている。

③ 既設及び新設発電所の最適運用及び不具合時の対応能力が強化される。
- 既設及び新設発電所の最適運用計画が策定される。
- 既設及び新設発電所の最適運用計画に従って、ケーススタディによる研修が行われ、理解されている。
- 発電所及び送変電設備の事故時、緊急時の対策マニュアルが整備される。
- 発電所及び送変電設備の事故時、緊急時の対策に対して、トラブルシューティングが作成され、ケーススタディによる研修が行われ、対応能力が身についている。
- 機器故障時の連絡先リストが整備される。（本邦業者、現地業者）
- 中長期のメンテナンス計画及び予算計画が策定される。

④ エネルギー省のモニタリング体制が確立される。
- 水力発電設備及び送配電設備のモニタリング体制が確立され、方法が理解される。
- 電気料金、基金運用に係るモニタリング体制が確立され、定期的に報告される。

4. ソフトコンポーネントの成果の確認方法

4.1 成果達成度の確認方法

ソフトコンポーネントの実施期間は、メーカーによる初期運転指導後、引き続き行われる。成果達成度の確認はソフトコンポーネント実施中に行う。各成果について以下の方法で確認を行い、後述成果品として報告書にとりまとめる。具体的な指標は、ソフトコンポーネント実施開始までに設定する。各項目で実施した技術移転内容に対しては、実地報告書に確認結果を記載する。

項目	成果	確認方法
新設発電設備の運転及び保守管理	発電設備維持管理マニュアル	マニュアルに基づき手順、内容を理解しているかをチェックする。
	運転日誌	運転日誌の記載をチェックする。
	日常点検簿	日常点検簿の記録をチェックする。
	設備、予備品、備品台帳	台帳をチェックする。
土木設備の保守管理	土木設備維持管理マニュアル	対策マニュアル
	日常点検	日常点検簿の記録をチェックする。
	補修記録簿	保守記録、補修記録をチェックする。
既設及び新設発電所の最適運用	最適運用計画	最適運用計画に従って、ケーススタディによる研修が行われ、理解されているをチェックする。
発電所及び送変電設備の事故時、緊急時	事故時及び緊急時対策マニュアル	ケーススタディによる研修が行われ、対応能力が身についているをチェックする。。
	機器故障時の連絡先リスト	連絡先リストをチェックする。
中長期のメンテナンス計画	機器の交換予定及び予算計画	機器の交換予定及び予算計画をチェックする。
モニタリング	水力発電設備及び送配電設備のモニタリング体制と方法	体制、書式を確認する。
	電気料金、基金運用に係るモニタリング体制と定期報告	体制を確認する。

5. ソフトコンポーネントの活動（投入計画）

上記の 5 つの成果を達成するため、以下の活動を実施する。

ソフトコンポーネントに先だって、施設、機材の初期操作指導、維持管理方法の説明は、本邦の建設業者および機材納入業者によって実施される。

ソフトコンポーネントは、発電、土木及び送変電設備の運転、保守点検能力の強化、既設及び新設発電所の最適運用及び不具合時の対応能力強化及びエネルギー省のモニタリング体制の整備を支援し、プロジェクトが円滑に立ち上がり、既設及び新設水力発電所の最適運用、持続的な運用、維持管理を確保するために行うものである。

メーカーは個々の設備の詳細な運転、保守マニュアルを準備するもので、このマニュアルだけでは、既設及び新設発電所の最適運用及び不具合時の対応能力の強化を図ることはできない。また、日常点検等により、最新の設備状況を把握して予防保全を確立する。

なお、ソフトコンポーネントのメンテナンスの対象は、日常点検、軽微なメンテナンスであり、大規模なオーバーホール、大規模なスペアパーツの取替は中長期計画を策定し、メーカーに発注されるものとする。

5.1 適正な発電設備の運転及び保守管理方法の確立

① 対象者：発電所運転員、保守管理要員（発電所）、電気技術者

② 期間 ：国内 0.3 か月
現地 0.23 か月（竣工後） 計 0.53 ヶ月

③ 実施リソース：本邦コンサルタント
発電設備保守指導／最適運用指導：1 名（国内 0.3MM（6 日）、現地 0.23MM（7 日））

④ 活動項目と方法

活動項目	方 法	日数
1) 発電設備維持管理マニュアルの作成	国内作業で作成する。	6 日
2) マニュアルを使った実践訓練（OJT）	マニュアルに従って、運転の訓練を行う。 1 日目 AM：座学（発電設備の運転・保守基礎知識） 1 日目 PM：OJT（運転開始・終了、保守点検） 2 日目は別グループ	2 日 (2ｸﾞﾙｰﾌﾟ)
3) 運転日誌の作成、記録	運転日誌を作成し、OJT により指導する。OJT の結果に基づき修正を行う。	1 日 (2ｸﾞﾙｰﾌﾟ)
4) 保守記録及び補修記録	保守記録、補修記録簿を作成し、OJT により指導する。OJT の結果に基づき修正を行う。	1 日 (2ｸﾞﾙｰﾌﾟ)
5) 設備、予備品、備品台帳の作成	台帳作成の OJT	1 日 (2ｸﾞﾙｰﾌﾟ)

備考： 現地 0.23MM（7 日）のうち、5 日は研修、2 日はレポート作成
対象者を 2 グループ（各 2 チーム）に分けて現地研修を行う。1 日の場合は午前と午後に分けて各グループの研修を行う。

⑤ 成果品の種類
発電設備維持管理マニュアル、運転日誌、発電設備保守点検記録簿、実施状況報告書、設備・予備品・備品台帳等

5.2 適正な土木設備の保守管理方法の確立

① 対象者：保守管理要員（発電所）

② 期間　：国内　0.3 か月
　　現地　0.3 か月（竣工後）　計 0.6 ヶ月

③ 実施リソース：本邦コンサルタント
　　土木設備保守指導：1 名（国内 0.3MM（6 日）、現地 0.3MM（9 日））

④ 活動項目と方法

活動項目	方　法	日数
1) 土木設備維持管理マニュアルの作成	国内作業で作成する。	6 日
2) マニュアルを使った実践訓練（OJT）	マニュアルに従って、土木設備点検の訓練を行う。 1 日目：座学（土木設計、土木設備保守管理等） 2 日目：土木施設の保守点検 OJT	2 日
3) 土木設備の日常点検簿の作成、記録	日常点検記録簿を作成し、OJT により実践指導する。OJT の結果に基づき修正を行う。 1 日目：日常点検簿作成の OJT 2 日目：土木設備の保守点検 OJT	2 日
4) 保守記録及び補修記録	保守記録、補修記録簿を作成し、OJT により指導する。OJT の結果に基づき修正を行う。	1 日

備考：現地 0.3MM（9 日）のうち、移動往復 4 日、研修 5 日

⑤ 成果品の種類
　土木設備維持管理マニュアル、土木設備の日常点検簿、実施状況報告書等

5.3 既設及び新設発電所の最適運用及び不具合時の対応能力強化

① 対象者：発電所運転員、保守管理要員（発電所）、電気技術者

② 期間　：国内　各 0.3 か月
　　現地　各 0.3 カ月（竣工後）　計 1.2 ヶ月

③ 実施リソース：本邦コンサルタント
　　発電設備保守指導／最適運用指導：1 名（国内 0.3MM（6 日）、現地 0.23MM（7 日）
　　送変電設備保守指導：1 名（国内 0.3MM（6 日）、現地 0.3MM（9 日）

④ 活動項目と方法

活動項目	方　法	日数
1) 既設及び新設発電所の最適運用計画の策定	最適運用計画が策定される。	発電設備 3 日（国内）
2) 最適運用計画の適用	最適運用計画に従って、ケーススタディによる研	発電設備

	修が行われる。 1 日目 AM：座学（発電計画、最適運用ルール） 1 日目 PM：乾季、雨季、夜間、中間の典型的な負荷パターンに対する最適運用ルール策定 2 日目は別グループ	2 日（現地） （2ｸﾞﾙｰﾌﾟ）
3)発電設備及び送変電設備の事故時、緊急時の対策マニュアル作成	事故時、緊急時の対策マニュアルを作成する。 事故時の連絡体制、補修業者をリスト化する。	発電設備 1 日（国内） 送変電設備 6 日（国内）
4) マニュアルを使った実践訓練（OJT）	ケーススタディによる研修が行われる。 発電設備 1 日目 AM：座学（遠隔操作による自動運転、水車発電機関連の不具合例） 1 日目 PM：不具合の発見と対応策に係る OJT 2 日目は別グループ 送変電設備 1 日目 AM：座学（送変電設備の基礎設計、送変電施設の不具合例）PM:別グループ 2 日目：不具合の発見と対応策に係る OJT 3 日目：不具合の発見と対応策に係る OJT（配電保守チームと合同訓練） 4、5 日目は別グループで OJT	発電設備 2 日（現地） 送変電設備 5 日（現地） （2ｸﾞﾙｰﾌﾟ）
5) 中長期のメンテナンス計画	水力発電機器の交換時期、予算計画が作成される。	発電設備 2 日（国内） 1 日（現地） （2ｸﾞﾙｰﾌﾟ）

備考： 活動 1）2)、5)は水車発電機設備保守指導のみ、3）、4）は両担当者が行う。
水車発電機設備保守指導 現地 0.23MM（7 日）のうち、移動帰路 2 日、研修 5 日
送変電設備保守指導 現地 0.3MM（9 日）のうち、移動往復 4 日、研修 5 日
1 日の場合は午前と午後に分けて各グループの研修を行う。

⑤ 成果品の種類

最適運用計画（既設及び新設）、発電設備及び送変電設備の事故時、緊急時の対策マニュアル、事故時の連絡体制、補修業者リスト実施状況報告書等

5.4 エネルギー省のモニタリング体制の確立

① 対象者：エネルギー省職員、URA[2]職員（Utilities Regulatory Authorities）

[2] 公益事業規制庁（URA）は、政府から独立した規制機関として、パヌアツ全域で、安全で信頼性が高

② 期間 ：国内 0.3 か月
現地 0.23 か月（竣工後）計 0.53 ヶ月

③ 実施リソース：本邦コンサルタント
業務主任／モニタリング指導：1 名（国内 0.3MM（6 日）、現地 0.23MM（7 日）

④ 活動項目と方法

活動項目	方 法	日数
1) 水力発電及び送変電設備のモニタリング	効果的な設備に対するモニタリング体制と方法について関係機関と協議し計画を策定する。 モニタリングフォーム作成を支援し、OJT により指導する。 1 日目：ﾌﾟﾚｾﾞﾝﾃｰｼｮﾝ（ﾓﾆﾀﾘﾝｸﾞ体制、方法、計画提案） 2 日目：ﾓﾆﾀﾘﾝｸﾞ体制、方法、計画の協議、最終化 3 日目：設備に係るﾓﾆﾀﾘﾝｸﾞに係る OJT	4 日(国内) 3 日(現地)
2) 電気料金、基金運用に係るモニタリング	効果的な電気料金、基金運用のﾓﾆﾀﾘﾝｸﾞ体制と定期的な報告について関係機関と協議し計画を策定する。 1 日目：ﾌﾟﾚｾﾞﾝﾃｰｼｮﾝ（ﾓﾆﾀﾘﾝｸﾞ体制、方法、計画提案） 2 日目：ﾓﾆﾀﾘﾝｸﾞ体制、方法、計画の協議、最終化）	2 日(国内) 2 日(現地)

備考：現地 0.23MM（7 日）のうち、移動帰路 2 日、研修 5 日

⑤ 成果品の種類
水力発電及び送変電設備のモニタリング様式、実施状況報告書等

6. ソフトコンポーネントの実施リソースの調達方法

本ソフトコンポーネントは、前述のとおり、本邦コンサルタント 4 名（業務主任、発電設備保守指導、送変電設備保守指導、土木設備保守指導）が直接指導を行い、ローカルリソースの再委託は実施しない。その理由は以下のとおりである。

(1) ローカルリソースに技術レベルを満足する適当な人材がいない。
(2) 新設発電所は、既設水力発電所からの遠隔自動制御となるため、基本設計を行った本邦コンサルタントが行う必要がある。
(3) 水力発電施設は、発電設備、送変電設備、土木設備より構成され専門の複数名の本邦コンサルタントの配置が必要である。

く手頃な電力及び水道サービスの提供を保証することを目的に、コンセッション地域内外における電力及び水道事業者を規制し、運用状況をモニターしている。また、消費者の苦情を管理し、電気に関する諸問題について政府に助言する責務を有している。 コンセッション地域内外の電気及び水道料金の見直しを行う権限を有している。

7. ソフトコンポーネントの実施工程

本プロジェクトは政府間交換公文（E/N）締結後、51 カ月の工程で実施される。工事期間は、調達、施設建設、機材の輸送、据付、検査・試運転を含めて約 43 カ月を要すると想定される。

工事着工前には、E/N、コンサルタント契約、詳細設計、入札図書作成、入札、入札評価、業者契約が行われる。

ソフトコンポーネントの詳細工程表を表 7-1、7-2 に、全体実施工程表を表 7-3 に示す。

8. ソフトコンポーネントの成果品

ソフトコンポーネントの成果品は次表のとおりである。

項　　目	時期	概略頁数
1. 完了報告書	完了後	30 ページ
2. 実施状況報告書（各検収項目）	実施後	30 ページ
3. 発電設備維持管理マニュアル （運転日報、日常点検簿、点検、保守記録、緊急時対策等含む。）	完了後	50 ページ
4. 土木設備維持管理マニュアル	完了後	30 ページ
5. 発電設備及び送変電設備の事故時、緊急時の対策マニュアル（点検、保守記録、緊急時対策等含む。）	完了後	20 ページ
6. 既設及び新設発電所の最適運用計画	完了後	20 ページ
7.発電設備及び送配電設備モニタリング様式	完了後	10 ページ
8. 設備、予備品管理台帳	完了後	10 ページ
9. 中長期メンテナンス計画（予算計画含む。）	完了後	10 ページ

9. ソフトコンポーネントの概算事業費

ソフトコンポーネントに要する概算費用は、施工業者契約認証まで非公表

10. 相手国実施機関の責務

VUI は、本計画で建設された新設水力発電所を継続的に、適正に運転、維持管理を行っていくとともに、既設サラカタ水力発電所との最適運用を行い、ディーゼル発電の焚き減らしを効果的に行う責務がある。また、エネルギー省及び URA は、2 箇所の水力発電所が最適運用を行って得られる便益が、電気料金の低減、基金積立金に貢献しているかをモニターする。

ソフトコンポーネントによる技術移転の対象は VUI 職員となる。2 箇所の水力発電所の運営組織は、現在の運転員及び保守要員が計 10 名で行う予定である。増員及び新規採用については、VUI と協議する必要がある。

(a) 新設発電所運用に必要な運転要員及び点検・保守要員が確保される。
(b) ソフトコンポーネント実施に必要な VUI 運転員及び保守要員、エネルギー省職員、URA 職員が確保される。技術を習得した発電所運転員及び点検・保守要員が継続的に勤務する。
(c) 発電所運転員及び点検・保守要員の後継者が育成される。
(d) エネルギー省、URA の継続したモニタリング体制が確立され、予算が確保される。
(e) 大規模事故、天災被害等に対する支援が行われる。

これらの責務に対する実現の可能性、想定される阻害要因また阻害された時に取るべき必要な措置等を次表に纏める。

	実現可能性	想定される阻害要因	阻害された時に取るべき必要な措置
(a)	新設発電所運用に必要な運転要員及び点検・保守要員の確保	現在、既設発電所の 10 人が新設発電所の運転、維持管理にあたる予定であるが、業務が増えるため対応できない。	要員の追加
(b)	技術を習得した発電所運転員及び点検・保守要員が継続的に勤務する。	職員の転職、退職	VUI 雇用計画に反映
(c)	発電所運転員及び点検・保守要員の後継者が育成		VUI 雇用計画に反映
(d)	エネルギー省、URA の継続したモニタリング体制の確立及び予算確保	人員不足、予算不足	事前に計画を立てておくことで、人員不足、予算確保する。
(e)	大規模事故、天災被害等	発電が停止する等の大規模な事故で、VUI 単独では復旧ができない。	政府の財政支援 JICA フォローアップ

コンセッション契約書の概要

コンセッション付与者は、サント島の一部とコンセッション計画で特定されたバヌアツの他地域において、バヌアツの国家エネルギーロードマップで政府が定めた以下の目的に対してコンセッション計画に基づいて実施することを要請するものである。

- アクセス可能なエネルギー
- 手頃なエネルギー
- 安全で信頼性の高いエネルギー
- 持続可能なエネルギー
- グリーン成長

これらの目的達成のために付与者は入札プロセスを実施し、全ての必要な承認を得た。

契約書の構成は以下のとおりである。

1. 定義された用語と解釈
2. 条件の判例
3. サービスの提供
4. 資産及びアクセス権の所有権
5. 特約手数料と国家グリーンエネルギー基金
6. 資産の維持
7. 年間事業計画及びその他の報告要件
8. 下請け契約
9. 担保権と契約期間
10. 運用システム
11. URA 監査
12. 知的財産
13. 保険
14. 契約履行保証
15. 罰則、清算された損害賠償および延滞額の利息
16. 不可抗力イベント
17. 法の変更
18. デフォルトと終了
19. 有効期限または終了時の引き渡し
20. コンセッションの購入
21. 表示および保証
22. 補償と責任の制限
23. 紛争解決
24. 税金及び費用
25. 守秘義務
26. 通知
27. 許諾者（コンセッション）の役割
28. 贈収賄防止・腐敗
29. 一般

a) 任命、更改、その他の取引
b) 通知する義務
c) 同意と承認
d) 賠償の継続と存続
e) 副本条項
f) 累積的な権利
g) 完全合意
h) 追加保証
i) 無効
j) 法的アドバイス
k) 損失に対する責任免除
l) 支払い
m) 当事者の関係
n) 分離条項
o) 変更
p) 特定履行
q) 存続と合併
r) 第三者の権利
s) 免除
t) 準拠法

契約書には以下の付属文書（schedule）が添付されている。

スケジュール 1： ディクショナリー
スケジュール 2： 新しい顧客接続
スケジュール 3： サービス
スケジュール 4： コンセッション要件
スケジュール 5： 満了または終了に対する義務
スケジュール 6： 初期資産登記
スケジュール 7： コンセッションエリア計画
スケジュール 8： コンセッションの表示と保証
スケジュール 9： 年次事業計画
スケジュール 10： 履行保証フォーム
スケジュール 11： ネットワーク技術要件
スケジュール 12： 低電圧顧客契約フォーム
スケジュール 13：高電圧顧客契約フォーム
スケジュール 14：移行計画フォーム
スケジュール 15： 下請け通知フォーム
スケジュール 16： ベースライン汚染レポート
スケジュール 17： 土地関連のリース文書

備考：
スケジュール 2： 新しい顧客接続
コンセッション所有者は、毎年、次の新規顧客に電力を供給する。

(a) 2019年にコンセッション地域内において300の純新規顧客。

(b) 2019年にコンセッション地域外において50の純新規顧客。

(c) 2020年にコンセッション地域内において300の純新規顧客。

(d) 2020年にコンセッション地域外において50の純新規顧客。

(e) 2021年にコンセッション地域内において30の新規顧客。

(f) 2021年にコンセッション地域外において50の純新規顧客。

(g) 2022年にコンセッション地域内において300の純新規顧客。

(h) 2022年にコンセッション地域外において50の純新規顧客。

(i) 2023にコンセッション地域内において300の純新規顧客。

(j) 2023年にコンセッション地域外において50の純新規顧客

スケジュール 3： サービス

このコンセッション契約に従って顧客に供給される電力の 100%は、2030 年 6 月 30 日までに再生可能エネルギー源の対象となる。

開始日から 10 年間の満了までに、コンセッションエリア内の適格な再生可能エネルギー源に 0.3 MW の新しい追加発電を設置する。

スケジュール 11： ネットワーク技術要件

1. 配電ネットワーク
2. サービスループ
3. 延長工事またはサービスループに対する共通規定
4. メーター（低圧用、高圧用、メーター検針）

スケジュール 14：移行計画フォーム

1. 従業員の移転
2. 契約の移譲
3. 顧客
4. メンテナンスプラン
5. オペレーティングシステム
6. ブランディング
7. 緊急対応
8. 障害報告システム及び通信
9. ディーゼル燃料（潤滑油を含む）
10. 特定の供給、機器及び車両
11. スペアパーツ
12. サイトアクセス/セキュリティ
13. 記録/データ
14. ネットワーク計画

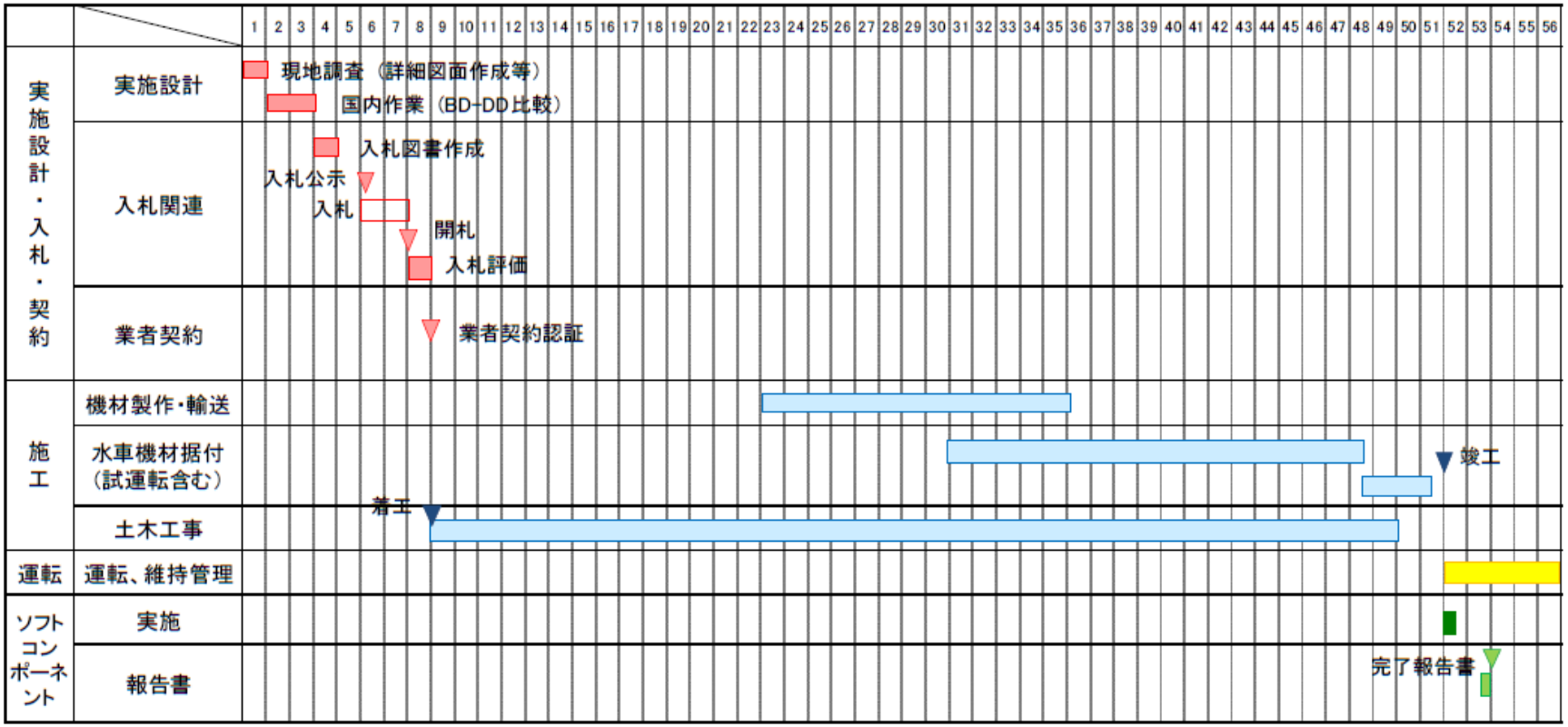
スケジュール 16:

Department of Environment, Protection and Conservation (DEPC)が作成したサラカタ川水力発電所及びルーガンピルディーゼル発電施設における環境汚染に係るレポートを添付

ソフトコンポーネント　詳細工程（案）

項目	活動
活動	ソフトコンポーネント詳細計画の策定
	発電設備維持管理マニュアルの作成
	土木設備維持管理マニュアルの作成
	発電設備及び送変電設備の事故時、緊急時の対策マニュアル作成
	既設及び新設発電所の最適運用計画策定
	中長期のメンテナンス計画策定
	設備、予備品台帳の作成
	実施報告書の作成
	完了報告書の作成
	発電設備の運転及び保守管理に係る実践訓練（0JT）
	土木設備の保守管理に係る実践訓練（0JT）
	既設及び新設発電所の最適運用能力強化のための実践訓練（0JT）
	事故時、緊急時の対応能力強化のための実践訓練（0JT）
	エネルギー省のモニタリング体制の確立
指導者	業務主任/モニタリング指導
	最適運用/発電設備保守指導
	送変電設備保守指導
	土木設備保守指導

ソフトコンポーネントの全体実施工程（案）



資料 6：収集資料リスト

6. 収集資料リスト

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

資料 7:その他

(1) 現地新聞記事

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.

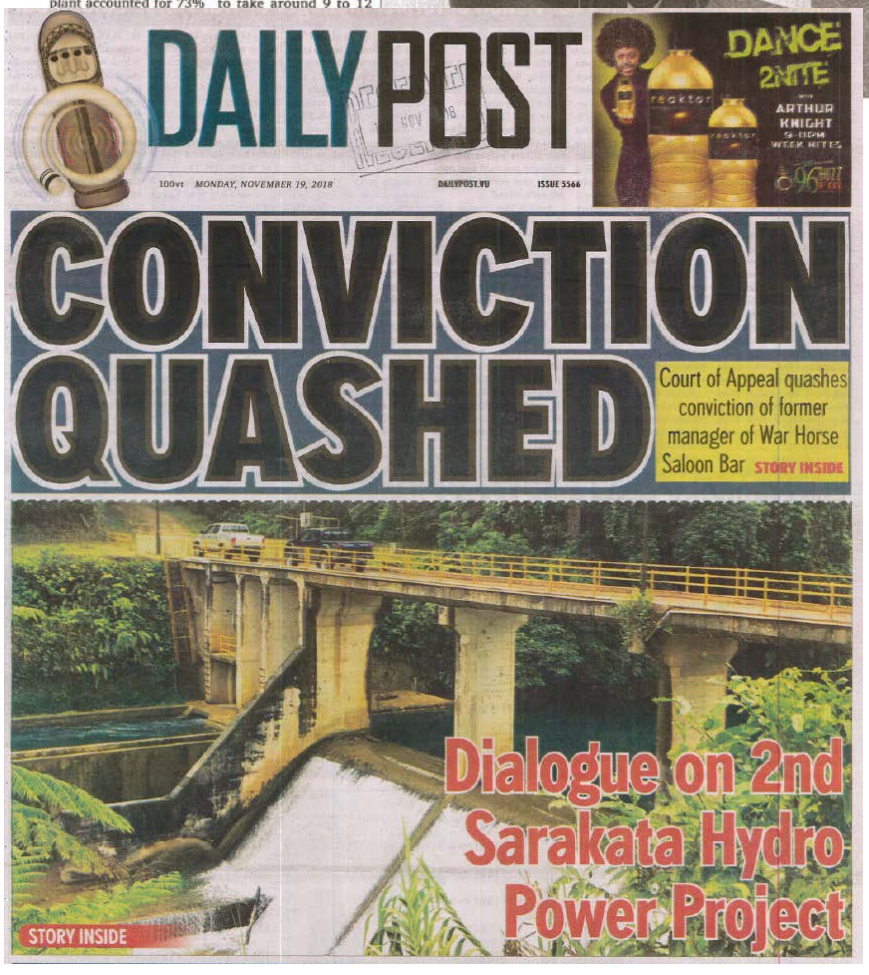
The Second Extra Ordinary Session at the end of this month will be his first parliament sitting as the Clerk of Parliament.

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(案)

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) EIA の TOR

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) ステークホルダー協議議事録

ステークホルダー協議議事録

表 ステークホルダー協議の概要

No.	開催日	開催場所	主な議題
1	2018 年 11 月 20 日	Sanma 州政府事務所	準備調査の説明及び現地調査（測量等）の同意
2	2018 年 12 月 5 日	Sanma 州政府事務所	現地調査の進捗説明及び用地の確認
3	2019 年 6 月 17 日	Natoto 村	環境社会配慮調査の説明及びカットオフデートの設定
4	2020 年 12 月 16 日	Sanma 州政府事務所	プロジェクト概要及び環境社会配慮調査結果の説明及び質疑応答、並びにプロジェクト実施の受入支持の確認

（1）第1回：2018年11月20日＠サンマ州政府事務所

GOVERNMENT OF THE
REPUBLIC OF VANUATU

**DEPARTMENT OF
ENERGY**

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GOUVERNEMENT DE LA
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**DÉPARTEMENT DE
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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

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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

REPUBLIC OF VANUATU

MINISTRY OF LANDS

DEPARTMENT OF LANDS, LANDS SURVEY AND LAND RECORDS

CONSENT FORM

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Name	Vernac	Signature	Date	Other Comments

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

Page 7 of 9

Position: Lands Officer

Signature

Date and Time: 20/11/18 : Tam 10.38

Place: SANMA Province

Name of Witness:

Signature:

Date and Time:

Place:

Annex 3

（2）第2回：2018年12月5日＠サンマ州政府事務所

GOVERNMENT OF THE
REPUBLIC OF VANUATU

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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.

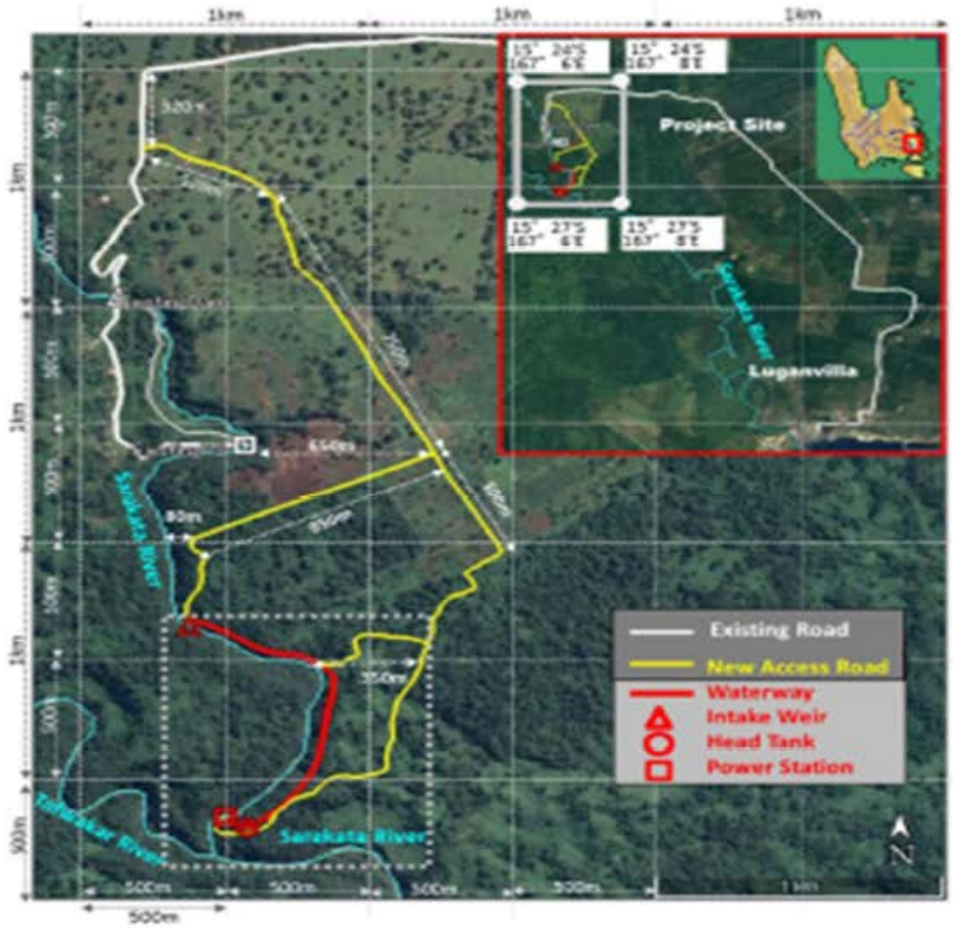
The representative of the four land owners present in the meeting appreciated the works carried out so far, moreover, that new findings from the field survey could be shared to them. They also appreciated that all communications to landowners was channeled through the committee.

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.

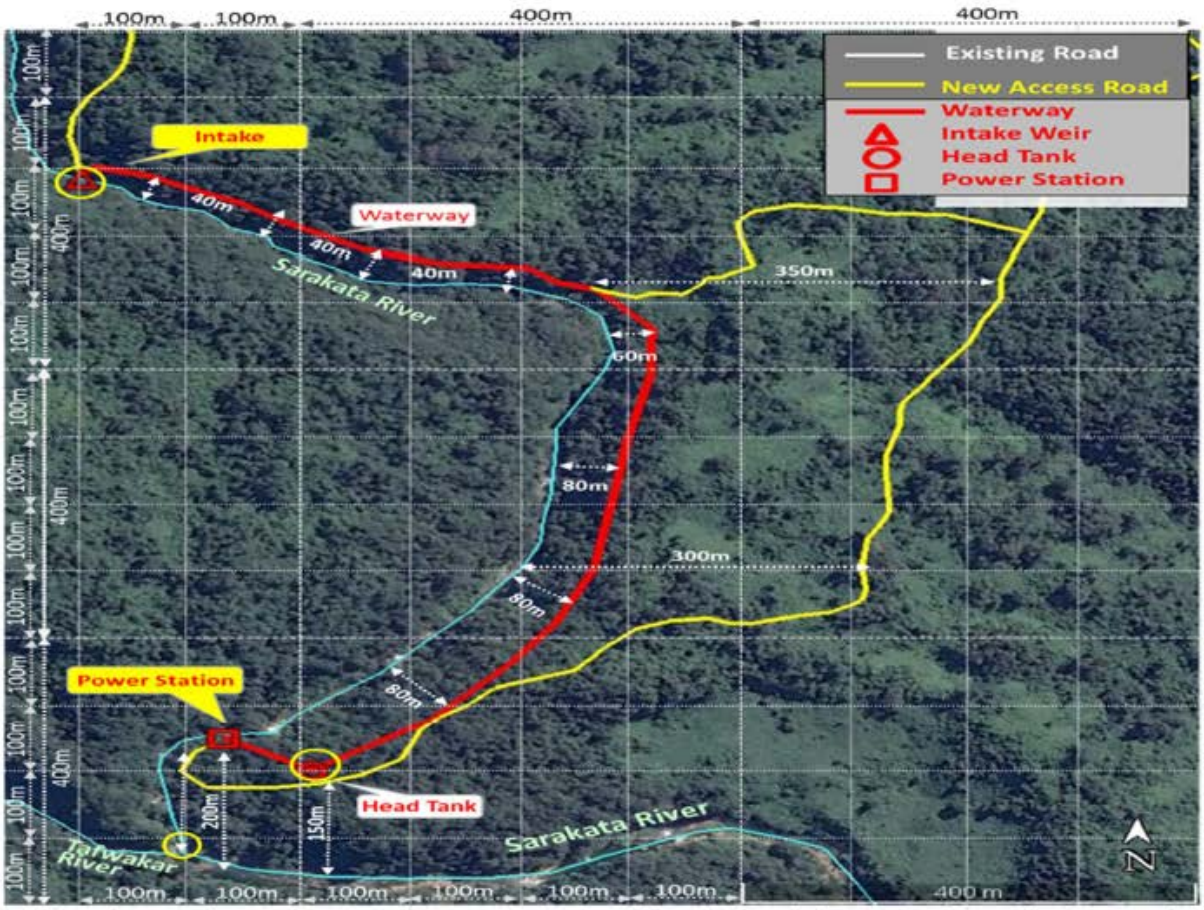
SARAKATA HYDRO PHASE TWO COMMITTEE		
Name	**Executive Position**	**Contact**
Newman Tangis	Secretary	5337857
Solomon Emil	Member	
Philimon Loe	Member	
Sakias Tosu	Chairman	5334677

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）第 3 回：2019 年 6 月 17 日@ナトト村

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）第 4 回：2020 年 12 月 16 日@サンマ州政府事務所

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. <u>Result of the Environmental Impact Assessment (EIA) and the Social Impact Assessment (SIA): By DEPC (Ms Julie Vatu)</u>

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. <u>Outline of the Land Acquisition Plan: BY DOE (Matthew Tasale)</u>

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.

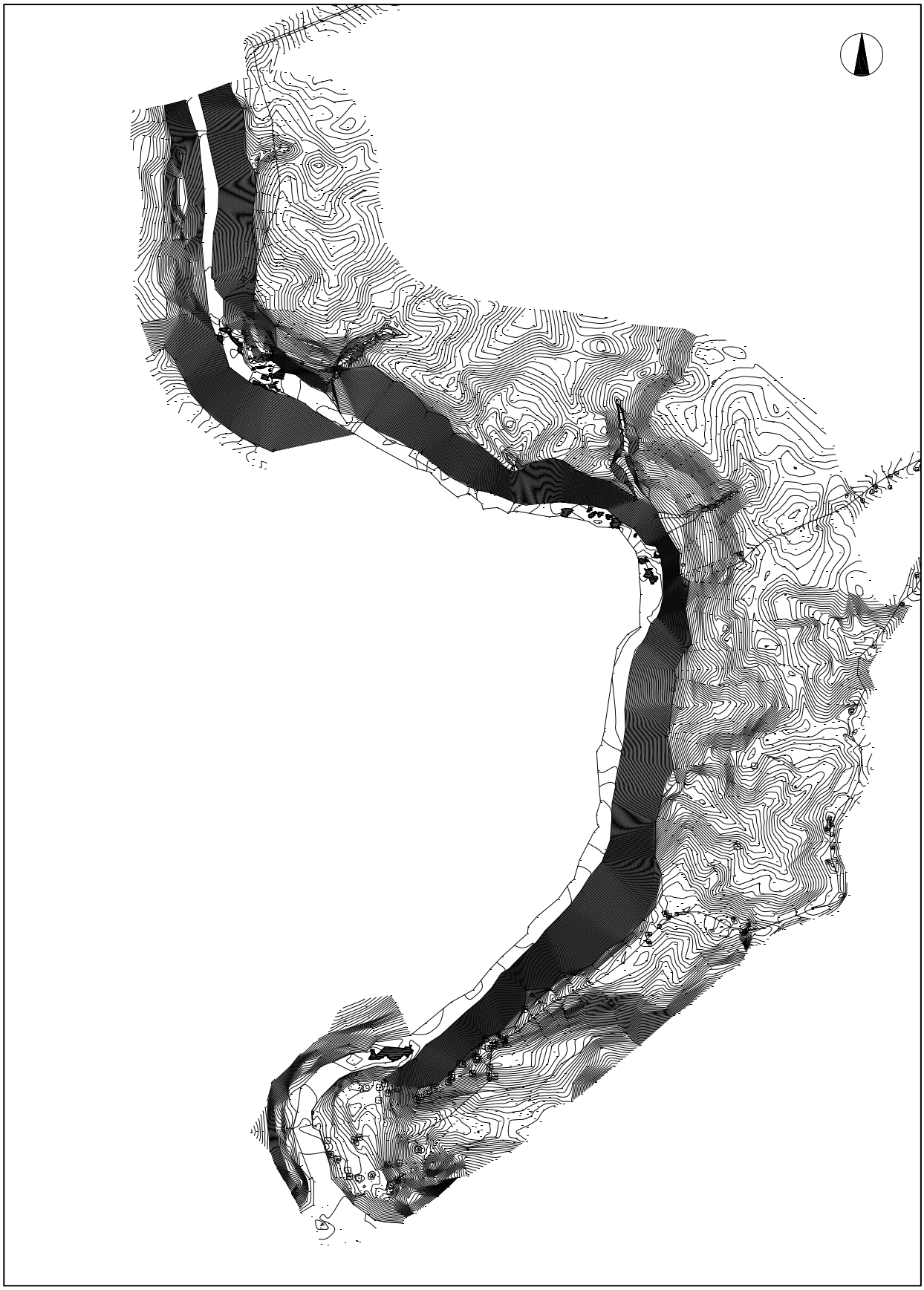
4. Others
    - The representatives of the land owners want to have a meeting of understanding with the Government and the Project Contractors before the construction begins
    - The land owners want to have a meeting of understanding with the Government before the operation of the new power plant

I. Attendees of the 4th Consultation Meeting

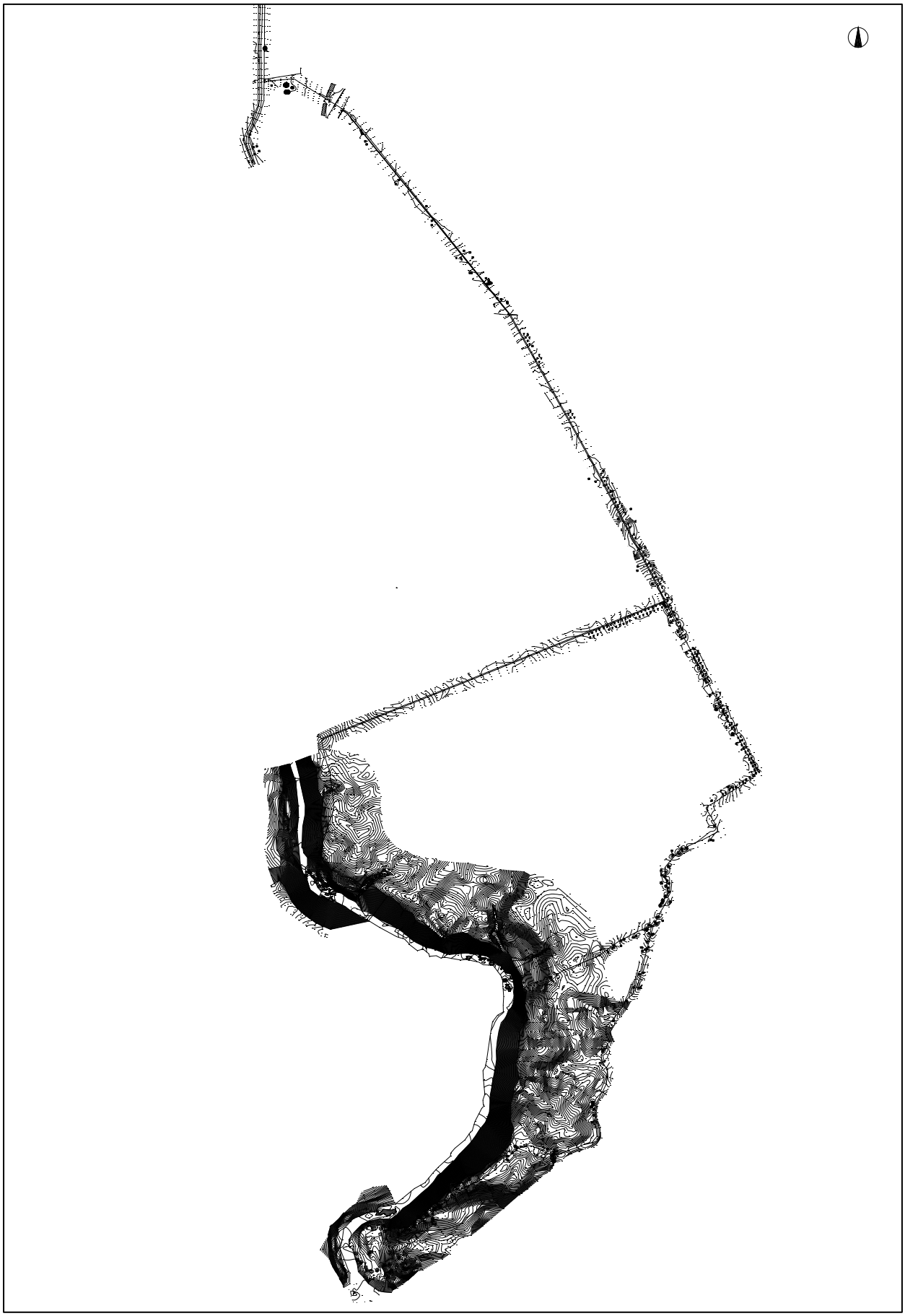
	Name	Title (Responsibility)	Village or Office	Contact (Mobile/Address)
1	Sackias Tosu	Custom Owner Rep (also Sanma Province elected Councillor)	Fanafo village	
2	Jeffery Sul	Custom Owner Rep (also Sanma Province elected Councillor)	Fanafo Monexil village	
3	Newman Tangis	Custom Owner Rep	Fanafo village	
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) 測量成果品

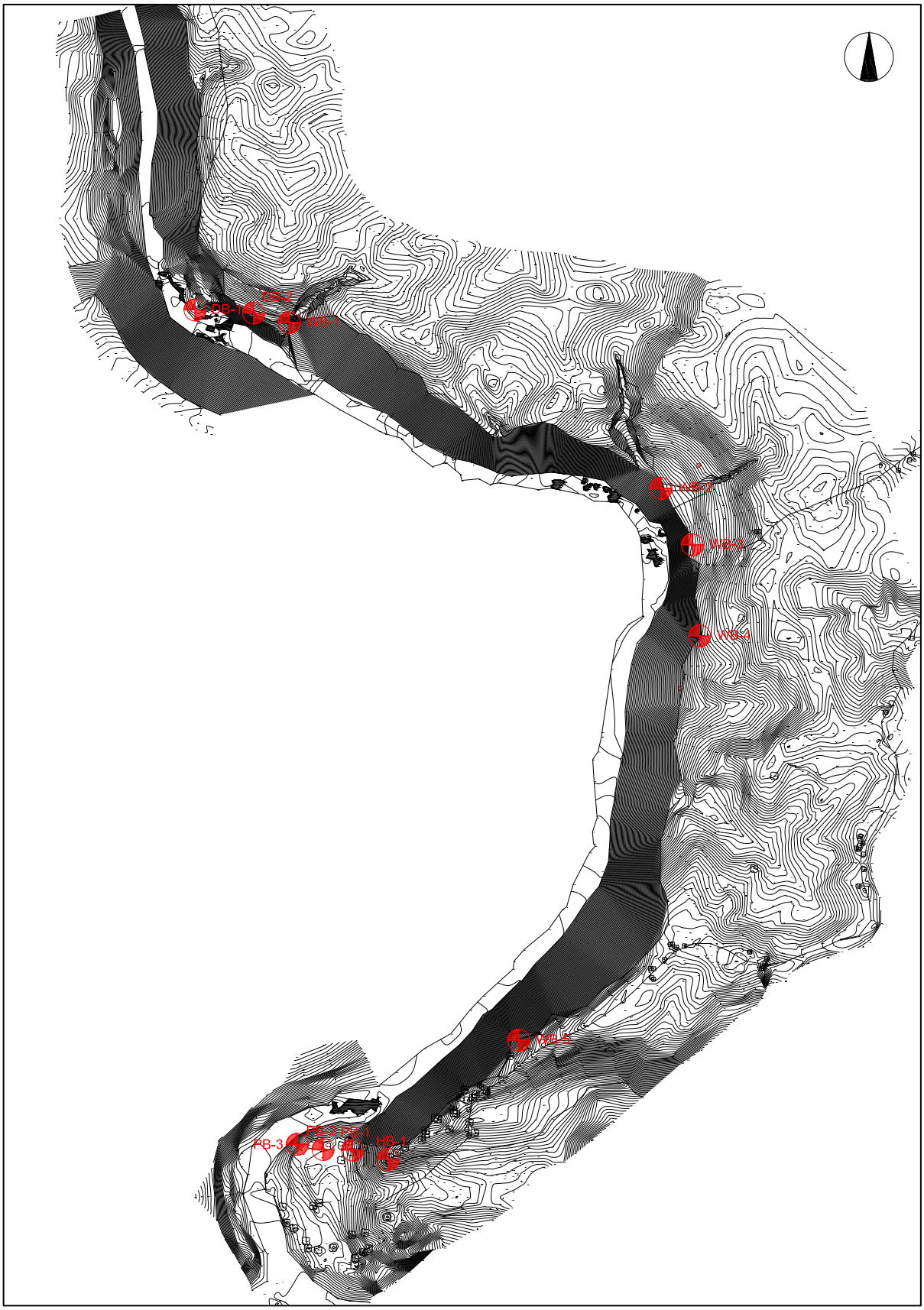


地形図（水力地点）



地形図（アクセス道路）

(6) ボーリング柱状図



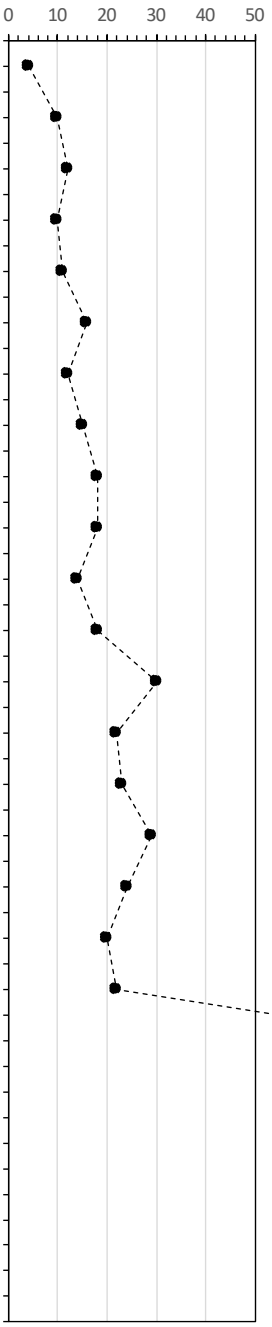
ボーリング位置図

ボーリング柱状図：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



ボーリング柱状図：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							
13							
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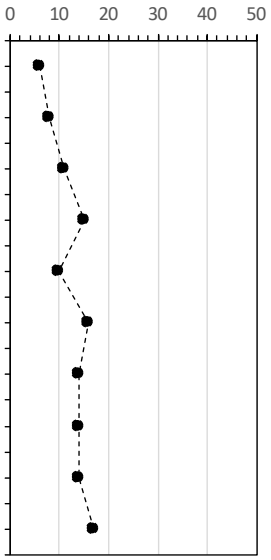
Graph of N-Value Variation with depth



ボーリング柱状図：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	Graph of N-Value Variation with depth
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						
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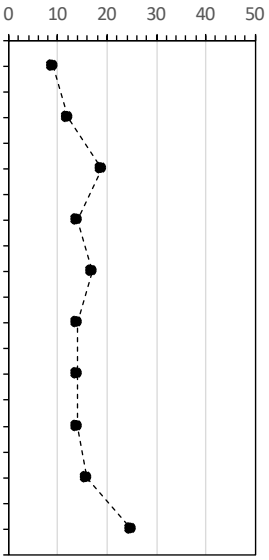

ボーリング柱状図：WB-3

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							
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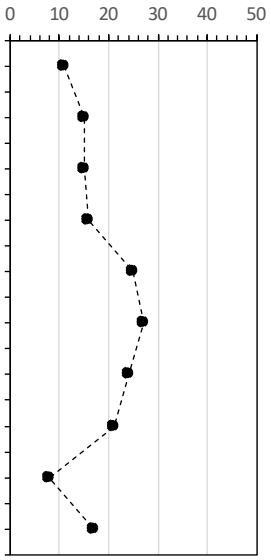
Graph of N-Value Variation with depth



ボーリング柱状図：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.	5	6	5	11	11	
2			4	7	8	15	15	
3			5	5	8	13	13	
4			13	5	6	11	11	
5			3	4	4	8	8	
6			3	3	4	7	7	
7			3	5	9	14	14	
8			3	3	5	8	8	
9			2	3	4	7	7	
10			3	4	6	10	10	
11		END OF BOREHOLE AT 10.5 METERS IN DEPTH						
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ボーリング柱状図：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	Graph of N-Value Variation with depth
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						
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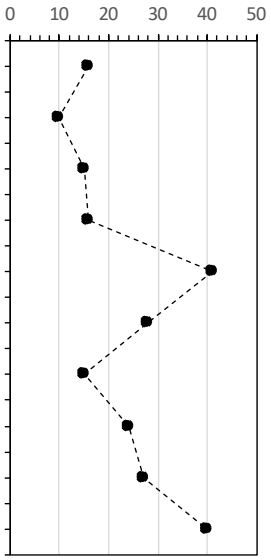
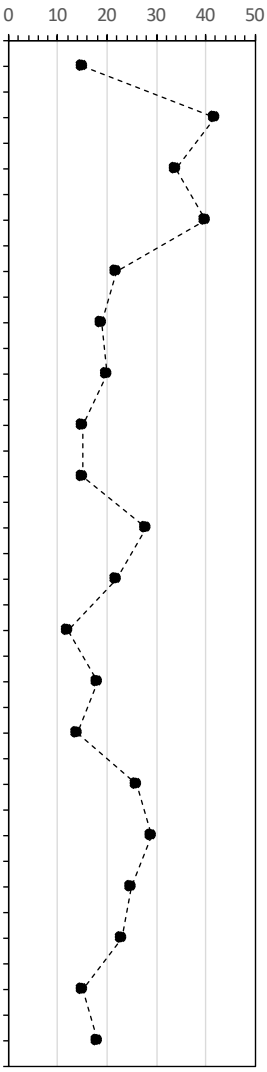


ボーリング柱状図：HB-1

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							
24							
25							
26							
27							
28							
29							
30							

Graph of N-Value Variation with depth

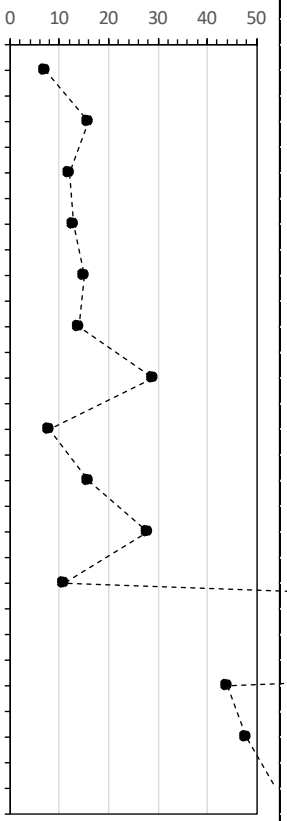


ボーリング柱状図：PB-1

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		Dep. 3.5 - 4.0m: A boulder of hard limestone.	6	9	6	15	15
6			5	7	7	14	14
7			12	11	18	29	29
8		Dep.7.3 - 12.0m: sea-shore deposits without coral limestone. Dep.7.3 - 7.5m: Old soil (dark brown colored clay). Dep.8.0 - 9.0m, 11.0 - 12.0m: Coarse sand, pale yellowish. Dep.9.0 - 11.0m: Sandy silt, dark greensih gray.	3	3	5	8	8
9			7	7	9	16	16
10			9	12	16	28	28
11			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							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

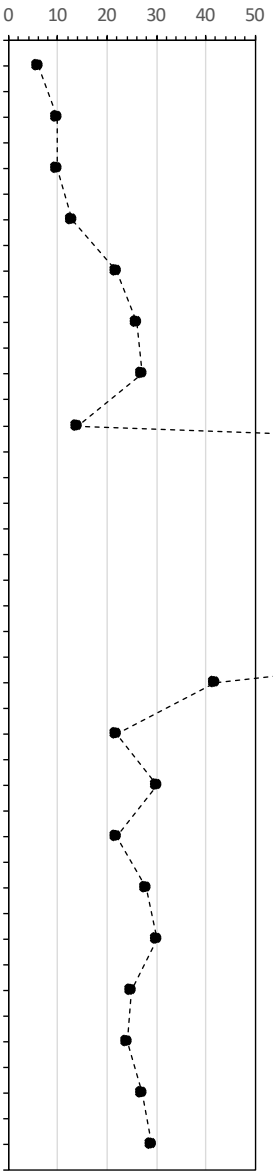
Graph of N-Value Variation with depth



ボーリング柱状図：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

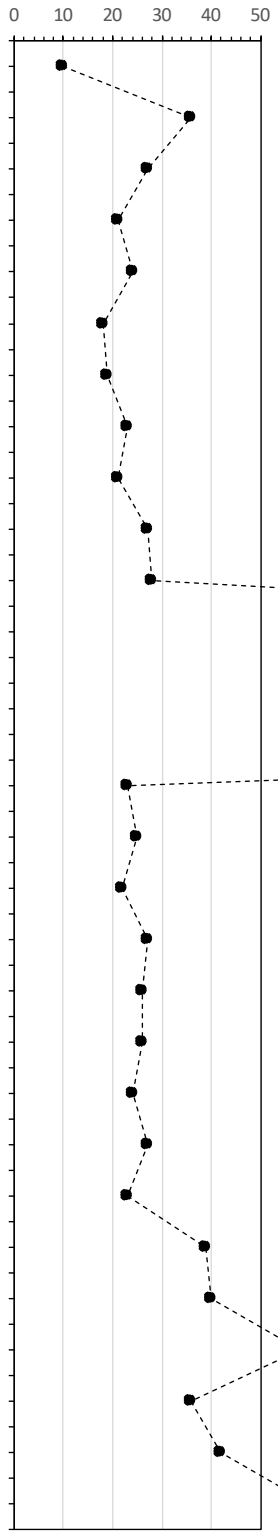
Depth (m)	Geologic Column	Description	SPT Blow Count 1st	2nd	3rd	N-Value	Modified N-Value
0							
1		Dep.0 - 3.0m: Debris flow deposit, subangular gravel of limesotne fragments mixing with clay, brown colored.					
2			3	20	12	32	6
3			5	50/4		50/4	10
4		Dep.3.0 - 4.0m: Hard coral limestone (a boulder).					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							



ボーリング柱状図：PB-3

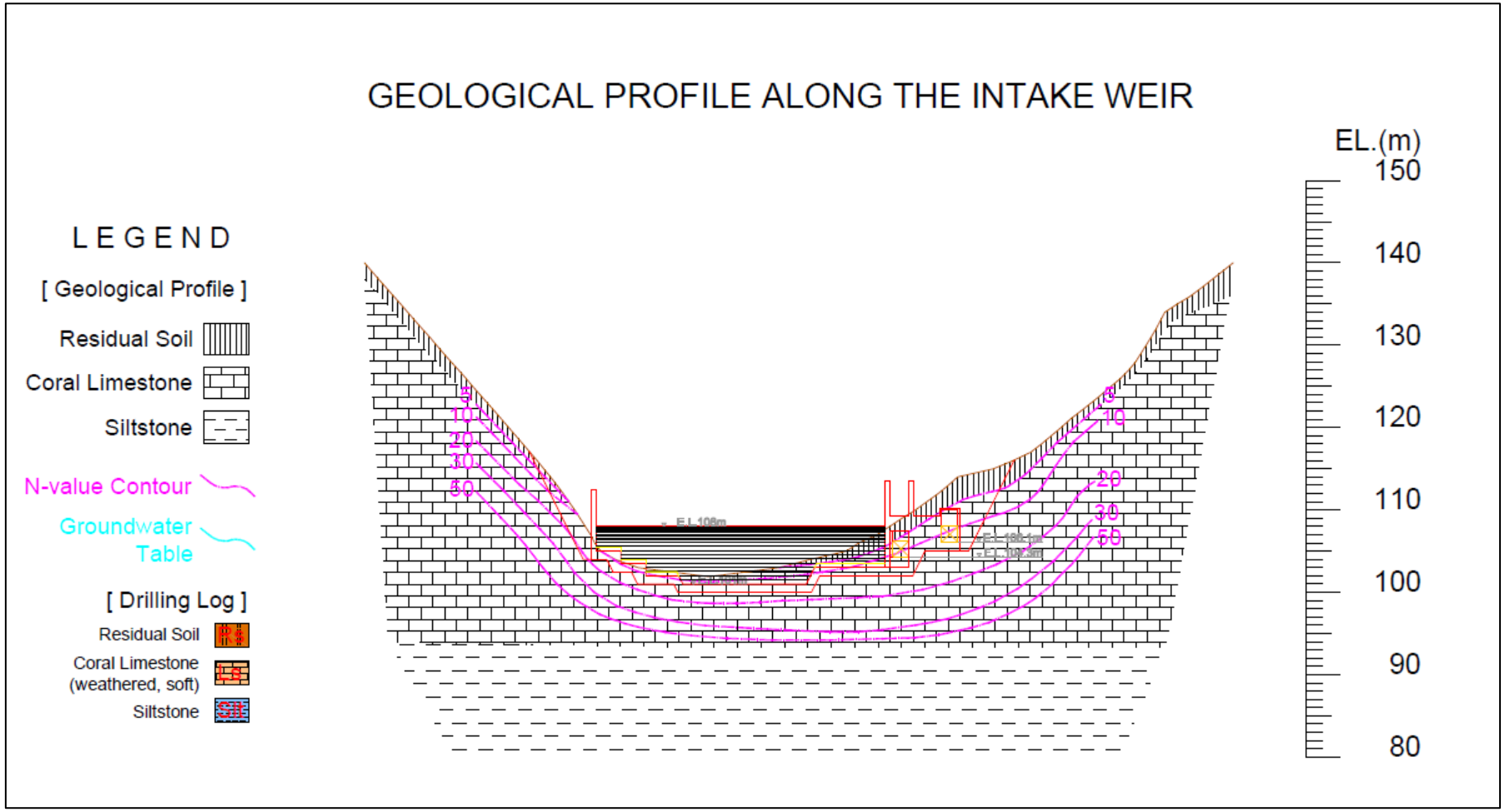
Project :	THE PREPARATORY SURVEY FOR THE PROJECT FOR CONSTRUCTION OF HYDROPOWER STATION IN ESPIRITU SANTO ISLAND							
Borehole No.	PB-3	Location	TAILRACE		Coordinate	X =	726786.14	
Elevation(m):	73.26	GWL(m):	-0.70		(UTM, WGS84)	Y =	8291641.93	

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					

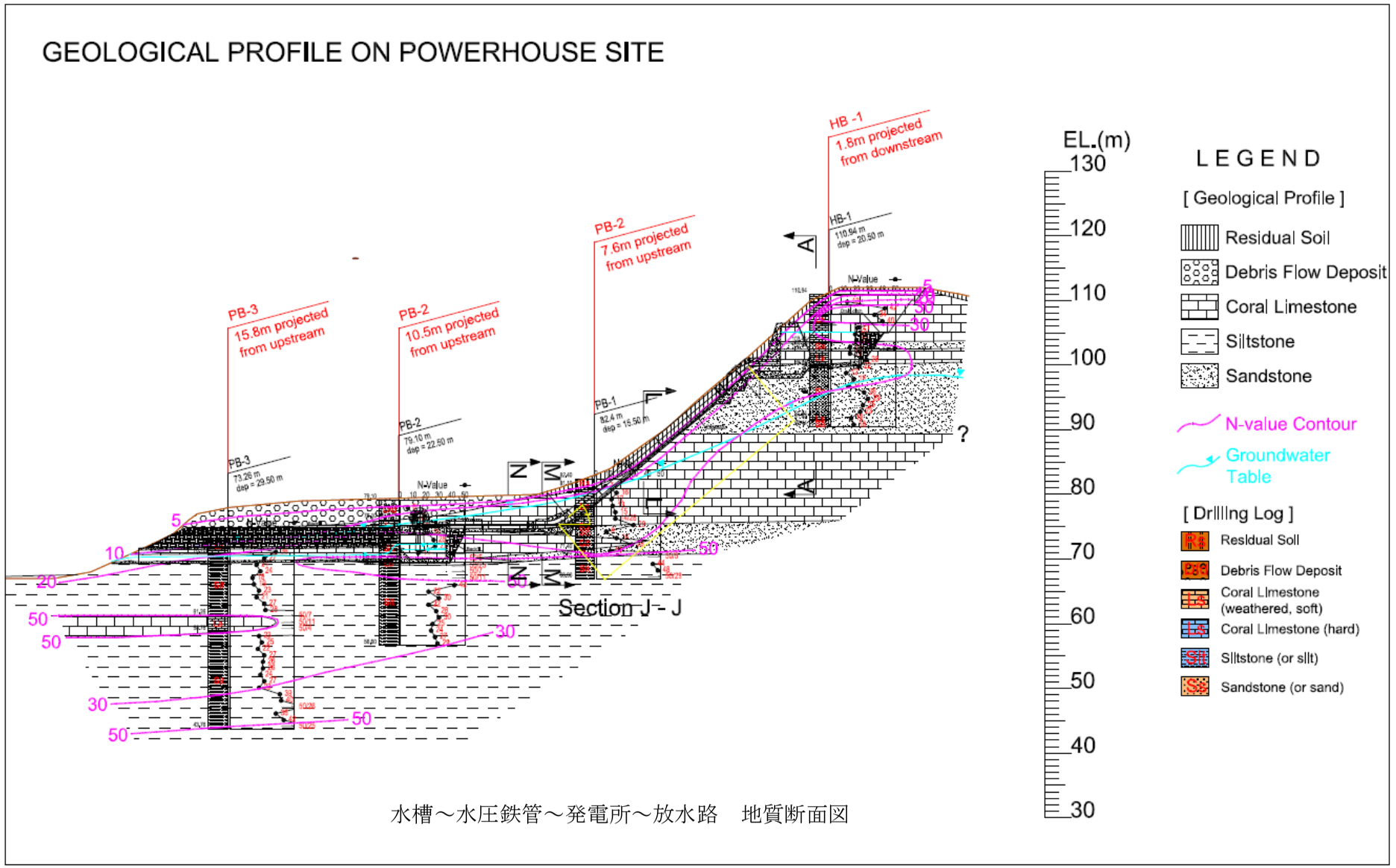


室内試験結果　一覧表

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 PROFILE ALONG THE INTAKE WEIR
EL.(m)
150
140
130
120
110
100
90
80
LEGEND
[Geological Profile]
Residual Soil
Coral Limestone
Siltstone
N-value Contour
Groundwater Table
[Drilling Log]
Residual Soil
Coral Limestone (weathered, soft)
Siltstone
5
10
20
30
50
EL.106m

取水堰堤　地質断面図



水槽～水圧鉄管～発電所～放水路　地質断面図