資料－１２　自然条件調査結果（2 回目）

REPORT

YACHIYO ENGINEERING CO., LTD

Improvement of Radio Broadcasting Network for Disaster Prevention in the Solomon Islands
Site Survey and Soil Investigation Report - Revised Site

Report prepared for:

YACHIYO ENGINEERING CO., LTD

Report prepared by:

TONKIN & TAYLOR INTERNATIONAL LTD

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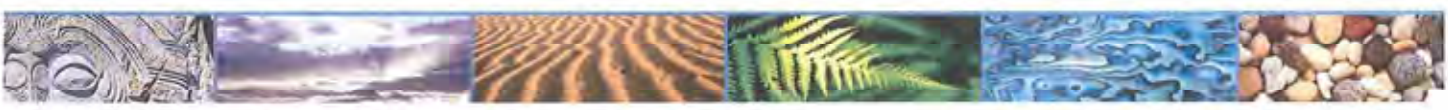

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1 Introduction

1.1 General

Yachiyo Engineering Co., Ltd (YEC) engaged Tonkin & Taylor International Ltd (T&TI) to carry out the soils investigation and topographical survey for the proposed improvement of the radio broadcasting network for the administration of disaster prevention in the Solomon Islands. The survey site is located near Henderson Airport on the island of Guadalcanal.

T&TI previously undertook investigations for this project in September 2009, the results of which are summarised in our report dated October 2009. However, due to land ownership issues, the project site has been moved to its present location approximately 300 m to the south east and the investigations have been repeated. This report makes reference to the results of the September 2009 investigations to broaden the understanding of the general area.

The investigation and survey have been carried out in accordance with the "Contract and Specification" (ref: Appendix A). The investigation work was completed from 13 to 15 December 2010 and was undertaken under the continuous supervision of a Field Investigation Manager from Tonkin & Taylor International, Mr Paul Hayes.

The soils investigation consisted of two hand auger boreholes along with two Scala penetrometer tests and laboratory testing of recovered soil samples. This work scope was agreed with YEC. This report summarises the results of the soils investigation and topographical survey work carried out.

1.2 Project Description

The Solomon Islands consists of nearly one thousand islands. Together they cover a land mass of 28,400 square kilometres. The capital is Honiara, located on the island of Guadalcanal.

The proposed project involves constructing two new short wave transmitting antennas and associated buildings to assist the local administration to co-ordinate between the islands in the event of a natural disaster. The project also involves upgrading existing antenna on some of the outer islands. No topographical survey or investigations were required on the outer islands.

The location of the site to be developed is described in more detail in Section 2.

2 Site Description

2.1 General

The project site is close to Henderson International Airport, which is positioned approximately 12km to the east of Honiara. The proposed antenna site is located approximately 1km to the south east of the airport runway. In the vicinity of the site there is an existing transmitter building, a generator hut and a house owned by the Solomon Islands Broadcasting Centre (SIBC).

Various short wave, medium wave and disused antennas are located to the north, east and west of the site.

The revised project site is located to the south of the generator hut and is bound to the west and south by overhead transmission lines. To prevent interference with the radio transmission, it was necessary to situate the project area at least 50 m from these lines.

At the time of the survey, the site was covered in 1-2 m high grasses. From discussions with SIBC, we understand that the site may have been farmed at some stage in the past, but has been disused for some time. Grass fires are common during the dry season and the site is frequently flooded during the rainy season.

The project site is relatively flat, except for a few mounds immediately to the south, a water filled trench and ridge immediately to the north and two approximately 3 m diameter by 2 m deep craters near the centre of the site. These are discussed in more detail in Section 2.2. At the time of the survey, the majority of the site was firm and dry underfoot, although there were a few swampy areas.

The location of the proposed antenna site in relation to the airport is shown in Figure 1 below and on the photographs in Appendix E.

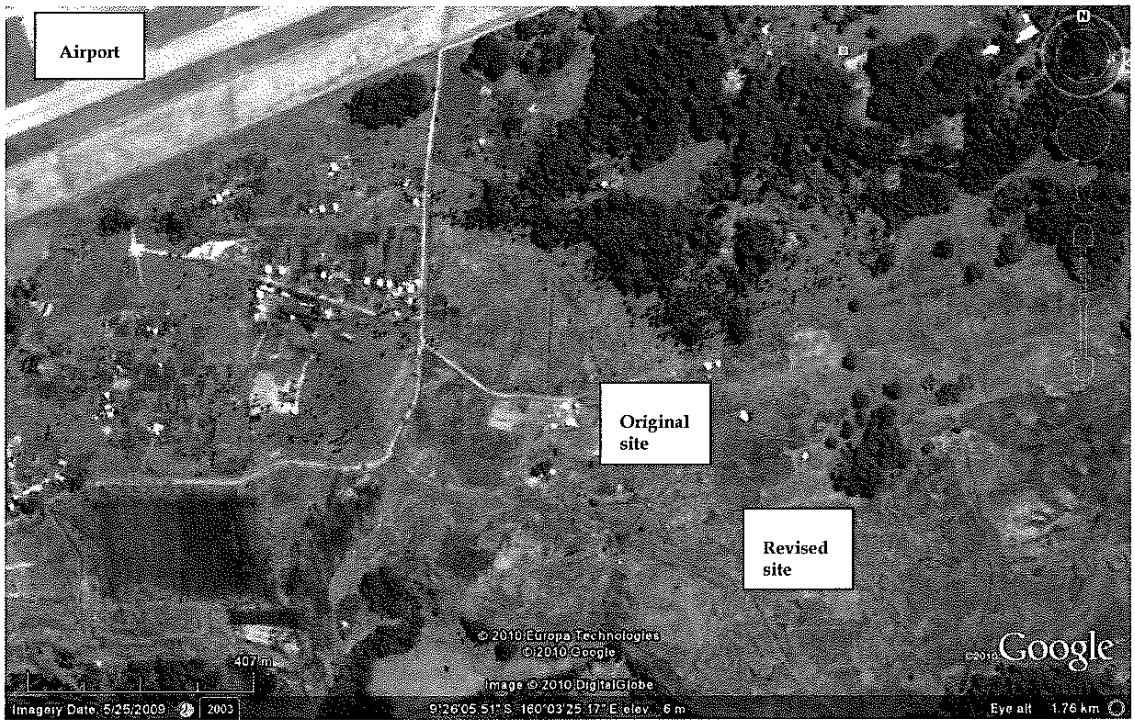

Figure 1: Site location plan

2.2 WWII relics

T&TI was initially advised by YEC that the site had been cleared of unexploded ordinances. However, during the initial site reconnaissance on 13 December 2010, T&TI came across what appears to be the unexploded head of a mortar shell (Figure 2). Following discussions with locals, SIBC and RAMSI police officers (Regional Aid Mission to the Solomon Islands), our understanding of the site history is as follows:

- The general airport area was the scene of some of the fiercest fighting during the Battle of Guadacanal (dates). The whole area is littered with unexploded ordinances and these are being discovered all the time.

- The project site has been "cleared" to the extent that if someone happens to discover an unexploded ordinance it will be removed. The new project site has not been "cleared" to the same extent as the original one as it is further from houses and the land has not been used for some time.
- The small mounds immediately to the south of the project site are buried stockpiles of unused ammunition left behind by the Americans following the end of WWII.
- The straight trench and channel immediately to the north of the project site is part of the war time military operations.
- Given the site history, we infer that the two holes found within the project site may be explosion craters.

SIBC undertook to arrange with Solomon Islands Police to visit the site and officially clear it of any remaining ordinances. This had not commenced prior to our departure.

3 Summary of Site Survey

The topographical survey was carried out from 13 to 15 December 2010 by Discovery Marine Limited (DML). After meeting with YEC on the evening of 13 December and again with YEC and SIBC on the morning of 14 December, it was evident that the final location of the project site had not yet been confirmed. There were, however, a number of constraints which governed the selection of the site. The site must be:

- located on SIBC land.
- located further than 100 m from the centre point of the antennas to the north of the broadcasting building
- located further than 50 m from the transmission lines and any other structures

On the evening of 13 December, YEC supplied T&TI with an aerial photograph with overlaid property boundaries. On 14 December DML undertook a survey on a 10 m grid over an area of 160 by 140 m. Based on this broad coverage, DML was able to select the most suitable location for the 80 m by 45 m site. This area was marked out on the ground and surveyed on a 5 m grid on 15 December. YEC inspected and approved the location of the marked site.

On 15 December YEC brought to site a copy of an old survey plan for the site, with co-ordinates of two of the boundary marks. Concrete pillars marking two of the boundary points were located on site, while a third pillar adjacent to the generator hut is not considered to represent a boundary point.

Based on the available data, it appears that the marked project site is located on SIBC land. However, there is a discrepancy with the site datums that has not been resolved. DML referenced their survey to a survey mark called Guy 3 which had UTM 57 S GPS coordinates of 8957529.700 N 614124.300 E. In comparison, the Ministry of Land survey data (also in UTM 57 S) gave the coordinates of "Guy 3" as 8958280.370 N 614021.070 E, a difference of 750.670 m in the north direction and 103.230 m in the east.

The reason for this discrepancy is not known, and it is possible that the Ministry of Land use a local adjustment to the UTM 57 S grid. It is worth noting that the DML GPS coordinates are consistent with those on the Solomon Islands Orthophotomap 1:5,000

Honiara G2, 2007, while the property cadastral survey plots to the north of the airport on this coordinate system.

While the datum discrepancy remains unresolved, DML have presented their data in two formats; UTM 57 S GPS coordinates and adjusted (local UTM57 S datum) coordinates.

A Trimble RTK GPS system consisting of the following equipment was used during the site survey:

- Trimble 5700 base receiver (12 channel dual frequency)
- Trimble 5800 receiver – rover unit with TSC2 controller (RTCM messages transmitted from base station to rover unit via UHF radio link)

This enables positional accuracy to be +20mm/ -20mm vertically and +10mm/ -10mm horizontally.

The topographical survey of the site was completed by observing points at 3m to 5m intervals. Additional points were recorded around the boreholes and in areas of significant elevation change.

In general, the site is located between 4 m and 7 m above mean sea level, with the majority of the project site between 5.0 and 6 m above mean sea level. A copy of the full survey report and topographical plans are presented in Appendix B.

4 Summary of Soils Investigation

4.1 General

The soils investigations were carried out in December 2010 and the scope of work and test locations were agreed on site with YEC. As discussed in Section 2.2, the project site has not been officially cleared of unexploded ordinances. Accordingly, there was the risk of impacting against and potentially detonating a buried ordinance. In the interest of operator safety, modifications to the specified programme were made.

A hand auger was used to bore slowly through the upper clay soils. This approach gave the operator the opportunity to feel any obstructions and terminate the test. A Scala penetrometer test was then started in the base of the auger hole, below the level of any potential ordinances. This approach is not considered to have resulted in the loss of useful data, as the 2009 report recommended using vane shear strengths rather than Scala results in the cohesive soils in the upper 2 m.

The location of the two test points was agreed with YEC. The first of these, HA3 (HA1 and HA2 were completed in 2009) was completed to the west of the project site in a location deemed to be at low risk of unexploded ordinances; next to a transmission pole in the wheel ruts of a track. Having proved the modified methodology in the first hole, the second (HA4) was completed in the centre of the project site.

The subsections below present a summary of the investigation work and laboratory testing results. Site investigation logs are presented in Appendix C and laboratory testing results are presented in Appendix D.

4.2 Scala Penetrometer and Hand Auger Investigations

A single hand auger hole was drilled at each test location to obtain shear strength data in the upper clayey soils and to recover soil samples for geotechnical laboratory testing. In-situ shear strength testing was carried out at regular intervals using a calibrated Pilcon shear vane. A Scala penetrometer test was undertaken in the base of the hole to provide continuous soil strength data. Descriptions of the subsurface soils, along with shear strength and Scala data are presented in Appendix C. The precise test locations and coordinates are presented in the Survey report in Appendix B.

Hand auger hole HA3 was drilled to 3 m depth. Penetration was stopped at this depth as sands encountered in the base of the hole were being washed out of the auger head by the groundwater. Scala SC3 was continued in the base of the hole from 3 m to 4.9 m depth, below which we were unable to proceed.

Hand auger hole HA4 was drilled to 1.25 m depth. Penetration was still possible at this depth, but the highly plastic nature of the soils provided too much skin friction on the rods to extract the auger. Scala SC4 was continued in the base of the hole from 1.25 m to 3.9 m depth, below which we were unable to proceed.

4.3 Geotechnical Laboratory Testing Results

The recovered samples were air freighted back to Auckland and geotechnical laboratory testing was carried out by Geotechnics Ltd. The laboratory tests have been completed in full accordance with the relevant New Zealand standards, identified in the subsections below, and the laboratory is fully accredited with International Accreditation New Zealand (IANZ) registration.

The soils testing consisted of the following:

- Specific Gravity tests (4 No.)
- Grain size analysis (4 No.)
- Moisture content test (4 No.)

Below is a summary table of the testing undertaken, including a summary of the test results from HA1 and HA2 on the adjacent site. A full set of the geotechnical testing data sheets is presented in Appendix D.

Table 1 – Summary of geotechnical testing

Sample identification	Specific Gravity	Grain Size Analysis	Moisture Content
HA3 – 0.4m to 1.1m	2.76 t/m³	Sandy SILT with some clay, stiff, medium brown, mottled black, highly plastic, slightly dilatant	48.8%
HA3 – 1.9m to 2.1m	2.76 t/m³	-	-
HA3 – 2.7m to 2.9m	-	Silty SAND with minor clay, firm, light blueish grey with brown, medium plasticity, slightly dilatant	41.4%
HA4 – 0.4m to 0.6m	2.75 t/m³	Clayey SILT with minor sand, stiff, dark brown, mottled black, high plasticity, slightly dilatant	44.4%
HA4 – 1.0m to 1.2m	2.76 t/m³	Clayey SILT with some sand, stiff, medium brown, mottled black, high plasticity, slightly dilatant	43.9%
HA1 – 0.5m to 1.0m	2.81 t/m³	Very clayey sandy SILT, stiff brown, high plasticity, slightly dilatant	45.9%
HA1 – 1.5m to 2.0m	2.82 t/m³	Very clayey sandy SILT, firm to stiff brown, high plasticity, slightly dilatant	43.3%
HA2 – 0.5m to 1.0m	2.81 t/m³	Very clayey sandy SILT, very stiff brown, high plasticity, slightly dilatant	49.3%
HA2 – 1.0m to 1.5m	2.80 t/m³	Very clayey sandy SILT, firm to stiff brown, high plasticity, slightly dilatant	46.5%

The geotechnical laboratory test results indicate that the near surface (upper 2m) geology across the general site area site is consistent, with similar test results recorded in all boreholes.

5 Subsurface Conditions

5.1 Geological Setting

The island of Guadalcanal in the Solomon Islands comprises high volcanic peaks with low lying dead coral along the northern coastline. The Ministry of Natural Resources, Geological survey map (GU5) for the site area indicates the geology to be alluvial deposits derived from the major rivers that flow from the high interior to the sea.

5.2 Ground and Groundwater Conditions

Both borehole locations encountered very similar ground conditions to those encountered in HA1/SC1 and HA2/SC2 at the original proposed site, and these are summarised in Table 2.

Table 2 – Summary of hand auger results

Depths (Below Ground level)	Geological unit	Soil type	Depths (Below Ground level)	Soil shear strength (kPa)	
				HA3	HA4
0-0.3 m	TOPSOIL	Dark brown clayey SILT with occasional rounded gravel and rootlets	N/A	-	-
0.3-2.7 m	ALLUVIUM	Highly plastic stiff and very stiff clayey SILT with occasional volcanic grains, orangeish brown transitioning to dark blueish grey	0.5 m	83/26	81/42
			1.0 m	107/45	128/52
			1.5 m	97/16	221/97*
			2.0 m	101/23	-
			2.5 m	130/39	-
2.7-3.0 m	ALLUVIUM	Dense, silty, medium SAND, dark blueish grey	2.8 m	105/19	-

* Final shear strength in HA4 measured at 1.25 m depth.

Groundwater was encountered in HA3 at 0.6 m depth, but was not encountered in HA4. However, free water was noted on SC4 at 3.5 m depth.

The Scala results and inferred soil strength are summarised in Table 3. From this summary it can be noted that the soil strength increases with depth at the site. It is also evident that the soil strengths inferred from the Scala results are more conservative than those measured in the hand auger holes. We recommend that the measured shear strengths summarised in Table 2 above are used as the basis for foundation design.

Table 3 – Summary of Scala penetrometer results

Depths (Below Ground level)	Average Scala Blows per 50 mm		Inferred Soil Strength (cohesive/granular)
	SC3	SC4	
0.5m	-	-	-
1.0m	-	-	-
1.5m	-	1	Soft-firm/loose
2.0m	-	1	Soft-firm/loose
2.5m	-	2.5	Firm-stiff/medium dense
3.0m	1	2.5	Firm-stiff/loose-medium dense
3.5m	2	8.5	Firm-very stiff/medium dense to dense
4.0m	8	8	Very stiff/dense
4.5m	5.5	-	Very stiff/dense
5.0m	7	-	Very stiff/dense

6 Discussion and Engineering Properties

6.1 General

Recommendations and opinions contained in this report are based upon data from:

- 4 No. hand auger boreholes
- 4 No. Scala penetrometer tests

The nature and continuity of the subsoil away from the test locations is inferred, but it must be appreciated that actual conditions could vary from the assumed model.

From the results of the soils investigation, geotechnical laboratory testing and also using published empirical relationships, we have assessed the engineering properties for the alluvium for the designer's consideration in the following subsections. We note that the strength of the upper 2 m of alluvium encountered in HA3 is approximately 80-100 kPa, which is lower than that encountered in any of the other auger holes. Given the susceptibility of the site to seasonal flooding and the potential for variation in underground conditions across the site, we recommend that the strength parameters from HA3 form the basis for design.

Actual ground conditions should be confirmed by a person competent to judge whether the soils exposed in the foundation excavations are compatible with those described within this report.

6.2 Bulk Density Range (γ)

The near surface alluvium material can be assumed to have the following bulk densities:

$$\gamma(\text{Bulk Density}) \text{ range} = 16 \text{ to } 18 \text{ kN/m}^3$$

6.3 Effective Cohesion (c')

The near surface material does provide some effective cohesion due to the cohesive nature of the alluvium. A value of 3 kPa should be used for design.

$$c' \text{ (Effective Cohesion)} = 3 \text{ kPa}$$

6.4 Effective Internal Friction Angle (φ)

The effective internal friction angle for the near surface alluvium has been estimated using a correlation from the Scala penetrometer and shear strength results. A value of 28° should be used as the effective internal friction angle for design.

$$\Phi \text{ (Effective internal friction angle)} = 28°$$

6.5 Bearing Capacity

Following discussions with YEC, it is understood that either strip or pad foundations will be constructed for the two proposed antennas, providing the ground conditions are suitable. Some smaller buildings will also be constructed to store equipment.

The site investigation data has indicated that shallow foundations may be utilised at the site depending on actual loadings, particularly wind loadings. We have provided bearing pressures at different depths in the upper 3m.

We recommend using a strength reduction factor of 0.5 (φ_G = 0.5) to give an ultimate limit state (ULS) bearing capacity, in accordance with New Zealand Design Standards (ref: NZS 1170). For serviceability limit state design we recommend a strength reduction factor of 0.33 (φ_G = 0.3) to give an allowable bearing capacity.

We recommend that due to the high plasticity exhibited by the near surface alluvium, all foundations should be embedded a minimum of 600mm below finished ground level to allow for seasonal water content changes (shrink and swell effects).

The strip or pad foundations would be constructed in the near surface alluvial clay material. Bearing capacities for this material based on the in situ testing undertaken are shown in the table below.

Table 4 – Bearing pressures within the alluvial clayey silt

Foundation embedment depth	Bearing Pressures					
	Shallow strip footings up to 1 m wide			Shallow isolated pad footings up to 2.5 m wide		
	Allowable	*ULS*	*Ultimate*	*Allowable*	*ULS*	*Ultimate*
0.6m	150kPa	220 kPa	450 kPa	160 kPa	250 kPa	500 kPa
1.0m	200 kPa	300 kPa	600 kPa	210 kPa	320 kPa	650 kPa
1.5m	200 kPa	300 kPa	600 kPa	220 kPa	340 kPa	680 kPa
2.0m	210 kPa	320 kPa	650 kPa	230 kPa	350 kPa	700 kPa
3.0m	230 kPa	350 kPa	700 kPa	250 kPa	370 kPa	750 kPa

We recommend that all foundation excavations are inspected and tested to ensure the ground conditions and bearing capacities are similar to those encountered during this investigation.

These bearing pressures should be re-assessed following completion of detailed design for the antennas to accommodate the high wind loadings for the structure.

6.6 Settlement

T&TI have not been provided with any vertical loads for the proposed structures. It is recommended that a settlement analysis is carried out following completion of the detailed design of the antennas including an allowance for the overturning forces due to the high wind loadings in this region.

We understand that some smaller buildings will be constructed to accommodate the equipment to operate the antenna. For floor slab loadings up to 10-15 kPa, preliminary analyses indicate the settlements should be less than 15mm to 20mm.

6.7 Young's Modulus Range (E)

The soil stiffness or Young's Modulus, E has been calculated from a correlation with SPT N values (Bowles et al) derived from the available shear strength and Scala penetrometer readings. The table below gives the range of Youngs Modulus values for varying depths.

Table 5 – Summary of Young's Modulus (E) with depth

Depth (Below Ground level)	Assumed soil strength		Corresponding SPT "N" values	Estimated Young's Modulus, E (MPa)
	Shear strength (kPa)	Scala blows/300mm		
0.5 m	80	-	4	3
1.0 m	90	-	4.5	3
1.5 m	90	-	4.5	3
2.0 m	100	-	5	3
2.5 m	130	-	6	3
3.0 m	100	12	5	3
4.0m	-	30	20	7
5.0m	-	35	23	8
6.0m	-	40	27	9
7.0m	-	45	30	10
8.0m	-	60	40	13

6.8 Seismicity

The Solomon Islands is situated near the active seismic zone along the boundary of the Indo-Australian and Pacific tectonic plates and, as such, is vulnerable to strong earthquakes. The SOPAC Technical Report 300 "Site-Specific Earthquake Hazard Determinations in Capital Cities in the South Pacific" (February 2001) discusses the seismic potential in the Honiara city centre. This report estimates a peak ground acceleration of 0.5 g for Honiara and provides 1 in 500 year earthquake acceleration response curves for three ground models (Figure 2). Of the three zones, the SIBC site is considered to be most similar to Zone A, which comprises 35 m of weak alluvial sediments overlying Honiara reef and bed limestone.

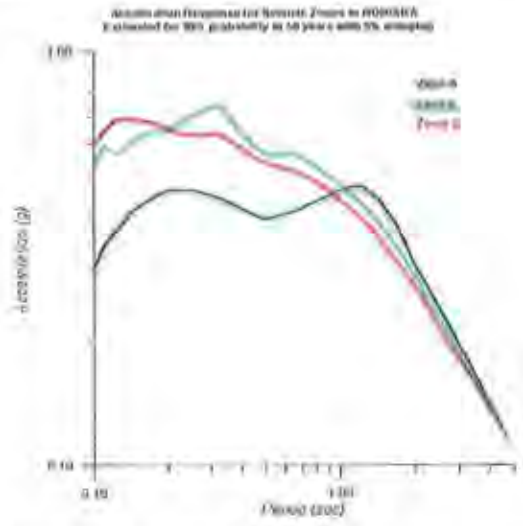

Figure 2. 1 in 500 year earthquake acceleration response curves for Honiara (SOPAC)

7 Applicability

This report has been prepared for the benefit of Yachiyo Engineering Co., Ltd with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

TONKIN & TAYLOR INTERNATIONAL LTD

Environmental and Engineering Consultants

Report prepared by:	Reviewed by:
.....	.....
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Geotechnical Engineer	Project Director

pjh

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Appendix A: Topographical Survey Report and Plans

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21 December 2010

HONIARA RADIO TRANMISSION SITE – PROVISONAL REPORT ON TOPOGRAPHIC SITE SURVEY

SURVEY DATE: The site was inspected by Discovery Marine Ltd (DML) staff on 12 September 2010. Following confirmation of the general area for survey by the client, the topographic survey was completed between 13 and 15 December 2010.

SURVEY PERSONAL: The survey field work was carried out by Declan Stubbing and Corrie Donselaar of DML. Survey plan production and reporting was completed by Declan Stubbing.

SITE LOCATION: The proposed antenna site is located approximately 1km south of the Honiara (Henderson) international airport runway. The proposed antenna site itself is a 76mx45m rectangle orientated for best transmission to the outer Solomon Islands.

SITE DESCRIPTION: The site that was selected by the client for survey is located in the south west of LOT10 of LR 83/R. The area surveyed is approximately 130m x 200m and is covered with tall grass, very thick in places.

The northern end of the site is bordered by dense bush moving into a low lying swamp with a deep man made trench and ridge line bounding the northern extent of the proposed antenna site. An overhead power line, vehicle track and small ridge bound the western side with the power line and vehicle track continuing around to the southern end of the site.

Around the general site itself there are three mounds that appear to be manmade and between 2m and 3m high. These according to local knowledge, could be historic ammunition dumps. Within the proposed antenna site there are two holes approximately 2m deep that have a small amount of water in the bottom of them.

ENVIRONMENTAL CONDITIONS: The environmental conditions of the site were very challenging. The site is covered with high sharp grass, some areas proving too thick to walk through. The heat and humidity were at extreme levels during the early part of the afternoon making progress very slow through that part of the day. There was some overnight rain on the site but did not affect progress.

GEODETIC CONTROL: The survey was undertaken on WGS84 Datum, UTM Grid Zone 57 (south).

Details as follows:

Co-ordinate System:

Name:	57 South
Group:	UTM

Ellipsoid:

Name:	World Geodetic System 1984
Projection:	Transverse Mercator
Parameters:	
Central Latitude:	0°00.0000'N
Central Longitude:	159°00.0000'E
False Northing:	10000000.00 m
False Easting:	500000.00 m
Scale Factor:	0.9996

NOTE: All survey plans have been created in the above coordinate system (UTM 57 S). However, the client has provided DML with coordinates for the control mark GUY3 in an unknown coordinate system. Although the supplied coordinates are reported to be in terms of UTM57 S repeated efforts have failed to establish a link between the DML surveyed data, which has been confirmed as UTM 57 S and the client supplied unknown GUY3 coordinates.

The origin of the client supplied GUY3 coordinates is unknown and differs by approximately 100m in the East and 750m in the North to the DML surveyed UTM57 S coordinates. The difference in coordinate values may be due to an unknown local false origin or local transformation parameters that DML has been unable to determine.

A second ASCII data set has been created for all survey data with the coordinate origin as the client supplied GUY3 coordinate. This data should not be used in conjunction with the DML created topographic survey plans.

SURVEY EQUIPMENT: The survey was undertaken using a Trimble R6 RTK GPS system. Corrections from RTK Base Station received at the rover unit via UHF Radio Link.

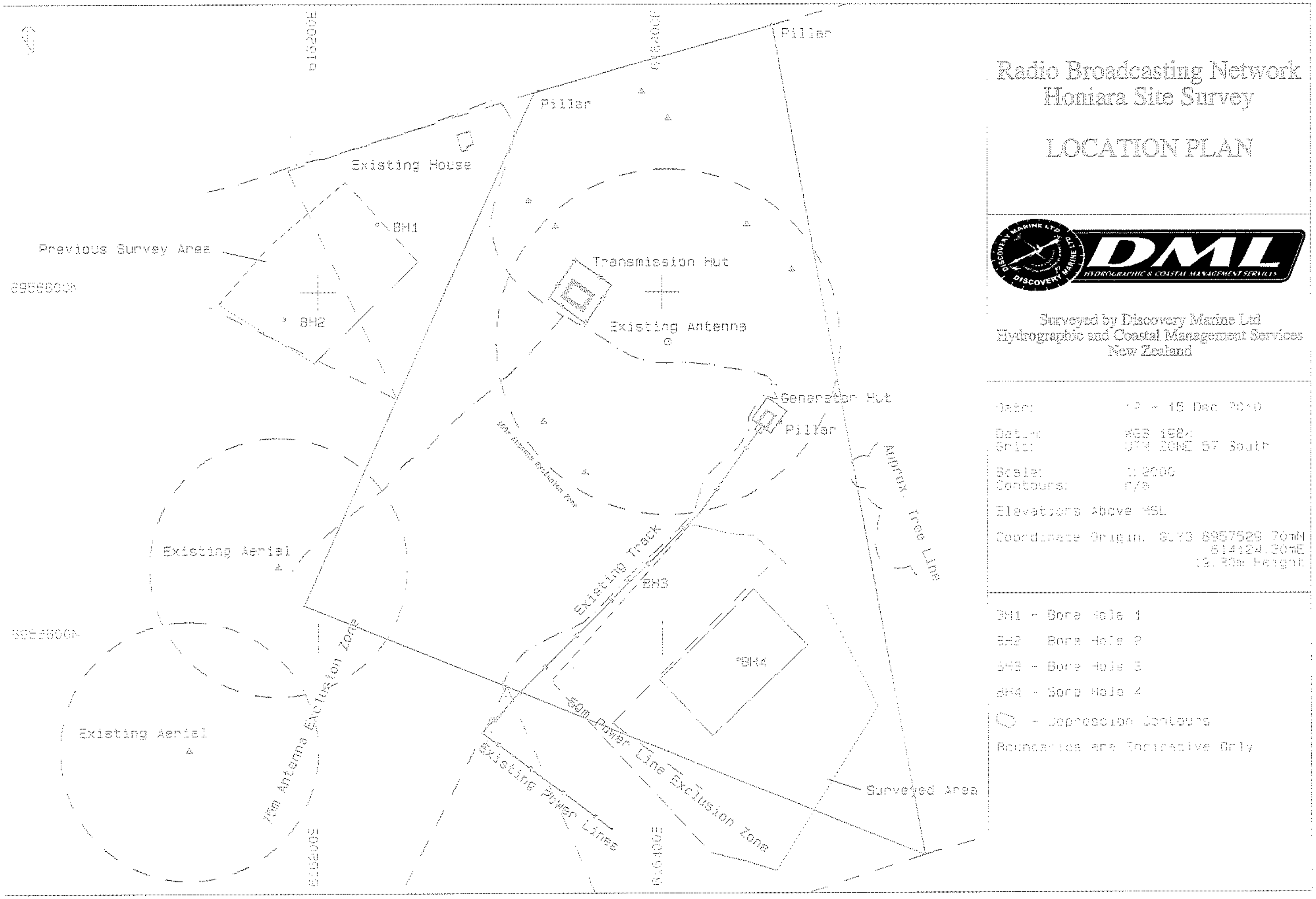
Accuracy of system: Horizontal: 10mm + 1ppm and Vertical: 20mm + 1ppm

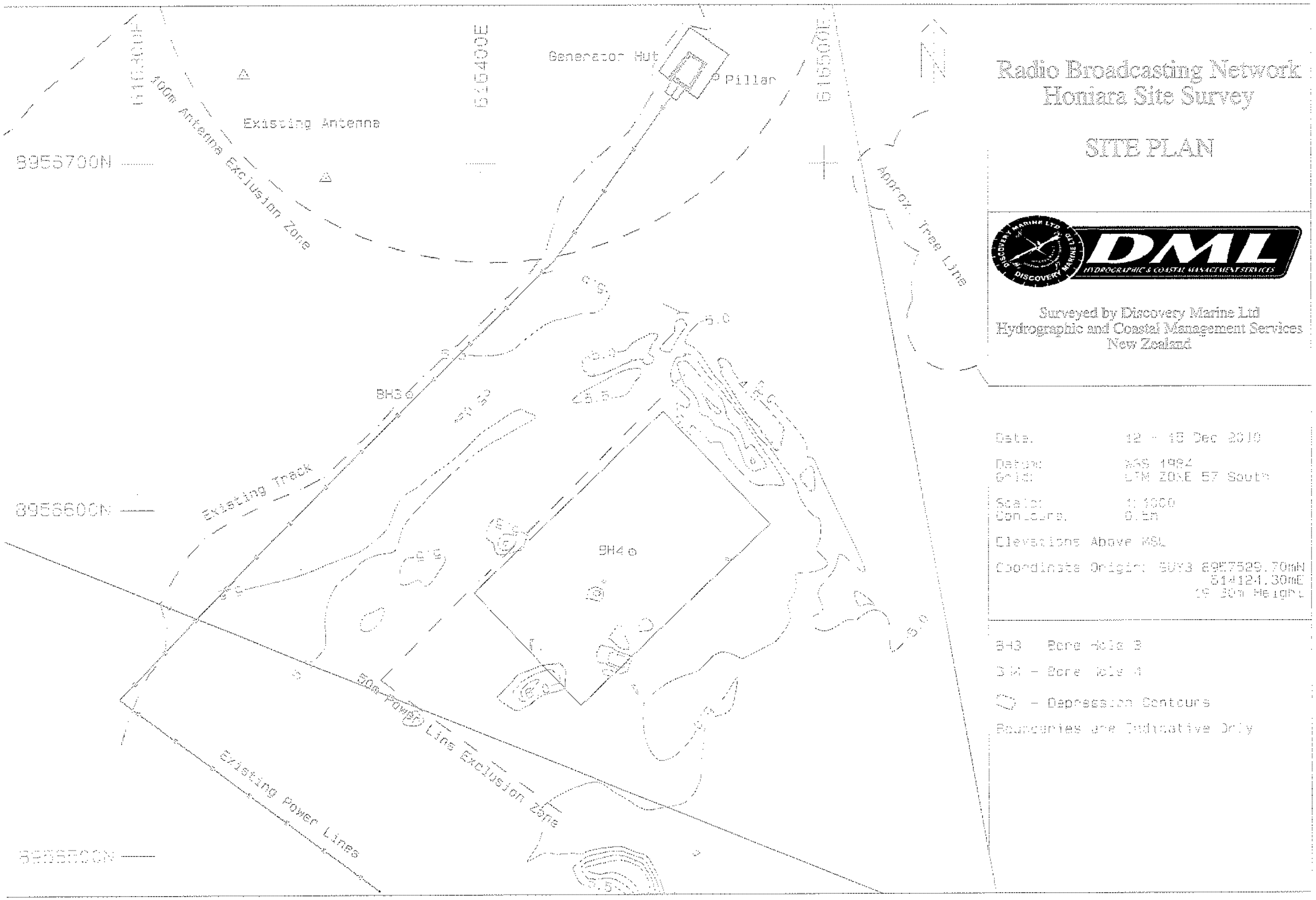
BRIEF DESCRIPTION OF SURVEY EVENTS: The RTK base station was first erected over an existing survey mark "Peg 2". This mark had been positioned during the initial topographic survey from the control mark "GUY3" located north of the airport. Survey marks "SR1" and "Pole" were checked to confirm horizontal and vertical accuracy. A temporary survey mark, 'Peg 3" was positioned within the proposed survey area, where the base station would be set up for the remainder of the survey.

From Peg3, the site survey was undertaken including positioning of nearby tracks, power lines, fences and antenna's. The topographic survey of the site was completed by observing ground levels at approximately 10m intervals over the 130m x 200m area. Ground levels were then measured at 5m intervals over the 76mx45m area selected by the client for the antenna. Extra ground levels were measured at the two borehole sites as well as over any significant ground gradient changes.

From the resultant data, topographic survey plans have been created at 1:500 and 1:1000 showing 0,2m and 0.5 m contours respectively. A 1:2000 scale plan has also been created showing the general location of the proposed antenna site within LOT10 of LR 83/R.

G.J. COX
Managing Director


Radio Broadcasting Network
Honiara Site Survey
LOCATION PLAN
Surveyed by Discovery Marine Ltd
Hydrographic and Coastal Management Services
New Zealand
Datum: WGS 1984
Grid: UTM ZONE 57 South
Scale: 1:2000
Contours: n/a
Elevations Above MSL
BH1 - Bore Hole 1
BH2 - Bore Hole 2
BH3 - Bore Hole 3
BH4 - Bore Hole 4
- Depression Contours
Boundaries are Indicative Only
Pillar
Pillar
Pillar
Existing House
BH1
BH2
Previous Survey Area
Transmission Hut
Existing Antenna
Generator Hut
Approx. Tree Line
Existing Aerial
Existing Aerial
Existing Track
BH3
BH4
75m Antenna Exclusion Zone
50m Power Line Exclusion Zone
Existing Power Lines
Surveyed Area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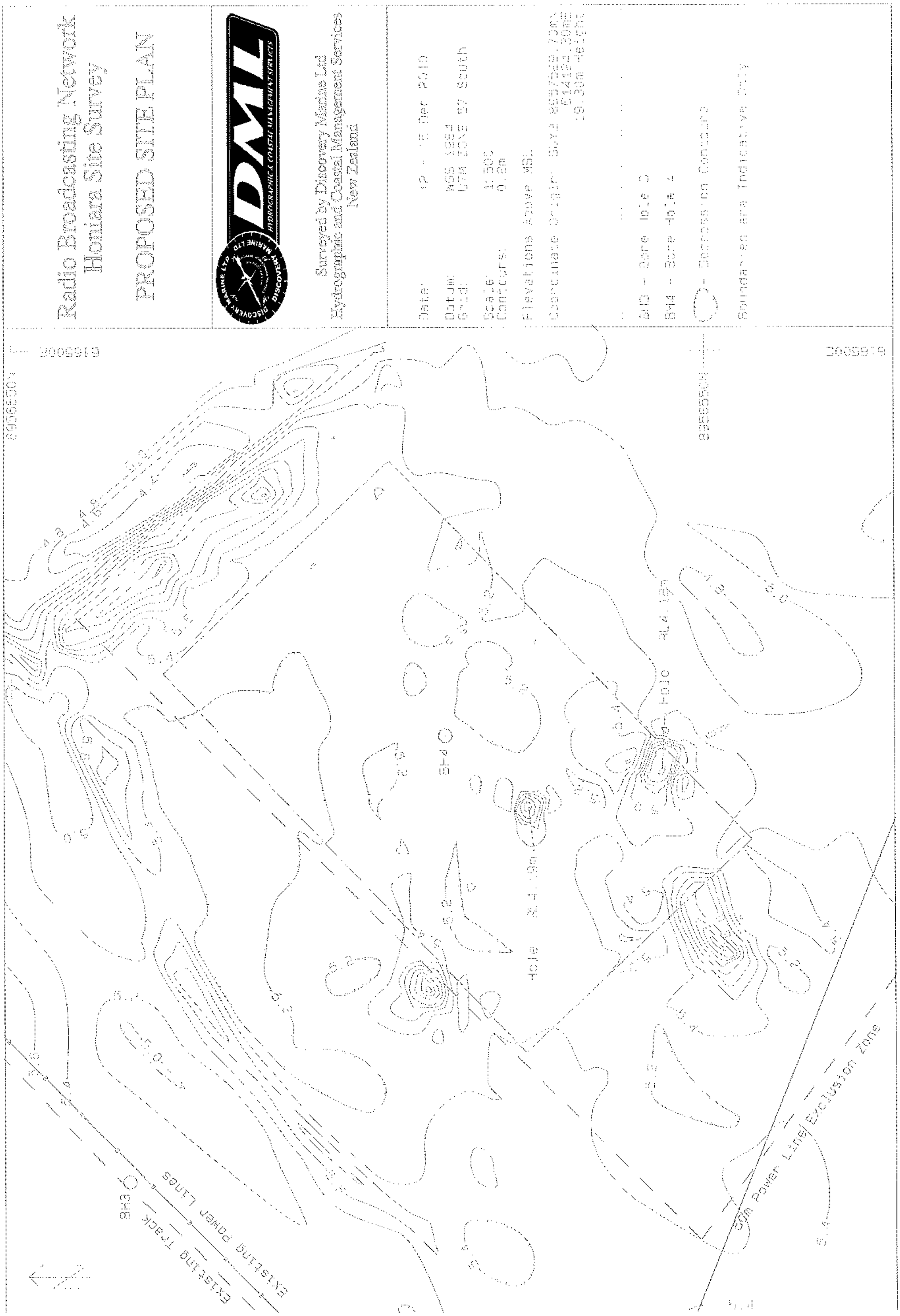
Hydrographic and Coastal Management Services
New Zealand
Generator Hut
Pillar
Existing Antenna
100m Antenna Exclusion Zone
Approx. Tree Line
Existing Track
BH3
BH4
50m Power Lines Exclusion Zone
Existing Power Lines
616400E
616500E
8955700N
8955600N
WGS 1984
UTM ZONE 57 South
Scale:
1:1000
Elevations Above MSL
Bore Hole 3
- Depression Contours
Boundaries are Indicative Only


Radio Broadcasting Network
Honiara Site Survey
PROPOSED SITE PLAN
DML
HYDROGRAPHIC & COASTAL MANAGEMENT SERVICES
DISCOVERY MARINE LTD
Surveyed by Discovery Marine Ltd
Hydrographic and Coastal Management Services
New Zealand
Scale: 1:500
Contours: 0.2m
Elevations Above MSL
Boundaries are Indicative Only
Existing Power Lines
Existing Track
30m Power Line Exclusion Zone
BH3
BH4
Hole

Appendix B: Investigation Logs

- **Handauger borehole logs**
- **Dynamic cone penetrometer results**

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: HA3
Hole Location: Refer to Site Plan

SHEET 1 OF 1

PROJECT: Geotechnical Investigation
LOCATION: Solomans Radio, Northeast Antenna JOB No: 750725

CO-ORDINATES 6956633
616379.2
R.L. 5.12 m
DATUM WGS1984 UTM 57S

DRILL TYPE: 50mm diameter Auger
DRILL METHOD: Handauger
DRILL FLUID: N/A

HOLE STARTED: 15/12/10
HOLE FINISHED: 15/12/10
DRILLED BY: PJH
LOGGED BY: PJH CHECKED: ADP

GEOLOGICAL / ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION	DEPTH (m)	R.L. (m)	TESTS	CLASSIFICATION SYMBOL	MOISTURE CONDITION	STRENGTH/DENSITY CLASSIFICATION	ENGINEERING DESCRIPTION
TOPSOIL	0.0	5.0	104/52kPa		M	F-St	Clayey SILT, moist, firm to stiff, high plasticity, dark brown, rootlets.
ALLUVIUM	0.5	4.5	83/26kPa	CM	M	St	Clayey SILT, moist, firm to stiff, high plasticity, orange brown, some sand sized grains can be broken down under finger pressure, rootlets.
			99/39kPa		W		Clayey SILT, wet, stiff, high plasticity, orangeish grey with some sand, fine gravel, sized grains of volcanic rock, rootlets.
	1.0	4.0	107/45kPa, 117/58kPa, 88/16kPa				
	1.5	3.5	97/16kPa, 97/16kPa				- fewer sand/gravels, grey with orange rootlets, no rootlets.
	2.0	3.0	101/23kPa				- more sand sized particles.
	2.5	2.5	130/39kPa				- dark blueish grey.
	3.0	2.0	105/19kPa	SM	Sat	D	SAND, silty, dark blueish grey, medium graines, dense.
	3.5	1.5					**END OF BOREHOLE AT 3.0m**
	4						1. No recovery in sample from 2.8m - 3.0m as sand washing out of auger head. 2. Freewater first appeared on auger tip at 1.1m. 3. There are frequent rounded river gravels across the site surface but not encountered in handauger. 4. Scala SC3 continued in base of hole to 5m. Staining on side of rod shows sand layer is less than 1m thick and then goes back to clays.

WATER: 15/12/10
METHOD: HANDAUGER

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

T+T DATATEMPLATE.GDT amm

BORELOG 750725.GPJ 26/1/11

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: HA4
Hole Location: Refer to Site Plan

SHEET 1 OF 1

PROJECT: Geotechnical Investigation
LOCATION: Solomans Radio, Northeast Antenna
JOB No: 750725

CO-ORDINATES 8956588
616444.1
DRILL TYPE: 50mm diameter Auger
HOLE STARTED: 15/12/10
HOLE FINISHED: 15/12/10

R.L. 5.27 m
DRILL METHOD: Handauger
DRILLED BY: PJH

DATUM WGS1984 UTM 57S
DRILL FLUID: N/A
LOGGED BY: PJH
CHECKED: ADP

GEOLOGICAL
ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION / ROCK DESCRIPTION
TOPSOIL				HANDAUGER				5.0	0								Clayey SILT, stiff, dark brown, moist, highly plastic, occasional rounded gravels.
ALLUVIUM						• 81/42kPa • 97/49kPa • 128/52kPa • 152/49kPa • 221/97kPa		4.5	0.5								Clayey SILT, stiff to very stiff, brown, moist, highly plastic (very sticky) trace sand sized volcanic grains
								4.0	1.0								**END OF BOREHOLE AT 1.25m** 1. No groundwater encountered but freewater at 3.5m on end of Scala rod. 2. Unable to penetrate deeper due to friction on sides of auger rods. 3. Scala SC3 continued to 4m in the base of hole.
								3.5	1.5								
								3.0	2.0								
								2.5	2.5								
								2.0	3.0								
								1.5	3.5								
								1	4								

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.
Defects: Type, inclination, thickness, roughness, filling.

T+T DATATEMPLATE.GDT amm

BORELOG 750725.GPJ 26/1/11

Solomon Radio SC3-4.xls

TONKIN & TAYLOR

SCALA PENETROMETER LOG

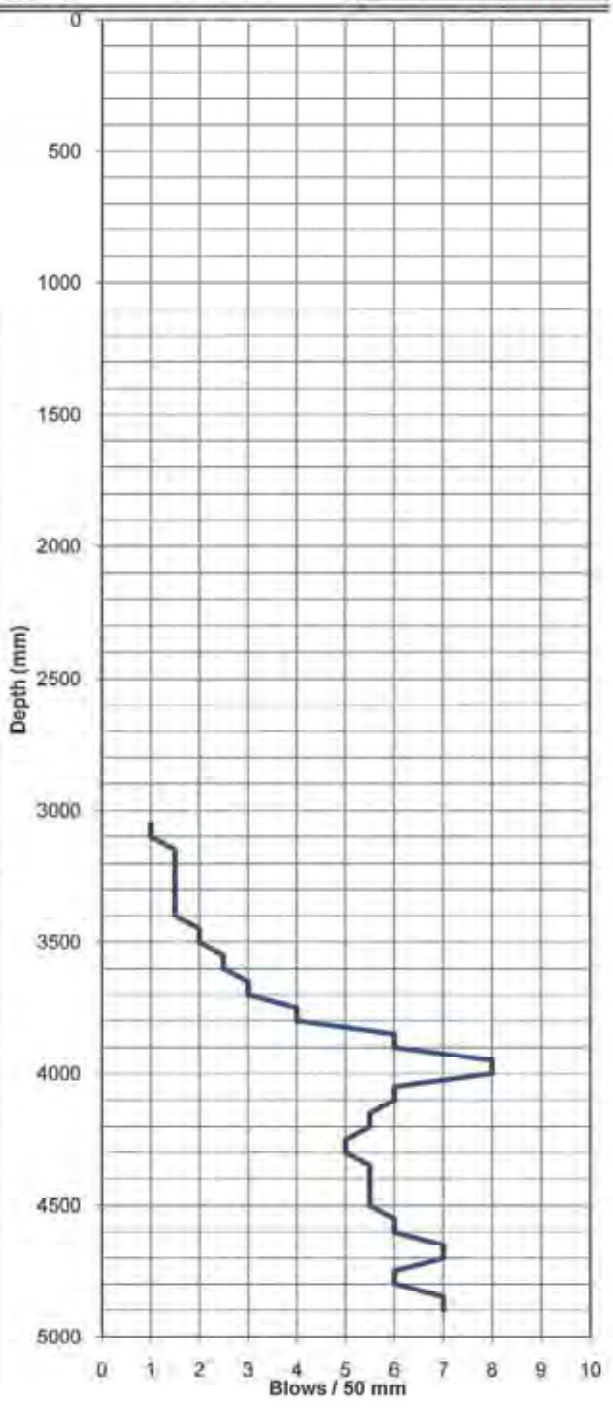
Job No: 750725.1
Project: Solomons Radio 2
Location: Henderson Airport, Honiara
RL:

Date: 15/12/2010
Operated by: PJH
Logged by: PJH
Checked by:

Test No. SC 3
Sheet 1
of 1

mm Driven	No. of Blows
50	
100	
150	
200	
250	
300	
350	
400	
450	
500	
550	
600	
650	
700	
750	
800	
850	
900	
950	
1000	
1050	
1100	
1150	
1200	
1250	
1300	
1350	
1400	
1450	
1500	
1550	
1600	
1650	
1700	
1750	
1800	
1850	
1900	
1950	
2000	
2050	
2100	
2150	
2200	
2250	
2300	
2350	
2400	
2450	
2500	

mm Driven	No. of Blows
2550	
2600	
2650	
2700	
2750	
2800	
2850	
2900	
2950	
3000	
3050	1
3100	1
3150	1.5
3200	1.5
3250	1.5
3300	1.5
3350	1.5
3400	1.5
3450	2
3500	2
3550	2.5
3600	2.5
3650	3
3700	3
3750	4
3800	4
3850	6
3900	6
3950	8
4000	8
4050	6
4100	6
4150	5.5
4200	5.5
4250	5
4300	5
4350	5.5
4400	5.5
4450	5.5
4500	5.5
4550	6
4600	6
4650	7
4700	7
4750	6
4800	6
4850	7
4900	7
4950	
5000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

CLIENT: Yachiyo Engineering Co Ltd
TITLE: Honaris Radio Mast
REFERENCE No. 750725

December 2010

Solomon Radio SC3-4.xls

TONKIN & TAYLOR

SCALA PENETROMETER LOG

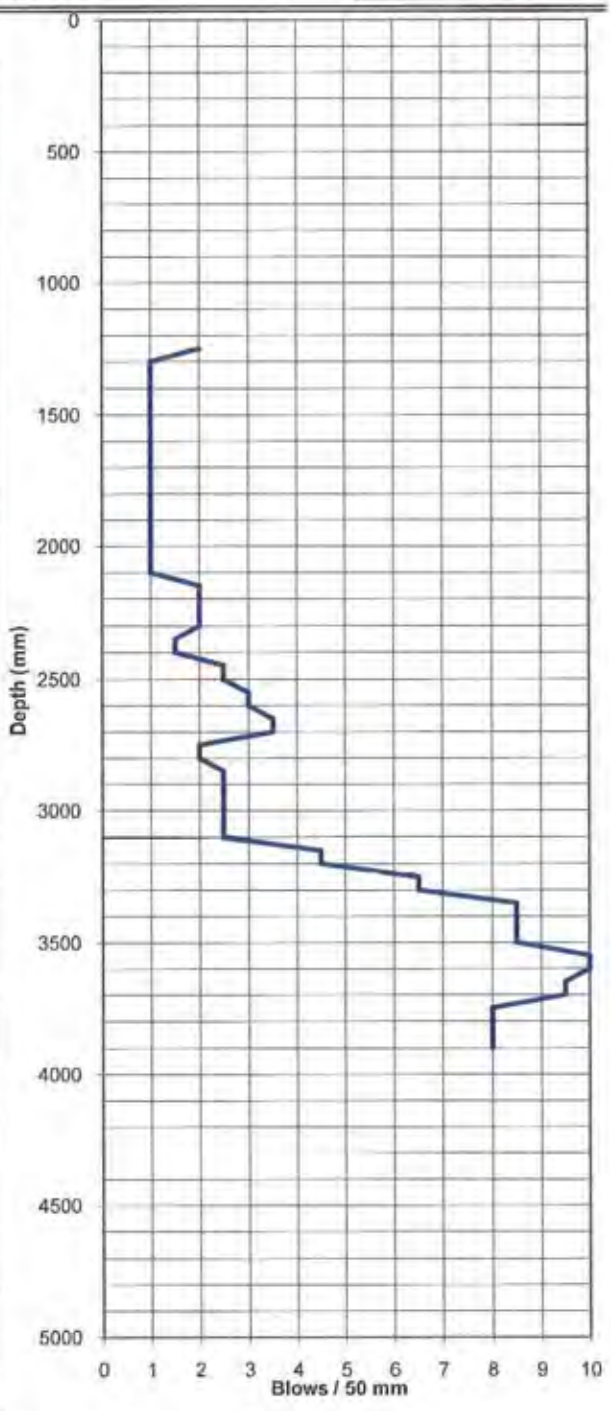
Job No: 750725.1
Project: Solomons Radio 2
Location: Henderson Airport, Honiara
RL:

Date: 15/12/2010
Operated by: PJH
Logged by: PJH
Checked by:

Test No. SC 4
Sheet 1
of 1

mm Driven	No. of Blows
50	
100	
150	
200	
250	
300	
350	
400	
450	
500	
550	
600	
650	
700	
750	
800	
850	
900	
950	
1000	
1050	
1100	
1150	
1200	
1250	2
1300	1
1350	1
1400	1
1450	1
1500	1
1550	1
1600	1
1650	1
1700	1
1750	1
1800	1
1850	1
1900	1
1950	1
2000	1
2050	1
2100	1
2150	2
2200	2
2250	2
2300	2
2350	1.5
2400	1.5
2450	2.5
2500	2.5

mm Driven	No. of Blows
2550	3
2600	3
2650	3.5
2700	3.5
2750	2
2800	2
2850	2.5
2900	2.5
2950	2.5
3000	2.5
3050	2.5
3100	2.5
3150	4.5
3200	4.5
3250	6.5
3300	6.5
3350	8.5
3400	8.5
3450	8.5
3500	8.5
3550	10
3600	10
3650	9.5
3700	9.5
3750	8
3800	8
3850	8
3900	8
3950	
4000	
4050	
4100	
4150	
4200	
4250	
4300	
4350	
4400	
4450	
4500	
4550	
4600	
4650	
4700	
4750	
4800	
4850	
4900	
4950	
5000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

CLIENT: Yachiyo Engineering Co Ltd
TITLE: Honiara Radio Mast
REFERENCE No. 750725

December 2010

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: HA1
Hole Location: Refer to Site Plan

SHEET 1 OF 1

PROJECT: Geotechnical Investigation — LOCATION: Solomans Radio, Northeast Antenna — JOB No: 750725

CO-ORDINATES 8956839.56 mN 616234.45 mE
R.L. 5.73 m
DATUM

DRILL TYPE: 50mm diameter Auger
DRILL METHOD: Handauger
DRILL FLUID: N/A

HOLE STARTED: 23/9/09
HOLE FINISHED: 23/9/09
DRILLED BY: ADP
LOGGED BY: ADP
CHECKED:

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION	METHOD	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	CLASSIFICATION SYMBOL	MOISTURE CONDITION	STRENGTH/DENSITY CLASSIFICATION	ENGINEERING DESCRIPTION (SOIL DESCRIPTION: Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION: Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.)
TOPSOIL	HANDAUGER				0.0–0.4				- dark brown clayey. SILT with occasional fine volcanic gravel and roots.
ALLUVIUM	HANDAUGER	• 136/56kPa	1		0.5	CL	M	St-VSt	Highly plastic SILT brown stiff to very stiff clayey.
		• 136/64kPa	2		1.0				
		• 144/48kPa	3		1.5				Highly plastic (very sticky) brown stiff to very stiff, very clayey SILT with some volcanic grains and trade organic debris.
		• 192/80kPa			2.0				

R.L. scale: 5.5, 5.0, 4.5, 4.0, 3.5, 3.0
Depth scale: 0.5, 1.0, 1.5, 2.0, 2.5, 3

END OF BOREHOLE AT 2.0m

1. No Groundwater
2. Unable to penetrate deeper due to skin friction on auger rods

Log Scale 1:15

BORELOG 750725.GPJ 1/10/09

TONKIN & TAYLOR LTD

BOREHOLE LOG

BOREHOLE No: HA2
Hole Location: Refer to Site Plan

SHEET 1 OF 1

PROJECT: Geotechnical Investigation — LOCATION: Solomans Radio, SouthWest Antenna — JOB No: 750725

CO-ORDINATES 8956784.67 mN 616180.26 mE — DRILL TYPE: 50mm diameter Auger — HOLE STARTED: 23/9/09

DRILL METHOD: Handauger — HOLE FINISHED: 23/9/09

R.L. 5.86 m — DRILLED BY: ADP

DATUM — DRILL FLUID: N/A — LOGGED BY: ADP — CHECKED:

GEOLOGICAL — ENGINEERING DESCRIPTION

GEOLOGICAL UNIT, GENERIC NAME, ORIGIN, MINERAL COMPOSITION	FLUID LOSS	WATER	CORE RECOVERY (%)	METHOD	CASING	TESTS	SAMPLES	R.L. (m)	DEPTH (m)	GRAPHIC LOG	CLASSIFICATION SYMBOL	MOISTURE CONDITION / WEATHERING	STRENGTH/DENSITY CLASSIFICATION	SHEAR STRENGTH (kPa)	COMPRESSIVE STRENGTH (MPa)	DEFECT SPACING (mm)	SOIL DESCRIPTION: Soil type, minor components, plasticity or particle size, colour. ROCK DESCRIPTION: Substance: Rock type, particle size, colour, minor components. Defects: Type, inclination, thickness, roughness, filling.
TOPSOIL								5.5									Black and dark brown, very clayey SILT with many roots and some volcanic grains.
ALLUVIUM				HANDAUGER		• 144/64kPa • 152/64kPa • 176/80kPa >224kPa	2 3	5.0 4.5 4.0	0.5 1.0 1.5 2.0		CL	M	St-VSt				Highly plastic (very sticky) brown very clayey SILT with occasional volcanic grains and fine volcanic gravel, trace organic debris.
								3.5 3.0	2.5 3								END OF BOREHOLE AT 2.0m 1. No Groundwater 2. Unable to penetrate deeper due to skin friction on auger rods. Very difficult to extrude equipment.

Log Scale 1:15

BORELOG 750725.GPJ 1/10/09

TONKIN & TAYLOR

SCALA PENETROMETER LOG

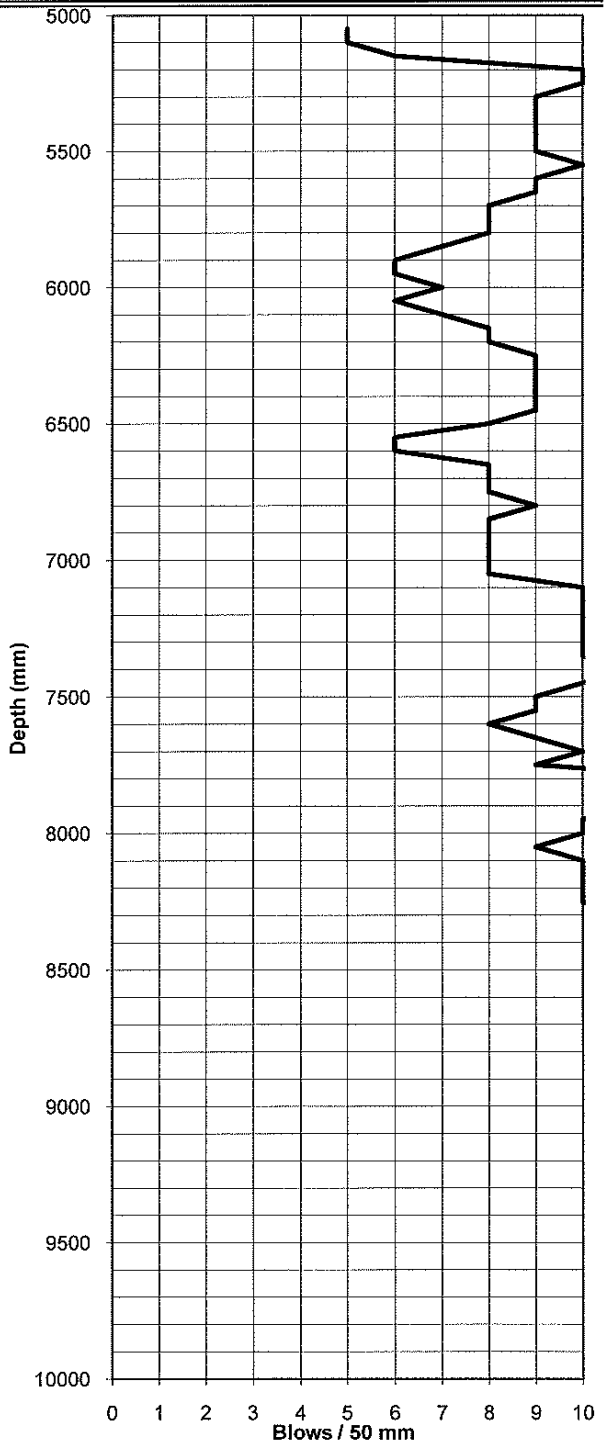
Job No: *750725*
Project: *Solomons Radio*
Location: *Henderson Airport, Honiara*
RL: *5.73m*

Date: *40078*
Operated by: *ADP*
Logged by: *ADP*
Checked by: *CJF*

Test No. *SC 1*
Sheet *2*
of *2*

mm Driven	No. of Blows
5050	5
5100	5
5150	6
5200	10
5250	10
5300	9
5350	9
5400	9
5450	9
5500	9
5550	10
5600	9
5650	9
5700	8
5750	8
5800	8
5850	7
5900	6
5950	6
6000	7
6050	6
6100	7
6150	8
6200	8
6250	9
6300	9
6350	9
6400	9
6450	9
6500	8
6550	6
6600	6
6650	8
6700	8
6750	8
6800	9
6850	8
6900	8
6950	8
7000	8
7050	8
7100	10
7150	10
7200	10
7250	10
7300	10
7350	10
7400	11
7450	10
7500	9

mm Driven	No. of Blows
7550	9
7600	8
7650	9
7700	10
7750	9
7800	13
7850	14
7900	11
7950	10
8000	10
8050	9
8100	10
8150	10
8200	10
8250	10
8300	11
8350	
8400	
8450	
8500	
8550	
8600	
8650	
8700	
8750	
8800	
8850	
8900	
8950	
9000	
9050	
9100	
9150	
9200	
9250	
9300	
9350	
9400	
9450	
9500	
9550	
9600	
9650	
9700	
9750	
9800	
9850	
9900	
9950	
10000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

TONKIN & TAYLOR

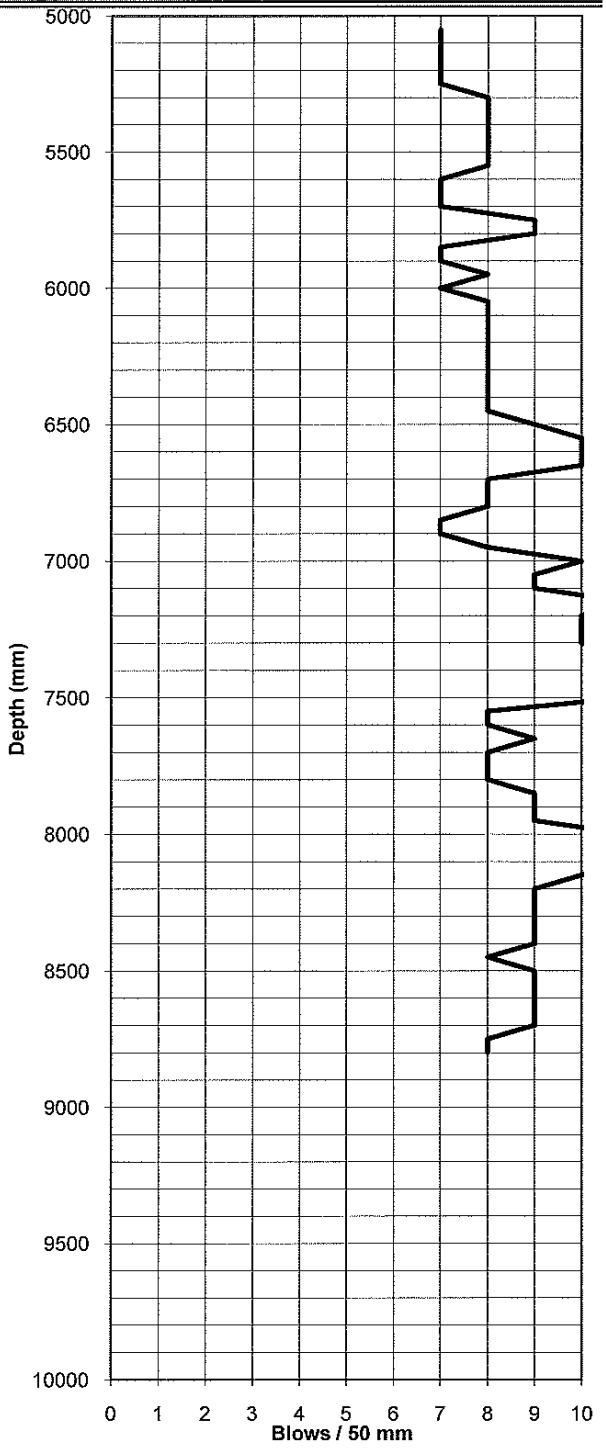
SCALA PENETROMETER LOG

Job No: *750725*
Project: *Solomons Radio*
Location: *Henderson Airport, Honiara*
RL: *5.86m*

Date: *40078*
Operated by: *ADP*
Logged by: *ADP*
Checked by: *CJF*

Test No. *SC 2*
Sheet *2*
of *2*

mm Driven	No. of Blows	mm Driven	No. of Blows
5050	7	7550	8
5100	7	7600	8
5150	7	7650	9
5200	7	7700	8
5250	7	7750	8
5300	8	7800	8
5350	8	7850	9
5400	8	7900	9
5450	8	7950	9
5500	8	8000	11
5550	8	8050	11
5600	7	8100	11
5650	7	8150	10
5700	7	8200	9
5750	9	8250	9
5800	9	8300	9
5850	7	8350	9
5900	7	8400	9
5950	8	8450	8
6000	7	8500	9
6050	8	8550	9
6100	8	8600	9
6150	8	8650	9
6200	8	8700	9
6250	8	8750	8
6300	8	8800	8
6350	8	8850	
6400	8	8900	
6450	8	8950	
6500	9	9000	
6550	10	9050	
6600	10	9100	
6650	10	9150	
6700	8	9200	
6750	8	9250	
6800	8	9300	
6850	7	9350	
6900	7	9400	
6950	8	9450	
7000	10	9500	
7050	9	9550	
7100	9	9600	
7150	11	9650	
7200	10	9700	
7250	10	9750	
7300	10	9800	
7350	11	9850	
7400	12	9900	
7450	11	9950	
7500	11	10000	



Test Method Used: NZS 4402:1988 Test 6.5.2 Dynamic Cone Penetrometer

Appendix C: Geotechnical Laboratory Testing

GEOTECHNICS
23 Morgan Street, Newmarket
Auckland 1023, New Zealand
p. +64 9 356 3510
w. www.geotechnics.co.nz

Form No.: P6
Form Date: January 2004

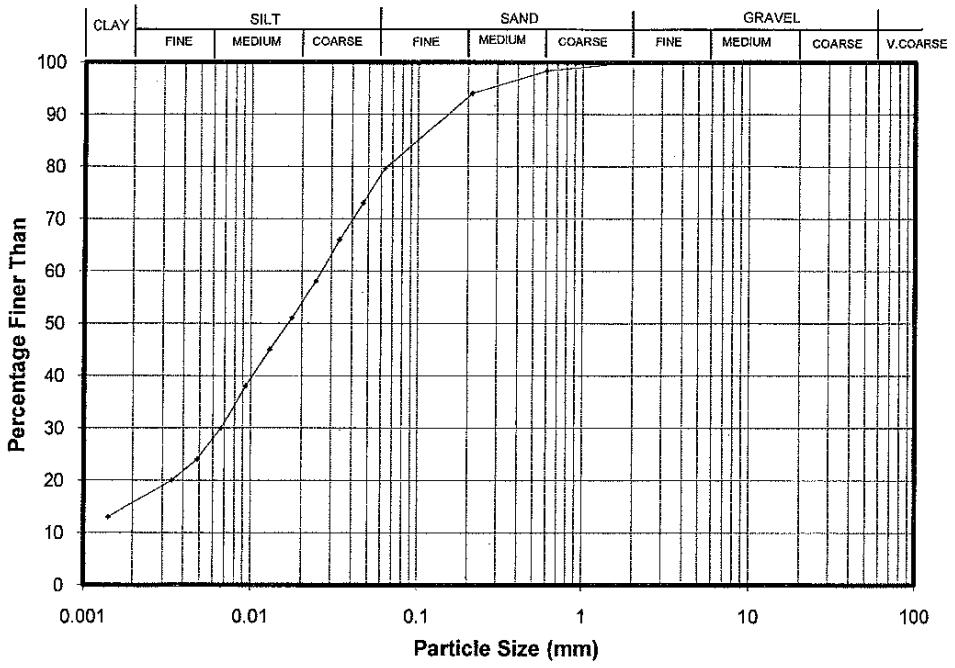
Plate No.: Page of Your Job No.: **750725.100**

Site : **Honiara Airport, Solomon Islands** Our Job No.: **615474.000**

HA No.: **3** Sample ID.: **1+2 (mixed)** Depth (m): **(0.4-0.6)+(0.9-1.1)mixed**

Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
2.00	100		
0.600	98		
0.212	94		
0.063	80		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0466	73
0.0336	66
0.0243	58
0.0175	51
0.0129	45
0.0093	38
0.0067	30
0.0048	24
0.0034	20
0.0014	13

Sample history : As received.

Description: sandy SILT with some clay, stiff, medium brown, mottled black, high plasticity, slightly dilatant.

Solid Density (Measured) : 2.76 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.0
The classification of sand-silt-clay components are described on the basis of particle size analysis.
Sample description is not IANZ endorsed.

Entered by : ST Date : 24/1/11 Checked by : MJRA Date : 24/1/11

GEOTECHNICS
23 Morgan Street, Newmarket
Auckland 1023, New Zealand
p. +64 9 356 3510
w. www.geotechnics.co.nz

Form No.: P6
Form Date: January 2004
File: P:\615465.000\Working Material\HA3_5_2.7-2.8m_Wet Sieve+Hydro.xls

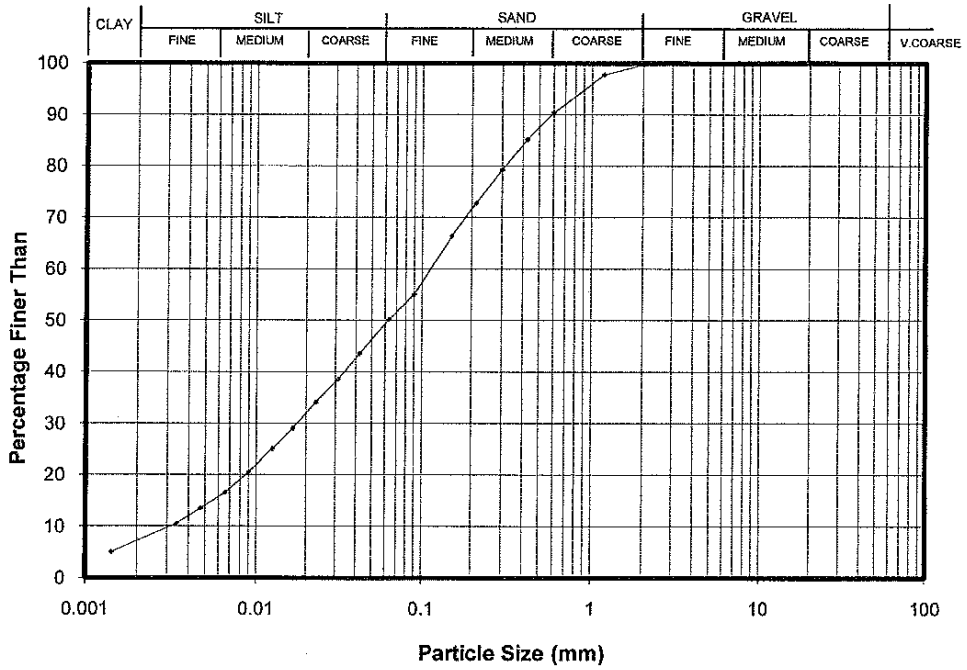
Plate No.: Page of Your Job No.: **750725.100**

Site : **Honiara Airport, Solomon Islands** Our Job No.: **615474.000**

HA No.: **3** Sample ID.: **5** Depth (m): **2.7-2.8**

Test Method Used : NZS 4402:1986 Test 2.8.1 Wet Sieve Test 2.8.4 Hydrometer

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
6.70	---	0.090	55
4.75	---	0.063	50
3.35	100		
2.00	100		
1.18	98		
0.600	90		
0.425	85		
0.300	79		
0.212	73		
0.150	66		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0421	44
0.0311	39
0.0227	34
0.0166	29
0.0125	25
0.0091	21
0.0066	17
0.0047	14
0.0034	11
0.0014	5

Sample history : As received.

Solid Density (assumed) : 2.75 t/m^3

Description : silty SAND with minor clay, firm, light bluish grey with brown, medium plasticity, slightly dilatant.

Remarks : Two representative sub samples were split from the original sample for wet sieve and hydrometer analysis. The wet sieve sample was washed over 0.063mm test sieve, until the individual particles were clean. The material retained on 0.063mm test sieve was oven dried and dry sieved. The hydrometer sample was oven dried at the end of the test to determine the mass passing 0.063mm for hydrometer calculations. The sieve data was combined with the hydrometer analysis to give a continuous curve. Suspension pH 8.0 The classification of sand-silt-clay components are described on the basis of particle size analysis. Sample description is not IANZ endorsed.

Entered by : ST Date : 24/1/11 Checked by : MJRA Date : 24/1/11

GEOTECHNICS
23 Morgan Street, Newmarket
Auckland 1023, New Zealand
p. +64 9 356 3510
w. www.geotechnics.co.nz

Form No.: P6
Form Date: January 2004

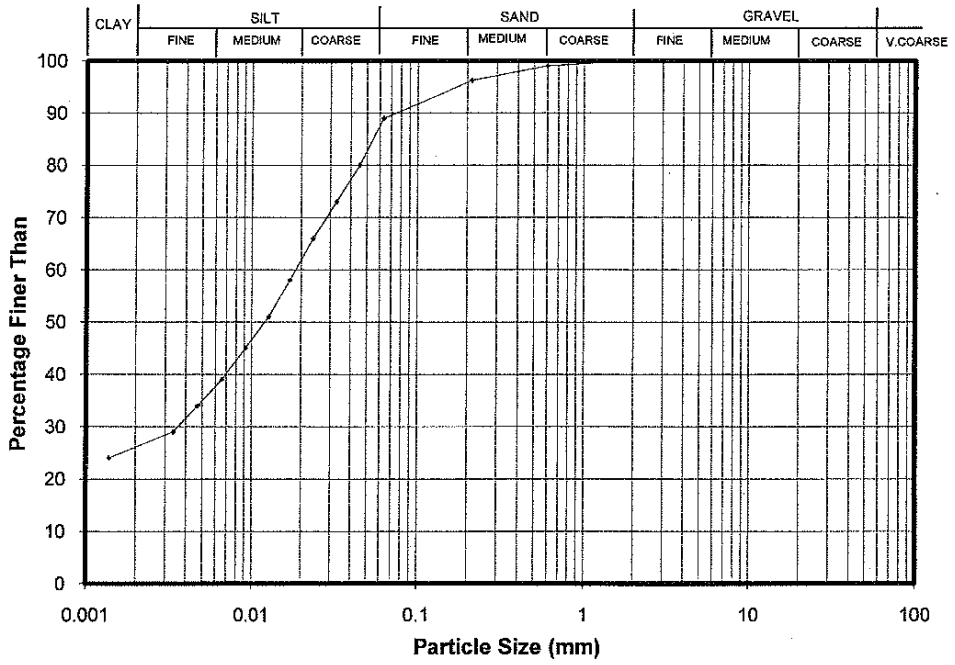
Plate No.: Page of Your Job No.: **750725.100**

Site : **Honiara Airport, Solomon Islands** Our Job No.: **615474.000**

HA No.: **4** Sample ID.: **1** Depth (m): **0.5**

Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
2.00	100		
0.600	99		
0.212	96		
0.063	89		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0453	80
0.0328	73
0.0237	66
0.0171	58
0.0127	51
0.0091	45
0.0066	39
0.0047	34
0.0034	29
0.0014	24

Sample history : As received.

Description: clayey SILT with minor sand, stiff, dark brown, mottled black, high plasticity, slightly dilatant.

Solid Density (Measured) : 2.75 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.0
The classification of sand-silt-clay components are described on the basis of particle size analysis.
Sample description is not IANZ endorsed.

Entered by : ST Date : 24/1/11 Checked by : MRA Date : 24/1/11

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Form No.: P6
Form Date: January 2004

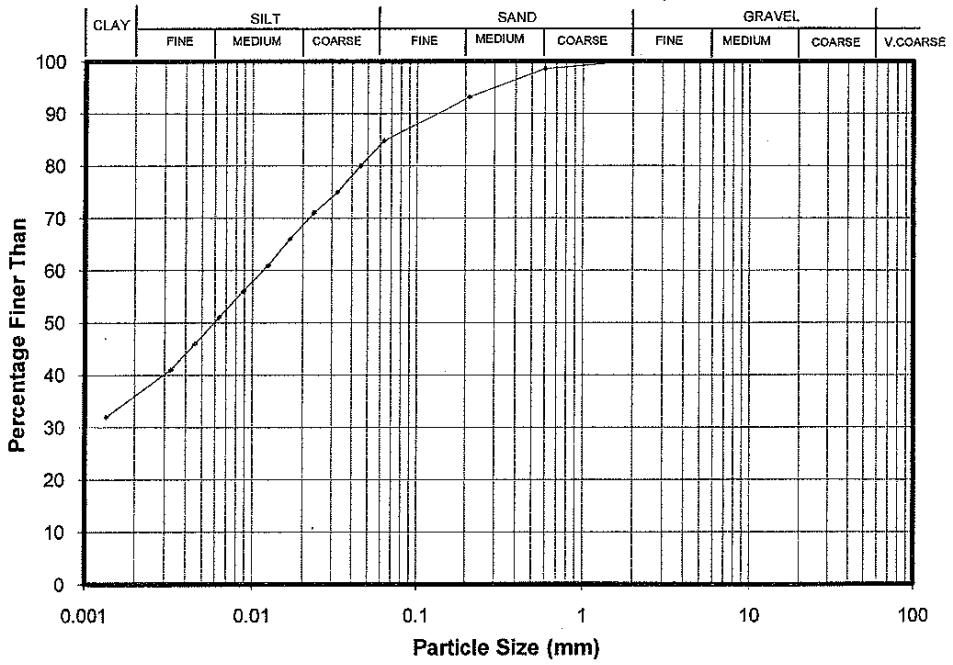
Plate No.: Page of Your Job No.: **750725.100**

Site : **Honiara Airport, Solomon Islands** Our Job No.: **615474.000**

HA No.: **4** Sample ID.: **2** Depth (m): **1.15**

Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
2.00	100		
0.600	99		
0.212	93		
0.063	85		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0452	80
0.0325	75
0.0233	71
0.0167	66
0.0124	61
0.0089	56
0.0063	51
0.0045	46
0.0033	41
0.0014	32

Sample history : As received.

Description: clayey SILT with some sand, stiff, medium brown, mottled black, high plasticity, slightly dilatant.

Solid Density (Measured) : 2.76 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~2 hrs), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.0
The classification of sand-silt-clay components are described on the basis of particle size analysis.
Sample description is not IANZ endorsed.

Entered by : ST Date : 14/1/11 Checked by : WRA Date : 24/1/11

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Plate No.: Page of **Your Job No.: 750725.100**

Site : Honiara Airport, Solomon Islands **Our Job No.: 615474.000**

Test Method Used: NZS 4402:1986 Test 2.1 Determination of Water Content

WATER CONTENT TEST RESULTS

Table 1: Water Content

HA No.	3	3	4	4
Sample ID.	1+2 (mixed)	5	1	2
Depth (m)	(0.4-0.6)+(0.9-1.1) (mixed)	2.7-2.9	0.5	1.15
Water Content (%)	48.8	41.4	44.4	43.9

Remarks: Due to insufficient sample mass, the water content was calculated from the sieve analysis in agreement with the engineer. Therefore the test results are not IANZ endorsed.

Tested by: ST Date: 24/1/11 Checked by: MJRA Date: 24/1/11

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Form No.: 84
Form Date: January 2004
File: P:\615474_Solid density_Summary.xlsx

Plate No.: Page of **Your Job No.: 750725.100**

Site : Honiara Airport, Solomon Islands **Our Job No.: 615474.000**

Test Method Used:NZS 4402:1986 Test 2.7.2 Determination of Solid Density of Soil Particles - Vacuum Method

SOLID DENSITY TEST RESULTS

Table 1: Solid Density

		*Single Specimen tested	*Single Specimen tested	*Single Specimen tested	*Single Specimen tested
HA No.:		***3**	***3**	***4**	***4**
Sample ID.:		**1+2 (mixed)**	**4**	**1**	**2**
Depth	(m)	**(0.4-0.6)+(0.9-1.1) (mixed)**	**1.9-2.1**	**0.5**	**1.15**
Solid Density	(t/m^3)	**2.76**	**2.76**	**2.75**	**2.76**

Sample History: Oven-dried.

Remarks : The whole sample was used to carry out a solid density test.

*As per the standard, two specimens required to perform a solid density, but due to insufficient sample mass obtained, it was performed on a single specimen as agreed with the engineer. Therefore the test results are not IANZ endorsed.

Tested by: ST Date: 24/1/11 Checked by: MJRA Date: 24/1/11

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Form No.: P6
Form Date: January 2004
File: P:\615120\Working material\Hydro_HA1_D1_0.5-1.0m.xls

Plate No.: Page of

Site : **Broadcasting Antenna, Honiara, Solmon Island**

HA No.: 1 Sample ID.: **D1**

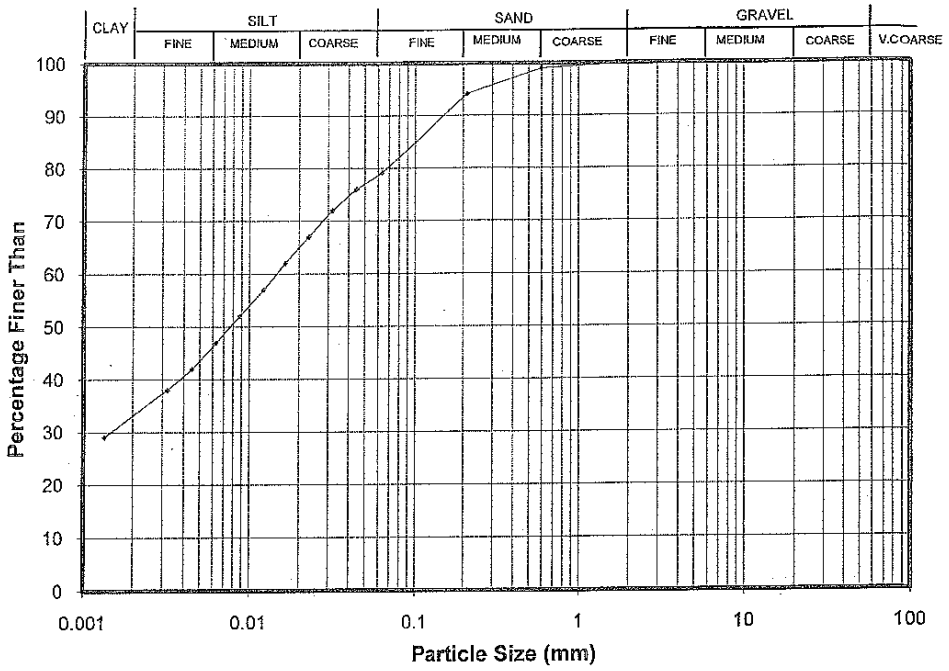
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: **750725**

Our Job No.: **615120.000**

Depth: **0.5-1.0 (m)**

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
3.35	100		
2.00	100		
0.600	99		
0.212	94		
0.063	79		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0445	76
0.0319	72
0.0229	67
0.0165	62
0.0122	57
0.0088	52
0.0063	47
0.0045	42
0.0032	38
0.0013	29

Sample history : As received.

Description: clayey/sandy SILT, stiff, brown, high plasticity, slightly dilatant.

Solid Density (measured) : 2.81 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~16 hours), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.0
Sample description is not IANZ endorsed.

Entered by : ST Date : 6/10/09 Checked by : ASFG Date : 6/10/09

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Form No.: P6
Form Date: January 2004
File: P:\615120\Working material\Hydro_HA1_D3_1.5-2.0m.xls

Plate No.: Page of

Site : **Broadcasting Antenna, Honiara, Solmon Island**

HA No.: **1** Sample ID.: **D3**

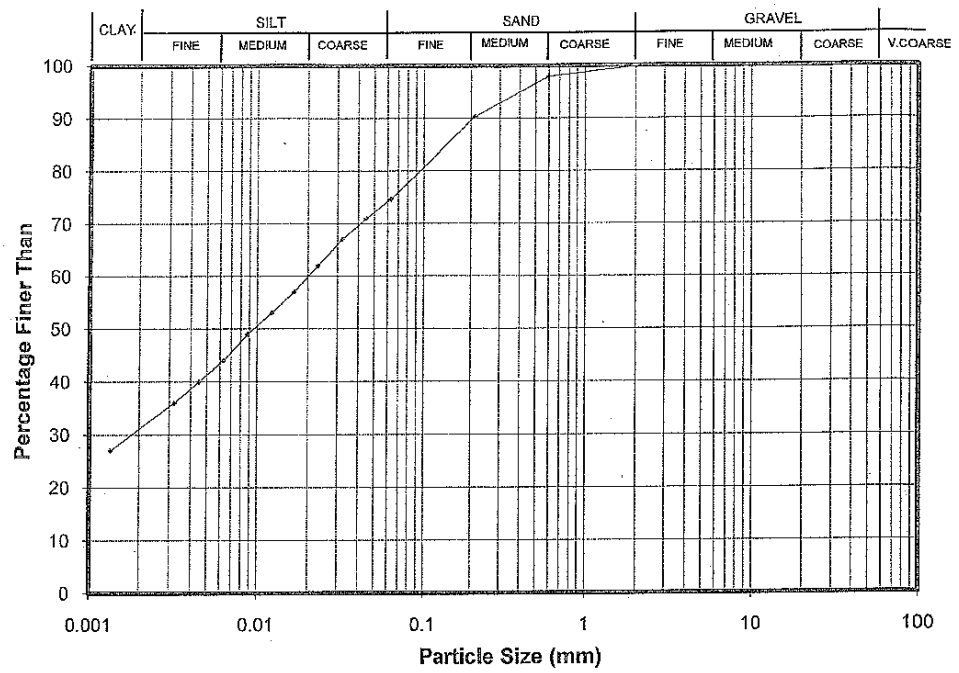
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: **750725**

Our Job No.: **615120.000**

Depth: **1.5-2.0 (m)**

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
3.35	100		
2.00	100		
0.600	98		
0.212	90		
0.063	75		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0448	71
0.0321	67
0.0230	62
0.0166	57
0.0122	53
0.0088	49
0.0063	44
0.0045	40
0.0032	36
0.0013	27

Sample history : As received.

Description: clayey/sandy SILT, firm to stiff, brown, high plasticity, slightly dilatant.

Solid Density (measured) : 2.82 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~16 hours), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.0
Sample description is not IANZ endorsed.

Entered by : ST Date : 6/10/09 Checked by : AJF Date : 6/10/09

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Form No.: P6
Form Date: January 2004
File: P:\615120\Working material\Hydro_HA2_D1_0.5-1.0m.xls

Plate No.: Page of

Site : **Broadcasting Antenna, Honiara, Solmon Island**

HA No.: **2** Sample ID.: **D1**

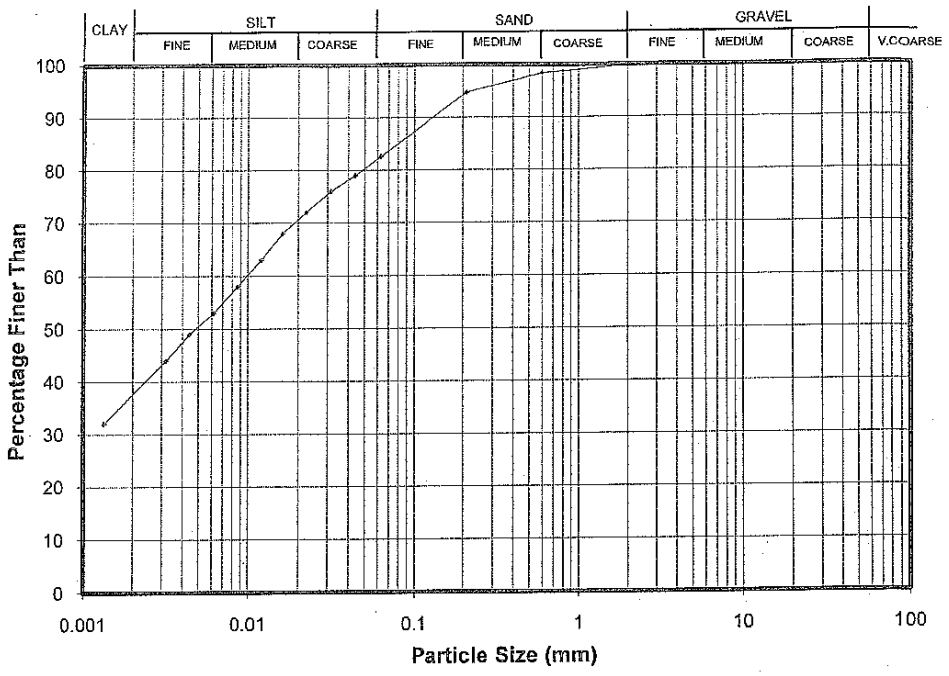
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: **750725**

Our Job No.: **615120.000**

Depth: **0.5-1.0 (m)**

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
3.35	100		
2.000	100		
0.600	98		
0.212	95		
0.063	83		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0441	79
0.0315	76
0.0225	72
0.0161	68
0.0120	63
0.0086	58
0.0062	53
0.0044	49
0.0032	44
0.0013	32

Sample history : As received.

Description: clayey SILT with some sand, very stiff, brown, high plasticity, slightly dilatant.

Solid Density (measured) : 2.81 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~16 hours), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.0
Sample description is not IANZ endorsed.

Entered by : SJ Date : 6/10/09 Checked by : ASF Date : 6/10/09

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Form No.: P6
Form Date: January 2004
File: P:\615120\Working material\Hydro_HA2_D3_1.0-1.5m.xls

Plate No.: Page of

Site : **Broadcasting Antenna, Honiara, Solmon Island**

HA No.: **2** Sample ID.: **D3**

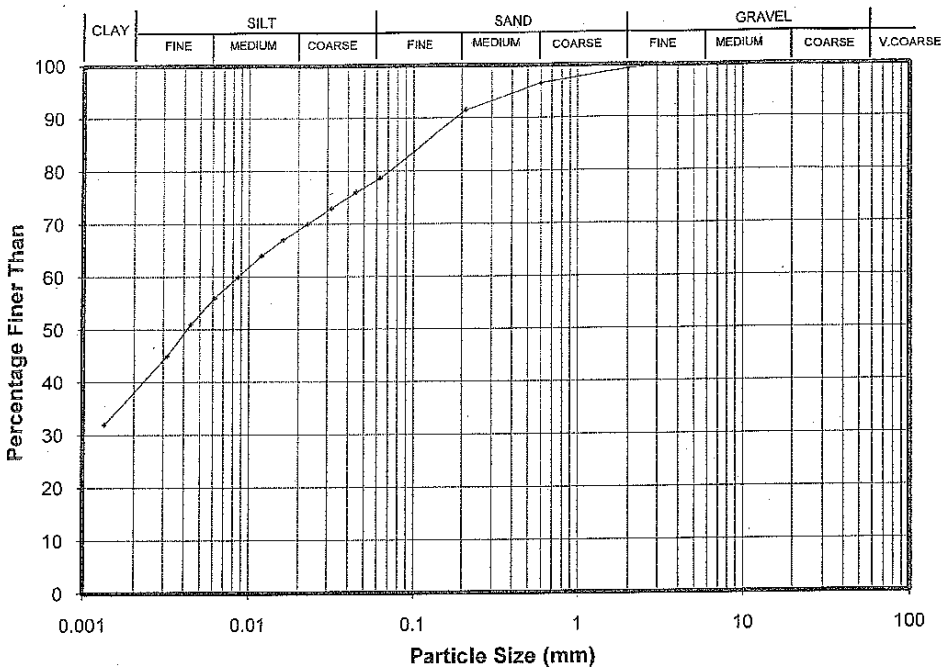
Test Method Used : NZS 4402:1986 Test 2.8.4 Hydrometer

Your Job No.: **750725**

Our Job No.: **615120.000**

Depth: **1.0-1.5 (m)**

PARTICLE SIZE ANALYSIS



Sieve (mm)	Total % Passing	Sieve (mm)	Total % Passing
3.35	100		
2.000	99		
0.600	97		
0.212	91		
0.063	79		

Equivalent Particle Diameter D (mm)	% of Particles Finer than D
0.0448	76
0.0319	73
0.0228	70
0.0163	67
0.0120	64
0.0086	60
0.0061	56
0.0044	51
0.0032	45
0.0013	32

Sample history : As received.

Description: clayey/sandy SILT, firm to stiff, brown, high plasticity, slightly dilatant.

Solid Density (measured) : 2.80 t/m^3

Remarks : A sub sample was split from the original sample for hydrometer analysis. This sample was soaked with a dispersing agent (~16 hours), then the mechanical shaker was used, until the material was brought into suspension, before proceeding with the test.
Suspension pH 8.0
Sample description is not IANZ endorsed.

Entered by : ST Date : 6/10/09 Checked by : [signature] Date : 6/10/09

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Form No.: 84
Form Date: January 2004
File: P:\615120\Working Material\Water content_summary.xls

Plate No.: Page of **Your Job No.: 750725**

Site : Broadcasting Antenna, Honiara, Solman Island **Our Job No.: 615120.000**

Test Method Used: NZS 4402:1986 Test 2.1 Determination of Water Content

SOLID DENSITY TEST RESULTS

Table 1: Solid Density

HA No.	1	1	2	2
Sample ID.:	D1	D3	D1	D3
Depth (m)	0.5-1.0	1.5-2.0	0.5-1.0	1.0-1.5
Water Content (%)	45.9	43.3	49.3	46.5

Remarks : Nil

Tested by: ST Date: 6/10/09 Checked by: KND Date: 6/10/09

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Form No.: S4
Form Date: January 2004
File: P:\615120\Working Material\Solid density_summary.xls

Plate No.: Page of Your Job No.: 750725

Site : Broadcasting Antenna, Honiara, Solman Island Our Job No.: 615120.000

Test Method Used: NZS 4402:1986 Test 2.7.2 Determination of Solid Density of Soil Particles by Vacuum

SOLID DENSITY TEST RESULTS

Table 1: Solid Density

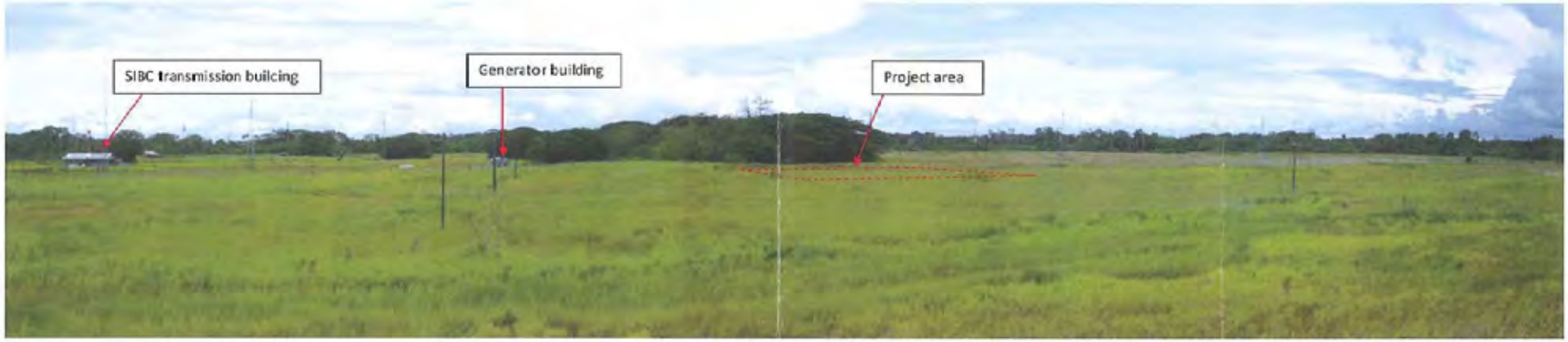
HA No.	1	1	2	2
Sample ID.:	D1	D3	D1	D3
Depth (m)	0.5-1.0	1.5-2.0	0.5-1.0	1.0-1.5
Solid Density (t/m^3)	2.81	2.82	2.81	2.80

Remarks : Solid density was performed on whole soil.

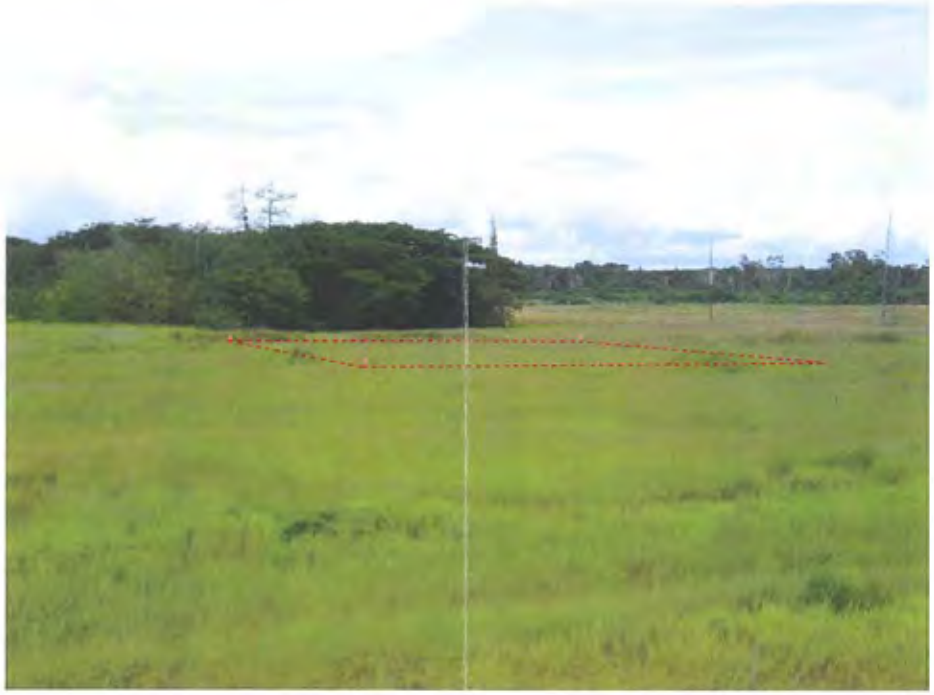
The average solid density reported to the nearest 0.01 t/m^3

Tested by: ST Date: 6/10/09 Checked by: AJFG Date: 6/10/09

Appendix D: Site photographs



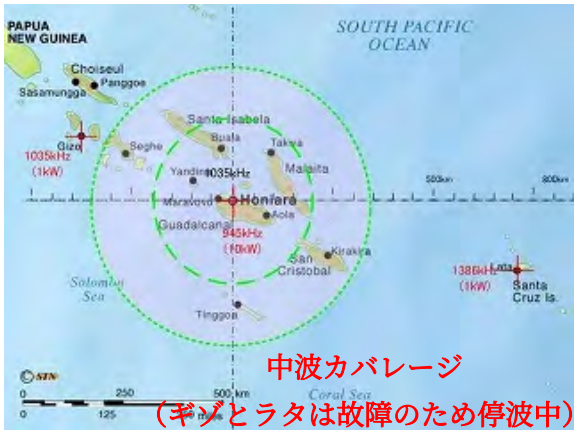
Photograph 1. General site area (pink flags mark four corners of the project area)



Photograph 2. Project site area (pink flags mark four corners of the project area)

資料－１３　離島調査結果まとめ

離　島　調　査



中波カバレージ
（ギゾとラタは故障のため停波中）

（FM 局設置の目的）

本計画では、現在中断しているホニアラの AM 短波放送を整備し、全国放送を可能とするものである。また、これまでの調査において、同短波放送を FM 波に変換し再放送する「FM 中継局」設置が、聴取を容易にするとされてきた。このため同可能性及び必要性を確認するため、以下の離島での調査を実施した。

（調査内容）

本計画では、離島に SIBC 支局や設備が少ないことから、同 FM 局の維持管理をテレコムに委託する方針で調査を進めた。一方、離島における日常や災害時における通信事情やラジオに対するニーズ等の社会状況調査を行った。

（調査結果）

マライタ州等のホニアラに面した都市では、ホニアラで放送される SIBC 中波放送が受信可能なものの、キラキラ（マキラ州）、チンゴア（レンネル・ベロナ州）は夜間等一部の時間のみ受信可能であることが判明した。その他の地域については、現在、SIBC の放送は受信不能となっている。一方、テレコム施設には FM 中継局用機材を設置するための維持管理体制及びスペースは確保可能と判断されるが、多くの離島では電力不足が深刻であり、同機材への電源の将来的な供給が厳しい状況であることが判明した。しかしながら、テレコム施設に本計画の FM 中継局用機材設置を実施後、維持管理のための費用を SIBC は負担する必要が生じ、大きな負担を強いることとなる。

この様な状況から、FM 中継局設置の必要性について、調査団と SIBC で協議の結果、現在故障中のホニアラの短波送信機及びアンテナを整備することで、全国放送を行い、FM 中継局については見送ることが、現在のところ妥当性があると、結論付けられた。

なお、下記離島における調査結果の概要は、以下のとおりである。

	ホニアラ ガダルカナル州	タロ チョイセル州	ギゾ ウェスタン州	ブアラ イサベル州	アウキ マライタ州	チンゴア リンネル・ベロナ州	キラキラ マキラ州	ラタ テモツ州
人口	79,555	24,060	83,759	23,209	143,852	2,890	38,123	21,190
機材設置スペース	○	○	○	○	○	○	○	○
電力	○	× ﾃﾚｺﾑ発電機のみ （修理中）	○	△ 慢性的な電力不足	○	× ﾃﾚｺﾑ予備発電機のみ	△ 慢性的な電力不足	△ 燃料不足
維持管理体制	○	△	○	○	○	△	○	○
中波･FM ラジオ 受信状況（SIBC）	中波: ○ FM : ○	中波: × （夜間短時間）	中波: × FM : ○	中波: △（昼間のみ）	中波: ○	中波: △（夜間のみ）	中波: △（夜間のみ）	中波: ×
社会状況 （インフラの状況）	電気: ○ 携帯: ○ ﾗｼﾞｵ: ○ 港: ○	電気: × 携帯: △(州都のみ) 港湾：△小型船のみ	電気: ○ 携帯: ○ 港: ○	電気: △（不安定） 携帯: △(州都のみ) 港: ○ ｺﾐｭﾆﾃｨ FM: ○	電気: ○ 携帯: ○(州都近郊) 港: ○ FM(民間): ○	電気: × 携帯: △(州都のみ) 港湾：×	電気: △(不安定) 携帯: △(州都のみ) 港：△波止場なし	電気: △(不安定) 携帯: △(州都のみ) 港: ○
その他（課題）		州知事に寄れば、将来的には、SIEA による電化が期待できるとの事。ホニアラから距離があり、燃料等輸送コストを要する。		水車発電機は修理中でディーゼル発電機 1 台。1200m の山の斜面が海岸部まで位置しており島内の移動は道がない		SIEA 未電化地域。電力はテレコムの自家発のみ。FM 送信機設置用に新たに電源の確保が必要。船着場からに荷揚げと、輸送が課題。		電力不足により中波送信機は停止中。

資料－１４　収集資料リスト

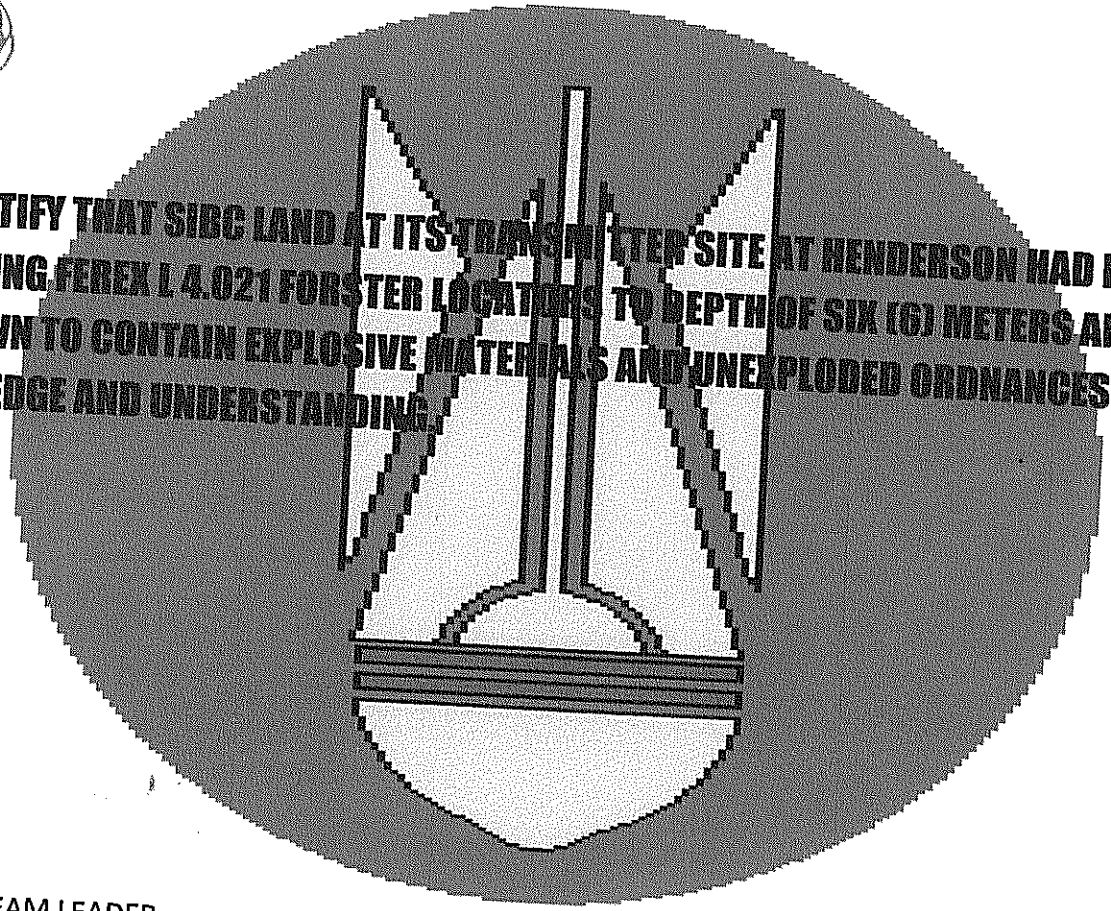
14. 収集資料ﾘｽﾄ

調査名: ソロモン国 防災ラジオ放送網改善計画 準備調査

番号	名 称	形態 図書･ビデオ･地図 ･写真等	ｵﾘｼﾞﾅﾙ･ｺﾋﾟｰ	発 行 機 関	発行年
1	Broadcasting in Solomon Islands – A Brief History	資料	コピー	Solomon Islands Broadcasting Corporation	不明
2	Receipt of Electricity at SIBC	資料	コピー	Solomon Islands Broadcasting Corporation	2009
3	Staff list of SIBC	資料	コピー	Solomon Islands Broadcasting Corporation	2009
4	Solomon Islands HF Restoration Project Supporting Words for the Project Costing 7/8/2009	資料	コピー	Solomon Islands Media Assistance Scheme	2009
5	Schedule 1 – Scope of Services: Project management of SIBC transmission works	資料	コピー	Solomon Islands Media Assistance Scheme	不明
6	Australian Broadcasting Corporation, Solomon Islands Broadcasting Corporation, Solomon Islands Media Assistance Scheme: Guyed Radio Mast at Gizo	資料	コピー	Solomon Islands Media Assistance Scheme	2009
7	Australian Broadcasting Corporation, Solomon Islands Broadcasting Corporation, Solomon Islands Media Assistance Scheme: Guyed Radio Mast at Honiara	資料	コピー	Solomon Islands Media Assistance Scheme	2009
8	National Disaster Management Office – 2010 Recurrent Budget	資料	コピー	National Disaster Management Office	不明
9	Organization Chart of Police Office	資料	コピー	Police Office	2009
10	Budget: Australia’s International Development Assistance Program	図書	コピー	Ministry for Foreign Affaires and Parliamentary Secretary for International Development Assistance	2009

番号	名 称	形態 図書･ビデオ･地図 ･写真等	ｵﾘｼﾞﾅﾙ･ｺﾋﾟｰ	発 行 機 関	発行年
11	Pacific Economic Survey: Connecting the region	図書	コピー	AusAID	2008
12	Approaches to Anti Corruption through the Australian Aid Program: Lessons from PNG. Indonesia and Solomon Islands	図書	コピー	AusAID	2007
13	Statement of Lines Report	資料	コピー	Solomon Telekom	2009

資料－１５　不発弾処理に係る証明書



EXPLOSIVE ORDNANCE DISPOSAL

THIS IS TO CERTIFY THAT SIBC LAND AT ITS TRANSMITTER SITE AT HENDERSON HAD BEEN CLEARED BY THE EODU TEAM USING FEREX L 4.021 FORSTER LOCATORS TO DEPTH OF SIX (6) METERS AND DECLEARED CLEAR OF ITEMS KNOWN TO CONTAIN EXPLOSIVE MATERIALS AND UNEXPLODED ORDNANCES TO THE BEST OF THE TEAMS KNOWLEDGE AND UNDERSTANDING.

EOC DETACHMENT TEAM LEADER

OFFICER COMMANDING EOD UNIT

On The Eighteenth day of the First Month of the Year Two Thousand and Eleven

A-15-1