5 参考資料

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9	Tuvalu Government National Budget 2010 – Program Estimates	電子ｺﾋﾟｰ	Nov. 2009	Ministry of Finance & Economic Planning
10	Tuvalu Government National Budget 2010 – Program Discriptions	電子ｺﾋﾟｰ	Nov. 2009	Ministry of Finance & Economic Planning
11	Tuvalu Government National Budget 2009	電子ｺﾋﾟｰ	Nov. 2008	Ministry of Finance & Economic Planning
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13	Tuvalu Government National Budget 2007 – Head M: Education & Sports	ｺﾋﾟｰ	Nov. 2006	Ministry of Finance & Economic Planning
14	Twenty-Third Annual Report of the Tuvalu Trust Fund Advisory Committee 2009	電子ｺﾋﾟｰ	Nov. 2009	TTFAC Secretariat
15	Tuvalu Trust Fund 20th Anniversary Profile 1987-2007	電子ｺﾋﾟｰ	2008	Tuvalu Trust Fund Board
16	Tuvalu Government European Commission 2008 Joint Annual Report	電子ｺﾋﾟｰ	Feb. 2009	European Commission
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18	Government of Tuvalu Biannual Statistical Report	電子ｺﾋﾟｰ	June 2008	Central Statistics Division
19	Household Income & Expenditure Survey (HIES) 2004/2005 Final Report	電子ｺﾋﾟｰ	Sept. 2006	Central Statistics Division
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番号	資料名	形態	発行年	発行機関
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36	Fiji Junior Certificate – Social Science Prescription	ｺﾋﾟｰ	2003	Ministry of Education, Fiji
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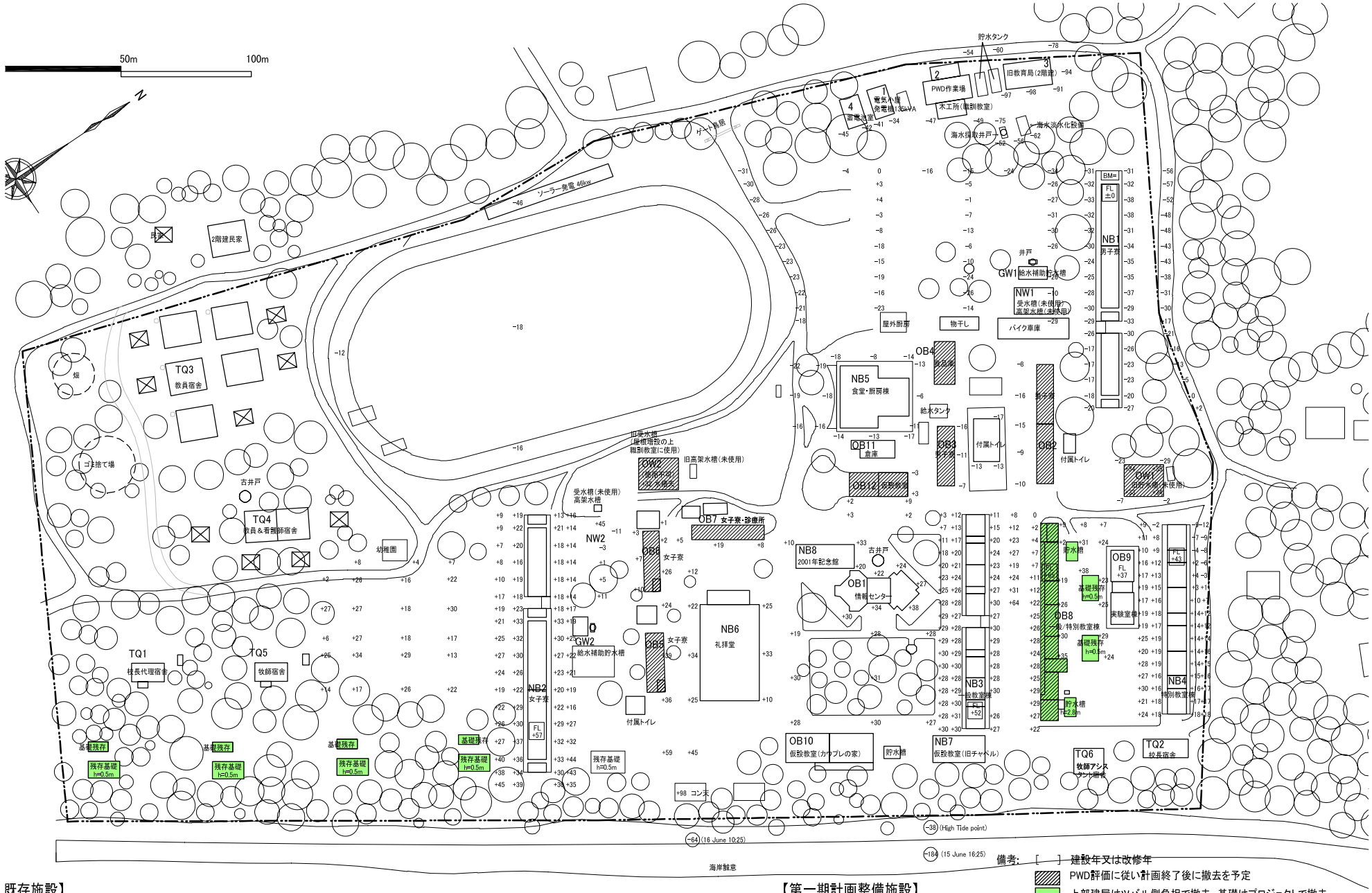
6. その他

- □ 敷地現況図
- □ 地盤状況調査結果 抜粋（現地再委託）



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備考: [ ] 建設年又は改修年
PWD評価に従い計画終了後に撤去を予定
上部建屋はツバル側負担で撤去、基礎はプロジェクトで撤去

既存施設】

01. 校長代理住居 [1979]
02. 校長住居 [1978]
03. 教員住居 [1988 以降]
04. 教員・看護師住居 [1988 以降]
05. 牧師住居 [1979]
06. 補助牧師住居 [1988 以降]

OB1. 資源センター [1991]
OB2. 男子寮 [1982]
OB3. 男子寮
OB4. 倉庫 [1982]
OB5. 女子寮 [1980]
OB6. 女子寮 [1980]
OB7. 女子寮・保健室 [1990]

OB8. 一般/特別教室棟 [1968]
OB9. 旧実験室棟 [1980]
OB10. 仮設教室(カウプレの家) [1976]
OB11. 倉庫 [1975]
OB12. 仮設教室(旧食堂) [1975頃]
OW1,2. 旧貯水槽・高架水槽
GW1,2. 井水使用補助貯水設備 [2001-2003]

NB6. 礼拝堂 [2004]
NB7. 仮設教室(旧チャペル) [2003, 改修]
NB8. 2000年火災事故配念館
1. 発電機室 [1988]
2. PWD ワークショップ [1993]
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【第一期計画整備施設】

NB1. 男子寮 [1998]
NB2. 女子寮 [1998]
NB3. 一般教室棟 [1998]
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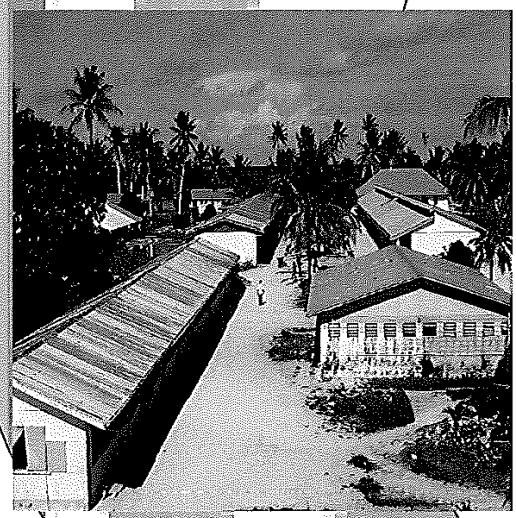
現況施設配置図
EXISTING FACILITY LAYOUT PLAN
S=1/2000

ツバル国モトフォウア高等教育施設整備計画
The Project for Improvement of Educational Facilities at Motufoua Secondary School

A-00

ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

PRELIMINARY GEOTECHNICAL INVESTIGATION of PROPOSED NEW DORMITORIES & CLASSROOM COMPLEX for MATSUDA CONSULTANTS CO., LIMITED



REFERENCE No.: 0400410

DATE: JULY 2010

PREPARED FOR: MATSUDA CONSULTANTS CO., LIMITED, 43-3 YOYOGI 3-CHOME, SHIBUYA-KU, TOKYO, JAPAN

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- Geotechnical
- Environmental
- Laboratory Testing
- Civil
- Structural
- Traffic
- Contract Admin
- Dispute Resolution

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1.0 PROJECT APPRECIATION

Entec Limited, Engineering & Science Consultants of Suva, Fiji (Entec) were invited by the Matsuda Consultants International Co; Ltd (MCICL) to provide a fee proposal to undertake a limited preliminary geotechnical engineering site assessment of ten (10 No.) proposed single storey dormitory and classroom complex development site being Motufoua Secondary School, Vaitupu Island, Tuvalu.

After discussions between the parties, Entec entered into an agreement with MCICL and it was confirmed to proceed with the site assessment and provide a report of the findings based on the requirements of the MCICL.

A Graduate Engineer from Entec Ltd in the presence of MCICL technical executives undertook the in-situ field investigation over 3 days from 15 to 17 June 2010. The findings are presented in this report.

2.0 GENERAL

2.1 Introduction

Entec's fee proposal was accepted and it was commissioned by the MCICL to undertake a limited preliminary geotechnical engineering assessment of the site for the ten (10 No.) proposed single storey buildings and provide a report on the findings. The purpose of this report being to assess the ground conditions for the design of the single storey building footings and determine the percolation rate of the ground for the design of the on-site sewage treatment system preferably septic tanks followed by soil absorption trenches or coral soak pits.

It is believed the proposed development entails the construction of ten single storey light steel framed portal structures lined with steel cladding roof and aerated lightweight precast concrete external and internal dividing walls on cast- in-situ concrete floor slab. The proposed buildings are to be constructed on an already developed site comprising of school buildings located along the eastern shoreline of Vaitupu Island in Tuvalu.

This report contains the details of the assessments undertaken, some analysis and results of the data collected and recommendations.

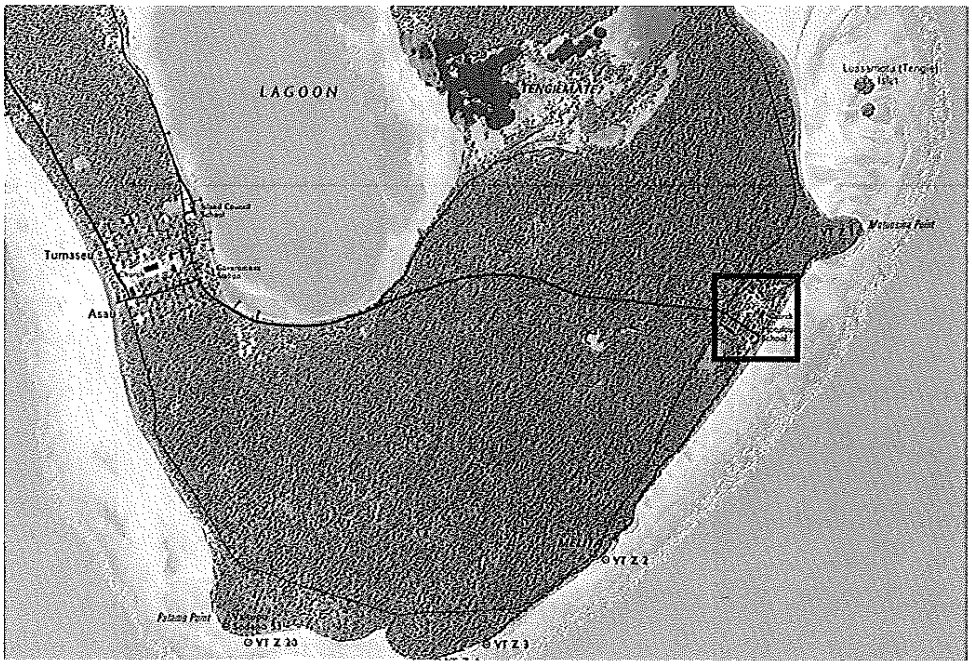
Based on the proposed layout plan attached in *Appendix A* called the 'Test Locality Plan', the preferred test locations were identified on site by the MCICL technical executives and required limited field tests were performed.

Field investigation work undertaken comprised of thirteen (13 No.) Scala Dynamic Cone Penetrometer (DCP) Tests up to a depth of 2.0m and three (3 No.) Water Penetration (WPT) Tests to a depth of 500mm for the absorption trench option and to a depth of 1.5m for the soak pit option.

Copies of the DCP and WPT tests obtained from the investigation are contained within *Appendix B* and *Appendix C* respectively.

Site Locality Plan, Figure 1 below shows the exact location of the site of the development.

Figure 1. Site Locality Plan



2.2 Purpose of Investigation

This report presents the results of a limited preliminary geotechnical engineering assessment performed at the site of the proposed development at Motufoua Secondary School, Vaitupu Island, Tuvalu. The purpose of the assessment was to undertake reasonable number of preliminary tests, both in the field and the laboratory and provide a report, which would:

- Determine the sub-surface conditions across the proposed ten building sites
- Recommend the footing system and estimate the required design parameters for the proposed footings
- Recommend the on-site sewage disposal system
- Undertake limited necessary laboratory tests on sand samples
- Discuss construction and drainage
- Comment on settlement and discuss construction issues

The above assessments having obtained adequate preliminary geological data and information of the site will thereby enable the design and construction of the proposed building footings and the on-site sewage disposal system.

3.0 PROPOSED DEVELOPMENT

The project entails construction of ten (10 No.) new single storey buildings on an already developed site located at Motufoua Secondary School, Vaitupu Island, Tuvalu. It is believed the proposed buildings will be constructed of light steel framed portal frames lined with steel cladding roof and aerated lightweight precast concrete external and internal dividing walls on cast-in-situ concrete floor slab.

DCP and WPT locations across the site were selected specifically to suit the locations of the proposed such buildings. Any additional phases of construction or works not shown on the plan within *Appendix A* will require further geotechnical testing to verify sub-soil conditions.

4.0 EXISTING SITE CONDITIONS

The proposed building sites are mostly vacant and some comprise of old footings of the demolished school buildings. In addition, there is no storm water drain running alongside the boundary of the proposed site. There is very little vegetation along with generally large coconut trees all over the site. There are also some palm trees and shrubs around some of the existing buildings which are currently being utilized for administration, classrooms and dormitory purposes.

Generally the site is flat and currently accessed via Main Road leading from Vaitupu Village to the school. Moreover the proposed development site is located along the shoreline of the eastern end of Vaitupu Island.

It is also noted that there are no visible storm water drain and it is unknown if there are other established underground services running through the development site.

5.0 FIELD INVESTIGATION

In order to assess the limited geotechnical engineering parameters and requirements for building footings and foundations and the on-site sewage disposal, a subsurface investigation was carried out on the proposed development site. The investigation comprised of desktop study of the area and its geological historical literature, in-situ testing, sand/coral sampling for laboratory tests, estimating of bearing capacity and recording/logging permeability of sub surface material.

From 15 to 17 June 2010, a Graduate Engineer from Entec visited the site to undertake the preliminary testing. The scope of works for the investigation comprised of the following:

- Carry out a brief desktop study of the area.
- Assess existing site conditions.
- Assess subsurface conditions and site geology by three (3 No.) Water Penetration Tests to 0.5m and 1.5m depths as well as thirteen (13 No.) Scala Dynamic Cone Penetrometer (DCP) tests targeted to a depth of 2m.
- Analyses and review of limited field and laboratory test results
- Laboratory testing of recovered limited sand/coral samples
- Footing & settlement recommendations
- Construction issues (limited only).

MCICL technical executives ascertained the test locations on site after having taken into account the approximate periphery of the proposed buildings and the topography of the site. Samples were recovered from Water Penetration Test No.02 site for limited laboratory testing and analyses. All samples at equivalent depths across the tested locations were identical.

The ground across the site comprises of 500mm thick layer of grey sand overlying pale brown coral sand with coral and some gravel to 2m depth.

The regional groundwater depth from the existing ground level across the site could not be determined on the day and during the time of testing on site. However, it could be estimated to be at a depth of approximately 3.0m from the existing ground level from the two existing water wells on-site which are used for emergency supply in cases of drought.

Findings from the DCP and WPT test results are appended within *Appendix B* and *Appendix C* respectively. The locations of all tests undertaken are shown within the Test Locality Plan included within *Appendix A*.

All recovered samples were collected and stored in sealed sample bags with clear identification marks, thus following in-house "Chain of Custody" procedures. Selected samples were sealed, tagged and brought back to the laboratory for relevant tests to be conducted.

6.0 SUB-SURFACE CONDITIONS

6.1 Reported Geology

The islands of Tuvalu are atolls with low-lying coral sand covering modern reef built upon older volcanic sea mounts (Ref. 1). The islands are geologically young, having been formed during the last 3000 years (Ref. 1).

6.2 Seismicity

A report on "Risk in Tuvalu" by the Public Works Department (Ref.2) indicates Tuvalu is situated far to the north of the Pacific Rim fault and indicates the earthquake risk is low. Therefore, for seismic

design actions purposes the site subsoil category of Intermediate may be adopted under the New Zealand Standard for General Structural Design and Design Loadings for Buildings, NZS 4203. Similarly a Zone Factor of 0.4 may be adopted.

6.3 Water Penetration Tests

Three (3 No.) water penetration tests (percolation) were conducted across the site to determine the rate of percolation in accordance with the Australian Environment Protection Authority, Health Department Victoria document "Septic Tanks Code of Practice", January 1990. Due to very high air void in the test layer which comprises of coral sand, it was very difficult to conduct the percolation tests however we believe an overall percolation rate in excess of 500mm/hr exists for both the grey and pale brown sands. From Figure A4.1 in the Septic Tanks Code of Practice the Soil hydraulic conductivity is about 2.0metres/day and a long term effluent infiltration rate of 41L/m^2/d. It should be noted that there is a significant chance of pollution of ground water occurring.

6.4 Scala Dynamic Cone Penetrometer Tests

Thirteen (13 No.) DCP tests in total were conducted on the site to estimate the soil stiffness and the allowable bearing capacity of the sub-surface soils. These results are appended in *Appendix B.*

The DCP test targeted a depth of approximately 2000mm below the existing ground level in order to profile the soil strength.

The results obtained from the DCP tests are generally consistent and indicate various reasonable allowable bearing capacities for the same and different founding depths. The preferred founding depth is 750mm from the existing ground level. Company standard operating procedure of DCP use, limited the test to prevent damage occurring to the equipment on a number of blows and upon a double bounce. Based on the results from DCP01, 03, 05, 07, and 13 it is estimated that the allowable bearing capacity of 120kPa is achievable at 750mm depth from the existing ground level. However, an allowable bearing capacity of 70kPa is estimated for DCP02, 04, 06 and 10 at a depth of 750mm. The Designer may consider a founding depth of 1100mm instead of 750mm for an allowable bearing capacity of 120kPa instead of 70kPa in DCP06 and 900mm instead of 750mm for an allowable bearing capacity of 120kPa instead of 70kPa in DCP10. An allowable bearing capacity of 175kPa may be adopted at a depth of 750mm in DCP08. Similarly, an allowable bearing capacity of 100kPa may be adopted at 750mm in DCP09 and 11. DCP12 showed poor results of 35kPa up to a depth of 1000mm and 70kPa for depths in excess of 1000mm. Note that the above stated allowable bearing capacities have a Factor of Safety of 3.0

7.0 Laboratory Tests

To determine the required engineering properties of the sub-surface soil the following laboratory tests were undertaken:

- Natural Moisture Content (MC) Tests

- Angle of Repose (AR) Tests
- Specific Gravity (Gs) Tests
- Dry Sieve Analysis (DSA) Tests

Full laboratory test results of the Natural Moisture Content, Angle of Repose, Specific Gravity and Dry Sieve Analysis Tests are appended in *Appendix D.*

7.1 Natural Moisture Content Tests

The average natural moisture content of the grey sand is between 22.8 and 23.5% whilst that of the pale brown sand is between 22.4 and 24.4%. The bulk density of the grey sand is approximately 10.9kN/m3 and that of the pale brown sand is approximately 11.0kN/m3. These may appear low but it is not unusual as the sand has some organic contamination and has been formed from coral. The samples in their naturally occurring form have slight dried organic plant roots.

7.2 Angle of Repose Tests

The angle of repose of the grey sand is approximately 32 degrees whilst that of the pale brown sand is 28 degrees. For simplicity these figures may be used for the angle of internal friction.

7.3 Specific Gravity Tests

The specific gravity of the pale brown sand is 2.3. Although this may sound low, but considering it has slight organic content the figure is not unreasonable.

7.4 Dry Sieve Analysis Tests

The grey sand comprises of some 50% coarse grains and 35% medium. The pale brown sand on the other hand comprises of 60% coarse and 30% fine.

8.0 DISCUSSION & RECOMMENDATIONS

8.1 Footing Recommendations

8.1.1 Footing Options

The field test results indicate the presence of low strength sand overlying a stiffer layer. The depths of the preferred founding depths and their relative bearing capacities are recommended in section 6.4 above. The best footing option for the type of development proposed is high level (shallow) strip with the suggested founding depths and bearing capacities. It will probably be necessary to provide construction joints in the floor slab to prevent shrinkage cracks, but this should not have a significant effect on the overall stiffness of the footing system.

The above recommendations are based on limited findings.

Due to limited testing it is ***STRONGLY RECOMMENDED*** that on site monitoring is carried out by a qualified geotechnical engineer at the time of undertaking the excavations for the building platform

and footings. Before casting concrete the foundations must be approved by a qualified geotechnical engineer. Should ground conditions vary enormously then it is likely that several allowable bearing capacities will be required to be adopted for the redesign of the footings. This may involve minor amendments to the footing design.

8.2 Retaining Walls

8.2.1 Earth Pressures

As a guideline we recommend that any proposed retaining walls be designed to the following design parameters although the lateral earth pressure will depend on the nature of the backfill.

It is recommended that for any proposed retaining walls in contact with, or close to, the naturally occurring weak soil are designed for a uniform lateral earth pressure distribution of 7.5H kPa, where H is the retained height. If the site is battered back and backfill placed after retaining wall construction, the lateral earth pressure will depend on the nature of the backfill.

Permanent drainage is always recommended behind the base of a wall. It is also recommended that a one half height hydrostatic pressure is added to the design lateral pressure to allow for storms and the poorly managed run offs from the neighboring properties.

8.2.2 Excavation Stability

Subject to geotechnical engineering inspection and approval at the time of excavation, the sand may be excavated to a temporary vertical batter. Excavation and retaining wall construction should be completed within reasonable time of cutting the vertical batter.

Prior to cutting a temporary vertical batter the bulk excavation should be inspected, while in progress, by a suitably experienced person to:

- Confirm that a vertical batter has adequate short term stability and that there are no adverse joint sets that may cause instability.
- Confirm that occupational health and safety issues are satisfied.

If a vertical batter is adopted, site personnel should regularly inspect the batter and the ground surface behind the batter for signs of instability and ensure that all Occupational Health and Safety requirements are satisfied.

8.3 Construction & Drainage

8.3.1 Footings and Earthworks

Care should be taken to ensure that proposed footings and or load bearing beams/walls are founded below any soil influenced by the presence of existing service trenches or disturbed by the removal of old foundations, services or trees. Care must be taken in undertaking works so as existing neighbouring building in particular the footings are not affected.

Footing excavations should be cleaned of all loose, disturbed or wet material prior to placing concrete.

If at the time of construction, the subgrade moisture content is above the standard optimum moisture content, it may be necessary to lime stabilize the upper subgrade levels or to adopt some subgrade replacement to allow subgrade preparation to proceed.

All disturbed and compacted soils **MUST** be engineered to meet the minimum requirements such as meeting the 98% Relative Compaction or as required by the Designer. During construction on-site verification **MUST** be carried out by a competent Geotechnical Engineer.

Contractors or tenderers should make at the time of construction their own assessment, or seek specialist advice, on the need and/or extent for subgrade stabilization or replacement.

8.3.2 Drainage and Services

Following are recommended for the drainage system and services:

- To preserve the stability of excavations for footing and service construction, all run-off water should be directed well away from the top of the excavations.
- Drainage should be provided behind the base of proposed retaining walls. The drain should be connected to the stormwater system or to a permanent automatic pump and sump.
- All services should be maintained in an excellent condition so that no stormwater or wastewater is delivered to the sub-surface in the vicinity of building footings.
- All run-off and roof water should be directed well away from the structures. This may require regrading of the ground surface adjacent to the building perimeter.
- All services through a footing should be sufficiently flexible to allow for some relative movement between the footing and the adjacent sub-surface.

9.0 CONCLUSION

The results of the geotechnical investigation are summarized as follows:

- Entec Ltd undertook a limited preliminary geotechnical investigation to determine 1) the footing and foundation conditions of the proposed single storey buildings which are believed to be constructed of reinforced concrete floor slab, light steel framed portal with infill light weight aerated precast concrete panels and 2) the percolation rate of the ground for on-site sewage disposal by septic tank.
- Collection of samples for laboratory testing, undertaking thirteen (13) Scala Dynamic Cone Penetrometer tests and three (3) Water Penetration tests.
- Subsurface conditions comprise of sand overlying coral.
- A high level strip footing and integral slab floor should be considered to be the most economical and appropriate for the planned structure. Any footing system must be **VERIFIED**

for the competency of the foundation by a competent Geotechnical Engineer before concrete slab is cast on the ground floor.

- Design Geotechnical Estimated Allowable Bearing Capacity between 35 and 175kPa may be adopted at various depths for structural engineering design purposes on the above basis.
- Differential settlements are expected to be negligible on the basis of the above recommendations.
- Septic tanks with absorption trenches or soak pits are viable, however, any contamination of the ground water must be investigated.
- Further inspection of the excavated soils during the construction phase is strongly recommended to verify the content of this report. This is due to the limited nature of the investigations and testing undertaken.
- Actual construction methodology may require further review to ensure the geotechnical results are understood and presented in the correct context.

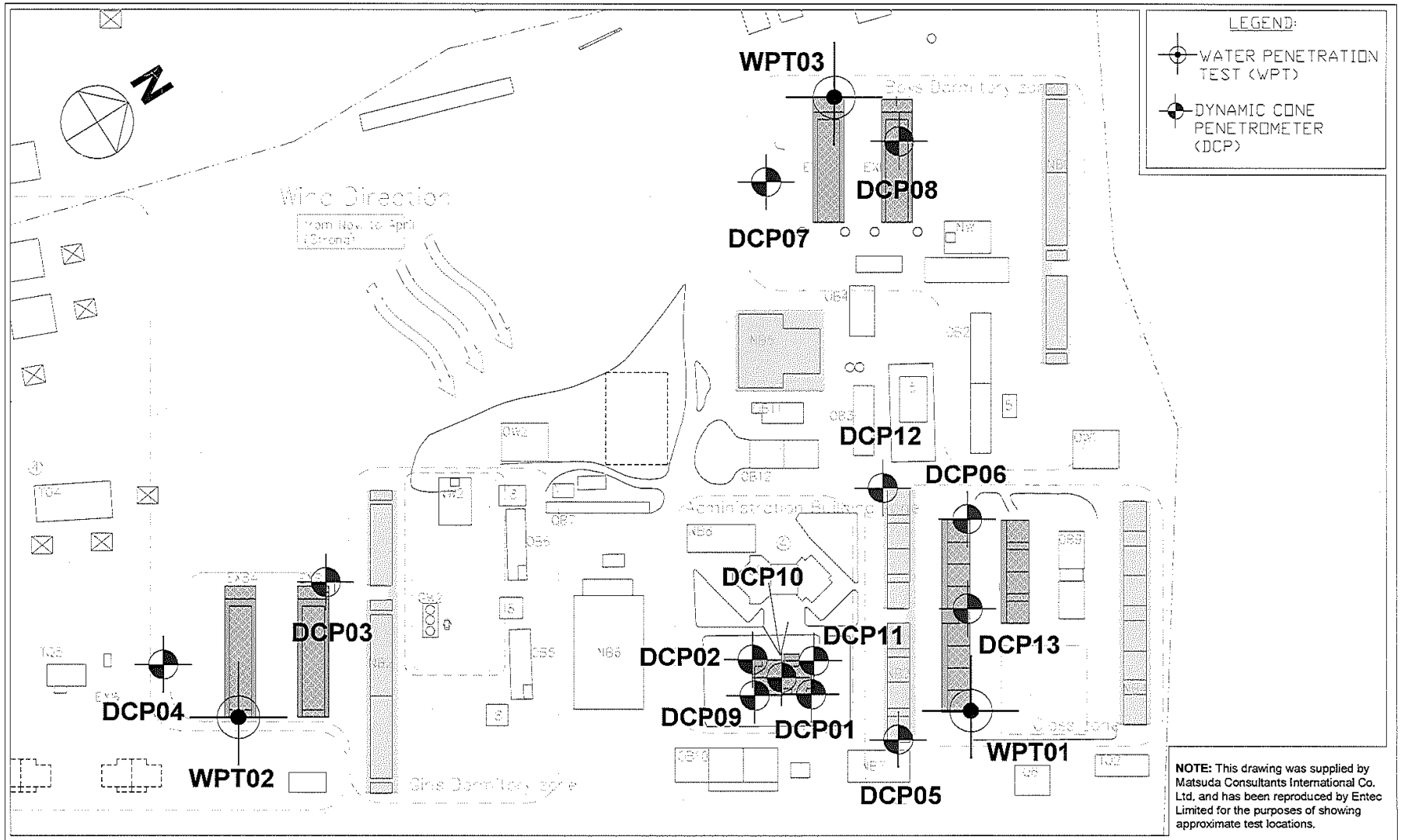
10.0 APPLICABILITY

This report has been prepared solely for the benefit of Matsuda Consultants International Co., Ltd, who has commissioned the works in accordance with the project brief only, which is based on information provided by them. All data or opinions contained in it may not be used in other contexts or for any other purpose without our prior review and agreement. It does not provide a complete assessment of the geotechnical status of the site and it is limited to the scope defined herein.

During construction, the site should be examined by a competent geotechnical engineer experienced and qualified to judge whether the exposed subsoils are compatible with the inferred conditions on which the report has been based. We would be pleased to provide this service to you and believe your project would benefit from this continuity. However, it is important that we be contacted if there is any variation in subsoil conditions from those described in the report.

Whilst every care has been taken in the investigation, assessment, testing program and compilation of this report, it is to be known that our recommendations are based on the limited tests and the conditions on the day of the test. No responsibility or liability is accepted for consequences arising from either errors or omissions in that data.

All conclusions and recommendations are based on a limited amount of analytical and historical information and therefore the conclusions must be seen in this light.



GEOTECHNICAL CONSULTANT:	Checked by: IT	Approved by: PS	CLIENT: JAPAN INTERNATIONAL COOPERATION AGENCY	Date: 15/06/10, 16/06/10 & 17/06/10	Scale: NTS
ENTEC LIMITED ENGINEERING & SCIENCE CONSULTANTS Level 2, Mid City Plaza, Cnr Cumming St & Renwick Rd, Suva, Fiji P.O. Box 12309, Suva, Fiji Phone : (679) 330 0300 Facsimile : (679) 331 8618 e-mail : entec@connect.com.fj			PROJECT: LIMITED PRELIMINARY GEOTECH INVESTIGATION OF PROPOSED NEW DORMITORY AND CLASSROOM COMPLEX, MOTUFOUA SECONDARY SCHOOL, VAITUPU ISLAND, TUVALU	TITLE: TEST LOCALITY PLAN Project Number: 0400410 / Edition: N/A / Sheet: 1/1	

Appendix B
Scala Dynamic Cone Penetrometer (DCP) Test Results

ENTEC LIMITED
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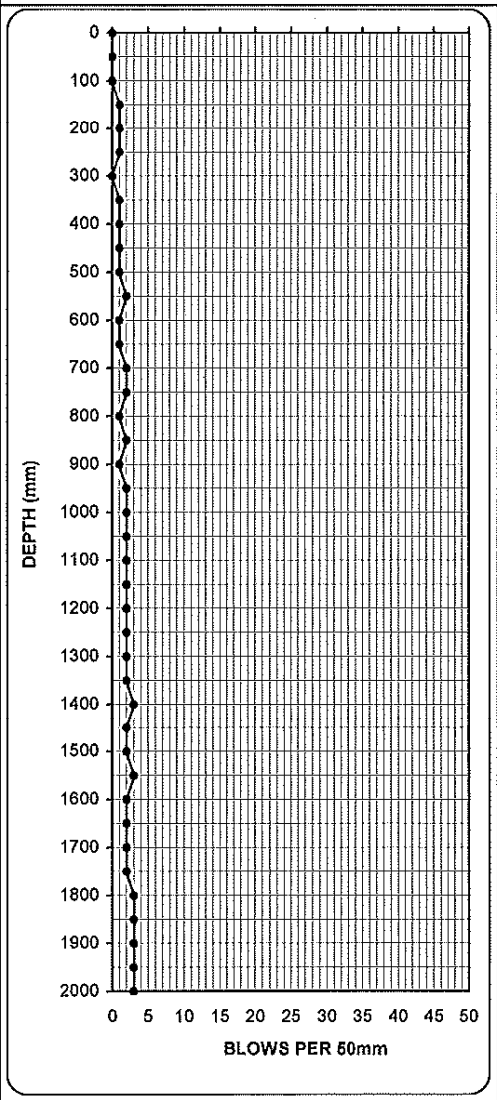
Dynamic Cone Penetrometer Test

PRINCIPAL	:	Japan International Cooperation Agency	PROJECT No.	:	0400410
PROJECT NAME	:	Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE / TIME	:	15/06/10 0900
SITE ADDRESS	:	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	:	Danish B
TEST LOCATION	:	Refer To Test Locality Plan			
SURFACE ELEVATION	:	-	TEST No.	:	01
DATUM	:	Existing Ground Level	MATERIAL DESCRIPTION	:	Gravelly SAND, loose, medium grained, dark grey black white, moist
CO-ORDINATES	:	-			

DEPTH (mm)	BLOWS PER 50 mm	INTERPRETED		
		Blows / 150 mm	Average 150 mm	Degree of Compaction
0				
50			1	V SOFT
100		1	1	V SOFT
150	1	2	2	SOFT
200	1	3	2	SOFT
250	1	2	2	SOFT
300		2	2	SOFT
350	1	2	2	SOFT
400	1	3	3	SOFT
450	1	3	3	SOFT
500	1	4	4	SOFT
550	2	4	4	FIRM
600	1	4	4	FIRM
650	1	4	4	FIRM
700	2	5	5	FIRM
750	2	5	5	FIRM
800	1	5	5	FIRM
850	2	4	5	FIRM
900	1	5	5	FIRM
950	2	5	5	FIRM
1000	2	6	6	FIRM
1050	2	6	6	FIRM
1100	2	6	6	FIRM
1150	2	6	6	FIRM
1200	2	6	6	FIRM
1250	2	6	6	FIRM
1300	2	6	6	FIRM
1350	2	7	7	FIRM
1400	3	7	7	FIRM
1450	2	7	7	FIRM
1500	2	7	7	FIRM
1550	3	7	7	FIRM
1600	2	7	7	FIRM
1650	2	6	6	FIRM
1700	2	6	6	FIRM
1750	2	7	7	FIRM
1800	3	8	8	STIFF
1850	3	9	9	STIFF
1900	3	9	9	STIFF
1950	3	9	8	STIFF
2000	3	6	8	FIRM

PENETROMETER CHART



COMMENTS :

Tested By: DB
Date: 15/06/10

Q.A. Check By: IT
Date: 23/06/10

Approved By: PS
Date: 23/06/10

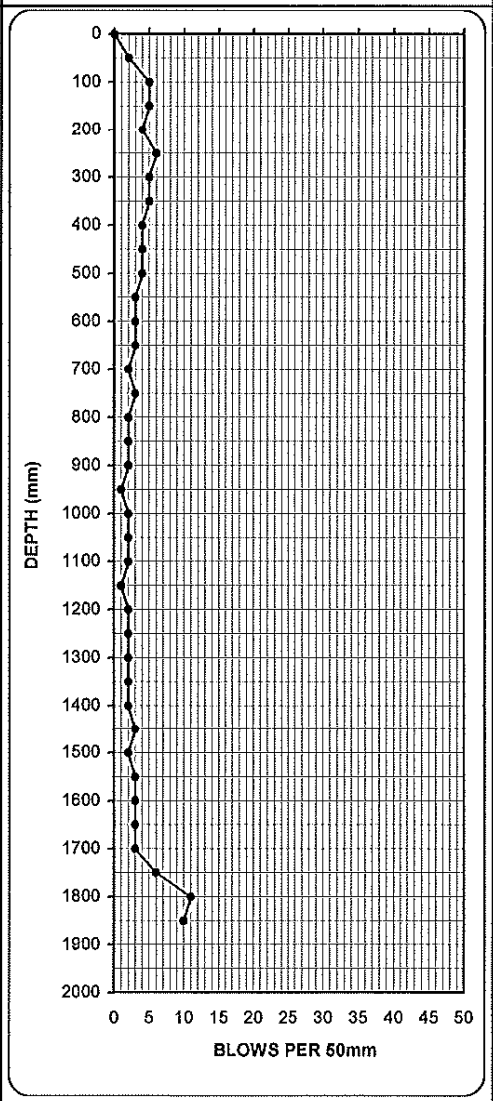
ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Dynamic Cone Penetrometer Test

PRINCIPAL	:	Japan International Cooperation Agency	PROJECT No.	:	0400410
PROJECT NAME	:	Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE / TIME	:	15/06/10 0900
SITE ADDRESS	:	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	:	Danish B
TEST LOCATION	:	Refer To Test Locality Plan			
SURFACE ELEVATION	:	-	TEST No.	:	03
DATUM	:	Existing Ground Level	MATERIAL DESCRIPTION	:	Gravelly SAND, loose, medium grained, dark grey black white, moist
CO-ORDINATES	:	-*			

DEPTH (mm)	BLOWS PER 50 mm	INTERPRETED		
		Blows / 150 mm	Average 150 mm	Degree of Compaction
0				
50	2	7	10	STIFF
100	5	12	11	STIFF
150	5	14	14	STIFF
200	4	15	15	STIFF
250	6	15	15	V STIFF
300	5	16	15	V STIFF
350	5	14	14	STIFF
400	4	13	13	STIFF
450	4	12	12	STIFF
500	4	11	11	STIFF
550	3	10	10	STIFF
600	3	9	9	STIFF
650	3	8	8	STIFF
700	2	8	8	FIRM
750	3	7	7	FIRM
800	2	7	7	FIRM
850	2	6	6	FIRM
900	2	5	5	FIRM
950	1	5	5	FIRM
1000	2	5	5	FIRM
1050	2	6	5	FIRM
1100	2	5	5	FIRM
1150	1	5	5	FIRM
1200	2	5	5	FIRM
1250	2	6	6	FIRM
1300	2	6	6	FIRM
1350	2	6	6	FIRM
1400	2	7	7	FIRM
1450	3	7	7	FIRM
1500	2	8	8	FIRM
1550	3	8	8	STIFF
1600	3	9	9	STIFF
1650	3	9	10	STIFF
1700	3	12	14	STIFF
1750	6	20	20	V STIFF
1800	11	27	23	V STIFF
1850	10	21	24	V STIFF
1900	DB			
1950				
2000				

PENETROMETER CHART



COMMENTS :
DB denotes Double Bounce

Tested By: DB
Date: 15/06/10

Q.A. Check By: IT
Date: 23/06/10

Approved By: PS
Date: 23/06/10

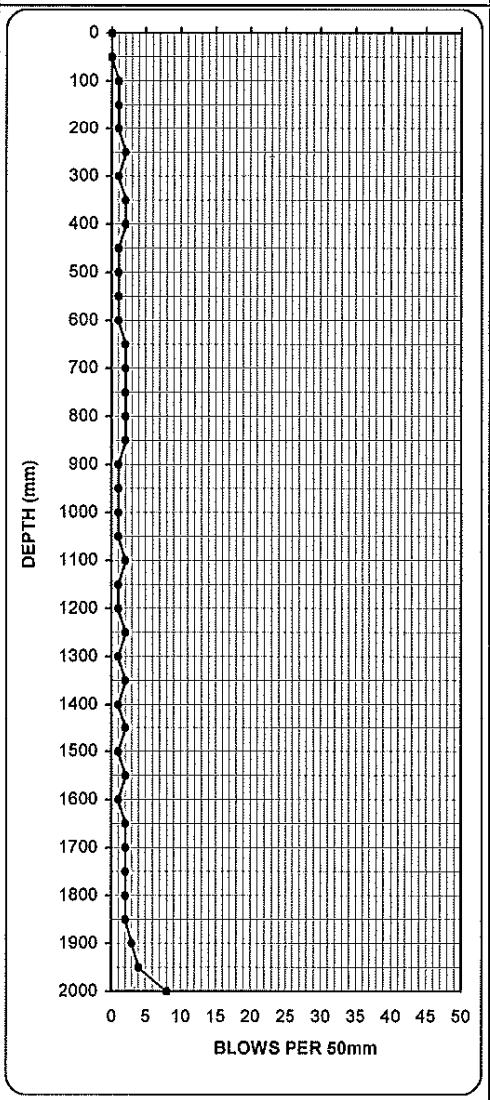
ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Dynamic Cone Penetrometer Test

PRINCIPAL	:	Japan International Cooperation Agency	PROJECT No.	:	0400410
PROJECT NAME	:	Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE / TIME	:	15/06/10 0900
SITE ADDRESS	:	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	:	Danish B
TEST LOCATION	:	Refer To Test Locality Plan			
SURFACE ELEVATION	:	-	TEST No.	:	04
DATUM	:	Existing Ground Level	MATERIAL DESCRIPTION	:	Gravelly SAND, loose, medium grained, dark grey black white, moist
CO-ORDINATES	:	-			

DEPTH (mm)	BLOWS PER 50 mm	INTERPRETED Blows / 150 mm	Average 150 mm	Degree of Compaction
0				
50		1	2	V SOFT
100	1	2	2	SOFT
150	1	3	3	SOFT
200	1	4	4	SOFT
250	2	4	4	FIRM
300	1	5	5	FIRM
350	2	5	5	FIRM
400	2	5	5	FIRM
450	1	4	4	FIRM
500	1	3	3	SOFT
550	1	3	3	SOFT
600	1	4	4	FIRM
650	2	5	5	FIRM
700	2	6	6	FIRM
750	2	6	6	FIRM
800	2	6	6	FIRM
850	2	5	5	FIRM
900	1	4	4	FIRM
950	1	3	3	SOFT
1000	1	3	3	SOFT
1050	1	4	4	SOFT
1100	2	4	4	FIRM
1150	1	4	4	FIRM
1200	1	4	4	FIRM
1250	2	4	4	FIRM
1300	1	5	4	FIRM
1350	2	4	5	FIRM
1400	1	5	4	FIRM
1450	2	4	5	FIRM
1500	1	5	4	FIRM
1550	2	4	5	FIRM
1600	1	5	5	FIRM
1650	2	5	5	FIRM
1700	2	6	6	FIRM
1750	2	6	6	FIRM
1800	2	6	6	FIRM
1850	2	7	7	FIRM
1900	3	9	10	STIFF
1950	4	15	12	STIFF
2000	8	12	14	STIFF

PENETROMETER CHART



COMMENTS :

Tested By: DB
Date: 15/06/10

Q.A. Check By: IT
Date: 23/06/10

Approved By: PS
Date: 23/06/10

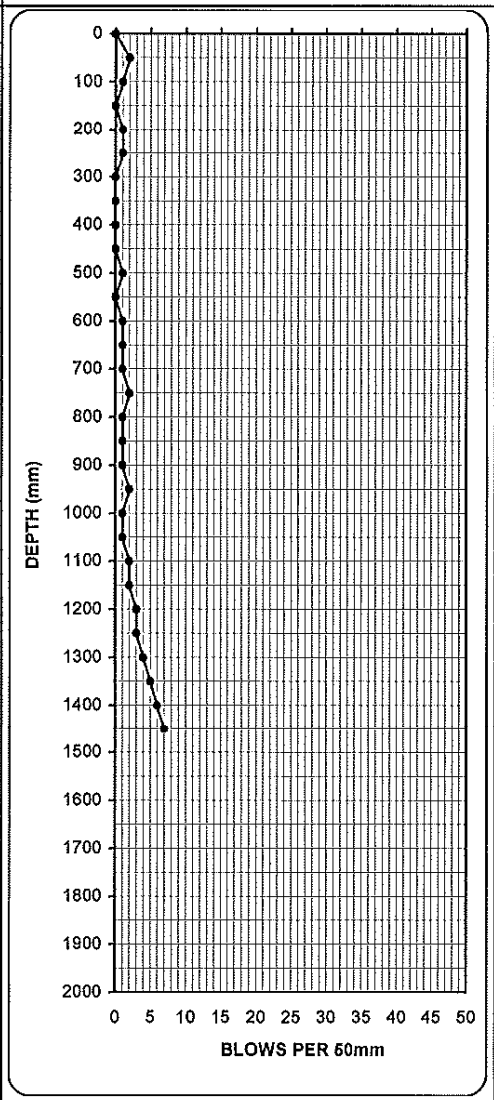
ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Dynamic Cone Penetrometer Test

PRINCIPAL	:	Japan International Cooperation Agency	PROJECT No.	:	0400410
PROJECT NAME	:	Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE / TIME	:	15/06/10 0900
SITE ADDRESS	:	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	:	Danish B
TEST LOCATION	:	Refer To Test Locality Plan			
SURFACE ELEVATION	:	-	TEST No.	:	06
DATUM	:	Existing Ground Level	MATERIAL DESCRIPTION	:	Gravelly SAND, loose, medium grained, dark grey black white, moist
CO-ORDINATES	:	-			

DEPTH (mm)	BLOWS PER 50 mm	INTERPRETED		
		Blows / 150 mm	Average 150 mm	Degree of Compaction
0				
50	2	3	3	SOFT
100	1	3	3	SOFT
150		2	2	SOFT
200	1	2	2	SOFT
250	1	2	2	V SOFT
300		1	1	V SOFT
350			0	V SOFT
400			0	V SOFT
450		1	1	V SOFT
500	1	1	1	V SOFT
550		2	2	V SOFT
600	1	2	2	SOFT
650	1	3	3	SOFT
700	1	4	4	SOFT
750	2	4	4	FIRM
800	1	4	4	SOFT
850	1	3	4	SOFT
900	1	4	4	SOFT
950	2	4	4	FIRM
1000	1	4	4	FIRM
1050	1	4	4	FIRM
1100	2	5	5	FIRM
1150	2	7	7	FIRM
1200	3	8	8	STIFF
1250	3	10	10	STIFF
1300	4	12	12	STIFF
1350	5	15	15	V STIFF
1400	6	18	15	V STIFF
1450	7	13	16	V STIFF
1500	DB			
1550				
1600				
1650				
1700				
1750				
1800				
1850				
1900				
1950				
2000				

PENETROMETER CHART



COMMENTS :
DB denotes Double Bounce

Tested By: DB
Date: 15/06/10

Q.A. Check By: IT
Date: 23/06/10

Approved By: PS
Date: 23/06/10

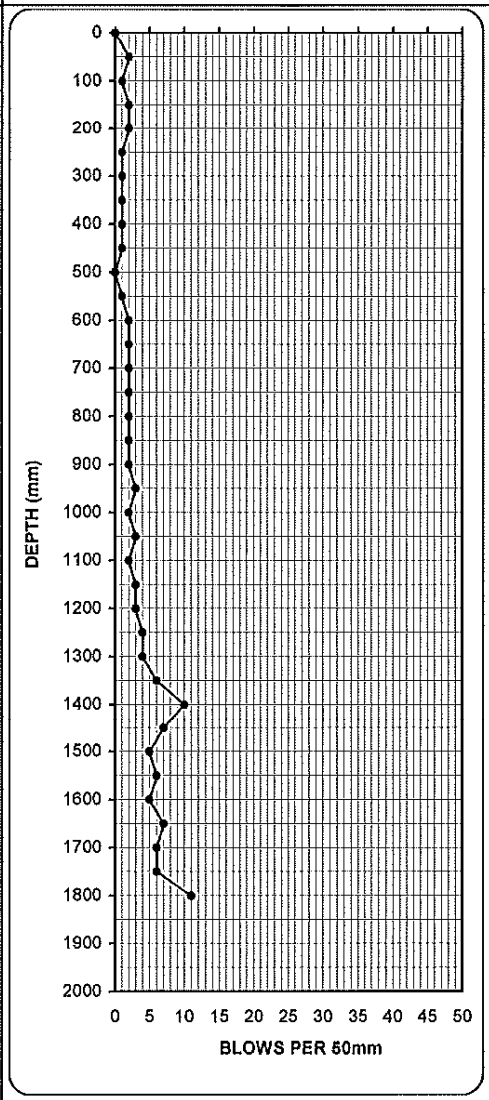
ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Dynamic Cone Penetrometer Test

PRINCIPAL	:	Japan International Cooperation Agency	PROJECT No.	:	0400410
PROJECT NAME	:	Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE / TIME	:	15/06/10 0900
SITE ADDRESS	:	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	:	Danish B
TEST LOCATION	:	Refer To Test Locality Plan			
SURFACE ELEVATION	:	-	TEST No.	:	07
DATUM	:	Existing Ground Level	MATERIAL DESCRIPTION	:	Gravelly SAND, loose, medium grained, dark grey black white, moist
CO-ORDINATES	:	-			

DEPTH (mm)	BLOWS PER 50 mm	INTERPRETED		
		Blows / 150 mm	Average 150 mm	Degree of Compaction
0				
50	2	3	4	FIRM
100	1	5	4	FIRM
150	2	5	5	FIRM
200	2	5	5	FIRM
250	1	4	4	FIRM
300	1	3	3	SOFT
350	1	3	3	SOFT
400	1	3	3	SOFT
450	1	2	2	SOFT
500		2	2	SOFT
550	1	3	3	SOFT
600	2	5	5	FIRM
650	2	6	6	FIRM
700	2	6	6	FIRM
750	2	6	6	FIRM
800	2	6	6	FIRM
850	2	6	6	FIRM
900	2	7	7	FIRM
950	3	7	7	FIRM
1000	2	8	7	FIRM
1050	3	7	8	FIRM
1100	2	8	8	FIRM
1150	3	8	9	STIFF
1200	3	10	10	STIFF
1250	4	11	12	STIFF
1300	4	14	15	V STIFF
1350	6	20	19	V STIFF
1400	10	23	22	V STIFF
1450	7	22	21	V STIFF
1500	5	18	19	V STIFF
1550	6	16	17	V STIFF
1600	5	18	17	V STIFF
1650	7	18	18	V STIFF
1700	6	19	20	V STIFF
1750	6	23	20	V STIFF
1800	11	17	20	V STIFF
1850				
1900				
1950				
2000				

PENETROMETER CHART



COMMENTS :

Tested By: DB
Date: 15/06/10

Q.A. Check By: IT
Date: 23/06/10

Approved By: PS
Date: 23/06/10

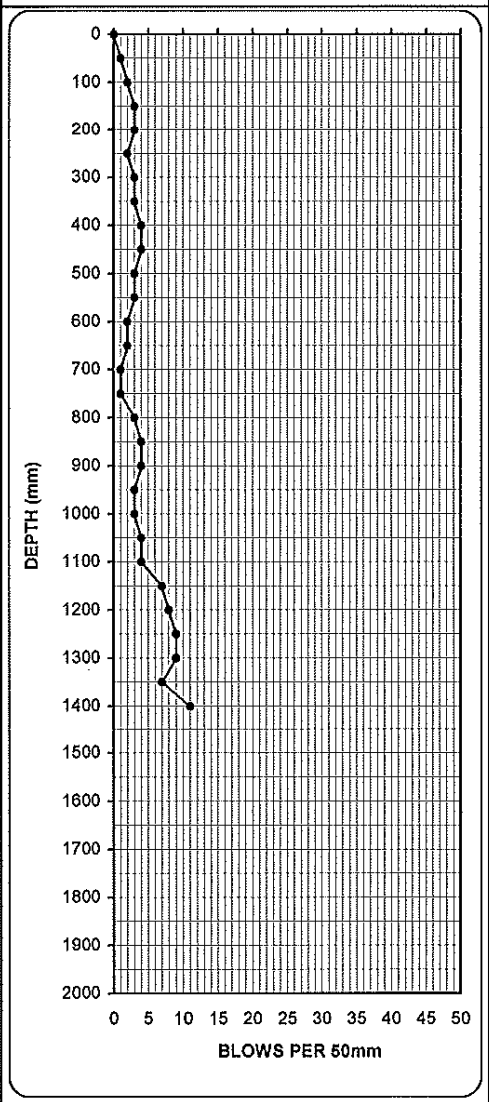
ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Dynamic Cone Penetrometer Test

PRINCIPAL	:	Japan International Cooperation Agency	PROJECT No.	:	0400410
PROJECT NAME	:	Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE / TIME	:	15/06/10 0900
SITE ADDRESS	:	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	:	Danish B
TEST LOCATION	:	Refer To Test Locality Plan			
SURFACE ELEVATION	:	-	TEST No.	:	08
DATUM	:	Existing Ground Level	MATERIAL DESCRIPTION	:	Gravelly SAND, loose, medium grained, dark grey black white, moist
CO-ORDINATES	:	-			

DEPTH (mm)	BLOWS PER 50 mm	INTERPRETED Blows / 150 mm	Average 150 mm	Degree of Compaction
0				
50	1	3	5	FIRM
100	2	6	6	FIRM
150	3	8	7	FIRM
200	3	8	8	STIFF
250	2	8	8	STIFF
300	3	8	9	STIFF
350	3	10	10	STIFF
400	4	11	11	STIFF
450	4	11	11	STIFF
500	3	10	10	STIFF
550	3	8	8	STIFF
600	2	7	7	FIRM
650	2	5	5	FIRM
700	1	4	5	FIRM
750	1	5	6	FIRM
800	3	8	8	STIFF
850	4	11	10	STIFF
900	4	11	11	STIFF
950	3	10	10	STIFF
1000	3	10	10	STIFF
1050	4	11	12	STIFF
1100	4	15	15	V STIFF
1150	7	19	19	V STIFF
1200	8	24	23	V STIFF
1250	9	26	25	V STIFF
1300	9	25	26	V STIFF
1350	7	27	23	V STIFF
1400	11	18	23	V STIFF
1450				
1500				
1550				
1600				
1650				
1700				
1750				
1800				
1850				
1900				
1950				
2000				

PENETROMETER CHART



COMMENTS :

Tested By: DB
Date: 15/06/10

Q.A. Check By: IT
Date: 23/06/10

Approved By: PS
Date: 23/06/10

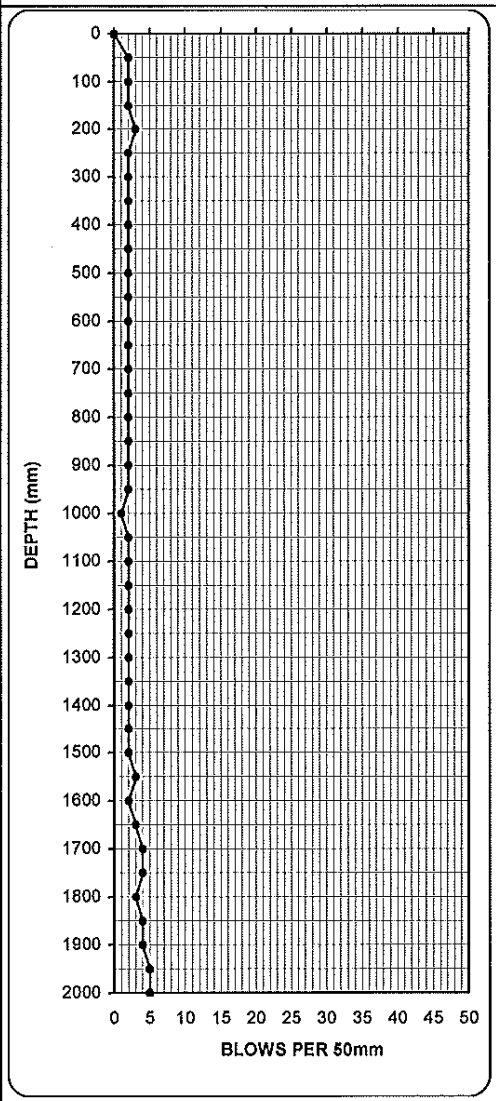
ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Dynamic Cone Penetrometer Test

PRINCIPAL	:	Japan International Cooperation Agency	PROJECT No.	:	0400410
PROJECT NAME	:	Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE / TIME	:	17/06/10 0915
SITE ADDRESS	:	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	:	Danish B
TEST LOCATION	:	Refer To Test Locality Plan			
SURFACE ELEVATION	:	-	TEST No.	:	13
DATUM	:	Existing Ground Level	MATERIAL DESCRIPTION	:	Gravelly SAND, loose, meduim grained, dark grey black white, moist
CO-ORDINATES	:	-			

DEPTH (mm)	BLOWS PER 50 mm	INTERPRETED		
		Blows / 150 mm	Average 150 mm	Degree of Compaction
0				
50	2	4	5	FIRM
100	2	6	6	FIRM
150	2	7	7	FIRM
200	3	7	7	FIRM
250	2	7	7	FIRM
300	2	6	6	FIRM
350	2	6	6	FIRM
400	2	6	6	FIRM
450	2	6	6	FIRM
500	2	6	6	FIRM
550	2	6	6	FIRM
600	2	6	6	FIRM
650	2	6	6	FIRM
700	2	6	6	FIRM
750	2	6	6	FIRM
800	2	6	6	FIRM
850	2	6	6	FIRM
900	2	6	6	FIRM
950	2	5	5	FIRM
1000	1	5	5	FIRM
1050	2	5	5	FIRM
1100	2	6	6	FIRM
1150	2	6	6	FIRM
1200	2	6	6	FIRM
1250	2	6	6	FIRM
1300	2	6	6	FIRM
1350	2	6	6	FIRM
1400	2	6	6	FIRM
1450	2	6	6	FIRM
1500	2	7	7	FIRM
1550	3	7	7	FIRM
1600	2	8	8	STIFF
1650	3	9	9	STIFF
1700	4	11	10	STIFF
1750	4	11	11	STIFF
1800	3	11	11	STIFF
1850	4	11	12	STIFF
1900	4	13	13	STIFF
1950	5	14	12	STIFF
2000	5	10	12	STIFF

PENETROMETER CHART



COMMENTS :

Tested By: DB
Date: 17/06/10

Q.A. Check By: DB
Date: 23/06/10

Approved By: PS
Date: 23/06/10

Appendix C
Water Penetration Test Results

ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Septic Tank Percolation Test Results

PRINCIPAL	: Japan International Cooperation Agency	**PROJECT No.**	: 0400410
PROJECT NAME	: Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	**DATE**	: 16/06/10
SITE ADDRESS	: Motufoua Secondary School, Vaitupu Island, Tuvalu	**TECHNOLOGIST**	: Danish B
MATERIAL TYPE & DESCRIPTION	: Gravelly SAND, loose, medium grained, dark grey black white, moist	**TEST METHOD**	: Septic Tanks Code of Practice (1990) Victoria

PERCOLATION TESTS: 02

TIME	1105	1115	1125	1140
Time (min)	Percolation (mm)			
	Bore Hole 1 (500mm)	Bore Hole 2 (500mm)	Bore Hole 3 (500mm)	Bore Hole 4 (500mm)
1	252	281	285	278
2	367	350	355	359
3	413	425	430	435
4	451	489	490	500
5	500	500	500	
6				
7				
8				
9				
10				
Average	396.60	409.00	412.00	107.00

TIME	1155	1155	-	-
Time (min)	Percolation (mm)			
	Bore Hole 5 (500mm)	Bore Hole 6 (500mm)		
1	290	281		
2	340	349		
3	390	427		
4	445	488		
5	500	500		
6				
7				
8				
9				
10				
Average	393.00	409.00		

Average Percolation Rate mm/hr (Standard 55mm Hand Auger)

COMMENTS :

Tested By: DB
Date: 16/06/10

Q.A. Check By: IT
Date: 09/07/10

Approved By: PS
Date: 09/07/10

ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Septic Tank Percolation Test Results

PRINCIPAL	: Japan International Cooperation Agency	**PROJECT No.**	: 0400410
PROJECT NAME	: Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	**DATE**	: 16/06/10
SITE ADDRESS	: Motufoua Secondary School, Vaitupu Island, Tuvalu	**TECHNOLOGIST**	: Danish B
MATERIAL TYPE & DESCRIPTION	: Gravelly SAND, loose, medium grained, dark grey black white, moist	**TEST METHOD**	: Septic Tanks Code of Practice (1990) Victoria

PERCOLATION TESTS: 03

TIME	1310	1325	1340	1355
Time (min)	Percolation (mm)			
	Bore Hole 1 (500mm)	Bore Hole 2 (500mm)	Bore Hole 3 (500mm)	Bore Hole 4 (500mm)
1	290	297	300	310
2	350	364	367	407
3	405	428	450	500
4	500	500	500	
5				
6				
7				
8				
9				
10				
Average	386.25	397.25	404.25	94.33

TIME	1410	1125	-	-
Time (min)	Percolation (mm)			
	Bore Hole 5 (500mm)	Bore Hole 6 (500mm)		
1	312	303		
2	418	410		
3	500	500		
4				
5				
6				
7				
8				
9				
10				
Average	410.00	404.33		

Average Percolation Rate mm/hr (Standard 55mm Hand Auger)

COMMENTS :

Tested By: DB
Date: 16/06/10

Q.A. Check By: IT
Date: 09/07/10

Approved By: PS
Date: 09/07/10

Appendix D
Laboratory Test Results

- Dry Sieve Analysis
- Natural Moisture Content
- Angle of Repose
- Specific Gravity

ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Dry Sieve Analysis
NZS 4402:1986 (Test 2.8.2)

PRINCIPAL :	Japan International Cooperation Agency	PROJECT No. :	0400410
PROJECT NAME :	Proposed New Dormitory & Classroom Complex at Motufoua Secondary School	DATE / TIME :	25/06/10 1730
SITE ADDRESS :	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST :	Isot T T/Altaf J S
SAMPLE LOCATION :	Water Penetration Test 02 (0 - 200mm)	MATERIAL TYPE & LOCATION :	Gravelly SAND, loose, medium grained, dark grey black, moist
TEST NUMBER :	01		

Sieve Overload Mass g	Sieve Size mm	Mass Retained g	Total Mass Passing g	% Total Passing g
200 mm Dia	75.0		1086.52	100.00
	53.0		1086.52	100.00
2200	37.5		1086.52	100.00
1800	26.5		1086.52	100.00
1200	19.0		1086.52	100.00
900	13.2		1086.52	100.00
600	9.5	9.92	1076.60	99.09
500	6.7	10.24	1066.36	98.14
200 mm Dia	4.75	13.82	1052.54	96.87
150	2.36	28.26	1024.28	94.27
100	1.18	62.13	962.15	88.55
75	600 µm	465.00	497.15	45.76
60	425 µm	113.00	384.15	35.36
50	300 µm	153.53	230.62	21.23
40	150 µm	181.68	48.94	4.50
25	75 µm	29.61	19.33	1.78
	Pan Total	19.33	0.00	0.00

TOTAL SAMPLE

Sieving Procedure (Dry): 1086.52 gM

Dry Mass after Washing: _ gM_1

Mass washing thru '75: _ . gM

SPLIT SAMPLE

Mass Passing Last Sieve: _ gM_3

Mass after Spliting: _ gM_4

Spliting Factor = M_3 / M_4

Mass Retained g	Corrected Mass Retained g	Total Mass Passing g	% Total Passing

Tested by : IT/AJS	Q.A. Check by : IT	Approved by : PS
Date : 25/06/10	Date : 26/06/10	Date : 26/06/10

ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Dry Sieve Analysis
NZS 4402:1986 (Test 2.8.2)

PRINCIPAL :	Japan International Cooperation Agency	PROJECT No. :	0400410
PROJECT NAME :	Proposed New Dormitory & Classroom Complex at Motufoua Secondary School	DATE / TIME :	25/06/10 1810
SITE ADDRESS :	Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST :	Isot T T/Altaf J S
SAMPLE LOCATION :	Water Penetration Test 02 (400 - 800mm)	MATERIAL TYPE & LOCATION :	Gravelly SAND, loose, medium grained, pale brown white, moist
TEST NUMBER :	02		

Sieve Overload Mass g	Sieve Size mm	Mass Retained g	Total Mass Passing g	% Total Passing g
200 mm Dia	75.0		1533.97	100.00
	53.0		1533.97	100.00
2200	37.5		1533.97	100.00
1800	26.5		1533.97	100.00
1200	19.0		1533.97	100.00
900	13.2		1533.97	100.00
600	9.5	5.01	1528.96	99.67
500	6.7	3.61	1525.35	99.44
200 mm Dia	4.75	5.71	1519.64	99.07
150	2.36	22.42	1497.22	97.60
100	1.18	62.96	1434.26	93.50
75	600 µm	845.00	589.26	38.41
60	425 µm	156.87	432.39	28.19
50	300 µm	196.95	235.44	15.35
40	150 µm	203.73	31.71	2.07
25	75 µm	18.61	13.10	0.85
	Pan Total	13.10	0.00	0.00

TOTAL SAMPLE

Sieving Procedure (Dry):	1533.97	gM
Dry Mass after Washing:	_	gM_1
Mass washing thru '75:	_	gM

SPLIT SAMPLE

Mass Passing Last Sieve:	_	gM_3
Mass after Spliting:	_	gM_4

Spliting Factor = M_3 / M_4

Mass Retained g	Corrected Mass Retained g	Total Mass Passing g	% Total Passing

Tested by : IT/AJS	Q.A. Check by : IT	Approved by : PS
Date : 25/06/10	Date : 26/06/10	Date : 26/06/10

ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Moisture Content Test Results

PRINCIPAL	: Japan International Cooperation Agency	PROJECT No.	: 0400410
PROJECT NAME	: Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE	: 22/06/10
SITE ADDRESS	: Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	: DB
MATERIAL DESCRIPTION	: Gravelly SAND, loose, medium grained, dark grey black, moist	TEST METHOD	: NZS 4402:1986
		SAMPLE No.	: 01

Moisture Content	%						
Container No.		I	J	N			
Mass of Container	g	13.85	14.00	13.67			
Mass of Container + Wet Soil	g	29.93	34.88	37.07			
Mass of Container + Dry Soil	g	27.03	31.24	32.37			
Mass of Dry Soil	g	13.18	17.24	18.70			
Mass of Moisture	g	2.90	3.64	4.70			
Moisture Content	%	22.00	21.11	25.13			22.75

Tested By: DB
Date: 22/06/10

Q.A. Check By: IT
Date: 23/06/10

Approved By: PS
Date: 23/06/10

ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Moisture Content Test Results

PRINCIPAL	: Japan International Cooperation Agency	PROJECT No.	: 0400410
PROJECT NAME	: Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	DATE	: 23/06/10
SITE ADDRESS	: Motufoua Secondary School, Vaitupu Island, Tuvalu	TECHNOLOGIST	: DB
MATERIAL DESCRIPTION	: Gravelly SAND, loose, medium grained, dark grey black, moist	TEST METHOD	: NZS 4402:1986
		SAMPLE No.	: 01

Moisture Content	%						
Container No.		29	39				
Mass of Container	g	14.59	14.12				
Mass of Container + Wet Soil	g	40.08	38.84				
Mass of Container + Dry Soil	g	35.56	33.84				
Mass of Dry Soil	g	20.97	19.72				
Mass of Moisture	g	4.52	5.00				
Moisture Content	%	21.55	25.35				23.45

Tested By: DB
Date: 22/06/10

Q.A. Check By: IT
Date: 23/06/10

Approved By: PS
Date: 23/06/10

ENTEC LIMITED
ENGINEERING & SCIENCE CONSULTANTS

Angle of Repose Test Resullts

PRINCIPAL	: Japan International Cooperation Agency	**PROJECT No.**	: 0400410
PROJECT NAME	: Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	**DATE**	: 25/06/10
SITE ADDRESS	: Motufoua Secondary School, Vaitupu Island, Tuvalu	**TECHNOLOGIST**	: IT
MATERIAL DESCRIPTION	: Gravelly SAND, loose, medium grained, dark grey black, dry	**TEST METHOD**	: NZS 4402:1986
		SAMPLE No.	:01 (0mm-400mm)

Test No	%	1	2	3			
Height of Conical Mound	mm	71	72	72			
Diameter of Conical Mound	mm	273	275	273			
Radius of Conical Mound	mm	136.5	137.5	136.5			
Angle of Repose	°	27.4	27.6	27.8			27.6

Tested By: IT/PS
Date: 25/06/10

Q.A. Check By: IT
Date: 28/06/10

Approved By: PS
Date: 28/06/10

ENTEC LIMITED
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Angle of Repose Test Resullts

PRINCIPAL	: Japan International Cooperation Agency	**PROJECT No.**	: 0400410
PROJECT NAME	: Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	**DATE**	: 25/06/10
SITE ADDRESS	: Motufoua Secondary School, Vaitupu Island, Tuvalu	**TECHNOLOGIST**	: IT
MATERIAL DESCRIPTION	: Gravelly SAND, loose, medium grained, pale brown white, dry	**TEST METHOD**	: NZS 4402:1986
		SAMPLE No.	: 02 (400mm-800mm)

Test No	%	1	2	3			
Height of Conical Mound	mm	73	71	72			
Diameter of Conical Mound	mm	235	233	236			
Radius of Conical Mound	mm	117.5	116.5	118.0			
Angle of Repose	°	31.9	31.4	31.4			31.6

Tested By: IT/PS
Date: 25/06/10

Q.A. Check By: IT
Date: 28/06/10

Approved By: PS
Date: 28/06/10

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Specific Gravity Test Results

PRINCIPAL	: Japan International Cooperation Agency	**PROJECT No.**	: 0400410
PROJECT NAME	: Proposed New Dormitories & Classroom Complex at Motufoua Secondary School	**DATE**	: 25/06/10
SITE ADDRESS	: Motufoua Secondary School, Vaitupu Island, Tuvalu	**TECHNOLOGIST**	: IT
MATERIAL DESCRIPTION	: Gravelly SAND, loose, medium grained, pale brown white, dry	**TEST METHOD**	: NZS 4402:1986
		SAMPLE No.	: 02 (400mm-800mm)

Test No	%	1	2				
Mass of Container (M_1)	g	47.57	44.87				
Mass of Container + Dry Soil (M_2)	g	113.02	142.59				
Mass of Container, Soil + Water (M_3)	g	298.83	312.97				
Mass of Container + Water (M_4)	g	262.35	259.07				
Mass of Soil $M_s = (M_2 - M_1)$	g	65.45	97.72				
Mass of Water Displaced by Soil Particles ($M_5 = M_4 - M_3 + M_s$)	g	28.97	43.82				
Specific Gravity ($G_s = M_s/M_5$)	%	2.3	2.2				

Tested By: IT/PS
Date: 25/06/10

Q.A. Check By: IT
Date: 28/06/10

Approved By: PS
Date: 28/06/10