E3517/1-AD  MKSP:MW
7 August 1996

C.F.A. Training College
RMB 300
BALLAN VIC 3342

Attention:

Dear Sir

RE: FIELD SITE APPRAISAL AND SAMPLING
BALLAN, VIC

We are pleased to submit our report on the above project. Three copies are provided for your records. Your attention is drawn to the enclosed sheet "Important Information about your Environmental Site Assessment".

As requested, a copy of 32 photographs taken during the field investigations have also been dispatched under separate cover (refer E3517/1-AF dated 8 August, 1996).

Should you have any queries regarding the report or its findings, please contact the undersigned.

For and on behalf of
COFFEY PARTNERS INTERNATIONAL PTY LTD

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Background</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Previous Investigations</td>
<td>1</td>
</tr>
<tr>
<td>2.0 STUDY METHODOLOGY</td>
<td>1</td>
</tr>
<tr>
<td>2.1 Objectives</td>
<td>1</td>
</tr>
<tr>
<td>2.2 Scope of Work</td>
<td>1</td>
</tr>
<tr>
<td>3.0 INVESTIGATION METHODS AND PROCEDURES</td>
<td>2</td>
</tr>
<tr>
<td>3.1 Sampling Strategy</td>
<td>2</td>
</tr>
<tr>
<td>3.2 In-Situ Soil Vapour Survey</td>
<td>2</td>
</tr>
<tr>
<td>3.3 Soil Sampling Procedures</td>
<td>2</td>
</tr>
<tr>
<td>3.4 Decontamination Procedures</td>
<td>3</td>
</tr>
<tr>
<td>3.5 Soil Collection and Transfer</td>
<td>3</td>
</tr>
<tr>
<td>3.6 Laboratory Testing</td>
<td>3</td>
</tr>
<tr>
<td>3.7 Quality Assurance/Quality Control (QA/QC)</td>
<td>4</td>
</tr>
<tr>
<td>4.0 RESULTS OF FIELD AND LABORATORY PROGRAM</td>
<td>5</td>
</tr>
<tr>
<td>4.1 Surface Conditions</td>
<td>5</td>
</tr>
<tr>
<td>4.2 Sub-Surface Conditions</td>
<td>5</td>
</tr>
<tr>
<td>4.3 Soil Vapour Survey</td>
<td>6</td>
</tr>
<tr>
<td>4.4 Laboratory Results</td>
<td>7</td>
</tr>
<tr>
<td>5.0 DISCUSSION AND CONCLUSIONS</td>
<td>8</td>
</tr>
</tbody>
</table>

REFERENCES

Important Information about your Environmental Site Assessment
TABLES
3-1 Summary of Samples Selected for Analysis (4 pages)
3-2 Laboratory Analytical Methods (4 pages)
4-1 Generalised Soil Profile Conditions (6 pages)
4-2 Adopted Soil Vapour Concentration Categories (6 pages)
4-3 Summary of PID In-situ and Headspace Results (7 pages)

FIGURES
1 Locality Plan
2 Site Plan
3 Test Pit Sampling Locations
4 Extent of Sludge Beneath Scoria Cover

APPENDICES
A Borehole Logs
   Descriptive Terms Soil and Rock (1 page)
   Graphical Symbols Soil and Rock (1 page)
   Soil Classification (1 page)
   Borehole Logs (20 pages)
B Summary of Soil Petroleum Hydrocarbon Results (1 page)
C NATA Certified Laboratory Results (3 pages)
1.0 INTRODUCTION

1.1 Background

This report presents the findings of an environmental site investigation undertaken by Coffey Partners International Pty Ltd at the C.F.A. Training College, Ballan VIC (refer Figure 1). The investigation was commissioned by (Local Purchase Order LP-127960) following the submission of our proposal EP3591/1-AA dated 11 July, 1996.

The investigations were undertaken to provide C.F.A. Training College with assistance in the delineation of former buried sludge pits which were used for flammable liquids fire training.

1.2 Previous Investigations

Excerpts from an environmental investigation conducted by Diomedes & Associates Pty Ltd in June 1996 (Diomedes, 1996) indicated the subsurface conditions for the area under investigation (refer Figure 2) generally comprised 0.1m to 0.8m of surface fill overlying silty clay, silty and gravelly clays overlying basalt. No groundwater was encountered during the investigation and the test bores were all terminated at refusal on the underlying basalts.

Soil vapour investigations reported by Diomedes (1996) indicated the presence of volatile hydrocarbons particularly in the vicinity of borehole BH3 (refer Figure 3).

2.0 STUDY METHODOLOGY

2.1 Objectives

The objectives of this study were to:

- delineate former buried sludge pits which were reportedly present on the site;
- assess the contaminant distribution within the soil profile in the vicinity of the sludge pits.

2.2 Scope of Work

The scope of work undertaken during the course of this assessment included:

- test-pit excavation;
- visual and olfactory observations;
- in-situ soil vapour survey;
• soil sampling;
• a laboratory analytical program;
• data interpretation and reporting of results.

3.0 INVESTIGATION METHODS AND PROCEDURES

3.1 Sampling Strategy

Soil sampling locations were selected in the field following discussions with the C.F.A. Training College. Anecdotal reports suggested the sludge from the former pits was scraped up and dumped in a more recent excavation between the sludge pits and the golf course. Test pits TP1, TP2, TP3 and TP4 (refer Figure 3) did not reveal any evidence of this disposal pit and in accordance with directions, attention was focussed in the former sludge pit area which was visually contaminated.

3.2 In-Situ Soil Vapour Survey

A portable MicroTIP photoionisation detector (PID) was used to screen the site for the presence of fuel vapours in the soil during excavation of each test pit. The PID gives a reading of the total concentration of ionisable volatile organic compounds (VOC) and was calibrated against a standard benzene reference gas. PID headspace measurements were also undertaken on duplicate soil samples. A summary of PID results are presented in Table 4-3.

3.3 Soil Sampling Procedures

Fieldwork was undertaken by a Coffey Environmental Scientist on 17 July, 1996. Twenty test pits (refer Figure 3) were excavated using a backhoe and soil samples were collected from 7 test pits; TP1, TP5, TP6, TP8, TP12, TP13 and TP14. Test pits were located on the basis of the inferred positions of the former sludge pits. The road between these pits was used as a major reference point.

Soil types were described in the field and logs of all test pits/excavations are provided in Appendix A together with explanatory sheets defining descriptive terms used on the logs.

Sample locations were chosen on the basis of visual observation of residual sludge and in situ PID readings. All samples were collected in duplicate in accordance with standard Coffey environmental protocols.
At the completion of the day’s sampling activities, duplicate jar samples were subjected to PID headspace measurement as a further screen for volatile organic compounds. It should be noted that these headspace measurements provide depth specific screening data in contrast to the in-situ PID measurements which reflect cumulative changes in volatile organic concentrations over the full profile depth. A summary of the PID headspace results are presented in Table 4-3.

3.4 Decontamination Procedures

Decontamination of sampling equipment was completed in accordance with the Coffey Environmental Field Procedures and comprised:

- removal of encrusted material;
- wash with Decon 90 detergent cleaning solution;
- rinse with potable water;
- final rinse with deionised water.

3.5 Sample Collection and Transfer

Following collection, samples were transferred to glass jars (250ml) and immediately sealed. Samples for volatile analysis were collected in 20ml VOA vials, sealed with a teflon seal and crimped closed. All sample containers were labelled, placed in eskys with ice packs and then dispatched to the laboratory for analysis under chain-of-custody conditions.

3.6 Laboratory Testing

Of the 12 samples collected, 10 individual samples were dispatched for limited analyses comprising total petroleum hydrocarbons (TPH) and volatile aromatic hydrocarbons (benzene, toluene, ethyl benzene and xylenes (BTEX)), i.e. visually observed sludge samples collected from TP6, TP8 and TP12 at shallow depth were characterised whilst the remainder of the samples tested were collected from the natural soil profile. A summary of the samples selected for analysis is presented in Table 3-1.

Samples were analysed by NATA registered National Analytical Laboratories (NAL). Analytical methods were based on VICEPA and USEPA standard methods and are given in Table 3-2. Laboratory detection limits were set at or below background levels wherever possible in accordance with VicEPA protocols.
TABLE 3-1
SUMMARY OF SAMPLES SELECTED FOR ANALYSIS

<table>
<thead>
<tr>
<th>Location</th>
<th>Sample No</th>
<th>Depth (m)</th>
<th>Soil Type *</th>
<th>Analysis (TPH, BTEX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>TP1-0.3-P</td>
<td>0.3</td>
<td>N (topsoil)</td>
<td>*</td>
</tr>
<tr>
<td>TP5</td>
<td>TP5-0.3-P</td>
<td>0.3</td>
<td>F (sludge)</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>TP5-0.8-P</td>
<td>0.8</td>
<td>N (clay)</td>
<td>*</td>
</tr>
<tr>
<td>TP6</td>
<td>TP6-0.3-P</td>
<td>0.3</td>
<td>F (sludge)</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>TP6-0.8-P</td>
<td>0.8</td>
<td>N (clay)</td>
<td>*</td>
</tr>
<tr>
<td>TP8</td>
<td>TP8-0.6-P</td>
<td>0.6</td>
<td>F (sludge)</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>TP8-1.0-P</td>
<td>1.0</td>
<td>N (clay)</td>
<td>*</td>
</tr>
<tr>
<td>TP12</td>
<td>TP12-0.7-P</td>
<td>0.7</td>
<td>F (sludge contaminated soil)</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>TP12-1.1-P</td>
<td>1.1</td>
<td>N (clay)</td>
<td>*</td>
</tr>
<tr>
<td>TP13</td>
<td>TP13-0.3-P</td>
<td>0.3</td>
<td>F (sludge)</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>TP13-1.0-P</td>
<td>1.0</td>
<td>N (clay)</td>
<td>*</td>
</tr>
<tr>
<td>TP14</td>
<td>TP14-0.2-P</td>
<td>0.2</td>
<td>N (topsoil)</td>
<td>*</td>
</tr>
</tbody>
</table>

* F=Fill; N=Natural

TABLE 3-2
LABORATORY ANALYTICAL METHODS

<table>
<thead>
<tr>
<th>% Moisture</th>
<th>VICEPA Chemical Analysis Polluted Soils Nov. 1981 No. 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTEX</td>
<td>NAL E106 (GC:Headspace)</td>
</tr>
<tr>
<td>Total Petroleum Hydrocarbons (TPHs)</td>
<td>NAL E104.52, E104.12 (GC:PID)</td>
</tr>
</tbody>
</table>

3.7 Quality Assurance/Quality Control (QA/QC)

Work on this project was completed in accordance with standard Coffey QA/QC procedures which specify sampling protocols, number and type of sample containers per sampling location, sample preservation methods, approved holding times, sample identification codes, QC sample requirements and chain of custody documentation procedures.

All samples were collected in duplicate with the duplicates being held in Coffey cold storage for subsequent analysis should the need arise. One equipment wash blank from the final rinse water used during decontamination of sampling equipment was also collected. A trip blank, which consisted of “clean” deionised water and used to document whether the primary samples were exposed to ambient volatile contaminant concentrations during sample transport and/or in the
laboratory was also collected. Due to budget constraints, however, no field QC samples were submitted for analysis although all field QC samples have been retained in storage for analysis if required.

The analytical laboratory also completed an internal QC program comprising blanks, duplicates, and recoveries on 5% of samples tested and these results are presented in Appendix C. Results generally demonstrated an acceptable agreement between duplicate pairs and acceptable recoveries between spiked samples.

On the basis of these results, it is considered that the analytical methods adopted by the laboratory and the results on the field samples can be taken as quantitative.

4.0 RESULTS OF FIELD AND LABORATORY PROGRAM

4.1 Surface Conditions

The area under investigation (refer Figure 2) contains 2 sludge pits where flammable liquid fire training was undertaken. Anecdotal reports suggest that a black diesel sludge covered this whole area until about 1989. Review of aerial photos, held by CFA Ballan, revealed significant spillage at the eastern end of the pits toward the golf course (refer Figure 3).

In about 1990, the spillage area and sludge pits were covered with approximately 0.3m of scoria fill, which could be seen on the aerial photos as having been dumped on the former roadway located between the sludge pits. In some places a superficial covering of clay was also reportedly used to level lower lying areas so that mowing of grass could be undertaken with greater ease. The site is currently well grassed.

4.2 Subsurface Conditions

The Geological Survey of Victoria 1:63,360 Ballarat Sheet, maps the site as Quaternary Olivine Basalts. The current investigation confirmed the published geology. Generally 1 m to 2 m of residual clay overlies basalt rock, the maximum depth of residual clay being 2.2 m at TP6. A summary of soil profile conditions found at the site where scoria cover exists is presented in Table 4-1, below.
### TABLE 4-1
GENERALISED SOIL PROFILE CONDITIONS

<table>
<thead>
<tr>
<th>Soil Unit</th>
<th>Depth to Top of Layer (m)</th>
<th>Thickness (m)</th>
<th>Material Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0.1 - 0.6</td>
<td>SCORIA FILL; SANDY GRAVEL: fine to coarse grained, red, fine to coarse grained sand with some medium plasticity red clay.</td>
</tr>
<tr>
<td>2</td>
<td>0.1 - 0.6</td>
<td>0.002 - 0.4</td>
<td>BLACK HYDROCARBON SLUDGE: appears as a thin layer (ranging from 2mm to 0.1m) on the surface of the underlying topsoil or mixed with soil over a specific interval (up to 0.4m).</td>
</tr>
<tr>
<td>3</td>
<td>0.102 - 1.0</td>
<td>0.1 - 0.2</td>
<td>TOPSOIL; SILTY CLAY: medium plasticity, brown. Black hydrocarbon sludge, where it occurs, usually associated with the surface of this unit.</td>
</tr>
<tr>
<td>4</td>
<td>0.2 - 1.2</td>
<td>0.1 - 0.2</td>
<td>SUBSOIL; SILTY CLAY: medium plasticity, grey to grey-brown, may comprise predominantly rounded buckshot gravel (2 to 5mm) with clay(CLAYEY SANDY GRAVEL)</td>
</tr>
<tr>
<td>5</td>
<td>0.3 - 1.4</td>
<td>Not penetrated</td>
<td>SILTY CLAY: high plasticity, yellow-grey to yellow-brown, mottled orange-yellow. Residual clay formed on basalt.</td>
</tr>
</tbody>
</table>

### 4.3 Soil Vapour Survey

Soil PID headspace results have been compared with standard investigation thresholds summarised in Table 4-2. PID in-situ and soil headspace results are tabulated in Table 4-3.

### TABLE 4-2
ADOPTED SOIL VAPOUR CONCENTRATION CATEGORIES

<table>
<thead>
<tr>
<th>Rating</th>
<th>Concentration Range (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible</td>
<td>0 - 20</td>
</tr>
<tr>
<td>Low</td>
<td>21 - 60</td>
</tr>
<tr>
<td>Moderate</td>
<td>61 - 300</td>
</tr>
<tr>
<td>Significant</td>
<td>&gt; 300</td>
</tr>
</tbody>
</table>
# TABLE 4-3
**SUMMARY OF PID IN-SITU SOIL AND HEADSPACE RESULTS**

<table>
<thead>
<tr>
<th>Location</th>
<th>Test Type*</th>
<th>Depth (m)</th>
<th>Duration (mins)</th>
<th>Background (ppm)</th>
<th>Last Reading (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>BH</td>
<td>0.3</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.3</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TP5</td>
<td>BH</td>
<td>0.3</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.3</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.8</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TP6</td>
<td>BH</td>
<td>0.4</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.3</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.8</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TP8</td>
<td>BH</td>
<td>0.6</td>
<td>1-2</td>
<td>0.0</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.6</td>
<td>1-2</td>
<td>0.0</td>
<td>23.4</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>1.0</td>
<td>1-2</td>
<td>0.0</td>
<td>1.4</td>
</tr>
<tr>
<td>TP9</td>
<td>BH</td>
<td>0.4</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TP12</td>
<td>BH</td>
<td>0.4</td>
<td>1-2</td>
<td>0.0</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.7</td>
<td>1-2</td>
<td>0.0</td>
<td>25.8</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>1.1</td>
<td>1-2</td>
<td>0.0</td>
<td>1.2</td>
</tr>
<tr>
<td>TP13</td>
<td>BH</td>
<td>0.3</td>
<td>1-2</td>
<td>0.0</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.3</td>
<td>1-2</td>
<td>0.0</td>
<td>30.9</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>1.0</td>
<td>1-2</td>
<td>0.0</td>
<td>2.0</td>
</tr>
<tr>
<td>TP14</td>
<td>BH</td>
<td>0.3</td>
<td>1-2</td>
<td>0.0</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td>HS</td>
<td>0.2</td>
<td>1-2</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

* BH=in-situ soil vapour measurement; HS=headspace sample measurement

PID in-situ and headspace results across the site were negligible except for headspace results for samples collected from TP8 at 0.6m depth, TP12 at 0.7m depth and TP13 at 0.3m depth where minor concentrations of total ionisable organic hydrocarbons were detected.

## 4.4 Laboratory Results

The soil test results have been compared with contamination reference criteria published by the Australian and New Zealand Environmental Conservation Council (ANZECC, 1992) and the relevant Dutch standards (ANZECC, 1990). These criteria provide a guide to acceptable levels of contamination in soils. Victorian EPA criteria for off-site disposal of contaminated soils as clean fill or low level contaminated fill have also been provided (VicEPA, 1995).

The Victorian EPA (VICEPA) consider ANZECC B and Dutch B levels as investigation threshold for environmental concern. ANZECC B criteria are mainly based on potential environmental effects and, in particular, possible phytotoxic effects on plants. Where concentrations exceed these criteria, VICEPA regard contaminant concentrations as being elevated and further investigation may
be required. Where concentrations exceed Dutch C criteria, contaminant concentrations are regarded as significant and some form of proactive site management or remediation may be required.

A summary of the soil analytical results are presented in Appendix B. The NATA certified laboratory results are included as Appendix C.

Test results indicate significant TPH concentrations, at levels exceeding Dutch C criteria, for samples collected from TP8 at depths of 0.6m in the sludge and from 1.0m in the natural soil profile. Elevated TPH concentrations were also detected for samples collected from TP6 at 0.3m depth and from TP14 at 0.2m depth at levels exceeding Dutch B criteria. TPH concentrations for samples collected from TP8, TP6 and TP14 are commensurate with VicEPA off-site disposal criteria for low level contaminated soil.

Consistent with the field soil vapour investigations, BTEX compounds were detected in visually observed sludge samples collected from TP8 and TP12 at depths of 0.6m and 0.7m respectively. However, concentrations were below Dutch B criteria. BTEX concentrations in all other samples tested were below laboratory detection limits.

5.0 DISCUSSION AND CONCLUSIONS

As discussed in Section 4.3, soil contamination has been gauged relative to ANZECC, Dutch and VicEPA criteria and the laboratory results for the limited samples tested indicate elevated TPH concentrations in the vicinity of locations TP8, TP6 and TP14 (refer Figure 3).

As observed during field investigations, the occurrence of sludge beneath the scoria cover is distributed across an area of approximately 1200 m². The sludge appears in the majority of cases as a relatively thin layer at the interface of the scoria cover and the underlying topsoil. The thickness of the sludge at this interface is generally 20 to 50 mm with maximum observed depth of 100 mm in the vicinity of TP8. At TP12 and TP13 the sludge was mixed with soil over an interval of up to 0.4m below the scoria cover. The laboratory results for a sample collected of the underlying natural soil from TP8 at 1m depth, however, also indicated that the sludge contamination has penetrated the underlying natural soil i.e. to a depth of approximately 0.4m below the scoria fill. The extent and depth of scoria cover and the thickness of visually observed black hydrocarbon sludge beneath the scoria cover is presented in Figure 4.
On the basis of the observed thickness of hydrocarbon sludge, the estimated volume of sludge in the investigation area is likely to be in the range of 20 to 60 m³, based on a sludge thickness of between 0.02 and 0.05m. It must be noted that the scoria cover, as presented in Figure 4, varies considerably across the area of investigation.

For and on behalf of

COFFEY PARTNERS INTERNATIONAL PTY LTD
REFERENCES


LEGEND

- TP1  TEST PIT
- BH1  PREVIOUS INVESTIGATION BOREHOLE
- POST (POWER POLE)

Coffey Partners International Pty Ltd

CFA TRAINING COLLEGE
BALLAN, VICTORIA
FIELD SITE APPRAISAL AND SAMPLING
TEST PIT SAMPLING LOCATIONS

Dwg. No. E3517/1-3

FIGURE 3
Approximate area of black sludge beneath scoria cover.

Legend:
- TP1: Test Pit
- Depth of scoria cover (m)
- Observed thickness of sludge beneath scoria cover (cm)
- BH1: Previous investigation borehole
- Post (power pole)

* TPH concentrations exceeding ANZECC B were detected at 1.0m in residual clay.

Coffey Partners International Pty Ltd

CFA Training College
Ballan, Victoria
Field site appraisal and sampling extent of sludge beneath scoria cover

FIGURE 4
These notes have been prepared by Coffey Partners International Pty. Ltd. (CPI) using guidelines prepared by ASFE; The Association of Engineering Firms Practicing in the Geosciences. They are offered to help you in the interpretation of your Environmental Site Assessment (ESA) reports.

REASONS FOR CONDUCTING AN ESA
ESA's are typically, though not exclusively, carried out in the following circumstances:

- as pre-acquisition assessments, on behalf of either purchaser or vendor, when a property is to be sold;
- as pre-development assessments when a property or area of land is to be redeveloped or have its use changed — for example, from a factory to a residential subdivision;
- as pre-development assessments of greenfield sites, to establish "baseline" conditions and assess environmental, geological and hydrological constraints to the development of, for example, a landfill; and
- as audits of the environmental effects of an ongoing operation.

Each of these circumstances requires a specific approach to the assessment of soil and groundwater contamination. In all cases, however, the objective is to identify and if possible quantify the risks which unrecognised contamination poses to the proposed activity. Such risks may be both financial, for example, clean-up costs or limitations on site use, and physical, for example, health risks to site users or the public.

THE LIMITATIONS OF AN ESA
Although the information provided by an ESA can reduce exposure to such risks, no ESA, however diligently carried out, can eliminate them. Even a rigorous professional assessment may fail to detect all contamination on a site. Contaminants may be present in area that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled.

AN ESA REPORT IS BASED ON A UNIQUE SET OF PROJECT SPECIFIC FACTORS
Your environmental report should not be used:

- When the nature of the proposed development is changed, for example, if a residential development is proposed instead of a commercial one;
- when the size or configuration of the proposed development is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership; or
- for application to an adjacent site.

To help avoid costly problems, refer to your consultant to determine how any factors which have changed subsequent to the date of the report may affect its recommendations.

ESA “FINDINGS” ARE PROFESSIONAL ESTIMATES
Site assessment identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists who then render an opinion about overall subsurface conditions, the nature and extent of contamination, its likely impact on the proposed development and appropriate remediation measures. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise its impact. For this reason, owners should retain the services of their consultants through the development stage, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.
SUBSURFACE CONDITIONS CAN CHANGE
Subsurface conditions are changed by natural processes and the activity of man. Because an ESA report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on an ESA report whose adequacy may have been affected by time. Speak with the consultant to learn if additional tests are advisable.

ESA SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS
Every study and ESA report is prepared in response to a specific Brief to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. A report should not be used by other persons for any purpose. No individual other than the client should apply a report even apparently for its intended purpose without first conferring with the consultant. No person should apply a report for any purpose other than that originally contemplated without first conferring with the consultant.

AN ESA REPORT IS SUBJECT TO MIS-INTERPRETATION
Costly problems can occur when design professionals develop their plans based on misinterpretations of an ESA. To help avoid these problems, the environmental consultant should be retained to work with appropriate design professionals to explain relevant findings and to review the adequacy of their plans and specifications relative to contamination issues.

LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT
Final borehole or test pit logs are developed by environmental scientists, engineers or geologists based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final logs are customarily included in our reports. These logs should not under any circumstances be redrawn for inclusion in site remediation or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimise the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To reduce the likelihood of boring log misinterpretation, the complete report must be available to persons or organisations involved in the project, such as contractors, for their use. Those who do not provide such access may proceed under the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing all the available information to persons and organisations such as contractors helps prevent costly construction problems and the adversarial attitudes which may aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY
Because an ESA is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are not exculpatory clauses designed to foist liabilities onto some other party. Rather, they are definitive clauses which identify where your consultant’s responsibilities begin and end. Their use helps all parties involved recognise their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your ESA report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.
APPENDIX A

BOREHOLE LOGS
SOIL DESCRIPTIONS

Classification of Material based on Unified Classification System (refer SAA Site Investigation Code AS1726-1975 Add. No. 1 Table D1).

Moisture Condition based on appearance of soil.
- dry: Looks and feels dry; cohesive soils usually hard, powdery or friable, granular soils run freely through hands.
- moist: Soil feels cool, darkened in colour; cohesive soils usually weakened by moisture, granular soils tend to cohere, but one gets no free water on hand on remoulding.
- wet: Soil feels cool, darkened in colour; cohesive soils weakened, granular soils tend to cohere, free water collects on hands when remoulding.

Consistency based on unconfined compressive strength (Qu) (generally estimated or measured by hand penetrometer).

<table>
<thead>
<tr>
<th>term</th>
<th>very soft</th>
<th>soft</th>
<th>firm</th>
<th>stiff</th>
<th>very stiff</th>
<th>hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qu kPa</td>
<td>25</td>
<td>50</td>
<td>100</td>
<td>200</td>
<td>400</td>
<td></td>
</tr>
</tbody>
</table>

If soil crumbles on test without meaningful result, it is described as friable.

Density Index (generally estimated or based on penetrometer result).

<table>
<thead>
<tr>
<th>term</th>
<th>very loose</th>
<th>loose</th>
<th>medium dense</th>
<th>dense</th>
<th>very dense</th>
</tr>
</thead>
<tbody>
<tr>
<td>density index %</td>
<td>15</td>
<td>35</td>
<td>65</td>
<td>85</td>
<td></td>
</tr>
</tbody>
</table>

ROCK DESCRIPTIONS

Weathering based on visual assessment.

- criterion
- Fresh: Rock substance unaffected by weathering.
- Slightly Weathered: Rock substance affected by weathering to the extent that partial staining or partial discolouration of the rock substance usually by limonite has taken place. The colour and texture of the fresh rock is recognisable; strength properties are essentially those of the fresh rock substance.
- Moderately Weathered: Rock substance affected by weathering to the extent that staining extends throughout whole of the rock substance and the original colour of the fresh rock is no longer recognisable.
- Highly Weathered: Rock substance affected by weathering to the extent that limonite staining or bleaching affects the whole of the rock substance and signs of chemical or physical decomposition of individual minerals are usually evident. Porosity and strength may be increased or decreased when compared to the fresh rock substance, usually as a result of the leaching or deposition of iron. The colour and strength of the original fresh rock substance is no longer recognisable.
- Extremely Weathered: Rock substance affected by weathering to the extent that the rock exhibits soil properties, i.e. it can be remoulded and can be classified according to the Unified Classification System, but the texture of the original rock is still evident.

Strength based on point load strength index, corrected to 50mm diameter - Is(50) (refer to I.S.R.M., Commission on Standardisation of Laboratory and Field Tests, Suggested Methods for Determining the Uniaxial Compressive Strength of Rock Materials and the Point Load Strength Index, Committee on Laboratory Tests Document No. 1) (Generally estimated: x indicates test result).

<table>
<thead>
<tr>
<th>classification</th>
<th>extremely low</th>
<th>very low</th>
<th>low</th>
<th>medium</th>
<th>high</th>
<th>very high</th>
<th>extremely high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is (50) MPa</td>
<td>0.03</td>
<td>0.1</td>
<td>0.3</td>
<td>1</td>
<td>3</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

The unconfined compressive strength is typically about 20 x Is(50) but the multiplier may range, for different rock types, from as low as 4 to as high as 30.

Defect Spacing

<table>
<thead>
<tr>
<th>classification</th>
<th>extremely close</th>
<th>very close</th>
<th>close</th>
<th>medium</th>
<th>wide</th>
<th>very wide</th>
<th>extremely wide</th>
</tr>
</thead>
<tbody>
<tr>
<td>spacing m</td>
<td>0.03</td>
<td>0.1</td>
<td>0.3</td>
<td>1</td>
<td>3</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Defect description uses terms contained on AS1726 table D2 to describe nature of defect (fault, joint, crushed zone, clay seam etc.) and character (roughness, extent, coating etc.).
graphic symbols
soil and rock

soil
- asphaltic concrete or hotmix
- concrete
- topsoil
- fill
- peat, organic clays and silts (Pt, OL, OH)
- clay (CL, CH)
- silt (ML, MH)
- sandy clay (CL, CH)
- silty clay (CL, CH)
- gravelly clay (CL, CH)
- sandy silt (ML)
- clayey sand (SC)
- silty sand (SM)
- sand (SP, SW)
- clayey gravel (GC)
- silty gravel (GM)
- gravel (GP, GW)

rock
- claystone (massive)
- siltstone (massive)
- shale (laminated)
- sandstone (undifferentiated)
- sandstone, fine grained
- sandstone, coarse grained
- conglomerate
- limestone
- coal
- dolerite, basalt
- tuff
- porphyry
- granite
- pegmatite
- schist
- gneiss
- quartzite
- talus
- alluvium

seams
- seam >0.1m thick (on a scale 1:50)
- seam 0.01m to 0.1m thick (on a scale of 1:50)

inclusions (special purposes only)
- rock fragments
- swamp
- ironstone, gravel, laterite
- shale breccia in sandstone

water level

surfaces

known boundary

probable boundary

? possible boundary
### Soil Classification

#### Including Identification and Description

<table>
<thead>
<tr>
<th>FIELD IDENTIFICATION PROCEDURES (excluding particles larger than 0.1 mm and losing fractions on estimated mass)</th>
<th>GROUP SYMBOL</th>
<th>TYPICAL NAMES</th>
<th>INFORMATION REQUIRED FOR DESCRIBING SOILS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FINE GRAINED SOILS OR FRACTIONS</strong></td>
<td><strong>ML</strong></td>
<td>Inorganic silts and very fine sands, rock flour, silt or clayey fine sands with low plasticity. Silts of low to medium liquid limits.</td>
<td><strong>SYMBOL</strong> Give typical name, indicate approximate percentages of sand and gravel, max. size, angularity, surface condition, and strength of the coarse grains: colour, amount and type of cementing material and fineness of clay component. For undisturbed soils add information on moisture condition and degree of compaction. Stabilization, cementation, durability. Give total and specific gravity and other pertinent descriptive information. Examples: SM Vividly Silty SAND coarse to fine, pale brown, 20% strong angular gravel particles - 10 mm maximum size, rounded and subangular sand, about 10% non-plastic fines, moils, dense, alluvial sand.</td>
</tr>
<tr>
<td><strong>CL</strong></td>
<td>Inorganic clays of low to medium plasticity, * gravel clays, sandy clays, silty clays.</td>
<td><strong>GROUP SYMBOL</strong> Give typical name, indicate degree and character of plasticity, clays, colour, amount and size of course grains. For undisturbed soils add information on moisture condition, consistency, structure, stratification, durability. Give total and specific gravity and other pertinent descriptive information. Examples: CL Sandy CLAY of low plasticity, pale grey and brown; Sand fine to medium, trace of fine gravel, dry, firm, numerous vertical root holes (FILL).</td>
<td></td>
</tr>
<tr>
<td><strong>PL</strong></td>
<td>Organic clays of high plasticity.</td>
<td><strong>GROUP SYMBOL</strong> Give typical name, indicate degree and character of plasticity, clay, colour, amount and size of course grains. For undisturbed soils add information on moisture condition, consistency, structure, stratification, durability. Give total and specific gravity and other pertinent descriptive information. Examples: CL Sandy CLAY of low plasticity, pale grey and brown; Sand fine to medium, trace of fine gravel, dry, firm, numerous vertical root holes (FILL).</td>
<td></td>
</tr>
</tbody>
</table>

#### Laboratory Classification Criteria

- **C₃₄** Greater than 4
- **C₅₄** Greater than 3
- **D₃₄** Greater than 6

- Not meeting all gradation requirements for GW.
- **C₃** Between 1 & 3
- **D₃** Between 1 & 3

- Not meeting all gradation requirements for SW.
- **C₅** Greater than 7
- **D₅** Greater than 7

- **O₅** Greater than 4
- **O₅** Greater than 4

1. **SYMBOL** Give typical name, indicate approximate percentages of sand and gravel, max. size, angularity, surface condition, and strength of the coarse grains: colour, amount and type of cementing material and fineness of clay component. For undisturbed soils add information on moisture condition and degree of compaction. Stabilization, cementation, durability. Give total and specific gravity and other pertinent descriptive information. Examples: SM Vividly Silty SAND coarse to fine, pale brown, 20% strong angular gravel particles - 10 mm maximum size, rounded and subangular sand, about 10% non-plastic fines, moils, dense, alluvial sand.

2. **GROUP SYMBOL** Give typical name, indicate degree and character of plasticity, clay, colour, amount and size of course grains. For undisturbed soils add information on moisture condition, consistency, structure, stratification, durability. Give total and specific gravity and other pertinent descriptive information. Examples: CL Sandy CLAY of low plasticity, pale grey and brown; Sand fine to medium, trace of fine gravel, dry, firm, numerous vertical root holes (FILL).

3. **Oriented** Disoriented or oriented shear plane.

Adapted from A.S. 1728-1981 [App. D]

---

**DRAINAGE** Effect on flowing water:

After removing particles larger than 0.2 mm size, prepare a test of moist soil with a volume of 10 cm³. Add enough water necessary to make the soil slightly wet but not saturated. Then pour the mixture into the capillary tube and observe the drainage. High dry strength is characteristic of the CH group. A typical loose sand shows little or no drainage whereas a plastic clay has no reaction. Inorganic clays, such as a typical rock flour, show a moderately quick reaction.
# Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Ballan  
**Pit Location:** Refer to Drawing No. E3517/1-3

<table>
<thead>
<tr>
<th>Period</th>
<th>Penetration</th>
<th>Weather</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2.34</td>
<td>0</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>As</td>
<td></td>
</tr>
</tbody>
</table>

**Soil Type:**  
- **Fill:** Silty Clay, high plasticity, yellow, mottled grey, some red-orange.  
- **CL:** Silty Clay, medium plasticity, brown.  
- **CL:** Silty Clay, medium plasticity, grey.  
- **CH:** Silty Clay, high plasticity, yellow-brown, mottled orange-yellow.

**Classification:**  
- **CH:** Fill
- **CL:** Tertiary Basalt

**Terrain Details:**  
- Basalt: brown, moderately to highly weathered

**Pit TP1 Terminated at 2.40 m**

**Consistency/Density Index:**  
- VS: very soft  
- S: soft  
- F: firm  
- St: stiff  
- Wc: very stiff  
- H: hard  
- Fo: friable  
- V: very loose  
- M: loose  
- MC: medium dense  
- D: dense  
- VD: very dense

**Symbols and Soil Description:**  
- U: undisturbed sample  
- D: disturbed sample  
- B: bulk sample  
- E: environmental sample  
- VS: vane shear  
- DP: dynamic penetrometer  
- FD: field density  
- WS: water sample  
- Wc: water content  
- Wp: plastic limit  
- WI: liquid limit

**Samples, Tests, Etc.:**  
- D: dry  
- M: moist  
- W: wet  
- VP: plastic limit  
- WI: liquid limit
**Engineering Log - Excavation**

**Client:** C.F.A. Training College

**Project:** Field Site Appraisal & Sampling, Ballan

**Site Location:** Refer to Survey No. ES17/1-3

**Equipment Type and Model:** Case 4000 Backhoe

**Excavation Dimensions:** 2 m long, 0.8 m wide

**Orientation:** R.L. Surface: Not Measured

**Material:**
- Soil type, plasticiy or particle characteristics
- Colour, secondary and minor components

**Classification:**
- Soil
- Material

<table>
<thead>
<tr>
<th>Penetration</th>
<th>Samples, Tests, Etc.</th>
<th>Support</th>
<th>Consistency/Density Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, 4</td>
<td>1, 2, 3, 4, 5</td>
<td></td>
<td>very soft</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>very soft</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>very soft</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>very soft</td>
</tr>
</tbody>
</table>

**BASALT:** Brown, moderately to highly weathered

Pit TP2 Terminated at 2.40 m

Basalt floaters, approx. 200-300mm in the clay

**Tertiary Basalt**
## Engineering Log - Excavation

### Client:
C.F.A. Training College

### Principal:
-

### Project:
Field Site Appraisal & Sampling, Ballan

### Pit Location:
Refer to drawing no. E3517/1-3

### Equipment Type and Model:
CASE: 400 Backhoe

### Excavation Dimensions:
2 m long, 0.8 m wide

### Orientation:

### Material:
- **Silty Clay**: Medium plasticity, brown
- **Silty Clay**: Medium plasticity, grey
- **Silty Clay**: High plasticity, yellow-grey, weathered orange-yellow

### Notes:
- Pit bolted on basalt
- Pit TP3 Terminated at 1.90 m

### Consistency/Density Index:
- VS = Very soft
- S = Soft
- F = Firm
- St = Stiff
- VSt = Very stiff
- H = Hard
- FH = Firm hard
- W = Water
- VH = Very hard
- VL = Very loose
- L = Loose
- MD = Medium dense
- D = Dense
- WD = Very loose
- WD = Very dense

### Additional Observations:
- Topsoil
- Subsoil
- Residual
# Engineering Log - Excavation

## Client:
C.F.A. Training College

## Principal:

## Project:
Field Site Appraisal & Sampling, Ballan

## Pit Location:
Refer to Drawing No. E3517/4-3

## Equipment Type and Model:
CASE 4800 RAGOE

## Excavation Dimensions:
2.0 m long, 0.8 m wide

## Material:

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Plasticity</th>
<th>Particle Characteristics</th>
<th>Colour, Secondary and Minor Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fill, gravelly clay</td>
<td>Medium plasticity</td>
<td>Red, gravel fine to coarse grained, with a trace of Silt clay.</td>
<td></td>
</tr>
<tr>
<td>Silty clay</td>
<td>Medium plasticity, grey, with a trace of Silt clay.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Silty clay, high plasticity</td>
<td>Yellow-grey, mottled orange-yellow, with a trace of Silt clay.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Structure and Additional Observations:

- Pit 4 Terminated at 2.00 m
- Pit bottomed on basement

## Consistency/Density Index:

| VS | Very Silt |
| VSS | Very Stiff |
| S | Silt |
| F | Firm |
| St | Stiff |
| VS | Very Stiff |
| H | Hard |
| FB | Fibrile |
| VL | Very Loose |
| M | Moist |
| L | Loose |
| ND | Medium Dense |
| D | Dense |
| W1 | Very Dense |

## Method:
- Natural exposure
- Existing excavation
- Bulldozer blade
- Bulldozer ripper
- Excavator
- Hand auger
- Hand tools

## Penetration:

<table>
<thead>
<tr>
<th>Penetration Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Little resistance ranging to very slow progress</td>
</tr>
<tr>
<td>2</td>
<td>None observed</td>
</tr>
<tr>
<td>3</td>
<td>Not measured</td>
</tr>
<tr>
<td>4</td>
<td>Water level</td>
</tr>
<tr>
<td>5</td>
<td>Water outfall</td>
</tr>
<tr>
<td>6</td>
<td>Water inflow</td>
</tr>
</tbody>
</table>

## Samples, Tests, Etc:

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>Undisturbed sample (mm)</td>
</tr>
<tr>
<td>D</td>
<td>Disturbed sample</td>
</tr>
<tr>
<td>B</td>
<td>Bulk sample</td>
</tr>
<tr>
<td>E</td>
<td>Environmental sample</td>
</tr>
<tr>
<td>VS</td>
<td>Vane shear</td>
</tr>
<tr>
<td>OP</td>
<td>Dynamic penetrometer</td>
</tr>
<tr>
<td>FD</td>
<td>Field density</td>
</tr>
<tr>
<td>WS</td>
<td>Water sample</td>
</tr>
</tbody>
</table>

## Classification Symbols and Soil Description:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS</td>
<td>Very Silt</td>
</tr>
<tr>
<td>VSS</td>
<td>Very Stiff</td>
</tr>
<tr>
<td>S</td>
<td>Silt</td>
</tr>
<tr>
<td>F</td>
<td>Firm</td>
</tr>
<tr>
<td>St</td>
<td>Stiff</td>
</tr>
<tr>
<td>VS</td>
<td>Very Stiff</td>
</tr>
<tr>
<td>H</td>
<td>Hard</td>
</tr>
<tr>
<td>FB</td>
<td>Fibrile</td>
</tr>
<tr>
<td>VL</td>
<td>Very Loose</td>
</tr>
<tr>
<td>M</td>
<td>Moist</td>
</tr>
<tr>
<td>L</td>
<td>Loose</td>
</tr>
<tr>
<td>ND</td>
<td>Medium Dense</td>
</tr>
<tr>
<td>D</td>
<td>Dense</td>
</tr>
<tr>
<td>W1</td>
<td>Very Dense</td>
</tr>
</tbody>
</table>
Engineering Log - Excavation

Client: C.E.A. Training College
Project: Field Site Appraisal & Sampling, Ballan
Pit Location: Refer to Drawing No. D3517/1-3

Equipment Type and Model: CASE 480P Backhoe
Excavation Dimensions: 2m long, 0.8m wide

Material
- Soil Type: Plasticity or Particle Characteristics
  - Colour, secondary and minor components

Consistency/Density Index
- Moisture Content
- Consistency Index
- Density

Structure and Additional Observations
- Scoria Fill
- Topsoil
- Subsoil
- Residual

Pit bottomed on basalt

Pit TPS Terminated at 2.50m

Penetration
- Method: Natural Exposure
  - 1. Backhoe bucket
  - 2. Bulldozer blade
  - 3. Bulldozer ripper
  - 4. Excavator
- Support: Hand auger
- Shoring: SC shotcrete
- No support
- Rebars

Samples, Tests, Etc.
- Undisturbed sample (nm)
- Disturbed sample
- Bulk sample
- Environmental sample
- Vane shear
- Dynamic penetrometer
- Field density
- Water sample

Classification
- Classification Symbols and Soil Description
  - Based on Unified Classification System
- Moisture
  - Dry
  - Moist
- Plastic Limit
- Liquid Limit

Consistency/Density Index
- VS: Very soft
- S: Soft
- F: Firm
- SL: Stiff
- VS1: Very stiff
- H: Hard
- FH: Firm
- VL: Very loose
- LS: Loose
- ML: Medium dense
- D: Dense
- VS: Very dense
## Engineering Log - Excavation

### Client:
C.F.A. Training College

### Project:
Field Site Appraisal & Sampling, Ballan

### Pit Location:
Refer to Drawing No. E751/1-3

### Equipment Type and Model:
CASE 4000 Backhoe

### Excavation Dimensions:
2 m long, 6.0 m wide

### Materials:

<table>
<thead>
<tr>
<th>Depth</th>
<th>Penetration</th>
<th>Sampled</th>
<th>Tests, etc.</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>1 2 3 4</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fill:** Sandy gravel, fine to coarse grained, red, sand, fine to coarse grained, with some clay, medium plasticity.

**Silt:** Clay with black hydration content of 3mm.

**C Aly Sol (Gavel):** Fine to medium grained, brown-grey, sand, fine to coarse grained, clay, medium plasticity, with buckshot gravel 2-8mm.

**Silt:** Clay, high plasticity, yellow-grey, mottled orange-yellow.

### Additional Observations:

- Pit bottomed on base.
- Pit TP 6 - Terminated at 2.00 m

### Consistency/Density Index

- **Consistency:**
  - VS: Very soft
  - S: Soft
  - F: Firm
  - H: Hard
  - D: Dry
  - M: Moist
  - W: Wet
  - PL: Plastic limit
  - LI: Liquid limit

- **Density:**
  - VS: Very stiff
  - S: Soft
  - F: Firm
  - H: Hard
  - D: Dry
  - M: Moist
  - W: Wet
  - PL: Plastic limit
  - LI: Liquid limit

---

**Notes:**
- BS: Bulk sample
- E: Environmental sample
- EP: Dynamic penetrometer
- FD: Field density
- NS: Water sample
- V: Very loose
- L: Loose
- MD: Medium dense
- D: Dense
- VS: Very dense
### Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Ballan  
**Pit Location:** Refer to Drawing No. E3617/1-3  
**Equipment Type and Model:** CASE 4800 Backhoe  
**Excavation Dimensions:** 9.6 m long, 0.8 m wide  
**Orientation:** R.L. Surface: NOT MEASURED  
**Structure and Additional Observations:**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8 m</td>
<td>SCoria fill</td>
</tr>
<tr>
<td>0.6 m</td>
<td>Topsoil</td>
</tr>
<tr>
<td>0.2 m</td>
<td>Residual</td>
</tr>
</tbody>
</table>

Pit TP8 Terminated at 2.50 m

**Method:**
- Natural Exposure
- Existing Excavation
- Backhoe bucket
- Bulldozer blade
- Bulldozer ripper
- Excavator
- Hand auger
- Hand tools

**Support:**
- No support
- Rock bolting

**Penetration:**
- Little resistance ranging to very slow progress

**Samples, Tests, Etc.:**
- Undisturbed sample (un)
- Disturbed sample
- Bulk sample
- Environmental sample
- Water sample
- Dynamic penetrometer
- Field density

**Classification:**
- Based on unified classification system

**Moisture:**
- Very soft
- Soft
- Firm
- Stiff
- Very stiff

**Consistency/Density Index:**
- Very soft
- Soft
- Firm
- Stiff
- Very stiff
- Hard
- Very hard
- Firm
- Very firm
- Loose
- Medium dense
- Dense
- Very dense
# Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Ballan  
**Pit Location:** Refer to drawing no. E3517/1-3  
**Pit No:** TP9  
**Commenced:** 17/7/96  
**Completed:** 17/7/96  
**Not Measured:**  

<table>
<thead>
<tr>
<th>Method</th>
<th>Support</th>
<th>Water</th>
<th>Samples, tests, etc</th>
<th>Soil tests</th>
<th>Penetration</th>
<th>Penetration/Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Material

- **Fill:** Clayey Sand Gravel, fine to coarse grained, red, sand. Fine to coarse grained, clay medium plasticity, red.
- **Silt Clay:** Medium plasticity, brown with black, oxidized mottling, approximately 1 mm thick.
- **Clayey Sand Gravel:** Fine to coarse grained, brown-grey, sand. Fine to coarse grained, clay medium plasticity.
- **Silt Clay:** High plasticity, yellow-grey, mottled orange-yellow.

### Structure and Additional Observations

- **SCORIA FELL**
- **Topsoil**
- **Subsoil (buckshot gravel-layer)**
- **Residual**

### Notes

- Pit bottomed on basalt.
- Pit TP9 Terminated at 2.30 m.

### Consistency/Density Index

- **YS:** very soft
- **S:** soft
- **F:** firm
- **Sr:** stiff
- **SL:** very stiff
- **H:** hard
- **Fb:** friable
- **ML:** very loose
- **L:** loose
- **HD:** medium dense
- **D:** dense
- **VD:** very dense
**Engineering Log - Excavation**

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Ballan  
**Pit Location:** Refer to Drawing No. E2517/1-3

**Equipment Type and Model:** CASE 4800 Backhoe  
**Excavation Dimensions:** 2 m long, 0.6 m wide

<table>
<thead>
<tr>
<th>Material</th>
<th>Soil Type</th>
<th>Plasticity or Particle Characteristics</th>
<th>Colour, Consistency and Minor Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>FILL: CLAYEY SANDY GRAVEL</td>
<td>Fine to coarse grained, red, sand, fine to coarse grained, clay medium</td>
<td>ELSINOGLY, RED</td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td>SILTY CLAY</td>
<td>Medium plasticity, brown with black, hydromorphic (silt) shape approximately 1mm thick</td>
<td></td>
</tr>
<tr>
<td>CH</td>
<td>SILTY CLAY</td>
<td>High plasticity, yellow-grey, mottled orange-yellow</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Observations:**  
Pit bottomed on basalt

**Structure and Additional Observations:**

**Pit TP10 Terminated at 2.00 m**
### Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Ballan  
**Pit Location:** Refer to Drawing No. E3517/4-3

<table>
<thead>
<tr>
<th>Method</th>
<th>Support</th>
<th>Penetration</th>
<th>Water</th>
<th>Samples, Tests, Etc</th>
<th>Classification</th>
<th>Consistency/Density Index</th>
<th>Moisture</th>
<th>Consistency/Density Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NSL</td>
<td>0</td>
<td>N</td>
<td>None observed</td>
<td>Very stiff</td>
<td>VS</td>
<td>Dry</td>
<td>VS</td>
</tr>
<tr>
<td>2</td>
<td>NSL</td>
<td>0</td>
<td>N</td>
<td>Not observed</td>
<td>Very stiff</td>
<td>VS</td>
<td>Moist</td>
<td>VS</td>
</tr>
<tr>
<td>3</td>
<td>NSL</td>
<td>0</td>
<td>N</td>
<td>Water level</td>
<td>Very stiff</td>
<td>VS</td>
<td>Wet</td>
<td>VS</td>
</tr>
</tbody>
</table>

**Classification Symbols and Soil Description:**
- **U:** Undisturbed sample (in situ)
- **D:** Disturbed sample
- **B:** Bulk sample
- **E:** Environmental sample
- **W:** Water sample
- **SP:** Dynamic penetrometer
- **FD:** Field density
- **VS:** Very stiff
- **VS:** Very stiff
- **H:** Hard
- **F:** Firm
- **S:** Soft
- **SL:** Stiff
- **YS:** Very stiff
- **M:** Moist
- **L:** Loose
- **D:** Dense
- **LD:** Medium dense
- **WD:** Water content
- **PL:** Plastic limit
- **LL:** Liquid limit
- **V:** Very loose
- **TL:** Tongue limit

### Additional Observations
- Pit TP11 Terminated at 1.50 m
- Pit bottomed on benit

**Structure and Additional Observations:**
- SCORIA FILL
- FORDS
- SUBSOIL
- RESIDUAL
### Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Balmain  
**Pit Location:** Refer to drawing no. E95177/1-3  
**Equipment Type and Model:** CASE 480C BACKHOE  
**Excavation Dimensions:** 2 m long, 0.8 m wide  
**Orientation:** R.I. Surface: NOT MEASURED  
**Consistency/Density Index:**
- VS: Very Soft  
- S: Soft  
- F: Firm  
- St: Stiff  
- VSt: Very Stiff  
- H: Hard  
- Fb: Frangible  
- Fl: Very loose  
- L: Loose  
- M0: Medium dense  
- D: Dense  
- VD: Very dense  

#### Material

<table>
<thead>
<tr>
<th>Soil Type/Consistency</th>
<th>Particle Characteristics</th>
<th>Colour, secondary and minor components</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC</td>
<td>Fine, clayey sandy gravel, time to coarse grained, red, sand, time to coarse grained, clay medium plasticity, red</td>
<td></td>
</tr>
<tr>
<td>CL-GH</td>
<td>Silty clay, medium to high plasticity, brown-yellow, yellow orange-yellow, containing black, hydrocarbon (petrol sludge) mixed with soil from 0.04 to 0.86m</td>
<td></td>
</tr>
</tbody>
</table>

- 200mm cement pipe at approx. 1m  
- Pit bottomed on basalt  
- Pit TP12 Terminated at 1.40 m  

#### Structure and Additional Observations

- SCoria and Soil Fill

#### Samples, Tests, Etc.

- Unmodified sample (unmodified)
- Disturbed sample (disturbed)
- Bulk sample (bulk)
- Environmental sample (environmental)
- Vane shear (vane shear)
- Dynamic penetrometer (dynamic penetrometer)
- Field density (field density)
- Water sample (water sample)
**Engineering Log - Excavation**

**Client:** C.F.A. Training College  
**Principal:**  
**Project:** Field Site Appraisal & Sampling, Ballan  
**Pit Location:** Refer to Drawing No. E3517/1-3

**Equipment Type and Model:** CASE 4800 Backhoe  
**Excavation Dimensions:** 2m long, 0.8m wide  
**Orientation:**

<table>
<thead>
<tr>
<th>Material</th>
<th>Material</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Type Plasticity or Particle Characteristics</td>
<td>Colour, Secondary and Minor Components</td>
<td>Moisture Condition</td>
</tr>
<tr>
<td>Fill: Clayey Gravel, Fine to coarse grained, red clay, medium plasticity.</td>
<td>Silty Clay: Medium plasticity, brow, containing black, hydrocarbon sludge with strong odour, 0.2 to 0.4%</td>
<td>WO</td>
</tr>
</tbody>
</table>
| Clay: Medium plasticity, 
Silty Clay: High plasticity, brown-yellow, brown-grey, mottled orange-yellow. | Silty Clay: Medium plasticity, brown-grey, medium plasticity, 
Clay: Medium plasticity, brown-grey, mottled orange-yellow. | MO |

**Pit TP13 Terminated at 1.30m**

**Consistency/Density Index**

<table>
<thead>
<tr>
<th>Consistency/Density Index</th>
<th>Consistency/Density Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS</td>
<td>very soft</td>
</tr>
<tr>
<td>S</td>
<td>soft</td>
</tr>
<tr>
<td>F</td>
<td>firm</td>
</tr>
<tr>
<td>St</td>
<td>stiff</td>
</tr>
<tr>
<td>VS</td>
<td>very stiff</td>
</tr>
<tr>
<td>M</td>
<td>hard</td>
</tr>
<tr>
<td>Vf</td>
<td>friable</td>
</tr>
<tr>
<td>VL</td>
<td>very loose</td>
</tr>
<tr>
<td>L</td>
<td>loose</td>
</tr>
<tr>
<td>MO</td>
<td>medium dense</td>
</tr>
<tr>
<td>D</td>
<td>dense</td>
</tr>
<tr>
<td>MD</td>
<td>medium dry</td>
</tr>
<tr>
<td>W</td>
<td>very wet</td>
</tr>
<tr>
<td>WD</td>
<td>dense</td>
</tr>
<tr>
<td>MO</td>
<td>very dense</td>
</tr>
</tbody>
</table>

**Sampling, Tests, etc:**

- Undisturbed Sample  
- Disturbed Sample  
- Bulk Sample  
- Environmental Sample  
- Vane Shear  
- Dynamic Penetrometer  
- Field Density  
- Water Sample

**Classification Symbols and Soil Description:**

- Based on Unified Classification System

**Moisture:**

- Dry  
- Moist  
- Wet  
- Very Wet

**Water Levels:**

- Water Outflow  
- Water Inflow

**Penetration Method:** Natural Exposure

**Penetration:** 1 2 3 4

- Little resistance ranging to very slow progress

**Water Sampling:**

- None observed  
- Not measured  
- Water level

**SUPPORT:**

- Backhoe bucket  
- Bulldozer blade  
- Bulldozer ripper  
- Excavator

**No Support:**

- Rockbolts

**Additional Observations:**

- SCP B-344
- Topsoil
- Silt with kebsho gravel
- Residual

**Pit TP13 Terminated at 1.30 m**
# Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Ballav  
**Pit Location:** Refer to Drawing No. E3517/1-3  

## Equipment Type and Model
- Case 4800 Backhoe

## Excavation Dimensions
- 2 m long  
- 0.8 m wide

## Material
- Soil type, plasticity, or particle characteristics
- Colour, secondary and minor components

<table>
<thead>
<tr>
<th>Layer</th>
<th>Penetration</th>
<th>Water</th>
<th>Samples, Tests, Etc</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Existing</th>
<th>Water Level</th>
<th>Soils, Tests, etc</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Classification and Additional Observations**
- FELL: Clayey gravel, fine to coarse grained, red  
  clay high plasticity,  
  SELTY CLAY, medium plasticity, brown, containing  
  traces of black, hydrocarbon staining (approx. 4mm)  
  SELTY CLAY, high plasticity, yellow-brown, mottled  
  orange-yellow  

**Pit TP14 Terminated at 1.00 m**

**Consistency/Density Index**
- VS: Very soft  
- S: Soft  
- F: Firm  
- SL: Stiff  
- VL: Very stiff  
- VSL: Very stiff  
- H: Hard  
- FH: Firm hard  
- W: Wet  
- MW: Medium wet  
- WD: Wet dense  
- MD: Medium dense  
- DD: Dense  
- LD: Loose  
- VD: Very dense
# Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Ballan  
**Pit Location:** Refer to Drawing No. E3517/1-3  
**Equipment Type and Model:** CASE 480D BACKHOE  
**Excavation Dimensions:** 2 m long, 0.8 m wide

<table>
<thead>
<tr>
<th>Depth</th>
<th>Material Description</th>
<th>Classification</th>
<th>Consistency Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Fill: Clayey gravel, fine to coarse grained, red, clay high plasticity,</td>
<td>GC</td>
<td>M</td>
</tr>
<tr>
<td>1</td>
<td>Silty clay, medium plasticity, brown, with a trace of coke.</td>
<td>CL</td>
<td>M</td>
</tr>
<tr>
<td>2</td>
<td>Limestone, 20% of black, hydrocarbon emulsion</td>
<td>CL</td>
<td>M</td>
</tr>
<tr>
<td>3</td>
<td>Silty clay, medium plasticity, brown-grey, orange-yellow.</td>
<td>CH</td>
<td>M</td>
</tr>
</tbody>
</table>

**Pit TP15 Terminated at 0.60 m**

**Identification:**
- **Consistency/Density Index:**
  - VS: Very soft
  - S: Soft
  - F: Firm
  - St: Stiff
  - VS: Very stiff
  - W: Hard
  - Fb: Frangible
  - Vf: Very friable
  - Wf: Water saturated
  - W: Wet
  - M: Moist
  - D: Dry
  - Mo: Plastic limit
  - Wi: Liquid limit
  - Md: Medium dense
  - LD: Loose
  - Vo: Very dense

**Method:**
- Natural exposure
- Existing excavation
- Backhoe bucket
- Bulldozer blade
- Bulldozer ripper
- Excavator
- Hand auger
- Hand tools
- Support
- Shoring SC sheetpiles
- No support
- Rocks/soil

**Penetration:**
- Little resistance ranging to very slow progress

**Samples, Tests, Etc.:**
- Undisturbed sample (and)  
- Disturbed sample  
- Bulk sample  
- Environmental sample  
- Kne shear  
- Dynamic penetrometer  
- Field density  
- Water sample
### Engineering Log - Excavation

**Client:** C.F.A. TRAINING COLLEGE  
**Project:** FIELD SITE APPRAISAL & SAMPLING, BALLAN  
**Pit Location:** REFER TO DRAWING NO. E59171/3

**Equipment and Model:** CASE 4000 DADOHE  
**Excavation Dimensions:** 2 m long, 0.8 m wide  
**Orientation:** A.L. Surface: NOT MEASURED

<table>
<thead>
<tr>
<th>Issue</th>
<th>Work</th>
<th>Description</th>
<th>Qty</th>
<th>Wet</th>
<th>D.P.</th>
<th>Consistency/Density Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Structure and Additional Observations:**
- SCORIA FILL
- TOPSOIL
- SUBSOIL
- RESIDUAL

**Pit TP15** Terminated at 0.60 m

**Method**
- Natural Exposure
- Existing Excavation
- Backhoe Bucket
- Bulldozer Blade
- Bulldozer Ripper
- Excavator
- Hand Auger
- Hand Tools
- Screen Shoveling, SE Shotcrete
- No Support
- Rockbolts

**Penetration**

<table>
<thead>
<tr>
<th>N</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>little resistance ranging to very slow progress</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Water**
- None observed
- Water Level
- Water Outflow
- Water Inflow

**Samples, Tests, Etc.**
- Undisturbed Sample (mm)
- Disturbed Sample
- Bulk Sample
- Environmental Sample
- Vane Shear
- Dynamic Penetrator
- Field Density
- Water Sample

**Classification**

<table>
<thead>
<tr>
<th>Classifications and Soil Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Classification System</td>
</tr>
<tr>
<td>Moisture</td>
</tr>
<tr>
<td>Consistency/Density Index</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Classifications and Soil Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
<tr>
<td>Classification System</td>
</tr>
<tr>
<td>Moisture</td>
</tr>
<tr>
<td>Consistency/Density Index</td>
</tr>
</tbody>
</table>

**Consistency/Density Index**
- Very Soft
- Soft
- Firm
- Stiff
- Very Stiff
- Hard
- Tricky
- Very Loose
- Loose
- Medium Dense
- Dense
- Very Dense
# Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Pit No.:** IP17  
**Pit Location:** Field Site Appraisal & Sampling, Ballan  
**Excavation Type:** CASE 4000 Backhoe  
**Excavation Dimensions:** 2 m long, 0.8 m wide

<table>
<thead>
<tr>
<th>Layer</th>
<th>Sample</th>
<th>Description</th>
<th>Colour, Plasticity or Particle Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>GC</td>
<td></td>
<td>Fill: Clayey gravel, fine to coarse grained, red.</td>
<td>Grey high plasticity.</td>
</tr>
<tr>
<td>CL</td>
<td></td>
<td>Silt Clay: Medium plasticity, brown.</td>
<td></td>
</tr>
<tr>
<td>CH</td>
<td></td>
<td>Silt Clay: Medium plasticity, brown-greyn.</td>
<td></td>
</tr>
<tr>
<td>CL</td>
<td></td>
<td>Silt Clay: High plasticity, grey.</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Observations:**
- Scoria Fill  
- Topsoil  
- Subsoil  
- Residual

**Pit IP17 Terminated at 0.50 m**

---

**Method:**
- Natural Exposure  
- Existing excavation  
- Backhoe bucket  
- Bulldozer blade  
- Bulldozer ripper  
- Excavator  
- Hand auger  
- Hand tools  
- Support: Shoring, shotcrete  
- No support  
- Rockbolts

**Penetration:**
- Little resistance ranging to very slow progress

**Samples, Tests, Etc.:**
- Undisturbed sample (m)  
- Disturbed sample  
- Bulk sample  
- Environmental sample  
- Vane shear  
- Dynamic penetrometer  
- Field density  
- Water sample

**Classification:**
- Symbols and Soil Description
- Based on unified classification system
- Moisture
- Water content
- Plastic limit
- Liquid limit

**Consistency/Density Index:**
- Very soft
- Soft
- Firm
- Stiff
- Very stiff
- Hard
- Frangible
- Very loose
- Loose
- Medium dense
- Dense
- Very dense
# Engineering Log - Excavation

**Client:** CFA Training College  
**Project:** Field Site Appraisal & Sampling, Ballan  
**Pit Location:** Refer to Drawing No. E35171-3

### Equipment Type and Model
CASE 450D BACKHOE

### Excavation Dimensions
- Length: 2 m
- Width: 0.8 m

### Material
- Soil Type: Plasticity or Particle Characteristics  
- Colour, secondary and minor components

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Texture</th>
<th>Plasticity</th>
<th>Clay Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>Silty Clay</td>
<td>Medium</td>
<td>Plasticity</td>
<td>Brown, contains some ochre gravel pieces in surface</td>
</tr>
<tr>
<td>CL</td>
<td>Silty Clay</td>
<td>Medium</td>
<td>Plasticity</td>
<td>Brown-grey, mottled orange-yellow</td>
</tr>
<tr>
<td>CH</td>
<td>Silty Clay</td>
<td>High</td>
<td>Plasticity</td>
<td>Yellow-brown, mottled orange-yellow</td>
</tr>
</tbody>
</table>

**Results:**
- **Pit TP18 Terminated at 0.69 m**

### Methodology
- Natural Exposure
- Existing Excavation
- Backhoe Bucket
- Bulldozer Blade
- Bulldozer Ripper
- Excavator
- Hand Auger
- Hand Tools
- Support
- Sharpened SC Shotcrete
- No Support
- Rockbolts

### Penetration
- Little resistance
- Very slow progress

### Samples, Tests, Etc
- UD: Undisturbed Sample (BM)
- DS: Disturbed Sample
- BS: Bulk Sample
- ENV: Environmental Sample
- VS: Vane Shear
- DP: Dynamic Penetrometer
- FD: Field Density
- WS: Water Sample

### Classification
- Symbols and Soil Description
- Based on Unified Classification System
- Moisture
- Consistency/Density Index

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### Notes
- Test results: [Details not legible]
- Water content: [Details not legible]
- Consistency: [Details not legible]

### Additional Observations
- Soil type: CLAY
- Grain size distribution: [Details not legible]
- Moisture content: [Details not legible]
- Consistency index: [Details not legible]
# Engineering Log - Excavation

**Client:** C.F.A. Training College  
**Project:** Field Site Appraisal & Sampling, Ballaw  
**Pit Location:** Refer to Drawing No. E961/7/1-3

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**Classification**  
Soil type: plasticity or particle characteristics
- Clay high plasticity
- Clay high plasticity
- Silty clay medium plasticity, brown
- Silty clay medium plasticity, brown-grey

**Material**  
- Fill, clayey silty, time to coarse grained, red
- Clay high plasticity
- Silty clay medium plasticity, brown
- Silty clay medium plasticity, brown-grey

**Structural and Additional Observations**  
- Site Fill
- Topsoil
- Subsoil

**Pit TP20 Terminated at 0.50 m**
APPENDIX B

SUMMARY OF SOIL PETROLEUM HYDROCARBON RESULTS
## SUMMARY OF SOIL PETROLEUM HYDROCARBONS RESULTS

**Location:** CFA Training College, Ballan VIC  
**Job Reference:** E3517/1  
**Results expressed in mg/kg dry weight**

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<th>Test Pit Location</th>
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<th>TOLUENE</th>
<th>ETHYL BENZENE</th>
<th>XYLENES</th>
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<th>TPH C10-C14</th>
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| TP8              | TP8-0.6-P | 0.6       | 0.08    | 0.42    | 0.17          | 0.59    | <20       | 610         | 42000       | 43000       |
| TP8              | TP8-1.0-P | 1.0       | <0.02   | <0.02   | <0.02         | <0.02   | <20       | 910         | 46000       | 41000       |
| TP12             | TP12-0.7-P | 0.7      | 0.32    | 0.69    | 0.36          | 1.80    | <20       | <20         | 160         | 100         |
| TP12             | TP12-1.1-P | 1.1      | <0.02   | <0.02   | <0.02         | <0.02   | <20       | <20         | <20         | <20         |
| TP13             | TP13-1.0-P | 1.0      | <0.02   | <0.02   | <0.02         | <0.02   | <20       | <20         | <20         | <20         |
| TP6              | TP6-0.3-P | 0.3       | <0.02   | <0.02   | <0.02         | <0.02   | <20       | <20         | 2100        | 790         |
| TP6              | TP6-0.8-P | 0.8       | <0.02   | <0.02   | <0.02         | <0.02   | <20       | <20         | <20         | <20         |
| TP5              | TP5-0.8-P | 0.8       | <0.02   | <0.02   | <0.02         | <0.02   | <20       | <20         | <20         | <20         |
| TP1              | TP1-0.3-P | 0.3       | <0.02   | <0.02   | <0.02         | <0.02   | <20       | <20         | 170         | 300         |
| TP14             | TP14-0.2-P | 0.2      | <0.02   | <0.02   | <0.02         | <0.02   | <20       | 34          | 1000        | 1900        |
APPENDIX C

NATA CERTIFIED LABORATORY RESULTS
CERTIFICATE OF ANALYSIS

DATE 29 July 1996

LABORATORY NUMBER JULR8265

CLIENT Coffey Partners International Pty Ltd

SAMPLE Sample/s received 19/7/96 - Job Ref: 3517/1

METHODS

Benzene, Toluene, Ethyl Benzene, Xylene NAL E106.01
Total Petroleum Hydrocarbons NAL E104.52

RESULTS

Please refer to attached page/s for results

Approved By ___________________________ Authorised By ___________________________

CHIEF CHEMIST MANAGING DIRECTOR

JULR8265...1 of3
### Results

### Laboratory Report

**Results expressed in mg/kg dry weight.**

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*A blank space indicates no test performed.*
# QUALITY ASSURANCE REPORT

**DATE:** 29/07/96  
**Client:** COFFEY PARTNERS INTERNATIONAL PTY. LTD.  
**Job Reference:** E3517/1

Results expressed in mg/kg dry weight.

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