

CSI Action Sheet

Fee Amount \$ 900 RECEIPT NO. 88752 RP/CoT YES NO FILE NO BNE1230

Officer	Action	Outcome	Signature & Date
Administration Officer <i>Darryl Byers</i>	CSI List, UXO List, Mailtracker checked and relevant info attached to file UXO LA Area?	No IPA Yes -forward to UXO advisor No - Write 'N/A' In UXO area below & pass to Dep. Registrar	sch4p4(6) Personal information <i>5/9/2002</i>
UXO Advisor	Assign Classification		
Deputy Registrar	Initial Entry/Update of EMR/CLR (copy EMR/CLR & CSR to file)		sch4p4(6) Personal information <i>5/11/02</i>

GIVE UXO FILES TO UXO ADVISOR (Disposal Permit & Data Validation checks not needed)

Lot & Plan	Report No	Entry Date	Initial Status	Reclass. Date	Final Status (Rem,<thresh,SMP)
<i>L1 M356/34</i>	<i>133-12</i>	<i>21/10/92</i>	<i>PRO</i>	<i>18/06/02</i>	<i>Managed</i>

Is there a CHEM notifiable activity on UXO site? YES NO

Officer	Action	Signature & Date
Disposal Permit	Check for previous correspondence & attach to file	sch4p4(6) Personal information <i>5/9/2002</i>
Data Validation	Check Notification & General files for previous correspondence & attach to file	<i>21/9/00</i>

PLACE CHEM FILES IN APPROPRIATE ORDER IN QUEUE

Officer	Action	Signature & Date
Contact Advisor	Review Assessment	sch4p4(6) Personal information <i>17/6/02</i>
Peer Review Advisor	Review Assessment	<i>16/2</i>
Date Final Submission Received	<i>20/05/02</i>	Key Contaminants <i>1 TPH/BTEX</i>
		Groundwater Contaminants <i>TPH/BTEX</i>
Studies Undertaken	<i>F:\Licensing\ContaminatedLand\Studies\BNE1230.doc</i>	

SMP. F:\Licensing\ContaminatedLand\Anita\ SMP'S\ BNE1230_SMP.doc

Deputy Registrar	Final check, update, print suit stat (own & appl) & letters (own & appl & local govt)	sch4p4(6) Personal information <i>18/6/02</i>
Contact Advisor	Check final suitability statements & letters	
Peer Review Advisor	Check final suitability statements & letters	sch4p4(6) Personal information
Delegated Officer	Final approval & sign suitability statement & letters	
GIS Officer	Enter relevant information to CSR-GIS	
Administration Officer	Mail suit. stat., smp and plan, copy to file, check CSI action sheet is complete, check file, update CSI file list, archive file	sch4p4(6) Personal information <i>20/6/02</i>

Application for Assessment of a Site Investigation Report

Please note: Failure to lodge all required information can result in your application being rejected and returned to you for completion and resubmission.

Complete both sides of this document (attach a separate sheet if more space required)

1. Applicant details

(This is the person to whom the suitability statement will be sent and to whom all enquiries will be directed)

Contact name sch4p4(6) Personal information

Telephone sch4p4(6) Personal information Fax 0740521546

Company name Goldier Associates
(if applicable)

Postal address PO Box 5823,
CAIRNS QLD Postcode 4870

2. Lodgement details

(Complete this section only if form not lodged by applicant)

Contact name _____

Telephone _____

Company name _____
(if applicable)

Postal address _____

Postcode _____

3. Site owner's details

(Agent's address not acceptable)

Full name Mobil Oil Australia Pty Ltd

Address Mobil House, 417 St Kilda Road
MELBOURNE VIC Postcode 3004

4. Site details

Name of local government Mareeba Shire Council

Suburb/Town/City Mareeba

Postcode 4880

Notifiable activity/possible contaminating activity

Fuel Depot

Intended use of the site Industrial/

Commercial Use.

5. Location and landuse details of each parcel covered by the site investigation report

Street No.	Street name	Lot on Plan description	Current landuse	Proposed landuse
<u>27</u>	<u>Reynolds Street</u>	<u>Lot 1 on Plan M356134</u>	<u>Fuel Depot</u>	<u>Industrial/Commercial Use</u>
.....				
.....				
18-292		File A		Page 2 of 131
.....				

6. Details of report

Is a development application pending under the *Integrated Planning Act 1997*?

☐ Yes ☒ No

The attached report contains (as per *Guidelines for the Assessment and Management of Contaminated Land in Queensland*) -

☒ Stage 1 investigation

☐ Stage 2 investigation

☐ Stage 3 investigation

If previous submissions have been made quote:

DEH File no.

Is a response required from DEH at this time or is further information following?

☒ Response required

☒ Further information following

Checklist — tick each box when complete

☒ Completed items 1-6 and written name and address in return slip (you **must** answer each item).

☒ Enclosed statutory fee.

☒ Enclosed statutory declarations by investigators, preparers and owners.

☒ Enclosed signed consultant's report (as per *Guidelines for the Assessment and Management of Contaminated Land in Queensland*).

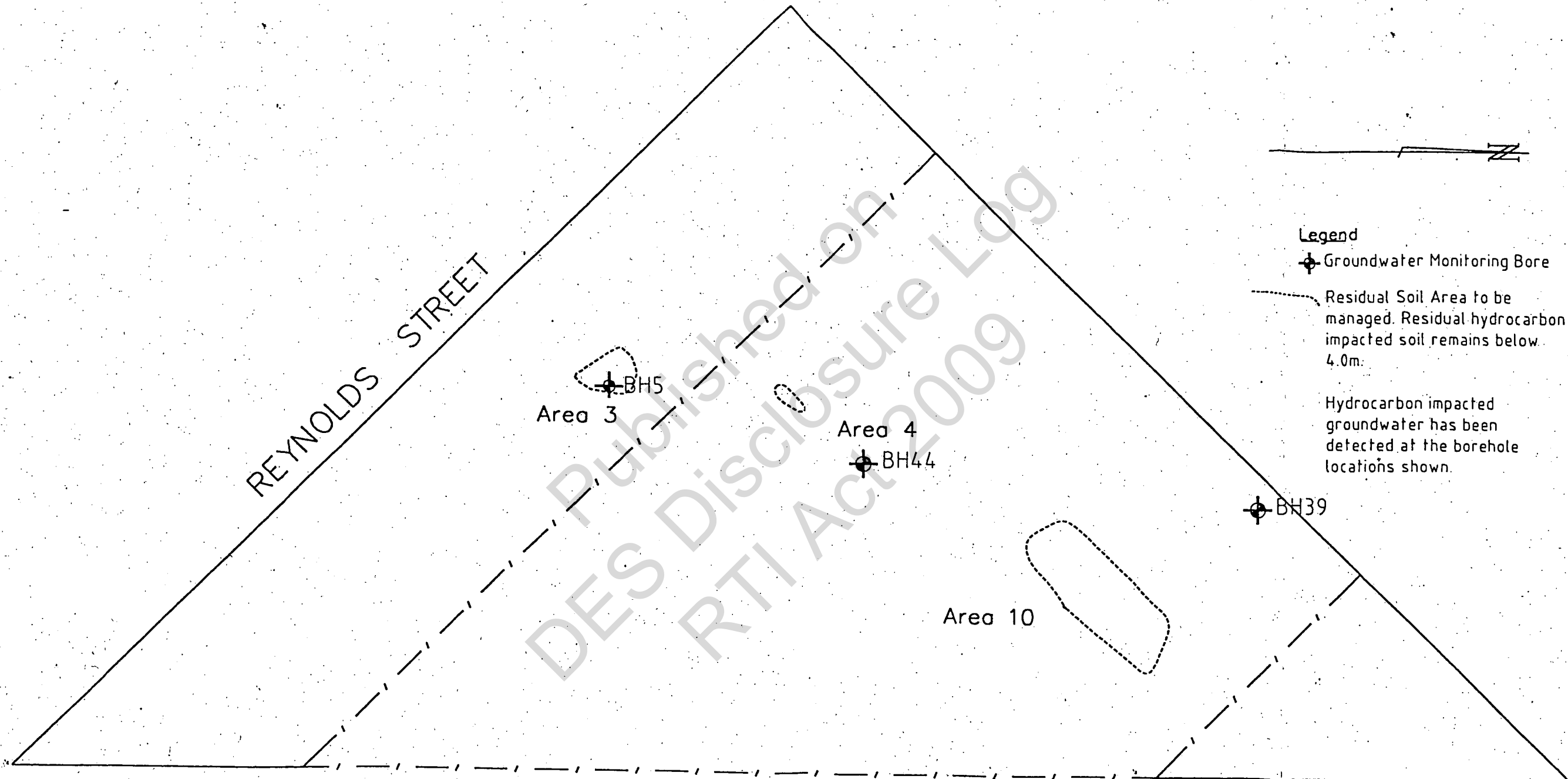
☒ Enclosed **legible** copy/copies of proof of ownership of site/s clearly showing the full name/s of the registered proprietor/s e.g. current Certificates of Title or Title Search/es. (Order in Council (Crown Land) and Form 100 (Change of Ownership Notification) may be accepted if the above are not available).

☒ Enclosed **legible** copy/copies of all relevant registered plans (available from the Titles Section, Department of Natural Resources) **clearly showing location of the site/s** and current registered plan details.

☒ Enclosed copy of a street map/area map clearly showing location of property.

FM 393 June 98

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Legend

- Groundwater Monitoring Bore
- Residual Soil Area to be managed. Residual hydrocarbon impacted soil remains below 4.0m.
- Hydrocarbon impacted groundwater has been detected at the borehole locations shown.

INDUSTRIAL LAND - NURSERY

File A	CLIENT		PROJECT	
	DRAWN	DATE	TITLE	
	CHECKED			
	SCALE		PROJECT NO.	FIGURE

SUITABILITY STATEMENT

DATE PRINTED: 18/06/2002

OWNER

MOBIL OIL AUSTRALIA PTY LIMITED
GPO BOX 4507
MELBOURNE
VIC 3001

DATE OF ISSUE : 18/06/2002

PROPERTY DESCRIPTION

LOT : 1 PLAN : M356134
27 REYNOLDS STREET
MAREEBA 4880

MAREEBA SHIRE COUNCIL
EMR Site ID: 13903 FILE REFERENCE: BNE1230

STUDIES UNDERTAKEN BY APPLICANT OR REQUESTED BY DIRECTOR

Environmental Site Assessment, Former Fuel Depot Site, Reynolds Street, Mareeba, Queensland, prepared for Mobil Oil Australia Pty Ltd, prepared by Golder Associates Pty Ltd dated August 2000 (Reference: 00673018(E)).

Remedial Excavation and Validation Works, Former Mobil Fuel Depot Site (PM01), Reynolds Street, Mareeba, Queensland, prepared for Mobil Oil Australia Pty Ltd, prepared by Golder Associates Pty Ltd dated August 2001 (Reference: 00673025(Q)).

Risk Assessment, Former Fuel Depot Site, Reynolds Street (PM01), Mareeba, Queensland, prepared for Mobil Oil Australia Pty Ltd, prepared by Golder Associates Pty Ltd dated August 2001 (Reference: 00673025(R)).

Additional information supplied in correspondence from Golder Associates Pty Ltd, dated 8 November 2001 and 22 January 2002.

STATEMENT OF SUITABILITY

On the basis of the information supplied to this Department, the subject site is suitable for the following use(s) providing the site is used and managed as per the Site Management Plan attached as Annexure 1.

Suitable for industrial/commercial use, including premises such as shops, offices and industrial buildings (but excluding uses where regular soil access by children is possible).

Other specific uses may be suitable for the site, please contact this Department for further advice. The suitability statement provides information on appropriate land uses at the date of effect. Subsequent uses

of the site for notifiable activities or for situations where a hazardous contaminant is released into the soil may result in the need to review suitable uses or amend the attached site management plan.

ENVIRONMENTAL MANAGEMENT REGISTER

LOT : 1 PLAN : M356134 is recorded on the Environmental Management Register with a Site Management Plan. A copy of the Site Management Plan is attached as Annexure 1.

sch4p4(6) Personal information

Delegate of Administering Authority
Environmental Protection Act 1994

Published on
DES Disclosure Log
RTI Act 2009

ANNEXURE 1 - SITE MANAGEMENT PLAN

LOT : 1 PLAN : M356134 FILE REF : BNE1230 PRINTED: 19/06/2002

DATE OF EFFECT : 18/06/2002

1.0 EXECUTIVE SUMMARY

This Site Management Plan (SMP) has been prepared by Golder Associates on behalf of Mobil Oil Australia Pty Ltd. The SMP applies to the Lot 1 on M356134 (Special Lease No. 09/53032), 27 Reynolds Street, Mareeba. A site plan showing the area to be managed is presented as Figure 1. The property was used as a fuel storage depot between 1963 and 1999. Future proposed land use at this site will be commercial/industrial land use.

Residual TPH is present in weathered rock at a depth of 4 m or greater in these areas. The residual contamination zone in the base of Area 3 had concentrations in the C₆-C₂₈ hydrocarbon fractions of up to 9950 mg/kg. The residual contamination zone in the base of Area 4 had concentrations in the C₁₀-C₁₄ hydrocarbon fraction of up to 340 mg/kg. The residual contamination zone in the base of Area 10 had concentrations in the C₁₀-C₂₈ hydrocarbon fractions of up to 2680 mg/kg. A quantitative risk assessment indicated that the residual TPH contamination in soil/weathered rock located more than 4m below the ground surface does not represent an unacceptable health risk to future commercial/industrial site users.

Groundwater monitoring conducted during assessment and remediation of the site indicated the presence of dissolved phase TPH and BTEX in a perched, seasonal aquifer beneath the site. This seasonal perched aquifer has a low yield (estimated to be less than 1 litre/sec). A deeper higher yielding aquifer has been intersected by an irrigation bore on the neighbouring property to the east. The water quality in this deeper bore was not impacted by TPH or BTEX. A quantitative risk assessment indicated that the dissolved phase TPH and BTEX concentrations in the seasonal perched aquifer do not represent an unacceptable health risk to future commercial/industrial site users or to potential offsite environmental receptors and groundwater users.

2.0 OBJECTIVES

The objectives to be achieved and maintained under this Site Management Plan (SMP) are to manage the contamination remaining on site (Lot 1 M356134) in a manner which protects human health and the environment. The site-specific elements relating to these objectives are the placement and maintenance of barriers which safely separate users of the site and the contamination; and the application of controls on site excavation works at depths greater than 4 metres.

3.0 ACHIEVEMENT AND MANAGEMENT OF OBJECTIVES

3.1 Responsibility. The owner of the land (as defined under the *Environment Protection Act 1994*) is to ensure the following conditions of this Site Management Plan and any variations to the plan approved or required by the Administering Authority are complied with.

The obligations and conditions set out in this Site Management Plan bind the owner from time to time, of the land.

The owner must provide any contractors, representatives and agents of the owner of the land associated with the design and construction of site facilities and infrastructure on the land with a copy of the

approved SMP prior to the commencement of work on-site.

The owner must provide a copy of the SMP to any lessee who intends to undertake site excavations prior to commencement of work.

3.2 Contaminated Soil Excavation and Removal. Contaminated soil must not be removed from the site without adequate sampling and analysis and prior approval from the Administering Authority under section 424 of the *Environment Protection Act 1994* or equivalent.

3.3 Land Use. The land is to be used for commercial/industrial purposes. This includes premises such as shops and offices as well as factories and industrial sites. Regular soil access by children is prohibited.

3.4 Groundwater Usage. Any use of groundwater from the contaminated perched aquifer located on this site is prohibited.

3.5 Workplace Health and Safety. A workplace Health and Safety Plan which satisfies relevant obligations of the *Workplace Health and Safety Act 1995*, subordinate legislation or its equivalent is to be developed for any excavation work on the site which extends to or below 4 metres. The Workplace Health and Safety Plan must specifically address dermal and inhalation exposures to site contaminants.

3.6 General Environmental Protection. Site works relating to excavation, removal and/or disposal of contaminated soil from the site must include provisions which ensure that the environment is protected, eg. preventing spread of contaminated soil by controlling site runoff, dust generation and spillage from haulage trucks or improper disposal of contaminated stormwater or seepage. All contamination, safety and excavation processes are to be documented and records kept which demonstrate SMP compliance.

3.7 Unexpected Contamination. It is a requirement of this plan that excavation works are to immediately cease and the Administering Authority notified within 1 business day and advised of appropriate delineation and remedial action in the event that monitoring reveals offensive or noxious odour at the work site and/or evidence of gross contamination not previously detected. Any remedial action is to be developed by a member of a prescribed organisation with relevant qualifications and experience according to section 381 of the *Environment Protection Act 1994*.

Administering Authority approval is required before site works can recommence at that location.

4.0 MAINTENANCE AND MONITORING REQUIREMENTS

The owner is to ensure that the following monitoring is carried out:

(a) A biennial inspection of the site is to be undertaken to ensure the integrity of the site capping. Records of these inspections and of any site excavations or permits issued under Section 424 of the *Environmental Protection Act 1994* are to be maintained by the owner for inspection by authorised officers. The biennial period is to commence from the effective date of this plan.

(b) The EPA may undertake periodic site inspections to monitor the site in relation to the above conditions.

This SMP has been developed to manage residual site contamination at the effective date. Subsequent uses of the site may result in the need to review the plan.

This SMP makes reference to a plan attachment that is available from the EPA if required.

Rayna,

Please reclassify Lot 1 M 356134 on the EMR as managed, suitable for commercial/industrial premises, HIL(F).

Date final submission: 20/05/2002

Key Cont: TPH / BTEX.

Groundwater: TPH / BTEX.

Studies:

Environmental Site Assessment, Former Fuel Depot Site, Reynolds Street, Mareeba, Queensland, prepared for Mobil Oil Australia Pty Ltd, prepared by Golder Associates Pty Ltd dated August 2000 (Reference: 00673018(E)).

Remedial Excavation and Validation Works, Former Mobil Fuel Depot Site (PM01), Reynolds Street, Mareeba, Queensland, prepared for Mobil Oil Australia Pty Ltd, prepared by Golder Associates Pty Ltd dated August 2001 (Reference: 00673025(Q)).

Risk Assessment, Former Fuel Depot Site, Reynolds Street (PM01), Mareeba, Queensland, prepared for Mobil Oil Australia Pty Ltd, prepared by Golder Associates Pty Ltd dated August 2001 (Reference: 00673025(R)).

Additional information supplied in correspondence from Golder Associates Pty Ltd, dated 8 November 2001 and 22 January 2002.

Thanks

sch4p4(6) Personal information

Anita Packwood
Senior Environmental Officer
Contaminated Land Unit

APPLICATION FOR ASSESSMENT OF A SITE INVESTIGATION REPORT

1. PRE-CHECK (Administration Officer)

		NOTES
a.	Current application form and statutory fee is included	✓✓ 100
b.	Check Excel trackers and Access to make sure no existing file for the site; check for IPA (attach if file exists)	✓✓ None - no IPA
c.	Check IVAS	✓✓ SUHLE STREET, MARKEBA
d.	Check EMR to see whether the site is listed. (If not, need Notification form).	✓✓ SITE ID 13903 PETROLEUM PRODUCT OR OIL STORAGE
e.	Check Certificate of Titles (CoT) for <u>all</u> lots are included	✓✓
f.	Check that the owner listed on the application form matches that on CoT	✓✓
g.	Check current Registered Plans for <u>all</u> lots are included	✓✓
h.	Check Statutory declarations:	✓✓
	-Investigator / report preparer has required qualifications and experience	✓✓
	-Correct format	✓✓

More information required? Yes / No
If yes, what is required?

Spoke to: _____ on: _____	
Details entered on 'Incomplete' tracker ☐	
Report returned: _____	

Date received all required information: 5/9/2000

'Incomplete' tracker amended

2. MAKE UP FILE

(Administration Officer.

Refer to instruction sheet for details)

a. Assign file number	
b. Write up file cover & attach blue flow chart	
c. Enter details into Excel tracker	
d. Enter details into ACCESS	
e. Enter details into CARMS, attach barcode	

3. CHECK FILE (Scientific Advisor)

a. Details on file cover are correct	✓
b. All required information has been provided	✓
c. Details on Excel and Access trackers are correct	✓
d. Lots in report, on CoT, RP & application form all match	✓

Comments:

4. FILE SENT ON ROUNDS

Date : 20/9/2000

Details updated on Excel and Access trackers

Cheque sent to finance: 20/9/2020

5. FILE HAS COMPLETED ROUNDS AND IS READY FOR QUEUE ☐

Release

Fuel Depot (Motel).
Sukle St Maruba
Gelders Assoc.

BNE 1230.

17/6/02.

Per reviewed by MD to val rpt. Gelders wanted removal
but RA insufficient → GW impacts.

∴ SARP proposed & Agreed with MD / owners consent
received 6/6/02. Addresses issues of concern.

- Restrict use of GW / land use industrial / commercial,
otherwise standard

- Agree to issue SARP.

sch4p4(6) Personal information

17/6/02

SUMMARY

FILE REFERENCE NO: BNE1230

SUBJECT: Suhle Street, Mareeba – Golder Associates Pty Ltd.

DATE: 17/06/2002

- ❖ Pre 1963 the land was vacant Crown Land, Survey plans state the site was “heavily timbered with Bloodwood, Box and Gum.” In the April of 1963 the site was leased to Esso Standard Oil (Australia). 1978 plans indicate the site had a drum fill platform, 2 UST’s, 4 x product pumps, tanker truck loading and unloading slabs and a bunded area containing 6 upright AST’s. In 1979 an extension to the bunded area was made for it to contain 10 AST’s, this was done and the concrete bases placed within the bund but the tanks were never installed. In 1992 the lease was transferred to Mobil Oil Australia.
- ❖ The site is approximately 5059m² but 3850m² of this has been fenced off and used as the depot. Southwest of the site is Reynolds Street and then Industrial land; to the northwest is the Mungana Railway Line, Chewco Road and then a sports fields; to the east is Commercial/Industrial land (nursery and then engineering workshops). The site is sloped approximately 1V:65H towards the northeast. The nearest surface water body is Granite Creek 1.2km north and Basalt Creek approximately 0.7m to the northeast. The nearest sensitive use (school/child care) is more than 1km away.
- ❖ The sub-surface profile consists of red-brown basaltic clays to depths varying from 1.5m at the northern end to >4m at the southern end, underlain by a series of overtopping basalt flows, the weathered basalt has a low but variable strength to depths of at least 10m (max depth of investigation). The site is underlain by olivine basalts of the Atherton Basalt Formation. These basalts are flow remnants. 2 distinct imported fill materials were identified during the investigation - brown gravelly sand/clayey gravel beneath the bitumen driveway areas at the front of the site and in former unsealed internal roads and parking areas; and light brown sand possibly UST bedding sand.
- ❖ DNR advised the site is not in a proclaimed area. The groundwater flow in the basalt is complex with a number of local flow systems which have not yet been accurately delineated. DNR also advised that bore yields in the area are very low <1L/s. Use of groundwater as potable water would be rare. In the immediate area of the site the groundwater is expected to be at 15m - 20m BGL, flowing north-easterly. Groundwater on the site is of potable standard.

Standing groundwater levels in both monitoring wells installed by Handex were between 6.25m and 6.5m BGL. Strong hydrocarbon odour was noted in the monitoring well at BH5. Limited groundwater flow data indicates that the flow is generally towards the northeast. A bore (20m depth) located 50m into the adjacent lot on the east boundary has been used by a nursery for irrigation for the past 24 years. No hydrocarbon odours or vegetation stress has been noted.

- ❖ Site demolition and UST removal occurred in October 2000. Approximately 1600m³ of TPH impacted soil was excavated over the next 4 months and bio-remediated. The site was excavated in section numbers 1 - 15. Laboratory analysis of 134 soil samples from the excavated areas was carried out. All were analysed for TPH, BTEX and Pb, 20 for PAH, a metal suite and phenolic compounds. Areas 3, 4 & 10 were areas where TPH impact remains. Residual contamination was within weathered rock at the base of all 3 excavations (approximately 4m or greater).
- ❖ Recommend that based on the remediation works undertaken and the information provided Lot 1 M 356134, Suhle Street, Mareeba be reclassified to managed on the EMR.

Mobil Oil Australia Pty Ltd
ABN 88 004 052 984

Mobil House
417 St Kilda Road
Melbourne VIC 3004
GPO Box 4507
Melbourne VIC 3001
Telephone: (03) 9252 3111

Correspondence No.		STH2002/4429	
File No.	BNE1230	PART	FOLIO
Action Officer		Related Items	
Anita Packwood			

Mobil

20 May 2002

Environment Protection Agency (Qld)
Contaminated Land Unit
288 Edward Street
Brisbane Qld 4000

Attention: Ms Anita Packwood

Dear Ms Packwood,

**Re: Draft Site Management Plan
Lot: 1 Plan: M 356134
Former Mobil Depot
27 Reynolds Rd, Mareeba Qld**

In reference to your letter dated 20 February 2002 (Ref: BNE 1230), find attached copy of SMP signed by Mobil Oil Australia Pty Ltd signifying acceptance of the conditions and the diagram.

If you require further information regarding the issue of Site Suitability Statement for the above referenced site, please contact: Mr [s.73] on [s.73]

Yours Sincerely,

[Redacted Signature]
sch4p4(6) Personal information

[Redacted Name]
s.73

Distributor Manager

cc:

[Redacted Name]
s.73

- Golder Associates Pty Ltd



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CONTAMINATED
MATERIAL
UNCLASSIFIED

ANNEXURE 1 - SITE MANAGEMENT PLAN

LOT: 1 PLAN: M 356134 FILE REF: BNE1230 PRINTED: 20 February 2002

DATE OF EFFECT: / /2002

1.0 EXECUTIVE SUMMARY

This Draft Site Management Plan (SMP) has been prepared by Golder Associates on behalf of Mobil Oil Australia Pty Ltd. The SMP applies to the Lot 1 on M356134 (Special Lease No. 09/53032), 27 Reynolds Street, Mareeba. A site plan showing the area to be managed is presented as Figure 1. The property was used as a fuel storage depot between 1963 and 1999. Future proposed land use at this site will be commercial/industrial land use.

Residual TPH is present in weathered rock at a depth of 4 m or greater in these areas. The residual contamination zone in the base of Area 3 had concentrations in the C₆-C₂₈ hydrocarbon fractions of up to 9950 mg/kg. The residual contamination zone in the base of Area 4 had concentrations in the C₁₀-C₁₄ hydrocarbon fraction of up to 340 mg/kg. The residual contamination zone in the base of Area 10 had concentrations in the C₁₀-C₂₈ hydrocarbon fractions of up to 2680 mg/kg. A quantitative risk assessment indicated that the residual TPH contamination in soil/weathered rock located more than 4m below the ground surface does not represent an unacceptable health risk to future commercial/industrial site users.

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3.1 Responsibility. The owner of the land (as defined under the *Environment Protection Act 1994*) is to ensure the following conditions of this Site Management Plan and any variations to the plan approved or required by the Administering Authority are complied with.

The obligations and conditions set out in this Site Management Plan bind the owner from time to time, of the land.

The owner must provide any contractors, representatives and agents of the owner of the land associated with the design and construction of site facilities and infrastructure on the land with a copy of the approved SMP prior to the commencement of work on-site.

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3.2 Contaminated Soil Excavation and Removal. Contaminated soil must not be removed from the site without adequate sampling and analysis and prior approval from the Administering Authority under section 424 of the Environment Protection Act 1994 or equivalent.

3.3 Land Use. The land is to be used for commercial/industrial purposes. This includes premises such as shops and offices as well as factories and industrial sites. Regular soil access by children is prohibited.

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3.5 Workplace Health and Safety. A workplace Health and Safety Plan which satisfies relevant obligations of the Workplace Health and Safety Act 1995, subordinate legislation or its equivalent is to be developed for any excavation work on the site which extends to or below 4 metres. The Workplace Health and Safety Plan must specifically address dermal and inhalation exposures to site contaminants.

3.6 General Environmental Protection. Site works relating to excavation, removal and/or disposal of contaminated soil from the site must include provisions which ensure that the environment is protected, eg. preventing spread of contaminated soil by controlling site runoff, dust generation and spillage from haulage trucks or improper disposal of contaminated stormwater or seepage. All contamination, safety and excavation processes are to be documented and records kept which demonstrate SMP compliance.

3.7 Unexpected Contamination. It is a requirement of this plan that excavation works are to immediately cease and the Administering Authority notified within 1 business day and advised of appropriate delineation and remedial action in the event that monitoring reveals offensive or noxious odour at the work site and/or evidence of gross contamination not previously detected. Any remedial action is to be developed by a member of a prescribed organisation with relevant qualifications and experience according to section 381 of the *Environment Protection Act 1994*.

Administering Authority approval is required before site works can recommence at that location.

4.0 MAINTENANCE AND MONITORING REQUIREMENTS

The owner is to ensure that the following monitoring is carried out:

- (a) A biennial inspection of the site is to be undertaken to ensure the integrity of the site capping. Records of these inspections and of any site excavations or permits issued under Section 424 of the Environmental Protection Act 1994 are to be maintained by the owner for inspection by authorised officers. The biennial period is to commence from the effective date of this plan.
- (b) The EPA may undertake periodic site inspections to monitor the site in relation to the above conditions.

This SMP has been developed to manage residual site contamination at the effective date. Subsequent uses of the site may result in the need to review the plan.

This SMP makes reference to a plan attachment that is available from the EPA if required.

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RTI Act 2009



REYNOLDS STREET

Area 3

BH5

Area 4

BH44

Area 10

BH39

Legend

Groundwater Monitoring Bore

Residual Soil Area to be managed. Residual hydrocarbon impacted soil remains below 4.0m.

Hydrocarbon impacted groundwater has been detected at the borehole locations shown.

INDUSTRIAL LAND - NURSERY



File A

CLIENT	Mobil Oil Australia Pty Ltd	PROJECT	Depot - Reynolds St, Mareeba (PM01)
DRAWN	LMG	DATE	06-08-01
CHECKED	(b) Personal information	DATE	06/02
SCALE	1:400	A3	PROJECT NO 00673025
Page 19 of 131		FOUNDER	

CONTAMINATED
LAND SECTION
06 JUN 1972

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DES Disclosure Log
RTI Act 2009

Enquiries Anita Packwood
Telephone (07) 3224 8168
Your reference Document No: 00673025(X)
Our reference BNE1230

20 February 2002

s.73

Golder Associates Pty Ltd
PO Box 5823
CAIRNS QLD 4870

Dear s.73

Re: Draft Site Management Plan for Lot 1 M 356134.

Please find attached a revised draft Site Management Plan (SMP) attachment and diagram for the Lot referenced above. The Environmental Protection Agency (EPA) has reviewed the conditions of the SMP and require that these conditions be approved by the owner of the lot and any proposed purchaser, if the site is scheduled for sale and a buyer/developer has entered into a contract.

A copy of the attached SMP, with the owner and proposed purchaser's signature (if applicable) on each page of the document and the diagram, must be forwarded to the EPA to signify their acceptance of the conditions and the diagram.

Further information may be obtained by telephoning Anita Packwood of the Contaminated Land Uniton (07) 3224 5090.

Yours sincerely

sch4p4(6) Personal information

Anita Packwood
Senior Environmental Officer
Contaminated Land Unit

cc: Att: s.73

Mobil Oil Australia Pty Ltd
Mobil House, 417 St Kilda Road
MELBOURNE VIC 3004

ANNEXURE 1 - SITE MANAGEMENT PLAN

LOT: 1 PLAN: M 356134 FILE REF: BNE1230 PRINTED: 20 February 2002

DATE OF EFFECT: / /2002

1.0 EXECUTIVE SUMMARY

This Draft Site Management Plan (SMP) has been prepared by Golder Associates on behalf of Mobil Oil Australia Pty Ltd. The SMP applies to the Lot 1 on M356134 (Special Lease No. 09/53032), 27 Reynolds Street, Mareeba. A site plan showing the area to be managed is presented as Figure 1. The property was used as a fuel storage depot between 1963 and 1999. Future proposed land use at this site will be commercial/industrial land use.

Residual TPH is present in weathered rock at a depth of 4 m or greater in these areas. The residual contamination zone in the base of Area 3 had concentrations in the C₆-C₂₈ hydrocarbon fractions of up to 9950 mg/kg. The residual contamination zone in the base of Area 4 had concentrations in the C₁₀-C₁₄ hydrocarbon fraction of up to 340 mg/kg. The residual contamination zone in the base of Area 10 had concentrations in the C₁₀-C₂₈ hydrocarbon fractions of up to 2680 mg/kg. A quantitative risk assessment indicated that the residual TPH contamination in soil/weathered rock located more than 4m below the ground surface does not represent an unacceptable health risk to future commercial/industrial site users.

Groundwater monitoring conducted during assessment and remediation of the site indicated the presence of dissolved phase TPH and BTEX in a perched, seasonal aquifer beneath the site. This seasonal perched aquifer has a low yield (estimated to be less than 1 litre/sec). A deeper higher yielding aquifer has been intersected by an irrigation bore on the neighbouring property to the east. The water quality in this deeper bore was not impacted by TPH or BTEX. A quantitative risk assessment indicated that the dissolved phase TPH and BTEX concentrations in the seasonal perched aquifer do not represent an unacceptable health risk to future commercial/industrial site users or to potential offsite environmental receptors and groundwater users

2.0 OBJECTIVES

The objectives to be achieved and maintained under this Site Management Plan (SMP) are to manage the contamination remaining on site (Lot 1 M 356134) in a manner which protects human health and the environment. The site-specific elements relating to these objectives are the placement and maintenance of barriers which safely separate users of the site and the contamination; and the application of controls on site excavation works at depths greater than 4 metres.

3.0 ACHIEVEMENT AND MANAGEMENT OF OBJECTIVES

3.1 Responsibility. The owner of the land (as defined under the *Environment Protection Act 1994*) is to ensure the following conditions of this Site Management Plan and any variations to the plan approved or required by the Administering Authority are complied with.

The obligations and conditions set out in this Site Management Plan bind the owner from time to time, of the land.

The owner must provide any contractors, representatives and agents of the owner of the land associated with the design and construction of site facilities and infrastructure on the land with a copy of the approved SMP prior to the commencement of work on-site.

The owner must provide a copy of the SMP to any lessee who intends to undertake site excavations prior to commencement of work.

3.2 Contaminated Soil Excavation and Removal. Contaminated soil must not be removed from the site without adequate sampling and analysis and prior approval from the Administering Authority under section 424 of the Environment Protection Act 1994 or equivalent.

3.3 Land Use. The land is to be used for commercial/industrial purposes. This includes premises such as shops and offices as well as factories and industrial sites. Regular soil access by children is prohibited.

3.4 Groundwater Usage. Any use of groundwater from the contaminated perched aquifer located on this site is prohibited.

3.5 Workplace Health and Safety. A workplace Health and Safety Plan which satisfies relevant obligations of the Workplace Health and Safety Act 1995, subordinate legislation or its equivalent is to be developed for any excavation work on the site which extends to or below 4 metres. The Workplace Health and Safety Plan must specifically address dermal and inhalation exposures to site contaminants.

3.6 General Environmental Protection. Site works relating to excavation, removal and/or disposal of contaminated soil from the site must include provisions which ensure that the environment is protected, eg. preventing spread of contaminated soil by controlling site runoff, dust generation and spillage from haulage trucks or improper disposal of contaminated stormwater or seepage. All contamination, safety and excavation processes are to be documented and records kept which demonstrate SMP compliance.

3.7 Unexpected Contamination. It is a requirement of this plan that excavation works are to immediately cease and the Administering Authority notified within 1 business day and advised of appropriate delineation and remedial action in the event that monitoring reveals offensive or noxious odour at the work site and/or evidence of gross contamination not previously detected. Any remedial action is to be developed by a member of a prescribed organisation with relevant qualifications and experience according to section 381 of the *Environment Protection Act 1994*.

Administering Authority approval is required before site works can recommence at that location.

4.0 MAINTENANCE AND MONITORING REQUIREMENTS

The owner is to ensure that the following monitoring is carried out:

- (a) A biennial inspection of the site is to be undertaken to ensure the integrity of the site capping. Records of these inspections and of any site excavations or permits issued under Section 424 of the Environmental Protection Act 1994 are to be maintained by the owner for inspection by authorised officers. The biennial period is to commence from the effective date of this plan.
- (b) The EPA may undertake periodic site inspections to monitor the site in relation to the above conditions.

This SMP has been developed to manage residual site contamination at the effective date. Subsequent uses of the site may result in the need to review the plan.

This SMP makes reference to a plan attachment that is available from the EPA if required.

REYNOLDS STREET

Area 3
BH5

Area 4
BH44

Area 10

BH39

Legend

⊕ Groundwater Monitoring Bore

--- Residual Soil Area to be managed. Residual hydrocarbon impacted soil remains below 4.0m.

Hydrocarbon impacted groundwater has been detected at the borehole locations shown.

INDUSTRIAL LAND - NURSERY



File A

CLIENT Mobil Oil Australia Pty Ltd		PROJECT Depot - Reynolds St, Mareeba (PM01)	
DRAWN LMG	DATE 06-08-01	TITLE RESIDUAL SOIL CONTAMINATION LOCATIONS	
CHECKED sch4p4 (6) Personal information	DATE 21/1/02		
SCALE 1:400	A3	PROJECT NO 00673025	FIGURE NO 1

Page 24 of 131

BNF1230

22 January 2002

00673025(Y)

Environmental Protection Agency
GPO Box 2771
BRISBANE QLD 4001

Attention: Ms Anita Packwood

Dear Madam

**FORMER MOBIL FUEL DEPOT SITE (PM01)
LOT 1 ON M356134, REYNOLDS STREET
MAREEBA**

Please find attached a copy of our draft Site Management Plan (SMP) for the above site for your comments.

Should you have any questions regarding the SMP, please do not hesitate to contact this office.

Yours faithfully,
GOLDER ASSOCIATES PTY LTD

sch4p4(6) Personal information

s.73

Associate

Attachments : Draft Site Management Plan (1 Hard Copy and 1 Electronic Copy)

cc: s.73 Mobil Oil Australia

PKS/cps

S:\DATA\3ENV00\00673025\73025LY.DOC



DRAFT SITE MANAGEMENT PLAN

**FORMER MOBIL FUEL DEPOT SITE (PM01)
LOT 1 ON M356134
REYNOLDS STREET
MAREEBA, QUEENSLAND**

Submitted to:

Mobil Oil Australia Pty Ltd
Mobil House
417 St Kilda Road
Melbourne Victoria 3004



DISTRIBUTION:

1 Copy - Mobil Oil Australia Pty Ltd
1 Copy - Environmental Protection Agency
2 Copies - Golder Associates Pty Ltd

January, 2002

00673025(X)



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1.0 INTRODUCTION

This Draft Site Management Plan (SMP) has been prepared by Golder Associates on behalf of Mobil Oil Australia Pty Ltd. The SMP applies to the Lot 1 on M356134 (Special Lease No. 09/53032), 27 Reynolds Street, Mareeba. A Site Locality Plan is shown on Figure 1 and a Site Plan is presented as Figure 2.

The property was used as a fuel storage depot between 1963 and 1999.

Future proposed land use at this site will be commercial/industrial land use.

2.0 SUMMARY OF CONTAMINATION

An initial site assessment conducted at Lot 1 on M356134 identified the presence of total petroleum hydrocarbons (TPH) exceeding Queensland Environmental Investigation Thresholds (Reference 1). Removal of tanks, demolition of buildings, excavation of hydrocarbon impacted materials to depths of at least 4m and remediation of hydrocarbon impacted materials occurred during 2000 and 2001.

Validation sampling has confirmed removal of hydrocarbon impacted materials from the base and walls of Areas 1, 2, 5 to 9 and 11 to 15, as shown on Figure 2.

Validation sampling of Areas 3, 4 and 10 (Figure 2) has confirmed removal of hydrocarbon impacted materials from the walls to depths of at least 4m. Residual TPH is present in weathered rock at a depth of 4 m or greater in these areas. The residual contamination zone in the base of Area 3 had concentrations in the C₆-C₂₈ hydrocarbon fractions of up to 9950 mg/kg. The residual contamination zone in the base of Area 4 had concentrations in the C₁₀-C₁₄ hydrocarbon fraction of up to 340 mg/kg. The residual contamination zone in the base of Area 10 had concentrations in the C₁₀-C₂₈ hydrocarbon fractions of up to 2680 mg/kg. A quantitative risk assessment indicated that the residual TPH contamination in soil/weathered rock located more than 4m below the ground surface does not represent an unacceptable health risk to future commercial/industrial site users.

Groundwater monitoring conducted during assessment and remediation of the site indicated the presence of dissolved phase TPH and BTEX in a perched, seasonal aquifer beneath the site. This seasonal perched aquifer has a low yield (estimated to be less than 1 litre/sec). A deeper higher yielding aquifer has been intersected by an irrigation bore on the neighbouring property to the east. The water quality in this deeper bore was not impacted by TPH or BTEX. A quantitative risk assessment indicated that the dissolved phase TPH and BTEX concentrations in the seasonal perched aquifer do not represent an unacceptable health risk to future commercial/industrial site users or to potential offsite environmental receptors and groundwater users.

The remediation works undertaken at this site has rendered it suitable for ongoing commercial/industrial land uses.

3.0 OBJECTIVE

The objective of this SMP is to manage residual contamination on site in a manner which protects human health and the environment, and ensures that the site is suitable for continued use for commercial/industrial purposes. This objective will be achieved through application of environmental control for onsite excavations to depths of greater than 4m.

4.0 ACHIEVEMENT AND MANAGEMENT OF OBJECTIVE

The owner of the site shall ensure that the following conditions are complied with and that the plan objective is achieved and maintained.

- No excavations of greater than 4m are to occur on site without the approval of the administering authority. Any excavations below 4m must be conducted under a Health and Safety Plan which satisfies relevant obligations imposed by the Workplace Health and Safety Act 1995 (Reference 2). The Health and Safety Plan shall specifically address dermal and inhalation exposure to TPH.
- Site works relating to the excavation, removal and/or disposal of soil from contaminated layers must include provisions which ensure that the environment is protected. All contamination, safety and excavation processes are to be documented and records kept which demonstrate compliance with the SMP.
- Before offsite removal of contaminated soil, approval shall be obtained from the Environmental Protection Agency under Section 118ZZF of the Environmental Protection Act (Reference 3).

5.0 MONITORING AND REPORTING REQUIREMENTS

No specific monitoring or reporting is required unless disturbance/excavation below 4m depth is to be conducted at this site. When disturbance below 4m occurs at this site a written report shall be prepared for submission to the EPA demonstrating compliance with the above conditions.

6.0 LIMITATIONS OF THIS DOCUMENT

This document has been prepared in accordance with the agreement between Mobil Oil Australia Pty Ltd and Golder Associates Pty Ltd (Golder Associates). The services performed by Golder Associates have been conducted in a manner consistent with the level of quality and skill generally exercised by members of its profession and consulting practice. No warranty or guarantee of site conditions is intended.

This document is solely for the use of Mobil Oil Australia and the Queensland Environmental Protection Agency, any reliance of this document by third parties shall be at such party's sole risk and may not contain sufficient information for purposes of other parties or for other uses. This document shall only be presented in full and may not be used to support any other objective than those set out in the document, except where written approval with comments are provided by Golder Associates.

The information in this document is considered to be accurate at the date of issue in accordance to the current conditions of the site. Subsurface conditions including contaminant concentrations can change in a limited period of time. This should be considered if the document is used after a significant delay in time.

Attached as Appendix A is a document entitled "Important Information About Your Geo-environmental Report" which should be read in conjunction with this SMP. We would be pleased to answer any questions about this important information.

GOLDER ASSOCIATES PTY LTD

s.73

Associate

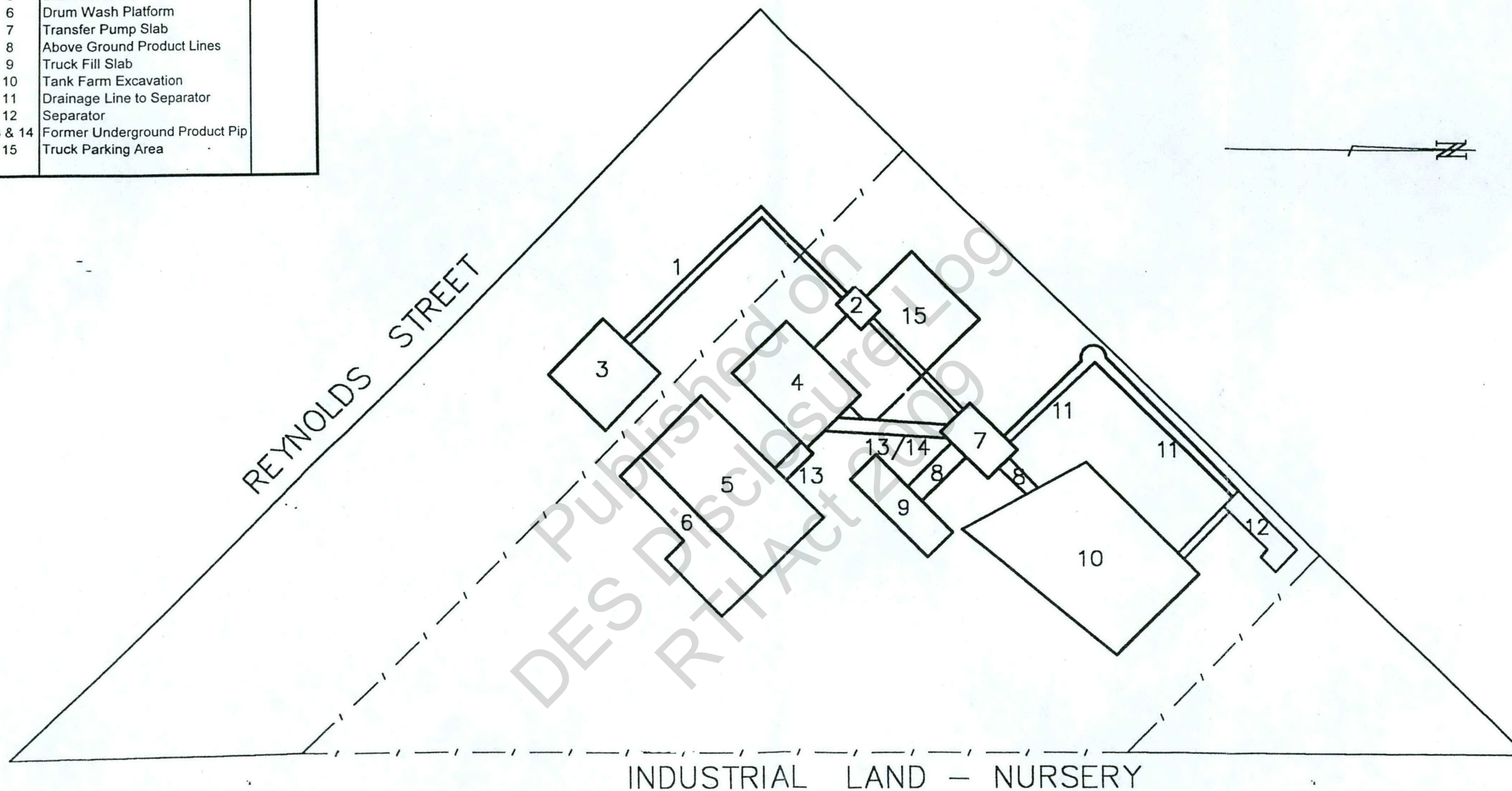
PKS/MSK/klm
S:\DATA\3ENV00\00673025\73025RX.DOC

7.0 REFERENCES

1. "Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland", Department of Environment, May 1998.
2. "Workplace Health and Safety Act", Queensland Government, 7 July 1995.
3. "Environmental Protection Act 1994", Queensland Government, 1994.

Published on
DES Disclosure Log
RTI Act 2009

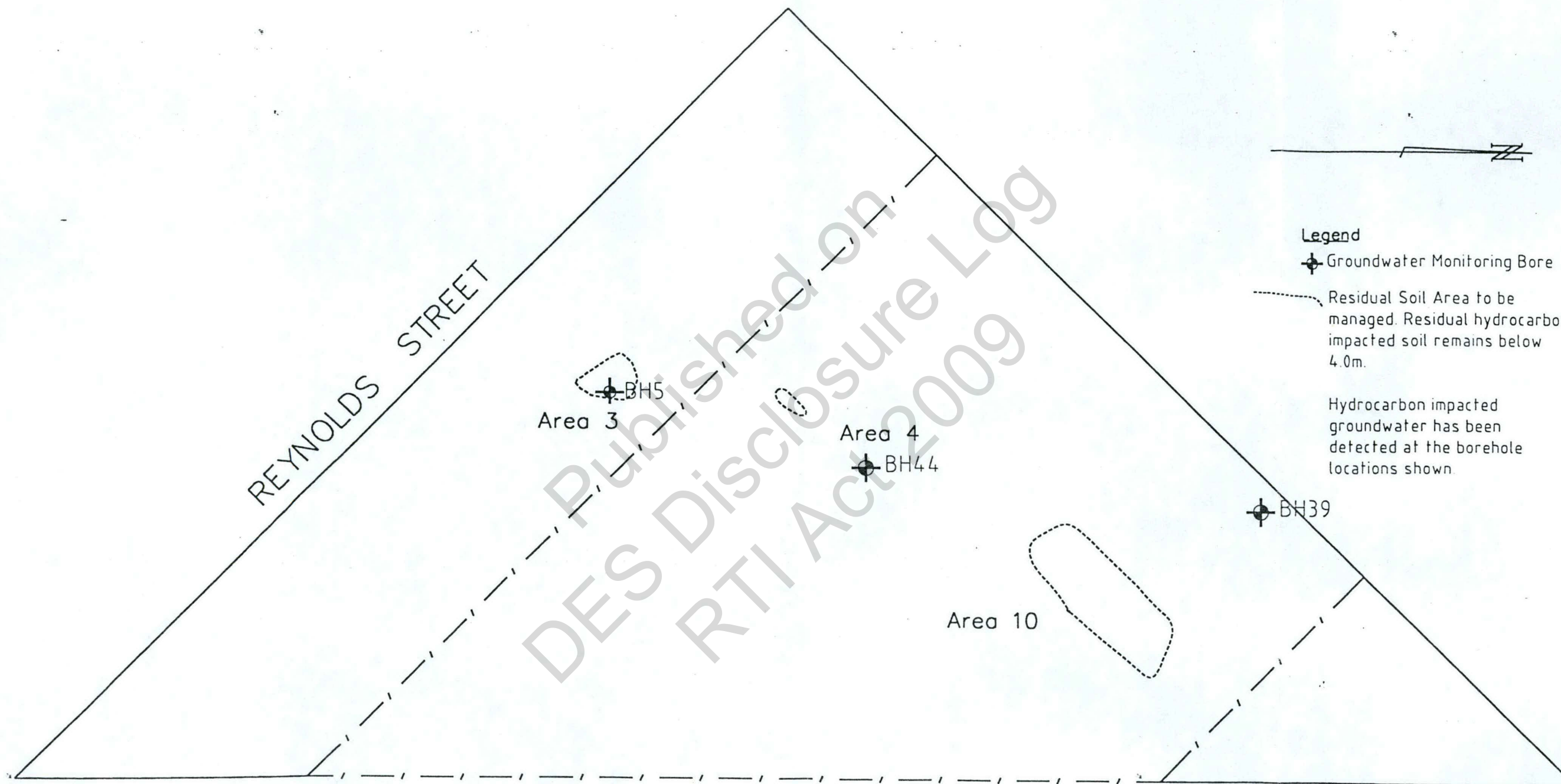
Area	Description
1	Underground Product Lines
2	Former Underground Tank
3	Driveway Bowers
4	Former Truck Fill Area
5	Drum Fill Shed
6	Drum Wash Platform
7	Transfer Pump Slab
8	Above Ground Product Lines
9	Truck Fill Slab
10	Tank Farm Excavation
11	Drainage Line to Separator
12	Separator
13 & 14	Former Underground Product Pip
15	Truck Parking Area



Legend

□ AREA OF EXCAVATION

	CLIENT Mobil Oil Australia Pty Ltd		PROJECT Depot - Reynolds St, Mareeba (PM01)	
	DRAWN LMG	DATE 30-07-01	TITLE EXCAVATION PLAN	
	CHECKED sch4p4(6) Personal information	DATE 13/8/01		
	SCALE 1:400	A3	PROJECT NO 00673025	FIGURE NO 1



 <p>File A</p>	CLIENT Mobil Oil Australia Pty Ltd		PROJECT Depot - Reynolds St, Mareeba (PM01)	
	DRAWN LMG	DATE 06-08-01	TITLE RESIDUAL SOIL CONTAMINATION LOCATIONS	
	SCALE 1:400		PROJECT NO 00673025	FIGURE NO 2
	A3		Page 33 of 131	

APPENDIX A

**“IMPORTANT INFORMATION ABOUT YOUR
GEO-ENVIRONMENTAL REPORT”**

Geo-environmental Report

These notes have been prepared by Golder Associates Pty Ltd using guidelines prepared by ASFE; The Association of Engineering Firms Practising in the Geosciences, of which Golder Associates Pty Ltd is a member. They are offered to help you in the interpretation of your Geo-environmental Report.

Geo-environmental studies are commissioned to gain information about environmental conditions on and beneath the surface of a site. The more comprehensive the study, the more reliable the assessment is likely to be. But remember, any such assessment is to a greater or lesser extent based on professional opinions about conditions that cannot be seen or tested. Accordingly, no matter how much data is accumulated, risks created by unanticipated conditions will always remain. *Have realistic expectations.* Work with your Geo-environmental consultant to manage known and unknown risks. Part of that process should already have been accomplished, through the risk allocation provisions you and your Geo-environmental professional discussed and included in your contract's general terms and conditions. This document is intended to explain some of the concepts that may be included in your agreement, and to pass along information and suggestions to help you manage your risk.

Beware of Change; Keep Your Geo-environmental Professional Advised

The design of a Geo-environmental study considers a variety of factors that are subject to change. Changes can undermine the applicability of a report's findings, conclusions, and recommendations. *Advise your Geo-environmental professional about any changes you become aware of them.* Geo-environmental professionals cannot accept responsibility or liability for problems that occur because a report fails to consider conditions that did not exist when the study was designed. Ask your Geo-environmental professional about the types of changes you should be particularly alert to. Some of the most common include:

- modification of the proposed development or ownership group,
- sale or other property transfer,
- replacement of or additions to the financing entity,
- amendment of existing regulations or introduction of new ones, or
- changes in the use or condition of adjacent property

Should you become aware of any change, *do not rely on an existing Geo-environmental report.* Advise your Geo-environmental professional immediately; follow the professional's advice.

Recognize the Impact of Time

A Geo-environmental professional's findings, recommendations, and conclusions cannot remain valid indefinitely. The more time that passes, the more likely it is that important latent changes may occur. *Do not rely on a Geo-environmental report if too much time has elapsed since it was completed.* Ask your environmental professional to define "too much time." In the case of Phase I Environmental Site Assessments (ESAs), for example, more than 180 days after submission is generally considered "too much."

Prepare To Deal with Unanticipated Conditions

The findings, recommendations, and conclusions of a Phase I ESA report typically are based on a review of historical information, interviews, a site "walkover," and other forms of noninvasive research. When site subsurface conditions are not sampled in any way, the risk of unanticipated conditions is higher than it would otherwise be.

While borings, installation of monitoring wells, and similar invasive test methods can help reduce the risk of unanticipated conditions, *do not overvalue the effectiveness of testing.* Testing provides information about actual conditions only at the precise locations where samples are taken, and only when they are taken. Your Geo-environmental professional has applied that specific information to develop a general opinion about environmental conditions. *Actual conditions in areas not sampled may differ (sometimes sharply) from those predicted in a report.* For example, a site may contain an unregistered underground storage tank that shows no surface trace of its existence. *Even conditions in areas that were tested can change,* sometimes suddenly, due to any number of events, not the least of which include occurrences at adjacent sites. Recognize, too, that *even some conditions in tested areas may go undiscovered,* because the tests or analytical methods used were designed to detect only those conditions assumed to exist.

Manage your risks by retaining your Geo-environmental professional to work with you as the project proceeds. Establish a contingency fund or other means to enable your Geo-environmental professional to respond rapidly, in order to limit the impact of unforeseen conditions. To help prevent any misunderstanding, identify those

empowered to authorize changes and the administrative procedures that should be followed.

Do Not Permit Any Other Party To Rely on the Report

Geo-environmental professionals design their studies and prepare their reports to meet the specific needs of the clients who retain them, in light of the risk management methods that the client and Geo-environmental professional agree to, and the statutory, regulatory, or other requirements that apply. The study designed for a developer may differ sharply from one designed for a lender, insurer, public agency ... or even another developer. *Unless the report specifically states otherwise, it was developed for you and only you.* Do not unilaterally permit any other party to rely on it. The report and the study underlying it may not be adequate for another party's needs, and you could be held liable for shortcomings your Geo-environmental professional was powerless to prevent or anticipate. Inform your Geo-environmental professional when you know or expect that someone else - a third-party will want to use or rely on the report. *Do not permit third-party use or reliance until you first confer with the Geo-environmental professional who prepared the report.* Additional testing, analysis, or study may be required and, in any event, appropriate terms and conditions should be agreed to so both you and your Geo-environmental professional are protected from third-party risks. *Any party who relies on a Geo-environmental report without the express written permission of the professional who prepared it and the client for whom it was prepared may be solely liable for any problems that arise.*

Avoid Misinterpretation of the Report

Design professionals and other parties may want to rely on the report in developing plans and specifications. They need to be advised, in writing, that their needs may not have been considered when the study's scope was developed, and, even if their needs were considered, they might misinterpret Geo-environmental findings, conclusions, and recommendations. *Commission your Geo-environmental professional to explain pertinent elements of the report to others who are permitted to rely on it, and to review any plans, specifications or other instruments of professional service that incorporate any of the report's findings, conclusions, or recommendations.* Your Geo-environmental professional has the best understanding of the issues involved, including the fundamental assumptions that determined the study's scope.

Give Contractors Access to the Report

Reduce the risk of delays, claims, and disputes by giving contractors access to the full report, *providing that it is accompanied by a letter of transmittal that can protect you* by making it unquestionably clear that: 1) the study was not conducted and the report was not prepared for purposes of bid development, and 2) the findings, conclusions, and recommendations included in the report

are based on a variety of opinions, inferences, and assumptions and are subject to interpretation. Use the letter to also advise contractors to consult with your Geo-environmental professional to obtain clarifications, interpretations, and guidance (a fee may be required for this service), and that in any event they should conduct additional studies to obtain the specific type and extent of information each prefers for preparing a bid or cost estimate. Providing access to the full report, with the appropriate caveats, helps prevent formation of adversarial attitudes and claims of concealed or differing conditions. If a contractor elects to ignore the warnings and advice in the letter of transmittal, it would do so at its own risk. Your Geo-environmental professional should be able to help you prepare an effective letter.

Do Not Separate Documentation from the Report

Geo-environmental reports often include supplementary documentation, such as maps and copies of regulatory files, permits, registrations, citations, and correspondence with regulatory agencies. If subsurface explorations were performed, the report may contain final boring logs and copies of laboratory data. If remediation activities occurred on site, the report may include: copies of daily field reports, waste manifests, and information about the disturbance of subsurface materials, the type and thickness of any fill placed on site, and fill placement practices, among other types of documentation. *Do not separate supplementary documentation from the report. Do not, and do not permit any other party to redraw or modify any of the supplementary documentation for incorporation into other professionals' instruments of service.*

Understand the Role of Standards

Unless they are incorporated into statutes or regulations, standard practices and standard guides developed by the American Society for Testing and Materials (ASTM) and other recognized standards-developing organizations (SDOs) are little more than aspirational methods agreed to by a consensus of a committee. The committees that develop standards may not comprise those best qualified to establish methods and, no matter what, no standard method can possibly consider the infinite client and project-specific variables that fly in the face of the theoretical "standard conditions" to which standard practices and standard guides apply. In fact, these variables can be so pronounced that Geo-environmental professionals who comply with every directive of an ASTM or other standard procedure could run foul of local custom and practice, thus violating the standard of care.

Accordingly, when Geo-environmental professionals indicate in their reports that they have performed a service "in general compliance" with one standard or another, it means they have applied professional judgement in creating and implementing a scope of service designed for the specific client and project involved, and which follows some of the general precepts laid out in the referenced standard. To the

extent that a report indicates "general compliance" with a standard, you may wish to speak with your Geo-environmental professional to learn more about what was and was not done. *Do not assume a given standard was followed to the letter.* Research indicates that that seldom is the case.

Realize That Recommendations May Not Be Final

The technical recommendations included in a Geo-environmental report are based on assumptions about actual conditions, and so are preliminary or tentative. Final recommendations can be prepared only by observing actual conditions as they are exposed. For that reason, you should retain your Geo-environmental professional to observe construction and/or remediation activities on site, to permit rapid response to unanticipated conditions. *The Geo-environmental professional who prepared the report cannot assume responsibility or liability for the report's recommendations if that professional is not retained to observe relevant site operations.*

Understand That Geotechnical Issues Have Not Been Addressed

Unless geotechnical engineering was specifically included in the scope of professional service, a report is not likely to relate any findings, conclusions, or recommendations about the suitability of subsurface materials for construction purposes, especially when site remediation has been accomplished through the removal, replacement, encapsulation, or chemical treatment of on-site soils. The equipment, techniques, and testing used by geotechnical engineers differ markedly from those used by Geo-environmental professionals; their education, training, and experience are also significantly different. If you plan to build on the subject site, but have not yet had a geotechnical engineering study conducted, your Geo-environmental professional should be able to provide guidance about the next steps you should take. The same firm may provide the services you need.

Read Responsibility Provisions Closely

Geo-environmental studies cannot be exact; they are based on professional judgement and opinion. Nonetheless, some clients, contractors, and others assume Geo-environmental reports are or certainly should be unerringly precise. Such assumptions have created unrealistic expectations that have led to wholly unwarranted claims and disputes. To help prevent such problems, Geo-environmental professionals have developed a number of report provisions and contract terms that explain who is responsible for what, and how risks are to be allocated. Some people mistake these for "exculpatory clauses," that is, provisions whose purpose is to transfer one party's rightful responsibilities and liabilities to someone else. Read the responsibility provisions included in a report and in the contract you and your Geo-environmental professional agreed to. They are important.

Rely on Your Geo-environmental Professional for Additional Assistance

Membership in ASFE exposes Geo-environmental professionals to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a Geo-environmental project. Confer with your ASFE-member Geo-environmental professional for more information.

Enquiries Anita Packwood
Telephone (07) 3224 8168
Your reference Mobil Mareeba
Our reference BNE1230

7 January 2002

s.73

Golder Associates Pty Ltd
PO Box 5823
CAIRNS QLD 4870

Dear s.73

Environmental Protection Act 1994, Chapter 7 Part 8

NOTICE TO SUPPLY ADDITIONAL INFORMATION

Environmental Site Assessment, Former Fuel Depot Site.
Remedial Excavation and Validation Works, Former Mobil Fuel Depot Site.
Remediated Soil Validation, Former Mobil Fuel Depot Site.
Risk Assessment, Former Fuel Depot Site
Suhle Street
MAREEBA QLD 4870

Pursuant to section 398 of the *Environmental Protection Act 1994* (EP Act), the following information is required to assist with assessment of health and environmental issues associated with the site described in the Reports referenced above dated August 2000 and the other three August 2001 respectively. **Lot 1 M 356134 will remain on the Environmental Management Register (EMR) with its current status until sufficient work is conducted to satisfactorily address the following point:**

- The EPA will consider a SMP for the above referenced site for continued future use as commercial or industrial land. Please supply a hard and soft copy of the draft Site Management Plan (SMP). The soft copy of the SMP must be compatible with Word 97 and can be supplied either on disk or e-mailed directly to anita.packwood@env.qld.gov.au. Also include a hard copy of a figure detailing the area of the site where contamination remains (this must be marked in the legend as the "Area to be Managed", it must indicate areas containing residual TPH and contaminated groundwater).

Yours sincerely,

sch4p4(6) Personal information

Anita Packwood
Senior Environmental Officer
Contaminated Land Unit

s.73

Page 1 of 1

Golder Associates Pty Ltd

A.C.N. 006 107 857
A.B.N. 64 006 107 857

216 Draper Street, Cairns, Qld 4870 Australia
(PO Box 5823, Cairns, Qld 4870 Australia)
Telephone (07) 4051 2033
Fax (07) 4052 1546
http://www.golder.com

8 November 2001



00673025(T)

Environmental Protection Agency
Level 12, 160 Anne Street
BRISBANE QLD 4000



Attention: Anita Packwood

Dear Madam

**NOTICE TO SUPPLY ADDITIONAL INFORMATION
FORMER MOBIL FUEL DEPOT SITE (PM01)
REYNOLDS STREET, MAREEBA, QUEENSLAND
(EPA REFERENCE BNE 1230)**

Further to your letter of 17 October 2001, regarding provision of additional information for the Former Mobil Fuel Depot in Mareeba. Mobil Oil Australia Pty Ltd have indicated that removal from the Environmental Management Register is not now required. Instead a Suitability Statement for future commercial or industrial land use (in line with current zoning) is sought.

Could you please reconsider the site for issuing of such a statement.

If you have any further queries, please do not hesitate to contact this office.

Yours faithfully,
GOLDER ASSOCIATES PTY LTD

sch4p4(6) Personal information

s.73

Associate

cc: Mobil Oil Australia Pty Ltd – s.73

LMG/PKS/cps
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Published on
DES Disclosure Log
RTI Act 2009

Enquiries Anita Packwood
Telephone (07) 3224 8168
Your reference Mobil Mareeba
Our reference BNE1230

17 October 2001

Mr [redacted] s.73
Golder Associates Pty Ltd
PO Box 5823
CAIRNS QLD 4870

Dear [redacted] s.73

Environmental Protection Act 1994, Chapter 7 Part 8

NOTICE TO SUPPLY ADDITIONAL INFORMATION

Environment Site Assessment, Former Fuel Depot Site.
Remedial Excavation and Validation Works, Former Mobil Fuel Depot Site.
Remediated Soil Validation, Former Mobil Fuel Depot Site.
Risk Assessment, Former Fuel Depot Site.
Suhle Street
MAREEBA QLD 4870

Pursuant to section 398 of the *Environmental Protection Act 1994* (EP Act), the following information is required to assist with assessment of health and environmental issues associated with the site described in the Reports referenced above dated August 2000 and the other three August 2001 respectively. **Lot 1 M 356134 will remain on the Environmental Management Register (EMR) with its current status until sufficient work is conducted to satisfactorily address the following point:**

- The Risk Assessment has looked at scenarios off-site and has established that for this current situation the off-site risk is acceptable, however, the scenarios have not been run for on-site situations. If the site is to be removed from the EMR these scenarios must be run for on-site situations also. Please ensure that these scenarios are undertaken and the results submitted to the Contaminated Land Unit for Assessment.

Yours sincerely

[redacted] sch4p4(6) Personal information

Anita Packwood
Senior Environmental Officer
Contaminated Land Unit

Memorandum

To Fili File Reference BNE 1230
From ms
Subject Kerkeruwa. Former Mobil Depot Maralea. Date 15/10/01.

Notes

Stage I & II Report.

Site description.

- area. - 5059 m^2 . only 3850 m^2 was used as fuel depot (fenced off).
- only slight slope on site to N.E.
- cracks approx 700 m^2 .
- sensitive area more than 1 Kaway.

Geology.

- red brown clay - from 1.5 N end > 4 southern end.
- underlain by series of basalt flows.
- 2 distinct input fill.
 - brown gravelly sand/clayey gravel.
 - light brown sand/bouldy sand??

Groundwater

- not proclaimed.
- low bore yield.
- complex flows through basaltic layers.
- g/w expected to be ~~at~~ 15-20 m flowing NE.
- installed 2 bores. but depth 6.25 & 6.5 m.
- h/c in Bore hole 5.
- a bore 50 m in adjacent lot. which draws water at 20 m. used for irrigation.

Memorandum

To _____ File Reference _____
From _____
Subject _____ Date _____
Notes _____

Site History.

Aerial Photo

- pre 63. vacant. land.
- 63 site leased to ESSO.
- 71 drum platform, AST in land, exposed ground.
- 78. site had drum fill plat 2 FOST & prod prod. tankers unloading platform, buried area 6 ASTs.
- 79. plans for 10 ASTs. - entire 3 tanks never used.
- 82 as 79.
- 92. lease to Mobil oil.

Managers 69-88.

5 ASTs

26000 l super

26000 l reg.

26000 l diesel.

2 x 54000 l LFO + diesel

78- 84000 l diesel tank.

- VST removed 1980-81.

No reclamation of 2nd VST.

Memorandum

To _____ File Reference _____
From _____
Subject _____ Date _____
Notes _____

washing of drums including
occurred on site using petrol
which was dumped on the
land.

88-93.

- Upgraded site
- no drum washing

93-96

- Through put 500000 L-7 1010⁶ L.
- back 95 in system to
diesel burner.
- 43 houses on site.

Investigations

~~Back 95~~

- 43 houses on site
- 1 sample, surf 1m etc.
- 2 gw holes installed.
- 83 soils submitted for analysis.
- 3 samples of fill
- 2 g/w.

Memorandum

To _____ File Reference _____
From _____
Subject _____ Date _____
Notes _____

Results.

- sig contamination in g/w. identified
- contam at depth in house area.
- contam in tank farm area and possibly associated pipework.

Remediation & Validation Report.

Works.

- ~~the~~ VSTs & site demolished in Oct 2000.
- approx 1600 m³ of soil excavated & bioremediated.
- 15 separate excavations and all but 3 came up OK. - areas 3, 4 & 10. remaining cont.
- 134 samples analysed. all for TPH BTEX & Pb.
- 20 for PAH & HM & Phenolic compounds.

House area.

Excavation 7.5 x 7.5 x 4. m.
box failed - expect to cont
for another 3m.

Memorandum

To _____ File Reference _____
From _____
Subject _____ Date _____

Notes

area 4 - excavation to 4m to
weathered rock - 9 m³ impacted.

area 10. - AST tank area.

- fumes of HC
- w/ weathered rock
- 4 floor failed. - depth
6m in one corner.

- temp tank storage OK.

- Validation of stockpile OK.

Conclusion.

Contaminants remaining on site in
3 areas, however, g/w was not addressed
in this report.

Risk Assessment Report.

- The top 4m of the site is clean.

- Installed 3rd g/w line. but not
triangulation.

BTHS & H5 - devel. - 10-14 85000.
15-28 170000.

18-292

BH 79 - petrol - Benzene 200.
16-9 2300.

File A

Memorandum

To _____ File Reference _____

From _____

Subject _____ Date _____

Notes

BH/44. - 6-9 2000.
10-14 1800

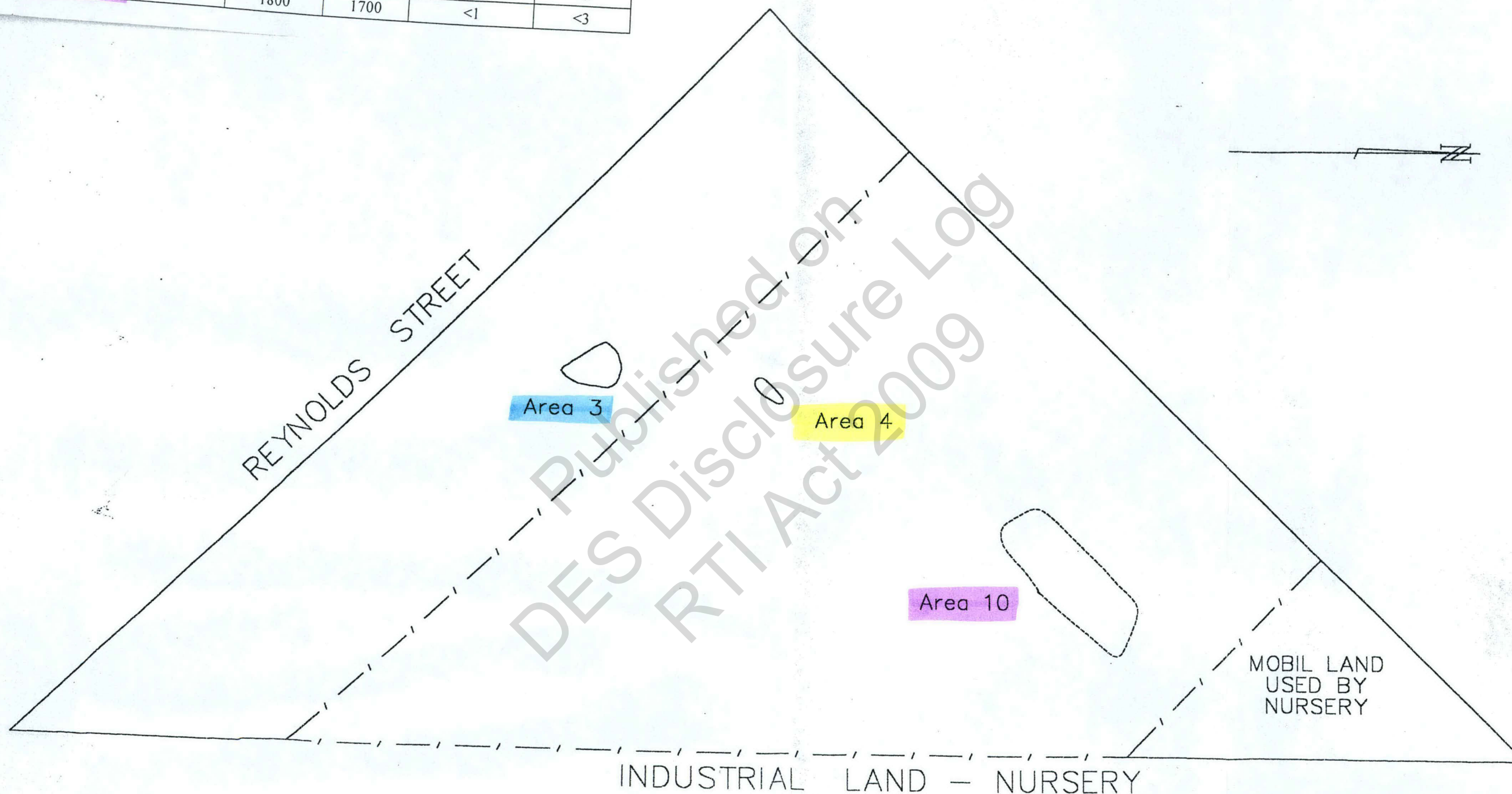
Risk Assessment has looked at scenarios off site and has established that for the current situation the off site risk is acceptable, however the scenarios have not been run on -site. If the site is to be removed from the EMR then scenarios must be run on -site as well.

sch4p4(6) Personal information

15/10/01.

09/10/2001 BNE1230	Anita Packwood Suhle Street, Mareeba	Petroleum Product or Oil Storage Lot 1 M 356134	Mobil Oil Australia Pty Ltd
Goal: Removal from the EMR.			
<u>Background Information:</u> <ul style="list-style-type: none"> * The geological structure of the area was identified as red brown basaltic clays to depth varying between 1.5m at the northern end of the site to greater than 4m in the southern. The area is underlain by remnant flows of olivine basalt of the Atherton Basalt Formation. * Impacted material was removed across the site to a minimum of 4m. Figure 1 shows areas where residual contamination remains and the table on Figure 1 shows the maximum levels remaining. * Groundwater - The site is not located in a proclaimed area. DNR information states that bore yield in the Mareeba area is generally <1L/s. Potable use of the groundwater would be rare. Groundwater beneath the site is expected to be 15m - 20m below ground surface. Groundwater flow direction is expected to be north east as per regional drainage lines. * Groundwater has been used by the neighbouring nursery for 24 years with no adverse effects seen to date. 4 bores were sampled in the groundwater monitoring. 3 on-site and the nursery bore. The on-site wells are believed to be located in a perched water table as the standing water levels were between 6.25m and 6.5m. * No phase separation was noted in any samples taken. Maximum TPH levels found in the ground water samples are shown in the table on Figure 2. 			
<u>Risk Assessment:</u> <ul style="list-style-type: none"> * The Risk assessment has been carried out with regards to the groundwater contamination. Golder's does not consider the hydrocarbon contamination remaining on site below 4m depth to be a risk. They believe that as the contamination is below the level required for building foundations or service trenches that no risk is evident. <ul style="list-style-type: none"> - The neighbouring commercial nursery extracts it's water from a different aquifer, therefore a complete exposure pathway does not exist. - The groundwater is at a level (6m) which is below the typical excavation level for most developments so worker exposure, according to Golder's, need not be considered. - The risk of exposure to recreational surface water users is minimal given the distance from the site to the nearest surface water body, 700m to basalt Creek. - The risk of ingestion of impacted water is considered to be low given the municipal water supply and generally low bore yields. However, the presence of domestic bores has not been determined as the area is not proclaimed. The nearest residence of concern is the one located is 200m down gradient of the site. * Parameters were decided on and plugged into the RISC V3 model. Results shown on Page 11 of Risk Assessment Report. * The risk assessment indicated that the dissolved phase hydrocarbons in the groundwater at the site do not represent an unacceptable health risk for domestic groundwater users. Indoor air monitoring for a 150m² building indicated an acceptable level of risk to adult workers. The risk assessment indicated that leaching of residual hydrocarbon contamination below 4m does not present an unacceptable health risk for potential domestic groundwater users. 			
<u>Recommendation:</u> <ul style="list-style-type: none"> ❖ Disagree that contamination below 4m can be disregarded and that the levels of contaminants found in the groundwater do not pose a possible risk to human health or the environment as it is noted that the Risk Assessment scenarios have been designed for off-site not on-site use. Scenarios should be carried out for an in-site bore and its use. ❖ Recommend that an additional information letter be sent to the consultant and owner stating that as contamination remains on site, the site will remain on the register. Suggest that the consultant undertake a further Risk Assessment analysis based on the on-site use of groundwater from a bore. 			

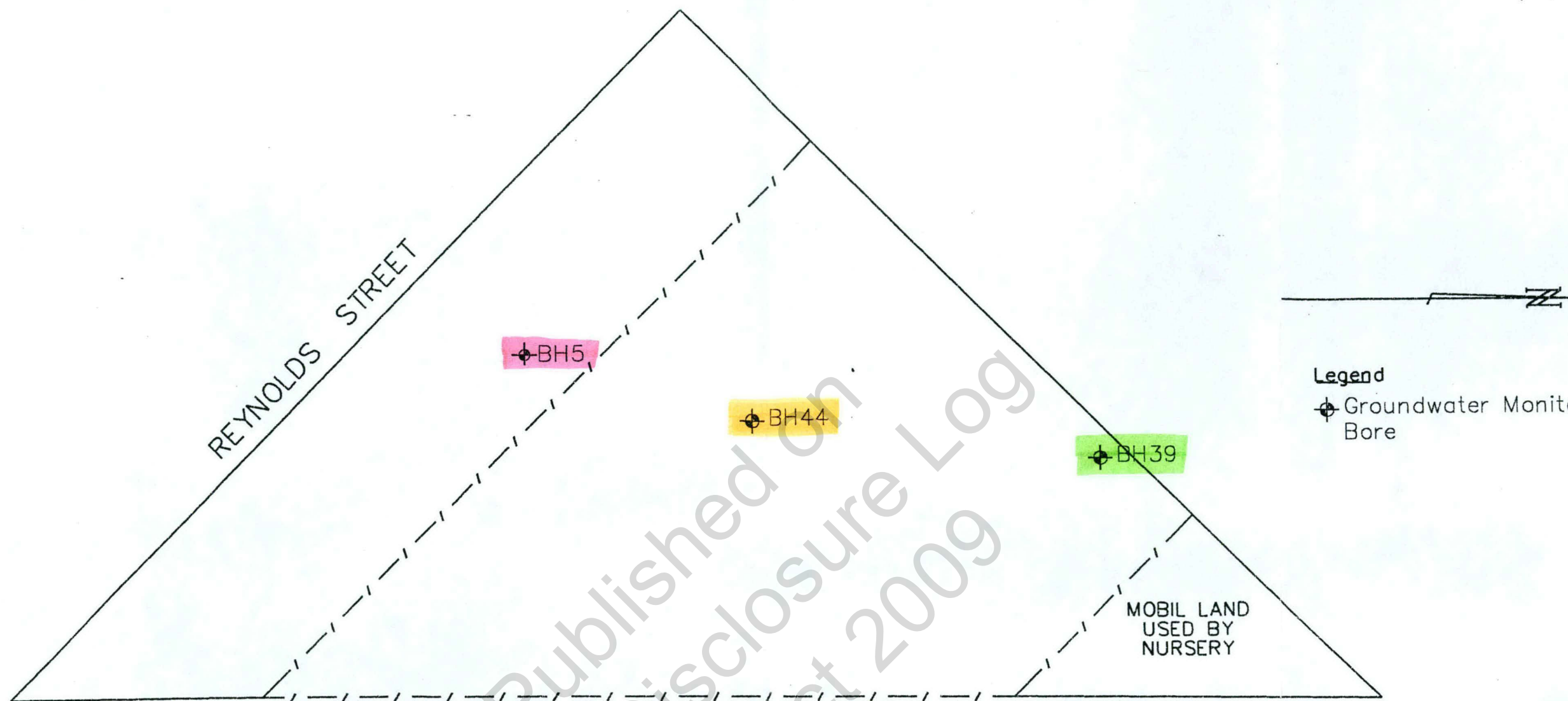
Location	Maximum Concentration Detected (mg/kg)				
	C ₆ -C ₉	C ₁₀ -C ₁₄	C ₁₅ -C ₂₈	Ethyl Benzene	Xylene
Area 3	710	4400	8200	1	9
Area 4	<5	340	<50	<1	<3
Area 10	330	1800	1700	<1	<3



Legend

Estimated Extent of Contamination remaining at depths greater than 4.0m

	CLIENT Mobil Oil Australia Pty Ltd		PROJECT Depot - Reynolds St, Mareeba (PM01)	
	DRAWN LMC	DATE 06-08-01	TITLE RESIDUAL SOIL CONTAMINATION LOCATIONS	
	CHECKED sch4p4(6) Personal information	DATE 8/8/01	PROJECT No 00673025	
	SCALE 1:400	A3	FIGURE No 1	



INDUSTRIAL LAND - NURSERY

MOBIL LAND
USED BY
NURSERY

Legend

Groundwater Monitoring Bore

Irrigation Bore

Location	Maximum Concentration Detected (µg/L)							
	C ₆ -C ₉	C ₁₀ -C ₁₄	C ₁₅ -C ₂₈	C ₂₉ -C ₃₆	Benzene	Toluene	Ethyl Benzene	Xylene
BH5	320	85000	170000	600	0.6	<1	3	3
BH39	2300	1400	<100	<100	200	4	150	390
BH44	2000	1800	400	<100	<0.5	<1	<1	500

<p>File A</p>	CLIENT	Mobil Oil Australia Pty Ltd	PROJECT	Depot - Reynolds St, Mareeba (PM01)
	DRAWN	LMG	DATE	06-08-01
	CHECKED	sch4p4(6) Personal information	DATE	8/8/07
	SCALE	1:500	A3	PROJECT No
			FIGURE No	Page 50 of 131

Golder Associates Pty Ltd

A.C.N. 006 107 857

A.B.N. 64 006 107 857

216 Draper Street, Cairns, Qld 4870 Australia

(PO Box 5823, Cairns, Qld 4870 Australia)

Telephone (07) 4051 2033

Fax (07) 4052 1546

<http://www.golder.com>



REPORT ON

**CONTAMINATED
LAND SECTION**

20 AUG 2001

**RISK ASSESSMENT
FORMER FUEL DEPOT SITE
REYNOLDS STREET (PMO1)
MAREEBA, QUEENSLAND**

Submitted to:

Mobil Oil Australia Pty Ltd

Mobil House

Floor 4, 417 St Kilda Road

Melbourne Victoria 3004

DISTRIBUTION:

- 3 Copies - Mobil Oil Australia Pty Ltd
- 1 Copy - Environmental Protection Agency
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August, 2001

00673025(S)

Release

EXECUTIVE SUMMARY

Golder Associates was engaged by Mobil Oil Australia Pty Ltd (Mobil) to carry out site contamination investigations, to oversee remedial works and to carry out a risk assessment related to residual hydrocarbon contamination at a former Fuel Depot (PM01) located at 27 Reynolds Street, Mareeba. The need for the work have prompted by the site closure and its proposed divestment. It is understood that Mobil wish to remediate the site to allow its removal from the Environmental Management Register (EMR) and allow unrestricted sale of the site. This report presents the results of the risk assessment.

Details relating to the site conditions prior to and following remedial earthworks have been previously presented in Golder Associates reports 00673018(E) dated August 2000 and 00673025(Q) dated August 2001. Findings from these reports have been used to establish some parameters for the modelling conducted during this assessment. The previous reports should be read in conjunction with this report.

The objectives of the risk assessment report were to:

- provide a quantitative evaluation of the risks/hazards associated with residual hydrocarbon contamination in soil/weathered rock located more than 4 m below the ground surface;
- provide a quantitative evaluation of the risks/hazards associated with dissolved phase hydrocarbon impacted groundwater; and
- progress the site towards removal from the Environmental Management Register.

Three main scenarios were modelled:

- Scenario 1 – Risk to child receptors from ingestion and dermal contact with impacted groundwater at a hypothetical residential well located between 100 m and 200 m downgradient of the site. In this scenario the impacted groundwater arises from transport of identified dissolved phase hydrocarbon in the groundwater beneath the site.
- Scenario 2 – Risks to adult workers from inhalation in an indoor area impacted with vapours from residual hydrocarbon contamination beneath a hypothetical building on the site.
- Scenario 3 – Risk to child receptors from ingestion and dermal contact with impacted groundwater at a hypothetical residential well located between 100 m and 200 m downgradient of the site. In this scenario the impacted groundwater arises from leaching from residual hydrocarbon impacted soils into groundwater which flows offsite.

Results of the risk assessment modelling are summarised below:

- The risk assessment indicated that the identified dissolved phase hydrocarbon concentrations in the groundwater at this site do not represent an unacceptable health risk for potential domestic groundwater users. Hazard quotients for the modelled scenarios were below 1 in all cases and carcinogenic risk associated with benzene was less than 1×10^{-5} .
- Modelling of indoor air quality for a 150 m^2 structure constructed over an area of residual hydrocarbon impacted soil indicated an acceptable level of health risk for adult workers. The hazard quotient for this scenario was less than 1 and the carcinogenic risk associated with benzene were less than 1×10^{-5} .
- The risk assessment indicated that leaching from the identified residual hydrocarbon soil contamination (below 4 m depth) into the groundwater does not represent an unacceptable health risk for potential domestic groundwater users. Hazard quotients for the modelled scenarios was below 1 in all cases and carcinogenic risk associated with benzene was less than 1×10^{-5} .

On the basis of these risk assessment findings, no further remedial works are considered to be warranted to address dissolved phase hydrocarbons in the groundwater or residual hydrocarbon contamination in soil below 4 m at this site. The results of the risk assessment also confirm that the site is fit for future use as an industrial or commercial site.

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Appendix C	RISC Modelling Input/Output Summaries
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1.0 INTRODUCTION

Golder Associates was engaged by Mobil Oil Australia Pty Ltd (Mobil) to carry out site contamination investigations, to oversee remedial works and to carry out a risk assessment related to residual hydrocarbon contamination at a former Fuel Depot (PM01) located at 27 Reynolds Street, Mareeba, Queensland. The need for the work was prompted by the site closure and its proposed divestment. It is understood that Mobil wish to remediate the site to allow its removal from the Environmental Management Register (EMR) and allow unrestricted sale of the site. This report presents the results of the risk assessment.

The objectives of the risk assessment report were to:

- provide a quantitative evaluation of the risks/hazards associated with residual hydrocarbon contamination in soil/weathered rock located more than 4 m below the ground surface;
- provide a quantitative evaluation of the risks/hazards associated with dissolved phase hydrocarbon impacted groundwater; and
- progress the site towards removal from the Environmental Management Register.

The work conducted for the risk assessment consisted of:

- installation of an additional groundwater monitoring well;
- collection and analysis of additional groundwater samples;
- collation of residual soil contamination data;
- identification of potential receptors and exposure pathways.
- evaluation/identification of parameters for the numerical assessment.
- "tier 2" evaluation of risk using numerical software package "RISC" including a sensitivity analysis.

The work undertaken is presented in the following sections.

2.0 SUMMARY OF ENVIRONMENTAL HISTORY

2.1 Previous Reports

An Environmental Site Assessment (ESA) for the site was conducted by Golder Associates in July 2000 [Report 00673018(E) dated August 2000]. The ESA report provides information on site conditions including site geology and hydrogeology; site history and potential sources of contamination; results of initial soil and water sampling; areas of hydrocarbon impact and their approximate extent; a site conceptual model and qualitative risk assessment; and risk management options. The ESA report should be read in conjunction with this report.

Remedial excavations to remove hydrocarbon impacted soils were conducted in October 2000 and February 2001. Discussion on the extent of excavations conducted, results of testing on soil samples to validate the excavations and the location of areas with residual contamination are presented in Golder Associates Report 00673025(Q) dated August 2001. The remedial excavation report should be read in conjunction with this report.

Earthworks to remediate excavated hydrocarbon impacted soils were conducted between November and April 2001. Results of testing on soil samples to validate the remediated soil are presented in Golder Associates Report 00673025(R) dated August 2001. The remediated soil report should be read in conjunction with this report.

A summary of relevant findings from the above reports and additional groundwater sampling and analysis are presented in the following sections.

2.2 Site Soil Conditions

The 1:250,000 scale geological map of the Mossman Region (Mapsheet SE, 55-1 1983) indicates that the site area is underlain by remnant flows of olivine basalts of the Atherton Basalt Formation.

The subsurface profile revealed during the ESA and subsequent excavations consists of red brown basaltic clays to depths varying between 1.5 m at the northern end of the site to more than 4 m at the southern end. The clays are underlain by a series of overtopping basalt flows. The weathered basalt had a low but variable strength to depths of at least 10 m, the limit of the investigation.

Excavations in October 2000 and February 2001 removed hydrocarbon impacted soils to depths of at least 4 m over the site area. Locations where residual hydrocarbon contamination is still present at depth are shown on Figure 1. A summary of laboratory results on soil samples of the residual contamination in these areas is provided in Table 1.

2.3 Site Groundwater Conditions

Department of Natural Resources (DNR) have advised that the subject site is not located in a proclaimed area and registration of bores is not required. DNR indicated that groundwater flow in the basalt is complex with a number of local flow systems which have not yet been accurately delineated. DNR further advised that bores around the township of Mareeba generally produce low yields of less than 1 litre/sec. A town water supply system provides water to the township and therefore potable use of the groundwater would be rare. Water used to irrigate the sports fields and parkland to the north west of the site is understood to be extracted from Granite Creek.

In the immediate vicinity of the site the groundwater table is expected to be close to the water levels in Basalt Creek and Granite Creeks (about 15 m to 20 m below the ground surface of the site). The direction of groundwater flow is expected to be north east in sympathy with the regional surface drainage lines.

The adjacent nursery owner, Mr Knowlton, indicated that a water bore was located at the nursery within 50 m of the common boundary (see Figure 2). Mr Knowlton indicated that the bore sourced water from an aquifer about 20m below the surface. The water from the bore has been used over the past 24 years to irrigate the rainforest trees propagated at the nursery. From Mr Knowlton's description of the pump size and number of sprinkler heads in the irrigation system, we estimate that the bore has a yield of about 5 litres per second. Mr Knowlton also indicated that hydrocarbon odours had never been observed in the irrigation water and no vegetation stress had resulted from use of the water. This nursery well was sampled in October 2000 and analysed for TPH and BTEX. The laboratory test certificate is presented in Appendix A and the results are summarised in Table 2.

Two groundwater wells (BH5 and BH39) were installed and sampled during the ESA (see Figure 2). Standing groundwater levels in the two monitoring wells installed were between 6.25 m (RL193.75 m) in BH5 and 6.5 m (RL192.6 m) in BH39 below the ground surface. Standing water levels measured on 12 July 2000 about a week after installation and development were 6.25 m and 6.5 m. The hydraulic conductivity and observations during development and purging of the monitoring wells suggest that the aquifer encountered would have a low yield (less than 1 litre/sec). Water samples collected from these wells were analysed for TPH and BTEX. The laboratory test certificates are presented in Appendix A and the results are summarised in Table 2.

A third monitoring well (BH44) was installed during the site remedial excavations (see Figure 2). The well construction details are provided on the borehole report in Appendix B. The water from this well was sampled and analysed for TPH and BTEX. The laboratory test certificate is presented in Appendix A and the results are summarised in Table 2.

No phase separated hydrocarbons were observed on the water samples removed from the nursery bore or the on site monitoring wells.

The difference in groundwater levels and estimated yields between the site monitoring wells and the irrigation bore on the adjacent property, plus the absence of hydrocarbon contamination in the water from the nursery bore indicate that two aquifers are present beneath the site which are separated by a confining layer.

Field electrical conductivity measurements indicate that the upper groundwater aquifer could be potentially used as a source of potable water and this would be the beneficial use which would need to be preserved under the Water Policy of the Queensland Environmental Protection Act.

2.4 Properties of Contaminants of Concern

2.4.1 Residual Soil Contamination

The closely spaced grid pattern sampling conducted during the ESA and subsequent removal of all fuel storage tanks, pipework and associated structures indicated a low probability of additional unidentified sources of hydrocarbon contamination to be present at the site. Validation sampling has indicated that hydrocarbon impacted soils have been removed to depths of at least 4 m below the ground surface. Residual hydrocarbon contamination is present in the soil (and weathered rock) at three locations as shown on Figure 1. The highest residual hydrocarbon contamination concentrations in the soil at these locations consists of:

Location	Maximum Concentration Detected (mg/kg)				
	C ₆ -C ₉	C ₁₀ -C ₁₄	C ₁₅ -C ₂₈	Ethyl Benzene	Xylene
Area 3	710	4400	8200	1	9
Area 4	<5	340	<50	<1	<3
Area 10	330	1800	1700	<1	<3

2.4.2 Dissolved Phase Hydrocarbons

Residual dissolved phase hydrocarbons identified in the groundwater at the three onsite groundwater monitoring wells (BH5, BH39 and BH44). The highest dissolved phase hydrocarbon contamination concentrations in the groundwater at these locations consists of:

Location	Maximum Concentration Detected (µg/L)							
	C ₆ -C ₉	C ₁₀ -C ₁₄	C ₁₅ -C ₂₈	C ₂₉ -C ₃₆	Benzene	Toluene	Ethyl Benzene	Xylene
BH5	320	85000	170000	600	0.6	<1	3	3
BH39	2300	1400	<100	<100	200	4	150	390
BH44	2000	1800	400	<100	<0.5	<1	<1	500

Groundwater levels in the monitoring wells indicate a hydraulic gradient of 0.03 to the north east in the upper aquifer. Field tests during the ESA indicate a indicated a hydraulic conductivity of 7.8×10^{-7} m/s within the upper aquifer.

3.0 EXPOSURE ASSESSMENT

3.1 Receptors and Exposure Pathways

3.1.1 Residual Soil Contamination

The potentially threatened sensitive receptors consist of:

- Future Industrial/Commercial Site Users (soil vapour).
- Residential Groundwater Users within 1 km downgradient of the site (leaching and groundwater transport).
- Relevant Surface Water Ecological Organisms (leaching, groundwater transport and discharge into surface water bodies).
- Recreational Surface Water Users (leaching, groundwater transport and discharge into surface water bodies).

A flowchart of potential exposure pathways for residual soil contamination is presented as Figure 3. Complete exposure pathways do not currently exist.

The risk of dermal exposure or particulate inhalation of residual hydrocarbon impacted soil located more than 4 m below the surface is unlikely for future commercial/industrial site users. Although the risk associated with long term exposure to fugitive hydrocarbon vapours needs to be considered for future commercial/industrial site users.

Redevelopment of the site and excavations for underground services and utilities are unlikely to require excavation to beyond 4 m and therefore assessment of the risks associated with dermal exposure and particulate inhalation of residual hydrocarbon impacted soil is not required.

A detailed risk assessment needs to be conducted of the impacts on the groundwater (and groundwater receptors) resulting from leaching of residual hydrocarbons in the soil/weathered rock profile below 4 m.

3.1.2 Dissolved Phase Hydrocarbons

The potentially threatened sensitive receptors consist of:

- Residential Groundwater Users within 1 km downgradient of the site (groundwater transport).
- Relevant Surface Water Ecological Organisms (groundwater transport and discharge into surface water bodies).
- Recreational Surface Water Users (groundwater transport and discharge into surface water bodies).

A flowchart of potential exposure pathways for dissolved phase groundwater contamination is presented as Figure 4. Complete exposure pathways do not currently exist.

The risk of commercial water user (nursery worker) exposure to impacted groundwater is considered to be negligible as the water bore on the adjacent property sources a deeper and separate aquifer to that intersected by the site monitoring bores. The results of analysis on a sample from the bore on the adjacent property confirmed that the deeper aquifer was not impacted with hydrocarbons and therefore a complete exposure pathway does not exist.

The groundwater at the site is at a depth (6 m) which is greater than would be typically excavated for most developments and therefore worker exposure need not be considered.

Risk of ingestion of impacted groundwater is considered to be low given the available town water supply and generally poor yields in the impacted aquifer. However, the presence of domestic bores has not been able to be determined as their registration is not required in this area. Although the aquifer is seasonal, a more detailed risk assessment is required to confirm the degree of risk assuming that a domestic bore supply is present at the nearest downgradient residence (more than 200 m from the site). Ingestion and dermal contact by child receptors needs to be considered, as they would be the critical receptors.

Risk of exposure to recreational surface water users and surface water aquatic ecosystems is considered to be minimal and is mitigated by the distance between the site and the nearest surface water body (Basalt Creek about 700 m to the north east).

3.2 Parameters and Assumptions

3.2.1 Residual Soil Contamination

Parameters and assumptions used during the risk assessment are listed in the table below. Conservative parameters have been selected to simulate worst case conditions.

Model Input Parameters – Residual Soil Contamination Leaching to Groundwater

Parameter	Value	Comment
Soil Properties		
Total Porosity	0.3	Assumed values for weathered basalt and soils derived from weathered basalt.
Residual Water Content	0.17 cm ³ /cm ³	
Fractional Organic Carbon	0.010 g oc/g soil	
Soil Bulk Density	1.7 t/m ³	
Infiltration Rate	20 cm/yr	
Saturated Conductivity of Vadose Zone	0.015m/day	
Van Genuchten's N	1.09	
Thickness of Vadose Zone	6 m	Depth to water table
Saturated Zone Degradation Rates	2%	Conservative Assumption
Aquifer Properties		
Hydraulic Conductivity	0.03 m/day	ESA Report
Effective Porosity	0.3 0.2	Assumption for Gravel Assumption for Clay
Soil Bulk Density	1.7 g/cm ³	Assumption for Gravel & Clay
Hydraulic Gradient	0.03	Based on groundwater levels in monitoring wells
Saturated Zone Degradation Rates	2%	Conservative Assumption
Source Geometry		
Thickness of Source	2 m	Average thickness based on findings of remedial excavations & ESA boreholes.
Length of Source in Direction of GW flow	60 m	Assumption – Distance between BH5 and north east boundary.
Width of Source Perpendicular to Direction of GW flow	30 m	Assumption – Distance between BH5 and the north west boundary.
Source Concentrations (mg/kg)		
Benzene	0.5	A database of all residual soil concentrations shown in Table 1 were considered. The average weighted concentration shown here were evaluated by applying a weighting factor to the results at each location based on the surface area of contamination at that location. Detection levels have been used for results with laboratory non-detects.
Ethyl benzene	1	
TPH Aromatics C ₅ -C ₇	144.7	
TPH Aromatics C ₈ -C ₁₀	1259.2	
TPH Aromatics C ₁₆ -C ₂₁	2031.2	
TPH Aromatics C ₂₁ -C ₃₆	50	
Toluene	1	
Xylene	3.5	
Fate and Transport Model		
Simulation Time	100 years	Assumption

Model Input Parameters – Residual Soil Contamination Vapour Migration to Building

Parameter	Value	Comment
Soil Properties		
Total Porosity	0.3	Assumed values for weathered basalt and soils derived from weathered basalt.
Residual Water Content	0.17 cm ³ /cm ³	
Fractional Organic Carbon	0.010 g oc/g soil	
Soil Bulk Density	1.7 t/m ³	
Infiltration Rate	20 cm/yr	
Saturated Conductivity of Vadose Zone	0.015m/day	
Van Genuchten's N	1.09	
Thickness of Vadose Zone	6 m	Depth to water table
Saturated Zone Degradation Rates	2%	Conservative Assumption
Source Geometry		
Thickness of Source	3.5 m	ESA boreholes.
Length of Source	7.5 m	Based on Results of Area 3.
Width of Source	7.5 m	Based on Results of Area 3.
Building Geometry		
Plan Area	150 m ²	Assumption
Foundation Thickness	0.1 m	Assumption
Source Concentrations (mg/kg)		
Benzene	0.5	Maximum concentrations listed in Table 1 used. Detection levels used for laboratory non-detects.
Ethyl benzene	1	
TPH Aromatics C ₅ -C ₇	71.0	
TPH Aromatics C ₈ -C ₁₀	4400	
TPH Aromatics C ₁₆ -C ₂₁	8200	
TPH Aromatics C ₂₁ -C ₃₆	50	
Toluene	9	
Xylene	3.5	
Fate and Transport Model		
Simulation Time	100 years	Assumption

3.2.2 Dissolved Phase Hydrocarbons

Parameters and assumptions used during the risk assessment are listed in the table below. Conservative parameters have been selected to simulate worst case conditions.

Model Input Parameters – Dissolved Phase Hydrocarbons in Groundwater

<u>Parameter</u>	<u>Value</u>	<u>Comment</u>
Aquifer Properties		
Hydraulic Conductivity	0.0093m/day	ESA Report
Effective Porosity	0.3	Assumption for Gravel
	0.2	Assumption for Clay
Soil Bulk Density	1.7 g/cm ³	Assumption for Gravel & Clay
Hydraulic Gradient	0.03	Based on groundwater levels in monitoring wells
Saturated Zone Degradation Rates	2%	Conservative Assumption
Source Geometry		
Thickness of Source	3.0 m	Assumption – thickness varies seasonally
Length of Source in Direction of GW flow	60 m	Assumption - Distance between BH5 and north east boundary
Width of Source Perpendicular to Direction of GW flow	30 m	Assumption - Distance between BH5 and the north west boundary
Source Concentrations (mg/L)		
Benzene	0.0576	A database of all concentrations shown in Table 2 (excluding the nursery bore) were considered. The average weighted concentration shown here were evaluated by applying a weighting factor to the results at each location based on the number of samples collected from that location. A weighting factor of 1 was applied to the results from BH5 and BH4. A weighting factor of 3 was applied to the results from BH39. Detection levels have been used for results with laboratory non-detects.
Ethyl benzene	0.0418	
TPH Aromatics C ₅ -C ₇	1.28	
TPH Aromatics C ₁₀ -C ₁₂	8.284	
TPH Aromatics C ₁₆ -C ₂₁	15.573	
TPH Aromatics C ₂₁ -C ₃₆	0.146	
Toluene	0.0018	
Xylene	0.735	
Fate and Transport Model		
Simulation Time	100 years	Assumption
Length of Pulse from Groundwater Source	5 years	Assumption – Time from report of bowser leak (1995) to removal of source (remedial earthworks 2000)

4.0 RISK/HAZARD CHARACTERISATION

4.1 Acceptable Risk/Hazard

The following target risk and hazard values have been used for the purposes of evaluating the degree of significance of quantified risk:

- A lifetime carcinogenic risk value of 1×10^{-5} or less is considered to be “acceptable”.

- A Hazard Quotient of less than 1 is considered to be "insignificant".

4.2 Numerical Model

The numerical model "RISC" (Risk-Integrated Software for Cleanups) Version 3.09 was used to quantify the level of risk associated with residual hydrocarbons in the subsoil profile and dissolved phase hydrocarbons in the groundwater. This model uses an inbuilt fate and transport model to simulate groundwater migration and can evaluate the level of risk associated with various exposure pathways. The model provides an evaluation of carcinogenic risk or in the case of non-carcinogenic compounds, hazard quotient.

Further information on RISC can be found at www.bprisc.com.

4.3 Modelling Results

Parameters listed in Sections 3.2.1 and 3.2.2 were used to evaluate the exposure risk for various scenarios of soil and groundwater contamination. The modelling scenarios and results are summarised in the table below. Model input and output summaries for each scenario are provided in Appendix C.

Summary of Results

SCENARIO	MODELLING RESULTS (mg/L)*								HAZARD QUOTIENT	CARCINOGENIC RISK (benzene only)
	C ₅ -C ₇	C ₁₀ -C ₁₂	C ₁₆ -C ₂₁	C ₂₁ -C ₃₅	Benzene	Ethyl benzene	Toluene	Xylene		
Groundwater Dissolved Phase Hydrocarbons										
Scenario 1 – Child receptor exposed to ingestion of groundwater and dermal contact from domestic bore installed 200m downgradient of source area. (Assuming gravel formation aquifer)	1.06 x 10 ⁻¹⁰	1.46 x 10 ⁻¹⁰	0	0	5.97 x 10 ⁻¹²	3.37 x 10 ⁻¹²	1.49 x 10 ⁻¹³	6.22 x 10 ⁻¹¹	1.4 x 10 ⁻¹⁰	3.4 x 10 ⁻¹⁶
Scenario 1b – As for scenario 1 but assuming clay formation aquifer.	0	0	0	0	0	0	0	0	0	0
Scenario 1c – As for scenario 1 but assuming domestic bore installed 100m downgradient of source area.	4.08 x 10 ⁻⁷	7.06 x 10 ⁻⁷	3.21 x 10 ⁻⁸	0	2.3 x 10 ⁻⁸	1.4 x 10 ⁻⁸	5.79 x 10 ⁻¹⁰	2.46 x 10 ⁻⁷	7 x 10 ⁻⁷	1.3 x 10 ⁻¹²
Residual Soil Contamination										
Scenario 2 – Adult worker receptor exposed to indoor vapours from residual soil contaminant.	NA	NA	NA	NA	NA	NA	NA	NA	0.77	1.1 x 10 ⁻⁷
Scenario 3a – Child receptor exposed to ingestion of groundwater and dermal contact from domestic bore installed 200m downgradient of source area. (Assuming leaching from residual soil contamination into gravel formation aquifer)	2.42 x 10 ⁻²	4.4 x 10 ⁻³	1.39 x 10 ⁻⁴	0	1.04 x 10 ⁻⁴	4.47 x 10 ⁻⁵	8.39 x 10 ⁻⁵	2.3 x 10 ⁻⁴	7.3 x 10 ⁻³	5.6 x 10 ⁻⁹
Scenario 3b – As for scenario 3a but assuming leaching from residual soil contamination into clay formation aquifer)	0	0	0	0	0	0	0	0	0	0
Scenario 3c – As for scenario 3a but assuming domestic bore installed 100m downgradient of source area.	1.23 x 10 ⁻¹	2.22 x 10 ⁻²	9.03 x 10 ⁻⁴	0	5.3 x 10 ⁻⁴	2.3 x 10 ⁻⁴	4.27 x 10 ⁻⁴	1.17 x 10 ⁻³	3.7 x 10 ⁻²	2.9 x 10 ⁻⁸

NOTES:

* Maximum Concentrations at receptor bore over 100 years of modelling for scenarios 1, 1b, 1c, 3a, 3b and 3c.

4.4 Summary of Findings

The risk assessment indicated that the identified dissolved phase hydrocarbon concentrations in the groundwater at this site do not represent an unacceptable health risk for potential domestic groundwater users. Hazard quotients for the modelled scenarios were below 1 in all cases and carcinogenic risk associated with benzene was less than 1×10^{-5} . At modelled receptor well locations, the indicated concentrations of C₆-C₃₆ hydrocarbons were below Dutch Intervention Levels (References 1 and 2) and BTEX concentrations were below Australian Drinking Water Quality Guidelines (Reference 3).

Modelling of indoor air quality for a 150 m² structure constructed over an area of residual hydrocarbon impacted soil indicated an acceptable level of health risk for adult workers. The hazard quotient for this scenario was less than 1 and the carcinogenic risk associated with benzene was less than 1×10^{-5} .

The risk assessment indicated that leaching of the identified residual hydrocarbon soil contamination below 4 m depth into the groundwater does not represent an unacceptable health risk for potential domestic groundwater users. Hazard quotients for the modelled scenarios were below 1 in all cases and carcinogenic risk associated with benzene was less than 1×10^{-5} . At modelled receptor well locations, the indicated concentrations of C₆-C₃₆ hydrocarbons were below Dutch Intervention Levels (References 1 and 2) and BTEX concentrations were below Australian Drinking Water Quality Guidelines (Reference 3).

5.0 CONCLUSIONS

The risk assessment has indicated that the residual soil contamination present below 4 m depth and dissolved phase hydrocarbons in the ground water beneath this site do not represent an unacceptable health risk to potential environmental receptors. On the basis of this risk assessment no further remedial works are considered to be warranted to address dissolved phase hydrocarbons in the groundwater or residual hydrocarbon contamination in the soil below 4m at this site.

The results of the risk assessment also confirm that the site is suitable for future use as an industrial or commercial site. It is recommended that this report is submitted to the EPA with a request to have the site removed from the Environmental Management Register.

6.0 LIMITATIONS OF REPORT

This report has been prepared in accordance with the agreement between Mobil Oil Australia Pty Ltd and Golder Associates Pty Ltd (Golder Associates). The services performed by Golder Associates have been conducted in a manner consistent with the level of quality and skill generally exercised by members of its profession and consulting practice. No warranty or guarantee of site conditions is intended.

This report is solely for the use of Mobil Oil Australia Pty Ltd and any reliance of this report by third parties shall be at such party's sole risk and may not contain sufficient information for purposes of other parties or for other uses. This report shall only be presented in full and may not be used to support any other objective than those set out in the report, except where written approval with comments are provided by Golder Associates.

The information in this report is considered to be accurate at the date of issue in accordance to the current conditions of the site. Subsurface conditions can vary across a particular site which cannot be explicitly defined by investigation. Therefore, it is unlikely that the results and estimations expressed in this report will represent the extremes of conditions within the site. Subsurface conditions including contaminant concentrations can change in a limited period of time. This should be considered if the report is used after a significant delay in time.

Attached as Appendix D is a document entitled "Important Information About Your Environmental Site Assessment" which should be read in conjunction with this report. We would be pleased to answer any questions about this important information.

GOLDER ASSOCIATES PTY LTD

sch4p4(6) Personal information

s.73

Associate

LMG/PKS/MSK/klm
\\SERVER15-DRIVE\DATA\ENV\00\00673025\73025RS.DOC

7.0 LIST OF REFERENCES

1. "Netherlands, Soil Clean-up Guidelines", 1983.
2. "Environmental Quality Objectives in the Netherlands", Ministry of Housing, Spatial Planning and the Environment, 1994.
3. "Australian Drinking Water Guidelines 6", National Health and Medical Research Council & Agriculture and Resource Management Council of Australia and New Zealand, 1996.

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DES Disclosure Log
RTI Act 2009

Test Location	Sample Number	Sample Depth (m)	PID (ppm)	C ₆ -C ₉	C ₁₀ -C ₁₄	C ₁₅ -C ₂₈	C ₂₉ -C ₃₆	Benzene	Toluene	Ethyl Benzene	Xylene
BH5	BH56	4.0-4.5	81.7	<u>710</u>	<u>4400</u>	<u>8200</u>	<50	<0.5	<1	<u>1</u>	<u>2</u>
Area 3 - Base	3B	4.0-4.1	7.5	<5	<u>120</u>	460	<50	<0.5	<1	<1	<3
Area 3 - Base	3K	4.0-4.1	50	<u>150</u>	<u>2400</u>	<u>7400</u>	<50	<0.5	<1	<1	<3
Area 3 - Base	3L	4.0-4.1	1.5	<5	<u>340</u>	320	<50	<0.5	<1	<1	<3
Area 4 - Base	4A	4.0-4.1	60	<5	<u>340</u>	320	<50	<0.5	<1.0	<1.0	<3.0
Area 10 - Base	10A	4.5-4.6	26	<5	<u>980</u>	<u>1700</u>	<50	<0.5	<1.0	<1.0	<3.0
Area 10 - Base	10B	4.5-4.6	32	100	<u>880</u>	540	<50	<0.5	<1.0	<1.0	<3.0
Area 10 - Base	10C	6.0-6.1	111	<u>330</u>	<u>1800</u>	980	<50	<0.5	<1.0	<1.0	<3.0
Area 10 - Base	01D	5.0-5.1	40	<5	<u>160</u>	60	<50	<0.5	<1.0	<1.0	<3.0
Environmental Investigation Thresholds ⁽¹⁾				100	100	1000 (>C17)		1	7 (total BTEX)		
Environmental Investigation Thresholds ⁽²⁾				-	-	-	-	1	-	-	-
Health Based Investigation Thresholds - Commercial/Industrial Use ⁽²⁾				-	-	-	-	-	-	-	-

Notes

All results are expressed as mg/kg unless otherwise specified

Results above Investigation Thresholds shown in underlined bold italics

(1) Draft Guidelines for Assessment of Contaminated Land in Queensland, March 1991

(2) Environmental and Health Based Investigation Levels from Draft Guidelines for Assessment and Management of Contaminated Land in Queensland, May 1998

Figures in bold italics that have been underlined exceed the Environmental Investigation Thresholds



TABLE 1

SUMMARY OF ANALYTICAL RESULTS

RESIDUAL SOIL CONTAMINATION

TOTAL RECOVERABLE HYDROCARBONS &

MONOCYCLIC AROMATIC HYDROCARBONS

MOBIL OIL AUSTRALIA PTY LTD

RISK ASSESSMENT

MAREEBA (PM01)

Input By: LMG

Date: 13/08/2001

Checked by: [Signature] Primary to public interest

Date: 13/08/2001

18-292

File A

Test Location	Sample Number	Date Sampled	C ₆ -C ₉	C ₁₀ -C ₁₄	C ₁₅ -C ₂₈	C ₂₉ -C ₃₆	Benzene	Toluene	Ethyl Benzene	Xylene
BH5	5	12/07/2000	<u>320</u>	<u>85,000</u>	<u>170,000</u>	<u>600</u>	0.6	< 1	3	3
BH39	39	12/07/2000	<u>1,600</u>	260	< 100	< 100	53	1	19	230
BH39	BH39	12/10/2000	<u>2300</u>	<u>1400</u>	< 100	< 100	210	4	150	390
Off-site Irrigation Bore	IR	12/10/2000	< 20	< 20	< 100	< 100	< 0.5	< 1	< 1	< 3
BH39	MMWR	12/03/2001	140	140	< 100	< 100	< 0.5	< 1	< 1	< 3
BH44	MMWC	12/03/2001	<u>2000</u>	<u>1800</u>	<u>400</u>	< 100	< 0.5	< 1	< 1	500
ANZECC Water Quality Guidelines for Protection of Aquatic Ecosystems (Fresh Waters)			NR	NR	NR	NR	300	300	NR	NR
Australian Drinking Water Guidelines 6			NR	NR	NR	NR	1	800	300	600
Dutch Guideline Levels										
(1) Dutch C - Netherlands Soil Clean-up Guideline, 1983.			150 ⁽¹⁾		600 ⁽²⁾		-	-	-	-
(2) Dutch Intervention Value - Environmental Quality Objectives in the Netherlands, 1994										

Notes

All results are expressed as ug/L unless otherwise specified

NR = No Recommendation

Bold Cells exceed ADWG levels

Shaded Cells exceed ANZECC Guidelines

Bold Italic Underlined cells exceed Dutch C or Dutch Intervention Values.



TABLE 2

SUMMARY OF ANALYTICAL RESULTS - GROUNDWATER TOTAL PETROLEUM HYDROCARBONS & MONOCYCLIC AROMATIC HYDROCARBONS

MOBIL OIL AUSTRALIA PTY LTD

RISK ASSESSMENT

MAREEBA (PM01)

Input By: LMG

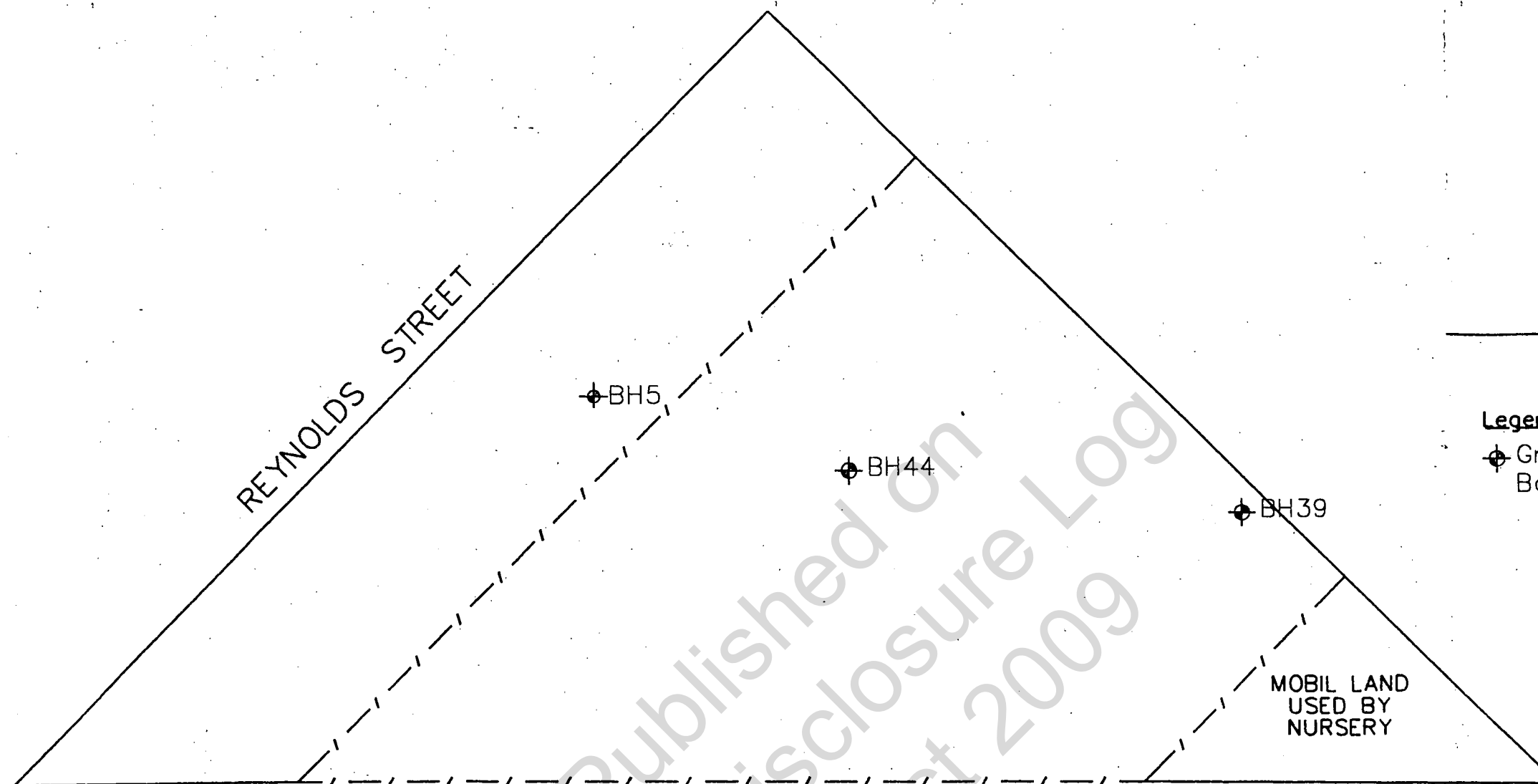
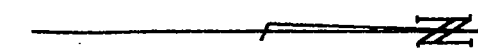
Date: 13/08/2001

Checked By:

Date: 13/08/2001

sch4047 (6) Personal information

18-292

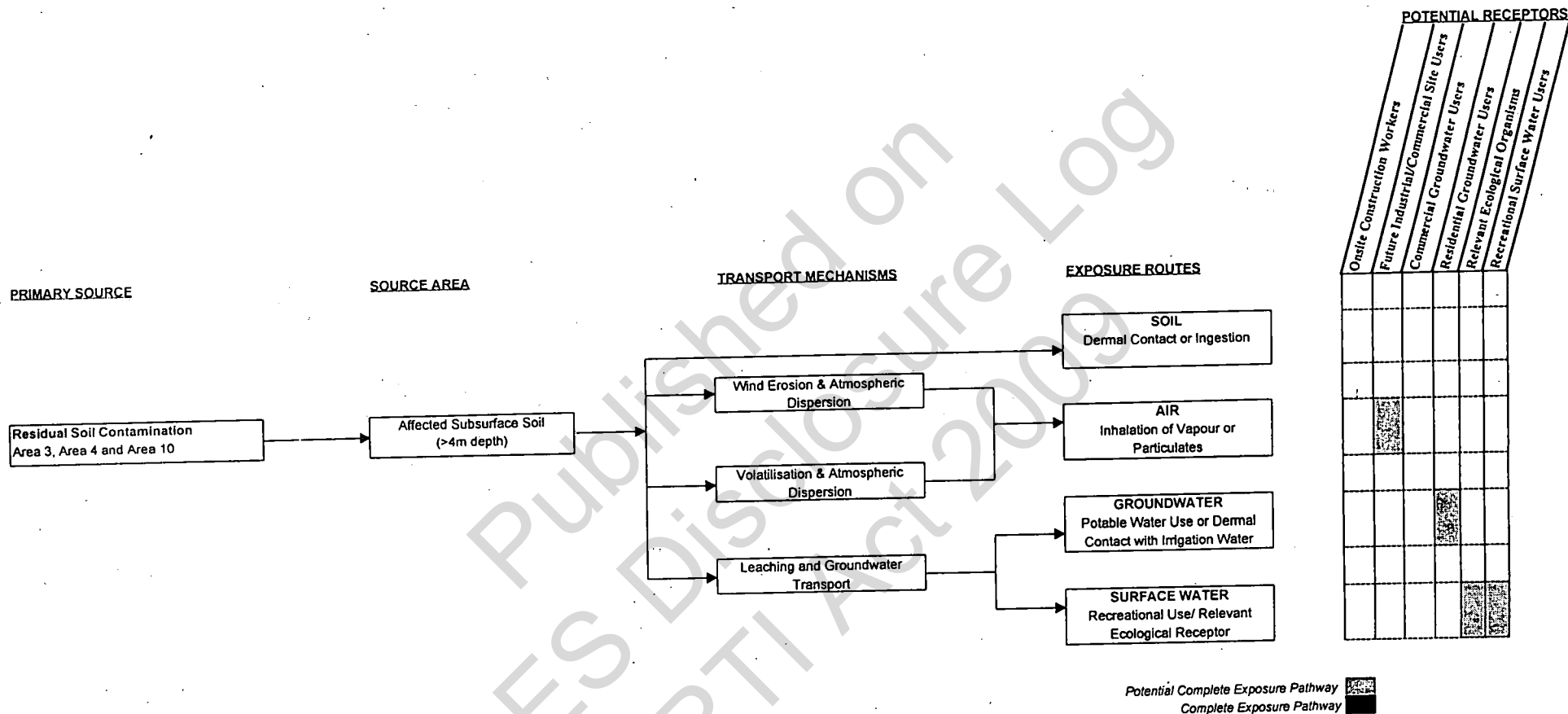


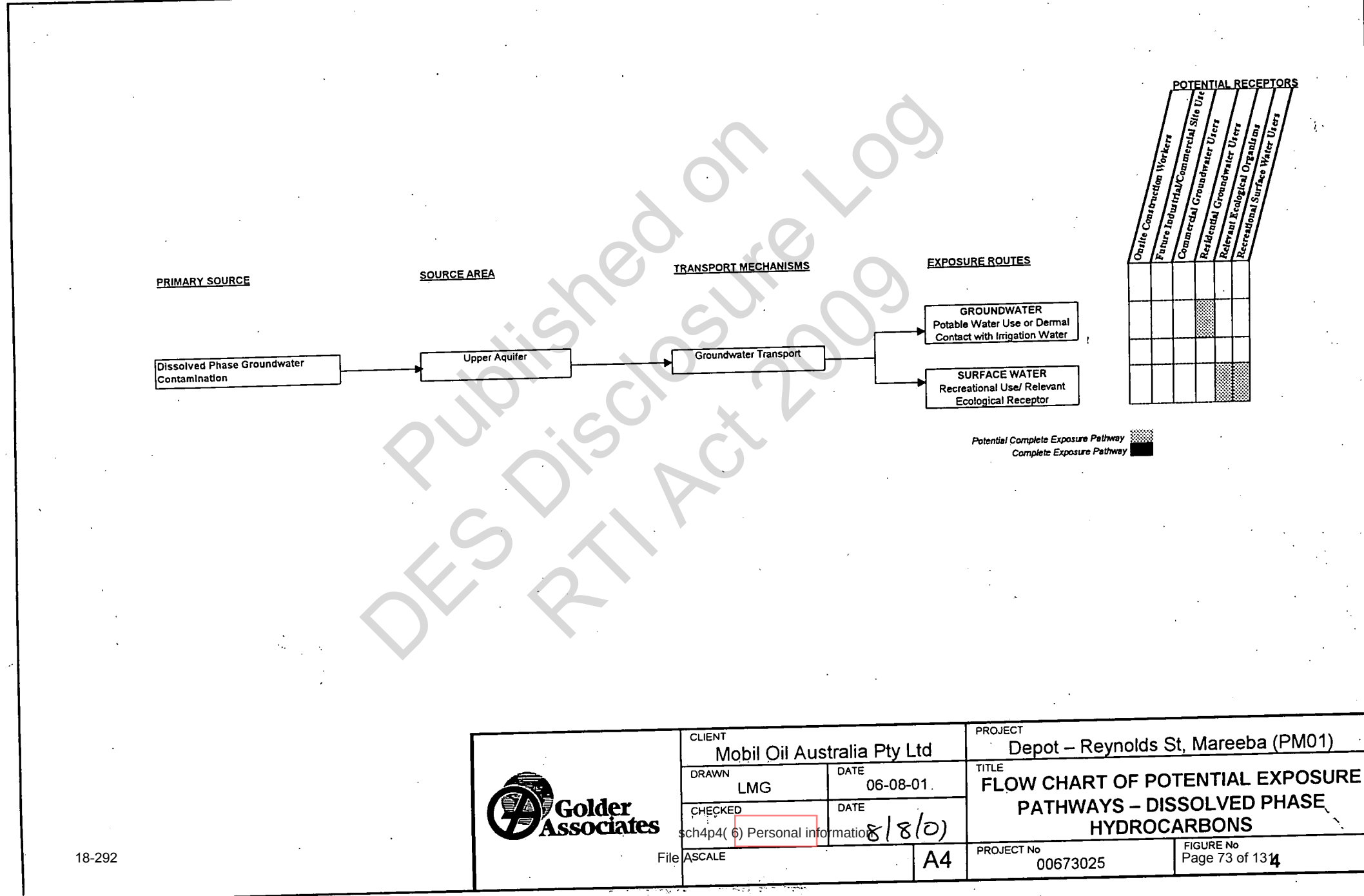
Legend

⊕ Groundwater Monitoring Bore

⊕ Irrigation Bore

 File A	CLIENT Mobil Oil Australia Pty Ltd		PROJECT Depot - Reynolds St, Mareeba (PM01)	
	DRAWN LMG	DATE 06-08-01	TITLE GROUNDWATER MONITORING BORE LOCATIONS	
	CHECKED sch4p4 (6)	DATE 8/8/07		
	SCALE 1:500	A3	PROJECT No 00673025	FIGURE No Page 71 of 131





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APPENDIX A

CHAIN OF CUSTODY AND ANALYTICAL RESULTS FOR GROUNDWATER SAMPLES

Accreditation No. 3163

ENVIRONMENTAL AND INDUSTRIAL SERVICES DIVISION

Trading as Australian Analytical Laboratories Pty Ltd

ACN 009 076 555

508 City Road
SOUTH MELBOURNE VIC 3205
Telephone: (03) 9699 8333
Facsimile: (03) 9699 9695

CERTIFICATE OF ANALYSIS

Contents :

1. Cover Page
2. Analysis Report Pages
3. QA/QC Appendix

Report No. : OM01459

Attention : s.73

Client : Golder & Associates

Samples : 3

Reference : PM01/00673025

Project : MOBIL - REYNOLDS ST, MAREEBA

Received Samples : 19/10/00

Instructions : 19/10/2000

Date Reported : 24/10/00

Method	Description	Extracted	Analysed
E0230	TPH C6-C9 by purge & trap	24/10/00	24/10/00
E0221	TPH (C10-C36)	23/10/00	23/10/00
E0010	Benzene, Toluene, Ethylbenzene & Xylene	24/10/00	24/10/00
E4870	Dissolved Metals by ICP-MS	23/10/00	23/10/00

MOBIL !!!

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for schemes indicated with * NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for < 10PQL) are reported for statistical purposes only.

PLEASE SEE ATTACHED PAGES FOR RESULTS

Sean Salibury

per S. WYTHE B.Sc (Hons)
Manager Environmental Melbourne

Job Number : OM01459

Client : Golder & Associates

Reference : PM01/00673025

Project : MOBIL - REYNOLDS ST, MAREEBA

Page 1 of 1

plus Cover Page

Analyte	Lab No	E19534	E19535	E19536		
	Sample Id	BH39	IR	TRIPBLK		
	PQL					
E0230 TPH in Water by Purge & Trap (µg/L)						
C6-C9 Fraction	20	2300	nd	--		
E0221 TPH in Water (µg/L)						
C10-C14 Fraction	20	1400	nd	--		
C15-C28 Fraction	100	nd	nd	--		
C29-C36 Fraction	100	nd	nd	--		
E0010 BTEX (P&T) in Water (µg/L)						
Benzene	0.5	210	nd	nd		
Toluene	1	4	nd	nd		
Ethylbenzene	1	150	nd	nd		
Total Xylenes	3	390	nd	nd		
4-Bromofluorobenzene-SURROGATE	1	101%	97%	92%		
E4870 Dissolved Metals in Waters						
<i>Analysed in AMDEL NSW</i>						
<i>NATA Accreditation No. 1464</i>						
Lead	0.001	0.001	nd	--		

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

nd = < PQL

-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified in Method Header

Leachates : mg/L (ppm) in leachate unless otherwise specified in Method Header

QA/QC APPENDIX NO. 0M01459

<u>Method</u>	<u>Description</u>
E0230	TPH C6-C9 by purge & trap
E0221	TPH (C10-C36)
E0010	Benzene, Toluene, Ethylbenzene & Xylene
E4870	Dissolved Metals by ICP-MS
GST	Australian GST

Chromatography QA/QC

	Yes	No	N/A
Retention Time Window Within Acceptance Criteria ($\pm 2\%$)			
Check Standard Within Acceptance Criteria ($\pm 10\%$)	✓		
Recalibration Within Acceptance Criteria ($\pm 15\%$)	✓		
Internal Standard (where applicable) shows acceptable recovery	✓		

Other QA/QC

Holding time conforming With Method Specification	✓
Chain of Custody Attached	✓

N/A = Not Applicable

Comments

1. Laboratory QA/QC including Duplicates, Matrix Spike Duplicates, and check/reference samples are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results available on request. (Where applicable)
3. Surrogate description and recoveries are recorded in the Report. (Where applicable)
4. Acceptance criteria for specific analytes are listed on each QA/QC page.
5. Practical Quantitation Limit (PQL is typically 2-10 x method detection limit (MDL)).
6. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted.
7. Results are uncorrected for matrix spike or surrogate recoveries.

Sean Salisbury

per S. WYTHE B.Sc. (Hons)
Manager Environmental Melbourne

QAQC : Laboratory Control Sample(s)

Analyte	Level (ppm)	Level Detected			Recovery Details		
		Result1 (ppm)	Result2 (ppm)	Result3 (ppm)	Rec 1 (%)	Rec 2 (%)	Rec 3 (%)
E0230 TPH in Water by Purge & Trap (µg/L)							
C6-C9 Fraction	200	200			101%		
E0221 TPH in Water (µg/L)							
C10-C14 Fraction							
C15-C28 Fraction	5500	5400			98%		
C29-C36 Fraction							
E0010 BTEX (P&T) in Water (µg/L)							
Benzene	10	9.4			94%		
Toluene	10	10			97%		
Ethylbenzene	10	10			100%		
Total Xylenes	30	30			100%		
E4870 Dissolved Metals in Waters							
<i>Analysed in AMDEL NSW</i>							
<i>NATA Accreditation No. 1464</i>							
Lead	0.100	0.106			106%		

PQL = Practical Quantitation Limit
 -- = Not Applicable
 nd = <PQL

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/l (ppm) unless otherwise specified

QAQC : Method Blank(s)

ANALYTE	Sample ID PQL	Blank1	Blank2	Blank3	Blank4	Blank5
E0230 TPH in Water by Purge & Trap (µg/L)						
C6-C9 Fraction	20	nd				
E0221 TPH in Water (µg/L)						
C10-C14 Fraction	20	nd				
C15-C28 Fraction	100	nd				
C29-C36 Fraction	100	nd				
E0010 BTEX (P&T) in Water (µg/L)						
Benzene	0.5	nd				
Toluene	1	nd				
Ethylbenzene	1	nd				
Total Xylenes	3	nd				
E4870 Dissolved Metals in Waters						
<i>Analysed in AMDEL NSW</i>						
<i>ATA Accreditation No. 1464</i>						
Lead	0.001	nd				

PQL = Practical Quantitation Limit
 nd = < PQL
 -- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
 (W) Waters : mg/l (ppm) unless otherwise specified

CHAIN OF CUSTODY/ANALYSIS REQUEST – MOBIL PROJECTS

Page
of

ENVIRONMENTAL AND INDUSTRIAL SERVICES DIVISION

Trading as Australian Analytical Laboratories Pty Ltd

ABN 30 008 127 802

508 City Road
SOUTH MELBOURNE VIC 3205
Telephone: (03) 9699 8333
Facsimile: (03) 9699 9695

CERTIFICATE OF ANALYSIS

Contents :

1. Cover Page
2. Analysis Report Pages
3. QA/QC Appendix
4. Additional Reports - External (if applicable)

Report No. : 1M00344
Attention :
Client : Golder Associates
Samples : 2
Reference : 00673025/MAREEBA
Project : 00673025/MAREEBA
Received Samples : 14/03/01
Date Reported : 21/03/01
Instructions : 14/03/01

PLEASE SEE FOLLOWING PAGE FOR METHOD LISTING

RESULTS

All samples were analysed as received. This report relates specifically to the samples received. Results relate to the source material only to the extent that the samples as supplied are truly representative of the sample source. This report replaces any preliminary results issued. Note that for schemes indicated with * NATA accreditation does not cover the performance of this service. Three significant figures (or 2 for < 10PQL) are reported for statistical purposes only. THIS REPORT HAS BEEN AUTO-AUTHORIZED BY NATA SIGNATORIES FOR PDF FORMAT. REFER TO THE SCHEME DESCRIPTIONS FOR FURTHER INFORMATION. PLEASE SEE ATTACHED PAGES FOR RESULTS

sch4p4(6) Personal information

S. Wythe B.Sc.(Hons)
Manager Environmental Melbourne



Report No. : 1M00344

<u>Initials</u>	<u>Name</u>
SW	Scott Wythe
SS	Sean Salisbury
KC	Kon Christopoulos
NS	Nina Shedrin
AK	Ammata Kittikhoun

<u>Authorization Code</u>
VOC, SVO INO, MET, WAT, EXT
VOC, SVO, INO, MET, WAT, EXT
VOC, SVO, EXT
VOC, SVO, EXT
VOC, MET, WAT, INO, EXT

<u>Method</u>	<u>Description</u>	<u>Extracted</u>	<u>Analysed</u>	<u>Authorised</u>
E0230	TPH C6-C9 by purge & trap	21/03/01	21/03/01	SS VOC
E0221	TPH (C10-C36)	21/03/01	21/03/01	SS SVO
E0010	Benzene, Toluene, Ethylbenzene & Xylene	21/03/01	21/03/01	SS VOC

Project : 00673025/MAREEBA

Page 1 of 1
plus Cover Page

[illegible]

PQL = Practical Quantitation Limit

LNR = Samples Listed not Received

$$nd = \angle PQL$$

-- = Not Applicable

Soils : mg/kg (ppm) dry weight unless otherwise specified

Waters : mg/L (ppm) unless otherwise specified in Method Header

Leachates : mg/L (ppm) in leachate unless otherwise specified in
Method Header



AMDEL INTERNAL QUALITY ASSURANCE REVIEW.

Job No. 1M00344

All testing in this report is covered by Amdel NATA accreditation number 3163, unless stated otherwise.

General

1. Laboratory QA/QC including Method Blanks, Duplicates, Matrix Spikes, Laboratory Control Samples or CRM's are included in this QA/QC appendix. (Where applicable)
2. Inter-Laboratory proficiency trial results are available upon request.
3. PQL's are matrix dependent and are increased accordingly where sample extracts are diluted due to interferences.
4. Results are uncorrected for matrix spike or surrogate recoveries.
5. Where 3 and 2 significant figures are reported for $>10\times$ PQL and $<10\times$ PQL respectively, the last figure is uncertain and is provided for statistical purposes only.
6. Samples duplicated or spiked are from this job and are identified in the following QA/QC report.
7. SVOC analyses on waters are performed on homogenized, unfiltered samples.

Maximum Holding Times for Soils, Sediments and Waters

Parameter

Holding Times

Soils

Volatile and Semi-Volatile Organic Analysis

Extracted in 14 days, analysed within 40 days.

Metals

Extracted and analysed within 28 days-6 months.

Inorganics*

Extracted and analysed within 7-28 days.

TCLPs*

Extracted and analysed within 14 days,
(Zero Headspace-TCLP 7 days).

Waters

Volatile Organic Analysis

Extracted in 7 days, analysed within 40 days.

Semi-Volatile Organic Analysis

Extracted in 7 days, analysed within 40 days.

Inorganics*

Analysed within 24 hrs-28 days.

Metals (dissolved metals should be
supplied field filtered)

Prepared and analysed within 28 days.

* Please refer to 'Preservation Information Chart for Soils, Sediments & Waters' for further information. (ISFORM.098). Holding times may be extended with the use of preservation bottles and/or freezing samples. Reference: USEPA SW846 and AMDEL SPM-01 (incorporating NEPM Guidelines).

Chain of Custody and Sample Integrity

Yes/No/NA

Chain of Custody received with samples
Custody seals were received intact, if used
Samples were received chilled and in good condition
Samples received appropriately preserved for all tests
VOC/SVOC samples were received in teflon lined containers
Volatiles samples received with Zero Headspace
Samples analysed within recommended holding times
Chain of Custody completed by Amdel and attached

Yes
Yes
Yes
Yes
Yes
Yes
Yes
Yes

Chromatography Calibration/Acceptance Criteria

Retention time window meets acceptance criteria (b2%)
Reference standard meets acceptance criteria (b10%)
Recalibration standard meets acceptance criteria (b15%)
Internal standard recovery acceptable.

Yes
Yes
Yes
Yes

AMDEL INTERNAL QUALITY ASSURANCE REVIEW Cont..

Amdel QA/QC Compliance Assessment

<u>Yes/No/NA</u>	
Yes	Surrogates performed on all appropriate GC analyses and meet acceptance limits (70% - 130% recovery*).
NA	Matrix Spikes performed once per process batch and at least 1 in 20 samples (Results meet acceptance limits - 70% - 130% recovery* or 80% - 120% recovery* for inorganics in water.)
Yes	Laboratory Control samples performed once per process batch and at least 1 in 20 samples (Results meet acceptance limits - 70% - 130% recovery* in soil or 80%-120%/90-110% recovery* for waters.)
NA	Laboratory Duplicate samples performed once per process batch and at least 1 in 10 samples (Results meet acceptance limits). <div data-bbox="405 837 724 927"> <p>< 4 PQL - +/- 2 PQL</p> <p>4-10 PQL - 0-25 or 50% RPD</p> <p>> 10 PQL - 0-10 or 30% RPD</p> </div>
Yes	Method Blanks performed once per process batch and at least 1 in 20 samples (Results not detected at the PQL).
	<p>N/A=Not Applicable.</p> <ul style="list-style-type: none"> * Phenols 50% - 130% recovery * SVOCs 60% - 130% recovery * Phenoxy Acid Herbicides 60% - 140% recovery

QA/QC Appendix

Please refer to the following pages for the QA/QC data.

sch4p4(6) Personal information

S. Wythe B.Sc.(Hons)
Manager Environmental Melbourne



AMDEL STANDARD LAB QUALIFIER CODES

Job NO. 1M00344

General

Lab Qualifier Codes	Description
*	PQLs raised due to matrix interference.
@	PQLs raised due to the limited sample volume submitted.
\$	Mass imbalance indicates the presence of other ions not measured as part of this procedure.
&	Surrogate recoveries could not be determined due to the dilution required to quantitate the analyte.
IS	Insufficient sample to conduct analysis
nd	<PQL
--	Not applicable
LNR	Sample listed on the COC, but not received.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presences of an analyte for which there is presumptive evidence to make a 'tentative' identification.
NJ	The analysis indicates the presences of an analyte that has been 'tentative' identified, and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The presence or absence of the analyte cannot be verified.
#	Spike concentration < 10% of the sample analyte concentration, thus spike recovery cannot be accurately determined.
A	Spike recovery outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.
B	Duplicate %RPD outside the recommended acceptance criteria. Further re-analysis indicating a sample matrix interference.
C	Sample not received in a suitable timeframe to allow completion within the recommended holding time.
D	The concentration of the Matrix Spike is at a level that recovery cannot be accurately determined.

Page 1 of 2

QAQC : Laboratory Control Sample(s)

[illegible]

PQL = Practical Quantitation Limit
 -- = Not Applicable
 nd = <PQL

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm) unless otherwise specified

Page 2 of 2

QAQC : Method Blank(s)

[illegible]

PQL = Practical Quantitation Limit
nd = <PQL
-- = Not Applicable

(S) Soils : mg/kg (ppm) dry weight
(W) Waters : mg/l (ppm) unless otherwise specified

APPENDIX B

**BOREHOLE REPORT FOR ADDITIONAL
GROUNDWATER MONITORING WELL**



REPORT OF BOREHOLE: BH44

CLIENT: Mobil Oil Australia Pty Ltd
PROJECT: Site Remediation & Validation
LOCATION: 27 Reynolds St, Mareeba
JOB NO: 00673025

POSITION: Refer to Site Plan
INCLINATION: -90°
HOLE DEPTH: 12.00 m

SHEET: 1 OF 1
DRILL RIG: Daly 1000
DRILLER: Walker Drilling
LOGGED: B.JI
CHECKED: [Signature]
DATE: 12/10/00
DATE: 13/8/01

Drilling				Sampling			Field Material Description and Instrumentation			
METHOD	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED	GRAPHIC LOG	SOIL / ROCK MATERIAL DESCRIPTION	AIRLIFT YIELD (L/s)	CONSTRUCTION	
AV		0	0.20	0.30-0.40m PID = 5.9 ppm			FILL:- Sandy CLAY Medium plasticity, brown			
				0.50-0.60m PID = 1.3 ppm			CLAY High plasticity, red brown			
				1.00-1.10m PID = 4.5 ppm						
				1.50-1.60m PID = 5.5 ppm						
				2.00-2.10m PID = 4.5 ppm						
			2.80	2.50-2.60m PID = 3.5 ppm						
RAB		3		3.00-3.10m PID = 4.5 ppm			Weathered BASALT Green, grey and light brown			
				3.50-3.60m PID = 4.7 ppm						
				4.00-4.10m PID = 3.0 ppm						
				4.50-4.60m PID = 3.5 ppm						
			5.80	5.50-5.60m PID = 1.5 ppm						
		6					Becoming very hard below 5.8m			
		7								
		8								
		9								
		10								
		11								
		12	12.00				BOREHOLE DISCONTINUED @ 12m			
		13								
		14								
		15								

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for Environmental purposes only, without attempt to consider geotechnical properties or the geotechnical significance of the materials encountered. As such it should not be relied upon for Geotechnical purposes.

GAP gINT FN. F05
RLO

EXPLANATION OF NOTES, ABBREVIATIONS & TERMS USED ON BOREHOLE AND TEST PIT REPORTS

DRILLING/EXCAVATION METHOD

AS	Auger Screwing	RD	Rotary blade or drag bit	HQ	Diamond Core - 63 mm
AV	Auger V-Bit	RT	Rotary Tricone bit	NMLC	Diamond Core - 52 mm
ATC	Auger TC-Bit	RAB	Rotary Air Blast	NQ	Diamond Core - 47 mm
HA	Hand Auger	RC	Reverse Circulation	BH	Tractor mounted backhoe
WB	Washbore or Bailer	PT	Push Tube	EX	Tracked hydraulic excavator
JET	Jetting	CT	Cable Tool Rig	EE	Existing Excavation

PENETRATION/EXCAVATION RESISTANCE

- L** Low resistance. Rapid penetration possible with little effort from the equipment used.
- M** Medium resistance. Excavation/possible at an acceptable rate with moderate effort from the equipment used.
- H** High resistance to penetration/excavation. Further penetration is possible at a slow rate and requires significant effort from the equipment.
- R** Refusal or Practical Refusal. No further progress possible without the risk of damage or unacceptable wear to the digging implement or machine.

These assessments are subjective and are dependent on many factors including the equipment power, weight, condition of excavation or drilling tools, and the experience of the operator.

WATER

	Water level at date shown		Partial water loss
	Water inflow		Complete water loss

GROUNDWATER NOT OBSERVED The observation of groundwater, whether present or not, was not possible due to drilling water, surface seepage or cave in of the borehole/test pit.

GROUNDWATER NOT ENCOUNTERED The borehole/test pit was dry soon after excavation, however groundwater could be present in less permeable strata. Inflow may have been observed had the borehole/test pit been left open for a longer period.

SAMPLING AND TESTING

SPT	Standard Penetration Test to AS1289.6.3.1-1993
4,7,11 N=18	4,7,11 = Blows per 150mm. N = Blows per 300mm penetration following 150mm seating
30/80mm	Where practical refusal occurs, the blows and penetration for that interval are reported
RW	Penetration occurred under the rod weight only
HW	Penetration occurred under the hammer and rod weight only
HB	Hammer double bouncing on anvil
DS	Disturbed sample
FP	Field permeability test over section noted
FV	Field vane shear test expressed as shear strength s_v
PID	Photoionisation Detector reading in ppm
PM	Pressuremeter test over section noted
PP	Pocket penetrometer test (expressed as instrument reading in kPa)
U63	Thin walled tube sample - number indicates nominal sample diameter in millimetres

Ranking of Visually Observable Contamination and Odour (for specific soil contamination assessment projects)

R = 0	No visible evidence of contamination	R = A	No non-natural odours identified
R = 1	Slight evidence of visible contamination	R = B	Slight non-natural odours identified
R = 2	Visible contamination	R = C	Moderate non-natural odours identified
R = 3	Significant visible contamination	R = D	Strong non-natural odours identified

ROCK CORE RECOVERY

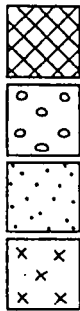
TCR = Total Core Recovery	SCR = Solid Core Recovery	RQD = Rock Quality Designation
$= \frac{\text{Length of core recovered}}{\text{Length of core run}} \times 100\%$	$= \frac{\sum \text{Length of cylindrical core recovered}}{\text{Length of core run}} \times 100$	$= \frac{\sum \text{Axial lengths of core > 100mm long}}{\text{Length of core run}} \times 100$

ROCK STRENGTH TEST RESULTS

-  Point Load Strength Index (Is50) (Axial test - MPa)
-  Point Load Strength Index (Is50) (Diametral test - MPa)
-  Uniaxial Compressive Strength (UCS) test result (MPa)

METHOD OF SOIL DESCRIPTION USED ON BOREHOLE AND TEST PIT REPORTS

GRAPHIC LOG - TYPICAL SYMBOLS FOR SOILS



FILL

GRAVEL (GP OR GW)

SAND (SP or SW)

SILT (ML or MH)

Modified from BS5930 - 1981



CLAY (CL or CI)

CLAY (CH)

Organic Soils (OL or OH or Pt)

COBBLES or BOULDERS

Combinations of these basic symbols may be used to indicate mixed materials such as sandy clay.

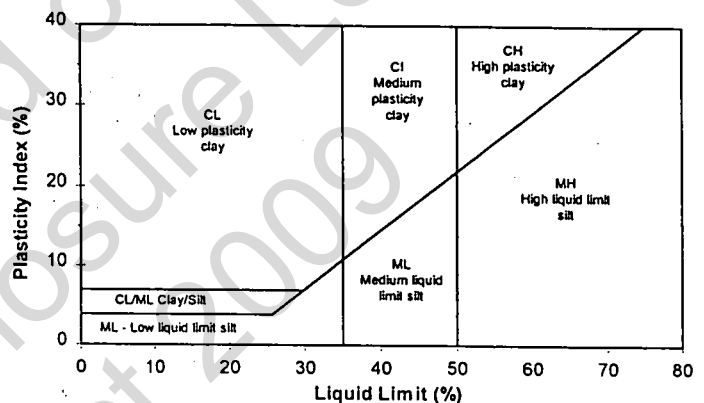
CLASSIFICATION AND INFERRED STRATIGRAPHY

Soil and Rock is classified and described in Reports of Boreholes and Test Pits using the preferred method given in AS1726 - 1993, Appendix A. The material properties are assessed in the field by visual/tactile methods.

Particle Size

Major Division	Sub Division	Particle Size
BOULDERS		> 200 mm
COBBLES		60 to 200 mm
GRAVEL	Coarse	20 to 60 mm
	Medium	6.0 to 20 mm
	Fine	2.0 to 6.0 mm
SAND	Coarse	0.6 to 2.0 mm
	Medium	0.2 to 0.6 mm
	Fine	0.075 to 0.2 mm
SILT		0.002 to 0.075mm
CLAY		< 0.002 mm

Plasticity Properties



MOISTURE CONDITION

AS1726 - 1993

Symbol	Term	Description
D	Dry	Sands and gravels are free flowing. Clays & Silts may be brittle or friable and powdery.
M	Moist	Soils are darker than in the dry condition & may feel cool. Sands and gravels tend to cohere
W	Wet	Soils exude free water. Sands and gravels tend to cohere.

CONSISTENCY AND DENSITY

AS1726 - 1993

Symbol	Term	Undrained Shear Strength	Symbol	Term	Density Index %	SPT "N" *
VS	Very Soft	0 to 12 kPa	VL	Very Loose	Less than 15	0 to 4
S	Soft	12 to 25 kPa	L	Loose	15 to 35	4 to 10
F	Firm	25 to 50 kPa	MD	Medium Dense	35 to 65	10 to 30
St	Stiff	50 to 100 kPa	D	Dense	65 to 85	30 to 50
VSt	Very Stiff	100 to 200 kPa	VD	Very Dense	above 85	Above 50
H	Hard	above 200 kPa				

SPT correlations may be subject to corrections for overburden pressure and equipment type.

In the absence of test results, consistency and density may be assessed from correlations with the observed behaviour of the material.

APPENDIX C
RISC MODELLING INPUT/OUTPUT SUMMARIES

Title:

Wareeba Fuel Depot - Scenario 1a PAGE 1.
08/01/01 10:04

Scenarios:

Child Resident - Typical

Routes:

INGESTION OF GROUNDWATER

DERMAL CONTACT DURING SHOWER

Chemicals:

Benzene

Ethylbenzene

Toluene

TPH Aromatic C10-12

TPH Aromatic C16-21

TPH Aromatic C21-35

TPH Aromatic C5-7

Xylenes (mixed)

SCENARIO:

SUMMARY OF INPUT PARAMETERS

1

Lifetime and Body Weight

Body Weight (kg)

16.00

Lifetime (years)

70.00

INGESTION OF GROUNDWATER

Ingestion rate (l/day)

.50

Exp. Freq Groundwater (events/year)

350.00

Exp. Duration Groundwater (years)

5.00

Absorption Adjustment Factor for

Ingestion of water (-)

Benzene

1.0

Ethylbenzene

1.0

Toluene

1.0

TPH Aromatic C10-12

1.0

TPH Aromatic C16-21

1.0

TPH Aromatic C21-35

1.0

TPH Aromatic C5-7

1.0

Xylenes (mixed)

1.0

DERMAL CONTACT DURING SHOWER

Total Skin Surface Area (cm²)

6800.00

Time in Shower (hour/day)

.12

Exp. Freq Groundwater (events/year)

350.00

Exp. Duration Groundwater (years)

5.00

Dermal Permeability Coefficient (cm/hour)

Benzene

2.10E-02

Ethylbenzene

7.40E-02

Toluene

4.50E-02

TPH Aromatic C10-12

8.70E-02

TPH Aromatic C16-21

.30

TPH Aromatic C21-35

1.5

TPH Aromatic C5-7

1.80E-02

Xylenes (mixed)

8.00E-02

Absorption Adjustment Factor for

Dermal Exposure to Water (-)

Benzene

1.0

Ethylbenzene

1.0

Toluene

1.0

TPH Aromatic C10-12

1.0

TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

Scenario 1a7a0E2

MEDIA CONCENTRATIONS

Concentration in Groundwater (mg/l)

Obtained from Fate and Transport output

AVERAGE Concentration (over exposure duration)
(used to calculate carcinogenic risk)

Exposure Duration (years)	5.0
Benzene	5.29E-12
Ethylbenzene	2.84E-12
Toluene	1.26E-13
TPH Aromatic C10-12	1.44E-10
TPH Aromatic C16-21	.00
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	9.55E-11
Xylenes (mixed)	5.18E-11

Concentration used to calculate hazard index
(Minimum of 7 years or exposure duration)

Exposure Duration (years)	5.0
Benzene	5.29E-12
Ethylbenzene	2.84E-12
Toluene	1.26E-13
TPH Aromatic C10-12	1.44E-10
TPH Aromatic C16-21	.00
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	9.55E-11
Xylenes (mixed)	5.18E-11

SLOPE FACTORS AND REFERENCE DOSES

Ingestion Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Ingestion Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10
Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

Dermal Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Dermal Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10

Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

SCENARIO 6 Page 3

SUMMARY OF RESULTS

INGESTION OF GROUNDWATER

Benzene

CDI (mg/kg-day)	1.59E-13
LADD (mg/kg-day)	1.13E-14
Cancer Risk (-)	3.28E-16
Hazard Index (-)	0.00E+00

Ethylbenzene

CDI (mg/kg-day)	8.51E-14
LADD (mg/kg-day)	6.08E-15
Cancer Risk (-)	0.00E+00
Hazard Index (-)	8.51E-13

Toluene

CDI (mg/kg-day)	3.77E-15
LADD (mg/kg-day)	2.69E-16
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.88E-14

TPH Aromatic C10-12

CDI (mg/kg-day)	4.32E-12
LADD (mg/kg-day)	3.08E-13
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.08E-10

TPH Aromatic C16-21

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C21-35

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C5-7

CDI (mg/kg-day)	2.86E-12
LADD (mg/kg-day)	2.04E-13
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.43E-11

Xylenes (mixed)

CDI (mg/kg-day)	1.55E-12
LADD (mg/kg-day)	1.11E-13
Cancer Risk (-)	0.00E+00
Hazard Index (-)	7.77E-13

DERMAL CONTACT DURING SHOWER

CDI (mg/kg-day)	5.43E-15
LADD (mg/kg-day)	3.88E-16
Cancer Risk (-)	1.13E-17
Hazard Index (-)	0.00E+00

Ethylbenzene

CDI (mg/kg-day)	1.03E-14
LADD (mg/kg-day)	7.34E-16
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.03E-13

Toluene

CDI (mg/kg-day)	2.77E-16
LADD (mg/kg-day)	1.98E-17
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.38E-15

TPH Aromatic C10-12

CDI (mg/kg-day)	6.13E-13
LADD (mg/kg-day)	4.38E-14
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.53E-11

TPH Aromatic C16-21

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C21-35

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C5-7

CDI (mg/kg-day)	8.41E-14
LADD (mg/kg-day)	6.01E-15
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.20E-13

Xylenes (mixed)

CDI (mg/kg-day)	2.03E-13
LADD (mg/kg-day)	1.45E-14
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.01E-13

SUMMARY OF HAZARD QUOTIENTS

Scenario 1a Pages

CASE 1:

Child Resident - Typical

	Ingestion of Groundwater	Dermal Contact Shower	TOTAL
Ethylbenzene	8.5E-13	1.0E-13	9.5E-13
Toluene	1.9E-14	1.4E-15	2.0E-14
TPH Aromatic C10-12	1.1E-10	1.5E-11	1.2E-10
TPH Aromatic C16-21	0.0E+00	0.0E+00	0.0E+00
TPH Aromatic C21-35	0.0E+00	0.0E+00	0.0E+00
TPH Aromatic C5-7	1.4E-11	4.2E-13	1.5E-11
Xylenes (mixed)	7.8E-13	1.0E-13	8.8E-13
TOTAL	1.2E-10	1.6E-11	1.4E-10

NOTE: A zero hazard index may indicate that a RfD was not entered for that chemical.

SUMMARY OF CARCINOGENIC RISK

SCENARIO 1, PAGE 1

CASE 1:

Child Resident - Typical

	Ingestion of Groundwater	Dermal Contact Shower	TOTAL
Benzene	3.3E-16	1.1E-17	3.4E-16
TOTAL	3.3E-16	1.1E-17	3.4E-16

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DES Disclosure Log
RTI Act 2009

08/01/01 10:14

Scenarios:

Child Resident - Typical

Routes:

INGESTION OF GROUNDWATER
DERMAL CONTACT DURING SHOWER

Chemicals:

Benzene
Ethylbenzene
Toluene
TPH Aromatic C10-12
TPH Aromatic C16-21
TPH Aromatic C21-35
TPH Aromatic C5-7
Xylenes (mixed)

SCENARIO:

SUMMARY OF INPUT PARAMETERS

1

Lifetime and Body Weight

Body Weight (kg)	16.00
Lifetime (years)	70.00

INGESTION OF GROUNDWATER

Ingestion rate (l/day)	.50
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Absorption Adjustment Factor for Ingestion of water (-)	
Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0
TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

DERMAL CONTACT DURING SHOWER

Total Skin Surface Area (cm ²)	6800.00
Time in Shower (hour/day)	.12
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Dermal Permeability Coefficient (cm/hour)	
Benzene	2.10E-02
Ethylbenzene	7.40E-02
Toluene	4.50E-02
TPH Aromatic C10-12	8.70E-02
TPH Aromatic C16-21	.30
TPH Aromatic C21-35	1.5
TPH Aromatic C5-7	1.80E-02
Xylenes (mixed)	8.00E-02

Absorption Adjustment Factor for
Dermal Exposure to Water (-)

Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0

TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

MEDIA CONCENTRATIONS

Concentration in Groundwater (mg/l)

Obtained from Fate and Transport output

AVERAGE Concentration (over exposure duration)
(used to calculate carcinogenic risk)

Exposure Duration (years)	5.0
Benzene	.00
Ethylbenzene	.00
Toluene	.00
TPH Aromatic C10-12	.00
TPH Aromatic C16-21	.00
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	.00
Xylenes (mixed)	.00

Concentration used to calculate hazard index
(Minimum of 7 years or exposure duration)

Exposure Duration (years)	5.0
Benzene	.00
Ethylbenzene	.00
Toluene	.00
TPH Aromatic C10-12	.00
TPH Aromatic C16-21	.00
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	.00
Xylenes (mixed)	.00

SLOPE FACTORS AND REFERENCE DOSES

Ingestion Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Ingestion Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10
Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

Dermal Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Dermal Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10

Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

Scenario 1b Page 3

SUMMARY OF RESULTS

INGESTION OF GROUNDWATER

Benzene

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

Ethylbenzene

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

Toluene

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C10-12

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C16-21

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C21-35

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C5-7

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

Xylenes (mixed)

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

DERMAL CONTACT DURING SHOWER

Benzene

File A

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Release

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
Ethylbenzene	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
Toluene	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C10-12	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C16-21	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C21-35	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C5-7	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
Xylenes (mixed)	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

Title:
Mareeba Fuel Depot - Scenario 1C
08/01/01 10:05

PAGE 1

Scenarios:
Child Resident - Typical

Routes:
INGESTION OF GROUNDWATER
DERMAL CONTACT DURING SHOWER

Chemicals:
Benzene
Ethylbenzene
Toluene
TPH Aromatic C10-12
TPH Aromatic C16-21
TPH Aromatic C21-35
TPH Aromatic C5-7
Xylenes (mixed)

SUMMARY OF INPUT PARAMETERS SCENARIO:
1

Lifetime and Body Weight

Body Weight (kg)	16.00
Lifetime (years)	70.00

INGESTION OF GROUNDWATER

Ingestion rate (l/day)	.50
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Absorption Adjustment Factor for Ingestion of water (-)	
Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0
TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

DERMAL CONTACT DURING SHOWER

Total Skin Surface Area (cm ²)	6800.00
Time in Shower (hour/day)	.12
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Dermal Permeability Coefficient (cm/hour)	
Benzene	2.10E-02
Ethylbenzene	7.40E-02
Toluene	4.50E-02
TPH Aromatic C10-12	8.70E-02
TPH Aromatic C16-21	.30
TPH Aromatic C21-35	1.5
TPH Aromatic C5-7	1.80E-02
Xylenes (mixed)	8.00E-02

Absorption Adjustment Factor for
Dermal Exposure to Water (-)

Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0

TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

MEDIA CONCENTRATIONS

Concentration in Groundwater (mg/l)

Obtained from Fate and Transport output

AVERAGE Concentration (over exposure duration)
(used to calculate carcinogenic risk)

Exposure Duration (years)	5.0
Benzene	2.07E-08
Ethylbenzene	1.17E-08
Toluene	5.05E-10
TPH Aromatic C10-12	6.93E-07
TPH Aromatic C16-21	2.65E-08
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	3.73E-07
Xylenes (mixed)	2.06E-07

Concentration used to calculate hazard index
(Minimum of 7 years or exposure duration)

Exposure Duration (years)	5.0
Benzene	2.07E-08
Ethylbenzene	1.17E-08
Toluene	5.05E-10
TPH Aromatic C10-12	6.93E-07
TPH Aromatic C16-21	2.65E-08
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	3.73E-07
Xylenes (mixed)	2.06E-07

SLOPE FACTORS AND REFERENCE DOSES

Ingestion Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Ingestion Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10
Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

Dermal Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Dermal Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10

Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

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SUMMARY OF RESULTS

INGESTION OF GROUNDWATER

Benzene

CDI (mg/kg-day)	6.20E-10
LADD (mg/kg-day)	4.43E-11
Cancer Risk (-)	1.28E-12
Hazard Index (-)	0.00E+00

Ethylbenzene

CDI (mg/kg-day)	3.50E-10
LADD (mg/kg-day)	2.50E-11
Cancer Risk (-)	0.00E+00
Hazard Index (-)	3.50E-09

Toluene

CDI (mg/kg-day)	1.51E-11
LADD (mg/kg-day)	1.08E-12
Cancer Risk (-)	0.00E+00
Hazard Index (-)	7.56E-11

TPH Aromatic C10-12

CDI (mg/kg-day)	2.08E-08
LADD (mg/kg-day)	1.48E-09
Cancer Risk (-)	0.00E+00
Hazard Index (-)	5.19E-07

TPH Aromatic C16-21

CDI (mg/kg-day)	7.93E-10
LADD (mg/kg-day)	5.67E-11
Cancer Risk (-)	0.00E+00
Hazard Index (-)	2.64E-08

TPH Aromatic C21-35

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C5-7

CDI (mg/kg-day)	1.12E-08
LADD (mg/kg-day)	7.99E-10
Cancer Risk (-)	0.00E+00
Hazard Index (-)	5.59E-08

Xylenes (mixed)

CDI (mg/kg-day)	6.19E-09
LADD (mg/kg-day)	4.42E-10
Cancer Risk (-)	0.00E+00
Hazard Index (-)	3.09E-09

DERMAL CONTACT DURING SHOWER

CDI (mg/kg-day)	2.12E-11
LADD (mg/kg-day)	1.52E-12
Cancer Risk (-)	4.40E-14
Hazard Index (-)	0.00E+00
Ethylbenzene	
CDI (mg/kg-day)	4.23E-11
LADD (mg/kg-day)	3.02E-12
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.23E-10
Toluene	
CDI (mg/kg-day)	1.11E-12
LADD (mg/kg-day)	7.94E-14
Cancer Risk (-)	0.00E+00
Hazard Index (-)	5.55E-12
TPH Aromatic C10-12	
CDI (mg/kg-day)	2.95E-09
LADD (mg/kg-day)	2.11E-10
Cancer Risk (-)	0.00E+00
Hazard Index (-)	7.37E-08
TPH Aromatic C16-21	
CDI (mg/kg-day)	3.88E-10
LADD (mg/kg-day)	2.77E-11
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.29E-08
TPH Aromatic C21-35	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C5-7	
CDI (mg/kg-day)	3.28E-10
LADD (mg/kg-day)	2.35E-11
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.64E-09
Xylenes (mixed)	
CDI (mg/kg-day)	8.08E-10
LADD (mg/kg-day)	5.77E-11
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.04E-10

Title:

Mareeba Fuel Depot - Scenario 2 *Page 1*
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Scenarios:

Worker - Typical

Routes:

INHALATION OF INDOOR AIR

Chemicals:

Benzene
Ethylbenzene
Toluene
TPH Aromatic C10-12
TPH Aromatic C16-21
TPH Aromatic C21-35
TPH Aromatic C5-7
Xylenes (mixed)

SUMMARY OF INPUT PARAMETERS

SCENARIO:

1

Lifetime and Body Weight

Body Weight (kg)	70.00
Lifetime (years)	70.00

INHALATION OF INDOOR AIR

Inhalation rate (m ³ /hr)	.63
Time indoors (hours/day)	4.00
Lung Retention Factor (-)	1.00
Exp. Freq. Indoor Air (events/yr)	125.00
Exp. Duration Indoor Air (yr)	4.00
Absorption Adjustment Factor for Inhalation (-)	

Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0
TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

MEDIA CONCENTRATIONS

Concentration in Indoor Air (mg/m³)

Obtained from Fate and Transport output

AVERAGE Concentration (over exposure duration)
(used to calculate carcinogenic risk)

Exposure Duration (years)	4.0
Benzene	5.32E-03
Ethylbenzene	2.33E-03
Toluene	4.44E-03
TPH Aromatic C10-12	.13
TPH Aromatic C16-21	2.39E-04
TPH Aromatic C21-35	1.62E-07
TPH Aromatic C5-7	6.6
Xylenes (mixed)	2.70E-02

Concentration used to calculate hazard index
(Minimum of 7 years or exposure duration)

Exposure Duration (years)	4.0
Benzene	5.32E-03
Ethylbenzene	2.33E-03
Toluene	4.44E-03

TPH Aromatic C10-12	.13
TPH Aromatic C16-21	2.39E-04
TPH Aromatic C21-35	1.62E-07
TPH Aromatic C5-7	6.6
Xylenes (mixed)	2.70E-02

SLOPE FACTORS AND REFERENCE DOSES

Inhalation Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Inhalation Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.29
Toluene	.11
TPH Aromatic C10-12	5.50E-02
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	.11
Xylenes (mixed)	.20

SUMMARY OF RESULTS

INHALATION OF INDOOR AIR

Benzene

CDI (mg/kg-day)	6.50E-05
LADD (mg/kg-day)	3.72E-06
Cancer Risk (-)	1.08E-07
Hazard Index (-)	0.00E+00

Ethylbenzene

CDI (mg/kg-day)	2.85E-05
LADD (mg/kg-day)	1.63E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	9.84E-05

Toluene

CDI (mg/kg-day)	5.43E-05
LADD (mg/kg-day)	3.10E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.76E-04

TPH Aromatic C10-12

CDI (mg/kg-day)	1.54E-03
LADD (mg/kg-day)	8.81E-05
Cancer Risk (-)	0.00E+00
Hazard Index (-)	2.80E-02

TPH Aromatic C16-21

CDI (mg/kg-day)	2.92E-06
LADD (mg/kg-day)	1.67E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C21-35

CDI (mg/kg-day)	1.98E-09
LADD (mg/kg-day)	1.13E-10
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C5-7

CDI (mg/kg-day)	8.13E-02
LADD (mg/kg-day)	4.64E-03
Cancer Risk (-)	0.00E+00
Hazard Index (-)	7.39E-01

Xylenes (mixed)

CDI (mg/kg-day)	3.31E-04
LADD (mg/kg-day)	1.89E-05
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.65E-03

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SUMMARY OF HAZARD QUOTIENTS

SCENARIO 2 PAGE 4

CASE 1:
Worker - Typical

Inhalation
of
Indoor Air TOTAL

Ethylbenzene	9.8E-05	9.8E-05
Toluene	4.8E-04	4.8E-04
TPH Aromatic C10-12	2.8E-02	2.8E-02
TPH Aromatic C5-7	7.4E-01	7.4E-01
Xylenes (mixed)	1.7E-03	1.7E-03
TOTAL	7.7E-01	7.7E-01

NOTE: A zero hazard index may indicate that a RfD was not entered for that chemical.

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CASE 1:
Worker - Typical

Inhalation
of
Indoor Air TOTAL

Benzene

1.1E-07 1.1E-07

TOTAL

1.1E-07 1.1E-07

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Title:
Mareeba Fuel Depot - Scenario 3a
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Page 1

Scenarios:
Child Resident - Typical

Routes:
INGESTION OF GROUNDWATER
DERMAL CONTACT DURING SHOWER

Chemicals:
Benzene
Ethylbenzene
Toluene
TPH Aromatic C10-12
TPH Aromatic C16-21
TPH Aromatic C21-35
TPH Aromatic C5-7
Xylenes (mixed)

SUMMARY OF INPUT PARAMETERS

SCENARIO:

1

Lifetime and Body Weight

Body Weight (kg)	16.00
Lifetime (years)	70.00

INGESTION OF GROUNDWATER

Ingestion rate (l/day)	.50
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Absorption Adjustment Factor for Ingestion of water (-)	
Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0
TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

DERMAL CONTACT DURING SHOWER

Total Skin Surface Area (cm ²)	6800.00
Time in Shower (hour/day)	.12
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Dermal Permeability Coefficient (cm/hour)	
Benzene	2.10E-02
Ethylbenzene	7.40E-02
Toluene	4.50E-02
TPH Aromatic C10-12	8.70E-02
TPH Aromatic C16-21	.30
TPH Aromatic C21-35	1.5
TPH Aromatic C5-7	1.80E-02
Xylenes (mixed)	8.00E-02

Absorption Adjustment Factor for
Dermal Exposure to Water (-)

Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0

TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

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MEDIA CONCENTRATIONS

Concentration in Groundwater (mg/l)

Obtained from Fate and Transport output

AVERAGE Concentration (over exposure duration)
(used to calculate carcinogenic risk)

Exposure Duration (years)	5.0
Benzene	8.72E-05
Ethylbenzene	4.36E-05
Toluene	7.96E-05
TPH Aromatic C10-12	4.39E-03
TPH Aromatic C16-21	1.39E-04
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	2.11E-02
Xylenes (mixed)	2.19E-04

Concentration used to calculate hazard index
(Minimum of 7 years or exposure duration)

Exposure Duration (years)	5.0
Benzene	8.72E-05
Ethylbenzene	4.36E-05
Toluene	7.96E-05
TPH Aromatic C10-12	4.39E-03
TPH Aromatic C16-21	1.39E-04
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	2.11E-02
Xylenes (mixed)	2.19E-04

SLOPE FACTORS AND REFERENCE DOSES

Ingestion Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Ingestion Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10
Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

Dermal Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Dermal Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10

Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

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SUMMARY OF RESULTS

INGESTION OF GROUNDWATER

Benzene

CDI (mg/kg-day)	2.61E-06
LADD (mg/kg-day)	1.87E-07
Cancer Risk (-)	5.41E-09
Hazard Index (-)	0.00E+00

Ethylbenzene

CDI (mg/kg-day)	1.31E-06
LADD (mg/kg-day)	9.33E-08
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.31E-05

Toluene

CDI (mg/kg-day)	2.39E-06
LADD (mg/kg-day)	1.70E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.19E-05

TPH Aromatic C10-12

CDI (mg/kg-day)	1.32E-04
LADD (mg/kg-day)	9.40E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	3.29E-03

TPH Aromatic C16-21

CDI (mg/kg-day)	4.16E-06
LADD (mg/kg-day)	2.97E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.39E-04

TPH Aromatic C21-35

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C5-7

CDI (mg/kg-day)	6.33E-04
LADD (mg/kg-day)	4.52E-05
Cancer Risk (-)	0.00E+00
Hazard Index (-)	3.17E-03

Xylenes (mixed)

CDI (mg/kg-day)	6.57E-06
LADD (mg/kg-day)	4.69E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	3.28E-06

DERMAL CONTACT DURING SHOWER

Benzene 18-292

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Release

CDI (mg/kg-day)	8.96E-08
LADD (mg/kg-day)	6.40E-09
Cancer Risk (-)	1.86E-10
Hazard Index (-)	0.00E+00
Ethylbenzene	
CDI (mg/kg-day)	1.58E-07
LADD (mg/kg-day)	1.13E-08
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.58E-06
Toluene	
CDI (mg/kg-day)	1.75E-07
LADD (mg/kg-day)	1.25E-08
Cancer Risk (-)	0.00E+00
Hazard Index (-)	8.76E-07
TPH Aromatic C10-12	
CDI (mg/kg-day)	1.87E-05
LADD (mg/kg-day)	1.34E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.67E-04
TPH Aromatic C16-21	
CDI (mg/kg-day)	2.04E-06
LADD (mg/kg-day)	1.46E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	6.79E-05
TPH Aromatic C21-35	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C5-7	
CDI (mg/kg-day)	1.86E-05
LADD (mg/kg-day)	1.33E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	9.30E-05
Xylenes (mixed)	
CDI (mg/kg-day)	8.57E-07
LADD (mg/kg-day)	6.12E-08
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.29E-07

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Scenarios:
Child Resident - Typical

Routes:
INGESTION OF GROUNDWATER
DERMAL CONTACT DURING SHOWER

Chemicals:
Benzene
Ethylbenzene
Toluene
TPH Aromatic C10-12
TPH Aromatic C16-21
TPH Aromatic C21-35
TPH Aromatic C5-7
Xylenes (mixed)

SUMMARY OF INPUT PARAMETERS

SCENARIO:

1

Lifetime and Body Weight

Body Weight (kg)	16.00
Lifetime (years)	70.00

INGESTION OF GROUNDWATER

Ingestion rate (l/day)	.50
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Absorption Adjustment Factor for Ingestion of water (-)	
Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0
TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

DERMAL CONTACT DURING SHOWER

Total Skin Surface Area (cm ²)	6800.00
Time in Shower (hour/day)	.12
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Dermal Permeability Coefficient (cm/hour)	
Benzene	2.10E-02
Ethylbenzene	7.40E-02
Toluene	4.50E-02
TPH Aromatic C10-12	8.70E-02
TPH Aromatic C16-21	.30
TPH Aromatic C21-35	1.5
TPH Aromatic C5-7	1.80E-02
Xylenes (mixed)	8.00E-02

Absorption Adjustment Factor for
Dermal Exposure to Water (-)

Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0

TPH Aromatic C16-21 1.0
 TPH Aromatic C21-35 1.0
 TPH Aromatic C5-7 1.0
 Xylenes (mixed) 1.0

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MEDIA CONCENTRATIONS

Concentration in Groundwater (mg/l)

Obtained from Fate and Transport output

AVERAGE Concentration (over exposure duration)
 (used to calculate carcinogenic risk)

Exposure Duration (years)	5.0
Benzene	.00
Ethylbenzene	.00
Toluene	.00
TPH Aromatic C10-12	.00
TPH Aromatic C16-21	.00
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	.00
Xylenes (mixed)	.00

Concentration used to calculate hazard index
 (Minimum of 7 years or exposure duration)

Exposure Duration (years)	5.0
Benzene	.00
Ethylbenzene	.00
Toluene	.00
TPH Aromatic C10-12	.00
TPH Aromatic C16-21	.00
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	.00
Xylenes (mixed)	.00

SLOPE FACTORS AND REFERENCE DOSES

Ingestion Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Ingestion Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10
Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

Dermal Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Dermal Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10

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Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

SUMMARY OF RESULTS

INGESTION OF GROUNDWATER

Benzene

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

Ethylbenzene

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

Toluene

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C10-12

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C16-21

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C21-35

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C5-7

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

Xylenes (mixed)

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

DERMAL CONTACT DURING SHOWER

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CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
Ethylbenzene	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
Toluene	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C10-12	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C16-21	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C21-35	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C5-7	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
Xylenes (mixed)	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

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Scenarios:
Child Resident - Typical

Routes:
INGESTION OF GROUNDWATER
DERMAL CONTACT DURING SHOWER

Chemicals:
Benzene
Ethylbenzene
Toluene
TPH Aromatic C10-12
TPH Aromatic C16-21
TPH Aromatic C21-35
TPH Aromatic C5-7
Xylenes (mixed)

SUMMARY OF INPUT PARAMETERS

SCENARIO:

1

Lifetime and Body Weight

Body Weight (kg)	16.00
Lifetime (years)	70.00

INGESTION OF GROUNDWATER

Ingestion rate (l/day)	.50
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Absorption Adjustment Factor for Ingestion of water (-)	
Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0
TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

DERMAL CONTACT DURING SHOWER

Total Skin Surface Area (cm ²)	6800.00
Time in Shower (hour/day)	.12
Exp. Freq Groundwater (events/year)	350.00
Exp. Duration Groundwater (years)	5.00
Dermal Permeability Coefficient (cm/hour)	
Benzene	2.10E-02
Ethylbenzene	7.40E-02
Toluene	4.50E-02
TPH Aromatic C10-12	8.70E-02
TPH Aromatic C16-21	.30
TPH Aromatic C21-35	1.5
TPH Aromatic C5-7	1.80E-02
Xylenes (mixed)	8.00E-02

Absorption Adjustment Factor for
Dermal Exposure to Water (-)

Benzene	1.0
Ethylbenzene	1.0
Toluene	1.0
TPH Aromatic C10-12	1.0

TPH Aromatic C16-21	1.0
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	1.0
Xylenes (mixed)	1.0

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MEDIA CONCENTRATIONS

Concentration in Groundwater (mg/l)

Obtained from Fate and Transport output
AVERAGE Concentration (over exposure duration)
(used to calculate carcinogenic risk)

Exposure Duration (years)	5.0
Benzene	4.45E-04
Ethylbenzene	2.20E-04
Toluene	4.02E-04
TPH Aromatic C10-12	2.22E-02
TPH Aromatic C16-21	8.97E-04
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	.11
Xylenes (mixed)	1.12E-03

Concentration used to calculate hazard index
(Minimum of 7 years or exposure duration)

Exposure Duration (years)	5.0
Benzene	4.45E-04
Ethylbenzene	2.20E-04
Toluene	4.02E-04
TPH Aromatic C10-12	2.22E-02
TPH Aromatic C16-21	8.97E-04
TPH Aromatic C21-35	.00
TPH Aromatic C5-7	.11
Xylenes (mixed)	1.12E-03

SLOPE FACTORS AND REFERENCE DOSES

Ingestion Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Ingestion Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10
Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

Dermal Slope Factor [1/(mg/kg-day)]

Benzene	2.90E-02
Ethylbenzene	ND
Toluene	ND
TPH Aromatic C10-12	ND
TPH Aromatic C16-21	ND
TPH Aromatic C21-35	ND
TPH Aromatic C5-7	ND
Xylenes (mixed)	ND

Dermal Reference Dose (mg/kg-day)

Benzene	ND
Ethylbenzene	.10

Toluene	.20
TPH Aromatic C10-12	4.00E-02
TPH Aromatic C16-21	3.00E-02
TPH Aromatic C21-35	1.0
TPH Aromatic C5-7	.20
Xylenes (mixed)	2.0

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SUMMARY OF RESULTS

INGESTION OF GROUNDWATER

Benzene

CDI (mg/kg-day)	1.33E-05
LADD (mg/kg-day)	9.53E-07
Cancer Risk (-)	2.76E-08
Hazard Index (-)	0.00E+00

Ethylbenzene

CDI (mg/kg-day)	6.59E-06
LADD (mg/kg-day)	4.71E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	6.59E-05

Toluene

CDI (mg/kg-day)	1.20E-05
LADD (mg/kg-day)	8.60E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	6.02E-05

TPH Aromatic C10-12

CDI (mg/kg-day)	6.66E-04
LADD (mg/kg-day)	4.76E-05
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.67E-02

TPH Aromatic C16-21

CDI (mg/kg-day)	2.69E-05
LADD (mg/kg-day)	1.92E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	8.96E-04

TPH Aromatic C21-35

CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00

TPH Aromatic C5-7

CDI (mg/kg-day)	3.17E-03
LADD (mg/kg-day)	2.27E-04
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.59E-02

Xylenes (mixed)

CDI (mg/kg-day)	3.35E-05
LADD (mg/kg-day)	2.39E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	1.68E-05

DERMAL CONTACT DURING SHOWER

CDI (mg/kg-day)	4.57E-07
LADD (mg/kg-day)	3.27E-08
Cancer Risk (-)	9.47E-10
Hazard Index (-)	0.00E+00
Ethylbenzene	
CDI (mg/kg-day)	7.96E-07
LADD (mg/kg-day)	5.69E-08
Cancer Risk (-)	0.00E+00
Hazard Index (-)	7.96E-06
Toluene	
CDI (mg/kg-day)	8.84E-07
LADD (mg/kg-day)	6.31E-08
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.42E-06
TPH Aromatic C10-12	
CDI (mg/kg-day)	9.46E-05
LADD (mg/kg-day)	6.76E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	2.36E-03
TPH Aromatic C16-21	
CDI (mg/kg-day)	1.32E-05
LADD (mg/kg-day)	9.40E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.39E-04
TPH Aromatic C21-35	
CDI (mg/kg-day)	0.00E+00
LADD (mg/kg-day)	0.00E+00
Cancer Risk (-)	0.00E+00
Hazard Index (-)	0.00E+00
TPH Aromatic C5-7	
CDI (mg/kg-day)	9.32E-05
LADD (mg/kg-day)	6.65E-06
Cancer Risk (-)	0.00E+00
Hazard Index (-)	4.66E-04
Xylenes (mixed)	
CDI (mg/kg-day)	4.37E-06
LADD (mg/kg-day)	3.12E-07
Cancer Risk (-)	0.00E+00
Hazard Index (-)	2.19E-06

APPENDIX D

**"IMPORTANT INFORMATION ABOUT YOUR
ENVIRONMENTAL SITE ASSESSMENT"**

Important Information About Your

Environmental Site Assessment

These notes have been prepared by Golder Associates Pty Ltd using guidelines prepared by ASFE; The Association of Engineering Firms Practising in the Geosciences, of which Golder Associates Pty Ltd is a member. They are offered to help you in the interpretation of your Environmental Site Assessment (ESA) report.

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 hydrogeological 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 areas 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 the 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 variations, 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, or by the client for a different 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 Misinterpretation

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 no 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.

ANNEXURE 1 - SITE MANAGEMENT PLAN

LOT : 1 PLAN : M356134 FILE REF : BNE1230 PRINTED: 16/01/2019

DATE OF EFFECT : 18/06/2002

1.0 EXECUTIVE SUMMARY

This Site Management Plan (SMP) has been prepared by Golder Associates on behalf of Mobil Oil Australia Pty Ltd. The SMP applies to the Lot 1 on M356134 (Special Lease No. 09/53032), 27 Reynolds Street, Mareeba. A site plan showing the area to be managed is presented as Figure 1. The property was used as a fuel storage depot between 1963 and 1999. Future proposed land use at this site will be commercial/industrial land use.

Residual TPH is present in weathered rock at a depth of 4 m or greater in these areas. The residual contamination zone in the base of Area 3 had concentrations in the C₆-C₂₈ hydrocarbon fractions of up to 9950 mg/kg. The residual contamination zone in the base of Area 4 had concentrations in the C₁₀-C₁₄ hydrocarbon fraction of up to 340 mg/kg. The residual contamination zone in the base of Area 10 had concentrations in the C₁₀-C₂₈ hydrocarbon fractions of up to 2680 mg/kg. A quantitative risk assessment indicated that the residual TPH contamination in soil/weathered rock located more than 4m below the ground surface does not represent an unacceptable health risk to future commercial/industrial site users.

Groundwater monitoring conducted during assessment and remediation of the site indicated the presence of dissolved phase TPH and BTEX in a perched, seasonal aquifer beneath the site. This seasonal perched aquifer has a low yield (estimated to be less than 1 litre/sec). A deeper higher yielding aquifer has been intersected by an irrigation bore on the neighbouring property to the east. The water quality in this deeper bore was not impacted by TPH or BTEX. A quantitative risk assessment indicated that the dissolved phase TPH and BTEX concentrations in the seasonal perched aquifer do not represent an unacceptable health risk to future commercial/industrial site users or to potential offsite environmental receptors and groundwater users

2.0 OBJECTIVES

The objectives to be achieved and maintained under this Site Management Plan (SMP) are to manage the contamination remaining on site (Lot 1 M356134) in a manner which protects human health and the environment. The site-specific elements relating to these objectives are the placement and maintenance of barriers which safely separate users of the site and the contamination; and the application of controls on site excavation works at depths greater than 4 metres.

3.0 ACHIEVEMENT AND MANAGEMENT OF OBJECTIVES

3.1 Responsibility. The owner of the land (as defined under the *Environment Protection Act 1994*) is to ensure the following conditions of this Site Management Plan and any variations to the plan approved or

required by the Administering Authority are complied with.

The obligations and conditions set out in this Site Management Plan bind the owner from time to time, of the land.

The owner must provide any contractors, representatives and agents of the owner of the land associated with the design and construction of site facilities and infrastructure on the land with a copy of the approved SMP prior to the commencement of work on-site.

The owner must provide a copy of the SMP to any lessee who intends to undertake site excavations prior to commencement of work.

3.2 Contaminated Soil Excavation and Removal. Contaminated soil must not be removed from the site without adequate sampling and analysis and prior approval from the Administering Authority under section 424 of the *Environment Protection Act 1994* or equivalent.

3.3 Land Use. The land is to be used for commercial/industrial purposes. This includes premises such as shops and offices as well as factories and industrial sites. Regular soil access by children is prohibited.

3.4 Groundwater Usage. Any use of groundwater from the contaminated perched aquifer located on this site is prohibited.

3.5 Workplace Health and Safety. A workplace Health and Safety Plan which satisfies relevant obligations of the *Workplace Health and Safety Act 1995*, subordinate legislation or its equivalent is to be developed for any excavation work on the site which extends to or below 4 metres. The Workplace Health and Safety Plan must specifically address dermal and inhalation exposures to site contaminants.

3.6 General Environmental Protection. Site works relating to excavation, removal and/or disposal of contaminated soil from the site must include provisions which ensure that the environment is protected, eg. preventing spread of contaminated soil by controlling site runoff, dust generation and spillage from haulage trucks or improper disposal of contaminated stormwater or seepage. All contamination, safety and excavation processes are to be documented and records kept which demonstrate SMP compliance.

3.7 Unexpected Contamination. It is a requirement of this plan that excavation works are to immediately cease and the Administering Authority notified within 1 business day and advised of appropriate delineation and remedial action in the event that monitoring reveals offensive or noxious odour at the work site and/or evidence of gross contamination not previously detected. Any remedial action is to be developed by a member of a prescribed organisation with relevant qualifications and experience according to section 381 of the *Environment Protection Act 1994*.

Administering Authority approval is required before site works can recommence at that location.

4.0 MAINTENANCE AND MONITORING REQUIREMENTS

The owner is to ensure that the following monitoring is carried out:

(a) A biennial inspection of the site is to be undertaken to ensure the integrity of the site capping. Records of these inspections and of any site excavations or permits issued under Section 424 of the *Environmental Protection Act 1994* are to be maintained by the owner for inspection by authorised officers. The biennial period is to commence from the effective date of this plan.

(b) The EPA may undertake periodic site inspections to monitor the site in relation to the above conditions.

This SMP has been developed to manage residual site contamination at the effective date. Subsequent uses of the site may result in the need to review the plan.

This SMP makes reference to a plan attachment that is available from the EPA if required.

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