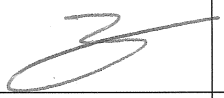
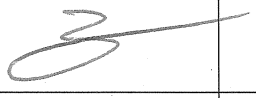
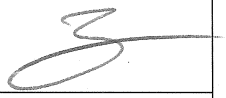
Environmental Management Plan

162-168 Hamilton Street, Queens Park, WA.

ITAC Commercial Developments

18th July 2011

QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks	Draft	2nd Draft following Contaminated Sites Auditor review	3nd Draft following feedback from interested third parties, DEC and Contaminated Sites Auditor	4th Draft following feedback from interested third parties, DEC and Contaminated Sites Auditor
Date	March 2011	April 2011	June 2011	July 2011
Prepared by	George King	George King	George King	George King
Signature				
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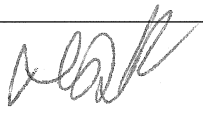
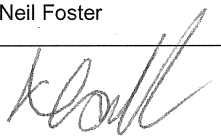
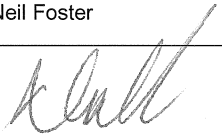
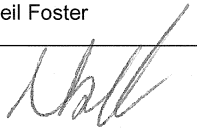
Signature				
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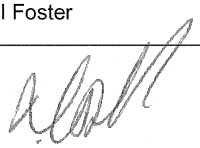
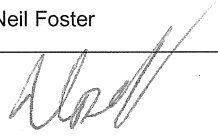
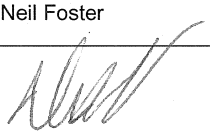
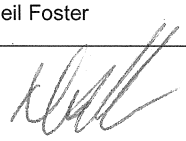
Signature				
Project number	0018065	0018065	0018065	0018065
File reference	0018065_EMP 01_DRAFT	0018065_EMP 01_V2	0018065_EMP 01_V3	0018065_EMP 01_V4

This report has been prepared in accordance with the scope of work presented in the WSP proposal submitted to and accepted by the Client. The report relies upon data and results taken at or under the particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client and WSP accepts no responsibility for its use by other parties.

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Appendices

1 Introduction

1.1 OVERVIEW

WSP Environment & Energy (WSP) was engaged by ITAC Commercial Developments Pty Ltd (ITAC) to prepare an Environmental Management Plan (EMP) for the site located at the 162-168 Hamilton Street, Queens Park, WA (the Site). The Site location is shown in Figure 1, **Appendix A**.

1.2 BACKGROUND

The Site is currently owned by ITAC who plan to sell it for residential development. The Site formed part of a larger Akzo Nobel Paint factory which ceased operation in 2003. The paint manufacturing facility operated from the early 1950's until its closure and subsequent demolition from 2003 to 2004. Historical operations resulted in a plume of dissolved hydrocarbons beneath the Site.

The Site has undergone a variety of remedial stages which have resulted in the reduced plume geometry and concentration. In addition there has been limited off-Site impact from the groundwater plume at down gradient monitoring points since the commencement of investigations in 2002

Following extensive remedial and validation works ITAC commissioned WSP in 2010 to prepare a Site Management Plan (SMP) for Monitored Natural Attenuation (MNA) to service the Site:

WSP, March 2011, Site Management Plan for Monitored Natural Attenuation, 162-168 Hamilton Street, Queens Park, WA ref: 2987 REP02_Hamilton Street_V3

1.3 OBJECTIVES OF THE EMP

The EMPs primary objective is to facilitate the Department of Environment and Conservations (DEC) requirements for Site Management plans for Residual Contamination Issues (*DEC - Email Alert 52: Site Management Plans for Residual Contamination Issues – 8th March 2010*) which came to effect in March 2010.

The DEC notification is detailed below:

"Site Management Plans for Residual Contamination Issues

Certain sites, provided specified restrictions are implemented, may be considered suitable for a particular use or range of uses even though soil and/or groundwater contamination remains at the site. Such sites are usually classified contaminated – restricted use or remediated for restricted use under the Contaminated Sites Act 2003.

In some cases, the restriction requires that third parties (i.e: someone other then a current site owner or occupier) follow specific procedures which are detailed in a Site Management Plan. Examples include:

- *Irrigating public open space areas with pathogen – contaminated groundwater, subject to approved management measures such as irrigating at night, even through private bores are prohibited.*
- *Maintenance/inspection requirements for asbestos contaminated soil remaining beneath roads or public open space and procedures to follow in the event of intrusive works.*

Please note that with immediate effect, the Department of Environment and Conservation (DEC) will require the following information before approving a Site Management Plan, classifying or re-classifying a site or clearing a relevant planning condition (as the case may be):

- *If the third party can reasonably be identified (e.g. local government authority, Water Corporation, Main Roads) – written advice from the relevant third party (or parties) that they have reviewed the contents of the Site Management Plan and accept the obligations it places upon them;*
- *If the third party cannot reasonably be identified at the time of submission (e.g. future owners or occupiers of a site) a mechanism for making the Site Management Plan readily available and accessible into the future, in a manner that will allow potential owners or occupiers, etc. to review the Site Management Plan contents before entering into any legally binding agreements.*

The above information should be included in the submission to DEC."

Given the complexity of the WSP Report: *Site Management Plan ref: 2987_REP 02_Hamilton Street_V3* (discussed in Section 1.2) this EMP has been prepared to provide stakeholders (see Section 6 for details) with a summary of information for ease of reference in relation to satisfying the requirements of the DEC notification. As such the EMP will:

- Communicate the requirement to implement suitable control measures where excavation is proposed to depths of greater than 1m below existing Site levels.
- Provide sufficient information to allow stakeholders to update their existing Health & Safety Documentation to include information and control measures in relation to the presence of residual contamination in groundwater and the potential for volatile vapours.
- The requirement for on-going management by outlining the nature and extent of known groundwater contamination across the Site
- The physical extent of the area covered by this EMP are shown Figure 2, **Appendix A.**

2 Limitations

The findings of this report are governed by the Scope of Work outlined above. As with any type of investigation the confidence in the findings, and the reliance that can be placed on this report, is limited by the scope of work. WSP E&E was engaged as an independent consultant to conduct the Scope of Work outlined in this report and to objectively present the results of the investigation conducted. We have no commercial interest in the Site and we have not been engaged to advertise, promote or endorse any client interests.

This report has been prepared for a specific purpose, and only for the Client referenced above. All other third parties (identified in the report), who intend to rely on this report, or any data presented in this report, must contact WSP E&E prior to doing so. WSP E&E will advise such parties in writing on the extent that they may rely on this report, or data presented in this report. Our advice for any such reliance will be based on our available knowledge and the expressed purpose for which the report is to be relied upon. Any party who relies on this report without written consent from WSP E&E does so entirely at their own risk.

The findings of this investigation are based on information provided by the Client referenced above and by other referenced sources outside of WSP E&E (eg. literature, client representatives, laboratories, other consultants, Government officers and people with some knowledge of the Site etc.). WSP E&E trust that the information provided by these sources is accurate, complete and is not misleading and, unless the Scope of Work states otherwise, we have not been engaged to audit the veracity of any information provided to us. So, while normal assessments of data reliability are made during the course of our work, we assume no responsibility or liability for any errors or any omissions in any information provided by sources outside of WSP E&E. Where inaccurate, incomplete or misleading information is provided to us by external parties there could be significant impacts on the integrity of the conclusions and recommendations presented in this report. As such no warranties, expressed or implied, can be made.

In any contamination investigation it is not feasible to assess, inspect or analyse every point in space and in time. It is therefore reasonable to expect spatial and temporal variations between data points within the area of investigation. Observations, conclusions and recommendations presented in this report are therefore based on the assessment of the available information, data points and on the professional opinions of personnel involved with the investigation.

The history of a Site may change due to anthropogenic factors (e.g. demolition, upgrades, redevelopments, land use changes etc.) and the potential for contamination to occur changes as a result. Natural processes occurring in the ground (e.g. infiltration, leaching, seepage, capillary action, changing groundwater elevations, chemical oxidation/reduction, acidification, transport of contamination by/on groundwater etc.) also have a potential to reduce or increase contaminant concentrations over time. As a result this report can only be taken to represent a ‘snapshot’ in time and events (anthropogenic and other) that post-date information referenced in this report may have a material affect on the findings of a report.

This report must never be reproduced or referenced unless in full.

3 Site Condition, Surrounding Environment and History

The following section provides a summary of Site information from environmental reports detailed in Section 4.

3.1 SITE IDENTIFICATION

The site details are summarised in Table 3.1 below:

TABLE 3.1 – SITE DETAILS

Street Address	162 – 168 Hamilton Street, Queens Park, WA
Property Description	Lot 9002 on Deposited Plan 66440, Volume: 2740 Folio: 761 The above lot is proposed for subdivision into Lots 523 to 529 subject to approval by the Western Australian Planning Commission (WAPC) & Department of Environment & Conservation (DEC).
Property Size	3,100m^2
Local Government Area	City of Canning
Current Use	Low Density Residential Housing (LDRH)
Surrounding Land Use	LDRH

3.2 SITE DESCRIPTION, SURROUNDING LAND USE AND SENSITIVE ENVIRONMENTS

There are currently no buildings on the Site (March 2011). The planned future development will comprise low density housing on six subdivisions (Lots 523 to 528). A seventh subdivision (Lot 529) is the subject of ongoing management as detailed in SMP (WSP, 2011).

The Site is bordered by roads on two boundaries

- Hamilton Street (main road) to the South East which services LDRH, estimated date of construction circa 1996
- Centre Street (main road) to the South West which services a newly constructed LDRH on its northern side and older LDRH on its southern side
- Both Hamilton Street and Centre Street are used to carry a number of sub surface utilities including:
- Western Power: electrical cables and sub station
- Telstra service: ducts and inspection pits
- ATCO Gas Australia: pipelines for high, medium and low pressure gas
- Water Corporation scheme water supply
- Water Corporation mains sewer – deep and shallow connections
- City of Canning storm water drains.

The nearest sensitive environments are as follows:

- Groundwater down gradient of the Site
- Current and future Site users accessing groundwater
- Current and future construction workers accessing groundwater.

3.3 TOPOGRAPHY

The site has a fall in grade from north-east to the south-west. Based on the topography and the permeable nature of the Site surface it is envisaged that the Site would be more prone to infiltration than runoff. Based on the Perth Groundwater Atlas, the topographic height at the Site is approximately 10mAHD.

3.4 SOILS AND GEOLOGY

Perth 1:50,000 Environmental Geology Series map (GSWA, 1986)

The natural geology of the Site includes Bassendean sands underlain by sandy clay to clayey sands of the Guildford Formation. These are typically described as pale grey at surface, yellow at depth, fine to medium grained, moderately sorted, sub-angular to sub-rounded, minor heavy mineral and of aeolian origin.

WSP Investigations

Investigations by WSP confirm the above geology, and note the following:

- The superficial geology within the excavation area has been identified to comprise Bassendean Sands, which generally consist of white to grey fine to medium grained sand; these are underlain by clay sands and sandy clays of the Guildford Formation
- Water ingress was quick through the underlying sandy matrix. The shear strength of the saturated sands is low and collapse of the excavation face occurred where batter slopes exceed a 30 degree angle

Published Groundwater Data

Based on the Perth Groundwater Atlas, the depth to groundwater at the Site ranges between approximately 3 mbgl and 3.5 mbgl, with an elevation of between 6.5 mAHD and 7 mAHD (DoE, 2004). The base of the superficial aquifer is estimated to range between approximately -10m AHD to 15m AHD (DoE, 2004) so the depth to the base of the superficial aquifer is in the order of about 20 mbgl to 25 mbgl, depending on the elevation of the Site.

Site Data

During summer the depth to groundwater from ground level was measured both on and immediately downgradient of the Site using groundwater monitoring bores. Please refer to Figure 3, **Appendix A.**

- 2.495 m below ground level (bgl) at the northeast end of the Site (MW12)
- 1.525 m bgl immediately southwest (OMW16) of the Site

During winter the depth to groundwater was measured both on and downgradient of the Site ranged from:

- 2.165 m bgl at the northeast end of the Site (MW12)
- 1.158 m bgl immediately southwest (OMW16) of the Site.

3.5 HYDROGEOLOGY AND HYDROLOGY

A dissolved contaminant plume has been identified at the Site containing the contaminants of concern identified in previous investigations See Section 4.1. In order to trace the movement of the plume down-hydraulic gradient, the contaminant concentrations in all available bores both on and off-Site have been assessed. As expected, the plume generally follows the pattern of groundwater flow, migrating in a south/south-westerly direction.

Contaminant concentrations have been found to decrease along the groundwater flow path. MW5 has been assessed as being within the centreline of the plume. Contaminant concentrations vary in MW5 in a similar pattern to that in the source area, although at much reduced concentrations indicating that the flux of contaminant migration is similar in both. This, together with the concentrations of contaminant concentrations in MW5 indicate that MW5 is located directly down-gradient of the source area in the plume centreline. See Figure 3, **Appendix A**. for monitoring well locations

3.6 SUMMARY OF SITE HISTORY

The Site has been developed by ITAC for residential development. The Akzo Nobel site refers to an area of land in Queens Park, Western Australia, which formerly had a paint manufacturing plant operating over a major part of a larger area of land now approved for residential redevelopment. The paint manufacturing facility operated from the early 1950's until its closure and subsequent demolition from 2003 to 2004. Historical operations have resulted in a plume of dissolved hydrocarbons beneath the Site in shallow groundwater (approximately 1.4m to 2.4m depth) beneath the Site.

The aquifer is comprised of Bassendean Sand, underlain by the clayey Guildford Formation which may act as an aquitard, preventing impact to deeper, more porous gravel lenses. The plume is dominated by the following compounds:

- Total petroleum hydrocarbons (TPH)
- C6 – C14
- BETEX
- Xylene;
- Ethylbenzene
- Mono Aromatic Hydrocarbons (MAH)
- 1,2,4 Trimethylbenzene; and
- 1,3,5 Trimethylbenzene.

The Site has undergone a variety of remedial stages which have resulted in the reduced plume geometry and concentration. In addition there has been limited off-Site impact from the groundwater plume at down gradient monitoring points since the commencement of investigations in 2002.

4 Summary of Previous Works

4.1 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

A large number of environmental investigations/ remediation and validation works have been completed in the past by the following consultancies:

- IT Environmental Pty Ltd
- OTEK Australia Pty Ltd
- WestonTox Pty Ltd
- WSP Environment & Energy

The work completed by theses consultancies has been both reviewed and reported on by the contaminated sites auditor –Phillip Hitchcock of Environmental Auditors Pty Ltd in the following reports:

- Environ Pty Ltd, 19 November 2007, *Mandatory Auditor's Report 162-176 Hamilton Street, Queens Park, WA* report prepared for ITAC Developments Pty Ltd (MAR, 2007).
- Environ Pty Ltd, 8 December 2009, Mandatory Auditor's Report 162-168 Hamilton Street, Queens Park, WA (MAR, 2009).

The focus of this section will be on a brief summary of the reports written by WSP which are provided below.

4.2 WSP (DECEMBER 2009) REPORT TO ADDRESS DATA GAPS, LOTS 522-537 – INTERSECTION OF HAMILTON, CENTRE AND TRAFALGAR, QUEENS PARK, WA REF: 008R02D

The purpose of the report was to document the three phases of work undertaken by WSP to address data gaps highlighted by the contaminated sites Auditor to demonstrate that the Stage 2 portion of the Site was suitable for development for residential land use. The three phases of work assessed soil, groundwater and soil vapour conditions.

Phase 1 – Further soil investigation, remediation and validation works were conducted with the following objectives:

- Identify and remove residual secondary sources of soil contamination to facilitate groundwater remediation.
- Review additional soil analytical data from previous investigation works to assess the presence and extent of identified potential chemicals of concern (PCoCs).
- Surface soil sampling and analysis to assess the presence of polycyclic aromatic hydrocarbon compound (PAHs).

Phase 2 – Further groundwater investigation and remediation works were conducted with the following objectives:

- Review of groundwater analytical data collected at downgradient groundwater monitoring wells at the Site during a previous OTEK investigation to assess the potential for off-Site migration of groundwater impacts.
- Groundwater monitoring during operation of the air sparging system to assess the effects on groundwater impacts.
- Review of additional groundwater analytical data from previous investigation works to assess the presence and extent of CoCs.

Phase 3 – Soil vapour investigations were conducted with the following objectives:

- Subsurface soil vapour survey from utility pits surrounding the Site to assess the potential for off-Site migration of contamination to be occurring.

- Subsurface soil vapour sampling from the vadose zone to assess the risk posed to human health by migration of vapours in the vadose zone into proposed residential dwellings.

- Human Health Risk Assessment using Site specific data to determine the risk to identified receptors under the applicable exposure scenarios.

- The report (in conjunction with the overall MAR, 2009) was successful in satisfying the DEC Contaminated Sites Branch (CSB) that adequate site works had been carried out to comply with Condition 1 of the Western Australian Planning Commission (WAPC) Subdivision Approval No 139154, set for Lot 9001.

4.3 LETTER FROM GEORGE KING AND JEFF MATTHEWS OF WSP TO PHILIP HITCHCOCK OF ENVIRONMENTAL AUDITORS TITLED "ITAC QUEENS PARK – STAGE 3 REMEDIAL STRATEGY" DATED 21 MAY 2010 REF: 2295_L01C

- This letter sets out a closure strategy for the Stage 3 development at Hamilton Street. The strategy is based primarily on a stakeholder meeting held on the 21 April 2010 between WSP, the Contaminated Sites Auditor and the CSB of the DEC. Monitored natural attenuation forms the core of the strategy however it is dependent on a series of additional data gaps being closed out. These were the validity of the HHRA in relation to current soil vapour concentrations and the provision of additional data on the aquifer properties at the Site.

4.4 WSP (SEPTEMBER 2010) SOIL VAPOUR MONITORING EVENT THREE, RESULTS & INTERPRETATION, LOT9002 162-168 HAMILTON STREET, QUEENS PARK, WA REF: 2987 REP01

- This report discusses the third and fourth round of soil vapour sampling (SVME) that took place at the Stage 3 development at Hamilton Street from June and July of 2010. The objectives of the SVMEs were to answer data gaps in relation to soil vapour, namely

- Complete subsurface soil vapour sampling from the vadose zone to assess the risk posed to human health by migration of vapours in the vadose zone into proposed residential dwellings.

- Demonstrate that soil vapour concentrations were the same or lower than soil vapour concentrations detected in 2009 during SVME2.

- Assess if soil vapour results validated the human health risk assessment (HHRA) completed in 2009.

- The conclusion of the report was that the HHRA completed in 2009 was validated by the evidence of decreasing soil vapour concentrations in the vadose zone.

- The report concluded that a sampling analysis and quality plan (SAQP) for MNA should be prepared for review by the Contaminated Sites Auditor and the DEC. The document should conform with the Department of Environment and Conservation Contaminated (DEC) Sites Management Series (CSMS) *Use of Monitored Attenuation for Groundwater Remediation – April 2004.*

4.5 WSP (MARCH 2011) SITE MANAGEMENT PLAN FOR MONITORED NATURAL ATTENUATION, ,162-168 HAMILTON STREET, QUEENS PARK, WA REF: 2987 REP02_HAMILTON STREET_V3

- *This report discusses the* additional series of Site works was conducted between March 2010 and June 2010 to complete the Site characterisation and to develop the hydrogeological conceptual site model and develop a fate and transport model for the Site.

The primary findings of the hydro conceptual site model were:

- The plume is in retreat and hence the source area does not represent an ongoing source of contamination.

- There is clear evidence of biodegradation occurring within the source area.

The Primary findings of the fate and transport model were:

- Xylene and Ethylbenzene are not predicted to migrate beyond the Site boundary.
- Plume stabilisation for ethylbenzene and xylene occurs within four (4) years and 12 years respectively.
- 1,2,4 TMB concentrations in the MW1/MW2 source area are predicted to exceed the target criteria by 1ug/L at the Site boundary.
- 1,2,4 TMB concentrations in MW16 are predicted to exceed target criteria at a maximum 20m from the Site boundary before plume stabilisation restricts any further migration.

The Site characterisation data was assessed using the Department of Environment & Conservation (DEC) guidance document (DEC, 2004) *Use of Monitored Natural Attenuation for Groundwater Remediation* with the following results:

- The data set compliance analysis confirmed that all of the basic requirements of DEC, 2004 have been met by the investigation works conducted to date.
- The feasibility assessment suggested the Site has a high suitability for adopting a MNA remedial strategy.
- The 4 stage design and implementation assessment process was completed and the Site found to be compliant.
- A sampling analysis and quality plan for the MNA strategy has been developed.
- An assessment of suitable remedial action plans was made for inclusion within the contingency plan development:
- Injection of Chemical Oxidant (Klozur ©) was the chosen remedial strategy.

5 Residual Contamination Issues & Residual Risk

The above investigations have indicated evidence of localised groundwater contamination at the Site. Levels of contamination, whilst exceeding guidelines for proposed land uses are not considered to present unacceptable human health risk for incidental exposure following the completion of the Human Health Risk Assessment documented in WSP Report: 08R02d (December 2010).

The following mitigation measures for residual groundwater contamination are discussed in Table 5.1 below

TABLE 5.1 – SOURCE – PATHWAY – RECEPTOR LINKAGE ASSESSMENT

Potential Receptor	Source – Pathway – Receptor Linkage Assessment	Residual Risk ?
Current & Future Resident	The residual hydrocarbon contaminants in groundwater are present at depths greater than 1m below site levels thus precluding exposure via ingestion and direct contact following the implementation of mitigations measures detailed above and on the individual certificates of title The HHRA confirms that volatile vapours do not pose a risk to this receptor.	No
Down Gradient Groundwater users (outside of the EMP boundary)	A memorial on the certificate of title has been placed on all residential lots at the Site to prohibit the extraction use of groundwater for any purpose (other than monitoring). A SMP is in place to monitor the residual hydrocarbon contamination in groundwater and ensure it does not migrate off Site. The SMP encompasses contingency measures to ensure that down gradient receptors will be protected.	No
Current / Future Construction or Maintenance Worker (above ground)	The residual hydrocarbon contaminants are present at depths greater than 1m below site levels thus precluding exposure via ingestion and direct contact. The HHRA confirms that volatile vapours do not pose a risk to this receptor. Notwithstanding the above, conventional OHS and safe work procedures will need to be implemented.	No
Current / Future Construction or Maintenance Worker (excavation within upper 1m of site surface)	The residual hydrocarbon contaminants are present at depths greater than 1m below site levels thus precluding exposure via ingestion and direct contact. The HHRA confirms that volatile vapours do not pose a risk to this receptor Notwithstanding the above, conventional OHS and safe work procedures will need to be implemented.	No

Potential Receptor	Source – Pathway – Receptor Linkage Assessment	Residual Risk ?
Current / Future Construction or Maintenance Worker (excavation to depth greater than 1.0m of site surface) *	Excavations which extend to depths of greater than 1m have the potential to intersect impacted groundwater which may contain contaminants. ■ The receptor therefore has the potential to be exposed to the source through the following pathways: ■ Odours – impacted groundwater is likely to be odorous due to the nature of the dissolved hydrocarbons it may contain (even at low levels). Whilst these may not necessarily be hazardous to health they can be unpleasant to work in or adjacent too. Additionally the odours may prove to be unpleasant/worrying to members of the public. ■ Saturated soil – containing impacted groundwater has the potential to expose the receptor to a risk of dermal contact and/ or ingestion of contaminated material ■ Impacted groundwater – has the potential to expose receptor to the risk of dermal contact/ eye splashes and/ or ingestion ■ Vapours – from impacted groundwater may expose the receptor to vapours exceeding the recommended occupational exposure levels for individual compounds. Appropriate real-time vapour monitoring (using photo ionisation detector PID) may be required to determine what constitutes "nuisance odour" and what has the potential to exceed occupational exposure criteria. ■ Further details on suggested Air Quality Monitoring Procedures for occupational exposure are presented in 7.1.2	Yes

Notes: * Where access is required to undertake emergency repair works to services greater that 1m in depth additional information may be required to notify contractors of the residual contamination in groundwater. See Section 6 for further details.

6 Community Consultation

This section summarises the various parties to be consulted under this EMP.

Table 6.1 details the actions required to provide the necessary evidence that the requirements of the DEC's notification on Site Management Plans for Residual Contamination Issues have been satisfied.

TABLE 6.1 – STAKE HOLDER COMMUNITY CONSULTATION

Party	Responsibility of Party
Developer – ITAC Commercial Developments Pty Ltd: **Contact**: Wayne Butler **Telephone**: (03) 9335-4444 **Email**: wayneb@ebtransport.com.au	1. Implementation of the Site Management Plan for Monitored Natural Attenuation at 162-168 Hamilton Street, Queens Park, WA ref: 2987 REP02_Hamilton Street_V3 to the satisfaction of the DEC 2. Ensure the development of the EMP is completed 3. Comply with the requirements of the EMP until the transfer of property has been completed 4. Complete Form 6 disclosure documents 14 days prior to the completion of property transfer 5. Ensure a memorial is placed on land titles for proposed lots 523-529 which states that the EMP must be followed where workers enter excavations deeper than 1m (based on current site surface level) 6. Provide signage, if required, at the Site to notify emergency repair workers of the presence of residual contamination in groundwater (at depths greater than 1m) and the necessary control measures [1]
DEC – Contaminated Sites Branch **Contact**: Andrew Miller **Telephone**: (8) 9333 7582 **Email**: andrew.miller@dec.wa.gov.au **Address**: Locked Bag 104, Bentley DC 6983	1. Review and accept the Mandatory Auditors Report (MAR) for the Site. a. This includes the Site Management Plan ref: 2987 REP02_Hamilton Street_V3 2. Review the EMP 3. Provide a page on the DEC website that can function as a repository for the EMP 4. Sign off the Site as acceptable for the proposed development
Environmental Consultant – WSP Environment & Energy [2] **Contact**: Neil Foster **Telephone**: (08) 9490 4325	1. Assist the Developer in implementing the Site Management Plan 2. Communicate (through the EMP) the requirement to implement suitable control measures where excavation is proposed to depths of greater than 1m

Party	Responsibility of Party
Email: Neil.Foster@WSPGroup.com **Address**:29 Catherine Street, Subiaco, WA 6008	below site levels. 3. Provide sufficient information within the EMP to allow third parties to update their existing Health & Safety Documentation to include information and control measures in relation to the presence of residual contamination in groundwater and the potential for volatile vapours.
Contaminated Sites Auditor - Environmental Auditors Pty Ltd [3] **Contact**: Phillip Hitchcock **Telephone**: (02) 4915-7000 **Email:** phitchcock@environmental-auditors.com.au **Address** Environmental Auditors Pty Ltd, 282 High Street Maitland, NSW, 2320:	1. Will audit the implementation of the Site Management Plan and report on its compliance to the DEC 2. As required, will review and provide comment on information provided by the Environmental Consultant. 3. As required, will provide approval to cease or vary any component of the EMP, which forms part of the Mandatory Auditors Report (MAR) for the Site.
EMP Community Contact - City of Canning, Environmental Health Services [4] **Telephone**: (08) 9231 0606 **Website**: www.canning.wa.gov.au **Address**: Locked Bag 80 Welshpool WA 6986	1. Will retain a current copy of the EMP as reference during assessment of Planning Application 2. Will direct Site based enquiries from the public to the DEC 3. Retain copies of Interested Third Party written acceptance of obligations and responsibilities within EMP – **Appendix D**
Owners & Occupiers: Potential owners/ tenants of Lots 523 to 529	1. Retains responsibility for following both the EMP and the specific restrictions set out by the memorial on title for the affected Lot 2. Will inform any contractors/construction workers employed by them of the said restrictions **3.** Notify the DEC of any incidents in connection with the EMP that suggest the EMP is ineffective.
Interested Third Parties – Subsurface Utility Providers:	
ATCO Gas Australia – HSE Department **Telephone**: (08) 9499 7205 **Website**: http://www.atcoaustralia.com.au **Address:** Gate 1, 81 Prinsep Road, Jandakot, WA 6164	1. Provide written advice that they have reviewed the contents of the EMP and accept the obligations it places upon them, namely: a. To update their existing Health & Safety Documentation to include information and control measures in relation to the presence of residual contamination in groundwater and the potential for volatile vapours 2. Will liaise directly with the developer and or owners of individual lots with respect to the installation of
Western Power – Environment Branch **Telephone**: 0437 900 737	

Party	Responsibility of Party
Website: www.westernpower.com.au **Address:** 363 Wellington Street Perth WA 6000	services. a. The developer and or owners of individual lots are commercially responsible for the additional requirements that may be required while working under the EMP b. The subsurface utility companies are providing an installation/maintenance service and are not responsible for any remedial activities on the lots. 3. Will promptly notify any concerns regarding the EMP to the DEC in relation to the discovery of a. Potential contamination outside of the Lot Boundaries (**Verge and Road Reserves of Centre and Hamilton Street)** which might be indicated by: i. Discoloured soils ii. Odorous soils b. Hydrocarbon Product outside of the Lot Boundaries (**Verge and Road Reserves of Centre and Hamilton Street)** which might be indicated by: i. Non aqueous floating liquid on the surface of groundwater ii. Sheen on groundwater
Water Corporation – EIA & Approvals **Telephone**: (08) 9420 3069 **Website**: www.watercorporation.com.au **Address**: 629 Newcastle St, Leederville WA 6007	
Telstra – Network Integrity Manager **Telephone**: 08 84334505 **Website**: www.in.telstra.com.au/ism/networkintegrity **Address**: 22 Henley Beach Road, Mile End, 5031 Address: TBC	
City of Canning – Developments **Telephone**: (08) 9231 0606 **Email**: http://www.canning.wa.gov.au **Address**: 1317 Albany Highway, Cannington WA 6107	

Notes:

1 – The Western Power substation located on the south east corner of the EMP Boundary has the facility for storing an information pack for emergency work contractors. Workers can be directed to the information pack via signage mounted on the substation wall. A copy of the Information Pack is presented in ***Appendix E.***
2 – Or a suitable environmental consultant
3 – Or a suitably WA DEC accredited Contaminated Sites Auditor
4 – Or a suitable government agency

7 Management of Future Works

7.1 ASSESSMENT PROCESS

If ground disturbing activities are planned to extend to depths greater than 1.0m, within the boundary of the EMP shown in Figure 2 Appendix A, the construction and or maintenance contractor should review and incorporate the following guidance within their health, safety and environmental plan (HSEP) or similar OHS documentation:

7.1.1 RESIDUAL DISSOLVED HYDROCARBONS

The location of residual dissolved hydrocarbons in groundwater is shown on Figures 3 & 4 in **Appendix A.**

The type and concentration of dissolved hydrocarbons is shown in Table 1 in **Appendix B**

These are discussed in greater detail in Site Management Plan (WSP, 2011) referenced in Section 1.2.

7.1.2 OUTLINE OH&S REQUIREMENTS FOR CONSTRUCTION & MAINTENANCE WORKERS

Health Safety and Environment Plans (HSEP) are documents generally developed by companies undertaking works to protect the health and safety of contractors / employees / general public during the course of the works. A typical HSEP would take account of, the contractor's current health and safety procedures, and day-to-day operations at the site

While developing HSEPs for works that are to be carried out in the area of the EMP the third parties detailed in Section 6 are advised to incorporate the following additional control measures prior to the commencement of any excavation works which will extend to depths of greater than 1m below site levels which may intercept groundwater.

- A copy of this EMP
- Appropriate personnel protective equipment (PPE) and hygiene protocols adopted such as:
- Disposable nitrile gloves to be worn when handling soil or groundwater
- Eye protection to prevent splashes of soil/groundwater entering the eyes
- Waterproof foot protection (gum boots)
- Air Quality Monitoring Procedures – use of a photo ionisation detector to record levels of potential volatile vapours where "nuisance odours" are encountered.
- Alarm values have been calculated for the primary toxic compounds see Table E1 – **Appendix C** which can be programed into a PID sensor
- These alarm values can be used to monitor vapour mixtures during the works and act a guide for the deployment of additional respiratory PPE (organic vapour masks) should they be required

7.1.3 SPECIFIC OH&S REQUIREMENTS FOR CONSTRUCTION & MAINTENANCE WORKERS

Excavations over 1m in depth have the potential to intersect contaminated groundwater and vapours.

As such they can be described as a Confined Space as per the definition provided in Australian Standard AS 2865 – 1995:

” ***6.2 Confined space*** *– an enclosed or partially enclosed space which:*

(a) is at atmospheric pressure during occupancy;
(b) is not intended or designed primarily as a place of work;
(c) may have restricted means for entry and exit; and
(d) may -
(i) have an atmosphere which contains potentially harmful levels of contaminant;
(ii) not have a safe oxygen level; or
(iii) cause engulfment.

6.3 Contaminant - any dust, fume, mist, vapour, gas or other substance in liquid or solid form, the presence of which may be harmful to health and safety”

Detailed work procedures for entry into excavations greater than 1m are considered beyond the scope of the EMP and would require task specific assessment by the interested party.

7.1.4 SOIL MANAGEMENT WITHIN STAGE 3 DEVELOPMENT BOUNDARY

Any excavated material exposed by excavation during construction and maintenance works within the Stage 3 Development Boundary shown in Figure 2 **Appendix A** must be properly managed to prevent contamination and or exposure to workers/ members of the public and surface soils:

Soil Disturbance 0.0m to 1.0m

Some shallow soil disturbance is expected during the development of the Lots in the future in order to construct building foundations and service installation. During reinstatement of any excavation works, the upper 1.0 m of site soils should be reinstated with material certified from a clean source:

- Material originating from above 1m
- Imported quarry sand from a certified source.

Soil Disturbance Greater than 1.0m

Excavations deeper than 1m in depth have the potential to intercept groundwater beneath the affected areas and therefore should be avoided by all parties. Where this is not practical the following measures are to be considered

- Stockpiles generated as part of during excavation works should be covered to prevent contamination to the surrounding environment and placed onto a hard standing surface or onto plastic sheeting to prevent contaminated water and soil migrating into the underlying soil.
- Should excess fill be generated that cannot be reinstated into the excavation (below 1m) the material should be analysed and classified in accordance for stockpiles DEC December 2009: Landfill Waste Classification and Waste Definitions 1996 (As amended 2009), DEC, 2009).
  - As a minimum the soil should be analysed for TPH, BTEX & MAH see Section 3.5
  - A useful guidance document for this process published by the Eastern Metropolitan Regional Council (EMRC) is presented in **Appendix F.**
  - Disposal will be to an appropriately licensed landfill in accordance with the waste classification.
- Any water pumped out of the excavation areas should be analysed for concentrations of the contaminants of concern then taken off-site for appropriate disposal by a licensed liquid waste contractor
- Alternatively a permit to discharge the waste water to sewer can be arranged with the Water Corporation. Details on the application process can be found **Appendix F** and at the Water Corporations website:

- http://www.watercorporation.com.au/I/industrialwaste_index.cfm

7.1.5 SOIL MANAGEMENT OUTSIDE OF STAGE 3 DEVELOPMENT BOUNDARY

Third party subsurface infrastructure (installation & maintenance) works outside of the Stage 3 Development Boundary, shown in Figure 2 **Appendix A,** should be properly managed so that workers/ members of the public and surface soils are protected should potentially impacted groundwater (and saturated soils) be encountered.

- Where the subsurface infrastructure works are likely to encounter groundwater (depth greater than 1m) all materials where possible are to be reinstated into the excavation
- The areas where soil has been stockpiled should be swept into the open excavation either by hand or use of a broom on a backhoe
- Soil and water environmental management controls should be installed prevent runoff from entering stormwater drains
- Soil should be returned to the excavation in the sequence in which it was removed i.e. deep saturated soils first, shallow dry soils last
- Should surplus soils be generated that cannot be reinstated into the excavation and require disposal from the work area the waste management procedures outlined in Section 7.1.4 can be adopted if the third party does not operate one
- If dewatering of deep excavations requires groundwater to be pumped to the Water Corporation's sewer the third party is advised to provide the Water Corporation with a copy of EMP when applying for an Industrial Waste Application (One-Off-Discharge) or similar permit.

8 Periodic Review

The Contaminated Site Auditor will review information prepared by the Environmental Consultant and approve any amendments to the EMP prior to finalisation and implementation.

The current EMP will be made available through the DEC website

The EMP is intrinsically linked to the Site Management Plan for Monitored Natural Attenuation - ref: 2987 REP02_Hamilton Street_V3. Changes to the Site Management Plan – including the successful completion of its remedial strategy will require the EMP to be updated accordingly

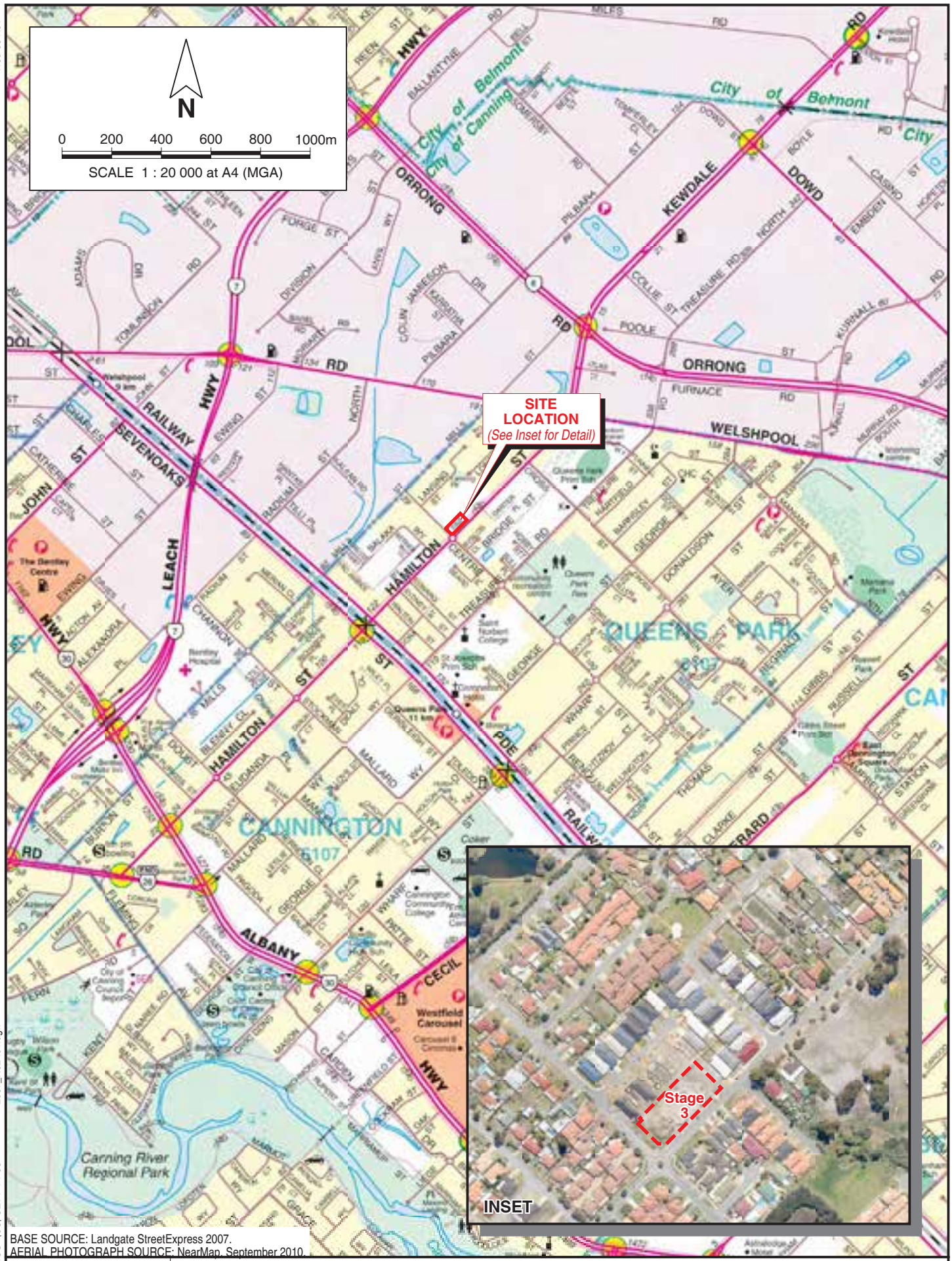
Copies of the written approval from all interested parties should be kept in **Appendix D.**

9 References

- WSP (December 2009) Report to Address Data Gaps, Lots 522-537 – Intersection of Hamilton, Centre and Trafalgar, Queens Park, WA (Revision – d) (WSP E&E , 2009)
- Environ Pty Ltd, 8 December 2009, *Mandatory Auditor's Report 162-168 Hamilton Street, Queens Park, WA* report prepared for ITAC Developments Pty Ltd (Environ, 2009)
- Letter from George King and Jeff Matthews of WSP to Philip Hitchcock of Environmental Auditors titled *"ITAC Queens Park – Stage 3 Remedial Strategy"* dated 21 May 2010 (ref: 2295_L01c)
- Letter from Philip Hitchcock of Environmental Auditors to Mr Wayne Butler of ITAC Commercial Developments titled "*Interim Audit Advice – Stage 3, 162-168 Hamilton Street, Queens Park, WA*" dated 10 June 2010 (ref: EA0023
- Letter from George King and Jeff Matthews of WSP to Philip Hitchcock of Environmental Auditors titled *"SAQP for Soil Vapour Monitoring Event Three, Hamilton Street, Queens Park, WA"* dated 17 June 2010 (ref: 2666_L01a)
- Environ Pty Ltd, 19 November 2007, *Mandatory Auditor's Report 162-176 Hamilton Street, Queens Park, WA* report prepared for ITAC Developments Pty Ltd (Environ, 2007)
- Standards Australia, HB 436 Risk Management Guidelines - Companion to AS/NZS 4360: 2004 (Standards Australia, 2004b)
- Standards Australia, Worksafe Australian National Standard, *Safe Working in Confined Space* – AS 2865 - 1995
- Western Australia Department of Environment and Conservation (DEC), December 2001: *Contaminated Sites Management Series: Reporting on Site Assessments* (DEC, 2001a)
- Western Australia Department of Environment and Conservation (DEC), April 2004: *Use of Monitored Natural Attenuation for Groundwater Remediation* (DEC, 2001b)
- Western Australia Department of Environment and Conservation (DEC), December 2001: *Contaminated Sites Management Series: Development of Sampling and Analysis Programs* (DEC, 2001b)
- Dr Frederic Leusch and Dr Michael Bartkow, Griffith University – Smart Water Research Centre, November 2010, A short primer on benzene, toluene, ethylbenzene and xylenes (BTEX) in the environment and in hydraulic fracturing fluids
- Rae Industries – Technical Note TN – 106 Correction Factors, Ionization Energies* and Calibration Characteristics

Appendix A Figures

- Figure 1 – Site Location
- Figure 2 – EMP Site Boundary
- Figure 3 – Monitoring Well Locations
- Figure 4 – EMP Conceptual Site Model



BASE SOURCE: Landgate StreetExpress 2007.
AERIAL PHOTOGRAPH SOURCE: NearMap, September 2010.

WSP

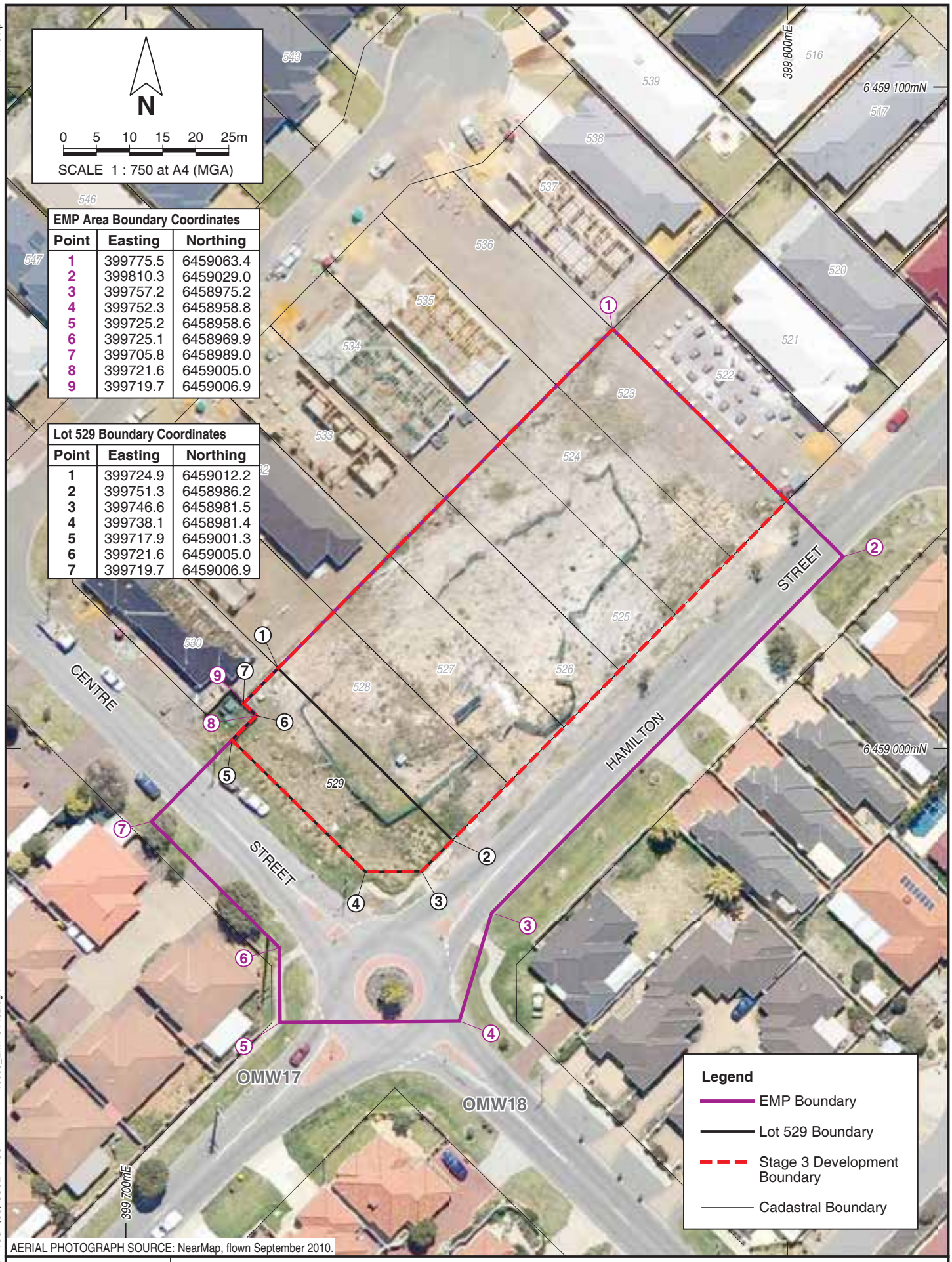
ITAC Commercial Developments Pty Ltd
HAMILTON STREET, QUEENS PARK

Date: 29 Mar 2011
Drawn: G. King

EMP - REGIONAL LOCATION MAP

Figure 1

Project No. 0018065 Report No. EMP 01



EMP Area Boundary Coordinates

Point	Easting	Northing
1	399775.5	6459063.4
2	399810.3	6459029.0
3	399757.2	6458975.2
4	399752.3	6458958.8
5	399725.2	6458958.6
6	399725.1	6458969.9
7	399705.8	6458989.0
8	399721.6	6459005.0
9	399719.7	6459006.9

Lot 529 Boundary Coordinates

Point	Easting	Northing
1	399724.9	6459012.2
2	399751.3	6458986.2
3	399746.6	6458981.5
4	399738.1	6458981.4
5	399717.9	6459001.3
6	399721.6	6459005.0
7	399719.7	6459006.9

AERIAL PHOTOGRAPH SOURCE: NearMap, flown September 2010.

WSP

ITAC Commercial Developments Pty Ltd
HAMILTON STREET, QUEENS PARK

Date: 15 Apr 2011
Drawn: G. King

ENVIRONMENTAL MANAGEMENT PLAN AREA

Figure 2

Project No. 00018065 Report No. 18065_EMP 01

AERIAL PHOTOGRAPH SOURCE: NearMap, flown September 2010.

WSP

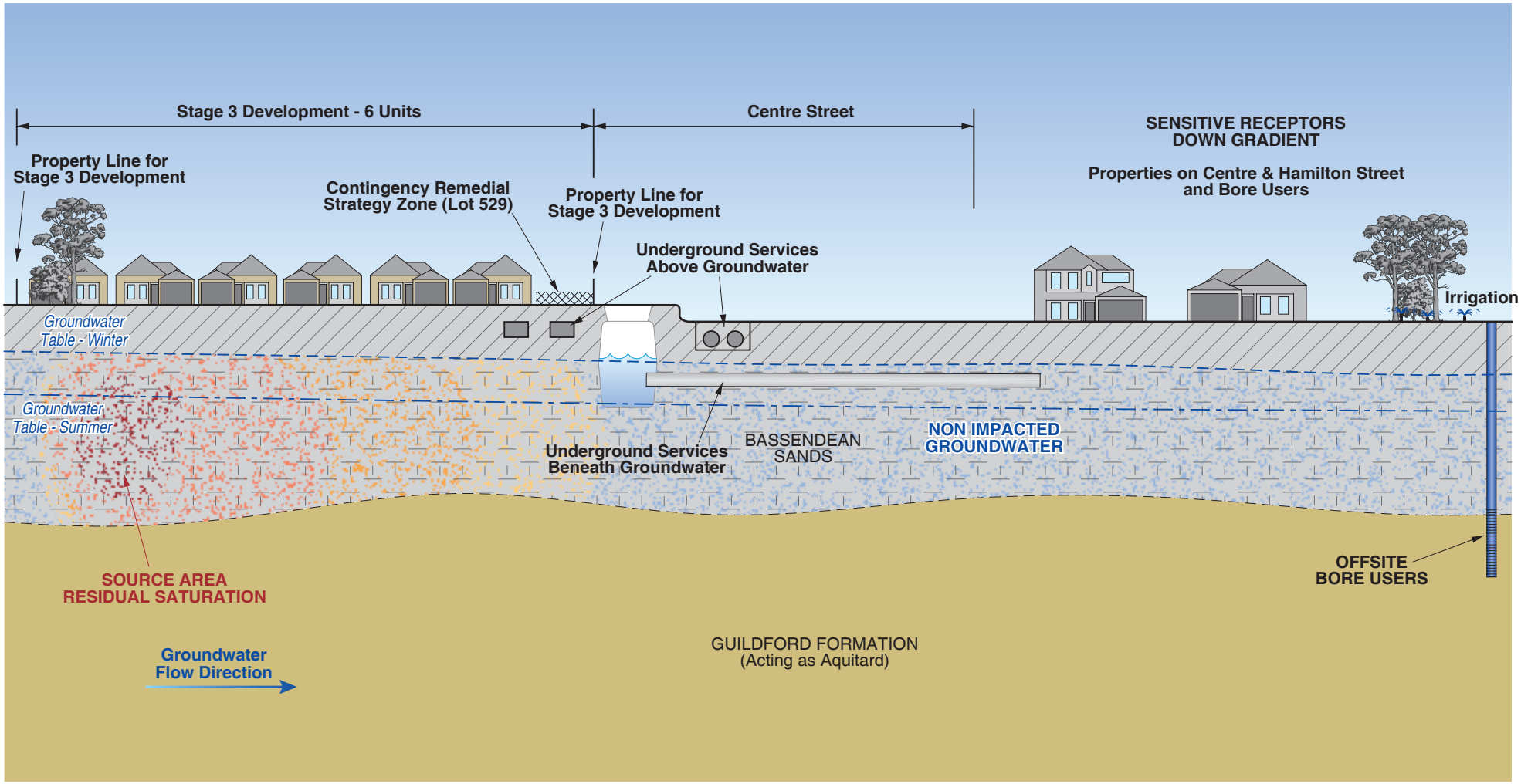
ITAC Commercial Developments Pty Ltd
HAMILTON STREET, QUEENS PARK

Date: 15 Apr 2011
Drawn: G. King

ENVIRONMENTAL MANAGEMENT PLAN MONITORING WELL LOCATIONS

Figure 3

Project No. 00018065 Report No. 18065_EMP 01



Legend

- 0 - 1.0m Beneath Site Surface and Above Groundwater - Unrestricted
- Greater than 1.0m Beneath Site Surface - Restricted

WSP

ITAC Commercial Developments Pty Ltd
HAMILTON STREET, QUEENS PARK

Date: 15 Apr 2011
Drawn: G. King

ENVIRONMENTAL MANAGEMENT PLAN

Figure 4

Project No. 00018065 Report No. 18065_EMP 01

Appendix B Chemical Analysis Results Tables

Table 01 - Residual Contaminant Levels in Groundwater

Sampled_Date-Time	LocCode	CO2 (Free)	CO2 (Total)	Benzene (BTEX)	Ethylbenzene (BTEX)	Toluene (BTEX)	Xylene (m & p) (BTEX)	Xylene (o) (BTEX)	Xylene Total (BTEX)
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		1000	1000	1	2	2	2	2	
DEC - Drinking Water Aesthetic Assessment Levels					**3**	**25**			**20**
DEC - Drinking Water Health Assessment Levels				*1*	*300*	*800*			*600*
DoH - Domestic non-potable groundwater use				10	3	25			20
Western TOX				10	30	250			200
1/14/2011	MW01	-	-	*6*	***4660***	**36**	33,300	14,400	***47,700***
1/14/2011	MW02	-	-	*2*	***3140***	<2	27,600	5830	***33,430***
1/14/2011	MW03	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	MW04	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	MW06	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	MW12	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	MW17	-	-	*2*	<2	<2	<2	<2	<4
1/14/2011	MW18	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	OMW17	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	OMW18	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	OMW19	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	OMW54	-	-	<1	<2	<2	<2	<2	<4
1/14/2011	OMW55	-	-	<1	<2	<2	<2	<2	<4
1/17/2011	MW05	72,000	336,000	*5*	**4**	<2	88	<2	**89**
1/17/2011	MW16	51,000	121,000	<1	**6**	<2	3880	4	***3884***
1/17/2011	MW19	25,000	232,000	<1	<2	<2	<2	<2	<4
1/17/2011	OMW15	19,000	130,000	<1	<2	<2	<2	<2	<4
1/17/2011	OMW16	62,000	157,000	<1	<2	<2	<2	<2	<4
1/17/2011	OMW20	21,000	196,000	<1	<2	<2	<2	<2	<4
Statistical Summary									
Number of Results		6	6	19	19	19	19	19	19
Number of Detects		6	6	4	4	1	4	3	4
Minimum Concentration		19,000	121,000	<1	<2	<2	<2	<2	<4
Minimum Detect		19,000	121,000	2	4	36	88	4	89
Maximum Concentration		72,000	336,000	6	4660	36	33,300	14,400	47,700
Maximum Detect		72,000	336,000	6	4660	36	33,300	14,400	47,700
Average Concentration		41,667	195,333	1.2	412	2.8	3415	1066	4481
Median Concentration		38,000	176,500	0.5	1	1	1	1	2
Standard Deviation		22,975	80,493	1.6	1255	8	9615	3494	12,967
Number of Guideline Exceedances		0	0	4	4	1	0	0	4
Number of Guideline Exceedances(Dete		0	0	4	4	1	0	0	4

Chlorinated Hydrocarbons

Sampled_Date-Time	LocCode	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2,3-trichloropropane	1,2-dichloroethane	Carbon tetrachloride	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Hexachlorobutadiene	Trichloroethene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		5	5	5	5	5	5	5	5	5	50	5	50	5	5	5	5	5	5	5	50
DEC - Drinking Water Aesthetic Assessment Levels																					
DEC - Drinking Water Health Assessment Levels							*30*		*3*	*3*						*0.7*		*50*			*0.3*
DoH - Domestic non-potable groundwater use							300		30	30	3					7		500			
Western TOX																					
1/14/2011	MW01	<5	<5	<5	<5	<5	<5	<5	*<5*	*<5*	<50	<5	<50	<5	<5	*<5*	<5	<5	<5	<5	*<50*
1/14/2011	MW02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW54	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/17/2011	MW05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/17/2011	MW16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/17/2011	MW19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/17/2011	OMW15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/17/2011	OMW16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/17/2011	OMW20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Statistical Summary																					
Number of Results		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Number of Detects		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration		<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<50
Minimum Detect		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration		<5	<5	<5	<5	<5	<5	<5	<5	<5	<50	<5	<50	<5	<5	<5	<5	<5	<5	<5	<50
Maximum Detect		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration																					
Median Concentration		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	25	2.5	25	2.5	2.5	2.5	2.5	2.5	2.5	2.5	25
Standard Deviation																					
Number of Guideline Exceedances		0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	1
Number of Guideline Exceedances(Dete		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Halogenated Benzenes

Sampled_Date-Time	LocCode	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Chlorobenzene
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		5	5	5	5	5	5
DEC - Drinking Water Aesthetic Assessment Levels							**10**
DEC - Drinking Water Health Assessment Levels		*30*		*1500*		*40*	*300*
DoH - Domestic non-potable groundwater use		5	5	1	20	3	10
Western TOX							
1/14/2011	MW01	<5	<5	<5	<5	<5	<5
1/14/2011	MW02	-	-	-	-	-	-
1/14/2011	MW03	-	-	-	-	-	-
1/14/2011	MW04	-	-	-	-	-	-
1/14/2011	MW06	-	-	-	-	-	-
1/14/2011	MW12	-	-	-	-	-	-
1/14/2011	MW17	-	-	-	-	-	-
1/14/2011	MW18	-	-	-	-	-	-
1/14/2011	OMW17	-	-	-	-	-	-
1/14/2011	OMW18	-	-	-	-	-	-
1/14/2011	OMW19	-	-	-	-	-	-
1/14/2011	OMW54	-	-	-	-	-	-
1/14/2011	OMW55	-	-	-	-	-	-
1/17/2011	MW05	-	-	-	-	-	-
1/17/2011	MW16	-	-	-	-	-	-
1/17/2011	MW19	-	-	-	-	-	-
1/17/2011	OMW15	-	-	-	-	-	-
1/17/2011	OMW16	-	-	-	-	-	-
1/17/2011	OMW20	-	-	-	-	-	-
Statistical Summary							
Number of Results		1	1	1	1	1	1
Number of Detects		0	0	0	0	0	0
Minimum Concentration		<5	<5	<5	<5	<5	<5
Minimum Detect		ND	ND	ND	ND	ND	ND
Maximum Concentration		<5	<5	<5	<5	<5	<5
Maximum Detect		ND	ND	ND	ND	ND	ND
Average Concentration							
Median Concentration		2.5	2.5	2.5	2.5	2.5	2.5
Standard Deviation							
Number of Guideline Exceedances		0	0	1	0	1	0
Number of Guideline Exceedances(Dete		0	0	0	0	0	0

Halogenated Hydrocarbons

Sampled_Date-Time	LocCode	1,2-dibromoethane	Bromodichloromethane	Bromoform	Bromomethane	Chlorodibromomethane	Dibromomethane	Dichlorodifluoromethane	Iodomethane	Trichlorofluoromethane
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		5	5	5	50	5	5	50	5	50
DEC - Drinking Water Aesthetic Assessment Levels										
DEC - Drinking Water Health Assessment Levels										
DoH - Domestic non-potable groundwater use										
Western TOX										
1/14/2011	MW01	<5	<5	<5	<50	<5	<5	<50	<5	<50
1/14/2011	MW02	-	-	-	-	-	-	-	-	-
1/14/2011	MW03	-	-	-	-	-	-	-	-	-
1/14/2011	MW04	-	-	-	-	-	-	-	-	-
1/14/2011	MW06	-	-	-	-	-	-	-	-	-
1/14/2011	MW12	-	-	-	-	-	-	-	-	-
1/14/2011	MW17	-	-	-	-	-	-	-	-	-
1/14/2011	MW18	-	-	-	-	-	-	-	-	-
1/14/2011	OMW17	-	-	-	-	-	-	-	-	-
1/14/2011	OMW18	-	-	-	-	-	-	-	-	-
1/14/2011	OMW19	-	-	-	-	-	-	-	-	-
1/14/2011	OMW54	-	-	-	-	-	-	-	-	-
1/14/2011	OMW55	-	-	-	-	-	-	-	-	-
1/17/2011	MW05	-	-	-	-	-	-	-	-	-
1/17/2011	MW16	-	-	-	-	-	-	-	-	-
1/17/2011	MW19	-	-	-	-	-	-	-	-	-
1/17/2011	OMW15	-	-	-	-	-	-	-	-	-
1/17/2011	OMW16	-	-	-	-	-	-	-	-	-
1/17/2011	OMW20	-	-	-	-	-	-	-	-	-
Statistical Summary										
Number of Results		1	1	1	1	1	1	1	1	1
Number of Detects		0	0	0	0	0	0	0	0	0
Minimum Concentration		<5	<5	<5	<50	<5	<5	<50	<5	<50
Minimum Detect		ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration		<5	<5	<5	<50	<5	<5	<50	<5	<50
Maximum Detect		ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration										
Median Concentration		2.5	2.5	2.5	25	2.5	2.5	25	2.5	25
Standard Deviation										
Number of Guideline Exceedances		0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Dete		0	0	0	0	0	0	0	0	0

Inorganics

Sampled_Date-Time	LocCode	Alkalinity (Bicarbonate)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	Anions Total	Cations Total	Chloride	Ferrous Iron	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)
		mg/L	µg/L	mg/L	µg/L	meq/L	meq/L	mg/L	mg/L	%	mg/L	mg/L	mg/L
EQL		1	1000	1	10	0.01	0.01	1	0.05	0.01	0.1	0.01	0.01
DEC - Drinking Water Aesthetic Assessment Levels								**250**					
DEC - Drinking Water Health Assessment Levels													
DoH - Domestic non-potable groundwater use								2500					
Western TOX													
1/14/2011	MW01	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW02	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW03	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW04	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW06	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW12	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW17	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	MW18	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW17	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW18	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW19	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW54	-	-	-	-	-	-	-	-	-	-	-	-
1/14/2011	OMW55	-	-	-	-	-	-	-	-	-	-	-	-
1/17/2011	MW05	300	<1000	300	1150	6.77	7.42	27	0.1	4.63	2	<0.01	<0.01
1/17/2011	MW16	79	<1000	79	330	4.77	5.45	84	0.08	6.73	1	0.02	<0.01
1/17/2011	MW19	235	<1000	235	60	14.2	15.6	**302**	3.98	4.84	0.2	0.06	<0.01
1/17/2011	OMW15	126	<1000	126	130	5.26	5.7	53	1.22	4.04	0.3	0.02	<0.01
1/17/2011	OMW16	108	<1000	108	560	5.05	5.48	53	0.1	4.09	0.9	<0.01	<0.01
1/17/2011	OMW20	199	<1000	199	840	5.45	5.79	47	0.21	3.11	1.4	<0.01	<0.01
Statistical Summary													
Number of Results		6	6	6	6	6	6	6	6	6	6	6	6
Number of Detects		6	0	6	6	6	6	6	6	6	6	3	0
Minimum Concentration		79	<1000	79	60	4.77	5.45	27	0.08	3.1	0.2	<0.01	<0.01
Minimum Detect		79	ND	79	60	4.77	5.45	27	0.08	3.1	0.2	0.02	ND
Maximum Concentration		300	<1000	300	1150	14.2	15.6	302	3.98	6.7	2	0.06	<0.01
Maximum Detect		300	ND	300	1150	14.2	15.6	302	3.98	6.7	2	0.06	ND
Average Concentration		175	500	175	512	6.9	7.6	94	0.95	4.6	0.97	0.019	0.005
Median Concentration		163	500	163	445	5.355	5.745	53	0.16	4.4	0.95	0.013	0.005
Standard Deviation		85	0	85	424	3.6	4	103	1.5	1.2	0.68	0.021	0
Number of Guideline Exceedances		0	0	0	0	0	0	1	0	0	0	0	0
Number of Guideline Exceedances(Dete		0	0	0	0	0	0	1	0	0	0	0	0

Assessment levels taken from:

1. DEC, Assessment levels for Soil, Sediment and Water, February 2010 (DEC, 2010)

Westen Tox, Table 4.1 Sugguested Cleanup Target Levels (WesternTox, 2007)

Notes:

-	No value available / not analysed
	Shading indicates concentration is above the relevant assessment level(s)
Aesthetic	Bold indicates concentration is above the DEC drinking water aesthetic assessment level
Health	Italics indicates concentration is above DEC drinking water health assessment level
Non-potable	Underline indicates concentration is above DoH - Domestic non-potable groundwater use
Westen Tox	Idicates concentration is above Westen Tox assessment level

Table 01 - Residual Contaminant Levels in Groundwater

									MAH					
		Nitrogen (Total Oxidised)	Nitrogen (Total)	pH (Lab)	Sodium (Filtered)	Sulphate	TDS	TOC	1,3,5-trimethylbenzene	n-butylbenzene	n-propylbenzene	p-isopropyltoluene	sec-butylbenzene	tert-butylbenzene
		mg/L	µg/L	pH Units	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		0.01	100	0.01	1	1	5	1	5	5	5	5	5	5
DEC - Drinking Water Aesthetic Asses				**6.5-8.5**										
DEC - Drinking Water Health Assessme						*500*								
DoH - Domestic non-potable groundwat						5000								
Western TOX									120					
Sampled_Date-Time	**LocCode**													
1/14/2011	MW01	-	-	-	-	-	-	-	937	57	126	44	<5	<5
1/14/2011	MW02	-	-	-	-	-	-	-	1020	13	92	15	<5	<5
1/14/2011	MW03	-	-	-	-	-	-	-	19	<5	<5	<5	<5	<5
1/14/2011	MW04	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/14/2011	MW06	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/14/2011	MW12	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/14/2011	MW17	-	-	-	-	-	-	-	<5	<5	6	<5	<5	<5
1/14/2011	MW18	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/14/2011	OMW17	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/14/2011	OMW18	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/14/2011	OMW19	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/14/2011	OMW54	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/14/2011	OMW55	-	-	-	-	-	-	-	<5	<5	<5	<5	<5	<5
1/17/2011	MW05	<0.01	2000	6.92	15	<1	448	28	131	13	49	26	<5	11
1/17/2011	MW16	0.02	1000	**6.49**	46	40	351	14	67	<5	8	<5	<5	<5
1/17/2011	MW19	0.06	300	7.27	210	47	1500	7	<5	<5	<5	<5	<5	<5
1/17/2011	OMW15	0.02	300	7.12	32	60	349	9	<5	<5	<5	<5	<5	<5
1/17/2011	OMW16	<0.01	900	6.54	50	66	356	13	<5	<5	<5	<5	<5	<5
1/17/2011	OMW20	<0.01	1400	7.27	29	6	386	15	<5	<5	<5	<5	<5	<5
Statistical Summary														
Number of Results		6	6	6	6	6	6	6	19	19	19	19	19	19
Number of Detects		3	6	6	6	5	6	6	5	3	5	3	0	1
Minimum Concentration		<0.01	300	6.49	15	<1	349	7	<5	<5	<5	<5	<5	<5
Minimum Detect		0.02	300	6.49	15	6	349	7	19	13	6	15	ND	11
Maximum Concentration		0.06	2000	7.27	210	66	1500	28	1020	57	126	44	<5	11
Maximum Detect		0.06	2000	7.27	210	66	1500	28	1020	57	126	44	ND	11
Average Concentration		0.019	983	6.9	64	37	565	14	116	6.5	17	6.6	2.5	2.9
Median Concentration		0.013	950	7.02	39	43.5	371	13.5	2.5	2.5	2.5	2.5	2.5	2.5
Standard Deviation		0.021	655	0.35	73	27	460	7.4	306	13	35	11	0	2
Number of Guideline Exceedances		0	0	1	0	0	0	0	3	0	0	0	0	0
Number of Guideline Exceedances(Dete		0	0	1	0	0	0	0	3	0	0	0	0	0

		Metals						Organic	PAH/Phenols	Solvents					TPH				
		Calcium (Filtered)	Chromium (hexavalent) (Filtered)	Chromium (III+VI) (Filtered)	Chromium (Trivalent) (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Methane	Naphthalene	Methyl Ethyl Ketone	2-hexanone (MBK)	4-Methyl-2-pentanone	Carbon disulfide	Vinyl acetate	TPH C6 - C9	TPH C10 - C14	TPH C15 - C28	TPH C29-C36	TPH+C10 - C36 (Sum of total)
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		1	0.01	0.001	0.01	1	1	0.01	7	50	50	50	5	50	20	50	100	50	50
DEC - Drinking Water Aesthetic Asses																			
DEC - Drinking Water Health Assessme			*0.05*																
DoH - Domestic non-potable groundwat			0.5																
Western TOX									300						200	500			
Sampled_Date-Time	**LocCode**																		
1/14/2011	MW01	-	-	-	-	-	-	-	226	<50	<50	<50	<5	<50	99,400	8770	1360	<50	10,100 - 10,155
1/14/2011	MW02	-	-	-	-	-	-	-	-	-	-	-	-	-	70,800	5400	190	<50	5590 - 5615
1/14/2011	MW03	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	120	160	<50	280 - 305
1/14/2011	MW04	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/14/2011	MW06	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	1190	2970	<50	4160 - 4185
1/14/2011	MW12	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/14/2011	MW17	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	250	720	90	1060
1/14/2011	MW18	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/14/2011	OMW17	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/14/2011	OMW18	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/14/2011	OMW19	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/14/2011	OMW54	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/14/2011	OMW55	-	-	-	-	-	-	-	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/17/2011	MW05	118	<0.01	<0.001	<0.01	8	11	10.7	-	-	-	-	-	-	300	2130	1970	60	4160
1/17/2011	MW16	46	<0.01	<0.001	<0.01	11	10	3.35	-	-	-	-	-	-	7720	520	140	70	730
1/17/2011	MW19	85	<0.01	<0.001	<0.01	26	6	0.072	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/17/2011	OMW15	66	<0.01	<0.001	<0.01	9	11	0.063	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/17/2011	OMW16	41	<0.01	<0.001	<0.01	13	7	0.275	-	-	-	-	-	-	<20	<50	<100	<50	<50
1/17/2011	OMW20	72	<0.01	0.002	<0.01	8	11	1.99	-	-	-	-	-	-	<20	190	530	<50	720 - 745
Statistical Summary																			
Number of Results		6	6	6	6	6	6	6	1	1	1	1	1	1	19	19	19	19	19
Number of Detects		6	0	1	0	6	6	6	1	0	0	0	0	0	4	8	8	3	8
Minimum Concentration		41	<0.01	<0.001	<0.01	8	6	0.063	226	<50	<50	<50	<5	<50	<20	<50	<100	<50	<50
Minimum Detect		41	ND	0.002	ND	8	6	0.063	226	ND	ND	ND	ND	ND	300	120	140	60	280
Maximum Concentration		118	<0.01	0.002	<0.01	26	11	10.7	226	<50	<50	<50	<5	<50	99,400	8770	2970	90	10,155
Maximum Detect		118	ND	0.002	ND	26	11	10.7	226	ND	ND	ND	ND	ND	99,400	8770	2970	90	10,155
Average Concentration		71	0.005	0.0008	0.005	13	9.3	2.7							9388	992	452	33	1429
Median Concentration		69	0.005	0.0005	0.005	10	10.5	1.1325	226	25	25	25	2.5	25	10	25	50	25	25
Standard Deviation		28	0	0.0006	0	6.9	2.3	4.1							27,160	2282	802	19	2710
Number of Guideline Exceedances		0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	0	0	0
Number of Guideline Exceedances(Dete		0	0	0	0	0	0	0	0	0	0	0	0	0	4	5	0	0	0

		VOCs													
		1,1-dichloropropene	1,2,4-trimethylbenzene	1,2-dibromo-3-chloropropane	1,2-dichloropropane	1,3-dichloropropane	2,2-dichloropropane	2-chlorotoluene	4-chlorotoluene	Bromobenzene	cis-1,4-Dichloro-2-butene	Isopropylbenzene	Pentachloroethane	Styrene	trans-1,4-Dichloro-2-butene
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL		5	5	5	5	5	5	5	5	5	5	5	5	5	5
DEC - Drinking Water Aesthetic Asses														**4**	
DEC - Drinking Water Health Assessme														*30*	
DoH - Domestic non-potable groundwat														4	
Western TOX			120												
Sampled_Date-Time	**LocCode**														
1/14/2011	MW01	<5	4660	<5	<5	<5	<5	<5	<5	<5	<5	78	<5	**<5**	<5
1/14/2011	MW02	-	2550	-	-	-	-	-	-	-	-	74	-	**<5**	-
1/14/2011	MW03	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	MW04	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	MW06	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	MW12	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	MW17	-	<5	-	-	-	-	-	-	-	-	6	-	**<5**	-
1/14/2011	MW18	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	OMW17	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	OMW18	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	OMW19	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	OMW54	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/14/2011	OMW55	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/17/2011	MW05	-	<5	-	-	-	-	-	-	-	-	18	-	**<5**	-
1/17/2011	MW16	-	256	-	-	-	-	-	-	-	-	12	-	**<5**	-
1/17/2011	MW19	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/17/2011	OMW15	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/17/2011	OMW16	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
1/17/2011	OMW20	-	<5	-	-	-	-	-	-	-	-	<5	-	**<5**	-
Statistical Summary															
Number of Results		1	19	1	1	1	1	1	1	1	1	19	1	19	1
Number of Detects		0	3	0	0	0	0	0	0	0	0	5	0	0	0
Minimum Concentration		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Minimum Detect		ND	256	ND	ND	ND	ND	ND	ND	ND	ND	6	ND	ND	ND
Maximum Concentration		<5	4660	<5	<5	<5	<5	<5	<5	<5	<5	78	<5	<5	<5
Maximum Detect		ND	4660	ND	ND	ND	ND	ND	ND	ND	ND	78	ND	ND	ND
Average Concentration			395									12		2.5	
Median Concentration		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Standard Deviation			1186									23		0	
Number of Guideline Exceedances		0	3	0	0	0	0	0	0	0	0	0	0	19	0
Number of Guideline Exceedances(Dete		0	3	0	0	0	0	0	0	0	0	0	0	0	0

Assessment levels taken from:
1. DEC, Assessment levels for Soil, Sed
Westen Tox, Table 4.1 Sugguested Clea
Notes:

-	No value ava
	Shading indic
Aesthetic	Bold indicate
Health	Italics indicat
Non-potable	Underline inc
Westen Tox	Idicates conc

Appendix C Chemical Information Sheets

- BTEX Toxicity Information
- Occupational Exposure Limits for Primary Toxic Compounds & Air Monitoring Guideline Values

A short primer on benzene, toluene, ethylbenzene and xylenes (BTEX) in the environment and in hydraulic fracturing fluids

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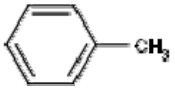
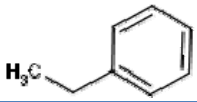
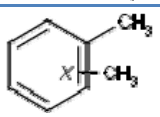
1. Some notes about concentrations

Concentrations in water in this document are generally given as part-per-billion (ppb), equivalent to one microgram per litre (µg/L). A microgram is a millionth of a gram. One ppb is roughly equivalent to a teaspoon of material in an Olympic-size swimming pool. Note that ppb air concentrations cannot simply be converted to µg/m^3 (and vice versa) but require a conversion factor.

2. What is BTEX?

BTEX is an abbreviation used for four related compounds found in coal tar, crude petroleum and a wide range of petroleum products. The compounds are **B**enzene, **T**oluene, **E**thylbenzene and **X**ylenes.

Table 1. Name, chemical abstract service registry number (CASRN, a unique identifier) and chemical structure of benzene, toluene, ethylbenzene and xylenes (BTEX).

Compound	CASRN	Chemical structure
Benzene	71-43-2	
Toluene	108-88-3	
Ethylbenzene	100-41-4	
Xylenes	1330-20-7	

Once released in the environment, BTEX compounds usually evaporate quickly into the air. BTEX can also dissolve in water, and it may be found in surface and groundwater at contaminated sites or in close vicinity to natural oil, coal and gas deposits.

3. Sources of BTEX

BTEX are naturally-occurring compounds in crude oil. Benzene for example is found at levels up to 4 g/L in crude petroleum, and can be found in sea water (0.8 ppb) in the vicinity of natural gas and petroleum deposits (IPCS 1993). Other natural sources of BTEX compounds include gas emissions from volcanoes and forest fires (IPCS 1985, 1993, 1996, 1997; ATSDR 2007a).

The primary man-made sources of BTEX into the environment are via emissions from motor vehicles and aircraft exhaust, losses during petrol marketing, spills and cigarette smoke. BTEX are created and used during the processing of refined petroleum products and coal and during the production of chemical intermediates and consumer products such as paints and lacquers, thinners, rubber products, adhesives, inks, cosmetics and pharmaceutical products (IPCS 1985, 1993, 1996, 1997; NTP 2005). BTEX compounds are among the most abundantly produced chemicals, with worldwide annual production of 8-10 million tons of benzene (NTP 2005), 5-10 million tons of toluene (ATSDR 2000), 5-10 million tons of ethylbenzene (IPCS 1996) and 10-15 million tons of xylenes (IPCS 1997).

The majority of BTEX released into the environment enter the atmosphere directly. BTEX may be introduced into water by industrial effluents and atmospheric pollution, but releases of BTEX to water are mainly related to spills of petrol and petroleum products or proximity to natural deposits of petroleum and natural gas (IPCS 1985, 1993, 1996, 1997). If present in drinking water sources, BTEX compounds can be efficiently removed by activated carbon filtration (NHMRC 2004).

3.1. BTEX in hydraulic fracturing fluids

BTEX-containing petroleum products (such as diesel) have been used as additives in stimulation fluids, particularly in hydraulic fracturing (fraccing). Well stimulation is used to increase production in oil and gas wells by improving the flow of hydrocarbons into the oil well. Fraccing is the process of pumping high pressure fluids into a coal seam to fracture the seam and allow gas to flow into the gas well, thus maximizing extraction. Fraccing fluid consists mostly of water and sand but small amounts of additives are used to thicken the fluid and improve the efficiency of the process, thus reducing the need for excess water use. The use of BTEX as an additive in fraccing fluids has in the past been permitted in coal seam gas extraction; however since 2003 the US industry has voluntarily agreed to discontinue using BTEX in fraccing fluids due to the availability of safer alternatives (USEPA 2004). In Queensland, BTEX is strictly regulated and must not be used in stimulation fluids in amounts greater than that provided by the legislation (SoQ 2010).

4. Exposure to BTEX

The presence of BTEX in petrol and as a widely used industrial solvent can result in significant and widespread emissions to the environment (Table 2). The most important source of human exposure to BTEX is from breathing of contaminated air, particularly in areas of heavy motor vehicle traffic, petrol stations and through cigarette smoke (IPCS 1985, 1993, 1996, 1997; WHO, 2008). Cigarette smoke in particular can contribute half of the daily exposure to BTEX compounds (ATSDR 2007a). Exposure to BTEX from water contributes only a small percentage of the total daily intake, compared with inhaled air and dietary sources (Table 3).

4.1. Benzene (IPCS 1993, ATSDR 2007a, NTP 2005)

Outdoor environmental levels of benzene range from 0.2 μg/m^3 (0.06 ppb) in remote rural areas to 349 μg/m^3 (107 ppb) in industrial centres with a high density of motor vehicle traffic. The percentage of benzene in unleaded petrol is approximately 1–2%. Driving a motor vehicle one hour per day is estimated to add 40 μg of benzene to a person's daily intake. Levels up to 10,000 μg/m^3 (3,000 ppb) have been measured in air at petrol stations. Spending a little under 2 min/week to refuel a car at the petrol station leads to an additional estimated daily intake of 10 μg. Benzene has been detected at levels as high as 500 μg/m^3 (154 ppb) in indoor residential air. Cigarette smoke contributes significant amounts of benzene to the levels reported in indoor air, with smokers inhaling approximately 1,800 μg benzene/d compared to 50 μg/d by non-smokers. Benzene can also occur in foods and drinks as a product of a reaction between benzoate and ascorbic acid, and has been found in soft drinks in the UK at concentrations as high as 28 ppb (μg/L) (FSA, 2006). In comparison, benzene concentrations in water are generally low (Table 2).

4.2. Toluene (IPCS 1985, ATSDR 2000)

The largest source of toluene release is during the production, transport, and use of petrol, which contains about 5–8% toluene. The concentrations of toluene in air have been found to be quite low in remote areas, but levels of 5-25 μg/m^3 (1.3–6.6 ppb) are common in suburban and urban areas, with levels as high as 1,310 μg/m^3 (350 ppb) in areas of high traffic density. Concentration at petrol station can be as high as 9,000 μg/m^3 (2,400 ppb), and refilling a car can add significantly to daily toluene intake. Toluene is also a common indoor contaminant, being used in common household products such as paints, adhesives and nail polish, as well as from cigarette smoke. Toluene is occasionally detected in drinking water supplies, but occurrence is not widespread and levels are generally below 3 ppb (but can go as high as 3,500 ppb in groundwater from industrially-polluted sites) (Table 2).

4.3. Ethylbenzene (IPCS 1996, ATSDR 2007b)

Ethylbenzene is ubiquitous in ambient air, primarily as a result of industrial releases and vehicle emissions. Petrol contains about 1-2% ethylbenzene. Ethylbenzene concentrations ranging from 0.74 to 360 μg/m^3 (0.1 – 83 ppb) have been measured at urban sites. Levels found at rural sites are generally <2 μg/m^3 (<0.46 ppb). Ethylbenzene releases to the air especially in indoor environments can occur with the use of consumer products such as pesticides, liquid process photocopiers and plotters, solvents, carpet glue, paints, varnishes, automotive products, adhesives, and fabric and leather treatments that contain ethylbenzene. Ethylbenzene is detected infrequently in drinking water (Table 2). Ethylbenzene levels in uncontaminated groundwater are generally <0.1 ppb. However, much higher levels have been reported for groundwater contaminated via waste disposal, fuel spillage and industrial facilities. At a solvent recovery facility, ethylbenzene concentrations of up to 28,000 ppb were measured in contaminated groundwater.

4.4. Xylenes (IPCS 1997, ATSDR 2007c)

Xylene is primarily released from industrial sources, in motor vehicle exhaust (petrol contains 7-10% xylenes), and during its use as a solvent. Typically, background levels of xylene in ambient air are around 1 μg/m^3 (0.23 ppb), but in suburban areas it is around 3 μg/m^3 (0.69 ppb). Higher levels have been measured in urban and industrialized areas, up to 775 μg/m^3 (178 ppb). In some cases, indoor levels of xylene can be higher than outdoor levels, especially in buildings with poor ventilation. Typically, background levels of xylenes in surface and ground waters are low (<0.1 ppb) (Table 2). Much higher levels have been measured in some industrial areas and areas associated with the oil industry.

Table 2. Reported concentrations of benzene, toluene, ethylbenzene and xylene (BTEX) in air and water.

	Benzene	Toluene	Ethylbenzene	Xylenes
Air (µg/m^3)				
Remote rural area	0.2 – 16	0.5 – 260	0.2 – 1.6	<0.1 – 3
Industrial centre with high traffic density	Up to 349	Up to 1,310	Up to 360	Up to 775
Water (ppb or µg/L)				
Surface water	<0.1 – 2.1	<1 – 15	<0.1 – 1.8	<0.1 – 1.2
Contaminated surface water	Up to 100	NA	Up to 15	Up to 32
Groundwater	<0.1 – 1.8	<1 - 100	<0.1 – 1.1	<0.1 – 0.5
Contaminated groundwater	Up to 330	Up to 3,500	Up to 2,000	Up to 1,340
Drinking water	<0.1 – 5	<1 – 27	<1 - 10	<0.1 – 12

Notes: All data in this table from ATSDR 2000, 2007a, 2007b and 2007c; IPCS 1985, 1993, 1996 and 1997; NTP 2005; WHO 2008; and NHMRC 2004.

Table 3. Estimated daily intakes of benzene, toluene, ethylbenzene and xylenes (BTEX). All values are in all in µg/d.

	Benzene	Toluene	Ethylbenzene	Xylenes
Air breathing	90 – 1,300	2 – 12,000	2 – 3,600	70 – 2,000
Cigarette smoking	1,800	2,000	40[a]	Up to 190[a]
Food	Up to 250	Up to 64	NA	NA
Drinking water	Up to 10[b]	Up to 43	Up to 20[b]	Up to 24[b]

Notes: Unless otherwise indicated, all data in this table from ATSDR 2000, 2007a, 2007b and 2007c; IPCS 1985, 1993, 1996 and 1997; NTP 2005; WHO 2008; and NHMRC 2004. [a] Assuming 5 cigarettes/d; [b] Assuming 2 L/d. NA: Not applicable.

4.5. Exposure to BTEX from hydraulic fracturing

There are two potential exposure sources to BTEX from hydraulic fracturing: 1) use of BTEX in fraccing fluids, and 2) fracturing through hydrologic confining layer and creating of a hydraulic communication between the coal seam and underground aquifers used for groundwater.

A report by the US Environmental Protection Agency (USEPA) showed that if BTEX was used as an additive to fraccing fluids, the concentration of BTEX at the point of injection would be 45-4,400 ppb for benzene, 120-31,000 ppb for toluene, 120-8,700 ppb for ethylbenzene and 330-26,000 ppb for xylenes (USEPA 2004). The report concluded that while these concentrations were high, the risk of contaminating groundwater sources of drinking water was minimal due to recovery of injected fluids (68-82%) combined with the mitigating effects of dilution and dispersion, adsorption and biodegradation (USEPA 2004).

BTEX are natural compounds found in crude oil, coal and gas deposits. As such, they may be naturally present at low concentrations in groundwater abstracted from aquifers in the vicinity of these deposits, whether BTEX has been used in fraccing fluids or not. Hydraulic fracturing may cause a link between BTEX-rich coal seam and nearby groundwater. The extent and nature of these fractures depend on the depth of the fracturing process and the local geomorphology. After careful modelling and evaluation, the USEPA report concludes that the possible hydraulic connections are unlikely to represent a significant potential threat to drinking water sourced from groundwater (USEPA 2004).

5. Impacts of exposure to BTEX

5.1. In humans

After exposure to BTEX, several factors determine whether harmful health effects will occur, as well as the type and severity of such health effects. These factors include the amount of BTEX to which you are exposed and the length of time of the exposure, as well as which BTEX compound you were exposed to. Of the four BTEX compounds, benzene is the most toxic. Most toxicity data is available for airborne exposure to BTEX, as this is the most common route of exposure to these volatile compounds.

Benzene is rapidly and efficiently absorbed and widely distributed throughout the body. Exposure to very high concentrations in air (10,000,000 ppb and above) can cause death (ATSDR 2007a). Lower levels (700,000 – 3,000,000 ppb) can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Long term exposure to benzene can cause cancer of blood forming organs (leukaemia). Eating foods or drinking liquids containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, coma, and death. The health effects that may result from eating foods or drinking liquids containing lower levels of benzene are not known (ATSDR 2007a).

Toluene is readily absorbed from the gastrointestinal tract after ingestion, and is distributed preferentially in adipose tissue, then the kidneys, liver and brain. The main effect of toluene is on the brain and nervous system, with fatigue and drowsiness being the most obvious symptoms (ATSDR 2000).

Ethylbenzene is readily absorbed from the human gastrointestinal tract. Animal studies show enlargement of the liver and kidney at high doses (400 mg/kg body weight per day). Liver effects were also observed in a number of inhalation studies. In general, acute and chronic toxicity is low in humans although symptoms such as irritation of eyes and the respiratory tract have been reported at high levels of exposure in air (IPCS 1996). Exposure to relatively low concentrations of ethylbenzene for several days to weeks resulted in potentially irreversible damage to the inner ear and hearing of animals (ATSDR 2007b).

Xylenes are readily absorbed after inhalation. Both short- and long-term exposure to high concentrations of xylene can also cause a number of effects on the nervous system, such as headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance as well as irritate the eyes and respiratory tract (ATSDR 2007c, IPCS 1997).

5.2. In aquatic organisms

Toxicity testing for BTEX compounds have also been conducted on aquatic organisms. Typically water concentrations in excess of 1 mg/L are required to produce acute toxic effects in organisms such as algae, daphnids and fish. Due to low background concentrations of these chemicals in water, rapid volatilization and degradation processes and their low to moderate toxicity, the overall risk to the aquatic environment is therefore considered low. It should be noted, however, that higher concentrations of these chemicals can occur in water at contaminated sites (IPCS 1985, 1996, 1997, USEPA 2010).

6. Guideline BTEX levels

6.1. Water

Public health guidelines for BTEX are available for drinking water in the Australian Drinking Water Guidelines (ADWG; NHMRC 2004). In air, different types of guidelines are available for both ambient and occupational settings (Air Toxics NEPM; EPHC 2004).

Benzene is a known carcinogen (cancer causing). The ADWG specify that it should not be detected in drinking water. For practical reasons, the drinking water guideline for benzene is 1 ppb (which is the analytical detection limit) (NHMRC 2004). The remaining chemicals (toluene, ethylbenzene and xylenes) are not recognized as carcinogenic (IARC 1989) and their drinking water guidelines are much higher (Table 4).

It is important to understand that health guidelines (such as the ADWG) are based on an acceptable daily intake. This is the amount of a chemical that can be ingested every day over a lifetime without adverse effect. Drinking water guidelines are set according to an acceptable daily intake based on a 70 kg person drinking 2 litres of water every day for 70 years. These guidelines provide a significant margin of safety – for example most people do not drink 2 litres of water per day and they are not constantly exposed to guideline levels of contaminants in their drinking water supply. This means that short-term exceedance of the guidelines do not necessarily represent a significant health risk depending on how often and how long these exceedances occur (enHealth 2002).

The following table summarizes current Australian and selected international guidelines both for drinking and environmental waters for the four components of BTEX.

Table 4. Water guidelines for benzene, toluene, ethylbenzene and xylene (BTEX). All values are in ppb (µg/L).

	CASRN[1]	QPHR[2]	ADWG[3]	WHO DWG[4]	US NPDWS[5]	ANZECC (99% protection)[6]
Benzene	71-43-2	1	1	10	5	600
Toluene	108-88-3	800	800 (25 for aesthetics)*	700	1 000	180
Ethylbenzene	100-41-4	300	300 (3 for aesthetics)*	300	700	50
Xylene	1330-20-7	600	600 (20 for aesthetics)*	500	10 000 (total xylenes)	200

[1] Chemical Abstract Services Registry Number; [2] Queensland Public Health Regulation (QHPR 2005); [3] Australian Drinking Water Guidelines (NHMRC 2004); [4] World Health Organisation Drinking Water Guidelines (WHO 2008); [5] United States National Primary Drinking Water Standards (USEPA 2003); [6] Australian and New Zealand Environment Conservation Council Environmental Protection Guidelines (ANZECC 2000). * Toluene, ethylbenzene and xylenes have a lower aesthetics guidelines than a health guideline. This is because these compounds will be noticeable by smell or taste before they become a health risk.

6.2. Air

The National Environment Protection (Air Toxics) Measure (Air Toxics NEPM) provides a framework for monitoring, assessing and reporting on ambient levels of five air toxics that includes benzene, toluene and xylene to assist in the future development of national air quality standards for these pollutants. The Air Toxics NEPM uses the term 'monitoring investigation levels' for air toxics. If these levels are exceeded then further investigation may be appropriate, but exceedance does not indicate that adverse health effects will occur and the goal is to gather sufficient data nationally to facilitate development of standards. As with the drinking water guidelines, benzene has the lowest value at 3 ppb (Table 5).

In Queensland, the Environmental Protection (Air) Policy 2008 (SoQ 2008) specifies guidelines for benzene, toluene and xylenes in air to ensure protection of human and environmental health from those pollutants in air (Table 5). The guidelines levels are based on the Air Toxics NEPM investigations levels.

Table 5. Air quality guidelines for benzene, toluene, ethylbenzene and xylene (BTEX). All values are in ppb.

	CASRN	NEPM Air Toxics (Annual Average)	Queensland (Air) EPP (Annual Average)
Benzene	71-43-2	3	3
Toluene	108-88-3	100	100 [a]
Ethylbenzene	100-41-4	NA	NA
Xylene	1330-20-7	200	200 [b]

Notes: [a] with concentrations up to 1,000 ppb acceptable for up to 24h. [b] with concentrations up to 250 ppb acceptable for up to 24h. NA: Not applicable

7. Conclusions

The primary exposure to BTEX is from breathing air contaminated by motor vehicle emissions, industrial use and cigarette smoke. The levels in drinking water are usually very low and intake from drinking and food sources is usually minor in comparison. However, contamination from fuel spillage and industrial activities can result in localised high concentrations in surface and groundwater. In those instances, activated carbon filtration is an effective treatment option to reduce BTEX concentrations to acceptable levels.

Use of BTEX in fraccing fluids is currently out of favour due to the availability of safer alternatives. Nevertheless, if BTEX were used in fraccing fluids, it is unlikely to significantly contribute to contamination of drinking water from groundwater sources. Groundwater in the vicinity of natural oil, gas and coal deposits may however contain elevated levels of naturally-occurring BTEX compounds. The local geomorphology and possibility of creating hydraulic connections between coal seam and nearby groundwater must be taken into account prior to using hydraulic fracturing.

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Calculation of Air Quality Monitoring Occupational Exposure Levels for VOCs

The following tables have been used to calculate occupational exposure levels for the chemicals in groundwater at the Site which have the potential to give rise to vapours

The Threshold Limit Value for the typical mixtures have been calculated based on the composition of groundwater from two wells: MW1 where the highest recorded values of impact has been recorded. MW16 at the southern boundary of the Site where.

The three values provide the user with guidelines with respect to working in atmospheres containing these compounds without PPE. The following action levels are recommended:

1. Lower Alarm Value Vapours are present. An approved organic vapour respirator (AS/NZS 1715 and 1716) can be worn for nuisance odour
2. High Alarm Value Vapours are present. Recommended use pproved organic vapour respirator (AS/NZS 1715 and 1716) while working
3. Threshold Limit Value Vapours are present at levels at or exceeding the occupational exposure levels without PPE. Exit work area and return if :
a. Levels monitored return to safe Alarm Value
b. an approved organic vapour respirator (AS/NZS 1715 and 1716) has been sourced and is worn.

Typical Contaminant Mixtures in Centre of Site (MW1)

Compound	Typical Concentration in Groundwater ug/l	Percentage of Vapour - Mole Fraction	Correction Factor for standard 10.6 PID lamp	Mole Fraction/ Correction Factor	TWA ppm	Mole Fraction/TWA	STEL	Mole Fraction/STEL
Benzene	6	0.000103	0.53	0.000195	1	0.000103	1	0.000103
Toluene	36	0.000621	0.5	0.001241	50	0.000012	150	0.000004
Ethyl benzene	4660	0.080346	0.52	0.154512	100	0.000803	125	0.000643
Xylene (o-, m-, p- isomers)	47700	0.822428	0.43	1.912623	80	0.010280	150	0.005483
Trimethyl benzene	5597	0.096502	0.35	0.275719	25	0.003860	125	0.000772
Total		1.00		2.4		0.015060		0.01
Threshold Limit Value max exposure limit (ppm)					TWA	66	STEL	143
Lower Alarm Value for PID (ppm)						14		30
High Alarm Value for PID ppm						28		59

Typical Contaminant Mixtures at Edge of Site Adjacent to Centre Street (MW16)

Compound	Typical Concentration in Groundwater ug/l	Percentage of Vapour - Mole Fraction	Correction Factor for standard 10.6 PID lamp	Mole Fraction/ Correction Factor	TWA ppm	Mole Fraction/TWA	STEL	Mole Fraction/STEL
Benzene	4	0.000686	0.53	0.001294	1	0.000686	1	0.000686
Toluene	0	0.000000	0.5	0.000000	50	0.000000	150	0.000000
Ethyl benzene	37	0.006342	0.52	0.012196	100	0.000063	125	0.000051
Xylene (o-, m-, p- isomers)	3760	0.644498	0.43	1.498832	80	0.008056	150	0.004297
Trimethyl benzene	2033	0.348474	0.35	0.995641	25	0.013939	125	0.002788
Total		1.00		2.4		0.022744		0.01
Threshold Limit Value max exposure limit (ppm)					**TWA** time weighted average for 8 hour shift	44	**STEL**	128
Lower Alarm Value for PID (ppm)						9		27
High Alarm Value for PID ppm						18		53

Reference Material

Occupational Exposure Limits for Primary Toxic Compounds (Vapour)

Standard Name	Synonyms	Cas No	TWA (ppm)	TWA (mg/m3)	STEL (ppm)	STEL (mg/m3)	Carcinogen Category
Benzene		71-43-2	1	3.2	1		see Haz. Substances information
Toluene		108-88-3	50	191	150	574	-
Ethyl benzene		100-41-4	100	434	125	543	-
Xylene (o-, m-, p- isomers)			80	350	150	655	-
Trimethyl benzene		25551-13-7	25	123	125*	-	-

Information Source: Safe Work Australia [Online - http://hsis.ascc.gov.au/SearchHS.aspx - 15 April 2011)
* with the exception of STEL for Trimethylbenzene - sourced from EH40 - UK HSE
Notes:

All occupational exposures to atmospheric contaminants should be kept to as low a level as is workable (practicable) and in all cases to below the National Standard.
These exposure standards are guides to be used in the control of occupational health hazards. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
T**WA (Time Weighted Average)**: the time-weighted average airborne concentration over an eight-hour working day, for a five-day working week over an entire working life. According to current knowledge this concentration should neither impair the health of, nor cause undue discomfort to, nearly all workers.
STEL (Short-Term Exposure Limit): the average airborne concentration over a 15-minute period which should not be exceeded at any time during a normal eight-hour work day.

Appendix D EMP Records of Third Party Review

- City of Caning
- ARCO Gas Australia
- Western Power
- Water Corporation
- Telstra

City of Caning

King, George (WSP Environmental, Perth)

From: Clint Burdett <clint.burdett@canning.wa.gov.au>
Sent: Monday, 11 July 2011 9:22 AM
To: King, George (WSP Environmental, Perth)
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi George,

The City, like most other Local Governments doesn't have a good working knowledge or experience in contaminated site investigation/remediation. It therefore places us in the position of not being able to answer competently (in my opinion) a persons queries in relation to an EMP or its implications. What we do currently on contaminated sites issues, is refer the person straight to DEC, as they are the experts in the field, we refer to the contaminated sites database and advise the person to discuss any issues with DEC, and if need be - to seek their own legal advice.

It would be the case that if we were to receive queries, we would refer the person to DEC.

It might also be worth noting that members of the public, site owners and applicants all have a responsibility to inform themselves - to do their research and liaise with DEC, check memorials etc.

I would suggest that we could retain a copy for our needs - such as reference during assessment of a Planning Application, however in terms of third parties obtaining copies or information on it, it must be linked to the already publicly available DEC database, or be available via the DEC's summary of records.

Hope this assists.

Clint Burdett

From: King, George (WSP Environmental, Perth) [mailto:George.King@WSPGroup.com]
Sent: Friday, 8 July 2011 5:09 PM
To: Clint Burdett
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Clint,

Thanks for the update.

In terms of providing access to the EMP in the future the DEC is likely to provide the following :

" DEC can provide a page on the DEC website that can function as a repository of management plans"

Notwithstanding the above there would be a strategically advantage for the City of Canning to retain the primary role outlined in Table 6.1, albeit after some practical refinement. If the DEC's website can provide a distribution point for the EMP how might the City of Canning direct queries to this from:

- Members of the Public
- Site Owners
- Planning applications from the Site

Could the City of Canning provide direction on how they would do this to provide a possible substitution to the current proposed role?

Please feel free to call if you have any queries.

Thanks again.

Kind regards

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia
Tel: +61 (0)8 9489 4325
Fax: +61 (0)8 9489 4399
Mobile: +61 (0)448 977 167
Web: http://www.wspenvironmental.com
Environmental Adviser of the Year 2010 - Acquisitions Monthly

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From: Clint Burdett [mailto:clint.burdett@canning.wa.gov.au]
Sent: Friday, 8 July 2011 4:27 PM
To: King, George (WSP Environmental, Perth)
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi George,

I note the additional role as specific in table 6.1.

The City would expect that the DEC (through the DEC's contaminated sites search facility) to be the agency responsible for providing information to interested parties on any matters relating to the contaminated site status or management of this site. We would however be open to retaining a copy of the EMP.

In terms of the EMP - Community Contact, I would advise that the City would not be willing to be identified as being responsilbe in this regard. This role/term would be more appropriately allocated to DEC or the owner/Environmental Auditor - who have the relevant experience and technical knowledge in the area of contaminated sites management.

Hope this assists.

Clint Burdett

From: King, George (WSP Environmental, Perth) [mailto:George.King@WSPGroup.com]
Sent: Friday, 8 July 2011 3:24 PM
To: Clint Burdett
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Clint,

Thanks for the confirmation.

Just a quick question. The City of Canning has two roles on Table 6.1.

EMP Community Contact - City of Canning, Environmental Health Services[3]

And the

City of Canning – Developments

The later relates to stormwater utilities which the City of Canning letter (Ref: 1677543 8 July 2011) covers.

Can the City of Canning comment/confirm on the first role as detailed below:

EMP Community Contact - City of Canning, Environmental Health Services[3] **Telephone**: (08) 9231 0606 **Website**: www.canning.wa.gov.au **Address**: Locked Bag 80 Welshpool WA 6986	1. Will retain a current copy of the EMP to enable distribution to interested parties/members of the public who request details on the Site in the future e.g. planning applications 2. Retain copies of Interested Third Party written acceptance of obligations and responsibilities within EMP – **Appendix D**

Please feel free to call if you have any queries.

Thanks again.

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia
Tel: +61 (0)8 9489 4325
Fax: +61 (0)8 9489 4399
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Environmental Adviser of the Year 2010 - Acquisitions Monthly

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From: Clint Burdett [mailto:clint.burdett@canning.wa.gov.au]
Sent: Friday, 8 July 2011 2:48 PM
To: King, George (WSP Environmental, Perth)
Subject: FW: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi George,

Please find attached a response to v3 of the proposed EMP. The original will be posted today.

If you have any further enquiries, please let me know.

Regards

Clint Burdett

From: King, George (WSP Environmental, Perth) [mailto:George.King@WSPGroup.com]
Sent: Wednesday, 22 June 2011 2:35 PM
To: Clint Burdett
Subject: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Clint,

Firstly thank you for all of your feedback and assistance to date, its proven to be most helpful in developing the current EMP.

Please find the attached copy of the EMP: **WSP Environment & Energy, Environmental Management Plan, 162-168 Hamilton Street, Queens Park, WA - version 3 (EMP V3).**
This version of the EMP has been revised to reflect the City of Canning's previous comments and letter of 2nd June 2011; **City of Canning *Environmental Management Plan – Centre & Hamilton St, Queens Park*, Ref: Doc ID 1677543**.

As discussed earlier today we would greatly appreciate the City of Canning's efforts in reviewing this version of the EMP and, if acceptable, providing written advice on its adoption.
Again please feel free to call if you require any additional information.

Kind regards

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia
Tel: +61 (0)8 9489 4325
Fax: +61 (0)8 9489 4399
Mobile: +61 (0)448 977 167
Web: http://www.wspenvironmental.com
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Enquiries: Clint Burdett
Telephone: 9231 0667
Doc ID: 1677543

RECEIVED 12/7/11

City of CANNING

8 July 2011

Mr G King
Senior Environmental Engineer
WSP Environment and Energy
29 Catherine St
SUBIACO WA 6008

Dear Mr King

ENVIRONMENTAL MANAGEMENT PLAN – CENTRE & HAMILTON ST QUEENS PARK

I refer to your email request to the City dated 22 June 2011 seeking the City's written advice in relation to a review and acceptance of proposed obligations placed on the City within the revised Environmental Management Plan (EMP) for the site located at 162-168 Hamilton Street, Queens Park.

It is acknowledged that this most recent version of the EMP has been revised to reflect the City of Canning's previous comments and letter of 2 June 2011. It is noted that the City has been acknowledged as a third party specified within the EMP and that the obligations placed upon the City have been revised.

As requested the EMP has been reviewed by the City's Environmental Health Services, and it is noted that the EMP proposes to place the following obligations upon the City of Canning;

1. *Provide written advice that they have reviewed the contents of the EMP and accept the obligations it places upon them namely;*
    a) *To update their existing health and safety documentation to include information and control measures in relation to the presence of residual contamination in ground water and the potential for volatile vapours.*
    b) *Provide signage at the site to notify emergency repair workers of the presence of residual contamination in ground water (in depths greater than 1 metre) and the necessary control measures.*
2. *Will liaise directly with the developer and or owners of individual lots with respect to the installation of services and any additional commercial requirements that may be required while working under the EMP.*
3. *Will promptly notify any concerns regarding the EMP to the DEC in relation to the discovery of;*
    a) *Potential contamination outside of the lot Boundaries (verge and road reserves of Centre and Hamilton Streets) which might be indicated by;*
        (i) Discoloured soils
        (ii) Odourous soils.

1317 Albany Highway, Cannington
(enter from George St. West)

Please address correspondence to:
Locked Bag 80, Welshpool, WA 6986

Telephone: (08) 9231 0606
Facsimile: (08) 9458 2353
Web: www.canning.wa.gov.au
Email: customer@canning.wa.gov.au

b) *Hydrocarbon product outside of the lot Boundaries (verge and road reserves of Centre and Hamilton Streets) which might be indicated by;*
   - *(i) Non aqueous floating liquid on the surface of groundwater*
   - *(ii) Sheen on ground water.*

As discussed, it is acknowledged that responsibility 1 (b) is directed to the commercial providers such as Western Power and is not a responsibility of the City. It is further noted that responsibility No. 2 above, is also directed to the commercial providers of services and not to the City.

Please be advised that the City acknowledges and accepts responsibility 1 (a) and 3, as stated above, and as shown within version 3 of the EMP.

Having said that, I take the opportunity to reiterate that the City expects that in accordance with the conditional subdivision approval as referenced above, that DEC being the responsible agency for clearing condition 1 of WAPC Approval No. 139154, will ensure that the remediation work completed so far, has been appropriately completed and that any additional remediation, monitoring and controls required by DEC are put in place by the owner such that no adverse impact occurs to surrounding residential properties or the adjacent road reserve.

It is anticipated that given the contamination has entered the road reserve that DEC will ensure that the owner remediates this contamination appropriately to avoid any adverse impact on the City or surrounding land owners. It is also anticipated that notification will be provided to the City by DEC, should classification of the site change.

Thank you for the opportunity to comment on the EMP. Should you require any additional information, please do not hesitate to contact Clint Burdett on 9231 0667.

Yours faithfully,

Clint Burdett
PRINCIPAL ENVIRONMENTAL HEALTH OFFICER

Cc: Department of Environment and Conservation

Enquiries: Clint Burdett
Telephone: 9231 0667
Doc ID: 1677543

RECEIVED 8/6/11

City of CANNING

2 June 2011

Mr G King
Senior Environmental Engineer
WSP Environment and Energy
29 Catherine St
SUBIACO WA 6008

Dear Mr King

ENVIRONMENTAL MANAGEMENT PLAN – CENTRE & HAMILTON ST QUEENS PARK

I refer to your email request to the City dated 15 April 2011 seeking the City's written advice in relation to a review and acceptance of proposed obligations placed on the City within the Environmental Management Plan for the site located at 162-168 Hamilton Street, Queens Park.

It is noted that a subdivision approval (Reference: Western Australian Planning Commission (WAPC) Application No: 139154) is current for the site and is subject to one condition of approval, relating to "all remediation works including valiadation of remediation being completed to the specifications of the Department of Environment and Conservation (DEC) and that DEC is responsible for clearing this condition prior to any site works commencing.

It is further noted that DEC has classified the site under the Contaminated Sites Act 2003 as "Contaminated – Remediation Required," and that until the remedial works are completed and a suitable validation report has been submitted to DEC, DEC cannot comment on the suitability of the site for any land use (Ref: Contaminated Sites Act 2003 – Basic Summary of Records Search Response).

As part of the submission to DEC for approval of the Environmental Management Plan (EMP) it is understood that any third party specified within that EMP should be consulted with and written advice obtained from them regarding the content of the EMP and specifically any obligations it places upon them.

As such, the EMP has been reviewed by the City's Environmental Health Services, and it is noted that the EMP proposes to place the following obligations upon the City of Canning;

1. The City of Canning will review the effectiveness of the EMP on an annual basis and following any incident or other event that suggests the EMP is ineffective.
2. The City of Canning will retain copies of Interested Third Party written acceptance of obligations and responsibilities within EMP – Appendix D.
3. The City of Canning will record any review of the EMP undertaken and ensure that any improvements deemed necessary are implemented and

1317 Albany Highway, Cannington
(enter from George St. West)

Please address correspondence to:
Locked Bag 80, Welshpool, WA 6986

Telephone: (08) 9231 0606
Facsimile: (08) 9458 2353
Web: www.canning.wa.gov.au
Email: customer@canning.wa.gov.au

communicated to relevant parties (Owners & Occupiers & Interested Third Parties).
7. The City of Canning will notify the EMP Monitoring Authority of any incidents in connection with the EMP that suggest the EMP is ineffective.

It is also noted that the City of Canning is proposed to be the EMP Monitoring Authority.

In reply, please be advised that the City declines to accept all responsibilities as stated within the EMP.

The City expects that in accordance with the conditional subdivision approval as referenced above, that DEC being the responsible agency for clearing condition 1 of WAPC Approval No. 139154, will ensure that the remediation work completed so far, has been appropriately completed and that any additional remediation, monitoring and controls required by DEC are put in place by the owner such that no adverse impact occurs to surrounding residential properties or the adjacent road reserve.

It is anticipated that given the contamination has entered the road reserve that DEC will ensure that the owner remediates this contamination appropriately to avoid any adverse impact on the City or surrounding land owners. It is also anticipated that notification will be provided to the City by DEC, should classification of the site change.

Thank you for the opportunity to comment on the EMP. Should you require any additional information, please do not hesitate to contact Clint Burdett on 9231 0667.

Yours faithfully,

Clint Burdett
PRINCIPAL ENVIRONMENTAL HEALTH OFFICER

Cc: Department of Environment and Conservation

ATCO Gas Australia

ATCO Gas Australia
12-14 The Esplanade
Perth WA 6000
Locked Bag 2507
Perth BC WA 6849
p. 08 6218 1700
f. 08 6218 1703
w. www.atcogas.com.au

5 August 2011

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine Street
Subiaco WA 6008

Re: 162-168 Hamilton Street, Queens Park, WA

Dear George,

On August 1, 2011 ATCO Australia Pty Ltd successfully acquired WA Gas Networks Pty Ltd and as a result, WA Gas Networks will now be trading as **ATCO Gas Australia**.

ATCO Gas Australia:

1. has reviewed the contents of the Environmental Management Plan (EMP), version 4 for 162-168 Hamilton Street, Queens Park, WA, dated 18th July 2011;
2. accepts the obligations that the EMP places upon them, namely, to update their existing Health & Safety Documentation to include information and control measures in relation to the presence of residual contamination in groundwater and the potential for volatile vapours in accordance with the recommendations and guidance set out in the EMP, in particular section 7.1;
3. will liaise directly with the developer and or owners of individual lots with respect to the installation of services who are commercially responsible for the additional requirements that may be required while working under the EMP;
4. acknowledges that it will, with its contractors, be providing an installation / maintenance service and are not responsible for any remedial activities on the lots;
5. will promptly notify any concerns regarding the EMP to the Department of Environment and Conservation in relation to the discovery of:
   a. potential contamination outside of the Lot Boundaries (Verge and Road Reserves of Centre and Hamilton Street) which might be indicated by discoloured soils or odorous soils; and
   b. Hydrocarbon Product outside of the Lot Boundaries (Verge and Road Reserves of Centre and Hamilton Street) which might be indicated by non aqueous floating liquid on the surface of groundwater or sheen on groundwater.

Yours faithfully

Richard Cain
Senior HSE Advisor
Telephone: (08) 9499 7205

Per. Matthew Marshall
Network Construction Manager
Telephone: (08) 9499 5273

Western Power

King, George (WSP Environmental, Perth)

From: King, George (WSP Environmental, Perth)
Sent: Friday, 15 July 2011 1:53 PM
To: 'Ben Kraft'
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Ben,,

Thanks for the update and acceptance.
Please find some notes/queries on Western Powers conditions

- The commercial aspects of the EMP implementation on the Site have been further defined. Please find these highlighted in grey the table below.
- The DEC has agreed to provide a webpage for the EMP. The signage can hold these details if further information is required. (Is there a specification location on the wall of the substation that the signage should be erected. Are any permits required to fix this or should this be conducted by Western Power?
- The EMP will be updated following the completion of the monitoring program at the site (expected to run for three years) which will ensure site meets the requirements of the Site Management Plan (discussed in the EMP)

Party	Responsibility of Party
Developer – ITAC Commercial Developments Pty Ltd: **Contact**: Wayne Butler **Telephone**: (03) 9335-4444 **Email**: wayneb@ebtransport.com.au	1. Ensure the development of the EMP is completed 2. Comply with the requirements of the EMP until the transfer of property has been completed 3. Complete Form 6 disclosure documents 14 days prior to the completion of property transfer; and 4. Ensure a memorial is placed on land titles for proposed lots 523-529 which states that the EMP must be followed where workers enter excavations deeper than 1m (based on current site surface level)
DEC – Contaminated Sites Branch **Contact**: Andrew Miller **Telephone**: (8) 9333 7582 **Email**: andrew.miller@dec.wa.gov.au **Address**: Locked Bag 104, Bentley DC 6983	1. Review and accept the Mandatory Auditors Report (MAR) for the Site. 2. Sign off the Site as acceptable for the proposed development
Environmental Consultant – WSP Environment & Energy[1] **Contact**: Neil Foster **Telephone**: (08) 9490 4325 **Email**: Neil.Foster@WSPGroup.com	1. Communicate (through the EMP) the requirement to implement suitable control measures where excavation is proposed to depths of greater than 1m below site levels. 2. Provide sufficient information within the EMP to allow third parties to update their existing Health & Safety Documentation to include information and control measures in relation to the presence of

Party	Responsibility of Party
Address:29 Catherine Street, Subiaco, WA 6008	residual contamination in groundwater and the potential for volatile vapours.
Contaminated Sites Auditor - Environmental Auditors Pty Ltd [2] **Contact**: Phillip Hitchcock **Telephone**: (02) 4915-7000 **Email:** phitchcock@environmental-auditors.com.au **Address** Environmental Auditors Pty Ltd, 282 High Street Maitland, NSW, 2320:	1. As required, will review and provide comment on information provided by the Environmental Consultant. 2. As required, will provide approval to cease or vary any component of the EMP, which forms part of the Mandatory Auditors Report (MAR) for the Site.
EMP Community Contact - City of Canning, Environmental Health Services[3] **Telephone**: (08) 9231 0606 **Website**: www.canning.wa.gov.au **Address**: Locked Bag 80 Welshpool WA 6986	1. Will retain a current copy of the EMP to enable distribution to interested parties/members of the public who request details on the Site in the future e.g. planning applications 2. Retain copies of Interested Third Party written acceptance of obligations and responsibilities within EMP – **Appendix D**
Owners & Occupiers: Potential owners/ tenants of Lots 523 to 529	1. Retains responsibility for following both the EMP and the specific restrictions set out by the memorial on title for the affected Lot 2. Will inform any contractors/construction workers employed by them of the said restrictions **3.** Notify the **EMP Community Contact** of any incidents in connection with the EMP that suggest the EMP is ineffective.
Interested Third Parties – Subsurface Utility Providers:	
WA Gas Networks – Environment Department **Telephone**: (08) 9499 7202 **Website**: www.wagasnetworks.com.au **Address:** Gate 1, 81 Prinsep Road, Jandakot, WA 6164	1. Provide written advice that they have reviewed the contents of the EMP and accept the obligations it places upon them, namely: a. To update their existing Health & Safety Documentation to include information and control measures in relation to the presence of residual contamination in groundwater and the potential for volatile vapours b. Provide signage at the Site to notify emergency repair workers of the presence of residual contamination in groundwater (at depths greater than 1m) and the necessary control measures [4] 2. Will liaise directly with the developer and or owners of individual lots with respect to the installation of services. a. The developer and or owners of individual lots are commercially responsible for the additional requirements that may be required while working under the EMP as

Party	Responsibility of Party
	outlined in Section 7.1.4 b. The utility company are providing an installation/maintenance service and are not responsible for any remedial activities on the lots. 3. Will promptly notify any concerns regarding the EMP to the DEC in relation to the discovery of a. Potential contamination outside of the Lot Boundaries (**Verge and Road Reserves of Centre and Hamilton Street)** which might be indicated by: i. Discoloured soils ii. Odorous soils b. Hydrocarbon Product outside of the Lot Boundaries (**Verge and Road Reserves of Centre and Hamilton Street)** which might be indicated by: i. Non aqueous floating liquid on the surface of groundwater ii. Sheen on groundwater

Kind regards

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia
Tel: +61 (0)8 9489 4325
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WSP Environment & Energy is one of the world's leading globally integrated consultancies. We help our clients manage their risks, enhance their management systems and make sustainable business improvements.

From: Ben Kraft [mailto:ben.kraft@westernpower.com.au]
Sent: Friday, 15 July 2011 1:36 PM
To: King, George (WSP Environmental, Perth)
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

George

Based on my site visit it appears that the wall of the substation would be the most appropriate place to store a copy of the Environment Management Plan (EMP) or at least the Appendix E of the EMP.

Western Power agrees to adopt the Environmental Management Plan (EMP) for 162-168 Hamilton Street, Queens Park, WA with the following conditions:
1. An EMP owner will be identified that will be responsible for **any additional costs** incurred by Western Power meeting the requirements of the EMP.
2. In emergency situations, Western Power may not follow the EMP, but will attempt to limit these situations.
3. The plan or brochure is placed on the wall of the substation and is regularly maintained by the EMP owner.

Please let me know when the EMP has been finalised and implemented so Western Power can commence adopting it.

If you have any queries, please give me a call.

Regards

Ben Kraft
Environment Mgmt & Performance Team Leader
Environment, Community and Approvals
Western Power - 363 Wellington Street Perth WA 6000 [map]

T: (08) 9326 4170 | **M:** 0419 847 484
E: ben.kraft@westernpower.com.au
W: westernpower.com.au
Twitter: twitter.com/westernpowerwa

"King, George (WSP Environmental, Perth)" <George.King@WSPGroup.com>

15/07/2011 12:41 PM

To "Ben Kraft" <ben.kraft@westernpower.com.au>
cc
Subject RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Ben,

Any news?

Kind regards

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia
Tel: +61 (0)8 9489 4325
Fax: +61 (0)8 9489 4399
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WSP Environment & Energy is one of the world's leading globally integrated consultancies. We help our

clients manage their risks, enhance their management systems and make sustainable business improvements.

From: King, George (WSP Environmental, Perth)
Sent: Tuesday, 12 July 2011 10:35 AM
To: 'Ben Kraft'
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Ben,

Thanks for the update. Contact details noted.
Do you have a time in mind for your Site visit. If its beneficial I may be able to meet you there?

Kind regards

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia
Tel: +61 (0)8 9489 4325
Fax: +61 (0)8 9489 4399
Mobile: +61 (0)448 977 167
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From: Ben Kraft [mailto:ben.kraft@westernpower.com.au]
Sent: Tuesday, 12 July 2011 10:16 AM
To: King, George (WSP Environmental, Perth)
Subject: Re: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

George

I have had a quick read of the revised management plan. I will need to visit the site this week to have a look at the substation area. My comments at this stage are:

- please remove my name and contact number and replace with: Environment Branch, number 0437 900 737.
- I'm unclear about the cost implications of works undertaken on the site. I would suggest that the developer will need to provide Western Power with funding to undertake the additional requirements in the area.

Once I have had a look at the site area, I will provide you with my final comments.

Regards

Ben Kraft
Environment Mgmt & Performance Team Leader
Environment, Community and Approvals
Western Power - 363 Wellington Street Perth WA 6000 [map]

T: (08) 9326 4170 | **M:** 0419 847 484
E: ben.kraft@westernpower.com.au
W: westernpower.com.au
Twitter: twitter.com/westernpowerwa

P Please consider the environment before you print this email.

"King, George (WSP Environmental, Perth)" <George.King@WSPGroup.com>

22/06/2011 02:48 PM

To <ben.kraft@westernpower.com.au>
cc
Subject Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Ben,

Firstly thank you for all of your feedback and assistance to date, its proven to be most helpful in developing the current EMP.

Please find the attached copy of the EMP: **WSP Environment & Energy, Environmental Management Plan, 162-168 Hamilton Street, Queens Park, WA - version 3 (EMP V3).**
This version of the EMP has been revised to reflect Western Power's specific feedback as well as that of the other stakeholders.

As discussed earlier today we would greatly appreciate Western Power's efforts in reviewing this version of the EMP and, if acceptable, providing written advice on its adoption.

Again please feel free to call if you require any additional information.

Kind regards

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia
Tel: +61 (0)8 9489 4325
Fax: +61 (0)8 9489 4399
Mobile: +61 (0)448 977 167
Web: http://www.wspenvironmental.com
Environmental Adviser of the Year 2010 - Acquisitions Monthly

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Water Corporation

Your Ref:
Our Ref: Aqua Doc # 5456164
Enquiries: Rupert Duckworth
Telephone: 08 9420 3069

629 Newcastle Street
Leederville 6007
Western Australia

PO Box 100
Leederville 6902
Perth Western Australia

Tel (+61 8) 9420 2420

www.watercorporation.com.au

ABN 28 003 434 917

12 July 2011

George King
WSP Environment and Energy
29 Catherine Street
SUBIACO W 6008

Dear Mr King

RE: 162-168 HAMILTON STREET, QUEENS PARK
ENVIRONMENTAL MANAGEMENT PLAN

The Water Corporation understands that the site located at 162 – 168 Hamilton Street has been remediated as part of a residential site redevelopment. The Environmental Management Plan (EMP) provides details of the work completed to date and the requirements of the Department of Environment and Conservation (DEC) with respect to sign off of the remedial works, approval of the Site Management Plan and third party obligations.

The Water Corporation will register the site in its spatial systems so that the correct OSH, Environmental and construction procedures may be used should work be carried out at the site or in the immediate vicinity. As previously advised all works at all Water Corporation construction sites are undertaken in accordance with the Water Corporation's OSH, Environmental and construction procedures and guidelines. Based on a review of the documentation provided we believe these procedures meet the requirements of the EMP.

The Water Corporation is however not able to provide written advice that we accept the obligations of the EMP. The contamination at the site and its subsequent remediation, should contaminated materials be encountered at some point in the future, is the responsibility of the property owner and not the Water Corporation. In order to ensure the Water Corporation's response is appropriate and that we are fully aware of all site management requirements, please can you provide a copy of the Site Management Plan for our information.

We trust that the above provides the information you require at this time. Please do not hesitate to contact Rupert Duckworth should any further information be required.

Yours sincerely

Rupert Duckworth
Manager EIA & Approvals

Telstra

26/7/2011

Field Enablement & Infrastructure
Network Integrity

Lvl 1/22 Henley Beach Rd
Mile End
SA 5031
Australia

Locked Bag 1634
Adelaide 5001

Telephone 08 8433 4505
Facsimile 08 8100 4118
Mobile 041 980 7901

Dave.H.Ballard@team.telstra.com

Mr George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco
WA
6008.

Dear George,

RE: EMP for 162 -168 ITAC Commercial Development, Hamilton St, Queens Park, WA

I have read and accept the contents of the Environmental Management Plan for 162-168 Hamilton Street Queens Park Western Australia provided by WSP Environment and Energy and agree to obligations placed on Telstra Corporation.

Peter Cameron (Environmental Specialist)

26/7/11

for
Dave Ballard,
Network Integrity Team Manager,
Telstra Corporation Ltd.

King, George (WSP Environmental, Perth)

From: Ballard, Dave H <Dave.H.Ballard@team.telstra.com>
Sent: Monday, 4 July 2011 9:46 AM
To: King, George (WSP Environmental, Perth)
Subject: FW: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

George,

Peter Cameron has agreed, will be happy to sign off on updated EMP when sent through.

Dave Ballard Network Integrity Manager Western

Field Delivery | Service Delivery| Telstra Operations

PHONE: 08 84334505, EMAIL FAX: 08 81004118, MOBILE: 0419 807901.

WEB http://www.in.telstra.com.au/ism/networkintegrity/index.asp
Address: 22 Henley Beach Road, Mile End, 5031
Postal Address: Locked Bag 1634, Adelaide, SA 5001

Dial 1100 Before you Dig Network Integrity: Working with the civil construction industry to prevent damage to Telstra's underground assets.

PLEASE CONSIDER THE ENVIRONMENT BEFORE YOU PRINT THIS E-MAIL!

From: Cameron, Peter T
Sent: Monday, 4 July 2011 9:55 AM
To: Ballard, Dave H
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Dave,

Yes, I'm happy with the additional wording.

Once George sends us the updated EMP with the proposed wording included in Section 6 (as indicated in his email below), I will be happy to provide written approval.

Kind Regards,

Peter Cameron Environment Specialist
HSE Operations | Centre of Expertise in Health, Safety & Environment
PHONE 08 8433 4784 | MOBILE 0419 867 763
EMAIL Peter.T.Cameron@team.telstra.com

From: Ballard, Dave H
Sent: Thursday, 30 June 2011 3:56 PM
To: Cameron, Peter T
Subject: FW: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Peter,

Response from George King below on some issues you wanted included. See highlighted area.

Dave Ballard Network Integrity Manager Western

Field Delivery | Service Delivery| Telstra Operations

PHONE: 08 84334505, EMAIL FAX: 08 81004118, MOBILE: 0419 807901.

WEB http://www.in.telstra.com.au/ism/networkintegrity/index.asp
Address: 22 Henley Beach Road, Mile End, 5031
Postal Address: Locked Bag 1634, Adelaide, SA 5001

Dial 1100 Before you Dig Network Integrity: Working with the civil construction industry to prevent damage to Telstra's underground assets.

Π PLEASE CONSIDER THE ENVIRONMENT BEFORE YOU PRINT THIS E-MAIL!

From: King, George (WSP Environmental, Perth) [mailto:George.King@WSPGroup.com]
Sent: Tuesday, 28 June 2011 6:09 PM
To: Ballard, Dave H
Subject: RE: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Dave/ Peter

Just a quick email to follow up on our conversation earlier in the week regards the specific wording of EMP V3 and commercial liability for costs associated with installation/maintenance on the lots.

Please find the proposed wording (highlighted) from Section 6.

Look forward to hearing from you.

Party	Responsibility of Party
Developer – ITAC Commercial Developments Pty Ltd: **Contact**: Wayne Butler **Telephone**: (03) 9335-4444 **Email**: wayneb@ebtransport.com.au	1. Ensure the development of the EMP is completed 2. Comply with the requirements of the EMP until the transfer of property has been completed 3. Complete Form 6 disclosure documents 14 days prior to the completion of property transfer; and 4. Ensure a memorial is placed on land titles for proposed lots 523-529 which states that the EMP

Party	Responsibility of Party
	must be followed where workers enter excavations deeper than 1m (based on current site surface level)
DEC – Contaminated Sites Branch **Contact**: Andrew Miller **Telephone**: (8) 9333 7582 **Email**: andrew.miller@dec.wa.gov.au **Address**: Locked Bag 104, Bentley DC 6983	1. Review and accept the Mandatory Auditors Report (MAR) for the Site. 2. Sign off the Site as acceptable for the proposed development
Environmental Consultant – WSP Environment & Energy[1] **Contact**: Neil Foster **Telephone**: (08) 9490 4325 **Email**: Neil.Foster@WSPGroup.com **Address**:29 Catherine Street, Subiaco, WA 6008	1. Communicate (through the EMP) the requirement to implement suitable control measures where excavation is proposed to depths of greater than 1m below site levels. 2. Provide sufficient information within the EMP to allow third parties to update their existing Health & Safety Documentation to include information and control measures in relation to the presence of residual contamination in groundwater and the potential for volatile vapours.
Contaminated Sites Auditor - Environmental Auditors Pty Ltd [2] **Contact**: Phillip Hitchcock **Telephone**: (02) 4915-7000 **Email:** phitchcock@environmental-auditors.com.au **Address** Environmental Auditors Pty Ltd, 282 High Street Maitland, NSW, 2320:	1. As required, will review and provide comment on information provided by the Environmental Consultant. 2. As required, will provide approval to cease or vary any component of the EMP, which forms part of the Mandatory Auditors Report (MAR) for the Site.
EMP Community Contact - City of Canning, Environmental Health Services[3] **Telephone**: (08) 9231 0606 **Website**: www.canning.wa.gov.au **Address**: Locked Bag 80 Welshpool WA 6986	1. Will retain a current copy of the EMP to enable distribution to interested parties/members of the public who request details on the Site in the future e.g. planning applications 2. Retain copies of Interested Third Party written acceptance of obligations and responsibilities within EMP – **Appendix D**
Owners & Occupiers: Potential owners/ tenants of Lots 523 to 529	1. Retains responsibility for following both the EMP and the specific restrictions set out by the memorial on title for the affected Lot 2. Will inform any contractors/construction workers employed by them of the said restrictions **3.** Notify the **EMP Community Contact** of any incidents in connection with the EMP that suggest the EMP is ineffective.
Interested Third Parties – Subsurface Utility Providers:	

Party	Responsibility of Party
WA Gas Networks – Environment Department **Telephone**: (08) 9499 7202 **Website**: www.wagasnetworks.com.au **Address:** Gate 1, 81 Prinsep Road, Jandakot, WA 6164	1. Provide written advice that they have reviewed the contents of the EMP and accept the obligations it places upon them, namely: a. To update their existing Health & Safety Documentation to include information and control measures in relation to the presence of residual contamination in groundwater and the potential for volatile vapours b. Provide signage at the Site to notify emergency repair workers of the presence of residual contamination in groundwater (at depths greater than 1m) and the necessary control measures [4] 2. Will liaise directly with the developer and or owners of individual lots with respect to the installation of services. a. The developer and or owners of individual lots are commercially responsible for the additional requirements that may be required while working under the EMP as outlined in Section 7.1.4 b. The utility company are providing an installation/maintenance service and are not responsible for any remedial activities on the lots. 3. Will promptly notify any concerns regarding the EMP to the DEC in relation to the discovery of a. Potential contamination outside of the Lot Boundaries (**Verge and Road Reserves of Centre and Hamilton Street)** which might be indicated by: i. Discoloured soils ii. Odorous soils b. Hydrocarbon Product outside of the Lot Boundaries (**Verge and Road Reserves of Centre and Hamilton Street)** which might be indicated by: i. Non aqueous floating liquid on the surface of groundwater ii. Sheen on groundwater
Western Power – Environment, Community and Approvals **Telephone**: (08) 9326 4170 **Website**: www.westernpower.com.au **Address:** 363 Wellington Street Perth WA 6000	
Water Corporation – EIA & Approvals **Telephone**: (08) 9420 3069 **Website**: www.watercorporation.com.au **Address**: 629 Newcastle St, Leederville WA 6007	
Telstra – Network Integrity Manager **Telephone**: 08 84334505 **Website**: www.in.telstra.com.au/ism/networkintegrity **Address**: 22 Henley Beach Road, Mile End, 5031 Address: TBC	
City of Canning – Developments **Telephone**: (08) 9231 0606 **Email**: http://www.canning.wa.gov.au **Address**: 1317 Albany Highway, Cannington WA 6107	

Kind regards

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia

Tel: +61 (0)8 9489 4325
Fax: +61 (0)8 9489 4399
Mobile: +61 (0)448 977 167
Web: http://www.wspenvironmental.com
Environmental Adviser of the Year 2010 - Acquisitions Monthly

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From: King, George (WSP Environmental, Perth)
Sent: Wednesday, 22 June 2011 2:46 PM
To: dave.h.ballard@team.telstra.com
Subject: Environmental Management Plan - Version 3: Revision following feedback and comments from stakeholders

Hi Dave,

Firstly thank you for all of your feedback and assistance to date, its proven to be most helpful in developing the current EMP.

Please find the attached copy of the EMP: **WSP Environment & Energy, Environmental Management Plan, 162-168 Hamilton Street, Queens Park, WA - version 3 (EMP V3).**
This version of the EMP has been revised to reflect Telstra's previous comments as well of those of the other stakeholders.

As discussed earlier today we would greatly appreciate Telstra's efforts in reviewing this version of the EMP and, if acceptable, providing written advice on its adoption.
Again please feel free to call if you require any additional information.

Kind regards

George King
Senior Environmental Engineer
WSP Environment & Energy
29 Catherine St
Subiaco, WA 6008, Australia
Tel: +61 (0)8 9489 4325
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Mobile: +61 (0)448 977 167
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Environmental Adviser of the Year 2010 - Acquisitions Monthly

Appendix E EMP Information Brochure

Information Brochure for Western Power Contractors

Presence of Dissolved Hydrocarbons in Groundwater Within Environmental Management Plan Area

Purpose

This brochure provides information for western power contractors undertaking emergency work on the existing underground cables and substation located on the north block corner of Hamilton Street and Centre Street.

These services are positioned adjacent to a Site impacted with residual dissolved hydrocarbons in groundwater and is managed in accordance with the *Contaminated Sites Act 2003* (CS Act).

Introduction

A memorial on the certificate of title has been placed on all residential lots at the Site to prohibit the extraction use of groundwater for any purpose (other than monitoring). A Site Management Plan is in place to monitor the residual hydrocarbon contamination in groundwater and ensure it does not migrate off Site.

Environmental Management Plan

Ground disturbing activities taking place in the area shown on the attached drawing – ***Figure 2 – Environmental Management Plan Area*** are managed by the following document:

WSP Environment & Energy*, June 2011: Environmental Management Plan, 162 – 168 Hamilton Street, Queens Park, WA. Ref: 0018065_EMP_V3*

Any excavations deeper than 1m have the potential to intercept groundwater containing dissolved hydrocarbons. The attached drawing ***Figure 4 – Environmental Management Plan*** provides a guide to the location of groundwater and services.

Advice to Contractors

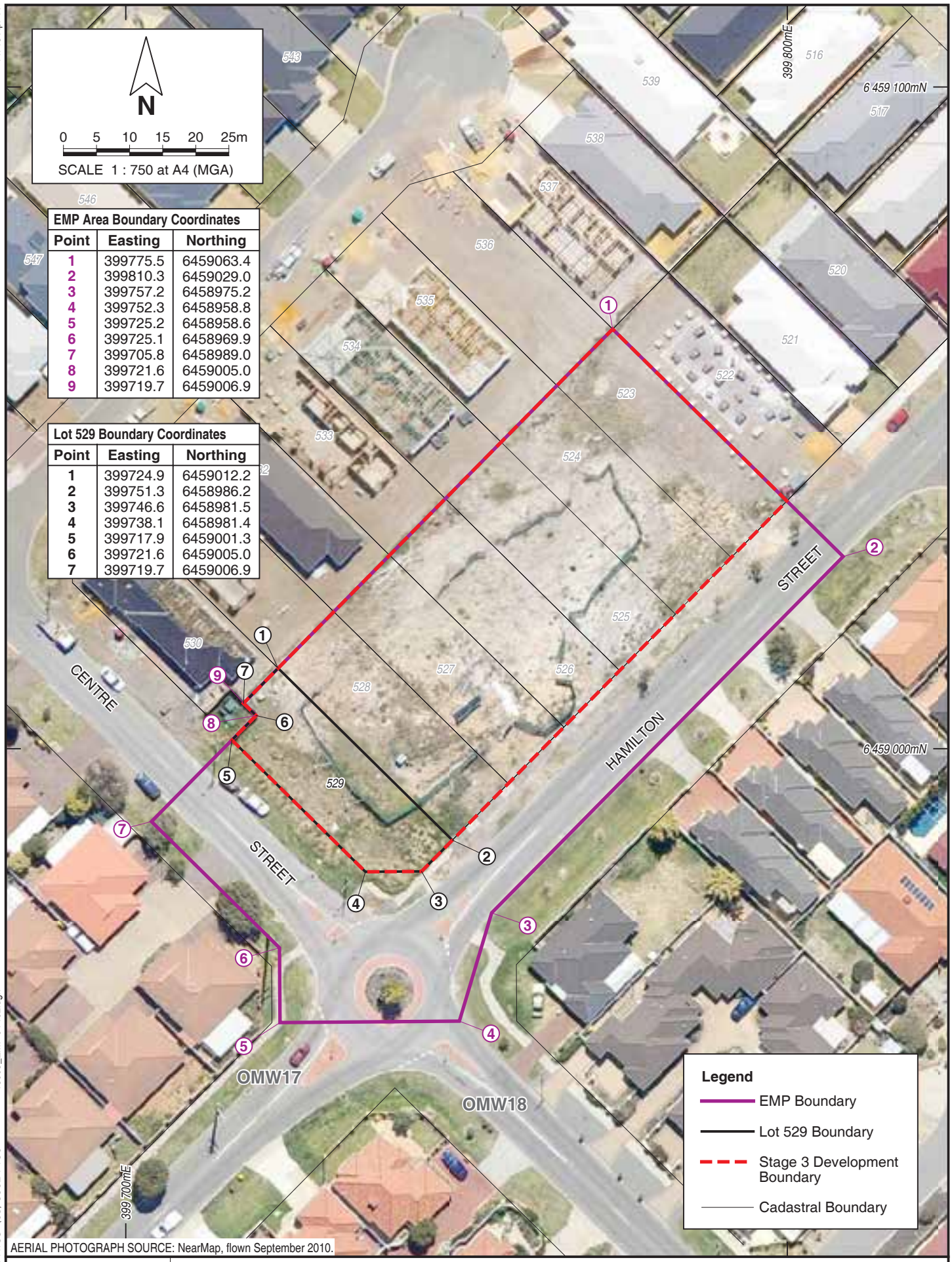
When accessing services deeper than 1m below ground level contractors are strongly advised in the first instance to contact:

Western Power – Environment, Community and Approvals
Name: Ben Kraft
Telephone: (08) 9326 4170
Mobile: 0419 847 484
Email: ben.kraft@westernpower.com.au

If this is not practical (emergency works) the following control measures are provided as a minimum guidance:

Environmental Control Measures For Excavations of Trenches deeper than 1m

Environmental Hazard	Control Measures
Odours – impacted groundwater is likely to be odorous due to the nature of the contaminants it may contain (even at low levels). Whilst these may not necessarily be hazardous to health they can be unpleasant to work in or adjacent too. Additionally the odours may prove to be unpleasant/worrying to members of the public.	Nuisance odours can be reduced through the use of respirators with volatile organic vapour filters.
Saturated soil – containing impacted groundwater has the potential to expose the receptor to a risk of dermal contact and/ or ingestion of contaminated material	Skin contact can be prevented through the use of suitable nitrile safety gloves and thigh high rubber wellington boots
Impacted groundwater – has the potential to expose receptor to the risk of dermal contact/ eye splashes and/ or ingestion	Safety glasses can be used to prevent splashes or soil from entering the eyes
Vapours – from impacted groundwater may expose the receptor to vapours exceeding the recommended occupational exposure levels for individual compounds. Appropriate real-time vapour monitoring (using photo ionisation detector PID) may be required to determine what constitutes "nuisance odour" and what has the potential to exceed occupational exposure criteria.	Vapour levels can be measured using hand held gas detectors capable of detecting volatile organic compounds (VOC) measured in PPM. Alarm levels have been calculated for the residual hydrocarbon contaminants in groundwater. The following alarm levels can be used to monitor safe occupational exposure levels while working: **Lower Alarm Value** consider use of VOC Filter Mask — 9ppm **High Alarm Value** consider use of VOC Filter Mask — 18ppm **Threshold Limit Value** exit work area and monitor until levels return to safe levels — 44ppm **TWA** time weighted average for 8 hour shift



EMP Area Boundary Coordinates

Point	Easting	Northing
1	399775.5	6459063.4
2	399810.3	6459029.0
3	399757.2	6458975.2
4	399752.3	6458958.8
5	399725.2	6458958.6
6	399725.1	6458969.9
7	399705.8	6458989.0
8	399721.6	6459005.0
9	399719.7	6459006.9

Lot 529 Boundary Coordinates

Point	Easting	Northing
1	399724.9	6459012.2
2	399751.3	6458986.2
3	399746.6	6458981.5
4	399738.1	6458981.4
5	399717.9	6459001.3
6	399721.6	6459005.0
7	399719.7	6459006.9

AERIAL PHOTOGRAPH SOURCE: NearMap, flown September 2010.

WSP

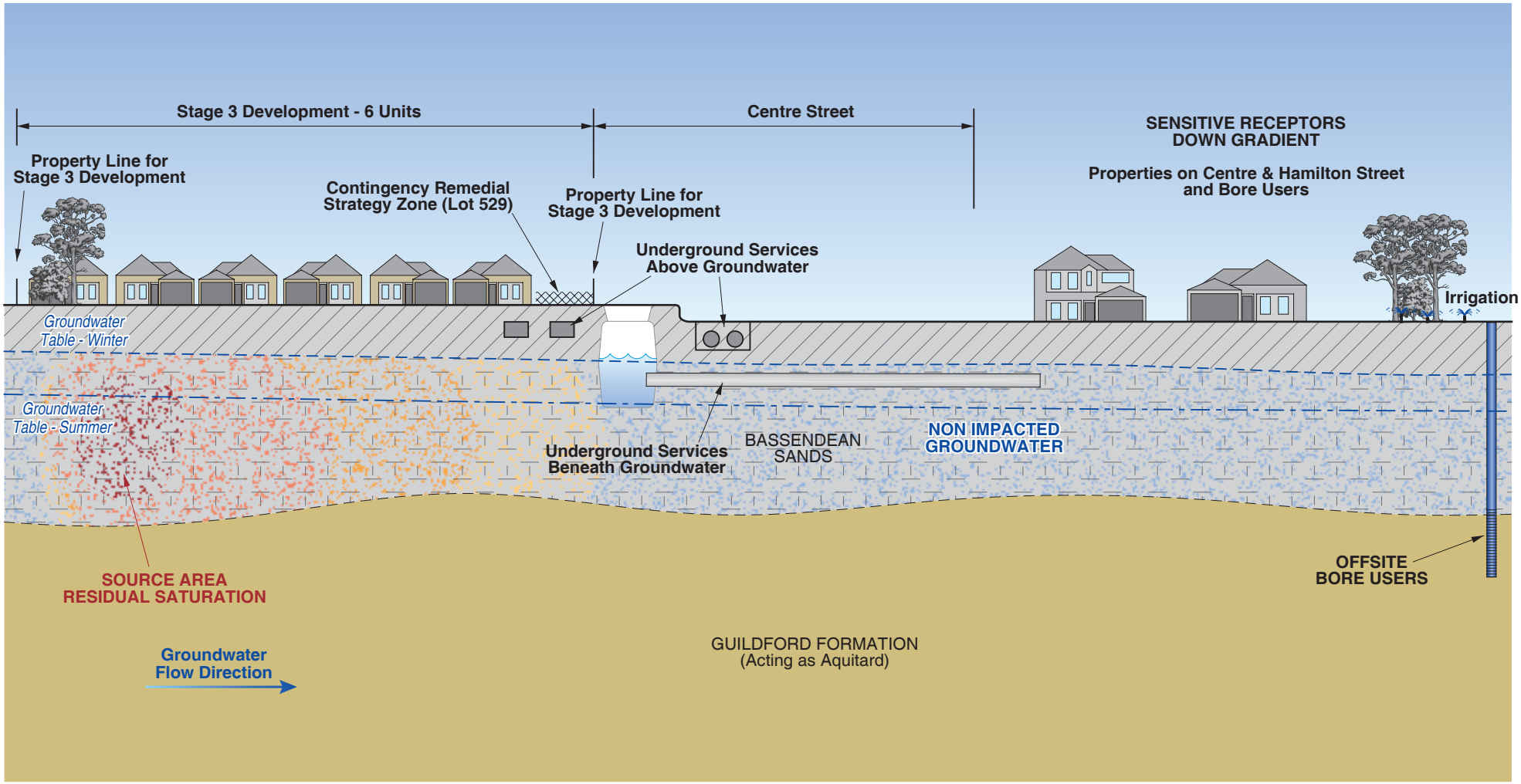
ITAC Commercial Developments Pty Ltd
HAMILTON STREET, QUEENS PARK

Date: 15 Apr 2011
Drawn: G. King

ENVIRONMENTAL MANAGEMENT PLAN AREA

Figure 2

Project No. 00018065 Report No. 18065_EMP 01



Legend

- 0 - 1.0m Beneath Site Surface and Above Groundwater - Unrestricted
- Greater than 1.0m Beneath Site Surface - Restricted

WSP

ITAC Commercial Developments Pty Ltd
HAMILTON STREET, QUEENS PARK

Date: 15 Apr 2011
Drawn: G. King

ENVIRONMENTAL MANAGEMENT PLAN

Figure 4

Project No. 00018065 Report No. 18065_EMP 01

Appendix F Waste Management Guidance

EMRC

Protecting Perth's Eastern Region

Red Hill Waste Management Facility-
Supplementary notes for contaminated waste disposal

Contact an Environmental Adviser at the EMRC

PHONE: 9424 2222
FAX: 9277 7598

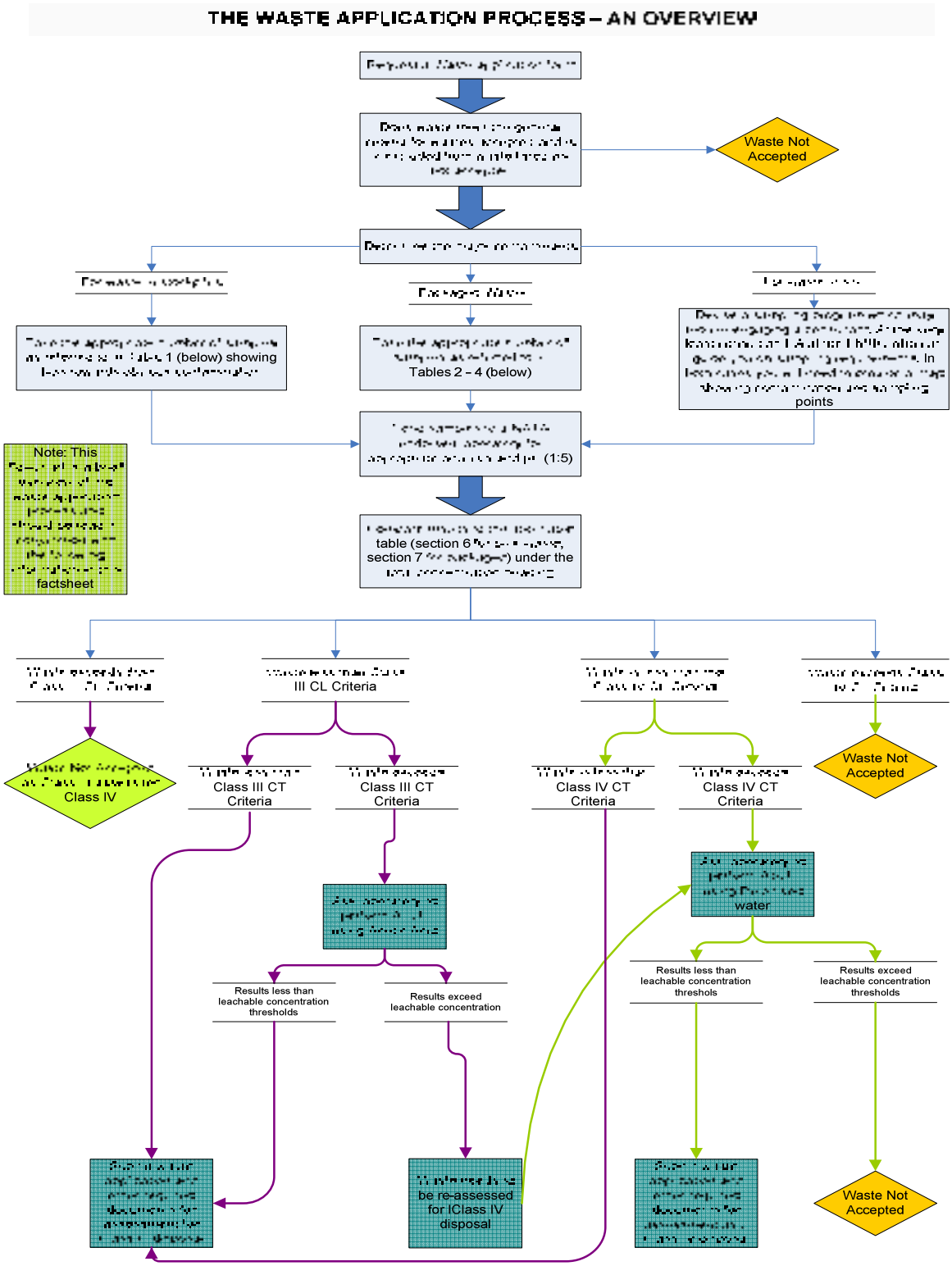
Table of Contents

1 Introduction

The following information is provided to assist customers completing the waste application process for the Red Hill Waste Management Facility. We encourage you to contact an Environmental Advisor from the Waste Management Section of the EMRC before lodging an application to ensure you are going to meet all requirements needed for a successful application and all the likely contaminants are identified.

2 Waste Acceptance

2.1 Waste Application Process



2.2 Wastes Accepted

EMRC's Red Hill Waste Management Facility is a Class IV facility and is licensed by the Department of Environment to accept Class 1-IV waste which includes a range of domestic and residential waste, contaminated wastes and asbestos waste. Contaminated waste includes contaminated soils and waste from industrial processes.

2.3 Wastes Not Accepted

Certain wastes are not acceptable for disposal at Red Hill due to varying chemical and physical characteristics that do not meet DEC landfill guidelines, licence requirements or Red Hill's standard operating procedures. These include:

- Liquids and sludges e.g. material with greater than 20% moisture content.
- Waste that has a **pH** that falls outside the acceptable range of **3.5-10.0**.
- Corrosive waste e.g. metal wastes, lead assay slags.
- Reactive waste e.g. pool chlorine (strong oxidiser).
- Flammable waste e.g. high sulphur wastes > 20 w/w%
- Radioactive waste.
- Infectious material (clinical and medical waste).
- Scheduled organochlorine pesticide waste.
- Explosives such as fireworks, ammunition or marine flares.
- Wastes which are dangerous when contacted with water e.g. bromine trifluoride, calcium carbide, sodium metal.
- Highly odorous waste (except where special arrangements are made with the Site Manager at Redhill) e.g. dead or rotting animal waste, biosolids, tannery waste and highly contaminated hydrocarbon waste.

2.4 Waste Application Process

If you wish to dispose of contaminated waste at the Red Hill Waste Management Facility you will need to submit an application form which will be assessed by the Environmental Staff at the EMRC. Information to be provided includes:

- A full description of the waste;
- Estimated quantity;
- Physical characteristics;
- Origin;
- Sampling procedure; and
- A copy of your NATA approved laboratory analysis

Prior to disposal at Red Hill, contaminated waste must be analysed to determine the total concentration of contaminants (measured in mg/kg) and their leachability. Following analysis, the contaminated waste is assessed in accordance with the DEC Landfill Waste Classification and Waste Definitions (1996).

Waste approvals are valid for one a month period and must be handed to the Weighbridge Attendant on arrival at Red Hill. Contaminated waste transported to Red Hill without a waste acceptance approval or controlled waste transport documentation will not be accepted.

2.5 Waste Application Form

A common mistake made by applicants is that not enough information is provided on the characteristics of the waste and the process generating the waste. At a minimum, a short paragraph explaining how the waste was created and the physical description plus any other relevant background information should be provided. The Environmental Advisor can then make an informed assessment and be confident that all contaminants have been identified.

3 Sampling of the Waste

3.1 How to take Samples

We would generally ask that the samples be taken from the most contaminated areas to give the worst case scenario. For in-situ sampling you will need to provide specific details on your sampling regime, which should include a map detailing the distribution of the contamination and the locations from which the samples were taken. If you have limited experience in this area you may wish to engage an environmental consultant to provide advice. A list of consultants can be found at www.eca.org.au

Soil samples should be stored with no head space in a glass jar with a PTFE lined cap which can be supplied upon request from most laboratories. Samples should be kept refrigerated and transported to a laboratory within 24hrs of sampling.

3.2 How Many Samples Need to be Taken

3.2.1 Bulk Waste

For bulk wastes the following table should act as a guide for the sampling requirements.

Table 1: Sampling requirements for bulk waste

Bulk Waste (Stockpiled)	Quantitative Assessment
<100m^3	3 samples
100m^3 to 200m^3	4 samples
200m^3 to 500m^3	6 samples
500m^3 to 1,000m^3	8 samples
1,000m^3 to 2,000m^3	11 samples
2,000m^3 to 3,000m^3	15 samples
3,000m^3 to 4,000m^3	18 samples
4,000m^3 to 5,000m^3	20 samples
5,000m^3 to 10,000m^3	24 samples OR Take a minimum of 12 samples and follow Procedure D – Determining the 95% Upper Confidence Limit (Contaminated Sites Sampling Design Guidelines, NSW EPA, 1995)
> 10,000m^3	Take 24 samples for volumes 5,000m^3 to 10,000m^3, plus 4 more samples for each additional 10,000m^3 OR Take a minimum of 12 samples and follow Procedure D – Determining the 95% Upper Confidence Limit (Contaminated Sites Sampling Design Guidelines, NSW EPA, 1995)

3.2.2 Packaged Waste

For packaged waste the number of samples is determined by the amount of information that is known regarding the source of the waste and the contaminants. The sampling requirements outlined below are taken directly from the DEC *Landfill Waste Classification and Waste Definitions 1996 (As amended).* Sufficient information will need to be provided to justify the scenario on which your sampling is based.

Table 2: Sampling requirements when contaminants unknown or no previous sampling has been conducted

Number of Containers	Sampling Requirements	Value to be compared with waste classification criteria
1 to 3	Three per container – one from the top, one from the middle and one from the bottom of each container	The average of the analysis results.
More than 3	Three containers selected randomly and sampled as for 1 to 3 containers above. One sample from each other container, with depth selected randomly	The average plus the standard deviation of the analysis results.

Table 3: Sampling requirements for known contaminants or when some previous sampling has been conducted

Number of Containers	Sampling Requirements	Value to be compared with waste classification criteria
1 to 3	One per container – with sampling depth selected randomly	The average of the analysis results.
3 to 6	Four containers selected randomly and one sample taken from each at a depth selected randomly.	The average plus the standard deviation of the analysis results*.
> 6	Three containers selected randomly and one sample taken from each at a depth selected randomly. One sample from each set of three (or part thereof) remaining containers, with containers and depths selected randomly.	The average plus the standard deviation of the analysis results*.

* The DEC *Landfill Waste Classification and Waste Definitions 1996 (As amended)* currently lists the value to the average of the sample results. This, however is an error carried over from the previous version of the guidelines.

Table 4: Sampling requirements for Homogenous Process Waste

Number of Containers	Sampling Requirements	Value to be compared with waste classification criteria
<10	Two containers selected randomly and one sample taken from each at a depth selected randomly	The average of the analysis results.
10 – 20	Three containers selected randomly and one sample taken from each at a depth selected randomly.	The average plus the standard deviation of the analysis results.
> 20	Three containers selected randomly and one sample taken from each at a depth selected randomly. One sample from each set of twenty (or part thereof) remaining containers, with containers and depths selected randomly. Eg. 45 containers = 5 samples 90 containers = 7 samples 105 containers = 8 samples	The average plus the standard deviation of the analysis results.

3.2.3 Insitu Waste

For in-situ wastes please contact an Environmental Advisor in the Waste Management Section at the EMRC, as an appropriate number of samples will need to be determined on a case by case basis.

4 Laboratory Analysis of Waste

4.1 Getting Samples Analysed

4.1.1 What Contaminants do I test for?

Based on the source of the waste you should be able to identify the likely contaminants, however it is recommended that you speak to an Environmental Advisor (Waste Management Section) at the EMRC who can provide guidance on the necessary analysis to be conducted for your particular waste.

Regardless of the type of waste you will always be required to provide the pH (1:5) of the material. If you are required to test for hydrocarbons it is necessary to ask the laboratory to report the aromatic and aliphatic results separately. When analysing for chromium, it is

necessary to provide the hexa-valiant chromium speciation. If the average result plus the standard deviation of the total concentration exceeds the contaminant threshold given in the table in sections 6 and 7 of the applications form, a leaching procedure (ASLP) will need to be carried out on the sample. For Class III waste the ASLP will need to be carried out using acetic acid. It is important that the laboratory determines the correct acetic acid leaching fluid using 1:20 pH measurements as per the Australian Standard Leaching Procedure, it may be necessary to tell the laboratory to conduct the ASLP using the leaching fluid as determined by them in accordance to the ASLP method. For Class IV waste the ASLP will need to be carried out using deionised water as the leaching fluid.

4.1.2 Getting the Samples Analysed

Analysis must be performed by a NATA (National Association Testing Authority) approved laboratory. Details of approved laboratories can be found at www.nata.com.au or by calling NATA on (08) 9451 0883. It is important to ensure that the laboratory of choice is NATA accredited for the actual tests required, and ask the laboratory to display their NATA accreditation on the laboratory reports to be submitted to the EMRC. Under no circumstances will a preliminary report be accepted. It is required that you request all Quality Control data associated with the samples to be included in the laboratory report. A chain of custody detailing the transfer of samples from the sampling stage to being accepted at the laboratory also needs to be submitted to the EMRC with your application.

4.1.3 Holding Times

You will need to ensure that samples are analysed within the appropriate holding times for the analysis required. Results obtained that are determined outside the holding times will not be accepted. This may be of high importance if additional analysis required, and may result in some cases the need for re-sampling to perform the additional analysis. The following tables give the maximum holding times for total concentrations and leaching procedures:

Table 5: The maximum soil sample holding times for total concentrations sourced from AS4482.1-1997

MAXIMUM SAMPLE HOLDING TIMES (DAYS)

Analyte	Maximum sample holding time prior to sample extraction, days
Inorganics	
Metals and metalloids other than mercury and hexavalent chromium	180
Mercury	28
Hexavalent chromium	28
Cyanide	7
Organics - Semivolatiles	
Polynuclear (polycyclic) aromatic hydrocarbons (PAHs)	14
Pesticides, organochlorine (OCs)	14
Pesticides organophosphate (OPs) and herbicides	14
Polychlorinated biphenyls (PCBs)	14
Petroleum Hydrocarbons	14
Phenols	14
Phthalate Esters	14
Other Semivolatiles	14

NOTES:

1 Table modified from ANZECC Guidelines for the laboratory analysis of contaminated soil—August 1996.

2 All samples for organics, hexavalent chromium, mercury and labile analytes should be kept at 4° C and forwarded to the laboratory as soon as possible.

Table 6: The maximum holding times for leaching procedures (ASLP) on soil samples sourced from AS4439.3-1997

MAXIMUM SAMPLE HOLDING TIMES (DAYS)

Analyte	Maximum sample holding time prior to bottle leaching days
Inorganics	
Metals (all)	28
Anions (Cl^-, F^-, I^-, SO_4^{2-}, S^{2-}, CN^-, NO_2^-, NO_3^-, PO_4^{3-})	7
Nitrogen (total Kjeldahl, NH_3/NH_4^+)	7
Phosphorus (all forms)	7
Organics	
Hydrocarbons (including total petroleum hydrocarbons, PAHs)	7
Pesticides, organochlorine (OCs)	28
Pesticides, other	7
Phenolics	7
Polychlorinated biphenyls (PCBs)	28
Other	14

4.1.4 Interpretation of results

Once the laboratory results are obtained they need to be entered into the table in Section 6 for bulk waste or the table in Section 7 for packaged waste. If the average result plus the standard deviation of the total concentration exceeds the contaminant threshold given in the table, a leaching procedure (ASLP) will need to be carried out on the sample. These results are then compared to the Leachable concentration values given in Tables 6 and 7 of the application. If the values are less than the thresholds your waste may be accepted providing that all other criteria are met. There is the option of either recording the analytical results in Sections 6 & 7 of the application form or alternatively, or requesting an electronic copy of these tables, in which you can enter your results and the calculations are automatically updated.

5 Exceptions to the Landfill Criteria

There are two occasions when waste meets the criteria for disposal in Class III landfill but cannot be accepted as Class III due to occupational health reasons. Under these circumstances waste may be disposed in the Class IV landfill and charged at the corresponding rate. These circumstances are detailed below:

5.1 The PPE Requirements of Class III

The Class III landfill is a highly active cell and the tip face is accessed not only by Red Hill operating staff but also by external contractors on a daily basis. To minimize potential health risks to Red Hill staff and other contractors, Class III contaminated waste that requires PPE beyond the standard Class III PPE will only be approved for Class IV disposal and associated charges will apply. Standard Class III PPE at Red Hill is steel capped boots, high visibility vest, long sleeved shirt and long trousers. Nitrile gloves and safety/sunglasses are also used in Class III when required.

5.2 Asbestos Contaminated Soil

Due to the high activity of the Class III tip face, soil contaminated with asbestos is not permitted. The movement of machinery over the waste can result in the asbestos becoming airborne presenting a health risk to anyone downwind of the Class III landfill. Plastic wrapped asbestos can be received in Class III landfill.

6 Consequences for the incorrect classification of waste

All waste that is accepted at Redhill Waste Management Facility will be sampled and tested by the EMRC to verify the class of the waste being accepted. Any waste that is found to be of a higher class than that indicated on the application form will be reported to the Department for the Environment. The EMRC will also meet with the applicant to determine the reason for the non-conformance and may take other action as appropriate.

Regular reclassification of waste from a single customer may lead to the EMRC banning waste from that customer. *For these reasons, the EMRC strongly encourages customers to ensure that the waste sampling methods and laboratory analysis adequately represent the waste, and that the application form depicts the true nature and origin of the waste*

WATER CORPORATION

Industrial Waste – Form 2-1-1
Industrial Waste Application (One-Off Discharge)

Use this Application to request approval from the Water Corporation for a short-term or one-off discharge of industrial waste to the wastewater system.

This application is required when a business proposes to discharge industrial waste to sewer for a short term. The Water Corporation Industrial Waste Section will assess the application and determine if the waste can be discharged, and any conditions which must apply. Waste can only be accepted if it has no harmful, disruptive or hazardous impacts on the wastewater system, the environment or human health.

This application is to be completed by the organisation proposing to discharge the waste. The applicant is responsible for overall management of the discharge and payment of accounts. For further information contact Water Corporation – Industrial Waste Section.

1. Applicant details

Business Trading Name _____ **ABN** _____

Business Address _____

Business Contact _____ **24hr Contact No** _____

E-mail _____ **Fax No.** _____

2. Property where the discharge will occur

Address _____

Property Account No. or Reserve No. (if known) _____ _____

Business Contact _____ **Phone No.** _____

2. Contractor details

If a contractor will operate the discharge, provide details.

Business Name _____

Business Contact _____ **Phone No.** _____

E-mail _____ **Fax No.** _____

3. Proposed Discharge Details

Provide details of the proposed discharge. A chemical analysis of a representative sample of the waste is required. (If this is not possible contact the Water Corporation – Industrial Waste Section) Samples must be tested by a NATA accredited laboratory for BOD, suspended solids, TKN, TP, pH, conductivity, and sulphate. Additional sampling and analyses may be required as part of the assessment.

Discharge rate and volume must be accurately verifiable by the Water Corporation during the discharge period.

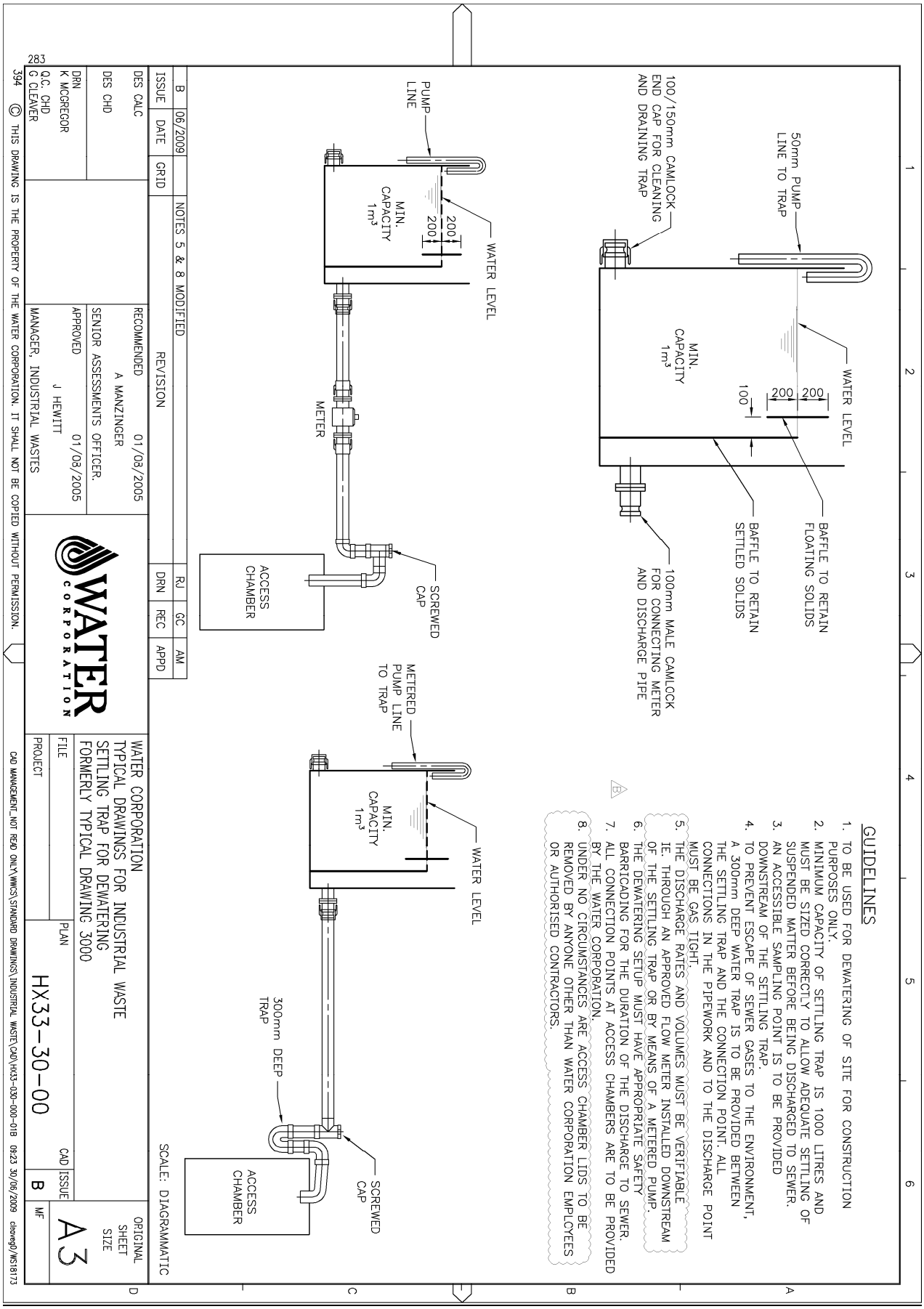
1. **Nature of industrial waste** *Attach lab results or MSDS.*	☐ lab results attached ☐ MSDS attached Concentration of product in wastestream		
2. **Reasons why the discharge is necessary**			
3. **Estimated total discharge vol** (kL)		4. **Proposed rate of discharge** (l/sec)	
5. **Method of discharge rate control and volume measurement**			
6. **Treatment prior to discharge** *Provide diagram.*	☐ diagram attached	☐ as per typical diagram (see over)	
7. **Location of discharge** *Provide a site plan indicating the proposed discharge location.*	☐ property sewer connection ☐ plan attached ☐ other *(Give details)*	☐ access chamber	No:
8. **Date(s) and time(s) of proposed discharge**			

4. Applicant's signature

Name _____ Signature _____

Position _____ Date _____

(Senior Company Representative)


GUIDELINES
1. TO BE USED FOR DEWATERING OF SITE FOR CONSTRUCTION PURPOSES ONLY.
2. MINIMUM CAPACITY OF SETTLING TRAP IS 1000 LITRES AND MUST BE SIZED CORRECTLY TO ALLOW ADEQUATE SETTLING OF SUSPENDED MATTER BEFORE BEING DISCHARGED TO SEWER.
3. AN ACCESSIBLE SAMPLING POINT IS TO BE PROVIDED DOWNSTREAM OF THE SETTLING TRAP.
4. TO PREVENT ESCAPE OF SEWER GASES TO THE ENVIRONMENT, A 300mm DEEP WATER TRAP IS TO BE PROVIDED BETWEEN THE SETTLING TRAP AND THE CONNECTION POINT. ALL CONNECTIONS IN THE PIPEWORK AND TO THE DISCHARGE POINT MUST BE GAS TIGHT.
5. THE DISCHARGE RATES AND VOLUMES MUST BE VERIFIABLE IE. THROUGH AN APPROVED FLOW METER INSTALLED DOWNSTREAM OF THE SETTLING TRAP OR BY MEANS OF A METERED PUMP.
6. THE DEWATERING SETUP MUST HAVE APPROPRIATE SAFETY BARRICADING FOR THE DURATION OF THE DISCHARGE TO SEWER.
7. ALL CONNECTION POINTS AT ACCESS CHAMBERS ARE TO BE PROVIDED BY THE WATER CORPORATION.
8. UNDER NO CIRCUMSTANCES ARE ACCESS CHAMBER LIDS TO BE REMOVED BY ANYONE OTHER THAN WATER CORPORATION EMPLOYEES OR AUTHORISED CONTRACTORS.
50mm PUMP LINE TO TRAP
WATER LEVEL
BAFFLE TO RETAIN FLOATING SOLIDS
BAFFLE TO RETAIN SETTLED SOLIDS
100mm MALE CAMLOCK FOR CONNECTING METER AND DISCHARGE PIPE
100/150mm CAMLOCK END CAP FOR CLEANING AND DRAINING TRAP
MIN. CAPACITY 1m³
200
200
100
PUMP LINE
WATER LEVEL
MIN. CAPACITY 1m³
200
200
METER
SCREWED CAP
ACCESS CHAMBER
METERED PUMP LINE TO TRAP
WATER LEVEL
MIN. CAPACITY 1m³
300mm DEEP TRAP
SCREWED CAP
ACCESS CHAMBER
SCALE: DIAGRAMMATIC
B 06/2009 NOTES 5 & 8 MODIFIED RJ GC AM
ISSUE DATE GRID REVISION DRN REC APPD
DES CALC
DES CHD
DRN K MCGREGOR
Q.C. CHD G CLEAVER
RECOMMENDED A MANZINGER 01/03/2005
SENIOR ASSESSMENTS OFFICER.
APPROVED J HEWITT 01/03/2005
MANAGER, INDUSTRIAL WASTES
WATER CORPORATION
TYPICAL DRAWINGS FOR INDUSTRIAL WASTE
SETTLING TRAP FOR DEWATERING
FORMERLY TYPICAL DRAWING 3000
FILE
PROJECT
PLAN
HX33-30-00
CAD ISSUE B
ORIGINAL SHEET SIZE A3
MF
283
394
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