APPENDIX 3

Phase One Environmental Site Assessments prepared by EIS

ENVIRONMENTAL INVESTIGATION SERVICES

REPORT

TO

KU-RING-GAI COUNCIL

ON

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT

AT

90 BABBAGE ROAD, ROSEVILLE CHASE, NSW 2069

APRIL 2012

REF: E25606KGrpt

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EXECUTIVE SUMMARY

Ku-ring-gai Council commissioned EIS to undertake a Phase 1 Environmental Site Assessment (ESA) at 90 Babbage Road, Roseville Chase. EIS understands that Council proposes to rezone the land from 'Recreation Existing 6(a)' to 'Residential 2(a)'. The primary objective of the investigation was to assess the potential risk of significant widespread contamination of the site.

A review of the regional geology indicates that the site is underlain by sandstone bedrock. The groundwater bore records indicate that groundwater is not considered to be a potential resource in the immediate vicinity of the site. The site is located within an area where there is no known occurrence of acid sulphate soils.

At the time of the investigation the site was a public reserve and was relatively inaccessible due to the heavy vegetation (ferns and medium to large trees) covering the majority of the site. The remainder of the site was cleared and contained several outcrops of sandstone. The site sloped down towards Middle Harbour, located approximately 50m east. The surrounding land use was predominantly residential.

A search of historical information did not indicate that the site had ever been developed. There are no recorded notices listed on the NSW EPA registers and WorkCover have no records of dangerous goods licenses issued for the site. A site inspection of accessible areas did not identify any obvious sources of potential contamination.

Although no obvious potential on-site contamination sources were identified during the investigation, it is possible that fill material may have been dumped on the site at some time in the past.

Contaminants of potential concern associated with imported fill material include heavy metals, petroleum hydrocarbons, BTEX compounds, PAHs and pesticides. The main potential receptors are considered to include Middle Harbour, site visitors, workers and adjacent property owners, who may come into contact with contaminated soil and/or be exposed to contaminated dust arising from construction activity; and future site occupants.

Based on the assessment findings, the potential for significant, widespread soil and/or groundwater contamination at the site is considered to be low.

However, as with all accessible vacant lands there is always a risk of tipping or filling having taken place at some time in the past. In the event that any evidence of tipping or filling is discovered after the site has been cleared an environmental consultant should be contacted to undertake a further assessment.

The conclusions presented in this report have been made within the limitations of the scope of works undertaken for the investigation. The conclusions and recommendations should be read in conjunction with the limitations presented in the body of the report.

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1 INTRODUCTION

Ku-ring-gai Council commissioned Environmental Investigation Services (EIS), a division of Jeffery & Katauskas Pty Ltd (J&K), to undertake a Phase 1 Environmental Site Assessment (ESA) at 90 Babbage Road, Roseville Chase.

The site is identified as Lot 119 DP1100208 and at the time of this investigation was a public reserve. The site location is shown on Figure 1 and the investigation was confined to the site boundaries as shown on Figure 2.

The assessment was undertaken generally in accordance with an EIS proposal (Ref: EP6204KG) of 1 March 2012 and written acceptance from Ku-ring-gai Council (Ref: S09007).

This report describes the investigation procedures and presents the results of the ESA, together with comments, discussion and recommendations.

1.1 Proposed Rezoning Details

EIS understands that Council proposes to rezone the land from 'Recreation Existing 6(a)' to 'Residential 2(a)'.

1.2 References to the State Body for Environmental Regulation

Over the past few years the environmental regulatory body has undergone a number of name changes, including:

- Environment Protection Authority (EPA);
- Department of Environment and Conservation (DEC);
- Department of Environment and Climate Change (DECC);
- Department of Environment, Climate Change and Water (DECCW); and
- Office of Environment and Heritage (OEH).

The department is currently known as the EPA.

2 OBJECTIVES AND SCOPE OF WORK

2.1 Objectives

The primary objectives of the investigation were to:

- Assess the potential risk of significant widespread contamination of the site; and
- Prepare a report presenting the results of the assessment generally in accordance with the *NSW EPA Guidelines for Consultants Reporting on Contaminated Sites (1997[1])* and *State Environmental Planning Policy No.55 – Remediation of Land (1998[2])*.

2.2 Scope of Work

The scope of work undertaken to achieve the objective included:

1. Review of historical aerial photographs;
2. Review of historical land title records;
3. Search of the NSW EPA public register for notices on the site under Section 58 of the *Contaminated Land Management Act* (1997[3]);
4. Search of the NSW EPA public register (POEO) for licences, applications or notices for the site;
5. Search of the NSW EPA public register for sites notified to the EPA under the *Guidelines on the Duty to Report Contamination*[4];
6. Search of WorkCover databases for licenses to store dangerous goods, including underground fuel storage tanks (USTs);
7. Review of Ku-ring-gai Council historical development applications (DA) and building approvals (BA) records for the site;
8. Purchase and review of the Section 149 (2 and 5) Planning Certificate (s149) for the site;
9. Review of regional geology and groundwater conditions, including the location of registered groundwater bores and major underground services in the vicinity of the site;
10. Review of acid sulphate soil (ASS) Risk map for the site;
11. Review of Dial Before You Dig (DBYD) plans for underground services;
12. Walkover inspection of the site and immediate surrounds to identify potential contamination sources;

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[1] *Guidelines for Consultants Reporting on Contaminated Sites,* NSW EPA, 1997 (Reporting Guidelines 1997)

[2] *State Environmental Planning Policy No. 55 – Remediation of Land,* NSW Government, 1998 (SEPP55)

[3] *Contaminated Land Management Act,* NSW Government Legislation, 1997 (CLM Act 1997)

[4] *Guidelines on the Duty to Report Contamination*, NSW Government Legislation, 2008 (Duty to Report Contamination 2008)

13. Preparation of a report presenting the results of the assessment together with recommendations and comments on the suitability of the site for the proposed development.

The site was inspected on the 21st of March, 2012.

3 SITE INFORMATION

3.1 Site Identification

The site identification details are summarised in the following table:

Site Owner:	Ku-ring-gai Council
Site Address:	90 Babbage Road, Roseville Chase
Lot & Deposited Plan:	Lot 119 DP1100208
Current Land Use:	Public Reserve
Proposed Land Use:	Residential
Local Government Authority:	Ku-ring-gai Council
Current Zoning:	Recreation Existing 6(a)
Proposed Zoning:	Residential 2(a)
Site Area:	Approximately 840m^2
AHD:	Approximately 27m-33m
Geographical Location (MGA):	S: 33°46'30" E: 151°12'16" (approximately)
Site Locality Plan:	Refer to Figure 1
Site Location Plan:	Refer to Figure 2

3.2 Site Description

The site is located on the western side of Babbage Road in Roseville Chase. The regional topography is hilly, sloping down to the north-east towards Middle Harbour. The site itself slopes down towards Middle Harbour, located approximately 50m to the east.

At the time of the investigation the site was a public reserve, although the site was relatively inaccessible due to vegetation. The majority of the site was heavily vegetated with ferns and medium to large trees (see Plate 1, Appendix B). The remainder of the site was cleared and contained several outcrops of sandstone. Surface water was observed running off the eastern boundary of the site towards a stormwater pipe (Plate 2).

A residential property was located on the adjacent lot to the south of the site (88 Babbage Road). A vegetated vacant lot, similar to the site, was located on the adjacent lot to the north of the site (92 Babbage Road). Residential properties were located at 94 Babbage Road further to the north and west of the site at 50 Babbage Road.

3.2.1 Underground Services

Underground services were not observed on-site during the site inspection. The 'Dial Before You Dig' (DBYD) plans were also reviewed as part of the Phase 1 ESA. The DBYD plans did not indicate the presence of underground services on-site.

3.3 Regional Geology

The geological map of Sydney (1983[5]) indicates the site to be underlain by Hawkesbury Sandstone, which typically consists of medium to coarse-grained quartz sandstone with minor shale and laminite lenses.

3.4 Acid Sulfate Soil Risk Map

The acid sulfate soil risk maps indicate areas of high risk, low risk and no known occurrence of acid sulfate soils. The acid sulfate soil risk map for the area prepared by Department of Land and Soil Conservation (1997[6]) indicates that the site is located within an area where there is no known occurrence of acid sulphate soils.

3.5 Hydrogeology

NSW Office of Water[7] records were researched for the investigation and indicated that four registered groundwater bores lie within 1km of the site. The groundwater works summaries and a map indicating the location of the bores in relation to the site are attached in Appendix A. The details are summarised in the following table:

Ref No	Approximate Distance from site (m)	Approximate Direction from site	Gradient from site	Depth (m)	Registered Purpose
GW065075	880	West	Up	150	Irrigation recreation
GW111006	800	West	Up	7.5	Monitoring bore
GW111007	750	West	Up	7.5	Monitoring bore
GW111008	750	West	Up	7.5	Monitoring bore

[5] *1:100,000 Geological Map of Sydney (Series 9130),* Department of Mineral Resources (1983/)

[6] *1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2),* Department of Land and Soil Conservation (1997)

[7] http://www.waterinfo.nsw.gov.au/gw/, visited on 21 March 2012

GW065075 appears to be an irrigation bore for the nearby Roseville Golf Club, while GW111006-GW111008 appear to be monitoring bores associated with a service station. The stratigraphy of the site is expected to consist of residual clayey soils overlying relatively shallow bedrock. Based on these conditions and the results of the groundwater bore search groundwater is not considered to be a significant resource in the immediate area of the site.

4 SITE HISTORY ASSESSMENT

4.1 Aerial Photographs

Aerial photographs of the site taken in 1930, 1951, 1961, 1970, 1978, 1986, 1994 and 2002 were obtained from the Department of Lands and were reviewed as part of the assessment of the site history. The information obtained from the photographs are summarised in the following table:

Year	Details
1930	The site and immediate surrounds appeared to be covered in vegetation. Properties on the looped section of Babbage Road on which the site is situated did not appear to have undergone any development. Suburban development for residential purposes appeared to have occurred approximately 700m west of the site.
1951	The site appeared similar to its appearance in the 1930 photograph. Some residential development appeared to have occurred on properties close to the site on Babbage Road.
1961	The site appeared similar to its appearance in the 1951 site photograph. Additional residential development appeared to have occurred on Babbage Road.
1970	The site appeared similar to its appearance in the 1961 site photograph.
1978	The site appeared similar to its appearance in the 1970 site photograph. Residential properties appear to have been constructed adjacent to the site.
1986	The site appeared similar to its appearance in the 1978 site photograph.
1994	The site appeared similar to its appearance in the 1986 site photograph.
2002	The site appeared similar to its appearance in the 1994 site photograph.

4.2 Land Title Search

A limited historical land title search was performed on our behalf by Advance Legal Searchers Pty Ltd. Copies of the title records are presented in Appendix A and a summary of the relevant information is provided in the following table:

Registration Date	Proprietor
1933 – 2012	Ku-ring-gai Council
1922 – 1933	Land Settlement Debenture Company Limited
1920 – 1922	George Knox & William Adams, contractors
1918 – 1920	Alfred Hookham, gentleman & William Knox, contractor
1915 – 1918	George Martin, merchant
1912 – 1915	John Moore, coach builder & Walter King, solicitor
1906 – 1912	Thomas Moore, coach builder

The land search has not indicated any particular land use that may be considered to have resulted in significant contamination of the soil and groundwater at the site.

4.3 Council Records

A search of Development Application (DA) and Building Approval (BA) records/the property file held by Ku-ring-gai Council was undertaken by EIS. Copies of the documents are presented in Appendix A. The council records search has not indicated any particular site use or development that may be considered to have resulted in significant contamination of the soil and groundwater at the site.

4.3.1 Section 149 Planning Certificate

The s149 (2 and 5) planning certificate for the site is included in Appendix A. A summary of the information most relevant to the ESA is presented below:

- The site is not deemed to be: significantly contaminated; subject to a management order; subject of an approved voluntary management proposal; or subject to an on-going management order under the provisions of CLM Act 1997; and
- A Site Audit Statement (SAS) is not known to have been issued for the site.

4.4 WorkCover Database Records

A records search for licenses to store dangerous goods was undertaken on our behalf by WorkCover. Copies of the records are attached in Appendix A. The records did not indicate the existence of any licences, including underground storage tanks, at this site.

4.5 NSW EPA Records

A search of the NSW EPA on-line database[8] did not indicate the existence of any notices for the site under section 58 of the CLM Act 1997.

A search of the list[9] of contaminated sites notified to the NSW EPA did not indicate that the site had been notified.

A search of the NSW EPA public register (POEO)[10] did not indicate the existence of any notices, applications and licenses for the site.

4.6 Assessment of Historical Information Integrity

The site history assessment has generally been obtained from government records including the NSW land titles office, historical aerial photographs and NSW WorkCover records. The veracity of the information from these sources is considered to be high.

4.7 Summary of Historical Site Use

The search of historical information has indicated the following:

- The site does not appear to have been developed at any time;
- There are no recorded notices listed on the NSW EPA registers; and
- WorkCover have no records of dangerous goods or underground storage tank licenses issued for the site.

[8] http://www.environment.nsw.gov.au/prclmapp/searchregister.aspx, visited on 21 March 2012.
[9] http://www.environment.nsw.gov.au/clm/publiclist.htm, visited on 21 March 2012.
[10] http://www.environment.nsw.gov.au/prpoeoapp/searchregister.aspx, visited on 21 March 2012.

5 CONCEPTUAL SITE MODEL

5.1 Summary of Site Conditions

Inspection of the site and a review of the site history information have indicated the following:

- The site is located in a predominantly residential area of Roseville Chase, approximately 50m from the waters of Middle Harbour;
- The site inspection did not identify any obvious sources of potential contamination;
- A review of the regional geology indicates that the site is underlain by sandstone bedrock;
- The groundwater bore records indicate that groundwater is not considered to be a potential resource in the immediate vicinity of the site; and
- the site is located within an area where there is no known occurrence of acid sulphate soils.

5.2 Potential On-Site Contamination Sources

Although no obvious potential on-site contamination sources were identified during the investigation, it is possible that fill material may have been dumped on the site at some time in the past.

5.3 Contaminants of Concern

Typical contaminants associated with imported fill material are summarised in the table below:

Potential Contaminant	Potential Source and/or Land Use Associated with the Contaminant
Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	• Imported fill material.
Total Petroleum Hydrocarbons (TPHs)	• Imported fill material.
Monocyclic Aromatic Hydrocarbons (BTEX compounds)	• Imported fill material.
Polycyclic Aromatic Hydrocarbons (PAHs)	• Imported fill material.
Organochlorine and Organophosphorus pesticides (OCPs and OPPs)	• Imported fill soils.

5.4 Potential Receptors

The main potential receptors are considered to include:

- Middle Harbour located approximately 50m to the east of the site;
- Site visitors, workers and adjacent property owners, who may come into contact with contaminated soil and/or be exposed to contaminated dust arising from construction activity; and
- Future site occupants.

5.5 Contaminant Fate and Transport

At this site, mobile contaminants would be expected to move down to the rock surface and migrate laterally down-slope from the source. The movement of contaminants would be expected to be associated with groundwater flow and seepage at the top of the bedrock.

6 ASSESSMENT CRITERIA DEVELOPMENT

6.1 Regulatory Background

In 1997 the NSW Government introduced the CLM Act. This Act has been amended by the *Contaminated Land Management Amendment Act* (2008[11]).

The CLM Act 1997, associated regulations, *State Environmental Planning Policy No.55* (1998[12]) and NSW EPA guidelines, were designed to provide uniform state-wide control of the management, investigation and remediation of contaminated land.

Prior to granting consent for any proposed rezoning or development, SEPP55 requires the consent authority to:

- Consider whether the land is contaminated;
- Consider whether the site is suitable, or if contaminated, can be made suitable by remediation, for the proposed land use; and
- Be satisfied that remediation works will be undertaken prior to use of the site for the proposed use.

Should the assessment indicate that the site poses a risk to human health or the environment, remediation of the site may be required prior to occupation of the proposed development. SEPP55 requires that the relevant local council be notified of

[11] *Contaminated Land Management Amendment Act,* NSW Government Legislation, 2008 (CLM Amendment Act 2008)

[12] *State Environmental Planning Policy No. 55 – Remediation of Land,* NSW Government, 1998 (SEPP55)

all remediation works, whether or not development consent is required. Where development consent is not required, 30 days written notice of the proposed works must be provided to council. Details of validation of remediation work must also be submitted to Council within one month of completion of remediation works.

The consent authority may request that a site audit be undertaken during, or following the completion of the site assessment process. Under the terms of the CLM Act 1997 the NSW EPA Site Auditor Scheme was developed to provide a system of independent review for assessment reports. An accredited Contaminated Site Auditor is engaged to review reports prepared by suitably qualified consultants to ensure that the investigation has been undertaken in accordance with the guidelines and confirm that the sites are suitable for their intended use.

Section 59(2) of the CLM Act 1997 states that specific notation relating to contaminated land issues must be included on Section149 (s149) planning certificates prepared by Council where the land to which the certificate relates is:

- Within an investigation or remediation area;
- Subject to an investigation or remediation order by the EPA;
- The subject of a voluntary investigation or remediation proposal; and/or
- The subject of a site audit statement.

Submission of contaminated site investigation and validation reports to council as part of rezoning or development application submissions may also result in notation of actual or potential site contamination on future s149 certificates prepared for the site.

Section 60 of the CLM Amendment Act 2008 sets out a positive duty on a land owner, or person whose activities have caused contamination, to notify the EPA if they are or become aware that contamination exists on a site that generally poses "*an unacceptable risk to human health or the environment, given the site's current or approved use*". This duty to report is based on trigger values, above which notification is required.

Off-site disposal of fill, contaminated material and excess soil/rock excavated as part of the proposed development works is regulated by the provisions of the *Protection of the Environment Operations Act* (1997[13]) and associated regulations and guidelines including the *NSW DECC Waste Classification Guidelines - Part 1: Classifying Waste*

[13] *Protection of Environment Operations Act,* NSW Government, 1997 (POEO Act 1997)

(2009[14]). All materials should be classified in accordance with these guidelines prior to disposal.

Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner.

6.2 Soil Contaminant Threshold Concentrations

The soil investigation levels adopted for this investigation are derived from the NSW DEC document *Guidelines for the NSW Site Auditor Scheme, 2nd Edition* (2006[15]) and the National Environmental Protection Council document *National Environmental Protection (Assessment of Site Contamination) Measure* (1999[16]). The contaminant thresholds listed below are levels at which further investigation and evaluation is required to assess whether the site is considered suitable for the proposed urban land use.

To accommodate the range of human and ecological exposure settings, a number of generic settings are used on which the Health based Investigation Levels (HILs) can be based. Four categories of HILs are adopted for urban site assessments. Contaminant levels for a standard residential site with gardens and accessible soil (Column A) are based on protection of a young child resident at the site. The remaining categories (Columns D to F) present alternative exposure settings where there is reduced access to soil or reduced exposure time. These categories include residential land use with limited soil access, recreational and public open space and commercial/industrial use. Where the proposed land use will include more than one land use category (e.g. mixed residential/commercial development) the exposure setting of the most "sensitive" land use is adopted for the site.

Threshold concentrations for petroleum hydrocarbon contaminants including total TPH and BTEX compounds have previously been established in the *NSW EPA Contaminated Sites: Guidelines for Assessing Service Station Sites* (1994[17]) publication and this document is referenced in the Site Auditor Guidelines 2006. Heavy fraction petroleum

[14] *Waste Classification Guidelines, Part 1: Classifying Waste,* NSW DECC, 2009 (Waste Classification Guidelines 2009)
[15] *Guidelines for the NSW Site Auditor Scheme, 2nd ed.,* NSW DEC, 2006 (Site Auditor Guidelines 2006)
[16] *National Environmental Protection (Assessment of Site Contamination) Measure,* National Environment Protection Council (NEPC), 1999 (NEPM 1999)
[17] *Guidelines for Assessing Service Station Sites,* NSW EPA, 1994 (Service Station Guidelines 1994)

hydrocarbon aliphatic/aromatic component threshold concentrations have also been introduced in NEPM 1999.

Soil samples for this investigation have been analysed for total recoverable hydrocarbons (TRH) rather than TPH. TRH analysis is undertaken without a preliminary silica gel clean-up of the sample. Consequently the TRH result may include other compounds such as phthalates, humic acids, fatty acids and sterols (if present).

6.2.1 Provisional Phytotoxicity Investigation Levels (PPILs)

The Provisional Phytotoxicity Investigation Levels (PPILs) are generic values based on phytotoxicity data for plant response to specific contaminants in a sandy loam matrix and are included in the contaminated site assessment where the proposed land use includes gardens or accessible soils. The PPILs are listed in the Site Auditor Guidelines 2006. The PPILs are identical to the Ecological Investigation Levels (EILs) originally specified in NEPM 1999.

6.2.2 Site Assessment Criteria (SAC) for Soil Contaminants

The 'residential with garden accessible soils' (Column A) exposure setting has been adopted for this assessment and the appropriate soil criteria are listed in the following table:

Contaminant	SAC - HILs Column A (mg/kg)	PPILs (mg/kg)
Heavy Metals		
Arsenic (total)	100	20
Cadmium	20	3
Chromium (III)	12%	400
Copper	1000	100
Lead	300	600
Mercury (inorganic)	15	1
Nickel	600	60
Zinc	7000	200
Petroleum Hydrocarbons		
TPH (C_6-C_9)	65 [a]	-
TPH (C_{10}-C_{36})	1000 [a]	-
Benzene	1 [a]	-
Toluene	1.4 [a]	-
Ethylbenzene	3.1 [a]	-
Total Xylenes	14 [a]	-

Contaminant	SAC - HILs Column A (mg/kg)	PPILs (mg/kg)
PAHs		
Total PAHs	20	-
Benzo(a)pyrene	1	-
Pesticides (OCPs & OPPs)		
Aldrin + Dieldrin	10	-
Chlordane	50	-
DDT+ DDD + DDE	200	-
Heptachlor	10	-
Total OPPs	0.1[b]	-

Note:
[a] Service Station Guidelines 1994
[b] Due to the absence of locally endorsed guideline criteria, the laboratory practical quantitation limit (PQL) has been adopted.
[c] Not Detected at Limit of Reporting (NDLR)

6.3 Groundwater Contaminant Trigger Values

Groundwater resources in NSW are managed and regulated by environmental and planning legislation which include the POEO Act 1997, *Environmental Planning and Assessment Act* (1979[18]) and the *Water Management Act* (2000[19]).

In 2000, Australian and New Zealand Environment Conservation Council (ANZECC) released the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000[20]) which superseded the previous guideline documents.

The ANZECC 2000 guidelines include a complete framework for the development of appropriate guidelines for aquifer assessment. The above guidelines provide water quality parameters at the point of use including aquatic ecosystems (fresh and marine waters), drinking water, industrial and agricultural/irrigation uses.

The National Health and Medical Research Council (NHMRC) released the *Australian Drinking Water Guidelines* (2011[21]). These guidelines are predominantly used to assess drinking water quality and have been referenced in some cases.

[18] *Environmental Planning and Assessment Act,* NSW Government, 1979 (EP&AA 1979)
[19] *Water Management Act*, NSW Government, 2000 (Water Act 2000)
[20] *Australian and New Zealand Guidelines for Fresh and Marine Water Quality,* ANZECC, 2000 (ANZECC 2000)

The appropriate settings for current and potential uses of groundwater should be identified in establishing applicable groundwater trigger values:

- raw drinking water source;
- agricultural use – stock watering;
- agricultural and domestic use – irrigation;
- protection of aquatic ecosystems – freshwater; and
- protection of aquatic ecosystems – marine.

The presence of elevated contaminant concentrations in groundwater triggers further investigation of aquifer conditions to assess the source(s) of contamination and the lateral and vertical extent of the contamination.

Guidance on the remediation and management of contaminated groundwater is presented in the document *NSW DECCW Guidelines for the Assessment and Management of Groundwater Contamination (2007[22])*.

6.3.1 Petroleum Hydrocarbons in Groundwater

In the absence of locally endorsed guidelines for petroleum hydrocarbon compounds in water, the 'intervention value' concentration for mineral oil specified in the *Circular on Target Values and Intervention Values for Soil Remediation* (2000[23]) has been adopted as the trigger value for TPH (C_{10}-C_{36} fractions only).

It is noted that these guidelines have not been endorsed by NSW EPA and are used only as a preliminary screening tool.

6.3.2 Site Assessment Criteria (SAC) for Groundwater Contaminants

The marine water trigger values have been adopted along with other guideline values for this investigation as outlined in the table:

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[21] *Australian Drinking Water Guidelines*, National Health and Medical Research Council, 2011 (NHMRC 2011)

[22] *Guidelines for the Assessment and Management of Groundwater Contamination,* NSW DECCW, 2007 (Groundwater Contamination Guidelines 2007)

[23] *Circular on Target Values and Intervention Values for Soil Remediation,* Ministry of Housing, Spatial Planning and Environment, 2000 (Dutch Guidelines 2000)

Contaminant	Units	Marine Water Criteria[1]	Drinking Water Criteria[2]	USEPA[5]
Metals				
Arsenic (total)[6]	µg/L	2.3[a]	10	-
Cadmium	µg/L	5.5	2	-
Chromium (VI)	µg/L	10[a]	50	-
Copper	µg/L	1.3	2000	-
Lead	µg/L	4.4	10	-
Mercury	µg/L	0.4	1	-
Nickel	µg/L	70	20	-
Zinc	µg/L	15	3000[d]	-
Petroleum Hydrocarbons				
TPH C_{10}-C_{36}	µg/L	600[b]	nsl	-
Benzene	µg/L	500[a]	1	-
Toluene	µg/L	180[a]	800	-
Ethylbenzene	µg/L	5[a]	300	-
o-Xylene	µg/L	350[a]	nsl	-
m + p Xylene	µg/L	75[a*]	nsl	-
PAHs				
Naphthalene	µg/L	50[c]	nsl	0.14
Anthracene	µg/L	0.01[c]	nsl	11000
Phenanthrene	µg/L	0.6[c]	nsl	-
Fluoranthene	µg/L	1[c]	nsl	1500
Benzo(a)pyrene	µg/L	0.1[c]	0.01	-

Notes:

[1] 95% Trigger Values for Marine Water (ANZECC 2000)

[2] Australian Drinking Water Guidelines (NHMRC 2011)

[5] Due to the absence of locally endorsed criteria, the USEPA Region 9 PRGs for Tap water have been adopted

[6] The Arsenic (III) trigger value has been quoted

[a] Low or Moderate Reliability Trigger Values have been quoted (ANZECC 2000)

[b] In the absence of locally endorsed guidelines, the Dutch investigation levels have been quoted

[c] 99% trigger values have been adopted due to the potential for bioaccumulation effects

[d] The aesthetic guideline concentration has been quoted

[a*] Low or Moderate Reliability Trigger Values (ANZECC 2000) for m-Xylenes have been quoted. We note that m-Xylene guideline value is 75µg/L and the p-Xylene guideline value is 200µg/L. However, these two isomers cannot currently be distinguished analytically

nsl – No set limit

7 DISCUSSION

7.1 Summary of Site Conditions

The site inspection and the information reviewed for this assessment has indicated the following:

- The regional geological conditions in the vicinity of the site are generally expected to comprise residual clayey soils over relatively shallow sandstone or shale bedrock;
- Groundwater is not considered to be a significant resource in the vicinity of the site;
- Mobile soil contaminants would be expected to move down to the water table/surface of the bedrock and migrate laterally from the source;
- The site is not known to have been developed at any time;
- There are no recorded notices listed on the NSW EPA registers;
- WorkCover have no records of USTs or licenses to store dangerous goods at the site licenses issued for the site; and
- The land title search did not indicate any particular land use that could be considered to have resulted in significant contamination of the soil and groundwater at the site.

7.2 Potential for Site Contamination

Based on the assessment findings, the potential for significant, widespread soil and/or groundwater contamination at the site is considered to be low.

However, as with all accessible vacant lands there is always a risk of tipping or filling having taken place at some time in the past. In the event that any evidence of tipping or filling is discovered after the site has been cleared an environmental consultant should be contacted to undertake a further assessment.

8 LIMITATIONS

EIS adopts no responsibility whatsoever for any problems such as USTs, buried items or contaminated material that may be encountered at the site.

The conclusions developed in this report are based on site conditions which existed at the time of the site assessment and the scope of work outlined previously in this report. They are based visual observations of the site and vicinity, together with the interpretation of available historical information and documents reviewed as described in this report.

The assessment and preparation of this report have been undertaken generally in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined previously in this report.

Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated.

EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination.

No subsurface investigation, sampling or analysis has been undertaken for this assessment. EIS cannot comment on actual contamination conditions at this site.

Previous use of this site may have involved excavation for the foundations of buildings, services, and similar facilities. In addition, unrecorded excavation and burial of material may have occurred on the site. Backfilling of excavations could have been undertaken with potentially contaminated material that may be discovered in discrete, isolated locations across the site during construction work.

EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site.

EIS have not and will not make any determination regarding finances associated with the site.

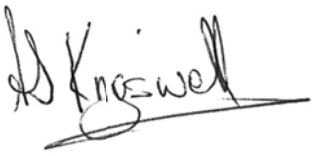
Changes in the proposed or current site use may result in remediation or further investigation being required at the site.

During construction at the site, soil, fill and any unsuspected materials that are encountered should be monitored by qualified environmental and geotechnical engineers to confirm assumptions made on the basis of the limited investigation data, and possible changes in site level and other conditions since the investigation. Soil materials considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa.

This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. Copyright in this report is the property of EIS. EIS has used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report.

Should you require any further information regarding the above, please do not hesitate to contact us.

Yours faithfully
For and on behalf of
ENVIRONMENTAL INVESTIGATION SERVICES



Rob Muller
Environmental Scientist

Adrian Kingswell
Senior Associate

ABBREVIATIONS

AAS	Atomic Absorption Spectrometry
AGST	Above Ground Storage Tank
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment Conservation Council
ASS	Acid Sulfate Soil
B(a)P	Benzo(a)pyrene
BH	Borehole
BTEX	Benzene, Toluene, Ethyl benzene, Xylene
COC	Chain of Custody documentation
CLM	Contaminated Land Management
DNR	NSW Department of Natural Resources (now part of DWE and OEH)
DWE	NSW Department of Water and Energy
DP	Deposited Plan
DQO	Data Quality Objective
EC	Electrical Conductivity
GC-ECD	Gas Chromatograph-Electron Capture Detector
GC-FID	Gas Chromatograph-Flame Ionisation Detector
GC-MS	Gas Chromatograph-Mass Spectrometer
HIL	Health Based Investigation Level
HM	Heavy Metals
ICP-AES	Inductively Couple Plasma – Atomic Emission Spectra
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
OCPs	Organochlorine Pesticides
OPPs	Organophosphate Pesticides
WHS	Workplace, Health and Safety
PAH	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photo-ionisation Detector
PPIL	Provisional Phytotoxicity Investigation Levels
PQL	Practical Quantitation Limit
P&T	Purge & Trap
RAP	Remedial Action Plan
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SAC	Site Assessment Criteria
SEPP	State Environmental Planning Policy
sPOCAS	suspension Peroxide Oxidation Combined Acidity and Sulfate
SPT	Standard Penetration Test
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TP	Test Pit
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
UCL	Upper Confidence Limit
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

IMPORTANT INFORMATION ABOUT THE SITE ASSESSMENT REPORT

These notes have been prepared by EIS to assist with the assessment and interpretation of this report.

The Report is Based on a Unique Set of Project Specific Factors:
This report has been prepared in response to specific project requirements as stated in the EIS proposal document which may have been limited by instructions from the client. This report should be reviewed, and if necessary, revised if any of the following occur:

- the proposed land use is altered;
- the defined subject site is increased or sub-divided;
- the proposed development details including size, configuration, location, orientation of the structures are modified;
- the proposed development levels are altered, e.g. addition of basement levels; or
- ownership of the site changes.

EIS/J&K will not accept any responsibility whatsoever for situations where one or more of the above factors have changed since completion of the assessment. If the subject site is sold, ownership of the assessment report should be transferred by EIS to the new site owners who will be informed of the conditions and limitations under which the assessment was undertaken. No person should apply an assessment for any purpose other than that originally intended without first conferring with the consultant.

Changes in Subsurface Conditions
Subsurface conditions are influenced by natural geological and hydrogeological process and human activities. Groundwater conditions are likely to vary over time with changes in climatic conditions and human activities within the catchment (e.g. water extraction for irrigation or industrial uses, subsurface waste water disposal, construction related dewatering). Soil and groundwater contaminant concentrations may also vary over time through contaminant migration, natural attenuation of organic contaminants, ongoing contaminating activities and placement or removal of fill material. The conclusions of an assessment report may have been affected by the above factors if a significant period of time has elapsed prior to commencement of the proposed development.

This Report is Based on Professional Interpretations of Factual Data
Site assessments identify actual subsurface conditions at the actual sampling locations at the time of the investigation. Data obtained from the sampling and subsequent laboratory analyses, available site history information and published regional information is interpreted by geologists, engineers or environmental scientists and opinions are drawn about the overall subsurface conditions, the nature and extent of contamination, the likely impact on the proposed development and appropriate remediation measures.

Actual conditions may differ from those inferred, because no professional, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from predictions. Nothing can be done to prevent the unanticipated, but steps can be taken to help minimise the impact. For this reason, site owners should retain the services of their consultants throughout the development stage of the project, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

Environmental Site Assessment Limitations
Although information provided by an environmental site assessment can reduce exposure to the risk of the presence of contamination, no environmental site assessment can eliminate the risk. Even a rigorous professional assessment may not detect all contamination on a site. Contaminants may be present in areas that were not surveyed or sampled, or may migrate to areas which showed no signs of contamination when sampled. Contaminant analysis cannot possibly cover every type of contaminant which may occur; only the most likely contaminants are screened.

Misinterpretation of Environmental Site Assessments by Design Professionals
Costly problems can occur when other design professionals develop plans based on misinterpretation of an environmental assessment report. To minimise problems associated with misinterpretations, the environmental consultant should be retained to work with appropriate professionals to explain relevant findings and to review the adequacy of plans and specifications relevant to contamination issues.

Logs Should not be Separated from the Environmental Assessment Report
Borehole and test pit logs are prepared by environmental scientists, engineers or geologists based upon interpretation of field conditions and laboratory evaluation of field samples. Logs are normally provided in our reports and these should not be re-drawn for inclusion in site remediation or other design drawings, as subtle but significant drafting errors or omissions may occur in the transfer process. Photographic reproduction can eliminate these problems, however contractors can still misinterpret the logs during bid preparation if separated from the text of the assessment. If this occurs, delays, disputes and unanticipated costs may result. In all cases it is necessary to refer to the test of the report to obtain a proper understanding of the assessment. Please note that logs with the 'Environmental Log' header are not suitable for geotechnical purposes as they have not been peer reviewed by a Senior Geotechnical Engineer.

To reduce the likelihood of borehole and test pit log misinterpretation, the complete assessment should be available to persons or organisations involved in the project, such as contractors, for their use. Denial of such access and disclaiming responsibility for the accuracy of subsurface information does not insulate an owner from the attendant liability. It is critical that the site owner provides all available site information to persons and organisations such as contractors.

Read Responsibility Clauses Closely
Because an environmental site assessment is based extensively on judgement and opinion, it is necessarily less exact than other disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, model clauses have been developed for use in written transmittals. These are definitive clauses designed to indicate consultant responsibility. Their use helps all parties involved recognise individual responsibilities and formulate appropriate action. Some of these definitive clauses are likely to appear in the environmental site assessment, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to any questions.

REPORT FIGURES

NOTES:
Figure 1 has been recreated from UBD on disc (version 5.0). Figure is not to scale.

UBD Map ref: 176 B16

Reference should be made to the report text for a full understanding of this plan.

ENVIRONMENTAL INVESTIGATION SERVICES	Project Number: **E25606K**	Title: **SITE LOCATION PLAN**
	Figure: **1**	Address: **90 BABBAGE ROAD, ROSEVILLE CHASE, NSW 2069**

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