Douglas Partners
Geotechnics / Environment / Groundwater

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Project 71920
13 October 2010
SCP:jlb

Holdmark Constructions Pty Ltd
c/- Robertson & Marks Architects Pty Ltd
Ground Floor, 11-17 Buckingham Street
SURRY HILLS NSW 2010

Attention: Mr Brian Mann
Mr Lesley Jacob

Email: brian.mann@rmarks.com.au
lesley.jacob@marks.net.au

Dear Sirs

Shepherds Bay Urban Renewal
Meadowbank

We understand that the concept design for the proposed Shepherds Bay Urban Renewal has been updated since the "Terrace Concept" and "Harbour View Concept" referred to within our reports.

The current concept design is understood to be referenced as the "Preferred Master Plan". It is understood that the preferred master plan still mainly consists of medium to high density residential development, but differs from the previous concept plans with regards to the precise building layout and building heights across the site, and that the proposed jetty is no longer under consideration. Details such as basement or excavation locations and depths are still not available.

We do not consider that the revisions to the proposed above-ground building layout significantly alter the comments in our Preliminary Geotechnical and Groundwater Assessment (Report 71920, dated 12 October 2010) or Preliminary Contamination Screening Assessment (Report 71920-1, dated 13 October 2010). Comments regarding the proposed jetty are, however, no longer relevant.

Please contact either Kurt Plambeck or Sally Peacock if you have any queries on the above.

Yours faithfully
Douglas Partners Pty Ltd

Kurt Plambeck
Environmental Scientist

Reviewed by

R.W.Lumsdaine
Principal

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Integrated Practical Solutions

REPORT
on
PRELIMINARY SCREENING CONTAMINATION ASSESSMENT

PROPOSED SHEPHERDS BAY URBAN RENEWAL
CONSTITUTION ROAD
MEADOWBANK

Prepared for
HOLDMARK PROPERTY GROUP

Project 71920-1
October 2010

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EXECUTIVE SUMMARY

This report provides the results of a preliminary screening contamination assessment undertaken for the proposed Shepherds Bay Urban Renewal at Constitution Road, Meadowbank. The work was requested by Robertson + Marks Architects Pty Ltd (R+M) on behalf of Holdmark Property Group.

This assessment was required as part of the response to the Director General Requirements (DGRs) prior to approval of the proposed development. In particular, this report considers the potential contamination risks and impacts in relation to the proposed project. This assessment has been prepared in conjunction with a Report on Preliminary Geotechnical and Groundwater Assessment for the site (Report 71920-2, dated 23 July 2010).

The assessment is a broad scale assessment based on a walkover of the accessible areas of the site, with a limited site history assessment. No intrusive testing was undertaken.

Based on the limited site history investigation and inspections of the site/s it is considered that there is generally a moderate potential for contamination, although the probability of widespread contamination at the site appears to be generally limited. It is considered that a number of potentially contaminating activities could have been undertaken within various properties within the site including demolition works (that may have left behind building rubble containing hazardous building materials), cut and fill and land reclamation of the site to level individual properties and to fill the former creek/gully and reclaim land along the shoreline of Shepherds Bay. Various commercial/industrial site uses over the past 50 or so years including storage of fuel and fuel related products in underground storage tanks, potentially industrial/commercial operations involving the use of chemical and the use of fuels, solvents and other degreasers at the numerous mechanics, auto shops and smash repairers within the site may also result in soil and/or groundwater contamination.

It is considered likely that some potential or actual acid sulphate soil materials are present, particularly in reclaimed areas and the area of the jetty.

It is recommended that more detailed contamination assessment be undertaken at the site at the subsequent stages of planning and development. The assessment would include a more detailed and focused site history assessment on the various lots/properties. The assessment can be undertaken in staged manner, in line with the program of site redevelopment. In this way, the various stages of development (development precincts) will be subject to appropriate intrusive investigation of the sub surface to verify the nature and extent of the soil and groundwater contamination at each precinct. The intrusive investigation should include an assessment of acid sulphate soils and/or salinity as appropriate.

Furthermore it is recommended that a regional groundwater study be conducted as part of the early works to assess the overall groundwater quality and conditions at the site and to assist in determining the overall potential for potential contamination issues within all or part of the site. More focused groundwater investigation could be undertaken where specific areas of concern are identified (such as site with known soil contamination or known presence of underground storage tanks).

In overall terms, it is considered that the contamination issues, if present, would most likely be mainly confined to areas close to the original source due to the generally shallow depth of bedrock at the site and can likely be dealt with in a relatively straight forward and staged manner and are unlikely to significantly affect the viability of the redevelopment project.

From a broad scale evaluation standpoint it is considered that the site can be rendered suitable for the proposed development. Further intrusive and more detailed assessment would however need to be undertaken, preferentially in stages to better define the nature and extent of any contamination issues and to develop a detailed remediation strategy for implementation (if required).

GLOSSARY

ANSTO	Australian Nuclear Science and Technology Organisation
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
BTEX	Benzene, Toluene, Ethyl Benzene and Xylenes
C10-C36	long to medium chain hydrocarbons
C6-C9	short chain hydrocarbons
COC	chain of custody
D.P.	Deposited Plan
DP	Douglas Partners
DQI	data quality indicator
DQO	data quality objective
EAW	Earth, Air and Water Consulting and Monitoring Pty Ltd
EPA	Environmental Protection Authority
GIL	groundwater investigation level
HIL	human health based investigation level
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NSW DECC	New South Wales Department of Environment and Climate Change
OCP	organochlorine pesticides
OPP	organophosphate pesticides
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PID	photoionisation detector
PPIL	phytotoxicity based investigation level
ppm	parts per million
PQL	practical quantification limit
PRG	primary remediation goal
Pty Ltd	Propriety Limited
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RPD	relative percentage difference
SAC	site acceptance criteria
SAQP	sampling analysis and quality plan
SMF	synthetic mineral fibres
TCLP	toxicity characteristic leaching procedure
TOPIC	total photoionisable compounds
TPH	total petroleum hydrocarbons
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compounds

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REPORT ON PRELIMINARY SCREENING CONTAMINATION ASSESSMENT
PROPOSED SHEPHERDS BAY URBAN RENEWAL
CONSTITUTION ROAD, MEADOWBANK

1. INTRODUCTION

This report provides the results of a preliminary screening contamination assessment undertaken for the proposed Shepherds Bay Urban Renewal at Constitution Road, Meadowbank. The work was requested by Robertson + Marks Architects Pty Ltd (R+M) on behalf of Holdmark Property Group.

This assessment was required as part of the response to the Director General Requirements (DGRs) prior to approval of the proposed development. In particular, this report considers the potential contamination risks and impacts in relation to the proposed project. This assessment has been prepared in conjunction with a Report on Preliminary Geotechnical and Groundwater Assessment for the site (Report 71920, dated 12 October 2010).

The assessment is a broad scale assessment based on a walkover of the accessible areas of the site, with a limited site history assessment. No intrusive testing was undertaken.

2. PROPOSED DEVELOPMENT AND OBJECTIVES

2.1 Proposed Development

2.1.1 Greater Site Area

It is proposed that the greater site is to be redeveloped as a new residential area. It is understood that the proposed development involves of the redevelopment of the existing, largely industrial area into residential properties. The works will include the construction of apartments and/or terraces, together with the construction, upgrade or renovation of associated infrastructure including roads and stormwater drainage. Some additional works are also proposed at the Shepherds Bay foreshore south of the site, including landscaping and a new jetty structure.

Two different development concepts were being considered at the time of writing of this report – the "Terrace Concept" and the "Harbour View Concept". These concepts include the construction of residential buildings of between 3 and 18 storeys at the Constitution Road site (though mostly 4 to 11 storeys), and a building of up to 33 storeys at Parsonage Street site. The Terrace concept layout is included in Drawing 3, in Appendix A, as an example of the proposed works.

The development works will be carried out in stages.

2.1.2 Stage 1 Works

At the time of the assessment, only the proposed works at the Stage 1 part of the site are better defined. The proposed development is understood to include the construction of a 7 to 8 storey residential building over much of the Stage 1 site. Basement car parking is proposed under the full building footprint, consisting of one to three levels, with the lowermost floor level at RL 1.7. Excavation will be required at the site, with the deepest excavation (of up to approximately 8 m) at the north-eastern end of the site, in an area of existing higher ground levels. As the surrounding ground levels fall towards the south-west, excavation requirements will progressively reduce to less than 1.5 m towards Rothesay Avenue.

The excavation will require the construction/implementation of associated structures/measures including retaining walls, excavation support and groundwater management measures, and new foundations will be required for the proposed building.

2.2 Objectives of Investigation

The objectives of the current investigation is to provide a broad scale assessment of the site to identify the likely site contaminants of concern and whether there are contamination issues that are likely to cause material impact on the proposed redevelopment. The assessment also provides some indication of the additional works that would be required to assess the contamination status of the site, once site access is more readily available.

3. SCOPE OF WORKS

The scope of works and methodology adopted is generally in accordance with DP's proposal dated 15 June 2010 which was accepted by the client.

The scope of the preliminary contamination assessment included;

- A review of the DP database for jobs conducted within and around the site area to determine the likely site condition;
- A review of published geological, soil landscape, acid sulphate soils and salinity mapping;
- A review of broad scale site history sources including:
  - Historical aerial photographs;
  - A search of the Department of Environment, Climate Change and Water (DECCW) register of contaminated sites and licences;
  - A search for register groundwater bores using DECCW online search;
  - A search of the local library for any available local histories (if available).
- A site walkover inspection of the sites;

- Identification of areas or issues of environmental concern (AECs) and likely issues associated with these AECs;
- Preparation of preliminary contamination assessment detailing the results of the assessment and making recommendations for future works.

4. LEGISLATIVE FRAMEWORK

Typically contamination assessments are conducted in a staged manner comprising;

- Phase 1 Contamination Assessment. A desktop study including a variety of site history sources such historical aerial photographs, historical title deeds and WorkCover Records and a detailed site inspection;
- Phase 2 Contamination Assessment. Intrusive investigations of soil and groundwater quality in accordance with sampling density requirements of DECCW to identify potential soil and/or groundwater contamination.

The current assessment broadly falls into the Phase 1 contamination assessment category. In view of the scape of the development and the intention at this stage to obtain broad scale information over the site only, the assessment was devised as a screening evaluation, focusing on the identification of potential issues and areas of environmental concern only.

The framework for contamination assessment is based on guidelines that have been issued and/or endorsed by the NSW Department of Environment, Climate Change and Water (DECCW) (incorporating the NSW EPA) under the following Acts/Policies:

- Section 105 of the "Co*ntaminated Land Management Act*" 1998 (CLM Act);
- "*State Environmental Planning Policy No- 55*" 1998 (SEPP 55); and
- "*Protection of the Environment Operations Act*" 1997 (POEO Act).

The relevant guidelines issued under the provisions of the above-mentioned Acts/Policies include:

- Department of Urban Affairs and Planning and NSW EPA (1998) "Managing Land Contamination: Planning Guidelines - SEPP55 - Remediation of Land";

- NSW EPA (1994), “Contaminated Sites: Guidelines for Assessing Service Station Sites”.
- NSW EPA (1995), “Contaminated Sites: Sampling Design Guidelines”;
- NSW EPA (2000), “Guidelines for Consultants Reporting on Contaminated Sites”;
- NSW EPA (2008), “Contaminated Sites: Guidelines for NSW Site Auditor Scheme”;
- NSW DECCW (2009) “Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997”;
- NEPM (1999), “National Environment Protection (Assessment of Site Contamination) Measure”, National Environment Protection Council (NEPC);
- NSW DECCW (2007) Guidelines for the Assessment and Management of Contaminated Groundwater”;
- Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) ‘Australian and New Zealand Guidelines for Fresh and Marine Water Quality”;
- NSW DECCW (2008) “Waste Classification Guidelines” revised July 2009.

It is noted that NEPM is currently undergoing a review with a public consultation period on the proposed changes currently underway and the final version scheduled to be released in 2011. The changes are likely to have some implications for the manner in which the site/s will be assessed, given the timeframe during which the proposed development will take place.

5. SITE DESCRIPTION

5.1 Site Identification

The site, covered in the current assessment, consists of two areas within the existing Meadowbank Employment Area. For the purpose of this report, the two areas are referred to as the "Constitution Road site" and "Parsonage Street site", while the term "greater site" refers to both areas. These sites are shown on Drawing 1 in Appendix A.

The Constitution Road site has an area of approximately 7.72 ha (77200 m^2). This site is located immediately south-west of Constitution Road, and is bound by Bowden Street to the north-west, Belmore Street to the south-east and Rothesay Avenue to the south-west. Hamilton Crescent, Hamilton Crescent West and Nancarrow Avenue are within the area of the proposed development.

The Parsonage Street site has an area of approximately 0.395 ha (3950 m^2). This site is bounded by Parsonage Street to the north-west, Well Street to the north-east, Church Street to the south-east and the Loop Road to the south-west.

Both sites consist of numerous DP lots. For simplicity, reporting and ease in reference to documents related to the proposed redevelopment of the greater site area has followed the property numbering scheme established in the table of existing land uses and site information, provided by R+M. The property descriptions and numbers are presented in Table 1 below and are shown in Drawing 2, in Appendix A. In summary, the greater site was divided into 41 individual properties as shown in Table 1.

Table 1 - Site Identification Tables

Site	Lot	DP	Street Address	Site Use	Occupied	Storeys	Built Up Area (m^2)	Site Area (m^2)
1	1	730371	102 Bowden Street, Meadowbank 2114	Commercial	Occupied	1	720	932
2	SP	20107	104 Bowden Street, Meadowbank 2114	Commercial	Occupied	1	695	1004
3	4	12534	106 Bowden Street, Meadowbank 2114	Commercial	Occupied	1	273	907
4	3	12534	108 Bowden Street, Meadowbank 2114	Commercial	Occupied	1	344	824
5	2	12534	110 Bowden Street, Meadowbank 2114	Commercial	Occupied	2	550	758
6	1	12534	112 Bowden Street, Meadowbank 2114	Commercial	Occupied	1	300	698
7	2	792836	116 Bowden Street, Meadowbank 2114	Commercial	Occupied	1 - 3	453	678
8	102	1037638	118-144 Bowden Street, Meadowbank 2114	Commercial	Occupied	1 - 3	5365	15690
9	1 - 17	19585	37 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	1	4662	8823
10	1	122205	37 Nancarrow Avenue, Ryde 2112	Path lane	Open Space	0	0	1199
11	8	19585	35 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	1	480	673
12	A	344550	33 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	1	530	717
13	1	120474	25, 29 and 31 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	2	1600	1798
14	1	810552	21-23 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	1	280	920
15	2	810552	21-23 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	1	850	2060
16	1	322641	6 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	1	120	812
17	11 - 12	7130	10 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	1	180	1955
18	13 - 15	7130	12-16 Nancarrow Avenue, Ryde 2112	Commercial	Vacant	1	1466	2515
19	16	7130	18 Nancarrow Avenue, Ryde 2112	Commercial	Occupied	2	692	850
20	4	548406	20 Nancarrow Avenue, Ryde 2112	Equipment Room	NA	1	32	66
21	2	550006	18 Constitution Road, Ryde 2112	Commercial	Occupied	1	530	908
22	1	104280	4 Constitution Road, Ryde 2112	Path lane	NA	0	0	566
23	1 - 2	930584	4 Constitution Road, Ryde 2112	Commercial	Occupied	1	650	1168
24	1	713706	8-14 Constitution Road, Ryde 2112	Commercial	Occupied	1 - 2	4737	6377
25	3	7130	16 Constitution Road, Ryde 2112	Commercial	Occupied	1	400	855
26	1	966400	20 Constitution Road, Ryde 2112	Commercial	Occupied	1	390	588
27	1	935254	22 Constitution Road, Ryde 2112	Commercial	Occupied	1	160	610
28	1	935253	24 Constitution Road, Ryde 2112	Commercial	Occupied	2	340	572
29	1	592021	26 Constitution Road, Ryde 2112	Commercial	Occupied	1	740	1358
30	88	615245	28 Constitution Road, Ryde 2112	Commercial	Occupied	1	740	1307
31	1	384185	39 Belmore Street, Ryde 2112	Equipment Area	NA	0	0	75
32	1	1072555	41 Belmore Street, Ryde 2112	Commercial	Vacant	1 - 4	11183	14490
33	1	703858	9-11 Rothesay Avenue, Ryde 2112	Commercial	Occupied- No 10 Rothesay Ave	1	879	1455
34	18	7130	11 Rothesay Avenue, Ryde 2112	Commercial	Occupied	2	85	793
35	17	7130	12 Rothesay Avenue, Ryde 2112	Commercial	Occupied	4	520	804
36	13 - 14	738232	8 Parsonage Street, Ryde 2112	Car Park	Occupied	0	0	362
37	7	809282	8 Parsonage Street, Ryde 2112	Path Lane	NA	0	0	745
38	100	851723	8 Parsonage Street, Ryde 2112	Car Park	Occupied	0	0	710
39	15	738232	8 Parsonage Street, Ryde 2112	Commercial	Occupied	1	1473	2082
40	1 & 2	982743	7 Hamilton Crescent, Ryde 2112	Open space/landscape	Vacant	0	0	1093
41	7073	93916	Waterview Street, Ryde 2112	Open space/landscape	vacant	0	0	509

The above table covers the entire development site. The area of the Proposed "Stage 1" Works is located in the south eastern corner of the site as shown on Drawing 3, Appendix A. The Stage 1 site is understood to include Property 31 and 32.

5.2 Site Description

At the time of this assessment, the majority of the greater site area was occupied by existing industrial properties. The buildings within the greater site were generally one to two storeys high and typically of brick or tilt-up concrete panel construction, although buildings up to four storeys high were present at the Constitution Road site. Partial basements or single level basements were visible at a number of the existing properties at the Constitution Road site. Outside of the buildings, the ground surfaces were generally paved with concrete or asphalt. Vegetated and grassed areas were typically limited to landscaped strips adjacent to individual property boundaries and to the nature strip.

The current land use on properties adjacent to the Constitution Road site is predominantly residential, with houses and apartments occupying the majority of properties on the far sides of Bowden Street, Constitution Road and Belmore Street. Industrial properties are present opposite the site at the north-eastern ends of Belmore and north western side of Bowden Street. An existing vacant lot is present immediately to the south-west of the site at 146 Bowden Street.

An embankment, referred to herein as "the Constitution Road embankment" is located along the northern border of the site along Constitution Road extending approximately 170 m along Constitution Road, as shown in Drawing 1 in Appendix A. The embankment height is up to 4.5 m high, and supports the main part of Constitution Road. Filling is visible on the batters of the embankment. The subject site is separated from the toe of the embankment by the single lane access road (also part of Constitution Road).

At the Parsonage Street site the land use of nearby properties is residential and industrial. The property on the far side of Parsonage Street is residential, while that on the far side of Wells Street is industrial. Parks and landscaped areas are present to the immediate south-west and on the far side of Loop Road.

The ground levels at the Constitution Road site generally fall from the north eastern corner of the site (at approximately RL 21), towards Shepherds Bay along the southern side of the site (to RL 2 to RL 4). Ground levels are typically high around Hamilton Crescent West (approximately RL 19 to RL 21) and low in the area south-west of the Constitution Road embankment (approximately RL 4 to RL 8). The ground levels fall in varying degrees over gently to moderately sloping ground, with retaining walls, existing cuts and sandstone cliffs noted in various locations.

Ground levels adjacent to the site are generally similarly gently sloping, except for at the Constitution Road embankment. South-east of the site, in the area of proposed landscaping and in the adjacent vacant property at 146 Bowden Street, ground levels continue to fall towards Shepherds Bay, down slopes and retaining walls noted at various places.

The ground levels at the Parsonage Street site generally slope gently down from the eastern corner of the site towards the western corner, from RL 13 to RL 10. Surrounding ground levels are generally gently sloping, although in the south-western part of the site the ground levels first slope gently down the existing strip of parkland, then very steeply down to Loop Road.

Regional topographic contours are shown in Drawing 4 in Appendix A, attached.

6. REGIONAL GEOLOGY, TOPOGRAPHY AND HYDROGEOLOGY

Following is a summary description of the regional geology, topography and hydrogeology. More detailed descriptions of the geological setting is presented in the Geotechnical report conducted concurrently with this investigation. The regional mapping is presented in Drawing 4, Appendix A.

Reference to the Sydney 1:100 000 Scale Series Geological Sheet indicates that the majority of the site is underlain by Hawkesbury Sandstone. The north eastern corner of the site is underlain by Ashfield Shale. Hawkesbury Sandstone typically comprises medium to

coarse grained quartz sandstone, with very minor shale and laminite lenses. Ashfield Shale typically comprises black to dark-grey shale and laminite. The published mapping was confirmed on site via observations of a number of sandstone outcrops/cuttings.

Reference to the NSW Acid Sulphate Soils Risk Maps indicates that in the western side of the site there is a significant area of disturbed ground extending from the south western corner of the site generally along Bowden Road up to Constitution Road.

As disturbed ground may be levelled with dredged materials, an acid sulphate soils assessment is required to determine if actual or potential acid sulphate soils are present. It is noted that the area of disturbed ground correlates to some degree to the location of a former creek/gully noted in the 1930 and 1943 aerial photographs. The eastern and central portions of the site are mapped as having no known occurrences of acid sulphate soils. The bay area (where the jetty is proposed) is mapped as having a high probability of acid sulphate soils being present in the bottom sediment in the bay which can cause severe environmental risk if disturbed.

Reference to the NSW Department of Infrastructure and Natural Resources (DIPNR – now Office of Water in DECCW) *Salinity Potential in Western Sydney 2002* map (refer to Drawing 4, Appendix A) indicates the site is outside the mapped area. This indicates a generally low potential for saline soils. Furthermore, saline soils are not common in areas of Hawkesbury sandstone. It is noted, however, that it is possible that soils in the tidal zone (i.e. near the waters edge of Shepherds Bay) may be influenced by some degree of salinity below the water table.

According to the Soil Landscapes of the Sydney 1:100,000 Sheet the site is mapped as the Gymea Soil Landscape Group. The Gymea group is characterised by landscapes with Undulating to rolling rises and low hills on Hawkesbury Sandstone. Local relief is typically 20-80 m with slopes 10-25% and Rock outcrops <25%. The soils are typically shallow to moderately deep (30 – 100 cm) Yellow Earths (Gn2.24) and Earthy Sands (Uc5.11, Uc5.23) on crests and inside of benches; shallow (<20 cm) Siliceous Sands (Uc1.21) on leading edges of benches; localised Gleyed Podzolic Soils (Dg4.21) and Yellow Podzolic Sands (Dy4.11, Dy5.11, Dy5.41) on shale lenses; shallow to moderately deep (<100 cm) Siliceous Sands (Ucl.1.2) and Leached Sands (Uc2.21) along drainage lines. The group typically has

limitations associated with localised steep slopes, high soil erosion hazards, rock outcrops, shallow highly permeable soil, very low soil fertility.

A search of the Office of Water (part of DECCW groundwater bore database was conducted as on 20 July 2010. The location of the registered groundwater bores within a 3 km radius are shown in Drawing 5, in Appendix A and the bore records are presented in Appendix C. There were no registered bores within the subject site area. There were three registered bores within a 1 km radius of the site. The bores were shallow monitoring bores. It is not considered that the conditions encountered would be representative of the subject site.

Surface water runoff drains into stormwater drains around the site with the overall direction of drainage towards the south (i.e. towards Shepherds Bay). Drains are located in the various locations over the site which drain towards Shepherds Bay.

7. REVIEW OF PREVIOUS REPORTS

Douglas Partners has undertaken a number of previous investigations within the current investigation area and the general region. These reports have been reviewed to assess the likely ground conditions that would be encountered at the site.

In summary the important findings from the previous investigation in the context of the current investigation are;

- Sandstone is typically shallow within the site and the region (within 2 to 3 m), however deeper filling may be present in some areas due to cut and fill to level sites and/or to backfill old features such as the former creek/gully and/or reclaim the shoreline;
- Groundwater was encountered intermittently. In some locations it may be perched above the bedrock, especially where deeper filling is encountered. In other locations it may be present in the fracture and bedding zones of the sandstone bedrock and in such cases groundwater flow would be expected to be minor flows;
- Groundwater near the shoreline of the bay may be expected to be saline or brackish;

- Dredged sediments and sandstone rubble may have been used to reclaim areas of Shepherds Bay. The dredged sediments may contain acid sulphate soil materials and contaminated sediments;
- A number of industrial properties are present in the area and within the site that have or have previously had underground petroleum storage tanks, chemical storage and processes as well as industrial and manufacturing activities that may have potentially contaminated the site and region;
- Natural sediments in the near shoreline area of Shepherds Bay may contain contaminated sediments from various industrial activities undertaken along Parramatta River and/or acid sulphate soils.

7.1 Reports Provided by Client

In addition to the DP reports two reports were provided by the client, namely:

- *Report on Contamination Assessment, Hoover Manufacturing Facility, Meadowbank, NSW*, by Egis Consulting Pty Ltd dated May 2000; and
- Report to Sydney Sae-Soon Presbyterian Church on Environmental Site Screening for Proposed Residential Development at 41-45 Belmore Street Meadowbank by EIS, report reference E18629FJ-RPT dated September 2004

7.1.1 Egis Report

The Egis assessment was conducted on part of the Stage 1 site viz. Site 32 (41-45 Belmore Road), along with the property at 3 Constitution Road (the council depot outside the current investigation area); and 84 Belmore Road which is also outside the current investigation area.

Based on the information provided in the text of the Egis report (either based on onsite operations, site history information or other reports referenced by Egis (but not available to DP)) a number of potential sources of contamination were identified including;

- Assembly line operations;

- Various metal treatment operations;
- Injection moulding of plastics;
- Storage of various raw materials including chemicals, solvents, oils and paints;
- Felt hatters in the western most end of Site 32 which may have used mercury;
- Importation of fill to level the site.

The report specifically listed a number of "previously identified contamination impacts" that were reportedly identified in other reports (but not provided to DP) which include;

- TPH and metal impacts near a former fuel storage area;
- Lead and TPH impacts near the south western corner (near a former hatters/launderers) and garden beds;
- TPH impacts near a former AST in the basement;
- Low level OCP detections in some locations and
- TPH and cadmium impacts beneath the driveway in the centre of the property.

While the above impacts are noted the actual degree and extent of these previously identified impacts have not been clearly defined/described

The Egis investigation included the drilling of 25 test bores within the site, however no groundwater investigation was included within the assessment. The report identified a number of areas where chemical contamination exceeded the guideline values for unrestricted residential use, which included the above listed lead, TPH and metal impacted areas and other cadmium impacted areas in the chassis welding area, the moulding area and near the boiler room. Based on the information in the report it appears that these exceedances were detected in one of the earlier reports (the results of which are not included in the Egis report).

While the complete Egis report was provided, it noted that the previous reports referred to in the Egis report (which identify various contamination issues) was not included and/or the results of the investigation not included and therefore the contamination issues

identified/flagged could not be checked and/or verified. Moreover, the extent of the contamination identified was not delineated or clearly defined in the Egis report.

It is also noted that trace levels of trichloroethylene (TCE) and dicloroethylene (DCE) were detected in some of the near surface samples. TCE and DCE are common dry cleaning solvents and/or breakdown products of dry cleaning solvents (such as perchlorethylene, PCE). While the detected levels were less than 1 mg/kg the full extent of solvent related contaminants in both soil and groundwater was not fully delineated in the report.

It is therefore likely that some form of remediation would be required on this site to render it suitable for the proposed Stage 1 residential works, although based on the information provided it appears likely that the contamination may not be extensive.

7.1.2 EIS Report

The EIS report was conducted on part of the Stage 1 site viz. Site 32 (41-45 Belmore Road), to provide supplementary information to the previous Egis report. The investigation included a review of the previous Egis 2000 report, the drilling of 25 test bores and the installation of three temporary standpipes.

A number of soil samples were collected and analysed for a variety of common contaminants (although volatile organic compounds including the solvents identified by Egis were not included in the analytical regime). Groundwater samples focused on contaminants associated with petroleum based hydrocarbon contamination and did not include a broad assessment of the groundwater contamination.

The conditions encountered in the test bores was generally shallow filling although a maximum depth of filling of up to 2.0 m was encountered. The fill was underlain by sandy clays and sandstone. Groundwater was measured at depths of between 1.05 m and 3.9 m below ground level in the temporary standpipes.

The major findings of the EIS investigation were;

- One sample (212/0-0.2) had an elevated arsenic concentration of 151 mg/kg which was above the assessment criteria for unrestricted residential landuse (although based on

the concept design proposed by Holdmark, the relevant assessment criteria would be for residential sites with limited access to soils, in which case the detected arsenic level would be within the appropriate assessment criteria);

- Elevated heavy fraction petroleum hydrocarbons (C10-C36) were detected in two samples above the adopted assessment criteria of 1000 mg/kg, in samples BH210/0.3-0.5 (2097 mg/kg) and BH212/0-0.2 (3221 mg/kg) the later being at hotspot (2.5 times the assessment criteria) concentration;
- Trace level of PAH and OCP compounds were detected in a few samples (at concentrations within the adopted guidelines); and
- Groundwater samples were analysed for lead, TPH and BTEX compounds. Light fraction (C6-C9) fraction TPH was detected in groundwater sample BH106 at a concentration of 240 µg/L (within the assessment criteria adopted by EIS, but above the Airport (Environment Protection) Regulations (1997), Schedule 2 Water Pollution Accepted Limit of 150 µg/L which is often adopted as a screening criteria in lieu of alternative Australian guidelines). The concentration of BTEX in the corresponding sample was below the laboratory detection limits with the exception of toluene which was detected at a trace level of 1 µg/L.

The absence of a significant BTEX component in the above mentioned TPH detection in groundwater in combination with the trace level detections by Egis of TCE and DCE suggests a data gap is present in the groundwater assessment. The presence of TCE and DCE in the soil samples collected by Egis indicates the potential for similar contamination in the groundwater (despite TCE and DCE only being detected at trace levels in the soil). The presence of TCE and DCE (and other VOCs) in groundwater sample BH106 can not be ruled out without further speciation of the C6-C9 TPH contamination identified. Therefore further groundwater assessment of the site is considered necessary to better characterise and delineate any groundwater contamination within the property. Any further groundwater assessment should also screen for a wider variety of potential contaminants such as VOCs, PAH, OCP, PCBs and phenols.

The results of the EIS investigations generally support the conclusion that some minimal site remediation would be required for Site 32 during redevelopment. Notwithstanding that, some

further investigation is likely to be required to confirm the scope of any remedial works and to further assess the potential for groundwater contamination.

8. SITE HISTORY INFORMATION

Following is a summary of the site history investigation undertaken as part of the current investigation. Due to the project timeframe the history search was limited to a review of historical aerial photographs, a search of records/publications at the local library and a review of the DECCW contaminated sites register. The limited scope of the site history assessment is considered suitable in view of the intended broad-scale nature of the assessment. More detailed site history assessment of the individual lots could be undertaken at a later stage (in a staged manner) as each section of the site is redeveloped.

The site history records are provided in Appendix C.

8.1 Aerial photographs

A review of aerial photographs from 1930, 1943, 1951, 1961, 1970, 1982, 1991, 1996, 2002 and 2010 was undertaken. Below is a general description of the overall site features and characteristics noted over the years. Details of the features of each of the individual sites are provided in Table 2. Copies of the aerial photographs are presented in Appendix C.

1930 Aerial Photograph

In the 1930 aerial photograph the various land parcels within the site appears to be vacant or residential in nature. There are a number of residential properties in the eastern (particularly north eastern) side of the site with others in the north western corner of the site. There appears to be a creek or gully running in a north to south direction in the western side of the site as indicated by the presence of a vegetation line. The general area is also residential in nature. A jetty is noted in Shepherds Bay

1943 Aerial Photograph

The 1943 aerial photograph is generally consistent with the 1930 aerial photograph. The only major changes appear to be the construction of Nancarrow Road and possibly some filling works along the creek/gully. Ryde Bridge is also noted, which was not present in the 1930 aerial photograph

1951 Aerial Photograph

The 1951 aerial photograph shows an increasing density of residential houses in the subject site and surrounding area. In addition commercial/industrial properties were first noted to have been present in the north west and south east quadrants of the site. In addition it appears that further works have been undertaken on the gully/creek with the north section filled in and the southern section widened.

1961 Aerial Photograph

The 1961 aerial photograph shows that the site was further redeveloped for commercial/industrial site use with a number of new commercial/industrial style buildings present. A similar development trend is noted in the surrounding area.

1970 Aerial Photograph

The 1970 aerial photograph shows a continuing trend towards commercial/industrial style redevelopment of the area. It is also noted that areas of Shepherds Bay have been reclaimed and the creek/gully completely filled in.

1982 Aerial Photograph

The 1982 aerial photograph is generally similar to the 1970 aerial photograph with a few new commercial/industrial buildings within the site.

1991 Aerial Photograph

The 1991 aerial photograph is generally similar to the 1982 aerial photograph with a few new commercial/industrial buildings within the site and the removal of the jetty in Shepherds Bay.

1996 Aerial Photograph

The 1996 aerial photograph is generally similar to the 1991 aerial photograph.

2002 Aerial Photograph

The 2002 aerial photograph is generally similar to the 1996 aerial photograph.

2010 Aerial Photograph

The 2010 aerial photograph is generally similar to the 2002 aerial photograph.

Summary

The site has undergone continued redevelopment from a mainly residential area prior to 1960 to mainly commercial/industrial properties by the 1970s. It is also noted that filling has occurred along Shepherds Bay to reclaim parts of the bay and to backfill a former gully/creek.

Table 2 - Historical Aerial Photograph Review

Site	1930	1943	1951	1961	1970	1982	1991	1996	2002	2010
1	residential	No significant change	No significant change	New commercial/Industrial development	extension to commercial/industrial development	no significant change	no significant change	no significant change	no significant change	no significant change
2	residential	No significant change	No significant change	No significant change	New Commercial/industrial	no significant change	no significant change	no significant change	no significant change	no significant change
3	residential	No significant change	No significant change	No significant change	No significant change	New commercial/industrial development	no significant change	no significant change	no significant change	no significant change
4	residential	No significant change	No significant change	No significant change	No significant change	New commercial/industrial development	no significant change	no significant change	no significant change	no significant change
5	residential	No significant change	No significant change	No significant change	New Commercial/industrial	no significant change	no significant change	no significant change	no significant change	no significant change
6	residential	No significant change	No significant change	No significant change	No significant change	New commercial/industrial development	no significant change	no significant change	no significant change	no significant change
7	residential	No significant change	No significant change	No significant change	No significant change	New commercial/industrial development	no significant change	no significant change	no significant change	no significant change
8	Vacant. Possibly creek or gully through centre	Vacant. Possibly creek or gully through centre	mostly vacant - one residential property in south west corner - paved/cleared section in south west corner - possible channel in middle (appears wider then previous)	Generally unchanged. New commercial/industrial building in north west corner. 30-40 cars parked on site or storage containers	Apparent filling across majority of site, especially along shoreline. Former gully/creek no loner present	Construction of new commercial/industrial building on north eastern side and new internal roadway	Demolition of small building on western side. Extension of commercial/industrial building on eastern side and construction of a new commercial/industrial building on western side	no change	no change	no change
9	Vacant. Possibly creek or gully through centre. Constitution Road Embankment appears to be present	No significant change. Constitution Road Embankment is clearer	Site redevelopment. New (large) commercial/industrial building occupying most of site. Possible filling of creek/gully. Possible some works on Constitution Road Embankment	No significant Change. Small new building/shipping crates in north west corner	Additions to north eastern side of building. No other significant change	No significant change	no significant change	Northern half of building demolished and replaced with on grade carpark	No significant channel	no significant change
10	Vacant	Vacant	vacant	vacant	vacant	vacant	vacant	vacant	vacant	vacant
11	Vacant	Vacant	vacant	New (small) commercial building at southern side of lot	Previous building demolished. New (larger) commercial/industrial building erected	no significant change	no significant change	no significant change	no significant change	no significant change
12	vacant	vacant	New small residential style building in centre of lot	no significant change	New commercial/industrial style building at rear of lot. Residential building still present	Residential style building at front of property demolished and removed	New commercial/industrial style building constructed in place of former residential at front of lot	no significant change	no significant change	no significant change
13	Two residential properties in the south western side of the site. The rest is vacant	no significant change	no significant change	One of the residential properties has been demolished. The residential property in the south west corner still present. The rest of lot redeveloped with a large commercial/industrial style development	No significant change	no significant change	no significant change	Residential property in south west corner demolished and removed. Commercial/industrial building extended.	no significant change	no significant change
14	Residential	No significant change	no significant change	no significant change	no significant change.	No significant change	No significant Change	Residential property demolished and converted to storage yard	no significant change	no significant change
15	Residential. Large residential house in south western side of site. North eastern side vacant	No significant change	Generally no change. Two small structures in northern half	Two new structure son the south eastern corner and north eastern corner of site	No significant change	Site redeveloped. Previous buildings and structures demolished and removed. Three new adjoining commercial/industrial style building erected	no significant change	no significant change	no significant change	no significant change

Site	1930	1943	1951	1961	1970	1982	1991	1996	2002	2010
16	Residential	no significant change	no significant change	no significant change	no significant change	no significant change	no significant change	no significant change	no significant change	no significant change
17	Two Residential properties.	no significant change	No significant change	no significant change	New commercial/industrial style buildings at rear of lots. No change to residential properties at front.	no significant change	no significant change	Residential property on eastern lot demolished. No change to western lot	no significant change	no significant change
18	Single residential property in eastern lot. Two western lots vacant	no significant change	New residential property is western lot. No other change	New commercial/industrial building in central lot. No other change	New commercial/industrial building at rear of eastern two lots. No other change	New commercial/industrial building at rear of western lot	no significant change	no significant change	no significant change	no significant change
19	Vacant. Trees along western side.	Site cleared. Possible concrete slab laid for a building or storage yard	No significant change	New commercial/industrial building erected	no significant change	no significant change	no significant change	Previous commercial building demolished and replaced by a new smaller commercial/industrial building	no significant change	no significant change
20	vacant	vacant	vacant	vacant	vacant	vacant	vacant	vacant	new equipment room	no significant change
21	Residential property present	no significant change	No significant change	Residential property demolished and new commercial/industrial building erected	no significant change	no significant change	no significant change	no significant change	no significant change	no significant change
22	Residential property present	no significant change	No significant change	No significant change	residential property demolished and removed. Site used as parking	no significant change	no significant change	no significant change	no significant change	no significant change
23	Two residential properties present	No significant change	No significant change	No significant change	Site redeveloped. Two residential properties demolished and removed. New commercial/industrial building with awning - possible service station	no significant change	no significant change	no significant change	no significant change	no significant change
24	Six residential properties present within site	no significant change	no significant change	Majority of Residential properties still present. Property in south western corner demolished and replaced with new commercial/industrial building	Two residential properties in the north western corner demolished and commercial building extended in their place. Residential properties remain in south eastern corner	Residential properties in the south east corner demolished and replaced with new commercial/industrial building.	no significant change	no significant change	No significant change	no significant change
25	Residential property present	no significant change	No significant change	New commercial/industrial style building at rear of property. Residential property still present	No significant change	no significant change	no significant change	no significant change	No significant change	no significant change
26	Residential property present	no significant change	No significant change	No significant change	Generally no change. Small commercial/industrial building added to rear of property	no significant change	no significant change	no significant change	no significant change	no significant change
27	Residential property present	no significant change	No significant change	No significant change	no significant change	no significant change	no significant change	no significant change	no significant change	no significant change
28	Residential property present	no significant change	No significant change	No significant change	Site redeveloped. Residential Property demolished and removed. New commercial/industrial style building erected	no significant change	no significant change	no significant change	no significant change	no significant change
29	Residential property present in northern half of lot. Southern half vacant.	No significant change	Residential property demolished, left vacant with trees. New commercial/industrial building erected on southern half of site.	New commercial/industrial building erected on northern half of site and appears to connect to southern half.	no significant change	building is shortened at both ends to accommodate parking	no significant change	no significant change	no significant change	no significant change
30	Two residential properties present	no significant change	No significant change	No significant change	no significant change	Residential buildings demolished and removed, site left largely vacant	New commercial/industrial building erected on site	no significant change	no significant change	no significant change
31	Vacant	Vacant	Site cleared and earthworks undertaken	Equipment room established	no significant change	no significant change	no significant change	no significant change	no significant change	no significant change

Site	1930	1943	1951	1961	1970	1982	1991	1996	2002	2010
32	Generally Vacant. Two residential properties in south eastern corner, one (possibly two) in south western corner and one in north western corner	No significant change.	Three new residential properties in the south western corner (on Rothesay Av). Two residential properties in south eastern corner (on Belmore St) have been demolished. Eastern 2/3 of the site has been cleared and levelled. Northern side of clearing appears to have been excavated to create level surface (possible placed as fill on southern half)	New commercial/industrial building occupying majority of site. The south western corner remains residential	No significant change to the site. Shore line area to south of site appears to have been filled/levelled and occupied by shipping containers	Residential properties in south western corner (on Rothesay Av) have been demolished and replaced with new commercial/industrial building	no significant change	no significant change	No significant change	no significant change
33	Residential property present in western side of lot. Eastern side vacant	No significant change. Some tree present in northern part of lot.	New residential building in the eastern half of the lot.	No significant change	New commercial/industrial building erected at rear of eastern house..	residential property on western side demolished and left vacant. New small building at rear of eastern side	New commercial/industrial building on western side of lot.	no significant change	No significant change	no significant change
34	Residential property present	no significant change	No significant change	No significant change	no significant change	no significant change	Residential property demolished and removed. New small commercial/industrial building erected at front of site	no significant change	no significant change	no significant change
35	Residential property present	no significant change	No significant change	No significant change	no significant change	no significant change	Residential property demolished and removed. New multistorey office block erected	no significant change	no significant change	no significant change
36	Residential property present	no significant change	No significant change	No significant change	no significant change	Residential property appears to be converted into commercial/industrial	Building demolished and left vacant	Site used for parking/storage	no significant change	no significant change
37	Road present	no significant change	No significant change	No significant change	no significant change	no significant change	Road redirected, site cleared and incorporated into adjacent commercial block and left vacant.	Used as internal roadway	no significant change	no significant change
38	vacant	vacant	vacant	vacant	Used as car parking	no significant change	no significant change	no significant change	no significant change	no significant change
39	Residential property present	vacant	Site redeveloped. New commercial/industrial building erected.	Commercial/industrial building extended.	no significant change	no significant change	no significant change	no significant change	no significant change	no significant change
40	Two residential properties present	no significant change	No significant change	No significant change	no significant change	no significant change	no significant change	Residential properties demolished and area left vacant.	no significant change	no significant change
41	Vacant. Small track/road present	vacant	vacant	vacant	vacant	vacant	vacant	vacant	vacant	vacant

8.2 Local Library Search

A search of the records and publications held at the local Ryde Library was conducted at part of the investigation. While a number of books on local histories were available and reviewed there was no specific information available that related to the subject site and/or the previous use of the site, and in particular no information on the contamination status of the site was available.

8.3 EPA Contaminated Land Register

A search was undertaken of the Department of Environmental Climate Change and Water (DECCW) Contaminated Land Register as part of the DP Preliminary Contamination Assessment on July 2010.

There were no records, notices on the site or orders to investigate or remediate the site

In addition, a search of DECCW register of licences was conducted. There were two surrendered licences within the site. These were;

- Site 17 – 10 Nancarrow Avenue – Duncan H. Macfarlane Pty Ltd. Ferrous and non-ferrous metal works;
- Site 32 – 41 Belmore Street – Hoover Company (Australia) Pty Ltd. An unspecified activity.

In addition there were two surrendered licences on sites on the opposite side of Belmore Street to the site. Theses were;

- 84 Belmore Street – Hoover Company (Australia) Pty Ltd. An unspecified activity; and
- 100 Belmore Road – Waters Trading. Agricultural produce.

In each case there was no details provided on the nature of the licence. However, it is considered likely that the licences would have been for chemical storage and/or chemical processes.

The results of the searches are presented in Appendix C.

9. RESULTS OF INVESTIGATION

The results of the field inspections are presented in Table 3, below. Photos from the inspections are provided in Appendix B.

Table 3 - Field Inspection Observations

Property	Business	Building materials	Waste Disposal Practices	Chemicals Stored on site	Surface Conditions	Underground structures	Vegetation/landscaping features	Other/General Description	Photo No.	Potential Contaminants
1	Browns Furniture. Boarded up	Brick and fibro roof	NA	Possible minor stores of vanishes and other wood and leather products	minor cut and fill	No signs/ evidence during inspection	None present	Office and warehouse	1	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
2	Kenco Car Care	Brick and fibro roof	Bins, possible sumps	Minor stores of solvents, degreasers, oils	Cut and fill. Minor stains on concrete surface Possible tanks on site	Possible sumps/oil water separators	None present	Office and warehouse with workshop for cars	2	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
3	SRSC Steel Roofing Supplies	Brick and steel	Bins/skips	Possible small stores of solvents, degreasers, oxyacetylene	Minor stains, some cut and fill. Possible sumps/oil water separators Possible tanks on site	Warehouse floor a semi basement	Small garden at front	Large warehouse and office with loading bay and some processing/cutting of steel products	3	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
4	SRSC Steel Roofing Supplies	Steel frame and concrete	Bins/skips	Possible small stores of solvents, degreasers, oxyacetylene	Minor stains, some cut and fill. Possible tanks on site	No signs/ evidence during inspection	None present	Small warehouse and storage yard	4	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
5	Jubilee Smash Repairs	Brick and steel	No access. Skips and sumps expected	Probable degreasers, solvents, paints and small oil stores	No surface contamination evident. Slight oil stains on pavement Some cut and fill. Possible tanks on site	No signs/ evidence during inspection. Sumps/oil water separators possible	None present	Smash repair business and mechanic	5	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
6	Wellyou Asian Grocery	brick	Skip bins	None observed	New slab. Some minor cut and fill	No signs/ evidence during inspection	1 tree	Brick grocery store. No signs of gross contamination	6	Metals, PAH, asbestos, pesticides, TPH, BTEX, from filling
7	Nossiter Pump Service	brick	Bins/skips	None observed. Degreasers, small oil and solvents expected	Concrete – no obvious stains/surface contamination Some cut and fill evident	No signs/ evidence during inspection	Trees and shrubs at front	Office and warehouse with workshop for pump repair/service	7	Metals, PAH, asbestos, pesticides, TPH, BTEX, VOC from onsite activities and filling
8	Metro Jasco P/L BA Business Aids Long Reach Grid Scene Catholic Healthcare	Concrete, brick and steel	Bins and skips on site	None observed	Exposed sandstone cutting in north east corner of site. Likely fill along southern side of site (near Shepherds bay. Rest of site generally paved	No signs/ evidence during inspection	Minor landscaping on fringes	Light commercial industrial facility with offices and warehouses	8-12	Metals, PAH, asbestos, pesticides, TPH, BTEX, VOC from onsite activities and filling

Property	Business	Building materials	Waste Disposal Practices	Chemicals Stored on site	Surface Conditions	Underground structures	Vegetation/landscaping features	Other/General Description	Photo No.	Potential Contaminants
8	Vacant strip on south western side	NA	NA	NA	Road base and gravels	No signs/ evidence during inspection	Few scattered trees/shrubs	Some small stockpiles of materials on site including soil, bitumen, concrete, old barrel and asbestos attached to concrete	13-16	Filling/stockpiles. Heavy metals, TPH, PTEX, PAH and asbestos
9	Colouright Vince and Ross Fitnessworld	Brick and concrete	Bins/skips	Possible oils, grease, solvents and inks	Site level. Cut and fill evident	No signs/ evidence during inspection. Tanks previously removed – possible further tanks	Minor landscaping at fringe	Office and warehouse at Nancarrow side. On Jubilee side is open carpark and a sandstone cliff/cutting. Substation present in NW corner	17-21	Metals, PAH, asbestos, pesticides, TPH, BTEX, PCB, VOC from onsite activities and filling
10	Path lane	NA	NA	NA	No evidence of surface contamination. Some cut and fill	No signs/ evidence during inspection	Trees and shrubs present	Vacant block with vegetation	22	Metals, PAH, asbestos, pesticides, TPH, BTEX, PCB, VOC from onsite activities and filling
11	Ryde Accident Repair	Brick and fibro roof	Bins, sumps, oil water separators	Small store of oils, grease, solvents, paints, degreasers	No evidence of surface contamination. Some cut and fill.	Possible sumps, oil/water separators and underground fuel tanks	Minor at front	Mechanic and smash repairer	23	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
12	Hunters Hill Car Repair and take away Glass Techno		Bins, sumps, oil water separators	Small store of oils, grease, solvents, paints, degreasers	No evidence of surface contamination. Some cut and fill.	Possible sumps, oil/water separators and underground fuel tanks. Possible grease trap at takeaway	Minor at front	Mechanics/smash repairer on 1st floor and take away on ground floor. Glass Techno in adjacent building	24	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
13	Tiger Automotive Mechanic Desmo Clinic (motor cycle repairs and sale Elle Automotive Centre	Brick Brick Brick	Bins/skips and sumps and oil/water separators	Minor stores of oil, grease, solvents, paints, degreasers	No signs of surface contamination. Some cut and fill	Possible sumps, oil/water separators and fuel tanks	None observed	Smash repairers, and motor mechanics	25-27	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
14	Mid Coast Timber	Brick	NA	None observed	No surface contamination observed. Some cut and fill	No signs/ evidence during inspection	Some at front	Converted house for office of Mid coast timber	28	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling

Property	Business	Building materials	Waste Disposal Practices	Chemicals Stored on site	Surface Conditions	Underground structures	Vegetation/landscaping features	Other/General Description	Photo No.	Potential Contaminants
15	Mid Coast Timber	Brick, and fibro	bins	None observed. Possible wood treatment	No surface contamination observed. Some cut and fill	No signs/ evidence during inspection	Some at front	Office and warehouse and outside storage	29-30	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
16	Residential house	brick	bins	Household chemicals	No surface contamination observed. Some cut and fill	No signs/ evidence during inspection	Trees and shrubs	Residential house	31	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
17	Oz Design Kitchens (attached to house) and vacant block	Brick and fibro roof	bins	None observed, household chemicals	No surface contamination observed	No signs/ evidence during inspection	Trees and shrubs	Residential house attached to office and a warehouse at rear of property	32	Metals, PAH, asbestos, TPH, BTEX, VOC from onsite activities and filling
18	Residential house Kitchen Aid Major League Records	Brick	Bins	None observed	No evidence of surface contamination. Some cut and fill	No signs/ evidence during inspection	Trees and shrubs at front	Three buildings 1 residential house 1 warehouse and office 1 converted residential house to office with workshop and warehouse at rear	33-35	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
19	Roller Makers (rubber products)	Brick and possible fibro	bins	Possible rubber and tar based products	No surface contamination observed. Some cut and fill	No signs/ evidence during inspection	Trees and shrubs at front	Converted house at front and office/warehouse at rear. Abandoned car at rear	36-37	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
20	Equipment room	brick	NA	NA	No evidence of surface contamination	No signs/ evidence during inspection	Trees at rear	Equipment room	38	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
21	BA Plumbing Electrical Carpentry	Brick fibro roof	NA	None observed	No evidence of surface contamination. Some cute and fill	No signs/ evidence during inspection	Minor landscaping at front	Office and warehouse	39	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
22	Car parking for Ryde Steering	NA	NA	None observed	No evidence of surface contamination. Some cute and fill	No signs/ evidence during inspection	Minor landscaping at front	Vacant lot used for parking	40	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling

Property	Business	Building materials	Waste Disposal Practices	Chemicals Stored on site	Surface Conditions	Underground structures	Vegetation/landscaping features	Other/General Description	Photo No.	Potential Contaminants
23	Ryde Steering and Auto Mechanic	Concrete and steel	Sumps, oil water separators and bins	Oils, grease, solvents, paints	No evidence of surface contamination. Some cute and fill. Some patches in concrete – possible from removal of old fuel lines and bowsers	Possible fuel tanks present beneath awning and sumps/oil water separators in workshop	Minor landscaping at front	Mechanic with office and workshop with an awning. Looks like a old service station	41	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities possible tanks and filling
24	Skaters Network and Aldon Trading Co.	Brick and concrete	Bins and skips	None observed	No evidence of surface contamination. Some cute and fill	No signs/ evidence during inspection	Minor landscaping at front	Office and warehouse Office and warehouse	42-43	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
25	Converted house	Brick	Bins	Household chemicals	No obvious surface contamination. Minor cut and fill	No signs/ evidence during inspection	Trees and shrubs at perimeter	House converted into office attached to timber yard	44	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
26	Residential house	Brick	Bins	Household chemicals	No obvious surface contamination. Minor cut and fill	No signs/ evidence during inspection	Trees and shrubs at perimeter	Single storey house	45	Metals, PAH, asbestos, TPH, BTEX, pesticides from onsite activities and filling
27	Residential house	Brick and timber	Bins	Household chemicals	No obvious surface contamination. Minor cut and fill	No signs/ evidence during inspection	Trees and shrubs at perimeter	Single storey house	46	Metals, PAH, asbestos, TPH, BTEX, pesticides from onsite activities and filling
28	S.C Carr Cabinet Makers	Brick	Bins/skips	Polishes and varnishes	No surface contamination. Some cut and fill	No signs/ evidence during inspection	Minor vegetation at front	Office and warehouse with workshop to build furniture	47	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
29	Mercupond Glass	Concrete and brick	Bins/skips	Unknown	No surface contamination. Some cut and fill	No signs/ evidence during inspection	None observed	Office and warehouse	48	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
30	Salmon Brothers Electrical Supplies	Brick and steel	Bins/skips	Unknown. Unlikely to have major stores	No surface contamination. Some cut and fill	No signs/ evidence during inspection	Minor vegetation at front	Office and warehouse with workshop for electrical goods	49	Metals, PAH, asbestos, TPH, BTEX, pesticides, VOC from onsite activities and filling. PCB from electrical capacitors
31	Equipment room (substation)	Steel and concrete	NA	Possible PCB in capacitors	No evidence of surface contamination. Minor cut and fill	Underground service	None observed	Substation	50	Possible pesticides, PCB and TPH in capacitors

Property	Business	Building materials	Waste Disposal Practices	Chemicals Stored on site	Surface Conditions	Underground structures	Vegetation/landscaping features	Other/General Description	Photo No.	Potential Contaminants
32	Large abandoned factory/warehouse	Brick, steel, concrete and fibro roof	NA	None at time of investigation	No evidence of surface contamination. Cut in the north eastern section, fill in the southern section	No signs/ evidence during inspection but underground tanks possible	Minor around edges	Large old factory/warehouse building with exposed sandstone at north east side and office space. Some old building materials stockpiled at front – presumably removed from inside building	51—61	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
33	Studio Clothing and Abandoned warehouse	Steel, concrete and brick	Bins/skips	Dyes, cleaners	No evidence of surface contamination. Minor cut and fill.	No signs/ evidence during inspection. A large water tank present	Minor at fringes	Residential style building converted to a office and workshop and warehouse buildings	62-65	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
34	Unknown office and Warehouse	Brick	Bins	Unknown	No evidence of surface contamination. Minor cut and fill.	No signs/ evidence during inspection but underground tanks possible	Minor at fringes	Office and warehouse with outside storage of materials	66	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
35	Office Block	Brick, concrete and steel	Bins/skips	Household cleaners	No evidence of surface contamination. Minor cut and fill.	No signs/ evidence during inspection	Minor at fringes	Multistorey office block	67	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
36	Corner of Parsons	NA	NA	None observed	No evidence of surface contamination. Some cut and fill	No signs/ evidence during inspection	Minor landscaping	Part of storage yard for parsons	68	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
37	Internal road of Parsons	Bitumen/concrete road	NA	None observed	No evidence of surface contamination. Some cut and fill	No signs/ evidence during inspection	None observed	Former road, now internal road for Parsons	69	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
38	Car parking for Parsons	Brick and steel	NA	None observed	No evidence of surface contamination. Some minor oil stains. Some cut and fill	No signs/ evidence during inspection	Minor landscaping	Ca parking area with awning	70	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling

Property	Business	Building materials	Waste Disposal Practices	Chemicals Stored on site	Surface Conditions	Underground structures	Vegetation/landscaping features	Other/General Description	Photo No.	Potential Contaminants
39	Parsons	Brick concrete and steel	Bins/skips	None observed	No evidence of surface contamination. Some cut and fill	No signs/ evidence during inspection	Minor landscaping	Office and warehouse	71	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
40	Vacant property	NA	NA	None observed	No evidence of surface contamination. Some cut and fill (embankments)	No signs/ evidence during inspection	Trees and shrubs around perimeter	Vacant block used as storage of materials and plant for adjacent residential development	72—73	Metals, PAH, asbestos, TPH, BTEX, VOC, pesticides from onsite activities and filling
41	Vacant block	NA	NA	NA	No evidence of surface contamination	No signs/ evidence during inspection	Trees and shrubs present	Vacant block	74	Metals, PAH, asbestos, pesticides TPH, BTEX, from filling

The proposed jetty will extend into the bay into Parramatta River. There were no obvious signs if concern from the shoreline, however, mangroves were noted along the shoreline.

10. DISCUSSION AND RECOMMENDATIONS

10.1 Soil Contamination

Soil, can become contaminated through a number of mechanisms including, *inter alia*:

- spillage and leakage from plant and equipment, chemical drums and tanks;
- inappropriate operating practices and/or disposal of waste materials;
- importation of contaminated filling;
- inappropriate building demolition methods and disposal of demolition waste/rubble on-site;
- deterioration and renovation of buildings causing lead paint spalls (residential gardens' surface soils);
- termite pest control spraying;
- chemical and dangerous goods storage;
- contamination ingress from off site sources (e.g. from nearby, former landfills).

The contaminants of concern (COC) will vary depending on the nature of the contaminating activities that have taken place. The predominant industrial types of activities identified within the site and as described in Table 1 and Table 3, above, typically have a range of COC which include:

- Petroleum hydrocarbons;
- Benzene, toluene, ethyl benzene and xylene;
- Heavy metals;
- Volatile Organic Compounds;

- Polycyclic aromatic hydrocarbons;
- Organochlorine pesticides;
- Polychlorinated biphenyls (on site transformers/capacitors);
- Asbestos.

Filling imported to a site has the potential to contain a wide variety of contaminants depending on the source of the fill. It is common practice to include the following, as a minimum, when assessing filling:

- Petroleum hydrocarbons;
- Benzene, toluene, ethyl benzene and xylene;
- Heavy metals;
- Organochlorine pesticides;
- Polycyclic aromatic hydrocarbons;
- Polychlorinated biphenyls;
- Phenol, and
- Asbestos.

The COC associated with buildings generally include (it is noted that these may be present from previous demolition activities such as the demolition of old residential properties to make way for new industrial developments:

- Organochlorine pesticides (building termite treatment or pest control);
- Heavy metals particularly lead (e.g. lead-based paints);
- Asbestos-based building products.

In particular, the potential sources of contamination identified at the subject site in the site history and site inspection were;

- Demolition waste – from demolition of (in particular) previous residential properties and commercial properties across the site. In particular, asbestos and lead based paint debris may be present within filling placed on the site from previous demolition activities;

- Filling of the site. Evidence from aerial photographs (and the site inspection) indicates that a number of the properties been filled or levelled. Imported fill from unknown sources site potentially contain heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc), total petroleum hydrocarbons (TPH), monocyclic aromatic hydrocarbons (BTEX – benzene, toluene, ethyl benzene, xylene), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), polychlorinated biphenyls (PCB), phenols and asbestos. In addition demolition rubble generated from demolition activities on the site may contain asbestos and lead based paints.
- Fill of previous creek and along reclaimed shoreline using imported materials and/or site derived fill. Based on the aerial photographs it is apparent that a creek/gully was backfilled in the western half of the site and that significant reclamation of land was undertaken along the shoreline. Uncontrolled filling may potentially contain a wide range of contaminants including heavy metals, TPH, BTEX, PAH, OCP, PCB, phenols, VOCs and asbestos.
- Industrial/commercial site activities. The site underwent progressive redevelopment form residential to commercial/industrial. There is a potential for underground storage tanks to be present (or to have previously been present on the sites). In particular there is potential for heavy metal, TPH, BTEX, PAH, phenol and VOC contamination within the commercial/industrial sites.

A site/precinct would need to be assessed by a soil sampling and analytical programme, the scope of which would depend on the size of the site, type of use(s) and the relevant COC that the investigation of site history identified. However, at least some of the soil samples should also be screened to include a broader range of commonly occurring contaminants that are not based on a site specific use.

It is considered that given the anticipated shallow depth to sandstone throughout the site that if present, the majority of the soil contamination would typically be relatively limited in its degree and extent to the vicinity of the original source and that widespread contamination at the site appears to be unlikely. It is anticipated that, if present, the contaminated soil could be managed in a relatively straightforward manner. Potential for some impacts on the groundwater could not at this stage, be discounted without further assessment

In regards to the jetty it is considered likely that the proposed works will disturb potentially contaminated sediments which have accumulated from the various industrial/commercial operations at or near the Parramatta River. Prior to the construction of the jetty an assessment of the sediment should be conducted to assess the risk associated with disturbing any contaminated sediments. Acid sulphate soils (discussed in Section 10.4 would also be an issue with disturbed sediments).

10.2 Groundwater Contamination

Groundwater can become contaminated through the migration of mobile contaminants and the desorption of chemicals in the soil. The migration of groundwater could also result in sites being impacted by contaminated groundwater from a hydraulically up-gradient source. This particularly important with respect to former petrol station sites and other sites that store or have stored petroleum hydrocarbons in underground tanks.

Surface water and sediments could become contaminated by surface run-off of spills and contaminated suspended particulates.

It is considered that there is a moderate potential that ground water contamination has occurred within the site (or parts of the site). In particular it is considered that there is an elevated potential for groundwater contamination in the vicinity of sites where underground tanks were installed (such as Property 9 (apparent former service station) and Site 23 (where records indicate a tank was removed). Or other underground structures such as sumps and oil water separators (at the many smash repairers/mechanics)

It is noted, however, that given the relatively shallow depth to sandstone and (the possible and envisaged) deep depth to groundwater in a substantial portion of site that the potential for migration of contaminants both laterally and vertically (to the groundwater table) would be limited mainly to the secondary migratory features in the rock such as joints and fractures.

Therefore it is considered that groundwater contamination, if present would likely be limited in extent and localised to the location of the contamination source (i.e. localised to an underground tank).

It is recommended that a "regional" approach be adopted in relation to groundwater assessment to be supplemented by additional test locations placed in the vicinity of the identified source of groundwater contamination (e.g. with respect to access conditions). In other words, rather then adopting a site by site assessment or assessing groundwater in a piecemeal fashion (as may be appropriate for soil assessment as various stages are developed). It is recommended that the "regional" groundwater assessment should be conducted at an early stage of the works, i.e. as part of the Stage 1 works, possibly supplemented where feasible with source specific wells place closer to the identified sources.

In addition, if signs of contamination are within individual sites/areas then a more targeted and detailed assessment of groundwater can be conducted within those areas.

It is considered that the potential for widespread or extensive groundwater contamination is generally low, however, adopting the regional groundwater assessment approach at an early stage of the works would help to confirm this and better identify any "problem" areas within the region. It is considered that if groundwater contamination is detected, further more targeted investigations will be conducted to better define the extent of the groundwater impact.

10.3 Building Materials

During the inspection a number of the properties were noted as having fibre cement roofs which would likely contain asbestos. Given the age of the majority of the properties it is considered likely that most properties contain some hazardous building materials such as asbestos (in roofing, wall panels, electrical backing boards), lead based paints and PCB capacitors in light fixtures.

Prior to demolition of any buildings/structures on the site a detailed hazardous materials survey should be conducted by a suitably qualified environmental consultant/occupational hygienist to identify the potential hazardous materials and a management plan developed to ensure that demolition works are conducted in a manner that is both safe and does not result in contamination of the site/s with demolition waste.

It is not considered that the presence of hazardous building materials within the existing structures at the site would pose an impediment to the proposed developed.

10.4 Acid Sulphate Soils

In overall terms it is considered that the potential for acid sulphate soils to be present within the site is low. However, it is considered possible that there are some (minor) areas that may contain actual or potential acid sulphate soils. This includes area along the shoreline near shepherds Bay and in the location of the former gully/creek near Bowden Street that may have been reclaimed/filled using dredged materials. During future intrusive investigations of the properties along Shoreline (i.e. along Rothesay Avenue – Sites 32, 33, 34 and 35 and Site 8 on Bowden Street) and the sites situated above the former gully/creek acid sulphate soils assessment should be undertaken.

In addition if signs of potential acid sulphate soils are noted in other locations such as peaty materials or organic (sulphidic) odours acid sulphate soils assessment should also be conducted.

If present potential or actual acid sulphate soils can be managed in a relatively straightforward manner via the implementation of a acid sulphate soils management plan which would include management option on the treatment of any excavated spoil (with lime) prior to disposal. If dewatering works are required in or near acid sulphate soil prone areas, a dewatering management plan should also be prepared/implemented to ensure that the impact of oxidised release of acid sulphate soils in minimised. The potential presence of acid sulphate soils at the site is not considered to be a significant impediment to the proposed development and can be managed in a relatively straight forward manner.

In regards to the proposed jetty, it is considered likely that potential or actual acid sulphate soils will be present in the bay area which may be disturbed by the proposed jetty development. It is recommended that an acid sulphate soils assessment be conducted in the area of the proposed jetty to assess to degree and nature of any acid sulphate soils present and to develop a management plan. It considered that if present that the acid sulphate soils can be effectively managed.

10.5 Salinity

Based on the available mapping and the presence of Hawkesbury Sandstone it is considered that the potential for saline soils at the site would be limited. It is noted that in tidal areas near Shepherds Bay that there may be some saline soils. However, it is envisaged that if present, saline soils could be managed in a straightforward manner via general site management practices and building practices and would not present a significant impediment on the development.

11. CONCLUSIONS

Based on the limited site history investigation and inspections of the site/s it is considered that there is generally a moderate potential for contamination, although the probability of widespread contamination at the site appears to be generally limited. It is considered that a number of potentially contaminating activities could have been undertaken within various properties within the site including demolition works (that may have left behind building rubble containing hazardous building materials), cut and fill and land reclamation of the site to level individual properties and to fill the former creek/gully and reclaim land along the shoreline of Shepherds Bay. Various commercial/industrial site uses over the past 50 or so years including storage of fuel and fuel related products in underground storage tanks, potentially industrial/commercial operations involving the use of chemical and the use of fuels, solvents and other degreasers at the numerous mechanics, auto shops and smash repairers within the site may also result in soil and/or groundwater contamination.

It is considered likely that some potential or actual acid sulphate soil materials are present, particularly in reclaimed areas and the area of the jetty.

It is recommended that more detailed contamination assessment be undertaken at the site at the subsequent stages of planning and development. The assessment would include a more detailed and focused site history assessment on the various lots/properties. The assessment can be undertaken in staged manner, in line with the program of site redevelopment. In this way, the various stages of development (development precincts) will be subject to appropriate intrusive investigation of the sub surface to verify the nature and extent of the soil and groundwater contamination at each precinct. The intrusive investigation should include an assessment of acid sulphate soils and/or salinity as appropriate.

Furthermore it is recommended that a regional groundwater study be conducted as part of the early works to assess the overall groundwater quality and conditions at the site and to assist in determining the overall potential for potential contamination issues within all or part of the site. More focused groundwater investigation could be undertaken where specific areas of concern are identified (such as site with known soil contamination or known presence of underground storage tanks).

In overall terms, it is considered that the contamination issues, if present, would most likely be mainly confined to areas close to the original source due to the generally shallow depth of bedrock at the site and can likely be dealt with in a relatively straight forward and staged manner and are unlikely to significantly affect the viability of the redevelopment project.

From a broad scale evaluation standpoint it is considered that the site can be rendered suitable for the proposed development. Further intrusive and more detailed assessment would however need to be undertaken, preferentially in stages to better define the nature and extent of any contamination issues and to develop a detailed remediation strategy for implementation (if required).

12. LIMITATIONS OF THIS REPORT

The scope of the site assessment activities and consulting services undertaken by DP were limited to those detailed in the proposal dated 15 June 2010 and accepted by Robertson + Marks Architects Pty Ltd on behalf of Holdmark Constructions Pty Ltd.

DP's assessment is necessarily based upon the result of a limited site investigation which was set out in the proposal. DP cannot provide unqualified warranties with regards to site contamination nor does DP assume any liability for site conditions not observed or accessible during the time of the investigations.

This report, its associated documentation and the information herein have been prepared solely for the use of Holdmark Constructions Pty Ltd. Any reliance assumed by third parties on this report shall be at such parties' own risk.

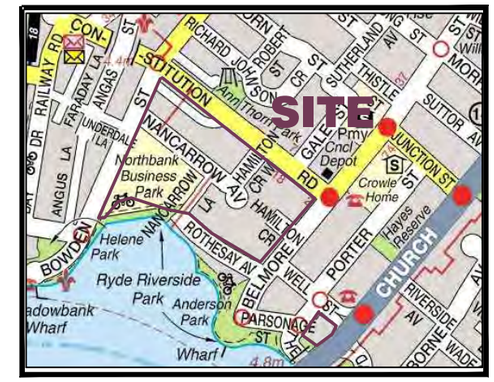
DOUGLAS PARTNERS PTY LTD

Kurt Plambeck
Environmental Scientist

Reviewed by

Ronnie Tong
Principal

APPENDIX A
Site Drawings

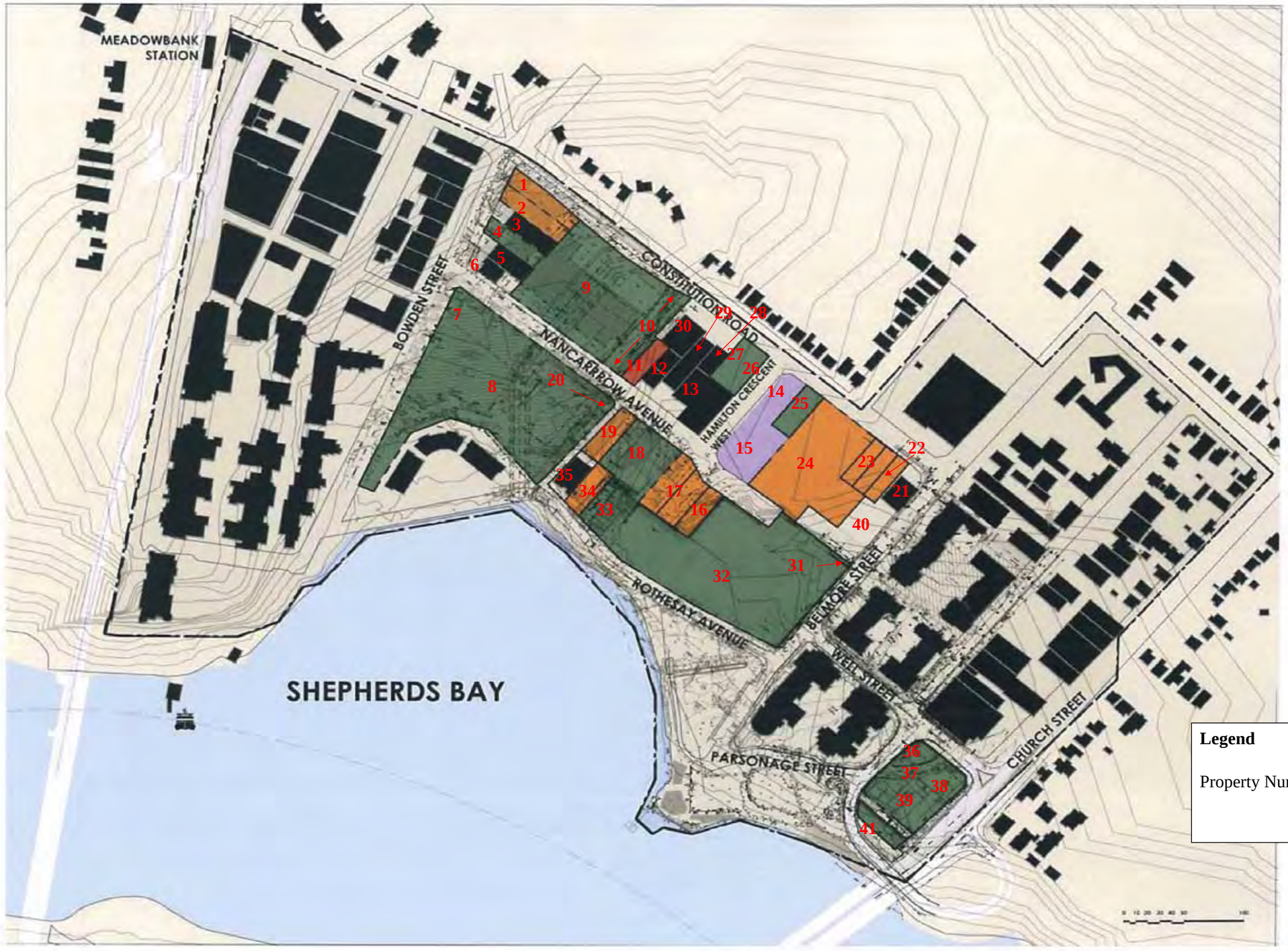


LOCALITY PLAN

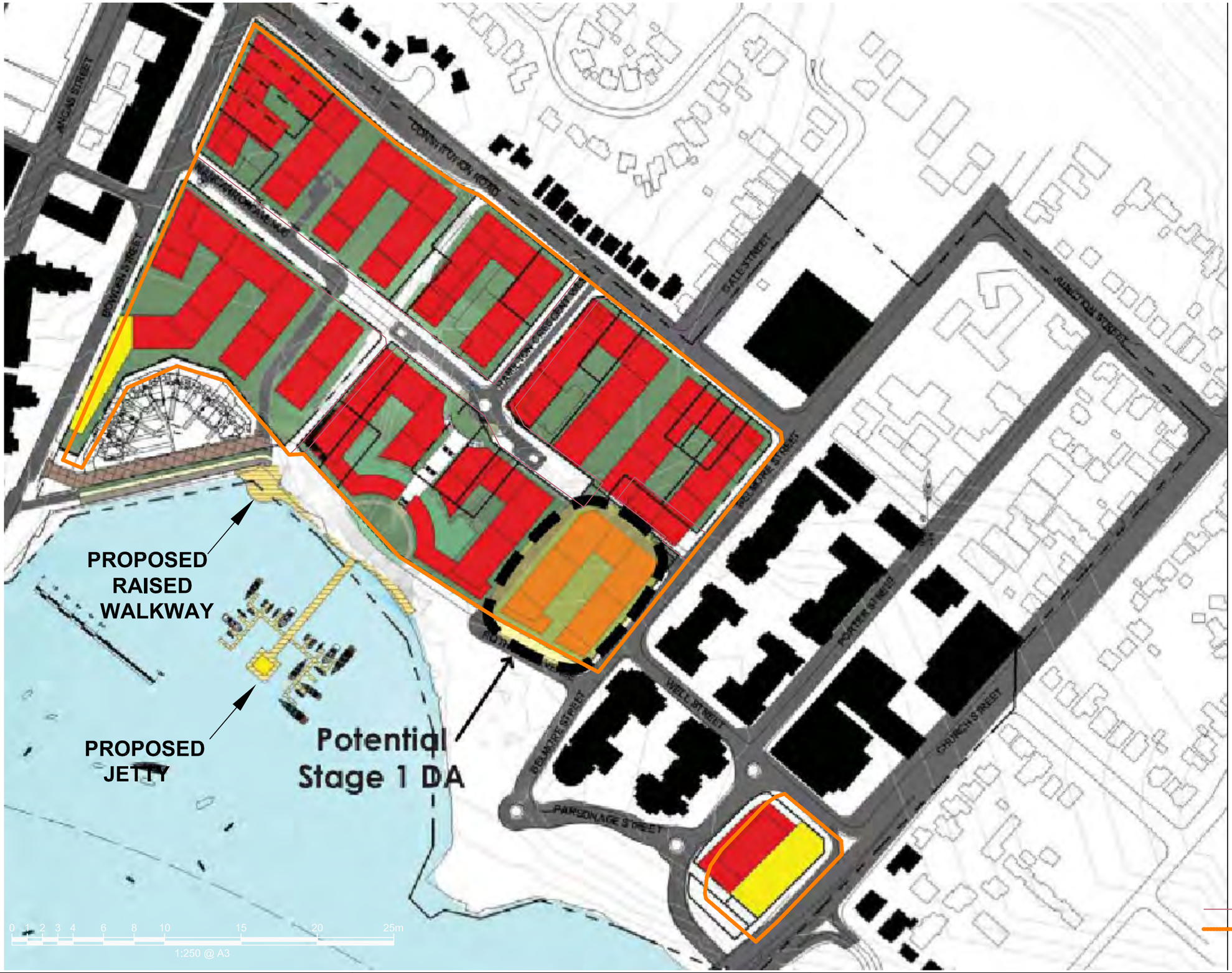
LEGEND

- EXISTING ROADS WITHIN SITE
- SITE BOUNDARIES
- CONSTITUTION ROAD EMBANKMENT

Douglas Partners Geotechnics • Environment • Groundwater	CLIENT: Holdmark Constructions Pty Ltd	TITLE: **Site Layout** **Proposed Shepherds Bay Urban Renewal** **Constitution Road, MEADOWBANK**	PROJECT No: 71920
	DRAWN BY: PSCH / SCALE: As shown / OFFICE: Sydney		DRAWING No: 1
	APPROVED BY: / DATE: 22.7.2010		REVISION: A



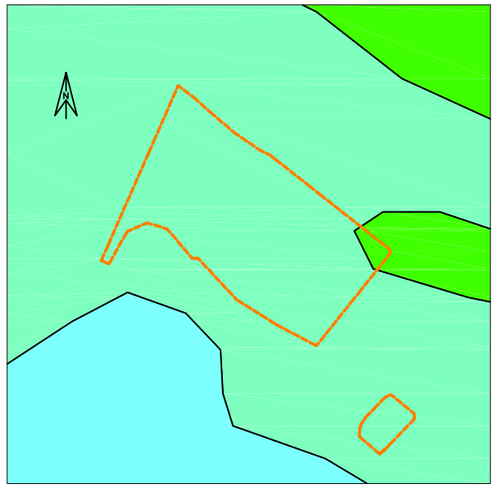
Douglas Partners Geotechnics • Environment • Groundwater	CLIENT: Holdmark Constructions Pty Ltd		TITLE:	**Site Numbering System** **Proposed Shepherds Bay Urban Renewal** **Constitution Road, MEADOWBANK**	Project No: 71920
	DRAWN BY: KP	SCALE: NTS OFFICE: Sydney			Drawing No: 2
	APPROVED BY: KP	DATE: 19.07.2010			Revision: A



Douglas Partners
Geotechnics · Environment · Groundwater

CLIENT: Holdmark Constructions Pty Ltd			TITLE: **Proposed Development - "Terrace Concept"**	PROJECT No: 71920
DRAWN BY: PSCH	SCALE: As shown	OFFICE: Sydney	**Proposed Shepherds Bay Urban Renewal**	DRAWING No: 3
APPROVED BY:		DATE: 22.7.2010	**Constitution Road, MEADOWBANK**	REVISION: A

REGIONAL GEOLOGY MAPPING

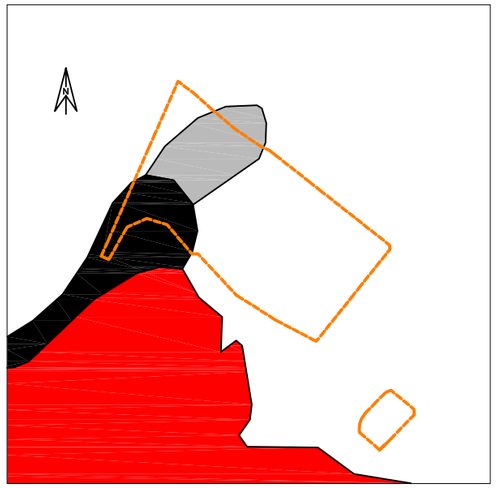


NOTE: Layer displays geological units for the Sydney 1:100 000 Geology sheet. Digital data supplied by the Geological Survey of NSW June 2009

LEGEND

- Hawkesbury Sandstone
- Ashfield Shale
- Water

ACID SULFATE SOIL (ASS) RISK MAPPING

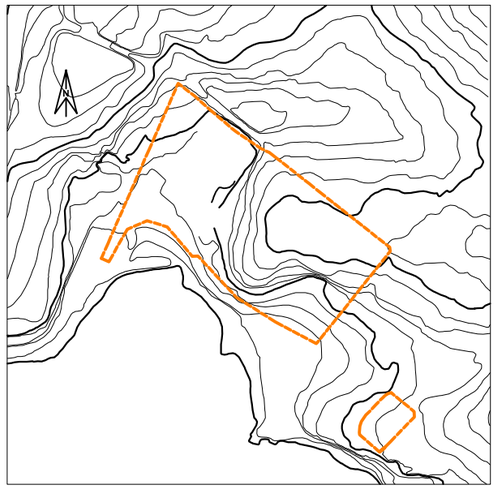


NOTE: Data supplied by NSW Department of Environment and Climate Change based on published 1:25,000 Acid Sulfate Soil Risk Mapping, 1994-1998

LEGEND

- High Probability of ASS Occurrence
- Disturbed terrain, unknown risk of ASS, elevation 2-4m
- Disturbed terrain, unknown risk of ASS, elevation >4m
- No known ASS

TOPOGRAPHIC CONTOURS

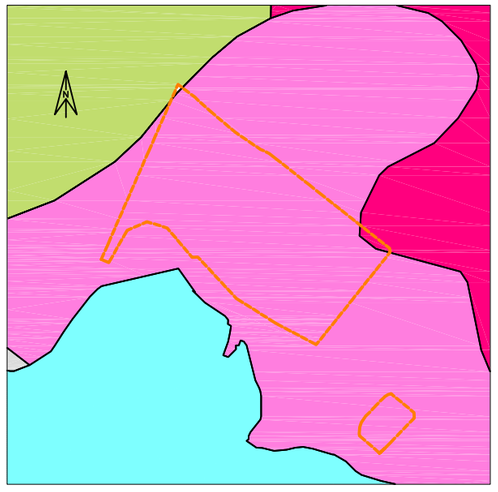


NOTE: These lines represent an imaginary line on the ground joining points of equal elevation in relation to the Australian Height Datum. The contour interval is 2 m. Data was provided by the NSW Department of Lands, April 2009.

LEGEND

- 2m Contour
- 10m Contour

SOIL LANDSCAPE MAPPING



NOTE: Soils Landscape Mapping of the Sydney 1:100 000 sheet. Based on digital data supplied by the NSW Department of Environment and Climate Change 2008.

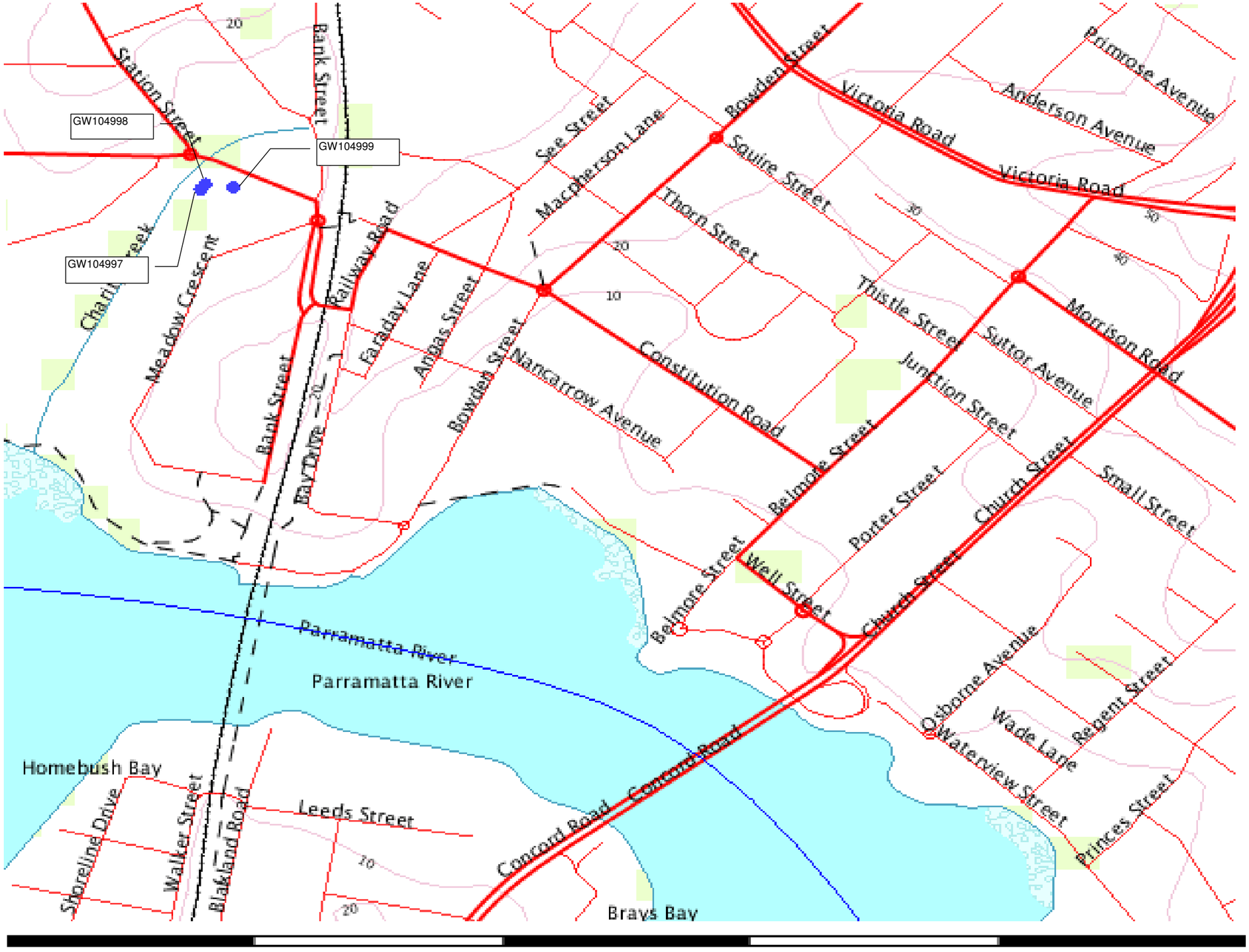
LEGEND

- Gymea Soil Landscape Grouping
- Glenorie Soil Landscape Grouping
- Lucas Heights Soil Landscape Grouping
- Water

0 100 200 300 400 500 750 1000m

Maps at 1:10000 @ A3

Douglas Partners Geotechnics · Environment · Groundwater	CLIENT: Holdmark Constructions Pty Ltd		TITLE: **Regional Mapping** **Proposed Shepherds Bay Urban Renewal** **Constitution Road, MEADOWBANK**	PROJECT No: 71920
	DRAWN BY: SCP	SCALE: As shown	OFFICE: Sydney	DRAWING No: 4
	APPROVED BY:		DATE: 22.7.2010	REVISION: A



Douglas Partners Geotechnics · Environment · Groundwater	CLIENT: Holdmark Constructions Pty Ltd			TITLE: **Location of Registered Groundwater Bores**	Project No: 71920
	DRAWN BY: KP	SCALE: NTS	OFFICE: Sydney	**Proposed Shepherds Bay Urban Renewal**	Drawing No: 5
	APPROVED BY: KP		DATE: 19.07.2010	**Constitution Road, MEADOWBANK**	Revision: A