Fire & Rescue NSW

Greenacre PFAS Investigation

Preliminary Site Investigation and Sampling & Analysis Quality Plan

August 2016

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Appendices

1. Introduction

GHD Pty Ltd (GHD) was commissioned by Fire and Rescue NSW (FRNSW) to undertake a combined preliminary and detailed site investigation at a land parcel identified within Lot 2 of DP588394 and Lot 1 DP 193478 located at 1 Amarina Avenue, Greenacre NSW 2190 (the 'site').

The site is a warehouse and mechanical workshop. There is one part of the site where foam was used when working on or the testing of trucks during maintenance and repair activities, which has potentially included the use of aqueous film forming foams (AFFF). The foams used may have contained perfluoro alkyl substances (PFASs) including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), which are potentially harmful to human health and the environment.

1.1 Background

The site area is approximately 23,550 m^2 and comprises Lot 1 DP 193478 and Lot 2 of DP588394. The approximate site boundaries are presented in Figure 1, Appendix A.

The site is owned by FRNSW. The site is currently used by Fire and Rescue NSW as storage, office and mechanical workshop and outfitting. The site area is bound by an industrial setting environment including industrial warehouses with Amarina Avenue to the west and Wentworth road to the east.

GHD understands AFFF and other firefighting foams potentially containing PFASs have historically been used at a number of FRNSW locations in NSW for firefighting training purposes. For this reason, PFAS may have been released to the environment, which may have resulted in contamination.

The NSW Environmental Protection Authority (NSW EPA) is currently undertaking an investigation program to assess the historical legacy of PFAS use across NSW. As part of this program of works, NSW EPA have identified impact in surface water on the site and have requested further investigation be undertaken by FRNSW, to understand the potential extent of contamination, if any.

In response to the request by the EPA, GHD have conducted a desktop-based preliminary site investigation (PSI) and a site inspection to develop a preliminary conceptual site model (CSM) for contamination issues at the site (refer to Section 2.6). This information was used to develop a sampling analysis and quality plan (SAQP), for assessing the potential impacts and risks at the site (refer to Section 3).

This report documents the findings of the PSI and presents a preliminary CSM and SAQP. The SAQP has been prepared to assess potential impacts from the use of PFAS at the site and its potential impacts off-site. It is understood that the SAQP will be provided to the NSW EPA for consideration prior to implementation of the investigations at the site.

1.2 Objectives

The overall objective of the investigation is to characterise impacts and subsequently assess the potential risks to human health and the environment from historical firefighting training activities at the site and the likelihood of impacts off-site.

The specific objectives of this PSI and SAQP are to:

- Describe the site (including boundaries and title descriptions)

- Document the history of the site
- Identify potential on and off-site sources of contamination
- Characterise pathways for impact migration
- Identify potentially sensitive receptors/environment
- Develop a preliminary CSM using the preliminary investigation data to assess potential source, receptor linkages
- Develop a SAQP to define future intrusive investigations to obtain quantitative data on contamination.

1.3 Scope of work

The scope of works undertaken by GHD to address the project objectives is described below.

The works were completed in accordance with GHD proposal 214723 dated 30 March 2016, which was approved for completion by FRNSW on 16 May 2016.

Limitations associated with GHD's work are provided in **Section 4.**

1.3.1 Task 1 - Information and Data Review (preliminary site investigation)

A detailed review of relevant information and data sources was undertaken to identify property details and potentially contaminating sources and activities.

The information reviewed was in general accordance with that recommended in *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011) and included:

- Local Council (heritage register, LEPs, zoning and permissible land use).
- Department of Lands (aerial photographs).
- Office of Environment and Heritage (including notices under *Contaminated Land Management* (CLM) *Act 1997*, *Pollution of the Environment Operations* (POEO) *Act 1997* Environment Protection License Register, environmental incidents and State Heritage Register).
- NSW Department of Primary Industries (DPI) Water (local and regional groundwater information, including groundwater bore search).

Further to this, a review of historical investigation reports provided by FRNSW was completed. This included a review of the NSW EPA investigation at the site.

The data reviewed was used to:

- Characterise the environmental setting for the site (see Section 2.3) to understand potential contaminant migration pathways and sensitive receptors in the receiving environment.
- Understand the site history and potential sources of impact (see Section 2.4)
- Review regulatory information pertaining to previous contaminating activities undertaken at the site to characterise potential sources of impact (See Section 2.5)
- Develop a preliminary CSM highlighting the pollutant linkages between sources and receptors. This was used to inform development of the SAQP (see Section 2.6).

1.3.2 Task 2 – Preparation of SAQP

The CSM developed from the PSI was used to prepare a SAQP. The SAQP outlines the strategy for assessing the nature and extent of contamination at the site.

The SAQP includes the following:

- Data Quality Objectives (DQO'S) which have been prepared in accordance with Appendix IV of the *Guidelines for the NSW Site Auditor Scheme* and the National Environment Protection (Assessment of Site Contamination) Measure (NEPM) (as amended 2013 – NEPM, 2013) to ensure that field investigations and analyses are undertaken in a way that enables the collection and reporting of reliable data on which to base the site assessment and remediation requirements (if required) – See Section 3.1.
- The basis if the assessment including details of the guidelines, policies and legislation that the investigation has been developed for (See Section 3.2).
- The requirements for sampling and assessment at the site (see Section 3).
- Assessment of potential sources of contamination and contaminants of concern including presentation of the preliminary CSM (see Section 2.6).
- Assessment of potential groundwater impacts (see Section 3).
- Proposed sampling and analytical program (see Section 3).
- Proposed sampling methodology (see Section 3).
- Quality Assurance and Control protocols (see Sections 3).

1.3.3 Reporting

GHD has prepared this report to present the preliminary site investigation and SAQP

1.4 Report Structure

The report includes the following key sections:

- Section 2 – Preliminary Site Investigation
- Section 3 – Sampling and analytical program

1.5 Limitations

GHD's limitations to the assessment are provided in Section 4.

2. Preliminary site investigation

2.1 Site identification

A summary of site identification details is provided in Table 1. The site location is presented in Figure 1 in Appendix A.

Table 1 – Site identification summary

Information	Details
Street Address	1 Amarina Avenue, Greenacre NSW 2190
Lot and DP number	Lot 1 DP 19347 and Lot 2 of DP588394
Site Area	23 550 m2
Local Government Area	Strathfield Municipal Council
Local Land Use Zoning	IN1 – General Industrial
Current Land Use	Mechanical workshop, mechanical fit out and offices.
Surrounding Land Use	Industrial and commercial businesses

2.2 Site inspection

Prior to undertaking site investigations, a questionnaire was issued to FRNSW staff to prompt collation of relevant information from appropriate personnel prior to the site visit.

The site inspection was completed on 13 July 2016 by an experienced environmental professional from GHD's contamination and environmental management team. The site inspection included a site walkover with site staff to identify areas of potential contamination based on surface conditions and evidence of current or former potentially contaminating activities or site operations. Further observations of AFFF impacts/use will be made during preparation and completion of field works, using visual observations of site conditions in previously uninspected areas.

The site inspection works provided the following information. The site features discussed are presented in Figure 2 of Appendix A: Selected photographs are provided in Plate A.

- The main area where AFFF has reportedly been used is around the pump pit (Photograph 1, Plate A) at the eastern boundary of the site. According to the staff at the site, the water in the trucks is recycled through this pump pit. The water is pumped into a holding tank within the pump pit then subsequently pumped back in to the truck after servicing is complete. GHD understands that the foam is not recycled. Trucks park up beside this area and the foam would be released from the foam holding tank of the truck. Best practice was to have a bunded container (IBC) where the foam was decanted and disposed of but this may not have always been the case. GHD were provided with a recommended practice document for the *Replacement of Inlet and Outlet Fittings Recovery and Refill of B Class Foam* which documents the best practice on the recovery and refilling of foam from the trucks.
- Greenacre site stores foam in either 20 L container or IBCs for disposal at the north eastern corner of the main warehouse and mechanical workshop. The subcontractor the disposal of the foam and have an inventory of what has been disposed of since 2014. All AFFF for disposal from locations throughout NSW comes to the site for disposal through Solveco (Photographs 4, 5, 6, 7, Plate A shows the AFFF for disposal).
- The site also stores foams that contain no PFAS and this is stored within the buildings in a lock cage area (Photograph 10, Plate A).

- The area in the south eastern corner of the site was also use to run training courses on fire extinguisher training to the public (Photographs 3, 11 and 12 of Plate A). This usually occurred on trays and the foam was allowed to evaporate and the end product was disposed into trade waste.
- No evidence of staining to the ground surface was noted on the site and there was very little vegetation or unsealed areas on the site.
- The AFFF was either stored in the truck itself or in 20 L containers as concentrate or in IBCs that are stored in the northern building of the site. The foam testing and use on trucks commenced in the 1980s and ceased in early 2016.
- No form testing is now conducted onsite and GHD understands that the maintenance of the trucks do no test any foam systems on the vehicles. The foam is only collected and disposed of as trade waste with Solveco.
- No ponded surface water was noted on site. The site is highest in elevation at the entrance to the site at Amarina Avenue. The site slopes towards the north eastern boundary with some low points in the middle of the site. The majority of the drains onsite lead to the onsite interceptor and other drains to stormwater which leaves the site in the north eastern corner. (Photographs 8, 13 and 14, Plate A)
- The immediate surrounding land use is all commercial / industrial with commercial railways lines to the east of the site. On the western side of Roberts Street, the land use is residential.

The findings of the site inspection are summarised in Table 2**.**

Table 2 – Site inspection summary

Items		Comments
General	Site use	The site is used for new truck outfits, mechanical maintenance of the vehicles and storage. There are also office spaces and a new building being built on the southern boundary of the site. Historically there was fire extinguisher training for the public in the south eastern corner of the site.
	Fencing	The whole site is closed off with a mixture of fences and building walls. The entrance and exit to the site is from Amarina Avenue. There is a boom gate and security gatehouse at this entrance/exit.
Ground surface	Ground cover:	The site is primarily covered by concrete and has been since the site was established. There are some mature trees located on the western boundary of the site. During the site inspection the former building located in the southern portion of the site had been demolished and a new building was being constructed.
	Topography	At the entrance from Amarina Avenue is the highest topographical point for the site. The site immediately slopes to the north to north west and seems to be cut into the hillslope on the southern boundary. Local topography dips to the north east.
	Vegetation	With the exception of some mature trees at the site boundary, little vegetation was present and the site was mostly hardstand. All vegetation that was observed appeared in good health.
	Surface water	There is no surface water present on site. The site is hardstand with internal drains and stormwater drains located on the site. GHD were given drainage plans from 1988 before the building was built and shows stormwater drains in the north eastern corner of the site and pipes leaving the site in the far north eastern corner and joins the stormwater drain network at Wentworth Street. There are internal drains that go to the main interceptor onsite.

Items		Comments
Evidence of contamination	Litter	The site was relatively clean and litter free.
	Waste drums or bulk storage facilities	Within the northern building on the site, in the western corner there is a collection of AFFF (IBCs and 20 L concentrate) and trade waste for collection and destruction. The AFFF has been sent to this site from other F&R NSW for destruction. The AFFF will be incinerated with a destruction certificates supplied. This building that contains this waste for destruction is also locked of an evening. All other storage area of non PFASs foam is stored within a fence on hardstand with no evidence of spills.
	Fill	No evidence of fill was noted during the site walkover. The site is mostly covered in concrete hardstand with the southern end of the site cut into the hillslope.

Plate A – Photographic record

▲**Photograph 1:** The pump test area located at the eastern side of the site. AFFF was flushed through the trucks and captured in IBCs. There is a potential for some spills and overflows during this process.

▲**Photograph 2:** The same as photograph 1 but facing further to the north. The area is all concrete hardstand and the area drains to the west towards subsurface drains.

▲**Photograph 3:** Facing south in the eastern end of the site. The area was formerly used as fire extinguisher training to the public. The new administration building is being built in the background.

▲ **Photograph 4.** Waste storage for destruction located in the northern building of the site at the western end. This product is fire-brake bushfire fighting foam.

▲**Photograph 5:** Same area as photograph 4 with more AFFF stored for destruction.

▲**Photograph 6:** Four IBCs with foam for destruction located at the same area.

▲**Photograph 7:** More drums for destruction located at the same area.

▲**Photograph 8:** The building located in the north of the site that is used for mechanical maintenance and machine fit out with one internal drain located in the middle of the road..

▲**Photograph 9:** Generator for the site in the western area of the site.

▲**Photograph 10:** Internal storage cage for the current use of AFFF foams (non PFAS containing foam).

▲**Photograph 11:** Facing south where the former fire extinguisher training was conducted.

▲**Photograph 12:** Facing south east where the former fire extinguisher training was conducted..

▲**Photograph 13:** The interceptor and rain tanks located near the truck wash in the eastern area of the site.

▲**Photograph 14:** The interceptor for the site where the internal drains go to.

▲**Photograph 15:** A drain outside the interceptor cage. Unsure if this is attached to the interceptor or stormwater for the site.

▲**Photograph 16:** Inside the northern building where truck fit outs, maintenance and the waste storage is held..

2.3 Environmental Setting

This section outlines relevant information relating to the environmental setting of the site.

2.3.1 Topography

Figure 3 of Appendix A presents the slope of the topography across the site. The site lies at approximately 25 m Australian Height Datum (AHD), according to *NSW Globe* from Land and Property Information. The regional topography appears to fall to the east from the site towards Wentworth Street.

2.3.2 Soils

General

According to eSPADE from Office of Environment & Heritage, the site is located on disturbed terrain, which has the following characteristics:

- **Landscape:** level plain to hummocky terrain, extensively disturbed by human activity, including complete disturbance, removal or burial of soil. Local relief <10 m, slopes <30%. Landfill includes soil, rock, building and waste materials. Original vegetation completely cleared, replaced with turf or grassland.
- **Soils:** turfed fill areas commonly capped with up to 40 cm of sandy loam or up to 60 cm of compacted clay over fill or waste materials.
- **Limitations:** dependent on nature of fill material. Mass movement hazard, unconsolidated low wet strength materials, impermeable soil, poor drainage, localised very low fertility and toxic materials.

Acid Sulphate Soils

The acid sulphate soil class at the site is Class C4 (ASRIS, 2013) and the works would have extremely low probability of encountering acid sulphate containing soils. There are no other soil classes located within 500 m of the site.

2.3.3 Hydrology

Surface water flow is expected to follow the local topography on-site and flow east or be intercepted by drainage lines located at the site, which would be directed to the east or north east. Dial before you dig information presented in Appendix D showed stormwater drainage infrastructure on Wentworth Road to the east of the site. Drainage diagrams for the site provided by FRNSW showed that all stormwater drains leave the site in the north eastern corner. The general catchment hydrology and slope is presented in Figure 3, Appendix A.

The closest receiving water bodies are Coxs Creek, located approximately 1 km south east of the site, which flows into Cooks river, located approximately 1.2 km east of the site. It is expected that the stormwater systems will intercept surface water flowing from the site before it reaches either of these receptors. However, stormwater drains leaving the site would potentially drain to either of these receptors.

2.3.4 Geology

The regional geology of the area is Bringelly Shale and near the interface with the Ashfield Shale that ranges in thickness from 48 to 54 metres across the Sydney area (Department of Mineral Resources and Energy 1983). The shale is underlain by Hawksbury Sandstone. This lithology is part of the Middle Triassic *Wianamatta* Group that is characteristic of shale with some sandstone beds.

2.3.5 Hydrogeology

The site is located on Bringelly and Ashfield Shale and residual clays, which are expected to have low overall hydraulic conductivities and have low beneficial use potential from both a yield and water quality perspective.

According to the Botany Basin Groundwater Management Map produced by the NSW Department of Primary Industries (Water), the site is within the Sydney Basin.

The low hydraulic conductivity shales and clays present the beneath the area will limit the hydraulic connection between site groundwater and impede the overall movement of contaminants off-site in groundwater.

Existing Groundwater Bores

GHD conducted a review of existing groundwater borehole records using the NSW Department of Primary industries, Office of Water, groundwater database. The search was conducted to identify registered groundwater boreholes in close proximity and to record information such as use and standing water level. A total of three (3) groundwater boreholes were identified within a 500 metre radius of the site (summarised in Table 3). None of these groundwater boreholes are within the site boundary. Details of the groundwater borehole search are presented in Appendix B.

Table 3 – Review of existing groundwater data

Borehole ID	Purpose	Depth (m)	Standing Water Level (m)	Approx. Distance from Site	Drillers Log
GW112333	Monitoring Bore	8.63	Unknown	150 m south west	Fill underlain by shale and sandstone
GW112334	Monitoring Bore	9.00	Unknown	260 m south west	Fill underlain by silty clay, shale and sandstone
GW112335	Monitoring Bore	8.80	Unknown	160 m south	Fill underlain by silty clay, shale and sandstone

Groundwater risk map

The *1:2,000,000 Groundwater in New South Wales, Assessment of Pollution Risk Map* (1987) indicates that the site is likely to be underlain by shale and siltstone. It was classified as having low potential for groundwater movement and a high salinity rendering it unlikely to be suitable for stock use (i.e. > 1400 mg/L).

2.4 Site history

2.4.1 Summary of previous investigations

Previous investigation by JK Geotechnics (2013) suggest that there is potential for some fill material to be present at the site to depths of approximately 0.85 m below ground level. The fill is underlain by sandstone. The investigation tested the soil pH for three samples, which ranged between 5.2 and 9.3, and the sulphate and chloride contents were a maximum of 210 mg/kg.

2.4.2 Aerial photographs

A selection of historical aerial photographs was examined in order to assess past activities and land uses at the site. A review of historical aerial photography is provided in Table 4.

The aerial photographs are presented in Appendix C.

Table 4 – Review of historical aerial photographs

Year	Site	Surrounds
1956 (black and white)	The site comprised vacant land with what appears to be free from any vegetation or debris.	The site appeared to be surrounded by industrial activities to the east, which appeared to be rail freight, and mostly vacant lands with some on-going development to the north, south and west.
1970 (black and white)	The site remained mostly unchanged from the previous aerial photograph apart from appearance of what appeared to be unsealed roads/paths on the site.	The areas surrounding the site appeared to have undergone major development. The industrial area to the east remained mostly unchanged from the previous aerial photograph. Construction of warehouses to the north and south had occurred. Residential development had occurred in the area to the east of the site.
1986 (colour)	The site appeared to have undergone major development. New warehouses had been built on the site with a concrete surface throughout the site area. The western border of the site appeared to be designated for vehicles or storage containers.	The industrial area to the east had some infrastructure/buildings demolished and the land cleared. Additional warehouses had been constructed to the north, south and south east of the site. The area to the east remained mostly unchanged from the previous aerial photograph. A major road that appeared to be the modern day Roberts Road, had been upgraded.
1998	The site remained mostly unchanged from the previous aerial photograph. The northern and western border of the site appeared to now be additional designated car parking or storage space.	The lot directly to the east of the site had undergone major development, with new warehouses constructed. The road to the east of the site, which appeared to be the modern day Wentworth street, had been upgraded. The lot to the south east of the site had undergone development and the surface was now concreted. The warehouses to the north of the site had been upgraded, with the roof covering a greater surface area. The remaining surrounding areas remained mostly unchanged from the previous aerial photograph.
2005	The site remained mostly unchanged from the previous aerial photograph.	The site remained mostly unchanged from the previous aerial photograph.
2016	The site remained mostly unchanged from the previous aerial photograph.	The area to the east of the site had undergone additional road infrastructure upgrade. The lot directly to the east of the site had undergone major development on the previously vacant land. The surface was now concreted and warehouses and buildings had been constructed. The remaining surrounding areas had remained mostly unchanged from the previous aerial photograph.

In summary, the following observations were made:

- The site has undergone substantial changes between 1970 to 1986 in the form of constructed buildings and infrastructure.

- The site has remained mostly unchanged since 1986, with the site layout largely reflecting that observed on site during the inspection undertaken as part of these works.
- The surrounding areas have undergone major changes from 1956 to 2005 in the form of major industrial to the north, south and east and residential development to the west.

2.5 Regulatory information review

2.5.1 Overview

As part of the desk based review, information was obtained from a number of sources to enable a greater understanding of historical land use at the site, including former site practices which may have the potential to cause contamination. The desk based review included the following sources of information:

- Council information including land zoning and permissible use.
- NSW EPA contaminated sites register (notifications or incidents.
- NSW EPA Protection of the Environment Operations (POEO) licence register.

2.5.2 Council information

Local Environment Plan (LEP)

The site is located in the Strathfield Municipal Council Area. Reference to the Strathfield Local Environmental Plan 2012 indicates that the site is zoned as IN1 - General Industrial'.

2.5.3 Environment Protection Authority

GHD reviewed datasets maintained by the Environment Protection Authority (EPA) including notices under *Contaminated Land Management Act 1997*, POEO Environment Protection License Register and State Heritage Register. Results are presented in Appendix B where applicable and summarised below.

Contaminated sites register

A site will be on the Contaminated Land: Record of Notices only if the EPA has issued a regulatory notice in relation to the site under the *Contaminated Land Management Act* 1997. GHD undertook a search of the register on 17 June 2016. No contaminated lands records are listed for the site or within a one kilometre radius of the site.

POEO environment protection license register

GHD undertook a search of the register on 22 June 2016. No record was found for the site. The search showed one property within a 500 metre radius of the site. Table 5 provides a summary of the licence.

Table 5 – Summary of POEO license register

Applicant	Site Address	Activity Type	Licence Status	Proximity to the site
Bitupave LTD	Boral Asphalt, 1-5 Norfolk Road, Greenacre, NSW 2190	Bitumen pre-mix or hot-mix production	No longer in force	150 m northwest

List of NSW contaminated sites notified to EPA

The sites appearing on the EPA "List of NSW contaminated sites notified to the EPA" indicate that the notifiers consider that the sites are contaminated and warrant reporting to EPA

However, the contamination may or may not be significant enough to warrant regulation by the EPA. The EPA needs to review information before it can make a determination as to whether the site warrants regulation.

GHD undertook a search of the listing on 17 June 2016. The search showed one premise within a one kilometre radius of the site. The listings are summarised in Table 6.

Table 6 – Summary of contaminated sites notified to EPA

Site Description	Site Address	Contamination Type	Proximity to the Site	EPA Assessment and Management
Caltex Service Station	87 – 91 Roberts Rd	Service Station	550 m south	Regulation under CLM Act not required

State heritage register

GHD undertook a search of the register on 27 June 2016. The search showed no premise within a one kilometre radius of the site.

2.6 Preliminary conceptual site model

Based on the current information, a preliminary CSM has been developed for the site.

The primary contaminants of potential concern (CoPC) are PFAS, notably PFOS and PFOA, which were components of AFFF. Other CoPCs include components of fuels and oils used as ignition sources such as total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and toluene (BTEX), polycyclic aromatic hydrocarbons (PAHs) and metals (notably lead).

The CSM concentrates mainly on PFAS as the main CoPC for the site and likely to be the key driver for any additional work at the site. The other CoPCs will be considered in the SAQP.

2.6.1 Sources

Based on anecdotal evidence, historical aerial photographs and the history of the Greenacre Fire and Rescue NSW site, the following historical contamination sources could have affected the site:

- The fleet management unit was developed between 1970 and 1986, which may have included limited firefighting training. Impacts from fire-fighting training activities the primary contaminants of concern associated with these activities are AFFFs, which have been used for extinguishing the ignition sources resulting in contaminants perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), and fuels and oils (total recoverable hydrocarbons – TRH; benzene, toluene, ethylbenzene and toluene – BTEX; PAHs; and metals (particularly lead)), which have been used as a source of ignition for vehicles and other hydrocarbon based equipment. The areas of concern include:
  - Designated firefighting extinguisher training areas where most firefighting foams and fuel for ignition are likely to have been used on
  - Designated storage of AFFF and locations where extinguishers were filled
  - Drainage or containment components receiving AFFF contaminated wastewater at designated equipment wash down areas after foam was used for firefighting training

- Oils from vehicles in car park spaces. The primary contaminants of concern are expected to include petroleum hydrocarbons and polycyclic aromatic hydrocarbons.
- Minor spills of petroleum hydrocarbons and oils from vehicles traversing the site. The primary contaminants of concern are expected to include petroleum hydrocarbons and polycyclic aromatic hydrocarbons.

Currently, the site is occupied by Fire and Rescue NSW and is used by staff as office space, meeting areas for crewing staff, storage and vehicle fleet maintenance and is thought to be of low contamination potential.

2.6.2 PFAS fate and transport

PFAS forms a component of AFFF which is sprayed onto fires during training events. The mode of use of AFFF through roof monitors and hoses allows for it to spread through airborne dispersion beyond the training area. Typically, this results in diffuse low levels of PFAS over a wider area. Generally, the highest soil concentrations tend to be at the point source.

PFAS are stable and persistent compounds that do not readily degrade in the environment.

Once in soil, PFAS can leach from soil to water (due to its solubility in water) as water migrates downward through soil to the water table, resulting in contaminated groundwater. Generally, the shorter chain PFAS species are more soluble than the longer chain PFAS. Groundwater will migrate and discharge into the nearest downgradient surface water body – in the case of the site the main discharge area is likely to be the Cooks River. 1.2 km east of site. The Cooks River is used for recreational activities and fishing purposes (although consumption of fish caught in this area is banned).

If the groundwater in the area is shallow, groundwater and PFAS may 'daylight' during high rainfall events and result in overland flow to surface drains and creeks.

Studies have indicated that as fresh water contacts sea water, PFAS's can partition into sediments suggesting a significant mass of dissolved phase PFAS's may partition into the sediment rather than become dissolved in sea water (You et al 2010, Zhang and Lerner 2012). This, combined with tidal effects, makes the discharge mechanisms in coastal regions very complex. Benthic organisms living in the sediment may then be impacted through ingestion of the sediments.

Migration through the soil will depend on the attenuation properties of the soil. Some components of the soil (notably organic carbon) can sorb PFAS components. Generally, the longer chain PFAS species will sorb more readily. This, combined with the lower solubility of the longer PFAS species, can result in mainly shorter chain PFAS species being dissolved in water while the large molecules remain in the soil.

The surface water on-site collects via stormwater pits and exits the site in the north eastern corner of the site. This then connects to a stormwater pipe that discharges into the Cooks River, 1.2 km east of the site. The main surface water receptors considered to be the Cooks River and ultimately Botany Bay.

Plants (including aquatic plants) have the ability to uptake PFAS through impacted soil water. Grasses and other flora can be consumed by micro- and macro-fauna which may in turn be predated.

The main risks to human health mainly arise through ingestion of impacted media i.e. soil, water or organisms.

In terms of risks to ecological receptors, while contamination can give rise to direct toxic effects on ecosystems, the limiting factor can be the bioaccumulation of contaminants in fish or other species affecting persons or other animals that consume these fish or other species.

2.6.3 Exposure pathways

The primary pathways by which receptors could be exposed to the sources of contamination outlined above are considered to be:

- Dermal contact with contaminated soil, surface water and groundwater.
- Incidental ingestion of contaminated soils, surface water and groundwater.
- Ingestion of groundwater and impacted plant and animal material.
- Terrestrial animal consumption of impacted animals, water, soils and plants.
- Inhalation of contaminated soils or dust and water (aquatic animals). (PFAS are not considered to be a vapour hazard dur to their low volatility).
- Extraction and use of groundwater.
- Surface runoff and sediment transport into storm water drainage and subsequent transport and discharge to surface waters. This may be enhanced during significant rain events.

2.6.4 Receptors

When evaluating potential adverse health / environmental effects from exposure to a contaminated site, all potentially exposed populations should be considered. For this site, the key populations or receptors of interest are considered to include:

- Current and future on-site workers and visitors to the site.
- Current and future construction/intrusive maintenance (utility) workers (on-site and off-site).
- Commercial / Industrial properties down gradient of the site.
- Users of groundwater. GHD understands that groundwater is not extracted at the site nor off-site for any purpose suggesting this may be a low risk. However, the potential for extraction remains both on-site and off-site.
- Aquatic ecological receptors – invertebrates, molluscs, fish, eels etc.
- Terrestrial ecological receptors – local invertebrates (worms, insects etc), mammals, birds, reptiles that might consume impacted animals, plants and surface water and groundwater. The closest surface water receptor is considered to be Coxs Creek, which is located approximately 1.2 km south east of the site

2.6.5 Potential source-pathway-receptor linkages

Based on the current information, the following preliminary contamination conceptual site model (CSM) has been developed for potential on site sources of contamination in Table 7 below and presented in Figure 4, Appendix A.

Table 7 – Preliminary Conceptual Site Model

Potential Source	Potential Contaminants	Potential Pathway	Potential Receptor
Current: Firefighting maintenance activities including pump out of AFFF from trucks	Primary contaminants of concern: PFASs	Human exposure: ● Ingestion of surface water, groundwater, soils and dust.	Human: ● Site users and visitors; ● Persons

Potential Source	Potential Contaminants	Potential Pathway	Potential Receptor
Current: Chemical spills	Other potential contaminants: TRH BTEX PAHs Heavy Metals (primarily lead)	● Indoor and outdoor inhalation of dust. ● Dermal contact with surface water, groundwater, soil and dust. ● Inhalation of contaminated soils or dust.	undertaking construction, demolition and maintenance works. Nearby ● Commercial / industrial users; ● Users of groundwater; ● Recreational users of Coxs and Cooks River
Former use of AFFF during fire extinguisher training			
Current/Historical: Neighbouring commercial/industrial land uses (off site)		Environmental exposure: ● Surface Water runoff. ● Vertical migration through the unsaturated zone into the saturated zone and horizontal migration within the groundwater.	Ecological: ● Ecology of Coxs and Cooks River ● Terrestrial organisms on-site and off-site

3. Sampling and analytical program

3.1 Overview

A process for establishing data quality objectives for an investigation-site has been defined by the NSW DEC *Guidelines for the NSW site Auditor Scheme (2nd edition,* 2006). The Data Quality Objective (DQO) process will be applied to the site investigation, as described below, to ensure that data collection activities are appropriate and achieve the project objectives. The DQO process involves seven steps as follows:

- Step 1: State the problem
- Step 2: Identify the decision
- Step 3: Identify inputs to the decision
- Step 4: Define the study boundaries
- Step 5: Develop a decision rule
- Step 6: Specify limits on decision errors
- Step 7: Optimise the design for obtaining data

The seven DQO steps for this project are defined in Table 8.

Table 8 – Data Quality Objectives

Step		Description
1	**State the problem to be resolved**	What is the likelihood that PFAS sources have contaminated the environment and what risks does it pose?
2	**Identify the decision/s to be made**	To address the problem set out in Step 1, the following decisions are required to achieve the task objective and to identify data gaps and additional information that may be required: • What are the potential sources of PFAS contamination at the site? • Do the concentrations of PFAS in the samples collected exceed adopted guideline criteria? • Do the results of the sampling and analysis indicate there is a potential risk to human health and ecological receptors on-site and off-site?
3	**Identify the inputs to the decision**	To inform the decisions and identify key data gaps and needs, the following information is considered necessary: • The location of potential PFAS contamination sources. • The concentrations of PFAS in soil, groundwater and surface water from laboratory analysis. • Identify potential exposure routes and contamination migration pathways. • The likelihood of PFAS migrating to groundwater and thence off-site.

Step		Description
4	**Define the boundaries of the study**	The study boundary comprises soil, groundwater and surface water within the on-site areas in the vicinity of the identified potential PFAS sources as shown in Figure 2, Appendix A. The study boundaries also extend to surface water impacts between the site and the Cooks River.
5	**Develop a decision rule**	The key decision rules are: Is PFAS present at concentrations above laboratory level of reporting (LOR) in soil and surface water? • If NO – risks to on-site receptors is low and the potential for PFAS contamination to migrate off-site is low. Further assessment is not supported. • If YES – assess the risks to on-site and off-site receptors; AND: Do the concentrations of PFAS in on-site samples exceed the adopted guideline criteria? • If NO – risks to on-site receptors is low and off-site impact is less likely. Assess the adequacy of the investigations to quantify risk. • If YES – conduct further assessment of risks to on-site receptors. Assess the likelihood of contamination migrating to groundwater and thence off-site.
6	**Specify the tolerable limits on decision errors**	A detailed assessment of potential for sampling and measurement errors will be undertaken based on investigation scope, methodology and results. Data quality will be assessed as detailed in Schedules B2 and B3 of the NEPM (2013). Implications for data quality with respect to the task objective will be identified and discussed. Due to the margin of error associated with analytical methods, any results close to the threshold (within the margin of error either over or under) are more likely to be incorrectly considered either “contaminated” or “uncontaminated”. As targeted samples are to be collected as part of a judgemental approach, greater confidence in results will be achieved through knowledge of the site and the likely location of PFAS sources. As such, the following tolerable limits on decision making are proposed for targeted sampling locations: • For results *within* the margin of error (either above or below the threshold) the initial classification would be considered valid (unless for a chemical not considered to be a contaminant of potential concern). • Any results *above* the threshold would require further investigation and delineation to determine the size of the impact identified.
7	**Optimise the design for**	The sample design will be optimised through: • Identification of potential PFAS sources from existing

Step		Description
	obtaining the data	information and investigations conducted by GHD and others i.e. results of PSI. • A review of the surface water pathways across and leaving the site. • Collection of soil, groundwater and surface water samples. • Appropriate laboratory analysis methodologies. • Evaluation and interpretation of results with respect to relevant guidelines.

3.2 Basis for assessment

The framework for the contamination assessment made herein, was developed in accordance with guidelines "made or approved", by the NSW EPA under Section 105 of the *Contaminated Land Management Act, 1997*. These guidelines include, but are not limited to the following:

- NSW EPA (1995) *Contaminated Sites: Sampling Design Guidelines*
- NSW DEC (2006) *Contaminated Sites: Guidelines for NSW Site Auditor Scheme*
- NSW DECC (2015) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*
- NSW EPA (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*
- NEPM (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure (No.1)*, National Environment Protection Council (NEPC)

3.2.1 Potential contaminants of concern

Based on the findings of the PSI and the key aims of this investigation the following contaminants of concern have been identified for the investigation:

- Primary potential contaminants of concern:
  - PFASs
- Other potential contaminants of concern:
  - Total recoverable hydrocarbons (TRH)
  - Benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN)
  - Polycyclic aromatic hydrocarbons (PAHs)
  - Metals (primarily lead)

The assessment criteria selected for these chemicals are discussed below.

3.2.2 Contamination assessment criteria

Screening levels – PFAS

There are no approved screening levels for concentrations of PFASs in soil, groundwater or surface water in Australian guidance. Recent documentation released by the Government of the Western Australia Department of Environment Regulations (DER, 2016) provides some interim guidance screening values. The Australian Department of Defence has also developed interim guidance based on a review of available literature on PFOS and PFOA toxicity to human and

aquatic ecosystems, however, while this information has been viewed it is not currently in the public domain.

GHD has also undertaken a review of available PFOS and PFOA information from Australia and overseas and developed interim screening levels (ISLs) which have been adopted for this investigation. The ISLs are presented in Table 9 below.

Table 9 – Adopted PFOS/PFOA ISLs – Soil and Groundwater

Media	Exposure Scenario	PFOS 1	PFOA	Source	Comments
Soil	Human Health Interim Screening Level (HISL) – Industrial Commercial (mg/kg)	100	240	USEPA Region 4 2009 (in USEPA 2014) - PFOA DER (2016) - PFOS	A scaling factor of 15 applied to residential criteria for PFAS
	Human Health Interim Screening Level (HISL) – Residential (mg/kg)	4	-	DER (2016) - PFOS	
	Ecological Interim Screening Level (EISL) – terrestrial (mg/kg)	0.373	3.73	UK Environment Agency 2009	
Water	Human Health Interim Screening Level (HISL) – Drinking water (µg/L)	0.5	0.4	Enhealth (2016) - PFOA DER (2016) - PFOS	
	Human Health Interim Screening Level (HISL) – Secondary contact (µg/L)	5	50	Enhealth (2016) - PFOA DER (2016) - PFOS	
	Ecological Interim Screening Level (EISL) – Fresh/Marine water (µg/L)	0.13	220	DER (2016)	For protection of slightly disturbed ecological systems

[1] Enhealth (June 2016) recommends PFOS and PHxS exposures should be summed and the total compared to the TDI for PFOS

Soil assessment criteria – other CoPCs

Site investigation levels have been adopted from assessment criteria presented in NEPM (2013) Given the site zoning is general industrial, health screening levels (HSL) and health investigation levels (HILs) for commercial / industrial will be used as the investigation screening criteria. Ecological investigation levels (EILs) and ecological screening levels (ESL) for commercial / industrial use are also used.

Assessment criteria – groundwater – other CoPCs

The NEPM (2013) Groundwater Investigation Levels (GILs) are based on the Australian Drinking Water Quality Guidelines 2015 and the Guidelines for Managing Risk in Recreational

Waters (NHMRC, 2008). The guidelines provide a framework for risk-based assessment of groundwater contamination.

Groundwater beneath the site is not used for drinking (the surrounding area is serviced by a reticulated potable water supply) but is used for domestic purposes. There is the potential for the underlying aquifer to be in hydraulic continuity with surface water features to the north of the site. Therefore, ecological receptors could come into contact with groundwater discharging from the site. Risks to these receptors will be assessed based on screening groundwater results against the NEPM (2013) GILs for fresh waters.

The HSLs, presented in NEPM (2013) are based on CRC CARE 2011, HSL D (for sand soils), adopted for this investigation are consistent with the soil investigation criterion detailed previously.

3.3 Field Investigation objective

The objective of the intrusive investigation is to provide information on the contamination status of the soil, groundwater and surface water and whether human and ecological receptors on the site and in the surrounding area may be at risk from site impact.

The investigation will also consider mechanisms that might enhance or inhibit contamination migration such as soil type, grain size, sorption capacity, hydraulic conductivity and water salinity. This site-specific information will inform our understanding of contaminant fate and transport which is essential to understanding risks. To achieve this samples of the soil will also be analysed for cation exchange capacity (CEC), total organic carbon and leachability.

3.4 Sampling rationale

To address the investigation objectives outlined above and based on the key risk identified in the preliminary CSM (see Section 2.6) the investigation has been designed to target:

- On site contamination status associated with AFFF to help FRNSW understand the residual issues to human health and the environment.
- Understand the risks to onsite employees and intrusive maintenance workers.
- Stormwater contamination status onsite as this will aid understanding of risks to down gradient surface water receptors (stormwater is understood to flow into the Cooks River).
- Groundwater to assess potential impacts to current and future down gradient groundwater users (if any).
- A tiered approach is proposed for field investigations, with initial works focusing on areas of most likely impact and characterising key on-site and offsite migration pathways. Information from these studies will be used to inform the requirement for further site investigations and to target residual data gaps in the CSM identified by initial the investigations.

3.5 Scope of intrusive investigations

The scope of the intrusive investigation is summarised as follows:

- Soil sampling at three on site locations (including concrete sampling) (SB01, MW01 and MW02).
- Stormwater and sediment sampling at three on site locations (SW01, SW02 and SS01).
- Recycled pump pit water sample (FW01).
- Groundwater sampling at two on site locations (MW01 and MW02).

The sample locations are provided on Figure 5 in Appendix A. Details of the investigation methodology are outlined below.

The rationale for the proposed sampling program is outlined in Table 10.

Table 10 – Sampling Program

Monitoring location	Location	Rationale	Laboratory Analysis
Former Fire Extinguisher Training area			
SB01	Down gradient of fire extinguisher training area	Provide a preliminary indication of possible PFAS soil/concrete impacts from reported fire extinguisher discharges in a key area of historical use.	Concrete – PFAS only Soil – PFAS, TRH, BTEX, PAHs, TOC, CEC, pH
Pump pit area			
MW01	Adjacent to stormwater drain – SOIL	Provide a preliminary indication of possible PFAS soil/concrete impacts from reported fire extinguisher discharges in a key area of historical use.	Concrete – PFAS only Soil – PFAS, TRH, BTEX, PAHs, TOC, CEC, pH
	Adjacent to stormwater drain - Groundwater	Provide a preliminary indication of possible PFAS groundwater impacts down gradient from reported fire extinguisher discharges in a key area of historical use.	PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
MW02	Adjacent to fire truck discharging area - SOIL	Provide a preliminary indication of possible PFAS soil/concrete impacts from fire truck foam discharges in a key area of historical use.	Concrete – PFAS only Soil – PFAS, TRH, BTEX, PAHs, TOC, CEC, pH
	Adjacent to fire truck discharging area - Groundwater	Provide a preliminary indication of possible PFAS groundwater impacts from fire truck foam discharges in a key area of historical use	PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
FW01	Storage tank where firefighting water is pumped to during fire truck maintenance. Trucks are then refilled with water from this tank	Assess fire water at this location with respect to PFAS presence within truck tanks and within this tank.	Fire water – PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
Stormwater leaving offsite			
SW01	Stormwater pit from which stormwater flows off-site	Assess stormwater and sediments at this location with respect	Sediment - PFAS, TRH, BTEX, PAHs, TOC, pH

Monitoring location	Location	Rationale	Laboratory Analysis
		to PFAS migrating offsite through stormwater	Surface water – PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
Drain near storage of foam for disposal			
SW02	Stormwater pit adjacent to PFAS storage	Assess stormwater and sediments at this location with respect to PFAS migrating offsite through stormwater	Sediment - PFAS, TRH, BTEX, PAHs, TOC, pH Surface water – PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
Site interceptor			
SS01	Sediment within the interceptor pit	Assess sediments at this location with respect to PFAS migrating through the onsite drainage.	Sediment - PFAS, TRH, BTEX, PAHs, TOC, pH Surface water – PFAS, TRH, BTEX, metals, pH, TDS, major ions, alkalinity
Waste classification			
WC01 to WC02	Waste Drums	Classification of soil and water waste prior to disposal.	TRH, BTEX, metals, PAHs,

3.6 Sampling Methods

3.6.1 Field work preparations

Health safety and environmental management

Prior to the commencement of field works a health, safety and environmental management plan will be prepared in accordance with GHD's health safety and environmental management policies and procedures.

Underground service location

A qualified service locator will be commissioned to clear all proposed intrusive locations prior to the commencement of drilling.

Hardstand coring

Where hardstand coring is likely to be required, a qualified subcontractor will be engaged to conduct these works. Each location will be reinstated with cement.

3.6.2 Soil Locations

Soil locations will be advanced by hand auger to approximately 1.5 m deep or until refusal. Each location will be checked against services plans and cleared by a service locator prior to commencement of augering.

The soil profile will be described in general accordance with the Unified Soil Classification System (USCS) and GHD's standard logging procedures, with features such as seepage, discolouration, staining, odours and other indications of contamination being noted on the borehole log, as well as soil sampling information.

All auger holes will be re-instated with spoil from the auger hole and packed down to ground surface.

3.6.3 Borehole drilling

The water bearing zone is expected to be shallow although no site-specific data is available, monitoring wells on neighbouring properties encountered ground water at <9 m below ground level. GHD proposes to install groundwater wells based on field observations so as to enable the well screen to intercept the water table. It is envisaged that groundwater will be no deeper than 9 m below ground surface. Therefore, it is proposed to drill boreholes to nominal depths of 9 m below ground level (bgl), or at least 1.5 m below the first water bearing unit (whichever is shallower).

The selected drilling technique will be dependent on the underlying geology and is likely to comprise concrete coring of the hardstand surface (where required) followed by hand augering in soils to a maximum depth of 1.3 m bgl, followed by push tube/solid stem auger to the desired depth.

The soil profile will be described in general accordance with the Unified Soil Classification System (USCS) and GHD's standard logging procedures, with features such as seepage, discolouration, staining, odours and other indications of contamination being noted on the borehole log, as well as soil sampling information.

3.6.4 Groundwater well installation

The monitoring wells will be installed in accordance with industry standards, including guidance provided in the Minimum Construction Requirements for Water Bores in Australia (NUDLC, 2011). Groundwater wells will be designed to ensure that the potential presence of light non aqueous liquid (LNAPL) can be measured.

Wells will be constructed using 50 mm, Class 18 uPVC flush jointed, threaded well screen and blank casing, a gravel pack surrounding the screened zone extending 0.5 m above the screened interval, a bentonite plug above the screen as a seal and cement grout to the surface. Wells will be completed with flush mounted, traffic rated, cast iron gatic covers. Following installation, the well will be developed using a submersible pump to remove silt introduced during drilling and for alignment of the gravel pack surrounding the well screens.

Following installation, the monitoring wells will be professionally surveyed according to the Australian Height Datum (AHD) and the location will be plotted on a plan.

A borehole log will be prepared for the monitoring well locations showing the geology and well construction details.

3.6.5 Soil and sediment sampling

Soil and sediment samples will be collected using the following methodology:

- All sampling will be undertaken by an appropriately experienced GHD environmental scientist in general accordance with GHD's Standard Field Operating Procedures to allow representative samples to be collected, information accurately recorded and quality control is maintained throughout the investigation.
- Soil samples will be collected directly from the hand auger or push tube, using dedicated disposable gloves, at the surface (0.0 to 0.2 m bgl), 0.5 m bgl, 1.0 m bgl and every metre thereafter to the base of the borehole. Additional samples will be collected should visual or olfactory evidence of contamination be identified. A PID will be used to assess for the presence of VOCs at each sampling interval.

- Two soil samples will be selected for analysis from each borehole, based on the results of PID screening and visual/olfactory evidence of contamination.
- Sample jars will be filled to minimise headspace. The containers will be labelled with the job number, sample identification and date collected. All sampling equipment will be Teflon free as this is understood to potentially interact with and impact PFAS concentrations in samples media.
- Following the collection of each sample, the jars will be placed immediately into coolers for preservation prior to and during transportation to the project laboratory.
- Samples will be accompanied with chain of custody documentation to the project laboratory and will be submitted within holding times appropriate to the analysis required.
- Decontamination procedures will be used during the soil sampling including the use of new disposable gloves for the collection of each sample, decontamination of sampling equipment between each sampling location (using DECON 90) and the use of dedicated sampling containers provided by the laboratory.

3.6.6 Groundwater sampling

Groundwater sampling will be carried out as follows:

- First round – the newly installed wells MW01 and MW02 will be sampled approximately one week following installation.

The groundwater wells will be sampled as follows:

- Prior to gauging the standing water level (SWL) in each monitoring well. The well will be allowed to stand for a few minutes to allow the SWL to stabilise under atmospheric conditions.
- The depth of the SWL and LNAPL, if present, will be measured at each monitoring well using an electronic interface meter, along with the total well depth with all measures recorded from the top of casing.
- Representative groundwater samples will be collected from the monitoring wells using the following sampling techniques:
  - Each well will be purged using low-flow sampling techniques with dedicated tubing, that is Teflon free. The depth of placement of the groundwater sample inlet tube will be recorded during sampling and will be consistent across monitoring locations.
  - Field parameters (pH, electrical conductivity (EC), oxygen redox potential, dissolved oxygen (DO) and temperature) will be measured and recorded during purging to ensure that extracted groundwater is representative of the surrounding groundwater conditions. When field parameters reach equilibrium, i.e. consecutive measurements are within 10% of each other for EC, redox and pH, groundwater will be deemed to be representative and groundwater samples will be collected.
  - Visual observations will be recorded, in particular, the absence or presence of a hydrocarbon sheen or odour will be recorded during purging.
  - Retrieved groundwater samples will immediately be placed into laboratory prepared bottles suitable for the requested analyses.
  - Sample bottles will be filled directly from the pump with a minimal amount of air contact and vials for volatile organic analysis will be filled to minimise headspace. Samples that are to be analysed for dissolved metals will be field filtered with a dedicated filter prior to placing the sample into the sample bottle.

- The containers will be labelled with the job number, sample identification and date collected.
- Following the collection of each sample, the bottles will be placed immediately into ice-filled coolers for preservation prior to and during transportation to the project laboratory.
- Samples will be accompanied with chain of custody documentation to the project laboratory and will be submitted within holding times appropriate to the analysis required.
- Dedicated sampling equipment (i.e. tubing, bailers, filters etc.) will be disposed of after each well is sampled with other sampling equipment decontaminated using a mixture of Decon 90 solution and potable water and then rinsed with potable tap water between each well location.

3.6.7 Stormwater sampling

If stormwater is present within the stormwater drains, sampling will be undertaken as follows:

- Stormwater samples will be collected by grab sampling with a dedicated sample bottle attached to an extendable arm.
- Samples from drainage channels will be collected from the centre of the drain and centre of the water column to the extent practicable.
- Stormwater samples will be placed in laboratory supplied bottles appropriate for the particular analyte. The bottles will be immediately stored in chilled insulated containers. All samples will be transferred to the nominated laboratory and accompanied by chain of custody (CoC) documents which will specify the tests required and the appropriate levels of reporting (LOR). Further detail on sample preservation, handling and transport is provided in 6.
- Dedicated sample bottles will be used to collect surface water samples, eliminating the need for decontamination of equipment and rinsate samples.
- Collection of Quality Assurance (QA) / Quality Control (QC) samples for groundwater including duplicate and split samples as discussed in Section 7.

3.7 Laboratory Analysis

The analytical schedule proposed for each sampling location is presented in Table 10.

In summary, soil samples will be analysed as follows:

- Two soil samples from each borehole will be submitted for laboratory analysis of COPC including PFAS, TRH, BTEXN, PAHs, 8 heavy metals, cation exchange capacity (CEC), total organic carbon (TOC), pH.
- QA/QC sampling will include one intra-laboratory duplicate sample, one inter laboratory duplicate sample and one trip spike sample.
- Concrete core samples will be scheduled for soils and leachate analysis using the Australian standard leaching procedure (ASLP) method.

Analysis of soil samples will be undertaken by a NATA accredited for the required analysis.

Groundwater and surface water samples will be analysed as follows:

- All groundwater samples (five) will be submitted for laboratory analysis of COPC including PFOS/PFOA, TRH, BTEXN, PAHs and eight heavy metals (standard laboratory limit of reporting).

- QA/QC sampling will include one inter-laboratory duplicate, one intra-laboratory duplicate and one trip spike per round. Analysis of groundwater samples will be undertaken by a NATA accredited for the required analysis.

3.7.1 Waste handling

Waste generated onsite will be stored in 205 L drums until such time as the waste can be characterised and transported off-site to an appropriately licenced waste facility.

A combination of in situ soil and water data and further soil analysis of generated waste will be used for characterising drilling waste and groundwater sampling generated.

3.7.2 Contingency plan

A contingency plan is outlined below, listing potential unexpected events that may arise during the fieldwork and actions that will be undertaken if unexpected conditions occur:

- Stakeholder engagement processes will be used to facilitate any off-site investigations on private property (should they be required), however, if any incidents or conflict occur with site owners or the public, GHD will cease works and vacate the site, until further direction from the stakeholder engagement team and FRNSW.
- Environmental controls will be implemented at all sites to migration of potentially impacted material to the surrounding environment.
- If evidence of contamination other than that expected is encountered, additional samples will be collected for assessment pending discussion with FRNSW.
- If friable asbestos is encountered, works will cease and the area made safe in consultation with GHD's licensed asbestos assessors and FRNSW. This will be undertaken as a variation to the existing scope and cost.

3.7.3 Reporting

The findings of the works documented in this PSI and SAQP will be combined with the site investigations report and presented as a site investigation report summarising the results of the investigation in general accordance with the *NSW Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011). The report will include the following:

- The preliminary site investigation findings.
- Data quality objectives for the works, including a description of the basis for the additional investigations.
- Description of the works undertaken.
- Results of the desktop assessment (information and data review)
- Assessment of potential areas of concern and chemicals of concern including a Tier 1 Risk Assessment for ongoing industrial/commercial use.
- Refined CSM.
- Provision of recommendations on remediation, site management or further investigation, as required.

The report will also contain figures illustrating results of sampling, highlighting exceedances against the adopted guidelines, groundwater flow contours and direction (if possible), and diagrammatic presentation of contaminant results where required.

4. Limitations

This report has been prepared by GHD Pty Ltd (GHD) for Fire & Rescue NSW and may only be used and relied on by Fire & Rescue NSW for the purpose agreed between GHD and Fire & Rescue NSW as set out in **Section 1** of this report.

GHD otherwise disclaims responsibility to any person other than Fire & Rescue NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

GHD was commissioned to undertake a preliminary site investigation and develop a SAQP for the site as outlined in Section 1.3.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

GHD has prepared this report on the basis of information provided by Fire & Rescue NSW and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

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Appendices

Appendix A – Figures

LEGEND

- Site Boundary
- Streets
- Major Waterways
- Minor Waterways

Paper Size A4

0 30 60 120 180 240

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Greenacre Site Investigation

Site Location and Key Off-site Receptors

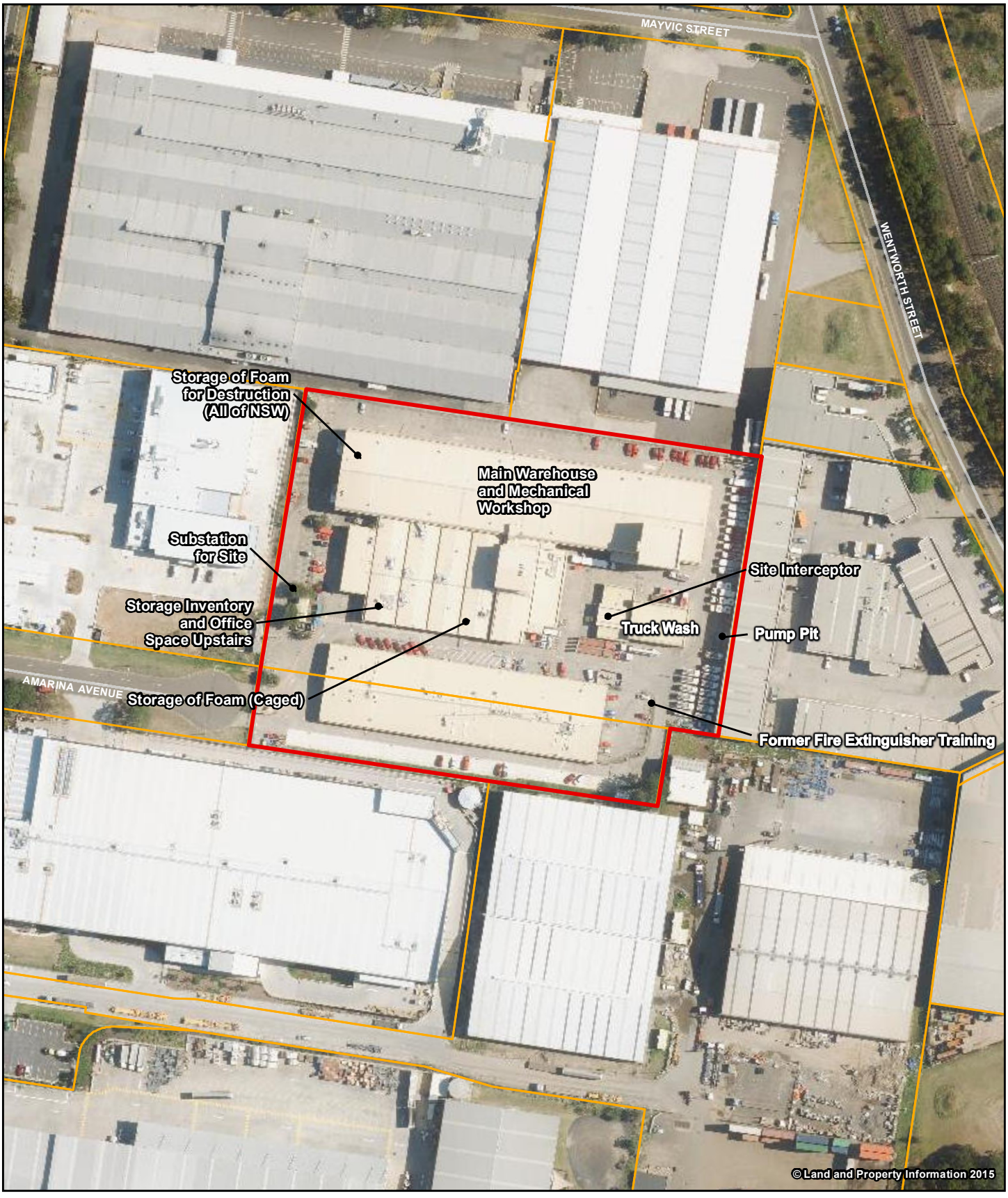
Job Number	21-25583
Revision	A
Date	08 Aug 2016

Figure 1

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z001_Greenacre_SiteLocation.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 08/08/16); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mweber



LEGEND

- Site Boundary
- Minor Waterways
- Cadastre
- Streets
- Major Waterways

Paper Size A4

0 5 10 20 30 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Fire & Rescue NSW
Greenacre Site Investigation

Job Number 21-25583
Revision A
Date 08 Aug 2016

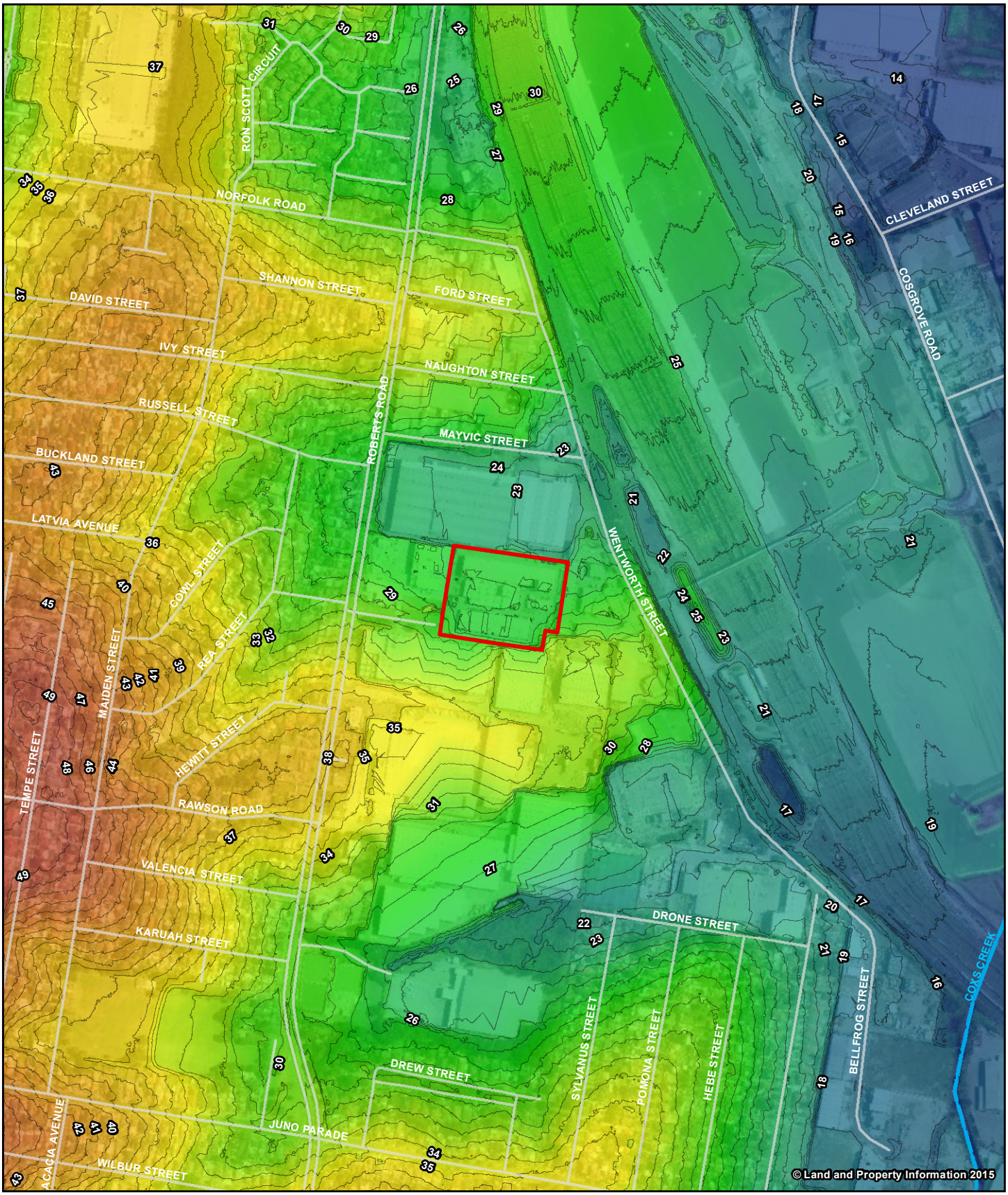
Site Layout

Figure 2

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z002_Greenacre_SiteLayout.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 08/08/16); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mweber



LEGEND

- Site Boundary
- Streets
- Contours
- Major Waterways
- Minor Waterways

Elevation (mAHD)

High : 50.234

Low : 11.81

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Fire & Rescue NSW
Greenacre Site Investigation

Job Number 21-25583
Revision A
Date 09 Aug 2016

Elevation

Figure 3

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z003_Greenacre_Elevation.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 09/08/16); Streets, Waterways - NSW LPI 2012 DTDB; LIDAR - NSW LPI. Created by:mweber

SOUTH WEST

SOURCES

1. Fire fighting maintenance activities - pump pit
2. Chemical spills
3. Fire extinguisher training area
4. Offsite potential users of AFFF

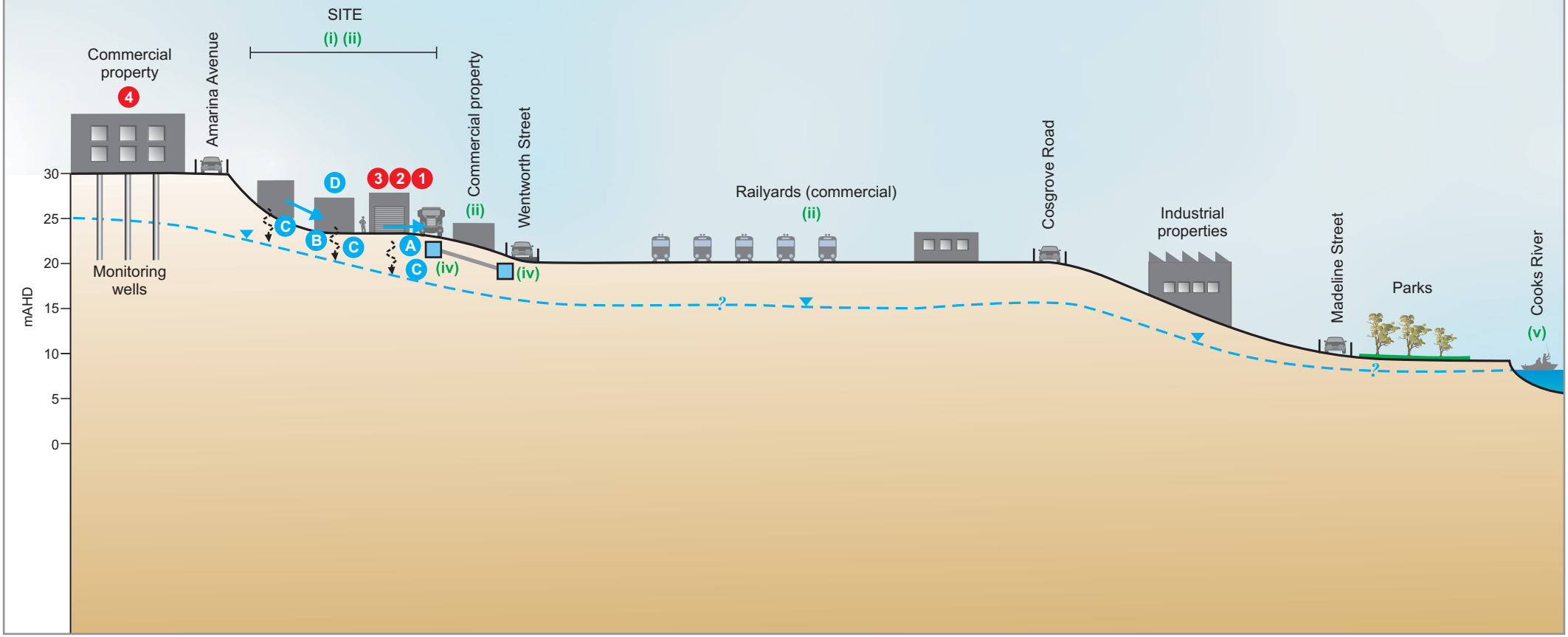
EXPOSURE PATHWAYS

A. Surface water / stormwater drainage
B. Groundwater migration
C. Impacted soils / sediment
D. Ingestion / dermal contact and inhalation of soil and dust

RECEPTORS

(i) On site users
(ii) Maintenance workers on and off site
(iii) Off site commercial workers
(iv) Stormwater drains
(v) Cooks River - ecological / recreational

NORTH EAST



Conceptual diagram only - not to scale

LEGEND

- Sandy clay
- Groundwater table
- Vapour migration
- Surface water flow

Fire & Rescue NSW
Greenacre Fleet Management Unit

Conceptual Site Model

Job Number	21-25583
Revision	A
Date	10 Aug 2016

Figure 4

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

LEGEND

- Site Boundary
- Streets
- Major Waterways
- Minor Waterways
- Proposed Monitoring Well (2)
- Proposed Soil Bore (1)
- Proposed Sediment Sample (1)
- Proposed Surface Water Sample (2)
- Proposed Recycled Fire Water Sample (1)

Paper Size A3

0 3.75 7.5 15 22.5 30

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Fire & Rescue NSW
Greenacre Site Investigation

Job Number 21-25583
Revision A
Date 09 Aug 2016

Proposed Sample Locations

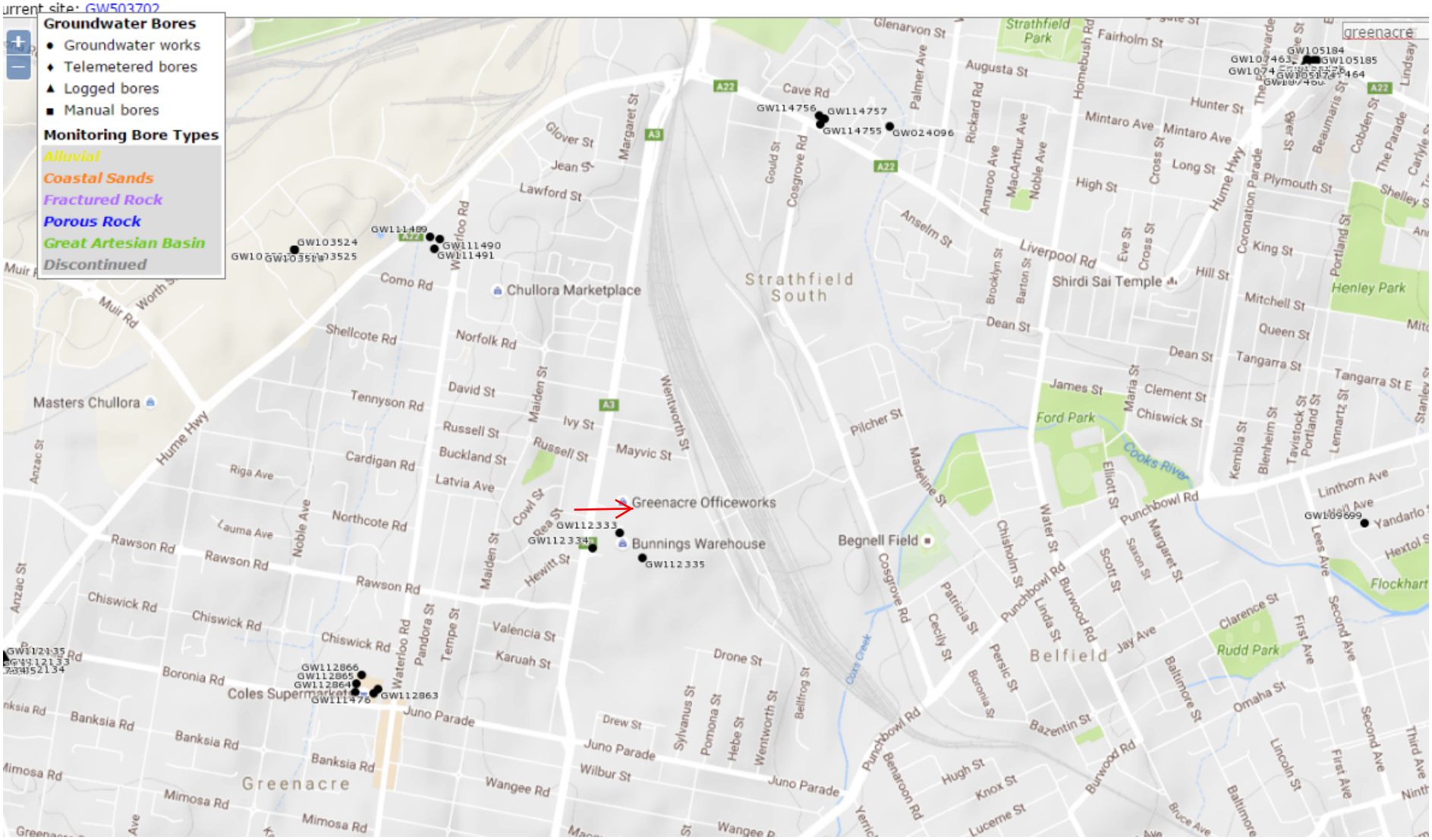
Figure 5

G:\21\25583\GIS\Maps\Deliverables\Greenacre\21_25583_Z004_Greenacre_SampleLocations_A3.mxd

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

Data source: Imagery - ©Land and Property Information (Extracted: 09/08/16); Streets, Waterways - NSW LPI 2012 DTDB. Created by:mweber

Appendix B – Desk Study Information


urrent site: GW503702
Groundwater Bores
Groundwater works
Telemetered bores
Logged bores
Manual bores
Monitoring Bore Types
Alluvial
Coastal Sands
Fractured Rock
Porous Rock
Great Artesian Basin
Discontinued
greenacre
Strathfield South
Chullora Marketplace
Masters Chullora
Greenacre Officeworks
Bunnings Warehouse
Begnell Field
Shirdi Sai Temple
Coles Supermarket
Belfield
Greenacre
Ford Park
Rudd Park
Henley Park
Flockhart
Strathfield Park
Cave Rd
Liverpool Rd
Punchbowl Rd
Hume Hwy
Rawson Rd
Chiswick Rd
Juno Parade
Wangee Rd
Banksia Rd
Mimosa Rd
Boronia Rd
Como Rd
Shellcote Rd
Norfolk Rd
Tennyson Rd
Russell St
Buckland St
Latvia Ave
Cardigan Rd
Riga Ave
Northcote Rd
Lauma Ave
Valencia St
Karuah St
Drone St
Wilbur St
Hewitt St
Maiden St
Waterloo Rd
Pandora St
Tempe St
Wentworth St
Mayvic St
Ivy St
Lawford St
Glover St
Jean St
Margaret St
Anselm St
Dean St
Mitchell St
Queen St
Tangarra St
Clement St
Chiswick St
James St
Pilcher St
Madeline St
Cosgrove Rd
Punchbowl Rd
Linthorn Ave
Yandarlo
Hunter St
Mintaro Ave
Long St
High St
Plymouth St
King St
Hill St
Augusta St
Fairholm St
Homebush Rd
Palmer Ave
Rickard Rd
Gould St
Amaroo Ave
MacArthur Ave
Noble Ave
Cross St
Eve St
Brooklyn St
Barton St
Coronation Parade
Hume Hwy
Portland St
Cobden St
Beaumaris St
The Parade
Shelley St
Lindsay St
Carlyle St
Tavistock St
Lennartz St
Kembla St
Blenheim St
Maria St
Elliott St
Water St
Chisholm St
Scott St
Saxon St
Margaret St
Lees Ave
Second Ave
First Ave
Third Ave
Clarence St
Jay Ave
Baltimore St
Omaha St
Bazentin St
Burwood Rd
Lincoln St
Hugh St
Knox St
Lucerne St
Bruce Ave
Benaroon Rd
Yerrick Rd
Persic St
Patricia St
Cecily St
Linda St
Sylvanus St
Pomona St
Hebe St
Bellfrog St
Drew St
Cowl St
Rea St
Coxs Creek
Muir Rd
Worth St
Anzac St
GW105184
GW105185
GW105174
GW105174464
GW114756
GW114757
GW114755
GW024096
GW111489
GW111490
GW111491
GW103524
GW103525
GW112333
GW112334
GW112335
GW112866
GW112865
GW112864
GW112863
GW111476
GW109699

NSW Office of Water
Work Summary

GW112333

Licence: 10BL603796 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status: Equipped
Construct.Method: Auger - Solid Flight
Owner Type: Private

Commenced Date:
Completion Date: 01/01/2010
Final Depth: 8.63 m
Drilled Depth: 9.50 m

Contractor Name: Soil Check
Driller: Yoon Fook Chin
Assistant Driller:

Property: MIRVAC PROJECTS PTY LIMITED
57 - 67 ROBERTS ROAD
GREENACRE 2190 NSW
Standing Water Level:
GWMA:
GW Zone:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.3	1//1149259
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6247137.0
Easting: 321209.0
Latitude: 33°54'03.6"S
Longitude: 151°03'58.7"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	8.63	100			Auger - Solid Flight
1		Annulus	Bentonite/Grout	1.90	2.15				
1		Annulus	Waterworn/Rounded	2.15	8.63				Graded
1	1	Casing	Pvc Class 18	0.00	2.63	50			Driven into Hole
1	1	Opening	Slots	2.63	8.63	50		1	Casing - Machine Slotted, PVC Class 18

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.60	2.60	FILL	Fill	

2.60	6.90	4.30	SHALE	Shale	
6.90	9.50	2.60	SANDSTONE	Sandstone	

Remarks

18/07/2014: Nat Carling, 18-July-2014; Changed work type & added status.

***** End of GW112333 *****

NSW Office of Water
Work Summary

GW112334

Licence: 10BL603796 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status: Equipped
Construct.Method: Auger - Solid Flight
Owner Type: Private

Commenced Date:
Completion Date: 01/01/2010
Final Depth: 9.00 m
Drilled Depth: 11.58 m

Contractor Name: Soil Check
Driller: Yoon Fook Chin
Assistant Driller:

Property: MIRVAC PROJECTS PTY LIMITED
57 - 67 ROBERTS ROAD
GREENACRE 2190 NSW
Standing Water Level:
GWMA:
GW Zone:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.3	1//1149259
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6247081.0
Easting: 321113.0
Latitude: 33°54'05.4"S
Longitude: 151°03'55.0"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	9.00	100			Auger - Solid Flight
1		Annulus	Bentonite/Grout	2.00	2.50				
1		Annulus	Waterworn/Rounded	2.50	9.00				Graded
1	1	Casing	Pvc Class 18	0.00	3.00	50			Driven into Hole
1	1	Opening	Slots	3.00	9.00	50		1	Casing - Machine Slotted, PVC Class 18

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	FILL	Fill	

0.30	2.00	1.70	SILTY CLAY	Silty Clay	
2.00	8.56	6.56	SHALE	Shale	
8.56	11.58	3.02	SANDSTONE	Sandstone	

Remarks

18/07/2014: Nat Carling, 18-July-2014; Changed work type & added status.

***** End of GW112334 *****

NSW Office of Water
Work Summary

GW112335

Licence: 10BL603796 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status: Equipped
Construct.Method: Auger - Solid Flight
Owner Type: Private

Commenced Date:
Completion Date: 01/01/2010
Final Depth: 8.80 m
Drilled Depth: 8.80 m

Contractor Name: Soil Check
Driller: Yoon Fook Chin
Assistant Driller:

Property: MIRVAC PROJECTS PTY LIMITED
57 - 67 ROBERTS ROAD
GREENACRE 2190 NSW
Standing Water Level:
GWMA:
GW Zone:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.3	1//1149259
Licensed:			

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6247050.0
Easting: 321296.0
Latitude: 33°54'06.5"S
Longitude: 151°04'02.1"E

GS Map: -
MGA Zone: 0
Coordinate Source: Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	8.80	100			Auger - Solid Flight
1		Annulus	Bentonite/Grout	4.50	5.00				
1		Annulus	Waterworn/Rounded	5.00	8.80				Graded
1	1	Casing	Pvc Class 18	0.00	5.80	50			Driven into small hole
1	1	Opening	Slots	5.80	8.80	50		1	Casing - Machine Slotted, PVC Class 18

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	FILL	Fill	
0.30	1.00	0.70	SILTY CLAY	Silty Clay	

1.00	5.60	4.60	SHALE	Shale	
5.60	8.80	3.20	SANDSTONE	Sandstone	

Remarks

18/07/2014: Nat Carling, 18-July-2014; Changed work type & added status.

***** End of GW112335 *****

Healthy Environment, Healthy Community, Healthy Business

Home Contaminated land Record of notices

Search results

Your search for:Suburb: GREENACRE

Search Again
Refine Search

did not find any records in our database.

If a site does not appear on the record it may still be affected by contamination. For example:

- Contamination may be present but the site has not been regulated by the EPA under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.
- The EPA may be regulating contamination at the site through a licence or notice under the Protection of the Environment Operations Act 1997 (POEO Act).
- Contamination at the site may be being managed under the planning process.

Search TIP

To search for a specific site, search by LGA (local government area) and carefully review all sites listed.

... more search tips

More information about particular sites may be available from:

- The POEO public register
- The appropriate planning authority: for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act.

See What's in the record and What's not in the record.

If you want to know whether a specific site has been the subject of notices issued by the EPA under the CLM Act, we suggest that you search by Local Government Area only and carefully review the sites that are listed.
This public record provides information about sites regulated by the EPA under the Contaminated Land Management Act 1997, including sites currently and previously regulated under the Environmentally Hazardous Chemicals Act 1985. Your inquiry using the above search criteria has not matched any record of current or former regulation. You should consider searching again using different criteria. The fact that a site does not appear on the record does not necessarily mean that it is not affected by contamination. The site may have been notified to the EPA but not yet assessed, or contamination may be present but the site is not yet being regulated by the EPA. Further information about particular sites may be available from the appropriate planning authority, for example, on a planning certificate issued by the local council under section 149 of the Environmental Planning and Assessment Act. In addition the EPA may be regulating contamination at the site through a licence under the Protection of the Environment Operations Act 1997. You may wish to search the POEO public register.POEO public register

17 June 2016

Connect Fee

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GREENACRE	Former Plating Works 12 Claremont STREET	Unclassified	Regulation under CLM Act not required
GREENACRE	7-Eleven (former Mobil) Service Station 301-305 Hume HIGHWAY	Service Station	Under assessment
GREENACRE	Caltex Service Station 87 - 91 Roberts ROAD	Service Station	Regulation under CLM Act not required

Healthy Environment, Healthy Community, Healthy Business

Search results

Your search for: **POEO Licences** with the following criteria

Suburb - greenacre

returned 6 results

Export to excel 1 of 1 Pages Search Again

Number	Name	Location	Type	Status	Issued date
745	BANKSTOWN CITY COUNCIL	BANKSIA ROAD, GREENACRE, NSW 2190	POEO licence	Surrendered	27 Apr 2000
11520	BANKSTOWN CITY COUNCIL	1-3 Anzac Street, GREENACRE, NSW 2190	POEO licence	No longer in force	10 Oct 2001
11678	BITUPAVE LTD	1-5 NORFOLK ROAD, GREENACRE, NSW 2190	POEO licence	No longer in force	05 Jun 2002
20156	CLEANAWAY PTY LTD	44 CLAREMONT AVENUE, GREENACRE, NSW 2190	POEO licence	Issued	21 May 2015
20506	RENEW RUBBER PTY LIMITED	67 - 77 Beresford Avenue, GREENACRE, NSW 2190	POEO licence	Issued	02 Apr 2015
3070	VEOLIA ENVIRONMENTAL SERVICES (AUSTRALIA) PTY LTD	75 ANZAC STREET, GREENACRE, NSW 2190	POEO licence	Issued	31 May 2000

22 June 2016

Healthy Environment, Healthy Community, Healthy Business

Licence summary

Search Again | Return to Previous Page

Summary Licence No: 11678

View this licence (PDF document 127 kb)

Licence holder: BITUPAVE LTD
Premises: BORAL ASPHALT
1-5 NORFOLK ROAD, GREENACRE, NSW, 2190
LGA: STRATHFIELD **Catchment:** Sydney Coast & Georges River
Administrative fee: $16,875.00
Licence status: No_longer_in_force
Activity type: Bitumen pre-mix or hot-mix production
Licence review: Complete date 17 Oct 2006
Due date 17 Oct 2011
Pollution incident management plan: No

Applications

Number	Application type	Current status	Date received
1034343	s.58 Licence Variation	Issued	04 Dec 2002

Notices

Number	Issue date	Notice type
1018142	12 Jun 2002	s.58 Licence Variation
1018819	19 Sep 2002	s.58 Licence Variation
1024203	07 Feb 2003	s.58 Licence Variation
1033147	15 Dec 2003	s.58 Licence Variation
1034343	21 Apr 2004	s.58 Licence Variation
1046230	10 Jun 2005	s.58 Licence Variation
1053898	12 Dec 2005	s.58 Licence Variation
1068622	29 Mar 2007	s.58 Licence Variation
1098247	30 Mar 2009	s.58 Licence Variation
1103943	10 Jul 2009	s.58 Licence Variation

Annual Returns

Start date	End date	Date received	Non-compliance	LBL data
01-Sep-2007	31-Aug-2008	15-Oct-2008	No	Not available
01-Sep-2006	31-Aug-2007	23-Oct-2007	No	Not available
05-Jun-2006	31-Aug-2006	25-Oct-2006	No	Not available
05-Jun-2005	04-Jun-2006	03-Aug-2006	No	Not available
05-Jun-2004	04-Jun-2005	02-Aug-2005	No	Not available
05-Jun-2003	04-Jun-2004	04-Aug-2004	No	Not available
05-Jun-2002	04-Jun-2003	04-Jul-2003	yes	Not available

Connect Fee

We
Pub

Office of Environment & Heritage

Home > Topics > Heritage places and items > Search for heritage

Search for NSW heritage

Return to search page where you can refine/broaden your search.

Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into three sections.

- **Section 1** - contains Aboriginal Places declared by the **Minister for the Environment** under the National Parks and Wildlife Act. This information is provided by the Heritage Division.
- **Section 2** - contains heritage items listed by the **Heritage Council of NSW** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Division.
- **Section 3** - contains items listed by **local councils** on Local Environmental Plans under the Environmental Planning and Assessment Act, 1979 and **State government agencies** under s.170 of the Heritage Act. This information is provided by local councils and State government agencies.

Section 1. Aboriginal Places listed under the National Parks and Wildlife Act.

Your search did not return any matching results.

Section 2. Items listed under the NSW Heritage Act.

Your search did not return any matching results.

Section 3. Items listed by Local Government and State Agencies.

Your search returned 7 records.

Item name	Address	Suburb	LGA	Information source
Chullora - Winsor Park Remembrance Drive & War Memorial	Hume Highway, Crn Brunker Road	Greenacre	Bankstown	SGOV
Electricity Substation No. 1257	70A Noble Avenue	Greenacre	Bankstown	SGOV
Enfield Bricks Pits	1-7 Juno Parade	Greenacre	Strathfield	LGOV
Greenacre Public School	Waterloo Road	Greenacre	Bankstown	LGOV
Hudson's Design Cottage	25 Old Kent Road	Greenacre	Bankstown	LGOV
Methodist Hall	2 Mimosa Road	Greenacre	Bankstown	LGOV

Potts Hill - Crown St 48"/42" Mains	Pipeline easement	Potts Hill To Waterloo (Via Greenacre,ashfield,pet	Sydney	SGOV

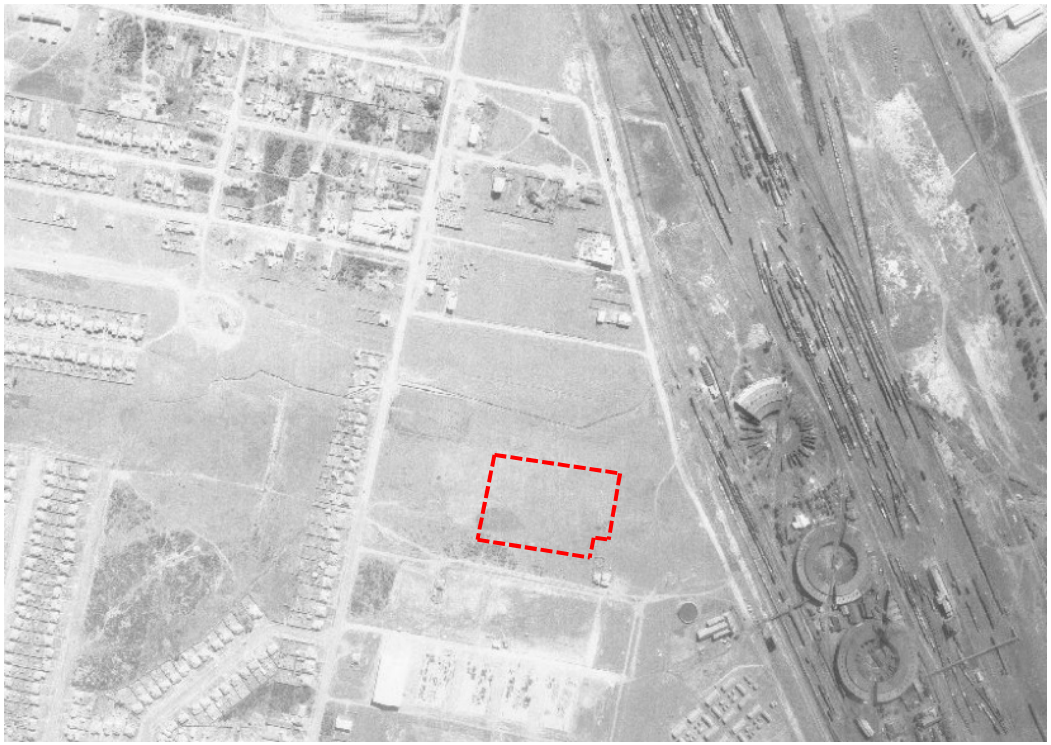
There was a total of 7 records matching your search criteria.

Key:
LGA = Local Government Area
GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.
Note: While the Heritage Division seeks to keep the Inventory up to date, it is reliant on State agencies and local councils to provide their data. Always check with the relevant State agency or local council for the most up-to-date information.

Appendix C – Historical Aerials Photo log

1956

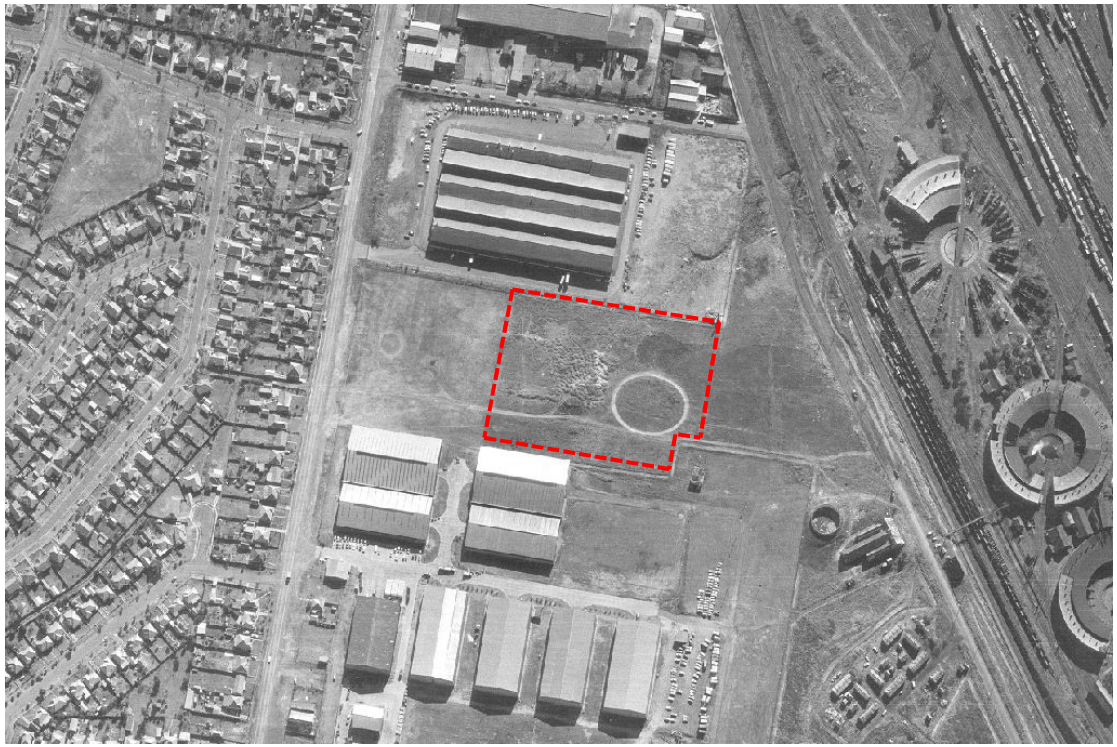
Approximate location of investigation area



North

1970

Approximate location of investigation area



North

1986

Approximate location of investigation area

North

1998

Approximate location of investigation area

North

2005

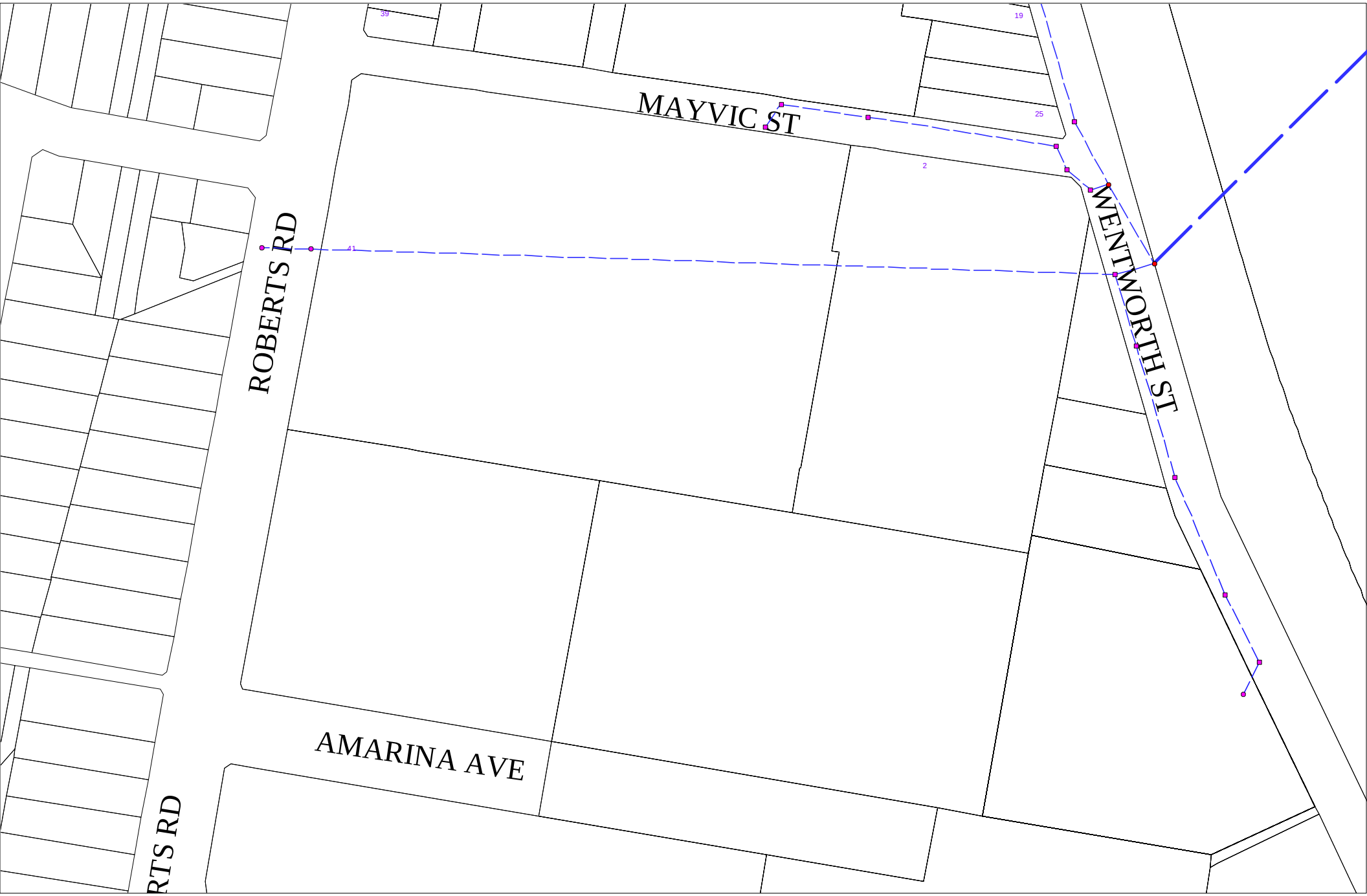
Approximate location of investigation area

North

2016 Approximate location of investigation area

North

Appendix D – Dial Before You Dig Services Utility search


MAYVIC ST
ROBERTS RD
WENTWORTH ST
AMARINA AVE
RTS RD

A3

ROBERTS LANE

AMARINA AVE

RD

ST

Goods

WENTWORTH ST

DBYD Address:
n/a Amarina Avenue
Greenacre NSW 2190

DBYD Job No: 10848583

DBYD Sequence No: 53666237

Scale: 1:1500

Date of Production: 20/06/2016

Plan 1 of 1

N

0m 9m 18m 27m 36m

REGENTS PARK 6C

SCALE 1:2000

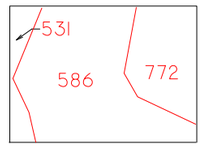
50 0 50 100 150 200

THIS MAP UPDATED ON 05/05/2016
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

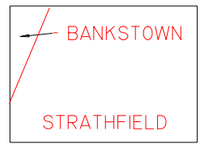
DATE ALTERED:..... BY:.....

RP5B	RP6A	RP6B
RP5D	RP6C	RP6D
RP8B	RP9A	RP9B

ADJOINING MAPS



NETWORK AREA



MUNICIPALITY AREA

Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

T	TRUNK PIPELINE	7000 kPa
P	PRIMARY MAIN	3500 kPa
S	SECONDARY MAIN	1050 kPa
400	NETWORK MAIN	400 kPa
	NETWORK MAIN	300 kPa
	NETWORK MAIN	210 kPa
100	NETWORK MAIN	100 kPa
30	NETWORK MAIN	30 kPa
	NETWORK MAIN	7 kPa
	NETWORK MAIN	2 kPa
	PROPOSED MAINS	
PR 11-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
	VALVE	
	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
123	NETWORK NODE	
123S	NETWORK VALVE NODE	
(298)	VALVE NUMBER	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
(6)NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BOUNDARY LINE	
1957	YEAR LAID	
- + + + -	MUNICIPALITY BOUNDARY	
	NETWORK BOUNDARY	
123	HOUSE NUMBER	

REGENTS PARK 6C

REGENTS PARK 9A

SCALE 1:2000

50 0 50 100 150 200

THIS MAP UPDATED ON 11/11/2015
THIS PLAN IS DIAGRAMATIC ONLY. DISTANCES SCALED FROM THIS PLAN MAY NOT BE ACCURATE.

DATE ALTERED:..... BY:.....

RP5D	RP6C	RP6D
RP8B	RP9A	RP9B
RP8D	RP9C	RP9D

ADJOINING MAPS

NETWORK AREA

MUNICIPALITY AREA

Jemena

KEY

MAX ALLOWABLE OPERATING PRESSURE

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	NETWORK MAIN	2 kPa
	PROPOSED MAINS	
PR 11-2 3	STEEL MAIN PROJECT NUMBER	
P	PRESSURE MONITORING STATION	
	VALVE	
	SYSTEM PRESSURE REGULATOR	
S	SIPHON	
123	NETWORK NODE	
123S	NETWORK VALVE NODE	
098	VALVE NUMBER	
6NB	6 INCH CAST IRON MAIN	
150MM	150MM STEEL MAIN	
110MM PE/NY	110MM POLYETHYLENE/NYLON MAIN	
6NB 50MM NY	50MM NYLON INSERTED INTO 6NB MAIN CAST IRON MAIN	
1.2MBL	DISTANCE IN METRES OF MAIN FROM BOUNDARY LINE	
1957	YEAR LAID	
-+++-	MUNICIPALITY BOUNDARY	
	NETWORK BOUNDARY	
123	HOUSE NUMBER	

REGENTS PARK 9A

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