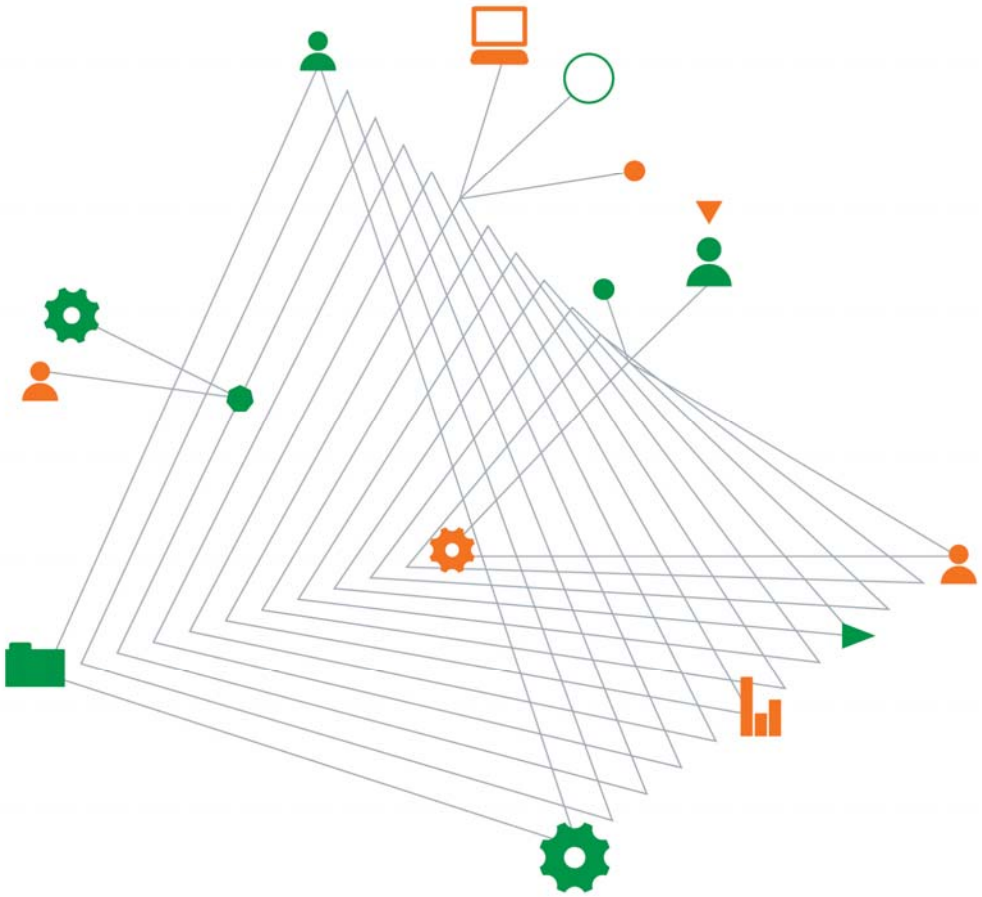
Dexus Property Group Pty Ltd

North Shore Private Hospital, Stage 1 - East Tower

Remedial Action Plan

26 July 2016



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North Shore Private Hospital, Stage 1 - East Tower

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For and on behalf of Coffey

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Abbreviations

µg/L	micrograms per litre
ACM	Asbestos Containing Materials
AH	Auger Hole
ANZECC	Australian and New Zealand Environment and Conservation Council
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999
bgs	below ground surface
BH	Borehole
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
C6-C36	Hydrocarbon chain length fraction
COPC	Chemical of potential concern
DA	Development Application
DP	Deposited Plan
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
EMP	Environmental Management Plan
ENM	Excavated Natural Material
GPR	Ground Penetrating Radar
Ha	Hectare
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
NSW EPA	Environment Protection Agency of NSW
OCP	Organochlorine Pesticide
OPP	Organophosphorous Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector
PPE	Personal Protective Equipment
ppm	parts per million

PSI	Preliminary Site Investigation
QA	Quality Assurance
QC	Quality Control
RAC	Remediation Assessment Criteria
RAP	Remedial Action Plan
RL	Relative Level
RPD	Relative Percent Difference
RSL	Regional Screening Level
SAQP	Sampling Analysis Quality Plan
SEPP55	State Environmental Planning Policy No. 55 – Remediation of Land
SVOC	Semi Volatile Organic Compounds
TEQ	Toxicity Equivalent Quotient
TPH	Total Petroleum Hydrocarbon
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Level
UPSS	Underground Petroleum Storage Systems
UST	Underground Storage Tank
VENM	Virgin Excavated Natural Material
VOC	Volatile Organic Compound

1. Introduction

1.1. General

Coffey Geotechnics Pty Ltd (Coffey) was engaged by Dexus Property Group (Dexus) to prepare a Remedial Action Plan (RAP) for the proposed Stage 1 development of the property situated at 12 Frederick Street, St Leonards (the 'site'). Figure 1 illustrates the location of the site.

The Stage 1 development comprises a multi-level medical facility known as East Tower, which will form part of the North Shore Private Hospital. East Tower will be located at the southern end of the site, occupying an area of land at the north east corner of Reserve Road and Westbourne Street. Figure 2 illustrates the extent of the site.

Coffey has undertaken a Preliminary Site Assessment (PSI) and a Detailed Site Investigation (DSI) for the site, and these assessments will form the framework around which the RAP will be based on.

The work was commissioned by Donald Cant Watts Cork on behalf of Dexus. The works were undertaken in accordance with our fee proposal submitted by Coffey via email on the 4th July 2016.

1.2. Objectives

The purpose of the RAP is to inform relevant stakeholders of the planned development and remediation of the site, including Council and NSW EPA, as well as guiding the works for implementation.

The objective of this RAP is to outline a remediation strategy and validation plan for contamination to render the site suitable for the proposed future use as a medical facility, with no associated on-going management requirements. The remediation strategy is to include outline procedures and requirements for the decommissioning and removal of the Underground Petroleum Storage System (UPSS), which are suspected to remain in the southern section of the site.

An additional objective of this RAP is to assist Dexus in meeting minimum requirements of the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014* (UPSS Regulation) with regard to decommissioning, remediation and validation of UPSS. A number of guidelines have been prepared by NSW environmental agencies to assist in the implementation of the UPSS Regulation, and the following are considered to be relevant to this RAP:

- NSW DECCW (2014) 'Guidelines for Implementing the Protection of the Environment (Underground Petroleum Storage Systems) Regulation 2014;
- NSW DECCW (2009a) 'Planning and Development Process for Sites with Underground Petroleum Storage Systems';
- NSW DECCW (2010) 'UPSS Technical Note: Site Validation Reporting'; and
- NSW DECCW (2010a) 'UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS'.

This RAP has also been prepared in accordance with the relevant sections of the NSW OEH 2011, 'Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites'.

1.3. Scope of Work

To meet the above objectives, Coffey undertook the following works:

- review of available contamination assessment reports for the site;

- preparation of a summary of the site identification, history and condition as well as the surrounding environment;
- establishment of remediation goals;
- establishment of Remediation Acceptance Criteria (RAC) for the contaminants of concern;
- identification and assessment of remediation options;
- recommending a preferred remediation option/s;
- outlining procedures and activities that are required for the implementation of the preferred remediation option;
- outlining requirements for site management (including occupational health and safety) to be implemented for the remediation;
- outlining requirements for a contingency plan for the remediation;
- outlining the regulatory compliance requirements for the remedial works;
- outlining procedures and activities that are required for validating the remediation; and
- defining roles and responsibilities for remediation works and validation activities and provide contacts for relevant parties.

1.4. Current Land Use

The site is situated at two distinct levels between a vacant, steeply sloping and mostly vegetated quarry face, reflecting the sites historic use as a former shale quarry. The southern part of the site comprises the crest of the former quarry (approx. RL98m) and is not currently occupied. The central portion of the site comprises a partially vegetated, steeply sloping face of the former quarry. The northern section of the site falls within the St Leonards Business Centre, which is situated within the base of the former quarry (approx. RL77m) and is occupied by a commercial warehouse that was tenanted by Australia Post.

1.5. Proposed Land use

The site historically formed part of a shale quarry that operated from about 1880 to the late 1960s. The proposed development will be constructed in two separate stages. The Stage 1 development extends over an exposed face of the former quarry walls, as illustrated below:

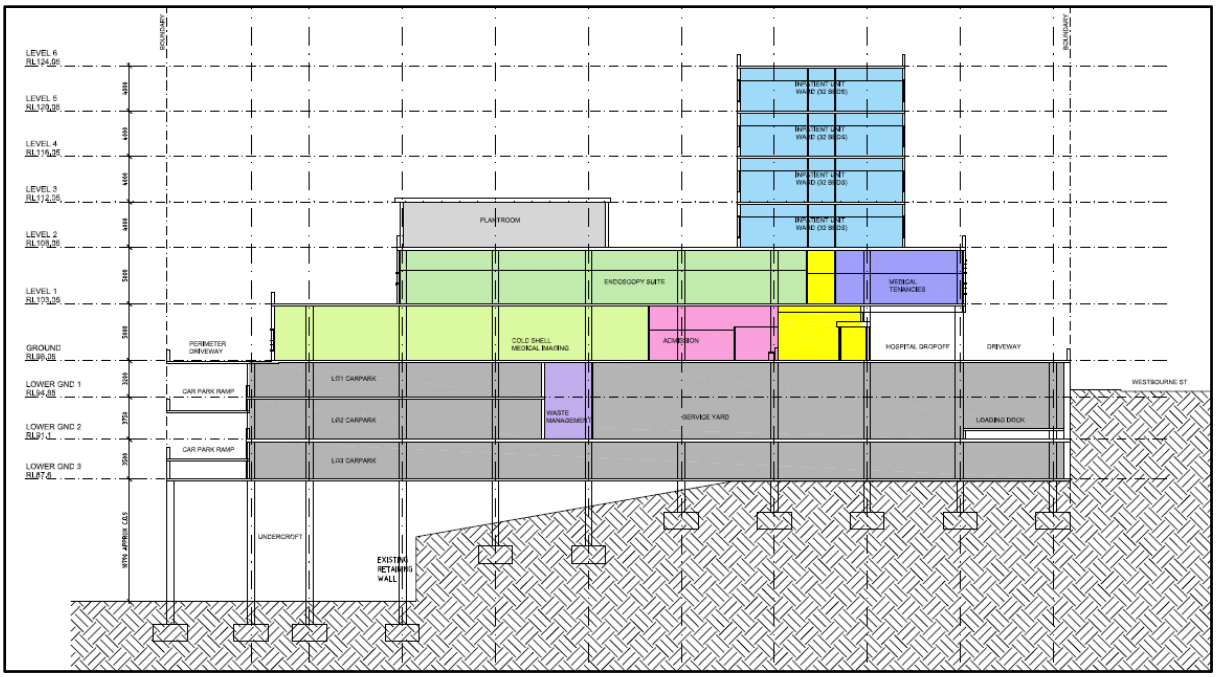


Figure 1.1: Illustration of the proposed Stage 1 Development

The proposed development will consist of a five to six level medical facility, with ground floor level at about RL 98m (near current street level at the intersection of Reserve Road and Westbourne Street at the south corner of the site). Below this will be a three level basement for car parking and storage.

The current design documents show the lowest of the three basement levels will be cut into the face of the former quarry to a depth of about RL 87 m, and be supported by columns above the old quarry base (approx. RL 77 m) to create an undercroft. The remaining quarry face will be retained by existing or new retaining walls, as shown in Figure 1.1.

Coffey understands that the further commercial development is planned across the remainder of the St Leonards Business Centre site to the north. This development is beyond the scope of this report.

1.6. Available Contamination Assessments

Previous site contamination reports relevant to the site include:

- Coffey (Oct 2015); *Phase 1 Preliminary Site Investigation; 12 Frederick Street, St. Leonards* (Ref: GEOTLCOV25513AA; dated 9th October 2015)
- Coffey (Apr 2016); *Detailed Site Investigation; 12 Frederick Street, St. Leonards* (Ref: GEOTLCOV25513AB-AC; dated 14th April 2016)

2. Site Setting

2.1. Site Identification

Site identification details are summarised in Table 2.1. The location and layout of the site is shown in Figures 1 and 2, respectively.

Table 2.1: Site Identification

Site Address:	12 Frederick Street, St. Leonards, NSW
Stage 1 Site Area:	Approximately 0.6ha
Site Identification:	Part Lot 1 in Deposited Plan (DP) 591747
Current Zoning:	IN1 – General Industrial in Willoughby Local Environmental Plan 2012
Current Land Use:	Light industrial/commercial

2.2. Site Description

The site falls within the St Leonards Business Centre, which is located within the south western part of a former quarry. The site is situated at two distinct levels between a vacant, steeply sloping and mostly vegetated quarry face.

The southern-most part of the site is situated at the crest of the former quarry (approx. RL 98m) and is accessed via locked gates along Reserve Road boundary. This part of the site was reportedly used as a landing site for helicopters transporting patients to/from the adjoining North Shore Hospital site. This part of the site is currently vacant with the exception of a small brick structure and concrete pad adjacent to the Westbourne Street boundary (refer Photo 1). The use of this brick structure is not known. The adjoining concrete pad appears consistent with petroleum storage infrastructure, comprising a small underground storage tank (UST), hand pump and vent pipe. No UST dip/fill points were noted (refer Photo 2).

Photo 1: brick structure and underground petroleum storage infrastructure.

Photo 2: concrete slab with suspected hand pump and vent pipe.

Ground surface across the southern part of the site is a mixture of concrete surfacing associated with the former helipad, and exposed soil. A number of mature trees are present along the Westbourne Street boundary, and ruderal vegetation is present along the crest and slope of the former quarry face.

The northern portion of the site is situated within the base of the former quarry (approx. RL77m) and accessed via a concrete paved road which links to Frederick Street to the north. This part of the site is occupied by a commercial warehouse that was tenanted by Australia Post. The warehouses were

concrete floored with shelving used to store various goods temporarily. No significant cracking or excessive staining was noted on accessible parts of the warehouse floor. The rooftop of this structure was used as car parking for the adjoining commercial building. Areas surrounding the warehouse are completely surfaced with concrete hardstand.

2.3. Surrounding Land Uses

Land uses surrounding the site are summarised within Table 2.2.

Table 2.2: Land uses surrounding the site

Direction	Land Uses
North	St Leonards Business Centre, which comprises 13 individual commercial office/warehouse units. Commercial land uses extend further beyond Frederick Street until the M2 Freeway approximately 450 meters north of the site. A tunnel believed to connect to an adjacent former shale quarry was located to the north along the western boundary of the quarry. The tunnel has been backfilled with fill material (building rubble) from an unknown location.
East	Various commercial/light industrial properties are located to the east of the site. The T1 Northern railway is located approximately 300m east of the site, beyond which lies various high density residential apartment blocks and recreational areas.
South	Royal North Shore Public Hospital and Gore Hill Memorial Cemetery and Park. Low density residential properties are located south of Gore Hill Park.
West	North Shore Private Hospital is located directly west of the site. Various commercial buildings are located further west of the site beyond which lies the Pacific Highway. Multiple high/low density residential structures are located west of Pacific Highway.

2.4. Local Geological Setting

The site locality is situated over landforms associated with the Ashfield Shale of the Wianamatta Group (typically black to dark grey shale and laminite), close to the geological interface with the underlying Hawkesbury Sandstone (typically medium to coarse grained, quartzose sandstone). At this separation is the variable Mittagong Formation, which typically comprises several metres thick of interbedded shale, laminite and medium-grained quartzose sandstone.

The locality was a former low shale ridge that was subject to quarrying for brick-making, with the floor of the former quarry likely extending to the underlying Mittagong Formation or Hawkesbury Sandstone.

Former quarry walls are exposure to a depth of about 18m below street level to the north of the site. These exposures indicate weathered Ashfield Shale bedrock, appearing to grade from residual soil at road level, to slightly weathered to fresh bedrock at the base of the excavation. The weathering due to exposure may disguise the true rock condition behind the faces.

Fill material was expected at the base and crest of the quarry. Based on the site setting, it is assessed that the site is not located within an area affected by acid sulphate soils.

2.5. Hydrogeology and Hydrology

No creeks or rivers surround or dissect the site. The closest surface water body is Gore Creek, a tributary of the Lane Cove River located approximately 650m south west of the site.

Given the setting of the site is a low shale ridge, it is anticipated that groundwater exists within the shale / sandstone bedrock below the base of the former quarry. Groundwater seepages may occur within shallower soil horizons within the southern portion of the site although these are likely to discontinuous lenses associated with infiltration rather than indicative of the underlying water table.

Given the sites geographic location, groundwater is expected to flow south-west towards the Lane Cove River and its tributaries.

A search of groundwater bore licences for the area identified three registered groundwater bores within a 500m radius of the site. The details of these bores are summarised in Table 2.3.

Table 2.3: Licensed groundwater bores within 500m of the Site

Bore ID	Installation Date	Use	Active?	Depth (m)	Location
GW072478	10/01/1995	Domestic	Unknown	180.5	North Shore Hospital approx. 200m south
GW103591	11/01/2001	Monitoring bore	Yes	5.80	Reil Dealership 24 Herbert St Artarmon 2064 NSW
GW103841	11/01/2001	Monitoring bore	Yes	5.80	Reil Dealership 24 Herbert St Artarmon 2064 NSW

2.6. Site History

Coffey were engaged by Dexus to prepare a review of historic land uses as part of the following assessments:

- Coffey (Oct 2015); *Phase 1 Preliminary Site Investigation; 12 Frederick Street, St. Leonards* (Ref: GEOTLCOV25513AA; dated 9th October 2015)
- Coffey (Apr 2016); *Detailed Site Investigation; 12 Frederick Street, St. Leonards* (Ref: GEOTLCOV25513AB-AC; dated 14th April 2016)

The review of available records indicates:

- The site operated as a shale quarry operated by North Sydney Brick & Tile Co. It is understood that quarrying activities commenced in 1880 and ceased in circa 1960. Site observations indicate that the quarry was not backfilled, but rather regraded to create two levels to facilitate development.
- Aerial photographs of the area indicate that site formed the south western corner of the quarry, with the quarry extending to the north and east of the site. The main processing plant for the brick and tile works were located off site, to the east/northeast of the site.
- The redevelopment of the site commenced in circa 1960 where a small warehouse was established on northern portion of the site, adjacent to Reserve Road. The southern portion of the site remained underdeveloped since this time.
- The commercial/warehouse operations were expanded on site during the 1970's with the St Leonards Business Centre established on site in 1974.
- Two licenses to store Dangerous Goods were identified within the St Leonards Business Park. Mockridge Bulmer was licensed to store approx. 1,400L liquid hydrocarbons associated with a

printing facility situated within Unit 2 of the St Leonards Business Centre. Noyes Bros. Pty Ltd was licensed to store 5,000L of petroleum hydrocarbons within a roofed store. Both operations are understood to have operated in units to the north of the site.

- A search of the public records held by the NSW Environment Protection Authority did not identify the site or land immediately surrounding the site as contaminated land.

3. Summary of Previous Investigations

3.1. Coffey (Apr 2016); *Detailed Site Investigation; 12 Frederick Street, St. Leonards*

Coffey was appointed by Dexus to prepare a Detailed Site Investigation (DSI) report to support a Development Application (DA) for the proposed development of the site. The DSI comprised of the following:

- Drilling of eight boreholes (i.e. BH1 to BH8) to depths ranging between 6.0m (BH6, BH7 and BH8) and 25.4m (BH1) below ground surface (mbgs). BH1 was drilled from helipad level (i.e. RL 97.5m) to a relative depth of RL 72.1m. The remaining boreholes were extended to relative depths between RL 88.4m (BH4) and RL 68.1m (BH5);
- Drilling of three hand augered boreholes (i.e. AH01 to AH03) completed to depths between 0.4m and 0.55mbgs;
- Installation of monitoring wells in BH02 and BH03 within the floor of the former quarry. Well development, purging and sampling of the two monitoring wells within the site;
- Chemical analysis of soil and groundwater samples collected. The identified contaminants of potential concern included heavy metals, PAH, TRH, BTEX, OCP, OPP, PCB and asbestos; and
- Assessment of ground contamination issues associated with the historical uses of the site.

3.1.1. Ground Conditions Encountered

Ground conditions encountered at the quarry floor comprised a thin layer of fill overlying sandstone bedrock. The fill materials encountered comprised sandy Clay to silty/clayey Sand and ranged in thickness from 0.4m and 1.1m. The bedrock was encountered at RL 76.5m to RL 72.6m and was described as typically fine to medium grained, high strength sandstone with dark grey laminations, interpreted to be Mittagong Formation, grading to Hawkesbury Sandstone at depth.

Available aerial photographs indicate that quarrying extended close to the southern boundary of the site. The exposed quarry walls are steeply sloping and expose a typical residual soil and deeply weathered shale bedrock profile. Deterioration of the quarry face has resulted in an accumulation of debris at the toe of the slope and existing retaining walls.

The former helipad present within the southern portion of the site appears to have been formed from loosely to moderately compacted fill, which typically comprised silty Clay with varying gravel content.

The thickness of fill recorded at BH1 was 19.5m, which reduced to approximately 1m to 3m in boreholes positioned along the southern site boundary (i.e. BH4, BH6, BH7 and BH8).

A generalised ground model interpreting the findings of the investigation is presented in Figure 3. It is noted however that the quality of fill and batter angles of the former quarry face in the southern corner of site are unknown, and have only been partially assessed by the borehole drilling due to access constraints.

A detailed appraisal of the historical uses of the site and surrounding area suggests the engineered embankment in the centre of the site was constructed circa 1960 using materials from the quarry floor that were ‘scraped back’ to form the embankment. Based on the known historical uses of the site, it is considered likely that the fill material used to form the embankment is of similar composition to that recorded in the southern and northern parts of the site.

Groundwater inflow was not encountered in any of the boreholes during drilling. Standing water levels were recorded in BH2 and BH3 at depths of 1.1m (RL 75.9m) to 1.4mbgs (RL 75.6m), respectively.

As part of the investigation, Ground Penetrating Radar (GPR) techniques were used to estimate the extent of the UST present within the southern portion of the site. In summary, the GPR survey was

inconclusive suggesting the UST is situated directly beneath the concrete pad, if still present within the site.

3.1.2. Soil Contamination Associated with Fill Materials

Previous investigations recorded fill materials up to 19.8mbgs (RL 78m) in the central portion of the site (BH01). Figure 3 provides an indication of the extent of fill within the embankment. Anthropogenic materials including brick and concrete were noted within the fill materials, however no asbestos containing materials were observed. Samples collected from soil bores established within the site reported concentrations of COPC below the health and ecological investigation criteria adopted for this site.

No olfactory or visual evidence of contamination was found in the boreholes, with the exception of a slight diesel odour detected in BH1 at 18.5mbgs. No staining was observed at this location and soil headspace measurements were 3.2 and 3.3ppm. Given the depth of this observation and the proximity to the underlying weathered siltstone, it is considered plausible the odour derives from auger drilling rather than a man-made source.

It is assessed that intrusive investigations conducted were sufficient to characterise shallow fill within the southern portion of the site, however as only one of the eight bores established in this part of the site was extended below the construction formation depth of RL 87.6m, some uncertainty remains regarding the quality of deep fill being retained beneath the proposed development. Similarly existing buildings and tenant activities within the northern portion of the site restricted the characterisation of fill within the base of the former quarry.

3.1.3. Soil Contamination Associated with UPSS

The investigations carried out to date have not identified significant contamination associated with fuel leakage from the UST located at the crest of the embankment. COPCs were below the LOR for all samples collected surrounding the UST, with the exception of minor detects of TRH F2 (C_{10}-C_{16} – naphthalene) of 96 mg/kg within sample BH06_4.0.

Soil headspace measurements from soil samples collected from each sampling location within the vicinity of the UST ranged from 2.1ppm to 126ppm, with most readings less than 10ppm which indicates that there is a low potential for volatile organic compounds to be present in those soil samples. The highest reading corresponded with the sample collected from BH6 (4mbgs) where no odour was noted. Sample BH6 (4mbgs) was subsequently submitted for laboratory analysis where trace concentrations of TPH C_{10}-C_{16} were detected. Other chemical indicators associated with fuel hydrocarbons were reported below the LOR, indicating the elevated PID reading may derive from auger drilling through weathered siltstone, rather than fuels that were stored on site. Soil headspace readings within sampling locations within the remainder of the site were below 10ppm, indicating there is a low potential for volatile organic compounds to be present in soil encountered at these sampling locations.

Coffey notes that it is common for USTs to leak and cause contamination to soil and groundwater and hence the possibility of contamination being present could not be precluded. However, the available data suggested that such contamination (if present) is likely to be localised.

3.2. Groundwater Contamination

Concentrations of COPCs within the two groundwater samples collected from BH2 and BH3 were below the LOR, with the exception of Acetone, which was detected at a concentration of 10 ug/L in the groundwater sample collected from BH02. The concentration of acetone detected fell below the USEPA Tap Water Regional Screening Level (RSL) of 14,000 ug/L, and as such is considered unlikely to pose a threat to human health. Given the distance between the site and the nearest surface water receptor, and that Acetone is susceptible to relatively rapid biodegradation, it is

assessed that the reported concentration of Acetone in BH2 do not pose a significant risk to aquatic ecosystems within Gore Creek, approximately 650m from the site.

Based on the information obtained from the DSI, it is considered unlikely that groundwater within the site poses an unacceptable risk to human health or aquatic ecosystems.

3.3. Reliability of Existing Data

The investigation programme implemented by Coffey adopted a range of quality control measures to assess the reliability of field and laboratory procedures, in accordance with recommendations provided within Schedule B2 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 (the 'ASC NEPM') (NEPC, 2013). In summary, the Detailed Site Investigation report concluded that the field and laboratory data overall met predetermined Data Quality Objectives (Coffey, 2016), and as such, was considered to be usable for the purposes of developing a RAP.

3.4. Data Gaps and Uncertainties

The following uncertainties have been identified with regard to site conditions:

- The proposed development involves the excavation of a section of soil and rock material where a UST is suspected to reside. At present, it is not been possible to confirm whether a UST remains on site, or the type of products stored within the UST. Intrusive investigations has not found evidence of sub-surface contamination in areas immediate adjacent to the UST although these investigations were not sufficient to confirm whether contamination is present at the base of the tank.
- The central section of the site that formed the exposed face of the former quarry was heavily vegetated and dipped steeply towards the north, rendering the area inaccessible for intrusive investigation equipment. As such, there remains some uncertainties regarding the quality of fill in this area of the site.
- Investigation records indicate that the embankment present within the central part of the site was most likely formed with scrapings from the original quarry floor. The proposed design involves cutting a section of this embankment down to RL 87.6m. It is assessed that intrusive investigations conducted were sufficient to characterise shallow fill within the southern portion of the site, however as only one of the eight bores established in this part of the site was extended below the construction formation depth, some uncertainty remains regarding the deep fill being retained beneath the proposed development.
- The presence of buildings and tenant activities restricted investigation across the northern portion of the site (i.e. floor of the former quarry), which reduced the sampling density within the northern part of the site and increasing uncertainties in the assessed quality of fill.

4. Conceptual Site Model

4.1. Source Zone Characteristics

4.1.1. Contaminant Sources

The primary sources of contamination impact at the site are considered to be:

- Residual fuel product within the UST and associated infrastructure (if any), and hydrocarbon impacted soils surrounding the UST area (if any);
- Fill materials that will be retained on site as part of the development.

4.2. Exposure Pathways and Contaminant Transport Mechanisms

The exposure pathways and primary transport mechanisms for migration of contamination at the site include:

- Dermal contact with soil
- Ingestion of soil
- Inhalation of dusts and vapours
- Infiltration and leaching from unsaturated soils to groundwater
- Vertical and lateral contaminant migration through the saturated zone
- Contaminant migration along preferential flow pathways (e.g. existing service corridors, building foundations etc.)
- Surface runoff / overland flow

4.3. Identification of Potential Receptors

The following potentially sensitive areas and possible receptors have been considered during the remediation works:

- Current commercial / industrial workers within the site;
- Construction workers during redevelopment of the site;
- Future adult workers - medical and support staff of the medical centre;
- Future persons attending medical facility, including sensitive populations (i.e. children and the elderly);
- Future maintenance workers involved in subsurface excavations; and

4.4. Source – Pathway – Receptor Relationships

The following sections discuss source – pathway – receptor relationships:

4.4.1. Soil and Fill

- Hydrocarbon fuels stored within the UST and associated infrastructure are considered to pose a potential risk to soils and groundwater in the event of leakage and/or accidental spillage, although given the depth to groundwater is approximately 20m below the base of the UST and there is currently no evidence of contamination impact, it is assessed that the potential risk to groundwater and receptors off site is assessed to be low.
- Hydrocarbon contaminated soils associated with the UPSS may present a potential risk to current site users, future maintenance and construction workers, and future users of the medical centre via the vapour inhalation pathway. Similarly, hydrocarbon contaminated soils present a potential risk to future maintenance and construction workers, via inhalation/ingestion of soil and dermal contact pathways.
- Construction workers and workers conducting future subsurface maintenance activities may also be exposed to fill materials retained within the development via the inhalation/ingestion of soil and dermal contact pathways. Analysis of samples of fill collected from bores within the northern and southern portion of the site reported concentrations of COPCs below the health and ecological assessment criteria adopted for the site. Similarly, analysis of groundwater samples collected at the base of the embankment have not reported concentrations of COPC above health or ecological assessment criteria, suggesting the fill within the embankment quality has not adversely affected the quality of groundwater. On this basis, it was assessed that the potential risks associated with fill were low. However, given the restrictions in characterising deeper fill that will be retained on site, further assessment of these materials are proposed to confirm their suitability to remain in-situ.

4.4.2. Groundwater

- Concentrations of all COPCs were detected below the LOR, with the exception of Acetone in BH02.
- Given the distance between the site and the nearest surface water receptor, and that Acetone is susceptible to relatively rapid biodegradation, it is assessed that the reported concentration of Acetone in BH2 do not pose a significant risk to aquatic ecosystems within Gore Creek.
- Groundwater is unlikely to pose a risk to human receptors due to the following:
  - No COPCs detected above LOR, besides acetone as mentioned above;
  - The concentration of Acetone detected fell below the USEPA Tap Water Regional Screening Level (RSL) of 14,000 ug/L, and as such is considered unlikely to pose an unacceptable risk to human health.
  - Vapour/inhalation risk (if present) is unlikely to come into contact with human receptors due to the presence of hard stand surfaces, and a void between the medical facility and the ground level;
  - The water extraction bore is located 200m away from site; and
  - Groundwater contact with construction workers is considered to be minimal when considering the proposed development. No groundwater body is expected to reside within the fill materials. A shallow groundwater body is present within the northern part of the site, where piling would be expected to occur, however due to the nature of piling it is expected workers exposure to groundwater would be minimal.

Based on the above, groundwater remediation is not required at this site.

5. Remediation Strategy

5.1. Remediation Goal

The overarching goal of the proposed remediation works is to make the site suitable for the proposed development by mitigating potentially unacceptable risks associated with the UPSS on site. A further goal in implementing the proposed remediation works is to carry out the works in a manner so as to minimise exposure risks to the public in the areas surrounding the site.

In addition to the above goals, further assessment of the fill that will remain on site is proposed to demonstrate these materials do not pose unacceptable risks in the context of the proposed development.

5.2. Location and Extent of Remediation Required

Based on the above ground infrastructure observed, the findings of GPR survey and intrusive investigations, the location and potential extent of soil remediation to remove the UPSS infrastructure is shown in Figure 4.

Accurate dimensions of the UST are currently not known. As such, the horizontal and vertical extent of contamination may be extended from the assessed extents during excavation and validation works as sub-surface soils are exposed and further assessed.

Based on the GPR survey, and observations on site, the size of the excavation to remove the UPSS is anticipated to be 5m width, 5m length, and 3m depth.

5.3. Remediation Option Assessment

Remediation works are proposed to mitigate risks associated with UPSS within the site. Based on the data presented in the available contamination assessments three remediation options were considered for implementation at the site.

5.3.1. ‘Do Nothing’ Approach

Given that an overarching remedial goal is to make the site suitable for the proposed development, and remove development constraints posed by UPSS, a ‘do nothing’ option is not considered to be appropriate.

5.3.2. Removal of UST, Associated Infrastructure and Impacted Soils (if present)

This option would comprise the removal of the UST and excavation of contaminated material (if present) that exceed the adopted remediation criteria and either disposal of these materials to an appropriately licensed facility. As the extent of the remediation excavation falls within the proposed basement, it is anticipated that the UPSS remediation excavation would take placed during the proposed basement excavation, thus avoiding the need to backfill the UST pit.

The advantages of this option include the removal development constraints associated with the UST and associated infrastructure, and greater certainty that soil contamination (if present) has been removed. This approach would reduce the need for on-going management of the land, as well as reducing restrictions on future land use following remediation and validation. The disadvantages of utilising this option include increased costs and environmental impacts associated with waste transport and disposal.

5.3.3. Tank Decommissioning & Isolation of Soil Contamination

This option would comprise decommissioning the existing UST in accordance with the guidance provided by WorkCover NSW[1]. In summary, this would comprise removing residual liquids from the tank and filling the tank with inert solid material such as concrete slurry or sand. All associated infrastructure should also be disconnected and made safe.

Isolation of contamination may be achieved by retaining existing hard ground cover to effectively mitigate human health risks via direct exposure routes. Investigation data has also indicated that UST does not appear to have adversely affected the quality of groundwater underlying the site.

The redevelopment of the site for commercial/industrial uses with minimal access to soil would likely maintain layers separating site users from impacted soils although the abandoned tanks may pose a constraint to future development.

An Environmental Management Plan (EMP) would be required to manage potential risks associated with possible future disturbance of the tanks and contained soil contamination.

5.4. Preferred Remediation Option

The preferred remediation option is the removal of UST, associated fuel infrastructure, and impacted soils. The primary factors considered during the appraisal of the options outlined above are as follows:

- Removal of the UST and associated fuel infrastructure a removes a potential constraint to future site development.
- Source removal provides improved confidence in remediation performance.
- Source removal of certain contaminant types removes the need for long term management requirements.

5.5. Key Stakeholders

The stakeholders directly involved in the remediation project are listed in Table 5.1.

Table 5.1: Remediation Project Stakeholders

Role	Organisation
Site Owner	Dexus Property Group Level 25, Australia Square 264-278 George Street Sydney NSW 2000
Environmental Consultant	Coffey Level 19, Tower B, Citadel Towers 799 Pacific Highway, Chatswood NSW 2067 (or others nominated by Dexus Property Group)
Remediation Contractor	Contractor nominated by Dexus Property Group

[1] WorkCover NSW; Factsheet 3_1: Dangerous Goods – Abandoning Disused Underground Tanks.

5.6. Sequence of Works

An indicative sequence of works is outlined in the following sections for the proposed tank removal and soil remediation activities.

5.6.1. Preliminaries

Prior to any works commencing on the site, notifications to third parties and obtaining licences, approvals and permits, will need to be undertaken. Further guidance regarding notifications, licenses, approvals and permits is presented in Section 9.1.

5.6.2. Site Establishment

This will include the establishment of the following:

- Work area fencing and temporary site facilities (as required).
- Environmental and occupational health and safety controls.
- Establishing stockpiling areas.
- Vehicular haul roads and transit routes on the site.
- Location, isolation, relocation, protection and/or termination of services potentially affected by remedial works.
- Demolition and removal of above ground structures including the concrete cover and vent pipes.

5.6.3. UPSS Removal

This will include:

- Removal and recycling/disposal of residual liquids from the UST and lines (if any);
- Remove hydrocarbon vapours from the UST and lines to mitigate risks associated potentially explosive atmospheres.
- Remove existing hard ground cover over the UST and disconnect fuel and vent lines from the UST.
- Excavate soils surrounding the UST to facilitate the removal of the tank. Excavated soils to be placed in designated stockpiling area on site.
- Remove tank and transport to nominated recycling facility or disposal site.

5.6.4. Excavation of Petroleum Hydrocarbon Impacted Soils (if present)

The soil excavations will be guided by the environmental consultant, who will attend site during the UST removal and excavation works. Excavations will be extended until there is no visual/olfactory or significant field screening evidence of petroleum hydrocarbon impact in the excavation.

Depending on the size of the tank and required extent of the remediation excavation, the excavation may require shoring, or constructed with an appropriate batter to prevent collapse.

Excavations will be validated to demonstrate achievement of the remediation assessment criteria proposed in Section 6.4.2.

5.6.5. Soil Stockpiling and Waste Classification

Excavated soils will be stockpiled in designated areas for assessment for waste classification purposes. Attempts should be made to segregate cleaner soils from those which exhibit indications of petroleum hydrocarbons being present.

The waste classification of stockpiled soils will be assessed, to facilitate offsite disposal. Further details on the classification of waste are presented in Section 11.

5.6.6. Offsite Disposal

Stockpiled soils excavated from the tank pit will be transported offsite for disposal at landfill licensed to accept the classified waste.

5.6.7. Backfilling

Backfilling of the tank pit would not be necessary if these works are undertaken as part of the proposed basement excavation for site development.

If the remediation works are undertaken in advance of the basement excavation works, backfilling of the excavation may be necessary to mitigate safety risks associated with a large open excavation, or for soil retention purposes. If required, the excavation should be backfilled with imported materials that classify as:

- Virgin Excavated Natural Material (VENM), or
- Excavated Natural Material (ENM) and subject to the specific requirements stipulated within the Excavated Natural Material Exemption (NSW OEH, 2012), or
- Similar material certified in accordance with an exemption issued by the NSW EPA.

6. Validation Plan

6.1. Remediation Validation

The intent of the validation works is to collect suitable data to support the assessment that the remediation works have met the objectives set out within Section 5.1.

6.2. Validation of UPSS

The base and walls of the excavation/s will be assessed for visual and olfactory evidence of potential contamination. Soil headspace screening using a calibrated photoionisation detector (PID) will also be undertaken to guide the collection of validation samples.

Samples will be collected from the base and walls of the remediation excavation, using the following sampling densities:

- Base – at least 2 sample from the base or one sample per 25m^2
- Walls – at least 1 sample per wall or 1 sample per 10 linear metres. Collection of samples at multiple depths at each sampling point should be considered, based on visual, olfactory and PID screening results.

If a soil excavation surface is considered to still be aesthetically impacted or the validation sample analytical results do not comply with the RAC, the soil will be further excavated, until validation results of the soil surface complies with the RAC.

Figure 4 shows an indicative soil validation sampling plan for the UST area.

6.3. Validation for Fill Materials

As noted in Section 3.4, some uncertainty remains regarding the quality of fill that will be retained on site. As part of the validation plan, further assessment is proposed demonstrate that these materials will not pose unacceptable risks.

It is proposed that the fill validation sampling plan is implemented following the demolition of existing buildings within the northern portion of the site, and excavation of the proposed basement within the southern portion of the site. The purpose of the validation assessment is to:

- Characterise soil conditions within the areas of the site where fill materials will remain and increase the sampling density to meet the minimum sampling density recommended within the Sampling Design Guidelines (NSW EPA, 1995).
- Conduct soil headspace screening for the presence of ionisable VOC using a calibrated PID.
- Visual screening for suspected asbestos containing materials (ACM).
- Recover representative samples from fill material at and below the nominated construction formation level for chemical analysis.

The validation assessment will comprise excavating test pits on a systematic grid to a target depth of 1.0m below the construction formation level, or depth of fill whichever is shallowest. Figure 4 provides an indicative validation sampling plan for the site. Each test pit shall be excavated under the guidance of the environmental consultant, who will assess material for visual and olfactory evidence of potential contamination. Where potential indications of potential contamination are noted, the test pit will be extended (where practical) to assess the depth and lateral extent of these observations.

To support the validation assessment of fill material, a minimum of two samples of fill will be analysed per sampling location for PAH, TRH, BTEX and heavy metals. As a guide, these samples will be

collected at near surface (0 – 0.2mbgs) and base of the test pit (0.8 – 1.0mbgs) to characterise soils that works are likely to come into contact with during construction and/or maintenance activities, although additional samples may be collected where excavations are extended to characterise deeper soils.

Soil samples shall also be scheduled for VOC and SVOC where odorous/stained soils and/or soil headspace screening records indicate the potential presence volatile compounds.

Our approach to asbestos validation is for observation of presence of visual ACM, or indicators of ACM, during the validation activity. If evidence of potential asbestos impact is identified during validation activity, then sampling and analysis for asbestos in soil shall be undertaken in accordance with procedures outlined within Schedule B2 of the ASC NEPM (NEPC, 2013).

6.4. Remediation Acceptance Criteria

6.4.1. Basis for Remediation Acceptance Criteria

To assist with assessing whether the remediation goal has been achieved, RAC have been adopted from the following documents:

- NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM).
- Friebel and Nadebaum (2011); CRC Care Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater.

Schedule B7 of the ASC NEPM (NEPC, 2013) states that the Health Investigation Levels (HIL) developed for the commercial/industrial land use scenario are not applicable to a site used frequently by more sensitive groups such as children and the elderly (i.e. hospitals and hospices). To account for these sensitive receptors, Coffey considers that the adoption of HIL consistent with a high density residential setting (HIL B) is reasonable, given:

- The HIL B criteria were derived to account for adults, children and infants who spend the majority of their time indoors within the premises, with some limited use of communal outdoor areas on site.
- Opportunities for direct access to soil on site will be minimal.

It is assessed that the HIL B criteria is also protective of for a generic commercial/industrial setting to assess potential health risks to construction workers involved with the redevelopment of the site, or workers conducting future subsurface maintenance activities.

Schedule B1 of the ASC NEPM (NEPC, 2013) provides HILs for various exposure settings. For compounds where the allowable soil vapour HSL exceeds the chemical constituent saturation concentration, Health Screening Levels (HSL) for direct contact pathways listed in Table B4 of CRC CARE Technical Report No. 10 (Friebel and Nadebaum; 2011) have been adopted as the RAC for this assessment. These values assume conservative characteristics regarding site conditions; namely, sandy soil profile and contamination occurring within the upper 1m of soil.

6.4.2. Remediation Acceptance Criteria – UPSS Validation

A summary of the adopted soil RAC for the UPSS validation assessment is presented in Table 6.1.

Table 6.1: Remediation Acceptance Criteria – UPSS Validation

Chemical Constituent	Remediation Acceptance Criteria – UPSS Validation Adopted from HIL B & HSL B (mg/kg) [1]
Lead	1200
F1 (TRH C_6-C_{10} excluding BTEX)	45
F2 (TRH C_{10}-C_{16} excluding Naphthalene)	110
F3 TRH C_{16}-C_{34}	5,800 [2]
F4 TRH C_{34}-C_{40}	8,100 [2]
Benzene	0.5
Toluene	160
Ethylbenzene	55
Total Xylene	40
Naphthalene	3
Carcinogenic PAH as Benzo(a)pyrene TEQ [3]	4
Total PAHs	400

Notes:

1. Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 2013) unless stated otherwise.
2. Table A4 – Soil Health Screening Levels for Direct Contact (CRC Care Technical Report No.10 (Friebel and Nadebaum; 2011)
3. TEQ = Toxicity Equivalent Quotient

6.4.3. Remediation Acceptance Criteria – Fill Validation Assessment

A summary of the adopted soil RAC for the fill validation assessment excavation is presented in Table 6.2.

Table 6.2: Remediation Acceptance Criteria – Fill Validation

Chemical Constituent	Sensitive Receptors within Medical Facility Adopted from HIL B & HSL B (mg/kg) [1]
Arsenic	500
Cadmium	150
Chromium (VI) [3]	500
Copper	30,000
Nickel	1200
Lead	1200
Zinc	60,000
Mercury	120

Chemical Constituent	Sensitive Receptors within Medical Facility Adopted from HIL B & HSL B (mg/kg) [1]
F1 (TRH C_6-C_9 excluding BTEX)	45
F2 (TRH C_{10}-C_{16} excluding Naphthalene)	110
F3 TRH C_{16}-C_{34}	5,800 [2]
F4 TRH C_{34}-C_{40}	8,100 [2]
Benzene	0.5
Toluene	160
Ethylbenzene	55
Total Xylene	40
Naphthalene	3
Carcinogenic PAH as Benzo(a)pyrene TEQ	4
Total PAHs	400
Total PCB	1
Asbestos (as Bonded ACM or asbestos fines)	None visible
Aldrin + Dieldrin	10
Chlordane	90
DDT+DDE+DDD	600
Endrin	20
Heptachlor	10
Hexachlorobenzene	15
Methoxychlor	500
Toxaphene	30
Other VOC and SVOC	< LOR [4]

Notes:

1. Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 2013) unless stated otherwise.
2. Table A4 – Soil Health Screening Levels for Direct Contact (CRC Care Technical Report No.10 (Friebel and Nadebaum; 2011)
3. Soils were tested for Total Chromium, which comprises both Chromium (III) and Chromium (VI) valence states. The HIL for Chromium (VI) has been adopted as a conservative assessment threshold.
4. A preliminary assessment criteria for other VOC and SVOC is the laboratory's Limit of Reporting (LOR). In the event VOC or SVOC are detected above LOR, further assessment is required to assess the significance of the potential risks.

6.4.4. Soils - Aesthetic Criteria

It is noted that Section 3.5 of NEPC (2013) requires that 'soils should not be discoloured, malodorous (including when dug over or wet) nor of abnormal consistency', and that 'the natural state of the soil should be considered'.

The decision making process in Appendix I of NSW DEC (2006) requires that aesthetic issues, including the generation of odours from the site (as a result of contamination), are considered. NSW DEC (2006) advises that consideration of discolouration on commercial or industrial sites is not required, although in the context of the proposed future use of this site, aesthetic issues require further consideration. Subsequently, given that high proportion of anthropogenic materials within the fill materials present within the site, the following assessment criterion has been adopted when considering soil aesthetics:

- no highly malodourous soils, taking into consideration the natural state of the soil;
- no staining or discolouration in soils , taking into consideration the natural state of the soil; and
- no large or frequently occurring foreign materials present (to the extent practicable).

7. Data gaps, uncertainties and contingency planning

7.1. Data gaps and uncertainties

The site has been subject to a previous phase of investigation to characterise ground contamination conditions within the site. Following the review of the available site history information and investigation data, the following potential data gaps and uncertainties have been identified:

- The presence of potentially unidentified contamination between investigation positions, or in areas where limited investigation data is currently available.
- Potential for asbestos impacted fill.
- Presence of potentially unidentified structures or conduits that contain deleterious materials.
- The presence of hydrocarbon impacted soils that extends beyond the extent of the proposed basement excavation.

The above data gaps and uncertainties have been used to develop the Unexpected Finds Protocol outlined.

7.2. Unexpected finds protocol

7.2.1. Training and induction of personnel

All earthworks / construction personnel working on the site at basement and ground levels are to be inducted on the identification of potential unexpected finds. The induction can be undertaken at the time of general site induction and toolbox meetings.

The initial induction of personnel shall cover contamination aspects, which should be based on advice from a suitably qualified environmental consultant.

Earthworks / construction personnel are required to have the general competencies to identify unexpected finds in the field.

Given that it is not possible to provide an awareness induction to cover all types of possible unexpected finds, it is assumed that “if in doubt” about a potential find, the precautionary principal will be employed and the unexpected finds procedure documented below will be activated.

Additionally, it is noted that some forms of potential contamination may not be associated with any visual or olfactory indications in the field. The unexpected finds procedure will not provide protection against such finds.

7.3. Procedure in the event of an unexpected find

7.3.1. General

Where indications of potential contamination area found in areas between sampling locations, or where limited investigation data currently exists, works will be suspended in the affected part of the site and the area will be isolated to minimise potential for disturbance to the affected soils. An appropriately qualified and experienced environmental consultant will undertake a preliminary assessment of the unexpected find and provide advice as follows:

- The need for implementation of immediate management controls (if any);

- What further assessment and / or remediation works are required and how such works are to be undertaken in accordance with contaminated site regulations and guidelines;
- Revision of the RAP (if necessary);
- Remediation works required (where applicable); and
- Validation works required following remediation works (if applicable).

An outline of some possible unexpected find scenarios, including initial response and the likely validation process, is presented below.

7.3.2. Asbestos Containing Materials

Asbestos have not been encountered during previous investigations conducted within the site. Given the typical random nature of asbestos distribution in fill, and limitations to adequately detect asbestos containing materials in boreholes, it is considered reasonable to develop controls to manage asbestos contaminated soils encountered during construction works.

Where a possible asbestos find occurs, the following measures should be adopted:

- Establishment of a restricted access area.
- Implement appropriate asbestos management controls during construction works in the impacted area, as advised by an appropriately licensed Asbestos Assessor. This may include:
  - Dampening the surface of the site and working area with a water cart or similar control;
  - Deploying covers over stockpiled soils, and ceasing work in strong winds.
  - Establish and conduct air monitoring.
  - Implement decontamination procedures for personnel and equipment.
  - Advice on Personal Protective Equipment (PPE) requirements.
- Engage licensed asbestos contractor to excavate and handle soils impacted with asbestos.

7.3.3. Presence of unidentified structures or conduits containing deleterious materials

Unidentified structures such as UST, sumps, or historic conduits may contain deleterious materials that have the potential to result in contamination. In the event that unidentified structure is encountered, the find shall be assessed by an appropriately qualified and experienced environmental consultant. Where the structure contains residues or liquids, these shall be removed. Monitoring shall be undertaken to check that the structure is gas-free prior to removing it from the ground to mitigate risks associated potentially explosive atmospheres.

The environmental consultant will observe the removal of the structure and inspect the surrounding ground for contamination. This assessment may result in the collection of additional samples for laboratory to inform the requirements for supplementary remediation measures. Where remediation works are required that deviate from the procedures outlined within this RAP, an addendum to the RAP will be prepared prior to implementation of these works.

7.3.4. Presence of hydrocarbon impacts beyond basement boundary

Where observations indicate that hydrocarbon impacted soils extend beyond basement wall or floor, the environmental consultant observing the basement excavation works shall develop a sampling plan to assess the extent of impact and potential for this impact to migrate beyond the site boundary. At this stage, it is anticipated that the sampling plan would rely upon test pits and/or soil bores positioned

in areas adjacent to the basement wall where the hydrocarbon is expected to exist. Soil headspace screening of soil arisings from each sampling location should be carried out at regular intervals to assess the presence of ionisable volatile hydrocarbons.

Data collected from the sampling exercise shall be collated and interpreted by the environmental consultant to assess the need for additional remediation works, or management measures. Where remediation works are required that deviate from the procedures outlined within this RAP, an addendum to the RAP will be prepared prior to implementation of these additional works.

8. Site Management Plan

8.1. General

The contractor appointed to carry out the tank removal and soil remediation works will implement a Site Management Plan (SMP) that addresses environmental, occupational health and safety hazards and risks during the remediation. The SMP should address the following aspects:

8.2. Occupational Health and Safety

The SMP should include a project specific occupational health and safety plan including the preparation of specific safe work method statements for key tasks required to achieve the remediation objectives.

8.3. Access Control

Access to the site will be restricted to authorised staff and contractors who have been inducted and appropriately trained for the works being undertaken. It is envisaged that the remediation contractor will control site access.

A fence or hoarding will be installed and maintained around the perimeter of the site.

Signage, including remediation contractor details and contact numbers, will be erected near the access gate to the site. The signage will remain displayed on the site entrance throughout the duration of the remediation works.

8.4. Water Management

In order to minimise the need for treatment/disposal of potentially contaminated surface water from excavation, the remediation contractor will implement controls to divert surface water away from open excavations. The contractor's diversion of surface water should not disrupt existing operations within the depot or contribute to adverse impacts to adjoining land.

Groundwater ingress may occur during excavation works. Management options for this groundwater may include:

- assessment of groundwater quality
- pumping, transport and disposal offsite at a licensed liquid waste facility; or
- discharge to sewer under a trade waste agreement.

Consideration will need to be given to both groundwater quantity and quality in selecting a management option.

8.5. Soil Management

Stockpiles will be designated and handled to ensure that the stockpiles are properly tracked and classified according to contaminant concentrations and minimise the potential for different classes of waste to be mixed.

Stockpiles will be placed on hardstand areas. If hardstand areas are not available, a reasonably robust, impermeable barrier will be placed on the ground where soils are to be stockpiled.

Stockpiles will be bunded with sediment control barriers to mitigate runoff from the stockpile to surrounding areas.

Stockpiles will not be placed near the site boundary, footpaths, roadways, gutters or storm water pits.

Stockpiles will be positioned and formed to minimise potential for stockpile erosion where possible.

Soil or sediment must not leave the site as a result of vehicle, plant and equipment movements. To limit the potential for tracking of soil or sediment off site via vehicle, plant or equipment movement:

- vehicles, plant and equipment on the site will be kept to a practical minimum;
- vehicle, plant and equipment entry to and exit from the site will be kept to a practical minimum; and
- plant and equipment will be washed down before it leaves the site.

8.6. Noise Controls

Noise producing machinery and equipment will only be operated during working hours as approved by local Council and/or NSW OEH. Australian Standard *AS2436-1981 Guide to noise control on construction, maintenance and demolition sites* outlines guidelines for the minimisation of noise on construction and demolition sites and these will be followed at all times.

No 'offensive noise' as defined under the *Protection of the Environment Operations Act 1997* should be created during remediation works/activities.

Mechanical plant, equipment and the like used during remediation works/activities will use practical and reasonable noise attenuating devices and measures to minimise noise being transmitted from the site. All equipment and machinery must be properly maintained and operated in an efficient manner to minimise the emission of noise.

8.7. Dust Control

Generation of dust during remediation works may occur. Site activities will be managed to minimise the generation of dust and the movement of dust off the site. The following strategies should be implemented to minimise dust generation and dust movement:

- wetting down of dry soils during excavation and loading;
- covering loads during transportation;
- application of shade cloth or similar to perimeter fencing;
- limiting excavation and loading activities during high winds;
- wetting down stockpiles and/or covering with plastic/geofabric; and
- maintaining stockpile heights below the heights of perimeter fencing.

8.8. Odour Control

Generation of odours during the remediation works may occur although are expected to be intermittent and detectable over short durations only.

No 'offensive odours' as defined under the *Protection of the Environment Operations Act 1997* should be emitted during remediation works/activities.

The following odour monitoring and management procedures may be used:

- undertaking the excavation works in a staged manner to limit the surface area and amount of potentially odorous materials being exposed;
- where offensive odours are detected, apply odour suppressants; and

- covering of transported soil, to suppress the release of the odours.

Vapour monitoring will be carried out by the remediation contractor and the environmental consultant during the excavation works using calibrated PID to assess for the presence of ionisable VOC. Air quality within workers' breathing zones will be monitored during the remediation works using the PID. Workers will stop work and withdraw from the work area when PID readings are greater than 10ppm in the workers' breathing zone. Where monitoring identifies a continual breach of this threshold, the contractor shall consider other forms of risk management (e.g. use of respirators, alternate work methods etc.).

8.9. Hours of Operation

Remediation works shall be undertaken within the hours of operation stated within the Development Consent for the project.

8.10. Communication & Complaints

Communication and complaints received for the site will be reported to Dexus, or their nominated contractor. All communications and complaints will be assessed and an appropriate response, corrective and/or preventative action implemented (as necessary).

A communication and complaints register will be operated on site to ensure that concerns of local residences and businesses are recorded and addressed.

8.11. Emergency Preparedness and Response

The remediation contractor shall prepare plans to respond to incidents and emergencies (e.g. fires, spills or other uncontrolled releases) in advance of commencing the works. The remediation contractor shall inform employees, sub-contractors and site visitors of the response plans and emergency protocols during site inductions.

9. Regulatory, Notification, Licence and Approval Requirements

9.1. Regulatory

The remedial works will be undertaken in accordance with, but not limited to, all relevant sections of:

- AS 1289-2000: Methods of Testing Soils for Engineering Purposes
- AS 1940-2004: Storage and handling of flammable and combustible liquids
- AS 2601-2001: The demolition of structures.
- Contaminated Land Management Act 1997 and associated guidelines
- Contaminated Land Management Regulations 2013
- National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended in 2013 (ASC NEPM, 2013)
- NSW EPA (2014) 'Waste Classification Guidelines, Part 1: Classifying Waste'
- NSW OEH (2011); Guidelines for Consultants Reporting on Contaminated Sites
- NSW WorkCover Authority 2005, 'Code of Practice: Storage and handling of dangerous goods'
- Occupational Work Health and Safety Act 2011
- Occupational Work Health and Safety Regulation 2011
- Protection of the Environment Operations Act 1997
- Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014 (UPSS Regulation)
- State Environmental Planning Policy No 55 - Remediation of Land

9.2. Notifications and Consents

It is considered likely that the proposed remediation works would classify as Category 2 works, with respect to State Environmental Planning Policy No 55 – Remediation of Land (DUAP/EPA, 1998). SEPP 55, made under the Environmental Planning and Assessment Act 1979, requires that notification of intent to remediate for Category 2 works generally be given to the consent authority at least 30 days before the commencement of remediation work. Further guidance on the content of notification is provided in SEPP 55. Dexus will be responsible for submitting the notification of intent to remediate.

The UPSS Regulation requires preparation of a site validation report where a tank has been decommissioned or removed from a site. The UPSS Regulation requires the validation report for a site to be submitted to the relevant local authority within 60 days of completion of the validation or remediation works. The report is used by the council to support future planning decisions about the land uses which are suitable for the site.

9.3. Licences, Approvals and Permits

All parties involved in the remedial works will ensure that they hold all relevant licences, approvals and permits for demolition activities, excavation activities and transport of wastes. This may include, but not be limited to:

- NSW Department of Fair Trading Contractor Licence
- WorkCover NSW Notification of Demolition
- WorkCover NSW Demolition Licence

10. Quality Assurance and Quality Control

Validation of remediation will be undertaken in accordance with a Sampling, Analytical and Quality Plan (SAQP). The approach to developing the SAQP is presented below.

10.1. Sampling Analytical and Quality Plan

Data Quality Objectives (DQOs) for validation activities have been developed generally in accordance with the seven step process outlined in NSW DEC (2006).

10.1.1. Step 1 – State the Problem

The primary objective is to collect sufficient data from the remediation works to demonstrate the remediation objectives have been met.

The main problems are:

- How should the soils be validated?
- What validation sampling layout should be used?
- What contaminants should be analysed for and by what method to be useful for assessment?

10.1.2. Step 2 – Identify the Decision

The decisions that are required to be made in this project include:

- Is the data suitable for assessing site suitability?
- Is the site suitable for the proposed use?

10.1.3. Step 3 – Identify Inputs to the Decision

The primary inputs to assessing the above include:

- the results and findings of previous assessment carried out on the site;
- data collected during remediation and validation works, including field measurements, observations and laboratory results;
- outcome of quality assessment of relevant data;
- the RAC in this RAP; and
- Applicable regulatory guidelines.

10.1.4. Step 4 – Define the Study Boundaries

<u>UST Area</u>

Based on the GPR survey conducted in the UST area, the lateral extent of the remediation area is expected to be slightly larger than the footprint of the concrete cover; that is approximately 5 meters length by 5 meters width. Due to insufficient available information regarding the tank, the vertical extent is not known, however when taking into consideration the width and length of the tank, it is estimated the vertical extent would be in the order of 3 meters.

The horizontal and vertical extent of the remediation excavation may be extended from the assessed extents as sub-surface soils are exposed and further assessed.

Fill Materials

The lateral extent of the study area for fill materials will be the site. The vertical extent will be 1m below the proposed construction formation level, or depth of fill, whichever is shallowest.

The lateral and vertical extent of contamination may be extended from the assessed extents during excavation and validation works as sub-surface soils are exposed and further assessed.

10.1.5. Step 5 – Develop a Decision Rule

The decision rules for the project will be as follows:

If the results of the analytical data quality control assessment are acceptable, then the data will be deemed suitable for the purposes of the project. In this regard, data will be assessed against completeness, comparability, representativeness, precision and accuracy.

- If the reported assessment and validation results are below relevant RAC provided within applicable regulatory guidelines, then the site soils will be considered suitable for proposed uses.

10.1.6. Step 6 – Specify Acceptable Limits on Decision Errors

There are two types of error:

- deciding that the soils are suitable for the proposed land use when they are not; and
- deciding that the soils are not suitable for the proposed land use when they are.

Where possible, the assessment will aim to conclude with 95% confidence that the site soils are suitable for the proposed land use. Consequently, the 95% UCL will be used to assess the mean concentrations of chemicals of potential concern (where appropriate).

Confidence in reliability of other validation methods (e.g. field observations) will be based on:

- appropriate levels of qualification and experience in the personnel undertaking the relevant validation task; and
- general adherence to Coffey standard operating procedures and other considerations described in NSW DEC (2006).

10.1.7. Step 7 – Optimise the Design for Obtaining Data

Validation methods and sampling will target contaminants of concern based on information from previous contamination assessments. Validation sampling/observations will focus on:

- The base and walls of the UST excavation after removal of petroleum hydrocarbon impacted soils (if any).
- Near surface soils of fill material following excavation to appropriate design level of the medical centre.

Collection of data will be undertaken in general accordance with relevant guidance documentation, including.

- NSW DECCW (2014) ‘Guidelines for Implementing the Protection of the Environment (Underground Petroleum Storage Systems) Regulation 2014
- Standards Australia (2005). AS 4482.1 Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 1: Non-volatile and semi-volatile compounds, , Standards Australia, Homebush NSW.

10.2. Fieldwork QA/QC

10.2.1. Preparation

Sampling equipment required for fieldwork will include the following (where appropriate):

- notebook/indelible marker pens;
- stainless steel sampling trowel;
- decontamination buckets;
- deionised or distilled water and Decon 90 detergent;
- laboratory prepared sample containers with Teflon lined lids
- insulated containers and ice;
- disposable latex gloves;
- PPE; and
- camera.

10.2.2. Soil Sampling, Preservation and Storage Procedure

Samples will be collected using a decontaminated stainless steel trowel or scooped directly into the laboratory prepared container using a fresh pair of nitrile gloves. The soil sample will be lightly packed into the container with headspace minimised to avoid the loss of volatiles. The sample containers will be labelled with a project number, sample location, sample depth (where applicable) and date the sample was collected.

Soil samples will be analysed on a discrete basis. Composite sampling and analysis methods will not be used.

Sample storage and preservation will be undertaken in accordance with Table10.1.

Table 10.1: Soil Sample Preservation and Storage

Analyte	Sample Volume and Container Type	Sample Container Preservative	Storage / Transport
TRH **BTEX** **PAH** **VOC / SVOC** **OCP / OPP**	1 x 250ml glass & Teflon lined lid	None	Minimal headspace Attempt to cool to 6ºC
Heavy Metals	1 x 250ml glass & Teflon lined lid	None	No special requirements
Asbestos	1x zip-lock bag	None	No special requirements

10.2.3. Decontamination Procedures

Non-disposable sampling equipment coming into in contact with soils and groundwater will be decontaminated before and between sampling events to minimise the possibility of cross contamination between samples and minimise the risk of impacting sample integrity. The decontamination process will include the following procedure:

- removal of soil/groundwater residue from the equipment with a clean plastic brush in potable water;
- washing the equipment in a solution of Decon 90 (or similar) detergent and potable water; and
- rinsing the equipment in potable water.

10.2.4. Storage and Transport Procedures

The sample containers will be transported to the NATA accredited analytical laboratory with the Chain of Custody form recording the following information:

- project reference;
- date of sampling;
- sample identifications;
- matrix and container details
- preservation methods
- name of sampler;
- required analysis;
- turnaround times required; and
- signatures of sender and receiving laboratory.

A copy of the Chain of Custody record will be kept in the project file. Samples will be transported to the laboratory with sufficient time to perform analysis within the applicable holding period.

10.2.5. Intra-laboratory Duplicates

Intra-laboratory field duplicates will be collected on an average frequency of one sample per twenty samples collected for chemical analysis (5%). The analytical results of the two spilt samples will be compared to assess the precision of the sampling protocol and to provide an indication of variation in the sample source.

10.2.6. Inter-Laboratory Duplicates

Inter-laboratory field duplicates will be collected on an average frequency of one sample per twenty samples collected for chemical analysis (5%). The analytical results of the two split samples will be compared to assess the precision of the sampling protocol, provide an indication of variation in the sample source and to assess the accuracy of the primary laboratory.

10.2.7. Rinsate Samples

Rinsate samples will be prepared in the field using empty bottles and the distilled water/potable water used for the cleaning of sampling equipment. These samples will be a check on field decontamination

procedures and sample device cleanliness. A rinsate sample will be collected and analysed for each day of field work carried out, where non-disposable sampling equipment has been used. Where non-disposable sampling equipment has been used and the same decontamination procedures are being used regularly for similar sampling equipment (and previous rinsate sample analysis has returned acceptable results), it will be appropriate to use rinsate samples on a “spot check” frequency rather than for each day of field work carried out.

10.2.8. Trip Blanks

Trip blanks are samples of organic free soil prepared by the laboratory and are a check on sample contamination originating from sample transport, shipping and site conditions. The blank will remain with the sample containers during sampling and during the return trip to the lab. At no time during these procedures will the blanks be opened. Upon return to the lab the blank will be analysed, if needed, as any other field sample. A trip blank will be used and analysed for a batch of samples released to the laboratory, where the contaminants being assessed are volatile in nature (e.g. BTEX or TPH C_6-C_9). Where the same sampling and transport procedures are being used regularly for samples proposed for volatile analysis (and previous trip blank analysis has returned acceptable results), it will be appropriate to use trip blanks on a “spot check” frequency rather than for every batch.

10.2.9. Trip Spikes

Trip spikes are samples prepared by the laboratory with a pre-determined concentration of BTEX and are a check on sample preservation during sample storage and transport. The spike will remain with the sample containers during storage and transport. At no time during these procedures will the spike be opened. Upon return to the lab, the spike will be analysed, if needed, as any other field sample. A trip spike will be used and analysed for a batch of samples released to the laboratory, where the contaminants being assessed are volatile in nature (e.g. BTEX or TPH C_6-C_9). Where the same storage and transport procedures are being used regularly for samples proposed for volatile analysis (and previous trip spike analysis has returned acceptable results), it will be appropriate to use trip spikes on a “spot check” frequency rather than for every batch.

10.3. Laboratory QA/QC

10.3.1. Laboratory Selection

The primary and secondary laboratories selected for this project shall hold NATA-accredited methods for the analyses to be undertaken. Laboratory Quality Control would include the following:

- the laboratory analysis of samples will be undertaken by a NATA accredited environmental testing laboratory;
- the NATA accredited environmental testing laboratory will implement a quality control plan conforming to Schedule B(3) Guidelines for Analysis of Potentially Contaminated Soils of the ASC NEPM (NEPC 2013);
- the laboratory will include reagent blanks, spike samples, duplicate spikes, matrix spikes, and surrogates spikes and duplicates to assess the laboratory quality control.

10.3.2. Data Assessment

The laboratory quality control data will be assessed as follows:

- checking that the reporting limits and procedures are satisfactory;

- checking that the samples are analysed within holding times;
- checking that laboratory blanks / reagent blanks are less than the laboratory reporting limits;
- checking the reproducibility of samples by calculating the Relative Percentage Differences (RPDs) between primary and duplicate laboratory samples submitted for chemical analysis; and
- checking that spikes, surrogate spikes, matrix spikes and duplicate matrix spike recoveries are within acceptable control limits.

Data Quality Indicators that will be adopted for quality control samples are presented in Table 10.2

Table 10.2: Data Quality Indicators for Quality Control Samples

Type of Quality Control Sample	Control Limit
Duplicate Samples	Relative Percentage Difference (RPD) within 50% for soil. Where a concentration is below 10 times the LOR, no RPD limit will apply
Spikes	Recoveries within the following ranges 70% - 130% for organics 60% - 140% for inorganics / metals
Blanks and Rinsate Samples	Analytes not detected.

11. Waste Classification

This section describes the methodologies to be used in order to classify waste prior to transport offsite for disposal.

11.1. Waste Classification Criteria

The surplus soil material will be assessed in accordance with Waste Classification Guidelines (NSW EPA, 2014).

11.2. Waste Soil Sampling Plan

The material will be assessed by a suitably qualified environmental consultant prior to removal and disposal offsite. This assessment will include:

- a visual survey of the surface of the stockpile; and
- collection and laboratory analysis of spatially representative samples of the soil material.

As a guide, samples collected for waste classification purposes shall be collected at the rate of one sample per 100m^3, or a minimum of 6 samples per stockpile. The actual sampling frequency shall be determined on 'case by case' basis, considering the variability of the material and its origin.

All samples collected of waste soil will be analysed for TPH, BTEX, PAH, Heavy Metals, OCP and OPP. Samples may also be analysed for other COPC (e.g. VOC, SVOC, asbestos) depending on field observations.

11.3. Waste Classification Reporting

The environmental consultant will prepare a report, advising the classification of the waste.

11.4. Waste Tracking

The source location, volume, classification and destination of waste material removed from site will be tracked by the remediation contractor. The remediation contractor will ensure that a materials tracking register is maintained along with consignment dockets confirming receipt of the material at the disposal facility. These records shall be presented within the Validation report.

12. Validation Reporting

The UPSS Regulation requires preparation of a site validation report where a tank has been decommissioned or removed from a site. The validation report aims to provide an independent verification that remedial goals associated with site works have been met and the site is suitable for its ongoing or future uses. The report is used by the council to support future planning decisions about the land uses which are suitable for the site.

Reports should be prepared by a suitably qualified and experienced environmental consultant.

At the completion of remediation and validation works, a validation report will be prepared in general accordance with the relevant sections of Guidelines for Consultants Reporting on Contaminated Sites (NSW OEH, 2011), UPSS Regulations and other relevant guidance documentation.

The validation report will include:

- Executive Summary
- Scope of Work
- Site Identification
- Summary of Site History
- Summary of Site Condition and Surrounding Environment
- Summary of Geology and Hydrogeology
- Remediation Activities Undertaken (including extent and observations of excavation/s, waste documentation and imported fill documentation)
- Validation Sampling and Analysis Plan (including Methodology)
- Field QA / QC
- Laboratory QA / QC
- QA / QC Data Evaluation
- Basis for Validation Criteria
- Validation Sampling Results (including sample descriptions)
- Site Characterisation
- Ongoing Site Monitoring Requirements
- Conclusions and Recommendations

13. Conclusions

The site falls within the St Leonards Business Centre, which is located within the south western part of a former quarry. The site is situated at two distinct levels between a vacant, steeply sloping and mostly vegetated quarry face. Dexus propose to redevelop the site by constructing a multilevel medical facility with ground floor level at near current street level at the intersection of Reserve Road and Westbourne Street. A three level basement for car parking and storage is also proposed which will be cut into the face of the former quarry, and will be supported by columns extended above the old quarry floor.

Previous investigations have identified a hand pump and vent pipe that appears consistent with petroleum storage infrastructure. It remains unknown whether a small UST remains beneath the hand pump and vent.

Investigations conducted by Coffey have not identified significant contamination associated with the storage of fuels in this area of the site. However, the existing UPSS present a constraint to the future development of the site. This RAP outlines a strategy to remove potential development constraints associated with UPSS and associated infrastructure, and a validation assessment programme to confirm that soils remaining on site to do not pose unacceptable risks in the context of the proposed future use of the site. This RAP also presents a strategy to manage unexpected finds of contamination that may be encountered during construction.

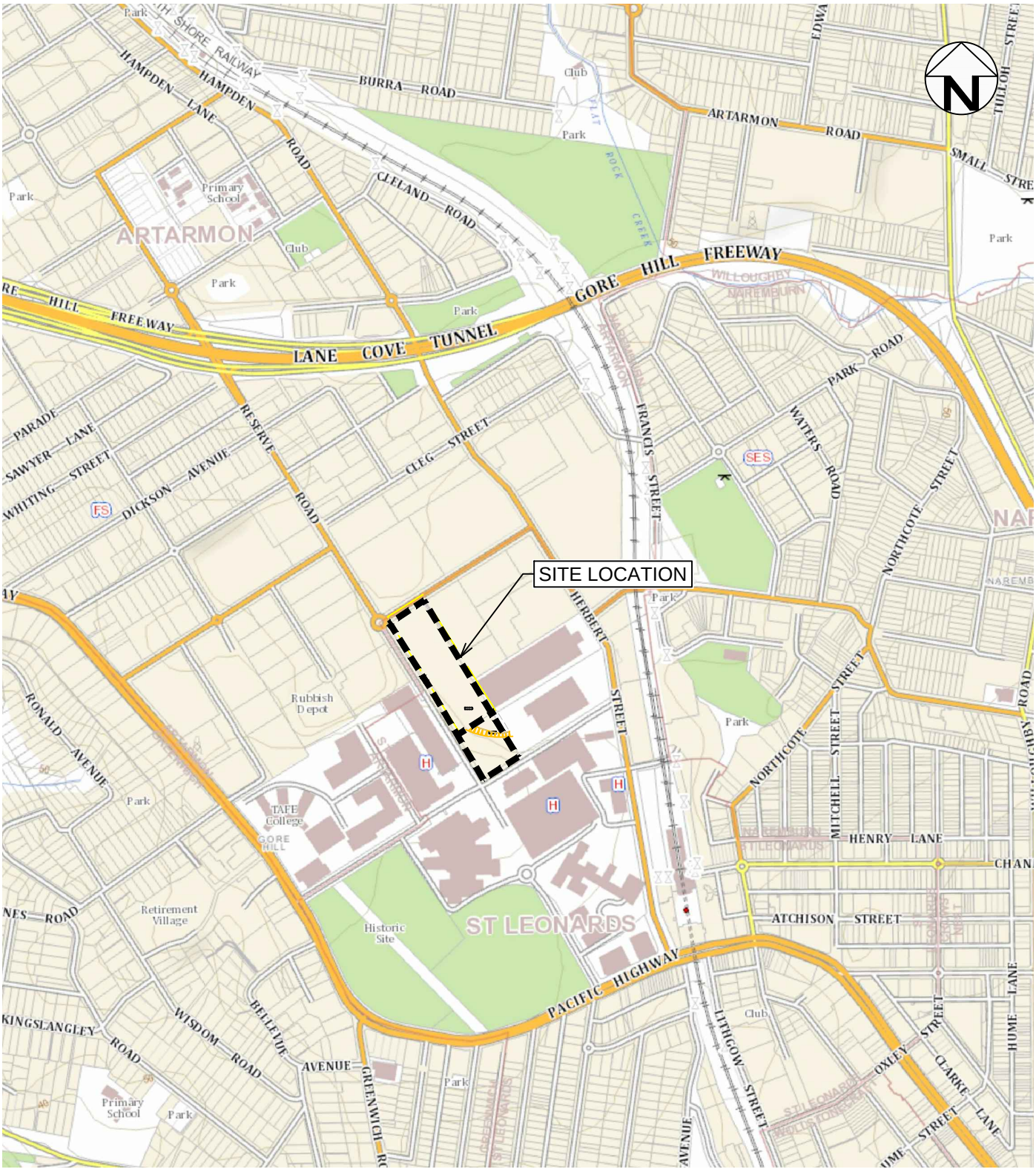
If the remediation is carried out in accordance with this RAP using the preferred remedial option, then Coffey concludes the site should be made suitable for the proposed development.

The reader should refer to the ‘Important Information About Your Coffey Environmental Report’ at the end of the document.

14. References

- Coffey (2015); Phase 1 Preliminary Site Investigation; 12 Frederick Street, St Leonards (Ref: GEOTLCOV25513AA; dated 9th October 2015)
- Coffey (2016); Detailed Site Investigation; 12 Frederick Street, St Leonards (Ref: GEOTLCOV25513AC; dated 14th April 2016)
- Friebel and Nadebaum (2011) CRC Care Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater.
- NEPC (2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 (NEPM), as amended in 2013, National Environment Protection Council
- NSW DEC (2006) Guidelines for the NSW Auditor Scheme (Second Edition)
- NSW DECCW (2014) 'Guidelines for Implementing the Protection of the Environment (Underground Petroleum Storage Systems) Regulation 2014;
- NSW DECCW (2009a) 'Planning and Development Process for Sites with Underground Petroleum Storage Systems';
- NSW DECCW (2010) 'UPSS Technical Note: Site Validation Reporting
- NSW DECCW (2010); UPSS Technical Note: Decommissioning, Abandonment and Removal of Underground Petroleum Storage Systems
- NSW EPA (1995) Sampling Design Guidelines.
- NSW EPA (2014) Waste Classification Guidelines Part 1: Classifying Waste
- NSE OEH (2011) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites OEH 2011/0650, ISBN 0 7310 3892 4, Office of Environment and Heritage, Sydney
- NSW OEH (2014); Excavated Natural Material Exemption
- WorkCover NSW; Factsheet 3_1: Dangerous Goods – Abandoning Disused Underground Tanks.

Figures



LEGEND

APPROXIMATE BOREHOLE LOCATION

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Scale (metres) 1:10 000

drawn	AR / AW
approved	ML
date	26 / 07 / 16
scale	AS SHOWN
original size	A4

coffey
A TETRA TECH COMPANY

client: DEXUS PROJECTS PTY LTD

project: STAGE 1 - PROPOSED VALIDATION PLAN
1-12 FREDRICK ST, ST LEONARDS, NSW

title: SITE LOCATION PLAN

project no: GEOTLCOV25513AC-R01 | figure no: FIGURE 1 | rev: A

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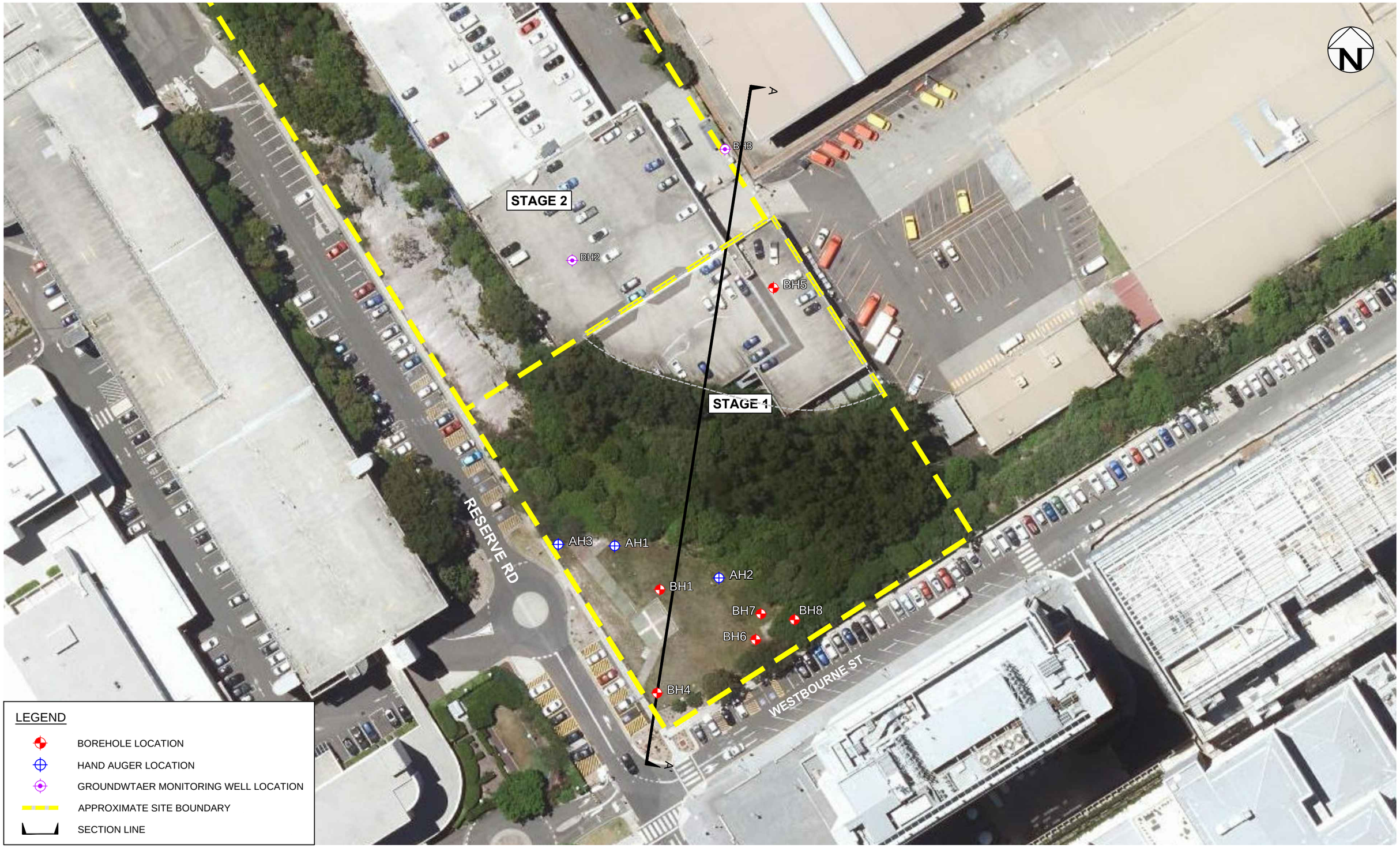

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Scale (metres) 1:750

drawn	AR / AW
approved	ML
date	26 / 07 / 16
scale	AS SHOWN
original size	A3

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client: DEXUS PROJECTS PTY LTD

project: STAGE 1 - PROPOSED VALIDATION PLAN
1-12 FREDRICK ST, ST LEONARDS, NSW

title: BOREHOLE LOCATION PLAN

project no: GEOTLCOV25513AC-R01 | figure no: FIGURE 2 | rev: A

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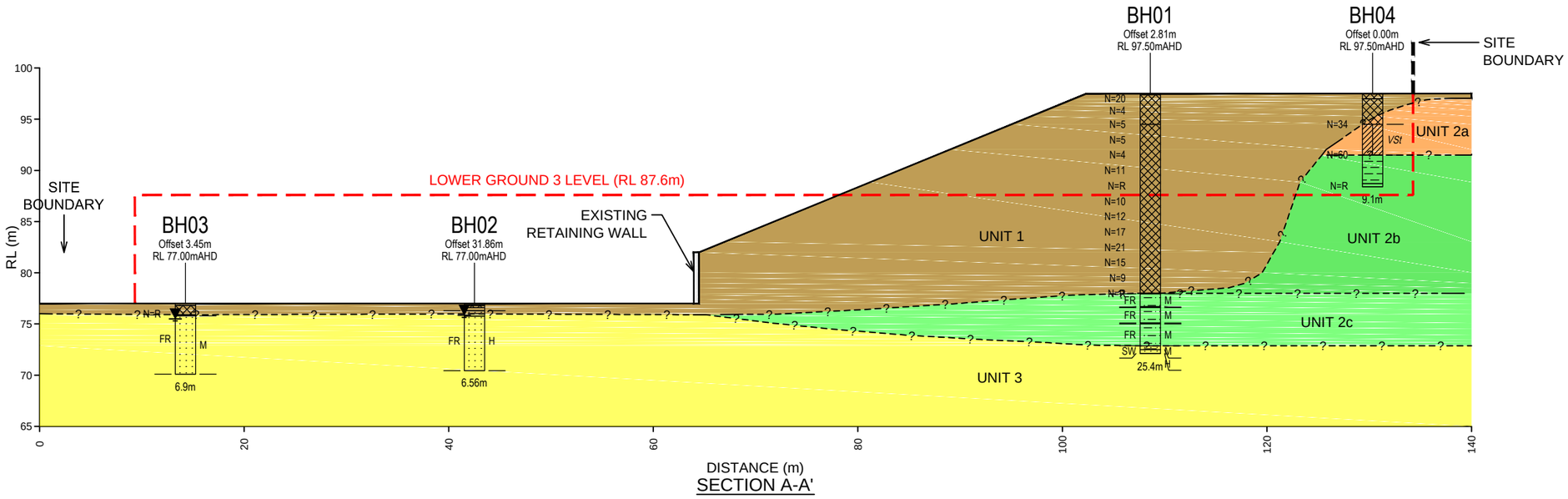

SECTION A-A'

LEGEND

- TOPSOIL
- FILL
- SILTY CLAY
- SILTSTONE
- NO CORE
- INTERBEDDED SILTSTONE & SANDSTONE
- SANDSTONE
- CONCRETE
- SHALE
- EXISTING GROUND SURFACE
- INFERRED GEOLOGICAL BOUNDARY
- WATER LEVEL
- N*=17 STANDARD PENETRATION TEST RESULT

UNIT LEGEND

- UNIT 1 - FILL
- UNIT 2a - RESIDUAL SOIL
- UNIT 2b - WEATHERED SHALE BEDROCK
- UNIT 2c - FRESH SHALE/SILTSTONE
- UNIT 3 - SANDSTONE

NOTES:
1. ELEVATION ARE APPROXIMATED FROM CLIENT PROVIDED SURVEY PLANS.
2. BOREHOLES ARE OFFSET FROM SECTION LINE.
3. ALL MATERIAL BOUNDARIES ARE INTERPOLATED FROM INVESTIGATION LOCATIONS, SITE CONDITIONS MAY VARY FROM INFERRED GEOLOGICAL BOUNDARIES.

revision

no.	description	drawn	approved	date
A	ORIGINAL ISSUE	AR	ML	26/07/16

Scale (metres) 1:750

drawn	AR / AW
approved	ML
date	26 / 07 / 16
scale	AS SHOWN
original size	A3

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client: DEXUS PROJECTS PTY LTD

project: STAGE 1 - PROPOSED VALIDATION PLAN
1-12 FREDRICK ST, ST LEONARDS, NSW

title: SECTION A-A'

project no: GEOTLCOV25513AC-R01 | figure no: FIGURE 3 | rev: A

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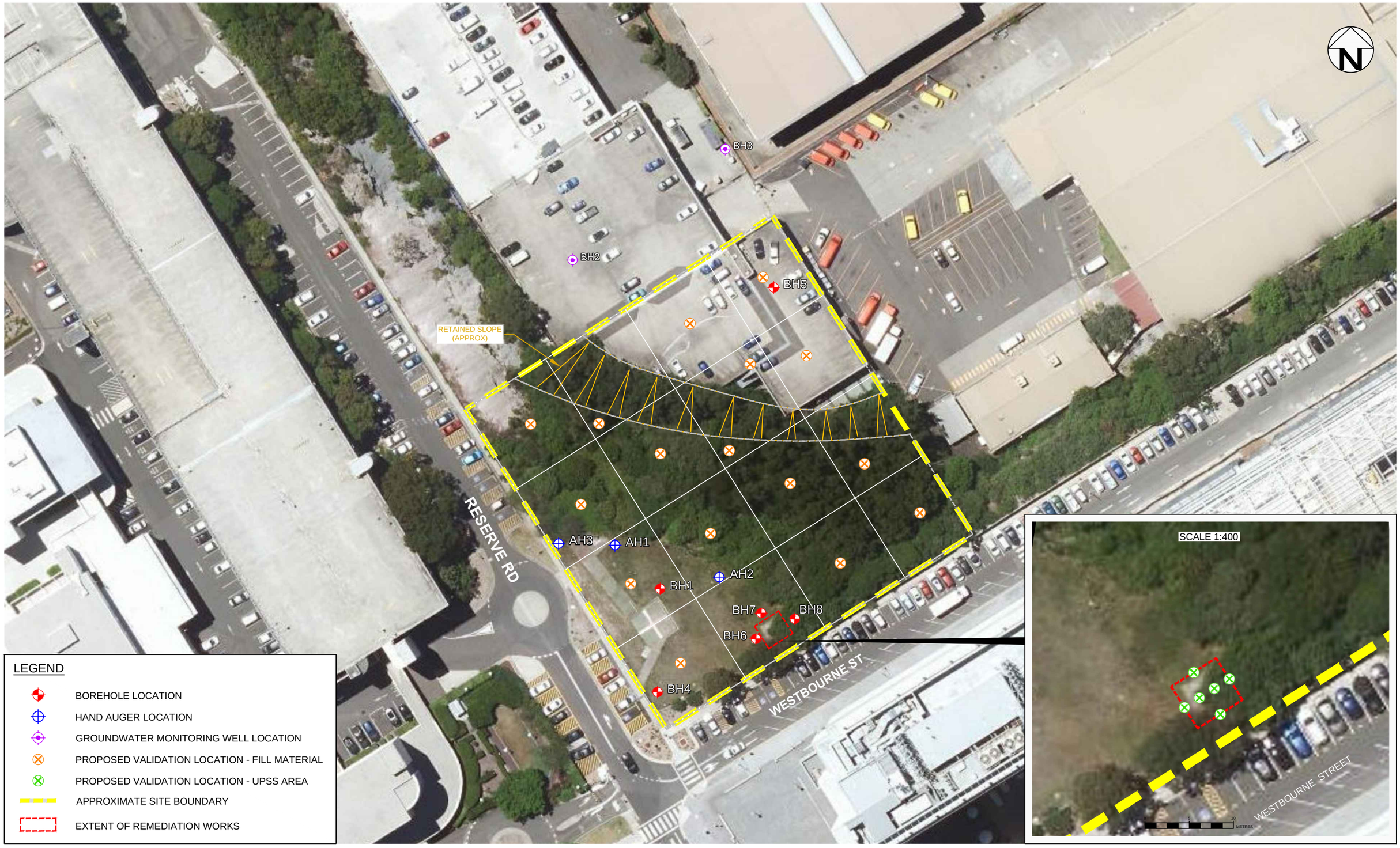

LEGEND

- BOREHOLE LOCATION
- HAND AUGER LOCATION
- GROUNDWATER MONITORING WELL LOCATION
- PROPOSED VALIDATION LOCATION - FILL MATERIAL
- PROPOSED VALIDATION LOCATION - UPSS AREA
- APPROXIMATE SITE BOUNDARY
- EXTENT OF REMEDIATION WORKS

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	AR	ML	26/07/16

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Scale (metres) 1:750

drawn	AR / AW
approved	ML
date	26 / 07 / 16
scale	AS SHOWN
original size	A3

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client: DEXUS PROJECTS PTY LTD

project: STAGE 1 - PROPOSED VALIDATION PLAN
1-12 FREDRICK ST, ST LEONARDS, NSW

title: EXTENT OF REMEDIATION WORKS
AND PROPOSED VALIDATION PLAN

project no: GEOTLCOV25513AC-R01 | figure no: FIGURE 4 | rev: A

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