Prepared for

John Holland CPB Ghella Joint Venture

Prepared by

Ramboll Australia Pty Ltd

Date

24 July 2020

Project Number

318000323-002

Audit Number

TO-024-2

SITE AUDIT REPORT CROWS NEST STATION BOX, PACIFIC HIGHWAY, CROWS NEST NSW



24 July 2020

John Holland CPB Ghella Joint Venture Attn.: Krissy Vajda Level 9, 50 Bridge Street Sydney NSW 2000

By email: krissy.vajda@sydneymetro2.com.au

Dear Krissy

SITE AUDIT REPORT - CROWS NEST STATION BOX, PACIFIC HIGHWAY, CROWS NEST NSW

I have pleasure in submitting the Site Audit Report for the subject site. The Site Audit Statement, produced in accordance with the NSW *Contaminated Land Management Act 1997*, is included as Appendix B of the Site Audit Report. The Audit was commissioned by John Holland CPB Ghella Joint Venture to assess the suitability of the site for its intended Metro train station (commercial/industrial) land use.

The Audit was initiated to comply with requirements of *Condition E67 of Infrastructure Approval, application SSI 15_7400*, approved by the Minister for Planning on 9 January 2017, and is therefore a statutory audit.

Thank you for giving me the opportunity to conduct this Audit. Please call me on 9954 8100 if you have any questions.

Yours faithfully, Ramboll Australia Pty Ltd

Tom Onus

EPA Accredited Site Auditor 1505

cc: NSW EPA – Statement only North Sydney Council Ramboll Australia Level 3, 100 Pacific Highway PO Box 560 North Sydney NSW 2060

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Ref 318000323-002

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APPENDICES

Appendix A

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Appendix B

Site Audit Statement

Appendix C

Interim Audit Advice

LIST OF ABBREVIATIONS

Measures

% per cent

μg/L Micrograms per Litre

ha Hectare km Kilometres m Metre

mAHD Metres Australian Height Datum mbgl Metres below ground level mg/kg Milligrams per Kilogram mg/L Milligrams per Litre

mm Millimetre ppm Parts Per Million

General

ACM Asbestos Containing Material

ADWG Australian Drinking Water Guidelines

AHD Australian Height Datum

ANZG Australian & New Zealand Guidelines

ASS Acid Sulphate Soil

AST Aboveground Storage Tank

ANZECC Australian and New Zealand Environment and Conservation Council

BaP Benzo(a)pyrene BGL Below Ground Level

BTEXN Benzene, Toluene, Ethylbenzene, Xylenes & Naphthalene

CLM Act NSW Contaminated Land Management Act 1997

COC Chain of Custody
Council North Sydney Council
CSM Conceptual Site Model
DGV Default Guideline Value
Douglas Partners Pty Ltd

DP Deposited Plan

DQI Data Quality Indicator
DQO Data Quality Objective
DSI Detailed Site Investigation
ENM Excavated Natural Material

EPA Environment Protection Authority (NSW)

EPL Environment Protection Licence
GIL Groundwater Investigation Level

GSW General Solid Waste
HIL Health Investigation Level
HSL Health Screening Level
HW Hazardous Waste
IAA Interim Audit Advice

JHCPBG JV John Holland CPB Ghella Joint Venture

LCS Laboratory Control Sample LEP Local Environment Plan

Metals As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg:

Mercury

ML Management Limits

MS Matrix Spike

NATA National Association of Testing Authorities

NC Not Calculated ND Not Detected

NEPM National Environment Protection Measure
NHMRC National Health and Medical Research Council

NL Non-Limiting
n Number of Samples
OCPs Organochlorine Pesticides

OEH Office of Environment and Heritage

OPPs Organophosphorus Pesticides
PAHs Polycyclic Aromatic Hydrocarbons

PCBs Polychlorinated Biphenyls

PFAS Per- and Poly-fluoroalkyl substances

pH A measure of acidity, hydrogen ion activity

PID Photoionisation Detector
PQL Practical Quantitation Limit
PSI Preliminary Site Investigation
QA/QC Quality Assurance/Quality Control

> ENVIRON Australia Pty Ltd Remediation Action Plan

RPD Relative Percent Difference RRE Resource Recovery Exemption **RRO** Resource Recovery Order RSL Regional Screening Level Site Audit Report SAR SAS Site Audit Statement Source-pathway-receptor SPR State Significant Infrastructure SSI Toxic Equivalence Quotient TEQ Total Petroleum Hydrocarbons **TPHs**

TV Trigger Value

RAP

TRHs

USEPA United States Environmental Protection Agency

Total Recoverable Hydrocarbons

UST Underground Storage Tank
VENM Virgin Excavated Natural Material
VOCs Volatile Organic Compounds

On tables is "not calculated", "no criteria" or "not applicable"

1. INTRODUCTION

1.1 Audit Details

A site contamination audit has been conducted in relation to the Crows Nest Station site of the Sydney Metro City and South West, which is located at Pacific Highway, Crows Nest.

The Audit was conducted to provide an independent review by an EPA Accredited Auditor of whether the land is suitable for any specified use or range of uses i.e. a "Site Audit" as defined in Section 4 (1) (b) (iii) of the NSW *Contaminated Land Management Act 1997* (the CLM Act).

A State Significant Infrastructure (SSI) development application (SSI 15_7400) was approved by the NSW Minister for Planning on 9 January 2017 for the construction and operation of a metro rail line, approximately 16.5 km long (of which approximately 15.5 km is located in underground rail tunnels) between Chatswood and Sydenham, including the construction of a tunnel under Sydney Harbour, links with the existing rail network, seven metro stations, and associated ancillary infrastructure. Condition E67 of the SSI development approval relates to contamination and requires a site audit as follows:

"If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with."

The Audit was initiated to comply with condition E67 of the SSI approval and is therefore a statutory audit. The site audit is also a requirement of Clause 10.14B of the Sydney Metro City & Southwest Tunnel and Station Excavation Works Design and Construction Deed (Contract No: 00013/11200).

Details of the Audit are:

Requested by: Caitlin Richards on behalf of John Holland CPB Ghella

Joint Venture (JHCPBG JV)

Request/Commencement Date: 5 October 2017

Auditor: Tom Onus

Accreditation No.: 1505

1.2 Project Background

As part of the Sydney Metro City and South West (Sydney Metro) Tunnel and Station Excavation (TSE) Works Package, a Remediation Action Plan (RAP) was developed to detail the work required to remediate impacted fill material during construction of the station box. The RAP was reviewed by the Auditor (see Section 1.3 for details) prior to remediation commencing.

The site comprises the 'excavation footprint' shown in blue on Attachment 1 (Appendix A). The surrounding 'Worksite Area' shown in red is not part of the site. Remediation was undertaken by excavation and off-site disposal of all fill material and natural soil/bedrock to an average depth of approximately 28.5 metres below ground level (mbgl) within the site. A bored pile wall with shotcrete over and between the spacings of 1.25 to 2.5 m was constructed along the site boundaries to facilitate the excavation. A water collection sump was located at the base of the excavation at each end of the station box.

1.3 Interim Audit Advice

Interim Audit Advice (IAA) was prepared by the Auditor in 2018 which provided an initial review of the suitability and appropriateness of a RAP, as well as a review of the previous investigations undertaken at the site. The IAA is provided in Appendix C. The reports reviewed for the IAA are listed in Section 1.4 below.

The IAA concluded that the proposed process for remediation of fill material was practical and that the site could be made suitable for the proposed land use if remediated in accordance with the RAP. The IAA noted that "At the completion of remediation of the site, a Section A Site Audit Statement and supporting Site Audit Report certifying suitability for the proposed use should be prepared."

The IAA is attached in Appendix C and is referenced throughout this Site Audit Report (SAR) where required, however, full details of the IAA are not repeated.

1.4 Scope of the Audit

The scope of work undertaken for the IAA included:

- Review of the following reports:
 - 'Report on Preliminary Site Investigation for Contamination, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, February 2018', report reference: Revision 0, dated 28 February 2018, prepared by Douglas Partners Pty Ltd (Douglas) (the PSI).
 - 'Report on Detailed Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, March 2018', report reference: Revision 1, dated 1 March 2018, prepared by Douglas (the DSI).
 - 'Remediation Action Plan, Sydney Metro City and South West Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, April 2018', report reference: Revision 1, dated 12 April 2018, prepared by Douglas (the RAP).
- A site visit by the Auditor on 6 March 2018.
- Discussions with JHCPBG JV, and with Douglas who undertook the investigations and prepared the RAP.

The PSI and DSI made references to previous reports by: Douglas and Golder Associates Pty Ltd (Golder); Aargus Pty Ltd (Aargus); and Coffey Corporate Services Pty Ltd (Coffey). The RAP made reference to a hydrogeological interpretive report prepared by Pells Sullivan Meynink (PSM). A summary of relevant information from these reports was included in the DP reports. DP also note (in the PSI report) that a number of previous reports pertaining to the site were made available to DP, however due to confidentiality agreements they could not be referenced. Copies of these reports were not provided to the Auditor for review.

The scope of work undertaken in competing the SAR included:

- Review of the following report:
 - 'Report on Validation of Remediation, Sydney Metro City and South West Tunnel and Station Excavation Works Package, Sydney Metro City and South West - Crows Nest Station, Pacific Highway, Crows Nest, NSW', report reference: Revision 0, dated 22 July 2020, prepared by Douglas (the Validation Report).

- Review of approximately 49 waste classification reports prepared by Douglas for material disposed from the site.
- Discussions with JHCPBG JV, and with Douglas who undertook the remediation and validation works.

2. SITE DETAILS

2.1 Location

The site is identified as the 'excavation footprint' (the site) for the station, shown in blue on Attachment 1 (Appendix A). The 'Worksite Area' shown in red on Attachment 1 surrounding the 'excavation footprint' has been excluded from the Douglas investigations and is not part of the site audit area. The site details are as follows:

Street address: 477 to 521 Pacific Highway, Hume Street, Clarke Lane and 14

Clarke Street, Crows Nest, NSW 2065

Identifier: Part Lot 100 and 101 DP747672

Part Lot A DP442804
Part Lot 1 DP1223850
Part Lot 1 and 2 DP575046
Part Lot 3 DP655677

Part Lot 4 DP1096359

Part Lot 10 DP1060663 (previously Strata Plan 71539)

Part Lot A and B DP374468
Part of Lot 61 and 62 DP1232021

Local Government: North Sydney Council

Owner: Transport for New South Wales

Site Area: Approximately 0.7 ha

The boundaries of the site comprise the walls of the excavation. The Worksite Area is bound by the Pacific Highway to the southwest, Oxley Street to the northwest, Commercial buildings to the southeast with Clarke Lane, Hume Street and Clarke Street to the east.

A survey plan of the site has been provided in Attachment 2 (Appendix A) and identifies the Site Audit boundary.

2.2 Zoning

The current zoning of the site is B4 Mixed Use under North Sydney Local Environment Plan (LEP) 2013.

2.3 Adjacent Uses

The site is located within an area of commercial and high-density residential land use. The surrounding site use includes:

North: the Worksite Area, then Oxley Street and high rise mixed-use building beyond.

East: the Worksite Area, then Clarke Lane and high rise mixed-use buildings beyond.

South: the Worksite Area, then Pacific Highway and commercial buildings located further to the south.

West: the Worksite Area, then Pacific Highway and commercial buildings located further to the west.

Pacific Highway is located on a ridge line with slopes to the north and east in the vicinity of the site. Douglas identified the closest sensitive ecological receptor for groundwater as an unnamed creek which drained into Flat Rock Creek located approximately 1.4 km to the northeast. Flat Rock Creek drains into Long Bay located approximately 2 km further to the east and northeast of the site.

The PSI identified a number of commercial/ industrial land uses within close proximity (100 m) to the site including former services stations, dry cleaners, vehicle service centres, printing operations, fabrication and manufacturing. A former dry cleaner was located approximately 50 m to the southeast. The business directory search reported that these facilities were operational in the 1950s to 1970s.

A search of the NSW EPA public records did not identify any sites listed as contaminated in the immediate vicinity of the subject site.

2.4 Site Condition

2.4.1 Pre-Remediation

Douglas inspected the site for the PSI on 20 September 2017 and noted the following:

- Demolition of buildings in the north and central sections was underway. Some of the former buildings in the south section were still intact. Basement levels were noted beneath two buildings.
- The ground surface over the majority of the site was paved with concrete. It was exposed in some sections where demolition was underway.
- Inspection of the basement at 521 Pacific Highway (by Douglas on 14 June 2017) identified an old fuel fill point on the driveway entrance adjacent to Oxley Street. A second fill point was located on the property boundary at Clarke Lane. A concrete patch was located in the north section of the basement suggesting the likely location of two former Underground Fuel Storage Tanks (USTs) and associated fuel lines. Groundwater monitoring wells were located in the vicinity of the concrete patch.
- The site was surrounded by high-rise residential apartments and commercial land use.

Douglas inspected the site during the DSI between 1 November and 12 December 2017 and noted the following:

- Majority of the former buildings had been demolished. Demolition waste had been stockpiled
 in some sections of the site. Douglas observed potential asbestos containing material (ACM)
 in some of the stockpiles. The stockpiles were being removed from the site for off-site
 disposal.
- ACM previously detected by Coffey at the surface on 479 Pacific Highway was inspected by Douglas. Douglas noted that the ACM was buried under a geo-fabric layer and backfilled with road-base to minimise exposure. No ACM was detected at the surface by Douglas.
- Shale/clay had been imported onto the site and was being used to fill the former basement at 521 Pacific Highway.

During the Auditor's site visit on 6 March 2018, the site was an active construction site, with the following features noted:

- The majority of the site surface had been cleared of slabs and pavements. Exposed soil was visible over the majority of the site. A concrete slab of a former basement was exposed in the south section.
- Imported material (DGB and ENM) had been placed on the surface for the construction of temporary piling platforms. Piling was underway in the north section.
- Temporary/ demountable sheds were located in the north section of the main site and on 14 Clarke Street.
- An electrical substation was located adjacent to the eastern boundary (Attachment 1, Appendix A). Site personnel reported that the substation was to be decommissioned and the footprint remediated with appropriate validation sampling.

- A gatic cover was located off-site in a pedestrian walkway along Oxley Street, adjacent to the northern site boundary. The gatic appeared to be a former fuel dip/fill point associated with the fuel infrastructure at 521 Pacific Highway.
- A large stockpile of fill soil was located in the south section awaiting off-site disposal. The stockpile occupied a large section of 479 Pacific Highway limiting visibility of the surface fill where the ACM was formerly detected by Coffey.

2.4.2 Post-Remediation

Douglas noted in the Validation Report that the site had been excavated to an average depth of 28.5 mbgl (approximately 33 m at the southern end, 28 m at Hume Street and 24 m at the northern end), no other observations were provided by Douglas.

2.5 Proposed Development

The proposed development includes the construction of a new below ground station, access road, transport interchange and upgrades to pedestrian access. The depth of excavation for the station box ranges from approximately 24 metres below ground level (mbgl) in the northern end to approximately 33 mbgl in the southern end. The base of the structure comprises approximately 250 mm thick concrete slabs and the walls include bored piles with shotcrete between the piles. Two water collection sumps are located at the base of the excavation, one at each end of the station box.

For the purposes of this audit, the 'commercial/ industrial' land use scenario will be assumed.

3. SITE HISTORY

The IAA provided a summary of the site history. The IAA noted that the PSI provided a summary of the site history based on a review of historical business listings, historical title deeds, aerial photographs, NSW EPA records and Section 149 (now termed Section 10.7) certificates. Douglas reviewed NSW SafeWork records as part of the DSI. The site history from the IAA is summarised as follows.

The site was developed and used for commercial and residential purposes from 1900. Clarke Lane and Hume Street were established prior to 1930. The commercial uses mainly included a timber yard (north section), electrical motors dealership, motor vehicle distribution, mechanical workshop, parking, toy manufacturing, offices and retail, tyre retail and fitting, fuel merchants, manufacturing of anti-corrosion compounds, rustproofing, plastic coating, and sale of concrete products.

Douglas noted that based on the review of the site history, previous investigation reports and SafeWork records, two USTs, bowsers and associated fuel lines were installed at 521 Pacific Highway (north section of the site) associated with the former use as a motor vehicle distributor. Douglas concluded that the USTs and associated fuel infrastructure were removed in 2015. The DSI indicated that Coffey identified ACM at the surface on 479 and 477 Pacific Highway which was subsequently buried on site.

A review of the NSW EPA public records did not find any sites notified as contaminated to the EPA. Based on the site location and history, potential contamination could have impacted the site from on-site and/or off-site sources.

3.1 Auditor's Opinion

In the Auditor's opinion, the site history indicates past activities that may have resulted in site contamination, including fuel storage, mechanical workshops, and various manufacturing facilities. Details of site operations were not provided, such as processes, chemical use and storage locations. Validation of the UST removal was not provided and is considered a data gap. The Auditor considers that the site history is broadly understood and adequate for identification of contaminants of concern (Section 4) and remediation of the site (Section 11).

4. CONTAMINANTS OF CONCERN

As outlined in the IAA, the Douglas PSI and DSI provided a list of contaminants of concern and potentially contaminating activities. These have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern

Area	Activity	Potential Contaminants
Entire Site	Fill and surface soil imported from unknown sources. Deep fill can be expected in the vicinity of the USTs. Demolition of former buildings containing hazardous materials. ACM has been previously identified at 479 Pacific Highway. Spills and leakage of chemicals associated with historical commercial/ industrial land use.	Metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylenes & naphthalene (BTEXN), volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs), polychlorinated biphenyls (PCBs), phenols, lead (from paint) and asbestos.
North Section	Former land use of north section as a timber yard. Activities may have included treatment of timber.	Metals (arsenic, boron, copper, chromium), phenols including creosols and PAHs.
521 Pacific Highway	Former land use as a vehicle service centre. Two former USTs, associated fuel infrastructure and wastewater pit.	Petroleum hydrocarbons (BTEX, TPH), PAHs, VOCs and phenols.
511 Pacific Highway (SP71539)	Electrical substation on the eastern site boundary.	PCBs and petroleum hydrocarbons (TPH).
503 Pacific Highway (Lot 3 DP655677)	Former land use for rustproofing. Spills and leakage of chemicals associated with the land use.	Per- and poly-fluoroalkyl substances (PFAS).
501 Pacific Highway (Lot 1 DP575046)	Former land use as a mechanical workshop. It is not known if USTs were associated with this land use.	Petroleum hydrocarbons (BTEX, TPH), PAHs, VOCs and lead.
Off-Site Sources	Migration of potentially contaminated groundwater from previous off-site industrial/ commercial activities.	Metals, Petroleum hydrocarbons (BTEX, TPH) and VOCs.

The DSI stated that based on the site observations and review of previous investigation reports, the two USTs and associated fuel infrastructure at 521 Pacific Highway were removed in 2015. The RAP states that JHCPBG JV undertook a subsurface inspection in the area of the former USTs. A trench was excavated to a depth of 1.5 mbgl to locate the USTs. Sand backfill was located within the excavation confirming that the USTs had been removed.

4.1 Auditor's Opinion

The Auditor considers that the analyte list used by Douglas adequately reflects the site history and condition.

5. STRATIGRAPHY AND HYDROGEOLOGY

5.1 Stratigraphy

Douglas reviewed geological maps and reported that the site is underlain by Ashfield Shale which comprises black to dark grey shale and laminite.

The sub-surface profile of the site encountered during the Douglas DSI prior to remediation is summarised by the Auditor in Table 5.1.

Table 5.1: Stratigraphy

Depth (mbgl)	Subsurface Profile
0.0 - 0.15	Concrete pavements/ slab underlain by rubble and gravel roadbase. Suspected ACM was detected at the base of the slab in CNTP11 and CNTP06.
0.18 - 1.8	Fill material comprising clay and sand with inclusions of demolition rubble (brick, tile, timber, metal, concrete), slag, ash, charcoal and bitumen. Ash/ coal was detected in 5 sampling locations. A fragment of ACM was detected in test pit CNTP11 between 0 mbgl and 0.15 mbgl.
0.3 - 10	Natural clay and silty clay.
1.45 to termination depth (10.5)	Weathered shale bedrock.

mbgl - metres below ground level

The subsurface profile comprised relatively shallow fill underlain by natural clay soil and shale bedrock.

Douglas indicated that the site is located within an area of no known occurrence of acid sulfate soils (ASS) and is not close to an area of associated risk of ASS.

Following remediation of the site (discussed in Section 11), fill material and natural soil/rock were removed from the entire site area to a depth of approximately 24-33 mbgl.

5.2 Hydrogeology

The PSI undertook a search of the groundwater information database maintained by the NSW Government and did not identified any registered groundwater bores within a 0.5 km radius of the site. The PSI concluded that based on the topography and the information from the previous investigations, groundwater is anticipated to flow to the north and northeast. DP identified the closest sensitive ecological receptor for groundwater to be Flat Rock Creek located approximately 1.4 km to the northeast. The creek drains into Long Bay located approximately 2 km to the east of the site. Excess surface water run-off is anticipated to flow into the local stormwater network.

As part of the DSI, four groundwater monitoring wells were installed on the site (Attachment 3, Appendix A). Groundwater seepage was noted during drilling at depths between approximately 5.4 mbgl (CNBH09) and 8.9 mbgl (CNMW15). Groundwater observations and sampling was undertaken as part of the DSI on 13 December 2017. Depth to groundwater in the monitoring wells was recorded between 1.97 mbgl to 4.77 mbgl. The DSI stated that based on groundwater levels and the site topography, the groundwater is anticipated to flow to the north and northeast.

The DSI included field records of groundwater parameters recorded during sampling. They indicated that the pH was 4.3 to 5.39, dissolved oxygen (DO) was 0.77 to 4.64 mg/L, redox was 56 to 229 mV, and electrical conductivity (EC) was 258 to 459 mS/cm.

The RAP includes a summary of the PSM (2018) Hydrogeological Interpretive Report, which modelled the groundwater seepage rates expected during and post construction. Details of the modelling and the results are included in the Hydrogeological Interpretive Report. Douglas summarised the findings as follows:

- Maximum modelled seepage rate during construction was 162 kL/day;
- Modelled steady state seepage rate post construction was 74 kL/day;
- Residual soil and Class IV and V rocks will be the biggest source of seepage/inflows;
- The predicted seepage rates were less than the rates outlined in the Scope of Work and Technical Criteria (SWTC) prepared for the design and construction of the station and tunnel;
- The modelled zone of capture for the first 10 years would extend to approximately 300 m from the site;
- There is limited capacity for attenuation of contaminants mobile in minor structures like joints and bedding plane partings; and
- PSM conclude that "no significant anthropogenic contamination issues are expected to influence groundwater quality".

The Auditor has not reviewed the PSM (2018) Hydrogeological Interpretive Report, however, considers that the primary long-term source of seepage/ inflows is likely to be seepage from residual soils and bedrock. This is based on the stratigraphy and hydrogeology encountered during the DSI.

5.3 Auditor's Opinion

The Auditor considers that the site stratigraphy and hydrogeology are sufficiently well known for the purpose of the Audit.

6. EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

An evaluation of the overall quality of the data obtained in previous investigations (DSI) at the site was presented in the IAA (Appendix C). In considering the data as a whole the Auditor concluded in the IAA that:

- The data are likely to be representative of the overall site conditions, including fill, natural soil and groundwater. Results for volatile organics in soil samples collected by solid stem auger may underestimate actual concentrations.
- The investigation data are considered to be complete.
- There is a high degree of confidence that the data are comparable for each sampling and analytical event.
- The laboratories provided adequate information to conclude that the data are of sufficient precision.
- There is a high degree of confidence that the data are accurate, however it was noted that the DSI used o-rings in monitoring wells and Decon 90 for decontamination of field equipment. These substances can contain PFAS and may be a potential source of PFAS detected at the site. The accuracy of the PFAS analytical results is considered to be low.

An evaluation of the overall quality of the data obtained during remediation and validation is presented in Section 11.3.

7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has adopted Tier 1 criteria from National Environmental Protection Council (NEPC) National Environmental Protection (Assessment of Site Contamination) Measure 1999, as Amended 2013 (NEPM, 2013). Other guidance has been adopted where NEPM (2013) is not applicable or criteria are not provided. Based on the proposed development (excavation and construction of a train station), the human health criteria for 'commercial/industrial' and ecological criteria appropriate for 'commercial/industrial' were adopted.

7.1 Soil Assessment Criteria

7.1.1 Human Health Assessment Criteria

The Auditor has adopted human health assessment criteria from the following sources:

- NEPM (2013) Health Investigation Levels (HILs) for 'Commercial/Industrial' (HIL D) land use.
- NEPM (2013) Health Screening Levels (HSLs) for 'Commercial/Industrial' (HSL D) land use. The HSLs assumed a sand soil type. Depth to source adopted was <1 m as an initial screen.
- NEPM (2013) Management Limits (MLs) for petroleum hydrocarbons for 'Commercial/Industrial' land use and assuming coarse soil texture.
- The presence/absence of asbestos.
- Friebel & Nadebaum (2011) HSLs for direct contact for all land use categories, and vapour inhalation/direct contact pathways for intrusive maintenance workers.
- HEPA (2020) PFAS National Environmental Management Plan Version 2.0. PFOS/PFHxS and PFOA soil criteria developed for 'Commercial/Industrial' land use. These criteria assumed 80% background exposure, i.e. 20% of the tolerable daily intake recommended by Food Standards Australia New Zealand (2017). The PFOS/PFHxS criteria is compared to the sum of the PFOS and PFHxS concentrations.

7.1.2 Ecological Assessment Criteria

The Auditor has not adopted ecological soil assessment criteria as soil from the site was excavated to a depth of 24-33 mbgl and disposed off-site during development of the site. Ecological soil criteria are applicable to depths of 2 mbgl and are therefore not applicable for the remaining natural soil.

7.1.3 Soil Aesthetic Considerations

The Auditor has considered the need for soil remediation based on 'aesthetic' contamination as outlined in *Section 3.6 Aesthetic Considerations* of NEPM (2013) Schedule B1, which acknowledges that there are no chemical-specific numerical aesthetic guidelines. Instead, site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

7.1.4 Imported Fill

Imported fill has been assessed in relation to attributes expected of virgin excavated natural material (VENM). The NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste* defines VENM as "...natural material (such as clay, gravel, sand, soil or rock fines):

- 'that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities
- 'that does not contain sulphidic ores or soils, or any other waste, and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice in the NSW Government Gazette."

On this basis, the Auditor considers that for soil to be classified as VENM, the following criteria generally apply:

- Organic compounds (including petroleum hydrocarbons, PAHs, OCPs, PCBs and phenols) should be less than the PQLs.
- Inorganic compounds should be consistent with background concentrations.
- The material should not contain or comprise actual or potential acid sulphate soil.

Imported material was assessed against the requirements of the applicable resource recovery order (RRO) and resource recovery exemption (RRE) issued by the EPA under clause 93 of the *Protection of the Environment Operations (Waste) Regulation 2014*.

7.2 Groundwater Assessment Criteria

7.2.1 Human Health Assessment Criteria

NEPM (2013) HSLs are not appropriate for assessing risks from groundwater to human health at the site due to the potential for direct contact. The Auditor has adopted human health assessment criteria from the following sources to assess risk from direct contact, inhalation and incidental ingestion:

- NHMRC (2011) National Water Quality Management Strategy, Australian Drinking-Water Guidelines (ADWG), Version 3.5 Updated August 2018.
- HEPA (2020) *PFAS National Environmental Management Plan* for drinking water and recreational water criteria for PFOS/PFHxS and PFOA.
- USEPA Regional Screening Levels (RSLs) Residential Tap Water Criteria. Online database of
 assessment criteria that are current as of May 2020. Tap water assessment criteria derived
 for carcinogenic compounds were multiplied by a factor of 10 to adjust the target cancer risk
 level from 1:1,000,000 to 1:100,000 to be consistent with Australia's recommended target
 cancer risk level. For some chemicals, where a criteria has been derived using both noncancer and cancer toxicity data, the lower criteria was adopted.
- WHO (2017) Guidelines for Drinking-water Quality, Fourth Edition, incorporating the 1st addendum.
- WHO (2008) Petroleum Products in Drinking-water. Background document of WHO Guidelines
 for Drinking-water Quality (adopted in absence of health-based criteria in WHO (2017)
 because the taste and odour of petroleum products will in most cases be detectable at
 concentrations below those of health concern).

7.2.2 Ecological Assessment Criteria

The Auditor has adopted ecological groundwater assessment criteria from the following sources:

- ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.
 Australian and New Zealand Governments and Australian state and territory governments,
 Canberra ACT, Australia (www.waterquality.gov.au/anz-guidelines). Criteria for freshwater water and 95% level of protection were adopted.
- HEPA (2020) PFOS/PFHxS and PFOA 'freshwater' criteria developed for the protection of 95% species protection for slightly to moderately disturbed systems.

7.3 Auditor's Opinion

Groundwater monitoring wells were screened across different soil profiles (fill, clay and shale). Groundwater identified in the wells may therefore relate to perched groundwater conditions. Extraction and use of groundwater as a resource is unlikely given that the yield in the wells was low, no registered bores were located within 0.5 km of the site, and there is a reticulated water

supply for the area. Assessment of direct contact and consumption of groundwater is therefore not considered to be required.

The environmental quality criteria referenced by the Auditor are consistent with those adopted by Douglas and in the IAA with the exception of the following:

- The DSI does not mention assessment of 'aesthetic' contamination as outlined in the NEPM (2013). However, the report results discuss potential aesthetic issues detected during sampling.
- The DSI adopted the OEH Science Draft Screening Criteria (May 2017) for PFAS in soil for commercial/ industrial land use. The report adopted the recreational water criteria (supported by OEH Contaminants and Risk) for assessing PFAS in groundwater. The report noted that the PFAS guidelines were yet to be finalised as the study of PFAS in the environment is an emerging field. It is unlikely that the groundwater at the site will be used for recreational purposes, the criteria for freshwater aquatic ecosystem outlined in the draft ANZECC is considered more appropriate. The RAP and IAA adopted the PFAS NEMP (January 2018) quidelines which has since been updated to PFAS NEMP Version 2.0 (January 2020).
- The DSI and RAP adopted 'hardness modified trigger values' (HMTV) for the assessment of individual metals in GILs. The hardness conditions of the receiving water body have not been assessed to justify the use of HMTV.
- The DSI and IAA adopted GILs listed in NEPM (2013) for protection of aquatic ecosystems referenced in ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. The 95% freshwater level of protection was adopted. The ANZG (2018) DGVs for freshwater and 95% level of protection adopted by the Auditor are largely based on trigger values (TVs) from ANZECC (2000).

Given the results obtained, the Auditor considers that these discrepancies do not affect the overall conclusions reached by Douglas and the Auditor.

8. EVALUATION OF SOIL RESULTS

The soil analytical results from the investigations (DSI) undertaken prior to the preparation of the RAP were reviewed by the Auditor and presented in the IAA (Appendix C). In assessing the results reviewed in the IAA, the Auditor made the following observations:

- Fill samples from CNTP17 and CNTP12 detected elevated concentrations of contaminants above the health screening criteria. The source of these contaminants can be attributed to the following:
 - Fill sample CNTP17 (0.4-0.5) detected lead exceeding the human health criteria. The underlying natural soil sample CNTP17 (0.8-0.9) was not contaminated indicating that the lead is confined to the fill profile which contained inclusions of charcoal, slag and coal.
 - Fill sample CNTP12 (0.4-0.45) detected B(a)P TEQ exceeding the human health criteria. Fill sample CNTP12 (0.5-0.55) detected B(a)P TEQ and TRH C_{16} - C_{34} . The fill at this location contained a strong hydrocarbon odour and bituminous material. A sample of the material was collected for laboratory analysis, which did not identify coal tar. The contamination appears to be confined to the fill profile.
 - The DSI concluded that the exceedances were not hotspots as all of the results were below 250% of the HSLs.
- Metals, heavy fraction TRH, individual PAHs, OCPs, PCBs and PFAS were detected in the fill samples at concentrations below the screening criteria.
- Asbestos was not detected in soil samples analysed or the one fragment of cement sheet analysed. However, a previous investigation by Coffey identified ACM at the surface on 479 Pacific Highway. Douglas reported that this ACM impacted material was buried onsite.
- Marginal detections of metals, PAHs and PFAS below the screening criteria were detected in some natural soil samples. The source of these contaminants can be attributed to the following:
 - Slight detections of PAHs in the natural soil in CNBH04 could be attributed to the sampling methodology used by Douglas (sampling from spiral augers) that may have resulted in cross contamination.
 - Detections of PFAS in the natural soil in CNTP11, CNTP12-1 and CNMW13 could be attributed to a number of sources such as leaching from the overlying fill material, samples obtained using spiral augers, ubiquitous nature of the contaminant, and/or contamination from field practices (discussed in Section 6 of IAA).
 - The majority of the metal results are consistent with background concentrations except for chromium which was above typical background levels (12-21 mg/kg). Chromium was detected in all of the natural soil samples at fairly consistent concentrations and therefore could indicate higher background concentrations at the site.
 - Strong hydrocarbon odour and high PID readings (270-370 ppm) were noted in the natural clay in CNMW13 at depths of 2.5 mbgl to 2.9 mbgl. A clay sample from this depth (2.5-2.7 mbgl) was analysed for TRH and BETX. All results were below the laboratory detection limits.

8.1 Auditor's Opinion

The soil analytical results obtained during the DSI are consistent with the site history and field observations. The results indicate the fill to be locally impacted by lead, B(a)P, TRH C_{16} - C_{34} and ACM. More widespread contamination from ACM is possible. Low level contamination of fill and

underlying natural soil was identified, however this was at concentrations less than the assessment criteria.

In the Auditor's opinion, the soil analytical results reviewed in the IAA indicate that contamination was present at the site and remediation was required. Remediation of fill material was undertaken and is discussed further in Section 11.

9. EVALUATION OF GROUNDWATER RESULTS

Groundwater monitoring was undertaken during the DSI. Douglas installed four monitoring wells at the site and undertook one groundwater monitoring event as part of the DSI. The groundwater analytical results from the DSI, undertaken prior to the preparation of the RAP, were reviewed by the Auditor in preparation of the IAA (Appendix C). In assessing the results reviewed in the IAA, the Auditor made the following observations:

- The groundwater analytical results for the majority of the analytes were below the human health and ecological screening criteria.
- Elevated cadmium, copper and zinc concentrations were detected in the groundwater samples. The DSI concluded that the heavy metals can be attributed to diffuse urban-sourced background levels and are not from a site-specific source.
- Marginally elevated concentrations of Aldrin and Dieldrin above the ecological screening criteria were detected in groundwater. Douglas stated that fill soils from CNTP16 and CNTP18 (up-gradient) detected Aldrin and Dieldrin and could be a potential source of contamination.
- The identification of volatile TRH F1 fraction and xylene in groundwater sample CNMW13 indicates that petroleum hydrocarbons are present at low concentrations. The DSI concluded that the source of hydrocarbons is most likely associated with the former USTs and site use as a mechanic. Considering the depth of excavation, site receptors could come into contact with contaminated groundwater. The WHO (2008) criteria were used to assess risk of exposure by direct contact. The TRH F1 concentration was below the assessment criteria.
- Low concentrations of individual VOCs (1,2,4-trimethylbenzene, chloroform, cyclohexane, isopropylbenzene and secbutylbenzene) were detected in groundwater. The concentrations were below the ecological and human health screening criteria. The DSI concluded that the source of VOCs could be from a fuel source and/or from solvent use. The presence of chloroform could be from chlorination of potable water.
- The DSI concluded that the potential on-site sources will be removed during site works and that groundwater treatment requirements will be considered for groundwater disposal during the construction phase.

The IAA concluded that "the analytical results indicate the presence of low level contamination of groundwater at concentrations less than the adopted human health screening criteria. Marginal exceedances of ecological screening criteria were reported for metals (cadmium, copper and zinc) and OCPs (Aldrin and Dieldrin). Ecological receptors will not be present onsite and the closest surface water receptor was 1.4 km to the northeast. Low level groundwater contamination at the site is therefore not considered to present a risk human health and ecological receptors. Further investigation or remediation of groundwater is therefore not considered to be required".

9.1 Auditor's Opinion

Groundwater assessments undertaken at the site have not identified significant groundwater contamination. The Auditor is satisfied that further investigation or remediation of groundwater is not required to demonstrate suitability of the site for the proposed use.

10. EVALUATION OF CONCEPTUAL SITE MODEL

A conceptual site model (CSM) is a representation of the source, pathway and receptor linkages at a site. Douglas developed a CSM and used it iteratively throughout the site assessment to inform decisions around investigation and remediation requirements. The CSM was initially developed following the preliminary investigations and included in the RAP and was reviewed by the Auditor in the IAA. Table 10.1 provides the Auditors review of the final CSM in the IAA.

Table 10.1: Review of the Conceptual Site Model

Element of CSM	Consultant	Auditor Opinion
Contaminant source and mechanism	Contaminated fill material containing lead, B(a)P, TRH C ₁₆ -C ₃₄ and ACM, impacted by former land use or imported to the site from unknown sources. Detections of TRH, VOCs and OCPs in groundwater. Unexpected contamination finds during excavation.	Source and mechanism for soil considered appropriate. The source of TRH and VOCs in groundwater has not been identified. TRH and xylene are likely associated with previously removed USTs. The source of the VOCs may be related to former onsite or off-site land use. The low concentrations identified on the site are not considered to present a potential risk to human health or the environment.
Affected media	Fill material and groundwater.	Agree fill is the primary affected media. Low level contamination was also reported in natural soil. Groundwater concentrations did not exceed adopted human health and ecological screening criteria. Groundwater is therefore not considered to be affected media.
Receptor identification	Future site users of the rail corridor, construction workers, adjacent land users, surface water receptors, groundwater and in-ground built structures.	Fill material will be entirely removed from the site during remediation. The only relevant receptor is therefore considered to be construction workers.
Exposure pathways	Inhalation of dust and vapours, lateral migration of groundwater, direct contact.	Inhalation, direct contact and incidental ingestion are considered to be complete exposure pathways during construction. No other complete exposure pathways are considered to be present on the site based on the investigations undertaken, the remediation proposed, and the proposed development.
Presence of preferential pathways for contaminant movement	Trenches for buried services may act as potential migratory pathways.	Not considered relevant for fill material removed during remediation. Preferential pathways for groundwater and vapour migration are not relevant as contamination representing a risk to human health or the environment has not been identified.
Potentially complete source-pathway- receptor (SPR) linkages requiring remediation or management	The pre-remediation CSM did not clearly specify potentially complete SPR linkages.	Potentially complete SPR linkages were to be largely addressed during excavation of the station box.
Evaluation of data gaps	The RAP states that the contaminants in groundwater will require treatment prior to disposal. However, treatment options were not addressed in the RAP.	No potentially significant data gaps were identified during review of the PSI, DSI and RAP. The lack of validation for the UST removal will be addressed through the planned excavation works.

The Auditor concluded in the IAA that the CSM presented was an adequate representation of the contamination at the site.

10.1 Auditor's Opinion

The Auditor is of the opinion that the CSM was a reasonable representation of the contamination at the site prior to remediation during the station box excavation.

11. EVALUATION OF REMEDIATION

11.1 Remediation Required

Douglas determined remedial requirements based on review of investigation results against screening criteria and consideration of aesthetic issues. The RAP considered the horizontal extent of the remediation to be the excavation footprint, and the vertical extent to be the depth of contaminated or potentially contaminated soils, or the base of the excavation (whichever occurs first). Douglas anticipated that all contaminated or potentially contaminated soils within the excavation footprint will be removed as part of the bulk excavation works required for the development. Excavation and off-site reuse or disposal of the soil was therefore considered in the RAP by Douglas to be the only practicable remediation strategy.

An evaluation of the RAP was undertaken by the Auditor as part of the IAA (Appendix C), which included a comparison with the requirements of OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* (current at the time of the IAA). The RAP was found to address the required information, and the Auditor concluded that the remediation approach was adequate to address contaminated fill material during redevelopment of the site through excavation and off-site disposal of contaminated fill material and natural soil and successful validation.

11.2 Remedial Works Undertaken

General excavation was carried out by State Roads Construction (SRC) and JC Excavations (JC) who supplied the operator and equipment. The management of SRC and JC was carried out by the principal contractor JHCPBG JV. Asbestos removal and load out of all asbestos impacted material was undertaken by Absolute Environmental Services Pty Ltd with ADE Consulting Group Pty Ltd (ADE) providing occupational hygiene services (air monitoring and surface clearances). Environmental consulting was provided by Douglas between January 2018 and July 2019.

Remediation/bulk earthworks were undertaken following demolition of site buildings and structures. The defined waste classification extents were progressively excavated and disposed offsite in accordance with their assigned classification. Unexpected finds of coal tar and a UST were encountered either following removal of concrete and/or during the bulk earthworks.

The Validation Report indicated that the remedial methodologies adopted for the unexpected finds were excavation and off-site disposal.

11.3 Validation Activities

11.3.1 Validation of Different Waste Excavations

Due to the order of the station box excavation program, the limited time available and the limited onsite area for stockpiling, Douglas indicated that a high density of test pits were excavated to delineate the different waste streams as opposed to obtaining post-excavation validation samples. Douglas indicated that the delineation samples were used to confirm the extent of a given waste classification prior to removal. Douglas noted that this approach was a deviation to the requirements of the RAP.

11.3.2 Validation of Asbestos Fill Excavations

The Validation Report indicates that asbestos clearances were provided (by others) following removal of materials containing asbestos. Documentation provided in the Validation Report included asbestos clearance documentation prepared by ADE which appeared to be documenting asbestos clearance for exposed surface soils following removal of asbestos impacted soils and asbestos conduits encountered during excavation works.

11.3.3 Validation of Unexpected Finds

The Validation Report indicates that a visual clearance following removal of coal tar impacted soils from the southern part of the site (495 Pacific Highway) was provided by others. The

documentation provided in the Validation Report included a visual clearance document prepared by Hibbs and Associates following removal. The clearance documentation indicates that no visible coal tar containing soil was observed on the ground surface and that the excavated material was stockpiled within a designated area lined with geofabric for disposal at a later time to a landfill as hazardous waste.

The Validation Report indicates that an UST was encountered during bulk earthworks along the western boundary near the 501 and 503 Pacific Highway property boundaries. Douglas indicated that the progression of bulk excavation works at the time removed the eastern and northern walls. Upon discovery the sand backfill from around the UST was excavated and stockpiled. Douglas reported that approximately 0.5 m³ of material was stockpiled and obtained three primary samples. Due to the small volume of the stockpile and the consistency of the validation sample results collected at the same time, only one of the samples was submitted for analysis.

Douglas indicated that no disposal records were provided however it was understood that the UST was disposed off-site in a skip bin and that there was no remnant liquid within the UST. Following removal of the tank, Douglas did not observe any staining or note any odours in the base or walls of the UST pit. A calibrated PID was used by Douglas to screen the exposed excavation faces and samples for the presence of volatiles with PID readings <1 ppm. One soil sample was obtained immediately below the UST location from the base of the excavation, one sample from the mid-point of the southern and western walls and one sample from the base of the excavation at the presumed locations of the northern and eastern tank pit walls. The UST and sample locations are presented in Attachment 4 (Appendix A). Samples were analysed for VOC, TRH, BTEX, PAH, total phenols and lead. Laboratory results for VOC, TRH, BTEX and PAH were less than the PQL. Lead concentrations ranged between 16 mg/kg and 22 mg/kg and are considered to be within background ranges for natural soil.

11.3.4 Evaluation of Validation QA/QC

Validation data generally included walkover inspections and observation including clearance documentation. Analytical validation data for soils was also obtained following removal of the unexpected UST find discussed in Section 11.3.3. Based on the QA/QC tables (Table 6.1 and 6.2 in IAA) used by the Auditor to assess previous data in the IAA attached in Appendix C, the Auditor has assessed the overall quality of the data presented in the Validation Report. In considering the data as a whole, the Auditor concludes that:

- The data from the DGI and validation are likely to be representative of the overall soil conditions.
- The data is considered to be adequately complete.
- There is a high degree of confidence that data is comparable for each sampling and analytical event.
- The laboratories provided sufficient information to conclude that data is of sufficient precision.
- There is a high degree of confidence that data is accurate.

11.3.5 Imported Material

The Validation Report indicates that approximately $8,300 \text{ m}^3$ of material was temporarily imported to the site to allow for construction activities that formed part of the excavation works. The materials imported are summarised in Table 11.1.

Table 11.1: Imported Fill

Source	Volume Imported (m³)	Material Type	Supporting Documentation
WestConnex M5 Tunnel (Arncliffe)	6,000	Light grey silt with some grey mottled red clay with shale /siltstone fragments	VENM Classification Report prepared by ADE (April 2017). ADE obtained 15 samples from a tunnel shaft noted to be approximately 40 mbgl. ADE described the material as in situ rock materials generally consisting of grey to brown sandstone. Samples were analysed for a range of potential contaminants including metals, TRH, BTEX, PAHs, PCBs, OCP, OPP, total phenols, PFAS, ammonia and asbestos. Concentrations of organic analytes were below the PQLs, asbestos was not detected and metals concentrations were low and consistent with expectations for natural soils/bedrock. Three groundwater samples were also obtained by ADE from fractures along the exposed sandstone face. Groundwater samples were analysed for ammonia, nitrate and nitrite. The laboratory results were not provided however ADE indicated that a slight detection of nitrate and nitrite were recorded in one sample with all other results below the PQL
Boral Recycling (St Peters)	600	Light grey gravelly sand with trace of brick, concrete, tile and clay	Documentation classifying the material under the Protection of the Environment Operations Act 1997 (POEO Act) were not provided, supply dockets from Boral for geotechnical testing of the material as 'Unbound Base'.
Boral Recycling	1,700	Light grey mottled red sand with a trace of gravel, bricks, concrete and tiles (Imported Recycled DGB)	Documentation classifying the material under the Protection of the Environment Operations Act 1997 (POEO Act) were not provided, supply dockets from Boral were also not provided.

The Auditor notes that there is a discrepancy in the description of the material sourced from WestConnex (M5 Tunnel) by ADE and Douglas. Douglas noted in the Validation Report that differences may be attributed to variations of material along the tunnel alignment, particularly given that the material was imported approximately nine months after the ADE report was issued. The Auditor notes that although there is a discrepancy in the material type, the information provided would indicate that the material was suitable for its intended temporary use.

Following completion of use on site, all of the imported materials were subsequently classified by Douglas and disposed of off-site to licensed facilities. The off-site disposal of these imported materials is discussed in Section 14.4.

11.3.6 Material Disposed Off-Site

Waste materials generated on-site were sampled and classified in accordance with the EPA (2014) *Waste Classification Guidelines*. Sampling from stockpiles of excavated soils and in-situ material was undertaken to characterise and classify the waste materials prior to off-site disposal. The Validation Report documents that 362.049 t of waste material was disposed off-site, including the following waste types:

- General Solid Waste (non-putrescible) (GSW)
- GSW Special Waste (Asbestos)
- Restricted Solid Waste (non-putrescible) (RSW)

- Hazardous Waste (HW)
- Special Waste (Asbestos)
- Excavated Natural Material (ENM)
- Virgin Excavated Natural Material (VENM)

Quantities of other wastes associated with demolition and construction activities were also documented in the Validation Report.

Waste materials were disposed from the site between December 2018 and July 2019. Douglas included supporting documentation from the contractors including waste disposal dockets, tipping information and registers for receival sites.

The Auditor has reviewed the documentation provided and is of the opinion that the supplied documentation is consistent with the remedial works described. Further assessment of the waste classifications and disposal quantities is provided in Section 14.4.

11.4 Auditor's Opinion

In the Auditors' opinion, the excavation works were appropriate to remediate onsite contamination.

12. CONTAMINATION MIGRATION POTENTIAL

Based on the remediation/excavation works outlined in the Validation Report it is considered that all on-site sources of contamination have been removed during remediation/excavation works. Contaminants detected prior to remediation within the soil at the site have not adversely affected the groundwater quality except possibly locally. As the highest concentrations in soil were removed as part of the remediation works, ongoing impacts are unlikely. In the Auditors opinion, the site in its remediated condition has a negligible potential for migration of contamination, including to groundwater.

13. ASSESSMENT OF RISK

Based on assessment of results against relevant guidelines and consideration of the overall investigations and remediation performed, the Auditor considers that contaminant concentrations remaining onsite are not considered to pose a risk to site users or the environment under the proposed land use scenario.

Contaminants within the groundwater are not likely to pose a risk to human health as the impacts are mostly localised and concentrations were less than adopted human health criteria. It is also noted that abstraction and use on-site is not expected as a viable aquifer is not readily accessible.

14. COMPLIANCE WITH REGULATORY GUIDELINES AND DIRECTIONS

14.1 General

The Auditor has used guidelines currently made and approved by the EPA under section 105 of the NSW *Contaminated Land Management Act 1997*.

The investigation was generally conducted in accordance with SEPP 55 Planning Guidelines and reported in accordance with the OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites* (which was applicable at the time the reports were prepared). The Validation Report was generally prepared in accordance with the NSW EPA (2020) *Consultants Reporting on Contaminated Land*.

14.2 Development Approvals

A statutory site audit is required for the proposed Crows Nest Station development, part of the Sydney Metro rail project between Chatswood and Sydenham, to address the requirements of Condition E67 of Infrastructure Approval, application SSI 15_7400, approved by the NSW Minister for Planning on 9 January 2017. Condition E67 relates to contamination and requires a site audit as follows:

"If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with."

This SAR and accompanying Site Audit Statement (SAS) has been completed in order to comply with this condition.

14.3 Duty to Report

Consideration has been given to the requirements of the EPA (2015) *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*. Based on the findings of this SAR, the Auditor considers that the site is not required to be notified under the Duty to Report requirements.

14.4 Waste Management

In accordance with Section 4.3.7 of the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, the Auditor has checked the following aspects relating to waste disposal and recycling.

14.4.1 Waste Classification

Forty-nine waste classification letters have been prepared by Douglas and although they were referenced, were not included within the Validation Report. These were provided separately to the Auditor and were reviewed during the course of the audit. It was reported that wastes were classified in accordance with the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste*. The adopted waste classification strategy included sampling from stockpiles of excavated soils and in-situ material.

Based on the summary of waste classification reports presented in Table 7 of the Validation Report, the waste classification reports were prepared for the following soils at the site:

• GSW (non - putrescible) - Special waste (asbestos waste) for selected fill.

- GSW (non putrescible) for select fill material, non-VENM natural soils and imported materials.
- RSW for fill material at the centre of the site between former locations CNTP11, CNTP18, CNTP113, CNTP114, CNTP119 and CNTP121.
- HW for fill material at the centre of the site identified at former location CNTP12/CNTP12-1 and stockpile CNSP4.
- HW Special waste (asbestos waste) for a stockpile assessed by ADE.
- ENM for imported VENM.
- VENM for remaining natural soils and bedrock.

14.4.2 Waste Volumes, Disposal Receipts and Disposal Facilities

The Validation Report provides disposal dockets for the off-site disposal of different wastes which occurred between December 2018 and July 2019. Dockets include materials disposed during demolition and excavation stages of the project. The Validation Report also includes a waste receiving site register and a waste tracking register prepared by JHCPBG JV.

Douglas report in Table 9 and 10 of the Validation Report that a total of 362,049 t (including VENM) was removed off-site. The JHCPBG JV records provided in Appendix I of the Validation Report indicate that a total of 365,359.78 t was removed off-site. The Auditor has assessed the volumes presented and calculates a similar number to those provided by JHCPBG JV. Based on the volumes presented by Douglas, it would appear that the construction and demolition wastes included in JHCPBG JV information are not included in the Douglas calculations. The addition of the construction and demolition waste volumes to the Douglas calculated total would provide a similar value to the Auditor and JHCPBG JV. This discrepancy is therefore minor and is due to an addition error.

Table 14.1 summarises the waste disposal information for non-VENM soil disposed off-site to several waste management facilities that are licensed to receive the specified waste under their Environmental Protection Licence (EPL).

Table 14.1: Summary of Waste Disposal

Waste Classification	Tonnage (t)	Disposal Facility	EPL No.
GSW (non-putrescible)	8,973.55	MET recycling (Silverwater)	20948
GSW (non-putrescible)	9,363.2	Sydney Recycling Park (Kemps Creek)	12901
GSW (non-putrescible)	378.48	Suez (Kemps Creek)	4068
GSW (non-putrescible)	88.96	Cleanaway (Enviroguard Pty Ltd) (Erskine Park)	4865
GSW (non-putrescible)	10,338	Hi-Quality Waste Management (St Marys)	5857
GSW (non-putrescible) and Special waste (Asbestos)	60.56	Suez (Kemps Creek)	4068
GSW (non-putrescible) and Special waste (Asbestos)	1,752.48	Genesis Dial A Dump (Eastern Creek)	13426
RSW	261.34	Suez (Kemps Creek)	4068
HW	323.22	Cleanaway (Kooragang Island)	6124

14.4.3 Auditor's Opinion

The Auditor considers that the waste management assessed as part of the remedial works was undertaken in accordance with the relevant guidelines and regulations. As discussed in Section 11.3, validation sampling was not undertaken following removal of defined extents of different (higher) classified wastes. In the Auditors opinion the lack of validation sampling provides uncertainty as to whether the higher classified waste was completely removed prior to disposal of lower classified wastes (including natural soils). There is the potential for higher classified wastes to have been disposed with adjacent areas classified as lower wastes and/or natural soils.

It is considered that this issue does not impact the conclusions reached by the Auditor regarding site suitability.

14.5 VENM and Other Imported Materials

As detailed in Section 11.3.6, VENM and other materials were imported to the site temporarily to allow for construction activities. The Auditor is of the opinion that the materials imported from Boral Recycling did not have supporting documentation which may have made the material not compliant with the the NSW EPA RRO for recovered aggregates (2014). Douglas indicated in the Validation Report that these materials were excavated, waste classified and disposed off-site and therefore are no longer present at the site.

14.6 Licenses

Excavation and off-site removal of ACM contaminated soils were required to be conducted by at least a Class B licensed contractor. Douglas did not confirm that the asbestos remediation works involved a Class B Asbestos removal contractor however did confirm that Absolute Environmental Services Pty Ltd (AES) were contracted for removal of small quantities of asbestos. The asbestos materials clearance reports prepared by ADE and provided by Douglas in the Validation Report indicate that AES and SLH Industries Pty Ltd (SLH) were the licenced asbestos removal contractors who undertook the removal works. Copies of the appropriate licences were not provided to the Auditor, however the Auditor undertook a search of the SafeWork NSW asbestos licence database on 12 June 2020 which indicates that AES and SLH are licenced for non-friable asbestos removal works (Licence numbers: AD204059 and AD212500). This licence information was not provided on the clearance documentation attached to the Validation Report.

14.7 Conflict of Interest

The Auditor has considered the potential for a conflict of interest in accordance with the requirements of section 3.2.3 of the NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme*.

The Auditor considers that there are no conflicts of interest, given that:

- 1. The Auditor is not related to a person by whom any part of the land is owned or occupied.
- 2. The Auditor does not have a pecuniary interest in any part of the land or any activity carried out on any part of the land.
- 3. The Auditor has not reviewed any aspect of work carried out by, or a report written by, the site auditor or a person to whom the site auditor is related.

15. CONCLUSIONS AND RECOMMENDATIONS

Based on the results documented in the Validation Report, Douglas concluded that "all on-site sources of contamination have been removed and suitably validated. Accordingly, it is considered that the site has been made suitable for the proposed development".

Based on the information presented in Douglas reports and observations made on site, and following the Decision-making process for assessing urban redevelopment sites in NSW EPA (2017) *Guidelines for the NSW Site Auditor Scheme (3rd Edition)*, the Auditor concludes that the site is suitable for the purposes of 'commercial/industrial' land use (proposed underground train station).

Groundwater has not been assessed for any beneficial re-use. Any future use of groundwater would require appropriate assessment and regulatory approvals from the NSW Office of Water.

16. OTHER RELEVANT INFORMATION

This Audit was conducted on the behalf of JHCPBG JV for the purpose of assessing whether the land is suitable for the proposed commercial/industrial uses i.e. a "Site Audit" as defined in Section 4 (definition of a 'site audit' (b)(iii)) of the CLM Act.

This summary report may not be suitable for other uses. Douglas included limitations in their reports. The Audit must also be subject to those limitations. The Auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which the Auditor had some control or is reasonably able to check.

The Auditor has relied on the documents referenced in Section 1 of the Site Audit Report in preparing the Auditors' opinion. If the Auditor is unable to rely on any of those documents, the conclusions of the audit could change.

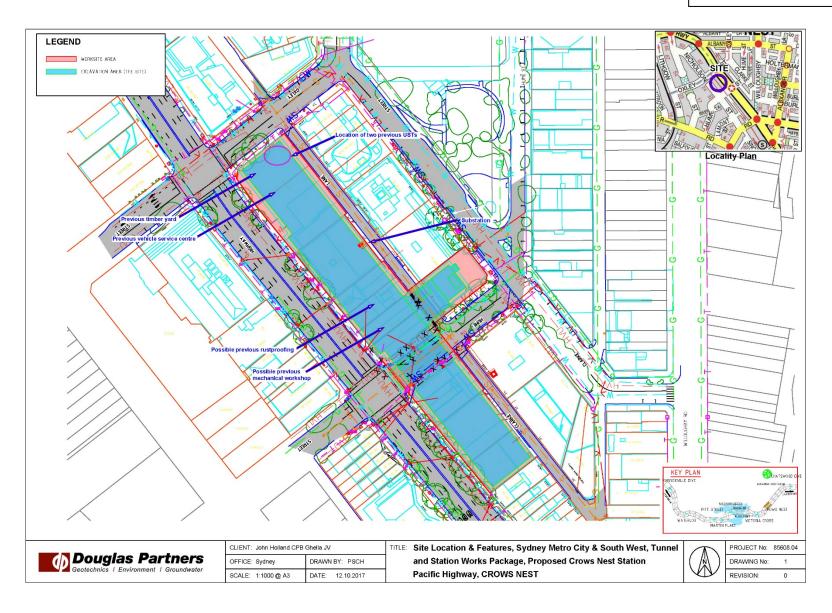
It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

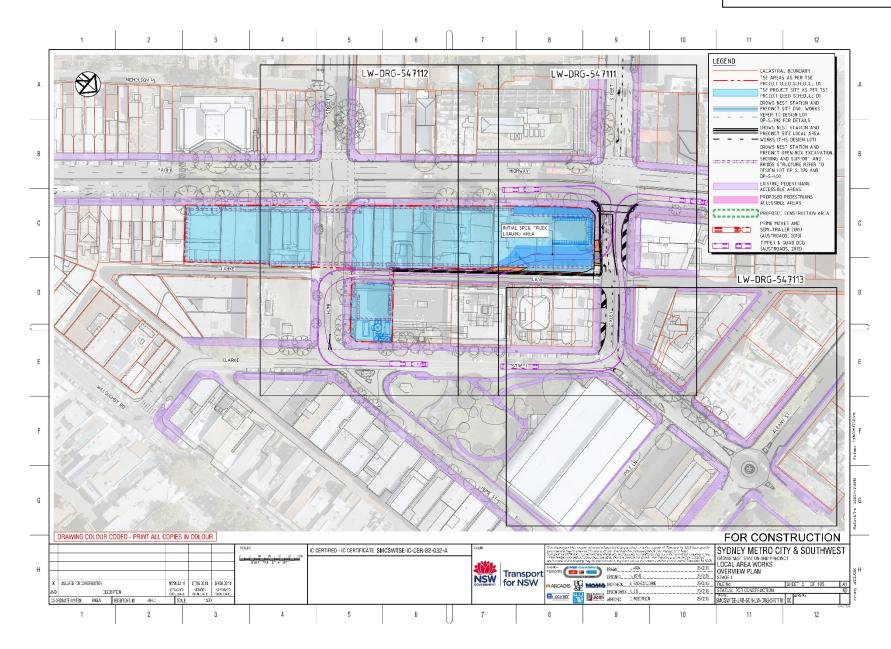
APPENDIX A ATTACHMENTS

Attachment 1: Site Location Attachment 2: Site Survey

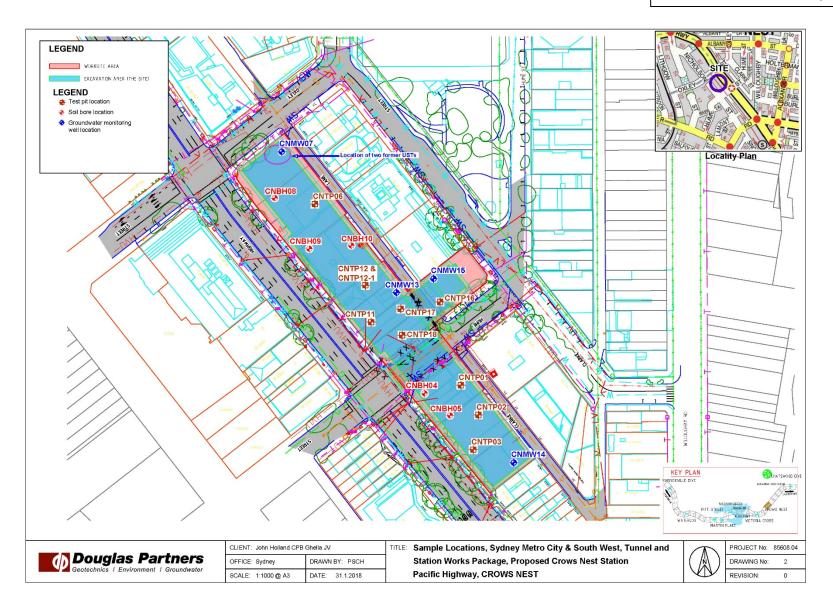
Attachment 3: DSI Sample Locations

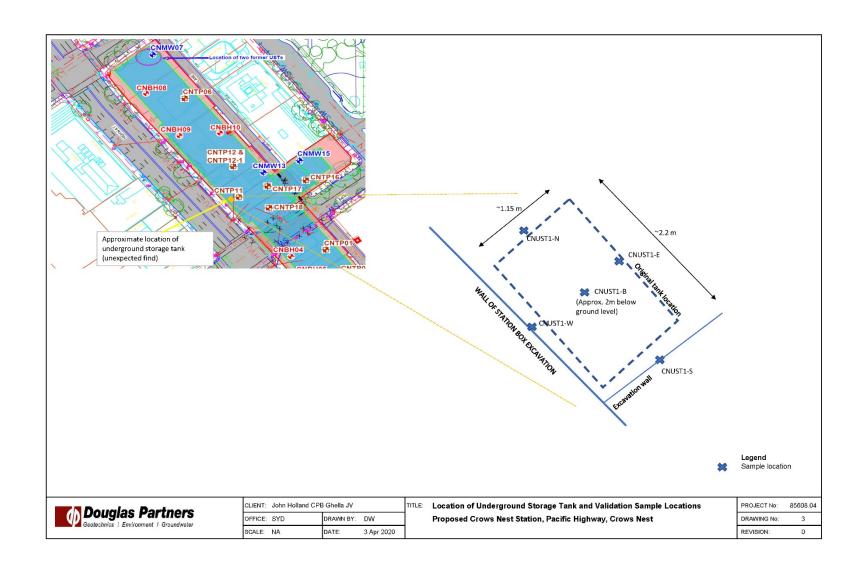
Attachment 4: UST Location and Validation Samples





Attachment 3: DSI Sample Locations





APPENDIX B SITE AUDIT STATEMENT



NSW Site Auditor Scheme

Site Audit Statement

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the *Contaminated Land Management Act 1997* on 12 October 2017.

For information about completing this form, go to Part IV.

Part I: Site audit identification

Site audit statement no. TO-024-2				
This	This site audit is a:			
\boxtimes	statutory	<i>y</i> audit		
	non-stat	utory audit		
withi	n the mea	aning of the Contaminated Land Management Act 1997.		
Site	auditor	details		
(As a	accredited	d under the Contaminated Land Management Act 1997)		
Nam	e:	Tom Onus		
Com	pany:	Ramboll Australia Pty Ltd		
Addr	ess:	Level 3		
		100 Pacific Highway, North Sydney		
		Postcode: 2060		
Phor	ne:	02 9954 8133		
Ema	il:	tonus@ramboll.com		
Site	details			
	Address: 477 to 521 Pacific Highway, Hume Street, Clarke Lane and 14 Clarke Street, Crows Nest, NSW			
		Postcode: 2065		

Property description

The site covers an approximate irregular rectangle shape (see figure at end of Part I of this statement). The Lot/Deposited Plan (DP) numbers for the site are as follows:

- Part Lot 100 and 101 DP747672
- Part Lot A DP442804
- Part Lot 1 DP1223850
- Part Lot 1 and 2 DP575046
- Part Lot 3 DP655677
- Part Lot 4 DP1096359
- Part Lot 10 DP1060663 (previously Strata Plan 71539)
- Part Lot A and B DP374468
- Part of Lot 61 and 62 DP1232021

Local government area: North Sydney Council			
Area of site (include units, e.g. hectares): Approximately 0.7 hectares			
Curre	ent zoning	: B4 Mixed Use under North Sydney Local Environment Plan 2013	
Reg	ulation a	nd notification	
To th	e best of i	my knowledge:	
	the site is the subject of a declaration, order, agreement, proposal or notice under the <i>Contaminated Land Management Act 1997</i> or the <i>Environmentally Hazardous Chemicals Act 1985</i> , as follows: (provide the no. if applicable)		
	□ De	claration no.	
	□ Ord	der no.	
	□ Pro	pposal no.	
	□ Not	tice no.	
	the site is not the subject of a declaration, order, proposal or notice under the Contaminated Land Management Act 1997 or the Environmentally Hazardous Chemicals Act 1985.		
To the best of my knowledge:			
	the site has been notified to the EPA under section 60 of the <i>Contaminated Land Management Act</i> 1997		
		nas not been notified to the EPA under section 60 of the Contaminated Land ment Act 1997.	

Site audit commissioned by

Name: Caitlin Richards

Site Audit Statement TO-024-2

Comp	pany: John Holland CPB Ghella Joint Venture
Addre	ess: Level 9, 50 Bridge Street, Sydney, NSW
	Postcode: 2000
Phon	e: 0407 176 672
Emai	l: caitlin.richards@sydneymetro2.com.au
_	
	tact details for contact person (if different from above)
Name	e: Krissy Vajda
Phon	e: 0439 477 649
Emai	l: krissy.vajda@sydneymetro2.com.au
Natu	re of statutory requirements (not applicable for non-statutory audits)
	Requirements under the <i>Contaminated Land Management Act</i> 1997 (e.g. management order; please specify, including date of issue)
\boxtimes	Requirements imposed by an environmental planning instrument (please specify, including date of issue)
	Condition E67 of Infrastructure Approval, application SSI 15_7400, approved by the Minister for Planning on 9 January 2017
	Development consent requirements under the <i>Environmental Planning and Assessment Act 1979</i> (please specify consent authority and date of issue)
	Requirements under other legislation (please specify, including date of issue)

Purpose of site audit

\boxtimes	A1 To determine land use suitability			
	Inten	ded uses of the land: Below ground train station		
OR				
	■ A2 To determine land use suitability subject to compliance with either an active or passive environmental management plan			
	Inter	ded uses of the land:		
OR				
(Tick	all th	at apply)		
	B1 T	o determine the nature and extent of contamination		
	B2 T	o determine the appropriateness of:		
		an investigation plan		
		a remediation plan		
		a management plan		
	grou	o determine the appropriateness of a site testing plan to determine if indwater is safe and suitable for its intended use as required by the <i>Temporary er Restrictions Order for the Botany Sands Groundwater Resource 2017</i>		
	B4 T	o determine the compliance with an approved:		
		voluntary management proposal or		
		management order under the Contaminated Land Management Act 1997		
		o determine if the land can be made suitable for a particular use (or uses) if the s remediated or managed in accordance with a specified plan.		
	Inter	ided uses of the land:		
	ī			
Info	m oti	on sources for site audit		
	Consultancies which conducted the site investigations and/or remediation:			
Dong	jias P	artners Pty Ltd (Douglas)		

Titles of reports reviewed:

'Report on Preliminary Site Investigation for Contamination, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, February 2018', report reference: Revision 0, dated 28 February 2018, prepared by Douglas.

'Report on Detailed Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, March 2018', report reference: Revision 1, dated 1 March 2018, prepared by Douglas.

'Remediation Action Plan, Sydney Metro City and South West - Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, April 2018', report reference: Revision 1, dated 12 April 2018, prepared by Douglas.

'Report on Validation of Remediation, Sydney Metro City and South West - Tunnel and Station Excavation Works Package, Sydney Metro City and South West - Crows Nest Station, Pacific Highway, Crows Nest, NSW', report reference: Revision 0, dated 22 July 2020, prepared by Douglas.

Other information reviewed, including previous site audit reports and statements relating to the site:

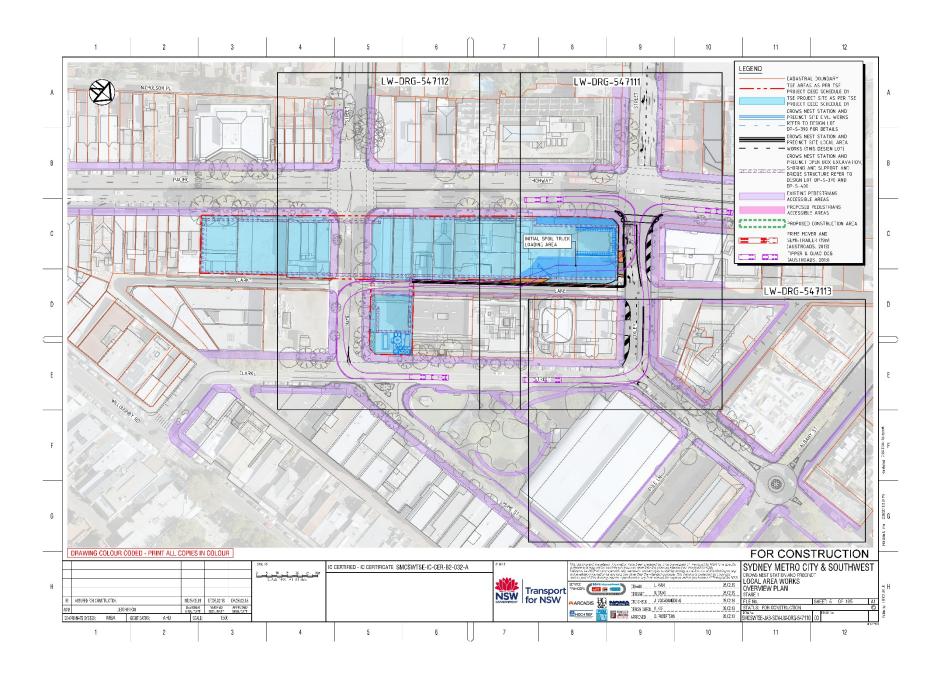
Approximately 49 waste classification reports prepared by Douglas for material disposed from the site.

Site audit report details

Title: Site Audit Report – Crows Nest Station Box, Pacific Highway, Crows Nest

NSW

Report no.: TO-024-2 (Ramboll Ref: 318000323-002) Date: 24 July 2020



Part II: Auditor's findings

Please complete either Section A1, Section A2 or Section B, not more than one section. (Strike out the irrelevant sections.)

- Use Section A1 where site investigation and/or remediation has been completed and a
 conclusion can be drawn on the suitability of land uses without the implementation of
 an environmental management plan.
- Use Section A2 where site investigation and/or remediation has been completed and a
 conclusion can be drawn on the suitability of land uses with the implementation of an
 active or passive environmental management plan.
- Use Section B where the audit is to determine:
 - o (B1) the nature and extent of contamination, and/or
 - (B2) the appropriateness of an investigation, remediation or management plan¹, and/or
 - (B3) the appropriateness of a site testing plan in accordance with the Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017, and/or
 - (B4) whether the terms of the approved voluntary management proposal or management order have been complied with, and/or
 - (B5) whether the site can be made suitable for a specified land use (or uses) if the site is remediated or managed in accordance with the implementation of a specified plan.

¹ For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

Section A1

I certify that, in my opinion: The site is suitable for the following uses: (Tick all appropriate uses and strike out those not applicable.) ☐ Residential, including substantial vegetable garden and poultry ☐ Residential, including substantial vegetable garden, excluding poultry ☐ Residential with accessible soil, including garden (minimal home grown produce contributing less than 10% fruit and vegetable intake), excluding poultry ☐ Day care centre, preschool, primary school ☐ Residential with minimal opportunity for soil access, including units ☐ Secondary school ☐ Park, recreational open space, playing field ☐ Commercial/industrial ☐ Other (please specify):

Overall comments:

from contamination.

OR

Historical investigations at the site identified lead, total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAHs) and asbestos contamination in soils. The contamination sources are from historic commercial/industrial onsite land uses including underground storage tanks (USTs) and fill material. The development (underground train station) required excavation to an average depth of approximately 28.5 m. Excavated soils and rock were classified and disposed offsite. The excavation works successfully removed the onsite sources of contamination.

I certify that, in my opinion, the site is not suitable for any use due to the risk of harm

Section A2

I cartify	that	in i	mv	oninion:
r oorany	tirat,		···y	оринон.

-	ect to compliance with the <u>attached</u> environmental management plan ² (EMP), ite is suitable for the following uses:			
(Tick	(Tick all appropriate uses and strike out those not applicable.)			
	Residential, including substantial vegetable garden and poultry			
	Residential, including substantial vegetable garden, excluding poultry			
	Residential with accessible soil, including garden (minimal home grown produce contributing less than 10% fruit and vegetable intake), excluding poultry			
	Day care centre, preschool, primary school			
П	Residential with minimal opportunity for soil access, including units			
	Secondary school			
П	Park, recreational open space, playing field			
П	-Commercial/industrial			
	Other (please specify):			
EMP	' details			
Autho	or:			
Date	: No. of pages:			
	Summary EMP (attached) is required to be implemented to address residual contamination on the			
site.	Zim (attashea) to required to be implemented to dadress residual contamination on the			
The I	The EMP: (Tick appropriate box and strike out the other option.)			
	☐ requires operation and/or maintenance of active control systems ³			
	□ requires maintenance of passive control systems only³.			

 $^{^2}$ Refer to Part IV for an explanation of an environmental management plan. 3 Refer to Part IV for definitions of active and passive control systems.

Site Audit Statement TO-024-2

Purpose of the EMP:
Description of the nature of the residual contamination:
Summary of the actions required by the EMP:
How the EMP can reasonably be made to be legally enforceable:
How there will be appropriate public notification:
Overall comments:

Section B

Purpose of the plan ⁴ which is the subject of this audit:			
I certify that, in my opinion:			
(B1)			
☐ The nature and extent of the contamination has been appropriately determined			
☐ The nature and extent of the contamination has not been appropriately determined			
AND/OR (B2)			
☐ The investigation, remediation or management plan is appropriate for the purpose stated above			
☐ The investigation, remediation or management plan is not appropriate for the purpose stated above			
AND/OR (B3)			
☐ The site testing plan:			
☐ is appropriate to determine			
☐ is not appropriate to determine			
if groundwater is safe and suitable for its intended use as required by the Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017			
AND/OR (B4)			
☐ The terms of the approved voluntary management proposal* or management order** (strike out as appropriate):			
☐ have been complied with			
□ have not been complied with.			
*voluntary management proposal no.			
**management order no.			
AND/OR (B5)			
☐ The site can be made suitable for the following uses:			
(Tick all appropriate uses and strike out those not applicable.)			
 Residential, including substantial vegetable garden and poultry 			
☐ Residential, including substantial vegetable garden, excluding poultry			

⁴ For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

Site Audit Statement TO-024-2

-	Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry
-	Day care centre, preschool, primary school
П—	Residential with minimal opportunity for soil access, including units
θ-	Secondary school
	Park, recreational open space, playing field
	-Commercial/industrial
-	Other (please specify):
	is remediated/managed* in accordance with the following plan (attached):
	as appropriate
Plan title	
Plan autho	
Plan date	No. of pages
SUBJECT	to compliance with the following condition(s):
Overall co	mments:

Part III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997*.

Accreditation no. 1505

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the Contaminated Land Management Act 1997, and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed

Date 24 July 2020

Part IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remediation plan or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use or uses of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A1 or Section A2 or Section B of Part II, **not** more than one section.

Section A1

In Section A1 the auditor may conclude that the land is *suitable* for a specified use or uses OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further investigation or remediation or management of the site was needed to render the site fit for the specified use(s). **Conditions must not be** imposed on a Section A1 site audit statement. Auditors may include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

Section A2

In Section A2 the auditor may conclude that the land is *suitable* for a specified use(s) subject to a condition for implementation of an environmental management plan (EMP).

Environmental management plan

Within the context of contaminated sites management, an EMP (sometimes also called a 'site management plan') means a plan which addresses the integration of environmental mitigation and monitoring measures for soil, groundwater and/or hazardous ground gases throughout an existing or proposed land use. An EMP succinctly describes the nature and location of contamination remaining on site and states what the objectives of the plan are, how contaminants will be managed, who will be responsible for the plan's implementation and over what time frame actions specified in the plan will take place.

By certifying that the site is suitable subject to implementation of an EMP, an auditor declares that, at the time of completion of the site audit, there was sufficient information satisfying guidelines made or approved under the *Contaminated Land Management Act 1997*

(CLM Act) to determine that implementation of the EMP was feasible and would enable the specified use(s) of the site and no further investigation or remediation of the site was needed to render the site fit for the specified use(s).

Implementation of an EMP is required to ensure the site remains suitable for the specified use(s). The plan should be legally enforceable: for example, a requirement of a notice under the CLM Act or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of the Environmental Planning and Assessment Act 1979.

Active or passive control systems

Auditors must specify whether the EMP requires operation and/or maintenance of active control systems or requires maintenance of passive control systems only. Active management systems usually incorporate mechanical components and/or require monitoring and, because of this, regular maintenance and inspection are necessary. Most active management systems are applied at sites where if the systems are not implemented an unacceptable risk may occur. Passive management systems usually require minimal management and maintenance and do not usually incorporate mechanical components.

Auditor's comments

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

Section B

In Section B the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or whether the terms of an approved voluntary management proposal or management order made under the CLM Act have been complied with, and/or whether the site can be made suitable for a specified land use or uses if the site is remediated or managed in accordance with the implementation of a specified plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement. The condition must not specify an individual auditor, only that further audits are required.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

Part III

In **Part III** the auditor certifies their standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to

- the NSW Environment Protection Authority: <u>nswauditors@epa.nsw.gov.au</u> or as specified by the EPA AND
- the **local council** for the land which is the subject of the audit.

APPENDIX C INTERIM AUDIT ADVICE



13 April 2018

John Holland CPB Ghella Joint Venture
Attn: Robert Muir
Senior Environment Coordinator
Sydney Metro City & Southwest
Level 3, 140 Sussex Street, Sydney NSW 2000

By email: Robert.Muir@sydneymetro2.com.au

Dear Robert

RE: INTERIM AUDIT ADVICE LETTER NO. 1 - REMEDIATION ACTION PLAN, CROWS NEST STATION, PACIFIC HIGHWAY, CROWS NEST, NSW

1. INTRODUCTION

As a NSW Environment Protection Authority (EPA) accredited Contaminated Sites Auditor, I am conducting an Audit in relation to the subject site. This initial review has been undertaken to provide an independent review of the suitability and appropriateness of a Remediation Action Plan (RAP).

A statutory site audit is required for the proposed Crows Nest station box bulk excavation area, part of the Sydney Metro rail project between Chatswood and Sydenham, to address the requirements of Condition E67 of Infrastructure Approval, application SSI 15_7400, approved by the Minister for Planning on 9 January 2017. The site audit is also a requirement of Clause 10.14B of the Sydney Metro City & Southwest Tunnel and Station Excavation Works Design and Construction Deed (Contract No: 00013/11200).

This IAA letter is based on a review of the documents listed below and observations made on a site visit on 6 March 2018, as well as discussions with John Holland CPB Ghella Joint Venture (JHCPBG JV) and Douglas Partners Pty Ltd (DP) who undertook the investigations.

The reports reviewed were:

- 'Report on Preliminary Site Investigation for Contamination, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, February 2018', report reference: Revision 0, dated 28 February 2018, prepared by DP (the PSI).
- 'Report on Detailed Site Investigation, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, March 2018', report reference: Revision 1, dated 1 March 2018, prepared by DP (the DSI).

Ramboll Australia Pty Ltd

Level 3, 100 Pacific Highway PO Box 560 North Sydney NSW 2060

T +61 2 9954 8100

www.ramboll.com

Ref 318000323-002

Page 2

Remediation Action Plan, Sydney Metro City and South West - Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John Holland CPB Ghella JV, Project 85608.04, April 2018', report reference: Revision 1, dated 12 April 2018, prepared by DP (the RAP).

A copy of the PSI (draft), DSI (Rev0) and RAP (draft) reports were issued for audit review. Review comments (issued by the Auditor by email) were incorporated into the final DP reports (listed above). The PSI and DSI make reference to previous reports by: DP and Golder Associates Pty Ltd (Golder) (Report numbers 418746-008-R-Rev4 dated 2016; 1650773-041-R-Rev1 dated 2017; 1650773-042-R-Rev0 dated 2017); Aargus Pty Ltd (Aargus) (Report number ES6287, August 2015); and Coffey Corporate Services Pty Ltd (Coffey) (Report number 754-ENAURHOD06460AA, December 2016). The RAP makes reference to a hydrogeological interpretive report (dated 19 March 2018) prepared by Pells Sullivan Meynink (PSM). A summary of relevant information from these reports was included in the DP reports. DP also note (in the PSI report) that a number of previous reports pertaining to the site were made available to DP but due to confidentiality agreements they could not be referenced. Copies of these reports have not been provided to the Auditor for this review.

2. SITE DETAILS

2.1 Location

The site is identified as the 'excavation footprint' (the site) for the station shown on Attachment 1. The 'Worksite Area' shown on Attachment 1 surrounding the 'excavation footprint' has been excluded from the DP investigations and is not part of the site audit area.

The site details are as follows:

Street address: 477, 479, 495, 497, 501, 503, 507, 511 and 521 Pacific Highway, Crows

Nest, NSW 2065 (the main site)

14 Clarke Street, Crows Nest, NSW 2065

Identifier: Part of Lots 100 and 101 DP747672

> Part of Lot A DP442804 Part of Lot 1 DP1223850 Part of Lots 1 and 2 DP575046

Part of Lot 3 DP655677 Part of Lot 4 DP1096359 Part of Strata Plan 71539 Part of Lots A and B DP374468

Local Government: North Sydney

Transport for New South Wales Owner:

Site Area: Approximately 0.7 ha

B4 - Mixed Use Zoning:

2.2 **Site Condition**

DP inspected the site for the PSI on 20 September 2017 and noted the following:

Demolition of buildings in the north and central sections was underway. Some of the former buildings in the south section were still intact. Basement levels were noted beneath two buildings.

- The ground surface over the majority of the site was paved with concrete. It was exposed in some sections where demolition was underway.
- Inspection of the basement at 521 Pacific Highway (by DP on 14 June 2017) identified an old fuel fill
 point on the driveway entrance adjacent to Oxley Street. A second fill point was located on the
 property boundary at Clarke Lane. A concrete patch was located in the north section of the
 basement suggesting the likely location of two former Underground Fuel Storage Tanks (USTs) and
 associated fuel lines. Groundwater monitoring wells were located in the vicinity of the concrete
 patch.
- The site was surrounded by high-rise residential apartments and commercial land use.

DP inspected the site during the DSI between 1 November and 12 December 2017 and noted the following:

- Majority of the former buildings had been demolished. Demolition waste had been stockpiled in some sections of the site, particularly in the vicinity of monitoring well CNMW13 (Attachment 2). DP observed potential asbestos containing material (ACM) in some of the stockpiles. The stockpiles were being removed from the site for off-site disposal.
- ACM previously detected by Coffey (2016) at the surface on 479 Pacific Highway was inspected by DP. DP noted that the ACM was buried under a geo-fabric layer and backfilled with road-base to minimise exposure. No ACM was detected at the surface by DP.
- Shale/clay had been imported onto the site and was being used to fill the former basement at 521 Pacific Highway.

During the Auditor's site visit on 6 March 2018, the site was an active construction site, with the following features noted:

- The majority of the site surface had been cleared of slabs and pavements. Exposed soil was visible over the majority of the site. A concrete slab of a former basement was exposed in the south section.
- Imported material (DGB and ENM) had been placed on the surface for the construction of temporary piling platforms. Piling was underway in the north section.
- Temporary/ demountable sheds were located in the north section of the main site and on 14 Clarke Street.
- An electrical substation was located adjacent to the eastern boundary (Attachment 1). Site personnel reported that the substation was to be decommissioned and footprint remediated with appropriate validation sampling.
- A gatic cover was located off-site in a pedestrian walkway along Oxley Street, adjacent to the northern site boundary. The gatic appeared to be a former fuel dip/fill point associated with the fuel infrastructure at 521 Pacific Highway.
- A large stockpile of fill soil was located in the south section awaiting off-site disposal. The stockpile
 occupied a large section of 479 Pacific Highway limiting visibility to the surface fill where the ACM
 was formerly detected by Coffey.

2.3 Adjacent Uses

The site is located within an area of commercial and high density residential land use. The surrounding site use includes:

North: Oxley Street and high rise mixed-use building beyond.

East: Clarke Lane and high rise mixed-use buildings beyond.

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South: Pacific Highway and commercial buildings located further to the south.

West: Pacific Highway and commercial buildings located further to the west.

Pacific Highway is located on a ridge line with slopes to the north and east in the vicinity of the site. DP identified the closest sensitive ecological receptor for groundwater as an unnamed creek which drained into Flat Rock Creek located approximately 1.4 km to the northeast. Flat Rock Creek drains into Long Bay located approximately 2 km further to the east and northeast of the site.

The PSI identified a number of commercial/ industrial land use within close proximity (100 m) of the site including former services stations, dry cleaners, vehicle service centres, printing operations, fabrication and manufacturing. A former dry cleaner was located approximately 50 m to the southeast. The business directory search reported that these facilities were operational in the 1950s to 1970s.

A search of the NSW EPA public records did not identify any sites listed as contaminated in the immediate vicinity of the subject site.

2.4 Proposed Development

The proposed development includes the construction of a new below ground station, access road, transport interchange and upgrades to pedestrian access. The depth of excavation for the station box will range from approximately 24 metres below ground level (mbgl) in the northern end to approximately 33 mbgl in the southern end (Attachment 2). The base of the structure will comprise approximately 250 mm thick concrete slabs and the walls will include bored piles with shotcrete between the piles. Two water collection sumps are proposed at the base of the excavation, one at each end of the station box.

For the purposes of this audit, the 'commercial/ industrial' land use scenario will be assumed.

3. SITE HISTORY

The PSI site history assessment included a review of historical business listings, historical title deeds, aerial photographs, NSW EPA records and Section 149 (2&5) certificates. DP reviewed NSW SafeWork records as part of the DSI. The site history is summarised in Table 3.1.

Table 3.1: Site History			
Date	Activity		
1900s - 2016	The site was developed and used for commercial and residential purposes. Some individual lots were vacant. Clarke Lane and Hume Street were established prior to 1930. The commercial uses mainly included a timber yard (north section), electrical motors dealership, motor vehicle distribution, mechanical workshop, parking, toy manufacturing, offices and retail, tyre retail and fitting, fuel merchants, manufacturing of anti-corrosion compounds, rustproofing, plastic coating, and sale of concrete products.		
2016 to date	The site is currently owned and occupied by Transport for NSW. The demolition of previous site structures commenced in 2017.		

The summary indicates that the site has been used for various commercial purposes since the 1900s. A small section of Hume Street forms part of the site. DP noted that based on the review of the site history, previous investigation reports and SafeWork records, two USTs, bowsers and associated fuel lines were installed at 521 Pacific Highway (north section of the site) associated with the former use as

a motor vehicle distributor. DP concluded that the USTs and associated fuel infrastructure were removed in 2015. The DSI indicated that Coffey (2016) identified ACM at the surface on 479 and 477 Pacific Highway which was subsequently buried on site.

A review of the NSW EPA public records did not find any sites notified as contaminated to the EPA. Based on the site location and history, potential contamination could have impacted the site from onsite and/or off-site sources.

3.1 Auditor's Opinion

In the Auditor's opinion, the site history indicates past activities that may have resulted in site contamination, including fuel storage, mechanical workshops, and various manufacturing facilities. Details of site operations were not provided, such as processes, chemical use and storage locations. Validation of the UST removal was not provided and is considered a data gap. The Auditor considers that the site history is broadly understood and adequate for identification of contaminants of concern (Section 4) and remedial planning (Section 10).

4. CONTAMINANTS OF CONCERN

The PSI and DSI provided a list of the contaminants of concern and potentially contaminating activities. These have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern			
Area (DP Source ID)	Activity	Potential Contaminants	
Entire Site	Fill and surface soil imported from unknown sources. Deep fill can be expected in the vicinity of the USTs.	Metals, total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, xylenes & naphthalene	
	Demolition of former buildings containing hazardous materials. ACM has been previously identified at 479 Pacific Highway.	(BTEXN), volatile organic compounds (VOCs), semi volatile organic compounds (SVOCs), polycyclic	
	Spills and leakage of chemicals associated with historical commercial/ industrial land use.	aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs), polychlorinated biphenyls (PCBs), phenols, lead (from paint) and asbestos.	
North Section	Former land use of north section as a timber yard. Activities may have included treatment of timber.	Metals (arsenic, boron, copper, chromium), phenols including creosols and PAHs.	
521 Pacific Highway	Former land use as a vehicle service centre. Two former USTs, associated fuel infrastructure and wastewater pit.	Petroleum hydrocarbons (BTEX, TPH), PAHs, VOCs and phenols.	
511 Pacific Highway (SP71539)	Electrical substation on the eastern site boundary.	PCBs and petroleum hydrocarbons (TPH).	

Table 4.1: Contaminants of Concern			
Area (DP Source ID)	Activity	Potential Contaminants	
503 Pacific Highway (Lot 3 DP655677)	Former land use for rustproofing. Spills and leakage of chemicals associated with the land use.	Per- and poly-fluoroalkyl substances (PFAS).	
501 Pacific Highway (Lot 1 DP575046)	Former land use as a mechanical workshop. It is not known if USTs were associated with this land use.	Petroleum hydrocarbons (BTEX, TPH), PAHs, VOCs and lead.	
Off-Site Sources	Migration of potentially contaminated groundwater from previous off-site industrial/commercial activities.	Metals, Petroleum hydrocarbons (BTEX, TPH) and VOCs.	

The DSI stated that based on the site observations and review of previous investigation reports, the two USTs and associated fuel infrastructure at 521 Pacific Highway were removed in 2015. The RAP states that JHCPBG JV undertook a subsurface inspection in the area of the former USTs. A trench was excavated to a depth of 1.5 mbgl to locate the USTs. Sand backfill was located within the excavation confirming that the USTs had been removed.

4.1 Auditor's Opinion

The Auditor considers that the analyte list used by DP adequately reflects the site history and condition.

5. STRATIGRAPHY AND HYDROGEOLOGY

Following a review of the DP reports, a summary of the site stratigraphy and hydrogeology conditions at the site are compiled below.

5.1 Topography, Geology and Stratigraphy

The PSI states that the site is located on a ridge line adjacent to Pacific Highway at approximately 85 m to 96 m Australian Height Datum (AHD) with slopes to the north and east. The site is located within the Blacktown soil landscape underlain by residual soils and by deeper Ashfield Shale bedrock. The Council Local Environmental Plan (LEP) and NSW Acid Sulfate Soil (ASS) Risk Map show that the site is located in an area of 'no known occurrences of ASS'.

The sub-surface profile detailed by DP in the DSI is summarised in Table 5.1.

Table 5.1: Stratigraphy		
Depth (mbgl)	Subsurface Profile	
0.0 - 0.15	Concrete pavements/ slab underlain by rubble and gravel roadbase. Suspected ACM was detected at the base of the slab in CNTP11 and CNTP06.	
0.18 - 1.8	Fill material comprising clay and sand with inclusions of demolition rubble (brick, tile, timber, metal, concrete), slag, ash, charcoal and bitumen. Ash/ coal was detected in 5 sampling locations. A fragment of ACM was detected in test pit CNTP11 between 0 mbgl and 0.15 mbgl.	
0.3 - 10	Natural clay and silty clay.	

Table 5.1: Stratigraphy	
Depth (mbgl)	Subsurface Profile
1.45 to termination depth (10.5)	Weathered shale bedrock.

mbgl - metres below ground level

The subsurface profile comprised relatively shallow fill underlain by natural clay soil and shale bedrock.

5.2 Hydrogeology

The PSI undertook a search of the groundwater information database maintained by the NSW Government and did not identified any registered groundwater bores within a 0.5 km radius of the site. The PSI concluded that based on the topography and the information from the previous investigations, groundwater is anticipated to flow to the north and northeast. DP identified the closest sensitive ecological receptor for groundwater to be Flat Rock Creek located approximately 1.4 km to the northeast. The creek drains into Long Bay located approximately 2 km to the east of the site. Excess surface water run-off is anticipated to flow into the local stormwater network.

As part of the DSI, four groundwater monitoring wells were installed on the site (Attachment 2). Groundwater seepage was noted during drilling at depths between approximately 5.4 mbgl (CNBH09) and 8.9 mbgl (CNMW15). Groundwater observations and sampling was undertaken as part of the DSI on 13 December 2017. Depth to groundwater in the monitoring wells was recorded between 1.97 mbgl to 4.77 mbgl. The DSI stated that based on groundwater levels and the site topography, the groundwater is anticipated to flow to the north and northeast.

The DSI included field records of groundwater parameters recorded during sampling. They indicated that the pH was 4.3 to 5.39, dissolved oxygen (DO) was 0.77 to 4.64 mg/L, redox was 56 to 229 mV, and electrical conductivity (EC) was 258 to 459 mS/cm.

The RAP includes a summary of the PSM (2018) Hydrogeological Interpretive Report, which modelled the groundwater seepage rates expected during and post construction. Details of the modelling and the results are included in the Hydrogeological Interpretive Report. DP summarised the findings as follows:

- Maximum modelled seepage rate during construction was 162 kL/day;
- Modelled steady state seepage rate post construction was 74kL/day;
- Residual soil and Class IV and V rocks will be the biggest source of seepage/inflows;
- The predicted seepage rates were less than the rates outlined in the Scope of Work and Technical Criteria (SWTC) prepared for the design and construction of the station and tunnel;
- The modelled zone of capture for the first 10 years would extend to approximately 300 m from the site:
- There is limited capacity for attenuation of contaminants mobile in minor structures like joints and bedding plane partings; and
- PSM conclude that `no significant anthropogenic contamination issues are expected to influence groundwater quality'.

5.3 Auditor's Opinion

The Auditor considers that the site stratigraphy and hydrogeology conditions detailed by DP adequately reflect the site conditions and are sufficient for remediation planning.

6. EVALUATION OF QUALITY ASSURANCE AND QUALITY CONTROL

The Auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations. The Auditor's assessment follows in Tables 6.1 and 6.2.

Table 6.1: QA/QC - Sampling and Analysis Methodology Assessment		
Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion	
Data Quality Objectives (DQO) The PSI and DSI defined specific DQOs in accordance with the seven step process outlined in Schedule B2 of NEPM (2013).	These were considered appropriate for the investigations conducted.	
Sampling pattern and locations Soil: The DSI reports that a general targeted and grid pattern or systematic sampling plan was adopted. The sources of contamination targeted during investigation of the site were not reported. Investigation locations were spaced to gain coverage of the majority of the site. The various fill materials at the site were also targeted for sampling. Groundwater: four monitoring wells (CNMW07, CNMW13, CNMW14 and CNMW15) were distributed across the site. CNMW07 was down-gradient of the site in the vicinity of the two former USTs on 521 Pacific Highway. CNMW13 was located in the central section of the site close to 501 and 503 Pacific Highway. The DSI stated that CNMW13 was damaged during demolition works.	Based on the site history and layout, it appears that the selected soil investigation locations targeted the former USTs and electrical substation. Remaining locations appear to be on grid. In the Auditor's opinion these investigation locations provide adequate site coverage and target the main known areas of concern.	
Sampling density Soil: The DSI included a sampling density of 17 locations (Attachment 2) over approximately 0.7 ha, which meets the minimum recommended by EPA (1995) Sampling Design Guidelines. The coverage provides a 95% confidence of detecting a residual hot spot of approximately 24 m diameter. Samples analysed for asbestos were not collected in accordance with the density outlined in NEPM (2013). Groundwater: A total of 4 groundwater samples were obtained from the monitoring wells at the site.	In the Auditor's opinion the sampling density was appropriate. Considering that the fill from the entire site would be excavated and disposed off-site as part of the development, the sampling adopted by DP is acceptable to give a general indication of the presence/ absence of asbestos in soil.	
Sample depths Soil: Samples were collected and analysed from a range of depths targeting the fill and natural clay and shale bedrock. The sample depth intervals ranged from 0.2 m to 11.45 mbgl. Groundwater: Groundwater samples were obtained from the standing water level (SWL) depths observed in the monitoring wells during sampling. The depth ranged from approximately	In the Auditor's opinion, this sampling strategy was appropriate and adequate to characterise the primary material types present on site.	

1.97 mbgl to 4.77 mbgl.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Well construction The wells were installed from the surface to depths of approximately 7.3 mbgl to 10.2 mbgl, and were constructed of 50 mm diameter acid washed, class 18, PVC casing and machine slotted well screen intervals. The top of the screened interval was up to 0.8-2 mbgl, and therefore the screens of the wells should extend above the groundwater table. The wells were completed to assess	The Auditor notes that, whilst it is preferable for monitoring wells to be screened over a discrete short vertical interval, the wells are sufficient to provide an indication of the groundwater conditions. Deeper groundwater was not assessed. The proposed excavation
shallow perched aquifer conditions. The DSI states that the wells were constructed with o-rings (in joints) which may contain PFAS.	will extend to a depth of 25-33 mbgl and may therefore intercept deeper groundwater.
Soil: Sample collection was by test pit and drilling (solid stem auger). Test pit samples were obtained directly from the excavator bucket. Drilling samples were collected from the auger flights, with external material removed prior to collecting the sample or via a SPT split spoon. Soil samples for PFAS analysis were obtained using new powder free nitrile gloves and placed in specific sampling containers provided by the laboratory. Groundwater: Wells were installed by solid flight augers, developed with a pump and samples were collected by low flow peristaltic pump with dedicated sample tubing. The DSI states that the tubing did not contain PFAS.	Sample collection from the auger flights is not ideal as it can result in loss of volatiles and sample cross contamination, although cross contamination was minimised by removing external material. Results for samples collected from solid flight augers may underestimate concentrations of volatile contaminants. Considering that a large portion of samples were from SPT split spoon, the overall sample collection method was found to be acceptable. The groundwater sample collection methodology is considered acceptable.
Decontamination procedures	Decon 90 solution may contain PFAS
Soil: Sampling equipment was cleaned with detergent (3% Decon 90 solution), tap water and then de-ionised water prior to sampling and between sampling events to prevent cross contamination. New gloves were reportedly used for each new sample. Groundwater: Dedicated sampling equipment was used for each well. New gloves were reportedly used for each new sample.	and should not be used for decontamination of field equipment used during sampling for PFAS contamination. The PFAS results are considered to be of low accuracy as a results of the sampling procedures adopted.
Sample handling and containers	Acceptable.
Soil samples were placed into prepared and preserved sampling bottles provided by the laboratory and chilled during storage and subsequent transport to the laboratories.	

Samples for PFAS testing were placed in specific jars provided

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment		
Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion	
by the laboratory. Laboratory reports indicate that asbestos analysis was undertaken on sub-samples from soil jars.		
Groundwater samples to be analysed for heavy metals were field filtered.		
Chain of Custody (COC)	Acceptable.	
Completed chain of custody forms were provided in the report.		
Detailed description of field screening protocols	Overall, the field screening protocols were acceptable to assess site contamination.	
Field screening for volatiles was undertaken using a calibrated hand held PID unit.		
The PID screening procedure was provided and involved placing the samples in ziplock plastic bags and measuring VOCs in the headspace after allowing time for equilibration. PID readings are provided on test pit and borehole logs. The PID values ranged between 75 ppm and 370 ppm (in CNMW13 at depth of 1.5-2.9 mbgl) indicating PID-detectable VOCs are present. A sample from CNMW13 could not be obtained for analysis due to lack of sample return from the SPT.		
The DSI reported groundwater quality parameters measured during well sampling in field logs for each well.		
Calibration of field equipment	Acceptable.	
Calibration information for the field equipment (PID and groundwater meters) was included in the DSI.		
Sampling logs	Acceptable.	
Soil logs were provided within the DSI, indicating sample depth, PID readings and lithology. The logs reported inclusions in fill (asbestos, ash) which could pose a contamination risk.		
Groundwater field sampling records were included in the DSI with well development and sampling details.		

Table 6.2: QA/QC - Field and Lab Quality Assurance and Quality Control		
Field and Lab QA/QC	Auditor's Opinion	
Field quality control samples	Acceptable.	
Field quality control samples including trip blanks (1 per field		
batch), trip spikes (1 per field batch), rinsate blanks (1 per		
day), field intra-laboratory and inter-laboratory duplicates		

Table 6.2: QA/QC - Field and Lab Quality Assurance and Quality Control **Auditor's Opinion** Field and Lab QA/QC (5% of primary samples) were undertaken by DP during the DSI. Field quality control results Overall, the field quality control results were found to be acceptable. The results of field quality control samples were generally RPD exceedances were infrequent within appropriate limits. The trip blank and field rinsate blank and minor and do not impact the results were below the laboratory PQL. The trip spike recovery overall dataset. DP assessed the was acceptable. results for primary samples and field Relative Percent Difference calculations (RPDs) for the intraduplicates against the site laboratory soil and groundwater duplicate samples for 6 acceptance criteria which is metals (soil) ranged from 67% to 100%. RPDs for the interconsidered appropriate. laboratory soil and groundwater duplicate samples for 6 The Auditor has adopted the highest metals (4 soil and 2 groundwater) ranged from 35% to 124% concentration from field duplicate and 2 TRHs (F3 and F4 in soil) from 64% to 91%. The DSI has and triplicate results. assessed field duplicate results along with the primary sample results against the site acceptance criteria. NATA registered laboratory and NATA endorsed Acceptable. methods Laboratories used included: Envirolab Services Pty Ltd (primary) and Eurofins Scientific (secondary). Laboratory certificates were NATA stamped. Analytical methods Acceptable. Analytical methods were included in the laboratory test certificates. Both Envirolab and Eurofins provided brief method summaries of in-house NATA accredited methods used based on USEPA and/or APHA methods (excluding asbestos) for extraction and analysis in accordance with the NEPM (2013). Asbestos analysis was based on AS4964-2004. Holding times Acceptable. Review of the COCs and laboratory certificates indicate that the holding times had been met. DP also reported that holding times have been met. Practical Quantitation Limits (PQLs) Overall the PQLs are acceptable. Soil: PQLs for individual PCBs and OCPs were slightly raised in The POL for asbestos analysis is some soil samples (Envirolab Reports: 178652 (samples 1, considered acceptable in the 1dm2); 179425 (samples 1, 1d); 180377 (sample 5); and absence of any other validated 182097) due to interference from analytes other than those analytical method. being tested. The raised PQLs were below the quality criteria. The elevated Azinophos-methyl PQL The PQL for TCLP PFAS analysis (Envirolab Report 182097-A) in groundwater was only marginally was raised by 2x due to internal standard suppression. above the trigger value and in the context of the results reported, this Groundwater: PQLs for groundwater were sufficiently low in

the majority of the analytes and acceptable for the DSI. The

discrepancy does not materially

affect the outcome of the audit.

Table 6.2: QA/QC - Field and Lab Quality Assurance and Quality Control		
Field and Lab QA/QC	Auditor's Opinion	
PQL for Azinophos-methyl (OPP compound) was 0.02 μ g/L which is above the 99% reliability criteria of 0.01 μ g/L.		
Laboratory quality control samples	Acceptable.	
Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratory.		
Laboratory quality control results	In the context of the dataset reported, the laboratory quality control results are acceptable for remediation planning purposes.	
The results of laboratory quality control samples were generally within appropriate limits, with the following exceptions:		
Percentage spike recovery was not possible for individual TRH due to high concentrations, the inhomogeneous nature of the compound in the sample and/or interference from analytes. Low recovery was noted for some metals due to matrix interferences. This was considered acceptable as acceptable recovery was reported for the laboratory control samples (LCS).		
Some samples sent for asbestos analysis were subsampled by the laboratory due to the weight of the sample exceeding the recommended 40-50 g (presence/absence) or samples not provided in zip-lock bags.		
The laboratory RPD acceptance criteria were exceeded for individual metals and PAHs. The laboratory reported that this was attributed to the non-homogenous nature of the samples. Triplicate results were issued by the laboratory to confirm the metal results exceeding the RPD criteria.		
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy) The DSI assessed the field and laboratory results against predetermined data quality indicators (DQIs) and internal standards. These were discussed with regard to the five category areas.	An assessment of the data quality with respect to the five category areas has been undertaken by the Auditor and is summarised below.	

In considering the data as a whole the Auditor concludes that:

- The DSI used o-rings in monitoring wells and Decon 90 for decontamination of field equipment. These substances can contain PFAS and may be a potential source of PFAS detected at the site. The accuracy of the PFAS analytical results is therefore considered to be low.
- The laboratories provided adequate information to conclude that the data are of sufficient precision.
- There is a high degree of confidence that the data are accurate (excluding PFAS as noted above).

- The data are likely to be representative of the overall site conditions, including fill, natural soil and groundwater. Results for volatile organics in soil samples collected by solid stem auger may underestimate actual concentrations.
- The investigation data are considered to be complete.
- There is a high degree of confidence that the data are comparable for each sampling and analytical event.

7. ENVIRONMENTAL QUALITY CRITERIA

The Auditor has assessed **soil** data provided with reference to criteria from National Environmental Protection Council (NEPC) *National Environmental Protection (Assessment of Site Contamination)*Measure 1999, as Amended 2013 (NEPM, 2013). Based on the proposed development (excavation and construction of a station), the Tier 1 (screening) criteria for a 'commercial/ industrial' setting were referred to as follows:

- Human Health Assessment:
 - Health Based Investigation Levels (HIL D).
 - Soil Health Screening Levels (HSL D) for Vapour Intrusion. The most conservative criteria were adopted i.e. assumed depth to source < 1 m and sand.
 - Asbestos presence/absence.
 - Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS): PFAS National Environmental Management Plan (PFAS NEMP, January 2018), published by the Head of EPAs Australia and New Zealand (HEPA). The human health screening values (HHSV) for potential human exposure through direct soil contact based on 20% of tolerable daily intake (TDI) (set by Food Standards Australia New Zealand (FSANZ) 2017) has been adopted.
- Terrestrial Ecological Assessment (TEA): The soil data has not been assessed against the TEA as soil from the site will be excavated to a maximum depth of 33 mbgl and disposed off-site during development of the site. The TEA is applicable to depths of 2 mbgl, and is therefore not applicable for the remaining natural soil.
- Management Limits (ML commercial/industrial) assuming coarse soil.
- Aesthetics
 - The Auditor has considered the need for remediation based on 'aesthetic' contamination as outlined in the NEPM (2013).

The Auditor has assessed the **groundwater** data provided with reference to Tier 1 (screening) criteria for 'commercial/ industrial' from the following:

- Human Health Assessment:
 - NEPM HSLs are not applicable for groundwater intercepted during excavation.
 - NHMRC and NRMMC (2011) *Australian Drinking Water Guidelines* (ADWG) where HSLs are not applicable.
 - USEPA RSL (on-line) Residential Tap Water Criteria for use where HSLs are not applicable or where local guidelines are not available for individual contaminants.
 - WHO (2008) Petroleum Products in Drinking-water guidelines where HSLs are not applicable.

- ADWG (2011) criteria with a factor of 10 for incidental direct contact (for non-volatiles).
- PFAS NEMP (January 2018) criteria for drinking water.

• Ecological Assessment:

- Groundwater Investigation Levels (GILs) listed in NEPM (2013) for protection of aquatic ecosystems referenced in ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Trigger values (TVs) provided are concentrations that, if exceeded, indicate a potential environmental problem at the point of use and 'trigger' further investigation. The 95% fresh water level of protection was adopted.
- PFAS NEMP (January 2018) provides Draft ANZECC guidelines for PFAS in Freshwater. The guideline value (GV) for 95% level of protection in fresh water was adopted.

Groundwater monitoring wells were screened across different soil profiles (fill, clay and shale). Groundwater identified in the wells may therefore relate to perched groundwater conditions. The yield in the wells was low and as there is a reticulated water supply for the area, extraction and use of groundwater as a resource is unlikely. Therefore assessment of direct contact and consumption of groundwater is not considered to be required.

The environmental quality criteria referenced by the Auditor are consistent with those adopted by DP, with the exception of the following:

- The DSI does not mention assessment of 'aesthetic' contamination as outlined in the NEPM (2013). However, the report results discuss potential aesthetic issues detected during sampling.
- The DSI adopted the OEH Science Draft Screening Criteria (May 2017) for PFAS in soil for commercial/ industrial land use. The report adopted the recreational water criteria (supported by OEH Contaminants and Risk) for assessing PFAS in groundwater. The report noted that the PFAS guidelines were yet to be finalised as the study of PFAS in the environment is an emerging field. It is unlikely that the groundwater at the site will be used for recreational purposes, the criteria for freshwater aquatic ecosystem outlined in the draft ANZECC is considered more appropriate.
- The RAP adopted the PFAS NEMP (January 2018) guidelines for the validation assessment.
- The DSI and RAP adopted 'hardness modified trigger values' (HMTV) for the assessment of individual metals in GILs. The hardness conditions of the receiving water body have not been assessed to justify the use of HMTV.

8. EVALUATION OF SOIL ANALYTICAL RESULTS

Soil samples were analysed for a variety of contaminants detailed in Tables 8.1 (fill) and 8.2 (natural). The results have been assessed against the environmental quality criteria and summarised below. Soil sampling locations are presented in Attachment 2.

Table 8.1: Evaluation of Fill Soil Analytical Results – Summary Table (mg/kg)					
Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	
Asbestos in soil (presence/ absence)	17	0	<pql< td=""><td>-</td></pql<>	-	
Asbestos in fragments (ACM)	1	0	<pql< td=""><td>-</td></pql<>	-	

Table 8.1: Evaluation of Fill Soil Analytical Results - Summary Table (mg/kg)					
Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	
Arsenic	19	11	16	0 above HIL D 3,000 mg/kg	
Boron	19	6	46	0 above HIL D 300,000 mg/kg	
Cadmium	19	2	3	0 above HIL D 900 mg/kg	
Total Chromium	19	19	60	0 above HIL D 3,600 mg/kg	
Copper	19	16	290	0 above HIL D 240,000 mg/kg	
Lead	19	19	3,300	1 above HIL D 1,500 mg/kg	
Mercury (inorganic)	19	5	1	0 above HIL D 730 mg/kg	
Nickel	19	17	18	0 above HIL D 6,000 mg/kg	
Zinc	19	18	3,500	0 above HIL D 400,000 mg/kg	
TRH (C ₆ -C ₁₀ minus BTEX)	19	0	<pql< td=""><td>0 above HSL D (sand 0-1 m) 260 mg/kg</td></pql<>	0 above HSL D (sand 0-1 m) 260 mg/kg	
				0 above ML 700 mg/kg	
TRH (>C ₁₀ -C ₁₆	19	3	240	0 above HSL D (sand 0-1 m) NL	
minus naphthalene)				0 above ML 1,000 mg/kg	
TRH (>C ₁₆ -C ₃₄)	19	8	5,300	1 above ML 3,500 mg/kg	
TRH (>C ₃₄ -C ₄₀)	19	5	1,100	0 above ML 10,000 mg/kg	
Benzene	19	0	<pql< td=""><td>0 above HSL D (sand 0-1 m) 3 mg/kg</td></pql<>	0 above HSL D (sand 0-1 m) 3 mg/kg	
Toluene	19	0	<pql< td=""><td>0 above HSL D (sand 0-1 m) NL</td></pql<>	0 above HSL D (sand 0-1 m) NL	
Ethylbenzene	19	0	<pql< td=""><td>0 above HSL D (sand 0-1 m) NL</td></pql<>	0 above HSL D (sand 0-1 m) NL	
Xylene	19	0	<pql< td=""><td>0 above HSL D (sand 0-1 m) 230 mg/kg</td></pql<>	0 above HSL D (sand 0-1 m) 230 mg/kg	
Total VOCs	14	1	1ª	-	
Total PAHs	19	13	1,100	0 above HIL D 4,000 mg/kg	
Carcinogenic PAHs (BaP TEQ)	19	9	100	2 above HIL D 40 mg/kg	
Benzo(a)pyrene	19	12	68	-	
Naphthalene	19	5	4	0 above HSL D (sand 0-1 m) NL	
Total Phenols	14	0	<pql< td=""><td>0 above HIL D 240,000 mg/kg</td></pql<>	0 above HIL D 240,000 mg/kg	
PCBs	14	1	0.3	0 above HIL D 7 mg/kg	
OPPs	14	0	<pql< td=""><td>0 above HIL D</td></pql<>	0 above HIL D	
OCPs	14	2	1.6	0 above HIL D	
PFOS + PFHxS	5	2	0.0008	0 above HHSV 20 ^b mg/kg	

Table 8.1: Evaluation of Fill Soil Analytical Results – Summary Table (mg/kg)					
Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	
PFOA	5	4	0.0001	0 above HHSV 50 ^b mg/kg	

n number of samples

No criteria available/used

NL Non limiting

TEQ Toxicity equivalent quotient

a 1,4-dichlorobenzene was detected in fill sample CNBH05 (0.4-0.5 mbgl)

b Human health screening values (HHSV) for commercial/industrial land use (PFAS NEMP 2018)

Analyte	n	Detections	Maximum	n >	
				Human Health Screening Criteria (NEPM, 2013)	
Asbestos in soil (presence/absence)	2	0	<pql< td=""><td>-</td></pql<>	-	
Arsenic	19	14	12	0 above HIL D 3,000 mg/kg	
Boron	19	0	<pql< td=""><td>0 above HIL D 300,000 mg/kg</td></pql<>	0 above HIL D 300,000 mg/kg	
Cadmium	19	0	<pql< td=""><td>0 above HIL D 900 mg/kg</td></pql<>	0 above HIL D 900 mg/kg	
Total Chromium	19	19	77	0 above HIL D 3,600 mg/kg	
Copper	19	4	33	0 above HIL D 240,000 mg/kg	
Lead	19	19	24	0 above HIL D of 1,500 mg/kg	
Mercury (inorganic)	19	0	<pql< td=""><td>0 above HIL D 730 mg/kg</td></pql<>	0 above HIL D 730 mg/kg	
Nickel	19	10	3	0 above HIL D 6,000 mg/kg	
Zinc	19	16	110	0 above HIL D 400,000 mg/kg	
TRH (C ₆ -C ₄₀)	19	0	<pql< td=""><td>0 above HIL D or ML</td></pql<>	0 above HIL D or ML	
BTEXN	19	0	<pql< td=""><td>0 above HSL D (sand 0-1 m)</td></pql<>	0 above HSL D (sand 0-1 m)	
Total VOCs	17	0	<pql< td=""><td>-</td></pql<>	-	
Total PAHs	19	1	1.8	0 above HIL D 4,000 mg/kg	
Carcinogenic PAHs (BaP TEQ)	19	0	<pql< td=""><td>0 above HIL D 40 mg/kg</td></pql<>	0 above HIL D 40 mg/kg	
Benzo(a)pyrene	19	1	0.1	-	
Total Phenols	16	0	<pql< td=""><td>0 above HIL D 240,000 mg/kg</td></pql<>	0 above HIL D 240,000 mg/kg	
PCBs	17	0	<pql< td=""><td>0 above HIL D 7 mg/kg</td></pql<>	0 above HIL D 7 mg/kg	
OPPs	16	0	<pql< td=""><td>0 above HIL D</td></pql<>	0 above HIL D	
OCPs	17	0	<pql< td=""><td>0 above HIL D</td></pql<>	0 above HIL D	

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Table 8.2: Evaluation of Natural Soil Analytical Results – Summary Table (mg/kg)					
Analyte	n	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013)	
PFOS + PFHxS	6	2	0.0008	0 above HHSV 20 ^a mg/kg	
PFOA	6	4	0.0001	0 above HHSV 50° mg/kg	

- n number of samples
- No criteria available/used
- NL Non limiting
- a Human health screening values (HHSV) for commercial/industrial land use (PFAS NEMP 2018)

In assessing the results, the Auditor makes the following observations:

- Fill samples from CNTP17 and CNTP12 detected elevated concentrations of contaminants above the health screening criteria. The source of these contaminants can be attributed to the following:
 - Fill sample CNTP17 (0.4-0.5) detected lead exceeding the human health criteria. The underlying natural soil sample CNTP17 (0.8-0.9) was not contaminated indicating that the lead is confined to the fill profile which contained inclusions of charcoal, slag and coal.
 - Fill sample CNTP12 (0.4-0.45) detected B(a)P TEQ exceeding the human health criteria. Fill sample CNTP12 (0.5-0.55) detected B(a)P TEQ and TRH C_{16} - C_{34} . The fill at this location contained a strong hydrocarbon odour and bituminous material. A sample of the material was collected for laboratory analysis, which did not identify coal tar. The contamination appears to be confined to the fill profile.
 - The DSI concluded that the exceedances were not hotspots as all of the results were below 250% of the HSLs.
- Metals, heavy fraction TRH, individual PAHs, OCPs, PCBs and PFAS was detected in the fill samples at concentrations below the screening criteria.
- Asbestos was not detected in samples of soil and one fragment of cement sheet. However, a
 previous investigation by Coffey (2016) identified ACM at the surface on 479 Pacific Highway. DP
 reported that this ACM impacted material was buried onsite.
- Fill appears to have been impacted by the historical activities undertaken at the site (Section 4).
- Marginal detections of metals, PAHs and PFAS below the screening criteria were detected in some natural soil samples. The source of these contaminants can be attributed to the following:
 - Slight detections of PAHs in the natural soil in CNBH04 could be attributed to the sampling methodology used by DP (sampling from spiral augers) that may have resulted in cross contamination.
 - Detections of PFAS in the natural soil in CNTP11, CNTP12-1 and CNMW13 could be attributed to a number of sources such as leaching from the overlying fill material, samples obtained using spiral augers, ubiquitous nature of the contaminant, and/or contamination from field practices (discussed in Section 6).
 - The majority of the metal results are consistent with background concentrations except for chromium which was above typical background levels (12-21 mg/kg). Chromium was detected in all of the natural soil samples at fairly consistent concentrations and therefore could indicate higher background concentrations at the site.

 Strong hydrocarbon odour and high PID readings (270-370 ppm) were noted in the natural clay in CNMW13 at depths of 2.5 mbgl to 2.9 mbgl. A clay sample from this depth (2.5-2.7 mbgl) was analysed for TRH and BETX. All results were below the laboratory detection limits.

8.1 Auditor's Opinion

In the Auditor's opinion, the soil analytical results are consistent with the site history and field observations. The results indicate the fill to be locally impacted by lead, B(a)P, TRH C_{16} - C_{34} and ACM. More widespread contamination from ACM is possible. Low level contamination of fill and underlying natural soil was identified, however this was at concentrations less than the assessment criteria.

Remediation of fill material is required. Off-site disposal of impacted fill and natural soil will require careful management during remediation. The remedial strategy outlined in the RAP is reviewed and summarised in Section 10.

9. EVALUATION OF GROUNDWATER ANALYTICAL RESULTS

Groundwater samples were collected from monitoring wells CNMW07, CNMW13, CNMW14 and CNMW15 by DP as part of the DSI. The DSI stated that CNMW13 was subsequently destroyed during site activities. The analytical results are summarised below in Table 9.1. Sampling locations are presented in Attachment 2.

Analyte	n	Detections	Maximum	n >ANZECC Fresh (2000)	n > ADWG/RSL
Arsenic	4	0	<pql< td=""><td>0 above criterion of 24 μg/L</td><td>0 above criterion of 10 μg/L</td></pql<>	0 above criterion of 24 μg/L	0 above criterion of 10 μg/L
Cadmium	4	3	0.3	3 above criterion of 0.06 μg/L	0 above criterion of 2 μg/L
Total Chromium	4	0	<pql< td=""><td>0 above criterion of 1 μg/L</td><td>0 above criterion of 50 μg/L</td></pql<>	0 above criterion of 1 μg/L	0 above criterion of 50 μg/L
Copper	4	2	25	2 above criterion of 1.4 μg/L	0 above criterion of 2,000 μg/L
Lead	4	1	1	0 above criterion of 3.4 μg/L	0 above criterion of 10 μg/L
Mercury	4	0	<pql< td=""><td>0 above criterion of 0.06 μg/L</td><td>0 above criterion of 1 μg/L</td></pql<>	0 above criterion of 0.06 μg/L	0 above criterion of 1 μg/L
Nickel	4	2	6	0 above criterion of 8 μg/L	0 above criterion of 20 μg/L
Zinc	4	4	78	4 above criterion of 8 μg/L	-
TRH (C ₆ -C ₁₀ minus BTEX)	4	2	110	-	0 above criterion of 15,000 μg/L ^a
TRH (> C_{10} - C_{16} minus naphthalene)	4	1	95	-	-
TRH (>C ₁₆ -C ₃₄)	4	0	<pql< td=""><td>-</td><td>-</td></pql<>	-	-

Analyte	n	Detections	Maximum	n >ANZECC Fresh (2000)	n > ADWG/RSL
TRH (>C ₃₄ -C ₄₀)	4	0	<pql< td=""><td>-</td><td>-</td></pql<>	-	-
1,2,4- Trimethylbenzene	4	1	2	-	0 above criterior of 56 μg/L
Chloroform (Trichloromethane)	4	1	1	0 above criterion of 370 μg/L	0 above criterion of 3 μg/L
Cyclohexane	4	1	6	-	0 above criterior of 13,000 μg/L
Isopropylbenzene	4	1	6	0 above criterion of 30 μg/L	-
Secbutylbenzene	4	1	1	-	0 above criterior of 2,000 μg/L
Benzene	4	0	<pql< td=""><td>0 above criterion of 950 μg/L</td><td>0 above criterior of 1 μg/L</td></pql<>	0 above criterion of 950 μg/L	0 above criterior of 1 μg/L
Toluene	4	0	<pql< td=""><td>-</td><td>0 above criterior of 800 μg/L</td></pql<>	-	0 above criterior of 800 μg/L
Ethylbenzene	4	0	<pql< td=""><td>-</td><td>0 above criterior of 300 μg/L</td></pql<>	-	0 above criterior of 300 μg/L
Xylene	4	1	5	0 above criterion of 350 μg/L	0 above criterior of 600 μg/L
Naphthalene	4	2	2.3	0 above criterion of 16 μg/L	-
Phenanthrene	4	1	0.1	0 above criterion of 0.6 μg/L	-
Aldrin	4	1	0.002	1 above criterion of 0.001 μg/L ^b	-
Dieldrin	4	2	0.011	1 above criterion of 0.01 μg/L ^b	-
Aldrin+Dieldrin	4	3	0.011	-	0 above criterior of 0.3 μg/L
Total OPPs	4	0	<pql< td=""><td>-</td><td>-</td></pql<>	-	-
Total PCBs	4	0	<pql< td=""><td>-</td><td>-</td></pql<>	-	-
Total Phenols	4	0	<pql< td=""><td>0 above criterion of 320 μg/L</td><td>-</td></pql<>	0 above criterion of 320 μg/L	-
PFOS + PFHxS	4	1	0.01	0 above criterion of 0.13 μg/L	-
PFOA	4	2	0.02	0 above criterion of 220 μg/L	-

n number of samples

No criteria available/used

- a WHO (2008) assessment criteria for TPH aliphatic fraction adjusted by x10 in accordance with NHMRC (2008) recommendations for incidental ingestion of groundwater.
- b In the absence of high reliability guidelines, the moderate or low reliability guideline concentration has been adopted.

In assessing the results, the Auditor makes the following observations:

- The groundwater analytical results for the majority of the analytes were below the human health and ecological screening criteria.
- Elevated cadmium, copper and zinc concentrations were detected in the groundwater samples. The
 DSI concluded that the heavy metals can be attributed to diffuse urban-sourced background levels
 and are not from a site specific source.
- Marginally elevated concentrations of Aldrin and Dieldrin above the ecological screening criteria were detected in groundwater. DP stated that fill soils from CNTP16 and CNTP18 (up-gradient) detected Aldrin and Dieldrin and could be a potential source of contamination.
- The identification of volatile TRH F1 fraction and Xylene in groundwater sample CNMW13 indicates
 that petroleum hydrocarbons are present at low concentrations. The DSI concluded that the source
 of hydrocarbons is most likely associated with the former USTs and site use as a mechanic.
 Considering the depth of excavation, site receptors could come into contact with contaminated
 groundwater. The WHO (2008) criteria were used to assess risk of exposure by direct contact. The
 TRH F1 concentration was below the assessment criteria.
- Low concentrations of individual VOCs (1,2,4-trimethylbenzene, chloroform, cyclohexane, isopropylbenzene and secbutylbenzene) were detected in groundwater. The concentrations were below the ecological and human health screening criteria. The DSI concluded that the source of VOCs could be from a fuel source and/or from solvent use. The presence of chloroform could be from chlorination of potable water.
- The DSI concluded that the potential on-site sources will be removed during site works and that groundwater treatment requirements will be considered for groundwater disposal during the construction phase.

9.1 Auditor's Opinion

In the Auditor's opinion, the analytical results indicate the presence of low level contamination of groundwater at concentrations less than the adopted human health screening criteria. Marginal exceedances of ecological screening criteria were reported for metals (cadmium, copper and zinc) and OCPs (Aldrin and Dieldrin). Ecological receptors will not be present onsite and the closest surface water receptor was 1.4 km to the northeast. Low level groundwater contamination at the site is therefore not considered to present a risk human health and ecological receptors. Further investigation or remediation of groundwater is therefore not considered to be required.

10. EVALUATION OF PROPOSED REMEDIATION

10.1 Conceptual Site Model

A conceptual site model (CSM) is a representation of the source, pathway and receptor linkages at a site. DP has developed a CSM based on the PSI and DSI. Table 10.1 provides the Auditor's review of the CSM used by DP to inform remediation of the site.

Table 10.1: Review of the Conceptual Site Model					
Element of CSM	Consultant	Auditor Opinion			
Contaminant source and mechanism	Contaminated fill material containing lead, B(a)P, TRH C ₁₆ -C ₃₄ and ACM, impacted by former land use or imported to the site from unknown sources. Detections of TRH, VOCs and OCPs in groundwater. Unexpected contamination finds during excavation.	Source and mechanism for soil considered appropriate. The source of TRH and VOCs in groundwater has not been identified. TRH and xylene are likely associated with previously removed USTs. The source of the VOCs may be related to former onsite or offsite land use. The low concentrations identified on the site are not considered to present a potential risk to human health or the environment.			
Affected media	Fill material and groundwater.	Agree fill is the primary affected media. Low level contamination was also reported in natural soil. Groundwater concentrations did not exceed adopted human health and ecological screening criteria. Groundwater is therefore not considered to be affected media.			
Receptor identification	Future site users of the rail corridor, construction workers, adjacent land users, surface water receptors, groundwater and in-ground built structures.	Fill material will be entirely removed from the site during remediation. The only relevant receptor is therefore considered to be construction workers.			
Exposure pathways	Inhalation of dust and vapours, lateral migration of groundwater, direct contact.	Inhalation, direct contact and incidental ingestion are considered to be complete exposure pathways during construction. No other complete exposure pathways are considered to be present on the site based on the investigations undertaken, the remediation proposed, and the proposed development.			
Presence of preferential pathways for contaminant movement	Trenches for buried services may act as potential migratory pathways.	Not considered relevant for fill material removed during remediation. Preferential pathways for groundwater and vapour migration are not relevant as contamination representing a risk to human			

Table 10.1: Review of the Conceptual Site Model				
Element of CSM	Consultant	Auditor Opinion		
		health or the environment has not been identified.		
Evaluation of data gaps	The RAP states that the contaminants in groundwater will require treatment prior to disposal. However, treatment options have not been addressed in the RAP.	No potentially significant data gaps were identified during review of the PSI, DSI and RAP. The lack of validation for the UST removal will be addressed through the planned excavation works.		

In the Auditor's opinion, the CSM developed is considered an adequate basis for assessing remedial requirements.

10.2 Remediation Required

The Auditor has assessed the RAP by comparison with the checklist included in OEH (2011) *Guidelines* for Consultants Reporting on Contaminated Sites. The RAP was found to address the required information, as detailed in Table 10.2, below.

Table 10.2: Evaluation of Remedial Action Plan				
Remedial Action Plan	Auditor Comments			
Remedial Goal The RAP stated four remediation goals as outlined below: 'render the site suitable for the proposed land use; maintain records of the remediation and earthworks undertaken including validation as required; mitigate adverse impacts on surrounding land and waterways during the remediation by the management of dust, water and noise emissions; and maximise the protection of workers involved with remediation and earthworks'.	In the Auditor's opinion, the goals are appropriate considering the proposed development of the site.			
Discussion of the extent of remediation required DP identified the entire excavation footprint (Attachment 2) as the lateral remediation extent and the vertical extent to be the depth of contaminated soil or the base of the excavation. Due to the nature of the development, bulk excavation will require removal of site soil to the desired levels (25-33 mbgl). The base and walls of the excavation will be validated to demonstrate removal of fill material.	The proposed extent of remediation is considered adequate. Further excavation would be undertaken in the event of validation failure.			
Remedial Options The RAP stated that due to the bulk excavation requirement for the proposed development, excavation and off-site disposal was the only viable option.	Acceptable.			
Selected Preferred Option	Acceptable.			
Excavation and off-site disposal of contaminated fill. Capture, treatment and disposal of groundwater during construction.	The RAP does not specify the treatment process for groundwater disposal, but outlines that it will be undertaken under an			

Remedial Action Plan	Auditor Comments
	Environmental Protection License (EPL).
Rationale	Acceptable.
Development of the site will involve bulk excavation from the surface to a depth of up to 33 mbgl. The impacted soil will be excavated and disposed off-site.	
Waste Characterisation and Disposal	Acceptable.
The DSI has identified the following waste streams based on <i>in situ</i> testing of fill material (Attachment 3): hazardous waste (HW); restricted solid waste (RSW); special waste – asbestos – general solid waste; general solid waste (GSW); and VENM. DP are to provide documented waste classifications based on an inspection of the material and available analytical data. Further <i>ex situ</i> waste characterisation will be undertaken if considered necessary.	
Waste material is to be removed by a licensed contractor. Each load will be documented, including weighbridge slips, trip tickets and consignment disposal confirmation. Waste will be disposed of at a facility legally able to accept the material.	
The RAP includes a plan for the classification, handling, characterisation, treatment and disposal of hazardous waste.	
Containment	Acceptable.
No requirement at this stage.	
Proposed Validation Testing	The Auditor considers the
Validation samples are to be collected following removal of USTs, waste with different classifications and fill material, as well as the footprint of stockpile areas.	validation sampling densities acceptable. Contaminants of concern for
Excavations (base $<500 \text{ m}^2$):	validation of fill material
Base – one sample per 25-50 m^2 . With a minimum of 3 samples.	removal are considered to
Walls – one sample per 10 m length exposed with additional samples collected at depths based on observations.	include metals, PAHs, TRHs, OCPs and asbestos. The density of testing for
Excavations (base ≥500 m²):	imported material would need
Base – grid based sampling to meet the density recommended in the NSW EPA <i>Sampling Design Guidelines</i> (minimum of 10 samples).	to be commensurate with the documentation provided, source, observations and the
Walls – one sample per 20 m length exposed with additional samples collected at depths based on observations.	consistency of the results. VENM certificates based on the template available on the NSW
Stockpiles:	EPA website should be
In accordance with NEPM (2013).	provided.
The RAP states that samples collected will be analysed for the contaminants of concern. However, it does not list the contaminants.	
Imported material is expected for temporary works such as construction of piling platforms. The RAP includes a material importation protocol and criteria for implementation. The protocol	

Table 10.2: Evaluation of Remedial Action Plan			
Remedial Action Plan	Auditor Comments		
requires review and approval of documentation by the environmental consultant, inspection of the material at the source site, inspection during importation and additional testing (testing details not provided in the RAP).			
Interim Site Management Plan (before remediation)	Acceptable. No other interim		
The RAP recommends a surface clearance for asbestos by an asbestos assessor prior to remediation.	management is considered necessary given the site is sealed with concrete and asphalt, fenced and occupied by JHCPBGJV.		
Unexpected Finds	The unexpected finds		
The RAP includes a contingency plan for unexpected finds, stopping work and assessment of the find by an occupation hygienist, asbestos consultant or environmental consultant. The RAP included a contingency plan for the removal of USTs if encountered during excavation work.	procedure (UFP) is considered acceptable.		
The RAP includes contingency in the event contaminated groundwater and/or hazardous ground gas are detected during site works.			
Validation should be undertaken in accordance with the procedures in the RAP.			
Site Management Plan (operation phase) including stormwater, soil, noise, dust, odour and OH&S	The site management plan is considered acceptable for		
The RAP includes a site management plan for implementation during remediation and validation that covers specific requirements for asbestos (including notification, air monitoring), specific requirements for chemical contaminants, fencing and signage, security and restriction of access, PPE, decontamination, disposal of water, clearance inspection and certificates.	remedial planning.		
The RAP includes a Hazardous Waste Plan to address the excavation and disposal of hazardous waste identified at the site.			
Contingency Plan if Selected Remedial Strategy Fails	The remedial strategy has a		
The RAP states that in the event of validation failure, the remediation contractor will undertake further 'chase out' excavation and disposal, followed by validation sampling.	low risk of failure, as validation failure would lead to further excavation which is required for the development.		
Contingency Plans to Respond to site Incidents	Acceptable.		
The RAP includes a contingency plan for unexpected finds.			
Remediation Schedule and Hours of Operation	The hours of operation are to		
Not provided in the RAP.	be governed by consent conditions.		
Licence and Approvals	Acceptable.		

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Table 10.2: Evaluation of Remedial Action Plan	
Remedial Action Plan	Auditor Comments
The RAP notes that the development is approved as critical State significant infrastructure under the <i>Environmental Planning and Assessment Act 1997</i> (EP&A Act). SEPP55 does not apply to the development.	
Waste disposal is to be tracked, and the receiving facility is to be licensed to accept the material.	
Council approval will be required for disposal of groundwater to the stormwater system if required during works. The RAP notes that an EPL will be in place for the disposal of water.	
Asbestos removal contractors are to be appropriately licensed. Air monitoring for asbestos is to be conducted during remediation.	
Contacts/ Community Relations	Acceptable.
Contacts were provided for the consultant and Auditor. The details of the project manager and remediation contractor are to be included following appointment. The emergency procedures and contact details are to be displayed at the site entrance.	
Direct community consultation is not proposed.	
Long-term environmental management plan	Acceptable.
No requirement based on the proposed remedial strategy.	
Validation Reporting	Acceptable.
The RAP included a validation plan which addresses the validation DQOs, QA/QC and DQIs in accordance with NEPM (2013). The validation requirements include: site inspections, sampling, documentation and reporting.	

It is considered that the remediation approach recommended by DP is largely appropriate. Staged remediation of the different waste streams would be feasible and considered appropriate for this site.

10.3 Auditor's Opinion

In the Auditors' opinion, the proposed remediation works should ensure that the site is suitable for the proposed land uses through: treatment and appropriate disposal of groundwater; excavation and off-site disposal of contaminated fill material and natural soil; implementation of the UFP; and successful validation.

11. CONCLUSIONS AND RECOMMENDATIONS

The RAP concluded "... that the site can be rendered suitable for the proposed development subject to implementation of this RAP".

Based on the information presented in the referenced reports and observations made on site, the Auditor concludes that the proposed process of remediation is practical and that the site can be made suitable for the proposed land use if remediated in accordance with the following RAP:

'Remediation Action Plan, Sydney Metro City and South West, Tunnel and Station Excavation Works Package, Proposed Crows Nest Station, Pacific Highway, Crows Nest, prepared for John

Holland CPB Ghella JV, Project 85608.04, April 2018', report reference: Revision 1, dated 12 April 2018, prepared by Douglas Partners.

The RAP has been reviewed and endorsed by the Auditor in accordance with Clause 10.14A(b) (v) of the Sydney Metro City & Southwest Tunnel and Station Excavation Works Design and Construction Deed (Contract No: 00013/11200).

At the completion of remediation of the site, a Section A Site Audit Statement and supporting Site Audit Report certifying suitability for the proposed use should be prepared.

Remediation and reporting can be conducted in stages provided suitable provisions are made to avoid cross-contamination.

* * *

Consistent with the NSW EPA requirement for staged 'signoff' of sites that are the subject of progressive assessment, remediation and validation, I advise that:

- This advice letter does not constitute a Site Audit Report or Site Audit Statement.
- At the completion of the remediation and validation I will provide a Site Audit Statement and supporting documentation.
- This interim advice will be documented in the Site Audit Report.

Yours faithfully Ramboll Australia Pty Ltd

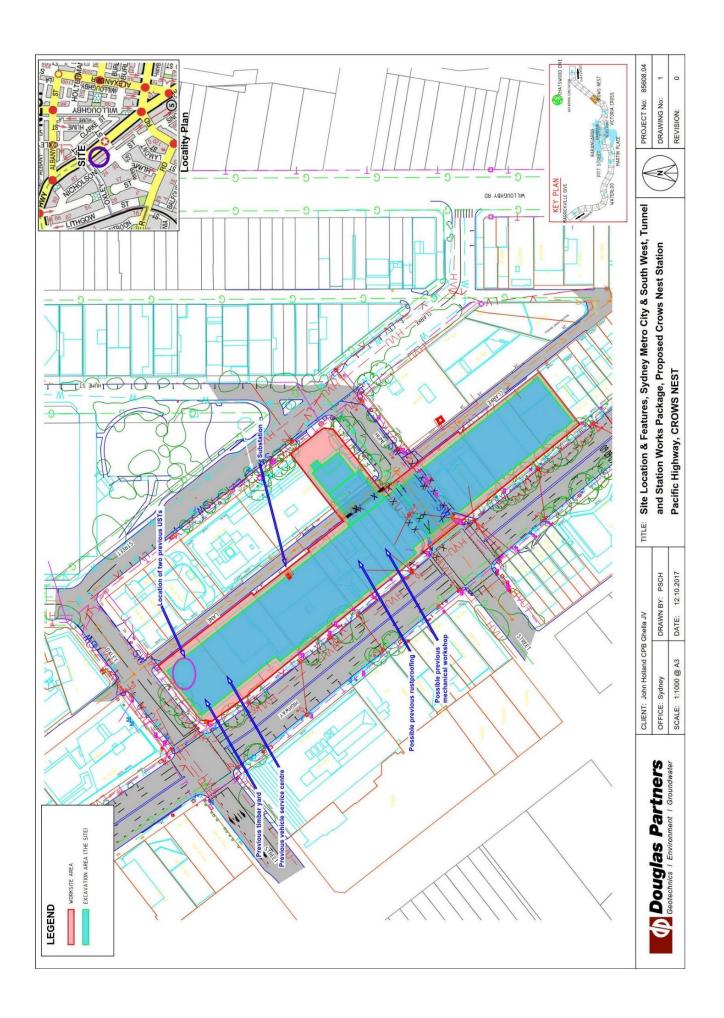
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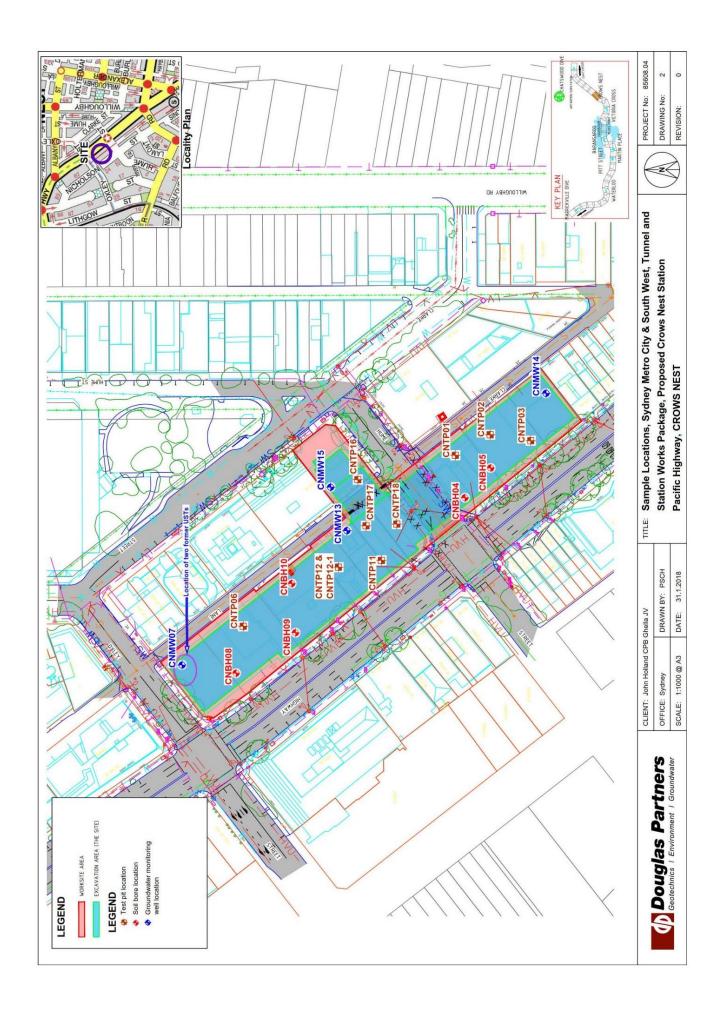
EPA Accredited Site Auditor 1505

Attachments: 1 Site Locality

2 The DSI Sampling Location Plan

3 Waste Classification and Soil Disposal Plan







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