Appendix G – Contamination Assessment

Technical Advice Note

28 August 2020

To	Hunter Water Corporation		
Copy to			
From	Alison Monkley	Tel	+61 2 49799990
Subject	Belmont Drought Response Desalination Plant - Contamination Review	Job no.	2219573

1 Introduction

This report provides a brief overview of the amended Project. A detailed description of the project is provided in Appendix D of the Amendment Report. This assessment considers the contamination impacts associated with the proposed amendments to the Project. Therefore, this report should be read in conjunction with GHD reports titled: *Belmont Drought Response Desalination Plant – Environmental Impact Statement (GHD, November 2019)* and *Belmont Temporary Desalination Plant Design Contamination Assessment Report (GHD, September 2019*).

2 The project

2.1 Overview

In addition to the proposed increase in the desalination plant's capacity up to 30 ML/day, the amended Project includes the following design changes:

- Seawater intake: Further design development and liaison with Hunter Water's construction partners following completion of the EIS identified reliability and construction risks with the proposed horizontal sub-surface intake system as described in the EIS. An assessment of the horizontal sub-surface intake system was undertaken against alternative intake options. This assessment found that a direct ocean intake would perform considerably better than a sub-surface option across key criteria including reliability, efficiency and scalability (see Section 2.2).
- Power supply: The EIS proposed to meet power requirements for the Project via a minor upgrade to the existing 11 kV power supply network in the vicinity of Hudson and Marriot Street. The amendment to the capacity of the water treatment process plant means this is now unfeasible, due to inability to meet energy requirements. Instead, the Project will connect to Ausgrid's 33 kV network in the vicinity of the Project.

2.2 Key features of the amended project

The amended Project for the construction and operation of a drought response desalination plant, designed to produce up to 30 ML/day of potable water, includes the following key components:

- **Direct ocean intakes** – To ensure provision of sufficient quantities of raw feed water for the water treatment process plant, a direct ocean intake is proposed as follows:
  - *Sea Water Pump Station (On-shore), including a central well, screening and pump housing*, proposed to be a concrete structure (referred to as a wet well) of approximately nine to 11 m diameter, installed to a depth up to 20 m below existing surface levels.

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  - *Intake pipeline,* the indicative pipeline alignment is approximately 1000 m in length, extending outwards from the central housing to the off-shore intake structure. Construction of the intake pipeline would be determined during detailed design; however, the following construction methodologies/ considered and assessed included Construction method 1 (CM1) Horizontal directional drilling (HDD) and (CM2) Pipejacking/micro-tunnelling.
  - *Intake structure (Off-shore)*, the intake structure would be in the form of a horizontal intake with a velocity cap structure and low through-screen velocity to minimise impacts on marine species and habitat. The intake structure would be 5 m in diameter, have a minimum of 5 m clearance from the seabed and a depth of approximately 18 m of water.
- **Water treatment process plant** – The water treatment process plant would not significantly change from that described in the EIS. The inclusion of buildings to house equipment rather than the installation of containerised equipment is the primary change. The buildings would be placed above ground level and located to allow incremental installation, if required. Services to and from the process equipment (e.g. power, communications, and raw feed water (seawater)) would comprise a mix of buried and overhead methods. The general components of the water treatment process would comprise:
  - *Pre-treatment: a pre-treatment system is required to remove micro-organisms, sediment, and organic material from the raw feed water.*
  - *Desalination: a reverse osmosis (RO) desalination system made up of pressurising pumps and membranes. These would be comprised of modular components. In addition, a number of tanks and internal pipework would be required.*
  - *Post treatment: desalinated water would be treated to drinking water standards and stored prior to pumping to the potable water supply network.*
- **Brine disposal system** – The desalination process would produce up to 56 ML/day of wastewater, comprising predominantly brine, as well as a small amount of pre-treatment and RO membrane cleaning waste. The waste brine from the desalination process would be transferred via a pipeline to a brine pump station at the Belmont WWTW for disposal via the existing ocean outfall pipe.
- **Power supply** – Power requirements of the amended water treatment process plant would require connection to Ausgrid's 33 kV line to the north-west of the water treatment process plant site, with new private power line connecting to a substation within the plant site.
- **Ancillary facilities** – Including a tank farm, equipment housing buildings, chemical storage and dosing, hardstand areas, stormwater and cross drainage, access roads, parking areas, and fencing, signage and lighting.

Each of these elements are described further in Appendix D of the Amendment Report.

The desalination plant would be connected to Hunter Water's potable water network via a potable water pipeline proposed to be constructed to augment the existing water network. The pipeline does not form part of the Project and would be part of a separate design and approvals process.

The Project area is located on the southern portion of the current Belmont wastewater treatment works site, off Ocean Park Road and to the east of the Pacific Highway as shown at Figure 2-1.

Paper Size ISO A4

0 110 220 330 440

Metres

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

N

Hunter Water Corporation
Belmont Drought Response Desalination Plant
Contamination Assessment

Project No. **22-19573**
Revision No. **0**
Date **29/07/2020**

Project Location

Figure 2-1

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Data source: LPI: DTDB / DCDB, 2017; public_NSW_Imagery: © Department of Customer Service 2020. Created by: TMorton

3 Contamination assessment (EIS Project)

3.1 Scope of works

The Contamination Assessment prepared for the EIS Project included assessment of the desalination plant and intake structures as well as water connections. With regards to the desalination plant and intake structures the contamination assessment included:

- Site history review including review of any available existing information including previous soil and groundwater assessment reports, former military uses etc.
- Review of geology, hydrology and topography information for the proposal area.
- Review of NSW Environment Protection Authority (EPA) record of notices and sites notified to the EPA under the Contaminated Land Management Act 1997 (CLM Act) and Protection of the Environment Operations (POEO) Environment Protection Licence (EPL) Register.
- Review of the NSW Office of Water Groundwater database on groundwater information for the area.
- A general inspection of the proposal area to identify areas of potential contamination concern.
- Collection of targeted soil samples from boreholes and test pits completed as part of the geotechnical investigations from the following areas:
  - Desalination Plant and Intake - Six test pit locations (TP101 to TP106) and four borehole locations (BH101 to BH104).
- Laboratory analysis of selected soil samples from each location for total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), polychlorinated biphenyl (PCB), heavy metals (As, Cd, Cr, Cu, Pb, Ni, Zn and Hg), pH, cation exchange capacity (CEC) and asbestos.

3.2 Desktop findings

The contamination desktop assessment was completed over the entire EIS Project Area. The desktop assessment identified that there was a potential for contamination to be present within soils in the former WWTW evaporation ponds and surrounding areas due to deposition of fill. The report also noted the potential for subsurface asbestos to remain on site.

Table 3-1 summarises the potential areas of environmental concern for the desalination plant area based on the results of the desktop review and site inspection.

Paper Size ISO A4

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Metres

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

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Belmont Drought Response Desalination Plant
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EIS Contamination Study Area

Figure 3-1

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Data source: LPI: DTDB / DCDB, 2017; DPE: Coastal Wetlands SEPP, 2018public_NSW_Imagery: © Department of Customer Service 2020. Created by: TMorton

Table 3-1 Potential contaminants of concern

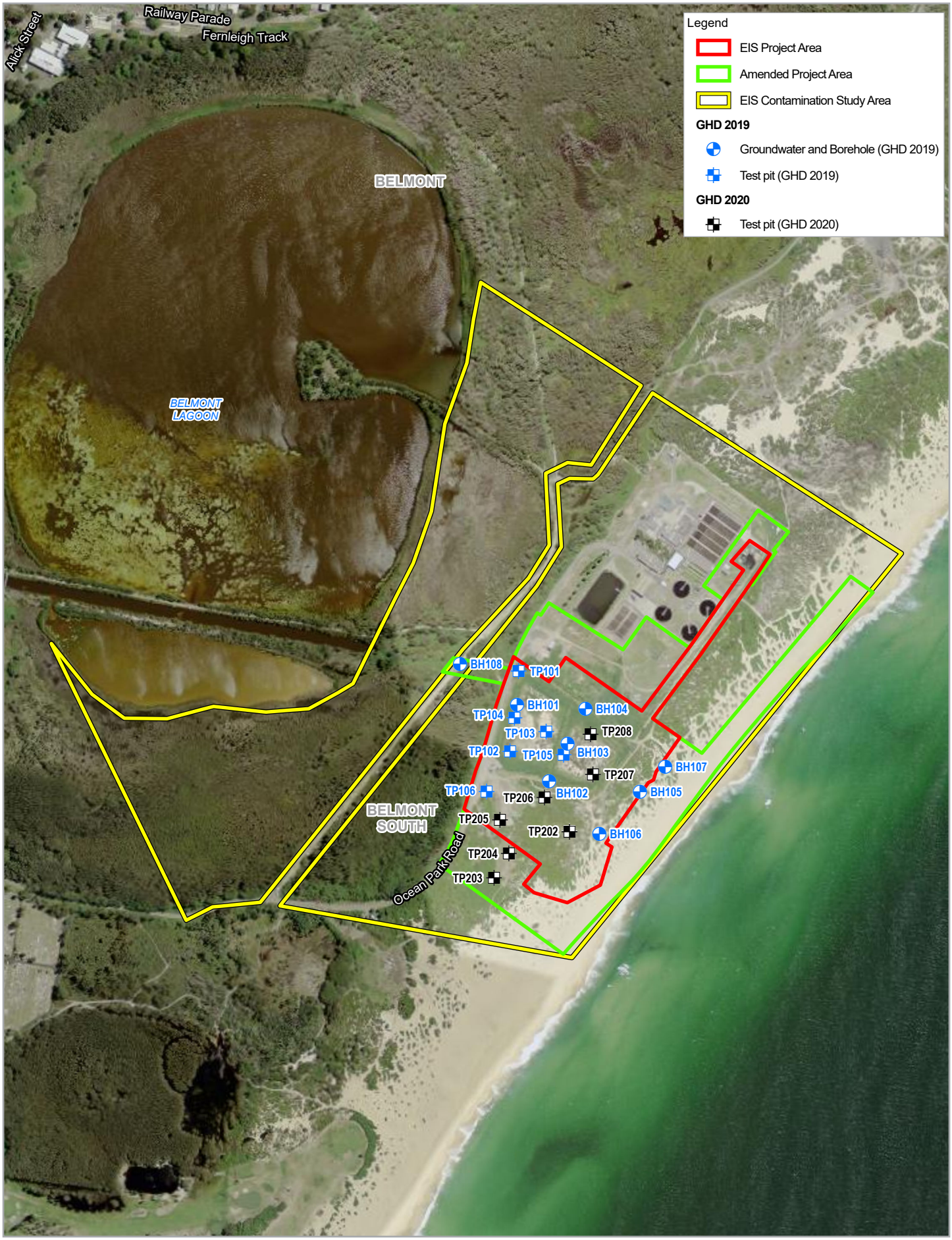
Source	Description	Potential Contaminants of Concern
Desalination plant area		
Deposition of wastes and fill from historical WWTW operations	Historical placement of WWTW wastes	Heavy metals, PAH, TPH, BTEX, phenols, asbestos, nutrient and microbial
Evaporation Ponds	Sludge from former WWTW operations	Heavy metals, PAH, TPH, BTEX, phenols, asbestos, nutrient and microbial
Leaks and spills from the adjacent WWTW	Leaks and spills associated with the current WWTW	Heavy metals, PAH, TPH, BTEX, phenols, nutrient and microbial
Spillage or leakage of oils, fuels	Spills and leaks associated with equipment and machinery historically used on the WWTW site.	Heavy metals, PAH, TRH, BTEXN, PCBs
Waste stored within Hunter Water compound	Potentially contaminated waste soils (tar etc.)	Heavy metals, PAH, TRH, BTEXN, Phenols, asbestos
Subsurface infrastructure potentially beneath the site	Subsurface infrastructure (pipes, conduit) potentially containing sludge residues or asbestos	Heavy metals, PAH, TPH, BTEX, phenols and asbestos
Illegal Dumping	Asbestos containing materials (ACM) may be present as a result of illegal dumpling	Asbestos, heavy metals, PAH, TRH, BTEXN, OCPs, OPPs and PCBs

3.3 Soil investigations results

Soil samples were collected to provide a preliminary indication of the potential for soil contamination within the EIS Project area. Samples were selected within the desalination plant and intake structures site based on the findings of the desktop review and field observations and included:

- Samples were collected from four boreholes and six test pits with analysis including pH, CEC, asbestos, heavy metals, BTEXN, TRH, PAH. Two composite samples were analysed for OCP and PCB.

The analytical program is summarised in Table 4.2 of the GHD 2019 report. Investigation locations are presented in Figure 3-2.



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Belmont Drought Response Desalination Plant
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Sample Locations

Figure 3-2

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Data source: LPI: DTDB / DCDB, 2017; DPE: Coastal Wetlands SEPP, 2018public_NSW_Imagery: © Department of Customer Service 2020. Created by: TMorton

3.3.1 Subsurface conditions

The typical subsurface profile encountered across the EIS Project area comprised varying depths of fill over alluvial sands.

No odours or staining was observed during the collection of soil samples. There were no other visual signs of contamination noted within the boreholes and test pits excavated during the assessment.

Groundwater was encountered in all but two of the test locations (TP101 and TP106). Water levels were logged at the desalination plant site between 0.95 mbgl (BH101) to 4.1 mbgl (BH105).

3.3.2 Health assessment criteria

Soil samples were compared to the National Environment Protection (Assessment of Site Contamination) Measure (referred herein as the NEPM) (NEPC, 1999) Health Investigation Levels (HILs) and Health Screening Levels (HSLs) for recreational/open space (HIL/HSL C) and commercial/industrial (HIL D)

Soil samples reported contaminants below both HIL C and HIL D for all samples.

No asbestos was detected in soil samples analysed. However, one fragment of non-friable potential ACM was observed between TP106 and GW102 within the proposed desalination plant site and other small fragments of non-friable potential asbestos containing material (ACM) were found on the surface near GW108 (70 m west of the construction footprint opposite the proposed desalination plant site). These fragments were bonded and given that there was no fibres identified in soils, the risk to workers is considered to be low and can be managed through an unexpected finds protocol in a contaminated soil management plan (CSMP).

3.3.3 Ecological assessment criteria

Soil samples were compared to the NEPM Ecological Investigation Levels (EILs) and Ecological Screening Levels (ESLs) for urban residential/ public open space and commercial/industrial land use for the desalination plant site.

Concentrations of copper and zinc were above both recreational and commercial/industrial land use EILs in TP106_0.0-0.2 / FD20. TP106 was located adjacent to an access track and the results are considered to be due to the presence of fill consisting of silty sand with gravel including asphalt, concrete, bricks and rock.

Concentrations of copper (BH104_0.0-0.2) and TRH F3 (BH104_0.0-0.2 and BH104_0.2-0.3) in fill samples from BH104 were above urban residential land use. This location was located on the northern boundary of the former evaporation ponds. Fill at this location was described as dark grey to brown silty sands and sands.

Concentrations of TRH F3 above the urban residential ESL in BH102_0.0-0.2 which was located south of the evaporation ponds. Fill at this location was described as brown to grey sand with rootlets and trace plastic and wire.

Although levels of contaminants were found to above both the recreational and commercial/ industrial EILs/ESLs, based on the former use of a portion of the site as a WWTW and the proposed future use as a desalination plant, there is limited ecological amenity in this area and it is considered unlikely that these contaminants would present a significant risk to the environment in this area.

3.3.4 Waste classification

Based on review of results against the NSW EPA Waste classification guidelines, soils would generally be classified as General Solid Waste, with the exception of the following:

- Soils at TP106 which would be classified as Restricted Solid waste based on a lead concentration of 287 mg/kg (General Solid Waste Contaminant Threshold is 100 mg/kg)[1].
- Soils where asbestos is identified would also be classified as asbestos waste.
- Soils where acid sulfate soils are identified would be classified as acid sulfate soil waste.

3.4 Site conceptual model

Based on the findings of the investigation the following site conceptual model was developed.

Sources

The following potential sources of contamination have been identified across the Project area:

- Placement of fill in the footprint of the former WWTW evaporation ponds.
- Spillage or leakage of oils, fuels.
- Wastes stored within Hunter Water WWTW (compounds).
- Subsurface infrastructure beneath the site.

Pathways

Migration pathways

The following migration pathways were identified for the proposal area:

- Vertical and horizontal migration of surface water and sediment.
- Vertical and horizontal migration of groundwater.
- Windborne dust.

Exposure (contaminant uptake) pathways

Based on the identified receptors and the release, fate, and transport characteristics of the chemicals of potential concern, pathways through which receptors may become exposed include inhalation, ingestion and dermal absorption. These are discussed briefly below in the context of the site setting:

- Inhalation Exposure Pathway: There is the potential for creation of dust from unsealed surfaces and filled areas of the site. Risk of potential inhalation of asbestos fibres contaminated dusts. Soil or groundwater vapour inhalation is also possible but unlikely.
- Ingestion Exposure Pathway: Ingestion of contaminants by current and future site workers through construction and/or maintenance activities which may involve direct contact with contaminated soils or groundwater.
- Dermal Exposure Pathway: Exposure may occur via sorption through biological membranes such as skin. This pathway may be a concern whenever contaminated soil, groundwater comes into direct contact with a biological membrane. This pathway could also be a concern if contaminated surface water (runoff from the sites) was to come into direct contact with benthic and aquatic flora and fauna within off-site surface-water receiving environments.

[1] Lead concentrations at TP106 were below both the HILs and EILs for commercial/industrial land use and urban residential/public open space land use.

Potential receptors

The following potential sensitive human and environmental receptors of contamination were identified for the site and surrounding areas:

- Human health receptors:
  - Site workers or visitors (e.g. workers, subcontractors and members of public).
  - Off-site receptors (users of surrounding water bodies, beach areas or walking tracks for recreational purposes).
  - Current and future occupants of surrounding properties.
- Environmental receptors
  - Flora and fauna within the proposal area and surrounding land.
  - Local drainage channels and surface water.
  - Groundwater beneath the study area.
  - Off-site ecosystems.

3.5 Conclusion and recommendations

Based on the investigations undertaken for the EIS and taking into account the proposed future land use the site was considered suitable from a contamination perspective for redevelopment. As no significant human health or environmental risks to construction workers or future site users were identified, no remediation within the site was proposed as part of the EIS mitigation measures.

Based on the desk top review and the results of the EIS investigations, it is considered that the potential risks from disturbance and exposure of potential contamination within the site could be managed through the development and implementation of a Contaminated Soil Management Plan (CSMP) as part of the Construction Environmental Management Plan, which would include requirements for:

- Stockpiling soils away from sensitive receptors such as waterways and drainage lines.
- Testing of soils to assess suitability if they are to be placed near sensitive receptors.
- Waste management.
- Management and safe guarding procedures for Unexploded Ordinance (UXO) waste (outside the desalination plant area).
- Unexpected contaminated soils finds protocols.

4 Contamination assessment (Amended project)

4.1 Scope of works

As part of the AR GHD completed a review of the amended Project area to assess if any additional contamination assessments were required. The review included:

- Review of the EIS and Contamination Assessment Report (GHD, 2019) in relation to the amended Project area.
- Completion of a site inspection of the amended Project area on 15 January 2020.
- Review of historical aerial photographs for the amended Project area.
- Review of additional contamination assessments undertaken as part of the desalination plant detail design.

4.2 Review of amended project area

Prior to the site inspection, GHD completed a review of the Contamination Assessment Report (GHD, 2019) that was prepared as part of the EIS. It is noted that the EIS contamination study area overlaps both the EIS Project area and amended Project area as illustrated in Figure 3-1. As a result it is considered that the contamination desktop review is applicable to the amended Project area.

The intrusive investigations completed as part of the EIS contamination assessment also covered the majority of the amended Project area.

4.3 Site inspection

A site inspection was completed by a senior environmental engineer on 15 January 2020 to confirm site conditions. The inspection was completed within the southern portion of the amended Project area. At the time of inspection the site consisted mainly of undulating sand dunes covered with Bitou Bush. A number of 4WD tracks were noted in the dunes leading to Nine Mile Beach. Small amounts of concrete were noted in some areas of the Bitou Bush. Overall the site area appeared to be similar to that of the EIS Project area.

4.4 Aerial photograph review

A review of available historical aerial photographs was completed for the amended Project area. The aerial photographs show that the majority of the southern portion of the amended Project area has remained undeveloped sand dunes with varying degree of vegetation since 1965. The northern of amended Project area appeared to have been used as evaporation ponds from around 1990 till sometime after 1996 (limit of aerial review).

4.5 Review of additional site investigations

GHD reviewed the following additional investigation reports that covered the amended Project area.

Belmont Drought Response Desalination Plant D&C, Supplementary Geotechnical and Contamination Assessment for Onshore Plant Layout, GHD 2020

GHD completed supplementary geotechnical and contamination investigations for the proposed seawater pump station and the 30 ML/day amended design footprint to provide an updated geotechnical model, indicative waste classification and provide information on potential management and/or remediation recommendation to inform the detail design.

Works included hand auger and test pit excavation at eight locations (HA201, TP202 to TP208) and cone penetrometer testing at three locations. Two locations TP203 and TP204 were located within the amended Project area not previously assessed. Sample locations are presented in Figure 3-2.

No visual or olfactory signs of contamination were noted during the investigation. No potential asbestos containing materials (ACM) were noted. Each contamination sample was screened for volatile organic compounds (VOCs) using a photo-ionisation detector (PID). All results were below 2 ppm.

Samples were compared to the NEPM 1999 HIL/HSL and EIL/ESL for commercial/industrial land use. All soil samples reported concentrations below the adopted health assessment criterial. Chrysotile asbestos was detected in the form of a loose fibre bundle in one soil sample analysed from TP204 0-0.1. Three samples (TP202 0-0.1, TP203 0-0.1, TP204 0-0.1) reported copper concentrations above the EILs, while zinc was reported above the EILs for TP202 0-0.1 and TP204 0-0.1.

Based on the results, soils were generally classified as general solid waste with the exception of soils at TP202 0-0.1 which would be classified as restricted solid waste (based on a lead concentration of 130 mg/kg) and TP204 0-0.1 which would be classified as restricted solid waste with asbestos (based on a lead concentration of 130 mg/kg and asbestos)[2].

The report recommended that further investigations are undertaken in the area of TP204 to assess the extent of asbestos impacts and potential risks to workers during construction. The report concluded that although there were levels of contaminants above the commercial/industrial EILs, based on the proposed future use as a desalination plant there is limited ecological amenity in the area and considered unlikely these contaminants would present a significant risk to the environment in this area.

It was also recommended that a contaminated soils management plan (CSMP) be prepared prior to construction to manage potential risks from disturbance and exposure of potential contamination within the site during construction.

5 Summary

Based on the site inspection, aerial photograph review and additional assessment review, it is considered that the amended Project area is similar to that assessed as part of the EIS Project area and as such the key potential sources and contaminants of concern (refer to Table 3-1) are the same as outlined in GHD 2019 Contamination Assessment Report for the EIS Project area. The EPA submission made in response to the EIS requested that prior to commencing any site preparation works Hunter Water provide the EPA with a Detailed Site Investigation (DSI) report, which addresses potential acid sulphate soil and contamination issues at the site. To ensure that this requirement is met without compromising the ability to deliver the desalination plant if the total water storage level reaches the trigger for construction, Hunter Water will undertake additional sampling and provide the report prior to Project Determination.

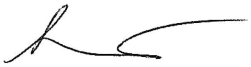
The DSI will include investigations within the northern portion of the amended Project area which have not previously been sampled. Locations will be chosen to provide spatial coverage across the site and target any areas of environmental concern identified during the site inspection. Based on existing contamination data and the low potential for significant contamination to be present on site, it is recommended that 12 sample locations are undertaken with selected samples to be analysed for heavy metals, TRH, BTEXN, PAHs, OCPs, PCBs and asbestos. Additional sampling in the area of TP204 will also be undertaken to further assess potential asbestos impacts. No sampling is proposed within the beach area beyond the dunes due to the low potential for significant contamination.

It is noted that sampling within the southern extent of the amended Project area cannot be completed until after approval of the Project. The presence of horizon A soils, identified in the Aboriginal Cultural Heritage Assessment as having the potential to contain Aboriginal cultural materials, requires that an Aboriginal Cultural Heritage Management Plan (ACHMP) be in place prior to any works in this area. Investigation of this area will be undertaken following approval of the ACHMP and prior to construction.

[2] Lead concentrations at TP202 and TP204 were below the HILs for commercial/industrial land use.

The findings of the DSI report will inform the management measures in the CSMP or whether remediation is required.

Regards



Alison Monkley
Business Group Leader – Contamination Assessment and Remediation

Appendix A

NSW4309 (M2029) Lake Macquarie City Council Run 8 19-5-1996

Lake Macquarie NSW3730 25-4-1990

BHPB Engineering 1987

Newcastle Run 16 4/9/1983

Lake Macquarie Run 1 27/5/1975

Northumberland Project Run 8 22/08/1965