

Remediation Works Environmental Management Plan

Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North,
NSW



Remediation Works Environmental Management Plan

Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North, NSW

Client: Ford Civil Contracting Pty Ltd

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Prepared by

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22-Jan-2020

Job No.: 60582210

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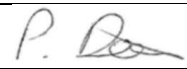
Ref 60582210

Date 22-Jan-2020

Prepared by Tama Armani

Reviewed by Ross McFarland

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	10-Aug-2018	Draft for Review	Peter Dean Project Manager	
B	10-Oct-2018	Preliminary Final	Peter Dean Project Manager	
C	07-Feb-2019	Preliminary Final	Peter Dean Project Manager	
D	25-Mar-2019	Preliminary Final	Peter Dean Project Manager	
E	02-Apr-2019	Preliminary Final	Peter Dean Project Manager	
F	04-Jun-2019	Preliminary Final	Peter Dean Project Manager	
0	16-Jul-2019	Final	Peter Dean Project Manager	
1	27-Nov-2019	Final – Include changes at client's request	Peter Dean Project Manager	
2	22-Jan-2020	Final	Peter Dean Project Manager	

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1.0 Introduction

1.1 General

AECOM Australia Pty Ltd (AECOM) was engaged by Ford Civil Contracting (FCC) to prepare this Remediation Works Environmental Management Plan (RWEMP) for the proposed remediation works due to be undertaken at the former Newcastle Gasworks Site located at 1 Chatham Road, Hamilton North, NSW (herein referred to as the Site).

This RWEMP follows on from the completion of Stage 1 above ground remediation works in 2015 and subsequent preparation of a Stage 2 Remedial Action Plan (RAP) (JBS&G, 2017). The RWEMP relates to the construction of a Low Permeability Barrier Wall (LPBW) and low permeability barrier layer (LPBL) to manage potential environmental and human health risks as a result of historical land use. It is understood that Stage 2 remediation work is a requirement under a Management Order issued to the Site owner (Jemena Gas Networks NSW) (Jemena) by the NSW Environmental Protection Agency (EPA) on 21 December 2015 and amended 30 December 2016 stating that remediation of the Site is required in accordance with the RAP (JBS&G, 2017).

The Site is identified as Lot 1 in Deposited Plan (DP) 79057 and Lot 270 in DP812689 under the Local Government Area (LGA) of Newcastle City Council (NCC) and is zoned as IN2 Light Industrial. In order to allow potential future use of the Site, it must be made suitable for commercial/industrial use under the aforementioned current land use zoning.

1.2 Management Systems

This RWEMP has been developed to ensure the proposed remedial works to be undertaken at the Site are completed in a manner consistent with the People, Environment and Sustainability Management Systems endorsed by FCC.

1.2.1 People and Sustainability

Ford Civil is committed to a Code of Conduct which describes how we do business. Ford Civil actively supports the principles covering human rights, labour, anti-corruption, bullying and harassment.

1.2.2 Environment

FCC is committed to the principles of responsible environmental management, sustainability and protection of the natural environment and recognise their moral and legal responsibility to ensure that their activities, products and services are designed to protect and enhance the environment in the communities in which we operate, and our obligations to ensuring that our operations do not place the natural environment or the local community at risk of harm.

Throughout the proposed remedial works FCC will work to:

- Reduce waste through innovative work practices, and the re-use and recycling of materials where possible
- Minimise environmental impacts by reduction of polluting substances produced by site operations, activities, products and services
- Minimise the impact of their operations on the neighbouring community
- Increase the use of environmentally acceptable materials, equipment and technology in place of those which are considered harmful
- Ensure that all suppliers follow acceptable environmental policies
- Actively promote environmental awareness among workers, client representatives, customers and the general public.

FCC recognises that the overall responsibility environmental sustainability rests with management, who will be accountable for the implementation of this policy. These responsibilities include:

- Ensuring that all environmental policies and procedures applicable to the Site are implemented

- Establishing measurable objectives and targets to ensure continued improvement aimed at the elimination of waste, pollution and environmental harm
- Encouraging consultation and co-operation between management, workers and stakeholders in matters which may affect or impact on the local environment
- Providing adequate resources to meet these environmental commitments.

FCC expects all employees, subcontractors and suppliers they engage to perform work at the Site will:

- Follow all FCC worker and environmental policies and procedures
- Recognise and report hazards which may affect the health and well-being of the environment and surrounding community.

1.3 Background

1.3.1 Site Contamination Status

The Site has been used as a gasworks plant from 1913 to 1985 when the production of town gas ceased. Post-1985, the majority of the Site remained largely vacant at the exception of the southern portion which was occupied by Elgas until mid-2014 for gas storage and bottling purposes. Historical use of the Site for gas production via the coal carbonisation process and associated waste disposal activities has resulted in the contamination of soil and groundwater at the Site.

The RAP identified a range of principal chemicals of potential interest (typical gasworks-derived chemicals), including:

- Inorganic compounds (ammonia, cyanide, nitrate, sulphate, sulphide and thiocyanate)
- Metals and metalloids
- Monocyclic aromatic hydrocarbons (MAHs) such as benzene, ethylbenzene, toluene and xylenes, (collectively referred to as BTEX)
- Phenolics (phenol, cresols, 2,4-dimethylphenol and pentachlorophenol)
- Polycyclic aromatic hydrocarbons (PAHs) including Acenaphthene, Acenaphthylene, Anthracene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(g,h,i)perylene, Benzo(k)fluoranthene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Fluorene, Naphthalene, Phenanthrene, Pyrene, and Indeno (1,2,3-cd) pyrene)
- Asbestos.

Historical environmental investigations completed at the Site have identified the presence of contamination in soil and groundwater in the form of separated phase gasworks and tar which includes light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL). Elevated concentrations of the following contaminants of concern have been identified at the Site:

- Petroleum hydrocarbons, MAHs, PAHs and cyanides in soils
- Ammonia, zinc, cyanides, thiocyanate, phenols, MAHs, naphthalene and petroleum hydrocarbons in groundwater
- MAHs, naphthalene and petroleum hydrocarbons in soil vapour
- Phenolic compounds (2,4-dimethylphenol), naphthalene, ammonia and nitrate in adjacent off-site surface water body (Styx Creek)
- Asbestos (generally as fibre cement sheet fragments) in fill material.

1.3.2 Stage 1 Remedial Works

Stage 1 remedial works were conducted in 2015 and involved the following activities:

- Hand picking of asbestos containing material (ACM) across the Site which involved visual inspection of the site surface and subsequent collection of ACM where observed
- Screening and validation of existing stockpiles on-site which involved the segregation of foreign material (e.g. concrete, metals, bricks, asphalt/ash, green waste, rubber, plastics and ACM) from the soil matrix followed by chemical assessment of the soil. Removal and segregation of foreign material was necessary before the stockpiles could be treated and/or reused.

Following segregation and chemical assessment, 11 main stockpiles (each comprising of several sub-stockpiles) were generated and classified as General Solid Waste (GSW), Special (asbestos) Waste, Hazardous Waste or Restricted Solid Waste (RSW). The stockpiles have been considered to be suitable to remain on-site for re-use as part of the Stage 2 Remedial works.

1.4 Regulatory Context

In 2011, the Site was declared as significantly contaminated by the NSW EPA under the *Contaminated Land Management Act 1997* (CLM Act) and requested that Jemena consider submission of a Voluntary Management Proposal (VMP) in Accordance with Section 17 of the CLM Act to adequately manage contamination at the Site. Two separate VMPs; VMP1 and VMP2, were prepared by Jemena and subsequently approved by the NSW EPA in August 2012 and January 2014 respectively.

The objectives of the VMP1 were to define the nature and extent of impacted soil and groundwater contamination, as well as the collection of environmental variables to enable the development of VMP2, which aimed to assess contamination management technologies. All commitments defined under VMP1 were considered to have been completed when VMP2 was approved.

Some key milestones and reporting requirements outlined in the approved VMP2 failed to be complied with and as a result, the NSW EPA served a Management Order (MO) (No. 20151403) for the Site on 21 December 2015 in the interest of fast-tracking the remediation works. The MO was amended on 30 December 2016 (No. 20164439) in order to allow Jemena additional time to comply with the requirements of the Department of Planning and Environment (DPE) for the remedial works, which have been determined to be State Significant Development (SSD) (SSD 7676). In October 2018, the MO was replaced by a new MO (No. 20181402) which incorporated incomplete and ongoing actions from MO (No. 20151403) as amended (No. 20164439).

A RAP (JBS&G, 2017) was prepared in November 2017 and subsequently approved by the appointed NSW Accredited Site Auditor, Mr James Davis of Enviroview Pty Ltd. Mr Davis was further engaged by Jemena to provide a Site Audit Statement (SAS) confirming the suitability of the Site for ongoing commercial/industrial land use following completion of the remedial works.

As identified in the RAP, the proposed scope of remedial works (discussed further in **Section 1.6** below) is considered as Category 1 remediation under the State Environmental Planning Policy (SEPP) No.55 – Remediation of Land. More specifically, the remedial works are classified as SSD under the State and Regional Development SEPP (2011). As such, development consent is required from The Minister for Planning. This RWEMP forms part of the required documentation to be submitted as part of the application process. Although the Minister for Planning is the consent authority for all SSDs, local support from NCC is required to facilitate the approval process.

1.5 Purpose of the RWEMP

This RWEMP has been prepared to document site-specific environmental management controls to be adopted to protect the environment and that appropriate monitoring is implemented to identify any improvements or repair to control measures required. All site personnel and visitors will be required to be inducted onto the RWEMP.

This RWEMP will be implemented from the start of remedial works so that all stages of the remediation outlined in the RAP are carried out in a safe and environmentally acceptable manner, without causing adverse impact to site personnel, the local community or the environment.

1.6 Scope of Remedial Works

The objective of the remedial works is to address the nature of contamination and risk of harm identified in the MO in a manner consistent with the guidelines made and/or approved under s.105 of the CLM Act.

The scope of the Remediation Works will include:

- Removal of all vegetation and mulching for off-site disposal
- Relocation of existing stockpiles within the area of the site hydraulically downgradient of the proposed LPBW
- Demolition of the former office building located in the south western portion of the Site
- Excavation and demolition of all gasworks related infrastructure (above and below ground)
- Retention of demolition material from existing site infrastructures within the area hydraulically downgradient of the proposed LPBW
- Grading of the Site to achieve final landform design in accordance with the RAP
- Installation of subterranean barrier wall
- Design and installation of the LPBL across the majority of the Site
- Design and installation of subsurface drainage infrastructure
- Sealing of the LPBL with a spray seal.

It is noted that two local heritage buildings comprising the Newcastle Gas Company Office building and the Pump House and Fence will be retained onsite during remediation. The LPBL is proposed to be installed across the entire site with the exception of the areas surrounding these buildings. Additionally, installation of the LPBL will not occur at the existing Caltex oil pipeline easement located adjacent the south-western site boundary. The locations of the local heritage buildings, the pipeline easement and the extent of the LPBL are outlined on Figure 1 (**Appendix A**). Exclusion zones will be established (i.e. through use of physical road barriers) and maintained around these sensitive assets throughout remediation works to prevent unauthorised access.

Given that relocation of existing stockpiles will likely involve disturbance of ACM, those works shall be conducted under the supervision of a Licensed Asbestos Supervisor competent and trained in working with both bonded and friable asbestos. Removal of hazardous materials from the building demolition works will likely involve disposal of hazmat materials offsite to landfill given that it these works will be carried out during Stage 3 construction works.

Removal of asbestos waste will be carried out under an Asbestos Removal Control Plan (ARCP) prepared by FCC. FCC will lodge a notification with SafeWork NSW prior to commencement of removal works as a contingency plan. The notification will be lodged no less than five working days before asbestos removal is proposed.

Proposed remedial works program is anticipated to commence in Q2 of 2019 and run through Q4 2019.

1.6.1 Staged Approach

Remediation Works will be undertaken in a staged approach with work commencing in the northern third of the Site (Stage 1) and generally progressing south into Stages 2 and 3 (refer to **Figure 1 and Figure 2, Appendix A**).

Notwithstanding, construction of the LPBW will be completed in one continuous phase commencing in Stage 1 and reaching completion in Stage 3. A continuous construction methodology is required to guarantee the formation of an integrated, monolithic structure with no permeable sections or joints. Other works including vegetation clearance and initial placement of LPBL materials will be conducted concurrently in other areas of the Site outside of the active LPBW construction area to ensure LPBW construction quality is not impacted.

1.7 RWEMP Objectives

The objectives of the RWEMP are to:

- Summarise background environmental information and current conditions at the Site
- Summarise proposed remedial activities
- Identify key personnel and responsibilities for the proposed field activities
- Ensure that all personnel performing work at the Site, including sub-contractors, are aware of the environment and their environmental responsibilities within the Site and beyond its boundaries
- Identify site-specific management requirements
- Identify site-specific environmental management controls
- Outline site-specific safety controls
- Outline the site-specific environmental monitoring strategies that are to be implemented to identify any improvements or repair to control measures
- Identify key triggers for the monitoring and corrective action of environmental conditions on-site, to ensure that remedial activities are carried out in a safe and environmentally acceptable manner, without causing adverse impact to site personnel, the local community or the environment.

The RWEMP will be used by the:

- Principal and Site Owner (Jemena)
- Remediation Contractor (FCC) and their appointed subcontractors
- The Validation Consultant (Ramboll Australia Pty Ltd) (Ramboll)
- The Geotechnical Consultant (Douglas Partners Australia) (Douglas Partners)
- All other Jemena-engaged subcontractors and consultants.

A copy of the RWEMP will be held at the site office at all times.

2.0 Site Identification

The information presented here in has been primarily sourced from the RAP (JBS&G, 2017) and as such, AECOM does not make any warranties as to the accuracy of information provided.

2.1 Site Description

The Site identification details are presented in **Table 1** below.

Table 1 Site Identification Details

Item	Description
Site Identification	Former Newcastle Gas Works
Site Address	1 Chatham Road, Hamilton North, NSW
Site Owner	Jemena Gas Networks (NSW) Ltd
Title Identification Details	Lot 1 DP 79057 and Lot 270 DP 812689
Previous Site Use	Former Gasworks
Current Land Use	Vacant commercial/industrial site
Zoning	Newcastle Local Environment Plan (LEP) IN2 Light Industrial under Newcastle LEP 2011.
Local Government Authority	Newcastle City Council
Site Area	Approximately 74,000m ²

2.2 Site History

The Site had been operated by the Newcastle Gas Company (now Jemena) as a gasworks plant since 1913 until its decommissioning in 1985. Since then, the majority of the site remained largely vacant at the exception of the southern portion which was occupied by Elgas until mid-2014 for gas storage and bottling purposes. The Site is now vacant and secured by a chain wire fence and locked gates, with security patrols controlling site access.

The Site is located in the inner-city region of Newcastle and is surrounded by a variety of land uses from residential to industrial. A Shell bulk fuel storage terminal is located directly to the south of the Site adjacent Styx Creek; this fuel storage terminal has been decommissioned since 2015.

Redundant above-ground infrastructure at the Site include the historical Office Building adjoining Clyde Street at the northern corner of the Site; and historical buildings in the northern, western and southern portions of the Site. Remnants of former roadways have also been identified with a rail siding on the north-eastern portion of the Site. Unsealed areas of the Site are typically grassed with large trees observed in the south western portion of the Site.

In addition to the above, there are a total of 11 main stockpiles across the Site making up a total surveyed volume of 4,513 m³. A single detection of asbestos was reported in stockpiled material at the Site, as identified in the RAP.

2.3 Geology and Hydrogeology

2.3.1 Local Region

The Site is underlain by Quaternary deposits/sediments described as gravel, sand, silt and clay. The estuarine deposition process in the Newcastle–Stockton embayment has resulted in the formation of unconsolidated sediment layers. The sediments are underlain by the sandstones/siltstones/shales of the Sydney basin.

2.3.2 Site

The geology encountered at the Site from previous environmental investigations can be generally summarised as:

- 0.0 – 2.0 metres below ground level (mbgl): Mixture of natural material comprising silty sand and sand and fill comprising a mixture of grass/topsoil. Coke, sand and building rubble
- 1.0 – 5.0 mbgl: Sand
- 2.0 – 4.0 mbgl: Clay lens, grey sandy clays, moderate plasticity, dense and moist
- 5.0 – 8.5 mbgl: Sand, light grey and brown, saturated
- 8.5.0 – 32.0 mbgl: Clay, grey stiff, low plasticity dense clay
- 29.0 – 32.0 mbgl: Bedrock.

Groundwater is anticipated to be present in three separate units being the sand aquifer, the clay aquitard/aquifer and the sedimentary rock aquifer. Although groundwater levels are highly influenced by rainfall events, the standing water level (SWL) in the shallow aquifer, is anticipated to be occurring at around 3.0mbgl. The majority of groundwater beneath the Site is anticipated to discharge into Styx Creek, however it was also acknowledged that there is potential for some groundwater to be discharging at locations further downstream.

3.0 RWEMP Application and Responsibilities

3.1 Application of the RWEMP

This document is to be used from preliminary site preparation (i.e. vegetation clearance) through to the application of the surface spray seal as described in **Section 1.6**.

3.2 Responsibilities

Table 2 below outlines the key personnel for the remedial works and their responsibilities in relation to site and environmental management. It is noted that AECOM has not been engaged to conduct any field work at this stage, and as such AECOM personnel responsibilities have not been included in **Table 2**.

FCC will ensure that all responsibilities are captured for site personnel. Management staff will have their responsibilities clearly relayed to them by FCC's Project Manager prior to the commencement of the project. Management staff will ensure that FCC personnel and its subcontractors comply with and uphold responsibilities illustrated within this RWEMP, and implement continuous improvement throughout the life of the project.

Table 2 Roles and Responsibilities

Title	Responsibilities
Jemena	
Jemena Representative – David Virtue Mobile: 0431 514 827 Email: david.virtue@jemena.com.au	<ul style="list-style-type: none"> Overall Project Management, project approvals, liaison with regulatory bodies, and contract administration Ensuring project compliance with Jemena policies and procedures via scheduled site health, safety and environment (HSE) audits.
FCC	
Project Director – Miguel Canas Mobile: 0421 029 279 Email: miguel.canas@fordcivil.com.au	<ul style="list-style-type: none"> Providing technical input to remedial activities Managing client relationship Ensuring project compliance with Jemena policies and procedures via scheduled site health, safety and environment (HSE) audits.
Project Manager – Garry Andrews Mobile: 0428 279 721 Email: Garry.Andrews@fordcivil.com.au	<ul style="list-style-type: none"> Overall project Management (Contract Administration, Coordination of Design Team Consultants, Financial Control & Programming of Works) Verify compliance with, and correct implementation of, the requirements of the RWEMP Approving plans, drawings and performance indicators related to environmental management Ensuring environmental policies and procedures are complied with Ensuring sufficient resources are available for the implementation of the RWEMP Maintain records and forwarding/retaining as appropriate Reviewing and authorising plan revisions Updating RWEMP as and when required Identifying and managing environmental risks associated with the project Purchasing of materials and material control Ensuring work procedures and/or relevant permits are followed in accordance with FCC and/or client requirements Ensuring traffic management plans are complied with

Title	Responsibilities
	<ul style="list-style-type: none"> • Verify site compliance with relevant environmental legislative and regulatory requirements as identified in Section 4.2 • Verify compliance with reporting requirements outlined in Section 6.12 • Ensure all monitoring and reporting records relating to environmental management (Section 6.0) are kept on file for future reference and documentation
Site Manager – William McGrath Mobile: 0403 045 453 Email: William.mcgrath@fordcivil.com.au	<ul style="list-style-type: none"> • Implementation of, and compliance with the requirements of the RWEMP • Daily coordination of site activities, subcontractors and subconsultants • General supervision of civil & remediation works and implementation of environmental controls • Verify the fulfilment of environmental monitoring and reporting requirements listed in Table 3 to Table 12 (Section 6.0) • Verify and ensure site compliance with relevant environmental legislative and regulatory requirements as identified in Section 4.2 • Regularly communicate site and individual worker obligations under the regulatory requirements in Section 4.2 via toolbox talks, regularly scheduled site progress reports, and following environmental incidents and near misses • Regularly report key environmental risks, incidents and near-misses to the Project Manager and Jemena per Section 6.12 • Ensure the regular updating of the RWEMP, environmental procedures and work instructions as circumstances dictate • Implement a system of recording and retaining all records relating to environmental management at the Site (Section 6.0) for the duration of remedial works.
Project Engineer – Tina Lien Mobile: 0429 150 353 Email: Tina.lien@fordcivil.com.au	<ul style="list-style-type: none"> • Implementation of the RWEMP • Implementation of Daily Quality Assurance and Quality Control of civil & remediation works, quantity measurements and environmental controls • Material Tracking • Liaison with subcontractors and subconsultants and associated compliance against the Project Requirements and RWEMP.
Project Engineer – Ben Ryan Mobile: 0404 047 165 Email: Ben.Ryan@fordcivil.com.au	
HSE Manager – Lawrence Saliba Mobile: 0408 653 267 Email: Lawrence.saliba@fordcivil.com.au	<ul style="list-style-type: none"> • Health, Safety & Environmental Systems Manager • Implementation and Monitoring of RWEMP.
Other site workers/sub-contractors/ subconsultants	<ul style="list-style-type: none"> • Comply with the requirements of the RWEMP • Ensure plant/equipment complies with site and regulatory requirements, e.g. for noise and exhaust emissions • Report environmental incidents and near-misses promptly • Report or rectify environmental hazards as appropriate • Ensure housekeeping standards are maintained • Ensure pre-start mobile plant inspections are carried out daily

Title	Responsibilities
	<ul style="list-style-type: none">• Ensure personnel are competent with the machine/task operating or undertaking• Contribute to safe work practices• Attend health, safety and environment meetings and other meetings as requested by the Site Manager• Be fit for duty• Ensure appropriate disposal of all wastes.

4.0 Statutory Requirements

4.1 Licences and Approvals Requirements

The Site is currently subject to a MO as discussed in **Section 1.4**. The MO defined milestones and deadlines to be complied with through to the submission of the validation report following completion of remedial works.

As discussed in **Section 1.4** an Auditor has been engaged to provide a SAS to confirm the requirements of the MO, namely mitigation of the risks posed to offsite receptors have been adequately achieved by the remediation works. As discussed in **Section 1.4** the remedial works have been deemed to be SSD by DPE and will require approval from the Minister of Planning and support from NCC.

4.1.1 Water Act 1912

Completion of remediation works associated with the LPBW are anticipated to intersect groundwater at the Site, however it is noted that no active dewatering measures are proposed during these activities, and Jemena does not propose to 'take' groundwater during construction of the LPBW.

Notwithstanding, Jemena has consulted with Department of Industry – Land and Water and confirmed it will require groundwater licence under Part 5 of the Water Act 1912 (NSW) for the works. Compliance with the conditions of the groundwater license will be the responsibility FCC for the duration of the remediation works.

The remediation works will be undertaken in accordance with the conditions of Bore Licence Certificate 20BL174008 (the License) issued to Jemena under Section 115 of the Water Act 1912 by the NSW Office of Water. The Licence permits interference with the local aquifer for the purposes of rehabilitation / restoration of the Site via construction of the LPBW and LPBL per the methodologies described in the RWP. Interference with the aquifer is subject to the following conditions:

1. Once the License Holder becomes aware of a breach of any condition on the Licence, the Licence Holder must notify The Minister as soon as practicable. The Minister must be notified by:
 - a. Email: water.enquiries@nrar.nsw.gov.au, or
 - b. Telephone: 1800 353 104. Any notification by telephone must also be confirmed in writing within seven (7) business days of the telephone call.
2. The aquifer interference activity authorised by the License must be performed within three (3) years from the date the Licence was granted [5 March 2019]
3. The footprint of the proposed aquifer interference activity must adhere to plans submitted to the Natural Resources Access Regulator (NRAR) Parramatta Office
4. Post-remediation monitoring must be carried out in accordance with a monitoring plan approved by NRAR
5. Vegetation clearance associated with the proposed aquifer interference activity must be limited to where the remediation is to be carried out, as shown on the approved plan(s)
6. Settlement of the LPBW must be monitored monthly over a one-year period, then on a yearly basis and the results reported to NRAR.

4.2 Regulatory Requirements

The remedial works are to be undertaken in accordance with the following key regulatory requirements:

- Contaminated Land Management Act, 1997; as amended 2008
- Protection of the Environment Operations Act, 1997 as amended 2011
- Environmental Planning and Assessment Act, 1979 (State Environmental Planning Policy No 55 – Remediation of Land)

- Environmental Planning and Assessment Regulation, 2010, under the Environmental Planning and Assessment Act, 1979
- Work Health and Safety Act 2011 No 10
- NSW EPA, 2014. Waste Classification Guidelines
- NSW Acid Sulfate Soil Management Advisory Committee, 1998. *Acid Sulfate Soil Manual, August 1998*
- NSW Acid Sulfate Soil Management Advisory Committee, 1998. *Acid Sulfate Soil Assessment Guidelines, August 1998*
- Traffic Act 1909 and regulations
- National Environment Protection Council (NEPC) May 2013 amended the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (the amended ASC NEPM)
- Relevant NSW EPA guidelines, which include but are not limited to:
 - NSW EPA, 2017. Contaminated Land Management, Guidelines for the NSW Site Auditor Scheme, 3rd Edition
 - NSW EPA, 2003. Draft Guidelines for the Assessment of Former Gasworks Sites
 - NSW Department of Environment and Climate Change (DECC) 2009. Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997
 - NSW OEH, 2011. Guidelines for Consultants Reporting on Contaminated Sites
 - NSW Government, 2014. Managing Asbestos in or on soil, March 2014
 - Friebel, E and Nadebaum, P, 2011. Health screening levels for petroleum hydrocarbons in soil and groundwater. CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia
 - NSW EPA, 2012. Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases.

In addition, all site personnel will abide by any directions or procedures provided by Jemena and/or FCC.

5.0 General Site Management

Key general site management requirements are outlined below, noting further requirements in relation to environmental and safety requirements are detailed in following sections.

5.1 Guidance Documents

In addition to the regulatory requirements of **Section 4.2**, works will be conducted in general accordance with the following guidance documents:

- Environmental Impact Statement prepared for the Site (GHD, 2018)
- Conditions of consent prescribed for the remedial works by DPE
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018)
- Landcom, 2004, Managing Urban Stormwater: Soils and Construction (Blue Book), 4th Edition.

It is recommended the procedures and controls outlined in this RWEMP and the Remedial Works Plan (RWP) (AECOM, 2018a) are reviewed against the conditions of consent imposed by DPE for compliance and amended as necessary prior to commencement of remediation works.

In the event that a deviation from the above guidelines is required, it shall be documented appropriately and discussed with Jemena prior to proceeding.

5.2 Site Access

The Site has two access points with one on Chatham Road and the other on Clyde Street. The primary access point for all personnel, light vehicles will be via the main site entrance on Chatham Road. Heavy Vehicles access will be via the entrance on Clyde Street. Site entrances are identified on **Figure 1, Appendix A**.

Site visitors will also need to be inducted, signed in, and be escorted by Jemena representatives or FCC representatives at all times.

5.3 Hours of Operation

All works will be carried out between 7:00am and 6:00pm Monday to Friday and 8:00am and 1:00pm on Saturdays.

Should there be requirements for works to be conducted outside of those hours, authorisation from Jemena and the Consent Authority (e.g. DPE) will be sought prior to proceeding. It is noted that the aforementioned working hours may be altered pending approval from DPE.

5.4 Security

The Site is currently fenced, with no site security personnel proposed. Jemena will be responsible for site security until official transfer of the Site to FCC as the Principal Contractor. FCC will then be responsible for site security until practical completion of remedial works.

5.5 Site Signage and Lighting

The Site will be classified as a construction area, and FCC will install signage stating site access is restricted to authorised personnel and contractors who have site safety induction and identifying any required personal protective equipment for remediation works.

FCC will, with approval from Jemena, install adequate lighting as required to:

- Comply with the latest version of AS 4282-1997 - Control of the obtrusive effects of outdoor lighting (Standards Australia, 1997)
- Ensure lighting is mounted, screened and directed to prevent nuisance to surrounding properties or the public road network.

5.6 Site Induction

All personnel and contractors will complete a site induction upon arrival at the Site, and prior to the commencement of any work tasks. The site induction will be facilitated by the Site Manager or delegate and identify:

- General site and project orientation
- Work tasks to be performed by the inductees and any special requirements or approvals
- Key environmental risks and worker health and safety risks associated with the work tasks and the wider remedial works
- Driver code of conduct to minimise vehicular traffic and noise impacts
- Specific requirements and responsibilities under the Development Conditions of Consent
- Worker obligations and reporting requirements for with environmental incidents or near-misses.

A less detailed induction may be completed by site visitors who will not be undertaking work tasks.

5.7 Communication Plan

5.7.1 Site Communications

Communication during site works is critical to the safety and effectiveness of the work program. Pathways of communication include:

- Communication between site personnel, including Jemena's Representatives, FCC personnel and their nominated subcontractors and subconsultants
- Communication between the FCC Site Manager and Project Manager, and relevant stakeholders, including the Site Auditor and regulatory agencies
- Communication between the Site Manager and all site personnel via daily tool box and tailgate meetings. This communication will establish the operational and environmental conditions for the day (toolbox), and for the following planned day ahead (tailgate) and identify the environmental controls and restrictions on work tasks to mitigate environmental impacts. For example, restrictions on concrete crushing plant operating times to minimise dust generation during forecast strong wind conditions. Toolbox and tailgate meetings will be documented in the daily field notes for the project
- The Site Manager will report to the Project Manager information that encompasses all parameters required for the continued compliance to the RWEMP. Communication will be via telephone or email, as the circumstances require
- The Site Manager with the assistance of the Project Engineer will report results and data collected over the course of site work to the Project Manager. This will be communicated via telephone/email daily summaries, which will be provided to Jemena (as required).

Prior to site works, the RWEMP will be updated to contain a list of key persons and relevant stakeholders affiliated with activities at the Site and their relevant contact information. In the event that a significant issue develops at the Site, including, but not limited to, a chemical spill, or uncontrolled release to land, water or atmosphere; an unauthorised visitor; or a significant change in project scope, authorised persons can consult the RWEMP for contact information and the timelines.

All contact information will be verified and updated as necessary during the remediation program.

5.7.2 Community Engagement

Communications letters and webpage updates have been provided to the local community since 2014 in light of upcoming remediation works. Additionally, Jemena has held four community drop-in information sessions between June 2014 and November 2017 so as to keep the local community up to date regarding the project and also provide an opportunity for questions to be raised and concerns addressed. A community hotline (1800 571 972) has been set up, and contact details posted on site gates along Clyde Street and Chatham Road. Jemena contact details including contact name and

phone number will be provided to the community via a Community Newsletter prior to the commencement of works.

Potential odour generating activities are expected through remedial works. Such activities will be conducted during normal working hours with appropriate controls in place. A sign with the contacts for Jemena will be posted on the external site fences at Clyde Street and Chatham road, to allow odour complaints or other issues to be reported by members of the public outside of normal working hours.

FCC shall direct all external communications and complaints to Jemena in accordance with **Section 5.6.3** below. A complaints register shall be maintained by FCC.

The web page address provided to local community members via communications letter is <https://jemena.com.au/about/projects/remediation-project/clyde-street/community-consultation>.

5.7.3 Complaints and Feedback Protocol

If a complaint or feedback is received via the community hotline number or email address, the Community Liaison Manager (CLM) will deal directly with the Complainant, liaising with the Jemena Project Manager and/or the FCC Project Manager to investigate and resolve the complaint within the stipulated timeframes.

If a complaint is received face-to-face on/near the project site by a project team member, politely ask the complainant to call the Community Liaison Manager on the community hotline number or email (site personnel should have access to the calling card with the community hotline/email contact details on it – to hand out as required).

If the complainant resists this process – escalate to the Site Manager – who will then seek the complainant's contacts (name and phone number as a minimum) and details/facts relating to the complaint. The Site Manager will investigate and if required, address the source of the complaint. The Community Liaison Manager should be advised as soon as practical, so that follow up & close out can occur as soon as possible. The Community Liaison Manager will document in the Project Communications database.

When dealing with a complainant, avoid getting into a detailed discussion by stating that you are not the best person to speak too, and that Jemena has a Community Liaison Manager, whose primary role is to facilitate the investigation of the complaint and ensure that it is addressed and resolved as quickly as possible.

The complainant might want to simply share the details with you (and not make a phone call to the Community Liaison Manager, nor give their contact details). It is preferred that contact details are taken so that a formal follow up to action and close out the issue can be undertaken, and the complaint is documented in the Project communications database.

Avoid sharing information about potential causes of their complaint at this stage, until the complaint is investigated and qualified/confirmed – that way you avoid any unintentional sharing of inconsistent or incorrect information.

If the complainant is irate, its best to listen to their concerns without interrupting them, wait till they are finished saying what they wish to say – before you respond. If you believe that giving out a calling card will worsen the situation, calmly let them know that you acknowledge and understand their concerns and will ensure we investigate the complaint immediately. Take their details and confirm that the Community Liaison Manager will call them back within one business day, to discuss the outcome of the investigation, or any further action/investigations required and associated timeframes.

All complaints should be actioned immediately and closed out within five business days, unless escalation is required. Please ensure all information is passed onto the Community Liaison Manager as soon as practical, for follow up and inclusion & reporting in the Project Communications database.

A flowchart summarising the above is attached as **Appendix F**.

6.0 Environmental Management

The purpose of this RWEMP is to identify potential environmental issues and mitigation measures together with corrective actions if an undesirable impact or unforeseen level of impact occurs.

The ultimate goal is to describe measures aimed at achieving environmental management relative to the nature of the works being undertaken and inherent risk of adverse impact to site personnel, the local environment and community.

The RWEMP is to be used by those persons who will have ongoing roles and responsibilities throughout the completion of the remedial works. All relevant personnel will be inducted to the requirements of this RWEMP and made familiar with their individual responsibilities for implementing the procedures to achieve environmental objectives.

6.1 Potential Environmental Impacts

Typical activities that will be undertaken during the remedial works, together with their potential impacts, are listed in **Table 3** below.

With regards to potential environmental impact, it is understood that no flora or fauna of environmental significance have been identified at the Site or within influencing distance of the Site boundaries. However, it is noted that the Site is located adjacent Styx Creek and as such adequate erosion and sediment controls shall be implemented as discussed in **Section 6.2**.

Dust/odour/vapour emissions as well as noise and vibrations are to be expected throughout remedial activities.

Table 3 Potential Environmental Impacts from Typical Activities

Site Activity	Consequence	Potential Impact
<ul style="list-style-type: none"> Vegetation Clearance and mulching Materials handling in general Movement of vehicles; loading and unloading of trucks (on to and off site); movement, grading and compaction of soils; relocation of existing stockpiles and transport of VENM to the Site for LPBL Localised excavation and general site-wide cut and fill activities and compaction Crushing of demolition waste Stockpiling of VENM/cut soils Excavation of Natural material within the 	Human health: Retrieval of gasworks-derived contamination from the subsurface during excavation	Increased intake of contaminants via: <ul style="list-style-type: none"> Direct contact (dermal) (onsite) Inhalation (of dust, vapour and volatilised surface water on and offsite) Incidental ingestion (onsite).
	Dust emission	Air pollution both on site and beyond boundaries from earthworks associated with contaminated soils and VENM, and demolition works.
	Odour and vapour emission	<ul style="list-style-type: none"> Air pollution both on site and beyond boundaries, including potential nuisance odour Potential explosive atmosphere around stockpiles and excavation zones Plant and machinery, and LNAPL impacted soil are potential ignition sources, with potential for fire and explosion Odours are also to be expected should gasworks wastes be encountered.
	Noise emission	<ul style="list-style-type: none"> Increase in ambient noise pollution both on site and beyond boundaries from plant/vehicles

Site Activity	Consequence	Potential Impact
<p>alignment of the LPBW</p> <ul style="list-style-type: none"> Demolition of existing site buildings and structures. 		<ul style="list-style-type: none"> Offsite noise pollution associated with the increased traffic to/from the Site via surrounding public roads.
	Vibration emission	Vibration both on site and beyond boundaries from heavy construction plant.
	<p>Water Quality: Soil erosion / sediment laden surface water run-off from disturbed areas and stockpiles (noting stockpiled material will be segregated into "clean" and "contaminated" stockpiles based on:</p> <ul style="list-style-type: none"> Historic classifications of soil (from previous investigations) Evidence of contamination observed 	Contamination of down-gradient waters and land off-site including site drains, roadways, off-site premises and stormwater drains (discharging to Styx Creek).
	Spills and leaks from plant / machinery	<ul style="list-style-type: none"> Contamination of the immediate area and of down gradient soil and groundwater Contamination of down-gradient off-site waters (Styx Creek).
	Potential acid sulfate soils	Generation of acidic soil conditions and sediment laden surface water run-off via excavation and incorrect handling of acid sulfate soils.
	Traffic	<ul style="list-style-type: none"> Increased congestion on surrounding roads Increased potential for vehicle and pedestrian-related incidents (e.g. collisions).
	Heritage	<ul style="list-style-type: none"> Damage and destruction of aboriginal and non-aboriginal artefacts during earthworks activities Damage to identified heritage buildings.
	Biodiversity	<ul style="list-style-type: none"> Loss of vegetation (including trees) during ground preparation works Loss of fauna habitats including existing buildings and structures) to be demolished.
	Waste generation	<ul style="list-style-type: none"> Impact to visual amenity around waste storage/stockpiling areas Offsite spread of litter (e.g. packaging, plastics)

Site Activity	Consequence	Potential Impact
		<ul style="list-style-type: none"> Consumption of available storage capacity at disposal facilities.
Equipment maintenance and refuelling	Hydraulic fluid, oil or fuel leak from plant item or from storage areas	<ul style="list-style-type: none"> Contamination of land Air pollution both on-site and beyond boundaries Contamination of down gradient waters and offsite waters.
	Generation of liquid and solid waste (oil, filters, parts, rags)	<ul style="list-style-type: none"> Litter Contamination of land Contamination of down-gradient waters and off-site waters.

Management controls for environmental issues associated with dust/odour/vapour emissions as well as noise and vibration are discussed in the Air Quality Management Plan (**Appendix B**) and the Noise and Vibration Management Plan (**Appendix C**). Specific details related to occupational health with regards to air quality and noise generation is provided in the Occupational Health and Hygiene Management Plan.

An Acid Sulfate Soil Management Plan (ASSMP) (**Appendix D**) has also been included to manage potential issues associated with the excavation and handling of acid sulfate soils.

Management controls and actions for the identified remaining issues are addressed in **Sections 6.2 to Section 6.10** below.

6.2 Erosion and Sediment Controls

A Soil and Water Management Plan (SWMP) prepared by Northrop Consulting Engineers (Northrop, 2018) will be implemented prior to and throughout the remedial works. The SWMP is appended to this RWEMP for reference as **Appendix E**. The control strategies outlined in the SWMP will be in general accordance with the principles of *Managing Urban Stormwater: Soils and Construction*, Landcom (2004).

Additional, specific erosion and sediment controls are summarised in **Table 4** below.

Table 4 Erosion and Sediment Controls

Management Considerations	Actions
Potential Impact	Soil loss and degradation during and following excavation, capping, and stockpiling activities.
Control Strategies	<ul style="list-style-type: none"> All remedial and other construction activities shall be undertaken in accordance with the SWMP for each stage. SWMP controls will be implemented prior to commencing works at each stage in addition to the following control strategies: Take all reasonable measures to minimise erosion potential including staging works to limit the extent of soil exposure as much as is practicable Provide day to day maintenance of exposed landforms to minimise erosion potential Where possible, stockpiles will be placed on hardstand or plastic sheeting and away from haulage routes, vegetation and hazard areas Construction of bunding around the perimeter of stockpiles using clean earth or imported fill, and/or covering of stockpiles with plastic sheeting

Management Considerations	Actions
	<p>(e.g. grain covers) or geofabric. Indicative stockpile locations during remediation works are outlined on Figure 1 (Appendix A)</p> <ul style="list-style-type: none"> • Compaction of the LPBL material during placement to provide a sealed surface that is resistant to erosion, including watering the surface to limit the potential for wind erosion • The perimeter of the Site (with the exception of the driveway thoroughfares on Clyde Street and Chatham Road) is to be lined with silt fencing (with additional hay bales at low-lying or otherwise sensitive areas, as detailed in the SWMP) • Visual monitoring for Acid Sulfate Soils (ASS) or Potential Acid Sulfate Soils (PASS) will be undertaken during excavation of the LPBW and soils excavated from below 3m bgl will be assessed and treated (if ASS) in accordance with the ASSMP (Appendix D of this REWMP) • Progressive application of bitumen surface seal to completed areas of the LPBL. <p><u>Water Storage berm</u></p> <ul style="list-style-type: none"> • Surface runoff from the Site will be collected by pumping or gravity feed into an onsite earth berm system to prevent discharge of sediment-laden water from the Site. The berm will be constructed in accordance with the detail provided in the SWMP. Water storage levels in the berm will be actively maintained to ensure enough freeboard capacity to account for runoff generated from a 100 year ARI 72 hour rainfall event • Accumulated sediment will be regularly (as required; assessed by daily inspection) cleaned out and upkeep of bund walls undertaken to maintain designed capacity • Captured water will be stored to allow settling of suspended sediment loads before re-use or discharge of the water • Captured runoff water may be discharged to sewer, disposed offsite via tanker truck or put to beneficial re-use on the Site (for example, dust suppression) if deemed suitable per Section 6.4. Runoff may be discharged to sewer under the conditions of the existing Trade Waste Agreement between Jemena and Hunter Water. A copy of the Trade Waste Agreement is provided in the SWMP prepared by Northrop (Appendix E).
Monitoring and Reporting Requirements	<p>Regular inspections shall be undertaken to ensure erosion and sediment controls are maintained and remain appropriate for the duration of the remediation works. The SWMP prescribes the following minimum inspection schedule:</p> <ul style="list-style-type: none"> • At least daily when work is occurring on site • At least weekly when work is not occurring on site • Within 24 hours of expected rainfall • Within 18 hours following a rainfall event that caused runoff on site. <p>In addition to the above, inspections following a rainfall event shall be conducted on a tiered frequency proportionate to the amount of rainfall received:</p> <ul style="list-style-type: none"> • 1-10 mm: within 18 hours following rainfall • 11-20mm: within 12 hours following rainfall

Management Considerations	Actions
	<ul style="list-style-type: none">• 21-30mm: within 8 hours following rainfall• Greater than 30mm: within 6 hours following rainfall <p>Inspection frequencies are inclusive of weekends and public holidays. Inspections should not be conducted overnight, but as soon as ambient light conditions allow.</p> <p>Daily turbidity monitoring of downstream water courses (Styx Creek) shall be undertaken during the construction phase.</p>
Trigger and Response Measures	If visual inspection identifies integrity of bunded areas or silt fences / hay bales are compromised, works are to be undertaken, at the earliest opportunity, to make good or replace controls to ensure their environmental performance.

6.3 Fire and Explosion Management Controls

As discussed in **Section 6.1** above, vapour has the potential to be generated as part of remedial works, particularly through disturbance of existing stockpiles and excavation of the LPBW.

High concentrations of hydrocarbon vapours at the Site (if present) may result in the potential for fire, explosion or serious acute health risks. Specific measures relating to management of potential acute health risks from vapours should be addressed through specific health and safety documentation including but not limited to:

- The Health and Safety Plan (HASP) prepared by FCC
- Task-specific Safe Work Method Statements (SWMS)
- The Occupational Health and Hygiene Management Plan (OHHMP) prepared by AECOM under separate cover
- The recommendations made by the site Occupational Hygienist's assessment of risk associated with exposure to hydrocarbon vapours during Remediation Works.

Such documentation should set out action levels for upgrading of PPE dependent on working conditions. This is also discussed in **Section 7.1**. The controls for mitigating potential for fire and explosion risks are summarised in **Table 5** below.

Table 5 Fire and Explosion Controls

Management Considerations	Actions
Potential Vapour Discharge Sources	<ul style="list-style-type: none"> • Disturbance of existing stockpiles • Excavation of LPBW in impacted areas.
Potential Ignition Sources	<ul style="list-style-type: none"> • Vehicle exhaust • Lighters/matches • Hot work activities.
Control Strategies	<ul style="list-style-type: none"> • Intermittent monitoring of the Lower Explosion Limit (LEL) and volatile gases using a portable Photoionisation Detector (PID) where required • Maintain emergency preparedness with two 9 kg powder fire extinguishers in close proximity to the excavation work zone. All excavation plant and associated vehicles to maintain dedicated fire extinguishers on-board. Contact emergency services if situation cannot be controlled • No on-site smoking or use of ignition sources (lighters, matches etc.) • Cleared vegetation, demolition materials and other combustible waste will not be burned on site.
Monitoring and Reporting Requirements	<ul style="list-style-type: none"> • Calibration and maintenance of LEL meter and PID • Inspection of fire extinguisher maintenance records and ensure fire extinguishers are serviced and replaced as required • Reporting to include documentation of the results of calibration, maintenance and monitoring events • Compliance with the requirements of the site-specific occupational hygiene assessment to be conducted by the site Occupational Hygienist. Further information is available in Section 5.3 of the OHHMP.

Management Considerations	Actions
Trigger and Response Measures	<ul style="list-style-type: none"> • Undertake regular PID and LEL monitoring • In the event of fire, follow the emergency response procedures outlined in the health and safety plan.

6.4 Water Quality Controls

Given the occurrence of shallow and perched groundwater at the Site, impacted groundwater is likely to be encountered during excavation of the LPBW. Saturated soils and impacted groundwater shall be managed appropriately to avoid off-site migration of contaminants. All surface water (including stormwater) and groundwater encountered during remediation works will be managed in general accordance with the SWMP (Northrop, 2018) (attached as **Appendix E**) and specific controls summarised in **Table 6** below.

Table 6 Water Quality Controls

Management Considerations	Actions
Surface water Discharge	Offsite surface water bodies may be adversely impacted by contaminants from saturated soil run off and/or surface water run off as a result of excavated of contaminated saturated soils, or through leaks and spills of product from site plant / machinery.
Control Strategies	<ul style="list-style-type: none"> • Construction of an onsite surface water storage berm along the southern and eastern site boundary adjacent Styx Creek. • Swale drains on the western and northern site boundaries will tie into and to direct surface water runoff to the storage berm • Contaminated runoff from excavated saturated soils (i.e. groundwater) to be redirected to the storage berm. It is noted groundwater is not proposed to be extracted during remediation work with the exception of incidental extraction during excavation of saturated soils from the LPBW trench • Surface water runoff through contaminated areas to be redirected to the storage berm • Prevent, as far as reasonably practical, surface water runoff entering work zones from surrounding areas • Prevent the uncontrolled release of product in a work zone to surrounding areas • Bunding and spill control procedures in hazardous areas (e.g. refuelling areas, maintenance areas, runoff areas), silt fences / hay bales • Beneficial re-use of water for dust mitigation, where the water quality has been tested and suitable for use without causing odour issues to neighbouring properties. Water proposed for re-use onsite will be compared against the: <ul style="list-style-type: none"> - ASC NEPM (2013) Groundwater Investigation Levels (GILs) - Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018), for 95% protection of marine species. <p>Water reuse and disposal strategies will be assessed by FCC, in conjunction with Ramboll, on a case by case basis.</p>

Management Considerations	Actions
	<p><u>Disposal:</u></p> <ul style="list-style-type: none"> No surface water or incidentally extracted groundwater will be discharged to Styx Creek via the stormwater system. Excess water may be disposed to sewer under Jemena's existing trade waste agreement with Hunter Water (subject to the water meeting Jemena's trade waste agreement criteria). A copy of the trade waste agreement is included in the SWMP (Appendix E) prepared by Northrop (2018). Additionally, excess water may be taken offsite via a specialist contractor (tanker truck) and disposed at an appropriately licensed facility. If off-site disposal of stored water is required, it shall be sampled and classified by Ramboll, and disposed of in accordance with the NSW EPA Waste Classification Guidelines (2014) Conceptual water treatment plant designs are provided in the SWMP, however installation of a treatment plant shall be considered a contingency measure only, should significant quantities of impacted waste water be generated. It is anticipated treated water would be discharged to sewer under the trade waste agreement. Spill response equipment will be available during works. Spill response equipment shall include but not be limited to absorbent materials, spill kits, containment trays over fill and drainage points to capture any spilled product, and ensuring connections are leak proof and sealed correctly while draining product from the infrastructure Construct and utilise a cattle grid and wheel wash area at 2 locations adjacent to Chatham Street and Clyde Street entry / exit points as detailed in the SWMP (Northrop, 2018) to remove loose soil and debris from trucks and other site vehicles before exit onto public roads Plant/machinery refuelling and maintenance shall be undertaken in controlled and dedicated areas on sealed surfaces Use of safe work method statements to minimise risk of leaks and spills during all affected works.
Monitoring and Reporting Requirements	<p>During construction of swale drains and storage bund:</p> <p><u>Visual Inspection:</u></p> <ul style="list-style-type: none"> Prior to the commencement of work each day and at a suitable time during daily operations At minimum twice-daily intervals (inclusive of weekends and public holidays) throughout a major storm event, where safe inspection conditions and lighting allow At the end of each work day Prior to the re-commencement of work following a stoppage for rainfall or other delay <p><u>Sample collection:</u></p> <p>Groundwater and surface water runoff generated at the Site throughout remedial earthworks is likely to be impacted by both sediment and a range of gasworks-related organic and inorganic contaminants. All runoff generated at the Site shall be considered to contain gasworks-related contaminants unless proven otherwise by sampling and analysis of the stored water.</p>

Management Considerations	Actions
	<p>Sampling and analysis of stored runoff will be undertaken by FCC to determine beneficial re-use or disposal options for the water. Stored runoff will be sampled prior to disposal to sewer (TWA) or via specialist disposal contractor. Analysis will comprise organic and inorganic parameters including:</p> <ul style="list-style-type: none"> • pH and Total Suspended Solids (TSS) as described in Section 3.2 of the SWMP • MAHs (benzene, toluene, ethylbenzene and xylenes) • Petroleum hydrocarbons (as total recoverable hydrocarbons) • PAHs and Phenols • Dissolved metals including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc • Cyanide (total, WAD and free cyanide) • Nutrients i.e. ammonia (as N) and nitrate (as N). <p><u>Ongoing monitoring:</u></p> <p>Ongoing monitoring of the effectiveness of remediation works will be undertaken by Ramboll in accordance with the details provided in the VSAQP. Monitoring will continue at the current frequency for 12 months following completion of remediation works, or until such time as the EPA deems monitoring is no longer required or may be reduced. Monitoring will include:</p> <ul style="list-style-type: none"> • Monthly monitoring at surface water locations SC-UP, SC-MID, SC-DOWN, and TC within Styx Creek until the verification of the remediation. Samples will be analysed for: <ul style="list-style-type: none"> - MAHs (benzene, toluene, ethylbenzene and xylenes) - Petroleum hydrocarbons (as total recoverable hydrocarbons) - PAHs and Phenols - Dissolved metals including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc - Cyanide (total, WAD and free cyanide) - Nutrients i.e. ammonia (as N) and nitrate (as N) • 6-monthly monitoring of groundwater at locations upgradient and downgradient of the LPBW, and offsite wells at Emerald Street. • Interpretation of surface water analytical data by calculation of the 95% UCL mean and comparison to ANZG (2018) as prescribed by the RAP. <p><u>Recording and Reporting of:</u></p> <ul style="list-style-type: none"> • The results of visual inspections and results of water quality testing • Reporting of water quality results against the ASC NEPM (2013) and ANZG (2018) and TWA criteria to determine re-use and disposal options • The condition of protective works, their performance, maintenance conducted on and the need for any additional protective works • Reporting of incidents such as leaks and spills.

Management Considerations	Actions
Trigger and Response Measures	<ul style="list-style-type: none"> If excessive rainfall is encountered, ensure adequacy of surface water runoff controls and rectify to ensure compliance measures are met. Ensure any damaged equipment (e.g. hay bales / silt fencing are replaced as soon as practicable) In the event that additional water management is required, FCC will liaise with Jemena to establish an appropriate course of action.

6.5 Waste Disposal and Recycling

The proposed controls for managing waste disposal and recycling are summarised in **Table 7** below. Wastes will be managed in accordance with the Protection of the Environment (Operations) Act 1997 and Waste Regulation (2014).

Table 7 Waste Disposal and Recycling

Management Considerations	Actions
Potential Impact	<ul style="list-style-type: none"> Wastes generated from the remediation works may include excavated soil that is unsuitable for re-use, excess geofabric and contaminated groundwater/surface water Other wastes may include general rubbish, waste from staff amenities and maintenance of plant and equipment, materials used to clean up spills.
Control Strategies	<p>Manage all wastes generated at the Site in accordance with the Waste Management Plan (Appendix B of the RWP) which:</p> <ul style="list-style-type: none"> Identifies all likely waste streams associated with the remediation works Identifies the hierarchy of waste management to be adopted at the Site and opportunities for the reuse or recycling of materials. The waste management hierarchy for the remediation works will be: <ul style="list-style-type: none"> Reduce waste at the source Reuse materials, where practicable Recycle wastes, where practicable Dispose of wastes off site appropriately and responsibly to a licenced/registered facility (as a contingency only). <p>Specific waste management options identified for the Site's wastes are identified as:</p> <ul style="list-style-type: none"> All above and below ground infrastructure are to be retained within the hydraulically down gradient portion of site below the proposed LPBL Classification of all wastes to be taken offsite in accordance with NSW EPA (2014) Should contaminated ground/surface water require off-site disposal, it will be sampled for contaminants of concern identified at the Site and will be classified and disposed off-site in accordance with NSW EPA (2014) If encountered, buried concrete is to be re-used at the Site and will be crushed as per the RAP Provision of portable, regularly maintained toilets for all workers

Management Considerations	Actions
	<ul style="list-style-type: none"> • Provision of waste disposal containers for general rubbish and personnel amenities waste • Provision of specialised containers for special waste (e.g. asbestos) • Regular tidying of work areas, amenities and site offices (e.g. at the end of each work day) to prevent accumulation of waste • Disposal of waste on a regular basis • Provision of waste disposal containers for wastes associated with plant and equipment maintenance <p>All wastes generated at the Site will be tracked using the waste tracking forms provided as Appendix E of the RWP. Completed waste tracking forms will be incorporated into the Site Materials Tracking Register to be maintained by FCC.</p>
Monitoring and Reporting Requirements	<p>All waste will be monitored to ensure that waste is disposed of appropriately. Disposal dockets from the approved waste facility and recycling facility shall be kept on record. Volume of material imported to site shall be recorded so that the material being handled can be identified and accounted for.</p> <p>A robust tracking system will be implemented and will ensure all materials imported to or exported from the site are identified with the following minimum information, where applicable:</p> <ul style="list-style-type: none"> - Material type/description - Material origin and unique identification/labelling - Time and date the material was generated - Stockpiled or excavated quantity - Intended end use (e.g. "for backfilling", "for containment") - Material placement details (e.g. location and quantities used) - Offsite disposal details (e.g. name of receiving facility, waste classification, waste transporter details) where appropriate. <p>Excavated and stockpiled materials will be identified with a marker (flag, stake) clearly labelled with the stockpile source information and a stockpile ID.</p> <p>Template materials tracking forms are provided in Appendix F of the RWP, however may be updated or superseded as needed during site works.</p>
Trigger	Proposed receiving waste facility cannot receive the category of waste generated.
Response Measures	Seek alternative waste facility registered to receive the proposed waste.

6.6 Chemicals and Dangerous Goods

All chemicals, fuels and oils used on-site must be stored in accordance with:

- The requirements of all relevant Australian Standards
- The NSW EPA Storing and Handling of Liquids: Environmental Protection – Participants Manual' if the chemicals are liquids.

The proposed general controls for managing chemicals and dangerous goods are summarised in **Table 8**.

Table 8 Chemicals and Dangerous Goods

Management Considerations	Actions
Potential Impact	<ul style="list-style-type: none"> • Potential for inappropriate storage • Potential for leaks and spills and exposure to site personnel.
Control Strategies	<p>The most effective way of dealing with chemicals and dangerous goods is to:</p> <ul style="list-style-type: none"> • Avoid using them, or by replacing them with less toxic materials • Use work practices that minimise their use. <p>If chemicals or dangerous goods are to be used and stored at the Site, FCC must develop a register and maintain it. All project personnel shall be made aware of the potential hazards of the chemicals / dangerous goods used at the Site.</p> <ul style="list-style-type: none"> • All dangerous goods will be stored in accordance with AS/NZS 3833:2007 <i>The storage and handling of mixed classes of dangerous goods, in packages and intermediate bulk containers</i> and according to individual chemical requirements • Diesel, oils and other fuels will be stored in self-bunded tanks within the site compound and parking area • Engine oil and hydraulic fluid will be stored in an appropriately bunded area within the site compound and parking area • Spill kits will be stored nearby stored chemicals and deployed to contain any spills which may occur during storage and use of chemicals • 2x 9kg dry powder type fire extinguishers will be available in the storage area for fire suppression, if required. Fire extinguishers will also be available on all items of heavy equipment. <p>A SDS will be required that documents information on the properties of the chemicals and dangerous goods, and how they affect health, safety and environment in the workplace. Information provided in the SDS shall include:</p> <ul style="list-style-type: none"> • The identity of the chemical • Health and physicochemical hazards • Safe handling and storage procedures • Potential environmental impact • Emergency procedures • Disposal considerations. <p>All chemicals on-site will be stored and handled in accordance with the SDS. A risk assessment will be undertaken for all dangerous goods to be stored onsite to identify individual storage and handling requirements are suitably available onsite.</p> <p>Additionally, a generic SDS for CoPC identified at the Site will be kept on-site.</p>
Monitoring and Reporting Requirements	<ul style="list-style-type: none"> • All chemicals and dangerous goods stored at the Site will be entered into a register that will remain at the Site • The Site Manager will conduct regular visual assessment of compliance with control strategies • The Site Manager will check the currency of the SDS and be familiar with the potential hazards and emergency response requirements.

Management Considerations	Actions
Trigger and Response Measures	If a release of a stored chemical occurs, the SDS for that chemical will be reviewed and product specific emergency response measures implemented.

6.7 Soil Contamination Controls

6.7.1 General

The SWMP (Northrop, 2018) is the overarching document for the management of sediment and surface water at the Site during remediation.

Additional, specific controls for managing soil contamination and general handling of materials to prevent contamination are summarised in **Table 9** below. It is noted that soil contamination controls in respect to managing the potential for dust, odour, or vapours to be present from contaminated soils, should be undertaken in accordance with the controls, monitoring, triggers and actions defined in **Section 6.2**.

General water quality controls are defined in **Section 6.4** and are supplemented in **Table 9** below to control potential ancillary impacts relating to runoff from soil contamination. This section provides further governance for all potentially contaminating remedial activities and shall supplement the abovementioned potential emission sources and controls.

Table 9 Soil Contamination Controls

Management Considerations	Actions
Discharge, including spillage of Contaminated Soil	<p>During excavation, stockpile management and transport of soil, and general site activities, there is the potential for contamination of:</p> <ul style="list-style-type: none"> • Soils that are free of contamination (i.e. clean excavated material and/or imported VENM/ENM) • Groundwater • Surface water.
Control Strategies – General	<p>The following control measures will be implemented to prevent potential impacts to soil, surface water and groundwater:</p> <ul style="list-style-type: none"> • Excavated clean soils and imported clean materials will be stockpiled in designated clean areas away from existing stockpiles and/or contaminated areas • Stockpiles will be segregated based on observations of contamination and clearly signposted as such (e.g. “clean” and “contaminated”) • Establish a robust materials tracking system (as per Table 7) • Silt fences / hay bales and diversion drains will be positioned to prevent migration of fine material down-gradient • Excavated spoil shall be placed directly into trucks for relocation • Bunds to prevent surface water ingress to exposed soil and prevent surface water leaving exposed areas • Use of geofabric to cover stockpiled material progressively through the day, or at the end of each working day as required • Material washed from vehicles and equipment to be captured and relocated down hydraulic gradient of the LPBW and below the LPBL • Ensure all plant and equipment that has come into contact with contaminated material is appropriately decontaminated • Maintain clear corridors between clean and dirty stockpiles to minimise risk of cross-contamination • Refuelling and maintenance of plant and vehicles to be conducted in areas of hardstand where possible or in areas where the potential for a spill or leak to cause soil and or water contamination is minimal. Spill kits to be available in the event of a spill from refuelling or maintenance activities • Use of licensed waste transporters and ensure the integrity of truck trays are sound (no holes or cracks) with loads covered.
Monitoring and Reporting Requirements	Visual assessment of compliance with control strategies by completion of daily checklist.
Trigger and Response Measures	Contain and collect spilled material and notify the Jemena and Ramboll representatives of areas that may have been impacted.

Additional specific soil controls are also required for the following activities and are discussed in more detail below.

6.7.2 Import and Use of ENM and Exempted Material at the Site

Details of ENM and material subject to an appropriate Resource Recovery Exemption under the POEO Act 1997 proposed to be imported to the Site are provided in Section 4.7 of the RWP. Imported materials will be used for all or some of the following components:

- Mixing with bentonite slurry and backfill into the LPBW and Bridging Layer to achieve design requirements
- Construction of the LPBL
- Construction of temporary haulage routes and working platforms.

All materials proposed to be imported must be appropriately certified by Ramboll (environmental suitability) and Douglas Partners (geotechnical suitability) prior to importation. A summary of all materials to be imported should be provided to Ramboll and Douglas Partners including:

- Material type, source, quantity and intended application
- The scope of assessment proposed to demonstrate geotechnical suitability of each material type before import
- The scope of assessment proposed to demonstrate environmental suitability of each material type before import
- The results of assessments above.

Assessment of the environmental suitability of imported material is a hold point (3 week allowance) in the remediation program and no material should be brought to the Site without prior agreement from Ramboll. Materials intended for importation may be subject to confirmatory inspection and sampling by Ramboll for verification purposes and adequate time should be allowed in FCC's program to account for this. Material sampling requirements will be detailed in the Validation SAQP prepared by Ramboll.

6.8 Flora and Fauna Controls

Initial site preparation will involve the clearing and grubbing of site vegetation to facilitate remedial works. Site vegetation will be processed and subsequently disposed off-site. The proposed controls for the management of Flora and Fauna, as describe in Table 8-59 of the EIS to avoid or minimise biodiversity impacts and include:

- Provision of an environmental induction to all workers prior to starting work on-site
- Inspection of onsite buildings for signs of roosting bats
- Weed management measures including:
 - Mapping showing the type and location of weeds of concern (including priority weeds) within the Site prior to remediation works
 - Identification of sensitive receivers (Styx Creek) adjacent to the Site
 - Measures to prevent the spread of weeds, including hygiene procedures for equipment, footwear and clothing
 - Weed disposal protocols.

FCC will implement practicable measures to control vermin and noxious weed growth at the Site during remediation works. Pest control may be undertaken on a regular basis and include:

- Placement spraying, slashing, smothering or uprooting of weeds
- Containment of putrescible wastes, and potential placement of vermin traps around amenities.

6.9 Road Controls

The proposed controls for site access and traffic movements are outlined in the Traffic and Pedestrian Management Plan (TMP) (Workplace Traffic, 2018) and summarised in **Table 10** below. The objectives of the TMP are to:

- Maintain appropriate public transport access
- Manage and control construction vehicle activity in the vicinity of the Site
- Restrict construction vehicle movements to designated routes to and from the Site
- Provide an appropriate and convenient environment for pedestrians
- Minimise the impact on pedestrian movements
- Maintain appropriate capacity for pedestrians at all times on footpaths adjacent to the Site along Chatham Road and Clyde Street.

Table 10 Road and Transport Controls

Management Considerations	Actions
Access	<ul style="list-style-type: none"> • FCC will provide access to the Site and will ensure the Site is secure at the end of each working day • FCC will be responsible for vehicle and truck movements across the Site.
Potential Impact	<ul style="list-style-type: none"> • Degradation of public roads surrounding the Site resulting from vehicle movements associated with: <ul style="list-style-type: none"> - Delivery / dispatch of plant and equipment to / from site - Transfer of material off- site - Transfer of VENM to the site - Spillage of non-hazardous and/or hazardous materials.
Control Strategies	<ul style="list-style-type: none"> • Establish site entrances and haul roads in accordance with the conditions of consent requirements, AUSTROADS guidance, and to accommodate the turning path of a truck and dog • Operating practices that prevent spillage from occurring, such as checking that trucks are not excessively filled, slow driving, covering loads, and careful loading and unloading, will be implemented • All vehicular movements to and from the Site will be in a forward direction • Ensure all haulage vehicles pass through a wheel wash, rumble grid or similar area prior to departing site so that no loose material remains on vehicle bodies or tyres • Ensure haulage vehicle movements take place during the timeframe listed under site working hours, or RMS vehicle restriction requirements • Loading and unloading will take place on site only, within designated areas • Use of licensed vehicles • The following operational protocols will be followed for truck movements around and to and from the Site: <ul style="list-style-type: none"> - Trucks will follow the site access routes which are to be confirmed at the start of works and for all truck drivers as part of site inductions - Operating practices for haulage will include covering of all loads

Management Considerations	Actions
	<ul style="list-style-type: none"> - All truck tail-gates will be securely fixed prior to loading and immediately after unloading solid material - Vehicles leaving the Site will be inspected to ensure they are clean, to prevent soiling roadways • Entrance via Gate 1 (southern existing gate) for material importation, light vehicle entry and daily access • Construction of Gate 2 (opposite 38 Clyde Street as outlined in TMP) for the floating of oversize earthmoving equipment on and offsite and exit of material importation vehicles • Use of the southern portion of site for onsite worker vehicle parking; parking on Chatham road to be used only as overflow parking (contingency measure) • Use of accredited traffic control personnel for any temporary road closure or disruption to public roadways • Plan truck movements to allow adequate manoeuvring space away from obstructions and vehicles, avoid excessive idling and banking up of trucks on surrounding roads • Provide adequate onsite parking for contractor vehicles and heavy vehicles.
Monitoring and Reporting Requirements	<ul style="list-style-type: none"> • Weekly inspection of site access / haul routes (greater frequency during rain events) • Monitoring of all truck movements onto and off the Site to ensure safety precautions are being adhered to • Daily monitoring of traffic flows on Chatham Road and Clyde Street to ensure no adverse impact caused by site-related vehicle movements • Maintain truck service logs • Daily inspection of the condition and visibility of all traffic signage related to site activities (on and offsite) • Notification of upcoming works to local community via Jemena's community liaison manager • Creation of exclusion zones and physical barriers (e.g. jersey barriers) around existing site heritage buildings.
Trigger and Response Measures	<p>If any of the above controls are not in place when required, the following actions may be required:</p> <ul style="list-style-type: none"> • Re-establish access routes and ingress / egress signage • Removal of plant/truck operator from the Site.

6.10 Heritage

The proposed controls for the management of heritage items are described in **Table 11** include:

Table 11 Heritage Controls

Management Considerations	Actions
Access	<ul style="list-style-type: none"> FCC will provide access to the Site and will ensure the Site is secure at the end of each working day to prevent unauthorised access by vandals.
Potential Impact	<ul style="list-style-type: none"> Permanent damage or destruction of local heritage buildings and aboriginal heritage items associated with: <ul style="list-style-type: none"> Site recontouring Tree removal LPBW construction and LPBL construction.
Control Strategies	<ul style="list-style-type: none"> In accordance with the Conditions of Consent, remediation works will be conducted under a Conservation Management Plan (CMP) for the conservation of the Newcastle Gas Co office building, Pump house and fence. The CMP will be prepared by Jemena and detail: <ul style="list-style-type: none"> The conservation measures and management strategies to protect the Newcastle Gas Co office building, Pump house and fence Protection systems to be implemented to prevent damage to the heritage items during remediation works. FCC to brief all workers and site personnel on: <ul style="list-style-type: none"> Heritage buildings (comprising the Newcastle Gas Company Office building and the Pump House and Fence) present at the Site, and exclusion zones around these buildings The possible identification of Aboriginal sites and objects during construction and worker's legislative responsibilities for preserving heritage items including reporting the discovery of unexpected heritage find to the Office of Environment and Heritage (OEH) The reporting protocol should suspected human remains be uncovered (albeit unlikely) during remediation works. Consider vibration impacts on building structures; and implement controls listed in the Noise and Vibration Management Plan (Appendix B) Establish suitable exclusion zones around heritage buildings to prevent incidental damage during remediation works Completion of dilapidation assessments of heritage buildings prior to commencement of remediation works and upon completion Vibration monitoring during high impact works within the recommended buffers from heritage buildings and substitution with lower vibration equipment.
Monitoring and Reporting Requirements	<ul style="list-style-type: none"> Maintain records of all site inductions completed by workers and site personnel Dilapidation survey of heritage buildings Monitoring in accordance with the Noise and Vibration Management Plan (Appendix B)

Management Considerations	Actions
	<ul style="list-style-type: none"> • Reporting and documenting any incidental damage to heritage buildings • Reporting the discovery of any suspected aboriginal heritage items to OEH • Reporting of suspected human remains during remediation works.
Trigger and Response Measures	<ul style="list-style-type: none"> • Incidental damage to heritage buildings (e.g. by excessive vibration and/or direct contact) • Uncovering of suspected aboriginal heritage items during remediation works • Uncovering of suspected human remains during remediation works.

6.10.1 Aboriginal Heritage

If any item or object of Aboriginal heritage significance is identified on site:

- All work in the immediate vicinity of the suspected Aboriginal item or object must cease immediately;
- A 10 m wide buffer area around the suspected item or object must be cordoned off
- The OEH must be contacted immediately.

Work in the immediate vicinity of the Aboriginal item or object may only recommence in accordance with the provisions of Part 6 of the National Parks and Wildlife Act 1974.

6.11 Site Inspections and Boundary Controls

Daily inspections of the proposed environmental control measures will be undertaken by the Site Manager. The inspections will be conducted visually prior to commencement of each day's work, at the end of each day's work, and during inclement weather conditions.

LEL/PID readings will be manually recorded intermittently during excavation activities and stockpile management relocation to identify potential trends in changing conditions.

The Site conditions for each operational day are to be recorded on the Daily Log Sheet. Items to be inspected will include but are not limited to:

- Site boundary and internal fencing
- Silt fencing, bunding and hay bales, and other erosion and sedimentation controls
- Potential offsite impacts of remedial works to Styx Creek, for example, uncontrolled discharge of water from the Site, or damage to structures
- Stockpiles and stockpile cover integrity
- Open excavations
- Efficacy of odour controls, for example, efficacy of odour encapsulator application to soils in excavations / stockpiles
- Weather station
- Inspection of dust gauges (if installed)
- Waste management
- Dust suppression controls
- Plant / machinery re-fuelling
- Waste management

- Vehicle and equipment hygiene.

Where necessary any damage to or reduced capacity of environmental control measures will be corrected as soon as practical. If deemed necessary after investigation, environmental control measures may be upgraded.

6.11.1 Audits

Audits of site HSE systems will be undertaken by Jemena and the FCC Project Manager. Audits will be conducted throughout the remedial works program and scheduled in advance by the FCC Project Manager to capture high-risk work items. Further detail is provided in the HASP.

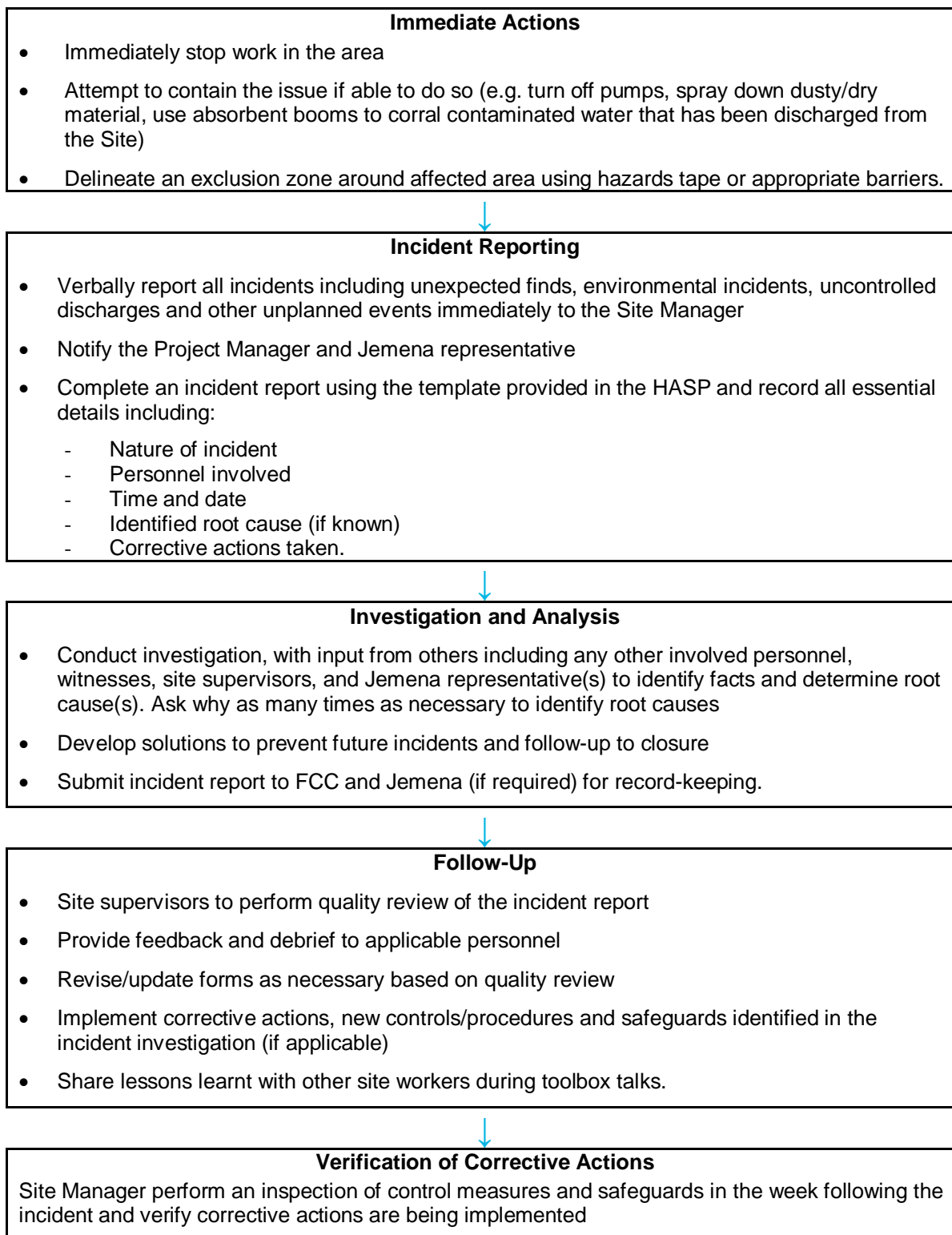
6.12 Reporting Requirements

Where significant environmental risks, incidents or near-misses are identified by the monitoring and reporting requirements outlined in **Table 3** to **Table 10** above, these must be documented by the Site Manager and provided to Jemena.

Reporting of environmental risks will be undertaken in daily end-of-day reports prepared by the Site Manager (or delegate) and provided to Jemena. Significant environmental risks, near misses and incidents will be reported immediately by phone call to Jemena.

Table 12 below outlines the procedure for recording and managing environmental incidents and near misses which may occur during the remediation works.

Table 12 Incident reporting flowchart



6.13 Document Control

This RWEMP, and associated environmental procedures and work instructions prepared by FCC, will be treated as “live” documents and will be continually updated and amended as experience/ conditions dictate. The updating of the RWEMP and associated documents will be the responsibility of the Site Manager or delegate.

6.14 Contingency Measures

Should controls documented in **Section 6.0** above fail to account for all environmental risks likely to be encountered during remedial works, additional contingency measures are provided in the Remedial Works Contingency Plan (RWCP) attached as **Appendix D** of the RWP provided under separate cover.

7.0 Work Health & Safety Legislation and Regulations

Remedial works will be conducted in compliance with applicable WH&S legislation, regulations and standards. In addition, the works will comply with relevant industry codes of practice, guidelines and other publications that have been developed by WorkCover. These may include but not be limited to:

- NSW Work Health and Safety Regulation, 2017
- The Work Health and Safety Act 2011 and Safety Regulation 2011
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC, 2005)
- Code of Practice: How to Manage & Control Asbestos in the Workplace, 2011
- The Dangerous Good Act 1975 and General Regulation 1999
- Electrical Practices for Construction Work (February 1992)
- Exposure Standards for Atmospheric Contaminants in the Occupational Environment (National Occupational Health and Safety Commission (NOHSC), 1995).

7.1 Site Health and Safety Plan

Prior to site establishment, an overarching HASP will be prepared by the FCC, which is to be signed onto and agreed to by all site personnel. The purpose of the HASP is to present all relevant worker health and safety information for the works that are otherwise beyond the scope of this RWEMP. It is intended that this RWEMP will supplement the HASP and that these documents will be implemented in conjunction to ensure all identified risks to human health, safety and the environment are documented and appropriately mitigated.

The information presented in the HASP will include:

- Assignment of responsibilities for all site personnel
- An outline of the existing site conditions; and details of all work to be conducted
- An evaluation of hazards and risks
- Details of the proposed measures to be implemented to manage the identified hazards and risks
- Establishment of personnel protection standards, PPE and mandatory safe work and hygiene procedures
- Establishment of Work Health and Safety (WH&S) monitoring protocols
- Training requirements for emergency team members
- Communication protocols and training procedures
- Evacuation procedures, emergency contacts and emergency drills to be implemented
- Provision for contingencies and changes in work practices
- Incident reporting procedures and investigation.

All site personnel and visitors will be required to be inducted onto the HASP. Additionally, all site personnel will be required to be inducted onto the RWEMP and ARCP.

7.1.1 Occupational Hygiene

It is noted previous assessment of risk to human health at the site conducted by JBS&G (2017) indicated concentrations of benzo (a) pyrene and pentachlorophenol in shallow soils have been found to pose a potentially unacceptable risk and/or hazard to workers performing sub-surface intrusive or excavation works.

The quantification of the actual risk to workers performing intrusive activities during remediation works cannot be completed until a site inspection and risk assessment has been undertaken and an occupational exposure sampling strategy developed. An occupational hygienist shall be engaged to conduct an assessment of risk, and advise a suitable monitoring strategy, with reference to the OHHMP (AECOM, 2018).

8.0 Key References

AECOM (2018), Occupational Health and Hygiene Management Plan, November 2018

AECOM (2019a), Remedial Works Plan, Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North, NSW, January 2019

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

GHD (2018) Jemena Gas Networks (NSW) Ltd Former Newcastle Gasworks (Clyde Street) Remediation Project, Environmental Impact Statement, July 2018

JBS&G (2017), Stage 2 Remedial Action Plan, Former Newcastle Gasworks 1 Chatham Road, Hamilton North, NSW, November 2017

Landcom (2004), Managing Urban Stormwater: Soils and Construction, 4th Edition, March, 2004

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)

Northrop (2018), Soil and Water Management Plan for Former Newcastle Gasworks Remediation Clyde street Hamilton, Revision D, November 2018

NSW EPA (2014), Waste Classification Guidelines Part 1: Classifying Waste, November 2014

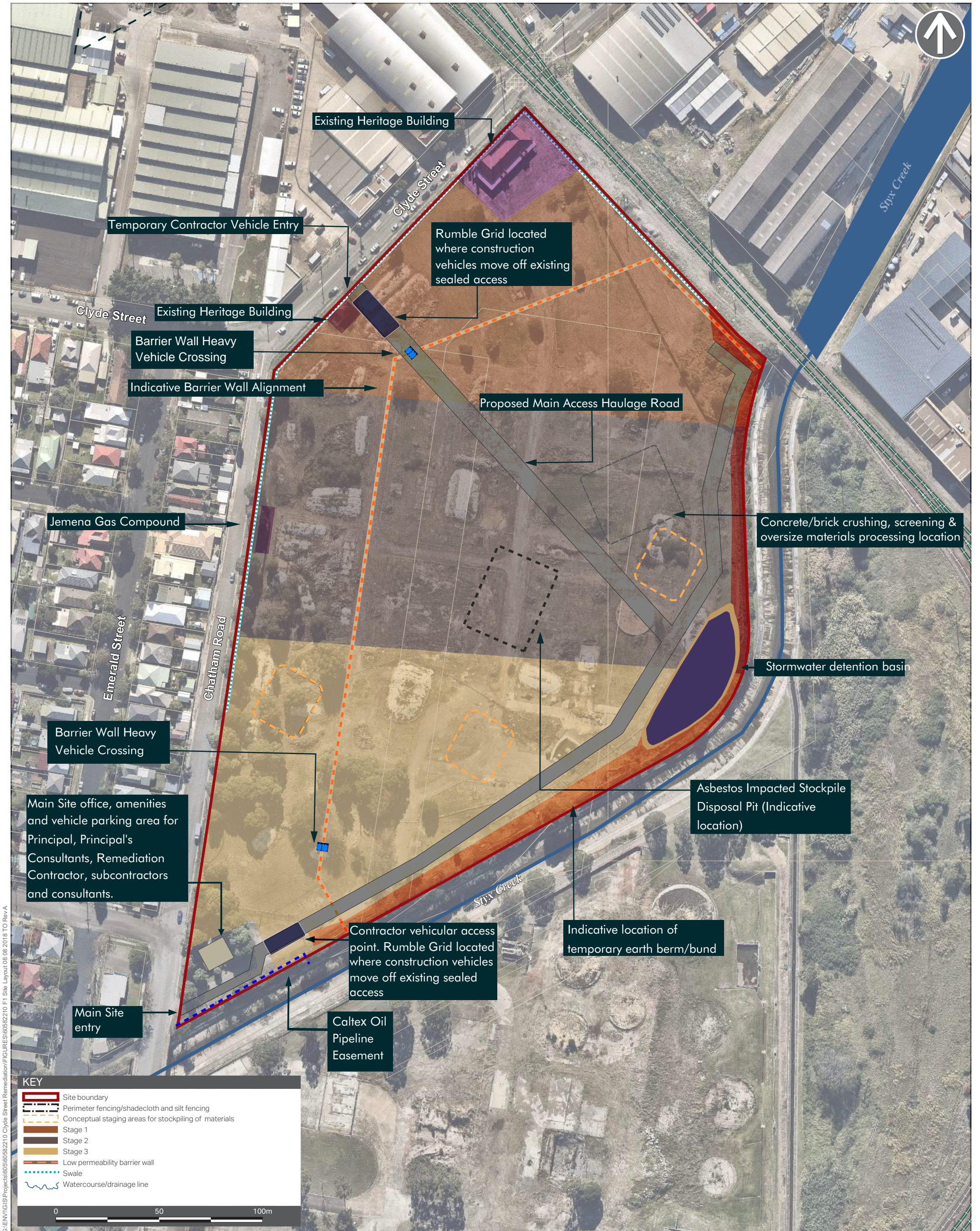
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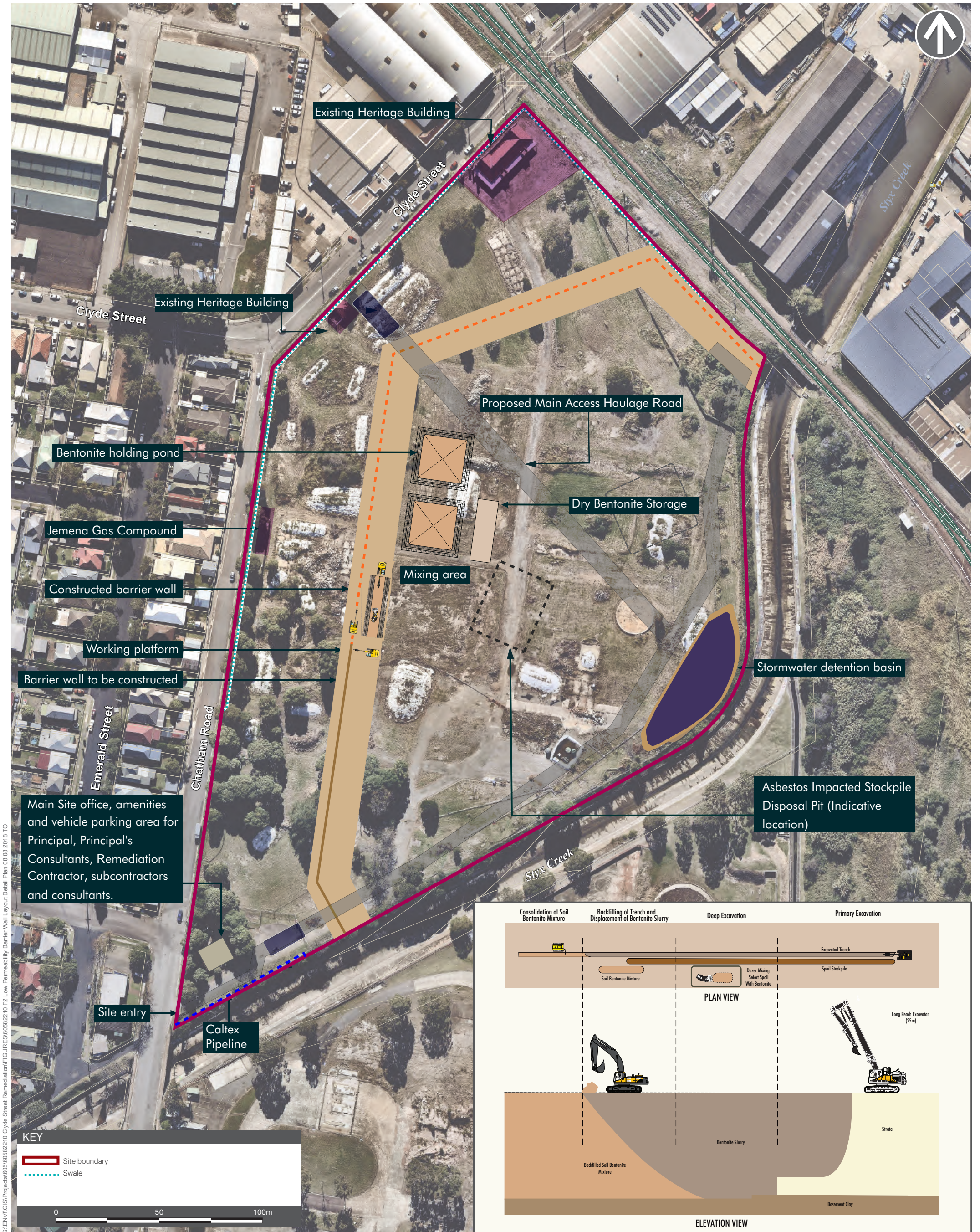
Appendix A

Figures

Appendix A Figures



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Appendix B

Air Quality Management Plan

Appendix B Air Quality Management Plan

Air Quality Management Plan

Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North,
NSW 2292



Air Quality Management Plan

Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North, NSW 2292

Client: Ford Civil Contracting

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22-Jan-2020

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Quality Information

Document Air Quality Management Plan

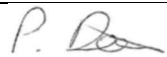
Ref 60582210

Date 22-Jan-2020

Prepared by James Enright / Cye Buckland

Reviewed by Paul Wenta / Chad Whitburn

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	08-Aug-2018	Draft	Peter Dean Project Manager	
B	10-Oct-2018	Preliminary Final	Peter Dean Project Manager	
C	07-Feb-2019	Preliminary Final	Peter Dean Project Manager	
D	25-Mar-2019	Preliminary Final	Peter Dean Project Manager	
E	02-Apr-2019	Preliminary Final	Peter Dean Project Manager	
F	04-Jun-2019	Preliminary Final	Peter Dean Project Manager	
0	16-Jul-2019	Final	Peter Dean Project Manager	
1	27-Nov-2019	Final - to include changes at client's request.	Peter Dean Project Manager	
2	22-Jan-2020	Final - to include changes at client's request.	Peter Dean Project Manager	

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1.0 Introduction

1.1 General

AECOM Australia Pty Ltd (AECOM) was engaged by Ford Civil Contracting Pty Ltd (FCC) to prepare an Air Quality Management Plan (AQMP) for proposed remediation works (the Project) due to be undertaken at the former Newcastle Gasworks Site located at 1 Chatham Road, Hamilton North, NSW (the Site). This AQMP has been prepared to supplement the Remediation Works Environmental Management Plan and guide management of potential emissions to air associated with Remediation Works.

1.2 Purpose

The purpose of this AQMP is to:

- Identify potential air emissions associated with the Stage 2 Remediation Works at the Site
- Identify mitigation measures that can be used to minimise air emissions
- Establish an air quality monitoring system to assess impacts on surrounding sensitive receptors.

2.0 Site Description

2.1 Site History

The site was operated by the Newcastle Gas Company (now Jemena) as a gasworks plant since 1913 until its decommissioning in 1985. Since then, the majority of the site remained largely vacant with the exception of the southern portion which was occupied by Elgas until mid-2014 for gas storage and bottling purposes. The site is vacant and secured by a chain wire fence and locked gates, with security patrols controlling site access.

The site is located in Hamilton North, a suburb to the north west of the Newcastle CBD, and is surrounded by a variety of different land uses from residential to industrial. A Shell bulk fuel storage terminal is located directly to the south of the site adjacent to Styx Creek; this fuel storage terminal was decommissioned in 2015.

Redundant above ground infrastructure at the site include the historical Office Building adjoining Clyde St at the northern corner of the site and other historical buildings in the northern, western and southern portions of the site. Remnants of former roadways have also been identified with a rail siding on the north-eastern portion of the site. Unsealed areas of the site are typically grassed with large trees observed in the south western portion of the site.

In addition to the above, there are a total of 11 main material stockpiles across the site making up a total estimated volume of approximately 4,513 m³.

2.2 Scope of Work

Excavation activities associated with the Remediation Works consist of the following key items:

Table 1 Proposed Excavation Activities

Activity	Details
Excavation of Low Permeability Barrier Wall (LPBW)	<p>Pre-excavation of a shallow (1.5 m bgl) trench along the length of the LPBW footprint to remove subsurface obstructions, assess conditions and prepare the ground for low permeability barrier wall (LPBW) construction.</p> <p>Excavation to approximately 9 m bgl to facilitate construction of a 492 m long LPBW parallel to the north and western site boundaries (3,570 m³).</p> <p>The LPBW will be constructed via a continuous process of trench excavation and simultaneous backfill with soil-bentonite slurry.</p>
Demolitions and Cut/Fill Earthworks	<p>Cut and fill earthworks and site re-grading to prepare subgrade to receive a Low Permeability Barrier Layer (LPBL) and achieve design finish surface contours.</p> <p>Works include the excavation and demolition of existing brick retaining walls and pavement slabs, removal of redundant service pits and infrastructure, crushing and screening of materials and placement under the LPBL (approximately 4,440 m³)</p>
Excavation of Stockpiles	Relocation of existing site stockpiles left from Stage 1 Remediation Works. Includes the removal and relocation of 11 major stockpiles and up to 40 sub stockpiles totalling approximately 4,513 m ³ inside the alignment of the LPBW.
Bentonite Mixing and Holding Ponds	Excavation associated with construction of temporary ponds for the onsite batching and storage of bentonite slurry during LPBW construction.

2.1 Remediation Works Staging

Remediation Works will be undertaken in a staged approach with work commencing in the northern third of the Site (Stage 1) and progressing south into Stages 2 and 3 (refer to **Figure 1, Appendix A**). Works will be staged so that ground preparation earthworks, LPBW construction and LPBL installation may occur concurrently in different Stage areas.

Notwithstanding this staged approach, construction of the LPBW will be completed in one continuous phase commencing in Stage 1 and ending in Stage 3. A continuous construction methodology is required for LPBW construction to guarantee the formation of a monolithic structure with no permeable joints that would allow groundwater infiltration.

2.2 Roles and Responsibilities

Table 2 below outlines the key personnel for the remedial works and their responsibilities in relation to air quality management at the Site.

Table 2 Roles and Responsibilities

Position and Company	Responsibilities
Remediation Contractor (FCC)	<ul style="list-style-type: none"> Monitor and be aware of meteorological conditions that may produce adverse levels of dust and offensive odours Monitor environmental alert systems and implement mitigation strategies accordingly Assess meteorological and site conditions before commencing and during work to minimise air quality impact.
Environmental Monitoring Contractor	<ul style="list-style-type: none"> Prepare monitoring equipment to function as required Perform data collection and maintenance activities associated with monitoring.
Competent Person (appointed by FCC)	<ul style="list-style-type: none"> Observe site conditions and implement appropriate mitigation measures when necessary Ensure work area is maintained to prevent adverse dust and odour risk Develop excavation inspection schedule and complete excavation inspections Ensure excavation areas are adequately secured to prevent unauthorised access Secure excavations that are left open after work hours and cover with tarpaulins / suppressants.
Operator / Spotter	<ul style="list-style-type: none"> Complete daily pre-start inspections of heavy equipment and ensure faulty equipment is repaired before use Ensure machinery and equipment meets site criteria before operating Operate machinery and equipment according to site requirements Comply with the directions of the Competent Person.

2.3 Potential Air Emissions

Excavation Works will result in the removal and handling of contaminated soils and the potential for release of pollutants of concern from the Site. Air emissions have the potential to result in complaints from members of the public, including occupants of adjoining sites and may result in delays to remediation works and regulatory penalties under environmental protection and planning legislation. Sources of emissions may include:

- Dust emissions arising from
 - Excavation
 - Material handling and placement, including displacement of dusty materials
 - Wind erosion of bare surfaces and stockpiles

- Wheel-generated dust
 - Particulate emissions from mobile plant.
- Dust emissions arising from operation of a concrete crusher located at the north east corner of the Site
- Release of Asbestos fibres due to handling and crushing of asbestos contaminated materials
- Odour emissions arising from handling of malodorous soil
- Release of PAH and VOC's from disturbance of materials.

It is preferable to control these emissions at the source, for example by suppressing odour at the excavation face, where practicable.

2.4 Seasonal Wind Speed and Direction

Stage 1 of the project is expected to commence in Q2 2019 with the final stage 3 expected to be completed in Q4 2019. As such historical wind speed and wind direction for the area have been sourced from the Bureau of Meteorology (BOM) Nobbys Head Station as an indication of typical wind conditions during the scheduled period of work as seen in **Table 3**, **Table 4** and **Table 5** below. It should be noted that Nobbys Head Station is a coastal station and conditions should be considered indicative.

The wind roses provided show the average 9am and 3pm wind conditions for each month between 1 January 1957 and 11 August 2018. The 9am wind roses are indicative of typical morning wind conditions for the month while the 3pm wind roses are indicative of afternoon conditions.

Table 3 Historical 9am and 3pm Wind Speed and Direction – April to June

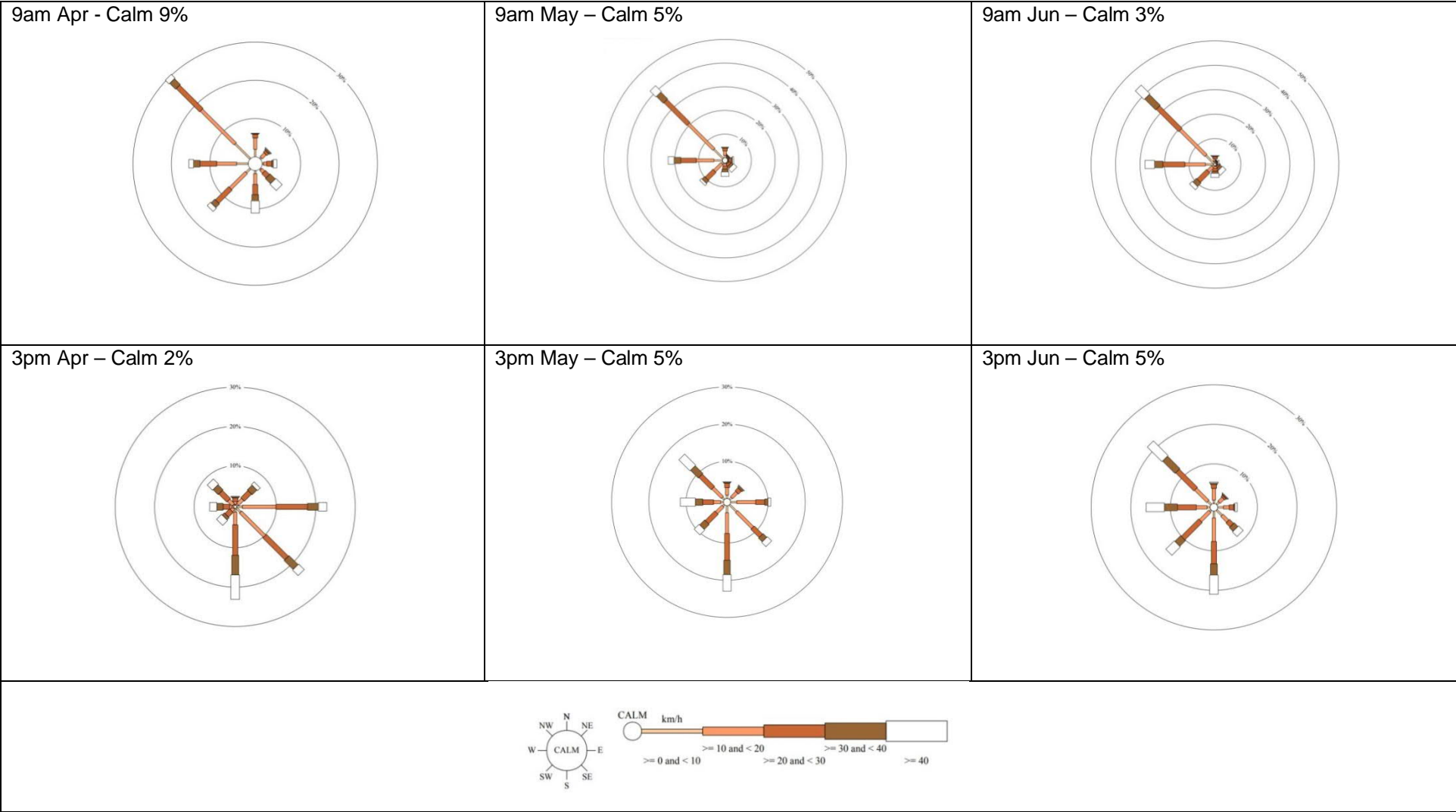


Table 4 Historical 9am and 3pm Wind Speed and Direction – Jul to Sep

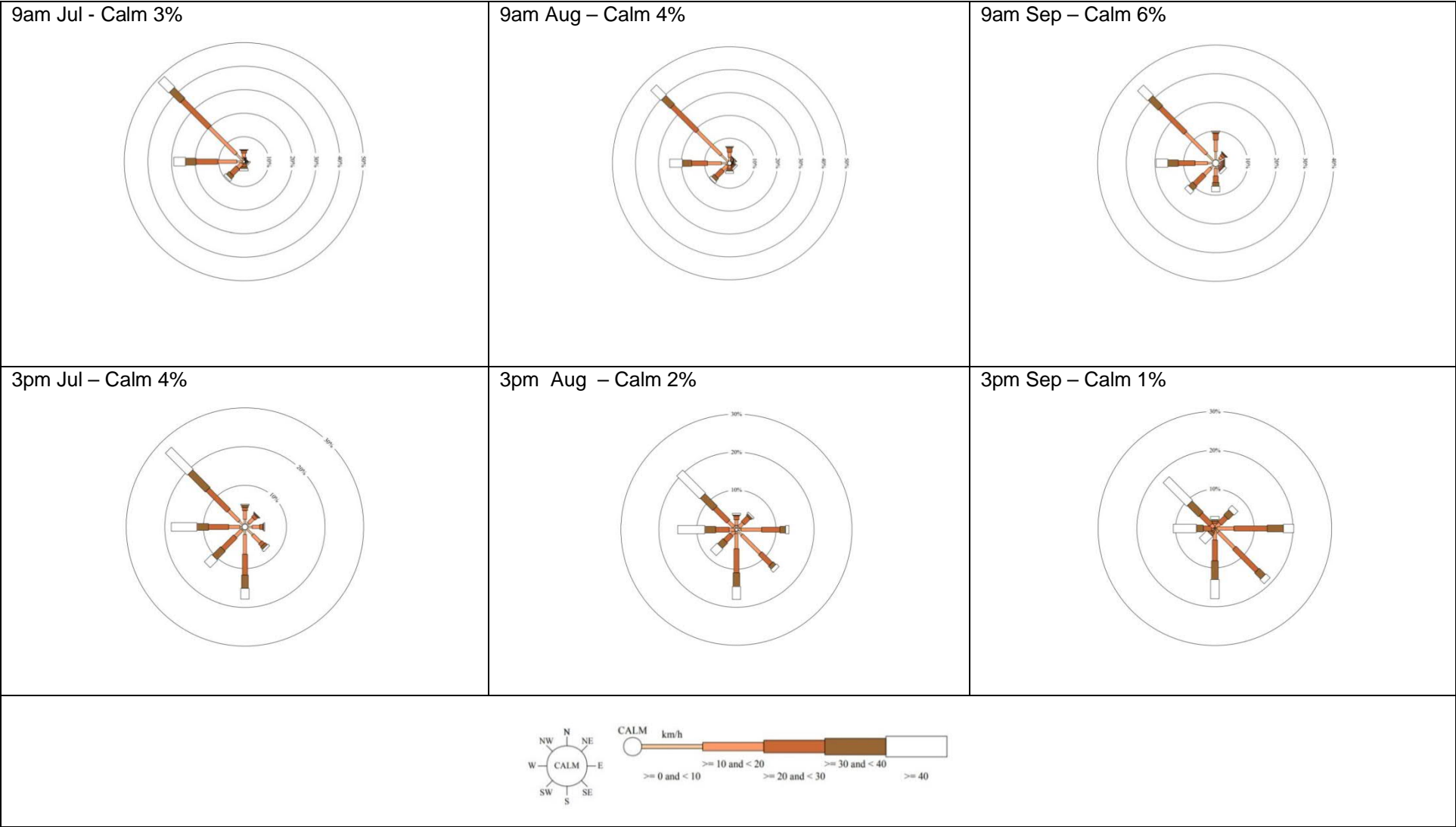
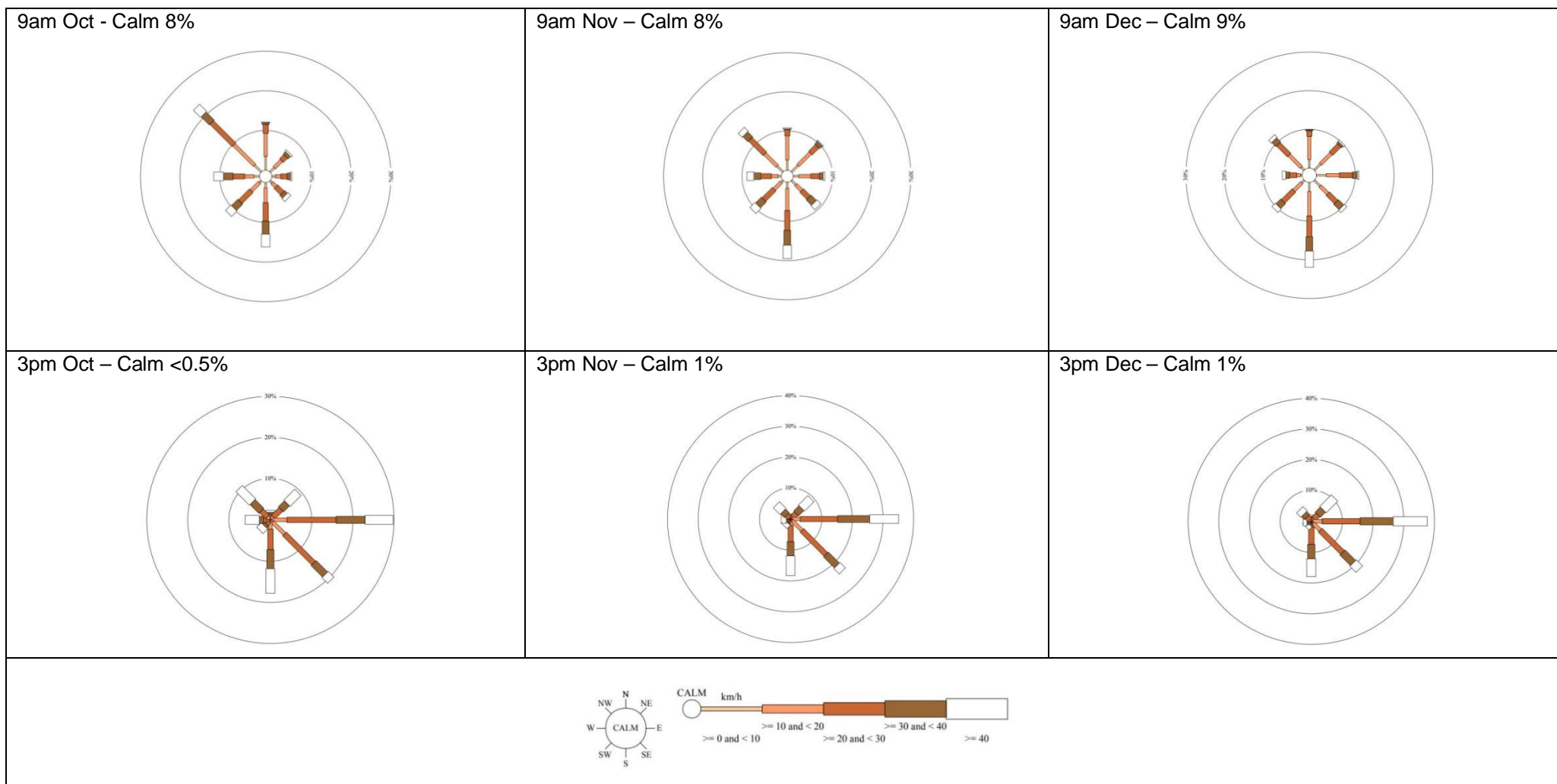


Table 5: Historical 9am and 3pm Wind Speed and Direction – Oct to Dec



As can be seen in **Table 3** and **Table 4**, morning winds for April to September are predominately from the north east. Afternoon winds are predominately from the east to south directions for April while May to August months are typically north east to south winds. September is predominately from the east to south.

As indicated in **Table 5** October shows morning winds from the northwest with west and south components. Morning winds for November and December are primarily from the south. Afternoon winds for October to December historically blow from the east.

2.5 Potential Sensitive Receptors

Land to the north and east of the Site is industrial and commercially zoned land. The main sensitive receptors of concern are residential land located immediately to the west and east of the Site. Residential houses in Hamilton North are located approximately 15m from the western boundary of the Site with residential housing approximately 100m to the east of the Site.

Residential houses are present along the north and south site boundaries but are located further away, on the far side of nearby industrial land. The closest residential buildings on these boundaries are over 100m beyond site boundaries.

Although receptors are situated beyond the boundary, the assessment of certain pollutants needs to be considered at or beyond the boundary (in accordance with the NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in NSW). All measurement activities will occur on the Site close to the boundary to ensure any pollutant measurements can be considered to apply at or beyond the boundary.

Figure 1 Site location and surrounding areas



3.0 Legislative Requirements

3.1 Air Quality Criteria

The EPA has specified ground level concentration criteria that are intended to minimise the adverse effects of airborne pollutants on sensitive receptors (EPA, 2016).

3.1.1 Dust

The ambient air quality dust criteria considered in this assessment are shown in **Table 6** and **Table 7** below.

Table 6 EPA Impact Assessment Criteria – PM₁₀ and TSP

Pollutant	Averaging Period	Criteria (µg/m ³)
Fine particulate matter (PM ₁₀)	24 hours	50
	Annual	25
Total Suspended Particulate (TSP)	Annual	90

Table 7 EPA Impact Assessment Criteria - Depositional Dust

Analyte	Annual Average Criteria
Deposited Dust Annual Average (Insoluble Solids)	4 g/m ² .month

3.1.2 PAH

Table 8 EPA Assessment Criteria - PAH

Analyte	1 Hour Average Criteria
Polycyclic Aromatic Hydrocarbon (as benzo[a]pyrene)	0.0004 mg/m ³

3.1.3 Airborne Asbestos

The Code of Practice How to Safely Remove Asbestos outlines air monitoring action levels which can be used to evaluate the implemented controls regarding airborne asbestos fibres. This is summarised in **Table 9**.

Table 9 Air Monitoring Action Levels

Action Level	Control	Action
Less than 0.01 fibres/ml	No new control measures are necessary	Continue with control measures
At 0.01 fibres/ml or more than 0.01 fibres/ml but less than or equal to 0.02 fibres/ml	1. Review	Review control measures
	2. Investigate	Investigate control measures
	3. Implement	Implement controls to eliminate or minimise exposure and prevent further release
More than 0.02 fibre/ml	1. Stop works	Stop works
	2. Notify regulator	Notify the relevant regulator by phone followed by fax or written statement that work has ceased and the results of the air monitoring
	3. Investigate the cause	Conduct a thorough visual inspection of the enclosure (if used) and associated equipment in consultation with all workers involved with the removal work
	4. Implement controls to eliminate or minimise exposure and prevent further release	Extend the isolated/barricaded area around the removal area/enclosure as far as reasonably practicable (until fibre levels are at or below 0.01 fibre/ml, increase control measures.
	5. Do not recommence work until further air monitoring is conducted	Do not recommence until fibre levels are at or below 0.01 fibres/ml.

4.0 Air Quality Mitigation Strategies

4.1 Dust

Remediation works will result in the potential for release of air emissions of concern from the Site. To minimise levels of these emissions, the following precautionary management and mitigation measures are recommended.

- Regular dust observations of active excavation and stockpiling areas will be undertaken to ensure visible dust is not moving offsite. Records of observations should be compiled to enable the demonstration that dust is being managed in an ongoing manner. Records should include (as a minimum) the following:
 - Observation date and time
 - Area being inspected
 - Level of dust being generated
 - Meteorological conditions when observation occurred
 - Any mitigation measures undertaken
- Promptly removing and disposing of spilled materials which may cause a dust nuisance
- Topsoil stockpiles to be located and shaped to minimise the area exposed to prevailing winds
- Exposed soil / stockpiles to be stored on areas of the Site furthest away from sensitive receptors with consideration given to wind conditions
- Minimise exposed surfaces, such as stockpiles and cleared areas, including covering of stockpiles with tarpaulins where practicable
- Watering of stockpiles to maintain a moisture content that minimises dust generation
- Establish defined site entry and exit points to minimise trafficking of soil on surrounding roads
- Install mud guards to prevent dust uplift & trafficking onto roads when leaving site
- Ensure machinery is working correctly
- Drive at low speeds to prevent stirring up excess dust e.g. less than 10kph
- Wet down unsealed roads and paths regularly with onsite water cart
- Loads to be covered before entering and exiting site
- Decontaminate vehicles and plant at a dedicated wheel wash prior to leaving site
- Regular inspections for visible dust and implementation of appropriate controls if excessive dust is observed
- Ongoing assessment of meteorological conditions to identify conditions conducive to excessive dust generation
- Real time PM₁₀ monitors will be installed on the boundary to provide real time warnings to staff if dust emissions reach high levels, as discussed in **Section 5.0**
- Ceasing or restricting dust generating activities such as the crusher during periods of high winds
- The crusher is located in the north east corner of the Site away from residential receptors. If winds direction and strength put sensitive receptors at risk of excessive dust impact, reduce or cease use of crusher until conditions are more suitable
- Vary Crusher operations in coordination with other site activities
- Predicted wind conditions to be utilised as part of the morning toolbox talk to raise awareness of the expected weather conditions that may affect the generation of pollutants e.g. dust.

4.2 Airborne Asbestos

Asbestos has been identified in fill across the Site. Site activities have the potential to disturb residual asbestos and generate airborne asbestos fibres. The following details precautionary management and mitigation measures in conjunction with those detailed in **Section 4.1**.

- Ensure works are conducted in accordance with the Asbestos Removal Control Plan (to be developed by the asbestos removal contractor)
- Undertake airborne asbestos fibre monitoring at the boundary during remediation stages of work in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos, 2nd Edition [NOHSC: 3003(2005)]*.

4.3 Odour

The main objective of odour control measures will be that no offensive odours shall be emitted beyond the boundary of the Site during remediation works and will include the strategies listed below.

- Odour suppressant is kept on hand to be mixed with water sprays / trucks for application
- Excavating the LPBW trench will be a continuous process of trench excavation and simultaneous backfill with soil-bentonite slurry to minimise exposure time of soils to atmosphere
- Exposed soil / stockpiles to be stored on areas of the Site furthest away from sensitive receptors with consideration given to wind conditions
- Exposed soil / stockpiles to be wet down with water spray or suppressant during the excavation process
- Exposed soil / stockpiles to be covered over with tarpaulins or similar when not being actively worked
- Daily odour surveys undertaken during site works
- Onsite awareness of potential offensive odours by staff and contractors.

4.4 Complaints

Community relations will be managed by Jemena in accordance with the methods described in Section 5.6.3 of the RWEMP. A complaints register will be established that records the frequency of occurrence, intensity, duration, offensiveness and location of public complaints regarding dust and odour. An investigation into the source and implementation of a mitigation strategy is required following the receipt of a complaint.

5.0 Air Quality Monitoring

An Air Quality monitoring program may be required for the duration of the Project subject to conditions of consent provided by the Department of Planning and Environment, and approval by Jemena. The proposed monitoring scope is provided below should monitoring be required throughout the project. The purpose of the monitoring program will be to provide a means to assess the effectiveness of the mitigation strategies listed in **Section 4.0**, and to provide an early indication of the potential for exceedances of the air quality criteria, listed in **Section 3.1**.

5.1 Dust Gauges

The Air Quality monitoring program for dust will consist of eight (8) depositional dust gauges (DDGs) installed around the perimeter of the Site in accordance with the Australian Standard for siting ambient air monitoring equipment (AS/NZS 3580.1.1:2016) as shown in **Figure 2**. Dust gauges are to be collected every 30 ± 2 days with analysis performed in accordance with the requirements of AS/NZS 3580.10.1:2016 and the Environmental Protection Authority (EPA) (DEC 2005a) guidelines. Those performing sampling and analysis will be NATA accredited.



Figure 2 Suggested Locations of eight depositional dust gauges

Dust gauges are to be analysed for insoluble solids and are used as a method of measuring dust fallout as an amenity guide only. Monthly dust levels are to be compared to The NSW EPA publication *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016) criteria of $4\text{g/m}^2\cdot\text{month}$ reported as an annual average (**Table 7**). This program will be shorter than 12 months however, dust levels at or above $4\text{g/m}^2\cdot\text{month}$ may pose a nuisance resulting from dust fallout on adjacent properties.

5.1.1 Real Time PM₁₀

Real time continuous PM₁₀ monitoring will be used as a management tool to assist in identifying dust issues as they occur in real time. PM₁₀ is measured in conjunction with analysis of meteorological conditions (predominantly wind direction) to provide alerts for when high levels of dust are leaving site.

Monitoring will be performed by three solar powered DustTrak PM₁₀ monitors positioned at three locations around the site boundary. Monitoring to be performed on a periodic basis based on consultation between AECOM and FCC. The locations will be selected based upon consideration of seasonal winds, location of site activities, nearby residential receptors and compliance with the Australian Standard for siting (AS/NZS 3580.1.1:2016).

The objective will be to target high risk activities which are likely to have the potential to generate higher levels of dust. The monitors are able to be moved during the course of monitoring to better suit changing site activities and conditions. Wind speed and wind direction will be monitored at a single location on site. The location will be co-located with one of the real time PM₁₀ monitoring stations, at a location that gives a representative indication of wind direction on site.

PM₁₀ data from the three monitoring sites as well as the single site wind speed and direction will be available in real time access through an online webpage in Eagle.io. Live SMS / email alerts will be issued to relevant site staff to alert them of critical dust levels. These live alerts will enable the instigation of dust mitigation measures in a timely manner.

5.1.2 Dust Compliance Monitoring

High Volume Air Samplers (HVAS) will be deployed prior to remediation to provide a baseline PM₁₀ concentration. Locations include two onsite and one offsite unit. If required, the HVAS may be programmed to a short cycle (e.g. a three-day schedule) to provide flexibility and optimise data collection over a short baseline monitoring interval.

Real time PM₁₀ monitoring will be utilised to identify trends and provide alerts but is not able to determine compliance due to the nature of the sampling methodology. The DustTraks are to be calibrated against a PM₁₀ HVAS prior to deployment on site allowing PM₁₀ dust data collected during active remediation works to be compared to data collected by the HVAS during the baseline monitoring period.

In order to provide a comparison to NSW EPA Impact Assessment Criteria discussed in **Section 3.0**, Dust Deposition Gauges (DDGs) will be installed at locations around the site boundary. Although the relevant criterion is an annual criterion (4 g/m².month), this will be used as a guide to assess individual monthly results and the rolling average for each monitoring location as the project progresses.

5.2 Odour

Odour monitoring will occur weekly during site operations or at a higher frequency on an as needs basis. Surveys will be conducted at the site boundary as close as possible to sensitive receptors. Sampling will include:

- Twice daily site boundary survey using a PID and LEL, and general odour surveys conducted by FCC personnel
- Weekly Nasal Ranger odour survey at up to seven locations around the perimeter of the Site, conducted by the environmental contractor. Additional surveys targeting potential odour-generating activities will be undertaken as needed, as determined by site progress.

If the surveys determine that an odour of concern is likely to be originating from the Site, additional sampling should be performed. Baseline sampling will be conducted on a daily basis for a minimum of one week prior to site works commencing where no activities are being undertaken. This baseline will be used to establish criteria for odour to be compared to.

In addition, the PID monitoring will assist in determining the presence of VOCs.

5.3 Airborne Asbestos

Airborne asbestos fibre monitoring will be used to assess the effectiveness of implemented control measures during works which have the potential to liberate asbestos fibres at the Site.

Airborne asbestos fibre monitoring will be undertaken during site works at the boundary of the asbestos work area (where determined) otherwise, it is to be conducted at the boundary of the Site (with the assumption that the whole site is classified as the asbestos work area). Airborne asbestos fibre monitoring should be undertaken during remediation stages of works and in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos, 2nd Edition* [NOHSC:3003(2005)].

All air monitoring and analysis should be carried out by National Association Testing Authority, Australia (NATA) accredited personnel to NATA Standards and in accordance with the *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibre 2nd Edition* [NOHSC:3003 (2005)].

Analysis of samples shall be carried out upon completion of a sampling run. NATA endorsed reports shall be made available to FCC.

5.4 Dust and Odour Contingency Measures

When monitoring systems continuously measure pollutant concentrations, an early warning system based on trigger levels can be used to minimise adverse impacts on the environment. The trigger levels are generally set below a relevant assessment criterion.

Based on the implementation of a real time PM₁₀ and odour monitoring programs a reactive management plan will be developed for the Site, based on a three-stage approach:

- **Investigate:** Identification of the likely reasons for the elevated pollutant concentration and formulation of a contingency response for the action stage from the mitigation measures discussed in **Section 4.1**;
- **Action:** Implementation of the measures formulated in the investigative stage and review of their effectiveness; and
- **Stop Work:** All dust and / or odour generating works associated with the remediation of site should stop at this stage until the measured pollutant levels are below the action level.

PM₁₀ and odour trigger values will be determined following commencement of the monitoring program.

The reactive management procedure is provided in **Table 10**.

Table 10 Reactive Management Procedure

Reactive Management Procedure		
Trigger Stage	Primary Responsibility	Action Required
1 Investigate	Environmental Manager	Environmental Manager to undertake review of possible sources operating during the average period. Identify possible measures for these activities, action if deemed necessary.
2 Action		Environment Manager to attend site and ensure implementation of the control actions identified in stage 1. Effectiveness of control actions to be reviewed and escalate where appropriate. Identify long-term solutions to issues.
3 Stop Work		Targeted shut down of pollutant generating activities until the measured pollutant levels are below the stated Action period trigger value.

A consideration is that regional ambient dust levels may impact the effectiveness of the real time dust monitoring network. Where high levels of regional ambient dust are present (e.g. dust storms, bushfires) there is the potential for the trigger levels to be exceeded regardless of the site's

contribution. Where this occurs, visual assessment by site staff should be undertaken to ensure dust generated by the site is minimised.

6.0 Review and Continual Improvement

A regular review (quarterly during site works) and update to the AQMP, including frequency and parameters monitored, shall be conducted taking into account:

- The monitoring program as described in **Section 5.0** of this AQMP
- Complaints regarding air quality
- Results of any community consultation
- Any significant changes to operations
- Incidents related to elevated pollutant levels.

The AQMP should be viewed as a live document and updated as necessary.

Appendix C

Noise and Vibration Management Plan

Appendix C Noise and Vibration Management Plan

Construction Noise and Vibration Management Plan

Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North



Construction Noise and Vibration Management Plan

Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North

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Quality Information

Document Construction Noise and Vibration Management Plan


Ref 60582210

Date 22-Jan-2020

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Reviewed by Gayle Greer

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	10-Aug-2018	Draft for Review	Peter Dean Project Manager	
B	10-Oct-2018	Preliminary Final	Peter Dean Project Manager	
C	06-Feb-2019	Preliminary Final	Peter Dean Project Manager	
D	25-Mar-2019	Preliminary Final	Peter Dean Project Manager	
E	02-Apr-2019	Preliminary Final	Peter Dean Project Manager	
F	04-Jun-2019	Preliminary Final	Peter Dean Project Manager	
0	16-Jul-2019	Final	Peter Dean Project Manager	
1	27-Nov-2019	Final. Include changes at client's request	Peter Dean Project Manager	
2	22-Jan-2020	Final	Peter Dean Project Manager	

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Glossary of Acoustic Terminology

The following is a brief description of acoustic terminology used in this report.

Sound power level	The total sound emitted by a source	
Sound pressure level	The amount of sound at a specified point	
Decibel [dB]	The measurement unit of sound	
A Weighted decibels [dB(A)]	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).	
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:	
	0dB(A) 30dB(A) 40dB(A) 50dB(A) 70dB(A) 80dB(A) 90dB(A) 100dB(A) 110 dB(A) 115dB(A) 120dB(A)	Threshold of human hearing A quiet country park Whisper in a library Open office space Inside a car on a freeway Outboard motor Heavy truck pass-by Jackhammer/Subway train Rock Concert Limit of sound permitted in industry 747 take off at 250 metres
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.	
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.	
L_{max}	The maximum sound pressure level measured over the measurement period	
L_{min}	The minimum sound pressure level measured over the measurement period	
L_{10}	The sound pressure level exceeded for 10 per cent of the measurement period. For 10 per cent of the measurement period it was louder than the L_{10} .	
L_{90}	The sound pressure level exceeded for 90 per cent of the measurement period. For 90 per cent of the measurement period it was louder than the L_{90} .	
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.	

Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{90} sound pressure level is used to quantify background noise.
Traffic noise	The total noise resulting from road traffic. The L_{eq} sound pressure level is used to quantify traffic noise.
Day	The period from 0700 to 1800 h Monday to Saturday and 0800 to 1800 h Sundays and Public Holidays.
Evening	The period from 1800 to 2200 h Monday to Sunday and Public Holidays.
Night	The period from 2200 to 0700 h Monday to Saturday and 2200 to 0800 h Sundays and Public Holidays.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.
Weighted sound reduction index [R_w]	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 "Acoustics – Glossary of terms and related symbols", the EPA's *Noise Policy for Industry and Road Noise Policy*.

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1.0 Introduction

AECOM Australia Pty Ltd has been engaged by Ford Civil Contracting Pty Ltd to prepare a Construction Noise and Vibration Management Plan (CNVMP) for the proposed remediation works due to be undertaken at the former Newcastle Gasworks Site located at 1 Chatham Road, Hamilton North, NSW (the Site) owned by Jemena Gas Networks (Jemena).

Noise and vibration mitigation strategies in this management plan have been based on the results of the report titled *'Former Newcastle Gasworks (Clyde Street) Remediation Project – Noise and Vibration Impact Assessment'* dated July 2018 prepared by GHD Pty Ltd (GHD, 2018).

A glossary for acoustic terminology used within this report can be found at the beginning of this document

1.1 Background

The Site accommodated a gasworks which was operated from 1913 to 1985 when the production of town gas ceased. Post-1985, the majority of the Site remained largely vacant at the exception of the southern portion which was occupied by Elgas until mid-2014 for gas storage and bottling purposes. Historical use of the Site for gas production via the coal carbonisation process and associated waste disposal activities has resulted in significant contamination of soil and groundwater at the Site.

Remediation works are proposed to remove potential exposure pathways from impacted fill material in a commercial/Industrial land use scenario and reduce off-site migration of contaminated groundwater into Styx Creek.

1.2 Site Description and Receptors

The Site is located at 1 Chatham Road, within the suburb of Hamilton North in the city of Newcastle, NSW. The Site is bounded by Chatham road and Clyde Street to the west, Styx Creek to the south and east, and the Main Northern railway line to the north.

Residential premises are located to the west, south and north east of the Site in the suburbs of Hamilton North and Islington. Industrial premises are located to the north and south of the Site along Chatham Road, Clyde Street and Chinchin Street. Commercial receivers are located to the north of the Site along Clyde Street.

Figure 1 below shows the location of the Site. A total of 507 receivers were identified for assessment in GHD (2018). Residential receivers have been further grouped by AECOM into two Noise Catchment Areas (NCAs). The noise environment within each NCA is considered to be comparable and can be used to develop assessment criteria for similar noise environments.



Figure 1 Site and NCAs

1.3 Proposed Works

1.3.1 Remediation Works

The scope of the remediation works will include:

- Site establishment, including vegetation clearing and mulching
- Demolition of redundant structures, including slabs and former office building located in the south western portion of the Site
- Crushing and screening of demolition materials and stockpiles
- Spreading of demolition screened stockpile material and stockpiles
- Installation of 492m subterranean Low Permeability Barrier Wall (LPBW)
- Construct bridging layer above LPBW
- Construct low permeability barrier layer (LPBL).

1.3.2 Remediation Work Hours

The remediation works are proposed to be scheduled during standard hours, which are as recommended in the ICNG as follows:

- Standard hours: 7 am to 6 pm Monday to Friday and 8 am to 1 pm Saturday
- Out of hours: before 7 am and after 6 pm Monday to Friday, before 8 am and after 1 pm Saturday, and all Sunday and public holidays.

No work is generally expected to be required outside of standard hours; however construction work and remediation works may occasionally be permitted outside of those times, if approved by the Jemena and the Consent Authority (Department of Planning and Environment).

1.4 Relevant Guidelines

- Department of Environment and Climate Change (DECC), 2009, *Interim Construction Noise Guideline* (ICNG)
- Department of Environment and Conservation (AVTG, DEC 2006), *Assessing Vibration: a technical guideline*
- Department of Environment Climate Change and Water (DECCW), 2011, *NSW Road Noise Policy* (RNP)
- Environmental Protection Authority (EPA), 2017, *Noise Policy for Industry* (NPfI)
- Australian Standard (AS), 2004, *Electroacoustics - Sound level meters - Specifications*, International Electrotechnical Commission (IEC) 61672.1-2004.

1.5 Scope of Works

The scope of this Noise and Vibration Management Plan is to:

- Identify background noise levels and construction noise and vibration management criteria
- Evaluate and assess potential noise and vibration impacts on receivers
- Describe environmental management controls to mitigate potential noise and vibration impacts on receptors
- Define procedures for monitoring and auditing of noise and vibration impacts against noise and vibration goals
- Outline procedures for the management of complaints, or non-compliances.

2.0 Noise Criteria

Noise and vibration criteria were established in the GHD (2018) and have been incorporated into this CNVMP.

2.1 Noise Management Levels

The NSW Environment Protection Authority's (EPA) *Interim Construction Noise Guideline* (ICNG) is the principal guidance for the assessment and management of construction noise in NSW.

GHD (2018) presents background noise measurements and construction noise management levels determined in accordance with the ICNG. The noise management levels are presented in **Table 1** below.

Table 1 Construction noise management levels, residential receivers

NCA	Period	Measured rating background level, dB(A)	Standard hours noise management levels, dB(A)	Out-of-hours noise management levels, dB(A)	Highly noise affected level, dB(A)
NCA1	Day	41	51	46	75
	Evening	38	N/A	43	75
	Night	34	N/A	39	75
NCA2	Day	40	50	45	75
	Evening	41	N/A	46	75
	Night	35	N/A	40	75

Noise management levels recommended by the ICNG for applicable non-residential receivers are shown in **Table 2**. These NMLs apply only during the hours in which the properties are in use.

Table 2 Construction noise management levels, non-residential receivers

Land use	Noise management level, L_{Aeq} dB(A)
Commercial premises (including offices, retail outlets)	70
Industrial premises	75

As works are not proposed to be conducted outside of standard hours, a sleep disturbance assessment has not been completed.

2.2 Maximum Noise Levels for Plant and Equipment

All plant and equipment used throughout the works should have an operating Sound Power or Sound Pressure Levels less than or equal to those in **Table 3**.

Table 3 Equipment Sound Power Levels

Equipment	Sound power level, dB(A)
Excavator	110
Mulcher	116
Excavator with breaker / hydraulic hammer	122
Crusher	118
Screen	107
Grader	113
Bulldozer	116
Compacting roller (pad foot)	109

2.3 Construction Road Traffic Noise Criteria

Noise from remediation traffic on public roads is not covered by the ICNG. However the ICNG does refer to the Environmental Criteria for Road Traffic Noise (ECRTN), now superseded by the Road Noise Policy (RNP), for the assessment of noise arising from traffic on public roads.

To assess noise impacts from construction and detour traffic, an initial screening test should be undertaken by evaluating whether existing road traffic noise levels will increase by more than 2 dB(A). Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The RNP does not require assessment of noise impact to commercial or industrial receivers.

2.4 Construction Vibration Criteria

Construction vibration criteria below have been sourced from GHD (2018).

2.4.1 Human Comfort – Tactile Vibration

Vibration criteria for human comfort have been established with consideration to:

- *Assessing Vibration: A Technical Guideline* (AVATG) (February 2006)

Maximum and preferred VDV_s for intermittent vibration arising from construction activities are listed in **Table 4**. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 4 Preferred and Maximum Vibration Dose Values for intermittent vibration (m/s^{1.75})

Location	Daytime (7 am – 10 pm) Low probability of adverse comment	Night-time (10 pm – 7 am) Low probability of adverse comment
Residences	0.2 to 0.4	0.1 to 0.2

2.4.2 Structural Damage

Vibration criteria for structural damage have been established with consideration to:

- British Standard BS 7385:1993 *Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Ground Borne Vibration for guidance on cosmetic damage to residential buildings*
- German Standard DIN 4150-3:1999-02 *Structural Vibration – Part 3: Effects of vibration on structures for guidance on cosmetic damage to heritage buildings*.

BS 7385:1993 provides recommended maximum levels of vibration that are likely to cause building damage and are presented in **Table 5**.

Table 5 Transient Vibration Guide for Cosmetic Damage (BS 7385:1993)

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	

Note that values referred to are at the base of the building

2.4.3 Heritage buildings

There are locally listed heritage items (Newcastle Gas Co. Office, and Pump House and Fence) within the project area. DIN 4150 provides guidance for recommended maximum levels of vibration for heritage structures that reduce the likelihood of building damage caused by vibration and is presented in **Table 6**.

Table 6 DIN 4150: Structural Damage Safe Limits for building vibration – heritage structures

Group	Type of structure	Vibration velocity in mm/s			
		At foundation at a frequency of			Vibration at the horizontal plane of the highest floor
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	All frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

In order to comply with both the structural damage and human comfort criteria, the safe working distances are presented in **Table 7** below.

Table 7 Recommended Minimum Working Distances from vibration intensive plant

Plant item	Rating/Description	Minimum distance	
		Cosmetic damage (BS 7385)	Human response (AVATG)
Vibratory roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small hydraulic hammer	300 kg (5 – 12 t excavator)	2 m	7 m
Medium hydraulic hammer	900 kg (12 – 18 t excavator)	7 m	23 m
Large hydraulic hammer	300 kg (18 – 34 t excavator)	22 m	73 m
Jackhammer	Hand held	1 m (nominal)	2 m

Vibration due to construction works also has the potential to affect services such as buried pipes. German standard DIN 4150.3 provides guidance on safe vibration levels for buried pipework. These levels apply to the wall of a buried pipe and are presented below in **Table 8**.

Table 8 Short term vibration – buried pipes

Pipe material	Guideline values for velocity measured on the pipe (mm/s)
Steel (including welded pipes)	100
Clay, concrete, reinforced concrete, metal (with or without flange)	80
Masonry, plastic	50

3.0 Noise and Vibration Management and Mitigation Strategies

3.1 Construction Noise

It has been identified that potential construction noise impacts within the vicinity of the project may be high, in some cases exceeding the noise management levels by 18 dB(A).

Table 9 presents project specific mitigation measures.

Table 9 Project Specific Mitigation Measures

Action required	Safeguard details
Management measures	
Implement community consultation measures	Periodic notification by Jemena on remediation/construction works via regular letterbox drop or equivalent, website, Community hotline phone number, Construction Response Line, email distribution list.
Hours and scheduling	<p>All work to be conducted during standard construction hours unless approval for work outside standard construction hours is granted. Work generating high noise levels will be scheduled for less sensitive time periods.</p> <p>For any work that would take place outside of normal construction hours:</p> <ul style="list-style-type: none"> • Undertake an assessment of the potential noise impacts associated with the proposed activities and outline specific mitigation measures • Residents potentially affected by such activities will be notified at least five days in advance • Minimise consecutive night time activities in the same locality and provide periods of quiet if activities occur for extended periods during the night • Conduct activities in a manner that eliminates or minimises the need for audible warning alarms.
Site inductions	<p>All employees, contractors and subcontractors are to receive an environmental induction. The induction will include:</p> <ul style="list-style-type: none"> • All relevant project specific and standard noise mitigation measures • Relevant licence and approval conditions • Permissible hours of work • Location of nearest sensitive receivers • Remediation employee parking areas • Designated loading/unloading areas and procedures • Site opening/closing times (including deliveries) • Environmental incident procedures.
Behavioural practices	<p>No swearing or unnecessary shouting or loud stereos/radios on site.</p> <p>No dropping of materials from height, throwing of metal items and slamming of doors.</p>
Noise monitoring	A noise monitoring program is to be carried out for the duration of the works in accordance with Section 4.0 of this Construction Noise and Vibration Management Plan and any approval and licence conditions.
Source controls	

Action required	Safeguard details
Construction respite period	High noise and vibration generating activities (rock breaking) may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of half an hour between each block.
Equipment selection	Use quieter and less vibration emitting construction methods where feasible and reasonable.
Maximum noise levels	The noise levels of plant and equipment must have operating sound power or sound pressure levels that would meet the predicted noise levels.
Rental plant and equipment	Noise emissions should be considered as part of the selection process.
Use and siting of plant	<p>Avoid simultaneous operation of noisy plant within discernible range of a sensitive receiver.</p> <p>The offset distance between noisy plant and adjacent sensitive receivers is to be maximised.</p> <p>Plant used intermittently to be throttled down or shut down.</p> <p>Plant and vehicles to be turned off when not in use.</p> <p>Noise-emitting plant to be directed away from sensitive receivers.</p>
Plan works site and activities to minimise noise and vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the Site.
Non-tonal reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) to be considered for all construction vehicles and mobile plant regularly used on site and for any out of hours work.
Minimise disturbance arising from delivery of goods to site	<p>Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers.</p> <p>Deliveries to occur during daytime hours as far as possible.</p> <p>Select site access points and roads as far as possible away from sensitive receivers.</p> <p>Dedicated loading/unloading areas to be shielded if close to sensitive receivers.</p>
Construction related traffic	<p>Schedule and route vehicle movements away from sensitive receivers and during less sensitive times.</p> <p>Limit the speed of vehicles and avoid the use of engine compression brakes.</p> <p>Maximise on-site storage capacity to reduce the need for truck movements during sensitive times.</p>
Silencers on Mobile Plant	<p>Where possible reduce noise from mobile plant through additional fittings including:</p> <ul style="list-style-type: none"> Residential grade mufflers Damped hammers such as "City" Model Rammer Hammers Air Parking brake engagement is silenced.
Path controls	

Action required	Safeguard details
Shield stationary noise sources such as pumps, compressors, fans etc.	Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.
Shield sensitive receivers from noisy activities	Use structures to shield residential receivers from noise such as site shed placement; earth bunds; fencing; erection of temporary noise barriers (where practicable) and consideration of site topography when siting plant.

3.1.1 Community Consultation and Complaints Handling

All residents and other sensitive receivers impacted by noise and/or vibration from the proposed works which is expected to exceed the NML/vibration criteria should be informed about the project prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works.

The information provided to the residents / building occupants should include:

- Programmed times and locations of construction work
- The hours of proposed works
- Construction noise and vibration impact predictions
- Construction noise and vibration mitigation measures being implemented on site.

Community consultation regarding construction noise and vibration should be detailed in a Community Liaison Plan for the construction of the project and should include a 24 hour hotline and complaints management process. The management of community consultation and complaints handling is to be conducted by Jemena in accordance with the procedure outlined in Section 5.6.3 of the overarching Remediation Works Environmental Management Plan (RWEMP).

3.2 Methodology for Reducing Excessive Construction Vibration

For vibration intensive works that occur within the safe working distances, management methods to mitigate potential impacts are presented in **Table 10**.

Table 10 Vibration Mitigation Measures

Action required	Safeguard details	Timing
General mitigation measures		
Works scheduling and respite periods	Works scheduling can often be adopted to effectively manage construction vibration impacts and in particular to limit potential impacts. Wherever possible, vibration intensive works would be limited to the least sensitive times of the day. Respite periods would be negotiated with the community for construction activities expected to generate high levels of vibration.	Construction
Building condition surveys	<p>Prior to commencement of the demolition work, building condition surveys are recommended for historical and other sensitive structures within the minimum working distances as presented in Table 7.</p> <p>The survey would document the current structural condition of these buildings/structures. It is also recommended that the surveys are repeated after the project is complete. The post completion surveys will identify any impact on the receivers as a result of the construction work.</p> <p>These surveys are to be conducted for the Newcastle Gas Company Office and Pump House and Fence, as well as the Styx Creek concrete channel located within the Site.</p>	Prior to commencement of works and after completion of works
Supplementary vibration monitoring	<p>If vibration intensive equipment is to be used within the minimum working distances in Section 2.4.2, then it is recommended that attended vibration measurements are undertaken when work commences, to determine site specific safe working distances.</p> <p>Vibration intensive work should not proceed within the safe working distances unless a permanent vibration monitoring system is installed, to warn operators (via flashing light, audible alarm, SMS etc.) when vibration levels are approaching the peak particle velocity objective.</p>	Construction
Source controls		
Equipment selection and maintenance	All equipment should be maintained and operated in an efficient manner, in accordance with manufacturer's specifications, to reduce the potential for adverse vibration impacts. Use less vibration intensive methods of construction or equipment where practicable.	Construction

4.0 Monitoring

A noise and vibration monitoring program may be required for the duration of the project subject to conditions of consent provided by the Department of Planning and Environment, and approval by Jemena. The proposed monitoring scope is provided below should monitoring be required throughout the project. The purpose of the monitoring program will be to provide a means to assess the effectiveness of the mitigation strategies listed in **Section 3.0**, and to provide an early indication of the potential for exceedances of the criteria, listed in **Section 2.0**.

4.1 Monitoring and Reporting

Full time, unattended monitoring will be undertaken throughout the remediation works.

4.2 Monitoring Procedure

The measurements will be conducted in accordance with the procedures outlined in Australian Standard AS 1055 *Acoustics – Description and measurement of environmental noise* and in accordance with methods outlined in the NSW Noise Policy for Industry (NPfI). The following points should be followed when conducting noise monitoring:

- A field calibration should be conducted before and after measurements
- The sound level meters must be set to an A-weighting and Fast
- The sound level meters sample period should be set to 15 minutes
- The following descriptors should be measured as a minimum: L_{A1} , L_{Aeq} and L_{A90}
- Measurements should be conducted a minimum of 3 metres from the nearest façade and/or solid fence/wall. If it is not possible to do this, corrections for façade reflection should be applied to the measurement results.

4.3 Monitoring of Equipment Procedure

In addition to the residential noise monitoring procedures described above, the following equipment measurements will be undertaken:

- Noise emission levels of all critical items of mobile plant and equipment will be checked for compliance by the FCC Site Manager (or delegate) for compliance with noise limits appropriate to those items prior to the equipment going into regular service
- For equipment and mobile plant used for construction works, L_{Aeq} measurements will be taken at an appropriate distance, normally 7m and converted to a Sound Power Level
- An *Equipment Noise Certificate*, presenting relevant sound levels of the equipment tested, will be issued by the site environmental officer within the first week of the equipment commencing at the construction site.

The equipment sound power levels will be compared to the levels contained in this report. If noise checks on any equipment result in a prediction of non-compliance, noise mitigation strategies to achieve compliance will be developed.

4.4 Equipment

All acoustic instrumentation employed throughout the monitoring programme will comply with the requirements of AS IEC 61672.1-2004 *Electroacoustics - Sound level meters – Specifications*. All sound level meters must have current calibration certificate from a NATA accredited laboratory in accordance with NATA guidelines. Instrument calibration shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ± 0.5 dB.

4.5 Monitoring & Reporting Schedule

4.5.1 Construction Monitoring Schedule

Table 11 below provides a preliminary monitoring schedule for construction.

Table 11 Construction Noise Monitoring Schedule

Schedule Day	Action
During first month of construction	Complete one round of operator-attended 15 minute noise monitoring at site boundaries. Noise measurements should be conducted during the initial operation of the crusher plant.
	Carry out equipment noise level checks on all critical items of plant and issue Equipment Noise Certificates
During subsequent months of construction period	Full time, unattended monitoring will be undertaken for the duration of remediation works

4.6 Reporting

4.6.1 Reporting Details

The following information must be included in the monthly reports:

- Field calibration results (before and after measurements)
- Measurement times and dates
- Qualitative description of the noise environment during the measurements
- L_{A1} , L_{Aeq} and L_{A90} levels
- Meteorological conditions during the measurements
- Estimation of or recorded noise contribution from other major noise sources.

A summary of the results of the quarterly reports should be included in the annual environmental report.

4.6.2 Record Keeping

The site engineer shall establish and maintain a system of records which provides full documentation of all noise monitoring results, complaint handling and responses to non-compliances. -The site engineer shall establish and maintain procedures for the collection, indexing, filing, storage and maintenance of the records.

4.7 Roles and Responsibilities

Responsibilities for the implementation of the CNVMP are summarised in **Table 12**.

Table 12 Roles and Responsibilities

Role	Responsibilities
Jemena	<ul style="list-style-type: none">• Management of community consultation and complaints handling.
FCC Project Manager	<ul style="list-style-type: none">• Overall implementation of the CNVMP• Implement methodology for avoiding excessive noise emissions• Authorise and confirm the implementation of mitigation measures• Maintain internal records of monitoring Report any community complaints received at the Site to Jemena for follow up.
FCC Site Manager or appointed specialist acoustic consultant	<ul style="list-style-type: none">• Undertake monitoring required by the CNVMP• Communication with EPA, as required• Coordinate monitoring and compile reports• Identify Non Conformances• Review and update the Noise and Vibration Management Plan as required.

5.0 Complaints Handling Procedure

If complaints are received, Jemena will complete an Environmental Incident Report Form to record details of the occurrence and actions. Where applicable, completed forms should detail the following:

- The date and time of the complaint
- The method by which the complaint was made
- Any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect
- The nature of the complaint
- Description of noise source that is the subject of complaint, duration of event
- Location of complainant during time of incident, and general area in which the noise source was located
- Identification of project related noise activities and locations that could have or are known to have contributed to the incident
- If known, identification of non-project related noise emission activities and location at time of incident
- Meteorological conditions at the time of the incident
- The action taken by the Site in relation to the complaint
- Any follow-up contact with the complainant
- If no action was taken by the site environmental officer, the reason why no action was taken.

All records are to be kept in a legible form, or in a form that can readily be reduced to a legible form and kept for at least 4 years after the complaint or event to which they relate took place.

Jemena will make available a report on complaints received to the relevant regulatory authorities upon request.

A response should be provided to the complainant within 24 hours. Corrective actions may involve supplementary monitoring to identify any non-compliance, and/or may involve modification of construction or operational techniques to avoid any recurrence or minimise impacts.

6.0 Review and Continual Improvement

A regular review (quarterly) and update to the CNVMP shall be conducted taking into account:

- Complaints regarding noise
- Results of the community consultation
- Any significant changes to operations
- Changes in land use
- Incidents related to noise emission exceedance.

The CNVMP should be viewed as a live document and updated as necessary.

7.0 References

GHD (2018) Jemena Gas Networks (NSW) Ltd Former Newcastle Gasworks (Clyde Street) Remediation Project, Environmental Impact Statement, July 2018

Appendix D

Acid Sulfate Soil Management Plan

Appendix D Acid Sulfate Soil Management Plan

Acid Sulfate Soil Management Plan

Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North,
NSW 2292



Acid Sulfate Soil Management Plan

Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North, NSW 2292

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22-Jan-2020

Job No.: 60582210

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Quality Information

Document Acid Sulfate Soil Management Plan

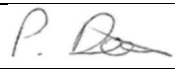
Ref 60582210

Date 22-Jan-2020

Prepared by Peter Dean

Reviewed by Clayton Cowper

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	10-Aug-2018	Draft for Review	Peter Dean Project Manager	
B	10-Oct-2018	Preliminary Final	Peter Dean Project Manager	
C	07-Feb-2019	Preliminary Final	Peter Dean Project Manager	
D	25-Mar-2019	Preliminary Final	Peter Dean Project Manager	
E	02-Apr-2019	Preliminary Final	Peter Dean Project Manager	
F	04-Jun-2019	Preliminary Final	Peter Dean Project Manager	
0	16-Jul-2019	Final	Peter Dean Project Manager	
1	27-Nov-2019	Final - to include changes at client's request.	Peter Dean Project Manager	
2	22-Jan-2020	Final	Peter Dean Project Manager	

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Glossary

Term	Description
ABA	Acid-Base Accounting - An ABA approach is widely used for predicting net acidity from sulfide oxidation of ASS. While several ABA models have been used for ASS, they all share a common underlying principle/approach, encapsulated in the following equation: Net Acidity = Potential Sulfidic Acidity + Existing Acidity – Acid Neutralising Capacity
ANC	The acid neutralising capacity (ANC) is a measure of the inherent ability of a soil to buffer acidity and resist the lowering of the soil pH. Acid buffering in the soil may be provided by dissolution of calcium and/or magnesium carbonates (e.g. shell), cation exchange reactions, and by reaction with the organic and clay fractions
ARI	Average Recurrence Interval - The average, or expected, value of the periods between exceedances of a given rainfall total accumulated over a given duration
ASS	Acid Sulfate Soils include actual acid sulfate soils (AASS) or potential acid sulfate soils (PASS). Actual and potential acid sulfate soils are often found in the same soil profile, with actual acid sulfate soils generally overlying potential acid sulfate soil horizons
AASS	Actual Acid Sulfate Soils are soils containing highly acidic soil horizons or layers resulting from the aeration of soil materials that are rich in iron sulfides, primarily sulfide. This oxidation produces hydrogen ions in excess of the sediment's capacity to neutralise the acidity resulting in soils of pH of 4 or less, when measured in dry season conditions. These soils can usually be identified by the presence of pale yellow mottles and coatings of jarosite
ASSMP	Acid Sulfate Soil Management Plan
ASSMAC	Acid Sulfate Soil Management Advisory Committee
Aglime	Finely crushed limestone
bgs	Below ground surface
CRS	Chromium Reducible Sulfur - A commonly used, low cost method of determining reducible inorganic sulfur compounds. It does not suffer from interferences from organic sulfur compounds or sulfates. Often used where results are close to trigger values and where significant organics are present although does not quantify the actual acidity resulting from AASS
CRS Suite	The Chromium suite is a collection of independent analytical methods, each of which determines a component of the acid base account
DECCW	NSW Department of Environment, Climate Change and Water (now EPA)
DO	Dissolved oxygen
Dolomite	Calcium magnesium carbonate
INSW	Infrastructure NSW
Jarosite	Hydrous sulfate of potassium and iron with a chemical formula of $\text{KFe(III)}_3(\text{OH})_6(\text{SO}_4)_2$; it is commonly present in oxidised acid sulfate soils
Magnesite	Magnesium carbonate
MSDS	Material Safety Data Sheets
Natrojarosite	Hydrous sulfate of sodium and iron with a chemical formula of $\text{NaFe(III)}_3(\text{OH})_6(\text{SO}_4)_2$; it is commonly present in oxidised acid sulfate soils

Term	Description
PASS	Potential Acid Sulfate Soils are soils which contain iron sulfides or sulfidic material which have not been exposed to air and oxidised. The field pH of these soils in their undisturbed state is pH 4 or more and may be neutral or slightly alkaline; however, they pose a considerable environmental risk when disturbed
S _{CR}	Chromium reducible sulfur
TAA	Total Actual Acidity
TPA	Total Potential Acidity
TSS	Total Suspended Solids

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1.0 Introduction

1.1 General

AECOM Australia Pty Ltd (AECOM) was engaged by Ford Civil Contracting (FCC) to prepare a Remediation Works Environmental Management Plan (RWEMP) for remediation works due to be undertaken at the former Newcastle Gasworks Site located at 1 Chatham Road, Hamilton North, NSW (the Site). This Acid Sulfate Soil Management Plan (ASSMP) has been prepared to supplement the RWEMP and guide management of potential acid sulfate soils if encountered during Stage 2 Remediation Works.

The Site Layout Plan is outlined on **Figure 1, Appendix A** of the Remediation Works Environmental Management Plan (RWEMP) (AECOM, 2019b).

1.2 Description of Acid Sulfate Soils

Acid Sulfate Soils (ASS) is the common name given to naturally occurring sediments and soils containing iron sulfides, the most common being pyrite. The exposure of the sulfide in these soils to oxygen by drainage or excavation leads to the generation of sulfuric acid. The release of sulfuric acid from ASS often mobilises metals such as aluminium, iron and magnesium from otherwise stable soil matrices. Elevated concentrations of such elements in site runoff may result in changes which are potentially detrimental to receiving water bodies and associated aquatic organisms.

The majority of ASS were formed by natural processes during the Holocene geological period (the last 10,000 years), when formation conditions were optimum. Formation conditions require the presence of iron-rich sediments, sulfate (usually from seawater), removal of reaction products such as bicarbonate, the presence of sulfate reducing bacteria and a plentiful supply of organic matter. It should be noted that these conditions exist in mangroves, salt marsh vegetation or tidal areas, and at the bottom of coastal rivers and lakes.

ASS which formed on coastal lowlands are generally found less than 2.5 to 3 m Above Sea Level (ASL), corresponding with the highest point of sea level rise following ice shelf melt during the mid-Holocene. The sea level has been dropping ever since due to isostatic adjustment of the lithosphere.

In an undisturbed and waterlogged state these soils are harmless, but when disturbed or exposed to oxygen through drainage, excavation or climate change, a process of oxidation can produce sulfuric acid in large quantities. In an undisturbed state these soils are called Potential ASS (PASS). Once they are disturbed and start oxidising, they are called Actual ASS (AASS). Collectively, they are referred to as ASS.

NSW regulatory requirement assumes that all coastal soils less than 5 m AHD that are likely to be disturbed by excavation or water table drawdown should be assessed for their ASS properties. Where their presence is identified, a management plan for minimising impacts must be developed.

1.2.1 Potential Impacts

Oxidation of PASS material can result in generation of AASS. The generation of AASS can result in the release of sulfuric acid and iron into the soil and groundwater. This in turn can release aluminium, nutrients and heavy metals (particularly arsenic) stored within the soil matrix. Once mobilised in this way, the acid, metals and nutrients can seep into waterways, impact soil and groundwater quality and can degrade concrete, steel pipes and structures to the point of failure.

1.3 Standards and Guidelines

This ASSMP has been prepared with reference to the NSW Acid Sulfate Soils Manual (Stone et al., 1998) which is the primary source of reference for the assessment of impacted sites within NSW and shall take precedence over other relevant guidance.

In addition, and in line with best practice, more recent guidelines were also consulted in formulating this ASSMP including publications by Queensland Acid Sulfate Soils Investigation Team (QASSIT) ASS Guidelines (Ahern et al., 1998), Laboratory Methods Guidelines (Ahern et al., 2004),

Management Guidelines (Dear et al., 2002) and Department of Environment and Climate Change (DECC) NSW EPA (2014) Waste Classification Guidelines: Part 4: Acid Sulfate Soils.

1.4 Purpose of the ASSMP

The purpose of this ASSMP is to consider both the existing and potential future environmental impacts relating to potential ASS material in and around the Site and to detail mitigation measures to minimise the potential impacts on the environment, including Styx Creek located to the south and east of the Site.

This ASSMP has been prepared for the construction of the Low Permeability Barrier Layer (LPBL) and Low Permeability Barrier Wall (LPBW). The control measures outlined are designed to mitigate the environmental impacts of associated excavation work to acceptable levels and have been developed to achieve the following objectives:

- Control and, where possible, minimisation of disturbance of potential ASS (if encountered)
- Confirmation of the success of impact control measures by the means of validation monitoring
- Compliance with statutory requirements
- Preservation of water quality.

Each environmental protection measure is based upon a proven methodology.

2.0 Site Description

2.1 Site History

The Site had been operating by the Newcastle Gas Company (now Jemena) as a gasworks plant since 1913 until its decommissioning in 1985. Since then, the majority of the Site remained largely vacant with the exception of the southern portion which was occupied by Elgas until mid-2014 for gas storage and bottling purposes. The Site is vacant and secured by a chain wire fence and locked gates, with security patrols controlling site access.

The Site is located in the inner city region of Newcastle and is surrounded by a variety of different land uses from residential to industrial. A Shell bulk fuel storage terminal is located directly to the south of the Site adjacent Styx Creek; this fuel storage terminal has been decommissioned since 2015.

Redundant above ground infrastructure at the Site includes the historical Office Building adjoining Clyde St at the northern corner of the Site; and historical buildings in the northern, western and southern portions of the Site. Remnants of former roadways have also been identified with a rail siding on the north-eastern portion of the Site. Unsealed areas of the Site are typically grassed with large trees observed in the south western portion of the Site.

In addition to the above, there are a total of 11 main stockpiles across the Site making up a total volume of approximately 4,513 m³.

2.2 Topography and Drainage

The Site is situated on relatively flat terrain, with a general slope toward the south-east. The Site is bound by Styx Creek located along the southern, eastern and northern site boundaries.

Site elevation ranges between 5m and 6.5m AHD and grades down locally in the vicinity of Styx Creek. Styx Creek is a concrete lined channel with width of 15 – 20m and steep sidewalls ranging in height of between 1.5 and 3m.

Weep holes and stormwater pipe outlets are positioned throughout the sidewalls to allow drainage of the Site and neighbouring properties. Seepage has also been identified at breaks in concrete sidewalls and channel base. The creek invert varies from approximately -0.05 mAHD at the northern portion of the Site to 0.65 mAHD in the south. The upper portion of the sloped base is approximately 0.6 to 0.7 m above the invert of the creek.

2.3 Geology and Hydrogeology

The ground conditions likely to be encountered during excavations works are summarised as:

- 0.0 – 2.0 metres below ground level (mbgl): Mixture of natural material comprising silty sand and sand and fill comprising a mixture of grass/topsoil. Coke, sand and building rubble;
- 1.0 – 5.0 mbgl: Sand (fine to medium grained)
- 2.0 – 4.0 mbgl: Clay lens, grey sandy clays, moderate plasticity, dense and moist
- 5.0 – 8.5 mbgl: Sand (fine to medium grained), light grey and brown, saturated
- 8.5 – 29.0 mbgl: Clay, grey stiff, low plasticity dense clay
- 29.0 – 32.0 mbgl: Bedrock.

Groundwater is anticipated to be present in three separate units being the sand aquifer, the clay aquitard/aquifer and the sedimentary rock aquifer. Although groundwater levels are highly influenced by rainfall events, the standing water level (SWL) in the shallow aquifer, is anticipated to be occurring at around 3.0 mbgl. The majority of groundwater beneath the Site is anticipated to discharge into Styx Creek, however it was also acknowledged that there is potential for some groundwater to be discharging at locations further downstream. The mean hydraulic conductivity was calculated at 2.63 m/day with groundwater gradient varying between 0.015 and 0.025.

2.3.1 Acid Sulfate Potential

Reference to the NSW Office of Environment and Heritage (OEH) Acid Sulfate Soil Risk Map for the Hamilton North area indicates that the Site lies in an area with a low probability of acid sulfate soil occurrence. The risk map indicates localised instances of ASS materials may occur in the area, with a higher probability of occurrence along drainage lines and boundaries with the natural environment.

2.3.2 Extent of Acid Sulfate Soils

ASS was encountered at the Site during a preliminary geo-environmental assessment undertaken by Douglas Partners in September 2017. 8 samples of natural silty sand material were collected from 4 test pits (DP2017-07B, DP2017-08, DP2017-10 and DP2017-11) excavated in the eastern portion of the Site adjacent to Styx Creek. Samples were recovered from depths ranging between 1.6 and 3.4 m bgl.

Field ASS assessment was undertaken on the samples in accordance with methodology described in the Queensland Acid Sulphate Soil Technical Manual v.4.0 (QASSIT, 2014). Based on the results of the screening tests, two soil samples (DP2017-08, 1.8 mbgl and DP2017-11, 3.4 mbgl) were selected for detailed laboratory testing.

The QASSIT guidelines indicate the presence of acid sulfate soils when either of the following criteria is met during field testing:

- Soils have a pH of <4 prior to field oxidation with hydrogen peroxide
- Soils have a pH of <3.5 following field oxidation, and/or exhibit a drop of 1 pH unit or more following field oxidation.

Field testing results suggested the presence of actual acid sulfate soil at the Site noting:

- One location (DP2017-10, 1.6m bgl) reported a pre-oxidation pH of 3.8
- 6 of the 8 samples exhibited a pH drop of greater than 1 pH unit
- Samples from DP2017-07B, DP2017-08 and DP2017-11 also exhibited a pH of <3.5 following field oxidation.

The results of ASS testing are provided in **Table 1**.

Table 1 Summary of Acid Sulfate Soil Field Testing - 2017

Sample	Depth (m)	Soil type	pH _F	pH _{FOX}	Δ pH (pH _F -pH _{FOX})	Existing and Potential Acidity (%S)
DP2017-07B	1.2	Fill – silty clay	4.4	3.3	1.1	-
DP2017-08	1.8	Silty clay	4.3	3.1	1.2	0.27
DP2017-08	2.4	Silty clay	5.1	4.0	1.1	-
DP2017-08	3.0	Silty clay	5.0	4.0	1.0	-
DP2017-10	1.6	Silty clay	3.8	3.6	0.2	-
DP2017-11	2.0	Silty clay	5.0	3.8	1.2	-
DP2017-11	2.8	Silty clay	4.5	3.4	1.1	-
DP2017-11	3.4	Silty clay	4.7	3.7	1.0	0.2
QASSIT Trigger value			<4	<3.5	≥1	0.1 ¹ /0.03 ²

Notes:

- pH_F – pH of soil prior to field oxidation
- pH_{FOX} – pH of soil following field oxidation (H₂O₂)
- ¹ - QASSIT Action Criteria for disturbance of 1-1000 tonnes of material
- ² - QASSIT Action Criteria for disturbance of more than 1000 tonnes of material

The results of the testing indicate the presence of actual acid sulfate soils at the Site which require management if disturbed during Remediation Works.

3.0 Scope of Remediation Works

Excavation activities associated with the Remediation Works that have the potential to encounter PASS and ASS materials are outlined in **Table 2**.

Table 2 Proposed Excavation Activities

Activity	Details
Excavation of LPBW	<p>Pre-excavation of a shallow (1.5m bgl) trench along the length of the LPBW footprint to remove subsurface obstructions, assess conditions and prepare the ground for LPBW construction.</p> <p>Excavation to approximately 9m bgl to facilitate construction of a 492m long LPBW parallel to the north and western site boundaries (approximately 3,570 m³ of material to be removed from the trench).</p>
Demolition and Cut/Fill Earthworks	<p>Cut and fill earthworks and site re-grading to prepare subgrade to receive the LPBL capping layer and achieve design finish surface contours. Works include:</p> <ul style="list-style-type: none"> Excavation and demolition of existing brick retaining walls and pavement slabs, removal of redundant service pits and infrastructure, crushing and screening of materials and placement under the LPBL (approximately 4,440 m³) Relocation of existing site stockpiles left from Stage 1 Remediation Works. Includes the removal and relocation of 11 major stockpiles and up to 40 sub stockpiles (approximately 3,548 m³) inside the alignment of the LPBW Re-grading of the existing site surface including trimming of high spots and filling of low-lying areas to achieve designed site drainage contours.
Bentonite Batching and Holding Ponds	Excavation associated with construction of temporary ponds for the onsite batching and storage of bentonite slurry during LPBW construction.

3.1 Roles and Responsibilities

Table 3 below outlines the key personnel and their responsibilities associated with management of acid sulfate soils during remediation works. The responsibilities identified below are to be executed in conjunction with those responsibilities set out in Table 2 of the RWEMP.

Staff will have their responsibilities clearly relayed to them by FCC's Project Manager prior to the commencement of the project during induction to the Site.

Table 3 Roles and Responsibilities

Title	Responsibilities
Jemena	
Jemena Representative – David Virtue Mobile: 0431 514 827 Email: david.virtue@jemena.com.au	<ul style="list-style-type: none"> Ensuring project compliance with Jemena policies and procedures via scheduled site health, safety and environment (HSE) audits Receive notifications of ASS treatment efficacy, non-conformance with the ASSMP and escalate as necessary (e.g. notifications to regulatory authorities in the event of off-site pollution).
FCC	
Project Director – Miguel Canas Mobile: 0421 029 279 Email: miguel.canas@fordcivil.com.au	<ul style="list-style-type: none"> Provision of adequate resources to manage acid sulfate soils in accordance with this ASSMP Ensuring project compliance with Jemena policies and procedures via scheduled site health, safety and environment (HSE) audits

Title	Responsibilities
Project Manager – Garry Andrews Mobile: 0428 279 721 Email: Garry.Andrews@fordcivil.com.au	<ul style="list-style-type: none"> • Ensuring sufficient resources are available for the implementation of the ASSMP • Ensure compliance with the ASSMP during site inspections and audits • Ensure subcontractors and subconsultants are aware of site-specific conditions and implications for the management of ASS • Notification of non-conformances to Jemena representative • Update ASSMP as required • Purchasing of materials and material control • Ensuring work procedures and/or relevant permits are followed in accordance with FCC and/or client requirements.
Site Manager – William McGrath Mobile: 0403 045 453 Email: William.mcgrath@fordcivil.com.au	<ul style="list-style-type: none"> • Ensure daily operations are conducted in compliance with the ASSMP • Monitor ASSMP implementation and identify updates ASSMP as required • Ensure subcontractors and subconsultants are aware of site-specific conditions and implications for the management of ASS • Ensure housekeeping standards are maintained • Notification of non-conformances to Jemena representative • Verify implementation of corrective actions where implemented.
Project Engineer – Tina Lien Mobile: 0429 150 353 Email: Tina.lien@fordcivil.com.au	<ul style="list-style-type: none"> • Ensure daily operations are conducted in compliance with the ASSMP • Ensure subcontractors and subconsultants are aware of site-specific conditions and implications for the management of ASS • Notify the Jemena representative of any non-conformances, issues or complications arising from implementation of the ASSMP
Project Engineer – Ben Ryan Mobile: 0404 047 165 Email: Ben.Ryan@fordcivil.com.au	
Other site workers/sub-contractors/ subconsultants	<ul style="list-style-type: none"> • Report environmental incidents and near-misses promptly • Report or rectify environmental hazards and non-conformances as appropriate • Ensure housekeeping standards are maintained.

4.0 Sampling and Analytical Program

4.1 Field Assessment to Evaluate the Presence of ASS

As PASS material has previously been identified at the Site, additional field and laboratory assessment is required prior to, or during, future excavation activities. The field assessment should be undertaken by an appropriately qualified soil scientist, and aim to confirm the presence of PASS or AASS and ensure appropriate management methods are implemented prior to and during any excavation works.

Field testing should be conducted on soil samples collected at regular intervals throughout the soil profile, in accordance with the Acid Sulfate Soil Management Advisory Committee (ASSMAC) Guidelines.

As many of the indicators for PASS/AASS are quite different, the field assessment will investigate for the presence of both soil types as defined in **Section 4.1.1** and **4.1.2**. Field testing for PASS/AASS will involve conducting the following two tests.

The field pH (pH_F) and field pH peroxide (pH_{FOX}) tests have been developed for a rapid assessment in the field of the likelihood of ASS. These tests are easy and quick to conduct, and have a minimal set-up cost. Soil field pH tests provide a useful indication of the existing and potential acidity levels in the soil. Although these field tests may provide an indication of ASS presence, they are purely qualitative and do not give any quantitative measure of the amount of acid that has been or could be produced through the oxidation process. Confirmatory field sampling and laboratory testing is required.

As appropriate, testing shall follow QASSIT methodology (QASSIT Guidelines, Ahern et al 1998; Soil Management Guidelines v3.8 Dear et al 2002; and Acid Sulfate Soils Laboratory Methods Guidelines Ahern et al 2004). The methodology is set out in **Attachment A**.

Where AASS and PASS are identified, the management strategy detailed in **Section 5.1** shall be implemented by FCC, insofar as is practical with regard to the volume of material encountered and potential risks posed to the receiving environment. All management measures will be agreed in the first instance with Jemena's appointed Validation Consultant (Ramboll Australia) (Ramboll) performing validation activities.

4.1.1 Field pH Test (pH_F)

Soil field pH provides a useful quick indication of the likely presence and severity of AASS:

- pH readings of pH ≤4, indicates that AASS are present with the sulfides having been oxidised in the past, resulting in acid soil (and soil pore water) conditions
- pH values >4 and <5.5 are acidic and may be the result of some previous or limited oxidation of sulfides, but is not confirmatory of AASS (noting that PASS can be >4 or close to neutral). Substantial exchangeable/soluble aluminium and hydrogen ions usually exist at these pH values.

Field pH alone cannot indicate PASS as they may be neutral to slightly alkaline when unoxidised.

4.1.2 Field Peroxide pH Test (pH_{FOX})

The measurement of the change in the pH_{FOX} following oxidation can give a useful indication of the presence of sulfidic material and can give an early indication of the distribution of sulfide down the soil profile or across the site under assessment. In the pH_{FOX} test 30% hydrogen peroxide is used to rapidly oxidise the sulfides, resulting in the production of acid with a corresponding drop in pH.

A number of factors need to be considered in arriving at positive field sulfide identification:

- A pH_{FOX} value at least one unit below field pH_F may indicate acid generating material requiring further testing. The greater the difference between the two measures (Δ pH), the more indicative the value is of a potentially acidic soil material. The lower the final pH_{FOX} value is, the stronger the indication of a positive result
- If pH_{FOX} < 3, and the above condition applies, then it strongly indicates PASS conditions. The greater the pH_{FOX} reduction below 3, the greater the presence of sulphides
- A pH_{FOX} of 3-4 is less positive and laboratory analysis is needed to confirm if sulfides are present;
- For pH_{FOX} 4-5 the test is neither negative nor positive. However further testing is required. Sulfides may be present either in small quantities and be poorly reactive under the quick field test conditions or the sample may contain carbonate, which neutralises some or all of the acid produced by oxidation. Equally the pH_{FOX} may be produced by organic acids and there may be no sulfides present in this situation
- For pH_{FOX} > 5 and little or no drop in pH from the field value, little net acidification ability is indicated.

Field staff should be provided with **Table 4** which includes a summary of field test responses to assess whether further action is required.

Table 4 Field Peroxide Test Result Interpretation

pH _{1:5}	pH _{FOX}	Δ pH	Δ Temp (°C)	Effervescence ^{1*}	Action Required
≥5.0	≥4.5	≤2.0	<5°C	None-Mild	None
<5.0	<4.5	>2.0	>5°C	Mild-Strong	Preliminary lab assessment
<5.0	<2.5	>2.0	>10°C	Strong-Extreme	Detailed assessment

Source: Victorian Government Department of Sustainability and Environment (2008)

Note(s): 1. levels of effervescence are: none; mild; strong; extreme

2. * also includes iron precipitation

It should be noted that the method is a field based method used for screening AASS and PASS that also captures acidity generated by non-sulfidic soils e.g. organosols.

If it is concluded by the appropriately qualified soil scientist undertaking the field testing that (based on the field peroxide test result interpretation) the soils tested within the Site do not pose a potential for either the occurrence or oxidation of ASS, then a memo should be prepared to this effect. The memo should justify why further assessment is not warranted and include maps of the Site showing features, any sample locations and areas of potential ASS occurrence (if these are present).

If it is concluded by the appropriately qualified soil scientist that (based on the field peroxide test result interpretation) the Site soils pose a potential for either the occurrence or oxidation of ASS, then samples collected during the field investigation should be subject to further laboratory testing.

4.1.3 Insitu Sampling

For in-situ sampling from test pits or boreholes ASSMAC (1998) recommends sampling at 0.5m intervals, with tests completed at the top and bottom of each distinct horizon, and a minimum of 1m below the level of excavation.

Since the Site has been identified as comprising ASS in natural deposits, further detailed site investigation is not required during the Remediation Works. If encountered within excavations, natural soils will be appropriately stockpiled and samples collected from the ex-situ material at a rate of 1 sample per 150m³ or a minimum of 3 samples unless otherwise agreed with Ramboll and Site Auditor.

4.2 Sample Handling

The laboratory analytical program requires consideration of appropriate handling and storage protocols. Due to the potentially volatile nature of the sulfur compounds being assessed and the act of removing them from an anoxic environment, collected samples should be sealed in containers or bags to minimise oxygen exchange. Samples should be stored in the dark and kept cool to frozen (preferably <4°C) until received at the laboratory.

If samples cannot be delivered to a NATA accredited laboratory within 24 hours the following options should be employed:

- Freezing the samples and/or transporting to the laboratory with dry ice
- Oven drying to 80-85°C forced convection as quickly as possible and transporting/storing in a low humidity environment.

4.3 Laboratory Analysis

Laboratory testing should involve one or more of the following in combination, depending on the methodology adopted by Ramboll and FCC to calculate effective lime treatment rates in accordance with ASSMAC (1998):

- Titratable Actual Acidity (TAA)
- Chromium Reducible Sulfur (CRS)
- Acid Neutralising Capacity (ANC)
- Other suitable means of calculating Sulfur and Acidity Trail (SPOCAS).

Tests should be completed at a NATA accredited laboratory from delivered sub-samples prepared by qualified field staff.

4.4 Action Criteria Triggering Management Response

The potential for samples to produce acid will be assessed against the screening criteria in accordance with the ASSMAC Guidelines as presented in **Table 5**.

Table 5 Action criteria to trigger ASS management

Type of Material		≤1000 T disturbed	>1000 T disturbed
Texture	Clay	Sulfur Trail	Sulfur Trail
Units	%	%S	%S
Coarse	≤5	0.03	0.03
Medium	5-40	0.06	0.03
Fine	≥40	0.1	0.03

Notes:

1. 'disturbed' refers to excavation, dewatering, dredging, etc.
2. Coarse = sands; Medium = sandy loams/silts to light clays/silts; Fine = medium to heavy clays, silty clays
3. Net Acid Generation Potential (NAGP) requires %S and acid neutralizing capacity (ANC) to determine

In the event that the above criteria are exceeded, lime treatment will be required. Reference can also be made to laboratory Certificates of Analysis for calculated lime dosing rates. However these should be independently verified by Ramboll and FCC.

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5.0 PASS Management Strategy

Management controls shall have due regard to the volume of material excavated and also make secondary consideration of material within excavation sidewalls and bases, if subject to long-term exposure to the atmosphere. It is intended that low-scale measures shall be implemented for the marginal volumes of material anticipated, in order to keep management costs proportionate to the environmental hazards posed.

Where the field or laboratory testing indicate the presence of ASS, the following management strategy is proposed (noting that alternative proposals from the FCC will also be sought to ensure a pragmatic and cost-effective approach that is specific to the site condition encountered).

In general, and where safe and practical to do so, the ASS material is to be placed into an appropriately bunded treatment area (e.g. concrete pads) and treated with a neutralising agent (e.g. lime). Good practice treatment pad design details are presented in **Section 5.2** but will vary in accordance with site-specific conditions and the volume of material encountered.

The generation of leachate from the ASS material will also need to be minimised and if generated managed and treated to ensure acid is not released to the surrounding environment.

Although not anticipated as part of Remediation Works, an alternative to on-site treatment would involve direct off-site disposal of suitably classified ASS to an appropriate landfill licensed in accordance with the requirements of DECC (2008). A possible strategy for off-site disposal of PASS is detailed in **Section 6.0** should this option prove necessary.

Tables 5 and 6 in Section 5.1 provide a checklist of general good practice procedures for the on-site management of PASS and mitigation of their potential impacts. These set the expected standards to be adopted by FCC in the event that ASS is encountered during the remedial works and requires treatment. As discussed previously, it is intended that low-scale measures shall only be required since the generation of ASS is anticipated to be minimal.

5.1 On-site PASS Management Procedures

Management of potential PASS impacts will be principally managed via implementation of the Soil and Water Management Plan (SWMP) prepared by Northrop (2018) and additional, specific controls provided herein.

Table 6 Procedure 1: ASS Assessment and Treatment during Excavation Works

Issue	Procedure
Operational Policy	To prevent, mitigate or manage potential impacts from acid sulfate forming material. To minimise potential impacts of ASS on the off-site watercourses and ecology (principally Styx Creek).
Performance Criteria	Final placement of treated soils will not be carried out until validation sampling ensures compliance with this ASSMP and relevant guidance.
Implementation Strategy/Mitigation Measures	<p>Assessment and management of acid sulfate material will be conducted in accordance with standard industry practice and, where practical, should incorporate the following procedures:</p> <ul style="list-style-type: none"> • Natural soils designated as PASS will be tested for acid sulfate potential and classified; suitable methods of treatment based on the testing classification will be designed, including calculation of liming rates using a safety factor of 1.5 and bulk densities (where applicable) of the material to be treated • Exposure of PASS material within an excavated trench/pit should be minimised to reduce the potential for oxidation and acid leachate generation • Excavation for LPBL works in exposed natural soils should avoid periods of heavy rainfall to minimise leachate generation, where practical, using appropriate heavy equipment • Excavations below the groundwater table (groundwater inferred at ~3m bgl) are not anticipated during the cut and fill earthworks. However localised excavations in shallow soils may encounter a perched groundwater table. Dewatering should be avoided and only permitted to allow placement of drainage infrastructure, following agreement with Ramboll. If permitted, groundwater will be pumped to on-site storage tanks and tested in accordance with the re-use criteria provided in Section 6.1.4 of the RWEMP to determine an appropriate disposal option • Materials excavated from the LPBW alignment will be mixed with bentonite slurry and replaced below the groundwater table in the trench in accordance with the methodology outlined in the Remedial Works Plan (RWP) • No PASS material will be used as fill wherever possible • Excavated materials will be monitored for colour and leachate quality. With respect to colour, it is noted that iron sulfate minerals like jarosite are commonly found in disturbed ASS. Jarosite $KFe_3(SO_4)_2(OH)_6$ and natrojarosite $NaFe_3(SO_4)_2(OH)_6$ form in distinct butter or straw coloured mottles • No PASS material will be placed and left at surface uncovered or untreated. Placed material will be stabilised to reduce dust emissions (e.g. track rolled and covered, but avoid water spray). Height of stockpiles should generally be <2m and placed on appropriate treatment pads (refer Section 5.2)

Issue	Procedure
	<ul style="list-style-type: none"> • Stockpiled material will be monitored for colour and leachate quality; stockpiling of PASS material for prolonged periods will be minimised where practical • Suitable quantities of treatment additives (for example, agricultural lime or calcium hydroxide solution) will be stockpiled on the Site for emergency treatment, if required.
Monitoring/Validation Sampling of Liming Rates	<ul style="list-style-type: none"> • Treated material will be monitored regularly for success using field-based tests and laboratory analysis e.g. SPOCAS, TPA or S_{CR} and TAA on representative samples of material being treated at a rate of one sample per 150m³ or a minimum of three samples (if field sampling indicates the presence of PASS soils) • Soil pH will be used as a measure of the effectiveness of neutralisation, and the material will only be considered to have been suitably treated when a pH value in excess of 6.5 and a peroxide pH value in excess of 5.5 have been attained consistently (or on average) throughout the batch of material being treated • Pooled surface water around the treatment pads (if present after heavy rainfall periods) should be visually monitored and pH field samples analysed to detect if acid leachate runoff is being generated by the treatment pads (noting FCC shall have controls in place to prevent this). Any substantial leachate generated within the treatment pad will be collected and treated within onsite storage tanks. If high acidities persist; the collected leachate will be treated using alkaline additives (lime) to an approximate acceptance standard pH of 6.5 after treatment • Records will be kept of lime dosing rates and monitoring results.
Identification of Incident or Failure to Comply	Acid sulfate field test and laboratory results indicate PASS materials found in the treated excavated material.
Corrective Action	<p>Further testing of materials in vicinity of the excavation using Chromium Suite method (S_{CR} and TAA) or equivalent (SPOCAS).</p> <p>Reprocessing of materials and additional treatment with lime.</p>

Table 7 Procedure 2: Surface Water Runoff Quality Management

Issue	Procedure
Operational policy	Treatment and management of substantial surface water runoff following heavy rainfall events from uncontained areas comprising exposed ASS (e.g. large open excavations) to prevent leaching of acidic waters and metal contaminants into the environment, should field pH testing indicate impacted runoff.
Performance Criteria	All impacted leachate and/or stormwater collected from exposed PASS soils should comply with Jemena's trade waste agreement criteria prior to disposal to sewer, if required.
Implementation Strategy/Mitigation Measures	<ul style="list-style-type: none"> • All leachate (if generated) from ASS treatment areas and areas of disturbed ASS, including areas where groundwater levels are lowered due to dewatering, will be collected and treated prior to discharge • Ponded water at the Site will be minimised wherever possible, unless part of the treatment process • Care shall be taken to avoid placement of treatment pads within the vicinity of existing site drainage features • All stormwater runoff from undisturbed areas and areas not affected by the remediation works will be directed away from disturbed areas; and existing surface water conditions shall be maintained wherever possible • Minor quantities of leachate runoff may be managed by placement of temporary earthen bunds or excavation of temporary sumps in the ground surface. Treated leachate runoff may be transferred to the earth berm storage area (as detailed in the SWMP) following successful treatment of leachate. • If increasing acidity is encountered, the collected waters from the excavations will be treated using lime (or similar approved material). • Successfully treated leachate and/or stormwater will be discharged to the sewer in accordance with the existing trade waste agreement between Jemena and Hunter Water. Water will be discharged in accordance with acceptable range for pH (and other water quality parameters) specified in the trade waste criteria. Treated leachate and/or stormwater will not be discharged to Styx Creek unless approval to do so is obtained from Council (to be obtained by Jemena). All water proposed to be discharged to Styx Creek will meet the stormwater quality criteria specified in the approval (including acceptable pH range) • Where appropriate to the works being undertaken, excessive sediment generation in waters to be discharged shall be avoided by the use of for example silt fencing/bags, hay bales around excavations/treatment pads or flocculation agents prior to discharge to sewer • Suitable occupational health and safety (OHS) standards for storage and handling alkaline substances such as hydrated lime must be strictly maintained during operation, in accordance with the registered safety data sheet (SDS) • Sufficient quantities of hydrated lime must be maintained on the Site to treat any acidic runoff water or leachate. The material shall be stored in 1 T bulk bags and covered to prevent rainwater ingress.

Issue	Procedure
Monitoring	<p>The following surface water pooling monitoring program should be adhered to from mobilisation to Site to completion of remedial works:</p> <ul style="list-style-type: none"> A water quality monitoring program will be developed for the remedial works, if required. However given the minor exposure of ASS envisaged, it is considered that the above mitigation and field testing measures should prove sufficient. <p>The water quality monitoring program (if required) will comprise:</p> <ul style="list-style-type: none"> Weekly monitoring in water bodies present within the Site (e.g. drainage swales/pooled surface water) with hand held pH and EC meter Daily monitoring of water within the settlement/polishing pond/tank (if present) with hand held pH meter and Secchi disk during period of treatment Weekly sampling and subsequent laboratory analyses at a NATA registered laboratory for: Sulfate, Chloride, Alkalinity and Acidity Analysis of stored water for Chloride and Sulfate (if EC < 10µS/cm), Alkalinity and Acidity, TSS and DO prior to discharge During flood events, samples of stormwater runoff may be collected and analysed for Colour, NFR (true colour) where access permits Visual inspection will be undertaken following each rainfall event and on a regular basis during dry periods to determine the presence or absence of iron staining, salt precipitation and integrity of the storage berm.
Auditing	<p>The FCC Site Manager will verify leachate and/or impacted stormwater have been suitably treated, and pH of the leachate is acceptable, prior to discharge from the Site.</p>
Reporting	<p>Weekly result sheets will be compiled for monitoring results relating to water quality of water bodies within the Site. Results will be available at all times.</p>
Identification of Incident or Failure to Comply	<p>Fall in surface water quality as per water quality criteria, at the environmental monitoring points to below background level.</p>
Corrective Action	<p>Identify reason for deterioration in surface water quality and determine if it is linked to the exposure of ASS during Remediation Works. Review of construction/maintenance operations. View and upgrade neutralisation treatment procedure.</p>

5.1.1 Site Management

PASS materials should be kept separate from non-PASS materials at all times to reduce the volume of material requiring treatment. Acid is transported by water; therefore, excavation works in PASS should be conducted during dry periods (where practical) to minimise the risk of overflow associated with sudden or heavy rain and to allow better control of treated waters for discharge.

5.1.2 Leachate Control

Leachate runoff from ASS or PASS materials should be contained in earth or otherwise impermeable bunds or excavated sumps and treated prior to discharge or re-use (per Section 6.1.4 of the RWEMP) onsite.

5.1.3 Liming Rates

A technique commonly used in ASS treatment is neutralisation where alkaline materials are physically incorporated into the soil. Sufficient neutralising agent(s) needs to be used to ensure that there is the capacity to neutralise all existing acidity that may be present and all potential acidity that could be generated from complete oxidation of the sulfides over time. Note: if there is existing acidity, limited effective natural buffering capacity remains.

Finely crushed limestone (also known as Aglime) is commonly used as the neutralisation agent for soil. (Note: Aglime is calcium carbonate and should not be confused with hydrated lime or calcium hydroxide, the latter commonly used to treat impacted water.)

The liming rate is the amount of Aglime required to neutralise existing and potential acidity in the soil material that has been disturbed by the earthworks activity. Liming rates need to be calculated based on the results of laboratory analytical data and must include a safety factor of 1.5.

The formula to calculate liming rates is:

$$\text{Oxidisable Sulfur (\%S)} \times 30.59 \times 1.02 \times 1.5 = \text{kg CaCO}_3/\text{tonne of soil}$$

Note: 30.59 converts S% to kg of H₂SO₄ per tonne; 1.02 converts kg of H₂SO₄ per tonne to kg of CaCO₃ per tonne; and 1.5 is the safety factor.

To convert units from tonnes to cubic metres, multiply the kg CaCO₃/tonne of soil by the bulk density of the soil.

Handling options for excavated PASS material should use accepted industry practice to mitigate acid generation.

The options for treatment include:

- Neutralisation of PASS/AASS material with finely crushed limestone (Aglime) at a predetermined rate including a safety factor of 1.5 to allow for mixing inconsistencies. This is the preferred option for on-site beneficial reuse of excavated PASS
- Over-excavation and burial below the water table
- Preloading and burial below the water table
- Disposal off-site.

5.1.4 Limestone (Aglime) Neutralisation

Neutralisation with Aglime treatment should be undertaken progressively in designated treatment areas. Treatment areas should be bunded and the bund walls lined with an anchored geotextile or plastic sheeting liner to minimise erosion and direct impact by the PASS. The bunds will also minimise surface water runoff entering or leaving the treatment areas. A guard layer of Aglime as described in **Section 5.2.1** should be placed over the underlying soil at the base of each treatment area, to provide further safeguard against any acidic leachate generated during treatment which is not fully neutralised by the Aglime treatment. The division of each treatment area into cells may expedite the treatment process as material can be allocated to different cells as excavation works progress, resulting in a staged treatment process.

Once PASS material has been placed in the treatment areas it should be allowed to drain (with leachate directed into the leachate management pond, if present depending on the extent of the proposed works) and then dosed with a neutralising agent (e.g. Aglime) in accordance with the required dosing rate (calculated based on assessment findings).

The application rate for the neutralising agent (liming rate) will depend on the agent used. It is recommended that fine grained Aglime with a neutralising value (NV) of at least 95% is used.

The lime should be thoroughly mixed through the soil with suitable site machinery. Additional quantities of Aglime above the calculated dosing rate should be made available to address difficulties in mixing and to act as a backup buffer under such circumstances. The effectiveness of the adopted

dosing rate should be confirmed by the regular sample screening of the treated material using pH and peroxide pH field tests, with additional lime added as required.

Soil pH will be used as a measure of the effectiveness of neutralisation, and the material will only be considered to have been suitably treated when a pH value in excess of 6.5 and a peroxide pH value in excess of 5.5 have been attained consistently (or on average) throughout the batch of material being treated.

If treated soils are to be disposed off-site (not anticipated), the field pH and peroxide pH of the stockpiled materials should be determined immediately prior to disposal. If material fails the pH and peroxide pH testing, further dosing with Aglime should be conducted as required prior to disposal.

Treatment works involving Aglime should not be conducted during windy conditions, unless the material can be appropriately conditioned to prevent dust generation. When the field screening indicates that the material has been suitably treated, the PASS should be reinstated or disposed of to an appropriately licensed facility in accordance with the appropriate waste classification.

5.2 Treatment Pad Design

For treatment of excavated PASS in an open area, neutralisation should be carried out on a treatment or liming pad. The following issues should be considered in the treatment pad design.

5.2.1 Guard Layers

A guard layer of neutralising agent should be spread onto the soil surface of the treatment pad prior to the placement of soils. This will reduce risk by neutralising acidic leachate generated in the treatment pile and not neutralised during the treatment process. This is especially relevant to the first layer of PASS that is placed for treatment prior to application of the neutralising agent. The guard layer will assist in protecting groundwater quality.

The rate of neutralising agent used in the guard layer (per square metre) should be based on 0.2 times the average of the potential and existing acidity for every metre depth of the soil to be treated (i.e. if 2 metres of soil are to be treated in the treatment pad, then twice x 0.2 times the neutralising agent required to neutralise the acidity should be spread as a guard layer). A safety factor of 1.5 to 2 is recommended for all guard layers. The safety factor may need to be increased for sands and for treatment pads that are adjacent to environmentally sensitive areas.

A minimum of 5 kg fine Aglime per m² per vertical metre of fill should be used in the guard layer.

5.3 Monitoring of Treatment

Treated layers should be monitored regularly for success using a combination of field based tests (*ASS Laboratory Methods Guidelines for pH before and after peroxide oxidation*, Ahern et al, 2004) and acid neutralising capacity or equivalent parameter on representative samples of material being treated. Monitoring should be undertaken before placement of subsequent layers upon same site with reference to the action levels listed in **Table 5**. Verification sampling should be undertaken at a rate of one sample per 150m³ or a minimum of three samples.

5.4 Water Quality Management

In the event that substantial acid leachate is produced, management procedures to be utilised for the treatment of acid leachate generated from exposure of PASS material and stormwater runoff should include:

- Direct drainage to a collection sump for treatment or pumping to a treatment point (e.g. on-site polytank or water treatment plant)
- All external drainage will be directed away from the excavated area to minimise the volume of water within that area that may require treatment
- Any surface water runoff collecting within the excavation shall be monitored and treated, if required, with hydrated lime or equivalent prior to discharge. Water accumulating within the

construction site will not be discharged to sewer until it meets acceptable water quality standards outlined in Jemena's trade waste agreement.

6.0 Off-site Disposal

In accordance with the NSW EPA (2014) Waste Classification Guideline: Part 4 – Acid Sulfate Soils, Actual ASS must be treated by the generator of the waste before they can be considered for off-site disposal. Treatment should be in accordance with the neutralising techniques outlined in the Acid Sulfate Soil Manual (Stone et al, 1998).

Following neutralisation, the chemical assessment of the soil must be undertaken in accordance with Step 5 of Part 1 of the Waste Classification Guidelines to determine whether there are any other contaminants that may affect how the waste is classified for disposal.

Once classified, the waste must be taken to a landfill licensed to accept that class of waste.

7.0 Key References

AECOM (2019b), Remediation Works Environmental Management Plan, Clyde Street Former Gasworks, 1 Chatham Road, Hamilton North, NSW, February 2019

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NSW EPA (2014), Waste Classification Guidelines, Part 4: Acid Sulfate Soils, November 2014

Stone Y, Ahern C R, and Blunden B (1998), Acid Sulfate Soils Manual 1998. Acid Sulfate Soil Management Advisory Committee (ASSMAC), Wollongbar, NSW, Australia

Attachment A: Acid Sulfate Soil Laboratory Methodology Guidelines

1 ACID SULFATE SOIL FIELD pH TESTS

KM Watling, CR Ahern and KM Hey

1.1 INTRODUCTION

The field pH (pH_F) and field pH peroxide (pH_{FOX}) tests have been developed for a rapid assessment in the field of the likelihood of acid sulfate soils. These tests are easy to conduct, quick, and have a minimum set-up cost. The field tests have been developed to give reasonable prediction for many soils (provided the tests are performed properly) whilst at the same time being relatively easy to perform with a minimal amount of equipment. Soil field pH tests provide a useful indication of the existing and potential acidity levels in the soil. Although these field tests may provide an indication of ASS presence, they are purely qualitative and do not give any quantitative measure of the amount of acid that has been or could be produced through the oxidation process.

Field pH tests should be part of any ASS investigation. The field pH tests (both pH_F and pH_{FOX}) should be conducted at 0.25 m intervals on the soil profile, ensuring at least one test per horizon. It is recommended that field tests be conducted on-site, in the field. If the tests can't be performed in the field on-site, tests should be conducted within 24 hours of soil sample collection, ensuring appropriate sample handling procedures (see Section B). Samples suspected of containing monosulfides should undergo field pH testing immediately in the field.

1.2 FIELD pH TEST (pH_F)

The procedure for the field pH test (pH_F) is outlined below:

1. **Calibrate battery powered field pH meter** according to manufacturer's instructions.
2. **Prepare the test tubes in the test tube rack.** Make sure the rack is marked with the depths so there is no confusion about the top and bottom of the profile. Use of separate racks for the pH_F and pH_{FOX} tests is recommended as contamination may occur when the pH_{FOX} reactions are violent. As the soil:water paste is inclined to stick to the walls of tubes, it is best to use shallow, broad test tubes as this makes cleaning easier.
3. **Conduct tests at intervals on the soil profile of 0.25 m or at least one test per horizon** whichever is lesser.
4. **Remove approximately 1 teaspoon of soil from the profile. Place approximately ½ teaspoon of that soil into the pH_F test tube and place ½ teaspoon of the soil into the pH_{FOX} test tube** for the corresponding depth test. It is important that these two sub-samples come from the same depth and that they are similar in characteristics. For example, DO NOT take ½ teaspoon of soil from the 0–0.25m depth that is grey mud, while selecting ½ teaspoon from the same depth that is a yellow mottled sample. These will obviously give different results independent of the type of test conducted.
5. **Place enough deionised water** (or demineralised water if deionised water is not available; never use tap water) **in the pH_F test tube** to make a paste similar to 'grout mix' or 'white sauce', **stirring the soil:water paste** with a skewer, strong tooth pick or similar to ensure all soil 'lumps' are removed. Do not leave the soil samples in the test tubes without water for more than 10 minutes. This will reduce the risk of sulfide oxidation—the pH_F is designed to indicate the existing pH of a soil in the field; any oxidation subsequent to the soil's removal from the ground will not reflect the true field pH. In some instances, in less than 5 minutes, monosulfidic material may start to oxidise and substantially affect the pH_F results.

6. **Immediately place the spear point electrode (preferred method) into the test tube**, ensuring that the spear point is totally submerged in the soil:water paste. Never stir the paste with the electrode. This will damage the semi-permeable glass membrane.
7. **Measure the pH_F** using a pH meter with spear point electrode.
8. **Wait for the reading to stabilise and record the pH measurement.**
9. **All measurements should be recorded on a data sheet.**

1.3 FIELD pH PEROXIDE TEST (pH_{FOX})

It is recommended that 30% hydrogen peroxide (H_2O_2) be used in the pH_{FOX} test. 30% H_2O_2 is highly corrosive and care should be taken when handling and using the peroxide. Safety glasses and gloves should be worn when handling and using peroxide. All chemical bottles should be clearly labelled and Material Safety Data Sheets (MSDS) should be kept with the chemicals at all times. Appropriate health and safety precautions should be adhered to. Peroxide should be kept in the fridge when not in use.

The procedure for the field pH peroxide test (pH_{FOX}) is outlined below:

1. **Adjust the pH of the hydrogen peroxide to pH 4.5–5.5 before going into the field.** This can be done by adding a few drops of dilute NaOH stirring and checking the pH with the electrode regularly until the correct range is reached. NaOH is highly caustic so safety precautions must be exercised. NaOH can raise the pH quickly or slowly, so the pH needs to be monitored. Recheck the pH after allowing the peroxide to stand for 15 minutes. Do NOT buffer a large quantity of hydrogen peroxide at one time. Only buffer the amount to be used in the field for about a month. This must be kept in a fridge, well labelled with only small quantities to be taken into the field at one time. This will ensure the longevity of the peroxide. Further, over time, the pH of the peroxide that has already been buffered may change. It is important to check the pH of the peroxide in the morning before departing to the field. Having a small quantity of NaOH in the field kit is recommended so the peroxide can be buffered if required.
2. **Calibrate battery powered field pH meter** according to manufacturer's instructions.
3. **Prepare the test tubes in the test tube rack as for pH_F test.** Make sure the rack is marked with the depths so there is not confusion about the top and bottom of the profile. Use of separate racks for the pH_F and pH_{FOX} tests is recommended as contamination may occur when the pH_{FOX} reactions are violent. It is important to use **heat-resistant test tubes** for the pH_{FOX} test as the reaction can generate considerable heat (up to 90°C). It is recommended that a tall, wide tube be used for this test as considerable bubbling may occur, particularly on highly sulfidic or organic samples.
4. **Conduct pH_{FOX} tests at intervals on the soil profile of 0.25 m or at least one per horizon** whichever is lesser.
5. **From the teaspoon of soil previously collected for the pH_F test, place approximately $\frac{1}{2}$ teaspoon of the soil into the pH_{FOX} test tube** for the corresponding depth test. It is important that these two sub-samples come from the same depth and that they are similar in characteristics. For example, DO NOT take $\frac{1}{2}$ teaspoon of soil from the 0–0.25m depth that is grey mud, while selecting $\frac{1}{2}$ teaspoon from the same depth that is a yellow mottled sample. These will obviously give different results independent of the type of test conducted.
6. **Add a few millilitres of 30% H_2O_2 (adjusted to pH 4.5–5.5) to the soil** (sufficient to cover the soil with peroxide) **and stir the mixture.** Do NOT add the peroxide to the test tube in which the pH_F test was conducted, that is, the pH_{FOX} test tube should not have any deionised water in it. Beakers can be used, however glass is usually easily broken when conducting field work, and when multiple tests are being conducted it is difficult to handle large beaker sizes efficiently. Do NOT add more than a few millilitres at a time. This will prevent overflow and wastage of

- peroxide. A day's supply of peroxide should be allowed to reach room temperature prior to use (cold peroxide from the fridge may be too slow to react).
7. **Rate the reaction of soil and peroxide using a XXXX scale** (see below and Table H1.1).
 8. **Ideally, allow approximately 15 minutes for any reactions to occur.** If substantial sulfides occur, the reaction will be vigorous and may occur almost instantly. In this case, it may not be necessary to stir the mixture. Careful watch will be needed in the early stages to ensure that there is no cross contamination of samples in the test tube rack. If the reaction is violent and the soil:peroxide mix is escaping from the test tube, a small amount of deionised water (or demineralised water; not tap water) can be added (using a wash bottle) to cool and calm the reaction. Usually this controls overflow. Do NOT add too much deionised water as this may dilute the mixture and affect the pH value. It is important to only use a small amount of soil otherwise violent reactions will overflow and the sample will be lost.
 9. **Steps 6 to 8 may be repeated** until the soil:peroxide mixture reaction has slowed. This will ensure that most of the sulfides have reacted. In the lab this procedure would be repeated until no further reaction occurs, however in the field, best judgement is recommended. Usually one or two extra additions of a few millilitres of peroxide are sufficient.
 10. If there is no initial reaction, individual test tubes containing the soil:peroxide mixture can be placed into a container of hot water (especially in cooler weather) or in direct sunlight. This will encourage the initial reaction to occur. When the sample starts to 'bubble', remove the test tube immediately from the hot water and replace into test tube rack.
 11. **Wait for the soil:peroxide mixture to cool** (may take up to 10 minutes). The reactions often exceed 90°C. Placing an electrode into these high temperature situations may result in physical damage and inaccurate readings. Check the temperature range of the pH meter and probe to see what temperature is suitable. Note that a more exact pH is achieved if a temperature probe is also used, however this may be impractical in some field situations.
 12. **Use an electronic pH meter (preferred method) to measure the pH_{FOX} .** Place a spear point electrode into the test tube, ensuring that the spear point is totally submerged in the soil:peroxide mixture. Never stir the mixture with the electrode. This will damage the semi-permeable glass membrane.
 13. **Wait for the reading to stabilise and record the pH_{FOX} measurement.**
 14. **All measurements should be recorded on a data sheet.**

a) Rating soil reactions of the pH_{FOX} test using the XXXX scale

The rate of the reaction generally indicates the level of sulfides present, but depends also on texture and other soil constituents. A soil containing very little sulfides may only rate an 'X' however a soil containing high levels of sulfides (remember the exact level of sulfides cannot be determined using the pH_{FOX} test) is more likely to rate a 'XXXX' although there are exceptions. This rating scale alone should not be used to identify ASS. It is not a very reliable feature in isolation as there are other factors including manganese and organic acids which may trigger reactions. Reactions with organic matter tend to be more 'frothing' and don't tend to generate as much heat as sulfidic reactions. Manganese reactions will be quite extreme, but don't tend to lower the pH_{FOX} . Table H1.1 indicates the reaction scale for pH_{FOX} tests.

Table H1.1 Soil reaction rating scale for the pH_{FOX} test.

Reaction scale	Rate of reaction
X	Slight reaction
XX	Moderate reaction
XXX	High reaction
XXXX	Very vigorous reaction, gas evolution and heat generation commonly >80°C

1.4 INTERPRETATION OF FIELD pH TESTS

For details on how to interpret the field pH tests (pH_F and pH_{FOX}) please refer to the following references:

Ahern CR, Ahern MR and Powell B (1998). *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998*. Department of Natural Resources, Indooroopilly, Queensland, Australia. pp. 28–30.

Ahern CR, Stone Y and Blunden B (1998). *Acid Sulfate Soils Assessment Guidelines*. Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia. pp. 56–58.

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Hey KM (ed) (2002). *Field Testing, Sampling and Safety for Acid Sulfate Soils*. Department of Natural Resources and Mines, Indooroopilly, Queensland, Australia. pp. 12–16.

2 EFFERVESCENCE TEST ('FIZZ TEST') FOR CARBONATES

This test is used to determine the presence of carbonates in soil. It is a quick, easy, cheap test to conduct in the field. The test should be conducted on samples suspected of containing carbonates (eg. fine shell, crushed coral etc).

The procedure for the fizz test is outlined below:

1. **Place a small sample of soil (approximately one teaspoon) into a clear test tube.** Clear test tubes are preferred as this makes it easier to see any reactions. It is important that test tubes used in the fizz test are not used for the field pH tests as cross-contamination may occur, affecting pH readings.
2. **Place two or three drops of 1 M hydrochloric acid (HCl) onto the soil sample.** HCl is highly corrosive so safety precautions must be exercised.
3. **Rate the reaction** (see Table H2.1).
4. **All measurements should be recorded on a data sheet.**

Table H2.1 Soil reaction rating scale for the fizz test (as described in McDonald *et al.* 1990, pp. 147–148).

Reaction scale	Rate of reaction
N – non-calcareous	No audible or visible effervescence
S – slightly calcareous	Slightly audible but no visible effervescence
M – moderately calcareous	Audible and slightly visible effervescence
H – highly calcareous	Moderate visible effervescence
V – very highly calcareous	Strong visible effervescence

References

McDonald RC, Isbell RF, Speight JG, Walker J and Hopkins MS (1990) 'Australian Soil and Land Survey Field Handbook, 2nd Ed'. (CSIRO Publishing: Canberra)

Appendix E

Soil and Water Management Plan

Appendix E Soil and Water Management Plan

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Ford Civil. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

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APPENDICES

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Appendix C – Stormwater Treatment Process Drawings

Appendix D – Hunter Water Trade Waste Agreement

1 Introduction

Northrop Consulting Engineers have been engaged by Ford Civil to provide soil and water management design advice for the Clyde Street Former Gasworks Remediation Project. The purpose of this document is as follows:

- To describe the proposed soil and water management strategy for the proposed remediation works, including a detailed erosion and sediment control plan; and,
- To describe the stormwater management measures proposed to be constructed and maintained upon completion of remediation activities.

This document is intended to form part of the overall reporting requirements nominated under the Jemena Project Brief and should be read in conjunction with the latest civil design drawings. This document will also be submitted to support a Development Application (DA) to Newcastle City Council (NCC) for the civil and stormwater works.

It should be noted that this soil and water management plan relates only to the control of sediment and erosion. The capture, management and disposal of any contaminated runoff remains the responsibility of others.

2 Project Background

2.1 Site Description

The site is comprised of Lot 1 DP79057 and Lot 270 DP812689 and is bounded by Clyde Street and Chatham Road to the west, Styx Creek to the south and east and the main northern railway to the north-east. The total area of the site is approximately 7.4 hectares. The site is currently vacant, with some existing areas of hardstand from previous land uses and several material and waste stockpiles. The site is generally flat with surface levels ranging from RL 5.0-6.0 mAHD. Surface levels locally grade at less than 1% at the western boundary towards the Styx Creek channel.

2.2 Proposed Works

As described in the Jemena Project Requirements (dated 11/05/2018), the site is to be remediated to address public health and environmental risks associated with significant site contamination. The remediation will allow continued commercial/industrial use of the site consistent with the current land zoning. The proposed remediation works will generally encompass the following:

- Clearing and grubbing of existing site vegetation;
- Demolition of remaining structures, pavements and excavation of redundant below-ground services within the site;
- Construction of a low-permeability barrier wall to reduce the amount of contaminated groundwater migrating off-site;
- Bulk earthworks to regrade the site to fall towards Styx Creek;
- Excavation and grading of drainage berms, cut-off swales and an outlet detention basin at the low-end of the site to capture detain overland flow prior to discharging to Styx Creek;
- Construction of a stormwater outlet structure from the detention basin to Styx Creek in accordance with Hunter Water's requirements;
- Construction of a capping system to reduce surface infiltration;
- Final spray sealing of the site to protect the capping layer and further reduce infiltration.

3 Sediment and Erosion Control

To mitigate the short-term impacts of sediment runoff on downstream waterways, as well as prevent contaminated runoff from discharging to Styx Creek, construction phase sediment and erosion controls are to be implemented and maintained for the duration of the works. The sediment and erosion control plan for this project has been prepared in accordance with the contamination management requirements of the Environmental Impact Statement (EIS) prepared by GHD, along with the requirements of Landcom's Managing Urban Stormwater: Soils and Construction (The Blue Book).

The key management outcomes for the works are identified below.

- All construction activities shall be undertaken in accordance with the Approved Soil and Water Management Plan for each stage;
- Erosion and sediment controls for each stage of the remediation works shall be implemented prior to commencing works on that stage;
- Regular inspections shall be undertaken to ensure erosion and sediment controls are maintained and remain appropriate for the duration of the remediation works. The maintenance period shall be as follows:
 - At least daily when work is occurring on site;
 - At least weekly when work is not occurring on site;
 - Within 24 hours of expected rainfall; and,
 - Within 18 hours following a rainfall event that caused runoff on site.
- The contractor is to ensure that appropriate procedures and appropriately qualified personnel are engaged to plan and conduct site inspections and water quality monitoring throughout the remediation works;
- Turbidity monitoring of downstream water courses shall be regularly undertaken during the construction phase;
- No-go areas will be established to minimise site disturbance extents for each stage. We note that the site is anticipated to be substantially disturbed following the removal of vegetation, erosion and sediment control provisions detailed on sheet C10.CC have been designed to accommodate the expected site disturbance;
- Periods of open soil exposure shall be minimised with areas stabilised/revegetated as soon as possible;
- Temporary diversion drains will be installed to minimise the flow of clean runoff into construction areas, material stockpiles and open trenches, in particular these will be provided around proposed stockpile areas and work zones as required to suit site works;
- Treatment of sediment-laden runoff will be undertaken from disturbed areas via installation of downslope sediment controls;
- Controls are to be implemented to prevent sediment being trafficked offsite; and,
- All internal and external stormwater structures are to be protected to prevent sediment laden-runoff entering the drainage system.

The proposed Erosion and Sediment Control Plan has been detailed on drawings C10.CC and C11.CC of the attached engineering plans (Appendix A).

3.1 Runoff Storage

In accordance with the project EIS, no stormwater runoff is permitted to discharge from the site for the duration of the remediation works. To satisfy this requirement, stormwater storage is to be provided to contain up to the 100-year ARI, 72-hour storm event. This will be achieved by constructing an earth berm at the low end of the site to RL 6.5 m AHD at the commencement of construction.

3.2 Water Quality Sampling, Analysis and Discharge

Currently, provisions for water quality management are based on addressing sediment laden water quality issues only and does not consider the presence or otherwise of inorganic and organic contaminants in the water. Sampling and analysis for sediment laden water is to include the parameters listed in Table 1.

Table 1 – Sampling and Analysis of Stored Runoff.

Water Quality Indicator	Frequency of Testing	Water Quality Treatment
Total Suspended Solids (TSS)	Minimum once fortnightly during discharge operations	Coagulant and flocculant polymers
pH		pH correction

Based on the results of the pre-treatment testing, coagulant and flocculant polymers will be added in addition to pH correction directly to the detention storage area. Post-treatment results will be used to confirm suitability of the waters prior to discharge to sewer.

If the stored runoff volume stored within the bunded area is deemed acceptable to discharge to sewer, the volume shall be pumped to the nominated trade waste discharge location nominated under the existing Hunter Water trade waste agreement for the site. In addition, the following requirements will need to be maintained for the duration of the discharge period:

- Under Schedule 1 Item 2 & 3, the maximum permissible discharge rate is 10 L/s allowable time of discharge is 7 days per week, 24 hours a day, resulting in an effective maximum discharge rate of 864 kL/day. Ford Civil will monitor the discharge via sampling and analysis on a minimum fortnightly basis to ensure treatment of water meets these requirements;
- Compliance with substance concentration limits nominated under Schedule 1 (c)(ii);
- Provision of a safe, accessible downstream sampling point prior to point of discharge to sewer for collection of water samples in accordance with Schedule 2;
- Monitoring the receiving access chamber to ensure volatile gases do not exceed 10% of the lower explosive limit (LEL);

The current Hunter Water trade waste agreement is included in Appendix D.

In the event of chemical contamination of stored surface water, one of the following two (2) contingency options will be enacted:

1. Pumping, transport & offsite disposal to licenced liquid waste disposal facility; or
2. Design, construction, commissioning and treatment of water via a dedicated waste water treatment plant followed by discharge to sewer on site in accordance with trade waste agreement.

Northrop understands that Ford Civil has selected option 2 as the preferred contingency method based on long-term water quality management on site should it be required. Conceptual treatment

plant design drawings, including general layout and process flow for the proposed 10 L/s waste water treatment plant have been included in Appendix C.

4 Stormwater Quantity Assessment

As part of the remediation works, the site is to be regraded and sealed which will substantially affect surface water runoff. In accordance with NCC's 2012 DCP Section 7.06 Stormwater, onsite storage has been provided to minimise the impact of site stormwater runoff on the downstream Styx Creek.

4.1 Modelling Approach

The upstream catchment and basin were modelled using the DRAINS software package using the IL/CL hydrological model and ARR2016 rainfall runoff procedures. The site was modelled as a single catchment node using the kinematic wave equation to estimate time of concentration. The pre-developed site was based on 'greenfield' conditions assuming the site had no impervious area. The post-developed catchment was based on the final remediated site which is to be completely sealed and can be considered 100% impervious.

The required detention storage was sized to ensure post-developed site runoff did not exceed pre-developed levels for the critical duration 20%, 10%, 5%, 2% and 1% AEP median storm events. Rainfall data for the model was obtained from the Bureau of Meteorology and temporal patterns were obtained from the ARR Data Hub.

4.2 Storage Basin

Detention storage will be provided in a proposed 2,500 kL detention basin constructed along the eastern boundary of the site. The basin will be fitted with a piped outflow to Styx Creek for low-flow discharge and a spillway weir for high flow events. DRAINS results are provided in Table 2.

Table 2 – Stormwater Runoff Results.

	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP
Pre-developed (m³/s)	0.89	1.30	1.78	2.50	2.92
Post-developed (m³/s)	0.80	1.10	1.68	2.11	2.78

Note: DRAINS model is available on request.

The modelling results indicate that the proposed basin will be sufficient to reduce post-developed flows below estimated pre-developed catchment runoff. The proposed Stormwater Management Strategy has been detailed on drawings C30.CC and C31.CC of the engineering plans attached as Appendix A.

5 Stormwater Quality

Stormwater quality measures have not been proposed as part of the remediation civil works. It is anticipated that water quality measures consistent with current planning requirements will be designed and constructed as part of future development of the site.

APPENDIX B – HUNTER WATER CORRESPONDENCE

From: Jarrod Wynn <Jarrod.Wynn@hunterwater.com.au>

Sent: Wednesday, 19 September 2018 8:15 AM

To: Chris Smith <CSmith@northrop.com.au>

Cc: Julia Irwin <julia.irwin@hunterwater.com.au>

Subject: RE: Clyde Street Hamilton North

Chris, please see attached correspondence with Jemena in relation to the works at Hamilton North.

Between Julia and I we have been in contact with Jemena verbally and via email in regards to what we would be expecting at the site.

Initial discussions were around asset condition and leachate from the site into the stormwater. Then it was more in relation to where the overland flows are to be directed.

Cheers jarrod

Jarrod Wynn

Team Leader Civil Engineering | Hunter Water Corporation

36 Honeysuckle Drive Newcastle NSW 2300 | PO BOX 5171 HRMC NSW 2310

T 02 4979 9703 | **M** 0450 646 996 | **F** 02 4979 9492 | Twitter: [@hunterwater](https://twitter.com/hunterwater)

jarrod.wynn@hunterwater.com.au | hunterwater.com.au

Please consider the environment before printing this email



Please consider the environment before printing this email.

Hunter Water acknowledges the Traditional Owners and custodians of the land and we pay our respects to their Elders, past, present and future. We're an inclusive workplace that embraces diversity in all its forms.

From: Chris Smith

Sent: Friday, 14 September 2018 1:53 PM

To: Dean Cecil <Dean.Cecil@hunterwater.com.au>

Cc: Jarrod Wynn <Jarrod.Wynn@hunterwater.com.au>

Subject: Clyde Street Hamilton North

Hi Dean,

Northrop have been engaged to prepare civil design documentation for the proposed bulk excavation and stormwater drainage for the Jemena Site located at Clyde Street, Hamilton North. Our scope includes documenting drainage connections to Styx Creek, which I understand is a Hunter Water asset.

We are in the process of preparing documentation for submission to HWC, and I would like to open up a line of communication with the relevant HWC personnel who will be undertaking the review and approvals processes. I understand Jarrod or one of his team may have previously issued some preliminary advice to Jemena on likely design requirements, in the first instance I was hoping that

the relevant correspondence could be forwarded to me so that we can consider and include in our submission to HWC.

I have attached a preliminary set of plans which have been prepared for the DA submission to give you some context on the proposed site works. Essentially the site is to be regraded to fall towards Styx Creek, and a large detention facility is to be provided along the southern boundary in order to attenuate flows entering Styx Creek.

Thanks for your help, happy to discuss over the phone if you have any queries.

Thanks



Chris Smith

Principal | Senior Civil Engineer

Northrop Consulting Engineers Pty Ltd

T: 02 4943 1777

F: 02 4943 1577

M: 0412 231 417

Level 1, 215 Pacific

Highway Charlestown NSW 2290

PO Box 180 Charlestown NSW 2290

www.northrop.com.au



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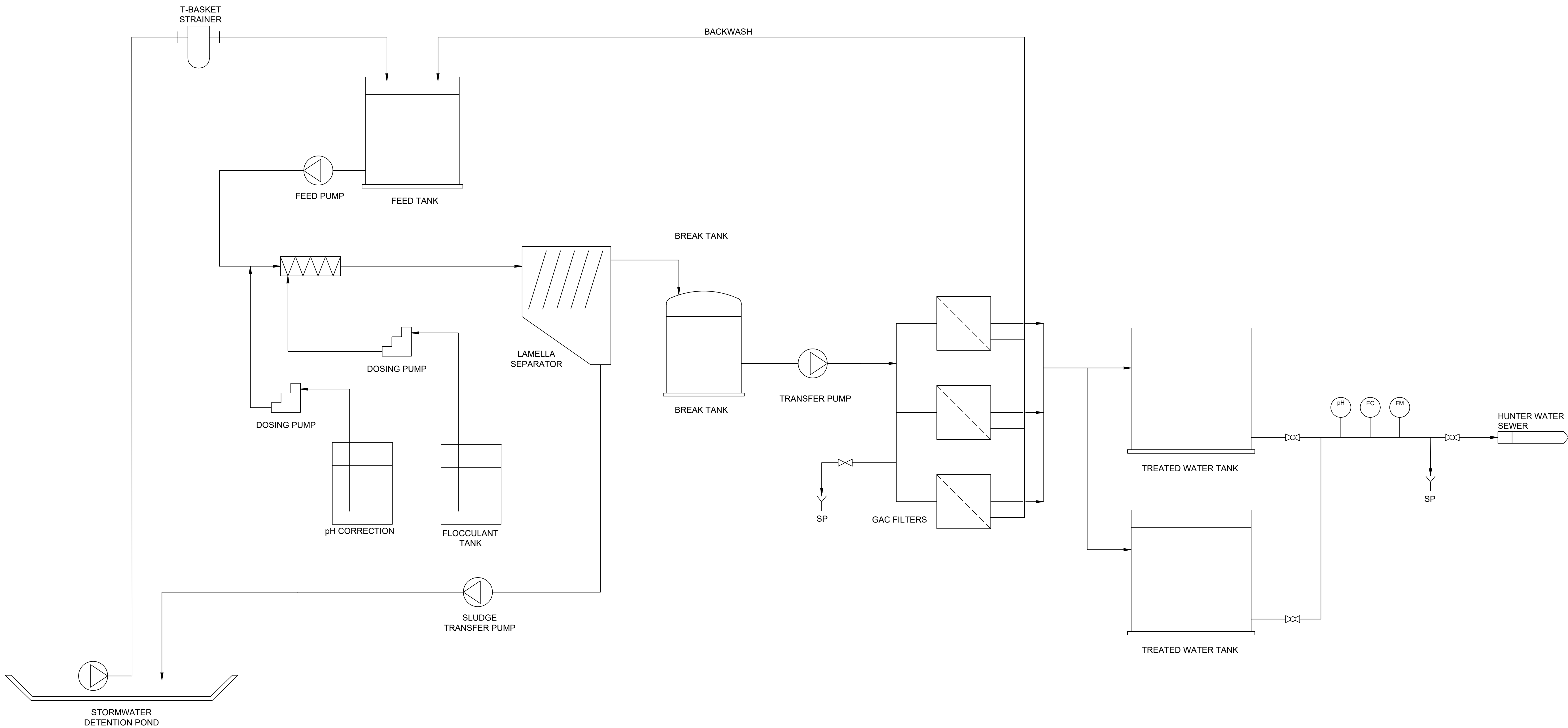
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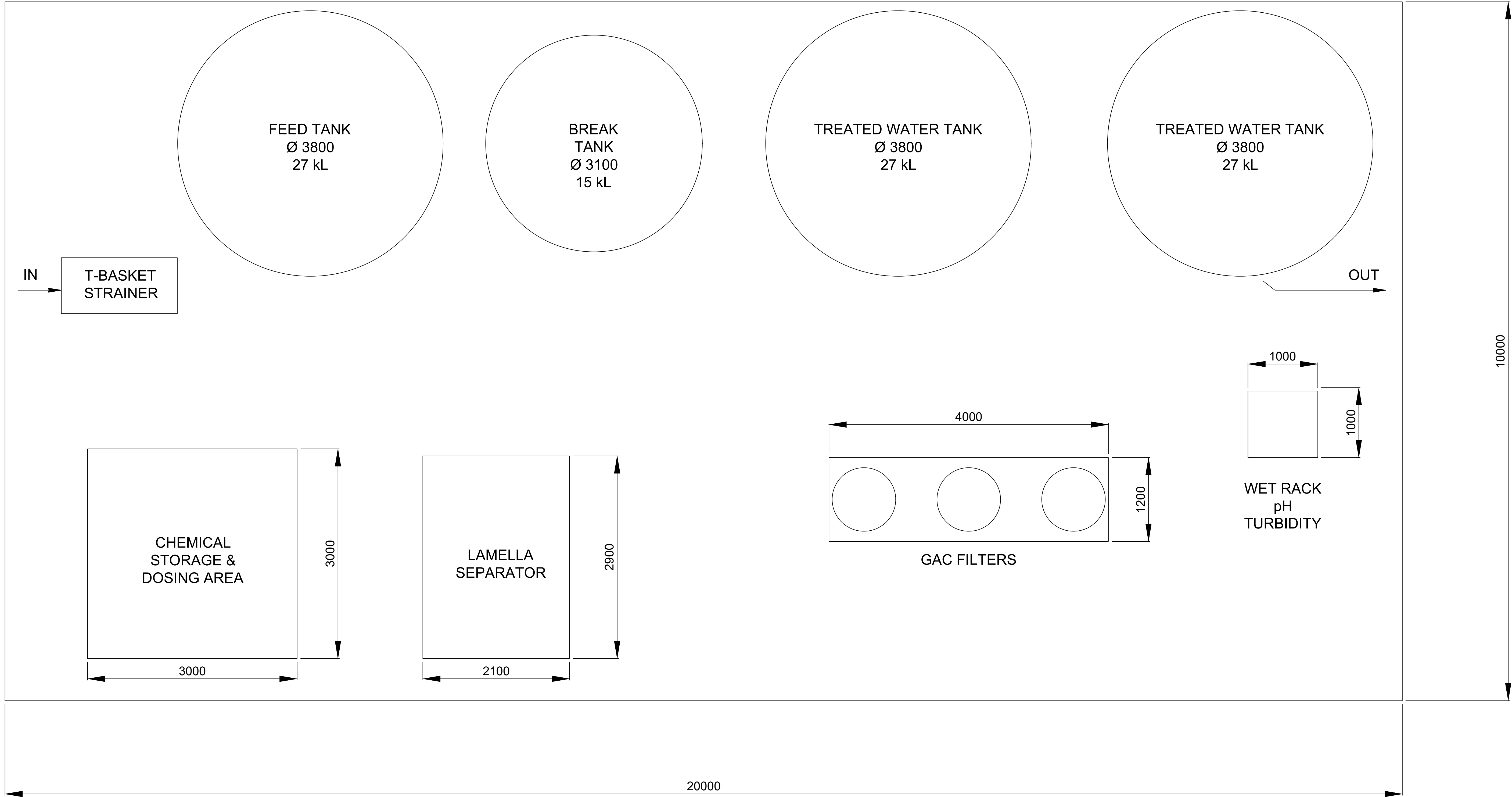
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APPENDIX C – STORMWATER TREATMENT PROCESS DRAWINGS



REVISIONS	Version	Description	Drawn By	Date and Signature	Checked By	Date and Signature	Client Approval By	Date and Signature	<div><div><div>SAS Water Solutions</div><div>SAS Water Solutions Pty Ltd 30/9 Salisbury Rd, Castle Hill, NSW 2154 Ph: +61 2 9620 4900 Fax: +61 2 9620 4388 ABN 52 100 723 402</div></div><div>The information contained in this drawing is subject to Copyright protection. © Copyright SAS Water Solutions Pty Ltd</div></div>	Client / Project :-		FORD CIVIL NEWCASTLE GAS WORKS		Drawing No:-	P18572-101		Revision:-	0	
	0	PRELIMINARY	PWS	1/11/2018	PT					Title:-		STORMWATER TREATMENT SYSTEM PROCESS FLOW DIAGRAM		A1					
										Client File Name:-		SHEET 1 OF 1							



ALL DIMENSIONS IN MILLIMETERS

REVISIONS	Version	Description	Drawn By	Date and Signature	Checked By	Date and Signature	Client Approval By	Date and Signature	<div><div>SAS Water Solutions Pty Ltd 30/9 Salisbury Rd, Castle Hill, NSW 2154 Ph: +61 2 9620 4900 Fax: +61 2 9620 4388 ABN 52 100 723 402</div></div> <div>The information contained in this drawing is subject to Copyright protection. © Copyright SAS Water Solutions Pty Ltd</div>	Client / Project :- FORD CIVIL NEWCASTLE GAS WORKS		Drawing No. :- P18572-200	Revision:- 0
	0	PRELIMINARY	PWS	09/05/2018	PT					Title:- STORMWATER TREATMENT SYSTEM PLOT PLAN			A1
									Client File Name:-		SHEET 1 OF 1		

APPENDIX D – HUNTER WATER TRADE WASTE AGREEMENT



Hunter Water Corporation
ABN 46 228 513 446

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Drive
NEWCASTLE NSW 2300
1300 657 657
(02) 4979 9711 (F)
enquiries@hunterwater.com.au

15/03/2016

Reference: 2007-489/1

JEMENA GAS NETWORKS PTY LTD
Jemana Pty Ltd
140 Tennyson Road
MORTLAKE NSW 2137

Attention: Beatrice Gomez

Dear Madam

RE: TRADE WASTEWATER AGREEMENT

Customer No: 6520110000

Property: 1-3 Chatham Road, HAMILTON

Please find enclosed your Trade Wastewater Agreement to discharge to Hunter Water's sewer under the requirements outlined in Hunter Water's **MAJOR TRADE WASTEWATER GENERAL CONDITIONS** and **TRADE WASTEWATER POLICY**.

Hunter Water's Trade Wastewater Agreements are determined by a risk assessment process using business operation type, water usage, discharge quality and trade waste facility type.

Please sign and witness both copies of the Agreement (**Page 3**) and return one copy only of page 3 to Hunter Water in the enclosed pre-paid envelope for our records. The remaining documentation is for your records.

Please note that in accordance with conditions 3.2 and 4.8 of the General Conditions, even if you have not returned a signed copy of page 3 of the Agreement to Hunter Water, the discharge of trade wastewater from the property substantially in accordance with the Agreement will constitute your acceptance of the Agreement. You will be liable for Hunter Water's fees and charges under the Agreement from that time.

You are required to supply a copy of this Agreement to the occupier and/or tenants of each of the dischargers listed in Schedule 7 for their records as noted in condition 4.9 of the General Conditions. Also attached is a summary sheet of current charges as approved by the Independent Pricing and Regulatory Tribunal (IPART). Please examine these documents carefully.

This Trade Wastewater Agreement constitutes a "Major Agreement" and please note that the establishment fee for a Major Agreement is \$548.81. This charge will be included in your next account. The establishment fee recovers cost of investigations by trade waste inspectors, sampling and analysis costs and administrative costs incurred by the Corporation in setting up your agreement. All ongoing costs related to this Agreement are the responsibility of the property owner.

As the owner of the property you have entered into a Customer Contract with Hunter Water for the provision of drinking water, sewerage and trade wastewater services. The Customer Contract provides the terms under which we provide these services, such as the right to disconnect or restrict the supply of water to your property if you discharge trade wastewater into Hunter Water's sewer system without a Trade Wastewater Agreement. The contract is a legally enforceable document and is a requirement of the Hunter Water Act. Please note that the rights of Hunter Water under this Trade Waste Agreement are in addition to and do not derogate from its statutory rights pursuant to Hunter Water Act 1991.

This Trade Wastewater Agreement includes special conditions for discharge to sewer which limit the discharge of organic material, such as food waste, suspended solids, greases and oils, metals and compounds of Sulphur and Phosphorus which may be additional and in some circumstances override the standards specified in the Trade Wastewater Policy.

It is a requirement of this Agreement that cleanout dockets and a record of cleaning dates for the maintenance of ALL trade wastewater facilities be kept on the premises and made available for inspection. Failure to produce this documentation may result in your discharge being an elevated risk and therefore may result in an increase in sampling and inspection frequency.

Hunter Water may periodically review the Trade wastewater Policy. A copy of the current policy can be obtained from <http://www.hunterwater.com.au> . This may require you to upgrade/modify your control systems and procedures from time to time.

If you would like to discuss any of the conditions contained in the Agreement please do not hesitate to contact the person listed below.

Yours sincerely



Victor Prasad
Manager, Technical Services Group

Attached: 1. Trade Wastewater Agreement
 2. Trade Wastewater Fees and Charges summary sheet

Enquiries: Jill Burke
Tel: (02) 4979-9591
Fax: (02) 4979-9711



**AGREEMENT TO DISCHARGE INDUSTRIAL TRADE WASTEWATER
HUNTER WATER CORPORATION**

and

JEMENA GAS NETWORKS PTY LTD, ("The Customer")

Occupiers trading as

JEMENA GAS NETWORKS PTY LTD, A.B.N. 052 167 405

AGREEMENT CATEGORY: 4

RISK INDEX: 948

CONSENT NO: 2007-489/1

ACCOUNT ID: 6520110000

This Agreement is made on **15/03/2016**

Executed for and on behalf of
Hunter Water Corporation

By

.....
(Signature)

Victor Prasad

Manager, Technical Services Group

In the presence of:

Witness

.....
(Signature)

Jill Burke

Executed for and on behalf of
the Customer:

By

.....
(Signature)

ALAN VAHTLA - SNR PROJECT MGR

(Print name and position of person signing)

who warrants s/he has sufficient authority to execute this consent.

In the presence of:

Witness

.....
(Signature)

CANDICE DESCHANEL

(Print name of witness)

**THIS AGREEMENT IS AN IMPORTANT LEGAL DOCUMENT
PLEASE READ IT AND KEEP IT IN A SAFE PLACE**

If you DO NOT understand any part, **PLEASE CONTACT US** (See SCHEDULE 10)

SCHEDULE 1

TRADE WASTEWATER WHICH MAY BE DISCHARGED

1. Trade wastewater substances

- (a) The Customer may discharge Trade Wastewater into the Sewer in a manner whereby the substance characteristics of the Trade Wastewater are of a type and discharged at a rate, level or concentration equal to or less than that described in this schedule.
- (b) Hunter Water continually monitors the volume and load placed upon our sewerage system and Waste Water Treatment Works. As a result of this, the acceptance standards and conditions are subject to change at Hunter Water's discretion.
- (c) The Customer must not discharge Trade Wastewater into the Sewer in a manner whereby the Trade Wastewater discharged;
 - (i). **contains, possesses or produces a substance characteristic not provided in, or which may be determined as being contrary to that described in this schedule.**
 - (ii). **is at or of a rate, level, or concentration not provided in, or which may be determined as being contrary to, that described in this schedule.**

SUBSTANCE	CONCENTRATION LIMIT (mg/L)
Biochemical Oxygen Demand (BOD)	not to exceed 500mg/L
Non-Filterable Residue (Suspended Solids)	not to exceed 500mg/L
pH	not to be less than 6.5 or greater than 10
Total Oil and grease (TOG)	not to exceed 50mg/L
Chemical Oxygen Demand (COD)	not to exceed 1500mg/L
Total Petroleum Hydrocarbons(TPH)	not to exceed 10mg/L
BTEX - Benzene	not to exceed 0.1mg/L
- Toluene	not to exceed 0.5mg/L
- Ethylbenzene	not to exceed 1mg/L
- Xylenes	not to exceed 1mg/L
Polycyclic Aromatic Hydrocarbons (PAH)	less than detectable limits
Ammonia	not to exceed 50mg/L
Sulphate	not to exceed 1000mg/L
Arsenic	not to exceed 0.1mg/L
Cadmium	not to exceed 0.1mg/L
Chromium	not to exceed 0.1mg/L
Copper	not to exceed 0.1mg/L
Lead	not to exceed 0.1mg/L
Mercury	less than detectable limits

Nickel	not to exceed 0.1mg/L
Zinc	not to exceed 0.1mg/L

CONCENTRATION LIMIT:

The Sample Concentration is to be determined for each of the above substances, and checked against the above Concentration Limit (mg/L) for each sample obtained. Exceeding the Concentration Limit constitutes a Breach.

2. Rate of discharge of Trade Wastewater to Sewer:

- (a) Instantaneous rate of discharge - **not to exceed 10 Litres/Second**
- (b) Maximum daily discharge – not to exceed **864 kilolitres/day**

Note: Hunter Water may require you to decrease or cease discharge during and immediately after wet weather events if the discharge flow rate impacts the sewerage system. Hunter Water shall advise the contact person nominated in this Agreement if this requirement eventuates.

3. Times of discharge

- (a). Days of week when discharge is permitted - **7 days**,
- (b). Hours of the day on day when discharge is permitted – **24 hours**.

SCHEDULE 2

SAMPLING, ANALYSIS, FLOW RATES AND VOLUME DETERMINATION

1. The Customer must provide and make available for the purpose of sampling and analysis;
 - (a) a sampling point located immediately downstream of the equipment described in Schedule 5 prior to the point of connection to the Sewer for instantaneous sampling (grab sampling) and automatic sampling; and
 - (b) access to the sampling point described in (a) during normal working hours to allow installation of sampling machines by Hunter Water and the taking and removal of samples for analysis
 - (c) All sample point locations are to meet Hunter Water's requirements which include accessibility and a safe working environment in which to carry-out the sampling duty. It is the responsibility of the Customer to provide a safe sample point location and to maintain it in such a manner.
2. Hunter Water shall undertake sampling and analysis by Standard Methods for the Examination of Water and Waste Water as published from time to time to determine the following:

Biochemical Oxygen Demand

Non-Filterable Residue (Suspended Solids)

pH

Heavy Metals

Ammonia

Sulphate

Chemical Oxygen Demand (COD)

Total Oil and Grease (TOG)

BTEX

Polycyclic Aromatic Hydrocarbons (PAH)

Total Petroleum Hydrocarbons (TPH)

Any other parameter determined by Hunter Water as being critical for assessing the effluent quality as notified by Hunter Water.

3. Hunter Water may at any time, without prior notice, inspect or take samples for analysis. Hunter Water's officers shall notify the Customer of their presence on the Premises.
4. The Customer and Hunter Water shall monitor the receiving access opening to ensure that volatile gases do not exceed 10 % of the lower explosive limit (LEL).
5. The volume of Trade Wastewater discharged into the Sewer must be obtained from the reading of the total flow on the Customer's flow-metering system.

The rate of Trade Wastewater discharged is to be obtained by the reading of the instantaneous flow rate indicator on the Customer's flow-metering system, or from any chart recorder interfaced to the Customer's flow metering system.

The flow metering system is to be installed and maintained by the Customer at the Customer's expense, including calibration at least annually by an approved person or company. A copy of the calibration certificate is to be provided to Hunter Water.

If the Customer's flow-metering system fails to record data for any period or may not be recording data accurately for any reason, Hunter Water is to be advised in writing by the Customer within 7 days of any such failure becoming known by the Customer.

If in Hunter Water's opinion the Customer's flow-metering system fails to record data for any period or may not be recording data accurately for any reason, Hunter Water may calculate an Estimate as follows:

Average of the waste discharged, registered for the four weeks before and/or after the failure to record.

The Customer may request a review of the Estimate. It is the Customer's responsibility, at its own cost, to obtain and provide to Hunter Water, evidence in support of any such request. Hunter Water may refuse to undertake a review of its Estimate in the event that any amount payable by the Customer to Hunter Water under this Agreement is unpaid, including any fees charged on the basis of the Estimate. Hunter Water may undertake its own investigations of any evidence required in order to review its Estimate. Any costs incurred by Hunter Water in undertaking a review of its Estimate are a debt due and payable by the Customer to Hunter Water on demand. Hunter Water may at its absolute discretion issue an adjustment of its Estimate, including any adjustment of the fees payable by the Customer. Any such adjustment may increase or decrease the Estimate and the associated fees payable by the Customer.

6. A discharge factor of Trade Wastewater from the Premises to the Sewer will be calculated by total meter flow to sewer.
7. The frequency of monitoring the analytes specified in point 2 will be:

12 times per annum

The frequency of sampling is based upon the risk index as specified in the customer details on the front page of the Agreement.

SCHEDULE 3

PAYMENTS

The Customer shall pay such amounts as Hunter Water may from time to time determine for the discharge of Trade Wastewater to the Sewer. These costs will be levied on the Customer with the normal water sewer account. Such amounts based on the fees for allowable concentration of the discharge to Sewer as determined by The Independent Pricing and Regulatory Tribunal of NSW (IPART). These fees and allowable concentrations are published in the HWC Trade Wastewater Policy and Management System and include:

1. High Strength BOD/NFR fees calculated on the discharge to Sewer, based on the average discharge strength when the concentration is greater than 350mg/L and determined from samples taken in accordance with Schedule 2,
2. An annual Agreement fee,
3. Fees based on the number of samples collected and analysed by Hunter Water in accordance with Schedule 2 and for sampling and analysis carried out by Hunter Water following a Breach of the Agreement,
4. Inspections fee for time taken by Hunter Water's officers or agents for inspections,
5. Costs incurred by Hunter Water associated with a Breach of this Agreement,

Payment shall be made to Hunter Water on or before the expiration of twenty one (21) days of service of account,

The Customer shall pay interest on any overdue amount at the rate which Hunter Water charges its customers from time to time.

The charges are effective from **15/03/2016** and will continue until otherwise advised by Hunter Water.

CHARGES FOR TRADE WASTEWATER DISCHARGE

(a) Mass Discharged:

For each substance, the Mass Discharged is calculated by multiplying the average sample concentration by the Trade Wastewater discharge for that billing period.

(b) Chargeable Trade wastewater Mass:

- (i) For the following substances, the Chargeable Trade wastewater Mass is equal to the Mass Discharged:
 - BOD/NFR
 - Heavy Metals
 - Phosphorus
 - Sulphate

(c) Charges Based on Estimate:

The Customer agrees to be bound by any Estimate calculated by Hunter Water unless and until Hunter Water issues an adjustment of such Estimate in accordance with Schedule 2 of this Agreement. The use of any Estimate by Hunter Water in determining the fees payable by the Customer under this Agreement will not affect the Customer's obligation to pay such amounts as Hunter Water may from time to time determine for the discharge of Trade Wastewater to the Sewer.

SCHEDULE 4

ADDITIONAL REQUIREMENTS

Please see clause 9 of General Requirements.

Site Containment Backflow Prevention:

NON COMPLIANT:

It has been identified that the Premises **does not comply** with Hunter Water's requirements for site containment backflow prevention. The Customer must install at their own cost a site containment backflow prevention device that meets the hazard rating for the use and type of property. The device shall be located at the Premises boundary at the outlet of the water meter on domestic services and after the inlet valve on all fire services. The device must be installed and maintained in accordance with the requirements of AS/NZS 3500 and AS/NZS 2845.

Clause 6.3 of the Customer Contract allows Hunter Water to disconnect or restrict the supply of water to the Premises upon failing to meet the direction to install a backflow prevention device.

Clause 8.5 of the Customer Contract allows Hunter Water to remedy any non-compliant or defective works at the owners cost.

SCHEDULE 5

APPARATUS, PLANT AND EQUIPMENT

PRE-TREATMENT FACILITIES ON SITE:	It is a requirement of this Agreement that the last two cleanout docketts and a record of cleaning dates for the maintenance of ALL Trade Wastewater facilities be kept on the Premises and made available for inspection. Failure to produce this documentation may result in your discharge being an elevated risk and therefore may result in an increase in sampling and inspection frequency. (See clause 13.3 of General Requirements).
--	---

Groundwater Treatment Plant 1			
Quantity	Facility	Size	Unit
1	Break Tank	1,000	Litres (L)
1	Effluent Pump	2	Litres /second (L/s)
2	Activated Carbon Filtration Vessel	1	Cubic metre

Groundwater Treatment Plant 2			
Quantity	Facility	Size	Unit
1	Silt Trap (“Siltbuster” 20m3/hr)	5,000	Litre (L)
1	Break Tank	10,000	Litres (L)
1	Effluent Pump	7	Litres /second (L/s)
3	Activated Carbon Filtration Vessels	1	Cubic metre

SCHEDULE 6

SPECIAL CONDITIONS

PROHIBITED DISCHARGES

The Customer shall not discharge prohibited substances into the Sewer unless otherwise allowed in accordance with the acceptance standards detailed in Schedule 2. Listed below is an extraction from the prohibited substances list from the Trade Wastewater Policy.

- (a) Any substance, which would cause an explosion or fire in any of Hunter Water's works,
- (b) Discrete oil,
- (c) Any infectious or contagious substance, whether solid or liquid which has not been disinfected,
- (d) Any toxic substance,
- (e) Any substance, whether or not a solvent, an enzyme, a mutant bacteria or an odour control agent, which could materially affect the operation of a grease arrestor or other device of equipment used for the treatment of wastewater,
- (f) Any substance which is carcinogenic or mutagenic and could materially affect the environment,
- (g) Any animal matter, wool, hair, fleshings, feathers, dust, ashes, soil, rubbish, grease, garbage, dead animal, vegetable or fruit parings, wood, rags, synthetic plastics, steam or any solid matter,
- (h) Any matter which, in the opinion of Hunter Water: -
 - (i) Is injurious, or liable to form compounds injurious to, any part of Hunter Water's works or to employees of Hunter Water engaged in the operation or maintenance of the works; or
 - (ii) Will impair or be liable to impair the operations or functions of Hunter Water and which Hunter Water has, by notice in writing, served personally or by post, requiring the Customer to cease or refrain from discharging,
- (i) Any other substance which may, within the meaning of the Protection of the Environment Operations Act 1997, cause pollution of any water,
- (j) Any other substance which the Corporation may declare to be prohibited by notice published in a newspaper circulating generally in the area covered by the Operating Licence.

UNINTENDED DISCHARGES

- (a). For the purpose of avoiding unintended discharges to the Sewer or the stormwater drainage system, all matter and substances on the Premises must be processed, handled, moved and stored in a proper and efficient manner.
- (b). Any substance on the Premises which, if discharged to the Sewer, may pose a danger to the environment, the Sewer or workers at a waste water treatment plant or may harm any sewage treatment process must be handled, moved and stored in areas where leaks, spillages or overflows cannot drain by gravity or by automated or other mechanical means to the Sewer or the stormwater drainage system.

REPORTING CONDITIONS

1. Immediate Reporting:

The Customer must report by telephone to the Hunter Water Corporation Contact Centre (1300 657 000) and by Facsimile Transmission to the Manager, Technical Services Group

(Fax 49-799 711) any event that causes or is likely to cause an exceedence of Agreement conditions.

2. Monthly Reporting:

The Customer shall, on a monthly basis submit to Hunter Water a flow meter report containing Trade Wastewater discharged to the Sewer. The report is to include daily pumped flows and monthly totals.

3. General Reporting Format:

Data compiled, collected or recorded during the currency of this Agreement must be identified by the name of the Customer and the location of the discharge point(s). The following reference number must be reported in all correspondence to Hunter Water, regarding the reporting of data compiled, collected or recorded as required by the Agreement.

Agreement Ref Number: 2007-489/1

PROVISION OF SAFE ACCESS

The Customer shall provide safe access to Hunter Water employees visiting the Premises. In the event that unsafe conditions are identified the Customer must take reasonable steps to correct unsafe conditions and create safe access.

SCHEDULE 7

1. Premises for which Consent is granted **1-3 Chatham Road , HAMILTON**
2. Industrial or other commercial activities for which Consent granted: **Miscellaneous**
3. The date for purposes of clause 3.1 is **15/03/2016**
4. The period for purposes of clause 3.2 is for **17** months
5. The receiving Treatment Plant is **Burwood Beach WWTW**
6. Business activities (generating trade wastewater) undertaken at premises:
* **JEMENA GAS NETWORKS PTY LTD**

SCHEDULE 8

NOTICES AND COMMUNICATION ADDRESSES

HUNTER WATER: PO BOX 5171
HRMC NSW 2310

TEL: 1300 657 657
FAX: (02) 4979 9711

CUSTOMER: JEMENA GAS NETWORKS PTY LTD
Jemana Pty Ltd
140 Tennyson Road
MORTLAKE NSW 2137

TEL: **02 8245 0300**
FAX:

SCHEDULE 9

AUTHORISED OFFICERS

HUNTER WATER: MANAGER
TECHNICAL SERVICES GROUP
36 HONEYSUCKLE DRIVE
NEWCASTLE NSW 2300

TEL: (02) 4979 9679
FAX: (02) 4979 9711
A.H: 1300 657 657

Postal Address: PO BOX 5171
HRMC NSW 2310

Email: victor.prasad@hunterwater.com.au

SCHEDULE 10

NOMINATED REPRESENTATIVES

HUNTER WATER: TRADE WASTE OFFICERS
36 HONEYSUCKLE DRIVE
NEWCASTLE NSW 2300

TEL: (02) 4979 9589
TEL: (02) 4979 9596
FAX: (02) 4979 9711

CUSTOMER: **Beatrice Gomez**

TEL: **02 8245 0300**
FAX:

Email: BGomez@jbsg.com.au

General conditions

Major Trade Wastewater Agreement

RECITALS:

Under its Operating Licence, Hunter Water provides sewerage services and treats and disposes of Trade Wastewater.

Hunter Water is granted by the Department of Environment and Climate Change, licences subject to conditions to discharge pollutants. A change to a licence condition may require that variations be made to consents granted by Hunter Water.

In the conduct of its business operations, Hunter Water must comply with its obligations, duties and responsibilities under the Act, its Operating Licence, the Protection of the Environment Administration Act 1991, the Protection of the Environment Operations Act 1997 and the Protection of the Environment Operations (General) Regulation 1998.

The Customer requests that Hunter Water grant consent to the Customer for the discharge of Trade Wastewater from the Premises to the Sewer.

Section 37 of the Act enables Hunter Water to enter into agreements with customers proposing to discharge Trade Wastewater. Under its Operating Licence, Hunter Water is entitled to impose terms and conditions under those agreements as may be negotiated.

Section 31 of the Act provides that it is an offence to discharge any substance into Hunter Water's works except with the written agreement of Hunter Water.

Section 3.2.4 of the Customer Contract allows the discharge of Trade Wastewater to Hunter Water only with written permission of Hunter Water.

Hunter Water grants to the Customer consent to discharge Trade Wastewater subject to the terms and conditions specified in this Agreement and the Customer accepts the consent and agrees to be bound by the terms and conditions of this Agreement and Hunter Water's Trade Wastewater Policy:

1. DEFINITIONS AND INTERPRETATION

1.1 In this Agreement, unless the contrary intention appears;

"Acceptance Standards" means Hunter Water's published concentration limits for certain substances in Trade Wastewater.

"Act" means the Hunter Water Act 1991 (NSW);

"Agreement" means this agreement together with its attached schedules and appendices and the Trade Wastewater Policy. Any definitions or standards referred to in this Agreement but not contained in it are deemed to form a part of this Agreement with necessary changes being made to accommodate their inclusion.

"Authorised Officer" means, with respect to Hunter Water, the person from time to time holding the position pertained in Schedule 9 or such other person or position as may be nominated by Hunter Water from time to time;

"Breach" means any contravention of or non-compliance with a term, condition or provision of this Agreement or the Act;

"Chargeable Trade Wastewater Mass" means the mass of a pollutant subject to Quality.

"Composite Sample" means a sample of Trade Wastewater obtained by combining equal volumes at either equal time or flow intervals.

"Customer" means the party or parties identified as the Customer on the first page of this Agreement.

"Customer Contract" means the Customer Contact made pursuant to Section 36 of the Act.

"Daily Mass" means the mass of a substance discharged during a 24 hour period.

"Standard Mass Charging Rate" means the charge per kilogram for substances as defined in schedule 3.

"Default Notice" means a notice issued in accordance with Clause 8.1.

"Department of Environment and Climate Change" means the authority established in September 2003 that consolidated the environment Protection Authority, National Parks and Wildlife Service, Botanic Garden Trust and Resource NSW.

"Domestic Concentration" means the concentration of a pollutant deemed by Hunter Water to be equivalent to that found in Domestic wastewater.

"Domestic wastewater" means water which has in it human faecal matter, urine or refuse of any type produced in, and which is permitted to be discharged to a Hunter Water sewer from, any premises used exclusively for residential purposes.

"Equivalent Domestic Mass" means the mass of a substance that would be expected in the Trade Wastewater if it were at Domestic Concentration.

"Estimate" means an estimate of data from the Customer's flow-metering system by Hunter Water in accordance with Schedule 2.

"Hunter Water" means Hunter Water Corporation;

"Long Term Average Daily Mass" means, for each pollutant, that figure listed in Schedule 1 and used to determine Critical Mass Charges as described in Schedule 3.

"Lower Explosive Limit" means the minimum concentration of flammable and/or explosive substances that would result in a fire or explosion.

"Mass Discharged" means the mass of a pollutant discharged on a sample day and is measured by multiplying the Composite Sample concentration by the Trade Wastewater discharge for that sample day.

"Maximum Daily Mass" means the greatest mass of a substance permitted for discharge within a 24 hour period.

"Premises" means the land, plant and buildings described and specified in paragraph 1 of Schedule 7 on or in which the Customer carries on industrial or other commercial activities specified in paragraph 2 of Schedule 7.

"Regulator" means any statutory authority which may grant permission, authority or licence to Hunter Water to operate the Sewer or treat or dispose of sewage treatment by-products.

"Residual Products" means biosolids, reuse water or such other product intended for reuse as may be developed by Hunter Water from time to time.

"Risk Index" means a ranking applied to the Agreement by Hunter Water to describe the relative risk of accepting the Trade Wastewater. Determination of the risk index will be based on the methodology determined from time to time by Hunter Water to take into account particular circumstances. The risk index is used to determine, amongst other things, the category of discharger, the number of inspections to be performed by Hunter Water and the annual agreement fee.

"Standard Methods" means Standard Methods for the Examination of Water and Waste Water, current edition, as published jointly by American Public Health Association, American Water Works Association, and Water Pollution Control Federation.

"Sewer" means the sewerage service of Hunter Water, including the sewage treatment plant, discharge to which is facilitated by a discharge point situated on the Premises and specified in paragraph 3 of Schedule 7.

"Significant Breach" means any breach of a nature outlined at Clause 14.3. Such breaches may result in immediate suspension or termination of the agreement.

“Trade Waste Officer” means an officer of Hunter Water who is authorised to enter land or buildings for purposes of carrying out his or her duties in relation to Hunter Water’s trade wastewater service.

“Trade Wastewater Policy” means Hunter Water’s Policy detailing the conditions under which Hunter Water will agree to accept Trade Wastewater to the Sewer and to recover the cost associated with the acceptance of Trade Wastewater by Hunter Water.

“Trade Wastewater” means any liquid and any substance in it that is produced in an industrial or commercial activity at the Premises and discharged into the Sewer but does not include Domestic wastewater.

“Trade wastewater residue” means any substance separated and retained from Trade Wastewater being discharged into the Sewer.

1.1 In this Agreement, unless the contrary intention appears:

- (a) A reference to an Act or any delegated legislation or instrument made under an Act includes any other Act delegated legislation or instrument as may amend or replace any of them.
- (b) A reference to a word or expression
 - (i) in the singular form includes a reference to the word or expression in the plural form; and
 - (ii) in the plural form includes a reference to the word or expression in the singular form.
- (c) A reference to a party or a natural person includes a reference to a corporation.
- (d) A word or expression that indicates one or more particular genders is taken to indicate every other gender.
- (e) Headings to clauses and paragraphs are included in this Agreement to assist understanding of its terms and conditions but are not intended to affect the meaning or application of any term or condition.
- (f) A reference to a clause, schedule or appendix is a reference to a clause of or schedule or appendix to this Agreement and any such schedule or appendix is a part of this Agreement.

1.2 Remedies available to the parties under this Agreement;

- (a) are cumulative; and
- (b) do not prejudice or affect any other remedy available to the parties.

1.3 No rule of construction applies to the disadvantage of a party because that party was responsible for the preparation of this Agreement or any part of it.

2. APPLICATION OF CERTAIN STATUTES AND LAWS

2.1 This Agreement is made under and is subject to the provisions of the Act.

2.2 This Agreement is governed by and will be performed according to the law applicable in the State of New South Wales.

2.3 Subject to the terms and conditions of this Agreement the Customer;

- (a) has lawful authority to dispose of Trade Wastewater for the purposes of;
 - (i) Section 115 of the Protection of the Environment Operations Act 1997; and
 - (ii) Section 31 of the Act; and
- (b) is exempt from the provisions of Section 120 of the Protection of the Environment Operations Act 1997 by virtue of the agreement granted in clause 4.1 and, Clause 55 of the Protection of the Environment Operations (General) Regulation 1998.

3. COMMENCEMENT AND TERM OF AGREEMENT

3.1 This Agreement commences on the date specified in paragraph 3 of Schedule 7.

3.2 The Customer may accept this Agreement by:

- (a) signing and returning a copy of this Agreement to Hunter Water;
- (b) giving verbal or written notice to Hunter Water that this Agreement is accepted; or
- (c) commencing the discharge of Trade Wastewater from the Premises to the Sewer substantially in accordance with this Agreement.

3.3 This Agreement and the consent granted under it will, unless terminated or renewed in accordance with this Agreement, continue for the period specified in paragraph 4 of Schedule 7.

4. DISCHARGE OF TRADE WASTEWATER INTO SEWER

4.1 The Customer may discharge Trade Wastewater from the Premises into the Sewer in accordance with this Agreement.

4.2 The Customer must not discharge Trade Wastewater from the Premises into the Sewer contrary to the provisions of Schedule 1 and Schedule 4.

4.3 The Customer must not discharge Prohibited Substances as set out in Schedule 6 into the Sewer unless otherwise allowed in this Agreement.

4.4 The Customer must, at its own cost, treat the Trade Wastewater so as to produce an effluent of acceptable quality in accordance with the requirement shown the Trade Wastewater Policy except where shown in Schedule 1.

4.5 The Customer shall not, without prior approval of Hunter Water vary any process of discharge of Trade Wastewater or alter any treatment process at the Premises that will affect or is likely to affect the quantity or quality of Trade Wastewater discharged into the Sewer.

4.6 The Customer indemnifies Hunter Water against all damages, losses, costs or expenses suffered or incurred by Hunter Water, caused by any unauthorised discharge from the Premises in respect of:

- (a) injury (including death) or harm to any person; or
- (b) damage to property; or
- (c) contamination of residual products; or
- (d) material harm to any sewage treatment process,

except to the extent to which the damages, losses, costs or expenses (as the case may be) were caused by either the negligent or wilful act or omission of Hunter Water or a breach of this Agreement by Hunter Water.

4.7 The Customer must take all precautions reasonably practicable to ensure that no person other than a person acting for or on behalf of or with the consent of the Customer discharges any matter from the Premises into the Sewer.

4.8 For the purposes of this Agreement, every discharge of matter from the Premises into the Sewer will be taken to have been a discharge by the Customer.

4.9 A copy of this Agreement must be kept on the Premises at all times for inspection.

5. CHARGES

5.1 The Customer must pay to Hunter Water, charges with respect to Trade Wastewater discharged to the Sewer and the administration of this Agreement within the time and in the manner specified in, Schedule 3.

- 5.2 The Customer shall pay Hunter Water's costs associated with any Breach.
- 5.3 Hunter Water may vary the basis of charges or the charging rates in Schedule 3;
- (a) as and when determined by the Independent Pricing and Regulatory Tribunal of New South Wales (IPART); or
 - (b) by written notice to the Customer.

6. INSPECTIONS

- 6.1 A Trade Waste Officer may enter the Premises at any time;
- (a) for purpose of inspecting whether the activities of the Customer are being conducted in accordance with this Agreement; or
 - (b) for the purposes described in section 20 of the Act; or
 - (c) in exercising any right or function conferred on Hunter Water under this Agreement.
- 6.2 This clause does not limit Hunter Water's statutory powers of entry.
- 6.3 When exercising rights under clause 6.1;
- (a) a Trade Waste Officer must not cause any delay or inconvenience to the efficient conduct of business activities by the Customer which could be reasonably avoided; and
 - (b) except for any relevant safety precautions, a Trade Waste Officer must not be impeded or delayed by any person on the Premises.
- 6.4 Any costs incurred by Hunter Water in exercising its rights under clause 6.1 are a debt payable by the Customer to Hunter Water on demand.

7. INQUIRIES

- 7.1 Hunter Water may convene and determine the terms of reference of a joint inquiry about the circumstances relating to an incident which may have caused a Breach.
- 7.2 An inquiry under clause 7.1 is to be conducted informally and without legal representation for purposes of gathering information about an incident directly from any person who may be expected to know, from his or her own observations, about the circumstances relating to the incident.
- 7.3 An inquiry under clause 7.1 may be conducted irrespective of whether the incident, the subject of the inquiry, is also the subject of a Default Notice.
- 7.4 Before conducting an inquiry under clause 7.1, the Customer and Hunter Water may agree about what action, if any (except any action pursuant to a statutory obligation), may be taken with respect to any information which may be gathered during the inquiry.

8. DEFAULT PROCEDURES

- 8.1 If, in the opinion of Hunter Water, the Customer commits, causes or allows to a Breach occur, Hunter Water may issue a Default Notice to the Customer.
- 8.2 A Default Notice must;
- (a) provide any relevant particular of the Breach alleged by Hunter Water, including any particular known to Hunter Water that may assist the Customer to ascertain the alleged Breach; and
 - (b) specify that the Customer must provide a response in writing to Hunter Water within 7 days of receipt of the notice.
- 8.3 A Default Notice is not invalid merely because it does not provide a particular that may assist the Customer to ascertain the alleged Breach.

- 8.4 Any supply to the Customer by Hunter Water of particulars under clause 8.7 (a) is taken, for purposes of clause 8.5, to be a Default Notice under clause 8.1.
- 8.5 The Customer must supply to Hunter Water a written response to a Default Notice within 7 days of receipt of the Default Notice which must;
- (a) request further particulars of the alleged Breach; or
 - (b) describe or explain the circumstances causing;
 - (i) the event which appeared to Hunter Water to be a Breach; or
 - (ii) the Breach to occur; and
 - (c) describe any action taken with respect to the alleged Breach; and
 - (d) provide a plan of action to be taken by the Customer to avoid the occurrence of any incident similar to the alleged Breach; or
 - (e) explain the reasons of the Customer for disputing the alleged Breach.
- 8.6 The Customer may make one request only for particulars under clause 8.5(a) with respect to a Default Notice.
- 8.7 When the Customer responds in writing to Hunter Water in accordance with clause 8.5, Hunter Water must within 7 days of receipt of that response either;
- (a) with respect to clause 8.5(a), provide in writing to the Customer any further particulars that it may be able to provide in which case the Customer shall be allowed a further 7 days from receipt of those particulars to respond as required by clause 8.5(b).
 - (b) specify to what extent it accepts, rejects or disagrees with the response under 8.5(b) and provide details of any action it proposes to take (including any special requirements it may impose) to deal with the Breach
- 8.8 The issue by Hunter Water of a Default Notice is without prejudice to any right or power Hunter Water may have pursuant to this Agreement or conferred on it by statute or statutory rule.
- 8.9 Any costs incurred by Hunter Water in exercising its rights and obligations under clause 8 are a debt payable by the Customer to Hunter Water on demand.

9. DILIGENCE PROGRAM

- 9.1 Within 6 months of the making of this Agreement, the Customer must give a notice to Hunter Water specifying a current diligence program.
- 9.2 For the purposes of clause 9.1, a diligence program includes a plan whereby the Customer demonstrates that the management of the Customer is exercising reasonable care in planning and taking appropriate action to prevent or minimise the effects of any incident which may constitute a Breach.

10. SUSPENSION OR TERMINATION OF CONSENT TO DISCHARGE TRADE WASTEWATER

- 10.1 Hunter Water may suspend or cancel the consent granted in clause 4.1 if;
- (a) the Customer does not comply with clause 4, 5, 8.5, 9.1, 11.1, 11.2, 13 or notice of the suspension is given to the Customer; or
 - (b) at anytime in its opinion the Customer has repeatedly or substantially breached the conditions of this Agreement; or
 - (c) Hunter Water is for any reason specified in clause 10.2 unable to accept for treatment Trade Wastewater that may be discharged by the Customer.

- 10.2 Hunter Water may by a notice given to the Customer, suspend the consent granted in clause 4.1 if, in the reasonable opinion of Hunter Water;
- (a) an emergency prevents the Sewer from accepting any or certain specified categories of Trade Wastewater that may be discharged by the Customer; or
 - (b) there has occurred an event which could have an adverse effect on any employee or agent of or contractor to Hunter Water or the Sewer, including any biological process,
- whether the emergency or event is caused by fire, storm, tempest, flood, malicious damage, act of war, civil disobedience, explosion, earthquake or an act or omission of an employee or agent of or contractor to Hunter Water or an unlawful discharge of matter into the Sewer, or some other cause.
- 10.3 The period of any notice of suspension given under clause 10.2 will be no shorter than any period which, in the opinion of Hunter Water, the circumstances dictate.
- 10.4 The Customer must comply with any notice under clause 10.1 or 10.2 subject only to any delay that may be required to safeguard the health or life of any person.
- 10.5 Any suspension under clause 10.1 or 10.2 must not be for a period longer than, in the opinion of Hunter Water, the circumstances dictate.
- 10.6 If the Customer does not cease discharging trade wastewater in accordance with a notice given under clause 10.1 or 10.2 and Hunter Water is of the opinion that the Customer is not taking appropriate measures to stop the discharge, a Trade Waste Officer may, with such other persons as he or she may think necessary, enter the Premises and take such measures as he or she may think necessary to stop the discharge.
- 10.7 A suspension under clause 10.1 or 10.2 or any action that may be taken in accordance with clause 10.6 does not give rise to any remedy to the Customer against Hunter Water for or in respect of the suspension or action.
- 10.8 Any costs incurred by Hunter Water with regard to taking action under clause 10.1(a), 10.1(b) or 10.6 are a debt payable to Hunter Water by the Customer on demand made by Hunter Water.
- 10.9 Hunter Water may suspend the consent granted in clause 4.1 if; the discharge of trade wastewater by the Customer in accordance with the consent granted under clause 4.1, by itself or in conjunction with the discharges of other persons is likely in the opinion of Hunter Water to cause Hunter Water to contravene any legislation, permission, authority or licence granted by a Regulator or any other regulatory authority.
- 10.10 Any suspension under clause 10.9 must be terminated as soon as Hunter Water is reasonably satisfied that the conditions giving rise to the suspension no longer exist.
- 10.11 If the Customer and Hunter Water cannot agree in accordance with clause 10.10 they will initiate and attend discussions with the Regulator to resolve any relevant matter.
- 10.12 If, after discussions under clause 10.11 the Customer and Hunter Water fail to agree in accordance with clause 11.10 the consent granted in clause 4.1 may be terminated by Hunter Water.
- 10.13 Without limitation of the effect of any other clause in this Agreement, Hunter Water may terminate or suspend the Customer's permission to discharge Trade Wastewater immediately by written notice to the Customer if in the opinion of Hunter Water the Customer's discharge of Trade Wastewater is in Breach of this Agreement and is likely to cause;
- (a) Hunter Water's contravention of the condition of any licence issued to it by the Department of Environment and Climate Change;
 - (b) the failure to meet a product specification of any of Hunter Water's Residual Products; or

- (c) Hunter Water to breach or fail to comply with any legislation.

- 10.14 A suspension under clause 10.9 or 10.13 in accordance with the terms of this Agreement or a termination under clause 10.12 or 10.13 in accordance with the terms of this Agreement does not give rise to any remedy to the Customer against Hunter Water for or in respect of the suspension or termination.
- 10.15 Without limitation of the effect on any other clause in this Agreement, Hunter Water may terminate or suspend the Customer's consent to discharge Trade Wastewater immediately by written notice served on the Customer in accordance with section 31a of the Act on the happening of any one of the following events;
- (a) the Customer fails to pay to Hunter Water any amount due and payable under this Agreement within twenty-one days of the due date for payment and such payment is not made within fourteen days of a written request from Hunter Water to do so; or
 - (b) the Customer is in Breach and is unable or unwilling to remedy the Breach as required by Hunter Water.
- 10.16 The Customer acknowledges and agrees that if following the termination of the Agreement it continues to discharge Trade Wastewater into the Sewer; a Trade Waste Officer may enter the Premises and take all reasonable necessary steps to stop the Customer's continued discharge of Trade Wastewater to the Sewer. The right of entry conferred by this clause is in addition to, and not in substitution for, any power of entry conferred on Hunter Water by this Agreement and the Act.
- 10.17 In the event of any Breach by the Customer, Hunter Water may disconnect or restrict the supply of water to the Premises in accordance with clause 6.3 of the Customer Contract.

11. SUPPLY OF INFORMATION

- 11.1 Any information supplied by the Customer to Hunter Water for the purposes of making this Agreement or for any purpose connected with this Agreement must as far as reasonably possible be a true and complete disclosure by the Customer for the purposes of enabling Hunter Water to;
- (a) determine whether to grant the consent in clause 4.1; and
 - (b) determine whether there has been any Breach.
- 11.2 The Customer must not, in or in connection with a document supplied to Hunter Water for the purpose of making this Agreement or for any purpose in connection with this Agreement, furnish information which is false or misleading in a material particular with regard to the Trade Wastewater to be discharged or discharged from the Premises to the Sewer.
- 11.3 Hunter Water must not disclose any confidential information obtained in connection with the administration or execution of this Agreement, unless that disclosure is made;
- (a) with the consent in writing of the Customer; or
 - (b) with other lawful excuse.

12. SAMPLING, ETC.

- 12.1 For the purposes of this Agreement, Schedules 1, 2 and 3 specify sampling and analysis criteria, flow rates and volume determinations of Trade Wastewater to be discharged or discharged under clause 4.1.
- 12.2 A Trade Waste Officer may take as many samples of Trade Wastewater at any point in any production process or storage facility or at any other point on the Premises as he or she thinks fit.
- 12.3 The Customer must comply with the provisions of Schedules 1, 2 and 3.

13. APPARATUS, PLANT & EQUIPMENT for RECORDING or TREATING TRADE WASTEWATER

- 13.1 The Customer must, at its own cost, provide, install, operate and maintain in an effective and efficient working order, the apparatus, plant and equipment described in Schedule 5 for the purposes of regulating, treating, determining and measuring the quality, quantity and rate of discharge of Trade Wastewater under this Agreement.
- 13.2 Hunter Water may require the Customer to use its discretion to formulate and take such additional actions as may be appropriate to achieve the objects which, in the opinion of Hunter Water, are necessary for the Customer to regulate, treat, determine or measure the discharge of Trade Wastewater under this Agreement.
- 13.3 The Customer must maintain records of particulars and dates of cleaning and maintaining all apparatus, plant and equipment described in Schedule 5 and particulars, dates and method of disposal of Trade Wastewater residue from such apparatus, plant and equipment. The Customer must provide copies of those records to Hunter Water upon request.
- 13.4 The Customer acknowledges that Hunter Water does not approve or warrant that any apparatus, plant or equipment used by the Customer is sufficient for the purposes of processing, treating or measuring the discharge of Trade Wastewater under this Agreement.

14. VARIATION AND RENEWAL OF AGREEMENT

- 14.1 Before varying, substituting or adding any process conducted or to be conducted on the Premises that may cause the volume, rate or quality of Trade Wastewater discharged to change from that agreed under Schedule 1 and Schedule 4, the Customer shall give Hunter Water not less than 14 days written notice of its intention. Any variation, substitution or addition shall only be conducted after receipt of written approval to same and subject to any conditions (including any requirement to vary the terms of this Agreement) that Hunter Water may impose.
- 14.2 Hunter Water may amend or vary the terms and conditions of this Agreement after notifying the Customer of its intention to do so.
- 14.3 Hunter Water may vary the terms of this Agreement where:
- (a) Hunter Water alleges a single Significant Breach or three Breaches, of the same nature, to have occurred in a six month period; or
 - (b) if, in the opinion of Hunter Water, a substantial or material part of any plan of action under clause 8.5(d) may not be completed for a period exceeding 90 days; or
 - (c) when the Customer gives Hunter Water notice under clause 14.1

For the purposes of this clause and without limitation the following circumstances shall be regarded as being a single Significant Breach:

- i. an activity or event that could adversely affect; the health and safety of any employee, agent or contractor to Hunter Water, the integrity of Hunter Water assets or the viability of any of Hunter Water's treatment processes or products; or
- ii. failure to install pre-treatment; or
- iii. by-pass pre-treatment and/or installation of equipment that facilitates by-pass of pre-treatment; or
- iv. flow-meter turning off or bypassed; or
- v. failure to install, operate and maintain flow-meter in accordance with this Agreement; or
- vi. failure to submit flow-meter reports in accordance with this Agreement.

14.4 A renewal of this Agreement may be initiated by the Customer:

- (a) not less than two months before the date of expiration of this Agreement, and
- (b) not more than six months before the date of expiration of this Agreement.

14.5 If this Agreement remains current immediately prior to the expiration of the term detailed in 3.2, or any subsequent terms renewed in accordance with this clause, and:

- (a) the Customer has not given notice in accordance with Clause 18.1 of this Agreement and;
- (b) Hunter Water has not given to the Customer at least 30 days notice prior to the expiration of this Agreement of its intention to permit the Agreement to expire in accordance with Clause 3.3,

then this Agreement and the consent granted under it shall be deemed to be renewed immediately following its expiration for a further period of 6 months.

14.6 Any amended schedules that Hunter Water prepares in response to a variation or renewal will be taken to be incorporated into this Agreement;

- (a) on execution by the Customer; or
- (b) after 14 days of receipt by the customer of the notice of the variation or renewal.

15. DISPOSAL OF TRADE WASTEWATER RESIDUE

The Customer must not dispose of any Trade Wastewater residue, except in accordance with the requirements of the Department of Environment and Climate Change.

16. ENTIRE AGREEMENT

- 16.1 This Agreement constitutes the entire agreement between the parties in relation to its subject matter.
- 16.2 No understanding, arrangement or provision not expressly set out in this Agreement will bind the parties. Accordingly all correspondence, negotiations and other communications between the parties in relation to the subject matter of this Agreement which precede this Agreement are superseded by and merged in it.
- 16.3 Clauses 16.1 and 16.2 do not prejudice the ability of the parties to vary or amend this Agreement in accordance with the provisions of this Agreement or by a further Agreement in writing.

17. NO TRANSFER OR ASSIGNMENT

The Customer cannot transfer or assign the consent granted in clause 4.1 nor any other right or obligation the Customer has or may have under this Agreement without the prior consent in writing of Hunter Water.

18. TERMINATION OF AGREEMENT BY CUSTOMER

- 18.1 Termination of this Agreement may be effected by the Customer upon the giving of at least 30 days notice in writing to Hunter Water. The notice must state the date on which this Agreement terminates.
- 18.2 The Customer is bound by the provisions of this Agreement with regard to any discharge of Trade Wastewater into the Sewer from the Premises, including the payment of charges under clause 5.1, from the commencement of this Agreement until its termination.
- 18.3 Notwithstanding provisions contained elsewhere in this Agreement the parties may terminate this Agreement in writing by mutual agreement provided the parties enter into a further Trade Wastewater Agreement immediately following termination of this Agreement.

19. NOTICES AND COMMUNICATIONS

- 19.1 The Customer shall, comply with the reporting conditions as described in Schedule 6.
- 19.2 A notice or communication under this Agreement must be in writing.
- 19.3 For purposes of clause 19.2, a notice or communication may;
- (a) be left at the address of the addressee; or
 - (b) be sent by prepaid ordinary post to the address of the addressee; or
 - (c) sent by facsimile transmission to the facsimile number of the addressee; or
 - (d) sent by email to the email address of the addressee specified in Schedule 8 or such other address as may be notified by the addressee to the other party.
- 19.4 Unless a later time is specified in it, a notice or communication takes effect from the time it is received.
- 19.5 Unless the contrary is shown, for purposes of clause 19.4, if a notice or communication is;
- (a) a letter sent by pre-paid post, it will be taken to have been received on the third day after posting; or
 - (b) a facsimile, it will be taken to have been received on receipt by the sender of a report by the sender's facsimile machine, confirming the successful transmission to the addressee's facsimile number of all pages comprising the notice.

20. MISCELLANEOUS

- 20.1 Each party must act in good faith in the implementation of this Agreement and, without limiting the scope of this obligation, must also seek to resolve any difference or dispute between them as to the Agreement in good faith.
- 20.2 No right under this Agreement is waived or deemed to be waived, except by written notice signed by the party waiving the right, or its authorised officer. A party does not waive its rights under this Agreement by granting an extension or forbearance to another party.
- 20.3 If any provision of this Agreement is void, voidable by any party, unenforceable or illegal, it shall be read down so as to be valid and enforceable or, if it cannot be so read down, the provision (or where possible, the offending words) shall be severed from this Agreement without thereby affecting the validity, legality or enforceability of the remaining provisions (or parts of those provisions) of this Agreement which shall continue in full force and effect.
- 20.4 The expiration or termination of this Agreement does not affect a right or remedy for breach that has accrued to a party before the expiration or termination date.
- 20.5 A right or obligation of a party that can operate or have effect on or after the completion, expiration, termination or rescission of this agreement will not merge on the occurrence of that event but will remain in full force and effect.
- 20.6 Each party warrants to the other party that:
- (a) this Agreement creates legal, valid and binding obligations, enforceable against that party in accordance with its terms; and
 - (b) unless otherwise stated, it has not entered into this Agreement in the capacity of any trust.

Appendix F

Complaints Protocol Flowchart

Appendix F Complaints Protocol Flowchart

