Newcastle Gasworks Remediation Project

State Significant Development Assessment (SSD 7676)

July 2019

Cover photo

Former Newcastle Gasworks Company office building (DPE staff photo)

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Glossary

Abbreviation	Definition
ACM	Asbestos Containing Material
AHD	Australian Height Datum
AIP	Aquifer Interference Policy
AQIA	Air Quality Impact Assessment
AQMP	Air Quality Management Plan
BCA	Building Code of Australia
CDWMP	Construction and Demolition Waste Management Plan
CIV	Capital Investment Value
CLM Act	*Contaminated Land Management Act 1997*
CMP	Conservation Management Plan
CNML	Construction Noise Management Level
Consent	Development Consent
Council	Newcastle City Council
DA	Development Application
DCP	Development Control Plan
Department	Department of Planning, Industry and Environment
DPI	Department of Primary Industries
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development
GDE	Groundwater Dependent Ecosystem
GNMP	Greater Newcastle Metropolitan Plan
GMA	Groundwater Modelling Assessment
ha	Hectares
HECZMP	Hunter Estuary Coaster Zone Management Plan
HA	Historical Heritage Assessment
HHA	Hydrological and Hydrogeological Assessment
HRP	Hunter Regional Plan
ICNG	Interim Construction Noise Guideline

LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Level of Service
LTEMP	Long-term Environmental Management Plan
MO	Management Order
Minister	Minister for Planning and Public Spaces
NAPL	Non-aqueous Phase Liquid
NCA	Noise Catchment Area
NVIA	Noise and Vibration Impact Assessment
OEH	Office of Environment and Heritage
OU	Odour Units
PRHHRA	Post-Remediation Human Health Risk Assessment
RAP	Remedial Action Plan
RMS	Roads and Maritime Services
RTS	Response to Submissions
RVR	Remediation Validation Report
RWHHRA	Remediation Works Human Health Risk Assessment
SAR	Site Audit Report
SAS	Site Audit Statement
SEARs	Secretary's Environmental Assessment Requirements
Secretary	Secretary of the Department of Planning, Industry and Environment
SEPP	State Environmental Planning Policy
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SSD	State Significant Development
SVHHRA	Soil Vapour Human Health Risk Assessment
TIA	Traffic Impact Assessment
UIE	Urban Island Effect
VMP	Voluntary Management Proposal
VSAQP	Validation Sampling Analytical Quality Plan

Executive Summary

Introduction

Jemena Gas Networks (NSW) Ltd (the Applicant) has lodged a Development Application (DA) and accompanying Environmental Impact Statement (EIS) seeking consent for the Stage 2 remediation works of the former Newcastle Gasworks site (the development) at 1 Chatham Road, Hamilton North, Lot 1 DP 79057 and Lot 270 DP 812689 (the site) in the Newcastle Local Government Area.

The Applicant acquired the site in 2006 however, the site was operated by the Newcastle Gas Company as a gasworks facility from 1913 to 1985. The Newcastle Gas Company produced 'town gas' through the coal gasification process (carbonisation of coal) until the late 1960s, when naptha replaced coal in town gas production. Town gas production by-products (ammonia liquors, coal tar and spent oxide) have accumulated within the site soils during the life span of the site operations. The Applicant is a major utility services supplier for Australian homes and businesses with $11 billion worth of gas, electricity and water supply infrastructure.

The site is located approximately 3 kilometres west of the Newcastle central business district and covers approximately 7.4 hectares of IN2 – Light Industrial zoned land. The site is surrounded by industrial land uses to the north and to the south and is adjacent to R2 – Low Density Residential zoned land of Hamilton North to the west along Chatham Road. The site adjoins Styx Creek along the eastern and south-eastern boundary. SP2 zoned railway lands are present at the north-eastern boundary of the site and across Styx Creek to the east.

Background

The Environment Protection Authority (EPA) declared the site to be significantly contaminated land under section 11 of the *Contaminated Land Management Act 1997* (CLM Act) on 18 August 2011. Preliminary site remediation, which included removal of some contaminated wastes and demolition rubble as well as stockpiling of residual contaminated materials, was undertaken and completed in 2015.

On 29 October 2015, the former Minister for Planning declared the then Clyde Street Remediation Project to be State significant development (SSD), with the Minister for Planning the consent authority. This followed advice from the then Planning Assessment Commission (the Commission), which concluded the development is of State and regional planning significance when measured against the six general issues set out in the Minister's Guideline on 'call-in' of SSD under the *Environmental Planning and Assessment Act 1979* (EP&A Act). In particular, the Commission found the project was consistent with the aim of SEPP 55, is highly complex, and that Council did not have the required expertise to assess the project.

On the 21 December 2015, the EPA issued the Applicant with a Management Order (MO 20151403) requiring the site to be remediated in accordance with the Remediation Action Plan (RAP) to prevent contaminated groundwater from migrating into Styx Creek. Under the MO, the Applicant was required to commence remediation works by January 2017 and complete these works by 30 December 2017. A new Management Order (MO 20181402) was issued to the Applicant on 26 October 2018 to replace MO 20151403. The MO now incorporates the incomplete and ongoing actions from MO 20151403 and includes financial assurance requirements for the long-term management of the site. Under the MO, the Applicant is required to complete and validate remediation works within 12 months of their commencement.

To meet the objectives of the MO, the Applicant is seeking development consent to conduct remediation works at the site. The scope of the Stage 2 remediation works identified in the final RAP includes the demolition of

concrete slabs and the former residence building, the construction of a subterranean barrier wall to redirect groundwater flows, the relocation of contaminated stockpiles behind the barrier wall and the construction of a capping layer.

The development would be undertaken over a period of approximately seven months. The development has a capital investment value of $11.5 million and is expected to generate 22 construction jobs.

In addition to being called-in as SSD, the development is classified as SSD under Part 4 of the EP&A Act because it involves the remediation of contaminated land which meets the criteria in Clause 24 of Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). Consequently, the Minister for Planning and Public Spaces is the consent authority for the development under section 4.5(1) of the EP&A Act.

Engagement

The Department of Planning, Industry and Environment (the Department) exhibited the EIS for the development from Thursday 2 August 2018 until Wednesday 29 August 2018. A total of 11 submissions were received, including seven from government agencies, one from Council, one from a special interest group and two from the general public. Of the 11 submissions received, one objected to the development.

Key concerns raised in the submissions related to the future use of the site following remediation works, construction noise, traffic and air quality impacts. The Applicant submitted a Response to Submissions (RTS) on 18 October 2018 to address and clarify matters raised in the submissions. In particular, further detailed design information relating to the subterranean barrier wall was included in the RTS.

The Department reviewed the RTS in consultation with Council and the government agencies and deemed that further information and clarification was required regarding visual impacts, heat generation impacts and traffic impacts. A further RTS, which responded to the Department, Council and government agency concerns, was submitted on 7 December 2018. Following residual concerns from Council regarding visual impacts, the Applicant provided further information on 1 February 2019.

Assessment

The Department's assessment of the application has fully considered all relevant matters under section 4.15 of the EP&A Act, the objects of the EP&A Act and the principles of ecologically sustainable development. The Department has identified the key issues for assessment are:

- remediation design
- groundwater impacts
- human health
- visual impact

The Department's assessment concluded the remediation program would effectively reduce the long-term source of contamination to groundwater and the Hunter River, which was identified as a risk of harm to human health and the environment in 2011. The Department and the EPA are satisfied the development would reduce the generation of contaminated groundwater and reduce its further migration offsite. The Department concluded the impacts of the development can be mitigated and/or managed to ensure an acceptable level of environmental performance, subject to the recommended conditions of consent. In summary, the development would:

- meet the objectives of the MO by isolating a significant source of contamination and minimising further impacts on groundwater and the Hunter River
- be overseen by an independent Site Auditor during implementation and validation

- be managed in perpetuity though a Long-term Environmental Management Plan and a financial assurance obligation.

Consequently, the Department considers the development is in the public interest and is recommended for approval, subject to conditions.

Contents

1. Introduction

1.1 The Department's Assessment

This report details the Department of Planning, Industry and Environment's (the Department) assessment of the State significant development (SSD) application (SSD 7676) for remediation works at the former Newcastle Gasworks site at 1 Chatham Road, Hamilton North (the site) in the Newcastle local government area (LGA) (see **Figure 1**). The Department's assessment considers all documentation submitted by Jemena Gas Networks (NSW) Ltd (the Applicant), including the Environmental Impact Statement (EIS), Remedial Action Plan (RAP), Response to Submissions (RTS) and submissions received from government authorities, stakeholders and members of the general public. The Department's assessment also considers the legislation and planning instruments relevant to the site and the proposed development (the development).

Figure 1 | Regional/Local Context Map

This report describes the proposed development (the development), surrounding environment, relevant strategic and statutory planning provisions and the issues raised in submissions. The report evaluates the key issues associated with the development and provides recommendations for managing any impacts during construction and operation. The Department's assessment of the Newcastle Gasworks Remediation Project has concluded that the development is in the public interest and should be approved, subject to conditions.

1.2 Development Background and Contamination History

The former Newcastle Gasworks was constructed in 1913 and was operated by the Newcastle Gas Company (now AGL) until 1985, when onsite operations ceased. The Newcastle Gasworks produced 'town gas' through the coal gasification process (carbonisation of coal) until the late 1960s, when naptha replaced coal in town gas production. Town gas production by-products (ammonia liquors, coal tar and spent oxide) have accumulated within the site soils during the life span of the site operations. Further contamination of soils subsequently occurred due to stockpiling of solid waste from the demolition works of former site infrastructure, including gas storage tanks.

The site was regulated on 10 June 1988 as a contaminated site requiring remedial action in accordance with a notice issued under Section 35 of the NSW *Environmentally Hazardous Chemicals Act 1985*. The Applicant acquired the site in December 2006 from AGL in a business transaction.

Jemena owns and operates more than $11 billion worth of major utility infrastructure, including electricity, gas and water across the east coast of Australia. In particular, Jemena Gas Networks Ltd is the largest distributor of gas in NSW, supplying over 1.3 million customers in NSW with natural gas.

The *Environmentally Hazardous Chemicals Act 1985* was repealed in August 2011 and the site was subsequently declared by the Environment Protection Authority (EPA) on 18 August 2011 to be significantly contaminated land under the *Contaminated Land Management Act 1997* (CLM Act) due to gasworks waste from historic gas production.

Preliminary site remediation was undertaken and completed in 2015. The preliminary remediation comprised minor works that could be readily undertaken and for which no further investigation works were required. They were classified as Category 2 remediation works pursuant to Clause 14 of the State Environmental Planning Policy No.55 - Remediation of Land (SEPP 55) and did not require development consent. The initial remediation works were intended to enable access for later, larger-scale remediation works and included the following:

- collection of bonded asbestos identified on the site surface and its disposal offsite
- separation of gasworks wastes, demolition rubble and asbestos containing materials and disposal offsite
- removal of bonded asbestos identified in subsurface soils and disposal off-site
- demolition and removal of contaminated site infrastructure, including a naptha tank, former LPG bottle plant building, water treatment tank, residual concrete slabs, footings and pipework
- stockpiling of residual contaminated materials and covering of these by anchored geofabric.

The Applicant made a request to the Department in May 2015 to declare the project as SSD in accordance with section 4.36 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The former Planning Assessment Commission (the Commission) considered the general issues of the project relating to State and regional planning to be significant in accordance with clause 124E of the *Environmental Planning & Assessment Regulation 2000* (EP&A Reg). The Commission reviewed the proposal against the six general issues of the Minister's guidelines for the 'call-in' of SSD and advised the Minister to declare the project to be SSD, particularly because it is consistent with the primary aim of SEPP 55. In October 2015, the former Minister for Planning declared the then Clyde Street Remediation Project to be SSD, with the Minister for Planning the consent authority.

A Management Order (MO 20151403) was issued by the EPA on 21 December 2015 to prevent offsite environmental harm. Due to groundwater being degraded by gasworks waste contaminants, contaminated groundwater may disperse into the Styx Creek and workers onsite may become exposed to vapours during subsurface works.

The Applicant is seeking development consent to undertake new remediation works (Stage 2) in response to the MO. The Applicant proposes to demolish existing structures onsite, regrade the site level and construct a subterranean wall and a capping layer to prevent contaminated groundwater from migrating into Styx Creek.

It is proposed the subterranean barrier wall would have a depth of 9 metres (m) and a length of 510 m, traversing north to south across the site. Demolition stockpiles from the Stage 1 remediation works would be relocated behind the subterranean barrier wall and a capping layer with a depth of 500 millimetres (mm) would be constructed across the entirety of the site.

1.3 Site Description

The site covers 7.4 hectares (ha) of IN2 - Light Industrial zoned land, being the former Newcastle Gasworks site at 1 Chatham Road, Hamilton North, Lot 1 DP 79057 and Lot 270 DP 812689. The site (see **Figure 2**) currently consists of:

- two items of local heritage significance, being the Newcastle Gasworks Company office building, and the Pump House and Fence located at the northern edge of the site on Clyde Street
- the former residence house located in the south-western corner of the site
- twenty-seven (27) waste stockpiles distributed across the site consisting of building rubble from demolition works conducted during the initial remediation works
- existing mature tree vegetation primarily located along the western boundary along the street frontage onto Chatham Road and Clyde Street
- vehicular access located at the south-eastern corner of the site on Chatham Road.

Figure 2 | Existing Site Map

1.4 Surrounding Land Uses

The site is located within the north-east of the suburb of Hamilton North, approximately 3 kilometres (km) west of the Newcastle central business district (see **Figure 1**). The site is bounded by Chatham Road to the west, Clyde Street to the north-west, a rail line to the north-east and Styx Creek to the east and south-east.

The locality consists of a mix of industrial, commercial and residential land uses. To the north of the site are industrial and commercial premises along with the educational precinct of TAFE NSW, approximately 450 m to the north-east. Low density residential land uses are featured directly adjacent to the site, being the suburbs of Hamilton North (to the west) and Islington (to the east) (see **Figure 3**). Directly to the south beyond Styx Creek is the Shell bulk fuel storage terminal with further industrial land uses to the south-east.

Figure 3 | Local Context Map

Approximately 300 m south-west of the site is the Newcastle Showground, which consists of the Newcastle Entertainment Centre and the Newcastle City Farmers Market (part of the broader Newcastle Entertainment Precinct). The Newcastle Entertainment Precinct includes sporting infrastructure and venues such as McDonald Jones Stadium, which is approximately 1.1 km south-west of the site and the Newcastle Basketball Stadium approximately 980 m to the south-west (see **Figure 1**).

1.5 Surrounding Road Network

The site is directly serviced by Chatham Road to the west and Clyde Street to the north-west. The greater surrounding road network features three main arterial roads (Griffiths Road/Donald Street to the south, Turton Road 1.25 km to the west and the Pacific Highway/Maitland Road 380 m to the north-east). In addition, the local roads of Broadmeadow Road and Georgetown Road provide access from the site to the main arterial roads of the greater road network (see **Figure 4**).

Figure 4 | Road Network Context Map

1.6 Other Development Approvals

The Applicant has provided copies of the following development approvals currently relating to the site:

- DA 401/86 dated 27 November 1986 – relating to additions to the cylinder filling shed within the existing Elgas complex
- DA 92/91 dated 11 April 1991 – relating to use of the existing redundant gas tank for storage of 2,000 tonnes of sulphuric acid.

The Department notes these development approvals relate to site infrastructure that has already been demolished. No other development approvals appear to exist for the site's former use as a gasworks, primarily as its operation largely pre-dated the EP&A Act.

1.7 Remediation History and Requirements

As discussed in Section 1.2, the site is contaminated with gasworks waste (PAHs, benzene, TPHs, arsenic and lead) causing risk of harm to the environment and human health. Soil contamination consisting of Non-Aqueous Phase Liquid (NAPL) is located in the central part of the site and has been determined to be old/stable. The contaminated groundwater plume under the site has demonstrated relatively limited migration in the many years it has been monitored. The approximate position of the NAPL contamination is shown in **Figure 5**.

Between February 1987 and June 2011, a large number of environmental investigations and trials were undertaken to establish the level and extent of ground contamination, however no remediation was undertaken. The site was declared significantly contaminated land by the EPA on 18 August 2011 under the CLM Act. Following this, environmental investigations concentrated on developing potential remediation strategies and scenarios,

collecting data on water and ground contamination, and technical feasibility. In January 2014, a Voluntary Management Proposal (VMP) was endorsed by the EPA for Stage 1 and Stage 2 remediation works. Stage 1 was to remediate onsite material known to be contaminated, and for which no additional investigation works or development approval were required. A Remedial Action Plan (RAP) was developed for the Stage 1 remediation works, which were completed and validated in November 2015 by a Site Auditor.

Figure 5 | Extent of NAPL Contamination

1.8 Ministerial Call-in

On 29 October 2015, the former Minister for Planning declared the Clyde Street Remediation Project to be SSD, with the Minister for Planning the consent authority. This followed advice from the Commission, which concluded

the development is of State and regional planning significance when measured against the six general issues set out in the Minister's Guideline on 'call-in' of State significant development under the EP&A Act. In particular, the Commission found the project was consistent with the aim of SEPP 55, is highly complex, and that Council did not have the required expertise that the State government possesses to assess the project.

It is of note the proposed Clyde Street Remediation Project declared to be SSD comprised remediation methods to treat contaminants to a level consistent with agreed re-use criteria to enable future commercial or industrial use of the site, which differs from the current SSD application (the subject of this report). The issue of a MO by the EPA automatically triggered the proposal to be SSD under *State Environmental Planning Policy (State and Regional Development) 2011*. Any proposed future uses of the land for industrial purposes would also require further remedial work to a standard which allows the proposed future use.

1.9 Issue of a Management Order

The EPA withdrew its approval for the VMP after the ministerial call-in and on 21 December 2015 issued MO no. 20151403 to the Applicant, which is legally enforceable. The MO stated the contamination on the site is significant enough to warrant regulation. In particular:

- groundwater has been degraded by gasworks waste contaminants at concentrations exceeding criteria for beneficial use and protection of aquatic ecosystems
- groundwater is also contaminated with phase separated hydrocarbons
- contaminated groundwater may migrate further offsite and ultimately impact the Hunter River
- workers may become exposed to vapours during subsurface works at the site.

The objective of the MO is to action remedial works that will prevent the further offsite migration of contaminated groundwater towards Styx Creek and the greater Hunter River. The MO requires the Applicant to prepare and implement a RAP – Stage 2 (the RAP), undertake the remedial works specified in the RAP, complete and validate the remedial works and submit a validation report for the completed remedial works to the EPA.

1.10 Remediation Options

The Applicant engaged JBS&G Australia Pty Ltd (JBS&G) to prepare the required RAP, which included the identification, review and evaluation of the suitable remediation options for the site.

An initial RAP was prepared in 2016 and presented the remediation strategy. JBS&G considered the available options for the Stage 2 remediation works in accordance with guidance from the *Guidelines for the Assessment and Management of Groundwater Contamination*. These options were evaluated and ranked on practicality to enable selection of the preferred remediation option to satisfy the objectives of the MO. The following potentially suitable remediation options were considered for groundwater and soil contamination:

- excavation of contaminated materials, treatment via bioremediation or stabilisation and replacement into the excavation
- excavation of contaminated materials, treatment and then disposal offsite at an appropriately licensed facility
- excavation of contaminated materials and then direct disposal offsite to an appropriately licensed facility
- in situ chemical oxidation
- in situ thermal treatment
- construction of permeable groundwater barriers
- installation of hydraulic controls and physical barrier.

Evaluation of the options above resulted in a preferred remediation strategy presented in the RAP that combines a number of technologies and management options, being:

- construction of a subterranean hydraulic control wall around the main area of soil contamination to redirect the flow of groundwater from upgradient areas of the site to minimise the groundwater flows through the main area of onsite contamination. Therefore, the potential for the stockpiles to contaminate groundwater would be reduced
- a low permeability physical barrier (capping layer) over the whole site to reduce the impacts of rain infiltration onsite, prevent surface ponding during rainfall events and allow for efficient drainage of the site.

1.11 Remediation Investigations

Following selection of the preferred remediation option and strategy and submission of the RAP, a number of further assessments and investigations were carried out to inform further refinement of the remediation works. These included the completion of a numerical groundwater model, NAPL investigation works, and an update of the human health risk assessment to incorporate soil vapour data collected in May 2017.

1.12 Remediation Design Development

Detailed design of the preferred remediation option sourced barrier layer requirements from the *Guidelines for the Assessment of On-Site Containment of Contaminated Soil*, ANZECC 1999 (ANZECC guidelines). The groundwater modelling results informed the design of the remediation method and the design parameters for the proposed hydraulic controls. These design parameters comprised the:

- required depth, thickness and hydraulic conductivity of the barrier wall
- required thickness, permeability and scope of the capping layer
- required level of decrease in groundwater flow from the contaminated portion of the site
- acceptable level of increase in groundwater levels in offsite areas (to prevent flooding)
- required extent of the barrier wall to ensure correct groundwater flow paths.

It was calculated that the combination of the subterranean barrier wall and the capping layer would decrease groundwater flow/contaminant mass flux from the contaminated portion of the site by approximately 85%, which is considered to meet the EPA requirements (see Section 6.1). A summary of the final design details of the barrier wall, capping and final landform is provided in **Table 1**.

The predicted outcomes and methodology of the remediation design were incorporated into a final RAP, which was deemed appropriate to satisfy the MO by the Site Auditor (James Davis of Enviroview) on 29 November 2017. The EPA deemed the RAP as appropriate to satisfy the MO on 15 March 2018.

1.13 Issue of a New Management Order

On 26 October 2018, the EPA issued a new MO (no. 20181402) and repealed MO 20151403. The new MO includes:

- incomplete and ongoing actions from MO 20151403
- a requirement for financial assurance in accordance with the CLM Act
- a requirement to engage a Site Auditor accredited under part 4 of the CLM Act to undertake a Site Audit of the implementation and validation of the remediation works
- clarification of the requirements of the NSW EPA accredited Site Auditor
- details of the required timings for surface water and groundwater monitoring programs

Copies of the new and old MO are provided in Appendix C.

2. Project

2.1 Description of the Development

The development consists of the construction of a subterranean barrier wall and installation of a capping layer across the whole of the site to contain contaminated soils and stockpiles.

The components of the development are summarised in **Table 1** and described in full in the EIS, included in **Appendix B**.

Table 1 | Main Components of the Development

Aspect	Description
Development Summary	• The construction of a subterranean barrier wall and capping layer to redirect groundwater and surface water flows away from contaminated soils
Site Area	• 7.4 ha
Pre-Remediation	• installation of 16 monitoring wells • installation of automated pressure transducers/loggers
Site Establishment	• establishment of environmental and safety controls • establishment of site compound/parking areas • clearing of onsite vegetation, including all trees and bushes • reinforcement of the Chatham Road access driveway • creation of a new vehicle access driveway on Clyde Street
Site Preparation	• demolition of existing concrete slabs • demolition of the former residence building • crushing and screening of demolition waste • relocation of the 27 Stage 1 remediation stockpiles behind the position of the new subterranean barrier wall • importation of 37,000 m^3 of low-permeability ENM or VENM material for site re-grading • re-grading of the site, including cut and fill earthworks up to 1.5 m below ground level
Construction of a Subterranean Barrier Wall	The purpose of the subterranean barrier wall is to redirect groundwater flows away from contaminated areas of the site (soils and stockpiles) • excavation of approximately 2,800 m^3 of soil along the alignment of subterranean barrier wall • approximate wall length of 510 m • depth of wall to be 9 m below ground level • minimum wall thickness of 600 mm • hydraulic conductivity of less than 10^{-9} m/s

Aspect	Description
	• wall to be constructed of excavated soil and bentonite mixture
Capping layer	The purpose of the capping layer is to prevent infiltration of rainwater into contaminated soils and stockpile material on the site, thereby reducing groundwater migration • capping layer to consist of 350 mm of clay and 150 mm of road base across the project area • permeability of less than 10^{-9} m/s • capping layer sealed with bitumen spray (surface skin only) • Dulux Aeromaster® light-coloured paint applied on top of the bitumen layer to approximately one-third of the site
Final landform	The final landform has been designed to assist in site drainage to further prevent surface water infiltration under the capping layer • final landform would comprise a 1.7% slope to the east (towards Styx Creek) • a slope of 5.3% to the west (towards Clyde Street/ Chatham Road)
Demobilisation of site	• removal of redundant environmental controls and warning signs • general site clean-up activities
Construction timeframe	• site establishment: approximately 2 weeks • remediation works: approximately 7 months • demobilisation of site: approximately one week
Traffic	• approximately 12 heavy vehicle and 60 light vehicle movements per week during site establishment (2 weeks) • approximately 12 heavy vehicle and 132 light vehicle movements per week from the demolition activities to the construction of the subterranean barrier wall (15 weeks) • approximately 300 heavy vehicle and 132 light vehicle movements per week during the construction of the capping layer (12 weeks) • approximately 12 heavy vehicle and 60 light vehicle movements per week during demobilisation of the site (1 week)
Construction hours	• Monday to Friday: 7 am – 6 pm • Saturday: 8 am – 1 pm • no works undertaken on Sundays or Public Holidays
Capital Investment Value	• $11,500,000
Employment	• 22 full-time construction jobs (10 full-time employees during the site establishment and demobilisation phases and 22 full-time employees during the remediation works phase)

2.2 Staging

It is proposed to undertake the remediation works progressively across three areas of the site as indicated in **Figure 6**, with works being undertaken from north to south following each phase of remediation works.

Figure 6 | Development Layout

The development phases for the development are as follows:

- Phase 1 - site establishment
- Phase 2 - remediation works
    - demolition activities and relocation of stockpiles
    - project area regrading
    - subterranean barrier wall construction
    - capping layer construction
    - sealing of the capping layer
- Phase 3 - demobilisation of the site.

2.3 Description of Remediation Works

The following section provides a description of the remediation works proposed for the site.

2.3.1 Vegetation Removal and Site Establishment

All vegetation on the site would be removed, including mature and young trees along the boundary. Fencing around the existing gas infrastructure compound area adjoining Chatham Road would remain to protect this asset. Work compounds, appropriate plant access and environmental controls would be established onsite.

2.3.2 Relocation of Remediation Stockpiles

The existing 27 stockpiles (see **Figure 2**) resulting from the Stage 1 remediation works consist of building rubble and potentially contaminated soils and have an approximate total volume of 2,475 m^3. Stockpiles containing building rubble (but not asbestos) would be screened and crushed prior to relocation by truck to the area of the site behind the proposed subterranean barrier wall. Any asbestos containing material (ACM) would be buried onsite at the designated asbestos disposal location shown in **Figure 7**.

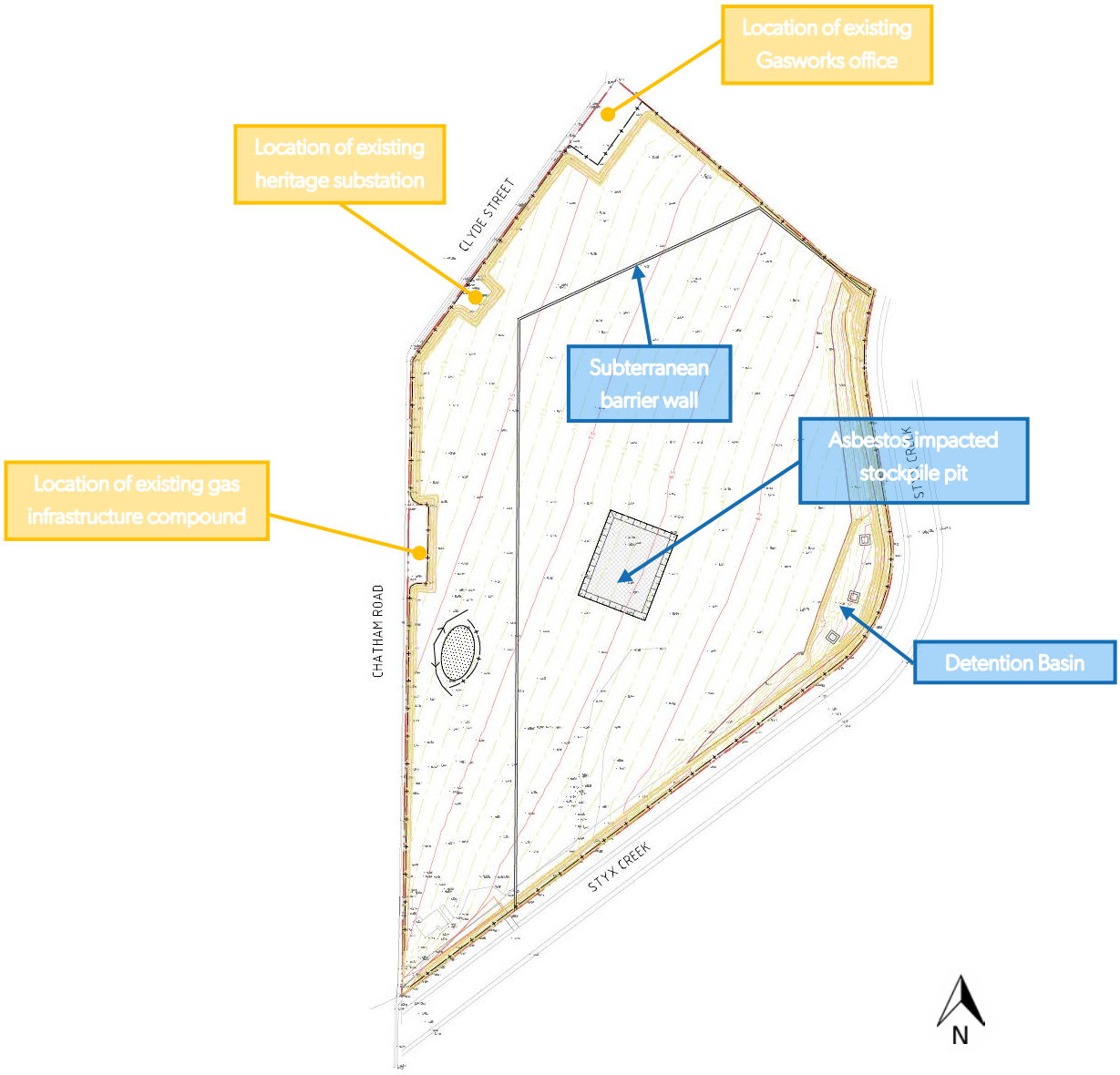

Figure 7 | Bulk Earthworks Plan

2.3.3 Site Re-grading

Re-grading works would include cut and fill earthworks of up to 1.5 m below ground level and integration of material from the relocated stockpiles using dozers and/or excavators and trucks.

2.3.4 Subterranean Barrier Wall Construction

The construction of the subterranean barrier wall involves the excavation of approximately 2,800 m^3 of soil for a trench to accommodate the wall to a depth of 500 mm below the clay base level (at approximately 9 m depth below ground level). A soil and bentonite slurry composite would then be backfilled into the trench to form the subterranean barrier wall. The wall would be located at the upgradient boundary of the most significantly contaminated portion of the site and have a length of approximately 510 m across the length of the site as shown in **Figure 7**. A cross-section of the subterranean barrier wall and capping layer is provided in **Figure 8**.

Two bentonite slurry holding ponds, a mixing area and a working platform for machinery would be utilised to facilitate the construction of the subterranean barrier wall (see **Figure 6**).

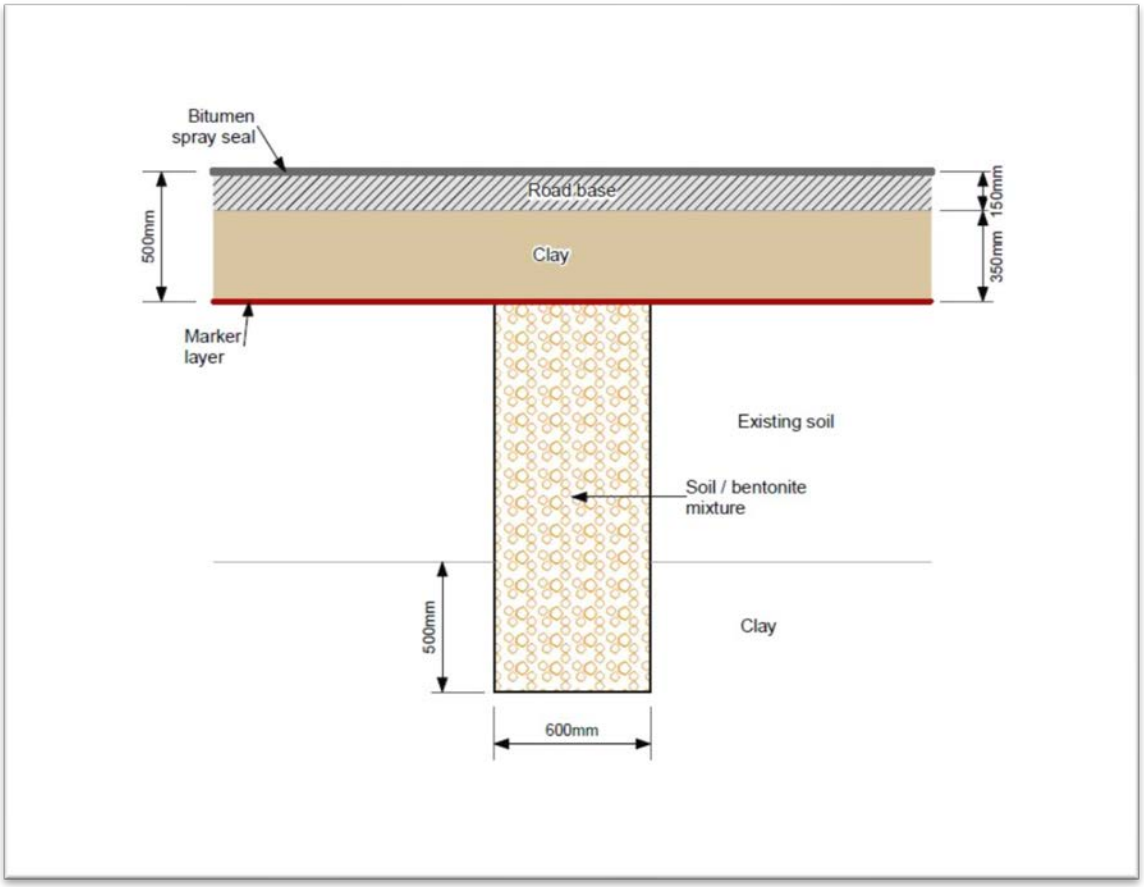

Figure 8 | Cross-section of subterranean barrier wall and capping layer

2.3.5 Capping Layer Construction

After the subterranean barrier wall has been constructed, the site would be sealed with a capping layer, with the exception of the Newcastle Gasworks Company office building, Pump House and Fence located at the north of the site on Clyde Street, and the existing gas infrastructure compound along the western boundary on Chatham Road. No vegetation would be present on the site, as this would have the potential to compromise the integrity of the capping layer.

The underlying soils would initially be covered by a marker layer consisting of bright-coloured geofabric to visually signify contaminated soils beneath. The capping layer would be laid over the top of the marker layer and consist

of a clay base with a depth of 350 mm and an overlay of road base with a depth of 150 mm. The road base layer would be sealed with a bitumen spray, surface skin only. Where possible, the bitumen spray seal would be applied progressively during capping to manage potential air and water quality impacts. The bitumen spray seal would minimise the potential for degradation of the capping layer through erosion and cracking and minimise rainwater infiltration that could cause groundwater quality impacts to Styx Creek and the Greater Hunter River. A light-coloured paint would be applied on top of the bitumen spray seal to approximately one-third of the site (along the boundaries) to mitigate heat effects, as discussed in section 6.5.

2.3.6 Post Remediation

Validation of the remediation would be achieved through the collection of data (sampling, analysis, and assessment of groundwater and surface water flow and levels) before, during and after works to assess their effectiveness. A Validation Sampling Analytical Quality Plan (VSAQP) would be developed prior to the commencement of sampling works, which would include details of groundwater monitoring wells both up and downgradient of the subterranean barrier wall. A validation report would be prepared at completion of the remediation works in accordance with the RAP. A Long-term Environmental Management Plan (LTEMP) would be prepared to document the ongoing management requirements for the development. As a requirement of the MO, financial assurance would be provided by the Applicant to ensure ongoing funding to implement the LTEMP and stewardship of the site in perpetuity.

2.4 Applicant's Need and Justification

The site is significantly contaminated and presents a risk of harm to human health and the environment. The Applicant maintained that remediating the site would greatly decrease a significant source of contamination that would reduce its impact on groundwater and the Hunter River including its tributaries. The remediation of the site would also be in the public interest as it reduces a long-standing source of contamination near the residential area of Hamilton North.

The Applicant additionally highlighted the need for the remediation works to satisfy both the statutory requirements and the requirements of the MO to prevent the offsite migration of groundwater. Justification for the Applicant's choice of remediation method for the site is discussed in Section 1.11.

3. Strategic Context

3.1 Greater Newcastle Metropolitan Plan 2036

The Greater Newcastle Metropolitan Plan 2036 (GNMP) produced by the NSW Government, sets out strategies and actions for the sustainable growth of the Cessnock City, Lake Macquarie City, Maitland City, Newcastle City and Port Stephens communities, which represent Greater Newcastle.

The site is identified in the GNMP as the Former Gasworks Precinct within the Broadmeadow Catalyst Area (see **Figure 9**). The Broadmeadow area is identified as a catalyst area for the sustainable growth of Greater Newcastle in the GNMP. The Broadmeadow area has a target of providing 550 new jobs and 1,500 new dwellings by 2036. The desired role of the Broadmeadow area as a catalyst for sustainable growth is to provide a nationally significant sport and entertainment precinct and to provide a mix of uses that facilitate growth and change in surrounding centres and residential areas.

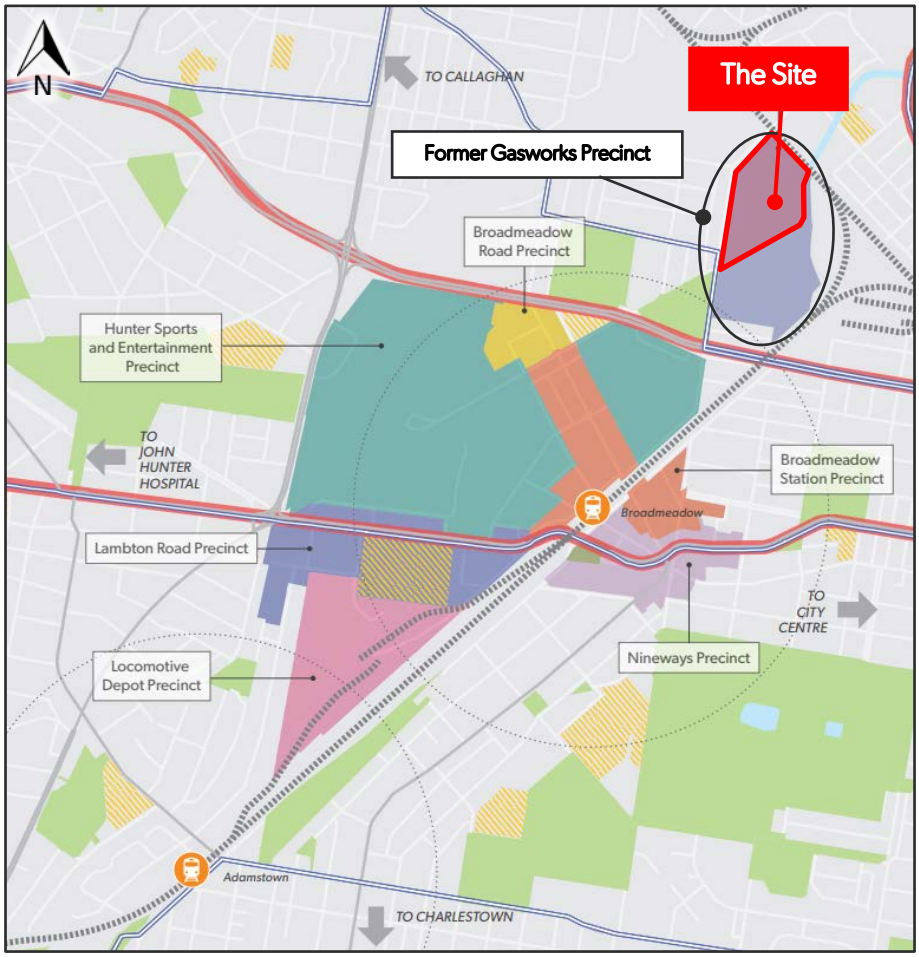

Figure 9 | Broadmeadow Catalyst Area Precincts (Source: GNMP)

The GNMP requires Newcastle City Council to respond to opportunities for re-use of the site for the potential of mixed industrial and commercial uses to provide economic renewal. Furthermore, Council is directed to ensure land remediation, flooding and transport corridor needs are addressed.

The development supports the GNMP as the remediation works do not preclude the use of the site for light industrial and commercial uses post-remediation. It is noted that any future land use at the site would be subject to a separate development application which may require further remediation works, that would be assessed on its merits.

3.2 Hunter Regional Plan 2036

The Hunter Regional Plan (HRP) sets out the NSW Government's vision for the Newcastle, Lake Macquarie, Port Stephens, Maitland and Cessnock LGAs until 2036. The HRP anticipates the population of the Hunter Region will grow by 25% between now and 2036, resulting in an increased demand for dwellings and jobs.

Key priorities of the HRP are to strengthen the region's economy, increase resilience to hazards and climate change, provide greater housing choices and employment and promote a biodiversity-rich natural environment. The development supports strategic direction number 15 of the HRP, to protect water catchments to sustain high water quality, by removing a source of significant groundwater contamination.

3.3 Newcastle Environmental Management Strategy 2013

The Newcastle Environmental Management Strategy 2013 is intended to direct Council's contribution towards a 'Protected and Enhanced Environment'. One of the core objectives of the strategy is to provide greater efficiency in the use of resources. As contaminated soils would be retained onsite, the proposal would contribute to this objective through reducing the amount of contaminated waste disposed of at landfills.

3.4 Hunter Estuary Coastal Zone Management Plan

The Hunter Estuary Coastal Zone Management Plan (HECZMP) is a document used to maintain the environmental values and improve the condition of the Hunter Estuary. An objective of the HECZMP is to prevent the mobilisation of contaminated sediment and groundwater from impacting on environmental processes within the Hunter Estuary. The development is considered to be consistent with this objective as it seeks to prevent contaminated groundwater from entering Styx Creek, being a tributary of the Hunter River.

4. Statutory Context

4.1 State Significant Development

The development is State significant development pursuant to Clause 3, Section 4.36 of the EP&A Act because it involves the remediation of contaminated land which meets the criteria in Clause 24 of Schedule 1 in the State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP). Consequently, the Minister for Planning and Public Spaces is the consent authority for the development.

4.2 Permissibility

The site is identified as being zoned IN2 – Light Industrial in accordance with the Newcastle Local Environmental Plan 2012 (LEP). The development is defined as 'environmental protection works' under the LEP and is not identified as being a form of development permissible with or without consent in the IN2 zone. Therefore, the development is a prohibited form of development in accordance with the LEP.

However, Category 1 remediation works are a permissible form of development with consent pursuant to Clause 8(1) of the State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55). In accordance with Clause 19 of SEPP 55, the SEPP prevails over the LEP in the event of an inconsistency between the SEPP and another Environmental Planning Instrument to the extent of the inconsistency.

Therefore, the development is a permissible form of development with consent in accordance with Clause 8(1) of SEPP 55.

4.3 Consent Authority

The Minister is the consent authority for the development under section 4.5 of the EP&A Act. On 11 October 2017, the Minister delegated the functions to determine SSD applications to the Executive Director, Key Sites and Industry Assessments where:

- the relevant local council has not made an objection and
- there are fewer than 25 public submissions in the nature of objections and
- a political disclosure statement has not been made.

Of the 11 submissions received, one objected to the development. Council did not object to the development. No reportable political donations were made by the Applicant in the last two years and no reportable political donations were made by any persons who lodged a submission.

Accordingly, the application can be determined by the Executive Director, Key Sites and Industry Assessments, under delegation.

4.4 Other Approvals

Under Section 4.42 of the EP&A Act, other approvals may be required and must be approved in a manner that is consistent with any Part 4 consent for the SSD under EP& A Act.

The Department of Industry Lands and Water has advised in its submission that the development would intercept groundwater and require a groundwater licence under Part 5 of the *Water Act 1912* (NSW) prior to the commencement of any groundwater works onsite.

4.5 Considerations under Section 4.15 of the EP&A Act

Section 4.15 of the EP&A Act sets out matters to be considered by a consent authority when determining a development application. The Department's consideration of these matters is set out in **Section 5** and **Appendix G**. In summary, the Department is satisfied the development is consistent with the requirements of section 4.15 of the EP&A Act.

4.6 Environmental Planning Instruments

Under Section 4.15 of the EP&A Act, the consent authority, when determining a development application, must take into consideration the provisions of any environmental planning instrument (EPI) and draft EPI (that has been subject to public consultation and notified under the EP&A Act) that apply to the development.

The Department has considered the development against the relevant provisions of several key environmental planning instruments including:

- State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP)
- State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)
- Newcastle Local Environmental Plan 2012 (Newcastle LEP).

Development Control Plans (DCPs) do not apply to SSD under Clause 11 of the SRD SEPP. However, the Department has considered the relevant provisions of the Newcastle Development Control Plan 2012 (Newcastle DCP) in its assessment of the development in **Section 6** of this report.

Detailed consideration of the provisions of all EPIs that apply to the development is provided in **Appendix G**. The Department is satisfied the development generally complies with the relevant provisions of these EPIs.

4.7 Public Exhibition and Notification

In accordance with Section 2.22 and Schedule 1 to the EP&A Act, the development application and any accompanying information of an SSD application are required to be publicly exhibited for at least 28 days. The application was on public exhibition from Thursday 2 August 2018 until Wednesday 29 August 2018 (28 days). Details of the exhibition process and notifications are provided in **Section 5** of this report.

4.8 Objects of the EP&A Act

In determining the application, the consent authority should consider whether the development is consistent with the relevant objects of the EP&A Act. These objects are detailed in Section 1.3 of the Act. A response to the Objects of the EP&A Act is provided in **Table 2**.

Table 2 | Consideration of the Objects of the EP&A Act

Objects of the EP& A Act	Consideration
(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources	• the proposal would ensure the proper management and conservation of natural resources, including the Hunter River and its tributaries through the prevention of contaminated groundwater entering Styx Creek.
(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment	• the Department has considered the encouragement of ecologically sustainable development (ESD) in its assessment of the proposal. This assessment integrates all socio-economic and environmental considerations and seeks to avoid potentially serious or irreversible environmental damage based on an appraisal of risk weighted consequences. The Department is satisfied

Objects of the EP& A Act	Consideration
	the proposal can be carried out in a manner that is consistent with the principles of ESD.
(c) *to promote the orderly and economic use and development of land*	• the development is a permissible use which would promote the orderly and economic development of land.
(e) *to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats*	• the Department's assessment in **Section 6** of this report demonstrates that, with the implementation of recommended conditions of consent, the impacts of the development can be mitigated and/ or managed to ensure an acceptable level of environmental performance.
(i) *to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State*	• the Department has assessed the development in consultation with, and giving due consideration to, the technical expertise and comments provided by other Government authorities. This is consistent with the object of sharing the responsibility for environmental planning between the different levels of government in the State.
(j) *to provide increased opportunity for community participation in environmental planning and assessment*	• the application was exhibited in accordance with Schedule 1 Clause 9 of the EP&A Act to provide public involvement and participation in the environmental planning and assessment of this application.

4.9 Ecologically Sustainable Development

The EP&A Act adopts the definition of ESD found in the *Protection of the Environment Administration Act 1991*. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

(a) the precautionary principle

(b) inter-generational equity

(c) conservation of biological diversity and ecological integrity

(d) improved valuation, pricing and incentive mechanisms.

The potential environmental impacts of the development have been assessed and, where potential impacts have been identified, mitigation measures and environmental safeguards have been recommended.

As such, the Department considers that the development would not adversely impact on the environment and is consistent with the objectives of the EP&A Act and the principles of ESD.

4.10 Contaminated Land Management Act 1997

The Contaminated Land Management Act 1997 (CLM Act) sets out accountabilities for managing contamination if the EPA considers the contamination is significant enough to require regulation under Division 2 of Part 3 of the CLM Act.

On 18 August 2011, the EPA declared the subject site to be significantly contaminated land under Section 11 of the CLM Act. Furthermore, on 21 December 2015 the EPA issued a MO to the Applicant under Section 14 of the CLM Act, which included objectives, milestones, reporting and approval requirements for the remediation of contamination on the site.

4.11 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), assessment and approval is required from the Commonwealth Government if a development is likely to impact on a matter of national environmental significance (MNES), as it is considered to be a 'controlled action'. The EIS included a preliminary assessment of the MNES checklist and concluded the development would not impact on any of these matters and is therefore not a 'controlled action'. As such, the Applicant determined a referral to the Commonwealth Government was not required.

5. Engagement

5.1 Consultation

The Applicant, as required by the Planning Secretary's Environmental Assessment Requirements (SEARs), undertook consultation with relevant local and State authorities as well as the community and affected landowners. The Department undertook further consultation with these stakeholders during the exhibition of the EIS and throughout the assessment of the application. These consultation activities are described in detail in the following sections.

5.1.1 Consultation by the Applicant

The Applicant undertook a range of consultation activities throughout preparation of the EIS including:

- a community phone line:1800 571 972
- a project website: http://jemena.com.au/clydestreet
- meetings with project stakeholders
- four community newsletters issued between June 2014 and November 2017
- four project update letters issued between June 2014 and November 2017
- five community information sessions held between June 2014 and August 2018
- door knocking conducted on 21 March 2018 and 26 June 2018.

5.1.2 Consultation by the Department

After accepting the application and the EIS, the Department:

- made it publicly available from **Thursday 2 August 2018** until **Wednesday 29 August 2018**
    - on the Department's website
    - at the Department's regional office (Level 2, 26 Honeysuckle Drive, Newcastle)
    - at Newcastle City Council (City Administration Centre, 282 King Street, Newcastle)
- notified landowners in the vicinity of the remediation site about the exhibition period by letter
- notified and invited comment from relevant State government authorities and Newcastle City Council by letter
- advertised the exhibition in the Newcastle Herald.

5.2 Summary of Submissions

During the exhibition period, a total of 11 submissions were received, including seven from government agencies, one from Council, one from a special interest group and two from the general public. Of the 11 submissions received, one objected to the development. A copy of each submission is included in **Appendix D**.

5.2.1 Key Issues – Government Agencies

The **EPA** raised no objection to or concerns regarding the development but provided clarification on statements made by the Applicant in the EIS about the appropriateness of the RAP. In addition, the EPA clarified that a new MO has been served on the Applicant in which the Applicant must provide a financial assurance for the ongoing maintenance and monitoring of the contamination site.

The EPA provided updated commentary on the development on 30 October 2018 which required the Applicant to provide a revised air quality impact assessment that assesses all identified contaminants of concern onsite and demonstrates that the potential impacts are lower than the EPA's impact assessment criteria.

The **Office of Environment and Heritage (OEH)** raised no objection to or concerns regarding the development. OEH was satisfied with the biodiversity assessment, Aboriginal cultural heritage assessment and water quality assessment provided.

Roads and Maritime Services (RMS) raised no objection to or concerns regarding the development as it has considered there would be no significant impact on nearby classified State road networks. RMS advised that the Department should consult further with Council, as the relevant local road authority, before determining the application.

The **Heritage Council** raised no objection to the development and provided recommended conditions of consent.

NSW Health raised no objection to the development but provided comment on issues that should be considered in the Department's assessment, including air quality, construction noise impacts, domestic bore water supply and heat generation from the bitumen capping layer.

Hunter Water Corporation raised no objection to or recommendations for the development. However, Hunter Water Corporation identified that the Applicant is required to consult further with it regarding the stormwater management system and the impacts of vibratory rolling on Hunter Water assets.

DoI raised no objection to the development, however provided comments on the requirements for extraction bores on Emerald Street to be included in the LTEMP and licences to be obtained under the *Water Act 1912*.

5.2.2 Council key issues

Newcastle City Council raised no objection to the development, however raised the following issues:

- the RAP is only a 'concept plan' for the remediation of the site
- noted that the EIS states that further remediation works would be required to support future development and land uses on the site.
- requested stormwater detention be provided for the entire site
- requested confirmation of drainage discharge connections to the existing street drainage on Clyde Street and Chatham Road. Council does not support drainage connections from the remediation works to the street
- Council does not support the proposed heavy vehicles access routes identified in the submitted Traffic Impact Assessment. Council recommends that consideration be made for driveway access to be created on the Clyde Street frontage.

5.2.3 Community issues

The Department received two submissions from the general public during the exhibition period. The two public submitters are located within 5 km of the site. Of the two submissions received, one provided support for the development and one provided comments on the development, including:

- the site should be remediated to accommodate the potential for residential and commercial development to achieve the expected growth of the Hamilton North and Broadmeadow area
- Hamilton North is no longer appropriate for industrial land uses and is strategically located within a growth corridor.

5.2.4 Special interest groups

The Department received one submission in the form of an objection from a special interest group, being the Correct Planning and Consultation for Mayfield Group. The reasons for objection are as follows:

- the site is considered valuable and should be remediated to accommodate an ongoing land use
- the proposed capping of the contamination is not an appropriate strategy for the stewardship of the land. The potential future use of the site should be established prior to the commencement of remediation works
- a condition should be included in the consent requiring any potential purchaser of the site to remediate the site in line with proposed future uses
- concern is raised regarding removing material and delivering fill during the remediation works
- concern is raised regarding the information within the EIS relating to truck movement numbers and identification of entry and exit points.

5.3 Response to Submissions

On 18 October 2018, the Applicant provided a Response to Submissions (RTS) report to address the issues raised in the submissions. The RTS was accompanied by detailed engineering drawings and a Safety Management Study Report (**Appendix E**). The RTS provided some modifications to vehicle access (see **Figure 10**) and the post-remediation detention basin.

The RTS was provided to key agencies to consider whether it adequately addressed the issues raised. A summary of the agencies' responses is provided below:

- **OEH** had no further comments.
- **Heritage Council** noted the Applicant supported the adoption of the recommend conditions provided in its original submission.
- **EPA** had no further comment or recommendations to make on the development as the Applicant has addressed all previous comments and issues raised by the EPA.
- **Council** noted they had no further comments regarding the RAP, future land uses, flood risk and development contributions. However, Council noted that the submitted stormwater plans do not address stormwater quality criteria as the future use of the site is not currently known and any future use would be required to address the relevant stormwater quality requirements. Council noted its support for the revised inbound and outbound vehicle routes proposed by the Applicant and provided recommended conditions for traffic and access. Council additionally requested the Applicant provide further consideration to the potential visual impacts of the site post-remediation and provide appropriate mitigation measures to address these impacts.
- **NSW Health** provided reference to documentation on the impacts of land-use on urban heat and the 'urban heat island' effect for the Applicant to address. NSW Health reiterated the potential impacts that excessive heat generation may have on human health and the importance for this potential impact to be appropriately addressed in the RTS.
- **Hunter Water Corporation** had no further comments.
- **DoI** stated that its previous comments regarding extraction bores of the site on Emerald Street to be included in the LTEMP was not sufficiently addressed in the RTS.

The Department also provided comment on the RTS, requiring an update of the traffic study to reflect the amendments to traffic routes and access to the site, a revised visual assessment including mitigation measures to reduce visual impacts, and an urban heat assessment.

Figure 10 | Revised traffic access

A revised RTS was submitted on 7 December 2018. The agencies reviewed the updated information and amendments to the development supplied with the revised RTS and provided the following comments:

- **NSW Health** was satisfied with the options analysis provided to reduce heat generation from the site and provided no further comment.
- **Council** provided comment on the options provided in the revised RTS to mitigate visual impacts of the development. On examination of the options provided, Council's preferred option was the provision of planting along the site boundary leaving some areas uncapped.
- **DoI** provided no further comments or recommendations on the development.

The Department required further information regarding the remediation design, in particular details of the reasoning supporting the chosen level of groundwater flow/mass flux reduction to achieve the project outcomes. This information was provided by the Applicant in July 2019.

6. Assessment

The Department has considered the EIS, the issues raised in the submissions, the Applicant's RTS and supplementary information in its assessment of the development. The Department considers the key assessment issues are:

- remediation design
- groundwater impacts
- human health impacts
- visual impact

A number of other issues have also been considered. These issues are considered to be minor and are addressed in **Table 4** in **Section 6.4**.

6.1 Remediation Design

The Department has contemplated the appropriateness of the preferred remediation option (subterranean barrier wall and capping layer) for reducing the risk of harm from the long-standing contamination issue at the site. In this regard, the Department has examined the options analysis presented in the RAP, written advice from the Site Auditor, James Davis, and the submission from the EPA. The Department notes the preferred remediation option would not fully remediate the site – it is designed to meet the requirements of the MO issued by the EPA by containing contaminated soils onsite, eliminating surface water infiltration of the contaminated areas and reducing groundwater pollution by diverting groundwater flows around the areas of greatest contamination.

RAP and Management Order

JBS&G prepared a detailed RAP for the Stage 2 remediation works to address the requirements of the MO. The MO specifically noted the contamination on the site is significant enough to warrant regulation for the following reasons:

- groundwater at the site that has been degraded by gasworks waste contaminants at concentrations exceeding criteria for beneficial use
- groundwater at the site that may migrate further offsite and ultimately impact the Hunter River
- risks posed to workers by being exposed to vapours during subsurface works at the site.

The RAP examined the nature of the contamination and risk of harm, detailed and appraised the remediation objectives, and described a methodology for the preferred remediation option. The consideration of groundwater remediation options in the RAP concluded that clean-up of groundwater to restore environmental values onsite is not feasible and clean-up to the extent practicable (CUTEP) is an appropriate objective for groundwater impact within the site boundary. For off-site groundwater, largely restoring environmental values external to the site at receiving downgradient receptors (Styx Creek) was the chosen remediation objective. Vapour risks to subsurface workers were discussed in the RAP in terms of managing these through the LTEMP in the event of a capping layer breach. A validation methodology was included in the RAP for the barrier wall, groundwater, surface water, and imported fill, as well as validation reporting.

The Site Auditor independently reviewed the RAP in November 2017 and concluded it is appropriate in relation to the contamination issues outlined in the MO. The EPA reviewed the RAP and associated documents in March 2018. The EPA noted it was reliant on the Site Auditor's technical review of the proposed remediation strategy and

investigations undertaken, including the approval of the selected remediation approach. The EPA stated that overall it considered the RAP is appropriate for the purposes of meeting the requirements of the MO. The EPA did not specifically recommend conditions of consent, however its requirements are detailed in the MO.

The Department has reviewed the RAP and its supporting documents, noting the groundwater flow/mass flux reduction proposed in the RAP varies between 79% and 91% (average 85%). The Department sought clarity from the Applicant about the underlying reasons for adopting an average reduction in groundwater flow/mass flux of 85% throughout the remediation design as it was concerned this reduction may not be sufficient to ensure adequate improvement in water quality in the adjacent Styx Creek post-remediation.

The Applicant provided an Ecological Risk Assessment and Groundwater Modelling Assessment (GMA) prepared by JBS&G in June 2016 and November 2017 respectively. The GMA advised that additional surface water monitoring at Styx Creek and Throsby Creek in 2016 and 2017 informed updated conclusions about the level of contamination in the receiving water bodies. All samples at Throsby Creek (downgradient from Styx Creek) showed concentrations of all contaminants to be below the laboratory limit of reporting and ecological screening criteria. At Styx Creek, surface water samples also registered less than the laboratory limit of reporting and ecological screen criteria, except 2,4-dimethylphenol (2,4-DMP) which exceeded the (low reliability) ecological screening criteria of 2 µg/L for chronic toxicity from the ANZECC guidelines at the mid- and downstream locations. The GMA discussed the applicability of adopting the low reliability trigger value and concluded it is overly conservative, especially as the samples were collected at low tide (to represent a worst-case scenario) and sample concentrations are expected to be lower during tidal inundation. Notwithstanding this, the GMA proposed the adoption of an objective of achieving the 2 µg/L trigger value at Styx Creek and estimated this to require a reduction in groundwater flow/mass flux of one order of magnitude (approximate 90% reduction).

The Department notes the additional surface water samples indicate the contamination levels in Styx Creek and Throsby Creek are relatively low and the EPA and Site Auditor were both satisfied with the remediation approach provided in the RAP. Given most sampled contaminants were found to be already under the criteria and the highly conservative nature of the exceedance of the trigger value for 2,4-DMP in surface water, the Department is satisfied the adoption of the proposed remediation design criteria of an average 85% reduction in groundwater flow/mass flux is sufficient and appropriate to reduce off-site surface water impacts in accordance with the MO.

The Department is satisfied the RAP discusses and addresses the three reasons cited by the EPA for regulating the site via an MO. The Department has included the EPA's requirement from the MO for the Site Auditor to provide a Section B4 Site Audit Statement (SAS) and Site Audit Report (SAR) in the recommended conditions. The Department is satisfied the recommended conditions, and obligations of the Applicant under the CLM Act are sufficient to ensure the Stage 2 remediation works are undertaken and managed appropriately to meet the requirements of the MO.

Barrier Wall and Capping Design

The barrier wall and capping design were informed by the onsite and off-site remediation objectives, as well as the GMA developed by JBS&G. The Department notes the Site Auditor has reviewed the GMA and has deemed it to have appropriately evaluated the hydraulic scenario for the preferred remediation option. The key design aspects of the subterranean barrier wall and capping layer are described in **Table 1** and **Section 2.3**.

The Department further notes the subterranean barrier wall and capping layer would result in an approximate 85% decrease in groundwater flow/mass flux, thereby reducing potential off-site ecological impact.

The Department is concerned the remediation option would limit the future use and development potential of the site as contamination would remain under the capping layer, which cannot be disturbed. Concern was also raised by the public and Council regarding this issue. The Applicant has suggested the remediation option was designed

to meet the MO and reduce the potential for contaminants to impact Styx Creek or the greater Hunter River. As such, it would appear the remediation option is an interim measure to protect the environment and, should the site be developed in the future, a separate development application and additional remediation would be required to remediate the site to an applicable standard to allow such development. Although, the site will sit vacant and under-utilised, the remediation option would prevent further off-site migration of contaminated groundwater towards Styx Creek and the greater Hunter River. For this reason, the Department considers the proposed remediation option appropriate, but will require the Applicant to manage the site in perpetuity through the implementation of an LTEMP that details any restrictions to future development of the site due to the nature of the remediation method and the capping layer. In addition, financial assurance (administered through the MO) is required to fund long-term management of the site.

Validation of Barrier Wall and Capping Construction

Construction of the barrier wall and installation of the capping layer require detailed quality control measures to ensure they can meet the objectives of reducing rainwater infiltration and groundwater contamination offsite. The RAP detailed the validation methodology for the remediation works, which included:

- development of a VSAQP prior to commencement of remediation works. The VSAQP would develop data quality objectives and indicators based on the final remediation design of the site.
- requirements for the remediation contractor to demonstrate during construction that the barrier wall, marker layer, subgrade and capping layer are being constructed according to the relevant specifications
- groundwater and surface water levels validation criteria (comparing before and after situations)
- groundwater and surface water quality monitoring
- imported fill validation guidelines
- preparation of a validation report upon completion of the remediation works, to be reviewed and endorsed by the Site Auditor
- preparation and implementation of an LTEMP

The MO requires the Applicant to prepare and submit a Remediation Validation Report (RVR) demonstrating the subterranean barrier wall and capping system have been installed to the design specifications. In addition, the EPA requires the Applicant to provide a copy of an interim advice from the Site Auditor that confirms the appropriateness of the RVR.

The Department considers the proposed quality control and independent quality assurance program described in the RAP is appropriate to ensure the construction of the barrier wall and capping layer is adequately validated to achieve the objectives of the MO. The Department has considered the requirements of the EPA in the MO and has recommended conditions to ensure the remediation works are constructed to the highest standard. These conditions include:

- appointment of a Site Auditor to independently review the implementation and validation of the remediation program and provide a SAS and SAR following construction
- submission to the Planning Secretary of an RVR prepared by a validation consultant.

The Department considers these conditions appropriate and adequate for ensuring the subterranean barrier wall and capping layer are installed in accordance with the RAP.

Long-term Environmental Management Plan

As contaminated soils containing PAHs, benzene, TPHs, arsenic and lead would be contained on the site, ongoing monitoring and management of all areas would be required to ensure the continued protection of human health and the environment in perpetuity. The Applicant has committed to preparing a LTEMP detailing the ongoing

management, monitoring, and maintenance requirements, as well as restrictions on site activities or uses. It is a requirement of the MO that the LTMP be submitted to the Site Auditor for approval and be revised on a periodic basis with EPA approval. The MO also requires the interim advice from the Site Auditor determining the appropriateness of the LTEMP to be provided to the EPA. Validation and ongoing monitoring would continue until it has been demonstrated (and accepted by the EPA) that the remediation works have achieved the objectives and requirements of the MO.

The Department notes the importance of detailing the long-term management measures to ensure the effectiveness of the barrier wall and capping layer in preventing offsite migration of contaminated groundwater. The LTEMP would provide the framework for minimising the risks to human health and the environment and would detail the maintenance and groundwater monitoring requirements.

The Department has included the EPA's requirement for interim advice on the appropriateness of the LTEMP in the recommended conditions. The Department considers this would ensure the subterranean barrier wall and capping layer are managed and maintained effectively in perpetuity.

Financial Assurance

The Department and the EPA identified the need for financial assurance to cover the liability for long-term maintenance and management of the subterranean barrier wall, capping layer and groundwater monitoring wells in perpetuity. This includes adequate funds to implement the LTEMP and ensure the integrity of the remediation works. Following discussions between the Department and EPA in August 2018, the EPA issued a new MO on 26 October 2018 that included provisions for financial assurance.

Under the new MO, the Applicant is required to obtain and submit to the EPA an independent assessment of the cost of operating the subterranean barrier wall and capping layer and ongoing implementation of the LTEMP. This is required within three months of the signed date of the LTEMP. Following receipt of the independent assessment of costs, the EPA will determine the amount of the financial assurance required and vary the MO to include the specific amount.

The Department supports the inclusion of a financial assurance in the MO and acknowledges the EPA is responsible for the management of the financial assurance and will claim on it if required.

Conclusion

The Department has reviewed all information provided and concludes the site remediation process detailed in the RAP would meet the requirements of the MO by reducing the offsite groundwater flow/mass flux by approximately 85%. The RAP would ensure all contaminated materials are placed behind the subterranean barrier wall and contained beneath a capping layer covering the whole extent of the site. The Department's assessment concludes:

- EPA considers the RAP is appropriate for the purposes of meeting the requirements of the MO. This suggests the subterranean barrier wall and capping layer are appropriate to reduce further offsite migration of contaminated groundwater into Styx Creek and the Hunter River, thereby reducing the risk of harm to human health and the environment.
- an independent review and validation of the remediation program will be undertaken by the EPA approved Site Auditor on completion of the remediation works. This would include issue of a SAS and SAR documenting the validation.
- a LTEMP would be prepared and implemented, including ongoing groundwater monitoring to manage residual contamination and ensure continuous care of the subterranean barrier wall and capping layer
- the new MO requires the Applicant to provide a financial assurance for long-term management of the site.

6.2 Groundwater Impacts

The proposed remediation works have the potential to further impact groundwater levels and quality both on and offsite during construction and operational phases. The EIS included a Hydrological and Hydrogeological Assessment (HHA) prepared by GHD in accordance with the relevant legislation, policies and guidelines.

Existing Groundwater Management

The existing groundwater monitoring network consists of 59 monitoring bores and 15 extraction bores, with monitoring of groundwater levels and quality undertaken on a six-monthly basis in accordance with the MO.

The monitoring data indicates the groundwater levels within the site can vary from 0.172 m AHD to 3.857 m AHD and the groundwater levels within the sandy aquifer respond rapidly to significant rainfall events, indicative of a high recharge/infiltration area. There appears to be very limited vertical groundwater flow from the sandy aquifer to the clay aquifer/aquitard. The base of the barrier wall would extend 0.5 m into the clay layer under the groundwater table, meaning the barrier wall would prevent groundwater moving under it into the contaminated portion of the site.

The HHA concluded the majority of groundwater from the site discharges to Styx Creek, with some potential for groundwater to discharge at locations further downstream.

Historical groundwater quality data shows elevated concentrations of ammonia, zinc, cyanides, thiocyanate, phenols, BTEX, naphthalene and petroleum hydrocarbons, with the highest levels within the plume areas and downgradient of the NAPL source areas (central and southern areas of the site). The HHA considered the groundwater plumes to be mature and stable.

The Department notes the Hunter River is among the groundwater dependent ecosystems (GDEs) listed in the HHA and is reliant on the subsurface presence of groundwater.

Groundwater Management during Construction of the Barrier Wall and Capping Layer

During installation of the subterranean barrier wall, material would be excavated 0.5 m into the basal clay layer/aquitard. No active dewatering would occur during these works; however, a limited volume of groundwater may be incidentally removed with excavated soil and via evaporation. Most excavated soil would be mixed with bentonite and reused to create the barrier wall, thereby preserving this water onsite. Excess saturated material not suitable for re-use onsite would be removed and disposed of at an appropriately licensed facility. The Applicant proposes to monitor groundwater levels during construction of the barrier wall.

The Department considers the proposed measures to manage groundwater during construction are adequate and has recommended conditions regarding the management and disposal of liquid wastes.

Groundwater Management during Operation

Groundwater sources on the site have been classified as *less productive fractured rock groundwater sources* under the NSW Aquifer Interference Policy (AIP). The AIP considers predicted impacts on groundwater sources less than Level 1 to be acceptable. The Level 1 minimal impact considerations for *less productive fractured rock groundwater sources* can be summarised as:

- water table – less than 10% cumulative variation at a distance of 40 m from any high priority GDEs or a maximum of 2 m cumulative water table decline at any water supply work (groundwater bore for domestic water supply).
- water pressure – a cumulative decline of not more than 40% at any water supply work
- groundwater quality – any change should not lower the beneficial use category of the groundwater beyond 40 m of the activity.

The HHA predicted the groundwater impacts from the development would be less than the Level 1 considerations and are therefore acceptable. Post-remediation, the HHA predicted the development would improve the quality of water entering Styx Creek by decreasing the groundwater flow/mass flux from the contaminated portion of the site by 85% on average.

Validation criteria for the effectiveness of the barrier wall and capping in managing groundwater impacts would be confirmed as part of the VSAQP. In addition, the Applicant would prepare a LTEMP that would identify post-remediation monitoring locations and frequency of monitoring.

The EPA did not raise any concerns with the proposed measures to manage groundwater. The Site Auditor concluded the risk for offsite users of groundwater was low, however future monitoring and education would be required. NSW Health noted that the HHRA found that potential exceedances of risk and hazard criteria were estimated for future scenarios where groundwater is beneficially used at offsite properties, for example via irrigation of home-grown produce by groundwater. Currently there is one existing landowner bore but no beneficial use of bore water in the area. NSW Health recommended that advice be provided to local landowners regarding the potential health risks of installing a bore and using bore water and suggested the monitoring of water bores within 500 m of the site.

The Department supports the proposed approach to validate the effectiveness of the barrier wall and capping layer to protect groundwater through monitoring. The Department has recommended conditions requiring the Applicant to provide details of the groundwater monitoring program within the LTEMP.

Conclusion

The Department notes the proposed barrier wall and capping layer have been designed to significantly reduce the flow of contaminated groundwater from the site. The Department considers the proposed long-term monitoring is appropriate to identify any significant changes in groundwater levels and contaminant concentrations. The Department has reflected the requirements of the MO and has recommended a condition requiring the groundwater monitoring to be provided to the EPA.

6.3 Human Health

Due to the nature of the identified contaminants onsite, the development has the potential to pose risks to human health.

Risks to Human Health from Remediation Works

A Remediation Works Human Health Risk Assessment (RWHHRA) was prepared by GHD in accordance with the Environmental Health framework *Guidelines for assessing human health risks from environmental hazards*, 2012. The RWHHRA examined health risks associated with contaminants in soil and vapour to both offsite receivers and onsite workers during the remediation. Emissions of contaminants from vapour and dust may occur during excavation and handling of contaminated soils. Contaminants of potential concern (COPC) are inorganic compounds, monocyclic aromatic hydrocarbons, phenols, and PAHs.

The Department notes excavation for the barrier wall would occur outside of the area worst-affected by contamination, however isolated areas of impact may be encountered during site regrading, capping or barrier wall installation. Wind-blown dust containing chemicals may settle in neighbouring properties where receptors may be exposed through contact or inhalation.

The RWHHRA examined contamination emission sources, dust emission rates, volatile chemical emission rates and chemical concentrations in the soil using conservative assumptions and the results of soil sampling from various soil testing undertaken between 2014 and 2017. A toxicity and exposure assessment was undertaken that evaluated the physical and chemical properties of the COPC and discussed their absorption pathways. In addition,

air dispersion modelling for contaminated dust migration was based on results from the Air Quality Impact Assessment prepared by GHD for the EIS. The final step of the RWHHRA, risk characterisation, combined the information regarding human exposure patterns, chemical-specific toxicity criteria and airborne dispersion of chemicals to assess the health risk for offsite receivers and onsite workers.

The RWHHRA concluded:

- the health risks to sensitive receivers at neighbouring properties from deposition of dust-borne contamination of surface soil and inhalation of volatile chemicals is low and acceptable due to the very low concentrations of chemicals predicted in dust and vapours reaching off-site sensitive receivers
- due to the short duration of the remediation works, it is unlikely the health risks to onsite workers from direct contact with carcinogenic PAHs would result in unacceptable exposure. However, to minimise the risk to workers, the RWHHRA recommended the development of a site management plan to include the use of personal protective equipment (PPE) and general hygiene measures for all workers onsite during the remediation works.

The Department has reviewed the information provided in the RWHHRA and concludes the remediation works represent low health risks to neighbouring properties, with some risk posed to the health of onsite workers during the remediation. NSW Health raised no objection to the development, however requested the Department to consider air quality impacts on workers and construction noise impacts on residents in its assessment. The Department is satisfied the risk to workers can be adequately managed by the implementation of appropriate safety measures, including the use of PPE, appropriate training and health monitoring. The Department has included the requirement for such safety measures to be included in a Health and Safety Plan for construction as a condition of consent.

Risks to Human Health Post-Remediation

A Post-Remediation Human Health Risk Assessment (PRHHRA) was prepared by JBS&G in accordance with the Environmental Health framework *Guidelines for assessing human health risks from environmental hazards*, 2012. The PRHHA examined the risk from residual soil contaminants to future site users post-remediation, as well as ongoing use of properties in the vicinity, including potential impacts to groundwater. The PRHHRA considered worst-case levels of contamination and used highly conservative exposure scenarios. The PRHHRA also assumed the remedial option in the RAP had already been implemented and the site was fully capped to prevent direct human exposure to contaminants. Various receptors were evaluated:

- onsite – surface maintenance workers and sub-surface excavation workers onsite for up to 15 days per year (post-remediation).
- off-site – trespassers and maintenance workers within Styx Creek, and users of extracted groundwater (for garden irrigation and swimming pools).

The Site Auditor reviewed the PRHHRA and provided his final advice on the adequacy of the assessment in an Interim Audit Advice letter dated 29 November 2017. The Site Auditor's review noted the design of the remediation (barrier wall and cap) would not achieve mass reduction of contaminants onsite, as these would remain in place. Consequently, the potential for risk to human health onsite following the completion of remediation works would be reduced only by the physical barrier (capping layer).

The Site Auditor's review concluded that, as the PRHHRA had only evaluated risk for 'infrequent' workers being onsite, the use of the site by workers may need to be restricted in future. The MO specifically requires the RAP to address the issue of subsurface workers being exposed to vapours, and the Site Auditor concluded this was addressed primarily through restricting use of the site to infrequent maintenance workers only and vapour inhalation risk would remain.

In its submission on the EIS, NSW Health emphasised the need to take all necessary precautions to ensure workers' health and safety, in conjunction with advice from SafeWork NSW. The Department also had concerns about worker health post-remediation and requested more information from the Applicant. In response, the Applicant provided a Soil Vapour Human Health Risk Assessment (SVHHRA) report, prepared by Ramboll in April 2019. The SVHHRA took a less conservative approach than the PRHHA, which had adopted the highest measure soil vapour concentration and applied it across the whole site. The SVHHRA assessed the risk posed by soil vapour both inside and outside the most-contaminated, central part of the site separately. Risk modelling found low risk to outdoor workers anywhere onsite post-remediation and the SVHHRA concluded residual soil vapour risks can be effectively managed through the LTEMP.

The PRHHA found there were no potential exceedances of risk or hazard criteria for trespassers to Styx Creek, occupants of off-site residential dwellings (via vapour intrusion into off-site buildings) or potential future off-site sub-surface maintenance workers. Potential exceedances of risk and hazard criteria were estimated for future scenarios if groundwater was beneficially re-used (e.g. to water vegetable gardens) at downgradient off-site/adjoining properties. However, as there is currently no known beneficial use of groundwater occurring downgradient of the site this risk was considered low.

The Department has considered the risks to human health posed by the development post-remediation and is satisfied there would be low risk to off-site receptors (residents and trespassers in Styx Creek). The Department notes the SVHHRA demonstrates there would be a low and acceptable risk to onsite workers and is satisfied the information presented in the SVHHA represents a more realistic characterisation of soil vapour concentrations than the PRHHA. The Department therefore considers the development would have limited potential to cause health impacts for workers onsite following remediation.

The Department's assessment concludes the risk to site occupants and off-site receptors can be adequately managed by the implementation of appropriate safety measures. The Department has included the requirement for such safety measures to be detailed in the LTEMP as a condition of consent.

6.4 Visual Impact

The remediation works include the removal of all vegetation and the construction of a capping layer with a bitumen spray seal across the entire site (7.4 ha), excluding the existing heritage items to be retained. As there is no future land use proposed following completion of the remediation works, it is likely the bitumen capping layer will remain in place for many years. As the current chain-wire fencing provides little screening of views of the site (see **Figure 11**), the remediation works have the potential to impact the visual amenity of the locality until a future, alternative use is established on the site.

Concern for the visual impacts on the low-density residential locality of Hamilton North was raised by Council and the Department in November 2018 following a visit to the site. The Department considers the size of the development, its proximity to residences, visibility from the street and the visual prominence of a bitumen seal would together contribute to negative impacts on visual amenity in the area. The Department subsequently requested the Applicant provide an options analysis of mitigation measures to reduce the visual impacts of the development.

In the RTS (December 2018), the Applicant submitted an analysis of five mitigation measures, as discussed in **Table 3**.

Figure 11 | View of the site and fencing from Clyde Street

Table 3 | Applicant's Consideration of Visual Mitigation Options

Option	Applicant's Consideration
1. vegetation planting along the site boundary, leaving areas of the site uncapped	• deemed impractical as this would leave portions of the western and north-western boundary un-capped to accommodate landscape planting. The provision of tree planting on the site would compromise the overall objectives of the development and its capability to satisfy the MO, as it would provide opportunities for water infiltration.
2. vegetation planting along the site boundary, over the capping layer	• deemed to compromise the project and MO objectives as the root systems of trees planted above the capping layer could potentially inhibit the integrity of the capping layer, providing the subsequent risk of water infiltration beneath it.
3. vegetation planting along the street frontage in the nature strip	• considered unfeasible due to the existing services infrastructure located underneath the Council-owned nature strip adjoining the north and north-western boundary of the site. Tree planting could potentially damage the existing service infrastructure.
4. construction of a solid fence along the western and north-western boundaries	• considered visually foreboding, also presenting the risk of graffiti which would contribute to further impacts on the visual amenity of the area.
5. installation of 2.1 m high black palisade fence with a shade cloth cover along the western and north-western boundaries	• this is the Applicant's preferred option as it could effectively minimise views of the site from the street frontage while achieving the objectives of the project and the MO.

Council reviewed the RTS and provided comments on the options. Despite the Applicant's preference, Option 1 was favoured by Council to enhance the visual amenity of the site post-remediation. Council's concern regarding Option 5 was the potential for dark shade cloth on palisade fencing to encourage graffiti. As an alternative, Council suggested the use of multi-coloured shade cloth on boundary fencing to discourage graffiti.

The Department has undertaken a review of the options presented in the RTS and met with the Applicant to discuss these, noting Council's preferred option. While acknowledging Council's preference, the Department considers departure from the endorsed remediation methodology to accommodate tree plantings to be unacceptable, as it is a potential compromise of the overall aims of the development to remediate the site, meet the objectives of the MO, and manage risks to human health and the environment.

The Department is satisfied the proposed 2.1 m high black palisade fence with fitted shade cloth would provide sufficient visual screening from the street frontage onto the site. The installation of the fencing would provide the least risk of compromising the integrity of the capping layer and the overall remediation objectives. The Department agrees with Council's suggestion that the shade cloth should consist of colours and patterns that may deter graffiti.

The Department's assessment concludes the installation of a 2.1 m high black palisade fence fitted with multi-coloured or patterned shade cloth adequately mitigates the potential visual impacts of the development post completion of remediation works without compromising the objectives of the development and the MO.

The Department recommends a condition of consent requiring the Applicant to provide a 2.1 m high palisade fence with the associated shade cloth to be designed in consultation with Council.

6.5 Other Issues

The Department's assessment of other issues is provided in **Table 4**.

Table 4 | Assessment of other issues raised

Findings	Recommended Condition
Noise	
• Noise generated by the remediation works has the potential to negatively impact surrounding residential and sensitive receivers. • GHD prepared a Noise and Vibration Impact Assessment (NVIA) in accordance with relevant EPA noise policies and guidelines. • The NVIA identified 507 sensitive receivers in the vicinity of the site and grouped them into nine noise catchment areas (NCA) by location. The NVIA also divided the noise generation into 13 scenarios equivalent to the staged activities of the remediation works. Each modelling scenario assumed the two loudest items of equipment were being used simultaneously to represent the worst-case scenario. • The NVIA identified multiple exceedances of the construction noise management levels (CNML) specified in the Interim Construction Noise Guidelines (ICNG) at all NCAs at varying stages of the works. Noise levels were predicted to exceed the CNMLs at six NCAs, with up to 87 dB predicted during site establishment works and 83 dB during the construction phase. These levels exceed the CNMLs by up to 36 dB and 31 dB respectively. NCA5	Require the Applicant to: • undertake remediation works 7 am – 6 pm Monday to Friday and 8 am – 1 pm on Saturdays, unless agreed upon in writing with the Planning Secretary • prepare and implement a CNVMP

Findings	Recommended Condition
and NCA6 (residences directly to the west of the site) were predicted to be the most affected due to the number and duration of sensitive receivers impacted. • The Department notes these noise levels exceed the 'highly noise affected' level of 75 dB (A) that represents the point above which there may be strong community reaction to noise. Of particular note, residents in NCA 6 (31 residences on Emerald Street backing onto Chatham Road) would be highly noise affected for up to three months of the seven-month remediation period. • The Applicant proposes mitigation measures to reduce the impact of noise and vibration, in line with best practice. These include general controls (behavioural practices, noise barriers and noise monitoring) and source controls (respite periods, equipment selection and scheduling). Due to the proximity of residential receivers, further community consultation on respite periods during construction to alleviate potential noise discomfort and the provision of a temporary noise barrier are also proposed. • The EPA provided comments requiring the construction hours to be restricted to ICNG-specified hours and further community consultation on noise impacts. NSW Health required complaints handling to include a mechanism to ensure corrective action would occur in a timely manner, while Council had no comment on noise and vibration impacts. • The Department notes the CNML exceedances are partly due to the proximity of sensitive residential receivers to the site and, as recommended in the ICNG, the Applicant has proposed methods to manage these, including screening by a temporary acoustic barrier, with other mitigation measures designed to provide periods of respite for the closest receivers as well as overall noise reduction. • The Department is satisfied the Applicant's assessment of noise impacts is appropriately conservative and the proposed mitigation measures are generally in accordance with the recommended work practices from the ICNG. • Despite the quite considerable noise impacts predicted, the Department notes the remediation works are necessary to achieve the development's objectives and meet the requirements of the MO. In addition, the impacts on nearby residential receivers would be relatively short-term, with no ongoing noise impacts once remediation works have finished. Further, the Department considers the proposed managements measures, including acoustic shielding and utilization of respite periods, are also appropriate to reasonably and feasibly control noise impacts on the highly affected receivers. • To support the minimisation of noise impacts, the Department has recommended conditions requiring remediation works to be undertaken during restricted timeframes and the preparation and implementation of a Construction Noise and Vibration Management Plan (CNVMP), which must include measures to manage high noise generating works based on the results of genuine community consultation.	

Findings	Recommended Condition
Traffic	
• The development would generate vehicle movements during the construction phase which have the potential to impact on the safety, capacity and efficiency of the local road network. • The EIS included a Traffic Impact Assessment (TIA) to assess construction traffic impacts and describe the existing traffic conditions. • Construction of the capping layer would generate the highest average daily traffic volume, with 72 movements per day over a duration of 12 weeks. Post-remediation, ongoing maintenance/operational traffic would be minimal, estimated at 3 vehicles per week. • The TIA assumed a conservative estimate of eight heavy vehicle movements per hour each way during the AM and PM peak hours. • The TIA assessed the traffic movements along Chatham Road and Clyde Street, concluding they can both absorb the additional traffic movements during the AM and PM peak hour periods while retaining their current levels of service efficiency (Level of Service (LoS) A and C respectively). • The Department notes that, except for Council, there were no concerns from agencies relating to the generation of traffic movements by the development. • The Department found the information provided sufficiently demonstrates that traffic generated from the development would have a negligible impact on the efficiency of Chatham Road, Clyde Street and the surrounding road network. • The TIA also identified the traffic impacts associated with vehicles entering and leaving the site via the existing access to the south-west on Chatham Road. • Council raised concerns regarding the proposed outbound traffic route through Boreas Road, which is heavily used and has traffic calming devices installed to control high vehicle use. Council maintains that heavy vehicles would not be able to sufficiently maneuver and recommended the Applicant consider providing a second access for outbound vehicles that would avoid Boreas Road. • The Applicant revised the proposed outbound access for heavy vehicles in the RTS (see **Figure 10**), creating a new temporary outbound driveway access on Clyde Street. Vehicles would travel east along Clyde Street to connect onto Broadmeadow Road. Council reviewed the RTS and provided support for the revised outbound access. No other agencies provided comment on the proposed inbound and outbound traffic accesses. • The Department found the revised outbound traffic route provides an acceptable outcome that has been agreed with Council. Furthermore, the Department considers the diversion of outbound traffic away from Boreas Road would reduce the development's potential traffic impacts on the low-density residential area and the local roads.	Require the Applicant to: • prepare and implement a CTMP

Findings	Recommended Condition
• The Department's assessment concludes that traffic generated by the remediation works would have an acceptable impact on the local road network. • To support the management of any potential traffic impacts, the Department has recommended conditions requiring the Applicant to prepare and implement a construction traffic management plan (CTMP), including a parking plan to ensure sufficient staff parking is provided onsite.	
Air Quality and Odour	
• The development has the potential to generate dust and odour impacts in the surrounding area. • The EIS included an Air Quality Impact Assessment (AQIA) prepared by GHD. The AQIA identified sensitive receivers are located along Chatham Road to the west, three residential receivers to the north on Girling Street and two receivers to the east on Fern Street. • The modelling in the AQIA identified potential dust and odour impacts from crushing and screening activities to be below the annual and daily criterion at all sensitive receivers. • The AQIA identified dust deposition from regrading activities would exceed the Approved Methods' criteria of 2 g/m²/month for monthly rates, producing a maximum of 4 g/m²/month. However, site regrading works would be undertaken over two months resulting in an annual average of only 0.92 g/m²/month, which is below the criteria. • To reduce dust impacts, the AQIA recommended the implementation of a Dust Management Plan (DMP) which would include the suppression of dust via water spray and the suspension of work during prevailing easterly winds. • The AQIA modelled the predicted maximum concentrations of naphthalene and TRH F2 odours and found the most affected sensitive receiver would be exposed to 0.01 odour units (OU), which is well below the Approved Methods criterion of 2 OU. • The EPA requested the Applicant revise the AQIA to ensure the assessment was carried out in accordance with the EPA's Approved Methods. • In its RTS, the Applicant included an addendum to the AQIA that addressed the cumulative dust impacts of crushing and site levelling activities, identifying that they would remain under the annual criterion of 90 micrograms per cubic meter (µg/m³). The EPA was satisfied with the response and had no further comments. • The Department has reviewed the information provided and notes the AQIA was undertaken on a conservative, worst-case basis. Under the scenarios modelled, dust and odour levels are predicted to be below the criteria in the Approved Methods, therefore the Department is satisfied the actual impact of the dust and odour produced would be even lower.	Require the Applicant: • to prepare and implement an AQMP, including a DMP

Findings	Recommended Condition
• The Department's assessment concludes the remediation works would have minor impacts on air quality and odour, which can be adequately mitigated through the preparation and implementation of an Air Quality Management Plan (AQMP) with the inclusion of a DMP.	
Heat Impacts	
• The proposed capping layer would be finished with a bitumen spray seal in a dark grey/black colour. As the site has an area of 7.4 ha, there is the potential for excessive heat to be generated via the Urban Island Effect (UIE). The UIE involves absorption of daytime heat by urban structures and the subsequent release of the stored heat at night. This may impact on human health within the locality through disturbed sleep and heat-related illness such as dehydration, heat cramps, heat exhaustion and heat stroke. • Health NSW raised concerns with the development's potential to generate excessive heat and requested further consideration of the issue by the Applicant. • In December 2018, the Applicant provided an options analysis which assessed five mitigation options based on urban heat impact literature. The options included provision of green open spaces, green buildings, permeable pavements, street trees and 'cool pavements'. • The Applicant identified cool pavement treatment as its preferred option as the other options have the potential to compromise the integrity of the capping layer and the development's capacity to achieve the objectives of the MO. • To achieve a 'cool pavement', the Applicant proposed use of a light-coloured Dulux Aeromaster paint product, applied to the western and north-western boundaries of the site (approximately one-third of the site) to minimise the absorption of heat. • Health NSW was satisfied with the investigation and presentation of the preferred option and raised no further concerns. • The Department reviewed the options presented by the Applicant and notes that, while no data was provided regarding the level of heat reduction provided by the surface treatment, the application of a light-coloured paint to the capping layer is the only feasible option and would potentially mitigate heat generation by reducing heat absorbed by the capping layer and its subsequent radiation during night-time. • The Department's assessment concludes that the Applicant has sufficiently investigated the potential for heat impact on human health and has recommended a condition requiring the Applicant to apply a light-coloured paint to 30% of the site along the western and north-western boundary of the site and maintain it as part of the LTEMP.	Require the Applicant: • to apply light-coloured paint to 30% of the site along the western and north-western boundary.
Heritage	

Findings	Recommended Condition
• The development has the potential to impact the three existing onsite items of local heritage significance listed under the Newcastle LEP – remnant gardens, Newcastle Gas Company Office and the Pump House and Fence. • The registered remnant gardens would be removed from the site to accommodate the capping layer. Vibration from construction vehicles has the potential to impact the structural integrity of the heritage structures. • A Historical Heritage Assessment (HA) prepared by Virtus Heritage identified that vibrations generated from the remediation works are anticipated to exceed the guideline value of 3 mm/s for sensitive structures. • The HA argued the exceedance of the guideline's values for sensitive structures does not guarantee the remediation works would cause cosmetic or structural damage to the heritage structures and has proposed the undertaking of a dilapidation survey to determine the impact of remediation works on the items. In addition, the Applicant has proposed the implementation of vibration monitoring throughout the remediation works to measure the potential for damage. • The Heritage Council provided recommended conditions requiring the implementation of a Conservation Management Plan (CMP) and photographic archival recording of the registered heritage items prior to commencement and at completion of the remediation works. • The Department considers the removal of the remnant gardens is necessary as the root structure of trees and vegetation would compromise the integrity of the capping layer and provide a direct pathway for water infiltration, preventing the works from achieving the objectives of the MO. • The Department considers the implementation of a CMP and vibration monitoring to be appropriate mitigation measures to minimise damage to the existing heritage structures. • The Department's assessment concludes that the protection of the existing heritage items can be adequately achieved through the implementation of a CMP, combined with construction vibration monitoring and a protocol for unexpected finds.	Require the Applicant: • to prepare and implement a CMP. • to adopt an unexpected finds protocol for any item or object of Aboriginal heritage significance identified on site.
Vibration	
• Vibration generated by the remediation works has the potential to impact residential buildings, human comfort, heritage buildings and buried infrastructure. • GHD prepared a Noise and Vibration Impact Assessment (NVIA) which addressed vibration issues in accordance with relevant policies and guidelines. • The NVIA concluded the predicted vibration levels of 3 mm/s would not be sufficient to cause structural damage to residential properties, however human comfort may be affected within the vibration buffer distances from Assessing	Require the Applicant to: • prepare and implement a CNVMP

Findings	Recommended Condition
Vibration: A Technical Guideline. No adverse impacts were predicted on nearby buried infrastructure. • The Department is satisfied the Applicant's assessment of vibration impacts is appropriately conservative, however has recommended conditions requiring preparation and implementation of a CNVMP, which must include measures to manage vibration impacts.	
Waste Management	
• The RAP and EIS propose the clearance of existing vegetation and structures onsite and the relocation of the existing Stage 1 remediation stockpiles to enable the construction of the subterranean barrier wall and capping layer. • The remediation works would generate waste from site clearing, excavation, general construction works and from site personnel. • The RAP and EIS noted that demolition waste, including concrete slabs and bricks, would be contained onsite underneath the capping layer. All vegetation cleared would be mulched onsite and disposed of offsite at a licensed waste facility. Additionally, waste materials from the construction of the subterranean barrier wall would be retained onsite. • The EIS notes that intercepted surface water is to be stored onsite and recycled for dust suppression and construction works. Excess groundwater and surface water is to be taken offsite as liquid waste and disposed of at a licensed waste facility. • The EPA did not raise any comments in relation to waste management. • The Department's assessment concludes that any waste generated from the remediation works can be managed subject to conditions. • The Department has recommended conditions of consent requiring the Applicant to prepare and implement a Construction and Demolition Waste Management Plan (CDWMP).	Require the Applicant: • to prepare and implement a CDWMP.

7. Evaluation

The Department has assessed the development against the matters listed in section 4.15 of the EP&A Act and the objects listed in section 1.3 of the EP&A Act, including the principles of ESD. The Department has considered the development on its merits, taking into consideration strategic plans that guide development in the area, the EPIs that apply to the development and the submissions received from Government agencies, Council and the public.

The key issues for the development relate to remediation design, groundwater impacts and visual impacts. The Department's assessment concluded the remediation works would reduce a long-term source of contamination adjacent to Styx Creek and the residential locality of Hamilton North.

The Department notes the remediation strategy was developed following detailed and extensive site investigations by independent experts. The remediation strategy was independently reviewed by the Site Auditor and the Department and the EPA are satisfied the proposed remediation program meets the requirements of the MO. Should further site uses be proposed the site would require remediation to an acceptable level for that intended use under a separate development application.

The Department considers the impacts associated with the remediation works can be managed and/ or mitigated to ensure an acceptable level of environmental performance, subject to the recommended conditions of consent including:

- the implementation of management and mitigation measures identified in the EIS
- a requirement to engage a Site Auditor to independently review the implementation and validation of the remediation program
- a long-term environmental management plan and a financial assurance to maintain the subterranean barrier wall and capping layer in perpetuity.
- the preparation and implementation of a Construction Traffic Management Plan (CTMP)
- the preparation and implementation of an Air Quality Management Plan (AQMP)
- the preparation and implementation of a Conservation Management Plan (CMP)

The Department also considers the proposal to be acceptable and in the public interest as the development:

- would reduce a long-term source of contamination to adjacent residential land and Styx Creek
- is consistent with the objectives of the Greater Newcastle Metropolitan Plan 2036
- would not result in any significant adverse environmental or amenity impacts

The Department concludes the impacts of the remediation program can be appropriately managed through implementation of the recommended conditions of consent. Consequently, the Department considers the development is in the public interest and should be approved, subject to conditions.

8. Recommendation

It is recommended that the Executive Director, Key Sites and Industry Assessments, as delegate of the Minister for Planning and Public Spaces:

- **considers** the findings and recommendations of this report; and
- **accepts and adopts** all of the findings and recommendations in this report as the reasons for making the decision to grant consent to the application;
- **agrees** with the key reasons for approval listed in the notice of decision;
- **grants consent** for the application in respect of Newcastle Gasworks Remediation Project, subject to the conditions in the attached development consent; or
- **signs** the attached development consent and recommended conditions of consent.

Recommended by:

Sheelagh Laguna 3/7/19
A/Principal Planner
Industry Assessments

Recommended by:

Chris Ritchie 3/7/19
Director
Industry Assessments

9. Determination

The recommendation is: **Adopted by:**

Anthea Sargeant
Executive Director
Key Sites and Industry Assessments

Appendices

Appendix A – List of Documents

List of key documents relied on by the Department in its assessment:

1. Former Newcastle Gasworks (Clyde Street) Remediation Project Environmental Impact Statement, prepared by GHD Pty Ltd, dated July 2018 and all attachments. Available on the Department's website at: https://www.planningportal.nsw.gov.au/major-projects/project/11491

2. Former Newcastle Gasworks (Clyde Street) Remediation Project Response to Submissions Report, prepared by GHD Pty Ltd, dated December 2018 and all attachments. Available on the Department's website at: https://www.planningportal.nsw.gov.au/major-projects/project/11491

3. letter RE: Former Newcastle Gasworks Remediation Project (SSD 7676), 1 Chatham Road, Hamilton North, from Jemena Gas Networks (NSW) Ltd, dated 1 February 2019 and all attachments.

4. Pre-remediation Soil Vapour Human Health Risk Assessment, Clyde Street Former Gasworks Remediation (draft) prepared by Ramboll, dated April 2019. Available on the Department's website at: https://www.planningportal.nsw.gov.au/major-projects/project/11491

5. Groundwater Modelling Assessment report, 1 Chatham Road, Hamilton North prepared by JBS&G, dated 13 November 2017. Available on the Department's website at: https://www.planningportal.nsw.gov.au/major-projects/project/11491

6. Ecological Risk Assessment report, Former Newcastle Gasworks prepared by JBS&G, dated 30 June 2016. Available on the Department's website at: https://www.planningportal.nsw.gov.au/major-projects/project/11491

7. submissions from the general public, Newcastle City Council and government agencies. Available on the Department's website at: https://www.planningportal.nsw.gov.au/major-projects/project/11491

8. relevant environmental planning instruments, policies and guidelines

9. relevant requirements of the EP&A Act.

Appendix B – Environmental Impact Statement

A copy of the EIS can be found on the Department's website, at the following link:

https://www.planningportal.nsw.gov.au/major-projects/project/11491

Appendix C – Management Orders

A copy of the Management Orders can be found on the Department's website, at the following link:

https://www.planningportal.nsw.gov.au/major-projects/project/11491

Appendix D – Submissions

A copy of the Submissions received by the Department can be found on the Department's website, at the following link:

https://www.planningportal.nsw.gov.au/major-projects/project/11491

Appendix E – Response to Submissions Report

A copy of the Applicant's RTS can be found on the Department's website, at the following link:

https://www.planningportal.nsw.gov.au/major-projects/project/11491

Appendix F – Community Views for Draft Notice of Decision

Issue	Consideration
Landuse • The site is a valuable parcel of land that needs to be remediated to have an ongoing useful life. • No land use identified for the site post remediation. • Condition of consent must clearly specify the requirements of any development application to maintain the integrity of the cap. • Condition of consent must require any future owner to remediate the site in line with the proposed future use.	*Assessment* • The Department acknowledges the community's concerns regarding the potential impacts of the proposed remediation works upon future land uses on the site post-remediation due to the nature of the remediation method. • Landuse was an issue assessed by the Department in consultation with Council, as the remediation method may restrict certain forms of development from being undertaken on the site post-remediation. • The Applicant submitted a Response to Submissions (RTS) report which addressed the concerns regarding the future land use of the site. The RTS noted that the current zoning of the site was IN2 – Light Industrial under the Newcastle Local Environmental Plan 2012 and that any future development or rezoning would be subject to a Development Application or Rezoning Application with Council. • The RTS additionally raised that the LTEMP would prescribe restrictions on activities undertaken on the site and advised that the structural integrity of the capping layer and subterranean barrier wall is capable of accommodating warehouse and industrial development. • The Department was satisfied the remediation method could accommodate future development permissible under the current IN2 zoning and the LTEMP would be applied to the site for the life of the capping layer and subterranean barrier wall. • Submission from Council indicated that any future development would need to be approved by Council and they were generally satisfied with the current remediation method. *Recommended Conditions/Response* Conditions include: • Prepare and implement a LTEMP detailing restrictions placed on the land for future development.
Traffic & Access • Truck numbers should indicate truck movements • Truck routes are not identified • Destination and departure points for trucks are not identified.	*Assessment* • The Department acknowledges the community's concerns regarding the potential impacts of heavy vehicle traffic movements on the locality. • Traffic impact was an issue assessed by the Department in consultation with Council and RMS as the vehicles generated from the remediation works have the potential to impact on the road performance and safety of the local road network. • The EIS included a Traffic Impact Assessment (TIA) which reviewed the development against RMS and Council road safety guidelines. The TIA demonstrated that conservative estimates of heavy vehicle movements

Issue	Consideration
	during peak hours would not alter the existing levels of service efficiency for Chatham Road and Clyde Street. • Council raised concern in its submission regarding the proposed outbound traffic route. The Applicant provided a revised outbound traffic route including a new outbound vehicle driveway access on Clyde Street to connect onto Broadmeadow Road, which was supported by Council. • The submissions from RMS and Council indicated they were satisfied that traffic impacts had been addressed by the Applicant. • The Department was satisfied that traffic generated by the remediation works would have an acceptable impact on the local road network. *Recommended Conditions/Response* Conditions include: • Prepare and implement a Construction Traffic Management Plan (CTMP)
Waste Management • All outbound trucks removing material from the site should take the material to a licensed landfill appropriate to the product being removed. • Inbound material should be certified clean product that is fit for purpose.	*Assessment* • The Department acknowledges the community's concerns regarding the potential impacts of waste management on the locality. • Waste management was an issue assessed by the Department in consultation with the EPA as the waste generated from remediation works may have an impact on the locality if not appropriately managed. • The EIS included a Remedial Action Plan (RAP) which identifies the methodology for remediating the site in accordance with WHS and EPA guidelines. The RAP outlined that suitable demolition waste would be contained onsite underneath the capping layer, with other waste, such as vegetation, being disposed of offsite at a licensed facility. Imported fill for construction works would be validated as suitable (fit for purpose) using sampling and analysis in accordance with EPA requirements. • The submission from EPA raised no issues with waste management. *Recommended Conditions/Response* Conditions include: • Prepare and implement a Construction and Demolition Waste Management Plan. • Restrict materials imported onto the site to materials approved in writing by the EPA or site auditor.

Appendix G – Statutory Considerations

Under 4.15 of the EP&A Act, the consent authority, when determining a DA, must take into consideration the provisions of any EPI and draft EPI (that has been subject to public consultation and notified under the EP&A Act) that apply to the development.

The Department has considered the development against the relevant provisions of several key EPIs, including:

- State Environmental Planning Policy (State and Regional Development) 2011 (SRD SEPP)
- State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55)
- Newcastle Local Environmental Plan 2012 (LEP).

The Department is satisfied the development complies with the relevant provisions of these EPIs.

State Environmental Planning Policy (State and Regional Development) 2011

The SRD SEPP identifies certain classes of development as SSD. In particular, the remediation of contaminated land that meets the criteria in Clause 24 of the SRD SEPP is classified as State significant development. The development satisfies the criteria in Clause 24 as it involves category 1 remediation work on significantly contaminated land that is required to be carried out under the *Contaminated Land Management Act 1997* be a Management Order.

State Environmental Planning Policy 55 – Remediation of Land (SEPP 55)

Clause 7 of SEPP 55 states that a consent authority must not consent to the carrying out of any development on land unless:

a) it has considered whether the land is contaminated
b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out
c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

SEPP 55 aims to ensure that potential contamination issues are considered in the determination of a development application. A Remedial Action Plan (RAP) has been prepared for the remediation site in accordance with SEPP 55, and the EPA has provided in-principal support for the RAP.

Newcastle Local Environmental Plan 2012 (Newcastle LEP)

The Newcastle LEP aims to encourage the development of housing, employment, infrastructure and community services to meet the needs of the existing and future residents of the Newcastle LGA. The Newcastle LEP also aims to conserve and protect natural resources and foster economic, environmental and social well-being.

The remediation site is zoned 'IN2' Light Industrial. The Department has consulted with Newcastle City Council throughout the assessment process and has considered all relevant provisions of the Newcastle LEP and those matters raised by Council in its submission on the EIS (see **Section 6** of this report). The Department concludes that the development is consistent with the relevant provisions of the Newcastle LEP.

Appendix H – Recommended Instrument of Consent

A copy of the Instrument of Consent can be found on the Department's website, at the following link:

https://www.planningportal.nsw.gov.au/major-projects/project/11491