Clause 6(5) of the TBM regulations requires that EPA ensures commercially sensitive information in an EMP is not published without consent.
Cleanaway has not consented to publishing the redacted material on the basis that it is commercially sensitive under the regulations. In the interests of transparent decision making, EPA will again seek consent to publish this material at the conclusion of the competitive process to select a site.

Environment Management Plan - Spoil Management and Reuse Facility for the West Gate Tunnel Project

227 Riding Boundary Road, part 304 Riding Boundary Road, part 714 and 1198 Christies Road, Ravenhall, part Christies Road and part Middle Road, Truganina.

Prepared for:
Cleanaway Operations Pty Ltd
Level 4, 441 St Kilda Road
Melbourne, VIC 3004

12 May 2021

Distribution

Environment Management Plan - Spoil Management and Reuse Facility for the West Gate Tunnel Project

227 Riding Boundary Road, part 304 Riding Boundary Road, part 714 and 1198 Christies Road, Ravenhall, part Christies Road and part Middle Road, Truganina.

Rev	Date Issued	Revision Record	Distribution	Copies
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List of Acronyms

Acronym	Definition
ABA	Acid base account
ADT	Articulated Dump Truck
AFFF	Aqueous film-forming foams
AHD	Australian Height Datum
ALARP	As Low as Reasonably Practicable
ASLP	Australian Standard Leaching Procedure
BPEM	Best Practice Environmental Management
Cat A	Category A Prescribed Industrial Waste
Cat B	Category B Prescribed Industrial Waste
Cat C	Category C Prescr bed Industrial Waste
CBD	Central Business District
[redacted]	[redacted]
CCTV	Closed-Circuit Television
CEMP	Construction environment management plan
CPBJH JB	CPB Contractors John Holland Joint Venture
CRS	Chromium Reducible Sulfur Method
EMP	Environment Management Plan
EPA	Environment Protection Authority (Victoria)
[redacted]	[redacted]
GPS	Global Positioning System
HAZOP	Hazard and operability assessment
HEPA	Heads of EPAs Australia and New Zealand
[redacted]	[redacted]
HIL	Health Investigation Levels
H:V	Horizontal to Vertical
ID	Identification
IWRG	Industrial Waste Resource Guidelines (EPA Victoria)
JSA	Job safety analysis
LNVA	Lower Newer Volcanics Aquifer
m	Metre

Acronym	Definition
m bgl	Metres below ground level
mg/kg	Milligrams per kilogram
mg/L	Milligrams per litre
m^3	Cubic Metres
MP	Monitoring Program
MS	Microsoft
MRL	Melbourne Regional Landfill
MRLCRG	Melbourne Regional Landfill Community Reference Group
NDCR	Non-Descript Crushed Rock
NEMP	National Environmental Management Plan (HEPA, 2020)
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure (as amended May 2013)
NPI	Non-Prescribed Industrial Waste
OMP	Operations Management Plan
PASS	Potential Acid Sulfate Soil
PIW	Prescribed Industrial Waste
PIP	Pollution Incident Plan
PPE	Personal Protective Equipment
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PFHxS	Perfluorohexane sulfonic acid
POP	Persistent Organic Pollutants
QMS	Quality management system
SAQP	Sampling, Quality and Analysis Plan
SEPP (PMCL)	State Environment Protection Policy (Prevention and Management of Contamination of Land)
SMRF	Spoil Management and Reuse Facility
SOP	Standard Operating Procedure
SWMP	Surface Water Management Plan
SWMS	Safe Work Method Statement
SWRRIP	Statewide Waste and Resource Recovery Infrastructure Plan
TBM	Tunnel Boring Machine
TDI	Tolerable Daily Intake

Acronym	Definition
TDS	Total Dissolved Solids
µg/L	Micrograms per litre
UNVA	Upper Newer Volcanics Aquifer
USEPA	United States Environment Protection Agency
VCAT	Victorian Civil and Administrative Tribunal
WGTP	West Gate Tunnel Project
WTC	Waste Transport Certificate
WTP	Water Treatment Plant

Definitions

Term	Definition
Containment System	Term used in the Environment Protection (Management of Tunnel Boring Machine Spoil) Regulations 2020 meaning the system used for the containment of Tunnel Boring Machine Spoil. The term containment system is applied, in this EMP, to the Lined Cells (refer to definition below).
[redacted]	This is the component of the Processing Area comprising [redacted] (refer to **Figure 2**).
[redacted]	[redacted]
Holding Pen	Lined structure located in the Processing Area designed to hold approximately 3,800 m³ of Tunnel Spoil received from the WGTP while the spoil is categorised for containment, reuse or disposal.
Leachate	A term used in the Environment Protection (Management of Tunnel Boring Machine Spoil) Regulations 2020 meaning to describe water generated from the dewatering of Tunnel Spoil or rainwater that has come into contact with Tunnel Spoil. The term used in this EMP to describe this water is Spoil Water (refer below definition).
Lined Cell	Is the Containment System comprising the engineered low permeability lining layers and Spoil Water collection system within the Lined Cells located in the SMRF (refer to **Figure 2**). The Lined Cells have been designed to receive Tunnel Spoil consistent with the descriptions in **Section 4.0** and classified as NPI waste consistent with the parameters defined in **Section 3.1.2**. The Lined Cells will have an engineered lining system equivalent to a landfill cell licensed to receive Category C prescribed industrial waste (PIW), i.e. a Type 2 lining system, with [redacted]
Melbourne Regional Landfill	EPA licensed landfill operations including closed, operating and planned cells and management infrastructure within the premises referred to under EPA Licence, reference 12160.
MRL Southern Expansion Area	Area of land within the Ravenhall industrial precinct planned for future landfill cells. Cleanaway received both EPA works approval and planning approval to develop the Southern Expansion area as a putrescible landfill. [redacted]
Processing Area	Term used in the Environment Protection (Management of Tunnel Boring Machine Spoil) Regulations 2020 defining the area, covered by an impervious surface, for receipt, consolidation, and dewatering of Tu[redacted]ine Spoil. The Processing Area at the proposed SMRF comprises the [redacted] Holding Pens, Settlement Ponds, the Spoil Water Holding Pond and the Water Treatment Plant (refer to **Figure 2**). It is noted that the Holding Pens and [redacted] are locations where Tunnel Spoil will be retained while sampling, laboratory analysis and further waste classification is completed on spoil received from the WGTP as NPI waste under the SAQP.
Ravenhall Precinct	The industrial precinct located in Ravenhall that comprises an operating basalt quarry, asphalt plant and pre-cast concrete manufacturing plant and the Melbourne Regional Landfill. The Ravenhall Precinct is considered as a Hub of State Significance for a number of reasons, including: • The precinct supports the largest putrescible waste landfill in the state. • The hub is close to sources of waste generation, has good transport networks, and supports compatible activities including quarrying.

Term	Definition
Reuse	Refers to the reuse of Tunnel Spoil received at the SMRF which has been tested in accordance with the procedures outlined in this EMP and found to have concentrations of PFAS within the ranges identified for specific reuse options a**t** MRL either in landfill cells or in applications outside landfill cells depending on hazard characteristics.
SAQP	Agon Environmental, 2020, *West Gate Tunnel Project – Zone 302 Sampling Analysis Quality Plan for Waste Categorisation of Tunnel Spoil for Reuse or Containment at, or Disposal by EPA Approved Premises.*
Settlement Pond	A [redacted] lined pond used to store Spoil Water to encourage settlement of suspended fines from the water prior to discharge to the Spoil Water Holding Pond.
Specifications for Containment Of Tunnel Boring Machine Spoil / Specifications for Containment	Upper threshold PFAS criteria and IWRG characteristics of the Tunnel Spoil that must be met for placement and containment of Tunnel Spoil in the Lined Cells (Containment System) at the SMRF, refer to **Section 3.1.2**.
Spoil Management and Reuse Facility (SMRF)	Facility designed to receive Tunnel Spoil from the WGTP located at 227 Riding Boundary Road, 304 Riding Boundary Road and 714 Christies Road. Consisting of weighbridge facilities, the Processing Area, Lined Cells and associated infrastructure on site to enable waste categorisation of the Spoil for either containment, reuse or disposal of that Spoil in accordance with this EMP.
Spoil Water	Water which has been released from or t**hat** has been in contact with Tunnel Spoil
Spoil Water Holding Pond	A [redacted] lined pond used to store Spoil Water prior to its treatment in an onsite Water Treatment Plant. The Spoil Water Holding Pond is component of the Processing Area.
Treated Water	Water discharged from the Water Treatment Plant containing concentrations of PFOS not exceeding detection limit for the laboratory analysis for PFAS, typically [redacted]
Tunnel Spoil	Mixtures of soil, rock, sludge and water generated by earth balance, tunnel boring machines used to excavate and construct two road tunnels for the WGTP. A total of [redacted] (loose cubic metres) of Tunnel Spoil is estimated to be produced from the two tunnel boring machines.
Type 2 Engineered Lining System	Engineered base and side-lining system for landfill cells sufficient to meet EPA Victoria minimum lining performance to control seepage to an amount not exceeding 10 L/ha/day and consistent with indicative designs in EPA Publication 788.3.
West Gate Tunnel Project (WGTP)	Victorian major infrastructure project includes tunnelling and construction of an elevated motorway connecting the West Gate Freeway, west of the West Gate Bridge, with the Port of Me bourne, CityLink and the central business district (CBD) of Melbourne. Tunnelling and bulk excavation works for the project are anticipated to generate approximately 3,600,000 metric tonnes of Tunnel Spoil, soil and rock that requires management as potential waste outside of the project boundary.
Water Treatment Plant	A water treatment facility mobilised to the SMRF to remove PFAS from Spoil Water prior to reuse or off-site disposal to sewer or licensed liquid waste facility. The Water Treatment Plant is a component of the Processing Area.

1.0 Introduction

1.1 General

Cleanaway Operations Pty Ltd (Cleanaway) engaged Senversa Pty Ltd (Senversa) to prepare this Environment Management Plan (the EMP) for a Spoil Management and Reuse Facility (SMRF), located at 227 Riding Boundary Road, part 304 Riding Boundary Road, part 714 and 1198 Christies Road, Ravenhall, part Christies Road and part Middle Road, Truganina VIC 3023.

The location of the SMRF is shown in **Figure 1**. The context of the SMRF in relation to the adjacent Melbourne Regional Landfill (MRL), proposed Southern Expansion of MRL (Southern Expansion) and Boral Quarry is shown in **Figure 2**.

The SMRF will receive non-prescribed industrial (NPI) waste Tunnel Spoil, hereafter referred to as "**Tunnel Spoil**" from the West Gate Tunnel Project (WGTP).

Tunnel Spoil will then be further categorised based on the requirements of the following:

- Agon Environmental, 2020, *West Gate Tunnel Project – Zone 302 Sampling Analysis Quality Plan for Waste Categorisation of Tunnel Spoil for Reuse or Containment at, or Disposal by EPA Approved Premises.*
- Additional sampling for Industrial Waste Resource Guideline (IWRG) 621 chemical parameters detailed in **Section 9.0** of the EMP.

Tunnel Spoil will be classified as NPI waste for its transportation from the WGTP Pivot Site to the SMRF due to the potential for per- and polyfluoroalkyl substances (PFAS) to be present in the spoil. Delivery of the Tunnel Spoil to the SMRF will be the responsibility of CPB John Holland Joint Venture (CPBJH JV).

Tunnel Spoil will be temporarily stored at the SMRF, in Holding Pens, while laboratory testing is conducted and the waste categorisation of spoil in each pen is determined. Tunnel Spoil will be determined to be either NPI waste or prescribed industrial waste (PIW).

Tunnel Spoil categorised as NPI waste will either be removed from the Processing Area and deposited into the Containment System (Lined Cells) at the SMRF or reused in specific applications at MRL.

Based on the waste categorisation procedures proposed in this EMP, Tunnel Spoil which has concentrations of perfluorooctane sulfonate (PFOS), perfluorohexane sulfonic acid (PFHxS) and perfluorooctanoic acid (PFOA) less than the detection limit for the laboratory analyses and concentrations of other chemicals less than the upper threshold criteria for Fill Material in IWRG 621 will be suitable for reuse in applications at MRL outside of the landfill cells (i.e. construction as cell or cap construction materials).

Tunnel Spoil categorised as a PIW, i.e. waste defined as either Category A, B or C contaminated soil under Industrial Waste Resource Guideline (IWRG) 621 [1]), or Tunnel Spoil with PFAS concentrations above a threshold value for containment at the SMRF, will be disposed off-site at an appropriate Environment Protection Authority Victoria (EPA)-licensed facility.

[1] EPA Publication IWRG621 *Industrial Waste Resource Guideline – Soil Hazard Categorisation and Management*, June 2009

1.2 Purpose and Objectives

The purpose of this EMP is to document the proposed engineering and management requirements for the SMRF in support of an application to EPA for approval of the SMRF development and operation under the *Environment Protection (Management of Tunnel Boring Machine Spoil) Regulations 2020* (the Regulations). The EMP is intended to demonstrate that management of Tunnel Spoil at the SMRF will be protective of human health and the surrounding environment and meet or exceed EPA's requirements for the activities to occur at the site.

EPA approval of the SMRF will cover acceptance and temporary storage of Tunnel Spoil in Holding Pens at the SMRF as NPI waste to facilitate sampling, laboratory analysis and further waste categorisation.

The EMP is also intended to provide a basis for EPA to approve containment and reuse options for Tunnel Spoil following waste categorisation. Cleanaway is seeking approval for the following containment and reuse options for Tunnel Spoil categorised as NPI waste:

- Containment of Tunnel Spoil with leachable concentrations of PFOS and PFHxS up to [redacted] and PFOA up to [redacted] in appropriately engineered Lined Cells at the SMRF.
- Reuse of Tunnel Spoil with concentrations of PFOS, PFHxS and PFOA less than the laboratory limit of reporting, consistent with EPA's Interim Position Statement on PFAS (EPA Publications 1669.4), and concentrations of other chemicals less than the upper threshold levels for Fill Material in IWRG 621 in specific applications at the adjacent MRL, including in applications outside of landfill cells.

Details of proposed reuse options for Tunnel Spoil are described in **Section 11.0**.

The EMP also serves a secondary purpose of supporting a planning scheme amendment to approve use and development of the land by way of Incorporated Document and Specific Controls Overlay by providing the plans that have been endorsed as part of that approval.

1.3 Scope of the EMP

The EMP has been prepared to address the management of potentially contaminated Tunnel Spoil following receipt at the SMRF.

Waste categorisation of Tunnel Spoil will be completed with respect to PFAS and IWRG chemical parameters and IWRG parameters in Domain 2 of the tunnel in accordance with the West Gate Tunnel Project – Zone 302 Sampling Analysis Quality Plan (SAQP) (Agon, September 2020) and in relation to IWRG chemical parameters outside of the Domain 2 in accordance with this EMP. Additional testing is proposed by Cleanaway, over and above that documented in the SAQP, for IWRG parameters and is described in **Section 9.0** of the EMP.

Sampling and waste categorisation will be conducted by an independent third party. It is intended that the scope of the independent third parties waste categorisation to address the sampling described in **Section 9.0** will be agreed with CPGJH JV and added to an updated version of the SAQP so that all sampling, quality and analysis requirements for all sampling of the Tunnel Spoil is addressed in a single document.

The independent third-party conducting sampling, laboratory analysis, data management, waste categorisation and auditor verification is to be agreed jointly by the CPBJH JV and Cleanaway but will be engaged by CPBJH JV. Cleanaway will rely on the waste categorisation made by the independent third parties as a basis for implementing containment, reuse or disposal of the Tunnel Spoil.

Onsite containment and reuse of Tunnel Spoil will be in accordance with this EMP and any subsequent requirements documented in EPA's approval of the EMP.

The current legislative and regulatory requirements understood to apply to the SMRF are presented in **Section 2.3**.

1.4 Format of the EMP

1.4.1 EMP Structure

The EMP outlines the key elements of the facility, conceptual design for engineering requirements and management processes for the proposed SMRF.

The structure of the EMP has been developed to comply with the requirements for an EMP under Reg. 6 of the *Environment Protection (Management of Tunnel Boring Machine Spoil) Regulations* 2020 "the Regulation". A guide to where the specific requirements of the Regulation are addressed in the EMP is presented in **Section 2.1**.

The structure of the EMP is as follows:

- An outline of the EPA approvals process (**Section 2.0**).
- Delineation of the project including context of the site and elements of the surrounding environment (**Section 3.0**).
- Our understanding of the Tunnel Spoil sources, location, quantity, characteristics and environmental and human health risks (**Section 4.0**).
- Our assessment of the environmental and human health risks (**Section 5.0**).
- Key design criteria and design responses to accommodate the WGTP requirements, amenity issues and engineered elements of the SMRF (**Section 6.0**).
- Key design criteria, design response and management of water at the SMRF (**Section 7.0**)
- The key processes for environment control, environmental monitoring and environmental management requirements to prevent impacts to human health and the environment (**Section 8.0).**
- A summary of the proposed plan for environmental sampling, analysis and quality control (**Section 9.0**).
- Treatment of Tunnel Spoil prior to reuse or disposal (**Section 10.0**).
- Documentation the identified reuse options for Tunnel Spoil (**Section 11.0**).
- Off-site disposal of Tunnel Spoil classified as PIW (**Section 12.0**).
- Material tracking procedures (**Section 13.0**).
- Traffic management to and within the SMRF (**Section 14.0**).
- Future uses for the site and decommissioning of the SMRF (**Section 15.0**).
- Stakeholder assessment and consultation (**Section 16.0**).

1.4.2 Versions of the EMP

The EMP, and attached figures, present the conceptual designs for the SMRF and rationale for its design and operation. This version of the EMP (Rev7) addresses specific issues identified by EPA in its review of Rev6 of the EMP. Rev 6 of the EMP was generally consistent with the preceding versions of the EMP (Rev3), which was previously approved by the EPA.

Rev2 of the EMP was originally verified by [redacted]. Rev3 of the EMP addressed some additional requirements from EPA identified in Rev2. Rev3 of the EMP was originally approved by the EPA, in a letter dated 12 October 2020. Rev3 of the EMP presented well developed concept designs for the SMRF. However, based on legal advice, the EPA subsequently required the following additional information be provided to fulfil the requirements of the Regulations in relation to approval of the EMP:

- Detailed designs and Technical Specifications of the Processing Area and containment system at the premises.
- A construction quality assurance plan (CQA Plan) for the containment system at the premises.
- A monitoring program.
- A pollution incident plan.
- A report prepared by and environmental auditor assessing the suitability of the detailed designs, technical specifications, CQA Plan, Monitoring Program (MP) and Pollution Incident Plan (PIP).

A Technical Specification, CQA Plan, a MP and PIP were presented in Appendices to Rev6 and Rev7 of the EMP (refer to **Table 1.1** in **Section 1.4.3** for details).

Some uncertainty remains regarding the total volume of Tunnel Spoil requiring containment at the SMRF and the turn-around times for waste categorisation and, consequently, the number of Holding Pens that will ultimately be required. As such, the detailed designs presented in **Appendix A** of the EMP are only for those elements of the SMRF which Cleanaway is confident will be required, or there is a high likelihood that they will be required, being the following:

- The first lift of the Lined Cells [redacted] to an elevation approximately [redacted] above the base of the cells.
- [redacted] Holding Pens, located east of the rock plinth dividing the SMRF.
- One Settlement Pond, located east of the rock plinth dividing the site.
- The Spoil Water Holding Pond.
- The [redacted].
- Water Treatment Plant.

For the avoidance of doubt, it is only the above elements of the SMRF, as shown on **Figure 2**, for which detailed design is provided and for which approval is sought in this Rev7 of the EMP. There is discussion in this EMP about the broader facility, and additional elements that may be required if, for example, the total volumes of Tunnel Spoil to be delivered to the facility require them. Those elements are:

- The additional [redacted] Holding Pens
- Additional lifts of the western bund of the Lined Cells; and
- The Settlement Pond located to the west of the rock plinth dividing the site.

The additional elements are shown in **Figure 4** as part of the overall facility layout, and are discussed in this document in sections that contemplate the entire volumes of Tunnel Spoil being delivered to the SMRF. If those or other additional elements are required, an amended EMP will need to be submitted to EPA for approval (refer to **Section 2.7**).

It should be noted that the detailed drawings and engineering requirements presented in the Technical Specification supersede the concept designs presented in the Figures to the EMP. The Figures presented in Rev6 of the EMP remain unchanged from those in Rev3, previously reviewed by the environmental auditor ([redacted]) and EPA.

Rev4, 4a and 5 were versions of the EMP provided to [redacted] for review, prior to finalisation of the EMP in Rev6 for submission to the EPA.

Rev6 of the EMP and detailed designs appended are consistent with the well-developed concept presented in Rev3 of the EMP, with the following key exceptions:

- Rev 3 outlined a process of secondary approval of specific designs for the SMRF. Those processes and secondary approval described in Rev3 have been replaced by the detailed designs, monitoring plan and pollution incident plan presented in Rev6 of the EMP. Detailed designs include a Technical Specification, Drawings and CQA Plan.
- The option for use of a [redacted], rather than a [redacted] has been adopted for the low permeability liner beneath the Holding Pens and [redacted], which is reflected in the detailed design documents. As such, further detailed modelling required by EPA in its approval letter for Rev3 of the EMP will not be required.
- The specification for [redacted] to be used beneath the Holding Pens and within the Lined Cells has been broadened to allow products more readily available through local suppliers with which Cleanaway has established procurement arrangements.

The [redacted] auditor verification report of Rev6 of the EMP is presented in **Appendix K-1**.

Rev7 of the EMP addressed specific comments identified by the EPA on Rev6 of the EMP. Rev7 of the EMP was also provided to [redacted] to confirm that the amendments required to address EPA's comments did not change the conclusions or outcomes of his verification of Rev6. A copy of [redacted] letter confirming his review of Rev7 of the EMP is presented in **Appendix K-2**.

1.4.3 Supporting Information

The EMP is this report and the technical studies and information appended. **Table 1.1** describes the information appended to the EMP.

Table 1.1: Supporting Information

Appendix	Information type
Figures	• Figures showing the location, general layout and concept designs for the SMRF. Design concepts presented in some of the Figures, as noted on the Figures, are superseded by details presented in the design drawings presented in the Technical Specifications.
Appendix A	Detailed design documents including the following: • A-1: Design Report. • A-2: Technical Specification, including detailed design drawings. • A-3: Construction Quality Assurance Plan. • A-4: WTP Designs.
Appendix B	• Operations Management Plan (Incorporating the operations risk assessment, Pollution Incident Plan (PIP) and Site Emergency Management Plan (SEMP))
Appendix C	• Monitoring Program
Appendix D	• Groundwater Quality Impact Assessment
Appendix E	• Conceptual Site Model Table
Appendix F	• Potential acid sulfate soil (PASS) risk and recommended contingency
Appendix G	• Holding Pen Liner Options Assessment
Appendix H	• Water Balance, Design Flow Rate and Spoil Water Holding Pond Storage Assessment
Appendix I	• EPA Waste Classifications (provided to WGTP for transport of Tunnel Spoil to the SMRF)
Appendix J	• Community Consultation Information
Appendix K	• K-1: Environmental Auditor's Verification Report of Rev6 of the EMP. • K-2: Environmental Auditor's letter confirming verification of Rev7 of the EMP.

2.0 Approval Process and Responsibilities

2.1 EPA Approval of an Environment Management Plan

This EMP is provided to EPA as the primary application document for approval of the SMRF in conformance with Regulation 4 of the Regulations to exempt the SMRF requiring a Works Approval or Licence under Sections 19A and 20(1) of the Environment Protection Act 1970. The requirements for the EMP are described in Regulation 6(2) of the Regulations and are reproduced in **Table 2-1** along with a summary of where the required information is located in this document.

Table 2.1: Requirements for an EMP (Regulation 6)

Reg. No.	Requirement	EMP Report Location
6(2)(a)	A description and map of the location of the premises at which tunnel boring machine spoil is to be received;	**Section 3.0** **Figure 1**
6(2)(b)	A plan of the premises identifying the location of the processing area for the purposes of regulation 5(b) and the location of the containment system;	**Figure 2**
6(2)(c)	A description of the physical characteristics of the premises and elements or segments of the environment adjacent to the premises;	**Section 3.0**
6(2)(d)	The existing and proposed uses of the premises and elements or segments of the environment adjacent to the premises;	**Section 3.0**
6(2)(e)	A description of the activities to be undertaken at the premises;	**Section 3.0** **Section 6.0** **Section 7.0** **Section 8.0**
6(2)(f)	A description of the tunnel boring machine spoil to be received at the site;	**Section 4.0** (summary only a full description is found in the SAQP).
6(2)(g)	The specifications for containment of tunnel boring machine spoil at the premises;	**Section 3.1.2** **Section 6.0**
6(2)(h)	The methodology for determining if tunnel boring machine spoil meets the specifications for containment of tunnel boring machine spoil;	**Section 4.0** (summary only a full description is found in the SAQP). **Section 9.0**
6(2)(i)	An assessment of the risk of adverse impacts from the receipt, storage, treatment, reprocessing, containment, handling or discharge or deposit onto the premises of tunnel boring machine spoil ("the Activities") on any beneficial uses of the environment;	**Section 5.0** **Appendix B** (Operations Management Plan)
6(2)(j)	Management arrangements and operating conditions designed to minimise the risk of adverse impacts from the Activities on any beneficial uses of the environment;	**Section 6.0** (design controls) **Section 7.0** (Spoil Water Management) **Section 8.0** (Environmental Management) **Appendix B** (Operations Management Plan) **Appendix C** (Monitoring Program)
6(2)(k)	Detailed designs and technical specifications of the processing area for the purposes of regulation 5(b) and the containment system at the premises, including features intended to minimise the risk of adverse impacts from the Activities on any beneficial uses of the environment;	**Appendices A-1 and A-2.**
6(2)(l)	A construction quality assurance plan for the containment system at the premises;	**Appendix A-3.**

Reg. No.	Requirement	EMP Report Location
6(2)(m)	Requirements for leachate sampling and analysis;	SAQP **Section 8.0** **Section 9.0** **Appendix B:** Monitoring Program
6(2)(n)	The specifications of the qualities and characteristics of leachate that is suitable for reuse and an identification of activities for which that leachate can be reused;	**Section 7.0**
6(2)(o)	Details of the method to be used to measure and record the information required to be recorded and retained under regulation 5(p);	**Section 8.0** **Appendix B:** Operations Management Plan
6(2)(p)	A monitoring program to demonstrate compliance with the environment management plan;	**Appendix C:** Monitoring Program and summarised in Section 8.0.
6(2)(q)	Requirements for an environmental auditor to audit the risk of harm actually or potentially arising from the Activities at the frequency specified in the environment management plan;	**Section 2.5**
6(2)(r)	A pollution incident plan setting out how any pollution incident will be responded to;	**Appendix B:** The Pollution Incident Plan is provided as an Appendix to the OMP.
6(2)(s)	A report prepared by an environmental auditor assessing the suitability of the detailed designs, technical specifications, construction quality assurance plan, monitoring program and pollution incident plan in achieving the requirements and objectives of these Regulations;	A description of how this will occur is presented in **Section 2.5**. The environmental auditor (Mr Peter Ramsay) will provide his verification report under separate cover.
6(2)(t)	How the environment management plan is to be reviewed.	**Section 2.6**

The responsibilities of the holder of the EMP at the facility are described in Regulation 5 of the Regulations and reproduced in Table 2-2 along with a summary of how each aspect is proposed to be addressed by Cleanaway.

Table 2-2: Responsibilities of the Holder of an EMP (Regulation 5)

Req. No.	Requirement	EMP Report Location
5(a)	TBM spoil is managed and disposed of in accordance with the EMP.	To be assessed during operations in accordance with Audit provisions descr bed in **Section 2.5** and environmental monitoring as descr bed in **Section 8.0.**
5(b)	The receipt, consolidation and dewatering of the TBM spoil occurs on an impervious surface ("the processing area").	Details of the surfaces and engineering lining system for the Holding Pen structures within the Processing Area are described in **Section 6.0**. Details of the engineering lining system for the Settlement Ponds and Spoil Water Holding Pond structures in the Processing Area are described in **Section 7.0**. Detailed designs for the structures within the Processing Area structures are provided as **Appendix A**.
5(c)	TBM spoil is received in the processing area.	The Processing Area is shown on Figure 2. An overview of SMRF operations is provided in **Section 8.1**.
5(d)	No liquids, slurry or sludge escapes, spills or leaks from the processing area.	Details of lining systems, holding capacities and freeboard allowances of the SMRF infrastructure (Holding Pens, Lined Cells and ponds) are described in **Section 6.0**. Detailed designs are provided as **Appendix A**. Environmental monitoring and inspections are described in **Section 8.0**.

Req. No.	Requirement	EMP Report Location
5(e)	The processing area is secured to prevent public access.	The site will be fenced and gated as described in **Section 6.5**.
5(f)	The boundary of the processing area is at least 200 metres from any building that is a sensitive land use, including a residential dwelling, a health service, a childcare centre or an education centre.	Separation distance of the Processing Area from sensitive land uses is described in **Section 3.5**.
5(g)	TBM spoil is not removed from the processing area until it is determined, in accordance with the methodology set out in the EMP if it meets the specifications for containment of tunnel boring machine spoil.	The TBM spoil will not be removed from the Processing Area to the Containment System/Lined Cells, until it is determined that it meets the specifications for containment of tunnel boring machine spoil described in **Section 3.1**. The process for sampling and analysis of spoil sampling and analysis is presented in Section 9.0. Operations and environmental management is descr bed in **Section 8.0**.
5(h)	Any spoil that does not meet the specifications for containment of tunnel boring machine spoil is assessed to determine if it is prescr bed industrial waste and, if it is prescr bed industrial waste within the meaning of the *Environment Protection (Industrial Waste Resource) Regulations* 2009 categorised in accordance with those Regulations.	As detailed in Section 9.1, tunnel boring machine spoil will be assessed against prescribed waste criteria, categorised as prescribed waste and disposed of appropriately. Disposal of Tunnel Spoil is described in **Section 12.0**.
5(i)	Subject to paragraph (j), any TBM spoil that does not meet the specifications for containment of tunnel boring machine spoil is, once removed from the processing area, deposited at a site licensed to accept industrial waste of that kind.	Disposal of Tunnel Spoil that does not meet the specifications for containment of tunnel boring machine spoil is described in **Section 12.0**.
5(j)	Leachate generated in the processing area, including liquid generated from dewatering of TBM spoil, is analysed in accordance with the requirements for leachate sampling and analysis set out in the EMP and removed from the processing area — (i) if the analysis determines that the leachate meets the specifications for reuse set out in the environment management plan, for the purposes of reuse; or (ii) for discharge or deposit into the sewerage system of a water corporation within the meaning of the Water Act 1989 if the discharge or deposit occurs in accordance with a trade waste agreement under that Act; or (iii) for deposit at a site licensed to accept industrial waste of that kind.	Leachate is defined in this EMP as “Spoil Water”. Spoil Water Management is descr bed in **Section 7.0**. Spoil Water Sampling will be completed as part of the Tunnel Spoil categorisation as described in **Section 9.0**.
5(k)	No dust generated by the receipt, storage, treatment, reprocessing, containment, handling or discharge or deposit onto the premises of tunnel boring machine spoil is discharged or emitted beyond the boundary of the premises that results in a risk of harm to human health or the environment.	Dust management and monitoring is described in **Section 8.0** and the operations Management Plan (OMP) included as **Appendix B.** Monitoring Program included as **Appendix C**.
5(l)	The containment system is designed and constructed in accordance with the EMP.	This will be assessed following construction in accordance with the environmental auditing provisions descr bed in **Section 2.5**.

Req. No.	Requirement	EMP Report Location
5(m)	The containment system is not used to contain any waste that is not tunnel boring machine spoil.	The containment system will only be used to contain tunnel boring machine spoil from the WGTP as described in **Section 4.0** and consistent with the exclusions in **Section 2.9**. It is noted that some material generated by decommissioning of the SMRF (eg. Engineered Fill) with concentrations of PFAS consistent with NPI waste may be reused into the Lined Cells as bridging material in the final capping process.
5(n)	The containment system is not used to contain tunnel boring machine spoil that does not meet the specifications for containment of tunnel boring machine spoil.	The criteria for Tunnel Spoil that does **not** meet the specifications for containment of tunnel boring machine spoil **Section 3.1**. Disposal of Tunnel Spoil is described in **Section 12.0**.
5(o)	The containment system is not used to contain tunnel boring machine spoil that contains free liquid as determined by Method 9095B - Paint Filter Liquids Test (Revision 2) published by the United States Environmental Protection Agency in November 2004.	The containment system will not contain tunnel boring machine spoil that contains free liquid, refer to **Section 6.7.4**.
5(p)	The following information is recorded and retained at the premises for at least 2 years — (i) the quantity of TBM spoil received at the processing area and the date on which it was received; (ii) the quantity of TBM spoil removed from the processing area for deposit in the containment system and the date on which it was removed and deposited; (iii) the quantity of leachate removed from the processing area for the purposes of reuse and the date on which it was removed; (iv) the quantity of leachate removed from the processing area for discharge or deposit into the sewerage system of a water corporation; (v) the quantity of TBM spoil and leachate removed from the processing area for deposit at a site licensed to accept industrial waste of that kind and the date on which it was removed.	Confirmation that records will be retained by Cleanaway is described in **Section 13.0**.
5(q)	Any pollution incident at the premises or escape, spill or leak of waste outside the processing area is reported to the Authority in writing as soon as is practicable and that the report includes the following information — (i) the time, date and location of the incident; (ii) the nature of the incident; (iii) the circumstances in which the incident occurred (including the cause of the incident, if known); (iv) the name of the person reporting the incident.	Details of Pollution incident response is descr bed in the OMP and Pollution Incident Plan (PIP) included as **Appendix B**.
5(r)	A copy of the environment management plan is available at the premises.	A copy of the EMP will be available at the SMRF as described in **Section 2.6**.

2.2 Publication of the Environment Management Plan

Regulation seven of the Regulations requires EPA to publish the approved EMP on its website. It is understood that this version of the EMP would be redacted to prevent lease of commercially sensitive information before being made available on the EPA's website prior to the tendering process for a facility to manage Tunnel Spoil has been awarded by CPBJH JV.

The timing and contents of the public version of the EMP will be confirmed in consultation with EPA at a later date, although Cleanaway's detailed designs, design documentation and construction methodology for the SMRF, being commercially sensitive information, would not be included in any public version of the EMP.

2.3 Relevant Legislation, Policy and Guidelines

The legislative, regulatory requirements and EPA guidance that relate to management and reuse of Tunnel Spoil at the SMRF that were relied on in the preparation of the EMP, include, but are not limited to:

- Environment Protection Act 1970.
- Planning and Environment Act 1987.
- Environment Protection (Management of Tunnel Boring Machine Spoil) Regulations 2020.
- Environment Protection (Industrial Waste Resource) Regulations 2009, which includes the following key guidelines:
    - EPA Publication IWRG621 Industrial Waste Resource Guideline – Soil Hazard Categorisation and Management, June 2009 (hereafter referred to as IWRG 621).
    - EPA Publication IWRG821 *Waste Transport Certificates*, June 2009.
- EPA Publication 788.3 Best Practice Environmental Management Siting Design Operation and Rehabilitation of Landfills, August 2015 (the BPEM).
- EPA Publicatation 332.7 Calculating the landfill levy and recycling rebates, November 2016.
- EPA Publication 1323.3 Landfill Licensing Guidelines, September 2016.
- EPA Publication 655.1 Acid Sulfate Soil and Rock, July 2009.
- EPA Publication 1518 Recommended Separation Distances for Industrial Residual Air Emissions.
- EPA Publication 1820 Construction – guide to preventing harm to people and the environment, October 2020.
- EPA Publication 1851.1 Implementing the general environmental duty: A guide for licence holders, November 2020.
- EPA draft Waste Classfications provided by CPBJH JV including:
    - EPA Classfication Number 2019/406 (SO 9038561).
    - EPA Classfication Number 2019/405 (SO 9038560).
    - EPA Classfication Number 2019/404 (SO 9038429).
- HEPA, PFAS National Environmental Management Plan Version 2.0. Heads of EPAs Australia and New Zealand. January 2020.
- Standards Australia, 2018, AS/NZS ISO 13000 Risk Management – Guidelines.
- WorkSafe, 2017. Industry Standard Contaminated Construction Site – Construction and Utilities, Issued June 2017.

It is noted that new environmental regulations will be developed and implemented by EPA from 1 July 2021. Cleanaway have assumed that the current legislation and guidelines will apply to the SMRF. If EPA consider new regulation or guidelines relevant to the operation of the SMRF and require amendment to the EMP, Cleanaway will consider those amendments and any commercial implications arising.

It is noted that IWRG 621 may be superseded by a new guideline. A draft version of the new guideline, EPA Publication 1828.1 *Waste Disposal Categories - Characteristics and Thresholds,* June 2020 (new Waste Guideline), has been circulated for comment by EPA. Potential implications of the new Waste Guideline in relation to characterisation of waste with respect to non-PFAS chemicals has been considered and is discussed further in **Section 9.1.3**.

2.4 Planning Approval

In November 2020 the Minister for Planning approved Amendment C222 to the Melton Planning Scheme to facilitate the SMRF. The amendment inserted an incorporated document titled the *Ravenhall Spoil Processing Facility, October 2020* (the Incorporated Document) in the schedules to Clause 45.12 and Clause 72.04 of the Melton Planning Scheme. The Incorporated Document enables the land to be used for a spoil processing facility (i.e. the SMRF) and contains conditions governing the ongoing use and development of the site.

The amendment also applied the Specific Controls Overlay (SCO5) to the affected land to identify that the project land is subject to the controls contained in the Incorporated Document.

The Planning Scheme Amendment Request was supported by technical reports to assess the planning, traffic, flora and fauna, bushfire, acoustic and cultural heritage impacts of the proposal.

The current zoning controls applying to the site and surrounding area are presented in **Figure 3**.

2.5 Environmental Auditing

2.5.1 Verification of the EMP

The EMP (Rev4) and appendices have been provided to [redacted], a person appointed by EPA as and environmental auditor, for verification against the requirements of the Regulation. Verification includes verification that the detailed designs, monitoring program and pollution incident plan appended are consistent with the rationale and engineering concepts presented in the EMP.

2.5.2 Verification of Construction

Construction of the engineering elements of the SMRF included in the detailed design documents (refer to Appendix A) will be verified by a person appointed as environmental auditor (the Construction Auditor).

An as-built report, documenting construction of the detailed design elements of the SMRF, and an auditor verification report prepared by the Construction Auditor will be forwarded to the EPA on completion of construction works.

2.5.3 Risk of Harm Auditing During Operations

Regulation 6(2)(q) of the Regulations require an environmental auditor to audit the risk of harm actually or potentially arising from the Activities at the frequency specified in the environment management plan. This auditing function will be completed by the SMRF Auditor (refer to **Section 2.7** for details). It is proposed to complete this audit 6-monthly following operations commencing.

2.5.4 Verification of Tunnel Spoil Waste Categorisation

This auditing function will be completed by the SAQP Auditor (refer to **Section 2.7** for responsibility details) and is outside the scope of this EMP.

2.6 Review of the EMP

In accordance with the Regulation, a copy of the EMP will be available at the SMRF. A programmed review of the EMP will be completed 6-monthly, following provision of the bi-annual audit report, and in response to any specific recommendations made by the SMRF Auditor. The review of the EMP will include review any of the subordinate plans, procedures or documentation as required to fulfil the SMRF Auditor's recommendation.

The EMP may also need to be reviewed "out of cycle" for operational reasons or in response to any of the following:

- When there is a change to a risk level of when a new risk is identified.
- When a procedure is changed or introduced.
- As required by changes in law or regulation.
- Following an incident, non-conformance or near-miss.
- When there is new information about hazards.
- When there are changes in personnel numbers or competency.
- If there is evidence that the original assessment is inaccurate.

2.7 Variations to the EMP

Once approved by the EPA, variations to the EMP, or the detailed designs appended to the EMP, may be required during construction or operation of the SMRF. The need for variations may arise for a number of reasons including:

- To respond to recommendations made by the SMRF Auditor,
- For operational reasons,
- The need to increase the capacity of the SMRF (eg. up to full capacity of the concept design), and
- To optimise designs due to changed ground conditions encountered during construction.

Consistent with advice from EPA, letter dated 23 February 2021, any changes to lining and spoil water collection layers for the Lined Cells, Holding Pens, Spoil Water Holding Pond and Settlement Pond or the design processes defined in the approved EMP and appended detailed designs will require a revised version of the EMP to be submitted to the EPA for approval under the Regulations, consistent with the guidance in Appendix 19 of EPA Publication 1323.3.

2.8 Responsibilities

This EMP is owned and controlled by Cleanaway. The overall responsibility for implementing the requirements of the EMP and any subordinate documents are the responsibility of Cleanaway and the following stakeholders are required to assume responsibility for the actions described in **Table 2-3**.

Table 2-3: EMP Responsibilities

Responsible Party	Responsibility
CPBJH JV (Tunnel Spoil generator)	• Responsible for implementing the requirements of Agon (2020) SAQP. • Responsible for dispatch and delivery of Tunnel Spoil to the Holding Pens at the SMRF. • Provision of appropriate material tracking information with trucks dispatched to the SMRF to support the requirements of the SAQP and EMP. • Responsible for all environmental sampling, laboratory analysis, interpretation, resolution of discrepancies or sampling failures or data loss, sample loss and categorisation of Tunnel Spoil. • Provision of data reliance on all sampling data, interpretation, categorisation and independent auditor verification to Cleanaway. • Responsible for timely communication of categorisation results and all supporting data to Cleanaway within the agreed reporting timeframes. • Responsible for preparation and timely provision of biannual (i.e. every 6 months) categorisation compliance reports and submission of the reports to the waste categorisation verification auditor for verification and EPA. • Engagement, coordination, and liaison with the appointed independent environmental auditor. • Removal and disposal or treatment of Category A and Category B PIW Spoil

Responsible Party	Responsibility
Facility Owner and Operator (Cleanaway)	Overarching responsibility for the communication and implementation of the requirements of the EMP, putting controls in place to ensure correct movement of Tunnel Spoil following categorisation and to minimise the risk to the environment by applying appropriate environmental controls and tracking processes, including: • Overall operation of the SMRF to adhere with the requirements of the EMP and subordinate plans. • Control and distr bution of the latest version of this EMP to responsible parties. • Communication of the tracking and management requirements in this EMP to anyone undertaking subsurface works or earthworks on site, via site inductions and monitoring. • Implementation of an Operations Management Plan (OMP) and Monitoring Program (MP) and Pollution Incident Plan (PIP) for the SMRF. • Environmental management of materials undergoing categorisation. • Environmental management of materials being stored temporarily. • Undertake periodic inspections of the site to review implementation of the control and management measures in the EMP are being adhered to. • Environmental management of any Tunnel Spoil reused at the SMRF or MRL. • Provision of documentation of information related to reuse of Tunnel Spoil at SMRF or MRL to EPA at the end of the project. • Manage construction of the SMRF. • Manage internal movement of Tunnel Spoil within the SMRF. • Movement and management of Tunnel Spoil categorised as Cat C to MRL for disposal under waste transport certification. • Management of Tunnel Spoil categorised for reuse. • Stakeholder engagement in relation to operation of the SMRF.
CPBJH JV Environmental Advisors (Agon)	• Author of the WGTP SAQP.
SAQP Auditor **Appointed by CPBJH JV**	• To be engaged by CPBJH JV. • Responsible for verification of the 6-monthly classification compliance reports prepared by CPBJH JV or their Environmental Advisors. • Responsible for confirmation of waste categorisations under the Waste Classification Procedure.
Cleanaway Environmental Advisors (Senversa)	Preparation of this EMP. Provide specialist advice to Cleanaway on: • Waste categorisation. • SMRF design, layout and configuration. • Engineering and environmental controls relating to storage of Tunnel Spoil. • Contaminated land and groundwater management issues. • Environmental and human health risk assessment • Development of an Environment Management Plan (EMP) • Review and updates to the EMP as required.
Regulating Authority (EPA)	• Approval of the EMP under the Regulation. • Administration of the Environment Protection Act 1970 and all subordinate regulations.
Construction Auditor (EPA-appointed environmental auditor) **Appointed by Cleanaway**	Responsible for: • Verification of construction of the various elements of the SMRF included in the detailed design documents (refer to Appendix A).
SMRF Auditor (EPA-appointed environmental auditor) **Appointed by Cleanaway**	Responsible for: • Completion of environmental audits of risk of harm actually or potentially arising from activities at the SMRF at 6-month intervals.

Responsible Party	Responsibility
Independent Third Party to undertake waste categorisation sampling of Tunnel Spoil and Water for the purposes of waste Categorisation.	An independent third party, agreed to by CPBJH JV and Cleanaway but appointed by CPBJH JV, responsible for sampling and assessing the waste categorisation of Tunnel Spoil and Spoil Water.

2.9 Exclusions from the EMP

The EMP does not address the following aspects:

- Management of liquid waste or wastewater generated by the WGTP works or at any WGTP sites, other than supernatant water released from Tunnel Spoil during temporary storage or containment at the SMRF or incident rainwater or run-off into Holding Pens or the Lined Cells.
- Management of any contaminated soil generated at the WGTP that is not Tunnel Spoil.
- Management of Tunnel Spoil destined for the SMRF prior to formal receipt at the weighbridge and deposited in the designated Holding Pen.
- Transport and material tracking during haulage from WGTP sites to the SMRF. Tracking will become the responsibility of Cleanaway following provision of written receipt from the weighbridge at the entrance of the facility and the spoil being deposited into the designated Holding Pen.
- Movement and reuse of Tunnel Spoil classified in Holding Pens as Fill Material in accordance with the SAQP.
- Transport of Tunnel Spoil classified in Holding Pens as Category A or B PIW or Tunnel Spoil with PFAS concentrations in excess of the Specification for Containment to other appropriately licensed facilities. The transport of Category A and B PIW will be by CPBJH JV and will be covered by EPA waste transport certificates (WTC). Transport of Category C PIW will be by Cleanaway to MRL via internal haul road and will be covered by covered by WTC.

3.0 Project Delineation

3.1 Project Definition

The project proposal for approval by EPA comprises the following components, as described in the following sections:

3.1.1 Development of a Spoil Management and Reuse Facility

It is proposed to develop the SMRF to receive Tunnel Spoil as NPI waste and temporarily store the Tunnel Spoil while it is further categorised. Following additional categorisation, NPI waste will be reused at MRL or contained at the SMRF.

The rationale, justification for engineering controls and management measures for handling of Tunnel Spoil during waste categorisation and for containment and reuse of NPI waste are described in the remainder of the EMP.

3.1.2 Criteria and Specifications for Containment, Reuse and Disposal

Table 3-1 describes specifications for containment of Tunnel Spoil in the Lined Cells that Cleanaway is seeking approval for under the Regulation., Hereafter in the EMP, the specifications for containment of Tunnel Spoil will be referred to as the "**Specification for Containment**".

Table 3-1: Specifications for Containment of Tunnel Spoil

Containment Type	Specification
Containment in engineered Lined Cells at the SMRF which do not overlay any part of MRL.	• Tunnel Spoil containing: ▪ PFOS + PFHxS with a leachable concentration not exceeding [redacted] ▪ PFOA with a leachable concentration not exceeding [redacted]. ▪ Sum of PFOS + PFHxS and PFOA with a total concentration not exceeding [redacted] ▪ Any other contaminants where contaminant concentrations and leachable concentrations do not exceed any TC0 thresholds specified in Publication IWRG621 (above) at Table 2; Soil hazard categorization thresholds. • Tunnel Spoil that does not display any of the specific hazard characteristics listed in Publication Table 1 (Specific hazard characteristics) of EPA Publication IWRG621.
Containment in engineered Lined Cells at the SMRF that overlay (i.e. are laid back over) Stages 2 and 3 of MRL.	• Tunnel Spoil containing: ▪ PFOS and PFHxS with a leachable concentration not exceeding [redacted] ▪ PFOA with a leachable concentration not exceeding [redacted] ▪ Sum of PFOS + PFHxS and PFOA with a total concentration not exceeding [redacted]. ▪ Any other contaminants where contaminant concentrations and leachable concentrations do not exceed any TC0 thresholds specified in Publication IWRG621 (above) at Table 2; Soil hazard categorization thresholds. • Tunnel Spoil that does not display any of the specific hazard characteristics listed in Publication Table 1 (Specific hazard characteristics) of EPA Publication IWRG621.

3.1.3 Criteria for Reuse and Disposal of Tunnel Spoil

A key component of the proposal is to seek reuse of Tunnel Spoil at MRL in a number of applications displaying defined characteristics [2]. It is understood that approval of specific reuse of Tunnel Spoil may be via a supplementary EPA approvals process, which has yet to be confirmed. If a separate approval for reuse of Tunnel Spoil is required, Cleanaway would seek that approval prior to reuse of any Tunnel Spoil.

It is anticipated that approval of the EMP under the Regulation would be sufficient information to issue Classifications for the reuse applications described in this EMP, however it is recognised that the actual approval mechanism may be under another mechanism and, as such, a specific approval application may be required. Furthermore, it is assumed that the testing described in the SAQP and **Section 9.0** of this EMP would be considered sufficient testing to categorise the Tunnel Spoil for the reuse applications as defined and no supplementary testing would be necessary.

Tunnel Spoil with concentrations of PFAS exceeding the Specification for Containment or meeting the definition of PIW as described in EPA Publication 621 will be disposed off-site. It is assumed that Tunnel Spoil with concentrations of PFAS in excess of the Specification for Containment would be classified by EPA as a PIW and it is herein this Tunnel Spoil is referred to as a PIW in the EMP. CPBJH JV would be responsible for collection of this PIW Tunnel Spoil from the SMRF and disposal of it.

Table 3-2 presents the criteria that Cleanaway proposes for reuse of Tunnel Spoil, termed the "**Reuse Criteria**" and the criteria proposes for off-site disposal of Tunnel Spoil, termed the "**Disposal Criteria**".

Table 3-2: Reuse and Disposal Criteria for Tunnel Spoil

Criteria Type	Proposed Use	Criteria Definition
Reuse	Use of Tunnel Spoil in a variety of applications at MRL.	• Tunnel Spoil with leachable concentrations of PFOS, PFHxS and PFOA not exceeding the laboratory limit of reporting, consistent with EPA's Interim Position Statement on PFAS (EPA Publications 1669.4). • Tunnel Spoil that does not display any of the specific hazard characteristics listed in Publication Table 1 (Specific hazard characteristics) of EPA Publication IWRG621. • Tunnel Spoil with concentrations other chemical contaminants not exceeding the upper limit threshold values for Fill Material as listed in Table 2 (soil hazard categorisation thresholds) of EPA Publication IWRG621.
Disposal	Tunnel spoil with exceeding the specified criteria and Prescribed industrial waste (including Category A, B and C wastes) as defined under IWRG to be sent to off-site licensed premises for pre-treatment, treatment or disposal.	• Tunnel Spoil containing: ▪ PFOS + PFHxS with a leachable concentration exceeding [redacted] ▪ PFOA with a leachable concentration exceeding [redacted]. • Tunnel Spoil that displays any of the specific hazard characteristics listed in Publication Table 1 (Specific hazard characteristics) of EPA Publication IWRG621. • Tunnel Spoil that does display any contaminant concentrations above the upper limit for Fill Material as listed in Table 2 (soil hazard categorisation thresholds) of EPA Publication IWRG621 (i.e. soil that would be categorised as Category A, Category B or Category C contaminated soil).

[2] Assumes the classifications are issued under the Environment Protection (Industrial Waste Resource) Regulations 2009. It is understood that under the upcoming Environment Protection Act 2017 this approval mechanism would be different however Senversa assumes this document would contain sufficient information for any reuse approval under the Environment Protection Act 2017.

3.1.4 Application of the Landfill Levy for Identified Reuses

It is expected that Tunnel Spoil categorised as NPI waste under the EMP approval and either contained or reused at the SMRF or MRL is exempt from the landfill levy. It is expected that the approval of the identified reuses from EPA would state that each identified reuse is levy exempt. Cleanaway has written to EPA for clarification on the application of the landfill levy for the identified reuses in the landfill cells at MRL and confirmation of the application of the levy was provided by EPA on 11 September 2020.

The application of the landfill levy for each identified reuse is discussed further in **Section 11.4.2**.

3.2 Site Definition

The proposed SMRF will be located at 227 Riding Boundary Road, part 304 Riding Boundary Road, part 714 and 1198 Christies Road, Ravenhall, part Christies Road and part Middle Road, Truganina in the Ravenhall Industrial Precinct, and covers an approximate area of 184.6 hectares. The location of the SMRF is shown in **Figure 1**.

The property titles relating to the sites on which the SMRF will be located are as follows:

- Crown Allotments 3, 4 and 6, Section 15 Parish of Derrimut (Volume 8697 Folio 969).
- Crown Allotment 1A, Section 14 Parish of Derrimut (Volume 9921 Folio 047).
- Crown Allotment 5, Section 14 Parish of Derrimut (Volume 7807 Folio 022).
- Lot S2, PS723362 (Volume 11910 Folio 274).
- Lot S3, PS723362 (Volume 11910 Folio 275).

The context of the SMRF in relation to the adjacent Melbourne Regional Landfill (MRL), proposed Southern Expansion area of MRL (Southern Expansion) and Boral Quarry is shown in **Figure 2**.

The SMRF will be located within an excavated basalt quarry [redacted] (227 Riding Boundary Road, 304 Riding Boundary Road and Former Middle Road) [redacted]. MRL is an EPA licensed landfill (Type 2) owned and operated by Cleanaway. The SMRF will fully occupy 227 Riding Boundary Road and part (Cell 1 and Cell 3) of the Southern Expansion area at MRL.

It is proposed that the lining system for the Lined Cells, located in the eastern part of the SMRF, will be connected to the basal lining systems in Stages 2 and 3 of MRL.

[redacted]

3.3 Processing Area Definition

The proposed SMRF Processing Area comprises the Holding Pens, [redacted], the Settlement Pond, Spoil Water Treatment Pond and the Water Treatment Plant is shown on **Figure 2**.

We note the Regulations define processing area as "*…being the area, covered by an impervious surface for receipt, consolidation, and dewatering of Tunnel Spoil*".

The Holding Pens, [redacted], Settlement Ponds and Spoil Water Treatment Pond incorporate low permeability lining systems to resist infiltration of Spoil Water through the base of the structures to protect underlying groundwater quality. Potential impacts of infiltration through the lining systems on underlying groundwater quality have been assessed using methodologies consistent with practices for landfills and containment of solid waste containing hazardous chemicals (refer to **Appendix D**). The basis for design of the low permeability liners beneath the Holding Pens and various ponds for storage of Spoil Water and potential impacts to groundwater quality are presented in **Sections 6.6** and **7.3** respectively.

3.4 Containment System Definition

The containment system is defined as the Lined Cells, which are located at the most easterly extent of the SMRF as shown on **Figure 4.**

The design basis for the Lined Cells, including the lining systems and protection of underlying groundwater quality, is presented in **Section 6.7**.

Permanent containment within the Lined Cells will occur once reuse options for Tunnel Spoil have been exhausted and final capping is in place over the cells. Prior to final capping, dewatering of the Tunnel Spoil will continue through consolidation processes and continuous, on-going extraction of Spoil Water that may appear in the spoil water drainage systems in the Lined Cells. No Spoil Water or 'free liquid' will be permanently contained within the Lined Cells, rather it will be continually extracted from the Spoil.

3.5 Required Separation Distance

The Regulation requires that the boundary of the processing area be at least 200 metres from any building that is a sensitive land use, including a residential dwelling, a health service, a childcare centre or an education centre. The location of the Processing Area is compliant with required 200 m separation distance, as also shown on **Figure 2**.

3.6 SMRF Layout

The proposed layout of the SMRF is presented in **Figure 4** and includes the following main elements:

- A main Site Entrance/Exit off Middle Road.
- [redacted].
- A ramp from the Site Entrance, at ground level, down to the quarry floor.
- A gatehouse and covered primary weighbridges for external vehicle traffic.
- [redacted].
- Noise walls around aspects of SMRF infrastructure.
- A sampling gantry.
- A delivery road network for road trucks to deliver spoil to Holding Pens.
- [redacted] SMRF holding pens for temporary storage of Tunnel Spoil, while laboratory analysis and waste categorisation are completed. It is noted that this EMP seeks approval of the [redacted] Holding Pens (refer to **Section 1.4.2)**.
- [redacted] Lined Cells for containment of NPI waste Tunnel Spoil. It is noted that this EMP seeks approval for [redacted] of the Lined Cells (refer to **Section 1.4.2**).
- An internal road network for transfer of categorised Tunnel Spoil.
- [redacted] Settlement Ponds and a lined Spoil Water Holding Pond to receive potentially contaminated Spoil Water removed from Holding Pens and the Lined Cells.
- A temporary Water Treatment Plant (WTP) for PFAS-impacted Spoil Water.
- An [redacted] Storage Area of approximately [redacted] in area.
- Provision for a [redacted] Treated Water Holding Pond following treatment constructed with a [redacted].
- A wheel wash for road trucks leaving the SMRF.
- [redacted]

The plan areas of the EMP boundary and major SMRF infrastructure are presented in **Table 3-2**.

Table 3-3: Plan area information

SMRF Area	Plan Area (ha)
SMRF Boundary	[redacted]
[redacted]	[redacted]
Lined Cells (base)	[redacted]
SMRF Holding Pens - East	[redacted]
Spoil Water Holding Pond	[redacted]
Treated Water Pond	[redacted]
Settlement Pond 1	[redacted]
Water Treatment Plant	[redacted]

Australian map grid (X and Y) coordinates for the SMRF boundary and major asset components are included on **Figure 2** and **Figure 4.**

3.7 Project Staging and Timing

3.7.1 SMRF

Cleanaway is seeking approval of this EMP to develop the SMRF in advance of confirmation from CPBJH JV that Cleanaway is a preferred supplier for management of Tunnel Spoil from the WGTP.

Upon confirmation from CPBJH JV that Cleanaway is the preferred supplier and assuming the relevant environmental and planning consents are in place, Cleanaway would commence the following works pursuant to development of the SMRF:

- Commence baseline groundwater monitoring at the SMRF and a baseline assessment of off-site surface water conditions.
- Complete limited baseline soil sampling of engineered fill placed beneath the SMRF assets including the [redacted], Holding Pens, Lined Cells, Spoil Water Holding Pond and Water Treatment Plant.
- Underground service relocation or protection approval for services in Middle Road.
- Construction of the following elements of the SMRF:
  - [redacted]

- [redacted]

Based on information provided by CPBJH JV, the SMRF will receive Tunnel Spoil for a period of approximately [redacted] following commencement of tunnel boring. Allowing for minor delays, it is assumed the site could receive Tunnel Spoil for a period of [redacted]. It is assumed that EPA approval of the EMP will be for coverage for the entire project, including any delays.

Removal of categorised Tunnel Spoil, both PIW and NPI, from the Holding Pens to onsite containment (the Lined Cells) or reuse applications at MRL may continue for up to one to [redacted] following receipt of the last load of Tunnel Spoil from the WGTP.

CPBJH JV will be responsible for transport and disposal of Category A and B PIW from the Holding Pens to an appropriately licensed facility.

Recovery and transfer of Tunnel Spoil categorised as NPI from the Lined Cells to reuse applications may continue for some years following receipt of the last load of Tunnel Spoil from the WGTP, depending on the need for reuse materials and any secondary approvals required. However, at least some proportion of the Tunnel Spoil is likely to remain contained in the Lined Cells for the purpose of rehabilitating the quarry void.

3.7.2 [redacted]

At the request of the CPBJH JV this EMP includes provision for a "[redacted]

The purpose of the [redacted]

[redacted].

Spoil water will be removed from the [redacted] in advance of removal of spoil from the Holding Pen.

The design rationale and design solution for the [redacted] is described in **Section 6.8**. The [redacted] option is included in the environmental and risk assessments included in the EMP.

3.8 Land Use and Setting

The land where it is proposed to construct the SMRF consists of a quarry void created by the extraction of basalt rock for concrete aggregate, crushed rock and other quarry products.

Basalt rock has been removed from the full extent of 227 Riding Boundary Road and the Southern Expansion area, with the exception of a “peninsula” of rock that extends from the southern boundaries of the adjoining properties, immediately east of the proposed Site Entrance, to a “plinth” of un-disturbed ground that will remain beneath pylons for high-voltage, overhead cables (refer to **Figure 2**). Once the “peninsula” of rock has been removed, no further extractive resources will remain, and the site is intended for reuse and/or rehabilitation.

The proposed use of the premises for the SMRF is consistent with current quarry, manufacturing and landfilling activities. The SMRF is in the Ravenhall Precinct, which is defined in Victoria’s State Waste and Resource Recovery Infrastructure Plan (SWRRIP) (SV, 2018) as a hub of state importance for such activities and the infrastructure, land use zoning, location and amenity buffers are established to receive this material.

The land uses surrounding the proposed site location are described in **Table 3-3.**

Table 3-4: Surrounding Land Use

Direction	Land use
North	• MRL licensed landfill – Stage 3 and Stage 4 putrescible waste and PIW cells defines the site to the north. • The Ravenhall precinct boundary (Melbourne to Ballarat rail line) is approximately 2.8 km from the north-west corner of the SMRF boundary. • The nearest dwelling is over 3 km from the proposed SMRF.
South	• The Ravenhall precinct boundary (Middle Road) defines the site to the south. • The nearest dwelling is over 1.7 km from the proposed SMRF.
East	• MRL licensed landfill – Stage 2 closed putrescible waste and PIW cells defines the site to the east. • The Ravenhall precinct boundary (Christies Road) is approximately 800 m the SMRF boundary. • The Metropolitan Remand Centre is approximately 1.6 km from the SMRF.
West	• The basalt quarry borders the SMRF to the west. • The Ravenhall precinct boundary (Hopkins Road) is approximately 2.5 km from the SMRF boundary. • The nearest dwelling is at 522 Middle Road. The Southern boundary of the [redacted] are approximately 600 m from the house and the western boundary of the Spoil Water Holding Pond is approximately 250 m from the house. The closest internal haul road to 522 Middle Road is approximately 520 m being the haul road at the eastern boundary of the Spoil Water Holding Pond.

3.9 Planning Zoning and Easements

The land at which the SMRF will be located is currently zoned under the Melton Planning Scheme as Special Use Zone – Schedule 1 Earth and Energy Resources Industry (SUZ1), consistent with use of the site for extractive industries and landfilling. The purpose of the Special Use Zone is to recognise or provide for the use and development of land for specific purposes as identified in a schedule to this zone. The purpose of Schedule 1 to the Special Use Zone (SUZ1) is:

- To recognise or provide for the use and development of land for earth and energy resources industry.
- To encourage interim use of the land compatible with the use and development of nearby land.
- To encourage land management practice and rehabilitation that minimises adverse impact on the use and development of nearby land.

The current lot details, planning zoning and easements is shown in **Figure 3**.

A high voltage powerline easement bisects the SMRF running south-west to north-east, as shown on **Figure 2**. The SMRF is not subject to any flood overlays under the City of Melton Planning Scheme.

A former road, which has never been developed, and is now freehold land runs north to south between the properties referred to as 227 Riding Boundary Road and the MRL Southern Expansion, as shown on **Figure 3**.

The proposed SMRF is located within the Ravenhall Precinct. The Ravenhall Precinct is considered as a waste and resource recovery Hub of State Importance in the SWRRIP for a number of reasons, including:

- The precinct supports the largest putrescible waste landfill in the state.
- The hub is close to sources of waste generation, has good transport networks, and supports compatible activities including quarrying.

3.10 Land Ownership and Authorisation

[redacted]

Cleanaway will have appropriate access to the SMRF footprint irrespective of the outcome of the works approval appeals. However, for completeness we note the following: Cleanaway received both EPA works approval and planning approval to develop the Southern Expansion area as a putrescible (Type 2) landfill. [redacted]

Prior to quarrying activities, the general natural surface topography of the area surrounding the site slopes from Mount Atkinson (135 m AHD), approximately 4 kilometres northwest of the site, southeast toward Port Phillip.

Being located in the floor of a quarry, the SMRF will sit below the surrounding natural ground surface. The excavated level of the quarry at the proposed SMRF and MRL Southern Expansion is approximately 52 m AHD compared to an undisturbed ground surface elevation to the south and west of the quarry void of between 62 and 64 m AHD.

Approximately [redacted] of filling will be required to create Holding Pens and Haul Roads on the quarry floor as part of the construction of the SMRF. However, the Haul Road would still be between approximately [redacted] below ground surface surrounding the quarry void.

The MRL landfill cells to the north and east extend up from the base of the quarry to approximately 95 m AHD at the highest level to the east and 73 m AHD to the north offering a significant amenity buffer to the east and north.

Being located in the floor of a quarry, approximately [redacted] below surrounding ground surface, most of the activities associated with the SMRF will largely be out of sight of surrounding land users to the south and west.

The visual impact of the SMRF, including the relative elevations of the Lined Cells is considered further in **Section 6.4.3**.

3.11 Geology and Groundwater Environment

The geology and groundwater environment of the site is well understood due to extensive investigations and ongoing monitoring requirements for the MRL and the Works Approval for the Southern Expansion. Groundwater monitoring has been conducted at the MRL site since 1994.

The following section has considered information for the most recent environmental audit of landfill operations for MRL (SLR, 2019) by Mr Anthony Lane (the Operations Auditor) and the Hydrogeological Assessment for the Southern Expansion (the HA report) completed by AECOM, dated 11 February 2016. Information from the conceptual hydrogeological model, such as geology, aquifers and groundwater quality are considered to be applicable at the proposed facility.

3.11.1 Geology

It is reported in SLR (2019) that the site is located on quaternary Newer Volcanics basalt. The geological units from shallowest to deepest is:

- Quaternary-aged **Newer Volcanics** consisting at least four flows of fresh to moderately weathered olivine basalt, intermittently separated by fossilised soil layers (paleosols) and scoria. Drilling in 2005 by Lane Consulting (2005), indicated that the Newer Volcanics are 56 m thick in the southeast corner of the site.
- Tertiary-aged **Brighton Group** sediments comprising non-marine sands and clays. A bore drilled at the southeast corner of MRL indicated Brighton Group sediments occurring between 56 m and 70 m depth below ground level (m bgl).
- Tertiary-aged **Fyansford Formation** sediments consisting of clay, ligneous clays and sandy clay. The Fyansford Formation sediments extended from 70 m to 141 m bgl in the bore in the southeast corner of MRL.
- Tertiary-aged **Werribee Formation** consisting of sand, sandy and silty clay. The Werribee Formation is likely to be between 100 m and 150 m thick beneath the site.
- Silurian-aged **Melbourne Formation** consisting of siltstone, mudstone, sandstone and shales, which form the bedrock of the Port Phillip area.

The geology at the site is shown in **Figure 7** and in Table 1 of the HA report, which is reproduced in **Appendix D**.

The formation of primary interest to assessment of groundwater impacts is the Newer Volcanics.

The naturally occurring ground surface of the site, prior to quarrying, consisted of a basaltic clay soil profile approximately 1.5 m to 3 m thick. Quarrying involved removal of the basaltic clay surface soil profile covering the uppermost flow of basalt rock. Overburden material has been stockpiled at locations within the quarry. The primary quarry products (i.e. concrete aggregate and crushed rock) were produced from the uppermost flow of basalt rock in the Newer Volcanics. Being above the water table in the Newer Volcanics, the uppermost flow of basalt represented the least decomposed, highest quality rock suitable for high-grade concrete aggregate and road pavement products. Typically, the quarry extended down to the base of the uppermost flow until the rock quality began to decline over the underlying paleosol or scoria. As shown in **Figure 7** and cross sections from the HA report reproduced in **Appendix D**, the floor of much of the quarry on which the SMRF will be constructed consists of paleosol beneath the eastern portion of the site and scoria beneath the western portion of the site.

The paleosols were formed by prolonged exposure of the upper surface of earlier basalt flows, which resulted in the decomposition of the basalt to basaltic clay soils, followed by burial and baking of the clay soil beneath subsequent lava flows. The paleosols tend to hydraulically separate water bearing layers in the overlying and underlying basalt rock. The scoria layers are likely to reflect highly visicular upper layers of lava flows associated with gases rising through the molten rock. Typically, scoria will represent more permeable zones within the Newer Volcanics but can more rapidly decompose than the basalt and form clay-rich zones.

3.11.2 Hydrogeology

Groundwater occurs in secondary porosity, fractures and joints, within the Newer Volcanics.

As identified in the Operations Audit, the two principal aquifers within the Newer Volcanics occur with fractures and joints in two separate basalt flows as follows:

- Upper Newer Volcanics Aquifer (UNVA) which is generally unconfined and recharged directly from rainfall infiltration; and
- Lower Newer Volcanics Aquifer (LNVA) which is separated from the UNVA by a clay layer at least 5 m thick and considered to be semi-confined to confined.

The principal groundwater segment at risk associated with storage and handling of potentially contaminated Tunnel Spoil at the SMRF is groundwater in UNVA. The UNVA occurs predominantly in the second basalt flow at the site, which underlies the paleosol and scoria in the floor of the quarry at the SMRF (refer to **Figure 7**). The LNVA occurs in the third basalt flow beneath the site.

AECOM (2016) estimated hydraulic conductivities of the different layers within Newer Volcanics as part of the preparation of the HA report (AECOM, 2016). Table 1 from the HA report has been reproduced in **Appendix D** of this report.

The hydraulic conductivity of the basalt rock of the UNVA beneath the site ranges from 0.1 m/day to 0.5 m/day in the UNVA, and in the deepest part of the LNVA from 5 m/day to 10 m/day (AECOM, 2016).

3.11.3 Groundwater Elevation, Flow and Discharge

Regional groundwater flow in the UNVA beneath the SMRF is from northwest to southeast. Generally, groundwater flow in the UNVA is expected to broadly follow the surface topography in the area.

Groundwater elevation contours in the UNVA are in the most recent Operations Audit report (SLR, 2019). Groundwater elevations in the UNVA beneath the proposed Lined Cells at the SMRF range 48 m AHD in northwest to 45 m AHD in the southeast corner (SLR, 2019), consistent with the regional groundwater flow direction.

The depth to the water table UNVA below the floor of the quarry beneath the Lined Cells is in the range of 3.5 m to 5.5 m.

Groundwater in the UNVA is expected to ultimately discharge to surface water bodies to the south and southeast. Receiving surface water bodies may include Skeleton Creek where it is deeply incised into the Newer Volcanics to a depth sufficient to intersect the UNVA water table. The nearest locations where groundwater may discharge to Skeleton Creek are; 1) approximately 2.5 kilometres south-southwest of the SMRF, north of Cottee Road (surface elevation 45 m AHD), or 2) at the Leakes Road Wetland, approximately 4.3 kilometres south-southwest of the site (surface elevation approximately 26 m AHD). Alternatively, groundwater beneath the site may ultimately discharge to wetlands at the lower reaches of Laverton Creek, approximately 10 kilometres southeast of the SMRF.

3.11.4 Salinity and Beneficial Uses

SLR (2019) reports that groundwater at and in the vicinity of MRL has a salinity in the range of 3,000 mg/l to 15,000 mg/l Total Dissolved Solids (TDS) and is Segment C as defined in SEPP (Waters). The protected beneficial uses of Segment C groundwater as reported in SEPP (Waters) are:

- Water dependent ecosystems.
- Potable mineral water supply.
- Agriculture and irrigation (Stock watering).
- Industrial and commercial.
- Water-based recreation (primary contact recreation).
- Traditional Owner cultural values.
- Cultural and spiritual values.
- Buildings and structures.
- Geothermal properties.

The site is not in an area where extensive mineral water or springs are expected to occur (VVG website [3]) and does not meet the definition of 'potable mineral water' (SEPP GoV). Therefore, the *Potable mineral water supply* beneficial use of groundwater has not been considered further. *Primary contact recreation* beneficial use is only relevant at the point of discharge.

The adopted criteria for PFAS for assessing the relevant beneficial uses described above is provided in **Section 5.0** along with an assessment of environmental and human health risks.

3.11.5 Surface Water Beneficial Uses

Based on groundwater level information and potential point(s) of discharge the closest potential location is Skeleton Creek at approximately 1.2 km south of the site (refer to **Section 3.12.3**), however, the Leakes Road Wetland is considered to be a more sensitive receptor with a higher level of ecosystems protection, therefore the beneficial uses for this surface waterbody have been conservatively adopted. The Leakes Road Wetland falls within the Wetlands Segment of SEPP (Waters).

The protected beneficial uses of the Wetlands Segment as set out in SEPP (Waters) are:

- Water dependent ecosystems and species that are slightly to moderately modified.
- Human consumption after appropriate treatment.
- Agriculture and irrigation.
- Human consumption of aquatic foods.
- Aquaculture.
- Water-based recreation (Primary and secondary contact and aesthetic enjoyment).
- Traditional Owner cultural values.
- Cultural and spiritual values.

The Leakes Road Wetlands are not located in an area where water is sourced for supply in accordance with the special water supply catchments area set out in Schedule 5 of the *Catchment and Land Protection Act 1994* or the *Safe Drinking Water Act 2003*. Therefore, the *Human consumption after appropriate treatment* beneficial use is not considered further.

Similarly, Senversa is not aware of any aquaculture licence has been approved in accordance with the *Fisheries Act 1995* for the Leakes Road Wetlands therefore the *Aquaculture* beneficial use has not been considered further.

3.12 Long-Term Groundwater Level and Waste Separation

The Landfill BPEM includes recommendations for siting new landfills that waste be deposited "…*at least two metres above long-term undisturbed depth to groundwater*…". Cleanaway proposes to adopt this principle in establishing the lowest elevation that Tunnel Spoil will be placed in the Lined Cells, on the basis that it may remain within those cells in the longer term. The methodology used to establish the "…*long-term undisturbed*…" groundwater elevation was similar to that adopted by Senversa for the design of Cells 3C and 4C at MRL immediately north of the SMRF.

Senversa referenced a hydrogeological assessment report prepared by AECOM (AECOM, 2016) for the Southern Expansion Works Approval Application, which assessed long-term fluctuations in groundwater elevations. AECOM used water level gauging data from monitoring wells around the MRL landfill since 1994. Gauging data used by AECOM included monitored water levels in wells MB03, MB04 and MB11 (refer to **Figure 8**) surrounding 227 Riding Boundary Road. The highest period of water levels in the UNVA observed at the site was during the period between 2010 and 2012; an extended period of above average rainfall following a nine-year drought between 2001 and 2010. AECOM concluded that monitored water levels around MRL may have been influenced (i.e. lowered) by evaporative loses from the floor of the quarry and recommended an additional 0.8 m be added to the water levels during the period 2010 to 2012.

[3] Visualising Victoria's Groundwater – Mineral Springs (vvg.org.au) (search conducted on 10 June 2020).

We note that current standing water levels will be approximately at least 2 m to 4 m below Tunnel Spoil and Spoil Water in the Holding Pens, Spoil Water Ponds and Settlement Ponds and will be maintained at those levels by on-going dewatering associated with evaporative losses from the floor of the Boral Quarry. Quarry operations will be continuing to maintain lower groundwater levels for a period extending beyond the use of the Processing Area in the SMRF. Senversa used highest groundwater levels from monitoring wells MB03, MB04 and MB11, located closest to the proposed SMRF, from the period between 2010 and 2012 and added 0.8 m as a basis for "*…long-term undisturbed…*" groundwater levels. The long-term groundwater elevations beneath the proposed Lined Cells at the SMRF are shown in **Figure 8**.

Detailed design for the Lined Cells is based on Tunnel Spoil placed being placed no lower than 2 m above the groundwater contours shown in **Figure 8**.

4.0 Expected Spoil Quantities, Locations and Characteristics

Cleanaway's understanding of the make-up and nature of the Tunnel Spoil is based on information provided by CPBJH JV. This section presents a summary of information contained in the Agon Environmental, September 2020, *West Gate Tunnel Project – Zone 302 Sampling Analysis Quality Plan for Waste Categorisation of Tunnel Spoil for Reuse or Containment at, or Disposal by EPA Approved Premises.* (the SAQP).

4.1 Expected Tunnel Spoil Quantities

All Tunnel Spoil received by the SMRF, approved under this EMP, will be sourced solely from the WGTP.

The Tunnel Alignment has been broadly delineated into 13 domains based on dominant expected geologic unit as presented in Figure 5 of the SAQP. A geological cross section is presented in Figure 4 of the SAQP and estimated volumes of the varying geological units is in the histogram reproduced in **Figure 4-1**.

A total of [redacted] (loose cubic metres) of Tunnel Spoil is estimated to be received at the SMRF. The estimate of loose cubic metres of Tunnel Spoil is based on an in-situ (bank) volume estimate of [redacted] and a bulking factor estimated by CPBJH JV. Senversa have used the loose cubic metres estimates of Tunnel Spoil to prepare its designs and management procedures for the SMRF on the basis that they provide the most relevant estimates for the required storage capacity and throughput.

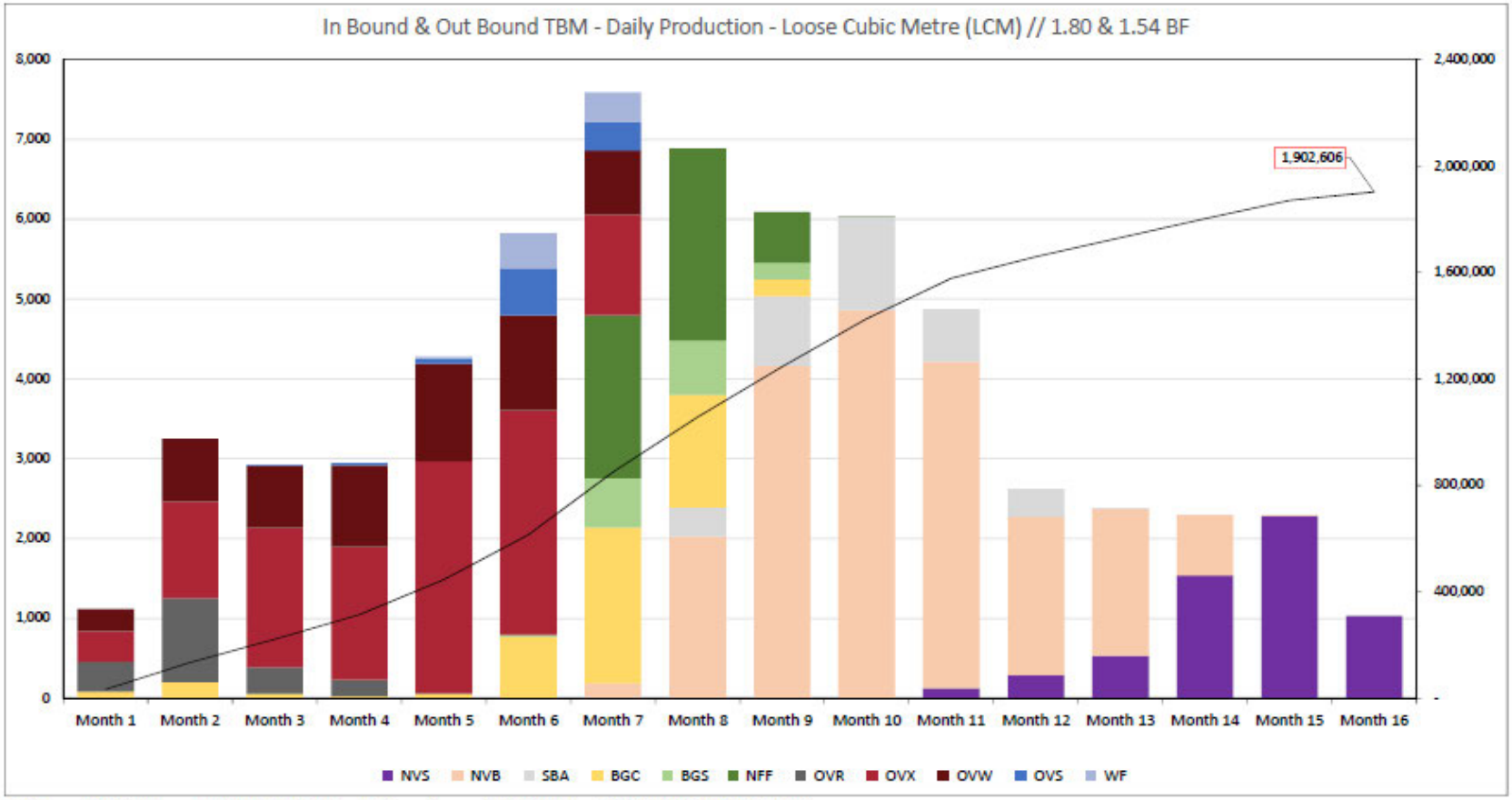
We note that EPA Classification SO 9038429 refers to a maximum quantity of Tunnel Spoil of 1,500,000 m^3 will be approved for transport from the WGTP to the SMRF as NPI waste. We assume that the maximum quantity to be approved by EPA refers to the bank volume excavated from the WGTP rather than the loose cubic metres.

4.2 Expected Tunnel Spoil Production Rates

The SMRF has been designed with [redacted] Holding Pens, each with a capacity of [redacted]. As such, each Holding Pen has the capacity to retain the [redacted] Assuming an average combined daily production rate of [redacted] of Tunnel Spoil from both TBMs, the SMRF will have capacity to store daily production for [redacted].

The requirement for a total of [redacted] Holding Pens in total has yet to be confirmed with CPBJH JV. The drivers for all [redacted] Holding Pens to be constructed will relate to a desired redundancy in capacity relating to delays in turn-around time for waste classification (i.e. up to [redacted]), daily production rates exceeding [redacted] during peak periods of TBM production and potential delays in emptying Holding Pens containing Tunnel Spoil categorised as Category A or B prescribed industrial wastes. As outlined in Section 1.4.2, Cleanaway is seeking approval of [redacted] Holding Pens at this time and, if required, will submit a revised EMP for EPA approval if additional pens are required.

As noted in the histogram in **Figure 4-1**, the expected production rates in the first month are quite low ([redacted]). This is based on only one TBM being in production in Month 1 (TBM1 – Outbound). In month 2, TBM2 (Inbound) also commences. Based on the staggered start for TBMs and expected tunnelling rates, [redacted] Calculations for expected spoil volumes for the [redacted] are included in **Figure 4-1**. Based on the calculated rates, [redacted].



In Bound & Out Bound TBM - Daily Production - Loose Cubic Metre (LCM) // 1.80 & 1.54 BF

Geological Unit / Name	Bulking Factor	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16
NVS - Slightly weathered Newer Volcanics	1.80	-	-	-	-	-	-	-	-	-	-	129	289	530	1,537	2,278	1,031
NVB - Brecciated Newer Volcanics	1.80	-	-	-	-	-	-	189	2,028	4,162	4,863	4,090	1,987	1,843	761	16	-
SBA - Sub basaltic alluvium	1.54	-	-	-	-	-	-	-	361	873	1,168	650	348	13	-	-	-
BGC - Brighton Group - Clays	1.54	82	204	57	24	59	773	1,951	1,411	211	-	-	-	-	-	-	-
BGS - Brighton Group - Sands	1.54	-	-	-	-	-	21	614	683	214	-	-	-	-	-	-	-
NFF - Fine grained Newport Formation	1.54	-	-	-	-	-	-	2,046	2,402	631	3	-	-	-	-	-	-
OVR - Older Volcanics Residual soil	1.54	374	1,046	332	206	4	-	-	-	-	-	-	-	-	-	-	-
OVX - Extremely weathered Older Volcanics	1.54	386	1,211	1,745	1,667	2,904	2,814	1,259	-	-	-	-	-	-	-	-	-
OVW - Weathered Older Volcanics basalt	1.54	276	790	780	1,025	1,222	1,187	806	-	-	-	-	-	-	-	-	-
OVS - Slightly weathered Older Volcanics basalt	1.54	-	-	14	27	65	591	356	-	-	-	-	-	-	-	-	-
WF - Werribee Formation	1.54	-	-	-	-	22	438	372	-	-	-	-	-	-	-	-	-
Per Day Total		1,117	3,252	2,927	2,948	4,276	5,824	7,592	6,885	6,091	6,033	4,870	2,623	2,387	2,299	2,294	1,031
Per Month Total		33,525	100,797	87,813	91,395	132,561	168,899	235,344	206,537	188,823	181,002	150,959	81,323	71,607	71,266	68,808	31,947

Figure 4-1: In Bound and Out Bound TBM Daily Production – Loose Cubic Metres (WGTP, 2020)

4.3 Expected Tunnel Spoil Physical Characteristics

Based on information presented in the SAQP and the histogram reproduced in **Figure 4-1**:

- Geotechnically the spoil could vary in composition from sandy gravel with cobble sized pieces of rock to clay.
- The spoil will be received as a mixture of solids and liquids. The liquids will include:
  - Natural moisture content of material.
  - Foaming agent added as part of tunnelling process.
  - Water added as part of tunnelling process.
- The estimated water volume as a percentage of total spoil volume is estimated to be between 50% and 58% as reported in Table 6 of the SAQP (AGON, 2020).
- Although some natural drainage of the spoil will occur prior to transport, the SMRF has been designed in consideration of receiving Tunnel Spoil with a significant volumetric water content as estimated above.

4.4 Potential for Contamination

The SAQP provides a synopsis of expected contamination status of spoil. Four clear Exception zones have been identified that will require management as follows:

- Exception Zone 1: North Yarra Main Sewer – Former sewer alignment including old sewer tunnel construction materials, grout backfill and potentially contaminated spoil, sediment and water within and surrounding the alignment.
- Exception Zone 2: Grout Blocks - This is material from the start and end both of tunnel alignments (approximately 14.4 m of length) includes headwall works of reinforced bored pile walls and cement treated spoil.
- Exception Zone 3: The Fyansford Formation Zone – geological unit identified to potentially classify as Potential Acid Sulfate Soil (PASS).
- Exception Zone 4: Cross Passages, Low Point Sumps and Exit Over and Unders: Areas requiring excavation that have been subject ground treatment and/or bentonite.

In addition to these identified exception zones, the remaining Tunnel Spoil is expected to have:

- Elevated natural concentrations of metals.
- Low dissolved concentrations of anthropogenic contaminants from groundwater (including metals, hydrocarbons, solvents, nutrients, volatile organic compounds and per- and polyfluoroalkyl substances (PFAS).

Although there is the potential for the chemicals indicated above to be present, with the exception of PFAS, the concentrations outside exception zones are not expected by the CPBJH JV to contain concentrations of contamination above the threshold criteria for Fill Material Categorisation [4]. The potential presence of PFAS impacts is the primary driver for the requirement of the SMRF and the estimated quantities of Tunnel Spoil with potential PFAS impacts is summarised in **Table 4-1**.

[4] EPA IWRG 621. Industrial Waste Resource Guidelines - Soil Hazard Categorisation and Management. June 2009

Table 4-1: Spoil PFAS Categorisation (AGON, 2020)

Length (m)	Insitu Volume (m^3) @ 191 m^3/m	Gross Spoil Volume (m^3)	Gross Spoil (Tonnes)	PFAS Classification
1,010	192,910	208,857 to 247,606	414,235 to 452,999	Low-moderate potential that PFAS impacted groundwater will be generated; with a low potential for PFAS to be encountered in the solid excavated component. This is based on the potential for reported detections of PFOS and PFHxS.
1,745	333,295	360,846 to 427,795	715,683 to 782,656	High potential that PFAS impacted groundwater will be generated: with a moderate to high potential for PFAS to be encountered in the solid excavated component. This is based on the potential for reported detections of 0.07 µg/L or greater for PFOS and PFHxS.
3,224	615,784	666,687 to 790,378	1,322,270 to 1,446,008	Moderate potential that PFAS impacted groundwater will be generated; with a low-moderate potential for PFAS to be encountered in the solid excavated component. This is based on the potential for reported detections of 0.01 µg/L or greater for PFOS and PFHxS.
100	19,100	20,679 to 24,515	41,103 to 44,851	Exception Zone Tunnel Domain 2 North Yarra Main Sewer
6,079	1,161,089	1,257,069 to 1,490,294	2,493,200 to 2,726,515	(TOTALS)

Based on information within the SAQP, the maximum expected PFAS (PFOS+PFHxS) concentration in spoil is 0.2 mg/kg, while the maximum expected concentration in Spoil Water is 4.5 µg/L. These concentrations have been assumed in the environmental risk assessment below in **Section 5.0**. PFOA has also been detected in soil and groundwater within the tunnel alignment, however at much lower concentrations than PFOS+PFHxS.

5.0 Environmental Risk Assessment

5.1 Introduction

This section describes the assessment of potential environmental and human health risks from development and operation of the SMRF.

This section considers:

- Development of a conceptual site model.
- Water quality criteria.
- Human health and environmental risks.
- Groundwater impacts.
- Potential acid sulfate soils (PASS).

An assessment of operations risks for the proposed SMRF with proposed controls is provided in the OMP (**Appendix B**) and described in **Section 8.0**.

Assessment of the risks to the environment is considered in terms of a conceptual site model (the CSM), which is based on potential linkages between a source of PFAS contamination, pathways for exposure and potential human or environmental receptors. On this basis, the fundamental structure of the CSM is based on key potential hazard being PFAS contained in Tunnel Spoil and Spoil Water.

5.2 Conceptual Site Model

The SMRF is located within a basalt excavated quarry, the current site surface being approximately [redacted] lower than surrounding land surfaces. The surface geology of both the site and surrounds is Quaternary-aged Newer Volcanics consisting of approximately 60 m depth (at least four flows) of basalt, intermittently separated by clay and scoria.

Based on available geological logs and understanding of the quarried resource, the majority of the quarried resource has been excavated to just above scoria and clay layers (interpreted to be paleosols) that overly the underlying basalt flow in the formation's geological sequence.

The natural water table groundwater elevation is understood to lie below the quarry floor with regional groundwater flow direction interpreted to be south-easterly, as described in **Section 3.12**.

A conceptual cross section is also presented in **Figure 7**.

5.2.1 PFAS in the Environment

Per- and poly- fluoroalkyl substances (PFAS), also commonly referred to as PFCs (Per- and polyfluorinated chemicals), are a large group of fluorinated compounds which were first manufactured in the 1940's and have been widely used for a number of industrial applications and consumer products since. PFAS form strong surfactants which are utilised in applications requiring heat resistance, dispersion of liquids, fire suppressant and surface protection (NICNAS, 2016). The pervasive use of PFAS in products and industrial processes over decades and its resistance to break down, has resulted in PFAS being detected throughout the environment from other non-aqueous film-forming foams (AFFF) sources.

PFAS are characterised by fluorinated carbon chains where hydrogen atoms have been replaced with fluorine atoms; the resulting carbon-fluorine bond is the strongest in organic chemistry and PFAS are subsequently highly resistant to degradation (Grijalva & Manuel, 2009). The fluorinated carbon forms a hydrophobic linear chain (typically C_4 to C_{16}) and an attached functional group creating a hydrophilic component. This structure results in variable surface active (polar and non-polar) properties.

Perfluorooctane sulfonate (PFOS) ($C_8F_{17}SO_3$) is the most common PFAS found in the environment due to its widespread historic use and its physico-chemical characteristics. PFOS is also the ultimate degradation or metabolic perfluorinated compound for a number of longer chain PFAS. PFOS is listed as a persistent organic pollutant (POP) under the Stockholm Convention.

PFOS will strongly adsorb to soils and sediments but will also disperse in the aqueous phase upon release. In contrast, relatively low $K_{o/c}$ values have been reported for PFOA (17-230; ATSDR, 2015), indicating that PFOA is less readily absorbed and may be more mobile in soil than PFOS. PFOS has a relatively high solubility in freshwater (>500 mg/L), which is reduced to approximately 15 mg/L in seawater (OECD, 2002). Higher pure water solubility has been reported for PFOA (9,500 mg/L; ATSDR, 2015), and as per PFOS and most organic and/or inorganic solutes, this solubility would be expected to decrease with increasing salinity.

PFOS will also absorb to suspended particulates readily and will settle and reside in sediment (Environment Canada, 2004). Impacts adsorbed to sediment may be remobilised into surface water over time or may enter the food chain. In addition, PFOS may adsorb to concrete and other porous materials and later desorb, potentially representing an ongoing source of PFAS. As noted above, the higher solubility and relatively lower $K_{o/c}$ reported for PFOA indicates that PFOA may be less likely to bind to and remain in the solid phase than PFOS. The potential for the receiving environmental conditions to accelerate mobilisation of PFAS is already accounted for by the use of ASLP testing to determine suitability for disposal. This is because ASLP is specifically designed to approximate 'worst case' for leaching conditions as described in the NEMP (HEPA, 2020).

5.2.2 Potential Sources of PFAS

The potential sources of impact relate primarily to the receipt, processing and storage of Tunnel Spoil which includes both the solid component as well as any free water that may be released from the spoil during holding or storage. Further details on the characteristics of the Tunnel Spoil are provided in **Section 4.0**. Specifications for containment are described in **Table 3-1** and thresholds reuse or disposal of Tunnel Spoil containing PFAS are described in 2.

5.2.3 Contaminants of Potential Concern

The primary contaminant of concern is the potential presence of PFAS across the entire Tunnel Spoil volume. The areas of expected PFAS contamination, concentrations and volumes is presented in **Section 4.4**

In addition to PFAS, Tunnel Spoil may also have:

- Elevated natural concentrations of metals.
- Low dissolved concentrations of anthropogenic contaminants from groundwater (including metals, hydrocarbons, solvents, nutrients, volatile organic compounds.

Four distinct exception zones have been identified where the presence of either inert wastes, higher levels of contamination and potential acid sulfate soil (PASS) may occur. In particular, Domain 2 (Exception Zone 1) is expected to contain higher concentrations of contamination and is proposed to be placed in a [redacted].

As described in **Section 4.4** above, the maximum expected PFOS+PFHxS mass concentration in tunnel spoil is 0.2 mg/kg, and the maximum expected concentration in Spoil Water is 4.5 µg/L. These concentrations have been assumed in the human health and environmental risk assessment below in **Section 5.4**.

It is noted that PFOA has also been detected in soil and groundwater within the tunnel alignment, however at much lower concentrations than PFOS+PFHxS (as detailed in the SAQP). Based on this, and the lower human and ecological toxicity of PFOA relative to PFOS and PFHxS (as indicated by the higher screening levels for PFOA vs. PFOS+PFHxS), PFOS and PFHxS are considered to be the key PFAS of concern in Tunnel Spoil.

5.3 Adopted Water and Soil Quality Criteria

5.3.1 Groundwater and Surface Water

Table 5-1 presents the adopted criteria for PFAS for the relevant beneficial uses of groundwater and surface water as identified in **Section 3.11**.

It is noted that PFOS and PFHxS are considered to be the primary potential risk drivers in tunnel spoil due to their higher toxicity than PFOA and their occurrence at higher concentrations in soil and groundwater within the tunnel alignment. However, water quality criteria for PFOA have also been summarised below for completeness.

Table 5-1: Groundwater and Surface Water Beneficial Use Criteria

Beneficial Use	Sum PFOS + PFHxS	PFOA	Comments and Source
Freshwater dependent ecosystems	0.00023 µg/L	19 µg/L	NEMP (HEPA, 2020) sourced from ANZECC. Conservatively 99% species level protection to account for potential bioaccumulation/ biomagnification and that the closest point of discharge is inferred to be Leakes Road wetland, which would fall within the 'Wetlands' segment as per SEPP Waters and is classed as 'slightly to moderately modified'. 95% species protection therefore applies, which results in the next higher 99% protection level for bioaccumulating compounds such as PFOS.
Agriculture and irrigation (Stock watering and/or irrigation)	0.07 µg/L	0.56 µg/L	Value is the NHMRC/NMMRC (2011) drinking water guideline, in accordance with ANZECC/ARMCANZ (2000) guidance which states that drinking water guideline should be adopted where no specific stock watering criteria has been derived. It is noted this value is not specifically derived to be protective of human consumers of stock and/or agricultural produce following bioaccumulation from stock and/or irrigation water. However, based on risk assessments completed by Senversa at multiple sites, this concentration would also not result in unacceptable bioaccumulation in agricultural produce (fruits, vegetables, etc) or livestock products (meat, offal, eggs, etc), i.e. resulting concentrations are expected to be below relevant FSANZ trigger levels [5]. The screening level is therefore considered protective of both risks to the livestock themselves, as well as human consumers of livestock products or agricultural produce.
Primary Contact Recreation Use and/or other occasional contact with water	2 µg/L	10 µg/L	NEMP (HEPA, 2020) sourced from NHMRC, 2019

Regarding other protected beneficial uses of surface water and/or groundwater:

- Based on the wide variety of aquatic species which may be consumed by humans present in surface water, there are no generic guideline values protective of the ***human consumption of aquatic foods*** beneficial use. Where surface water is found to be impacted by PFAS in groundwater discharging from the site, a review of the potential for human consumption of biota will be undertaken and consideration given to deriving appropriate risk-based criteria.
- No environmental quality objectives for ***traditional owners' cultural values*** and for ***cultural and spiritual values*** have been specified in SEPP Waters, therefore the objectives for water dependent ecosystems and species and water-based recreation have been adopted as default objectives on the assumption that if these objectives are achieved, then the beneficial use of traditional owners' cultural values will also be protected.
- Similarly, no generic investigation levels or thresholds for ***industrial and commercial water quality*** are provided in the NEMP (HEPA, 2020) or ANZECC/ARMCANZ (2000). However, where an existing, proposed or likely industrial or commercial use may occur on or in the vicinity of the site, the potential for contamination to preclude this beneficial use is further considered. SEPP

[5] *Perfluorinated Chemicals in Food* (FSANZ, 2017)

Waters states that consideration must be given to Section 2.2.4 of ANZECC/ARMCANZ (2000) for guidance on deriving guidelines for compounds where no guidelines currently exist. As industrial/ commercial uses are likely to be less sensitive than stock watering for the purpose of the EMP, conservatively the stock watering values are considered protective of industrial/commercial uses that may be realised either on- or off-site.

- For ***buildings and structures***, PFAS are not relevant indicators as per SEPP Waters, i.e. they are not corrosive to structures or building materials. Therefore, no objectives have been adopted.
- For ***geothermal properties***, groundwater at the site does not have geothermal properties, thus this beneficial use is not considered relevant.

5.3.2 Soil

Table 5-2 presents the adopted soil screening levels for PFAS for a range of land uses (including sensitive uses even though these are not present on or in close proximity to the site).

Table 5-2: Soil Investigation Levels

Land Use / Receptor	Sum PFOS + PFHxS	PFOA	Source and Notes
Human Health – Commercial/Industrial – Land Use (HIL D)	20 mg/kg	50 mg/kg	NEMP (HEPA, 2020); derived as per ASC NEPM. Note: The commercial/industrial criterion for PFOA has been set as 50 mg/kg in anticipation of Stockholm Convention low content limit of 50 mg/kg. The health-based criterion for PFOA for this land use would be higher.
Human Health – Public Open Space (HIL C)	1 mg/kg	10 mg/kg	
Human Health – Residential with Minimal Soil Access (HIL B)	2 mg/kg	20 mg/kg	
Human Health – Residential with Garden/Accessible Soil (HIL A)	0.01 mg/kg	0.1 mg/kg	
Ecological – Direct Soil Exposure – All Land Uses	1 mg/kg	10 mg/kg	NEMP (HEPA, 2020); human health screening level for public open space is recommended as an interim level.
Ecological – Indirect Exposure (via food chain) – All Land Uses	0.01 mg/kg	-	NEMP (HEPA, 2020); based on dietary exposure of a secondary consumer. Higher value (up to 0.14 mg/kg) may be appropriate for intensively developed sites with no secondary consumers and minimal potential for indirect ecological exposure.

5.4 Human Health and Environmental Risks

An evaluation of risks to human health or the environment for identified complete exposure pathways as per the CSM is presented in **Appendix E**. For each identified pathway, the approach to the assessment was qualitative and/or semi-quantitative, and comprised either:

- Comparison of expected or reported contaminant concentrations to relevant health-based screening levels. For PFAS, this considered screening levels recommended in the PFAS NEMP (e.g. those for direct contact with spoil or water) and the maximum expected PFAS concentrations in Tunnel Spoil and/or Spoil Water (see **Section 5.2.3**). The assessment also considered the possibility that Tunnel Spoil may contain PFAS concentrations up to the acceptance limits for SMRF containment (PFOS+PFHxS mass concentration of [redacted] and leachable concentration of [redacted]), however based on information provided in the SAQP, these concentrations are unlikely to be encountered in Tunnel Spoil.
- Screening calculations to estimate chemical intakes and compare to relevant tolerable daily intakes (TDI). For PFAS, the TDI was that derived by FSANZ (2017), as recommended in the PFAS NEMP.
- Consideration of other qualitative factors or lines of evidence relevant to the expected level of exposure and associated health risk (e.g. inherent design controls that will prevent a complete exposure pathway and control measures and management processes to be implemented during operations, including Tunnel Spoil handling as described in **Section 8.6** to limit direct contact with Tunnel Spoil or Spoil Water).

Where relevant, additional risk reduction due to operational risk control measures have also been identified and considered.

Specifically, the receptors and pathways considered in **Appendix E** comprise the following (for both PFAS and other contaminants that may be present in spoil and associated spoil water:

- On-site workers:
  - Direct contact with spoil and water.
  - Inhalation of dust derived from spoil.
  - Inhalation of volatiles derived from spoil or water.
- Off-site human users of groundwater:
  - Direct or indirect contact with water following extraction for protected beneficial uses.
- Off-site human users of surface water:
  - Direct contact with water during recreational use.
  - Other indirect / bioaccumulation pathways.
- Off-site aquatic ecological receptors (flora, fauna and other organisms in receiving surface water bodies).
- Off-site terrestrial biota (flora, fauna, soil dwelling organisms).
- Off-site receptors to which dust might migrate.

As shown in **Appendix E**, the risk screening indicates that risks to both human and ecological receptors due to spoil contaminants (both on- and off-site) are low and acceptable.

5.5 Groundwater Quality Impact Assessment

Potential infiltration of PFAS impacted Spoil Water that is being extracted from the Tunnel Spoil in the Holding Pens, Lined Cells and ponds at the SMRF to the underlying groundwater environment has been assessed to demonstrate that the SMRF operations will be protective of the underlying groundwater environment. A tiered approach to the assessment comprising both dilution factor modelling and seepage modelling has been completed and is described in **Appendix D.**

The impacts to groundwater are considered further, in relation to the proposed engineered lining systems proposed are described in the following sections:

- Holding Pens – **Section 6.6**.
- [redacted] – **Section 6.8**.
- Lined Cells – **Section 6.7**.
- Settlement Pond and Spoil Water Holding Pond – **Section 7.3**.

5.6 Assessment of Potential Acid Sulfate Soils

The potential risk for Tunnel Spoil to be potential acid sulphate soil (PASS) associated with the presence of Tertiary-aged Newport Formation sediments within the spoil and the potential damage to the [redacted] underlying the Holding Pens at the SMRF (if this lining system is used) has been assessed and is provided as **Appendix F**.

The risk posed by PASS and the recommended contingencies are considered further in **Section 6.6.3**. Treatment of PASS in the Holding Pens, if encountered is considered in **Section 10.3**.

5.7 Primary Risk Management and Controls

The assessment of risks has been used to derive the type and performance standard of the controls needed to reduce the risks to acceptable levels. A number of the controls are inherent due to the location of the facility (i.e. being in the base of the quarry), which are described in **Section 6.4**. Further controls are a combination of engineering and design controls and management controls intended to control the process. The primary risk management controls are described in the following sections:

- Engineering controls and treatment of Spoil Water – **Sections 6.0** and **7.0**.
- Procedural, behavioural and training “management” controls – **Section 8.0.**

6.0 Facility Design

6.1 Introduction

Design of the SMRF and its engineered elements required the following general categories of requirements be addressed:

- Receipt and processing of Tunnel Spoil such that it does not delay progress of the TBMs and allows the WGTP to proceed without additional hinderance associated with the processes of waste categorisation, containment, reuse and disposal of the spoil.
- Minimising amenity impacts to surrounding land users associated with the siting and design of the SMRF.
- Protection of the segments of the environment surrounding the SMRF associated with temporary storage, handling, containment and reuse of the Tunnel Spoil.

The requirements of the WGTP have been stipulated by CPBJH JV in the Invitation to tender (ITT) and the SAQP. The design responses to CPBJH JV's requirements are summarised in **Section 6.2 and 6.3**.

Minimising amenity impacts relates primarily to siting of the SMRF and buffer distances to surrounding land uses, which are addressed in detail in the Planning Application for the site being prepared separately for Cleanaway by Tract. Potential impacts on surrounding amenity associated with the location of the SMRF are summarised in **Section 6.4**. Operational management measures for potential amenity impacts, such as noise, dust and odour, are presented in **Section 8.0**.

Engineered elements of the SMRF design (e.g. Holding Pens, Lined Cells and ponds) have been designed to protect the surrounding groundwater and surface water segments of the environment. The need for those engineered elements arose from the risk assessment (refer to **Section 5.0**). Design of key engineering controls are consistent with EPA regulations and guidance for management of potentially contaminated soil and waste and the NEMP. Design of the engineering controls for the various elements of the SMRF are presented in **Sections 6.2** to **6.8**.

Roofing or covering the SMRF is not considered practical due to the area and relatively short time period for the project. Alternative means of managing Spoil Water and any dust are considered appropriate to manage the potential risks associated with spoil handling. Spoil Water management associated with the SMRF is presented in **Section 7.0** and environmental management is described in **Section 8.0**.

6.2 WGTP Design

6.2.1 Design Criteria

The key objective for design of the SMRF is building sufficient capacity to avoid delays to progress of the TBMs. Design of the SMRF was based on the following key design criteria included in the ITT and summarising discussions with CPBJH JV:

- Accept up to approximately [redacted] metric tonnes, or an estimated [redacted] loose m^3, of Tunnel Spoil.
- Acceptance of Tunnel Spoil delivered at a rate up to an average, during the peak month of production, of [redacted] per day from both TBMs (i.e. [redacted] per TBM).
- Capable of meeting a peak daily production rate of [redacted] per day.
- Ability to accept Tunnel Spoil [redacted].
- Capacity to temporarily store daily Tunnel Spoil production for up to [redacted] in lined storage bays (Holding Pens) pending the results of waste categorisation.
- Ability to remove Tunnel Spoil from temporary storage, at a rate that at least matches the delivery rate to the site (i.e. less than 24 hours), following waste categorisation.
- Maximise reuse of Tunnel Spoil categorised as NPI waste.
- Ensure any Tunnel Spoil classified as PIW is disposed at appropriately EPA-licensed facilities.

6.2.2 Overall Facility Layout and Processing

The proposed layout of the SMRF is shown in **Figure 4** and key elements of the facility are summarised in **Section 3.6** of the EMP.

The processes for receipt, temporary storage, waste categorisation, containment, reuse or off-site disposal is summarised in the Spoil Management Process Plan in **Figure 9** and described in detail in **Section 8.1**.

The fundamental purpose of the SMRF is to receive and temporarily store Tunnel Spoil while samples are forwarded to laboratories for chemical testing and waste categorisations are completed. Temporary storage of Tunnel Spoil during the waste categorisation process will be in the [redacted] Holding Pens. Once Tunnel Spoil in a Holding Pen has been given a waste categorisation, consistent with the Specification for Containment (**Table 3-1**) or reuse or disposal (**Table 3-2**) it will be loaded out of the pen as follows:

- [redacted]
- Containment of NPI Tunnel Spoil that meets the Specification for Containment in Lined Cells at the SMRF; or
- Tunnel Spoil categorised as PIW for IWRG parameters or exceeding the Specification for Containment or will be dispatched for off-site disposal to an appropriately licensed facility.

Tunnel Spoil will be transported to the SMRF in EPA licensed road trucks by contactors engaged by CPBJH JV. The trucks will enter the site via a Site Entrance off Middle Road on the southern side of the SMRF. If the [redacted] is required by CPBJH JV, [redacted] (refer to **Section 6.8**).

Tunnel Spoil will be delivered to the SMRF 24 hours a day, seven days a week for approximately [redacted]. However, we understand that trucks will be dispatched to avoid morning and afternoon peak hour traffic and more trucks may be operating during daylight hours than overnight. During typical monthly peak spoil production, the Traffic Impact Assessment (GTA, 2020) reports that [redacted] would arrive at the SMRF (approximately [redacted]). At the absolute peak spoil production, which is approximately one month in duration (refer to **Section 4.0**), truck arrivals to the SMRF increases to [redacted] or approximately [redacted].

On entering the site, trucks will descend from natural ground level (elevation approximately 62 m AHD) into the former quarry (elevation approximately 53 m AHD) via a ramp. Existing elevations of the quarry floor and surrounding land are shown in **Figure 10**. The Gatehouse, weighbridges, sampling gantry, wheel wash and all other office and amenities associated with the Site Entrance will be located on engineered fill and paved haul roads (Haul Roads) constructed on the floor of the quarry. The trafficable surface of the Haul Roads will be raised above the quarry floor by approximately 4 m to 5 m (elevation approximately 55.5 m to 57.5 m AHD) (refer to **Figure 10**).

After being weighed and, if necessary, sampled, each truck entering the site with Tunnel Spoil will be allocated a Holding Pen at the Gatehouse. Tunnel Spoil from each TBM will be allocated to a single Holding Pen for that day of production. Typically, only two Holding Pens will be receiving spoil on a given day. The road trucks will follow Cleanaway traffic controls along the paved Haul Roads to the tipping end of the allocated Holding Pen. The traffic loops to be followed by road trucks delivering Tunnel Spoil to the Holding Pens is shown in **Figure 11**.

The Holding Pens make up the largest portion of the SMRF footprint (refer to **Figure 4**) and are located at 227 Riding Boundary Road [redacted].

The Holding Pens are divided by a “plinth” of basalt rock and undisturbed natural soil on which a pylon for high-voltage overhead power lines is located. The overhead power lines run from northeast to southwest across MRL and the SMRF (refer to **Figure 3**). Haul Roads will run around the northern end of the plinth on the quarry floor.

Road trucks will back up to a [redacted] at the tipping end of the Holding Pens and deposit Tunnel Spoil into the pens. Road trucks will then exit the site via Haul Roads, a wheel wash and the Site Entrance.

Because [redacted] will be removing Tunnel Spoil from the Holding Pens on a number of occasions. The Holding Pens will be constructed with a [redacted] Beneath the [redacted] will be a [redacted], underlain by a [redacted]. The lining system will be founded on [redacted]. Details of the Holding Pen design are presented in **Section 6.6**.

Once Tunnel Spoil in a Holding Pen has been categorised and prior to removal of the spoil, Spoil Water will be removed from the pen by a [redacted] of the Holding Pen and discharged into the Settlement Pond. A [redacted] will also drain any Spoil Water present in the sump connected to the [redacted] underlying the [redacted] in the Holding Pen. If sampling of Spoil Water provides confidence that contaminants other than PFAS are not present at concentrations that would preclude reuse of treated water, Spoil Water may be removed prior to waste categorisations for PFAS being completed. Management and treatment of Spoil Water is detailed in **Section 7.0** of the EMP.

Tunnel Spoil that meets the Reuse Criteria (refer to **Table 3-2**) will be transported from the Holding Pens to the [redacted] in the western part of the SMRF (refer to **Figure 4**). The [redacted] will be surrounded by an [redacted]. No further testing on this material is proposed prior to reuse. Given that this material will have been categorised as fit for reuse in applications outside of a containment cell (i.e. either the Lined Cells at the SMRF or a landfill cell at MRL), due to hazard characteristics being below IWRG threshold levels, no further environmental controls, other than bunding to prevent turbid run-off are considered necessary.

Testing of both Tunnel Spoil and Spoil Water for IWRG parameters is proposed in the SAQP and EMP respectively to confirm that no unacceptable concentrations of chemical other than PFAS are present in at concentrations that could represent a risk to the surrounding groundwater or surface water environments. Assuming IWRG testing indicates unacceptable concentrations of chemicals other than PFAS are not present in Tunnel Spoil and Spoil Water, placement of Tunnel Spoil which complies with the Reuse Criteria in unlined bunded areas and reuse of treated Spoil Water.

Tunnel Spoil that meets the Specification for Containment (refer to **Table 3-1**) will be transported from the Holding Pens to the Lined Cells for containment. The Lined Cells will have a geomembrane and compacted clay liner layers consistent with the requirements for a Type 2 landfill in the Landfill BPEM and/or the most recent cells approved by EPA for MRL, with enhancements to the lining system commensurate to the proposed Specification for Containment for NPI Tunnel Spoil to provide additional protection to the underlying groundwater environment.

Tunnel Spoil may be temporarily stored in [redacted] (refer to **Section 6.8**) prior to transfer to the Lined Cells, or an off-site disposal location.

Tunnel Spoil that meets the Reuse Criteria (refer to **Table 3-2**) will be transported from the Holding Pens to MRL for reuse as identified applications in landfill cells applications. Details of the reuse options are presented in **Section 11.0**.

Consolidation of Tunnel Spoil in the Lined Cells will partially dewater the spoil over time. Dewatering will be encouraged by a Spoil Water drainage system which mirrors the requirements for a leachate collection system in Type 2 landfill cell plus additional enhancements. Any water removed from the drainage system in the Lined Cells will be considered Spoil Water and will be directed to the Settlement Ponds or Spoil Water Holding Pond (refer to **Section 7**). The containment system will not be used to permanently contain any free water.

Details of the lining and dewatering systems in the Lined Cells are presented in **Section 6.7**. Details of management and treatment of Spoil Water are presented in **Section 7**.

Tunnel Spoil may be “mined” out of the Lined Cells and further dried prior to reuse if appropriate uses can be found and any additional EPA approvals that may be required are obtained or will remain in the Lined Cells to rehabilitate the quarry void.

If a reuse for the Tunnel Spoil in the Lined Cells is not identified and approved in five years following final placement of material in the Lined Cells then a final capping layer will be constructed over the Lined Cells. The final capping system for the Lined Cells will be consistent with the requirements for a type two landfill in the BPEM and will include [redacted]. Details of the final capping system for the Lined Cells are presented in **Section 6.7.7**.

6.2.3 Drying and Reuse of Tunnel Spoil

Prior to reuse, Tunnel Spoil received at the SMRF will need to be dried to reduce its moisture content close to the optimum moisture content for compaction for reuse. In particular, Tunnel Spoil generated during the first half of the WGTP, largely comprised of sediments rather than basalt rock, will need to be dried prior to reuse. The identified reuse options all require some level of compaction to minimise settlement of the Tunnel Spoil. Optimum moisture content for Tunnel Spoil will vary based on the formations comprising the spoil and will need to be determined as some point in the future. However, it is likely that optimum moisture contents of the Tunnel Spoil will be significantly less than the moisture content of spoil received at the SMRF.

Water and foaming agents will be added to the Tunnel Spoil at the cutting face of the TBMs to enhance removal of spoil from the cutting face by auger and transferred to bins at the WGTP site on a conveyor belt. The foaming agent will assist in keeping Tunnel Spoil workable without releasing excess Spoil Water. However, foam in the Tunnel Spoil is expected to degrade over two to seven days and supernatant Spoil Water may be released from the spoil in the Holding Pens.

Further reduction of moisture content may be achieved through a process of consolidation and enhanced dewatering systems in the Lined Cells. However, consolidation is a slow process and yet further reduction in moisture content of the Tunnel Spoil may be required to allow effective compaction as part of reuse applications. Further moisture reduction is likely to require mechanical drying methods such as spreading and wind-rowing.

Senversa considered the option of progressively drying the Tunnel Spoil during the WGTP rather than placing it into the Lined Cells. While Tunnel Spoil that meets the Reuse Criteria may be dried in the [redacted] at the SMRF, Tunnel Spoil categorised for reuse in or containment would need to be dried on lined areas to protect underlying groundwater quality and surrounding surface water from PFAS impacts.

The proportion of Tunnel Spoil that will be categorised as NPI waste is unknown at this time. However, if Tunnel Spoil was categorised as NPI waste during peak periods of production, the areas of lined pad were estimated to be impracticably large to dry spoil during the WGTP. For example - assuming an average daily Tunnel Spoil production rate of [redacted] would have to be spread at a thickness of [redacted] of lined pad would be required for drying each day of spoil production. If Tunnel Spoil was categorised as NPI waste for a month, [redacted] of lined pad area would be required to dry out the spoil and the time required to achieve that drying out process may be [redacted], depending on the time of year.

Based on these estimates, attempting to dry spoil during the WGTP was considered too great a risk to the ability of the SMRF to continue to receive Tunnel Spoil at the anticipated production rates. It is for this reason that longer term containment in the Lined Cells and using consolidation as a dewatering method was adopted for the SMRF.

If additional moisture reduction of the Tunnel Spoil is required following a period of consolidation, the spoil could be excavated from the Lined Cells and dried in the Holding Pens. The lining systems and Spoil Water removal system beneath the Holding Pens will be protective of underlying groundwater quality (refer to **Section 6.6** for details) and ensures compliance with Reg.5(o).

6.2.4 Temporary Storage of Rocky Tunnel Spoil

Based on information provided with the SAQP, Tunnel Spoil produced later in the WGTP will be comprised largely of basalt rock and may be much easier to dry such that it can be reused.

The moisture condition of Tunnel Spoil and its material behaviour will be monitored in the Holding Pens. If the rockier Tunnel Spoil classified as NPI waste will stand without buttressing and appears to free drain, it may be temporarily stored on the surface of [redacted]. Outside a portion of [redacted] which has already been capped (refer to **Figure 20**), Stages 2 and 3 have an interim capping layer of [redacted] of clay overlying up to [redacted] of municipal waste and basal lining systems consistent with the Landfill BPEM requirements for a Type 2 landfill (i.e. [redacted]). Provided the temporary storage areas are bunded and Spoil Water draining from the rocky Tunnel Spoil is collected and transferred to the Settlement Ponds, storage of spoil on [redacted] will be protective of the surrounding environment.

6.3 Throughput and Capacity

The principal elements of the SMRF that will affect throughput and capacity for Tunnel Spoil from the WGTP are:

- The Holding Pens used to temporarily retain spoil while waste categorisation is completed,
- The Lined Cells used to contain Tunnel Spoil until either reused in other applications or remaining in place as part of the rehabilitation of a quarry void, and
- The capacity for EPA licensed facilities to receive any Tunnel Spoil classified as PIW.

Throughput and capacity of the principal elements of the SMRF are discussed in this section of the EMP. Impacts of Tunnel Spoil disposal classified as Category C PIW on licensed municipal landfill capacity is also discussed in **Section 6.3.4**.

6.3.1 Holding Pens

The Holding Pens have been designed with a storage capacity of [redacted], with a freeboard of [redacted] above that capacity. The capacity was selected on the basis that it represents the [redacted] Tunnel Spoil production from one TBM [redacted] **Figure 4-1**).

Typically, Tunnel Spoil will be directed to [redacted] Holding Pens on a given day, one Holding Pen per TBM. However, there may be days during the months of peak period of production when daily production from each TBM exceeds [redacted]. If the daily production rate exceeds [redacted], [redacted] Holding Pens will be used to contain Tunnel Spoil from each TBM.

As indicated in the SAQP, it is anticipated that waste categorisation process will require Tunnel Spoil to remain in a Holding Pen for up to [redacted] During conversations with CPBJH JV personnel, it was considered possible that waste categorisation may take up to [redacted]. The concept design of the SMRF (refer to **Figure 4**) included [redacted] Holding Pens to be able to retain Tunnel Spoil from both TBMs for up to 28 days at the average daily production rate during the peak month of production.

If total daily Tunnel Spoil production rates exceed [redacted], four Holding Pens per day will need to be filled so the number of days of Tunnel Spoil production that can be retained in the Holding Pens may be reduced to [redacted]. [redacted] of Tunnel Spoil production in excess of [redacted] would reduce the time for waste categorisation down to [redacted] for [redacted].

If total daily Tunnel Spoil production rates exceed [redacted] per day, more than two Holding Pens per TBM may be required (i.e. [redacted] Holding Pens in total). As such, the ability for the SMRF to store spoil would be further limited or the time for waste categorisation would need to be further reduced.

The proposed [redacted] Holding Pens have been designed with capacity to store spoil for the average daily production rates estimated by CPBJH JV for [redacted]. It is anticipated that CPBJH JV would liaise with Cleanaway if Tunnel Spoil production is planned to exceed [redacted] per day. Subject to suitable contractual arrangements being agreed and for additional cost, the SMRF may be able to accept greater than [redacted] per day but only where waste categorisation turnaround times are less than [redacted].

The Holding Pens have been designed with a [redacted] wide [redacted] truck and dog vehicles delivering Tunnel Spoil to quickly and efficient deposit their loads.

The layout of the Holding Pens has considered the ability to direct trucks from the two TBMs to Holding Pens in separate parts of the SMRF, to further reduce traffic congestion on internal haul roads and at the tipping curbs. The Holding Pens have been designed for [redacted] within the pens to allow the pens to be emptied within one [redacted].

It should be noted that if Tunnel Spoil is categorised as Category B or A PIW, delay may be experienced in emptying a Holding Pen (refer to **Section 6.3.3**) due to the rate at which PIW can be received at an appropriately licensed facility. This will further reduce the capacity of the Holding Pens and the SMRF to receive Tunnel Spoil.

6.3.2 Lined Cells

The Lined Cells have been designed to contain Tunnel Spoil that meets the applicable Specification for Containment as defined in **Table 3-1**. The proportion of the total volume of NPI Tunnel Spoil that will ultimately need to be contained in the Lined Cells is not known at this time. To accommodate this, the Lined Cells have been designed to [redacted] allow flexibility in the final capacity and have a maximum capacity able to accommodate the entire volume of Tunnel Spoil.

[redacted] of the Lined Cells and progressive capacities are detailed in **Section 6.7** of the EMP.

The maximum capacity of the Lined Cells is [redacted]. As such, the Lined Cells can accommodate the entire volume of Tunnel Spoil generated by the WGTP, understood to be approximately [redacted].

6.3.3 Dispatching Prescribed Industrial Waste

The rate at which Tunnel Spoil classified as PIW can be unloaded from the Holding Pens may be limited by the rate at which appropriately EPA-licensed facilities off-site can receive those wastes.

Category C PIW

Tunnel Spoil classified as Category C PIW with respect to IWRG chemical parameters will be transferred from Holding Pens to active cells in Stages 3 or 4 of MRL. Moxies transferring spoil to MRL will pass over a weigh bridge in the northern part of the SMRF (refer to **Figure 4**) prior to crossing into MRL. This process will be subject to EPA's waste tracking and transport requirements under Cleanaway's responsibility.

CPBJH JV will be responsible for transport and disposal of any Tunnel Spoil categorised as Category B or A PIW with respect to IWRG parameters or Tunnel Spoil with PFAS concentration above the Containment Criteria from the Holding Pens to the appropriately licensed facility. Cleanaway's contractors will load EPA-licensed vehicles for transfer of Category B and A PIW. This process will be subject to EPA's waste tracking and transport requirements under CPBJH JV's responsibility.

6.3.4 Impacts on Metropolitan Melbourne Existing Type 2 Licensed Landfill Capacity

If a significant proportion of the Tunnel Spoil is classified as Category C PIW and this material was directed to landfill, the available Type 2 (putrescible waste landfill) air space on which the Melbourne Metropolitan waste management strategy is based could be significantly impacted. In addition, attempting to transfer [redacted] into operating Type 2 landfill cells could significantly disrupt tipping activities in licensed cells. [redacted]

The design of the proposed SMRF Lined Cells enables Tunnel Spoil that meets [redacted]. Based on the SAQP, contamination of Tunnel Spoil with IWRG chemical parameters is only considered likely in Domain 2 of the WGTP, although the possibility of other Category C PIW exists.

6.4 Protection of Amenity

6.4.1 Planning and Works Approval Processes

In November 2020 the Minister for Planning approved Amendment C222 to the Melton Planning Scheme to facilitate the SMRF. The amendment inserted an incorporated document titled the *Ravenhall Spoil Processing Facility, October 2020* (the Incorporated Document) in the schedules to Clause 45.12 and Clause 72.04 of the Melton Planning Scheme. The Incorporated Document enables the land to be used for a spoil processing facility (i.e. the SMRF) and contains conditions governing the ongoing use and development of the site.

The quarry and landfills have all gone through planning processes and the landfills have gone through Works Approvals processes.

6.4.2 Site Location and Amenity

Being entirely located on the floor of an existing quarry, visual and noise impacts will be significantly mitigated.

The SMRF will be 2.6 kilometres from the nearest residential sub-division, currently under construction to the northwest (refer to **Figure 1**). The nearest residences are rural residential blocks located approximately 470 m and 960 m west of the proposed SMRF respectively.

The next nearest existing land uses other than agriculture are a correctional facility approximately 1.4 kilometres northeast of the SMRF and industrial development approximately 1 kilometre southeast.

6.4.3 Visual Impact

The SMRF will be constructed and operate largely below surrounding ground level in within the former quarry void (refer to **Figures 7** and **10**). The only parts of the SMRF observable above ground level will be the gate into the facility and, if filled to capacity, the final capped surface of the Lined Cells.

Infrastructure for the Site Entrance (including weighbridges and the sampling gantry) will all be located on the floor of the quarry. Once trucks delivering Tunnel Spoil start their decent down the ramp to the quarry floor they will drop out of sight of surrounding land users.

If the Lined Cells are not filled to capacity, which is probable given the entire anticipated volume of Tunnel Spoil is lower than the total combined Cells capacity, the final capping of the Lined Cells may not be visible from surrounding properties.

The final surface elevation contours of the Lined Cells filled to capacity are shown on **Figure 21**. The highest point on the perimeter bund around the Lined Cells will be approximately [redacted] AHD and the final cap surface will [redacted]
The highest elevation of the final cap of the Lined Cells filled to capacity would be [redacted]. A [redacted] is sufficient in this instance due to the waste stream being relatively homogeneous and so less susceptible to differential settlement whilst still promote shedding of water from the cap surface.

The visual impact of the maximum final capped surface is shown by the oblique 3-dimensional view of the Lined Cells from the property to the south of the SMRF, as shown in **Figure 6-1**. The green surface in the oblique view is the filled surface of Stages 2 and 3 of MRL and the grey surface is the final cap of the Lined Cells. The light blue is the perimeter bund of the Lined Cells.

Figure 6-1: Oblique View of the Lined Cells from the South

An earthen screen (dark green in the oblique view) and plantings along the southern boundary of the SMRF will provide additional visual screening of the Lined Cells from the south. Existing plantings along the western side of the quarry void will provide visual screening of the Lined Cells from the west. The final surface contours of MRL will screen the SMRF to the east and north.

6.4.4 Traffic and Road Access

Road access to the site will be from the Western Freeway, via Christies Road and an up-graded section off Middle Road to the site entrance. Christies Road primarily serves traffic to and from MRL and the Boral Quarry. Christies Road effectively terminates immediately south of Middle Road and Middle Road is currently unpaved and rarely used.

Traffic impacts are discussed in more detail in **Section 14.0** of the EMP and a detailed management plan will be prepared as part of the operation of the facility.

MRL is currently approved to operate over a 24-hour period and receives an average of [redacted] truck arrivals each day. MRL has planning and EPA approval to operate on that basis. The receipt of Tunnel Spoil over a 24-hour period is therefore feasible on the basis that it is consistent with current operations at the adjacent facilities. Planning approval is also assumed to be given for a 24-hour operation.

6.4.5 Noise

As mentioned previously, the fact that the SMRF will largely operate on the floor of the quarry should significantly mitigate noise impacts on surrounding properties.

The site has been used for a quarry for some years, which involves traffic movements and rock blasting. Aside from additional traffic movements on Middle Road up to the Site Entrance from Christies Road, noise impacts associated with the SMRF are considered manageable within the existing buffers around the site.

Noise impacts have been independently assessed by Marshall Day Acoustics as part of the planning assessment process and management measures proposed for the SMRF are detailed in **Section 8.0** and the OMP (**Appendix B**) and are generally consistent with those employed by Cleanaway at MRL.

6.4.6 Dust

Operation of the SMRF will generate dust during dry periods. The potential sources of dust are likely to be:

- Haul Roads for delivering Tunnel Spoil from the Holding Pens to the Lined Cells or off-site disposal; and
- Uncapped spoil in the Lined Cells.

In general, Tunnel Spoil in the Holding Pens is considered unlikely to generate dust due to its anticipated moisture content on delivery and relatively short time in the pens.

Suppression and management measures for control of dust at MRL are proposed and considered appropriate for management of dust at the SMRF, including boundary monitoring.

Dust management and monitoring measures proposed for the SMRF are detailed in **Section 8.0** and the OMP (**Appendix B**).

6.4.7 Odour

Based on the expected characteristics of the Tunnel Spoil described in **Section 4.0**, the potential for large quantities of odorous material is considered to be low along most of the tunnels. Domain 2 (I.e. the North Yarra main sewer) is considered to be the most likely source of odorous material within Tunnel Spoil.

Some natural geological formations contributing to the Tunnel Spoil (e.g. the Fyansford Formation) may be odorous. However, the risk of odour impacting surrounding properties in the context of the existing buffers around the SMRF are considered likely to be low. In the event that odour does become an issue with the Tunnel Spoil at the SMRF, management measures proposed are outlined in **Section 8.0** of the EMP and will be incorporated into the OMP.

6.5 Site Entry

The proposed Site Entrance to the SMRF will be located off Middle Road or via a new entry on Christies Road (see **Figure 12** and **Figure 13**). Middle Road will be upgraded and sealed to allow safe trafficking between Christies Road and the site entrance. The perimeter boundary fence will be extended immediately north of Middle Road and be formed by a minimum 1.8 m high cyclone fence. A lockable security gate will be constructed at the site entrance, which can be closed during any down time of SMRF operations.

The road into the SMRF will be bi-directional (in and out) and each will be a single carriageway. The full width of the haul road will be approximately [redacted] to allow for a [redacted] on the outer edges as a guide to the crest of the embankment batter slopes. In addition, a separator bund (soil or water filled barriers) between the two single carriageways will be constructed to delineate each carriageway. The vertical road alignment will fall from the top of the basalt shelf off Middle Road at a gradient of approximately [redacted] to approximately [redacted] RL at the weighbridges. The embankment batter slopes will be [redacted], built with engineered fill and each carriageway will have a sealed surface. The sealed surface will extend approximately [redacted] north of the entry weighbridge.

Immediately before the entry weighbridge will be a slip road off the entrance carriageway, where the trucks may be untarped and the contents inspected / sampled from an elevated gantry. The gantry will be approximately [redacted] long, [redacted] wide and at a height where spoil inspection / sampling may be undertaken safely.

There will be [redacted] long weighbridges located [redacted] to mitigate engine noise. The weighbridge house will be located between the two weighbridges and have an emergency back-up power supply. The [redacted] will be formally designed as part of [redacted] although, it will be constructed from [redacted]. To the west of the weighbridges will be the site compound, comprising offices, toilets / ablution facilities, first aid area, crib rooms, etc. and an allowance for parking of 12 light vehicles.

A wheel wash comprising a steel rumble bar over a soil collection pit will be constructed on the exit ramp to remove spoil on wheels, truck bodies, etc. prior to the vehicle leaving site. In addition, a light vehicle track will be constructed so that light vehicles can bypass the exit weighbridge and wheel wash.

6.6 Holding Pens

6.6.1 Loading and Unloading Holding Pens

Details of the Holding Pen designs are shown **Appendix A-2**, which supersede **Figures 15** and **Figure 15**.

Each Holding Pen will occupy approximately [redacted] in plan and have an average depth of about [redacted] including a freeboard of [redacted]

The Holding Pens will have a steep ([redacted]) at each end. The Holding Pen floor will fall at [redacted] from the toe of the unloading batter diagonally across the floor of the pen to the side the steeper tipping face where a spoil water sump is located.

The Holding Pens will be constructed on a minimum of [redacted] and include (in order from lowest to highest), the following layers:

- [redacted]
  - [redacted]
  - [redacted]
    - [redacted]
    - [redacted].

The [redacted] is intended to provide [redacted].

The conclusions of the options assessment for [redacted] included in the detailed designs is considered a [redacted] that will have to be inspected for damage after each unloading event from a Holding Pen and maintained or 'topped-up' as needed throughout the life of the SMRF. Rectification works would be completed as needed to maintain the integrity of the surface and would comprise [redacted].

The Holding Pens incorporate a [redacted] to collect any Spoil Water that migrates through the [redacted] of the Holding Pens. Spoil Water will be retained over a [redacted] and flow via the [redacted] to a [redacted]. Spoil Water will be extracted from the drainage system by [redacted] installed in the corner of the [redacted] Holding Pen (refer to **Figure 16**).

A [redacted] installed beneath the [redacted]. Both [redacted] materials have been assessed in relation to protection of underlying groundwater quality (refer to **Section 6.6.2**) and risk of exposure to acid pore water (refer to **Section 6.6.3**) and are considered appropriate for use in the Holding Pens. However, Cleanaway has chosen to proceed with a [redacted].

An earthen separator bund will be constructed between Holding Pens and will be a maximum of [redacted] wide at the base and [redacted] wide at the crest. The separator bund will be constructed from [redacted] and a surfacing of [redacted]. As with the surface layer to the pens, the [redacted] will have to be inspected and maintained periodically throughout the life of the SMRF. Rectification works would be completed as needed to maintain the integrity of the surface and would comprise [redacted] as needed.

A surface drainage system has been incorporated into the Haul Roads to intercept stormwater and divert it away from the Holding Pens. These [redacted] which will need on-going maintenance and surface water will discharge to the south of the Holding Pens.

Any incidental rainwater or Tunnel Spoil residues on the [redacted] into the Holding Pens and be treated as Spoil Water.

[redacted] will transport Spoil Water to one of the Settlement Ponds to remove sediment prior to being discharged to the Spoil Water Holding Pond and treated to remove PFAS at the WTP.

6.6.2 Groundwater Quality Impact Assessment

Potential infiltration of PFAS in Tunnel Spoil stored in the Holding Pens through the basal lining system incorporating options for [redacted] was assessed using POLLUTEv7. Infiltration modelling is presented in **Appendix D** of the EMP. Both lining options were assessed to allow flexibility if supply of [redacted] from overseas manufacturers is problematic during Covid 19 restrictions. However, Cleanaway have committed to the use of [redacted].

Infiltration through the floor of the Holding Pens was modelled assuming a concentration of dissolved PFOS in water of [redacted].

A conservative assumption was adopted that the Holding Pens would be filled to capacity and saturated conditions in the entire vertical column of Tunnel Spoil would result in a driving head of [redacted] over the low permeability liners. Although the anticipated time for waste categorisation to be completed on Tunnel Spoil in the Holding Pens is [redacted], modelling was completed for a period of up to [redacted]. We note that following waste categorisation, Spoil Water will be removed from the drainage [redacted], via sumps, thereby removing the head over the liner. Periodic extraction of Spoil Water from the sumps will continue to maintain the head over liner layer to much less than the [redacted] assumed in infiltration modelling.

It was assumed that groundwater would move beneath up to three the Holding Pens, i.e. from northwest to southeast. As such, the total distance groundwater would move beneath the Holding Pens is [redacted]

The diffusion coefficient for PFOS through the [redacted] layer is a key variable in assessing impacts on underlying groundwater. To provide a highly conservative approach to estimating impacts on groundwater quality, [redacted]
Therefore, we believe the infiltration modelling results for the [redacted] option to be highly conservative.

Modelling results in groundwater beneath the Holding Pens were compared to the drinking water criteria for PFOS (0.07 µg/L), which indicated that lining systems involving [redacted] would be protective of underlying groundwater quality with respect to PFAS. It is noted that the Newer Volcanics Aquifer beneath the site is considered to be Segment C and use of the drinking water criteria is a highly conservative threshold value for most sensitive protected uses, primary contact recreation and stock watering.

The results of infiltration modelling through [redacted] would not result in concentrations of PFOS above the drinking water standard if the Holding Pens were to remain filled to capacity for up to [redacted]. Modelling indicated that [redacted] lined Holding Pens would be protective of groundwater quality if filled for a much longer period of time.

It is proposed that [redacted] Senversa do not believe such testing is warranted for Holding Pens with a design life of less than 2 years and, due the time required to complete that testing, could impact construction schedules for the SMRF. [redacted].

6.6.3 Potentially Acid Sulphate Soils (PASS)

The SAQP identifies the potential risk for Tunnel Spoil to be potential acid sulphate soil (PASS) associated with the presence of Tertiary-aged Newport Formation sediments within the spoil.

[redacted].

If required, risk of PASS Tunnel Spoil causing damage to the use of [redacted], combined with [redacted] beneath the [redacted] is considered low and acceptable on the basis that the spoil generated in Domain 2 will not incorporate Newport Formation material.

For Rev3 of the EMP, Cleanaway engaged [redacted] to conduct a review of available information in relation to Tunnel Spoil being PASS. [redacted] report is presented in **Appendix F** of the EMP.

In conclusion, [redacted] found the following:

> *Based on the data provided that has been collected from in-situ samples of Tertiary aged sediments (including from the coarse- and fine-grained Newport Formation [NFC and NFF]), the PASS risk is interpreted to be negligible and not of concern. However, it is recommended that a contingency plan be put in place in the (unlikely) event that a larger than expected portion of NFC sediments (which have a significantly higher PASS risk) is encountered.*
>
> *This contingency involves the placement of a [redacted] at the base of the holding pens that will potentially contain [redacted], whilst testing of the tunnel spoil is performed to quantify the actual acid-base account (ABA) of the material. The results of the testing (CRS Suite) will determine whether the [redacted] will be required for further holding pens that will contain a portion of NFF (and potentially [redacted]) sediments.*

The [redacted].

It was also recommended that daily testing for PASS, a CRS Suite, is conducted on Tunnel Spoil from the first Holding Pen that the '[redacted]' is implemented for [redacted], "*…so at least [redacted] in total and the potentially highest concentration material at [redacted] is tested.*" Consistent with EPA guidance and between [redacted] samples per Holding Pen are analysed for the CRS Suite.

If the CRS Suite testing confirm calculations that the potential for oxidation is negligible, placement of the [redacted]' in subsequent Holding Pens can cease.

Enquiries were also made with [redacted]) regarding the potential impacts of low pH - on [redacted] performance. [redacted] indicated that their standard specification [redacted] were maintain permeability performance from pH 4 and higher. For pH lower than 4, addition of a [redacted] is recommended to maintain permeability performance down to a pH of 2. However, on the basis that [redacted] will not be used in the Holding Pens in the SMRF and Newport Formation material will not form part of the Tunnel Spoil in Domain 2, no further requirements for management of PASS have been incorporated in the detailed designs or operational procedures for the SMRF.

6.6.4 Dissolved Calcium Impacts on [redacted]

In consulting with [redacted] regarding potential high pH water associated with the use of a [redacted], the manufacturer indicated that their standard [redacted] product will maintain its permeability performance is not affected by high pH water. However, [redacted] did indicate that their standard [redacted] product can be affected by high levels of dissolved (or leachable) calcium, which can impact the performance of the [redacted] due to ionic exchange sodium to calcium in the bentonite clay minerals used in [redacted].

[redacted] confirmed that placement of [redacted], as a potential source of dissolved calcium, has been investigated and does not present an issue. [redacted] in a number of waterproofing applications over the years and the permeability of the [redacted] has not been compromised.

The design of the Holding Pen lining system will incorporate a [redacted] during construction. The [redacted] should also offer additional protection against dissolved calcium.

[redacted] was asked to consider potential impacts of dissolved calcium associated with the [redacted] performance (refer to **Appendix F**). [redacted] concluded the following:

> *The potential for leaching of dissolved calcium (Ca^{2+} (aq)) from the [redacted] has also been assessed and found to be negligible. In essence, the form of Ca^{2+}(s)(CaCO3) has a low solubility (0.0013 g/100g) compared to other forms of $Ca^{2+}_{(s)}$ expected to be found in [redacted] which is hydrated and Ca(OH)2 which has reported a solubility of 0.12 g/100g). Any $Ca^{2+}_{(s)}$ that is dissolved from $CaCO_3$ in the [redacted] is calculated to have a lower dissolution concentration (<0.5%) than that derived from [redacted] making up the holding pen floor.*
>
> *The $Ca^{2+}_{(s)}$ in the [redacted] will only be dissolved by acid, which if sulfuric acid (H_2SO_4) from PASS oxidation (along with sulfate [SO_4^{2-} (aq)] sourced from connate seawater will unlikely re-precipitate $Ca^{2+}_{(aq)}$ as gysum ($CaSO_4$), or be exchanged with sodium ($Na^{+}_{(s)}$) on soil exchange positions (resulting in increased $Na^{+}_{(aq)}$ in soil pore water). The reaction times for these processes is likely to extend significantly beyond [redacted] (the reported maximum timeframe for spoil to reside in the holding pens).*

Based on the information provided by [redacted] and the assessment conducted by [redacted], use of [redacted] the Holding Pens will not be compromised by the proposed wear surfaces (concrete or cement stabilised crushed rock) or the use of a AgLime 'guard layer'.

However, on the basis that [redacted] will not be used in the Holding Pens in the SMRF and Newport Formation material will not form part of the Tunnel Spoil in Domain 2, no further requirements for management of risk associated with a 'guard layer' have been incorporated in the detailed designs or operational procedures for the SMRF.

6.7 Lined Cells

6.7.1 Lined Cell Development

The [redacted] Lined Cells ([redacted] will be located along the eastern boundary of the SMRF (refer to **Figure 4**). The Lined Cells will be used to contain Tunnel Spoil categorised as NPI waste with respect to PFAS that meet the Specification for Containment.

Waste placed in the Lined Cells [redacted].

The [redacted]

Due to uncertainty regarding the proportion of the total volume of Tunnel Spoil received at the facility (i.e. estimated to be [redacted]) that will require containment, the Lined Cells will be [redacted]. The Lined Cells will be constructed sequentially to a bund height of [redacted] above the floor of the cell (approximately [redacted]). The [redacted]

The proposed sequence of construction will be as follows:

- [redacted]

Detailed designs for the additional lifts of the [redacted] have not been included with Rev7 of the EMP. If required, a revised version of the EMP, with detailed designs for the additional lifts of the [redacted], will be submitted to EPA for approval.

The layout of the Lined Cells showing the internal bunds is shown in **Appendix A-2**, which supersede **Figure 16** and **Figure 17**. A three-dimensional oblique view, looking northwest, of the Lined Cells is shown in **Figure 6-2**.

Figure 6-2: Oblique view of the lined cells

The capacity of the [redacted] of the Lined Cells and [redacted] for Tunnel Spoil is shown in **Table 6-1**:

Table 6-1: Estimated Cell Capacity

Cell	Area (Plan) (m^2)	Depth of Tunnel Spoil (Maximum) (m)	Airspace Capacity (approximate) (m^3)
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
Total Capacity			[redacted]

6.7.2 Cell Engineered Lining System

Details of the basal lining system of the Lined Cells are presented in **Figures 18** to **20**.

The Lined Cells designed consistent with requirements of a Type 2 lining system, with enhancements and include (from base up) the following elements:

- [redacted]

- [redacted]

The intent is that the design of the Lined Cells will be consistent with the requirements for lining and capping systems for Type 2 landfill cells in the Landfill BPEM and the NEMP requirements for PFAS impacted waste at the concentrations proposed, with the inclusion of the [redacted].

The [redacted] of the Lined Cells will be [redacted]

The [redacted]. It is proposed that the [redacted] of the Lined Cells will be [redacted]

Details of the [redacted] are shown in **Appendix A-2**.

To our knowledge, [redacted]

6.7.3 Spoil Water Collection System

Details of the Spoil Water collection systems proposed for the Lined Cells are presented in **Figures 18** to **20**.

The Spoil Water collection and extraction system proposed for the Lined Cells exceeds the requirements of the Landfill BPEM for Type 2 landfills with additional measures included to address the expected characteristics of the Tunnel Spoil and attempt to maximise dewatering associated with consolidation.

The Spoil Water collection and extraction system proposed in the base of the Lined Cells includes:

- [redacted]

[redacted] layer will also be placed [redacted] of the Lined Cells performing as both a [redacted]

Trials will also be conducted on deploying [redacted] across the surface of the Tunnel Spoil during placement in the Lined Cells to [redacted]. Rolls of [redacted] of the Lined Cells, to ultimately drain to the Spoil Water collection system in the base of the cells.

The spacing of the drainage system [redacted].

To reduce the [redacted]

[redacted] as shown in **Figure 14**. As the [redacted]

6.7.4 Prevention of Free Liquid in the Lined Cells

Reg. 5(o) of the Regulations requires that the containment system are not used to contain Tunnel Spoil that contains free liquid. The test method described by the Regulations to confirm the presence of free liquid is the USEPA testing method 9095B Paint Filter Liquids Test (Paint Filter Test).

In consultation with EPA, Cleanaway understand the intent of Reg.5(o) and the reference to the Paint Filter Test is to ensure that pumping or discharging Spoil Water directly into containment cells does not occur.

This EMP does not include any such pumping or discharge of free liquids into the Containment System, rather this EMP facilitates the removal, storage and treatment of as much Spoil Water as possible. The SMRF will incorporate sufficient storage for Spoil Water, based on conservative assumptions (refer to **Section 7.3**), and will mobilise a Water Treatment Plant (WTP) to the site for the duration of the WGTP. No Spoil Water or free liquids will be discharged to the Lined Cells from the Holding Pens or elsewhere.

Dewatering of the Tunnel Spoil will be conducted in the Holding Pens, during waste categorisation, and in the Lined Cells prior to final capping as follows:

- Any supernatant water or incident rainwater (i.e. Spoil Water) will be removed from the Holding Pens immediately prior to transfer of waste from the pens.
- Spoil water will be extracted from the Holding Pens both directly from the unloading ramp and from the sumps connected to the [redacted] over-lying the [redacted] in the base of the pens by a [redacted].
- The Holding Pens have been designed to [redacted] As such, no "free" Spoil Water will be present in the Holding Pens prior to transfer of Tunnel Spoil to the Lined Cells.
- Spoil Water extracted from the Holding Pens will be discharged to the Settlement Pond.
- Tunnel Spoil will be dewatered in the Lined Cells using enhanced drainage measures to encourage consolidation processes as the spoil is surcharged.
- Additional engineering measures, over and above normal Landfill BPEM requirements for leachate collection in Type 2 landfill cells, incorporated into the Lined Cells to encourage dewatering include:
  - [redacted]
  - [redacted]
  - [redacted]
- Spoil Water will be continuously extracted from sumps in the Lined Cells by pumps on a water level control system to maintain a maximum leachate level across the floor of the cells at less than [redacted] and discharged to the Spoil Water Pond, ensuring that the Containment System does not contain any free liquids.

Prior to final capping, [redacted] in accordance with the reuses detailed in **Section 11.3**. During this period dewatering of the Tunnel Spoil will continue. Spoil Water extraction from the Lined Cells will continue to operate after final capping so as to ensure the Containment System continues to expel (and not contain) any remaining spoil water / free liquids until such time that Spoil Water is no longer accumulating in the Spoil Water Sumps or it can be demonstrated that no unacceptable impacts to underlying groundwater quality will occur if extraction ceases.

6.7.5 Tunnel Spoil Placement in Lined Cells

Transportation of Tunnel Spoil from the Holding Pens to the Lined Cells will be by [redacted]). Tunnel Spoil will be contained in the Lined Cells until dewatering has occurred and re-use requirements have been explored.

Tunnel Spoil will be deposited into the Lined Cells by the [redacted] at numerous locations around each of the cells from defined tipping points, [redacted] in an attempt to fill each cell without the need for spreading of the material. Where the material properties do not permit the cell to fill consistently around the perimeter, the use of [redacted] may be needed to spread the material away from the tipping points. The [redacted] associated with tipping points are a proposed operational control and subject to the results of a [redacted]. If included, consideration would be given to how the [redacted] such that the liner is not compromised.

6.7.6 Groundwater Quality Impact Assessment

Potential infiltration of PFAS in Tunnel Spoil stored in the Lined Cells was assessed using a two-tier assessment as follows:

Tier 1 Assessment

- Simple dilution factor (DF) modelling based on an assumed constant PFOS concentration [redacted], and mixing (dilution) with underlying groundwater; and

Tier 2 Assessment

- More complex, time-based seepage modelling based on variable PFOS concentrations, calculated seepage rates for the specific [redacted] using POLLUTEv7.

The results of the two assessments are presented in **Appendix D**.

Infiltration through the [redacted] used in the Tier 1 assessment assumed a PFOS concentration in Spoil Water of [redacted].

It was assumed that groundwater would move from northwest to southeast resulting a total distance travelled beneath the Lined Cells of 350 m.

The diffusion coefficient for PFOS through the [redacted] layer is a key variable in assessing impacts on underlying groundwater. To provide a highly conservative approach to estimating impacts on groundwater quality, an equivalent diffusion coefficient for chloride was assumed in infiltration modelling completed. We note that a recent research paper [redacted]) indicates that the diffusion coefficient for PFAS through [redacted] is much lower than that for chloride.

The result of infiltration modelling assuming a diffusion coefficient consistent with chloride indicates that the drinking water criteria for PFOA would not be exceeded in groundwater within 100 years. [redacted]), the concentration of PFOS in groundwater would be less than 50 % of the concentration estimated using the chloride diffusion coefficient.

Based on the infiltration modelling presented in **Appendix D**, containment of Tunnel Spoil with PFOS and PFHxS [redacted] in the proposed Lined Cells will be protective of groundwater quality beneath the site.

6.7.7 Internal Separation Bunds

At this time, the moisture condition of Tunnel Spoil and the actual levels of PFAS in Tunnel Spoil from different sections of the tunnels cannot be confirmed. To facilitate [redacted]. The [redacted] may also be used to improve vehicle access to the Lined Cells to assist placement of relatively dry Tunnel Spoils. Indicative alignments of potential bunds are shown in **Figures 16** to **19**. However, the indicative alignments are superseded by the detailed designs of the first

lifts of Lined Cells [redacted] presented in **Appendix A-2**. Depending on operational requirements, any the layout of any internal bunding to facilitate placement of Tunnel Spoil in the Lined Cells during subsequent lifts of the Lined Cells will be developed based on trial pads and details being provided to the construction verification auditor for approval.

Although infiltration modelling suggests that a [redacted] will be protective of underlying groundwater quality, Cleanaway intend taking the conservative approach of avoiding placement of Tunnel Spoil with a concentration of PFOS and PFHxS in excess of [redacted] in areas [redacted]. As such, [redacted] will only be placed in the following locations in the Lined Cells:

- [redacted]

6.7.8 Lined Cell Capping

Once all the NPI waste has been deposited in the Lined Cells, the upper surface of NPI waste will be mounded and capped with typically [redacted] where possible.

It is expected that the Tunnel Spoil received later in the WGTP will be largely comprised of basalt rock and will therefore behave as a course crushed rock type material and would both permit access by [redacted] to promote surface drainage.

Once the WGTP is complete and the Holding Pens are no longer required, the Holding Pens will be decommissioned. [redacted]

The intent for the Lined Cells in [redacted] s deemed the preferred option. If a reuse application is not identified and approved by EPA within [redacted] of final placement in the Lined Cells, final capping would be applied.

Water balance modelling for the SMRF demonstrates that once the Holding Pens are not operating, the capacity of the Spoil Water Holding Ponds will be sufficient to manage Spoil Water removed from the Lined Cells by evaporation. Thereby a maximum head of [redacted] of Spoil Water can be maintained in the Lined Cells.

Final capping will be an engineered cap consisting of [redacted] in accordance with a [redacted] materials profile. The profile of the capping system is shown in **Figure 20** of the EMP. Materials specifications for capping materials are presented in Section 17 of the Technical Specification (refer to **Appendix A-2**). Quality assurance testing requirements for the capping materials are presented in Section 16 of the CQAP (refer to **Appendix A-3**).

The final cap will be shaped to promote water shedding and form a [redacted] as identified in **Figure 21**. Typical landfill cap grades recommended in the Landfill BPEM for putrescible landfills are between 5% and 20%. However, the landfill BPEM indicates that grades as flat as 1% on putrescible landfills can be achieved with inclusion of appropriate engineering controls. The minimum grades are specified to minimise development of depressions in the surface and on low permeability within capping systems associated with differential settlement of highly variable putrescible wastes. Although significant settlement of Tunnel Spoil in the Lined Cells is likely to occur, the risk of differential settlement resulting in depressions in the capping system is considered to be less than for putrescible waste. On this basis and to minimise visual impacts of the Lined Cells, we believe that a minimum grade on the cap for the Lined Cells of [redacted].

Spoil Water will continue to be removed from the Lined Cells once final capping is completed.

A Closure, Decommissioning and Post-Closure Plan (Closure Plan) will be prepared which will set out final capping details and on-going management requirements for the Lined Cells (refer to **Section 8.5**). The Closure Plan will include drawings showing final grades, connections to MRL capping and stormwater management features. The Closure Plan will be verified by the construction verification auditor and submitted to EPA for review prior to implementation.

6.8 [redacted]

6.8.1 Purpose

The purpose of the [redacted]

6.8.2 Spoil and Timing

It is envisaged that the [redacted].

Once the SMRF is operational the [redacted]

Three general types of Tunnel Spoil will be generated during drilling of the initial phases of the WGTP as follows:

- Tunnel Spoil with concrete and cement grout associated with the tunnel portal walls.
- Tunnel Spoil between the portal and Domain 2.
- Domain 2 Tunnel Spoil.

Tunnel Spoil with concrete and cement grout associated with the portal walls may be considered to be construction and demolition waste, which may result in a solid inert waste categorisation even if no PFAS is present in the spoil.

Based on groundwater and soil testing results, CPBJH JV are anticipating that the Tunnel Spoil between the portal and Domain 2 is unlikely to be contaminated and may be prepared to take the risk that a single waste categorisation of the material is to be consistent with Fill Material. Therefore, they would not require Holding Pens and daily waste categorisations.

Tunnel Spoil from Domain 2, the former alignment of the sewer main beneath Whitehall Street, Yarraville has been identified as the domain within the tunnels with the greatest risk of contamination by chemicals other than PFAS. As such, Tunnel Spoil from Domain 2 has the potential to be classified as a PIW with respect to IWRG chemical parameters.

The Outbound and Inbound tunnels will be bored by TBMs 1 and 2 respectively. TBM1 in the Outbound tunnel will be commissioned first and will travel a greater distance than TBM 2 to pass beyond Domain 2. As such, a greater volume of Tunnel Spoil proposed for the [redacted] will be generated by TBM 1.

Tunnel Spoil would be removed from the [redacted] consistent with waste categorisation and the management processes defined for Holding Pens in the SMRF. Once emptied, the [redacted] proposed for Holding Pens in the SMRF (refer to **Section 15.3.2**).

The Holding Pens are also available for temporary storage of Tunnel Spoil, providing operational flexibility and to enable optimal functionality. Tunnel Spoil may also be temporarily transferred from the Holding Pens to the [redacted] for temporary storage prior to movement into the Lined Cells is available.

6.8.3 [redacted]

The [redacted] involves [redacted] are shown on **Figure 22** and **Figure 23**.

The [redacted] include the following:

- [redacted]

[redacted]

As shown in **Figure 22**, a [redacted]

To provide for Tunnel Spoil being delivered to the [redacted] with a relatively dry moisture condition such that it will not flow away from the tipping pad, placement procedures will be developed, based on [redacted], that will ensure that any equipment entering the pens will only do so on top of sufficient thickness of spoil to ensure no damage is caused to the underlying lining system.

Further assessment will be during the early phase of construction regarding the risk of damage to the lining system associated with tipping Tunnel Spoil into the [redacted] and strain associated with flow of the spoil across the surface of the lining system. Further assessment may involve [redacted] to [redacted]. If required, a [redacted]

Once waste categorisation for the Tunnel Spoil has been obtained, the [redacted] will be dewatered Spoil Water and emptied of spoil.

[redacted]

Section **15.3.2**.

6.8.4 Groundwater Quality Impact Assessment

Potential infiltration of PFAS in Tunnel Spoil stored in the Holding Pens through the basal lining system of the [redacted] was assessed using POLLUTEv7. Infiltration modelling is presented in **Appendix D**.

Although other contaminants may potentially be present in the Domain 2 Tunnel Spoil, modelling PFAS infiltration through the basal liner was considered to represent a conservative indicator of impacts to underlying groundwater due to the relatively low water quality criteria and attenuative properties.

Infiltration through the floor of the [redacted] was modelled assuming a concentration of dissolved PFOS in water of [redacted]

Saturated conditions and a driving head of [redacted] in the [redacted] were assumed and a [redacted] for Tunnel Spoil to reside in the pens.

Modelling results in groundwater beneath the Holding Pens were compared to the drinking water criteria for PFOS (0.07 µg/L), which indicated that the lining system would be protective of underlying groundwater quality with respect to PFAS.

7.0 Spoil Water Management

A site Water Balance, Design Flow Rate and Spoil Water Holding Pond Storage Assessment are presented as **Appendix H**.

7.1 Spoil Water Management Overview

The overall Spoil Water management process is presented in **Figure 24** and is described further below:

- Water that is released from Tunnel Spoil or from incidental rainfall while being held in Holding Pens will be categorised based on the results of the Tunnel Spoil and Spoil Water sampling results as outlined in the SAQP.
- Spoil Water in the Holding Pens will be removed by [redacted] accessing the pens from the [redacted] and from [redacted] connected to the [redacted] (refer to **Figure 14**).
- Spoil Water will be removed from the Holding Pens following waste categorisation and prior to transfer of Tunnel Spoil from the pens. If Spoil Water and Tunnel Spoil sampling consistently indicates that concentrations of chemicals other than PFAS are unlikely to constrain reuse of treated water, Spoil Water may be extracted from Holding Pens prior to waste categorisation.
- For Tunnel Spoil categorised as PIW or Spoil Water which cannot be reused with respect to IWRG parameters, associated Spoil Water will be disposed of off-site to a licenced facility for treatment and/or disposal. Spoil Water from PIW impacted Spoil will be directed to series of temporary storage tanks prior to disposal. Tank capacity will be at least [redacted]' worth of Spoil Water volume.
- Spoil Water extracted from the basal and sidelining systems of the Lined Cells will be directed to the Settlement Ponds. Spoil Water will not be permanently contained in the Lined Cells but rather will be continually drained from the Spoil using consolidation process to the Settlement Ponds.
- Spoil Water will be discharged from the Settlement Pond to the Spoil Holding Water Pond.
- Spoil Water in the Spoil Water Holding Pond will be then pumped into the onsite WTP to remove PFAS from the water to concentrations [redacted] for laboratory analyses (e.g. [redacted] of PFOS and PFHxS).
- Periodic removal of sediment from the Settlement Ponds will occur with any sediments placed into the Lined Cells.
- Treated water will be discharged to a storage pond for reuse in dust suppression or construction, as described in **Section 7.7**.

7.2 Spoil Water Sources and Catchment

The sources of Spoil Water that will requirement management are the following:

- Water released from Tunnel Spoil, expected following the degradation of foaming agents in the Holding Pens and Lined Cells.
- Incident rainwater landing in the Holding Pens.
- Water extracted from the [redacted] of the Lined Cells.
- Incident rainwater landing in the Lined Cells.
- Water discharged into the Settlement Pond and Spoil Water Holding Pond.
- Incident rainwater in the Settlement Pond and Spoil Water Holding Pond.

The catchment areas for rainfall for each of SMRF elements are identified in **Table 7-1**. These rainfall catchment areas are based on the current SMRF design (June 2020) and assume any rainfall falling on these areas is collected in the water management system. Any rainfall falling outside of the catchment will be treated as run-off as described in **Section 7.6**.

Table 7-1: SMRF Catchment Areas for Rainfall

Catchment Name	Catchment Area	Total (ha)
Holding Pens	[redacted]	[redacted]
Lined Cells	[redacted]	[redacted]
Settlement Ponds	[redacted]	[redacted]
Spoil Water Holding Pond	[redacted]	[redacted]
	Total catchment for rainfall	[redacted]

7.3 Water Storage Capacity and Design

7.3.1 Spoil Water Holding Pond and Water Treatment Plant Rationale

Assessment of the Spoil Water Holding Pond storage capacity requirements in presented in **Appendix H**.

Preliminary Spoil Water Holding Pond sizing indicated that reliance evaporation solely to reduce the water stored on site, would require a storage of approximately [redacted]). A water storage structure of this capacity is not viable so use of a WTP is proposed that would scrub the spoil water of detectable levels of PFAS, effectively creating a clean treated water stream. The WTP would only treat PFAS impacted Spoil Water only. Assuming a WTP of typically [redacted] but up to [redacted] throughput is in use the estimated storage volume of the Spoil Water Holding Pond would reduce to a plan area of 3 hectares.

Cleanaway has explored the option with providers of the WTP of increasing the throughput and have been informed that the throughput could be increased to as much as [redacted] to [redacted] If Cleanaway adopt the option of a higher throughput WTP, the size of the Spoil Water Holding Pond may be reduced based on similar calculations to those presented in **Appendix H**.

A [redacted] freeboard has been assumed for the Spoil Water Holding Ponds, Holding Pens and Lined Cells. A 1 in 100-year rainfall event in the site vicinity is estimated to be [redacted]. Given that no run-on will be directed into any of the structures holding Spoil Water, even when at capacity the [redacted] freeboard is considered more than adequate for a facility that will be operational for a maximum period of approximately [redacted].

7.3.2 Settlement Ponds

Spoil Water from the Holding Pens collected in [redacted] will be deposited into one of two Settlement Ponds. Settled Spoil Water would flow over the [redacted] to the Spoil Water extraction point where a [redacted] would be used to regulate flow along the main to the Spoil Water Holding Pond.

The area and depth of the Settlement Ponds is provided in **Table 7-2**.

Table 7-2: Settlement Pond

Pond Type	Plan Area (ha)	Depth (m)	Freeboard (m)
Settlement Pond 1	[redacted]	[redacted]	[redacted]
Settlement Pond 2	[redacted]	[redacted]	[redacted]

Each Settlement Pond will be lined to prevent potential impacts to the underlying groundwater environment, comprising from base up:

- [redacted]

A layer of [redacted] in the Settlement Pond to assist with sediment removal. Sediment would be removed periodically and placed in the Lined Cells.

The location and configuration of the Settlement Ponds is shown in **Figure 25** and the proposed lining profile is shown in **Figure 27.**

7.3.3 Spoil Water Holding Pond

Spoil Water will be contained in the Spoil Water Holding Pond prior to treatment in the WTP. The area, depth and capacity of the Spoil Water Holding Pond is provided in **Table 7-3**.

Table 7-3: Spoil Water Holding Pond

Pond Type	Plan Area (ha)	Depth (m)	Volume (ML)	Freeboard (m)
Spoil Water Holding Pond	[redacted]	[redacted]	[redacted]	[redacted]

Inlet mains from the two Settlement Ponds and the Lined Cells will direct Spoil Water into the Spoil Water Holding Pond. An extraction sump located in the north east corner of the pond will be connected to an extraction main will direct water from the Spoil Water Holding Pond to the WTP.

The Spoil Water Holding Pond will be lined to prevent potential impacts to the underlying groundwater environment, comprising from base up:

- [redacted]

The location of the Spoil Water Holding Pond is shown in **Figure 26** and the proposed lining profile is shown in **Figure 27.**

7.3.4 Contaminated Spoil Water Holding Tanks

Spoil Water removed from Holding Pens that have been categorised as PIW will be disposed to an off-site treatment plant. Contaminated Spoil Water would be directed from the Holding Pens to temporary (covered and sealed) above ground polyethylene water tanks (Holding Tanks) by [redacted] for holding prior to off-site disposal.

Assuming a weekly Spoil Water generation of [redacted] (approximated from the water balance in **Appendix H**), [redacted] temporary Holding Tanks are proposed.

Holding Tank capacity can be scaled up and down depending on Spoil production although Holding Tank capacity will always be at least one weeks' worth of anticipated Spoil Water generation from the Holding Pens.

Environmental controls associated with the Holding Tanks are considered as part of the Operations Risk Assessment included in the OMP (**Appendix B**). The Holding Tanks will incorporate visual indicators of water level in the tanks to facilitate monitoring of capacity prior to filling with potentially contaminated spoil water.

7.3.5 Groundwater Quality Impact Assessment

Potential infiltration of PFAS in Spoil Water stored in the Settlement Ponds and the Spoil Water Holding Pond was assessed, using the methodology described in **Appendix D**.

The assessed infiltration through the floor of the pond lining systems assumed a PFOS concentration in Spoil Water of [redacted].

The assessment concluded that the proposed liner systems for both pond lining systems would be protective of groundwater quality beneath the site. The full assessment is presented in **Appendix D**.

7.4 Water Treatment Plant

In conjunction with evaporative losses in the Holding Pens, Lined Cells, Settlement Ponds and Spoil Water Holding Pond, Spoil Water containing PFAS will also be treated at an onsite WTP.

The WTP being considered for use at the SMRF is a plant sourced from [redacted]. Based on the Water Balance, presented in **Appendix H,** the proposed WTP capacity is [redacted]. An estimated [redacted] will be required for filter backwashing and system maintenance. This results in a maximum daily treated volume of [redacted].

Mobilisation and commissioning of the WTP is approximately [redacted]. The WTP proposed is predominantly a containerised water treatment system to minimise onsite installation and commissioning times. The proposed WTP uses a [redacted] in the treatment process, as even with breakthroughs, the PFAS concentrations in the discharge can still be compliant. This system primarily consists of various specialist [redacted] with the following components:

- [redacted]

Design basis information, functional layouts and process flow diagrams provided by the proposed supplier are included as **Appendix A-4.**

The WTP is designed to treat water with a maximum PFAS concentration of [redacted], with the post-treated water containing concentrations not exceeding [redacted]. It is proposed to sample every [redacted] of treated discharge water and test PFAS levels to verify the performance of the WTP. [redacted] which will be promptly rectified. This process water sampling regime is in addition to treated water sampling proposed for environmental monitoring purposes described in **Section 8.0**.

Waste generated by the WTP will be managed in accordance with the waste hierarchy such that impacted PFAS treatment media is destroyed rather than landfilled as follows:

- Spent media, whether Granular Activated Carbon (GAC) or Anion Exchange Resin would be [redacted].

7.5 Spoil Water Transfer

In addition to [redacted] of the Holding Pens, a pipe and pump solution will be constructed to transport Spoil Water between the Lined Cells and Ponds and WTP. The proposed locations of water transfer mains are shown in Drawings 3, 15 and 20 in the Technical Specification (refer to **Appendix A-2**).

7.6 Surface Water Run-Off Outside of the Catchment

The SMRF is to be located at the base of an extracted basalt quarry. Given this, run-off created from incidental rainfall is not able to discharge from the site as would have been in the case if the site was not quarried. Incident rainfall often ponds at the base of the quarry where it [redacted]. The approach to management of incident rainfall landing outside of the Spoil Water catchment delineated in **Section 7.2** will be [redacted].

Site infrastructure, such as the Holding Pens, Haul Roads will be [redacted], as shown in **Figure 25**.

Haul roads will be constructed from [redacted]. In addition, Haul Roads [redacted]. Any water shedding into the Holding Pens would be treated and managed as Spoil Water. Any run-off that sheds to unused areas of the quarry floor [redacted]. Given the elevation difference between the Spoil Water catchment and surface water in the base on the quarry, surface water flows are not capable of flowing into the Spoil Water catchment.

Monitoring of the quality of surface water run-off at the SMRF generated from incidental rainfall outside of the Spoil Water catchment area is not proposed.

7.7 Reuse of Treated Water

Treated water for reuse is treated water containing concentrations of PFOS not exceeding [redacted]
The treated water from the WTP will be reused at the SMRF or at MRL. Proposed uses of treated water at the SMRF or MRL include:

- [redacted]

The volume of water available for reuse is not yet known, but preliminary water use volumes for the MRL Southern Expansion indicate [redacted] of water could be used per annum. [redacted].

To service this reuse, it is recommended that a Treated Water Pond of approximately [redacted] in size is constructed so treated water can be collected and reused at the SMRF or MRL. A proposed location for this Treated Water Pond is included in the SMRF layout (**Figure 4).** The Treated Water Pond would be constructed with a [redacted] and a specification for this would be developed. Where treated water cannot be reused, it would be [redacted]

8.0 Operations and Environmental Management

8.1 SMRF Operations Overview

A summary of the management process for Tunnel Spoil produced by the WGTP is shown as a Process Flow Chart presented in **Figure 9**.

8.1.1 Tunnel Spoil

Currently the location of Tunnel Spoil sampling is to be confirmed, and this EMP allows for the flexibility of sample collection at either the WGTP or the SMRF.

The overall process for management of Tunnel Spoil is summarised as follows:

- Option - Samples collected from WGTP:
  - An independent third-party, agreed by CPBJH JV and Cleanaway, engaged by CPBJH JV will determine whether a sample required from Tunnel Spoil at the WGTP site to meet either or both requirements of the SAQP and Cleanaway's additional sampling (described in **Section 9.0**).
  - Tunnel Spoil samples will be collected from Spoil at the WGTP site prior to transportation to the SMRF.
  - Trucks delivering Tunnel Spoil will be received at the gatehouse and weighed.
  - Data received from CPBJH JV will be used to allocate a Holding Pen for each TBM's daily spoil production.
  - The truck will drive to the allocated Holding Pen, following Cleanaway traffic controls, and tip Tunnel Spoil into the allocated Holding Pen.
  - Spoil Water samples will be collected by the independent third-party from any free water in the Holding Pen [redacted], or following release of sufficient water to enable sampling (although a provision for collection of the Spoil water sample from the WGTP site is to be included).
- Option - Samples collected from SMRF:
  - Trucks delivering Tunnel Spoil will be received at the gatehouse and weighed.
  - The independent third-party will determine whether a sample required from Tunnel Spoil at the WGTP site to meet either or both requirements of the WGTP SAQP and Cleanaway's additional sampling (described in **Section 9.0**).
  - The independent third-party will determine whether a sample is required from a truck and will communicate to the truck driver the need to stop at the Sampling Gantry.
  - Tunnel Spoil samples will be collected from the trucks by the independent third party at a Sampling Gantry near the Site Entrance.
  - The truck will drive to the allocated Holding Pen, following Cleanaway traffic controls, and tip Tunnel Spoil into the allocated Holding Pen.
  - Data received from CPBJH JV will be used to allocate a Holding Pen for each TBM's daily spoil production.
  - Spoil Water samples will be collected by the independent third-party from any free water in the Holding Pen [redacted] or following release of sufficient water to enable sampling (although a provision for collection of the Spoil water sample from the WGTP site is to be included).

- Tunnel Spoil Categorisation:
  - The independent third party will forward Tunnel Spoil and Spoil Water samples to laboratories for required analyses, receive the results of analyses and undertake a waste categorisation.
  - In the event of sample loss, quality control discrepancies or the need for additional sampling to confirm a categorisation then an escalation procedure, to be agreed with CPHJH JV is to be followed.
  - No Tunnel Spoil to be processed from the Holding Pens until the categorisation is agreed.
  - The independent third party will provide all waste categorisation determinations, accompanied by relevant data and comparison to threshold criteria, to CPBJH JV and Cleanaway.
  - CPBJH JV will be responsible for preparing 6-monthly EPA categorisation compliance reports. The 6-monthly compliance reports will be provided to the waste classification verification auditor for verification.
  - The Auditor verified 6-monthly compliance reports will be provided to Cleanaway and EPA by CPBJH JV.

8.2 SMRF Operating Hours

It is proposed to operate the SMRF [redacted] at least during tunnelling works. Reduced operating hours may be possible during other periods but approval of the SMRF would be for [redacted] for the entire operating life of the SMRF to provide operational continuity to the WGTP.

8.3 Health, Safety and Environmental Management Systems

Cleanaway operates under an Environmental Management System (EMS) certified under ISO 14001:2015 and an ISO 9001:2015 accredited Quality System. The EMS provides details of Cleanaway's overarching approach to HSE management, including:

- Leadership.
- Planning - including planning, objectives and targets for health and safety, environmental management, emergency management and the frameworks for risk and change management.
- Support – including governance and compliance, health and hygiene, rehabilitation, injury management, communication, training and competency.
- Operations – including hot works, confined spaces, fall prevention, isolation of energy, industrial activities, plant, electrical safety, manual tasks and hazardous chemicals and dangerous goods (including requirements for provision of Safety Data Sheets (SDS) for all chemicals and dangerous goods).
- Performance and Evaluation – including measurement, monitoring and review.
- Improvement – including reporting, investigations and corrective actions.

8.4 Risk Management Framework

Cleanaway requires that a risk management framework be in place and is integrated into all facility operating practices and decision making. The risk management model for the SMRF operation will be in accordance with AS/NZS *ISO 31000 Risk Management - Guidelines*.

Cleanaway's risk management framework is used to develop suitable risk control measures as shown **Figure 8-1**. After risk mitigation activities, the residual risk shall be deemed tolerable provided that it has been determined that this risk is As Low As Reasonably Practicable (ALARP). A monitoring and review process shall be established to ensure this risk remains ALARP.

Figure 8-1: Cleanaway Risk Management Model and Hierarchy of Risk Controls

An assessment of the operations risks has been completed for the SMRF and is presented in the Operations Management Plan (OMP) provided as **Appendix B**. The risk assessment has been used as the basis for development of both the MP and PIP.

8.5 Environmental Management Documents and Plans

A number of subordinate management plans and documents are required to describe the operations, both for sampling and transportation of Tunnel Spoil from the WGTP and once it has been received and processed at the SMRF. **Table 8-1** describes the key subordinate plans and management documentation that have been prepared and those that will need to be prepared.. The plans that still need to be prepared would only be prepared upon confirmation by CPBJH JV that Cleanaway is a preferred provider for management of the Tunnel Spoil. In some cases the plans would need to be prepared in conjunction with CPBJH JV as the party responsible for Tunnel Spoil categorisation.

Table 8-1: Subordinate Management Plans

Plan Name	Application / Coverage	Status / Owner
Operations Management Plan (OMP)	The primary overarching operations management plan for the SMRF activities documenting environment management requirements and procedures for day-to-day use by parties conducting activities at the SMRF. The OMP is descr bed further in **Section 8.6**.	The OMP is provided as **Appendix B**.

Plan Name	Application / Coverage	Status / Owner
Monitoring Program (MP)	Primary reporting documenting the types, locations, frequencies, reporting and quality controls for all environmental monitoring. MP is descr bed further in **Section 8.8.**	The MP is provided as **Appendix C**.
Pollution Incident Plan (PIP)	The PIP has been prepared to comply with Regulation 6(2)(r) of the Regulations.	The PIP is provided as an appendix to the OMP.
Site Emergency Management Plan (SEMP)	The SEMP is a component of Cleanaway HSE Management Standards. The SEMP would include the Pollution Incident plan to comply with Regulation 6(2)(r) of the Regulations.	The SEMP is included as an appendix to the OMP.
Sample Analysis Quality Plan (SAQP)[1]	The SAQP sets out sampling, analysis and quality control requirements and criteria for categorisation of Tunnel Spoil with respect to PFAS and IWRG parameters.	Document has been prepared by AGON Environmental and is subject to approval by EPA. The SAQP is owned by CPBJH JV and implemented by the Independent Third Party. It is anticipated that Cleanaway's additional sampling requirements would be combined into a finalised overarching SAQP.
Health, Safety and Environment (HSE) Plan	The HSE Plan will address operations and management of the SMRF activities. A Hazard and Operability (HAZOP) assessment will also be completed as part of commissioning the SMRF and the findings will inform any changes to the HSE Plan.	To be developed by Cleanaway using existing Cleanaway methodology and procedures.
Materials Transport and Tracking Procedure	The ensure the orderly tracking of Tunnel Spoil from 'cradle to grave', a material tracking system shall be developed and include the elements below for each truck load of Tunnel Spoil released from the WGTP site: • Spoil **o**rigin **i**nformation. • SMRF receipt. • Sampling. • Tip of at the Holding Pen and Holding Pen number. • Waste categorisation. • Containment, reuse or disposal determination. • Emptying of Holding Pen. • Final destination and consignment. • Reporting requirements. The Materials Transport and Tracking Procedure is described further in **Section 13**.	To be developed by CPBJH JV. The Materials Transport and Tracking Procedure is owned by CPBJH JV and implemented by the Independent Third Party.
Tunnel Spoil Categorisation Procedure	A procedure will be developed to determine the categorisation of Tunnel Spoil if the results of Round 1 sampling indicate concentrations of an IWRG 621 chemical parameter exceed the threshold concentrations for Fill Material. The procedure will document: • Requirements for additional Tunnel Spoil sampling • Additional laboratory analysis. • Roles and responsibilities. • Review of laboratory data and provision of a recommended categorisation to the independent environmental auditor review. • Confirmation of the categorisation by the independent environmental auditor.	To be developed by CPBJH JV and Cleanaway. The Tunnel Spoil Classification Procedure is owned by CPBJH JV and Cleanaway and implemented by the Independent Third Party.

Plan Name	Application / Coverage	Status / Owner
SMRF Closure, Decommissioning and Post-Closure Management Plan (Closure Plan).	The Closure, Decommissioning and Post-Closure Plan (Closure Plan) will be prepared prior to closure of the SMRF and will be in place at the time of closure to address the environmental management of the SMRF closure, including: • Decommissioning of infrastructure. • Waste classification and reuse of materials. • Remaining soil validation. • Closure of the Lined Cells, including drawing showing final capping layout, connections with surrounding caps and stormwater management infrastructure. • Post-Closure monitoring and management requirements of the Lined Cells and Spoil Water system (as needed). • Cap erosion inspection and remediation. Aspects of the closure and decommissioning plan may be expedited (e.g. for the [redacted]) if completed prior to the main SMRF closure program.	To be developed prior to the closure and decommissioning of the SMRF. The SMRF Closure Plan will be verified by an environmental auditor and provided to EPA for review.

1. Assumes all environmental spoil and water sampling, including Cleanaway's proposed additional sampling requirements are specified in a revised SAQP by AGON. In the event that the additional sampling by Cleanaway is reported in a standalone SAQP then this will need to be reflected in the OMP.

8.6 Operations Management Plan

A Operations Management Plan (OMP) that documents the environment management requirements for the SMRF activities and procedures for day-to-day use by parties conducting activities at the SMRF is provided as **Appendix B.**

The purpose of the OMP is to:

- Define the key environmental risks for the site operations.
- Define how the risks can be controlled to a practical extent and in accordance with best practise
- Minimise the generation of waste in accordance with the waste hierarchy and State policy and legislation.
- Outline the reporting and training requirements relating to the operation.

The OMP has been informed by the operations risk assessment and will be finalised prior to commencing operations at the SMRF facility.

Environmental management of the following aspects of the SMRF are described in the OMP:

- Cleanaway Health, Safety and Environmental management standards.
- Site description and environmental setting.
- Risk assessment of operations risks.
- SMRF asset design controls.
- Procedural, behavioural and training controls.
- Complaints management.
- Incident response and investigation.
- Organisational structure and responsibilities under the OMP.
- Complaints procedures and response.
- Corrective actions.
- Competency and assurance.
- Reporting, documentation and record keeping.

A summary of a number of the OMP aspects is described in the remainder of this Section.

The SEMP and the PIP are included as appendices of the OMP (**Appendix B**).

8.6.1 Handling Tunnel Spoil

It is not expected that Tunnel Spoil would be handled by SMRF personnel other than for laboratory sampling at the Sampling Gantry, however as a matter of good practice, and in accordance with the *Worksafe Victoria Industry Standard Contaminated Construction Sites* (2017) key elements of the general control measures and procedures that would be incorporated include:

- Preparation of Standard Operating Procedures (SOPs).
- Preparation of Safe Work Method Statements (SWMSs) and/or Job Safety Analysis (JSAs) that take into consideration the hazards associated with handling potentially contaminated Tunnel Spoil or unidentified contamination.
- Establishment of a safe work zone around the work areas that clearly defines the work zone and restricts public access and intruders (i.e. fencing).
- Provision of adequate signage at the boundary of the site to deter entry.
- Minimising physical contact with the spoil and be rigorous in matters of personal hygiene during and following activities involving potentially contaminated spoil (e.g. wash any mud, dirt or dust particles from skin and clothing before eating, drinking and /or smoking).
- Implementation of a site wide workplace health and safety processes and procedures that include assessment to eliminate the risk of handling Tunnel Spoil or Spoil Water.
- Use of personal protective equipment (PPE) that is task specific and fit for purpose, including specifying the minimum PPE requirements on SOPs and SWMs.
- Hygiene controls including provision of washing facilities, including specifying the minimum hygiene control requirements on SOPs and SWMs.
- Provision of first aid, washing and toilet facilities away from work areas.

8.6.2 Dust Suppression and Control

Weather monitoring is proposed and enables SMRF operators to understand and prepare for weather conditions or events that would typically lead to dust being generated (including extended periods of hot dry weather, high windspeed days or days where wind direction could cause dust to be generated in the direction of a neighbouring sensitive receptor). Daily perimeter inspections will be completed for both the purpose of understanding if and where dust is being generated but also to confirm that pre-emptive suppression is available and being used, it is providing the required level of suppression or whether additional actions are required.

Notwithstanding that the SMRF is sited in the base of a quarry, the higher moisture content of the Tunnel Spoil is likely to mitigate dust or air quality management issues at the SMRF although the generation of dust would be minimised to reduce the risks to workers and neighbouring site occupants. Treated Water will be available for dust suppression.

In the event that dust is detected, the operator would take actions to mitigate dust generation and suppress wind-blown dust already generated.

Dust control and suppression techniques will include one or more of the following:

- Pro-active wetting down if hot, dry, windy conditions are expected.
- Use of mobile water carts and regular application of water or dust suppressants to dry materials to respond to different areas of the SMRF as needed.
- Continued wetting down of dry Tunnel Spoil and Haul Roads on hot, dry, and windy days.
- Use of asphalt haul roads where possible.
- Modifying operations and use of equipment on windy days to minimise generation of dust.
- Limit the size of an exposed works areas where practicable.
- Ensure that a water supply (such as a water carts) is available during operations, so that it can be utilised as necessary.
- Vehicle wheel wash and wash down if necessary
- Dust deposition monitoring events to confirm operator inspections.

- Use of additional or increased PPE including dust masks or sealed protective eyewear as needed.

8.6.3 Management of Odorous Tunnel Spoil

Water carts with additives odour suppressants would be maintained at the SMRF and deployed if required.

8.6.4 Noise Abatement

Noise would be from plant and operational vehicles consistent with current quarry and landfill operations at the Ravenhall precinct. SMRF operations would also be approximately [redacted] providing a buffer to receptors in the south and also sheltered by the operation quarry and landfill cells to the north, east and west offering additional protection.

Operationally, Cleanaway would use noise mitigation including [redacted], including:

[redacted]

- DAY: All mobile plant to be fitted with broadband reversing alarms.
- EVENING and NIGHT: Operations restricted to receiving and emptying third-party trucks:
  - Third-party trucks with tonal reverse alarms will not be accepted on-site during the evening and night period.
  - All third-party trucks accessing the site during the evening and night-time will be fitted with broadband reverse alarms.
  - No Holding Pen unloading activities to occur.

SMRF:

- DAY: All mobile plant to be fitted with broadband reversing alarms.
- EVENING and NIGHT: Operations restricted to receiving and emptying third-party trucks:
  - Third-party trucks with tonal reverse alarms will not be accepted on-site during the evening and night period.
  - All third-party trucks accessing the site during the evening and night-time will be fitted with broadband reverse alarms.
  - No Holding Pen or Cell unloading activities to occur.
- Site plant to be fitted with exhaust and / or intake attenuation.
- Compaction equipment to be fitted with sound panels and exhaust attenuation.
- Vehicle movement restrictions during evening and night periods to comply with Environmental Noise Assessment requirements (MDA, 2020).

A noise assessment forms part of the Planning Scheme Amendment documentation. Noise mitigation measures identified from the Planning approvals process will be incorporated into Design Package 6.

8.6.5 Prevention of Land and Groundwater Contamination Outside of Holding Pens and Lined Cells

The following measures to prevent land or groundwater contamination would be implemented at the SMRF:

- Bunding of any fuels or chemicals stored at site.
- Spill kits placed at strategic locations.
- Safe work procedures.
- Incident response procedures.
- Pre-start plant and vehicle checks and toolbox meetings.
- Operation of the facility by authorised and trained personnel.

8.6.6 Site Emergency Management Plan

Potential emergency situations are identified, and emergency procedures documented in a Site Emergency Management Plan (SEMP) for site operations. The SEMP includes steps to control further loss and triggers for review when there are changes in operations, products or services. Appropriate resources will be identified to ensure effective implementation of the emergency response plans and relevant internal and external stakeholders will be consulted when identifying potential emergencies and developing and testing emergency plans.

SMRF personnel will be trained to understand and implement crisis, emergency, and business resilience plans, with respect to their own roles and responsibilities in the event of an emergency and the minimum competency and training requirements (appropriate for likely hazards at sites and plant/equipment controlled by the company) will be established for site emergency personnel.

Suitability, location, and accessibility of emergency equipment will be assessed and suitably maintained by competent persons throughout SMRF operations. Resources, including equipment and warning devices, required for emergency response and ongoing recovery activities, will be identified, maintained, and tested in line with legislative requirements.

Site evacuation plan and emergency contact list shall be prominently positioned on noticeboards and at other suitable locations around the site. Emergency response drills and exercises will be scheduled and conducted regularly with learnings from emergency response drills documented and clearly communicated. The following elements will be addressed in the plan:

- Description of hazardous events and the likelihood of occurrence.
- Details of critical prevention and mitigation controls including safety equipment.
- Inventory of potential pollutants.
- Emergency contact list, including emergency services, response personnel and relevant government agencies.
- Site evacuation plan.
- Emergency response procedures.
- Pollution incident response procedures.
- Roles and responsibilities.
- Minimum competency and training requirements.
- Testing of emergency response procedures and communication of outcomes maintenance of emergency response equipment and resources review and revision requirements.

8.6.7 Pollution Incident Plan

The Pollution Incident Plan has been prepared to meet Regulation 6(2)(r) of The Regulation. The PIP includes:

- Site contact details.
- A summary of environmental hazards, impacts and controls (from the operations risk assessment).
- Actions to be taken during or immediately after a pollution incident.
- Contacting the community.
- Staff training.
- Testing and update frequency.

In accordance with the Regulation, the PIP has been verified by the environmental auditor.

8.7 Incidents, Complaints and Response

Cleanaway operates a 24-hour community telephone hotline should members of the public seek to make complaints about the facility. All complaints to the hotline or received via other means are logged in Cleanaway MyOSH system investigated by Cleanaway staff and rectified as necessary.

The outcome of the investigation and any corrective action taken is recorded in the MyOSH system in accordance with the requirements of Cleanaway's Quality Management System (QMS) certified under ISO 9001:2015.

Cleanaway will inform EPA of any complaint made or environmental incident at the SMRF. All complaints and incidents will be investigated per the agreed response protocols and the outcome will be communicated to EPA.

In the event of a complaint or upon EPA request, the following actions will be undertaken immediately:

- Record the details of the complaint in the Cleanaway MyOSH Incident Management System including the time, location and nature of the complaint. If the complaint relates to an odour then information on the intensity and description of the odour will be collected.
- Survey the site to identify any potential or likely cause of the complaint.
- Correlate complaint times with weather conditions, site activities and deliveries leading up to the complaint times.
- Have a Cleanaway staff member survey the boundary and then possible sources within the Facility (if possible). If the complaint is odour related and an odour from site is heading towards a nearby residence, then the operator would drive to the residence and check if the odour is apparent there. If the odour is verified as coming from site, then operations would cease or change immediately.
- Develop, document and implement corrective actions as necessary.
- Maintain records of complaints and corrective actions for auditing purposes.
- Progressively and regularly communicate the outcomes of the above processes to the complainant as they unfold.

The SEMP is to be followed in the event of an emergency. Incidents are investigated in accordance with Cleanaway HSE Standards, comprising the following actions:

- Incidents, near misses, customer complaints and non-conformities shall be reported through and investigated in the appropriate system. Notifications shall be in accordance with Internal Notification Matrix. External notifications shall be approved in accordance with the internal notification hierarchy.
- All incidents shall be investigated in accordance with the information supplied in the Quick Reference Guide – Incident Reporting and Investigations.
- Responsibilities for completion of corrective actions are assigned, tracked, and monitored through MyOSH.
- Effectiveness of corrective actions is monitored through key learnings information sheets, safety walk (interactions), workplace inspections, formal internal review processes and external audit programs.
- Relevant workers shall be adequately skilled/trained in incident investigation processes. Worker and Contractor representatives will be encouraged to participate in incident investigations as appropriate.
- Results of investigations, key learning's and subsequent changes in written processes resulting from the corrective actions shall be communicated to the appropriate management authority and where required, internal and external stakeholders. The issuing of Hazard Alerts occurs when incident learnings apply to more than one Branch.
- Compliance shall be maintained with the applicable legislative requirements related to incidents, including reporting to the regulatory authorities, documentation and record keeping.

Corrective actions to address non-conformances arising from incident investigations and the audit and inspection program will be documented and tracked within the Cleanaway MyOSH Incident Management System. Responsibilities for corrective actions will be clearly defined and the allocated time for completion will reflect the risk of the matter.

The effectiveness of corrective actions will be assessed through safety 'interactions' (coaching), daily and weekly inspections and the audit program.

8.8 Monitoring Program

To ensure compliance with Regulation 6(2)(p) of the Regulation, a Monitoring Program has been developed and is provided as **Appendix C**. The MP is consistent with the approach in *EPA Publication 1851: Implementing the general environmental duty: A guide for licence holders* has been developed that responds to the environmental risks identified in the *Operations Risk Assessment* documented in the OMP. The MP documents the required environmental monitoring requirements to each applicable environmental segment (such as air quality, dust, noise, surface water or groundwater). It specifies the location, frequency, type and quality control requirements required in order to demonstrate compliance with the EMP. The MP includes daily inspection against the control measures and the trigger levels/indicators for further assessment. In accordance with the Regulation, the MP has been verified by the environmental auditor.

A summary of the main components of the MP are provided in **Table 8-2** and discussed further in the following sections.

Table 8-2: Summary of proposed Environmental Monitoring

Operational Monitoring	Location	Frequency
Spoil Water		
Lined Cells – Spoil Water Level Gauging	[redacted] – Sump (south-east) Sump (north-east) – Sump (south-east)	• [redacted]
Lined Cells – Spoil Water Quality Sampling	[redacted] – Sump (south-east) – Sump (south-east)	• [redacted]
Treated Water Pond Quality	Treated Water Pond	• [redacted]
Water Storage Freeboard	Settlement Pond 1 Settlement Pond 2 Spoil Water Holding Pond Treated Water Pond	• [redacted]
Holding Pen Freeboard	Each filled Holding Pen	• [redacted]
Integrity of SMRF Infrastructure	SMRF infrastructure (Holding Pens, Ponds and Lined Cells) for cracking, damage and rectification as needed	• [redacted]
Groundwater		
Groundwater Quality and Elevation	Groundwater monitoring bores (refer **Figure 28**)	• [redacted]

Operational Monitoring	Location	Frequency
Amenity (Dust, Noise and Aesthetics)		
Gravimetric Perimeter Dust Monitoring	Existing and proposed gravimetric sampling points (refer **Figure 28**)	• [redacted]
Perimeter Acoustic Monitoring	Western perimeter or closest to sensitive receptor locations	• [redacted]
Offsite Amenity – Dust, Noise, Odours Litter, Weeds, Vermin, Trafficable Mud	Site inspection and perimeter wa k	• [redacted]
Onsite Amenity – Dust, Noise, Odours Litter, Weeds, Vermin, Trafficable Mud	Site inspection and perimeter wa k	• [redacted]

8.8.1 Groundwater Monitoring

A comprehensive groundwater monitoring network associated with MRL is already established that will be used for the purpose of assessing any impacts to groundwater from SMRF activities. It is proposed to increase the monitoring network with six additional groundwater monitoring bores targeting the Upper Newer Volcanics Aquifer (UNVA) to the south of the SMRF to provide additional coverage down hydraulic gradient of the site.

It is expected that any potential impacts to groundwater would be occur mainly to the shallow, unconfined UNVA rather than the deeper confined Lower NVA, and as such the UNVA is the target aquifer for the groundwater monitoring program. This is consistent with previous groundwater investigations completed to assess impacts for the MRL extension works approval application.

The existing and proposed groundwater monitoring bores are shown in **Figure 28.** The analytical suite, methodology and quality assurance and controls would be per the requirements of the auditor-verified landfill environmental monitoring plan (LEMP) (SMEC, 2020) with the inclusion of PFAS compounds. A summary of the proposed groundwater monitoring shown in **Table 8-3**.

Table 8-3: Groundwater Monitoring

Aspect	Parameter
Locations	• Groundwater monitoring bores as shown on **Figure 28,** comprising: ▪ Existing bores (GW03, GW04, GW05, GW07, GW08, GW12, MB03, MB04, MB08, MB15) ▪ Six proposed bores along the southern boundary of the SMRF
Target Aquifer	• Upper Newer Volcanics Aquifer (UNVA)

Aspect	Parameter
Sampling Parameters	• Analytical (ultra-trace level analysis as available): ▪ PFAS compounds (analytical suite to be agreed with the Environmental Auditor prior to commencement). ▪ Total organic carbon (TOC). ▪ Total dissolved solids (TDS). ▪ Electrical conductivity (EC). ▪ Volatile fatty acids (VFAs). ▪ Major ions (calcium, magnesium, potassium, chloride as Cl, sulphate as S, sodium, bicarbonate alkalinity – as HCO3). ▪ Heavy metals (iron, arsenic, cadmium, chromium, nickel, manganese, copper, lead, mercury, zinc). ▪ Volatile and semi-volatile organic compounds (VOCs and SVOCs). • Field: ▪ Standing water level. ▪ Dissolved oxygen (DO). ▪ Redox potential. ▪ Electrical conductivity. ▪ pH. ▪ Temperature.
Sampling Frequency	• [redacted].
Sampling Methodology	• Sampling will be undertaken in accordance EPA Publication 669 *Groundwater Sampling Guidelines* (April 2000), including: ▪ Low flow sampling using a micro-purge kit. ▪ Stabilisation of groundwater quality indicators during purging before sampling occurs. ▪ Samples preserved and delivered to the laboratory under appropriate chain of custody. ▪ Standing water level measured with a water level meter or interface probe.
Quality Control Sampling	• Minimum of: ▪ One intra-laboratory (‘blind’) duplicate sample analysed by the primary laboratory for every 20 groundwater samples collected for analysis. ▪ One inter-laboratory (‘split’) duplicate sample analysed by the secondary laboratory for every 20 groundwater samples collected for analysis. ▪ One field blank sample collected each day of sampling. ▪ One trip blank sample collected each day of sampling. ▪ Use of laboratory provided containers with preservatives as required for the analysis. ▪ Decontamination of apparatus between each sampling location.

8.8.2 On-site Water Quality Monitoring

Water quality monitoring is proposed for both Spoil Water and Treated Water and will be completed at the following locations:

- Treated Water Pond.
- Lined cell 1 – Sump (south-east).
- Lined cell 2 – Sump (south-east).

The analytical suite, methodology and quality assurance and controls would be per the requirements of the auditor-verified landfill environmental monitoring plan (LEMP) (SMEC, 2020) with the inclusion of PFAS compounds for Spoil Water Monitoring. A summary of the proposed water quality monitoring is provided in **Table 8-4**.

Table 8-4: Water Quality Monitoring

Aspect	Parameter
SMRF Locations	• Treated Water Pond. • Cell 1 – Sump (south-east). • Cell 2 – Sump (south-east).
Sampling Parameters	• Analytical (ultra-trace level analysis as available): ▪ PFAS compounds. ▪ Total organic carbon (TOC). ▪ Total dissolved solids (TDS). ▪ Total suspended solids (TSS). ▪ Turbidity. • Field: ▪ Dissolved oxygen (DO). ▪ Redox potential. ▪ Electrical conductivity. ▪ pH. ▪ Temperature.
Sampling Frequency	• Operational sampling: ▪ Monthly (first three months of SMRF operations). ▪ Quarterly (for the remainder of SMRF operations). ▪ 6-monthly thereafter. • Monthly level gauging
Spoil Water Extraction Rate (from Lined Cells)	• Flow meters installed at inlet to settlement ponds
Sump Level Gauging	• Dipped manually or bubbler sump monitoring installed. • Use of disposable bailers if dipped manually.
Sampling Methodology	• Grab sample using telescopic sampler from safe location.
Quality Control Sampling	• Minimum of: ▪ One intra-laboratory (‘blind’) duplicate sample analysed by the primary laboratory for every 20 groundwater samples collected for analysis. ▪ One inter-laboratory (‘split’) duplicate sample analysed by the secondary laboratory for every 20 groundwater samples collected for analysis. ▪ One field blank sample collected each day of sampling. ▪ One trip blank sample collected each day of sampling. ▪ Use of laboratory provided containers with preservatives as required for the analysis • Decontamination of apparatus between each sampling location.

8.8.3 Off-site Surface Water, Sediment and Biota Sampling

Prior to commencement of SMRF operations it is proposed to complete background surface water sediment and biota monitoring at offsite locations to characterise the off-site environment. This is proposed in the event that there is an uncontrolled discharge of Spoil Water from the SMRF during operations. Background monitoring of the following locations is proposed (specific locations to be confirmed):

- Skeleton Creek.
- Leakes Road Wetland.
- Laverton Creek.

The purpose of the background sampling is to establish the quality of the water and sediments already present in the receiving environment. Initially three sampling rounds of sampling are proposed using the methodology described in **Table 8-4**.

Background surface water and sediment samples would be analysed for a broader suite of contaminants, comprising the proposed analytical and field parameters presented in **Table 8-4** and:

- Nitrogens (nitrate as N, nitrite as N and ammonia NH3 as N).
- Electrical conductivity.
- Major ions (calcium, magnesium, potassium, chloride as Cl, sulphate as S, sodium, bicarbonate alkalinity – as HCO3).
- Heavy metals (iron, arsenic, cadmium, chromium, nickel, manganese, copper, lead, mercury, zinc).
- Volatile and semi-volatile organic compounds.

Surface water and sediment samples should be collected on three occasions prior to commencement of the SMRF operations. Samples should be collected, where practicable, at least one month apart. The exception to this is sampling for PFAS compounds which should be undertaken weekly for the first three weeks. The initial PFAS results should be assessed and if concentrations above the limit of reporting (LOR) are measured then weekly monitoring should continue to establish a statistically significant data set. If PFAS compounds are measured below LOR then monitoring should return to monthly in line with other surface water monitoring.

Background biota (fish and invertebrates) sampling will be completed following the initial surface water and sediment sampling as this information will be used to prepare an SAQP for the biota sampling (this is described further in the MP).

Off-site surface water quality monitoring will continue during operations at 6-monthly intervals. In the event of an uncontrolled discharge of Spoil Water that could have conceptually resulted in a release to the surface water environment or if during the monitoring, PFAS compounds are showing a trend of increasing concentrations then biota sampling will be completed to assess any impacts.

8.8.4 Boundary Dust Monitoring

It is proposed to extend the dust monitoring program recently developed and auditor-verified that is used at MRL and documented in the Dust Monitoring Plan (Cardno, 2019). The Dust Monitoring Program would be augmented for use at the SMRF with additional sampling rounds and locations to account for sensitive receptor locations and prevailing wing direction. A summary of the proposed dust monitoring is provided in **Table 8-5**.

Table 8-5: Dust Monitoring

Aspect	Parameter
Monitoring Type	• Daily inspections. • Dust deposition monitoring (gravimetric sampling). • Weather monitoring (to supplement dust monitoring and assist dust complaints investigation).
Frequency	• Monthly for first six months of SMRF operations at new SMRF locations. • Quarterly (commencing at the start of month 1 operations) at new SMRF locations. • Three events per year at existing MRL locations.
Locations	• SMRF perimeter. • Five boundary monitoring locations at the west and south of the SMRF as shown in Figure 28. • MRL weather station.
Sampling Method	• Gravimetric sampling used to calculate the average dust concentration over a 30 day period. • Sampling to be in accordance with the existing Dust Monitoring Plan (Cardno, 2019).

Aspect	Parameter
Assessment criteria	• 4g/m2/month (30 days) – gravimetric sampling. • No observable dust offsite.

8.8.5 Inspection and Checklists

To ensure compliance against this EMP, an environmental daily checklist shall be developed and implemented by the SMRF Site Manager or authorised representative, with exception reporting to the Senior Environmental Business Partner. This should include daily auditing against the control measures and the trigger levels/indicators presented in the checklist. Corrective actions arising from the daily inspections will be implemented immediately where possible. Issues requiring additional resources or investigation, will be escalated by raising an incident in MyOSH.

The following management aspects will be included as a minimum in the checklist to be included in the final OMP:

- Holding Pens (including [redacted]):
  - Freeboard.
  - Evidence of cracks or loss of containments (including spills).
  - Presence or otherwise of supernatant water.
  - Presence of water in [redacted].
  - Dust, noise or odours.
- Lined Cells:
  - Freeboard.
  - Evidence of cracks or loss of containments (including spills).
  - Presence or otherwise of supernatant water.
  - Spoil water collection operating effectively (including evidence of clogging).
  - Dust, noise or odours.
- Settlement Ponds and Spoil Water Holding Ponds:
  - Build-up of sediment
  - Freeboard.
  - Evidence of cracks or loss of containments (including spills).
  - Presence or otherwise of supernatant water.
  - Noise or odours.
- House-keeping:
  - Treated Water Pond freeboard.
  - Mud of sealed haul road at entry that could be trafficked off-site.
  - Plant and equipment functioning appropriately.
  - Leaks or spills.
  - Availability of spill kits.
  - Dust, noise or odours.
  - Chemicals, oils and lubricants appropriately stored.
- Perimeter inspections:
  - No uncontrolled surface-water discharge.
  - Offensive odour.
  - Nuisance dust.
  - Excessive noise.
  - Presence of litter, vermin or weeds.
  - Presence of spills.

8.9 Triggers and Contingencies

8.9.1 Amenity Triggers

The proposed amenity triggers and contingencies, including dust, noise, odour, stormwater contamination) is described in **Table 8-6**.

Table 8-6: Amenity Triggers and Contingencies

Issue	Level 1 Primary Indicator Trigger	Level 1	Level 2	
		Action	Trigger Level(s)	Action
Noise	Noise complaint	Investigate noise source and mitigate or terminate noise source (i.e. vehicle or plant).	Out of hours noise complaint.	Mitigate or terminate noise source (i.e. contain equipment, remove vehicle / replace plant at site if possible).
Dust control	Excessive dust or exceedance of 4g/m2/month (30 days) threshold	Provide additional dust suppression measures (if not already). Provide appropriate PPE (Class P1 or P2 particulate respirators If dust cannot be controlled, stop work, review alternative control measures, and provide active personnel and boundary monitoring.	As set out in relevant SEPPs, guidelines and other relevant publications for personnel and ambient dust monitoring (in accordance with the project risk assessment).	Stop work immediately. Cover exposed soil to prevent dust generation. Review and implement other control measures or complete works when wind subsides.
Contamination of public roads from vehicle movements	Observable mud on public roads	Consider water spraying options to decontaminate vehicles before leaving site, whilst containing wastewater and not creating run-off.	Observable mud on public roads discharging into stormwater drains.	Immediately review vehicle decontamination procedures. Have a roadworthy road sweeper available to clean / sweep Middle Road and Christies Road.
Odours	Odour complaints	Investigate odour complaint in accordance with complaint investigation procedure.	Verified odour complaint.	Stop work immediately. Apply odour suppressants as necessary Review and implement other control measures or complete works when odour subsides.
Contaminated Stormwater	Vis ble contamination in stormwater	Investigate source of contamination. Check controls are in place. Upgrade controls to prevent contamination of stormwater.	Contaminated stormwater breakout verified from contaminated source (such as holding pen).	Implement PIP requirements and analytical testing of the stormwater if the contamination is from a confirmed contaminated source.
Clogging of the Lined Cells Drainage	Increasing head of water in the sump or reduced Spoil water flow	Check pump. Increase monitoring frequency in sump . Consider need to use mobile water removal plant.	Pump failure Increasing head in sump or further reduced flow of spoil water.	Increase [redacted] frequency Increase mobile water removal infrastructure. Segregate cells to contain released spoil water. Increase groundwater monitoring frequency.

8.9.2 Groundwater Monitoring Triggers

The overall approach is based on defining 'Tier 1' trigger levels, which are generally based on exceedance of an agreed criterion for a contaminant of potential concern (COPC) where, depending on the risk, an increase in monitoring and reporting is triggered. A 'Tier 2' trigger level is also defined which, if exceeded, would result in specific mitigation actions. This approach allows time for consideration and review of:

- Baseline conditions and observed magnitude and rate of departure (i.e. trend) from baseline.
- Verification of the monitoring results.
- The appropriate monitoring frequency, and adjustment of this frequency as necessary.
- Potential need for new monitoring locations.
- Monitoring and laboratory analytical suite.
- Technical, financial and logistical assessment of the possible mitigation responses.
- Likelihood of continued departure from baseline without further action.
- Preparation to implement mitigation measures.
- Informing management, client and regulatory authorities.

This tiered process will allow different risks to be assessed on a case-by-case basis, allowing for the tailoring of responses that are specific to the observed scenarios.

Preliminary trigger levels are summarised in **Table 8-7.** The trigger levels are based on experience and information reviewed to date, and the principle of statistically significant departure from agreed baseline conditions. They are likely to change and be refined upon completion of further monitoring, modelling and detailed assessment of baseline conditions.

Table 8-7: Groundwater Triggers

Criteria	Tier 1 Trigger Level	Tier 2 Trigger Level
Contamination concentration (plume migration)	Results will be initially compared with the protected beneficial use (BU) screening criteria for each monitoring parameter. A statistically significant trend* of increasing concentrations is observed in one or more bores, over a minimum of four monitoring rounds (i.e. evidence that the impact may be expanding), this will constitute an exceedance of the 'Tier 1' trigger level. Exceedance of the 'Tier 1' trigger level would also occur if the contaminant is detected above the adopted assessment criteria for the first time after three consecutive non-detects (NDs).	Results that exceed the 'Tier 1' trigger level will be assessed on an individual basis to determine whether the 'Tier 2' trigger level is exceeded or the rate of change is l kely to potentially result in an unacceptable risk. An unacceptable risk will be considered an exceedance of the 'Tier 2' trigger level, and requiring the implementation of additional, 'Tier 3' mitigation and control measures.

The trigger level assessment framework and contingencies are described in the MP.

8.10 Construction Environment Management Plan

A construction environment management plan (CEMP) will be developed by the construction contractor and approved by Cleanaway prior to any construction commencing.

The CEMP will conform to the requirements of EPA Publication 1820 (2020) *Construction – guide to preventing harm to people and the environment* and adhere to any construction management conditions of the Works Approval. It is expected to address the following components:

- Governance and reference to any overarching EMP.
- Purpose and scope.
- Project information, relevant plans and documentation.
- Environmental setting and context.
- Application of environmental policy and regulations.
- Construction planning, including but not limited to:
    - Roles and responsibilities.
    - Nominated personnel.
    - Risk assessment.
    - Legal requirements.
    - Environmental management controls (including dust, noise, lighting, sediment and erosion control).
    - Induction, training, competency, and awareness.
    - Chemical use, storage and handling.
    - Waste management.
    - Crib and lunch area management.
    - Materials management.
- Communication and consultation.
- Incidents and emergencies.
- Non-conformance, corrective actions, preventative actions and continual improvement.
- Monitoring, reporting and evaluation.
- Relevant plans, checklists, safe work procedures, permits and approvals appended.

9.0 Sampling Analysis and Quality Plan for Categorisation

This section outlines the proposed sampling, analysis and categorisation process for the Tunnel Spoil over and above that already described in AGON (2020). The SAQP is implemented and controlled by CPBJH JV and contains information on the following aspects:

- Expected Tunnel Spoil characteristics (as described in **Section 4.0**).
- The requirements and approach to sampling.
- The scope of further sampling and testing of Tunnel Spoil (location, sample collection and field-testing requirements, sampling nomenclature, laboratory testing suites).
- Data quality indicators.
- Criteria and decision-making rules for Tunnel Spoil categorisation.
- Monitoring of Tunnel Spoil reuse or disposal compliance.
- Reporting requirements and independent verification of SAQP requirements.

The purpose of the additional sampling is to provide assurance to all parties on categorisation of the Tunnel Spoil for reuse, and documents the sampling “in principal” to demonstrate the Tunnel Spoil is appropriately categorised for reuse for the purposes of approval by EPA. It is intended that the detailed sampling, analysis and quality requirements for the sampling described in this section will be added to an updated version of the SAQP so that all sampling of the Tunnel Spoil is addressed in a single document.

9.1 Waste Categorisation Sampling Overview

9.1.1 PFAS

The SAQP sets out sampling to be conducted and criteria for categorisation of Tunnel Spoil with respect to PFAS. It is assumed that the PFAS sampling program detailed in the SAQP will be sufficient for categorisation of Tunnel Spoil as NPI waste and permit the containment and reuse options identified in this EMP.

As such, no additional sampling and analysis for PFAS is proposed in this EMP.

9.1.2 IWRG Parameters

Domain 2

The SAQP includes sampling and analysis of Tunnel Spoil for IWRG 621 chemical parameters in Domain 2 due to the presence of the former North Yarra Sewer Main. The North Yarra Sewer Main would have transmitted a range of industrial effluents and chemical to the Werribee Sewage Farm over a number of decades and represents a source of potential contamination. As such, the frequency of Tunnel Spoil sampling in Domain 2 reflects the requirements of IWRG 702 for potentially contaminated soil.

Cleanaway do not propose any additional sampling for IWRG parameters in Domain 2 and will rely on data generated by the sampling program proposed in the SAQP and waste categorisation made by the independent third party to identify containment, reuse or disposal options for Tunnel Spoil from that domain.

Outside Domain 2

Based on information relating to potential sources of contamination and contamination found along the routes of the tunnels, CPBJH JV has concluded that the risk of Tunnel Spoil being “potentially contaminated” consistent with the requirements of IWRG 702 to be low. As such, the SAQP does not propose sampling for IWRG 621 chemical parameters outside of Domain 2, which is identified as an “Exception Zone” compared to the rest of the tunnel alignment.

To provide additional confirmation that contamination other than PFAS is not present in Tunnel Spoil, the SAQP includes Spoil Water sampling and analysis for a broad range of chemical parameters during

the initial period that a new geological formation is encountered by TBM. The assumption underlying the proposed Spoil Water sampling is that groundwater in a newly encountered geological formation may contain contaminants not encountered in portions of the tunnel bored earlier.

If significant concentrations of chemicals not considered naturally occurring are present in the Spoil Water samples, further investigation of the presence of those chemicals may be warranted. As such, Cleanaway consider the Spoil Water sampling will provide a useful line of evidence and a partial screening tool for IWRG chemicals.

In addition to the Spoil Water sampling included in the SAQP, Cleanaway are proposing that one sample of Tunnel Spoil is collected from each Holding Pen in the SMRF and analysed for IWRG 621 chemical parameters to provide additional screening for other potential contaminants.

It is recognised that some naturally occurring concentrations of metals may exceed IWRG 621 criteria. It is assumed that the independent third party and Waste Classification Auditor will consider existing information on naturally occurring concentrations metals that will not alter the waste categorisation of Tunnel Spoil as NPI for reuse at MRL in applying a waste category.

It is assumed that the Spoil Water sampling and additional Tunnel Spoil sampling for IWRG parameters will form an adequate screening process for potential IWRG chemical impacts. Together, the Spoil Water and Tunnels Spoil sampling will be referred to as **Round 1** sampling.

If the results of Round 1 sampling indicate potential for contamination associated with IWRG chemical parameters to be present in Tunnel Spoil in a particular Holding Pen, additional analysis of the Tunnel Spoil in that Holding Pen will be conducted to obtain a statistically significant data set to confirm the waste category for that Holding Pen. Additional IWRG categorisation of Tunnel Spoil in a Holding Pen is referred to as **Round 2** sampling.

Details of Round 1 and 2 IWRG sampling proposed by Cleanaway are presented in **Section 9.3.2** and **Section 9.3.3** respectively.

It is noted that the proposed sampling frequency does not explicitly comply with the EPA IWRG 702 minimum sampling requirements of 1:250 m^3 for large volumes of “potentially contaminated” soil. Based on the SAQP, the potential for the Tunnel Spoil to exceed the EPA IWRG 621 Fill Material thresholds outside identified exception zones for listed contaminants of concern is considered to be low. The sampling frequency proposed by Cleanaway is based on the assumption that Tunnel Spoil generated outside of Domain 2 is unlikely to be “potentially contaminated” due to the absence of a specific industrial activity that may have been the source of contamination, other than PFAS, at the depths below ground level at which the TBMs will operate.

The additional IWRG sampling proposed by Cleanaway is, therefore considered a robust approach which will allow reuse of Tunnel Spoil without any further regard to IWRG parameters.

9.1.3 EPA Publication 1828

The list of analytes to classify Fill Material is essentially the same as that in Table 3 of EPA Publication 1828.1. Analysis of any additional analytes under Table 3 of EPA Publication 1828.1 would be based on site history indicating the presence of specific chemicals. The only reason to add to the IWRG 621 is if additional site history information provided by CPBJH JV indicated the potential for specific chemicals to be present. However, given that IWRG sampling of Tunnel Spoil was not required outside of Domain 2 in the SAQP, which was approved by EPA, it is assumed that not additional analytes will be required.

9.2 Responsibility for Sampling

It is understood that it will be the responsibility of independent third-party to collect all Tunnel Spoil and Spoil Water samples required for categorisation i.e. those required by the SAQP and those described in **Section 9.3.2** and **Section 9.3.3**.

We believe that having a single party, the independent third party, complete all sampling and waste categorisation activities, will provide a consistent approach and methodology in sample collection, chain of custody, sample storage, laboratory analysis and assessment of waste category.

Confirmation of the scope of work for the independent third party in relation to sampling proposed in the SAQP and this EMP will be confirmed and agreed with CPBJH JV and the Waste Classification Auditor, prior to commencement of tunnel boring and receipt of Tunnel Spoil at the SMRF.

9.3 Spoil Categorisation Sampling Requirements

This section presents a summary of the sampling to categorise the Tunnel Spoil.

9.3.1 CPBJH JV Sampling Requirements

Sampling requirements proposed by CPBJH JV are detailed in the SAQP.

All laboratory sampling will be conducted by an independent third party engaged by CPBJH JV. At this stage options presented by the CBBJH JV SAQP for collection of samples are:

- Sampling from each Holding Bay (at SMRF) or from tipped Tunnel Spoil at entrance to each Holding Bay.
- Sampling from the trucks from a gantry at or near the weighbridge entrance to SMRF.
- Sampling at the WGTP site, with supplementary sampling at each Holding Bay (if needed).

Although none of these options are excluded, the latest version of the SAQP considers sampling Tunnel Spoil at the Pivot site.

It is expected that CPBJH JV will provide sufficient and suitably qualified staff to complete the sampling [redacted].

It is assumed that Cleanaway would be provided with the following information from the independent third party within **24 hours** of the category being finalised:

- Raw tabulated data in MS Excel and ESDAT compatible forms,
- Laboratory certificates, interpreted results, quality control information and resulting hazard category.

It is also assumed that Cleanaway will have reliance on the data and waste categorisations generated by the independent third party.

9.3.2 Cleanaway Round 1 Sampling

As part of Round 1 sampling that will be conducted on Tunnel Spoil from all domains outside of Domain 2, Cleanaway propose tha[redacted] per Holding Pen is collected and analysed. The Round 1 sampling frequency will correspond to [redacted], per TBM. Based on anticipated Tunnel Spoil production rates (refer to **Figure 4-1**) and the capacity of Holding Pens, the proposed sampling frequency will correspond to [redacted]

It is noted that if daily Tunnel Spoil production rates exceed [redacted], during peak production periods, spoil over that volume will be a separate Holding Pen that pen will be sampled as part of Round 1 sampling.

Round 1 samples will either be collected, by the independent third party, at the WGTP Pivot site or from trucks via the Sampling Gantry at the entrance to the SMRF.

Round 1 samples will be analysed for total concentrations of the full suite of IWRG 621 parameters.

The independent third party will review the results of Round 1 sampling and Spoil Water sampling to confirm that concentrations of IWRG parameters in Tunnel Spoil in a Holding Pen are consistent with Fill Material prior to the pen being emptied.

Table 9-1 presents the inputs from the project that were used to develop the Round 1 sampling frequencies.

Table 9-1: Round 1 Sampling Frequencies and Rationale

Input Description	Input Value	Assumptions/ Source
Total Volume of Spoil (LCM)	[redacted]	Estimated from TBM daily spoil histograms in **Figure 4-1** Table 4-1
Maximum Volume of Spoil per day (LCM)	[redacted]	[redacted] However, has indicated that Tunnel Spoil production rates may be as much as [redacted] per day.
Total Maximum Volume of Spoil per day per tunnel	[redacted]	50% of daily tunnel volume - Month 7 of histogram in **Figure 4-1**
Estimated number of operational days	[redacted]	Based on an [redacted] schedule as presented in histogram in **Figure 4-1**.
Sampling Requirement (low risk)	[redacted]	CPBJH JV's SAQP Table 10 "Tunnel Spoil Solids Testing Framework" states that "*EPA has confirmed it does not expect additional testing (other than PFAS) outside of the known impacted areas*" The purpose of this testing is for confirmation that the material is Non-prescribed industrial waste Spoil and PFAS (2019/404, SO9038429) or Fill Material and therefore the sampling frequency per volume does not meet EPA IWRG 702 of 1:250 m^3 as described in further detail in Section 9.1.2 "Outside Domain 2" above.
Expected sampling rate range	[redacted]	Maximum rate estimated from TBM1 daily tunnelling volume from [redacted] histogram in **Figure 4-1**. Minimum as per CPBJH JV's "Minimum Testing Regime" as outlined SAQP Table 10 "Tunnel Spoil Solids Testing Framework"
Minimum Sampling Requirement per day	[redacted]	Calculated from above and daily tunnel volume - histogram in **Figure 4-1**
Expected sampling rate – Round 1		
Total number of primary samples IWRG621	[redacted]	Based on minimum 1 per tunnel per day and maximum rate of between [redacted] to [redacted]
Total number of QAQC sets for IWRG621 – Total Concentrations	[redacted]	Based on [redacted]

9.3.3 Cleanaway Round 2 Sampling

The purpose of the Round 2 sampling is to confirm the waste category of Tunnel Spoil in a Holding Pen and satisfy any sampling requirements that external PIW receiving facilities might require.

If the results of Round 1 sampling indicate concentrations of an IWRG 621 chemical parameter exceed the threshold concentrations for Fill Material, then Round 2 analyses will be conducted to obtain a statistically significant data set for Tunnel Spoil in the Holding Pen to confirm the waste categorisation with respect to IWRG parameters.

Round 2 sampling and interpretation will be undertaken by the independent third party.

Cleanaway proposes the following Round 2 sampling:

- [redacted] of Tunnel Spoil from a Holding Pen will be collected in addition to the Round 1 samples.
- Round 2 Tunnel Spoil samples will be collected either from bins at the WGTP Pivot site or from trucks at the SMRF Sampling Gantry.
- Round 2 Tunnel Spoil samples will be collected at intervals during a day of TBM operation to be representative of the entire volume of a day's production of Tunnel Spoil in a Holding Pen.
- The [redacted] Round 2 samples will be forwarded to the laboratory and placed on hold until the results of Round 1 sampling becomes available.
- Analysis of the [redacted] for both total and leachable, Australian Standard Leaching Procedure (ASLP) concentrations of the following parameters:
  - Chemical parameters that exceeded the IWRG Fill Material threshold in the Round 1 sample.
  - Any parameter that had a concentration higher than 80% of the Fill Material threshold concentration.
- QC samples will be collected and analysed for total concentrations at a frequency of [redacted] analysed (i.e. [redacted]).
- The QC sample is to be analysed for the same parameters as the corresponding primary sample.
- Review of laboratory data by the independent third party and provision of data and recommended categorisation of the Holding Pen to the independent environmental auditor review.
- Confirmation of the waste categorisation by the independent environmental auditor.

9.3.4 Sampling Methodology and Laboratory Testing Requirements

Although the responsibility for sampling will be undertaken by an independent third party (as detailed in **Section 9.2** above) the minimum requirements for sampling and testing will be required to be in general accordance with the following guidance (where applicable):

- Australian Standard: Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 1: Non-volatile and Semi-volatile compounds. Standards Australia, 1999, AS 4482.2-1999
- Australian Standard: Guide to the Sampling and Investigation of Potentially Contaminated Soil. Part 2: Volatile Substances. Standards Australia, 2005, AS 4482.1-2005,
- EPA Victoria, Industrial Waste Resource Guideline Sampling and Analysis of Waters, Wastewaters, Soils and Wastes (IWRG 701).
- NEPC National Environment Management (Assessment of Site Contamination) Measure 1999 (amended 2013) (the NEPM), Schedule B1.

Detailed requirements for sampling, laboratory analysis and reporting will be developed noting alignment with requirements under the SAQP Attachment A2 “Sampling Procedures and Technical Specification for Laboratory Testing and will include details on the following but not necessarily limited to:

- Field documentation: recording of sample location, sample description.
- Appropriate collection of representative primary, duplicate and triplicate samples.
- Collection of other quality control samples such as rinsate samples, field blanks and trip blanks (where appropriate).
- Sampling container and volume requirements.
- Handling and transport of samples to ensure sampling integrity including preservation, holding times and chain of custody requirements.
- Equipment decontamination and PPE requirements.
- Appropriate selection of primary and secondary laboratories with relevant NATA accreditation for the selected analysis (IWRG parameters).
- Laboratory limits of reporting requirements.
- Records and data management.
- Reporting requirements.

9.4 Cleanaway Sampling Responsibilities

Table 9-2 presents the tasks and responsibilities for Cleanaway’s sampling requirements to determine potential spoil destination either on site, or to its neighbouring facility.

Table 9-2: SAQP Tasks and Responsibilities

Task No.	Task	Responsibility	Comments
1	**Database development for management of all incoming data for material tracking purposes (i.e. ESdat, geographic information, vehicle identification, Holding Pen identification, destination)**	Cleanaway	Developed at start of project to ensure that data requirements for material tracking are achieved.
2	**IWRG Sampling (Tunnel Spoil and Spoil Water) and Categorisation for on-site reuse/ temporary storage**	Independent third party	As this resource is likely to be a shared resource with CPBJH JV a nominal cost has been included in the submission to pay for a resource for normal working hours, [redacted].
3	**IWRG Laboratory Analysis Cost**	Cleanaway	Although an independent third party is proposed for the sampling and reporting, Cleanaway has made an allowance in its submission for costs of laboratory analysis [redacted].
4	**Review and confirm analysis reports received from independent third party and CPBJH JV**	Cleanaway	Daily review once all data received for a particular Holding Pen.
5	**6 Monthly Reporting on on-site spoil tracking, analysis and reuse/disposal**	Cleanaway	3 reports based on 18-month project timeframe
6	**Environmental monitoring (as described in Section 8.0)**	Cleanaway	Including off-site surface water sampling and addition of biota sampling if PFAS compounds above established background levels are detected in the nominated off-site locations.

10.0 Treatment of Tunnel Spoil

10.1 Proposed Treatment

Treatment of Tunnel Spoil at the SMRF will include the following:

- Dewatering (described further in **Section 10.2**).
- Stabilisation of any potential acid sulphate soils (PASS) if required (described further in **Section 10.3**).

No treatment of Tunnel Spoil categorised as PIW is proposed at the SMRF and is not addressed in this EMP. It is assumed that any treatment of PIW would be conducted at an appropriately licensed facility.

Cleanaway will load Category A and B PIW from Holding Pens, and CPBJH JV will be responsible for consignment, transport and disposal at an appropriately licensed facility and any treatment required prior to disposal at those facilities.

10.2 Dewatering in the Lined Cells

As discussed in **Section 6.2.3**, the moisture content of Tunnel Spoil will need to be reduced to allow compaction of the material in a range of reuse options. Ultimately, the moisture content of the Tunnel Spoil will need to be close to the optimum moisture content (OMC) of the material for effective compaction in reuse options outside of the Lined Cells. It is anticipated that Tunnel Spoil will be received at the SMRF will have a moisture content between 5% to 20% above the OMC.

Other than removal of supernatant Spoil Water, no other active drying processes will be attempted in the Holding Pens.

While Tunnel Spoil remains in the Lined Cells, dewatering associated with consolidation of the spoil will be [redacted] re presented in **Section 6.7.4**.

Spoil Water will continue to be extracted from the Lined Cells following construction of interim and final capping to maintain a Spoil Water elevation at, or below [redacted] measured in the sumps. As such, the Lined Cells will not be used to permanently contain any free water / Spoil Water.

If Tunnel Spoil contained in the Lined Cells is proposed for reuse and still requires further drying, it will be excavated from the Lined Cells and dried in the Holding Pens. Tunnel Spoil will be spread to depths of approximately [redacted] and regularly tilled and wind-rowed to encourage further drying.

The [redacted] will allow further mechanical drying to be achieved while protecting underlying groundwater.

10.3 Management of Potential Acid Sulfate Tunnel Spoil

As discussed in **Section 6.6.3**, the potential for Tunnel Spoil to be PASS was assessed by [redacted], a soil scientist with extensive experience in management of PASS and acid mine drainage. His report is presented in **Appendix F** of the EMP.

The Newport Formation has some potential to generate acidic pore water. However, due to the relatively low potential of the Newport Formation to be acid generating and that it will represent only a portion of the Tunnel Spoil produced by the TBMs, risk that the spoil will be PASS is considered to be negligible.

Use of a [redacted] is proposed when Newport Formation is encountered in the TBMs until the PASS status of the Tunnel Spoil can be confirmed. Details of this contingency measure are presented in **Appendix F**.

No other treatment for PASS is considered necessary at this time. However, if testing shows the Tunnel Spoil partly comprised of Newport Formation material to be PASS, it is proposed that the spoil will be placed in the Lined Cells and covered with non-PASS containing Tunnel Spoil.

The [redacted] for the Lined Cells will not be unacceptably impacted by PASS and, provided the Tunnel Spoil containing PASS is covered within a few days, no acid drainage should be produced in the Lined Cells.

11.0 Reuse of Tunnel Spoil

11.1 Reuse Objectives

The reuse of objectives for NPI Tunnel Spoil are:

- [redacted]

The remainder of this section details the proposed reuse options that Cleanaway would be seeking approval for under this EMP.

11.2 Reuse Scenarios and Approval

Cleanaway is seeking reuse Tunnel Spoil in applications at [redacted].

As described in **Section 3.1.2**, it is anticipated that approval of the EMP under the Regulation would be sufficient information for EPA to approve the reuse applications described in this EMP, however it is recognised that the actual approval mechanism will be separate from the EMP approval. It is anticipated that the testing described in **Section 9.0** is sufficient testing to categorise the Tunnel Spoil for the reuse applications as defined and no supplementary testing would be necessary. Tunnel Spoil meeting the Reuse Criteria would be deemed fit for the specific purpose by the [redacted], in conformance with the Classification and the conditions of the MRL licence. It is also recognised that where reuses are proposed in landfill construction applications that use of the material in that application would be subject to approval of the material under EPAs landfill construction process, as described in EPA Publication 1323.3 *Landfill Licensing Guidelines*.

It is also assumed that Tunnel Spoil reused in landfill cell construction or final capping activities at MRL would be exempt the landfill levy.

11.3 Identified Reuse Options

11.3.1 Reuse Rationale

The rationale for the reuse is:

- Tunnel Spoil reused at [redacted] would either be:
- [redacted].

11.3.2 Identified Reuses

The identified reuse options for NPI Tunnel Spoil meeting the Reuse Criteria for approval by EPA are described in **Table 11-1**. In each case, the reuse is considered to meet with the reuse objectives.

Table 11-1: Identified Reuse

Reuse	Description	Cleanaway understanding of application of the Landfill Levy
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Reuse	Description	Cleanaway understanding of application of the Landfill Levy
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

12.0 Off-Site Disposal and Treatment of Prescribed Industrial Waste Tunnel Spoil

This section relates to Tunnel Spoil categorised as PIW at the SMRF only.

12.1 Off-Site Treatment and Disposal of PIW Tunnel Spoil

CPBJH JV will be responsible for transport and disposal of Category A and B Tunnel Spoil with respect to IWRG parameters of Tunnel Spoil PIW with PFAS concentrations above the Specification for Containment, including any pre-treatment that may be required. It is noted that due to constraints at the receiving facilities, it may not be possible to transfer sufficient Category A or B Tunnel Spoil to empty the Holding Pen. In such circumstances, Holding Pens may need to be emptied over prolonged periods and will not be available to receive Tunnel Spoil. CPBJH JV or Cleanaway may need to consider contingencies if several days of Tunnel Spoil are categorised as Category A or B PIW and a number of Holding Pens are not available to receive new Tunnel Spoil.

It is assumed a copy of the relevant testing data for consignment will be provided to the receiving facility before off-site transportation. Any additional testing requested by the off-site receivers or licensed facilities must be undertaken by an experienced contaminated land practitioner, in line with IWRG621.

Any EPA Waste Transport Certificates and other landfill disposal dockets must be retained by the waste producer (contractor, tenant and/or site owner).

EPA licensed trucks with covers shall be organised by the CPBJH JV for transportation of Category A or B PIW.

12.2 Offsite Disposal of Category C Tunnel Spoil to MRL

Category C contaminated Tunnel Spoil from the SMRF will be directed to MRL via internal haul road using ADTs (or similar) truck movements. Entry to MRL from the SMRF will be via a dedicated weighbridge to enable waste, consignment, receipt and tracking by the MRL landfill operations team. This activity is not addressed by the EMP other than a summary of the transport and tracking requirements provided in **Section 12.4**.

Cleanaway will be responsible for transport and tracking of Category C PIW. Details of material tracking are presented in **Section 13.0**.

13.0 Materials Transport and Tracking

To ensure the orderly tracking and transport of Tunnel Spoil from 'cradle to grave', a materials transport and tracking system shall be developed. The system would be developed by CPBJH JV as the generator of the material. However, Cleanaway would need to implement and coordinate parts of the system.

This section outlines the "in principal" requirements of the proposed materials tracking and tracking process to demonstrate the material can be appropriately tracked for the purposes of approval by EPA. The main elements of the materials tracking system are described in **Table 13-1**. The material tracking system will be finalised prior to commencement of SMRF operations.

Table 13-1: Material Tracking Requirements

Tracking Activity	Timing	Description/ Actions	Responsibility	Comment
Spoil Origin Information	Prior to truck arriving at the SMRF	Information to be received includes but not limited to: • Vehicle ID (either number plate, GPS truck ID or both), date of loading, transport and delivery of weighed tonnes. • Load source (the Tunnel Spoil of origin/ approximate source chainage, which TBM).	CPBJH JV	This information must be received prior to trucks arriving on site.
SMRF receival	At SMRF weighbridge	• Vehicle ID (either number plate, GPS truck ID or both), date of receipt, tonnage received at weighbridge. • Determine Holding Pen destination based on information received on "Spoil Origin Information" above.	Cleanaway	Destination will be determined based on information received from CPBJH JV regarding each individual truck and dog's contents.
Sampling	At WGTP site or sampling gantry at the SMRF	• PFAS sampling as per SAQP. • EPA IWRG 621 sampling per this EMP. • Any other sampling required as per SAQP (e.g. acid sulfate soil potential).	Independent Third Party	Sampling records must include truck ID, source TBM, approximate chainage, time sampled and Holding Pen destination as identified at the weighbridge.
Holding Pen receival	At Holding Pen	Information to be verified at designated Holding Pen • Visual check and record truck ID and confirming it matches information received at gate regarding its proposed destination.	Cleanaway	Information will be collated and checked daily to ensure no non-compliance.
Waste Categorisation	Prior to emptying the Holding Pen	Categorisation report to be received which includes the following: • PFAS categorisation • EPA IWRG 621 categorisation • Any other categorisations required to determine containment, reuse or disposal requirements. • Identification of Holding Pen number	Independent third party	The timing of receipt of this information is critical to ensuring no delays in empty Holding Pen availability. The categorisation must be suitable for both on-site reuse/containment and where required, off-site disposal.

Tracking Activity	Timing	Description/ Actions	Responsibility	Comment
Containment, Reuse or Disposal Determination	Prior to emptying the Holding Pen	Confirm appropriate containment, reuse or disposal requirements. Confirm proposed destination. Remove any standing water from the Holding Pens with a [redacted].	Cleanaway	The proposed reuse options are described in **Section 11**.
Emptying of Holding Pens	Vehicle loading from Holding Pen	• The depth of spoil in will be measured from the tipping curb to provide an estimate of the total volume in Holding Pen. • Vehicle ID (either number plate, GPS truck ID or both). • Truck mass and capacity. • Estimated volume of spoil (i.e. how full). • Direction on destination. • Confirmation that identified destination will accommodate/ accept material.	Cleanaway	Type of vehicle will be dependent on proposed destination (e.g. transport for onsite reuse will not require EPA licensed vehicles for transport).
Final Destination	At destination site/ receival site weighbridge.	For on-site containment or reuse: • Visual check and record truck ID and confirming its Holding Pen and proposed destination are correct. • Recording of date, time and destination location (including specific details such as cell, layer where placed in engineered containment. For off-site disposal, • Creation of Waste Transport Certificate (EPA online). • Recording of Vehicle ID (either number plate, GPS truck ID or both), date of loading. • Record Holding Pen number and number of trucks loaded • Provision of waste categorisation. • Record mass of truck and dog in and out of SMRF. • Receipt of weighbridge data from disposal facility. • Receipt of acceptance from off-site disposal destination via EPA online Waste Transport Certificates.	Cleanaway CPBJH JV CPBJH JV Cleanaway CPBJH JV Cleanaway CPBJH JV CPBJH JV	Records to be maintained and checked on a weekly basis for compliance purposes.
Reporting	Per Table 23 of SAQP	Provision of data and reporting in accordance with requirements outlined in the SAQP	All parties	It is noted that an independent third party will be responsible for provision of spoil reuse/ disposal reports.

The following information will be recorded and retained by Cleanaway for at least 2 years:

- The quantity of Tunnel Spoil received at the SMRF and the dates on which it was received.
- The quantity of Tunnel Spoil removed from the Holding Pens for placed in the Lined Cells and the date on which it was placed.
- The quantity of Spoil Water removed from the Holding Pens and Lined Cells and directed to the WTP for treatments and the date on which it was removed.
- The quantity of Tunnel Spoil and Spoil Water removed from the SMRF for deposit at a site licensed to accept industrial waste of that kind and the date on which it was removed.

14.0 Traffic Management

14.1 Haulage to the SMRF from WGTP Sites

Haulage of all Tunnel Spoil from WGTP sites to the SMRF will be the responsibility of CPBJH JV. Access to the SMRF for trucks delivering Tunnel Spoil will be as follows:

- The Western Freeway to the Christies Road exit.
- South on Christies Road to the intersection of Middle Road.
- Right onto Middle Road to the Site Entrance.
- Through the Site Entrance to the Gatehouse.

The public road system surrounding the site and Site Entrance are shown on **Figure 1**. The truck routes from the Western Freeway to the SMRF entrance is shown on **Figure 8.** Trucks leaving the SMRF will turn left back on to Middle Road, left onto Christies Road and re-join the Freeway at the Christies Road entry.

14.2 Traffic Management at the SMRF

A traffic management plan for internal operations at the SMRF will be developed prior to first operation of the SMRF. The traffic management plan will address safe movement of delivery vehicles, haulage vehicles together with site plant light vehicles at the SMRF only.

The SMRF entry configuration, including traffic separation and lane use is provided to support the approval in **Figure 12** and **Figure 13**.

14.2.1 Delivery Trucks

Proposed internal traffic flows for trucks delivering Tunnel Spoil are shown on **Figure 11** although this is subject to confirmation in the final internal traffic management plan.

Truck movements between the Gatehouse to tipping curbs of the Holding Pens (i.e. the [redacted] and back to the Site Entrance will be via one of three loops (refer to **Figure 16**), depending on the Holding Pen allocated to each truck.

Cleanaway reserves the right to ban any truck drivers not complying with the requirements of the traffic management plan or instructions from Cleanaway.

All delivery trucks will be required to pass through the wheel wash located at the site entrance prior to departure.

14.2.2 Internal Haulage

Cleanaway will engage contractors to load and transport Tunnel Spoil categorised for reuse and Category C PIW to MRL using ADTs (or similar) via internal Haul Roads over a dedicated calibrated weighbridge to enable waste receipt and tracking by the MRL landfill Operations team.

Internal trucking will move from the unloading end of the Holding Pens [redacted]) to the destinations.

Trucks unloading Tunnel Spoil may intersect delivery truck flows at key intersections. The Traffic Management Plan will document traffic control measures to be implemented at key intersections, including right of way and use of 2-way radio communications.

14.3 Haulage of Category A and B Tunnel Spoil Off-site

Loading of Tunnel Spoil categorised as Category A and Category B PIW or with concentrations of PFAS in excess of NPI waste criteria (i.e. [redacted] of leachable PFOS and PFHxS) from the Holding Pens into vehicles will be completed by Cleanaway. It is assumed that haulage and disposal of such material will be undertaken by CPBJH JV. This activity is not addressed by the EMP.

Haulage of PIW must be under the appropriate EPA Waste Transport Certificates and disposal dockets must be retained by the waste producer (contractor, tenant and/or site owner). EPA licensed trucks with covers shall be organised by the CPBJH JV for transportation of Category A or B PIW.

14.4 Vehicle Control and Decontamination

All vehicles transporting materials around the site shall be operated in a manner so as to prevent loss of materials during loading, transport and unloading activities. The truck drivers shall be responsible for maintaining the cleanliness of their vehicles as they leave site. Adequate truck cleaning equipment will be made available by Cleanaway for the drivers' use. A street sweeper shall be deployed periodically to minimise the transport of mud offsite.

15.0 Future Facility Uses

15.1 SMRF Reuse

The SMRF has been designed and will be constructed to service the WGTP. The function and sizing of the various elements of the SMRF has been specifically designed based on the potential nature and volumes of Tunnel Spoil produced by the WGTP. As such, the SMRF may be redundant at the completion of the WGTP.

Consistent with EPA's waste hierarchy, Cleanaway will seek to reuse or recycle any elements of the SMRF as appropriate.

Components of the SMRF that are located on land due to be developed into landfill cells as part of southern expansion of MRL would be decommissioned in time to enable the landfilling to occur.

It is noted that [redacted]

If no further use of the SMRF is envisaged following the WGTP, or an alternative use of the relevant areas is proposed, the facility would be decommissioned, which is described in more detail in **Section 15.3**.

Once the elements of the SMRF which are no longer deemed usable are decommissioned, the remaining infrastructure associated with the SMRF, with the exception of those elements located at 227 Riding Boundary Road may be incorporated into the Southern Expansion. Elements of the SMRF that may be reused in the Southern Expansion include the following:

- The Site Entrance (refer to **Section 15.2**).
- Spoil Water Holding Ponds.
- Treated Water Pond.
- Haul Roads.

Specific reuse options for these elements of the SMRF, and their appropriateness for those reuses, will be considered at that time.

Materials used to construct the SMRF will be recycled where appropriate and practicable (refer to **Section 15.3**). Recycled materials may include Engineered Fill used to construct the SMRF.

15.2 SMRF Entrance Reuse

The Site Entrance to the SMRF and associated infrastructure such as the weighbridge, wheel wash, site offices, sampling gantries and amenities may be retained and either transition into the long-term entrance for the Southern Expansion of MRL (subject to approval under the relevant planning permit) or serve as an alternative entrance to that facility.

15.3 Facility Decommissioning

15.3.1 SMRF

The primary elements of the SMRF to be decommissioned include the following:

- The [redacted] see further discussion in **Section 15.3.2**.
- The Holding Pens.
- Settlement Ponds.
- Spoil Water Holding Ponds.
- Haul Roads.
- Lighting and other utilities associated with the SMRF.

Materials in the Holding Pens, Settlement Ponds and Spoil Water Ponds which came into contact with Tunnel Spoil or Spoil Water will be sampled and tested to confirm PFAS concentrations. PFAS concentrations will compared to the baseline engineered fill sampling to understand if there has been any impacts from the overlying structures and to confirm waste categorisation. Following removal of the infrastructure, the remaining soils would be validated in accordance with the NEPM (2013). A program for this work would be specified as part of detailed planning for the decommissioning works.

Any material components of the Holding Pens and Ponds deemed to be NPI waste consistent with the approvals being sought in this EMP will be placed in the Lined Cells or reused if possible. Materials placed in the Lined Cells as a bridging layer for final capping may include the following:

- [redacted]

15.3.2 [redacted]

Materials in the [redacted], which came into contact with Tunnel Spoil or Spoil Water will be tested to confirm the waste categorisation.

Where appropriate, any materials produced by decommissioning the [redacted] will be contained in the Lined Cells or reused if possible.

It is currently anticipated that the [redacted]

16.0 Stakeholder Assessment and Consultation

16.1 Stakeholder Engagement Plan

Cleanaway has developed a Community Engagement Plan for the project, which is included as **Appendix J**. Cleanaway has also used their existing MRL Community Reference Group (MRLCRG) forum to consult on this project. The purpose of the MRLCRG forum is to share information about the landfill operations with the community members that represent the interests of the wider community.

An overview of Cleanaway's Engagement and Education programs for MRL is also presented in **Appendix J**.

16.2 Stakeholder Consultation

Engagement activities have been completed with a number of stakeholders pursuant to the EPA approval and planning scheme amendment, including with EPA, DELWP, City of Melton, City of Brimbank, CPBJH JV and the MRLCRG.

Cleanaway has prepared a website to provide information on this proposal, including a short video describing the SMRF operations that can be accessed at: https://www.cleanaway.com.au/melbourne-regional-landfill-mrl/smrf/

Specific engagement activities with EPA throughput initial development of the EMP comprised:

- Meetings with EPA officers responsible for facilitating approvals associated with infrastructure projects on:
  - 5 February 2020.
  - 12 March 2020.
  - 20 May 2020.
  - 3 July 2020.
- A draft EMP was submitted to EPA on 8 May 2020 and comments were received on the draft on 15 May 2020. This final version of the EMP includes consideration of EPA and the Environmental Auditor's comments on the draft EMP.
- Provision of draft guidelines for EMP requirements provided by EPA on 12 June 2020, which are now superseded by the Regulations.
- Provision of a letter dated 18 June 2020 entitled: Levy Exemption Clarification Request. Letter provided in response to Cleanaway's letter to EPA dated 18 March 2020.
- Provision of comments from EPA on the updated EMP on 3 September 2020 and follow-up discussions prior to submission of the next revision of the EMP.
- Provision of comments from EPA on Rev6 of the EMP on 23 April 2021 and discussions prior to submission of the final EMP.

Subsequent discussions, meetings and correspondence between EPA and Cleanaway has occurred pursuant to submission of the most recent revision of the EMP.

16.3 Ongoing Consultation

Cleanaway is committed to ongoing consultation of the project through the EMP assessment process and is planning to conduct the following:

- The MRLCRG meets quarterly and Cleanaway representatives intend to provide an update to the project at the next meeting.
- Provide regular updates to Council on progress of the project.
- Respond to queries by stakeholders and interested third parties promptly.
- Provide additional information on the project to EPA and consultation agencies, as required, to progress the EMP application.

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18.0 Principles and Limitations

The following principles are an integral part of drafting the EMP and are intended to be referred to in resolving any ambiguity or exercising such discretion as is accorded the user.

Area	Description
Limitations of Information	This EMP has been prepared by Senversa for the use of Cleanaway Operations Pty Ltd (Cleanaway). The sources of information used by Senversa are outlined in this Report. In preparing the Report, Senversa has relied upon information regarding the Spoil Management and Reuse Facility (SMRF) prepared by companies including but not limited to Agon Environmental, Cardno, EES, Jacobs Aurecon Joint Venture, CPBJHJV, DCE, GTA, Shamrock, Monford, Tract, Biosis, Marshall Day Acoustics, SLR, SMEC and Cleanaway and no independent verification of this information has been made beyond the agreed scope of works and we assume no liability for any inaccuracies in or omissions to that information. No indications were found during our development of the Report that information contained in this Report as provided to Senversa was intentionally false.
Level of Assessment	Senversa prepared this Report in a manner consistent with the level of care and skill ordinarily exercised by members of Senversa's profession practicing in the same locality under similar circumstances at the time the services were performed.
Nature of Advice	This Report should be read in full. No responsibility is accepted for use of any part of this Report in any other context or for any other purpose or by third parties. Senversa does not seek or purport to provide legal or business advice.