Prestons Waste Treatment Facility
Amendment Report

Appendix L
# Hazard identification report

ARCADIS

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# ABBREVIATIONS

| | |
|---|---|
| AC | Activated Carbon |
| ADR | International Carriage of Dangerous Goods by Road |
| AS | Australian Standard |
| ASS | Acid Sulphate Soil |
| AQIA | Air Quality Impact Assessment |
| BaP | Benzo(a)pyrene |
| BTEXN | Benzene, Toluene, Ethylbenzene, Xylenes, and Naphthalene |
| CO | Carbon Monoxide |
| $CO_2$ | Carbon Dioxide |
| DG | Dangerous Goods |
| DPHI | Department of Planning Housing and Infrastructure |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| EPA | Environmental Protection Authority |
| EPL | Environmental Protection Licence |
| GAC | Granular Activated Carbon |
| GIA | General Immobilisation Approvals |
| GGBFS | Ground Granulated Blast Furnace Slag |
| HAC | Hazardous Area Classification |
| HAZID | Hazard Identification |
| HAZOP | Hazard and Operability |
| HCl | Hydrochloric Acid |
| HIPAP | Hazardous Industry Planning Advisory Paper |
| HVAC | Heating, Ventilation and Air Conditioning |
| IBC | Intermediate Bulk Container |
| ISO | International Organisation for Standardisation |
| MMF | Multi-Media Filtration |
| MSDS | Material Safety Data Sheet |
| NaCN | Sodium Cyanide |
| NIA | Noise Impact Assessment |
| NSW | New South Wales |

| | |
|---|---|
| NV | Neutralising Value (relative to pure $CaCO_3$: NV = 100) |
| OEMP | Operational Environmental Management Plan |
| OPC | Ordinary Portland Cement |
| OWMP | Operational Waste Management Plan |
| PASS | Potential Acid Sulphate Soil |
| PFAS | Per-/Poly-Fluoroalkyl Substances |
| PFHxS | Perfluorohexane-1-Sulfonic Acid |
| PFOA | Perfluorooctanoic Acid |
| PFOS | Perfluorooctane Sulfonic Acid |
| PPE | Personal Protective Equipment |
| RRO | Resource Recovery Order |
| RtS | Response to Submission |
| SEPP | State Environmental Planning Policy |
| SFARP | So Far As Reasonably Practicable |
| SIA | Specific Immobilisation Approval |
| SSD | State Significant Development |
| UM | Unmanaged |
| VCZ | Volcanic Clinoptilolite Zeolite |
| WTF | Waste Treatment Facility |
| WWTP | Waste Water Treatment Plant |

# TERMINOLOGY

| Term | Definition |
|---|---|
| Action/Business Owner | The Arcadis/Hi-Quality group accountable for managing the specific identified risk event and liaising with the relevant parties as required. |
| ADG Code | The Australian Code for the Transport of Dangerous Goods by Road & Rail. |
| Cause | Any causes that could result in a loss of control or containment event impacting safety and environmental factors onsite and/or offsite. |
| Consequence | An outcome of the event affecting Hi-Quality objectives and key target groups of humans and local environmental systems. When consequences are developed, both the onsite and offsite impact should be considered (regardless of controls in place). |
| Consequence Rating | The severity of an event with controls. |
| Event/Incident | Occurrence or change of a particular set of circumstances. |
| Facility Section | Seven facility sections defined for this workshop:<br>• Carpark/External.<br>• Compartment 1 – Existing Warehouse.<br>• Compartment 2 – Waste Water Treatment Plant.<br>• Compartment 3 – Packaged Waste.<br>• Mechanical/HVAC Room.<br>• Office.<br>• Laboratory. |
| Hazard | Potential source of injury or damage to the health of people, or damage to property or the environment. |
| Likelihood Rating | The frequency of an event occurring with controls. |
| Mitigation Controls | Existing and/or proposed design or operational controls to mitigate a loss of containment/loss of control scenario from reaching the consequence or minimising its impact to effected target groups. |
| Preventative Controls | Existing and/or proposed design or operational controls to prevent the cause or event from reaching the loss of containment/loss of control scenario. |
| Risk Category | Risk will be assessed qualitatively for the following categories:<br>• Safety.<br>• Environmental. |
| Risk Rating | A level of risk used to define if an event is acceptable with controls or whether corrective action is required. |
| Risk Reduction Option/Action | An action designed to reduce risk rating to within an acceptable range as per Hi-Quality risk tolerance. |

| Term | Definition |
|---|---|
| Unmanaged (UM) Consequence Rating | The severity of an event without controls. |
| UM Likelihood Rating | The frequency of the identified event occurring without controls. |
| UM Risk Rating | A level of risk used to define if an event is acceptable without controls. |

# 1. HAZID WORKSHOP SUMMARY

## 1.1. Background

Hi-Quality Waste Treatment Service Pty Ltd (Hi-Quality) is proposing to develop a Waste Treatment Facility (WTF) for the receival, treatment, storage, and dispatch of contaminated soils, water, and sludges (the 'Proposal') at 9-13 Whyalla Place, Prestons, NSW.

Arcadis Australia Pacific (Arcadis) on behalf of Hi-Quality is preparing an amendment report to support State Significant Development Application (SSD-9346594).

Sherpa Consulting Pty Ltd (Sherpa) was engaged by Arcadis as an independent facilitator to carry out a Hazard Identification (HAZID) study in response to clarifications required by the EPA during exhibition of the Proposal Environmental Impact Statement (EIS) and Response to Submissions (RtS) report, as well as ongoing consultation. In particular, the NSW EPA wished to understand the potential hazards and associated risks that could occur during the operations phase of the Proposal and requested a gateway hazard and risk analysis be performed. The HAZID and qualitative risk assessment is focused on the environmental impacts as well as offsite safety of the Proposal to confirm the risks are understood and that the proposed controls will allow for the risks to be adequately managed to an acceptable level.

The overall objective of the HAZID was to investigate risks from the co-receival, storage, and treatment of the waste codes proposed for the Facility by:

- Confirming events that could lead to a loss of control or loss of containment of waste and reagent material that may have a safety or environmental impact
- Identifying the causes, potential safety and environmental consequences, and proposed preventative and mitigative controls of identified events
- Using the Hi-Quality risk matrix to undertake a qualitative risk rating (safety and environment only) for each potential event, both unmanaged and managed
- Identifying additional controls and action items required where managed risks are considered 'High' or 'Medium' to meet Hi-Quality risk acceptability criteria and demonstrate the risk is reduced So Far As Reasonably Practicable (SFARP)
- Preparing a HAZID study report to meet the expectations of NSW Department of Planning Housing and Infrastructure (DPHI) Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 Hazard Analysis.
- Preparing a HAZID study report that can be used to improve the WTF design, prepare operations related documents and identify actions to undertake further environmental and safety studies.

## 1.2. Meeting

The HAZID workshop was conducted as a virtual event (Microsoft Teams) over a period of one day on August 13th, 2024. The HAZID workshop team was well balanced and included experienced design, operations and project personnel from Hi-Quality and Arcadis, with the session facilitated by an independent Sherpa leader.

## 1.3. Main findings and recommendations

A total of 106 minute items and 31 action items were raised during the HAZID. All HAZID minutes were recorded in Excel and are detailed in the complete minutes in APPENDIX D of this report. The action items proposed during the HAZID workshop are presented in APPENDIX E and have been provided electronically to the project manager to allow tracking and closeout.

Assessment of all facility sections as outlined in the provided site floor plan (APPENDIX B) showed that no High risk (unmanaged) safety or environmental events were identified as per the Hi-Quality risk matrix. However, controls and actions were recorded for each event to reduce the risk rating. The greatest environmental impact possible was associated with a loss of containment of incoming waste in the external receival area of the WTF. Hi-Quality confirmed strict scheduling of waste receival to minimise the volume of waste present externally at any one time, the covering of trucks and recording of unaccepted waste to maintain waste generator accountability, and the bunding of the weighbridge where the trucks would enter directly upon arrival at the facility. The managed environmental risk was reduced to Low.

Within the enclosed WTF, managed environmental consequences were minimised due to the contained nature of the warehouse and the inbuilt bunding and leachate retrieval system. Hi-Quality identified that the waste types with the highest environmental and safety risks were those with a high moisture content, specifically sludges and drill muds. The isolation of these waste types in triple layered underground receival pits with overflow protection demonstrated that the managed safety and environmental risks were reduced SFARP.

Incompatibility of waste types in the main facility sections was also addressed as the incoming waste types were noted by Hi-Quality to be solid soil materials. The nature of the solid wastes reduced the potential mobility and accidental interaction of waste batches during receival, treatment, and storage. Acceptance protocols detailing the rejection of mixed loads and unauthorised dangerous goods wastes act to further reduce the identified risks. Controls in the facility (e.g. bunding, segregation of treatment bays, and decontamination protocols) were identified and the managed safety and environmental risks reduced SFARP at this stage of the Proposal design.

Multiple action items were identified during the workshop with the major areas requiring reform identified as:

- Provide further information within the relevant sections in the Operational Waste Management Plan (OWMP) for the receival of unscheduled/unacceptable waste types specifically in reference to potentially dangerous packaged waste, flammable waste, or asbestos contaminated drill muds.
- Adaptation of Hi-Quality Yatala Queensland facility testing protocols to confirm the composition of received packaged waste. Prior to verification, a hazardous area isolation zone for the packaged waste must be implemented
- Clarification regarding the capture, storage, and treatment of leachate from waste piles within the main facility, specifically the interface of the leachate system with the Waste Water Treatment Plant (WWTP).
- Comparison of safe inhalation limits of per-/poly-fluoroalkyl substances (PFAS) relative to contamination limits for landfill must be documented.
- Clear preventative maintenance plans for diaphragm pumps of hazardous reagents (i.e. hydrochloric acid (HCl) and caustic soda) within the WWTP must be developed.
- Confirmation of WTF operations protocol in the event of a malfunction/failure in the Heating, Ventilation and Air Conditioning (HVAC)/scrubber system. Receival of new waste piles must cease. However, current waste piles must continue to be treated.

## 1.4. Action closeout

All HAZID action items will be managed under the Hi-Quality safety and environment management systems and work processes. The HAZID actions have been provided electronically to Arcadis in a form suitable for the project to import to the project action management database.

Responses to each of the HAZID actions were provided by Arcadis and Hi-Quality (APPENDIX E). Subsequent to the provision of the action items to Hi-Quality, several additions to the relevant documentation were made and it has been confirmed by the Hi-Quality Project Manager that:

- The status of HAZID workshop action items will be regularly reviewed as part of the detailed design development and operation of the facility
- All action items are closed out and documented as such
- Any post-workshop changes will be controlled via project management of change procedures
- Additional workshops will be scheduled following project approval to cover any items not addressed to date and that cannot be confirmed at this stage of the project, (i.e. updated protocols outlined in the Operational Environmental Management Plan and

OWMP, future Hazard and Operability study), and as triggered by the Management of Change process.

# 2. INTRODUCTION

## 2.1. Project description

Hi-Quality Waste Treatment Service Pty Ltd (Hi-Quality) is proposing to develop a Waste Treatment Facility (WTF) for the receival, treatment, storage, and dispatch of contaminated soils, water, and sludges (the 'Proposal') at 9-13 Whyalla Place, Prestons, NSW. As a part of the Proposal, the Prestons WTF will treat 210,500 tonnes per annum of waste material.

Arcadis Australia Pacific (Arcadis) on behalf of Hi-Quality is preparing an amendment report to support State Significant Development Application (SSD-9346594).

## 2.2. Study requirement

During the Environmental Impact Statement (EIS) consultation process, Arcadis was advised by the NSW Environment Protection Authority (EPA) that a Hazard Identification (HAZID) study was required to support the development application. In particular, the NSW EPA wished to understand the potential hazards and associated risks that could occur during the operations phase. As the WTF would accept some dangerous goods Class 8 materials, as well as other potentially hazardous waste, the NSW EPA required Hi-Quality to determine the risks involved with the handling of contaminated materials and that any residual risks are acceptable.

In April 2024 the EPA provided comments requesting additional information be provided for the Proposal. Further consultation was carried out in a meeting (on 17 June 2024) to discuss the comments provided and agree an approach to addressing these comments. Those relevant to this HAZID study are present in Table 2.1.

As part of the Gateway risk study, Arcadis engaged Sherpa Consulting Pty Ltd (Sherpa) to conduct a HAZID study and Qualitative Risk Assessment of the potential offsite safety and environmental impacts, allowing the risks to be understood. The objective of the HAZID is to identify proposed controls and actions that will confirm the risks are adequately managed to an acceptable level. This study was undertaken in a workshop setting with Hi-Quality and Arcadis representatives.

**Table 2.1 EPA EIS comments**

| No. | Information Required | Further Clarifications |
|---|---|---|
| 1 | Management of Dangerous Goods by the Facility:<br>The Applicant has committed to not receiving any waste streams on site that would meet the classification of Dangerous Goods (DGs) other than DGs Code Class 8, Packing Groups II and III. However, the documents submitted do not currently reflect this commitment. The International Carriage of Dangerous Goods by Road (ADR) includes an expansive list of waste streams that are incompatible and potentially have toxic, flammable and reactive characteristics. | The EPA provided further clarity that they are looking to investigate the potential incompatibility of keeping waste materials next to each other – and that this should be considered in a risk assessment and that the HAZOP process should be followed to establish any storage incompatibility between waste codes.<br>Arcadis noted that the HAZOP guidelines require detailed design to follow in full and have committed to completing a HAZOP following project approval once conditions of consent and detailed design are finalised.<br>The EPA agreed that in the interim a gateway risk study should be carried out and noted the commitment to doing the HAZOP in a more detailed manner at a later stage. |
| 2 | Provide a detailed risk assessment, operating manual and Hazard and Operability Study (HAZOP) for the proposed consolidation process. A Hazardous Area Classification (HAC), as described below, should also consider the potential for flammable vapours to be generated during the consolidation of hazardous chemicals. | |

## 2.3. Project status

The Proposal is currently in the planning approval and concept design phase with 70% designs prepared. After approvals have been granted, detailed design will commence.

## 2.4. HAZID objectives

In a workshop setting with Hi-Quality and Arcadis representatives, the HAZID objectives were to:

- Confirm events that could lead to a loss of containment or loss of control of waste and reagent material that may have a safety or environmental impact
- Identify the causes, potential safety and environmental consequences (onsite and offsite) and proposed preventative and mitigative controls of identified events
- Qualitatively assess the unmanaged and managed safety and environmental risk for each identified event using the Hi-Quality risk matrix
- Identify additional controls and action items required where the managed risk was considered ‘High’ or ‘Medium’ risk to meet Hi-Quality risk acceptability criteria and assist in demonstrating risks are reduced So Far As Reasonably Practicable (SFARP)

- Prepare a HAZID study report to meet the expectations of NSW Department of Planning Housing and Infrastructure (DPHI) Hazardous Industry Planning Advisory Paper (HIPAP) No. 6 Hazard Analysis, Ref [1]
- Prepare a HAZID study report that can be used to improve the WTF design, prepare operations related documents and identify actions to undertake further environmental and safety studies.

## 2.5. HAZID workshop scope

In agreement with Hi-Quality, the HAZID followed the waste treatment flow path for when the WTF would be in full operational mode. Operational activities covered were:

1. Waste receipt (including carpark) and distribution
2. Compartment 1 – Existing Warehouse
3. Compartment 2 – Waste Water Treatment Plant (WWTP)
4. Compartment 3 – Packaged waste
5. Mechanical/Heating, Ventilation and Air Conditioning (HVAC) Room
6. Office
7. Laboratory.

## 2.6. Exclusions and limitations

The following exclusions and limitations apply to this study (Table 2.2).

**Table 2.2: HAZID study exclusions and limitations**

| No. | Exclusion/Limitation |
|---|---|
| 1 | As required by NSW EPA, there are still studies to be conducted (e.g. Hazardous Area Classification). This study did not cover these amendments; however, findings from the HAZID will be used as inputs. |
| 2 | This HAZID study has identified actions for review that will act as inputs for future HAZOP studies. |
| 3 | This HAZID workshop was conducted based on a static design and information compiled as of Aug 13th, 2024. Further design updates were communicated during the drafting of the HAZID report (APPENDIX B); however, changes were not made to workshop inputs and comments to reflect later design revisions. |
| 4 | The outcome of the HAZID relied upon the experiences of the client and client representative workshop attendees when assigning a risk rating against identified hazard events. |
| 5 | The HAZID was primarily concerned with offsite safety impacts due to waste treatment processing, however, where there was an onsite safety issue this has been noted. Potential environmental impacts were identified for further assessment by Arcadis as part of an amendment report to support State Significant Development Application (SSD-9346594). |
| 6 | Events with only financial or reputational impacts were not considered during the workshop. |
| 7 | Action closeout is not performed by Sherpa but by the Project Manager. |
| 8 | Managed risk rating assigned in the HAZID is only valid if identified controls are fit for purpose, maintained, and operable when required. |

# 3. PROCESS DESCRIPTION

A full description of the WTF process and proposed operations is provided in the Amendment Report, Ref [2]. The following sections have been summarised from Arcadis EIS related documentation as appropriate for this HAZID.

## 3.1. Overview

The Prestons WTF has been approved to accept 210,500 tonnes of waste material annually. Accepted waste treatment codes are shown in APPENDIX B. However, all wastes received annually are categorised for treatment/storage as in Table 3.1.

**Table 3.1: General waste categories accepted onsite**

| Waste Category | Annual Treatment Quantity (tonnes or kL) |
|---|---|
| Packaged waste (solid and liquid) | 40,000 |
| Drill muds | 2,000 |
| Sediments and sludges | 7,000 |
| Liquid waste | 70,000 |
| PFAS soil | 7,500 |
| Bulk soils for treatment (total) | 84,000 |
| *Immobilisation* | *50,000* |
| *Bioremediation* | *8,000* |
| *Potential Acid Sulphate Soil (PASS/ASS)* | *26,000* |

The Prestons WTF location, site floor plan, and operational information is presented in APPENDIX B. In consultation with Hi-Quality, the WTF was separated according to their waste treatment flow and processing pathway. The HAZID covered the following sections:

1. Waste Receipt (Carpark/External)
2. Compartment 1 – Existing Warehouse
3. Compartment 2 – WWTP
4. Compartment 3 – Packaged Waste
5. Mechanical/HVAC Room
6. Office
7. Laboratory.

## 3.2. Waste treatment protocols

To facilitate the identification of potential hazards and events, a summary of waste treatment protocols adapted from the draft Operational Waste Management Plan (OWMP) was consulted (Table 3.2).

**Table 3.2: Overview of treatment protocol for accepted waste categories.**

| Waste Type | Treatment Description |
|---|---|
| Packaged Waste | Contaminated material is only stored onsite. No treatment is to be performed.<br>Non-contaminated solids are stored onsite as well as shredded pursuant to waste codes.<br>Non-contaminated liquids are only stored onsite. No treatment is to be performed.<br>Chemical waste (DG Class 8, Packing Group II & III) is only stored onsite. No treatment is to be performed. |
| Drill Muds | Physical separation is performed before solids are tested for compliance to NSW EPA resource recovery order and exemption.<br>Recovered waste water is sent to the WWTP. |
| Sediments and Sludges | Sediments and sludges are initially thickened when required.<br>Dewatered soils are sent for relevant bulk soils treatments.<br>Recovered waste water is sent to the WWTP. |
| Liquid Waste (Non-PFAS) | Treatment pathway for non-PFAS liquid is as follows: holding tanks, oil separation unit, mixing tank for dosing and coagulation, clarifier, sand and carbon Multi-Media Filtration (MMF), dewatering unit, and trade waste discharge. |
| Liquid Waste (PFAS) | Treatment pathway for non-PFAS liquid is as follows: holding tanks, mixing tank for dosing and coagulation, clarifier, Volcanic Clinoptilolite Zeolite (VCZ) filtration, Granular Activated Carbon (GAC) filtration, coconut GAC adsorption filtration, weak base anion exchange filtration, kinetic GAC adsorption filtration, and trade waste discharge. |
| PFAS Soil | No treatment is to be performed; waste received is only for onsite storage. |
| Bulk Soils (Immobilisation) | Physical separation is performed on soils.<br>General (GIA) or Specific Immobilisation Approvals (SIA) are applied in the treatment process.<br>Addition of cementitious reagents in accordance with OWMP to waste soil is performed, before curing, cutting, and offsite disposal of immobilised waste. |
| Bulk Soils (Bioremediation) | Physical separation is performed on soils.<br>Bacteria (*Bascillus cereus*) is mixed with non-contaminated soil and moisture content is maintained between 25 – 80 wt.%. |
| PASS/ASS | Soil is treated with aglime to neutralise acidity and verified in accordance with the OWMP. |

# 4. HAZID WORKSHOP METHODOLOGY

## 4.1. Overview

The HAZID is a form of design review concentrating on the potential risk of the Prestons WTF operations to offsite safety and environment during loss of containment or loss of control scenarios, rather than on how it will perform under normal operating conditions.

The workshop was carried out by an independent Sherpa facilitator and attended by Hi-Quality and Arcadis personnel. The experience of the attendees was in waste treatment operations, engineering, and environmental management expertise. The study was conducted in a systematic manner, using waste treatment protocols to list all relevant plant areas/activities/process units and identify potential hazards within each facility section.

The HAZID provided the opportunity for personnel to think creatively and examine ways in which hazards or risks to safety and the environment may arise.

The HAZID approach was executed in accordance with:

- HIPAP No. 6 Hazard Analysis, Ref [1]. This provides a framework for hazard identification and risk assessment.
- ISO 17776:2016 Petroleum and natural gas industries – Offshore production installations – Major accident hazard management during the design of new installations, Ref [3]. This provides a set of guidewords that are appropriate for a process plant.
- ISO 31000:2018 Risk Management – Guidelines, Ref [4]. The risk assessment followed the study approach of hazard identification and assessment of risk based upon both likelihood and potential consequence.
- State Environmental Planning Policy (SEPP) Resilience and Hazards: Chapter 3 - Hazardous and Offensive Development, Ref [5]. This provides context if the facility is considered to be a potentially hazardous development. The potentially offensive aspect is covered by the EIA process.

## 4.2. Meeting details and HAZID workshop team

The HAZID workshop was conducted as a virtual event (Microsoft Teams) over one day on August 13th, 2024. The HAZID workshop team was well balanced and included experienced design, operations and project personnel from Hi-Quality and Arcadis, with the session facilitated by an independent Sherpa leader.

The attendees are listed in APPENDIX C.

## 4.3. Design information

Supporting information was provided by Hi-Quality during the workshop to enable the team to understand the design intent. Additional information was relayed between the

workshop participants by both Hi-Quality and Arcadis personnel. The facilitated discussions enabled an informed assessment of each risk. Key information used in the workshop is listed in APPENDIX B. This workshop was used to identify actions for the Hi-Quality team to investigate further in the future WTF detailed design phase and for conducting additional design reviews (e.g. HAZOP studies).

### 4.4. Meeting procedures

The HAZID workshop commenced with a safety moment, introductions by Hi-Quality and Arcadis team members, their role in the project, and an overview discussion of the project. The workshop scope was then agreed by the team.

The Prestons WTF was examined by the following steps:

1. Description of the facility section to be examined (seven facility sections), relevant waste types/treatment protocols, and operating conditions. This design basis information was presented by Hi-Quality and is reproduced in APPENDIX B.
2. Prior to the workshop, Sherpa identified loss of containment and loss of control events, a total of 106 events. The potential events were developed from examination of waste contaminant and reagent Material Safety Data Sheets (MSDS), co-location and potential mixing of waste and reagent types, previous experience with other (non-Hi-Quality) WTFs, previous hazard identification study conducted for Prestons WTF, Ref [6], and consideration of NSW EPA comments on Hi-Quality EIS submission (SSD-9346594), Ref [7]. For each of the seven facility sections, the identified events were reviewed and re-confirmed with the HAZID team.
3. Where a risk event was identified, the cause and unmanaged consequences were recorded.
4. The Hi-Quality risk matrix (see APPENDIX A) was applied to qualitatively assess the unmanaged safety and unmanaged environmental risk (i.e. the risk of the worst-case credible consequence, assuming there are no controls in place).
5. The preventative and mitigation controls included in the Prestons WTF design and operation were then recorded for the risk event.
6. The Hi-Quality risk matrix was re-applied to qualitatively assess the managed safety and managed environmental risk (i.e. the risk of the worst-case credible consequence with controls).
7. Actions for risk reduction were identified for further consideration, if required, and accountability assigned, as part of Hi-Quality risk treatment criteria.
8. Additional information was recorded as follows:
    a. Remarks where there was significant discussion explaining or justifying the design, associated safeguards, or suggested actions.

b. Comparisons made by Hi-Quality personnel in reference to the existing Yatala, Queensland facility.

c. Comments were recorded where there was significant discussion explaining or justifying proposed design and associated safeguards (i.e. *'No action'* required but comments were recorded for future reference).

It should be noted that:

- The main aim of the workshop was to identify problems needing solution, rather than to agree to a specific solution. Issues requiring further review and time for resolution outside the meeting, were noted and the workshop continued.

The minutes were recorded electronically in Excel and shared virtually with all HAZID workshop attendees to engage agreement at the conclusion of the workshop. The finalised minutes are provided in APPENDIX D.

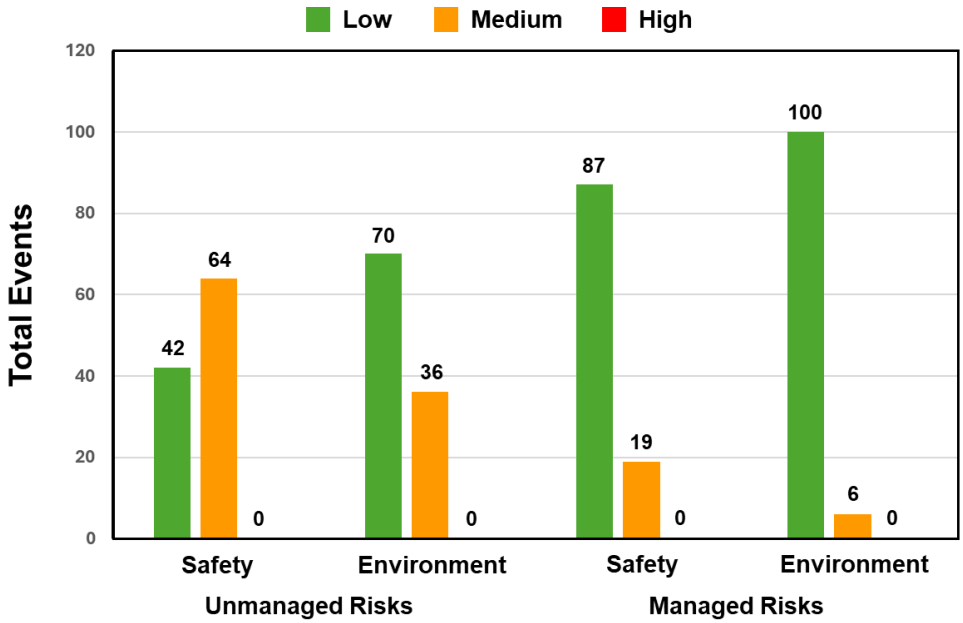
# 5. HAZID WORKSHOP FINDINGS

## 5.1. Workshop minutes

Draft minutes were issued to the Hi-Quality and Arcadis attendees after the HAZID workshop for review and agreement, before formal issue by the project manager. The agreed HAZID minutes are detailed in APPENDIX D of this report, with the agreed actions and preliminary responses from Arcadis detailed in APPENDIX E.

A total of 106 events were identified during the HAZID workshop with 31 further actions for risk reduction identified. A summary of the unmanaged and managed event risk ratings with respect to safety and environmental impacts is shown in Figure 5.1.

**Figure 5.1: Summary of event risk ratings**




## 5.2. Key findings

A comprehensive list of acceptable waste codes (Appendix B4) and onsite storage capacities (Appendix B5) is outlined to assist in determining the potential risks associated with loss of control, loss of containment, or incompatible mixing events. In identifying consequences for each risk event, a drafted list of potential waste contaminants and reagents to be received onsite was prepared based on information provided prior to the HAZID workshop (Appendix B6). Whilst some contaminants are classified as dangerous goods when high concentrations are present (e.g. benzo(a)pyrene (BaP)), the accepted concentrations to the WTF, as outlined by the listed waste codes, maintain that no waste types with a DG code other than Class 8, Packing Group II & III will be accepted onsite. Key controls including waste receival protocols, a rejected loads register, as well as the implementation of an isolation and testing protocol for unverified waste were identified during the HAZID workshop to reduce the likelihood and impact of unacceptable waste onsite. The primary safety

consequence associated with the list of waste contaminants and reagents was the inhalation of dust and particulate matter, whereas the primary environmental consequence was identified as toxicity to aquatic life and the potential for harm to local water systems.

The key findings from each of the seven facility sections are outlined as follows:

Carpark/External

- No High risk (unmanaged) environmental and safety events were identified as per Hi-Quality risk matrix.
- The key safety risks identified were associated with the ignition of the entering vehicles as a result of fuel leaks or interacting hot loads. Each event presented as a fatal scenario (conservative assessment). Hi-Quality confirmed that no mixed or flammable waste loads are accepted, hence the risk was categorised as Medium when managed.
- The key environmental risks identified were associated with a loss of control of the waste and reagent delivery vehicles. Release of waste materials and concentrated reagents when entering the facility from Whyalla Place could result in severe pollution of local surface/ground water and the stormwater system. However, when considering the proposed controls (e.g. waste receival scheduling, uniform loads, acceptance protocols, and emergency response protocols) the managed environmental risks of these events were categorised as Low.
- Hi-Quality identified actions to improve the safety and environmental aspects of the acceptance of delivery vehicles on site. These actions included: notifications issued to waste generators regarding vehicles used in an unmaintained state; and the inclusion of a rejected loads register to prevent non-conforming waste from being transported onsite. When implemented the managed risks would be further improved and meet SFARP.

Compartment 1 – Existing Warehouse

- No High risk (unmanaged) environmental and safety events were identified as per Hi-Quality risk matrix.
- The key safety risk is associated with the vacuum pressure tanker used for sludge delivery with the spill of sludge outside the treatment pits. Fatal consequences from rapid depressurisation of the vacuum tanker and release of the sludge waste were identified. Hi-Quality confirmed the operation of the trucks only by trained transport personnel, as well as the treatment of sludges to a soil consistency, removing the requirement of vacuum tankers for the reloading and offsite disposal of the treated waste material. The managed risk was categorised as Medium.
- The key environmental risks were associated with the loss of containment of waste sludge and captured waste water from drill muds and sludges during dewatering. In

both cases, liquid waste material rather than solid waste (which is the major physical state present at the WTF) provides a more credible release pathway for environmental impact. Loss of liquid waste could reach the stormwater system. However, proposed measures including the enclosing of the dewatering system, installation of a warehouse wide leachate capture system, and bunding of the warehouse facility reduced the managed risk to Medium.

- Co-location of multiple waste types within Compartment 1 was addressed through discussion of contamination and mixing scenarios for the processing area. It was noted by Hi-Quality that due to the solid nature of the waste soils received, significant cross-contamination was unlikely due to the low mobility of the waste. It was also noted that no mixed loads were to be received onsite to further reduce the likelihood of unintentional mixing and risks associated with incompatible waste types.
- Actions identified to improve the risk rating included: drafting of a protocol for the unintended unloading of contaminated drill muds; adaptation of Hi-Quality hot works protocols to prevent maintenance and hot works activities near the sludge pits; and clarification of the aeration action during bioremediation treatment.

Compartment 2 – WWTP

- No High risk (unmanaged) environmental and safety events were identified as per Hi-Quality risk matrix.
- The key safety risks to personnel identified were associated with the release of waste water from the initial holding tanks, as well as loss of containment of concentrated reagents, specifically hydrochloric acid (HCl) and caustic soda. The proposed controls including tank overflow protection, isolation valve installation on processing lines, and the bunding of the WWTP reduce the managed risk to Medium.
- The key environmental risk was associated with the release of waste water from the initial holding tanks. Waste water stored here could be captured from a mixture of waste piles within the main warehouse and hence poses a significant environmental impact due to the mixture of potential contaminants present (APPENDIX B). Each tank is designed to hold 135 kL, with the potential release of the full volume to reach the stormwater system and result in contamination. This holding tank area was found to have the higher risk when compared to the processing units of the WWTP which are smaller in size. When considering the proposed controls (i.e. bunding containing 110% of largest tank capacity in compliance to AS 3780 for the storage and handling of Class 8 liquids) the managed environmental risk was categorised as Medium.
- Several actions were raised relating to operation and maintenance protocols in the WWTP that when implemented would reduce the environmental risks. Key actions included: classifying disposal protocols for liquid waste spillages in the WWTP, inclusion of a preventative maintenance schedule (leak prevention) for HCl and caustic soda dosing pumps; inclusion of action to cease operations in WWTP in the

event of an activated carbon spill; and the drafting of protocols for the exchange and disposal of spent filtration media.

Compartment 3 – Packaged Waste

- No High risk (unmanaged) environmental and safety events were identified as per Hi-Quality risk matrix.
- The key safety risk was associated with the operation of the shredder. Disposal of packaged waste materials could result in the release of projectiles presenting a fatal scenario if an operator was struck. The managed risk was categorised as Medium.
- The key environmental risk identified was the acceptance of non-conforming or dangerous goods waste onsite (e.g. flammable waste, asbestos contaminated waste). The nature of the waste relative to the accepted waste codes could have a more significant impact to waterways if release occurred. Based upon the controlled acceptance protocols the managed risk was categorised as Low.
- Several actions to manage the environmental risks were raised and key actions included: the adaptation of testing and hazardous area isolation zone protocols for dangerous packaged waste received onsite; confirmation of a fogging suppression system onsite; and the confirmation of an interlocking mechanism on the shredder to prevent operation when the safety guard is not engaged.

Mechanical/HVAC Room

- No High risk (unmanaged) environmental and safety events were identified as per Hi-Quality risk matrix.
- The key safety risk was associated with the malfunction of the HVAC/scrubber system. Current waste batches under treatment must be maintained during the malfunction period presenting an increased danger to personnel from a build-up of dust and fumes. The managed risk was categorised as Medium.
- The key environmental risks identified were associated with excess discharge or discharge of particulate matter from a malfunctioning HVAC/scrubber system. Dispersion of fumes and particulates outside the facility boundaries and its surroundings, is likely to impact and reduce local air quality, affecting nearby businesses and potentially residences. The self-contained nature of the warehouse and negative pressure maintained reduced the managed risk to Medium.
- Key actions identified to reduce the environmental impact was the immediate cessation of receival operations in the event of a HVAC/scrubber system malfunction. Confirmation that new waste will not be accepted on site in this event must be outlined in the WTF Operational Environmental Management Plan (OEMP) emergency response. Clarification regarding ventilation system design and an assessment of discharge flowrates and velocities with respect to environmental impacts should also be updated in the Air Quality Impact Assessment (AQIA).

Office

- No High risk (unmanaged) environmental and safety events were identified as per Hi-Quality risk matrix.
- The key safety risk was associated with a potential fire in the office. Fire emergency response plans as well as fire walls, sprinklers, and fire extinguishers reduced the managed risk to Medium.
- No significant environmental risks were identified for the office facility section. Hi-Quality acknowledged that only non-flammable waste materials are stored onsite, reducing the potential impact of ignition events.
- No additional necessary actions were identified for the office facility section outside of the standard SafeWork emergency procedures.

Laboratory

- No High risk (unmanaged) environmental and safety events were identified as per Hi-Quality risk matrix.
- No significant safety risks were identified for the laboratory facility section.
- No significant environmental risks were identified for the laboratory facility section.
- A key action was identified relating to the requirement for testing and confirmation of packaged waste composition as stated in Compartment 3 – Packaged Waste for the receival of all packaged waste materials.

## 5.3. HAZID workshop risk reduction options and actions

A total of 31 risk reduction options and actions were raised across the seven facility sections. The major areas requiring action were identified as:

- Addition of further details for protocols in the OEMP for the receival of unscheduled/unacceptable waste types, specifically in reference to potentially dangerous packaged waste or asbestos contaminated drill muds.
- Adaptation of Hi-Quality Yatala Queensland facility testing protocols to confirm the composition of received packaged waste. Prior to verification, a hazardous area isolation zone for the packaged waste must be implemented
- Clarification regarding the capture, storage, and treatment of leachate from waste piles within the main facility, specifically the interface of the leachate system with the WWTP.
- Comparison of safe inhalation limits of PFAS relative to acceptable contamination limits for landfill must be documented.
- Clear preventative maintenance plans for diaphragm pumps of hazardous reagents (i.e. HCl and caustic soda) within the WWTP must be developed.

- Confirmation of WTF operations protocol in the event of a malfunction in the HVAC/scrubber system. Receival of new waste piles must cease; however, current waste piles must continue to be treated.

## 5.4. Next steps

### 5.4.1. Action closeout

The status of the HAZID workshop actions should be regularly reviewed and the project manager should demonstrate that all actions are closed out, documented, and allow for continues improvement as required. The actions have been provided electronically to the Arcadis project manager in a form suitable to the project. Preliminary responses from Arcadis as of August 22nd, 2024, have been summarised alongside the action items in APPENDIX E.

### 5.4.2. Need for HAZOP review

The study team identified process areas that would benefit from a HAZOP review during the detailed design phase of the Proposal to check that the WTF can respond to potential deviations. These process areas abatement systems are:

- Co-location and storage of waste onsite for the detailed assessment of incompatibility scenarios.
- High moisture content waste types including drill muds and sludges.
- Interface between main warehouse (Compartment 1) leachate retrieval system and WWTP.
- Liquid waste spillages in the WWTP.
- HVAC/scrubber system potential failure modes (e.g. exhaustion of Activated Carbon (AC) media) and performance deviations.
- AC storage conditions and regulations to assess the requirements for a HAC within the WTF.

# 6. REFERENCES


[1] NSW Department of Planning, “Hazardous Industry Planning Advisory Paper No. 6 - Hazard Analysis,” 2011.

[2] Arcadis Australia Pacific, “Prestons Waste Treatment Facility: Amendment Report,” 30135841 Amendment Report Rev E, 2024.

[3] International Organization for Standardization, “ISO17776,” ISO17776-2016, 2016.

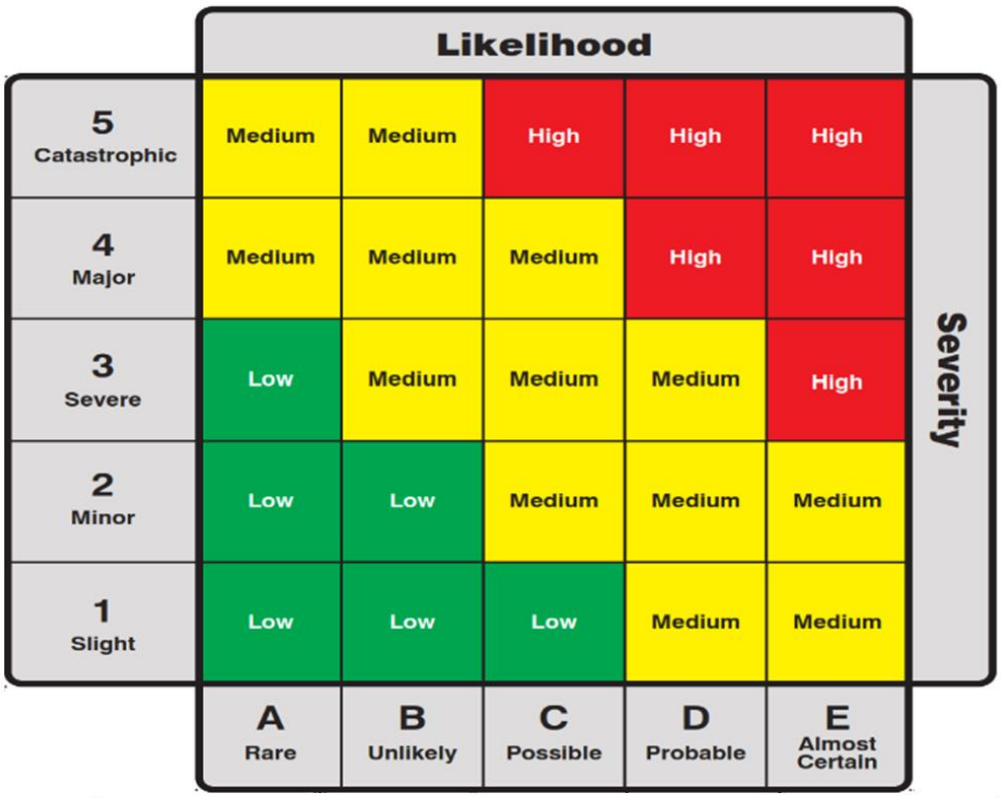
[4] International Organization for Standardization, “ISO 31000:2018 Risk Management — Guidelines,” 2018.

[5] NSW Department of Planning, “State Environmental Planning Policy (SEPP) Resilience and Hazards: Chapter 3 - Hazardous and Offensive Development,” 2021.

[6] SMEC Holdings, “Hazard Identification Outcome,” MIN_30019108_096_HAZID Outcome_Rev0, 2022.

[7] NSW Environmental Protection Agency, “EPA Advice on Environmental Impact Statement for SSD-9346594 proposed Hi Quality Waste Treatment Service Pty Ltd Prestons Waste Treatment Facility,” DOC21/1022343-10, 2022.

# APPENDIX A. HI-QUALITY RISK MATRIX



## A1. Consequence criteria

| Level | Severity Description | Safety | Environment | Water Quality | Air Quality | Noise and Vibration |
|---|---|---|---|---|---|---|
| 1 | Slight | Injury requiring no/minimal first aid treatment. Internal incident report. | No/minimal environmental impact. No regulatory or punitive action. Internal incident report. | No/limited duration and minimal localised impact on water quality. | No/limited duration and minimal localised impact on air quality. | Applicable noise standards met. No detectable effects. |
| 2 | Minor | Lost time injury (LTI) resulting in temporary/medium term impairment. | Low environmental impact. Minor breach of legislation. Warning notice issued by regulator. | Impact on water quality not exceeding NSW environmental guidelines. | Impact on air quality not exceeding applicable air quality objectives. | Isolated exceedance of applicable noise standards that are short lived (over a 48-hour period or less). Minor number of complaints. |
| | | | | | | Localised exceedance of applicable vibration standards resulting in annoyance that is short lived (over a 48-hour period or less). Minor number of complaints. |
| 3 | Severe | Medical treatment injury (MTI) resulting in long term/permanent impairment. | Medium level of harm to environment over an extended period of time. Systemic minor breaches of legislation. Company charged with minor fine (Tier 3). | Localised short-term impacts on water quality and/or aquatic life in breach of environmental guidelines. | Localised impacts on air quality cause marginal exceedance of applicable air quality objectives. | Isolated exceedance of applicable noise standards which are short or medium term in a local area (longer than 48 hours). Significant number of complaints. |
| | | | | | | Localised exceedance of applicable vibration standards resulting in annoyance for an extended period (more than 48 hours). Significant number of complaints. |

| Level | Severity Description | Safety | Environment | Water Quality | Air Quality | Noise and Vibration |
|---|---|---|---|---|---|---|
| 4 | Major | Single fatality or critical life-threatening injury. | Serious environmental harm. Moderate breaches/single material breach of legislation. Company charged with moderate fine (Tier 2). | Widespread short-term/localised long-term impacts on water quality and/or reduction in aquatic ecosystem function. | Widespread short-term impacts on air quality causing significant exceedances of applicable air quality objectives. | Exceedance of applicable noise standards resulting in annoyance which requires temporary relocation of some sensitive receptors.<br>Exceedance of applicable vibration standards resulting in annoyance that requires temporary relocation of some sensitive receptors. |
| 5 | Catastrophic | Multiple fatalities. | Permanent or long-term serious environmental harm. Material breaches of legislation. Company charged with material fine (Tier 1) and loss of operation/license. | Widespread long-term impacts on water quality and loss of a significant portion of surrounding aquatic ecosystems. | Widespread long-term impacts on air quality causing significant exceedances of applicable air quality objectives and resulting in adverse impacts on human health. | Exceedance of applicable noise standards resulting in significant and widespread annoyance necessitating relocation of many sensitive receptors.<br>Exceedance of applicable vibration standards resulting in significant and widespread annoyance necessitating relocation of many sensitive receptors. |

## A2. Likelihood criteria

| Level | Likelihood description | Description |
|---|---|---|
| A | Rare | Exceptional circumstances required to occur. |
| B | Unlikely | Not likely to happen in normal circumstances. |
| C | Possible | Has occurred before under normal circumstances. |
| D | Probable | Expected to happen under normal circumstances. |
| E | Almost Certain | Expected to happen regularly under normal circumstances. |

## A3. Risk rating and treatment

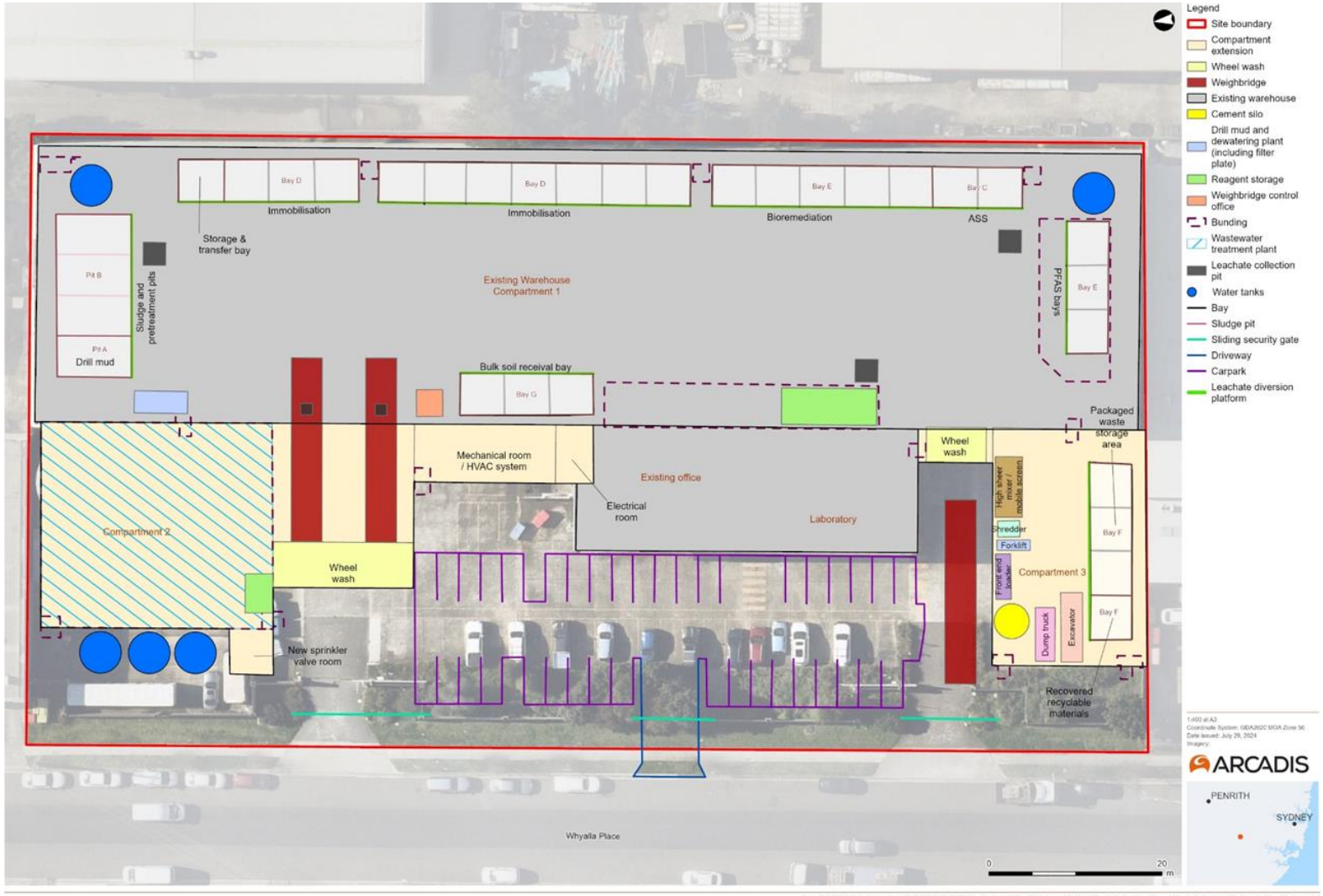
| Risk rating | Description |
|---|---|
| **High** | Unacceptable level of risk. Controls must be in place to reduce to lower levels. |
| **Medium** | Can be acceptable if controls are in place. Attempt to reduce to low level. |
| **Low** | Acceptable level of risk. Attempt to eliminate risk but higher risk levels take priority. |

# APPENDIX B. HAZID WORKSHOP REFERENCE INFORMATION

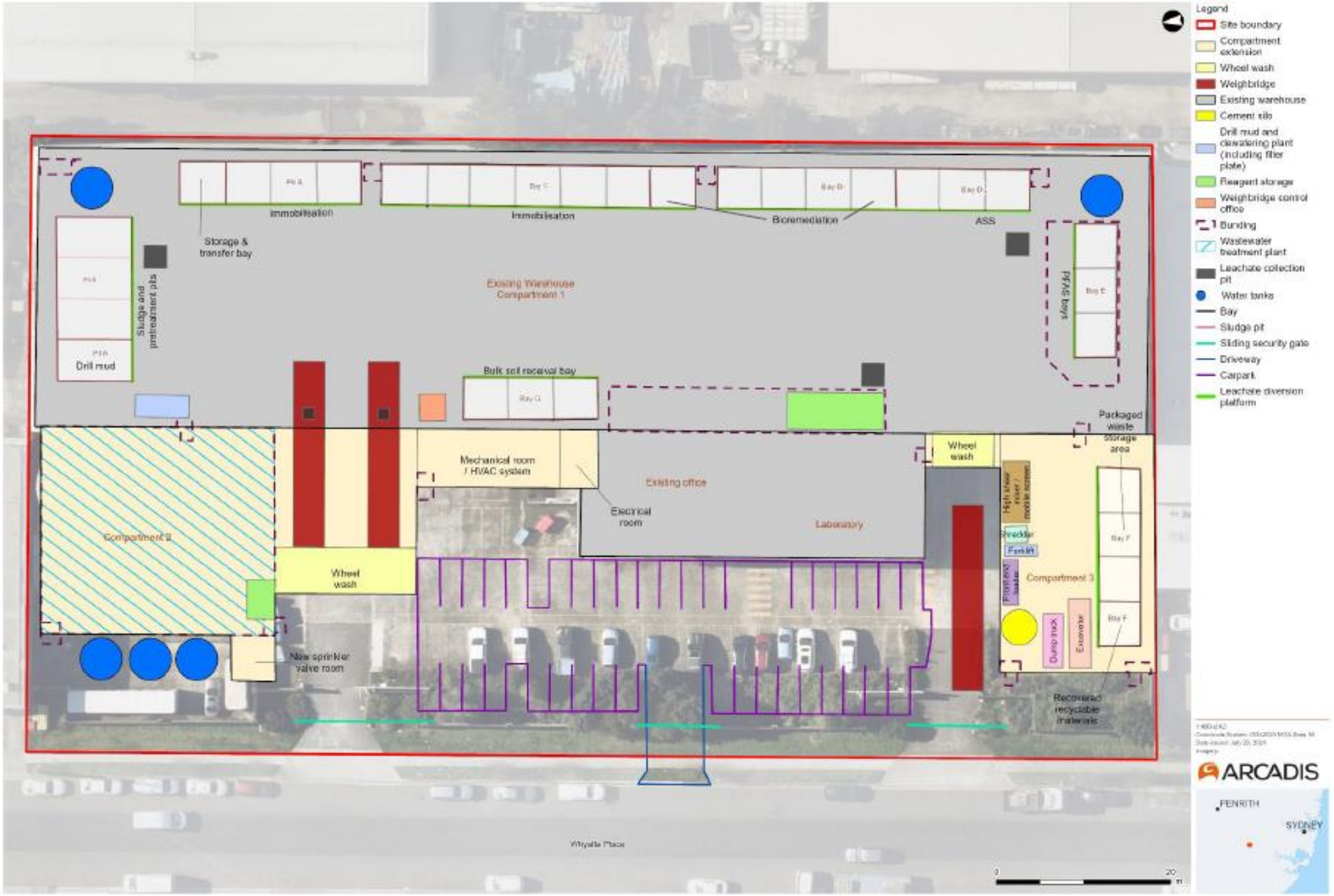
All information presented in this Appendix was provided by Hi-Quality and Arcadis for the workshop. An updated site layout received post-workshop has been included.

## B1. Site location

## B2. Site layout



## B3. Updated Site Layout



## B4. Accepted waste codes

| Waste Code | Waste Description | Activity |
|---|---|---|
| J100 | Mineral Oils | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| J160 | Waste Tarry Residues | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| N120 | Soils contaminated with a substance or waste referred to in Parts 1 or 2 of Schedule 1 of the Protection of the Environment Operations (Waste) Regulation 2021 | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| G100 | Esters | Waste Storage |
| N190 | Filter Cake | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| G110 | Organic solvents, other than halogenated solvents | Waste Storage |
| D340 | Perchlorates | Waste Storage |
| G160 | Waste from the manufacture, formulation or use of organic solvents | Waste Storage |
| N140 | Fire debris and Wash Waters | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| G150 | Halogenated organic solvents | Waste Storage |
| N205 | Residues from industrial waste treatment | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| M160 | Organo halogen compounds—other than substances referred to in this Table or Table 2 Oxidising agents | Waste Storage |
| M100 | Waste substances and articles containing or contaminated with polychlorinated biphenyls, polychlorinated napthalenes, polychlorinated terphenyls and/or polybrominated biphenyls | Waste Storage |
| D130 | Arsenic; arsenic compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D170 | Antimony; antimony compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D290 | Barium compounds (excluding barium sulphate) | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D160 | Beryllium; beryllium compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D130 | Boron compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |

| Waste Code | Waste Description | Activity |
|---|---|---|
| D150 | Cadmium; cadmium compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D140 | Chromium compounds (hexavalent and trivalent) | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D190 | Copper compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| N150 | Fly Ash | Waste Storage |
| D220 | Lead; lead compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D120 | Mercury; mercury compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D100 | Metal carbonyls | Waste Storage |
| D120 | Nickel compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D300 | Non-toxic salts | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| H110 | Organic phosphorous compounds | Waste Storage |
| M250 | Surface active agents (surfactants), containing principally organic constituents and which may contain metals and inorganic materials | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D360 | Phosphorus compounds excluding mineral phosphates | Waste Storage |
| D240 | Selenium; selenium compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D250 | Tellurium; tellurium compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D180 | Thallium; thallium compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| H170 | Waste from manufacture, formulation and use of wood preserving chemicals | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D270 | Vanadium compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D230 | Zinc Compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| C100 | Basic solutions or bases in solid form | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| B100 | Acidic solutions or acids in solid form | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |

| Waste Code | Waste Description | Activity |
|---|---|---|
| T100 | Waste chemical substances arising from research and development or teaching activities, including those which are not identified and/or are new and whose effects on human health and/or the environment are not known | Waste Storage |
| D350 | Chlorates | Waste Storage |
| N160 | Encapsulated, chemically-fixed, solidified or polymerised wastes that are referred to in this Part | Waste Storage |
| M220 | Isocyanate compounds | Waste Storage |
| R120 | Waste pharmaceuticals, drugs and medicines | Waste Storage |
| J120 | Waste oil/water, hydrocarbons/water mixtures or emulsions | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| M230 | Triethylamine catalysts for setting foundry sands | Waste Storage |
| E100 | Waste containing peroxides other than hydrogen peroxide | Waste Storage |
| H100 | Waste from the production, formulation and use of biocides and phytopharmaceuticals | Waste Storage |
| F100 | Waste from the production, formulation and use of inks, dyes, pigments, paints, lacquers and varnish | Waste Storage |
| T120 | Waste from the production, formulation and use of photographic chemicals and processing materials | Waste Storage |
| F110 | Waste from the production, formulation and use of resins, latex, plasticisers, glues and adhesives | Waste Storage |
| R140 | Waste from the production and preparation of pharmaceutical products | Waste Storage |
| A100 | Waste resulting from surface treatment of metals and plastics | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| A110 | Waste from heat treatment and tempering operations containing cyanides | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |

| Waste Code | Waste Description | Activity |
|---|---|---|
| D110 | Inorganic fluorine compounds excluding calcium fluoride | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| N100 | Containers and drums that are contaminated with residues of waste referred to in this Table | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D200 | Cobalt Compounds | Waste Processing (Non-Thermal Treatment)<br>Waste Storage |
| D330 | Inorganic sulphides | Waste Storage |
| M150 | Phenols, phenol compounds including chlorophenols | Waste Storage |
| A130 | Cyanides (inorganic) | Waste Storage |
| M210 | Cyanides (organic) | Waste Storage |
| M260 | Highly odorous organic chemicals (including mercaptans and acrylates) | Waste Storage |
| M180 | Polychlorinated dibenzo-p-dioxin (any congener)<br>Reactive chemicals | Waste Storage |

## B5. Onsite storage capacity

| Substance | DG Class | Packing Group | Activity | Onsite Storage |
|---|---|---|---|---|
| **Waste Material** | | | | |
| Packaged (non-contaminated solid) | - | - | Shredding<br>Storage | 300 $m^3$ (with non-contaminated liquid)<br>IBC drums adjacent to office (< 4 days) |
| Packaged (non-contaminated liquid) | - | - | Storage | 300 $m^3$ (with non-contaminated solid)<br>IBC drums adjacent to office (< 4 days) |
| Packaged (chemical waste) | 8 | II & III | Characterisation<br>Storage | II - 13 tonne<br>III - 5 tonne<br>IBC drums in compartment 3 (< 4 days) |
| Drill Muds (non-contaminated) | - | - | Dewatering<br>Wastewater treatment<br>Testing against Resource Recovery Order (RRO) | 250 $m^3$<br>Bay A (2 weeks) |
| Sludges | - | - | Dewatering<br>Wastewater treatment<br>Immobilisation/ Bioremediation<br>Storage | - |
| Liquid Waste (non-contaminated) | - | - | Wastewater treatment | 200 $m^3$<br>Holding tanks in WWTP (< 2 days) |
| Liquid Waste (PFAS) | 8 | II & III | Wastewater treatment | II - 10 tonnes<br>III - 40 tonnes<br>Designated tank in WWTP (< 2 days) |
| PFAS Contaminated Soil | - | - | Storage | 200 $m^3$<br>Bay D (< 2 months) |
| Immobilisation soils | - | - | Immobilisation | 925 $m^3$<br>Bay B & C (1 - 3 weeks) |
| Bioremediation soils | - | - | Bioremediation | 375 $m^3$<br>Bay E3 (3 weeks) |
| PASS/ASS | - | - | Acid Neutralisation<br>Immobilisation/ Bioremediation<br>Storage | 200 $m^3$<br>Bay C (4 days) |

| Substance | DG Class | Packing Group | Activity | Onsite Storage |
|---|---|---|---|---|
| Recovered Recyclable Material | - | - | Storage | 50 $m^3$<br>Bay F (< 2 days) |
| Waste Oils (from sludge thickener) | - | - | Storage | 1 $m^3$<br>IBC in bunded WWTP (< 2 days) |
| **Reagents** | | | | |
| Ferrous sulphate (powdered) | - | - | WWTP<br>Reducing agent for metals | 5 tonne<br>2 tonne WWTP |
| Bacteria (liquid form) | - | - | Bioremediation | 1 tonne |
| Urea | - | - | Not Clear | 5 tonne |
| Super phosphate | - | - | For lead immobilisation | 5 tonne |
| Biodegradable surfactant | - | - | Chemical Separation (soils) | 2 tonne |
| Polymer (Liquid or powdered) | - | - | WWTP<br>Coagulating agent | 2 tonne<br>2 tonne WWTP |
| Bentonite | - | - | Sludge Thickening | - |
| Aglime | - | - | ASS Neutralisation | 20 tonne |
| Primary Cementitious stabilising agents OPC, GGBFS, Pulverised Fuel Ash, Cement Kiln Dust | - | - | Primary Binding (Immobilisation) | 50 tonne |
| Secondary Stabilising Agents Lime, Sodium Silicate, carbons, organophilic clays, natural pozzolans, bentonites | - | - | Secondary Binding (Immobilisation)<br>Bentonite used for thickening of sludges<br>Lime for arsenic | 50 tonne |
| Aluminium Sulphate (28 wt.%) | - | - | WWTP<br>coagulating agent, precipitation of phosphate | 5 tonne<br>2 tonne WWTP |
| HCl (37 wt.%) | 8 | II | WWTP<br>Precipitation of heavy metals<br>Reduce alkalinity | 5 tonne<br>2 tonne WWTP |
| Caustic Soda (30 wt.%) | 8 | II | WWTP<br>Precipitation of heavy metals<br>Reduce acidity | 5 tonne<br>2 tonne WWTP |

| Substance | DG Class | Packing Group | Activity | Onsite Storage |
|---|---|---|---|---|
| Magnesium Oxide (powdered) | - | - | Immobilisation (cement, also CaO used)<br>Also WWTP precipitation of heavy metals, neutralising acidity | 5 tonne<br>2 tonne WWTP |
| Activated Carbon | - | - | GAC Filtration<br>Coconut GAC Filtration<br>Also WWTP Adsorption of organics, PFAS, elimination of odour | 2 tonne WWTP |
| Decon 90 (mixed to 2 - 5% sol.) | - | - | Decontamination of Bays | - |

## B6. Waste contaminant and reagent classifications

The following classifications were obtained from material safety data sheets for the following compounds. The DG classifications presented are in direct relation to the contaminant material itself and do not reflect classifications of accepted waste materials. DG waste received onsite will be accepted if it is classified as Class 8, Packing Group II or III; no other form of DG waste will be accepted. In each instance, if an exact match could not be obtained for the contaminant, the worst-case scenario effect was recorded.

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| **Waste Contaminants** | | | | |
| BaP | Sludge<br>Chemical<br>Separation<br>Immobilisation<br>WWTP - Oil Sep | < 500 mg/kg (Imb.) | ADG<br>Class 9, Packing III<br><br>Hazardous<br>Skin 1,<br>Mutagenicity 1B,<br>Carcinogenicity 1A,<br>Reproductive 1B | **Safety**<br>Avoid breathing dust<br>Personal Protective Equipment (PPE)<br>Produces CO and $CO_2$ during combustion<br><br>**Environment**<br>Very toxic to aquatic life with long lasting effects (not mobile from low solubility) |
| Coal Tar | Sludge<br>Chemical<br>Separation<br>Immobilisation | < 1 wt.% | ADG<br>Class 9, Packing III<br><br>Hazardous<br>Inhalation 3,<br>Dermal 4, Skin 2,<br>Eye 2A,<br>Mutagenicity 1B,<br>Carcinogenicity 1A,<br>Reproductive 1B,<br>Organ 1 | **Safety**<br>Avoid breathing dust<br>PPE<br><br>**Environment**<br>Toxic to aquatic life with long lasting effects (specifically benzene, toluene, and naphthalene) |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Arsenic | Sludge<br>Chemical Separation<br>Immobilisation | < 5 wt.% | ADR/RID<br>Class 6.1, Packing II<br><br>Hazardous<br>Oral 3, Inhalation 3, Kin 2, Eye 1, Carcinogenicity 1A, Short-term aquatic 1, Long-term aquatic 1 | **Safety**<br>Avoid breathing dust<br>PPE<br><br>**Environment**<br>Toxic to fish, aquatic invertebrates, algae, bacteria |
| Tebuconazole | Sludge<br>Chemical Separation<br>Immobilisation | 920 mg/kg | Hazardous<br>Reproduction 2, oral 4, Aquatic (short/long) 1 | **Safety**<br>Avoid swallowing<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life with long lasting effects<br>Low mobility in soil |
| Di-2-Ethyl Hexyl Phthalate | Sludge<br>Chemical Separation<br>Immobilisation | 2,400 mg/kg | Hazardous<br>Reproduction 1B | **Safety**<br>Avoid swallowing<br>PPE<br><br>**Environment**<br>Potential harm to aquatic life<br>No soil mobility data |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Copper- Chrome-Arsenate | Sludge<br>Chemical<br>Separation<br>Immobilisation | Unknown | Hazardous<br>Carcinogenicity 1A | **Safety**<br>Combustible dust<br>PPE<br><br>**Environment**<br>Not environmentally hazardous |
| Cresol | Sludge<br>Chemical<br>Separation<br>Immobilisation | Unknown | ADR/RID<br>Class 6.1, Packing II<br><br>Hazardous<br>Oral 3, Dermal 3, Skin 1B, Eye 1 | **Safety**<br>Avoid swallowing<br>PPE<br><br>**Environment**<br>Potential harm to aquatic life with some evidence of bioaccumulation (solubility too low to harm) |
| Cyanide | Sludge<br>Chemical<br>Separation<br>Immobilisation | < 4000 mg/kg (Imb.) | Hazardous<br>Oral 4, Dermal 4, Inhalation 4 | **Safety**<br>Contact with acids liberates very toxic gas<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life and highly mobile in soil due to solubility in the form of Sodium Cyanide (NaCN) |
| AC | Sludge<br>Chemical<br>Separation<br>Immobilisation | Unknown | Non-hazardous | **Safety**<br>Combustible material<br>PPE<br><br>**Environment**<br>No data |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Beryllium | Sludge<br>Chemical<br>Separation<br>Immobilisation | Unknown | Hazardous<br>Oral 3, Inhalation 2, Skin 2, Eye 2, Carcinogenicity 1B, Organ 3 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>No data |
| Chromium (VI) | Sludge<br>Chemical<br>Separation<br>Immobilisation | < 5 wt.% | ADR/RID<br>Class 5.1, Packing II<br><br>Hazardous<br>Oxidising 1, Oral 3, Inhalation 2, Dermal 3, Skin 1A, Eye 1, Respiratory 1, Mutagenicity 1B, Carcinogenicity 1A, Reproductive 2, Organ 3, Aquatic 1 | **Safety**<br>Strong oxidizer (in oxide form), may cause fire<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life with long lasting effects (pH shift) |
| Selenium | Sludge<br>Chemical<br>Separation<br>Immobilisation | < 5 wt.% | Hazardous<br>Oral 3, Inhalation 3, Organ 2 | **Safety**<br>Avoid swallowing<br>PPE<br><br>**Environment**<br>Potentially toxic to aquatic life (solubility is too low for real harm) |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Nickel | Sludge<br>Chemical Separation<br>Immobilisation<br>WWTP - Oil Separator<br>WWTP - Mixing Tank | < 5 wt.% | Hazardous<br>Skin 1,<br>Carcinogenicity 2,<br>Organ 1 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Potentially toxic to aquatic life |
| Copper | Sludge<br>Chemical Separation<br>Immobilisation<br>WWTP - Oil Separator<br>WWTP - Mixing Tank | < 5 wt.% | Non-hazardous | **Safety**<br>PPE<br><br>**Environment**<br>No data |
| Silver | Sludge<br>Chemical Separation<br>Immobilisation<br>WWTP - Oil Separator<br>WWTP - Mixing Tank | < 5 wt.% | Hazardous<br>Aquatic 1, | **Safety**<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Cadmium | Sludge<br>Chemical Separation<br>Immobilisation<br>WWTP - Oil Separator<br>WWTP - Mixing Tank | < 5 wt.% | TDG<br>Class 6.1, Packing 1<br><br>Hazardous<br>Flammable 2, Oral 4, Dermal 4, Inhalation 2, Mutagenicity 2, Carcinogenicity 1A, Reproductive 2, Organ 3 | **Safety**<br>Combustible dust<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life with long lasting effects |
| Mercury | Sludge<br>Chemical Separation<br>Immobilisation<br>WWTP - Oil Separator<br>WWTP - Mixing Tank | < 5 wt.% | ADR/RID<br>Class 8, Packing III<br><br>Hazardous<br>Inhalation 2, Reproductive 1B, Organ 1, Aquatic 1 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life with long lasting effects |
| Lead | Sludge<br>Chemical Separation<br>Immobilisation<br>WWTP - Oil Separator<br>WWTP - Mixing Tank | < 5 wt.% | ADR/RID<br>Class 9, Packing III<br><br>Hazardous<br>Reproductive 1A, Organ 1, Aquatic 1 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life with long lasting effects, non-biodegradable and bioconcentrates |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Total Petroleum Hydrocarbons (C10 - C36) | Sludge<br>Chemical<br>Separation<br>Bioremediation<br>Immobilisation<br>WWTP - Oil Sep | < 5 wt.% (Bio.)<br>< 20 wt.% (Imb.) | Hazardous<br>Flammable 2, Oral 4, Skin 2, Eye 2A, Organ 3, Aquatic 1 | **Safety**<br>Highly flammable liquid and vapour<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life with long lasting effects |
| Total Recoverable Hydrocarbons | Sludge<br>Chemical<br>Separation<br>Bioremediation<br>Immobilisation<br>WWTP - Oil Sep | < 5 wt.% (Bio.) | Hazardous<br>Skin 2, Eye 2, Carcinogenicity 2, Organ 3, Aspiration 1, Aquatic 2, Ozone 1 | **Safety**<br>Do not breathe fumes<br>Do not swallow<br>PPE<br><br>**Environment**<br>Toxic to aquatic life with long lasting effects<br>Harms public health and the environment by destroying ozone in the upper atmosphere |
| Polycyclic Aromatic Hydrocarbon | Sludge<br>Chemical<br>Separation<br>Bioremediation<br>Immobilisation | < 13,000 mg/kg (Imb.) | Hazardous<br>Inhalation 4, Carcinogenicity 1, Reproduction 2, Organ 2, Aspiration 1 | **Safety**<br>PPE<br><br>**Environment**<br>May accumulate in sediments or penetrate soil causing ground water contamination |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Phenols (non-halogenated) | Sludge<br>Chemical<br>Separation<br>Bioremediation<br>Immobilisation | < 2,000 mg/kg (Imb.) | Hazardous<br>Oral 3, Inhalation 3, Dermal 3, Skin 1B, Eye 1, Mutagenicity 2, Organ 2, Aquatic 2 | **Safety**<br>Avoid swallowing<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Toxic to aquatic life with long lasting effects |
| Benzene (BTEXN) | Sludge<br>Chemical<br>Separation<br>Bioremediation | Unknown | Hazardous<br>Flammable 2, Skin 2, Eye 2A, Mutagenicity 1B, Carcinogenicity 1A, Organ 1, Aspiration 1 | **Safety**<br>Highly flammable liquid and vapour<br>PPE<br><br>**Environment**<br>Endangers drinking water supplies if in soil/water, potential harm to aquatic life |
| Toluene (BTEXN) | Sludge<br>Chemical<br>Separation<br>Bioremediation | Unknown | Hazardous<br>Flammable 2, Skin 2, Reproductive 2, Organ 3, Aspiration 1 | **Safety**<br>Highly flammable liquid and vapour<br>PPE<br><br>**Environment**<br>Potentially harmful to aquatic life, shows bioaccumulation potential |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Ethylbenzene (BTEXN) | Sludge<br>Chemical Separation<br>Bioremediation | Unknown | ADR/RID<br>Class 3, Packing II<br><br>Hazardous<br>Flammable 2, Inhalation 4, Organ 2, Aspiration 1 | **Safety**<br>Highly flammable liquid and vapour<br>PPE<br><br>**Environment**<br>Potentially harmful to aquatic life |
| Xylene (BTEXN) | Sludge<br>Chemical Separation<br>Bioremediation | Unknown | Hazardous<br>Flammable 3, Inhalation 4, Dermal, 4m Skin 2, Eye 2, Organ 3, Aspiration 1 | **Safety**<br>Highly flammable liquid and vapour<br>PPE<br><br>**Environment**<br>Potentially harmful to aquatic life |
| Napthalene (BTEXN) | Sludge<br>Chemical Separation<br>Bioremediation | Unknown | Hazardous<br>Flammable 2, Carcinogenicity 2, Aquatic 1 | **Safety**<br>Flammable solid<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life with long lasting effects, not biodegradable |
| Acid Sulfate | ASS Treatment | < 5.5 pH | Hazardous<br>Skin 2, Eye 2A | **Safety**<br>PPE<br><br>**Environment**<br>Low mobility expected and is not an environmental threat |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| PFAS | PFAS soil storage<br>WWTP - Oil Separator<br>WWTP - Mixing Tank<br>WWTP - Ion Exchange<br>WWTP - GAC Filtration<br>WWTP - Coconut GAC | < 72 mg/kg | Hazardous<br>Flammable 2, Oral 3, Inhalation 3, Dermal 3, Carcinogenicity 2, Reproductive 2, Organ 2 | **Safety**<br>Highly flammable liquid and vapour<br>PPE<br><br>**Environment**<br>Potentially toxic to aquatic life |
| Perfluorooctane Sulfonic Acid (PFOS) | PFAS soil storage | < 1.8 mg/kg | Hazardous<br>Oral 4, Inhalation 4, Carcinogenicity 2, Reproductive 1B, Organ 1, Aquatic 2 | **Safety**<br>PPE<br><br>**Environment**<br>Toxic to aquatic life with long lasting effects |
| Perfluorohexane-1-Sulfonic Acid (PFHxS) | PFAS soil storage | < 1.8 mg/kg | Hazardous<br>Flammable 2, Oral 3, Dermal 3, Skin 2, Eye 2B, Inhalation 4, Organ 1 | **Safety**<br>Highly flammable<br>PPE<br><br>**Environment**<br>Potentially harmful to aquatic life, hydrolyses readily on contact with water |
| Perfluorooctanoic Acid (PFOA) | PFAS soil storage | < 18 mg/kg | Hazardous<br>Carcinogenicity 2, Respiratory 1B, Eye 1, Oral 4, Inhalation 4 | **Safety**<br>PPE<br><br>**Environment**<br>Hazardous to water even in small quantities |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Boron | Provided waste codes | Unknown | Hazardous<br>Oral 4 | **Safety**<br>Do not swallow<br>PPE<br><br>**Environment**<br>No ecological problems expected |
| Vanadium | Provided waste codes | Unknown | Hazardous<br>Oral 3, Inhalation 2, Mutagenicity 2, Carcinogenicity 1B, Reproductive 2, Organ 3, Aquatic 2 | **Safety**<br>Do not breathe in dust<br>PPE<br><br>**Environment**<br>Toxic to aquatic life with long lasting effects |
| Cobalt | Provided waste codes | Unknown | Hazardous<br>Aquatic 1, Respiratory 1 | **Safety**<br>Do not breathe in dust<br>PPE<br><br>**Environment**<br>Toxic to aquatic life with long lasting effects |
| Zinc | Provided waste codes | Unknown | Non-hazardous | **Safety**<br>May liberate toxic fumes in a fire<br><br>**Environment**<br>Poor solubility limits environmental impacts |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Antimony | Provided waste codes | Unknown | Hazardous Carcinogenicity 2, Organ 2 | **Safety**<br>Do not breathe in dust<br>PPE<br><br>**Environment**<br>Toxic to aquatic life with long lasting effects, not mobile due to poor solubility |
| Tellurium | Provided waste codes | Unknown | Hazardous Inhalation 4, Skin 1B, Reproductive 1B | **Safety**<br>Do not breathe in dust<br>PPE<br><br>**Environment**<br>Toxic to aquatic life with long lasting effects |
| Barium | Provided waste codes | Unknown | Hazardous Water contact 2, Skin 2, Eye 2A, Organ 3 | **Safety**<br>When in contact with water emits flammable gases<br>PPE<br><br>**Environment**<br>No documented environmental impact |
| Thallium | Provided waste codes | Unknown | Hazardous Kin 2, Eye 2A, Metal Corrosive 1 | **Safety**<br>Potentially corrosive to metals<br>PPE<br><br>**Environmental**<br>No documented environmental impact |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Asbestos | General Contaminant | None - this material is not accepted onsite. | Hazardous Carcinogenicity 1A, Organ 1 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>No documented environmental impacts |
| **Treatment Reagents** | | | | |
| Biodegradable Surfactant | Chemical separation (soils) | 2 tonne | | Further details required, but Hi-Quality has commented it is non-hazardous. |
| OPC | Primary Immobilisation | < 50 tonne | Hazardous Skin 2, Eye 1, Organ 2 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Non-toxic when a cured solid, but high pH may result in adverse effects on aquatic life<br>Product forms an alkaline slurry when mixed with water, low degradability and low mobility |
| GGBFS | Primary Immobilisation | < 50 tonne | Hazardous Skin 2, Eye 2A, Organ 3, Cancer 1A | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Non-toxic when a cured solid, but high pH may result in adverse effects on aquatic life<br>Product forms an alkaline slurry when mixed with water, low degradability and low mobility |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Pulverised Fuel Ash | Primary Immobilisation | < 50 tonne | Hazardous<br>Skin 2, Eye 2A, Cancer 1A, Organ 1, Aquatic 4 | **Safety**<br>May contain Chromium (VI)<br>PPE<br><br>**Environment**<br>No documented environmental effects |
| Cement Kiln Dust | Primary Immobilisation | < 50 tonne | Hazardous<br>Skin 1C, Eye 2B, Organ 3 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Non-toxic when a cured solid, but high pH may result in adverse effects on aquatic life<br>Product forms an alkaline slurry when mixed with water, low degradability and low mobility |
| Calcium Oxide | Primary Immobilisation | < 50 tonne | Hazardous<br>Skin 2, Eye 1, Organ 3 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Do not empty into drains, potential impact to aquatic life (minor) |
| Magnesium Oxide | Primary Immobilisation<br>WWTP - Mixing Tank | 5 tonne<br>2 tonne WWTP | Non-hazardous | **Safety**<br>PPE<br><br>**Environment**<br>Poor solubility limits ecological effects on plants and aquatic organisms |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Super Phosphate | Immobilisation | 5 tonne | Non-hazardous | **Safety**<br>PPE<br><br>**Environment**<br>Not anticipated to cause any adverse effects to plants or animals |
| Lime | Secondary Immobilisation | < 50 tonne | Hazardous<br>Skin 2, Eye 1, Organ 3 | **Safety**<br>Thermal decomposition can lead to the release of irritating vapours<br>PPE<br><br>**Environment**<br>Water soluble and may spread in water systems<br>Not environmentally hazardous, however, may affect pH of waterways with the potential to harm aquatic life |
| Sodium Silicate | Secondary Immobilisation | < 50 tonne | Hazardous<br>Skin 2, Eye 2A | **Safety**<br>May liberate toxic fumes in fire including oxides of silicon and sodium<br>PPE<br><br>**Environment**<br>Harmful effect due to pH shift<br>Mobile in soil but quickly depolymerises into inert silica |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Organophilic Clay | Secondary Immobilisation | < 50 tonne | Hazardous<br>Skin 2, Eye 2A, Organ 3 | **Safety**<br>Potentially carcinogenic<br>PPE<br><br>**Environment**<br>No documented environmental impacts |
| Natural Pozzolans | Secondary Immobilisation | < 50 tonne | Hazardous<br>Skin 2, Eye 2A, Organ 2, Cancer 1A | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>No documented environmental impacts |
| Bentonite | Sludge Thickening<br>Secondary Immobilisation | < 50 tonne | Hazardous<br>Skin 2, Eye 2A, Organ 3 | **Safety**<br>Do not breathe dust<br>PPE<br><br>**Environment**<br>Low toxicity to aquatic species |
| Bacteria | Bioremediation | 1 tonne | | Further details from Hi-Quality required. |
| Urea | Bioremediation | 5 tonne | Non-hazardous | **Safety**<br>PPE<br><br>**Environment**<br>Toxic to algae, discharge into environment should be avoided |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Aglime | ASS Treatment | 20 tonne | Non-hazardous | **Safety**<br>PPE<br><br>**Environment**<br>No impact to environment |
| HCl | WWTP - Mixing Tank | 5 tonne<br>2 tonne WWTP | ADG<br>Class 8, Packing II<br><br>Hazardous<br>Corrosive 1, Skin 1, Eye 1, Organ 3 | **Safety**<br>PPE<br><br>**Environment**<br>Do not empty into drains, large amount will affect pH and harm aquatic organisms, mobile due to solubility |
| Caustic Soda (NaOH) | WWTP - Mixing Tank | 5 tonne<br>2 tonne WWTP | ADG<br>Class 8, Packing II<br><br>Hazardous<br>Corrosive 1, Skin 1A, Eye 1 | **Safety**<br>Do not breathe fumes<br>PPE<br><br>**Environment**<br>Do not empty into drains, large amount will affect pH and harm aquatic organisms, mobile due to solubility |
| $AlSO_4$ | WWTP - Mixing Tank | 5 tonne<br>2 tonne WWTP | Hazardous<br>Skin 1A, Eye 1, Oral 4, Cell Mutagenicity 2, Aquatic 2 | **Safety**<br>PPE<br><br>**Environment**<br>Very toxic to aquatic life |
| Polymer | WWTP - Mixing Tank | 2 tonne<br>2 tonne WWTP | | Further details from Hi-Quality required |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| AC | WWTP - Mixing Tank<br>WWTP - GAC Filtration<br>WWTP - Coconut GAC Filtration | 2 tonne | Non-hazardous | **Safety**<br>Combustible material (dust)<br>PPE<br><br>**Environment**<br>No data |
| Ferrous sulphate | WWTP - Mixing Tank | 5 tonne<br>2 tonne WWTP | Hazardous<br>Oral 4, dermal 4, inhalation 4, Skin 2, Eye 2A | **Safety**<br>Contact with most metals generates flammable and explosive hydrogen gas<br>PPE<br><br>**Environment**<br>Some toxicity to small aquatic organisms (mosquito fish, water flea) |
| VCZ | WWTP - Secondary PFAS Wastewater Treatment | Unknown | Non-hazardous | **Safety**<br>PPE<br><br>**Environment**<br>Is a natural mineral with no harmful effects |
| Ion Exchange Resin | WWTP - Secondary PFAS Wastewater Treatment | Unknown | | Further details from Hi-Quality required. |
| Anion Exchange Resin | WWTP - Quinary PFAS Wastewater Treatment | Unknown | | Further details from Hi-Quality required. |

| Compound Name | Process Unit/Waste Treatment | Expected Concentration/Volume | Hazardous/ADG Codes | Safety/Environmental Consequences |
|---|---|---|---|---|
| Decon-90 | Decontamination | Unknown | Hazardous<br>Maybe corrosive, skin irritation, eye irritation | **Safety**<br>PPE<br><br>**Environment**<br>Biodegradable<br>High alkalinity may affect aquatic organisms if released into water course untreated |

## B7. Project description presentation

The following presentation was provided to Sherpa on July 22nd, 2024. Only relevant slides have been included in this report.

# Prestons Waste Facility approval status

# Approval status

- Being assessed as State Significant Development with an Environmental Impact Statement displayed at the end of 2021 Prestons Waste Treatment Facility | Planning Portal - Department of Planning and Environment
- Further information has been requested by the EPA and the Department of Planning and Environment.
- Key specialist assessments requested include:
  - HAZID assessment
  - Hazardous waste risk identification and mitigation report
  - Liquid waste risk identification and mitigation report
  - Updated traffic assessment with swept paths updates
- Minor project description and management plans updates. These in effect lessen impacts, such as reducing the types of materials that can be received onsite.
- Arcadis will submit an amendment report that includes clarifications in response to agency comments, changes to proposal operations and design refinements.

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# Prestons waste treatment facility location

# Existing site: Site Context

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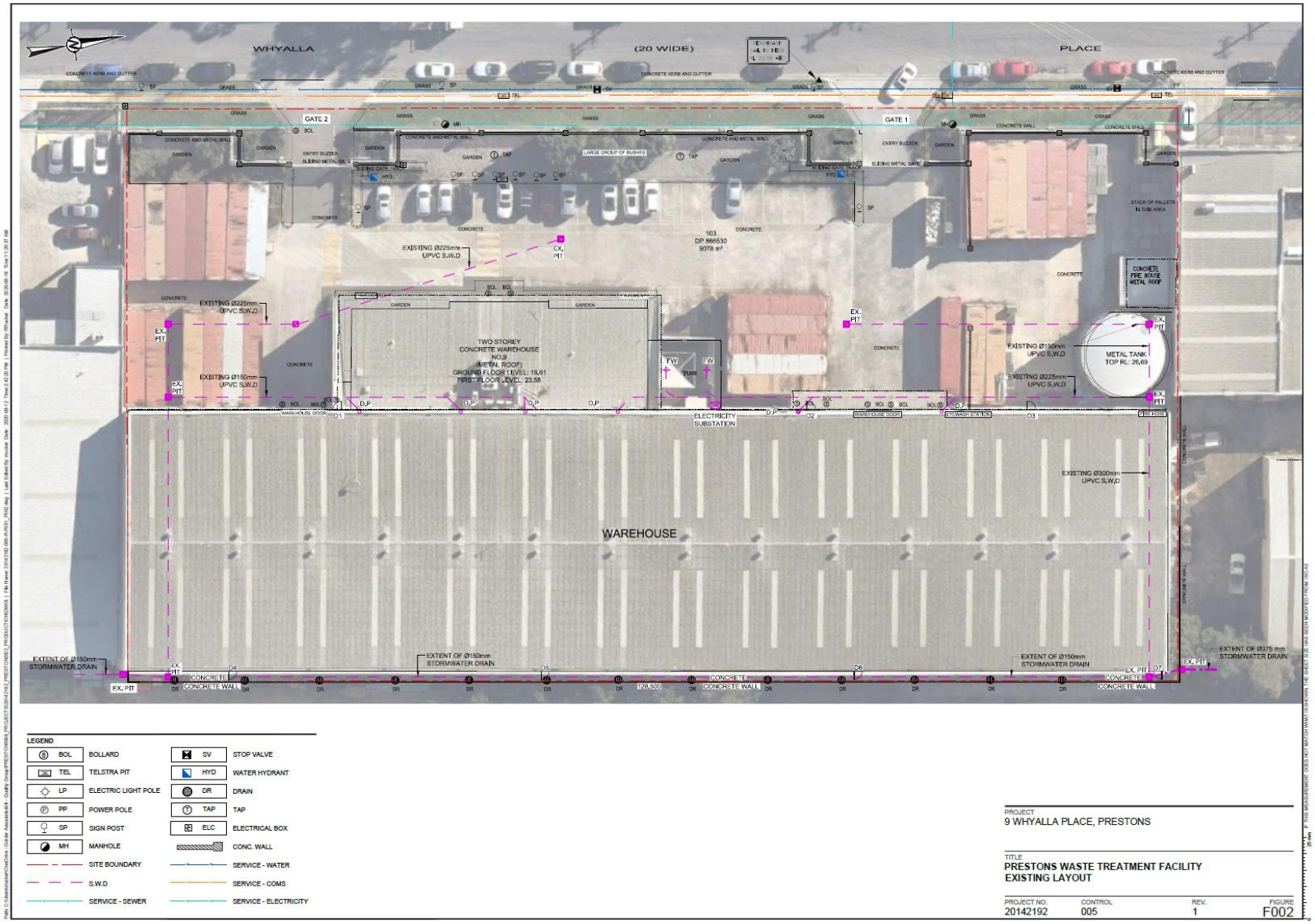
# Existing site: Existing building

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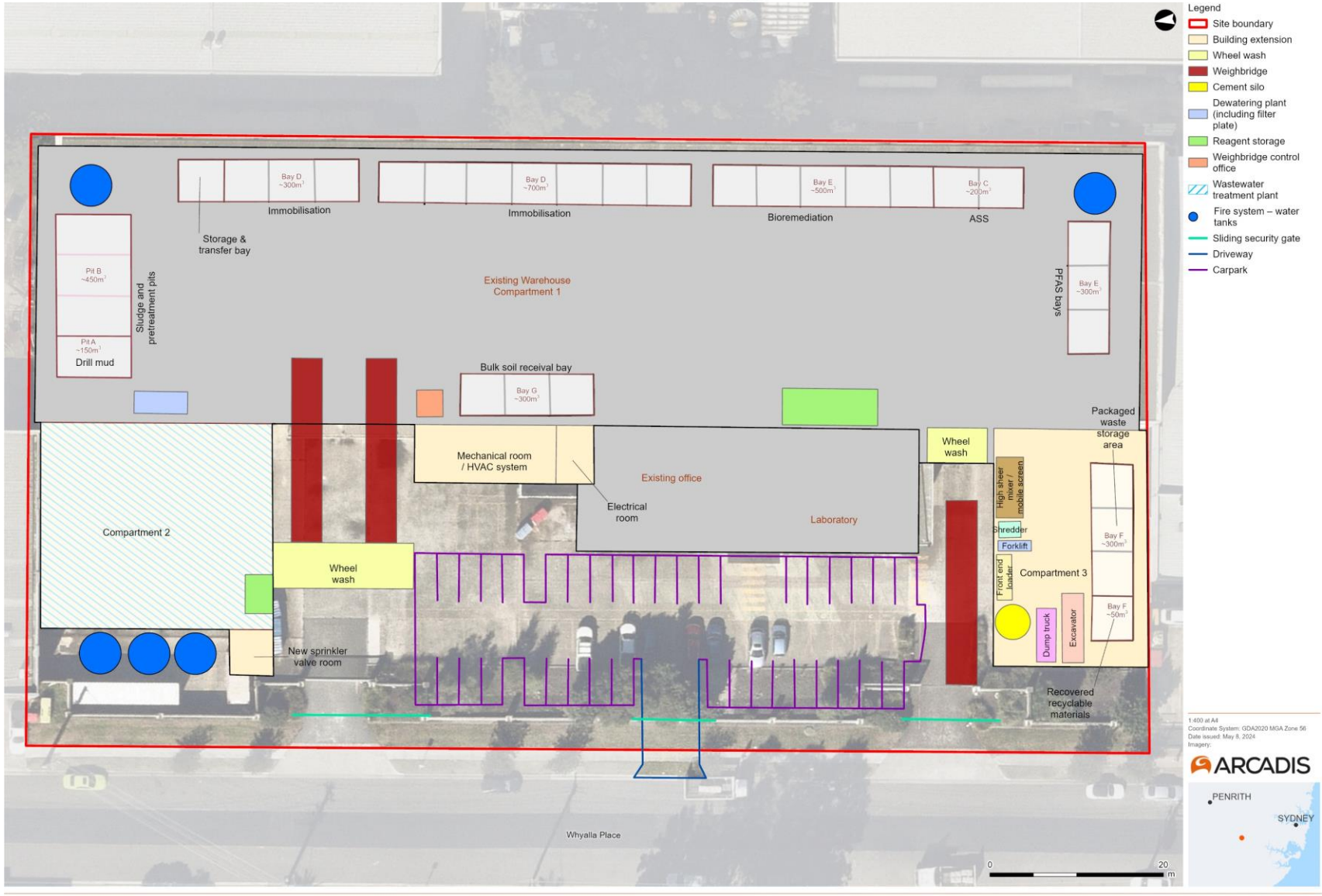
# Proposed site layout and extension areas

# (under refinement)

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# Prestons waste treatment facility proposed operations

# Purpose of the Proposal

- The Prestons waste treatment facility will provide a critical piece of infrastructure within the Sydney region.
- There is currently a shortage of facilities within Sydney that are capable of receiving or treating contaminated wastes.
- In many cases waste must be transported to Queensland or Victoria for disposal or treatment and are often left in situ for extended periods of time awaiting transportation interstate.
- The Proposal offers a centralised, regulated and environmentally responsibly managed facility to receive, store and treat contaminated material.

# Waste received: stages

The Proposal would occur in two stages:

**Stage 1**

- Extension of warehouse building
- Construction of weighbridges and a new driveway
- Internal fit out
- Installation of heating, ventilation upgrades to the existing HVAC system and fire management systems and internal fit out
- Waste types to be accepted:
  - Packaged waste
  - Acid sulfate soil (ASS) and potential acid sulfate soil (PASS)
  - Contaminated soil including PFAS contaminated soil

**Stage 2**

- Installation of wastewater treatment equipment including tanks, pits, silos, filters, pumping and dosing systems
- Waste types to be accepted:
  - Packaged waste
  - ASS/PASS
  - Contaminated soil/sludges including that contaminated by PFAS
  - Liquid waste including PFAS contaminated water

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# Prestons Waste Treatment

| Waste stream | Treatment type | Key approval and management considerations |
|---|---|---|
| **Packaged waste** | Stored only | ✓ Wastes types would be nominated<br>✓ Identified prohibited wastes streams would not be accepted |
| **PFAS** | Stored | ✓ A holding storage limit will be nominated<br>✓ Treatment would only occur for liquid waste (Stage 2) |
| **ASS/PASS** | Stored and treated | ✓ Receipt of both VENM PASS/ASS and potentially contaminated PASS/ASS that has been pre-characterized and classified with dosing rates |
| **Contaminated soil/sludges** | Stored and treated via immobilisation or bioremediation | ✓ Undertaken as per the requirements of General Immobilisation Approvals and approved Specific Immobilisation Approvals<br>✓ A site limit for bioremediation would be nominated<br>✓ Sludges would only be received as part of Stage 2 operations |
| **Asbestos** | Not to be accepted | ✓ Would not be accepted |
| **Liquid waste** | Stored and treated | ✓ Sydney Water Trade Waste Agreement would be set up<br>✓ As part of Stage 2 operations |

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# Waste received volumes and management

| Type of Waste | Management | Tonnes per Annum |
|---|---|---|
| **Packaged waste – Liquid** | Contaminated packaged waste: no treatment, only storage<br>Non-contaminated waste: shredding and offtake for disposal | 40,000t |
| **Packaged waste – Solid** | | |
| **PFAS contaminated soils** | Storage only | 7,500t |
| **Bulk soils** | Various methods: | 84,000t |
| **Contaminated soils** | Primarily immobilisation | 50,000t |
| **Contaminated soils** | Primarily bioremediation | 8,000t |
| **Acid sulfate soil** | Acid neutralisation in batches | 26,000t |
| **Drill muds** | Dewatering and wastewater treatment | 2,000t |
| **Sediments and sludges** | Dependent on moisture content of sludges – dewatering, wastewater treatment and soil decontamination | 7,000t |
| **Liquid waste (Stage 2 only)** | Treated and validated in 50 kL batches through the wastewater treatment plants | 70 ML |
| | **Total** | 210,500 |

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# Waste treatment options

| Waste Type | Description | Treatment Methodology | Stage |
|---|---|---|---|
| **Packaged Waste (solid, liquid, sludge)** | Non-contaminated solid packaged waste for destruction | • Shredding and storage | 1 & 2 |
| | Non-contaminated liquid packaged waste for storage | • Storage only | 1 & 2 |
| | Packaged industrial chemical waste<br>(note may include waste classified as a Dangerous Good Class 8 PG II and III) | • Characterisation of unknown wastes only<br>• Storage | 1 & 2 |
| **Sediments and Sludges** | PFAS Contaminated Soil | • Storage | 1 & 2 |
| | Total Petroleum Hydrocarbons (TPH) | • Physical separation/screening<br>• Bioremediation<br>• Storage | 1 |
| | Soils containing Total Recoverable Hydrocarbons (TRH) and Benzene, Toluene, Ethylbenzene, Xylenes and Napthalene (BTEXN) | • Bioremediation<br>• Storage | 1 & 2 |
| | Coal Tar Contaminated Soil from Former Gasworks Sites (less than 1% (by weight) of coal tar or coal tar pitch waste) | • Immobilisation<br>• Storage | 1 & 2 |
| | Material containing heavy metals, e.g.:<br>• Lead<br>• Chrome<br>• Copper<br>• Arsenic<br>• Nickel | • Immobilisation<br>• Storage | 1 & 2 |
| | Sludges | • Dewatering<br>• Wastewater treatment<br>• Contaminated soil treatment | 2 |
| | Acid Sulfate Soils | • Contaminated soil treatment (if required)<br>• Acid neutralisation | 1 & 2 |
| **Non-Contaminated Drill Muds** | Non-contaminated soil and water slurry from hydroexcavation works | • Dewatering and separation into liquid waste (wastewater treatment) and soils<br>• Further treatment of water in wastewater treatment plant<br>• Testing against Treated Drilling Mud Resource Recovery Order / Resource Recovery Exemption (RRO/RRE) (2014) | 2 |
| **Liquid Wastes** | Contaminated liquid, water outputs of slurry and drill mud dewatering<br>(note may include waste classified as a Dangerous Good Class 8 PG | • Wastewater treatment | 2 |

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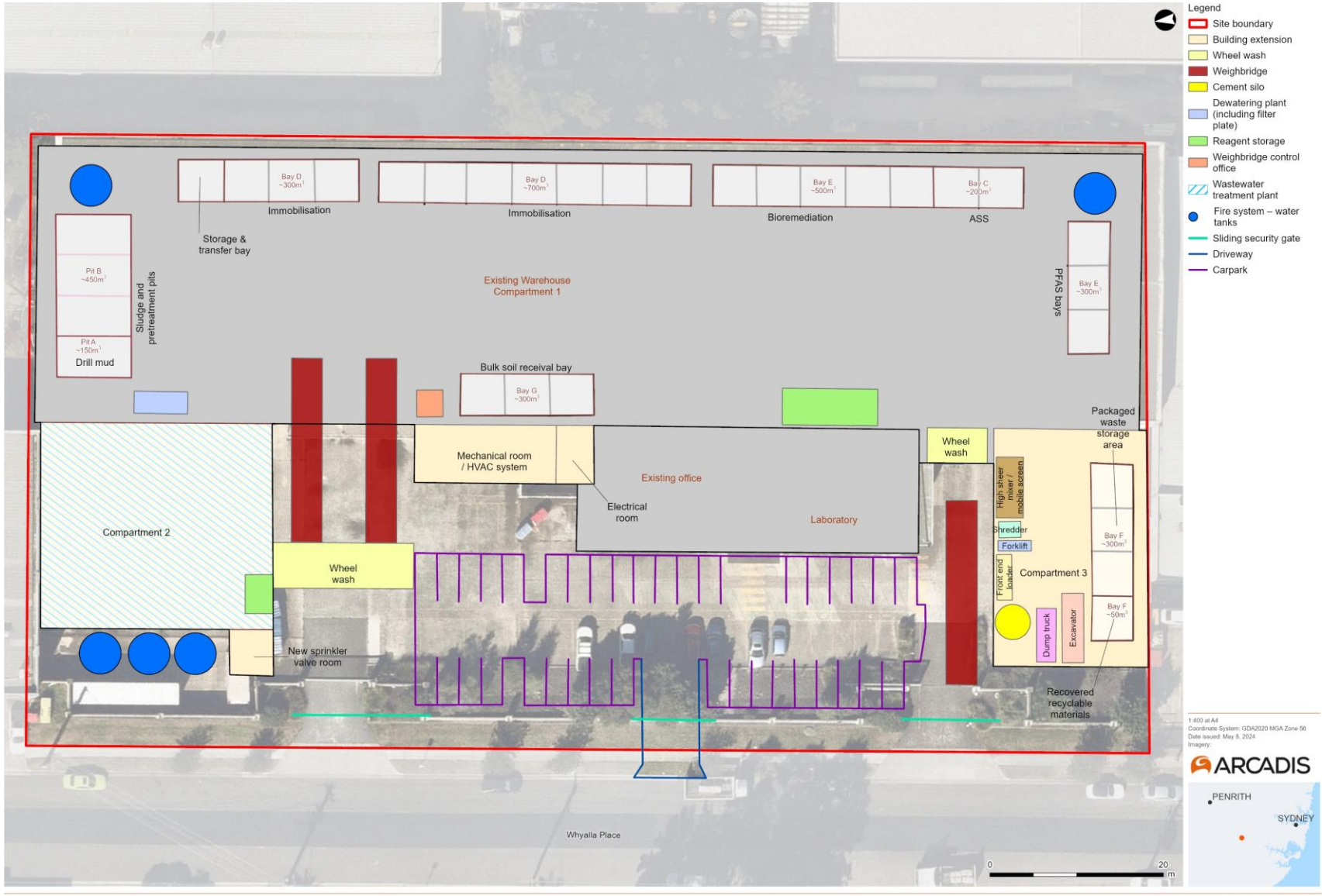
# Warehouse building extension

# Proposed site layout

# (note currently being updated)

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# Facility extension

- Building to be extended during Stage 1 of the Proposal. This would extend the internal floorspace of the Site from 1,300m2 to a total of 6,400m2.
- Compartment 1: Waste treatment storage and transfer bays, dewatering plant, water tanks, wheel wash, weighbridge, reagent storage and leachate collection pits
- Compartment 2: Wastewater Treatment Plant and reagent storage
- Compartment 3: Mobile plant and equipment, cement silo and packaged waste and resource recovery materials storage area.

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# Key documentation and information requested

# Key documents to support HAZID assessment

- Project Description
- Draft Operational Environmental Management Plan
- Draft Operational Air Quality Management Plan
- Draft Operational Waste Management Plan
- Design Drawings
- Technical assessments within the EIS.

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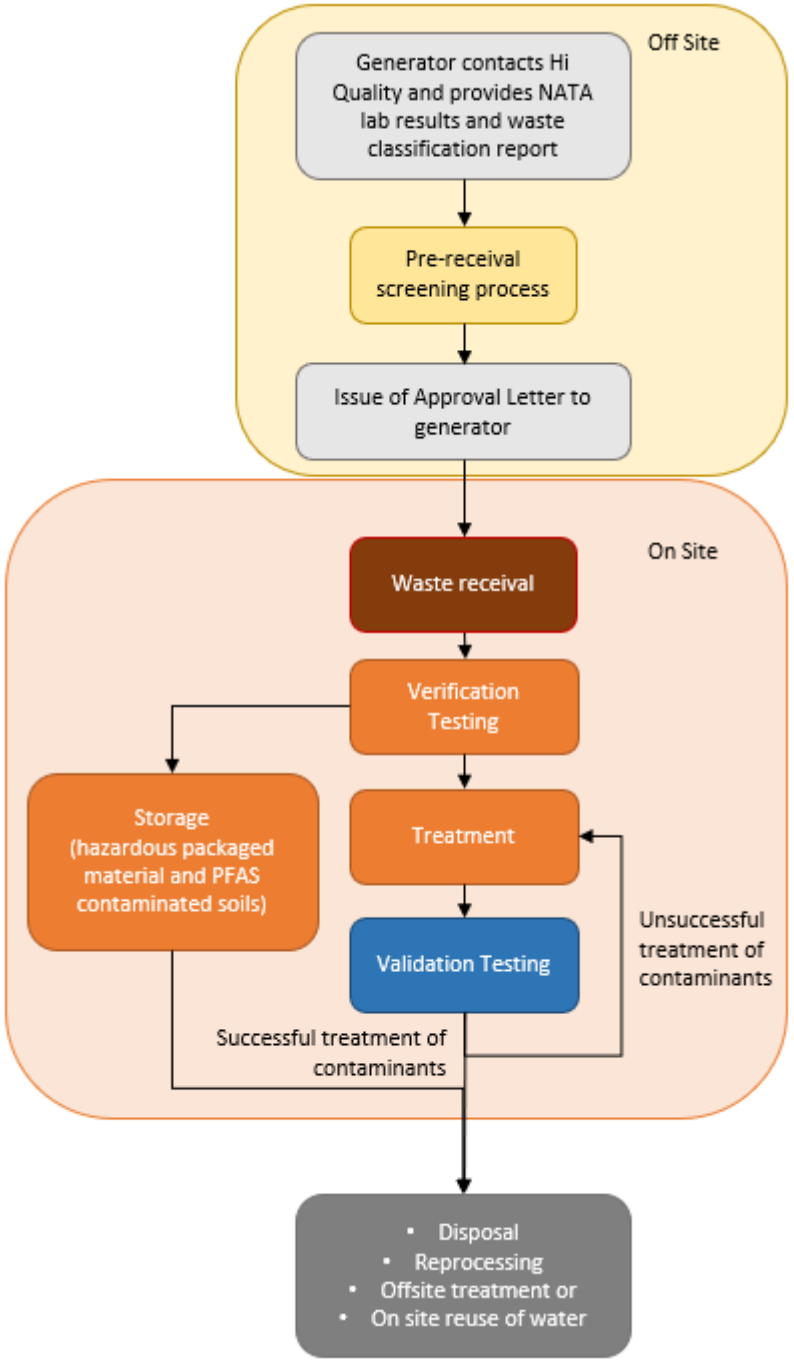
| Information requested | Document location |
| --- | --- |
| Layout plan<br>• Project site and development footprint<br>• Locality plan showing immediate neighbours/land uses | Within the project description (as shown in this presentation). |
| Details of all dangerous goods to be stored and used onsite:<br>• Quantity<br>• Storage location onsite<br>• Safety Data Sheets (SDS) | • Dangerous goods will be stored on site both in the form of waste (wastewater and packaged waste – Class 8 PG II and III) as well as for operational use (reagents)<br>• Quantity is provided in Table 1-10 of the Project Description (information provided on following slide – for Reagents)<br>• Storage locations are within design drawings. Additional information to be provided to support.<br>• SDS provided for reagents |
| Details of the facility:<br>• Proposed process flow diagram of the various treatment systems including all waste streams<br>• Design standards to be adopted in the process, waste storage and handling<br>• Fire and gas detection system<br>• Fire protection and/or suppression system<br>• Ventilation and scrubbing system<br>• Odour handling system<br>• Stormwater management<br>• Wastewater treatment and disposal | • Flowcharts within Section 1.4 of project description<br>• Design drawings to be provided.<br>• Fire information provided in Figure 1-7 of the Project Description and Appendix K of the EIS<br>• Ventilation System and Odour management in Section 1.2.7 of the project description and within Appendix F of the EIS<br>• Stormwater management Section 1.2.8 of Project Description and Appendix H of the EIS.<br>• Wastewater treatment and disposal within Section 1.2.8 of the Project Description. |

# Process slides

# Key steps

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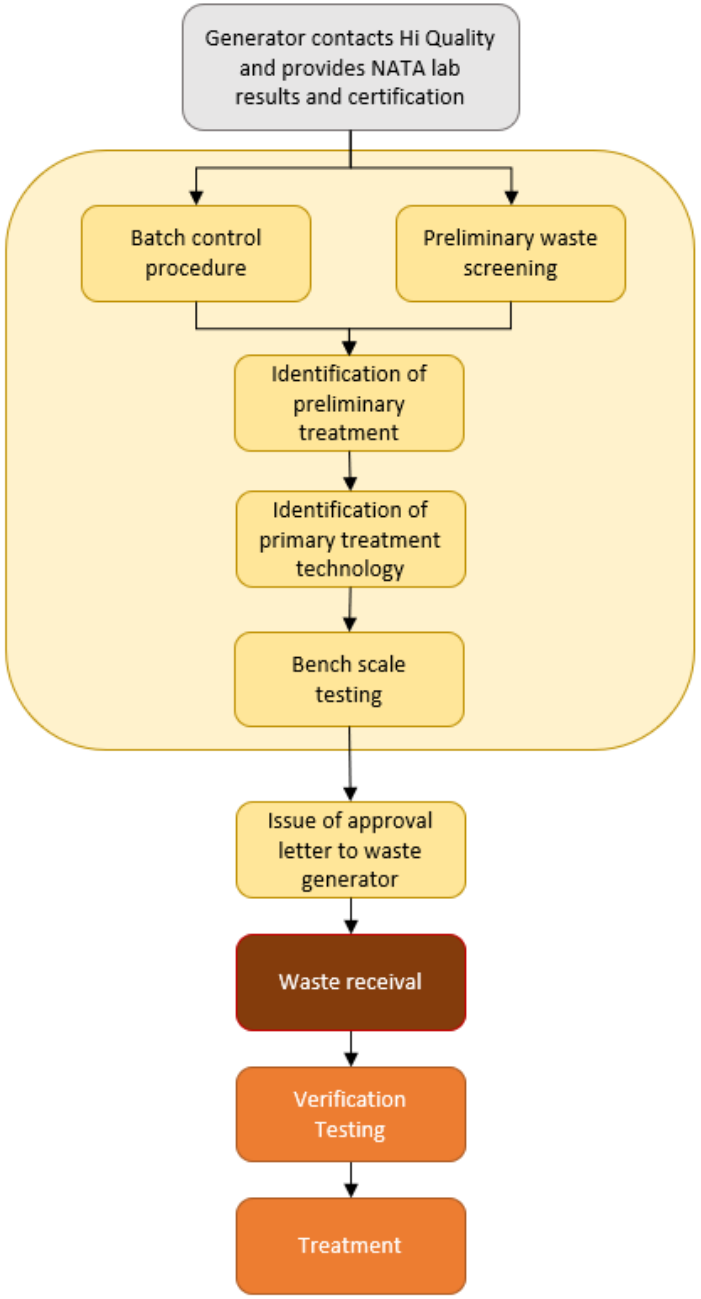
# Waste receival process

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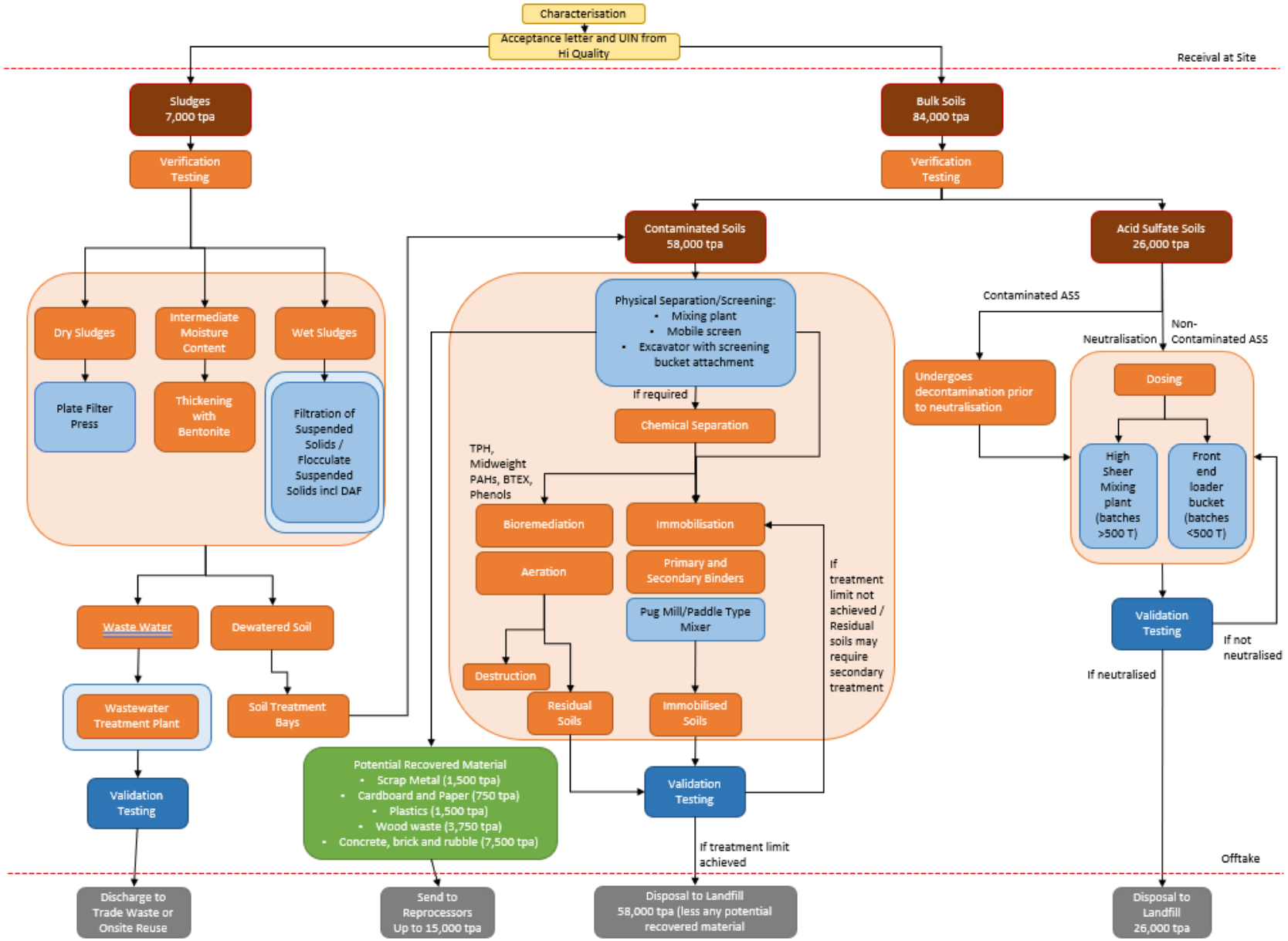
# Soils, sediments and sludges process flow

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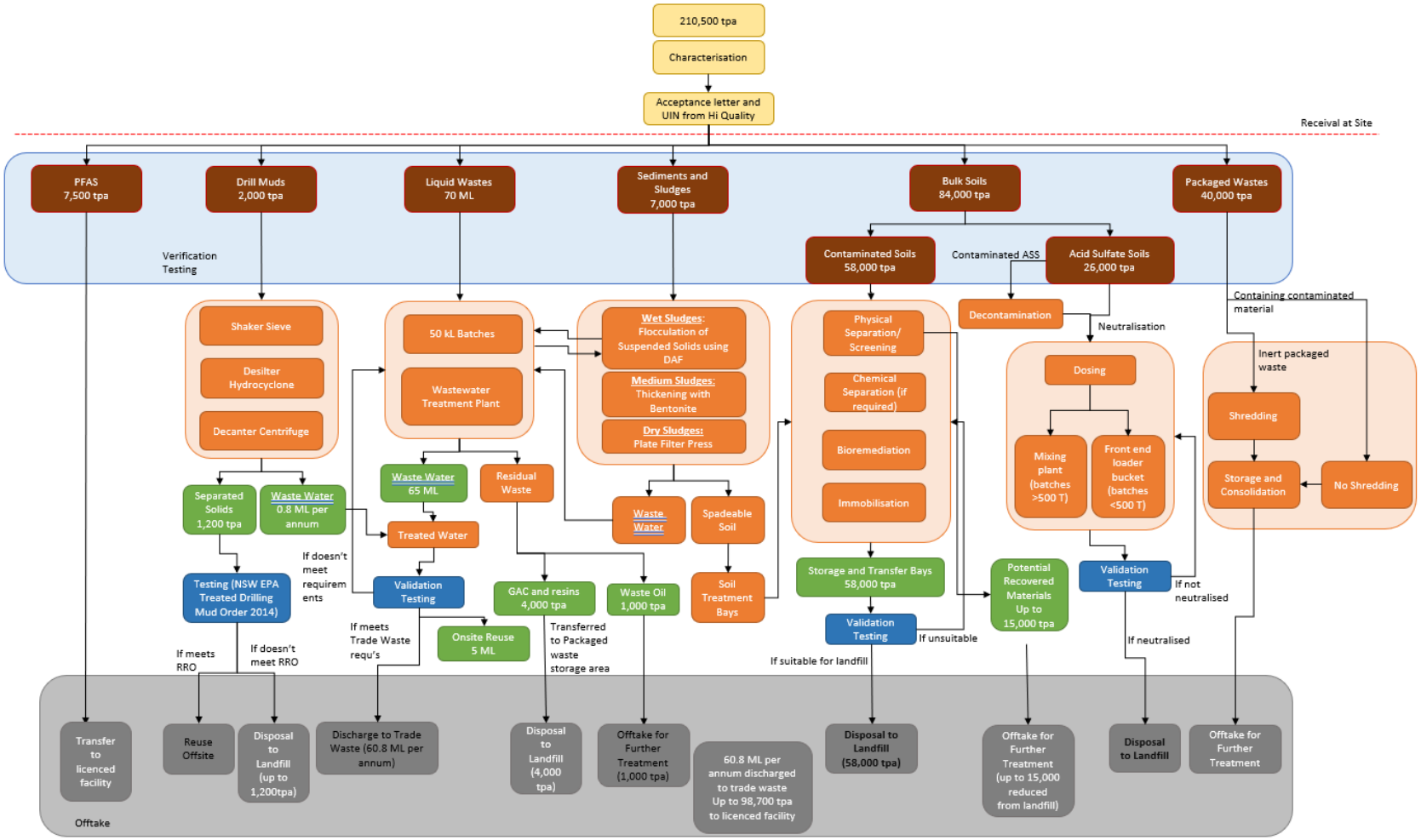
# Site mass balance and process flow

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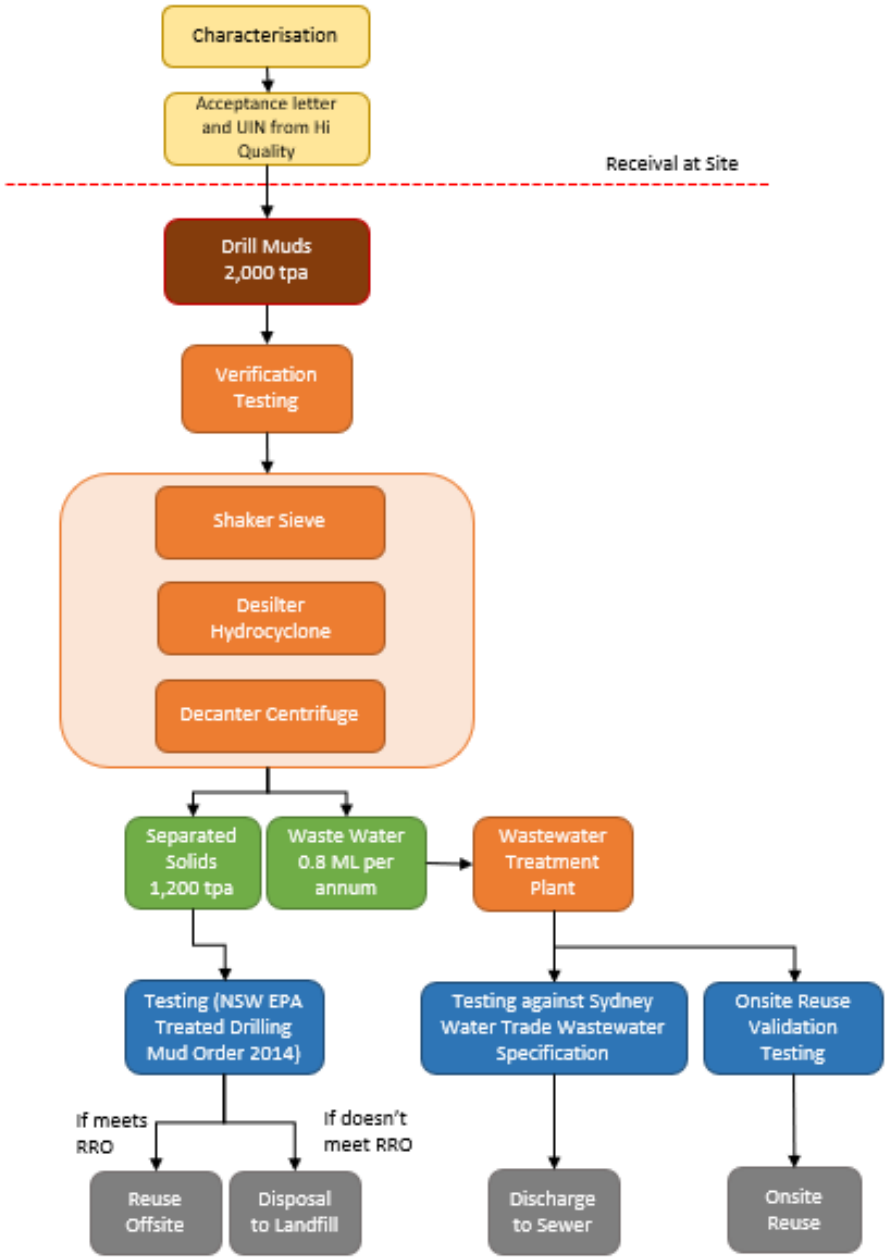
# Drill muds

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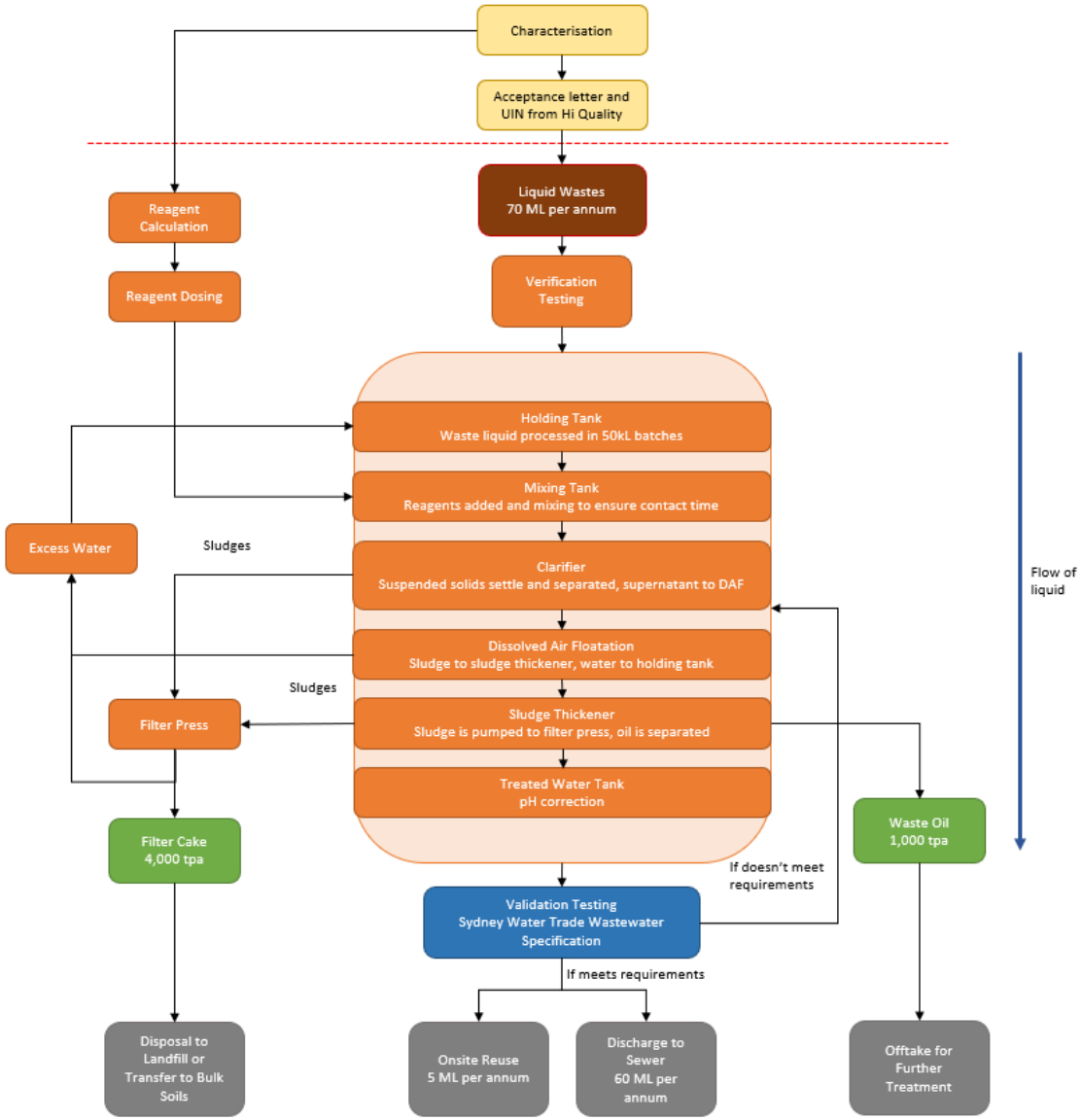
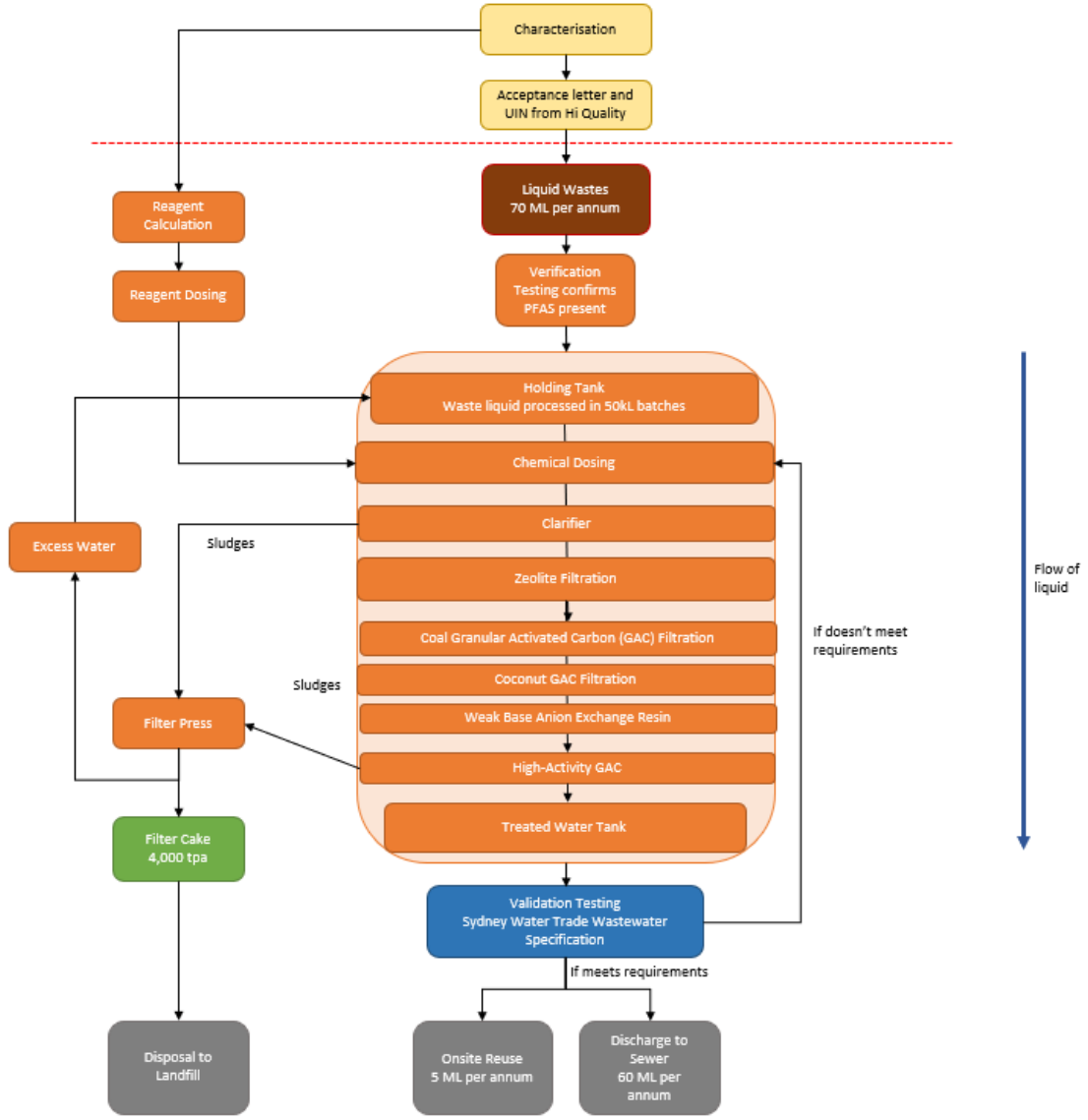
# Non-PFAS and PFAS liquid waste process flow



# APPENDIX C. HAZID WORKSHOP TEAM

| Company | Name | Role | Attendance |
|---|---|---|---|
| Hi-Quality | Daniel Blair | General Manager – Waste Treatment Services | Y |
| Hi-Quality | Jason Welch | Technical Manager | Y |
| Arcadis | Claire Hodgson | Technical Director - Environment | Y |
| Arcadis | Ryan Thomas | Principal Environmental Consultant | Y |
| Arcadis | Grace Paul | Environmental Consultant | Y |
| Sherpa Consulting | Louisa Rebec | Environment & Sustainability Consultant | Y |
| Sherpa Consulting | James Morel | Risk Engineer | Y |

**KEY:**

Y Full time

PT Part time

N Not present

# APPENDIX D. HAZID WORKSHOP MINUTES

# RISK REGISTER

| | | | | | | | Unmanaged (UM) | | | | | | | | Managed Risk | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Safety | | | Environment | | | | | Safety | | | Environment | | | | | |
| ID | Plant Area / Activity / Process Unit | ISO17776 Guideword (Prompt) | Event (Hazard) | Comments / Notes (Background Information / Regulator / Sherpa) | Cause | Consequence (Direct and Escalated) | L (Saf - UM) | C (Saf - UM) | RR (Saf - UM) | L (Env - UM) | C (Env - UM) | R (Env - UM) | Preventative Controls (Minimize potential loss of containment / impact) | Detection / Mitigation Controls (Maximize recovery from loss of containment / impact) | L (Saf) | C (Saf) | RR (Saf) | L (Env) | C (Env) | RR (Env) | Control Option/Action | Action Owner | Comments |
| 1 | [Carpark / External] Waste Receival and Offtake | On-Land Transport (Driving) | Loss of control of waste trucks | A large number of environmental consequences to consider given the variety of waste loads<br><br>Drill muds - uncontaminated<br>Soil: ASS, PFAS, TPH, TRH, BTEXN, coal tar, CCA, BaP, Phenol, AC, heavy metals (Pb, Cr, Cu, As, Ni, Cd, Hg, Se, Ag)<br>Sludge - all soil contaminants?<br>PFAS Soil<br>Liquid waste: TPH, PAH, heavy metals, organics<br>PFAS Liquid waste<br>Packaged waste (unknown contaminants?) | Waste truck driver error<br><br>Poor markings, speeding, new driver, evening operations<br><br>Driver medical condition<br><br>Driver unfamiliar with site | **Safety**<br>Harm to personnel (by impact)<br><br>Damage to nearby parked vehicles in carpark (Escalated: Fire or Explosion, Injury / Fatality)<br><br>**Environment**<br>Spillage of liquid waste product, unwanted reactions, leak of waste material beyond site boundary (Whyalla Place). Pollution of waterways / mixing with stormwater system / groundwater<br><br>Spillage of solid waste leading to release of contaminant particulates, vapours, dust, and odours | Possible | Severe | Medium | Unlikely | Major | Medium | Separation between heavy and light vehicle sectors<br><br>Truck scheduling / access known<br><br>Loads are uniform and known<br><br>Trucks covered until they enter facility (OEMP)<br><br>Driver training / protocol<br><br>Speed limits (5 km) and traffic control, signage | Emergency response plan (spills, fire) (OEMP)<br><br>OTMP - responsbility of directors to manage incoming deliveries<br><br>Weighbridge is bunded | Rare | Severe | Low | Rare | Severe | Low | | | In discussion Hi-Quality noted that the responsibility for this incident would also fall to the transport provider |
| 2 | [Carpark / External] Waste Receival and Offtake | General | Leak of waste material from waste truck | Already a leak present when truck arrives at facility | Improper securing of waste containers during transport<br><br>Improper closing of truck storage<br><br>Wheel generated dust movements | **Safety**<br>Harm to personnel (skin contact, inhalation) (Specifically liquid waste and drill muds)<br><br>**Environment**<br>Spillage of liquid waste product, unwanted reactions, leak of waste material beyond site boundary (Whyalla Place). Pollution of waterways / mixing with stormwater system / groundwater<br><br>Spillage of solid waste leading to release of contaminant particulates, vapours, dust and odours | Possible | Minor | Medium | Possible | Minor | Medium | Quality control of operators / transporters (blacklisting - also a requirement for overloading) | Spill kits - OEMP emergency response (employee induction on procedure)<br><br>PPE on personnel | Unlikely | Minor | Low | Unlikely | Minor | Low | Add notification to generator of vehicles in an unmaintained state to the OEMP (Acceptance protocol | Arcadis on behalf of Hi-Quality | Incident has occurred twice during operation at Yatala. |
| 3 | [Carpark / External] Waste Receival and Offtake | Incompatible Mixing | Receival of unacceptable waste types / Incompatible material | Dangerous goods except for Liquid wastes Class 8 Packing II & III<br>Any form of Asbestos<br>PFAS materials (apart from PFAS contaminated soil for storage - to be reviewed from EPA EIS Response)<br><br>Flammable and pH are the important factors to consider | Inadvertant waste mixing (undetected contaminant)<br><br>Improper cataloging of waste<br><br>Incorrect classification of waste type<br><br>Mixing of waste batches | **Safety**<br>Cross-contamination, unwanted reactions<br><br>Harm to personnel<br><br>**Environment**<br>Release of dangerous goods waste materials | Possible | Minor | Medium | Possible | Slight | Low | Generator screening / acceptance protocol<br><br>OEMP / OWMP unexpected finds protocol | Rejected loads protocol for onsite receival<br><br>PPE for personnel | Rare | Minor | Low | Rare | Slight | Low | Confirm inclusion of rejected loads register as a part of non-conforming waste protocol | Arcadis on behalf of Hi-Quality | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | [Carpark / External] Waste Receival and Offtake | On-Land Transport (Driving) | Waste trucks on hold | Hold up within facility meaning trucks need to wait outside site with waste loads | Incorrect delivery schedule<br><br>Traffic delays<br><br>Facility mismanagement | **Safety**<br>Potential traffic obstruction and accident risk<br><br>**Environment**<br>Release of dust and odours of exposed solid waste | Unlikely | Slight | Low | Unlikely | Slight | Low | 7 stacking spaces in facility, turning circles<br><br>OTMP and scheduling of deliveries<br><br>OWMP outlining stoppage protocols<br><br>Inspection of vehicles during arrival | Loads are covered - acceptance protocol / legislation<br><br>Industrial area (no large pedestrian numbers / through traffic) | Rare | Slight | Low | Rare | Slight | Low | Review number of vehicles stacked on site within Compartment 1 (Existing Warehouse) | Arcadis on behalf of Hi-Quality | All vehicles accepted to be covered according to acceptance protocol. |
| 5 | [Carpark / External] Waste Receival and Offtake | Open Flame | Fire / Ignition | Vehicle fires | Ignition source from waste truck (fuel leak, hot surfaces e.g., breaks)<br><br>Hot loads | **Safety**<br>Harm to personnel (Escalated: Explosion)<br><br>**Environment**<br>Release of vapours / gases / odours | Unlikely | Major | Medium | Unlikely | Severe | Medium | Not accepting mixed waste loads / organics / flammable<br><br>Acceptance protocol | Building has fire walls to stop spread into facility<br><br>OEMP includes emergency response plan (fire) / employee training on procedure<br><br>Hose reel at the front<br><br>Fire extinguishers<br><br>PPE for personnel | Rare | Major | Medium | Rare | Minor | Low | | | Hi-Quality acknowledges that a major safety risk persists due to potential fatility in vehicle fire. |
| 6 | [Carpark / External] Reagent Receival | On-Land Transport (Driving) | Loss of control of reagent trucks | HCl (8 II) - Hazardous (Corrosive 1, Skin 1, Eye 1, Organ 3)<br>Caustic Soda (8 II) - Hazardous (Corrosive 1, Skin 1A, Eye 1)<br><br>Ferrous sulphate - Hazardous (Oral 4, Skin 2, Eye 2A, Aquatic 2)<br>OCP - Hazardous (Skin 2, Eye 1, Organ 2)<br>GGBFS - Hazardous (Skin 2, Eye 2A, Organ 3, Cancer 1A)<br>PFA - Hazardous (Skin 2, Eye 2A, Cancer 1A, Organ 1, Aquatic 4)<br>CKD - hazardous (Skin 1C, Eye 2B, Organ 3)<br>Lime - Hazardous (Skin 2, Eye 1, Organ 3)<br>Sodium silicate - Hazardous (Skin 2, Eye 2A)<br>Organophilic Clays - Hazardous(Skin 2, Eye 2A, Organ 3)<br>Pozzolans - Hazardous (Skin 2, Eye 2A, Organ 2, Cancer 1A)<br>Bentonite - Hazardous (Skin 2, Eye 2A, Organ 3)<br>Aluminium Sulphate - | Reagent truck driver error<br><br>Poor markings, speeding, new driver | **Safety**<br>Harm to personnel<br><br>Damage to nearby vehicles in carpark (Escalated: Fire or Explosion)<br><br>**Environment**<br>Loss of containment of reagents, unwanted reactions, leak of reagent material beyond site boundary (Whyalla Place. Pollution of waterways / mixing with stormwater system / groundwater<br><br>Release of dust / odours / biohazards | Rare | Severe | Low | Rare | Severe | Low | Reagents are non-reactive (cementious) or natual (bacteria)<br><br>Parking location - no interaction of reagent deliveries with waste trucks<br><br>Trusted suppliers / packaging<br><br>Infrequent deliveries - smaller quantities of material<br><br>Site manager knowledge of deliveries / schedule | Spill kits<br><br>OEMP emergency procedures<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | Breach of packaging also required for this event. |
| 7 | [Carpark / External] Reagent Receival | General | Leak of reagent material from transport truck | Already a leak present when truck arrives at facility | Improper securing of reagent containers during transport<br><br>Improper closing of truck storage<br><br>Wheel generated dust movement | **Safety**<br>Harm to personnel (skin contact, inhalation)<br><br>**Environment**<br>Leak of reagent material beyond site boundary (Whyalla Place), unwanted reactions. Pollution of waterways / mixing with stormwater system / ground water<br><br>Release of dust and odours | Rare | Slight | Low | Rare | Slight | Low | Trusted suppliers<br><br>Trained site manager | Spill kits<br><br>OEMP response protocols<br><br>PPE for personnel | Rare | Slight | Low | Rare | Slight | Low | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | [Carpark / External] Reagent Receival | Open Flame | Fire / Ignition | Vehicle fires<br><br>How are reagents delivered? Separate trucks from separate companies? | Ignition source from waste truck (fuel leak, hot surfaces e.g., breaks) | **Safety**<br>Harm to personnel<br><br>**Environment**<br>Release of toxic fumes (reagent or waste within facility) | Unlikely | Major | Medium | Unlikely | Minor | Low | Stable choice of reagents<br><br>Known reagent schedule / reactions | Building has fire walls to stop spread into facility<br><br>OEMP includes emergency response plan (fire)<br><br>Hose reel at the front<br><br>Fire extinguishers<br><br>PPE for personnel / training | Rare | Major | Medium | Rare | Slight | Low | | | No flammable reagents used.<br><br>Hi-Quality acknowledges that a major safety risk persists due to potential fatility in vehicle fire.<br><br>Truck frequency for reagent vehicles is far lower than waste trucks. |
| 9 | [Carpark / External] General | Natural and Environmental hazards (effect on surroundings) | Natural Events / Disasters | Accounting for floods | High rainfall above the 1 in 100 year floodline | **Safety**<br>Inability to deliver waste<br><br>**Environment**<br>Overflow of waste from truck bed<br><br>Release of untreated waste to nearby waterway and stormwater system | Rare | Slight | Low | Rare | Minor | Low | Scheduling of deliveries<br><br>Shut-down protocol (OEMP flood event protocol)<br><br>7 stacking spaces inside facility | | Rare | Slight | Low | Rare | Minor | Low | Include notification to delivery services of flooding resulting in facility shutdown in the OEMP | Arcadis on behalf of Hi-Quality | Facility above 1 in 500 year flood level. |
| 10 | [Carpark / External] General | Compliance / Regs | Noise Pollution | EPA has specifically outlined inadequacies in addressing the generated noise from the facility (sleep distrubance?)<br><br>81 trucks per day | Waste / reagent truck delivery during day and / or night | **Safety**<br>Distruption to local commercial / recreational facilities<br><br>Health impacts due to employee long term exposure<br><br>Noise impacts and sleep disturbance for nearby residents | Possible | Slight | Low | Possible | Slight | Low | Built in an indutrialised area<br><br>7 stacking spaces inside facility<br><br>Traffic management and scheduling | Traffic manager directs drivers to turn off engines<br><br>OEMP has noise and vibration management plan (working hours, practices to minimise) | Unlikely | Slight | Low | Unlikely | Slight | Low | Review number of waste / reagent delivery trucks daily to the facility<br><br>Review noise pollution modelling and results to confirm if environmental standards are met | Arcadis on behalf of Hi-Quality | Hi-Quality commented that the throughput of the facility is being reconsidered and the initial suggestion of 81 trucks per day is being substaintially reduced - expected to be closer to 40 (this is at maximum operational capacity).<br><br>Yatala is around 20 / day. |
| 11 | [Carpark / External] General | Health | Arrival / Leaving facility | | Poor lighting<br><br>Car strikes person<br><br>Uneven surface | **Safety**<br>Harm to personnel<br><br>**Environment**<br>Soil and waste tracking in neighbouring streets<br><br>Dust and odour | Possible | Minor | Medium | Possible | Slight | Low | OTMP - carparking management strategy<br><br>Shift scheduling - not a high frequency of vehicles<br><br>Induction of personnel on protocol | | Possible | Minor | Medium | Unlikely | Slight | Low | | | It is noted that this is more of an OHS safety issue, hence similar safety risks are not covered for each stage of the facility as the HAZID / ENVID focuses on loss of containment / control scenarios. |
| 12 | [Compartment 1 - Exisiting Warehouse] Wheel Wash / Weighbridge | Incompatible Mixing | Loose contaminated waste material enters site | | Clogging / contamination of wheel well | **Safety**<br>Exposure of personnel / personal items to waste<br><br>**Environment**<br>Contaminated wash water causes pollution of waterways / mixing with stormwater system / groundwater | Rare | Slight | Low | Rare | Slight | Low | Concrete treated with performance based sealant (70% design report) | Bunding of washing area | Rare | Slight | Low | Rare | Slight | Low | | | Arcadis noted that the wheel wash is a control. |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 13 | [Compartment 1 - Existing Warehouse] Waste Trucks | On-Land Transport (Driving) | Loss of control of waste trucks / heavy machinery | EPA requests assessment of the movement of heavy machinery within the warehouse<br><br>Differs from HAZID-1 and HAZID-6 as this is now within the warehouse rather than the external receival area | Waste truck driver error<br><br>Poor markings, speeding, new driver, evening operations | **Safety**<br>Harm to personnel (impact)<br><br>Damage to heavy vehicles (forklift, excavator, frontloader, mobile plant)<br><br>Damage to site equipment (dewatering, mobile plant)<br><br>**Environment**<br>Mixing of waste batches, unwanted reactions, loss of containment beyond designated bays or beyond bunded region of warehouse<br><br>Loss of containment of stored reagents<br><br>Release of dust and odours | Possible | Severe | Medium | Possible | Minor | Medium | SWIM protocols<br><br>Weigh bridge operator to guide to designated bay<br><br>Driver training | Bunding within warehouse to withstand 1 tanker load (20 KL) of lost waste (70% design report)<br><br>Entire building is at negative pressure (70% design report)<br><br>Scrubber / HVAC system<br><br>OEMP - emergency response plan | Unlikely | Severe | Medium | Unlikely | Minor | Low | | | Hi-Quality acknowledges the inherent risk associated with the use of heavy machinery. |
| 14 | [Compartment 1 - Existing Warehouse] Leachate Management System | General | Compromise of mechanical Integrity | Refers to actual failure of piping network within warehouse | Crack - heavy machinery, waste trucks<br><br>Improper installation | **Environment**<br>Leaching into groundwater<br><br>Release of leachate into sewer / local waterways<br><br>Cross-contamination of waste loads from overflow of system | Probable | Slight | Medium | Probable | Slight | Medium | Engineering design of leachate system<br><br>Regular inspections / maintenance program (OEMP) | | Rare | Slight | Low | Rare | Slight | Low | | | Hi-Quality commented that waste materials are primarily non-biological material so odours are a minor issue. |
| 15 | [Compartment 1 - Existing Warehouse] Leachate Management System | Toxic fluid | Leachate spill | Not much leachate in untreated soils | System blockage with solid waste material<br><br>Failure of waste effluent pump system<br><br>Overflow of underground holding tanks (Stage 1) | **Environment**<br>Cross-contamination of waste piles<br><br>Unintended release of leachate to ground water / storm water system | Unlikely | Slight | Low | Unlikely | Severe | Medium | Waste types (dryer soils) do not release excess quantities of leachate<br><br>Regular inspections / maintenance program (OEMP) | Bunding of facility<br><br>OEMP - spill response / incident response | Rare | Slight | Low | Rare | Severe | Low | | | Hi-Quality noted that all incoming waste materials treated at the facility have already been dug from environment.<br><br>A similar event has not occurred at Yatala during operation.<br><br>Personnel are not considered at risk due to minimal volumes of leachate expected from the waste materials. |
| 16 | [Compartment 1 - Existing Warehouse] Pit A (Drill Mud) | Asphyxiates | Airborne particulate release | Any process requiring the rellocation of drill muds (off loading from trucks, physical screening, loading for disposal offsite)<br><br>Unknown contaminants | Transfer from truck to storage<br><br>Improper operation of physical screening process | **Safety**<br>Harm to personnel (inhalation)<br><br>**Environment**<br>Transfer of dust beyond site boundary polluting air for nearby commercial / recreation / residential settings<br><br>Odour release | Rare | Slight | Low | Rare | Slight | Low | Drill muds are kept wet across entire treatment period<br><br>Known waste schedule / type | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>Personnel PPE | Rare | Slight | Low | Rare | Slight | Low | | | Drill muds are inherently wet and do not give off particulates<br><br>No odours either |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 17 | [Compartment 1 - Existing Warehouse] Pit A (Drill Mud) | Dynamic situation hazards | Implosion of vacuum pressure truck | Not sure if credible, but is the only case where a vacuum tanker is used<br><br>Drill muds released under gravity | Pressure failure of vacuum tanker | **Safety**<br>Harm to personnel (exposure to waste, injury from debris / implosion)<br><br>Damage to site equipment (dewatering)<br><br>**Environment**<br>Loss of containment of non-contaminated drill mud<br><br>Mixing of waste batches / contamination of bays in Compartment 1 | Rare | Major | Medium | Rare | Severe | Low | Drill muds are treated to a soil consistency (reloading does not require vacuum tanker)<br><br>Qualified transporters used to unload under supervision of site staff (met at unload point) | OEMP spill procedures<br><br>PPE for personnel | Rare | Major | Medium | Rare | Severe | Low | | | Hi-Quality acknowledges that a major safety risk persists due to potential fatility in vehicle implosion. |
| 18 | [Compartment 1 - Existing Warehouse] Pit A (Drill Mud) | General | Drill mud spill | Drill mud is non-contaminated, minimal hazard | Overfilling of drill mud pit<br><br>Improper decontamination of pit<br><br>Leak during physical separation (shaker sieve, desilter hydrocyclone, and decanter centrifuge)<br><br>Blockage of physical separation equipment<br><br>Inaccurate discharge / filling of waste truck<br><br>Compromise of pit lining | **Safety**<br>Harm to personnel (contact with waste, injury from solid material)<br><br>**Environment**<br>Cross-contamination of waste batches<br><br>Sepage into groundwater from pit | Unlikely | Minor | Low | Unlikely | Slight | Low | Engineered design of pit (HDPE liners of pit, earthen clay liner, concrete)<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection of pits for faults | Bunding of facility (OEMP)<br><br>Emergency response plans (OEMP)<br><br>PPE for personnel | Unlikely | Minor | Low | Unlikely | Slight | Low | | | Hi-Quality and Arcadis confimed that the underground pits have a three layer barrier to prevent leakage into the surrounding groundwater. |
| 19 | [Compartment 1 - Existing Warehouse] Pit A (Drill Mud) | On-Land Transport (Driving) | Overfilling of drill mud bays | EPA notes that treatment time is not sufficent to include both waste treatment as well as the analytical time to validate waste treatment techniques | Delays in analytical treatment protocols<br><br>Misbatching | **Safety**<br>Rejection of incoming waste streams / distruption of treatment schedule<br><br>Accelerated levels of wear / corrosion on storage pits<br><br>**Environment**<br>Longer than acceptable storage times for treated drill muds leading to odourous emissions (low odours) | Unlikely | Minor | Low | Unlikely | Minor | Low | Engineered design of pit (HDPE liners of pit, earthen clay liner, concrete)<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection of pit<br><br>Supporting supervisor onsite during all unloadings | HVAC / Scrubber system<br><br>OEMP - emergency response<br><br>Personnel PPE | Unlikely | Minor | Low | Unlikely | Minor | Low | | | |
| 20 | [Compartment 1 - Existing Warehouse] Pit A (Drill Mud) | Incompatible Mixing | Unexpected / Unknown Contaminants | Need to be defined by Hi-Quality - are there any that are specifically monitoring for / pose a greater danger level? | Inaccurate generator waste certificate / incorrect waste classification<br><br>Mixing of waste batches (mislabelling / human error)<br><br>Transportation cross-contamination<br><br>Improper decontamination of pit prior to restock | **Safety**<br>Exposure of personnel (skin contact)<br><br>**Environment**<br>Unwanted reactions<br><br>Distruption to treatment schedule<br><br>Release of unintended contaminants to landfill or waterways through wastewater (contaminant dependent) | Possible | Minor | Medium | Possible | Minor | Medium | Drill mud initial location sourcing (low risk)<br><br>Visual observation of any contaminants / waste during offloading<br><br>Non-confining waste protocol (if hasn't been unloaded) - follow up with provider | Post-treatment analytical assessment<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | Define a protocol for unloaded contaminated drill muds and include in the OEMP | Arcadis on behalf of Hi-Quality | |

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| 21 | [Compartment 1 - Existing Warehouse] Pit B (Sludge Pits) | Toxic fluid | Sludge spill | Sludge pits are below ground<br><br>Environmental consequences for: Soil: TPH, TRH, BTEXN, coal tar, CCA, BaP, Phenol, AC, heavy metals (Pb, Cr, Cu, As, Ni, Cd, Hg, Se, Ag) Sludge - all soil contaminants? | Overfilling of sludge pits<br><br>Aggressive mixing during bentonite dosing<br><br>Inaccurate discharge / filling of waste truck<br><br>Compromise of pit lining | **Safety** Harm to personnel<br><br>**Environment** Release of leachate beyond pit area, into sewer system, or into groundwater<br><br>Potential release of odour to surrounding industrial and residential neighbourhood<br><br>Vapour generation during mixing | Unlikely | Severe | Medium | Possible | Severe | Medium | Engineered design of pit (HDPE liners of pit, earthen clay liner,concrete)<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection of pit<br><br>Supporting supervisor onsite during all unloadings | Leachate system<br><br>Scrubber / HVAC system<br><br>Bunding of facility (OEMP)<br><br>OEMP emergency / spill response<br><br>PPE for personnel | Unlikely | Severe | Medium | Unlikely | Severe | Medium | | | Hi-Quality and Arcadis confimed that the underground pits have a three layer barrier to prevent leakage into the surrounding groundwater. |
| 22 | [Compartment 1 - Existing Warehouse] Pit B (Sludge Pits) | Toxic fluid | Bentonite spill | Sludge pits are below ground<br><br>Bentonite is a hazardous material (Skin 2, Eye 2A, Organ 3) | Malfunction of dosing system<br><br>Overflowing of sludge pits<br><br>Aggressive mixing during bentonite dosing | **Safety** Harm to personnel (inhalation)<br><br>Dosing of incorrect waste batch, unwanted reactions<br><br>**Environment** Potential air pollution due to the release of dust and particulate matter | Probable | Minor | Medium | Probable | Minor | Medium | Design of pits (layered with appropriate headroom)<br><br>Separation of sludge pits from soil treatment area<br><br>Transported in a bulker bag<br><br>Operator protocols / training / maintenance checks / induction | Spill kits<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | | | |
| 23 | [Compartment 1 - Existing Warehouse] Pit B (Sludge Pits) | Compliance / Regs | Incomplete waste treatment | EPA notes that most treatment protocols suggested have not been used at an industrial level, posing the risk of scale-up issues affecting treatment viability<br><br>Environmental consequences for: Soil: TPH, TRH, BTEXN, coal tar, CCA, BaP, Phenol, AC, heavy metals (Pb, Cr, Cu, As, Ni, Cd, Hg, Se, Ag) Sludge - all soil contaminants? | Large scale failure of lab tested waste treatment technique<br><br>Incorrect assessment of sludge type | **Safety** Harm to personnel<br><br>Damage to plant equipment (overflow of plate press, blockage of WWTP)<br><br>**Environment** Release of odours | Unlikely | Severe | Medium | Unlikely | Severe | Medium | Redundancy through generator certificate and onsite testing (OEMP)<br><br>Testing post-treatment to verify conformity to waste regulations, if unacceptable further treatment is performed | PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 24 | [Compartment 1 - Existing Warehouse] Bay C (ASS) | Toxic solid | ASS spill | Environmental consequences for acid sulfate release<br><br>Generally uncontaminated, can become acidic through exposure to moisture or oxygen<br><br>More so PASS, all naturally occuring | Improper operation of physical screening process<br><br>Inaccurate discharge / filling of waste trucks<br><br>Aggressive aglime mixing in high shear mixer | **Safety** Harm to personnel<br><br>**Environment** Cross-contamination of waste batches<br><br>Release of leachate beyond pit area<br><br>Discharge of ASS to surrounding soils and waterways when soils rewetted, resulting in reduced pH, decreased oxygen concentration in water and the release of heavy metals, acid and other contaminants, posing a risk to aquatic ecosystems and human health.<br><br>Minor odours | Unlikely | Minor | Low | Unlikely | Severe | Medium | Management procedures for transporting, screening, and mixing (OWMP)<br><br>Minimised exposure of soil to moisture (transforms PASS into ASS) | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>Leachate system<br><br>OEMP spill response<br><br>PPE for personnel | Rare | Minor | Low | Rare | Severe | Low | | | Hi-Quality commented that most soil received is PASS and can only become ASS with moisture and oxygen, very mild acidic soil. |

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| 25 | [Compartment 1 - Existing Warehouse] Bay C (ASS) | Toxic solid | Aglime spill | Aglime is a non-hazardous material | Aggressive mixing in high shear mixer | **Safety** Harm to personnel (inhalation)<br><br>**Environment** Dosing of incorrect waste batch | Possible | Minor | Medium | Possible | Slight | Low | Transported in bulker bag<br><br>PASS treatment protocol training (OWMP) | OEMP spill protocols<br><br>PPE for personnel | Unlikely | Minor | Low | Unlikely | Slight | Low | | | |
| 26 | [Compartment 1 - Existing Warehouse] Bay C (ASS) | Compliance / Regs | Incomplete waste treatment | EPA notes that most treatment protocols suggested have not been used at an industrial level, posing the risk of scale-up issues affecting treatment viability<br><br>Environmental consequences for ASS release | Large scale failure of lab tested waste treatment technique<br><br>Incorrect dosing calculation<br><br>Quality issue with bullk aglime | **Environment** Impact to downstream treatment protocols (bioremediation / immobilisation)<br><br>Leachate out to water ways<br><br>Release of odours (low) | Unlikely | Minor | Low | Unlikely | Severe | Medium | Testing post-treatment to verify conformity to waste regulations, if unacceptable further treatment is performed | HVAC / Scrubber system | Rare | Minor | Low | Rare | Severe | Low | | | Landfills licenced to take PASS are fully lined |
| 27 | [Compartment 1 - Existing Warehouse] Bay C (ASS) | Incompatible Mixing | Unexpected / Unknown Contaminants | EPA notes the requirement for batch control to prevent cross-contamination<br><br>Cannot test for asbestos internally | Inaccurate generator waste certificate / incorrect waste classification<br><br>Mixing of waste batches (mislabelling / human error)<br><br>Transportation cross-contamination<br><br>Improper decontamination of pit prior to restock | **Safety** Exposure of personnel<br><br>**Environment** Unwanted reactions<br><br>Reduction in treatment effectiveness and release of untreated ASS to downstream processes<br><br>Undetermined concentration of leachate released | Unlikely | Minor | Low | Unlikely | Severe | Medium | Generator screening / acceptance protocol<br><br>OEMP / OWMP have an unexpected finds protocol / non-conforming waste protocol intially<br><br>Onsite testing prior to treatment | PPE for personnel | Rare | Minor | Low | Rare | Severe | Low | | | |
| 28 | [Compartment 1 - Existing Warehouse] Bay C (ASS) | Asphyxiates | Airborne particulate release | | Loading / unloading of waste with trucks<br><br>Physical screening | **Safety** Harm to personnel<br><br>Airborne particulates to surrounding community<br><br>**Environment** Potential odour emissions | Possible | Minor | Medium | Possible | Minor | Medium | Dust suppression (water) - unloading / loading / treatment<br><br>Visual inspection during treatment | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / scrubber system<br><br>Wheel wash - not tracking out dust<br><br>PPE for personnel | Unlikely | Minor | Low | Rare | Minor | Low | | | |
| 29 | [Compartment 1 - Existing Warehouse] Bay C (ASS) | Corrosive substances | Corrosion (Pit) | Aglime use<br><br>Also requested by EPA | Failure of cleaning / maintanance (improper decontamination)<br><br>Build-up of concentrated leachate<br><br>Use overtime | **Safety** Equipment failure<br><br>**Environment** Loss of containment of ASS (bay are concrete) leading to contamination of ground water / storm water system | Unlikely | Slight | Low | Rare | Slight | Low | Leachate system<br><br>OWMP - treatment procedure / dosing<br><br>Bay decontamination<br><br>Regular inspection of bunding / general bay / pavement condition | | Unlikely | Slight | Low | Rare | Slight | Low | | | |
| 30 | [Compartment 1 - Existing Warehouse] Pit B (Sludges) - Chemical Separation | Toxic fluid | Leachate release | Process is used to remove hydrocarbons before bioremmediation or immobilisation | High dosing of surfactant - surface tension releases high quantities of leachate | **Safety** Fire (ignition of hydrocarbon rich leachate)<br><br>Harm to personnel<br><br>**Environment** Release into local water ways / ground water / storm water system | Unlikely | Minor | Low | Rare | Minor | Low | All tanks include overflow protection and alarms (OEMP)<br><br>Engineered design of pit (HDPE liners of pit, earthen clay liner,concrete)<br><br>Visual inspection of pit<br><br>Supporting supervisor onsite during all unloadings | Bunding (OEMP)<br><br>OEMP emergency / spill response<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | | | |

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| 31 | [Compartment 1 - Existing Warehouse] Pit B (Sludges) - Chemical Separation | Open Flame | Fire / Ignition | Process is used to remove hydrocarbons before bioremmediation or immobilisation | Leachate rich in hydrocarbons | **Safety**<br>Harm to personnel<br><br>**Environment**<br>Generation of toxic vapours (BETX, BaPs, phenols, etc.) and odours - release beyond site boundaries effecting nearby community and ecosystem | Rare | Minor | Low | Rare | Minor | Low | No flammable waste accepted on site<br><br>Underground pit design<br><br>Segragation of pits from bays | Fire extinguishers onsite (fire designs)<br><br>OEMP - fire protocols<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | Add an action to stop any maintenance / hot works activities near sludge pits (even when empty) in the OWMP. Adapted from existing company wide Hi-Quality hot works protocol | Arcadis on behalf of Hi-Quality | Company wide protocol of hot works protocol<br><br>Material accepted is combustible and not flammable |
| 32 | [Compartment 1 - Existing Warehouse] Bay D (Immobilisation) | Toxic solid | Soil spill | Environmental consequences for:<br>Soil: TPH, TRH, BTEXN, coal tar, CCA, BaP, Phenol, AC, heavy metals (Pb, Cr, Cu, As, Ni, Cd, Hg, Se, Ag) | Improper operation of physical screening process<br><br>Incorrect transfer of soil to high shear mixer<br><br>Transfer of soil along shear mixer belt<br><br>Blockage and overflow of mixer | **Safety**<br>Harm to personnel (inhalation)<br><br>Damage to equipment<br><br>**Environment**<br>Cross-contamination with other waste loads<br><br>Generation of dust released to atmosphere<br><br>Odour release | Possible | Minor | Medium | Rare | Minor | Low | Stockpile size limits<br><br>Push walls in bays give minimum 1 m clearance<br><br>Operator induction of shear mixer / heavy equipment (OWMP) | Leachate system<br><br>Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>OEMP - spill beyond bay (incident procedures)<br><br>PPE for personnel | Possible | Slight | Low | Rare | Minor | Low | | | Similar to general operation of waste facility |
| 33 | [Compartment 1 - Existing Warehouse] Bay D (Immobilisation) | Compliance / Regs | Incomplete waste treatment | EPA suggests that oxidation times are inaccurate<br><br>EPA notes that most treatment protocols suggested have not been used at an industrial level, posing the risk of scale-up issues affecting treatment viability<br><br>EPA specifically requests further info on treatment of coal tar soil, heavy metal soil, and bulk soils<br><br>Environmental consequences for:<br>Soil: TPH, TRH, BTEXN, coal tar, CCA, BaP, Phenol, AC, heavy metals (Pb, Cr, Cu, As, Ni, Cd, Hg, Se, Ag) | Large scale failure of lab tested waste treatment technique<br><br>Incorrect initial classification of waste batch<br><br>Accidental treatment of incorrect waste material<br><br>Improper mixing<br><br>Excess humidity / moisture (cement to moisture ratio) preventing complete cure<br><br>Generalised treatment to 'family' of chemicals is ineffective | **Safety**<br>Harm to personnel during concrete cutting - release / exposure to untreated waste (dust)<br><br>**Environment**<br>Release of untreated waste to landfill / contaminated wastewater or leachate to local waterways<br><br>Release of generated dust | Possible | Minor | Medium | Possible | Minor | Medium | Redundancy through generator certificate and onsite testing prior to treatment (OEMP)<br><br>Each load is individually examined to design treatment protocol (OWMP)<br><br>Testing post-treatment to verify conformity to waste regulations, if unacceptable further treatment is performed | PPE for personnel | Rare | Slight | Low | Rare | Minor | Low | | | Hi-Quality has reported no issues with large batch testing at Yatala - if batch is too large, it is split into smaller batches and treated individually |
| 34 | [Compartment 1 - Existing Warehouse] Bay D (Immobilisation) | Incompatible Mixing | Unexpected / Unknown Contaminants | EPA notes the requirement for batch control to prevent cross-contamination | Inaccurate generator waste certificate / incorrect waste classification<br><br>Mixing of waste batches (mislabelling / human error)<br><br>Transportation cross-contamination<br><br>Improper decontamination of pit prior to restock | **Safety**<br>Inhalation - specifically asbestos contamination (not tested for onsite)<br><br>**Environment**<br>Unwanted reactions<br><br>Distruption to treatment protocol and release of untreated waste to landfill / contaminated wastewater or leachate to local waterways | Probable | Severe | Medium | Rare | Minor | Low | Redundancy through generator certificate and onsite testing prior to treatment (OEMP)<br><br>Visual inspection<br><br>Non-conforming protocol<br><br>Water supression for dust | Leachate system<br><br>PPE for personnel | Unlikely | Minor | Low | Rare | Minor | Low | | | |

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| 35 | [Compartment 1 - Existing Warehouse] Bay D (Immobilisation) | Toxic solid | Cementious stabiliser spill | EPA notes the requirement for how these spills will be managed<br><br>Hazardous materials: OCP, GGBFS (carcinogenic), PFA (carcinogenic, danger to aquatic life), CKD Lime, Sodium silicate, organophilic clay, pozzolans (carcinogenic), bentonite | Improper mixing of cement with waste batch | **Safety**<br>Harm to personnel (inhalation of particulate matter)<br><br>**Environment**<br>Spread of particulate matter beyond site boundaries to pollute surrounding air | Possible | Minor | Medium | Rare | Slight | Low | Bulk container transport when moving<br><br>OWMP for immbolisation | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>OEMP spill response<br><br>PPE for personnel | Unlikely | Minor | Low | Rare | Slight | Low | | | |
| 36 | [Compartment 1 - Existing Warehouse] Bay D (Immobilisation) | Incompatible Mixing | Mixing of contaminated waste from other stockpilies (in high shear mixer) | EPA requests how will cross contamination of Hazardous waste stockpiles be prevented | Remenant waste in excavator during transfer<br><br>Inadequate decontamination procedure<br><br>Residue material left on high shear mixer belt<br><br>Overflow of liquid contaminant from bund | **Environment**<br>Unwanted reactions<br><br>Distruption to treatment protocol and release of untreated waste to landfill / contaminated wastewater or leachate to local waterways | Possible | Slight | Low | Unlikely | Minor | Low | Types of soil waste (non-hazardous and similar contaminant types)<br><br>Decontamination procedure<br><br>Individual treatment of batches (treatment / storage)<br><br>OWMP - management requirements<br><br>Overseen by supervior (visual inspection) | Testing post-treatment to verify conformity to waste regulations, if unacceptable further treatment is performed | Unlikely | Slight | Low | Rare | Slight | Low | | | Hi-Quality commented that the relative levels of material remaining in bays are negligible (kg of remenant material vs tonnes of new batch)<br><br>Soils not hazardous<br><br>General acceptance of a wide variety of contaminant types across the facility<br><br>Most likely place is soil unloading area (Bay G) |
| 37 | [Compartment 1 - Existing Warehouse] Bay D (Immobilisation) | Asphyxiates | Airborne particulate release | | Concrete cutting (curred)<br><br>Removal of cured waste<br><br>Improper operation of heavy equipment<br><br>Physical screening | **Safety**<br>Harm to personnel (silicosis (inhalation))<br><br>**Environment**<br>Release of concrete dust to the air | Possible | Minor | Medium | Rare | Slight | Low | Bulk container transport when moving<br><br>OWMP for immbolisation | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>OEMP spill response<br><br>PPE for personnel | Unlikely | Minor | Low | Rare | Slight | Low | | | |
| 38 | [Compartment 1 - Existing Warehouse] Bay D (Immobilisation) | Open Flame | Fire / Ignition | Hydrocarbon presence | Soils containing hydrocarbons (TPH, PAH, BTEXN)<br><br>Activated carbon waste<br><br>Heavy machinery ignition source | **Safety**<br>Harm to personnel<br><br>Release of toxic fumes (Escalated: Explosion)<br><br>**Environment**<br>Pollution of local air quality spreading to nearby residential, commerical, and recreational facilities | Rare | Severe | Low | Unlikely | Minor | Low | Waste type (low concentration of hydrocarbons accepted < 5% - worst case scenario)<br><br>Non-flammable waste types<br><br>Enclosed building<br><br>Hot works protocol (Hi-Quality company wide) | OEMP - fire management<br><br>Fire design features (extinguishers, detectors)<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | | | |

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| 39 | [Compartment 1 - Existing Warehouse] Bay E (Bioremediation) | Compliance / Regs | Bioremediation treatment | EPA specifically requested environmental impact of bioremediation<br><br>Gases released specifically during treatment | Breakdown of HVAC system<br><br>Release of gases during bioremediation<br><br>Release of particulates or odours during aeration<br><br>Release of BTEX compounds<br><br>Use of urea as a nutrient | **Safety**<br>Harm to personnel - aerosolised carcinogenic compounds (benzene, naphthalene, benzopyrene)<br><br>Release of CO2<br><br>**Environment**<br>Reduction of air quality for local residences, commercial and recreational businesses | Possible | Severe | Medium | Unlikely | Minor | Low | Continuous addition of moisture during the process (no dust)<br><br>Temperature monitoring to ensure bacteria remain viable<br><br>Discrete sizing of waste batches | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>PPE for personnel | Rare | Slight | Low | Rare | Minor | Low | Clarify bioremediation treatment protocol, specifically if aeration occurs through pumps or is performed manually by a front end loader | Arcadis on behalf of Hi-Quality | Soil 30% - 40% moisture content<br><br>Hi-Quality commented they are only required to meet landfill requirements not environmental criteria<br><br>Mixing can be performed through front end loader or air pumps and tubes at the bottom of the pile for continuous mixing<br><br>Hi-Quality commented that *Bascillus cereus* is the dominant bacteria, however, the supplier provides a mixture with other species. The specific mixture has not reported any odour issues during operation at Yatala. |
| 40 | [Compartment 1 - Existing Warehouse] Bay E (Bioremediation) | Toxic solid | Soil spill | EPA specifically requested environmental impact of bioremediation<br><br>Environmental consequences for:<br>Soil: PAH, TPH, TRH, BTEXN, Phenol | Improper operation of physical screening process | **Safety**<br>Harm to personnel (Inhalation)<br><br>**Environment**<br>Release of bacteria into waterways (*Bacillus cereus* ) | Possible | Minor | Medium | Rare | Minor | Low | Stockpile size limits<br><br>Push walls in bays give minimum 1 m clearance<br><br>Operator induction of shear mixer / heavy equipment (OWMP) | OEMP - spill beyond bay (incident procedures)<br><br>Leachate system to recirculate liquid waste / bacteria<br><br>PPE for personnel | Possible | Slight | Low | Rare | Minor | Low | | | Hi-Quality noted that the bacteria is commonly used for diesel oil<br><br>Bacteria typically sold with a few other varients but *B. cereus* is the dominant |
| 41 | [Compartment 1 - Existing Warehouse] Bay E (Bioremediation) | Toxic fluid | Biological material spill | Need more information on the bacteria type - but most likely non-hazardous | Improper handling - human error<br><br>Compromise of container | **Safety**<br>Harm to personnel<br><br>**Environment**<br>Release of excess bacteria quantities through leachate system<br><br>Release of contaminate to nearby waterway and ecosystem | Rare | Slight | Low | Rare | Slight | Low | 5 L container of bacteria for 50 tonne treatment (minimal reagent volume)<br><br>OWMP for bioremmediation<br><br>Chosen bacteria strain (SDS for bacteria) | PPE for personnel | Rare | Slight | Low | Rare | Slight | Low | | | |
| 42 | [Compartment 1 - Existing Warehouse] Bay E (Bioremediation) | Compliance / Regs | Incomplete waste treatment | EPA suggests that factors for successful bioremediation treatment are difficult to predict with certainity<br><br>Environmental consequences for:<br>Soil: PAH, TPH, TRH, BTEXN, Phenol | Incorrect initial classification of waste batch (i.e., high levels of benzopyrene)<br><br>Accidental treatment of incorrect waste material<br><br>Inactive bacteria / natural variation in biological performance (shelf life / expiry)<br><br>Improper mixing or aeration<br><br>Incomplete chemical separation (remaining hydrocarbons / tar) | **Environment**<br>Release of strong odours (death of bacteria)<br><br>Release of untreated waste to landfill / contaminated wastewater or leachate to local waterways | Possible | Minor | Medium | Possible | Minor | Medium | Redundancy through generator certificate and onsite testing prior to treatment (OEMP)<br><br>Each load is individually examined to design treatment protocol (OWMP)<br><br>Temperature and moisture content monitoring throughout treatment | Landfill site standards<br><br>Testing post-treatment to verify conformity to waste regulations, if unacceptable further treatment is performed<br><br>PPE for personnel | Rare | Slight | Low | Rare | Minor | Low | | | Hi-Quality commented that copper will kill bacteria - needs to be immobilised prior to treatment |

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| 43 | [Compartment 1 - Existing Warehouse] Bay E (Bioremediation) | Open Flame | Fire / Ignition | Hydrocarbon presence (same as immobilisation) | Soils containing TPH<br><br>Large quantities of organic material | **Safety**<br>Harm to personnel<br><br>Release of fumes (Escalated: clean burning fire)<br><br>**Environment**<br>Pollution of local air quality spreading to nearby residential, commerical, and recreational facilities | Rare | Severe | Low | Unlikely | Minor | Low | Waste type (low concentration of hydrocarbons accepted < 5% - worst case scenario)<br><br>Non-flammable waste types<br><br>Hot works protocol (Hi-Quality company wide) | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>OEMP - fire management<br><br>Fire design features (extinguishers, detectors)<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | | | |
| 44 | [Compartment 1 - Existing Warehouse] Bay E (PFAS Soil) | Toxic solid | PFAS soil spill | No treatment is given to this material<br><br>Environmental consequences for PFAS | Loading / unloading of waste with trucks | **Safety**<br>Harm to personnel (inhalation)<br><br>**Environment**<br>Release of PFAS contaminated water to leachate system and ecosystem | Possible | Minor | Medium | Rare | Minor | Low | Stockpile size limits<br><br>Push walls in bays give minimum 1 m clearance<br><br>Operator induction of shear mixer / heavy equipment (OWMP)<br><br>Supervision during offloading and reloading procedures | OEMP - spill beyond bay (incident procedures)<br><br>Bunding around PFAS bay isolating from the warehouse floor<br><br>PPE for personnel | Possible | Slight | Low | Rare | Minor | Low | Confirm and document inhalation limits for human safety and the environment of PFAS compared to accepted contamination limits for landfill | Arcadis on behalf of Hi-Quality | Hi-Quality confirmed that Prestons WTF is a holding facility before any PFAS waste is sent to QLD (immobilisation) or VIC (thermal treatment).<br><br>Cannot take hazardous levels of PFAS, only restricted levels (included in OWMP).<br><br>Hi-Quality confirmed that the PFAS soil will remain moist to reduce airborne particulates and inhalation risks.<br><br>Solid soil spills were noted to be a part of normal operation, however, these breaches occurred in a minor amount that do not present a signifcant safety hazard. The solid nature of the waste and the location within the enclosed warehouse does not provide a logical pathway for release to the environment. |
| 45 | [Compartment 1 - Existing Warehouse] Bay E (PFAS Soil) | Incompatible Mixing | Cross-Contamination | EPA has suggested that it not be stored at the facility | Improper storage<br><br>Human error with batch handling<br><br>Failed seal in storage bay | **Environment**<br>Failure in waste treatment of surrounding batches (unwanted reactions)<br><br>Release of PFAS through solid waste batches or contaminated water to leachate system | Possible | Minor | Medium | Rare | Minor | Low | PFAS levels are already minimal (contamination would be a residual amount) - eliminated through restricted levels of PFAS accepted at facility<br><br>OTMP - waste scheduling | | Rare | Minor | Low | Rare | Minor | Low | | | Hi-Quality confirmed that all contaminated soils will go to a regulated landfill |
| 46 | [Compartment 1 - Existing Warehouse] Bay G (Bulk Soil) | Toxic solid | Soil spill | Soils first stored here for initial physical screening then transferred to more specific bays<br><br>Environmental consequences for:<br>Soil: TPH, TRH, BTEXN, coal tar, CCA, BaP, Phenol, AC, heavy metals (Pb, Cr, Cu, As, Ni, Cd, Hg, Se, Ag)<br><br>Similar to immobilisation soil spill | Improper operation of physical screening process<br><br>Inaccurate discharge / filling of waste trucks | **Environment**<br>Release of mixed contaminant leachate | Possible | Minor | Medium | Rare | Minor | Low | Stockpile size limits<br><br>Push walls in bays give minimum 1 m clearance<br><br>Operator induction of shear mixer / heavy equipment (OWMP) | Leachate system<br><br>OEMP - spill beyond bay (incident procedures)<br><br>PPE for personnel | Possible | Slight | Low | Rare | Minor | Low | | | Solid soil spills were noted by Hi-Quality to be a part of normal operation, however, these breaches occurred in a minor amount that do not present a signifcant safety hazard. The solid nature of the waste and the location within the enclosed warehouse does not provide a logical pathway for release to the environment. |

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| 47 | [Compartment 1 - Existing Warehouse] Bay G (Bulk Soil) | Incompatible Mixing | Cross-Contamination | Similar to immobilisation mixing of contaminated waste | Improper operation of physical screening process<br><br>Inaccurate discharge / filling of waste trucks<br><br>Degradation of bay lining | **Environment**<br>Reduction of specific waste treatment effectiveness due to new contaminants | Possible | Slight | Low | Unlikely | Minor | Low | Types of soil waste (non-hazardous and similar possible contaminant)<br><br>Decontamination procedure<br><br>Individual testing and treatment design for batches<br><br>OWMP - management requirements<br><br>Overseen by supervior (visual inspection) | Testing post-treatment to verify conformity to waste regulations, if unacceptable further treatment is performed | Unlikely | Slight | Low | Rare | Slight | Low | | | |
| 48 | [Compartment 1 - Existing Warehouse] Reagent Storage | Incompatible Mixing | Different reagent spills | EPA specifically requests consideration of the stored reagents on site and the environmental controls<br><br>Liquids stored in IBCs<br><br>Powders stored in bags<br><br>List of hazardous reagents present: Ferrous sulphate (Aquatic), Aluminium sulphate (Aquatic, cell mutagen), HCl, Caustic Soda, Decon 90 | Human error - waste truck, heavy machinery, on-foot collision<br><br>Improper / degradation of packaging | **Safety**<br>Harm to personnel (skin, eye, respitory, carcinogenic)<br><br>Corrosion/damage to bunding<br><br>Unwanted reactions<br><br>**Environment**<br>Release of undiluted chemicals to waterways (danger to aquatic life) | Unlikely | Severe | Medium | Rare | Severe | Low | OEMP stating segregation according to Australian guidelines<br><br>Operator training / handling procedures | Spill kits<br><br>Fire extinguishers<br><br>Specific bunding isolating reagent storage from warehouse floor<br><br>Leachate diversion system<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 49 | [Compartment 1 - Existing Warehouse] Dewatering | Toxic fluid | Leachate release | Similar to sludge spill | Overflow of detwatering equipment<br><br>Inaccurate discharge from feed tank / truck | **Safety**<br>Harm to personnel<br><br>Cross-contamination of waste batches<br><br>**Environment**<br>Release of untreated waste to sewer system | Unlikely | Severe | Medium | Unlikely | Severe | Medium | Enclosed pump system<br><br>Supervisor observing treatment | Bunding within main warehouse floor (OEMP)<br><br>Leachate system to WWTP<br><br>OEMP emergency / spill response<br><br>PPE for personnel | Unlikely | Severe | Medium | Unlikely | Severe | Medium | | | Hi-Quality acknowledges the higher risk associated with this piece of equipment due to the higher quantity of liquid waste and the proximity of the unit to the facility entrance. |
| 50 | [Compartment 1 - Existing Warehouse] General | Compliance / STDS | Floor degradation | Similar to leachate system loss of mechanical integrity | Waste / reagent trucks<br><br>Internal use of heavy machinery | **Safety**<br>Uneven surfaces disrupting machinery operation leading to loss of containment of waste materials<br><br>Harm to personnel (trips / injury)<br><br>Build up of contaminated material in cracks / faults | Probable | Slight | Medium | Probable | Slight | Medium | Regular inspections / maintenance program (OEMP)<br><br>Visual inspections | | Rare | Slight | Low | Rare | Slight | Low | | | |
| 51 | [Compartment 1 - Existing Warehouse] General | Compliance / Regs | Acceptance of asbestos contaminated materials | Similar to immobilisation contaminant | Incorrect generator certificate<br><br>Human error mixing up batches<br><br>Cross-contamination during transport | **Safety**<br>Harm to personnel (inhalation - e.g., dusting during sieving, aeration for bioremediation)<br><br>**Environment**<br>Release of asbestos for landfill | Probable | Severe | Medium | Rare | Minor | Low | Work conducted with trusted / known / reputable suppliers<br><br>Visual inspection | Water supression for dust<br><br>PPE for personnel | Unlikely | Minor | Low | Rare | Minor | Low | | | Hi-Quality confirmed that waste generators are required to provide a detailed waste analysis prior to acceptance of the waste on site and if unnacceptable waste (*i.e.* , asbestos) is discovered, the waste is returned and incident recorded in the rejected wastes register. |

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| 52 | [Compartment 1 - Existing Warehouse] General | Compliance / Regs | Noise Pollution | EPA has specifically outlined inadequacies in addressing the generated noise from the facility | Heavy machinery operation<br><br>Treatment equipment operation | **Safety**<br>Long term health effects for employees<br><br>Distruption to nearby recreational / industrial businesses | Possible | Slight | Low | Possible | Slight | Low | Built in an industrialised area | Enclosed warehouse<br><br>OEMP has noise and vibration management plan (working hours, practices to minimise)<br><br>PPE for personnel | Unlikely | Slight | Low | Unlikely | Slight | Low | | | |
| 53 | [Compartment 1 - Existing Warehouse] General | Natural and Environmental hazards (effect on surroundings) | Natural Events (Flooding) | EPA has specifically requested further insight into the leachate and water management infrastructure | High rainfall<br><br>Crack in the roof | **Safety**<br>Cross-contamination of waste loads<br><br>Unwanted reactions<br><br>Harm to personnel<br><br>**Environment**<br>Excess leachate released into natrual waterways/sewer system<br><br>Harm to nearby ecosystem | Rare | Severe | Low | Rare | Severe | Low | Building built to Australian standards<br><br>Reagents stored above flood level<br><br>Entire facility is above the 1 in 500 flood level | Bunding of warehouse floor<br><br>WWTP / leachate system filter / storage tanks | Rare | Severe | Low | Rare | Severe | Low | | | |
| 54 | [Compartment 1 - Existing Warehouse] General | Corrosive substances | Comprimise of bunding (Mechanical / Corrosion) | EPA has specifically requested further insight into the leachate and water management infrastructure | Collision of heavy machinery / waste trucks<br><br>Exposure to waste treatment loads / reagents | **Environment**<br>Release of leachate beyond bay designation<br><br>Cross-contamination of waste loads | Rare | Slight | Low | Unlikely | Minor | Low | Regular maintenance checks | Double bunding (pits and facility) | Rare | Slight | Low | Rare | Minor | Low | | | |
| 55 | [Compartment 1 - Existing Warehouse] General | Compliance / STDS | Pit Decontaminati on | Addressing the risk of repeated contact with Decon90 while decontaminating waste pits | Consistent use of Decon90 use | **Safety**<br>Harm to personnel<br><br>**Environment**<br>Release of undiluted solution to waterways | Possible | Minor | Medium | Rare | Minor | Low | Small quantities handled<br><br>OEMP - inductions and site management | Safety showers and personal deconamination<br><br>PPE used during decontamination procedure | Rare | Minor | Low | Rare | Minor | Low | | | |
| 56 | [Compartment 2 - WWTP] Holding Tanks (4 x 135 KL) | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: TPH, PAH, heavy metals, organics PFAS Liquid waste<br><br>Similar to sludge spill | Inaccurate unloading of waste truck<br><br>Leak in tank<br><br>Overflow of tank<br><br>Pump failure | **Safety**<br>Harm to personnel (saturation with liquid waste)<br><br>**Environment**<br>Mixing of liquid waste batches<br><br>Contamination of drill mud<br><br>Partial flooding of compartment 1<br><br>Leak to outside of building confines (soil / waterways / groundwater) | Possible | Severe | Medium | Unlikely | Severe | Medium | All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Training / use of trusted transport operators<br><br>Maintenance checks on tank integrity | Bunding (OEMP) (for WWTP and Compartment 1)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Unlikely | Severe | Medium | Unlikely | Severe | Medium | Classify disposal protocols for liquid waste spillages within WWTP. Define if recirculation through the system or pumping out and disposal off site is required<br><br>Clarify the connection of the leachate retrieval system to the WWTP holding tanks. Any leachate returned from Compartment 1 must be treated in the PFAS line due to the potential for contamination from the stored soil. | Arcadis on behalf of Hi-Quality | Bunding of WWTP accounts for 110% of the volume of the largest vessel in the WWTP<br><br>Batch process with manual controls for pumps (< 1 hr)<br><br>Hi-Quality and Arcadis commented on the possibility of trucks to draw waste liquid out and dispose offsite to licensed facilities in the event of a loss of containment. |

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| 57 | [Compartment 2 - WWTP] Coalescing Plate Oil Separator | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: TPH, PAH, heavy metals, organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | Overflow of separator<br><br>High / uncontrolled inflow<br><br>Machinery malfunction | **Safety** Harm to personnel (saturation with liquid waste)<br><br>**Environment** Mixing of liquid waste batches<br><br>Leak to outside of building confines (soil/ waterways / groundwater) | Possible | Severe | Medium | Possible | Severe | Medium | Supporting supervisor<br><br>Equipment alarms<br><br>Visual inspection during operation<br><br>OWMP protocol and operator training<br><br>Maintenance checks on equipment | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>PPE for personnel | Unlikely | Severe | Medium | Unlikely | Severe | Medium | | | |
| 58 | [Compartment 2 - WWTP] Coalescing Plate Oil Separator | Toxic fluid | Separation of oil<br><br>(Oil spill) | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | High inflow<br><br>Machinery malfunction | **Safety** Oil overflow and potential ignition source<br><br>Harm to personnel (saturation with liquid waste, inhalation)<br><br>**Environment** Leak to outside of building confines (soil / waterways / groundwater)<br><br>Release fumes / odours | Unlikely | Minor | Low | Unlikely | Minor | Low | Dual operation team<br><br>Equipment alarms<br><br>Visual inspection during operation<br><br>OWMP protocol and operator training<br><br>Maintenance checks on equipment | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | | | Stored in 1 kL IBC<br><br>Hi-Quality commented that the potential volume of oil will be low mitigating some of the risk, however, the concentrated nature of the removed oil still presents an inherent risk. |
| 59 | [Compartment 2 - WWTP] Coalescing Plate Oil Separator | Open Flame | Fire / Ignition | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | Machinery malfunction<br><br>External ignition source (operator, office) against protocol | **Safety** Harm to personnel<br><br>Damage to equipment<br><br>**Environment** Release of hazardous vapours / fumes<br><br>Pollution of local air quality spreading to nearby residential, commerical, and recreational facilities<br><br>Spread to compartment 1 waste piles | Rare | Severe | Low | Rare | Minor | Low | Fire wall enclosing compartments<br><br>Fire shutter | OEMP - Fire reel, extinguisher<br><br>PPE for personnel | Rare | Severe | Low | Rare | Minor | Low | | | |
| 60 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: heavy metals, organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | Overflow from incoming waste stream<br><br>Overflow from incoming dosing agents<br><br>Overmixing of system | **Safety** Harm to personnel (saturation with liquid waste)<br><br>**Environment** Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 61 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Incompatible Mixing | Incompatable mixing | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Addition of incorrect additives or incorrect quantities which may cause undesirable reactions | Human error<br><br>Treatment miscalculation<br><br>Improper labelling / confusion of reagents | **Safety** Unwanted reactions (heat generation, toxic vapour generation)<br><br>**Environment** Unreacted waste moving through treatment process | Possible | Minor | Medium | Rare | Minor | Low | Dilute acid / caustic reagent<br><br>Relative volume of liquid waste compared to added reagents<br><br>OWMP - treatment protocols | PPE for personnel | Unlikely | Minor | Low | Rare | Minor | Low | | | |

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| 62 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Toxic fluid | Hydrochloric acid (37 wt.%) spill | Hazardous<br>Corrosive 1, Skin 1, Eye 1, Organ 3<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | Pump malfunction<br><br>Leak in piping | **Safety**<br>Harm to personnel<br><br>Damage to equipment<br><br>**Environment**<br>Improper dosing and incomplete treatment of waste water<br><br>Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Rare | Minor | Low | Use of relatively dilute acid<br><br>OWMP - Mixing protocols / Operator training<br><br>Regular maintenance checks on pumps (preventative maintenance to change diaphrams)<br><br>Isolation valves on processing lines<br><br>Dual operation team<br><br>Plant operators carry a two-way radio at all times | Bunding of WWTP (OEMP)<br><br>Emergency shower<br><br>PPE for personnel | Unlikely | Severe | Medium | Rare | Minor | Low | Update preventative maintenance plan for HCl diaphragm pump in the OEMP | Arcadis on behalf of Hi-Quality | Hi-Quality and Arcadis confirmed that all transport of liquid waste occurs within the site boundary or the enclosed facility. Hence, any leakage as a result of wear or malfunction of pumps or breach of piping will be contained onsite within the capture range of the leachate system. |
| 63 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Toxic fluid | Caustic soda (30 wt.%) spill | Hazardous<br>Corrosive 1, Skin 1A, Eye 1<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | Pump malfunction<br><br>Leak in piping | **Safety**<br>Harm to personnel<br><br>Damage to equipment<br><br>**Environment**<br>Improper dosing and incomplete treatment of waste water<br><br>Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Rare | Minor | Low | Use of relatively dilute base<br><br>OWMP - Mixing protocols / Operator training<br><br>Regular maintenance checks on pumps (preventative maintenance to change diaphrams)<br><br>Isolation valves on processing lines<br><br>Dual operation team<br><br>Plant operators carry a two-way radio at all times | Bunding of WWTP (OEMP)<br><br>Emergency shower<br><br>PPE for personnel | Unlikely | Severe | Medium | Rare | Minor | Low | Update preventative maintenance plan for caustic soda diaphragm pump in the OEMP | Arcadis on behalf of Hi-Quality | Hi-Quality and Arcadis confirmed that all transport of liquid waste occurs within the site boundary or the enclosed facility. Hence, any leakage as a result of wear or malfunction of pumps or breach of piping will be contained onsite within the capture range of the leachate system. |
| 64 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Toxic solid | Aluminium sulfate (28 wt.%) spill | Hazardous<br>Skin 1A, Eye 1, Oral 4, Cell Mutagenicity 2, Aquatic 2<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | Mishandling of 20 kg by operator | **Safety**<br>Harm to personnel<br><br>**Environment**<br>Environmental impact on aquatic life if released to water ways<br><br>Improper dosing and incomplete treatment of waste water<br><br>Pollution of soil, groundwater and local waterways | Rare | Minor | Low | Rare | Minor | Low | Maximum limits of reagents transported (OEMP) | Scrubber / HVAC system<br><br>Spill kits (OEMP)<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | Draft handling and transport procedures for mixing tank reagents in the the OEMP | Arcadis on behalf of Hi-Quality | |
| 65 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Toxic fluid | Polymer spill | Polymer not specified<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | Mishandling of 20 kg by operator | **Need further polymer details**<br><br>**Improper dosing and incomplete treatment of waste water** | Rare | Minor | Low | Rare | Minor | Low | Maximum limits of reagents transported (OEMP) | Scrubber / HVAC system<br><br>Spill kits (OEMP)<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | Draft handling and transport procedures for mixing tank reagents in the the OEMP<br><br>Update mixing tank procedure to include polymer type in OEMP | Arcadis on behalf of Hi-Quality | |

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| 66 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Toxic solid | Activated carbon spill | Non-hazardous<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | Mishandling of 20 kg by operator | **Safety**<br>Formation of combustible carbon cloud - fire / ignition<br><br>**Environment**<br>Improper dosing and incomplete treatment of waste water | Unlikely | Severe | Medium | Rare | Minor | Low | Running of air operated pumps, no electric motors reducing ignition sources<br><br>Downstream equipment using AC to further treat relevant contaminants preventing environmental impacts | Scrubber / HVAC system<br><br>PPE for personnel | Rare | Severe | Low | Rare | Minor | Low | Draft handling and transport procedures for mixing tank reagents in the the OEMP<br><br>Include action in the OEMP to cease operation of WWTP in the case of an activated carbon spill | Arcadis on behalf of Hi-Quality | |
| 67 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Toxic solid | Magnesium oxide spill | Non hazardous<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | Mishandling of 20 kg by operator | **Environment**<br>Improper dosing and incomplete treatment of waste water<br><br>Potential to alter nearby soil conditions and effect ecosystems | Rare | Minor | Low | Rare | Minor | Low | Maximum limits of reagents transported (OEMP) | Scrubber / HVAC system<br><br>Spill kits (OEMP)<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | Draft handling and transport procedures for mixing tank reagents in the OEMP | Arcadis on behalf of Hi-Quality | |
| 68 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Toxic solid | Ferrous sulfate spill | Hazardous (Oral 4, Skin 2, Eye 2A, Aquatic 2)<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | Mishandling of 20 kg by operator | **Environment**<br>Improper dosing and incomplete treatment of waste water | Rare | Minor | Low | Rare | Minor | Low | Maximum limits of reagents transported (OEMP) | Scrubber / HVAC system<br><br>Spill kits (OEMP)<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | Draft handling and transport procedures for mixing tank reagents in the OEMP | Arcadis on behalf of Hi-Quality | |
| 69 | [Compartment 2 - WWTP] Mixing Tank (50 KL - Batch) | Compliance / Regs | Incomplete waste treatment | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for:<br>Liquid waste: heavy metals, organics<br>PFAS Liquid waste | Malfunction of dosing system<br><br>Unknown contaminants<br><br>Incorrect generator certificate<br><br>Incorrect initial site testing | **Safety**<br>Damage to downstream equipment<br><br>**Environment**<br>Pollution of soil, groundwater and local waterways | Rare | Slight | Low | Possible | Severe | Medium | Operator training on treatment protocols (OEMP)<br><br>Maintenance of pumps | Treated water sampled prior to discharge with any unacceptable liquid wastes recirculated for further treatment<br><br>Discharge to sewage is then further treated by an offsite treatment plant before discharge to environment | Rare | Slight | Low | Rare | Minor | Low | | | Hi-Quality confirmed that all waste must meet tradewaste agreement criteria for discharge |
| 70 | [Compartment 2 - WWTP] Clarifier | Toxic fluid | Wastewater spill | Gravity settling<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for:<br>Liquid waste: organics<br>PFAS Liquid waste<br><br>Similar to holding tank wastewater spill<br>Check personnel placement and leachate system | High inflow | **Safety**<br>Harm to personnel (saturation with liquid waste)<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment**<br>Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 71 | [Compartment 2 - WWTP] Clarifier | Toxic solid | Contaminants (solids) | Gravity settling<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | High inflow | **Safety**<br>Solid particulates carried through system clogging downstream filtration equipment or overflowed onto WWTP floor<br><br>Slips / falls | Possible | Minor | Medium | Rare | Slight | Low | Daily decontamination of WWTP floor (OWMP)<br><br>Solids management outlined in OWMP | Bunding of WWTP (OEMP)<br><br>PPE for personnel | Unlikely | Minor | Low | Rare | Slight | Low | | | |

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| 72 | [Compartment 2 - WWTP] Sand & Carbon (MMF) | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | High inflow<br><br>Blockage / pressure build-up | **Safety** Harm to personnel (saturation with liquid waste)<br><br>Damage to equipment<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment** Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 73 | [Compartment 2 - WWTP] Sand & Carbon (MMF) | Toxic solid | Filtration Media Spill | Sand and activated carbon (non-hazardous)<br><br>Glass beads instead of sand filters<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | High inflow<br><br>Blockage / pressure build-up<br><br>Media Exchange | **Safety** Harm to personnel | Unlikely | Slight | Low | Rare | Slight | Low | Maintenance checks on piping and process unit integrity<br><br>OWMP operating protocols | PPE for personnel | Unlikely | Slight | Low | Rare | Slight | Low | Outline protocol in the OWMP for the exchange of filtration media for MMF process unit | Arcadis on behalf of Hi-Quality | |
| 74 | [Compartment 2 - WWTP] Plate Filter Press | Toxic fluid | Wastewater spill | Batch - used for some compartment 1 treatments?<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | High inflow<br><br>Poor equipment sealing<br><br>System blockage | **Environment** Release of leachate in solids disposal | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | Hi-Quality commented that low level quantity of waste in each treatment batch and does not present a safety hazard |
| 75 | [Compartment 2 - WWTP] VCZ Mechanical and IE Filtration | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | High inflow<br><br>System blockage / pressure build-up | **Safety** Harm to personnel (saturation with liquid waste)<br><br>Damage to equipment<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment** Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 76 | [Compartment 2 - WWTP] VCZ Mechanical and IE Filtration | Toxic solid | VCZ Spill | Non-hazardous<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | High inflow<br><br>System blockage / pressure build-up<br><br>Media exchange | **Safety** Harm to personnel | Unlikely | Slight | Low | Rare | Slight | Low | OWMP operating protocols | PPE for personnel | Unlikely | Slight | Low | Rare | Slight | Low | Outline protocol in the OWMP for the exchange of filtration media for VCZ and IE process unit | Arcadis on behalf of Hi-Quality | Hi-Qualty confirmed that media is wet from WWTP so inhalation / particulates are not considered |

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| 77 | [Compartment 2 - WWTP] GAC Adsoprtion Filtration | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | High inflow<br><br>System blockage / pressure build-up | **Safety** Harm to personnel (saturation with liquid waste)<br><br>Damage to equipment<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment** Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 78 | [Compartment 2 - WWTP] GAC Adsoprtion Filtration | Toxic solid | Activated Carbon Spill | Non-hazardous<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | High inflow<br><br>System blockage / pressure build-up<br><br>Media exchange | **Safety** Damage to equipment<br><br>**Environment** Ineffective filtration of incoming liquid waste | Unlikely | Slight | Low | Rare | Slight | Low | OWMP operating protocols | PPE for personnel | Unlikely | Slight | Low | Rare | Slight | Low | Outline protocol in the OWMP for the exchange of filtration media for GAC adsorption filtration process unit | Arcadis on behalf of Hi-Quality | Hi-Qualty confirmed that media is wet from WWTP so inhalation / particulates are not considered |
| 79 | [Compartment 2 - WWTP] Coconut GAC Adsorption | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | High inflow<br><br>System blockage / pressure build-up | **Safety** Harm to personnel (saturation with liquid waste)<br><br>Damage to equipment<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment** Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 80 | [Compartment 2 - WWTP] Coconut GAC Adsorption | Toxic solid | Activated Carbon Spill | Non-hazardous<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | High inflow<br><br>System blockage / pressure build-up | **Safety** Damage to equipment<br><br>**Environment** Ineffective filtration of incoming liquid waste | Unlikely | Slight | Low | Rare | Slight | Low | OWMP operating protocols | PPE for personnel | Unlikely | Slight | Low | Rare | Slight | Low | Outline protocol in the OWMP for the exchange of filtration media for coconut GAC adsorption filtration process unit | Arcadis on behalf of Hi-Quality | Hi-Qualty confirmed that media is wet from WWTP so inhalation / particulates are not considered |
| 81 | [Compartment 2 - WWTP] Weak Base Anion Exchange | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | High inflow<br><br>System blockage / pressure build-up | **Safety** Harm to personnel (saturation with liquid waste)<br><br>Damage to equipment<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment** Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |

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| 82 | [Compartment 2 - WWTP] Weak Base Anion Exchange | Toxic solid | Resin spill | Need to further define ion exchange<br><br>2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | High inflow<br><br>System blockage / pressure build-up<br><br>Media exchange | **Environment**<br>Ineffective filtration of incoming liquid waste | Unlikely | Slight | Low | Rare | Slight | Low | OWMP operating protocols | PPE for personnel | Unlikely | Slight | Low | Rare | Slight | Low | Outline protocol in the OWMP for the exchange of filtration media for weak base anion exchange process unit<br><br>Update weak base anion exchange procedure to include resin type in the OEMP | Arcadis on behalf of Hi-Quality | Hi-Qualty confirmed that media is wet from WWTP so inhalation / particulates are not considered<br><br>Polymer resin (plastic beads), different affinities for different contaminants |
| 83 | [Compartment 2 - WWTP] Kinetic GAC Adsorption | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | High inflow<br><br>System blockage / pressure build-up | **Safety**<br>Harm to personnel (saturation with liquid waste)<br><br>Damage to equipment<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment**<br>Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 84 | [Compartment 2 - WWTP] Kinetic GAC Adsorption | Toxic solid | Activated Carbon Spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids | High inflow<br><br>System blockage / pressure build-up | **Safety**<br>Damage to equipment<br><br>**Environment**<br>Ineffective filtration of incoming liquid waste | Unlikely | Slight | Low | Rare | Slight | Low | OWMP operating protocols | PPE for personnel | Unlikely | Slight | Low | Rare | Slight | Low | Outline protocol in the OWMP for the exchange of filtration media for kinetic GAC adsorption process unit | Arcadis on behalf of Hi-Quality | Hi-Qualty confirmed that media is wet from WWTP so inhalation / particulates are not considered |
| 85 | [Compartment 2 - WWTP] Holding Tank / Trade Waste Discharge | Toxic fluid | Wastewater spill | 2 sets of each equipment - one for PFAS liquids and one for non-PFAS liquids<br><br>Environmental consequences for: Liquid waste: organics PFAS Liquid waste<br><br>Similar to holding tank wastewater spill Check personnel placement and leachate system | High inflow<br><br>Leak in tank<br><br>Human error - release timing | **Safety**<br>Harm to personnel (saturation with liquid waste)<br><br>Damage to equipment<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment**<br>Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Unlikely | Severe | Medium | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |
| 86 | [Compartment 2 - WWTP] Screw Press | Toxic fluid | Wastewater spill | Used for by-products of wastewater treatment process. Dewatered material either sent for landfill or treated further using bulk soils methodology | High inflow<br><br>Poor equipment sealing | **Safety**<br>Harm to personnel (saturation with liquid waste)<br><br>Damage to equipment<br><br>Compromise of Compartment 1 boundary and contamination of waste piles<br><br>**Environment**<br>Pollution of soil, groundwater and local waterways | Possible | Minor | Medium | Unlikely | Slight | Low | Dual operation team<br><br>All tanks include overflow protection and alarms (OEMP)<br><br>Visual inspection during loading / operation<br><br>Operator training<br><br>Maintenance checks on tank integrity | Bunding of WWTP (OEMP)<br><br>OEMP emergency / spill response<br><br>Isolation of processing line with valves<br><br>PPE for personnel | Rare | Severe | Low | Rare | Severe | Low | | | |

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| 87 | [Compartment 2 - WWTP] Reagent Storage | Incompatible Mixing | Reagent spills | Reagent storage for excess filter media and other dosing chemicals in use (excl. HCl and caustic soda)<br><br>Hazardous:<br>Aluminium sulphate, polymer, ferrous sulphate | Compromise of packaging<br><br>Human error / mishandling | **Safety**<br>Harm to personnel (skin, eye, respitory)<br><br>Unwanted reactions<br><br>Corrosion/damage to bunding<br><br>**Environment**<br>Release of undiluted chemicals to soil / groundwater / waterways (danger to aquatic life) | Possible | Severe | Medium | Rare | Severe | Low | OEMP stating segregation according to Australian guidelines | Spill kits<br><br>Fire extinguishers<br><br>Spill training<br><br>Bunding of WWTP<br><br>Leachate system<br><br>PPE for personnel | Unlikely | Severe | Medium | Rare | Severe | Low | | | |
| 88 | [Compartment 2 - WWTP] Reagent Storage | Toxic fluid | Hydrochloric acid (37 wt.%) spill | Hazardous<br>Corrosive 1, Skin 1, Eye 1, Organ 3 | Pump malfunction<br><br>Leak from IBC | **Safety**<br>Harm to personnel<br><br>**Environment**<br>Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Rare | Minor | Low | Use of relatively dilute acid<br><br>OWMP - Mixing protocols / Operator training<br><br>Regular maintenance checks on pumps (preventative maintenance to change diaphrams)<br><br>Isolation valves on processing lines<br><br>Dual operation team<br><br>Plant operators carry a two-way radio at all times | Bunding of WWTP<br><br>Emergency shower<br><br>PPE for personnel | Unlikely | Severe | Medium | Rare | Minor | Low | | | Hi-Quality and Arcadis confirmed that all transport of liquid waste occurs within the site boundary or the enclosed facility. Hence, any leakage as a result of wear or malfunction of pumps or breach of piping will be contained onsite within the capture range of the leachate system. |
| 89 | [Compartment 2 - WWTP] Reagent Storage | Toxic fluid | Caustic soda (30 wt.%) spill | Hazardous<br>Corrosive 1, Skin 1A, Eye 1 | Pump malfunction<br><br>Leak from IBC | **Safety**<br>Harm to personnel<br><br>**Environment**<br>Pollution of soil, groundwater and local waterways | Possible | Severe | Medium | Rare | Minor | Low | Use of relatively dilute base<br><br>OWMP - Mixing protocols / Operator training<br><br>Regular maintenance checks on pumps (preventative maintenance to change diaphrams)<br><br>Isolation valves on processing lines<br><br>Dual operation team<br><br>Plant operators carry a two-way radio at all times | Bunding of WWTP<br><br>Emergency shower<br><br>PPE for personnel | Unlikely | Severe | Medium | Rare | Minor | Low | | | Hi-Quality and Arcadis confirmed that all transport of liquid waste occurs within the site boundary or the enclosed facility. Hence, any leakage as a result of wear or malfunction of pumps or breach of piping will be contained onsite within the capture range of the leachate system. |
| 90 | [Compartment 2 - WWTP] Filtration Disposal | Toxic solid | Spent filtration media spill | EPA is concerned with the disposal and storage of spent filtration media (specifically GAC and VCZ) | Improper handling - human error<br><br>Compromise of IBC tank | | Unlikely | Slight | Low | Rare | Slight | Low | Segregation of media in different drums based on treatment stage<br><br>Operators forklift certified (enter through truck bay) | Spill kits<br><br>PPE for personnel | Rare | Slight | Low | Rare | Slight | Low | Include detailed disposal protocol of spent filtration media in the OEMP | Arcadis on behalf of Hi-Quality | Hi-Quality confirmed the need for testing of filtration media prior to disposal<br><br>Storage with other reagents |
| 91 | [Compartment 2 - WWTP] General | Natural and Environmental hazards (effect on surroundings) | Natural Events (Flooding) | Closed or open tanks in use? | High rainfall<br><br>Compromise of facility roofing | **Safety**<br>Compromise of reagent packaging leading to exposure of personnel<br><br>**Environment**<br>Pollution of soil, groundwater and local waterways | Rare | Minor | Low | Rare | Minor | Low | Bunding preventing entry of water to WWTP<br><br>Reagents stored above flood level<br><br>Above ground tanks prevent contamination of flood water | Emergency response (OEMP)<br><br>PPE for personnel | Rare | Slight | Low | Rare | Slight | Low | | | |

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| 92 | [Compartment 3 - Packaged Waste]<br>Bay F<br>(Packaged Waste) | Compliance / Regs | Acceptance of dangerous goods waste | Packaged waste received of a different dangerous goods class (e.g., Class 3, 5, 6.1) | Unintended contamination<br><br>Mislabelled waste drums | **Safety**<br>Harm to personnel (flammable materials, toxic odours)<br><br>**Environment**<br>Pollution of air quality<br><br>Leak of liquid wastes beyond sote boundary and contamination of local waterways / entry into storm water system | Probable | Severe | Medium | Possible | Severe | Medium | Chemical analysis or an SDS for each packaged waste batch<br><br>Non-conforming protocols | | Rare | Severe | Low | Rare | Severe | Low | Adapt isolation protocol from Yatala for dangerous packaged waste received onsite. This includes storage and onsite testing of dangerous waste materials to confirm against received SDS / chemical analysis | Arcadis on behalf of Hi-Quality | Hi-Quality confirmed that the procedure at Yatala - testing upon receival to immediately determine if suitable for onsite storage<br><br>Hi-Quality commented that a degree of knowledge on the waste generator / waste material is required - is hazardous waste expected from this supplier, what physical / chemical qualities are expected for this waste type? A rejected waste register is also maintained to ensure the conformity of all suppliers |
| 93 | [Compartment 3 - Packaged Waste]<br>Bay F<br>(Packaged Waste) | Open Flame | Fire / Ignition | | Human error in vehicle handling<br><br>External ignition from laboratory or office | **Safety**<br>Harm to personnel (inhalation)<br><br>Release of toxic fumes (Escalated: Explosion)<br><br>**Environment**<br>Pollution of local air quality and potential odour spreading to nearby residential, commerical, and recreational facilities | Unlikely | Severe | Medium | Unlikely | Minor | Low | Fire walls<br><br>Hot works protocol<br><br>Staff inductions / training | Fogging suppression system (70%)<br><br>HVAC / Scrubber system<br><br>Fire hose reel, extinguisher (OEMP)<br><br>Emergency response plan<br><br>PPE for personnel | Rare | Severe | Low | Rare | Minor | Low | Confirm inclusion of fogging suppression system in the fire management plan | Arcadis on behalf of Hi-Quality | It was noted that industry incidents have been associated with flammable materials (hand sanitisers) |
| 94 | [Compartment 3 - Packaged Waste]<br>Bay F<br>(Packaged Waste) | Natural and Environmental hazards (effect on surroundings) | Natural Events (Flooding) | EPA specifically enquires as to storage of hazardous packaged waste | High rainfall<br><br>Compromise of facility roofing | **Safety**<br>Unwanted reactions<br><br>**Environment**<br>Cross-contamination of waste batches<br><br>Loss of containment through compromise of packaging<br><br>Pollution of soil, groundwater and local waterways | Rare | Minor | Low | Rare | Minor | Low | Hazardous waste stored in line with Australian guidelines<br><br>Stored above flood level (1 in 500 years) | | Rare | Minor | Low | Rare | Minor | Low | | | |
| 95 | [Compartment 3 - Packaged Waste]<br>Bay F<br>(Recovered Recyclables) | Incompatible Mixing | Contaminants | | Carry over contaminants from soil batches | **Safety**<br>Harm to personnel (arsenic timber)<br><br>Unwanted reaction<br><br>**Environment**<br>Release of contaminants to landfill for disposal | Unlikely | Minor | Low | Rare | Slight | Low | OEMP treatment protocols (physical screening)<br><br>Storage limit of 35 tonnes before removal (in line with fire safety guidelines)<br><br>Sampling of recovered material for contaminants (case-by-case basis) | PPE for personnel | Rare | Minor | Low | Rare | Slight | Low | | | Hi-Quality commented arsenic levels already lower than landfill limits for timber |

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| 96 | [Compartment 3 - Packaged Waste] Bay F (Recovered Recyclables) | Open Flame | Fire / Ignition | Wood from physical separation of soils | Heavy machinery<br><br>External ignition sources (office / laboratory) | **Safety**<br>Harm to personnel<br><br>Spread and ignition of flammable waste (Escalated: Explosion)<br><br>**Environment**<br>Pollution of local air quality spreading to nearby residential, commerical, and recreational facilities | Possible | Severe | Medium | Possible | Minor | Medium | Storage limit of 35 tonnes before removal (in line with fire safety guidelines)<br><br>OEMP fire safety protocol<br><br>Fire walls | Fogging suppression system (70%)<br><br>Enclosured / negative pressure of treatment facility (limits exposure)<br><br>Push walls minimum 1 m above stockpile height<br><br>HVAC / Scrubber system<br><br>Fire hose reel, extinguisher (OEMP)<br><br>Emergency response plan<br><br>PPE for personnel | Unlikely | Severe | Medium | Rare | Minor | Low | | | |
| 97 | [Compartment 3 - Packaged Waste] Shredder | Open Flame | Fire / Ignition | | Mechanical action of shredding<br><br>Malfunction of equipment<br><br>Failure of nearby heavy vehicles<br><br>Shredding of incorrect waste type | Safety<br>Harm to personnel (inhlation, burns)<br><br>**Environment**<br>Spreading to packaged waste and stored waste in compartment 1 resulting in ignition, release of toxic fumes (Escalated: Explosion), pollution of local air quality (high PM) spreading to nearby residential, commerical, and recreational facilities | Possible | Severe | Medium | Possible | Minor | Medium | Storage limit of 35 tonnes before removal (in line with fire safety guidelines)<br><br>OEMP fire safety protocol<br><br>Fire walls<br><br>Dual operation<br><br>Automatic shutdown interlocks / emergency stops<br><br>Thermal overloads for shredder | Fogging suppression system (70%)<br><br>Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>Fire hose reel, extinguisher (OEMP)<br><br>Emergency response plan<br><br>PPE for personnel | Rare | Severe | Low | Rare | Minor | Low | | | |
| 98 | [Compartment 3 - Packaged Waste] Shredder | Dynamic situation hazards | Projectiles | | Improper loading / overloading of shredder<br><br>Human error | **Safety**<br>Harm to personnel (injury, released waste exposure)<br><br>Damage to heavy machinery<br><br>**Environment**<br>Striking / damaging of packaged waste containers leading to loss of containment (solid / liquid waste) and release of untreated waste to stormwater system | Possible | Major | Medium | Rare | Slight | Low | Dual operation<br><br>Operator training to prevent overloading<br><br>Safe operating distance | PPE for personnel | Unlikely | Major | Medium | Rare | Slight | Low | Confirm if shredder covering has an interlock preventing operation of shredder while open | Hi-Quality | Discussion with Hi-Quality reagrding potential fatalities at this site and existing facilities (https://www.owhsp.qld.gov.au/court-report/waste-resource-company-fined-140000-after-worker-fatality). Hi-Quality felt the incident was not comparable to the proposed facility at Prestons. |
| 99 | [Compartment 3 - Packaged Waste] Shredder | Asphyxiates | Airborne particulate release | EPA requests environmental controls | Shredding of packaged materials | **Safety**<br>Harm to personnel (inhalation)<br><br>Cross-contamination of packaged waste | Possible | Minor | Medium | Possible | Slight | Low | Material choice for shredding doesn't form particulates<br><br>Cross checking of materials before shredding activity<br><br>Operator training (OEMP) - procedures, SOPs, training | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>PPE for personnel | Rare | Minor | Low | Rare | Slight | Low | | | |

| ID | Plant Area / Activity / Process Unit | ISO17776 Guideword (Prompt) | Event (Hazard) | Comments / Notes (Background Information / Regulator / Sherpa) | Cause | Consequence (Direct and Escalated) | L (Saf - UM) | C (Saf - UM) | RR (Saf - UM) | L (Env - UM) | C (Env - UM) | R (Env - UM) | Preventative Controls (Minimize potential loss of containment / impact) | Detection / Mitigation Controls (Maximize recovery from loss of containment / impact) | L (Saf) | C (Saf) | RR (Saf) | L (Env) | C (Env) | RR (Env) | Control Option/Action | Action Owner | Comments |
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| 100 | [Compartment 3 - Packaged Waste] Heavy Equipment | Incompatible Mixing | Cross-Contamination | Loaders and seives used for a number of different operations<br><br>Similar to immobilisation mixing of waste | Improper decontamination between uses | **Safety**<br>Impact to effectiveness of waste treatment procedures<br><br>Corrosion of equipment<br><br>Unwanted reactions | Possible | Slight | Low | Unlikely | Minor | Low | Types of soil waste (non-hazardous and similar contaminant compositions)<br><br>Decontamination procedure<br><br>Individual treatment of batches (treatment / storage)<br><br>OWMP - management requirements<br><br>Overseen by supervior (visual inspection) | Testing post-treatment to verify conformity to waste regulations, if unacceptable further treatment is performed | Unlikely | Slight | Low | Rare | Slight | Low | | | |
| 101 | [Compartment 3 - Packaged Waste] Heavy Equipment | Dynamic situation hazards | Loss of control of machinery / mobile plant | Occurances during treatment within compartment 1<br><br>EPA also noted this point | Human Error<br><br>Equipment Malfunction | **Safety**<br>Harm to personnel<br><br>Falling of vehicle into treatment pits<br><br>Cross-contamination of waste loads<br><br>Loss of containment for current treatment load<br><br>Damage to plant bunding | Possible | Severe | Medium | Rare | Slight | Low | Training protocols for machinery operation (OEMP)<br><br>Swept path analysis to determine manouverabilty of heavy machinery (Proposal description)<br><br>All operators carry two-way radios<br><br>Supervisors<br><br>Equipment maintenance program | Bunding of compartment 3<br><br>PPE for personnel | Unlikely | Severe | Medium | Rare | Slight | Low | | | Hi-Quality commented that collision is more of a risk than spilling of waste. |
| 102 | [Compartment 3 - Packaged Waste] Cement Silo | Toxic solid | Cementious spill | EPA specifically requests consideration of the stored cement on site and environmental controls<br><br>List of hazardous materials present<br>OCP, GGBFS (carcinogenic), PFA (carcinogenic, danger to aquatic life), CKD<br>Lime, Sodium silicate, organophilic clay, pozzolans (carcinogenic), bentonite | Human error - collision of heavy vehicle<br><br>Overflow / inaccurate filling of storage container | **Safety**<br>Harm to personnel (inhalation)<br><br>Contamination of packaged waste<br><br>**Environment**<br>Release of cementious particulates to surrounding area | Possible | Severe | Medium | Rare | Slight | Low | Bulk container transport when moving | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>OEMP spill response<br><br>PPE for personnel | Unlikely | Minor | Low | Rare | Slight | Low | | | |
| 103 | [Mechanical Room / HVAC System] | Toxic gas | Excess discharge / high velocity rates | OEMP Section 2.9 | Malfunction of HVAC system (electrical, maintenance)<br><br>Damage due to road impact | **Safety**<br>Build up of particulates and fumes presenting a potential for harm to personnel in the warehouse<br><br>Harm to the nearby community<br><br>**Environment**<br>Further spread of particlate matter, fumes/vapors, odorous cloud to nearby residential, commercial, and recreational sites | Possible | Severe | Medium | Possible | Severe | Medium | Area is protected within light vehicle carpark<br><br>Bollards in front of HVAC room<br><br>Protocol to stop site operation (any odour or gas generating activity) if HVAC / Scrubber is compromised<br><br>Monthly exchange of filters (1 - 2 hrs to exchange) | Self-contained warehouse for fumes / pollutants / particulates<br><br>Air quality management plan<br><br>PPE for personnel | Unlikely | Severe | Medium | Unlikely | Severe | Medium | Confirm that stop operation protocol is included in the emergency response as outlined in the OEMP.<br><br>Revise Air Quality Impact Assessment (AQIA) to provide clarification regarding the ventilation system design and assessment of ventilation flowrates and discharge velocities. | Arcadis on behalf of Hi-Quality | Hi-Quality acknowledged that this is an acceptable risk to warehouse personnel given the current waste piles still need to be maintained even when the acceptance of new waste has been halted. |

| ID | Plant Area / Activity / Process Unit | ISO17776 Guideword (Prompt) | Event (Hazard) | Comments / Notes (Background Information / Regulator / Sherpa) | Cause | Consequence (Direct and Escalated) | L (Saf - UM) | C (Saf - UM) | RR (Saf - UM) | L (Env - UM) | C (Env - UM) | R (Env - UM) | Preventative Controls (Minimize potential loss of containment / impact) | Detection / Mitigation Controls (Maximize recovery from loss of containment / impact) | L (Saf) | C (Saf) | RR (Saf) | L (Env) | C (Env) | RR (Env) | Control Option/Action | Action Owner | Comments |
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| 104 | [Mechanical Room / HVAC System] | Asphyxiates | Discharge of pollutant particulates / polluting fumes | EPA notes arsenic and chromium specifically | Filter failure with HVAC system<br><br>Malfunction of HVAC system | **Safety**<br>Build up of particulates and fumes presenting a potential for harm to personnel in the warehouse<br><br>Harm to the nearby community<br><br>**Environment**<br>Pollution of local air quality spreading to nearby residential, commerical, and recreational facilities | Probable | Minor | Medium | Possible | Severe | Medium | Testing by independent consultants (3 months) to ensure conformity with EPL<br><br>Protocol to stop site operation (any odour or gas generating activity) if HVAC / Scrubber is compromised<br><br>Monthly exchange of filters (1 - 2 hrs to exchange) | Self-contained warehouse for fumes / pollutants / particulates<br><br>Air quality management plan<br><br>PPE for personnel | Unlikely | Minor | Low | Unlikely | Severe | Medium | Confirm that stop operation protocol is included in the emergency response as outlined in the OEMP.<br><br>Revise Air Quality Impact Assessment (AQIA) to provide clarification regarding the ventilation system design and assessment of ventilation flowrates and discharge velocities. | Arcadis on behalf of Hi-Quality | Hi-Quality commented on the presence of arsenic and chrominum as minor contaminants within the soils for immobilisation. |
| 105 | [Office] | Open Flame | Fire / Ignition | | Improper use of workplace appliances<br><br>Contraband personal items | **Safety**<br>Harm to personnel (burns, inhalation)<br><br>**Environment**<br>Spread and ignition of waste, pollution of local air quality spreading to nearby residential, commerical, and recreational facilities | Unlikely | Severe | Medium | Unlikely | Minor | Low | On-site protocols for unacceptable personal items<br><br>Fire walls<br><br>Operator / personnel training | Enclosured / negative pressure of treatment facility (limits exposure)<br><br>HVAC / Scrubber system<br><br>Fire walls<br><br>Fire hydrants<br><br>Fire response plan<br><br>Office protocols / fire wardens<br><br>PPE for personnel | Unlikely | Severe | Medium | Unlikely | Minor | Low | | | Hi-Quality confirmed that only non-flammable materials are to be stored onsite reducing the severity of any fires, however, the inherent risk of a fire is still acknowledged. |
| 106 | [Laboratory] | Compliance / Regs | False test results | | Cross-contamination of laboratory equipment<br><br>Sample non-representative of bulk waste batch<br><br>Improper technique | **Safety**<br>Distruption to waste treatment schedule (build-up in facility)<br><br>**Environment**<br>Incorrect treatment protocol, unwanted reactions, discharge of untreated waste (offsite or tradewaste)<br><br>Pollution of drainage system and waterways | Possible | Minor | Medium | Rare | Minor | Low | Scheduled waste delivery of known batches<br><br>Australian standards for testing protocols / waste verification<br><br>Lab technician training<br><br>Fume hood<br><br>Two qualified personnel on site (one actively working)<br><br>Verification / validation against incoming certificates / chemical analysis | Spill kits<br><br>Fire extinguishers<br><br>Emergency response plan (OEMP)<br><br>PPE for personnel | Rare | Minor | Low | Rare | Minor | Low | Update standards for laboratory testing in the OEMP based on EPL (once license received) | Arcadis on behalf of Hi-Quality | |

# APPENDIX E. HAZID WORKSHOP ACTION SUMMARY

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| 1. Add notification to generator of vehicles in an unmaintained state to the OEMP - Acceptance Protocol. | HAZID ID-2 | Arcadis on behalf of Hi-Quality | Arcadis proposes to add the following to OEMP Section 2.3.3 Waste receival<br>"Any truck in unmaintained state that may cause a risk of leaking will be assessed for safety to access the Facility and if required the operator of the vehicle will be notified to fix any leak risks prior to future bookings."<br><br>Arcadis proposes to add the following to OWMP Section 5.2.3.1 Weighbridge Operational requirements<br>"Any truck in unmaintained state that may cause a risk of leaking will be assessed for safety to access the Facility and if required the operator of the vehicle will be notified to fix any leak risks prior to future bookings." | OEMP<br>OWMP |
| 2. Confirm inclusion of rejected loads register as a part of the OEMP - Non-Conforming Waste Protocol. | HAZID ID-3 | Arcadis on behalf of Hi-Quality | The 'Weighbridge operator procedure' in the OWMP (Section 5.2.3.1) and the 'Waste receival' section of the OEMP (Section 2.3.3) mention the rejected loads register. A placeholder section of the report will be added to include an appendix for the rejected loads register. | OEMP |
| 3. Review number of vehicles stacked on site within Compartment 1 (Existing Warehouse). | HAZID ID-4 | Arcadis on behalf of Hi-Quality | The OTMP indicates up to 6 vehicles can be stored on-site at any one time either loading, unloading or waiting. Another four could be stored within the weighbridge if required. | OTMP |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| 4. Include notification to delivery services of flooding resulting in facility shutdown in OEMP. | HAZID ID-9 | Arcadis on behalf of Hi-Quality | The OEMP Appendix B Incident and Emergency Response to include the following (addition in bold):<br><br>In the event of a flood, the following procedure is to be followed:<br>• Establish access to up to date and credible information<br>• Alert and connect with staff<br>• Conduct an incident assessment and assess the potential for impact to the facility<br>• Evacuate if necessary – using the nearest safe exit<br>• Assemble at the relevant muster point in your area<br>• Notify any scheduled deliveries that booking will be cancelled due to flood event.<br>• Await further instructions. | OEMP |
| 5. Review number of waste/reagent delivery trucks daily to the facility. | HAZID ID-10 | Arcadis on behalf of Hi-Quality | Based on Yatala, on average two deliveries of reagents/ other products per a day are assumed. | |
| 6. Review noise pollution modelling and results to confirm if environmental standards are met. | HAZID ID-10 | Arcadis on behalf of Hi-Quality | The Noise Impact Statement (NIA) completed as part of the EIS concluded that the WTF operation does not exceed the PNTLs for the day, evening and night-time periods. | HAZID |
| 7. Define a protocol for unloaded contaminated drill muds and include in OEMP. | HAZID ID-20 | Arcadis on behalf of Hi-Quality | This is covered in the Drill Mud treatment procedure (Section 6.3.2 of the OWMP) | N/A |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| 8. Add an action to stop any maintenance/hot works activities near sludge pits (even when empty) in OWMP. Adapted from existing company wide Hi-Quality hot works protocol. | HAZID ID-31 | Hi-Quality | Reference to protocol will be included within Section 2.7 Fire Protection of the OEMP and protocol appended in the Appendix. | OEMP |
| 9. Clarify bioremediation treatment protocol, specifically if aeration occurs through pumps or is performed manually by a front end loader. | HAZID ID-39 | Hi-Quality | Hi-Quality has confirmed that it will be manual aeration in bioremediation protocol.<br><br>Note current wording in Section 6.2.1.3 is below. Wording would be changed to confirm manual aeration using below proposed deletion.<br><br>“The mobile soils screen will be used to sieve and aerate the soil as it is unloaded into the bioremediation bay.<br>Reagents will be dosed via an enclosed automated liquid dosing system and mixed to increase contact<br>Soils will be treated in biopiles with GORE cover system (or similar) with introduction of air by turning of soils for aeration. Water will be gently applied using methods such as sprinklers or misters and the stockpile aerated using a blower or turning of the material using the rotary mixer or excavator, should monitoring indicate that moisture and oxygen levels have fallen below optimal.<br>The temperature, moisture and oxygen content of the soil will be checked and, if at the correct levels (as per the Primary Treatment Procedure) a GORE cover (or similar) will be applied to the pile.<br>The material will be monitored in accordance with the SAQP and Primary Treatment Procedure to confirm that soil moisture, temperature and oxygen levels remain optimal during the treatment, until validation sampling has confirmed the bioremediation is complete.” | OWMP |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| 10. Confirm and document safe inhalation limits of PFAS compared to accepted contamination limits for landfill. | HAZID ID-44 | Arcadis on behalf of Hi-Quality | As per the PFAS National Environmental Management Plan (2020), the human health investigation levels or soil suggest that for industrial/commercial activities a PFOS + PFHxS level of 20 mg/kg and PFOA of 50 mg/kg are acceptable. The Facility would accept PFAS up to the restricted solid waste level which exceeds the human health level for PFOA (72 mg/kg).<br><br>A PFAS Contaminated Soil Procedure is included in Table 6-15. Spills Response is in OEMP Incident and Emergency Response as copied below<br><br>**Spills Response**<br>Spills at the Facility are most likely to involve fuel, hydraulic oil, engine oil spilled from plant items, though potentially paint and solvents may also be present.<br>If a chemical spill occurs, Hi-Quality's Hazardous Chemical Emergency Management Plan (SAF-M-13) will be followed:<br>• All work to cease in the affected area<br>• Check personnel safety<br>• Immediately identify the spilled material and notify the Site Manager. A Register and Safety Data Sheet (SDS) is kept for all hazardous substances kept at the workplace. Spill Kits are kept near chemical storage areas, bunded and refuelling areas, high trafficked areas, etc; and<br>• Any incidents on site which are likely to cause material hard to the environment are to be immediately reported to the Site Manager. | |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| 11. Classify disposal protocols for liquid waste spillages within WWTP. Define if recirculation through the system or pumping out and disposal off site is required. | HAZID ID-56 | Arcadis on behalf of Hi-Quality | Potential liquid waste spillage would be recirculated through the WWTP. The following wording will be added to OEMP Incident and Emergency Response spills response section<br><br>”Any liquid waste spillages would be recirculated through the WWTP.“ | OEMP |
| 12. Clarify the connection of the leachate retrieval system to the WWTP holding tanks. Any leachate returned from Compartment 1 must be treated in the PFAS line due to the potential for contamination from the stored soil. | HAZID ID-56 | Hi-Quality | Leachate system will be hard plumbed with a pump to the WWTP. It should be feasible to connect to PFAS Treatment Tanks. | OWMP |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| 13. Update preventative maintenance plan for HCl diaphragm pump in the OEMP. | HAZID ID-62 | Arcadis on behalf of Hi-Quality | Under the OWMP (Table 9-4), the Site Manager has the responsibility for "Preventative maintenance plan for plant and equipment, including weighbridges."<br><br>This maintenance plan would be best prepared as part of the detailed design of the Facility. This will include the requirement for maintenance of the HCl diaphragm pump in accordance with the manufacturer's specifications. Will include drafting<br><br>Current wording is below. OWMP Section 7.5 Maintenance Procedure will be updated to include is updated a drafting note be used to state that a "Preventative maintenance plan will be prepared as part of the detailed design based on manufacturing specifications. The Site Manager has the responsibility for the preparation and implementation of this plan as per OWMP Table 9-4."<br>Further, suggest in the OEMP to include the task to "Implement preventative maintenance plan for plant and equipment, including weighbridges."<br>Maintenance Procedure<br>Maintenance of equipment and machinery will be carried out regularly to ensure that the equipment, including weighbridges and the ventilation systems, are maintained in proper working order. | OWMP |
| 14. Update preventative maintenance plan for caustic soda diaphragm pump in the OEMP. | HAZID ID-63 | Arcadis on behalf of Hi-Quality | Suggest the above changes. | OWMP |
| 15. Draft handling and transport procedures for mixing tank reagents in the OEMP. | HAZID ID-64, ID-65, ID-66, ID-67, ID-68 | Hi-Quality | This process will vary depending on type of reagents used and the layout and dosing system of the plant. It is proposed to include a handling and transport procedure for mixing tank reagent into the OWMP at the detailed design phase. | OEMP |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| 16. Update mixing tank procedure to include polymer type in OEMP. | HAZID ID-65 | Hi-Quality | The polymer will be confirmed at the detailed design stage. Hi-Quality is currently considering the use of Redox Clearflox 560. | OEMP |
| 17. Include action in OEMP to cease operation of WWTP in the case of an activated carbon spill. | HAZID ID-66 | Hi-Quality | Wording to be included within OEMP and spills procedure to cease operation of WWTP in the case of an activated carbon spill. | OWMP |
| 18. Outline protocol in the OWMP for the exchange of filtration media for MMF process unit. | HAZID ID-73 | Hi-Quality | The exchange of filter media will be approximately the same. Process for this can vary between the types of housing used so final protocol will need to be developed during the detailed design / purchasing / construction phase. However, this process typically involves accessing the internal chamber of the filter housing through a hatch or valve and vacuuming the spent media with a vactruck or industrial vacuum. Spent media is then dealt with as outlined in row 25 to this table. Fresh media is placed in the housings and the unit is returned to service. | OWMP |
| 19. Outline protocol in the OWMP for the exchange of filtration media for VCZ and IE process unit. | HAZID ID-76 | Hi-Quality | | OWMP |
| 20. Outline protocol in the OWMP for the exchange of filtration media for GAC adsorption filtration process unit. | HAZID ID-78 | Hi-Quality | | OWMP |
| 21. Outline protocol in the OWMP for the exchange of filtration media for coconut GAC adsorption filtration process unit. | HAZID ID-80 | Hi-Quality | | OWMP |
| 22. Outline protocol in the OWMP for the exchange of filtration media for weak base anion exchange process unit. | HAZID ID-82 | Hi-Quality | | OWMP |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| 23. Update weak base anion exchange procedure to include resin type in the OEMP. | HAZID ID-82 | Arcadis on behalf of Hi-Quality | Ion exchange resin will be Ecolab PFA694 or similar. Final decision on which resin will be made during the construction phase of the treatment plant. | OWMP |
| 24. Outline protocol in the OWMP for the exchange of filtration media for kinetic GAC adsorption process unit. | HAZID ID-84 | Hi-Quality | It is proposed to include protocol into the OWMP at the detailed design phase. | OWMP |
| 25. Include detailed disposal protocol of spent filtration media in the OEMP. | HAZID ID-90 | Arcadis on behalf of Hi-Quality | The OWMP has the below process<br><br>"After the primary clarifier, a series of sand and carbon filters (also known as Multi Media Filters (MMF)) will be used to "polish" the treated water prior to disposal to trade waste. Sand filtration effectively removes any colloidal particles that have not been separated in the primary clarification stage. Carbon filtration effectively removes any colour and organics that have not been separated in the primary clarification.<br>Although sand and carbon filtration is not likely to be essential to meet trade waste discharge criteria, it is seen as an added layer of protection and additional treatment.<br>The sand and carbon filtration system will need backwashing periodically. The backwashed solids will be fed back into the storage and equalisation tanks. When the activated carbon and/or sand material is spent the material will be containerised, transferred to the 'packaged waste storage area' and transferred offsite to an appropriately licensed disposal facility."<br><br>The following will be added to the OWMP. Spent filtration media will be stored, sampled and analysed. Disposal will be determines based on this analysis with disposal options being directed to landfill disposal, treatment prior to disposal to landfill (onsite or offsite), disposal via | OWMP |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| | | | thermal destruction. Waste transport protocols will be followed where required (e.g. waste tracking and interstate consignment authorisations). | |
| 26. Adapt isolation protocol from Yatala for dangerous packaged waste received onsite. This includes storage and onsite testing of dangerous waste materials to confirm against received SDS/chemical analysis. | HAZID ID-92 | Hi-Quality | The general protocol is;<br>• Received product, manifest and quote checked off against each other<br>• Non-listed products to be referred to Chemist/ Ops Manager / Sales team and discussed with generator<br>• Non-acceptable waste to be refused<br>• Packaged waste to be sampled and visually checked, pH and flashpoint compared to expected.<br>Unexpected package waste to be isolated in the isolated in isolated area and referred to Chemist / Ops Manager / Sales team to determine further steps. | OWMP |
| 27. Confirm inclusion of fogging suppression system in the fire management plan. | HAZID ID-93, ID-96, ID-97 | Arcadis on behalf of Hi-Quality | The OAQMP states that the need for fogging suppression systems would be determined during detailed design. | N/A |
| 28. Confirm if shredder covering has an interlock preventing operation of shredder while open. | HAZID ID-98 | Hi-Quality | All opening hatches and personnel access to shredder will be interlocked or guarded. | OWMP |
| 29. Confirm that stop operation protocol is included in the emergency response as outlined in the OEMP. | HAZID ID-103, ID-104 | Arcadis on behalf of Hi-Quality | The emergency section within the OEMP Incident and Emergency Response is below.<br><br>Emergency Preparedness and Response<br>In the event of an emergency, the safety of people shall always be the FIRST PRIORITY. In the event of an emergency, the procedures and instructions contained in the Emergency Plan will be adhered to. | OEMP |

| Risk Reduction Option | Place(s) Used | Action Owner | Hi-Quality and Arcadis Response (Sep 9th 2024) | Relevant Documents |
|---|---|---|---|---|
| | | | Steps to be followed include:<br>• Check personnel safety and attend to any injured personnel so far as is required to prevent further injury, provided no other person is put at risk in the process<br>• All personnel on site shall be alerted to emergencies by verbal command and directed to an assigned muster or assembly point<br>• Once emergency services have been notified, site personnel shall, at the earliest opportunity, contact the relevant other parties to report the incident and determine the appropriate course of action. | |
| 30. Revise AQIA to provide clarification regarding the ventilation system design and assessment of ventilation flowrates and discharge velocities. | HAZID ID-103, ID-104 | Arcadis on behalf of Hi-Quality | The AQIA considers ventilation flowrates and discharge velocities. | |
| 31. Update standards for laboratory testing in the OEMP based on Environmental Protection License (EPL) (once license received). | HAZID ID-106 | Arcadis on behalf of Hi-Quality | The laboratory testing standards will be updated once the EPL is received. | OWMP |