



# **Operations and Maintenance Manual – Odour Control**

**Delmore WwTP**

**PROJECT NUMBER: 241104**

**Revision 1  
5 June 2025**

<b>Principal</b>	Delmore
<b>Site Address</b>	
<b>Project Number</b>	
<b>Revision</b>	<b>1</b>
<b>Date</b>	5 June 2025
<b>File Location</b>	

## REVISION HISTORY

Revision	Date	Purpose	Author	Reviewed
1				

## DISTRIBUTION LIST

Date	Name	Title/Role	Organization

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## APPENDICES

Appendix A	Vacuum Pressure Inspection Sheet
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DATE

Lead Compliance Officer – Northern Region  
Licensing and Regulatory Compliance  
Auckland Council  
135 Albert Street  
AUCKLAND CENTRAL

**Operations and Maintenance Plan – Odour Control — Consent BUNXXXXXX**

## **1. INTRODUCTION**

Consents have been granted to Delmore for the discharge of non-hazardous vapours to the air which are associated with to the operation of wastewater infrastructure.

This letter and the associated Operations and Maintenance Manual – Odour Control appended has been prepared to fulfil Condition XXX of BUNXXXXXXXXX.

## 2. OVERVIEW OF SITE OPERATIONS

### PURPOSE OF THE FACILITY

The Delmore Wastewater Treatment Plant has been established to meet the community's need for effective wastewater processing. The facility design anticipates and addresses the potential for odour emissions, particularly fugitive odours, arising from the treatment process.

### CORE WASTEWATER TREATMENT PROCESSES

The facility includes the following key treatment stages:

- Preliminary Screening – Removal of large solids from raw sewage.
- Stage 1 Anoxic Treatment & Flow Equalization – Initial nutrient removal under low-oxygen conditions.
- Aerobic Biological Treatment – Oxygenated treatment to further break down waste.
- Stage 2 Anoxic Treatment – Additional denitrification and nutrient removal.
- Membrane Filtration – Fine filtration of treated water.
- Ultraviolet Disinfection – UV exposure to inactivate pathogens.
- Chemical Disinfection with Sodium Hypochlorite – Final disinfection using chlorination.
- Permeate Storage – Holding of treated effluent before disposal.
- Permeate Disposal – Discharge to land treatment or rapid infiltration systems.
- Waste Activated Sludge (WAS) Storage – Interim holding of biological solids.
- Sludge Dewatering – Reduction of sludge volume through water removal.

### SUPPORTING INFRASTRUCTURE

The following ancillary systems support plant operation:

- Centralized control and automation systems
- Loading facilities for bulk chemical transfer
- Storage for:
  - 1% Sodium hypochlorite
  - 30% Sodium hydroxide
  - 49% Acetic acid
- Emergency diesel-powered backup generator

## 2. AIR EMISSIONS AND ODOUR MANAGEMENT

### PRINCIPAL ODOUR GENERATION MECHANISMS

Odour emissions at the plant are primarily due to anaerobic bacterial activity, which occurs when organic waste breaks down in the absence of oxygen. These conditions can arise when:

The biological oxygen demand of wastewater exceeds the available dissolved or molecular oxygen.

Although anaerobic processes are standard in some wastewater systems, the Delmore plant is specifically engineered to prevent anaerobic conditions through:

- Continuous aeration,
- Monitoring of oxygen levels,
- Redundant systems for fail-safe operation.

Key odour risk areas include:

- Raw sewage reception and screening
- Waste activated sludge (WAS) handling and thickening
- Raw Sewage Reception
- Sewage is delivered via a pump station connected to the gravity sewer network.
- Longer retention times in the sewer can lead to oxygen depletion and the formation of odours before arrival at the plant.
- The screening system is therefore a high-risk area for odour emissions.
- Waste Activated Sludge (WAS) Handling
- Proper solids retention time (SRT) is crucial to maintain process stability.
- Sludge that remains too long in storage tanks may become anaerobic, generating odours.
- Consistent sludge removal and forced aeration help mitigate this risk.

### ADDITIONAL POTENTIAL ODOUR SOURCES

Other areas that could emit odours under certain conditions include:

- Inlet screening units
- Screenings collection skips
- Decanter centrifuge for sludge dewatering
- Skips containing dewatered sludge
- Return liquor pump station
- Main plant building (housing screening and dewatering equipment)
- WAS storage tanks
- Biological treatment stages
- The Odour Control Unit itself

### ODOUR CONTROL MEASURES

#### Inlet Screening Area

1. Located in a sealed plant room maintained under negative pressure.
2. Vapours from the screening chamber and skip bins are extracted and treated via the Odour Control Unit.

#### Decanter Centrifuge

1. Treats aerated WAS to prevent anaerobic conditions.
2. Centrifuge housing is negatively pressurized and connected to the odour extraction system.
3. Associated skips are also enclosed and ventilated.

#### Return Liquor Pump Station

1. Collects liquid residuals from various process areas.
2. The pump station is continuously vented under negative pressure to the Odour Control Unit.

#### Main Plant Building

1. Contains major odour sources including screens and centrifuge.
2. Maintained under slight negative pressure to prevent fugitive emissions.
3. Ventilated air is treated prior to discharge.

#### WAS Storage Tanks

1. Continuously aerated to prevent the formation of anaerobic conditions.
2. Tank headspace is extracted at a higher flow rate than the aeration input, ensuring containment.

### Biological Treatment Zones

1. To balance nutrient removal and odour control, the plant uses targeted aeration and monitoring:
2. Anoxic Stage 1: Receives recycled aerated water. Oxidation-reduction potential (ORP) is monitored to prevent anaerobic activity.
3. Aeration Stage: Dissolved oxygen (DO) is continuously measured to maintain optimal aerobic conditions.
4. Anoxic Stage 2: Mirrors Stage 1 control strategy using ORP monitoring.
5. Membrane Stage: Aeration supports both treatment and membrane scouring.

## 3. ODOUR CONTROL UNIT SPECIFICATIONS

The Odour Control Unit treats air extracted from all high-risk zones, including:

- Headworks screening
- Sludge tanks and skips
- Dewatering equipment
- Wastewater sumps
- Main process room

Design parameters include:

- Use of activated carbon media impregnated with chemicals like sodium hydroxide or potassium iodide.
- Media depth designed for minimum 3 seconds residence time at maximum airflow.
- Maximum gas velocity through media: 0.2 m/s, unless approved otherwise.



## SUMMARY OF KEY OPERATIONAL PARAMETERS

Table 1 below summarises each area of potential fugitive odour generation and the design features or operational parameters that exist to prevent against odour release.

Table 1 – Barriers and Mitigations to Fugitive Odour Release.

Source	Primary Barrier and Operational Parameters	Secondary Barrier and Operational Parameters	Tertiary+ Barriers and Operational Parameters	Other
Raw Sewage Inlet Screens	<b>BARRIER</b> 1. Enclosed headspace  <b>OPERATIONAL PARAMETER</b> 1. N/A	<b>BARRIER</b> 1. Inlet Screens are located inside.  <b>OPERATIONAL PARAMETER</b> 1. N/A	<b>BARRIER</b> 1. Headspace maintained at negative pressure.  <b>OPERATIONAL PARAMETER</b> 1. Confirmation of vacuum pressure monitored and recorded weekly	
Dewatering Centrifuge	<b>BARRIER</b> 1. Enclosed headspace  <b>OPERATIONAL PARAMETER</b> 1. N/A	<b>BARRIER</b> 2. Dewatering centrifuge is located inside.  <b>OPERATIONAL PARAMETER</b> 1. N/A	<b>BARRIER</b> 1. Headspace maintained at negative pressure.  <b>OPERATIONAL PARAMETER</b> 1. Confirmation of vacuum pressure monitored and recorded weekly	
Main Plant Room	<b>BARRIER</b> 1. Room has forced ventilation.  <b>OPERATIONAL PARAMETER</b> 1. N/A			
Waste Activated Sludge Tank	<b>BARRIER</b> 1. Headspace maintained at a negative pressure  <b>OPERATIONAL PARAMETER</b> 1. Confirmation of vacuum pressure monitored and recorded weekly	<b>BARRIER</b> 1. Forced aeration of tank contents to avoid anaerobic conditions  <b>OPERATIONAL PARAMETER</b> 1. Aeration blowers operational and available		The aeration system has been designed and installed with the following redundancy: <ul style="list-style-type: none"> <li>- Three blowers in the configuration of Duty, Standby and Jockey have been installed.</li> <li>- An emergency back-up generator with auto changeover will power these units in the event of a power failure.</li> <li>- UPS system to ensure power of the control system in the event of a power change over or total power failure</li> </ul>
Return Liquor Pump Station	<b>BARRIER</b> 1. Enclosed headspace  <b>OPERATIONAL PARAMETER</b> 1. N/A	<b>BARRIER</b> 1. Headspace maintained at negative pressure  <b>OPERATIONAL PARAMETER</b> 1. Confirmation of vacuum pressure monitored and recorded weekly		
Biological Treatment Process	<b>BARRIER</b> 1. Anoxic 1 ORP Continuous Monitoring 2. Aeration Dissolved Oxygen Concentration Monitoring 3. Anoxic 2 ORP Continuous Monitoring 4. Membrane Tank Forced Aeration			The aeration system has been designed and installed with the following redundancy: <ul style="list-style-type: none"> <li>- Three blowers in the configuration of Duty, Standby and Jockey have been installed.</li> <li>- An emergency back-up generator with auto changeover will power these units in the event of a power failure.</li> </ul>

	<b>OPERATIONAL PARAMETER</b> <ol style="list-style-type: none"> <li>1. Refer Functional Description</li> <li>2. Dissolved Oxygen Concentration must not drop below 0.1mg/L for more than 12 hours.</li> <li>3. Refer Functional Description</li> <li>4. Refer Functional Description</li> </ol>			<ul style="list-style-type: none"> <li>- UPS system to ensure power of the control system in the event of a power change over or total power failure</li> </ul>
Odour Scrubber Unit	<b>BARRIER</b> <ol style="list-style-type: none"> <li>1. Chemically impregnated, steam activated carbon bed.</li> </ol> <b>OPERATIONAL PARAMETER</b> <ol style="list-style-type: none"> <li>1. Inline duct heater capable of reducing the RH of the incoming air at the maximum design flowrate from 100% to 70% at 20 degrees Celsius</li> <li>2. Residence time of minimum 3 seconds in carbon bed at maximum flowrate</li> <li>3. Maximum gas velocity of 0.2m/s through the carbon bed, exceptions with Auckland Council approval</li> <li>4. Monitoring of saturation of adsorptive media on a monthly basis</li> <li>5. Weekly monitoring of temperature and RH of airflow into and out of the heater</li> </ol>			<p>An emergency back-up generator with auto changeover will power the Odour Control Unit in the event of a power failure.</p> <p>A UPS system ensures power of the control system and monitoring systems in the event of a power change over or total power failure</p>

### 3.1. Critical Spares

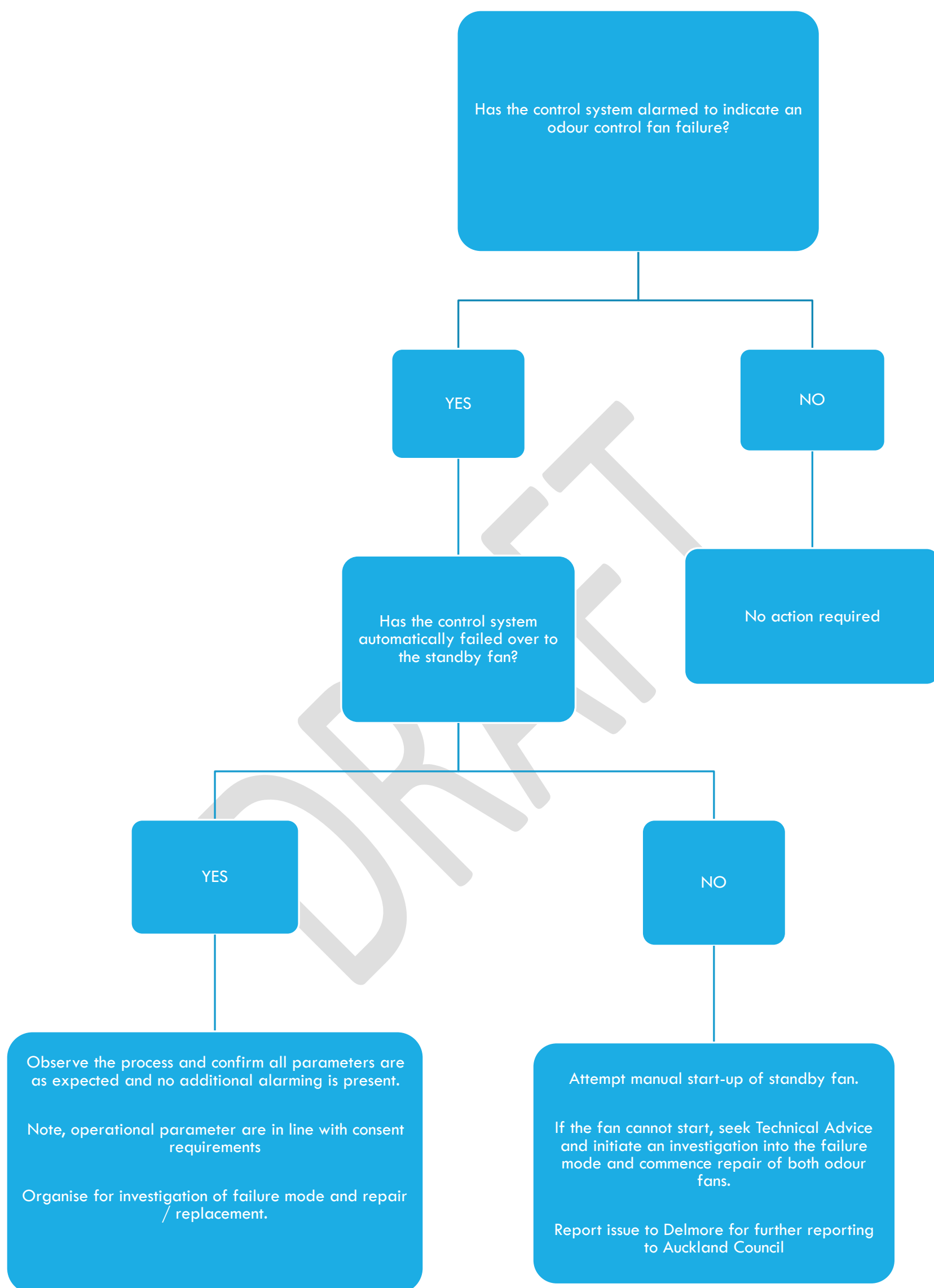
The following items have been identified as critical spares which must be held on site or must be regularly stocked items held by third parties, or by the Apex Water Service and Sales Team. Criticality is qualified by the item being necessary for the operation of any system that protects against fugitive odour generation or emission.. Table 2 below, outlines the critical spares identified.

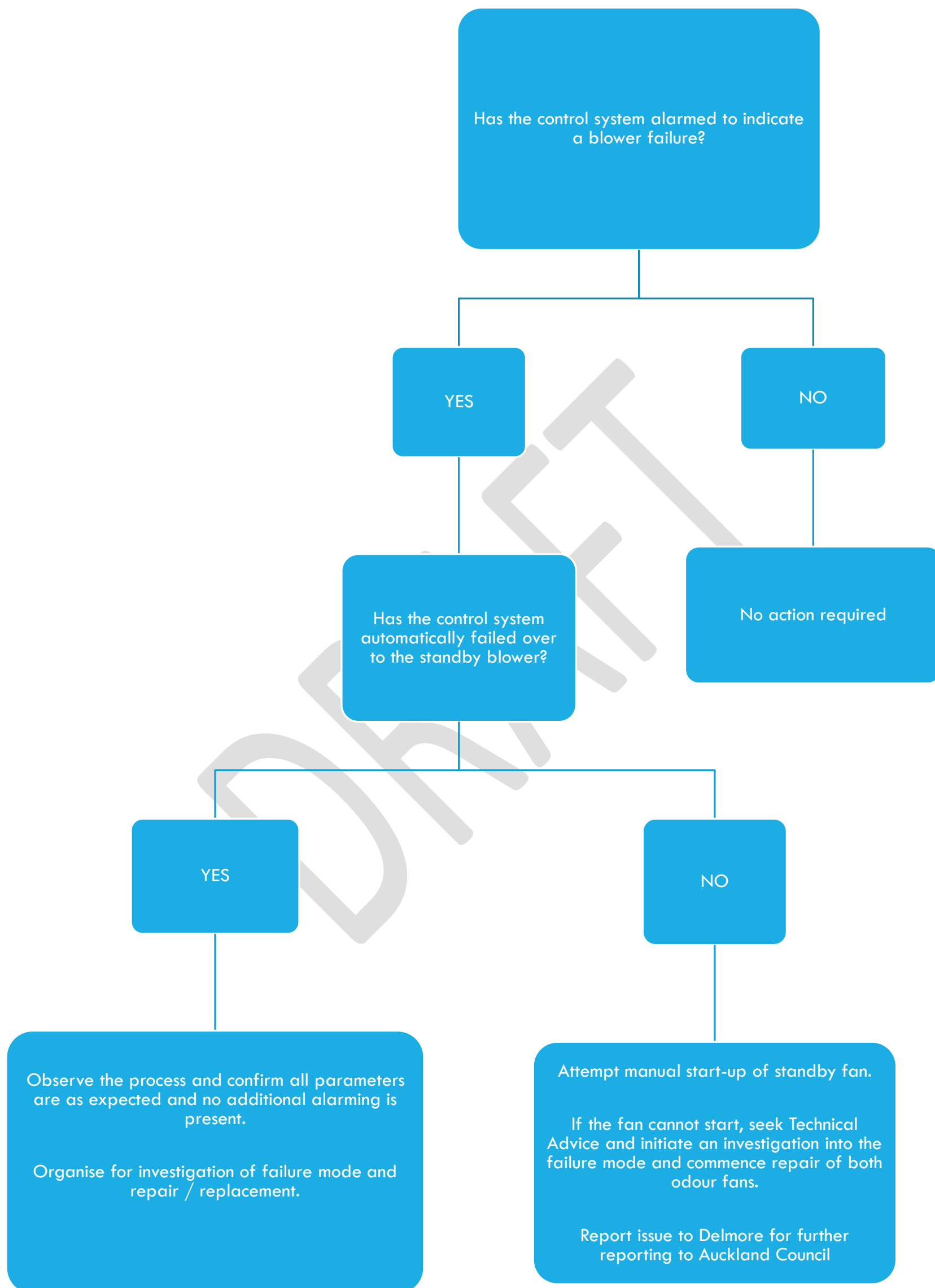
Table 2 – Critical Spares required for Odour Control.

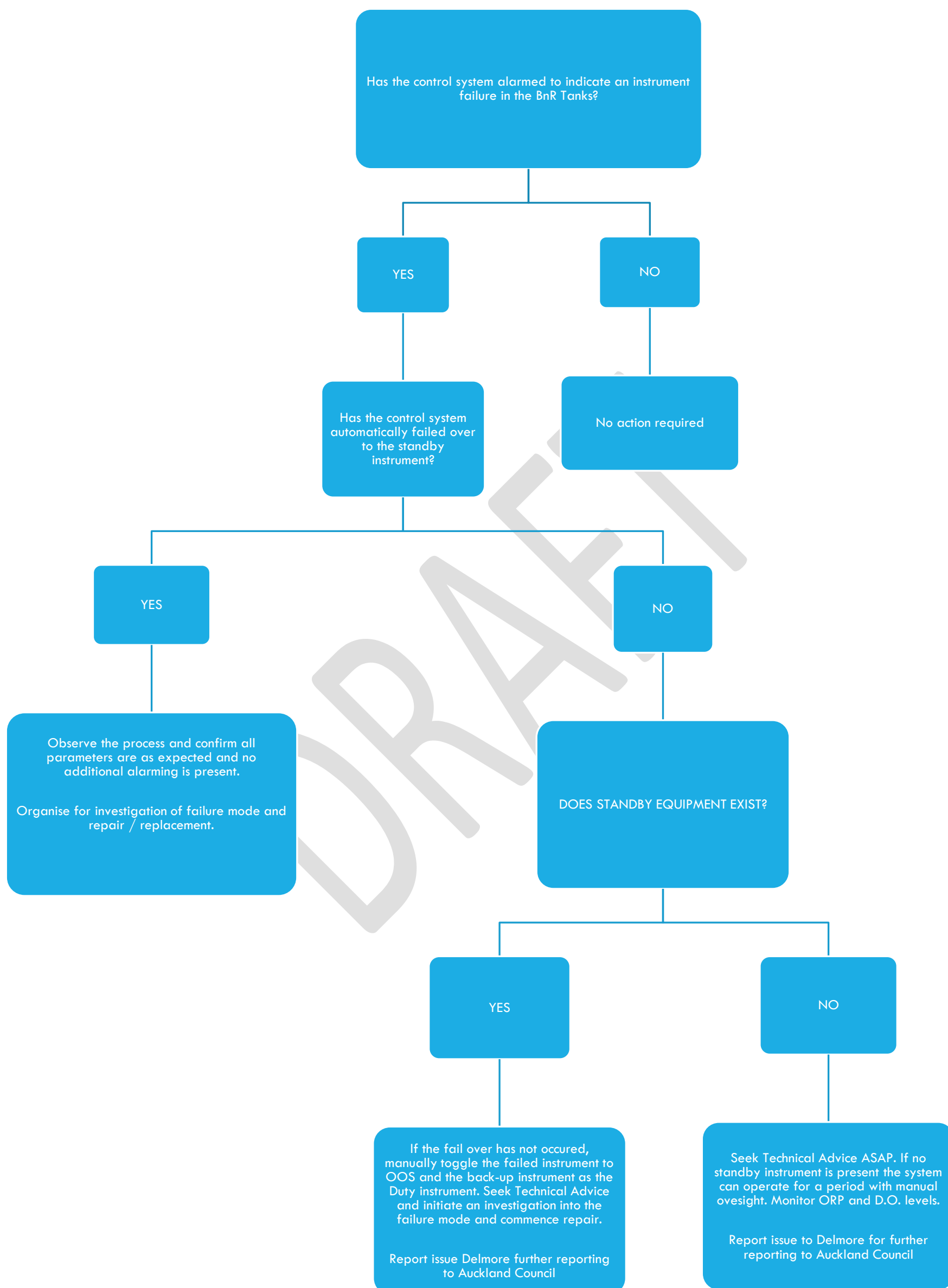
Description	Location	Function	Requirement

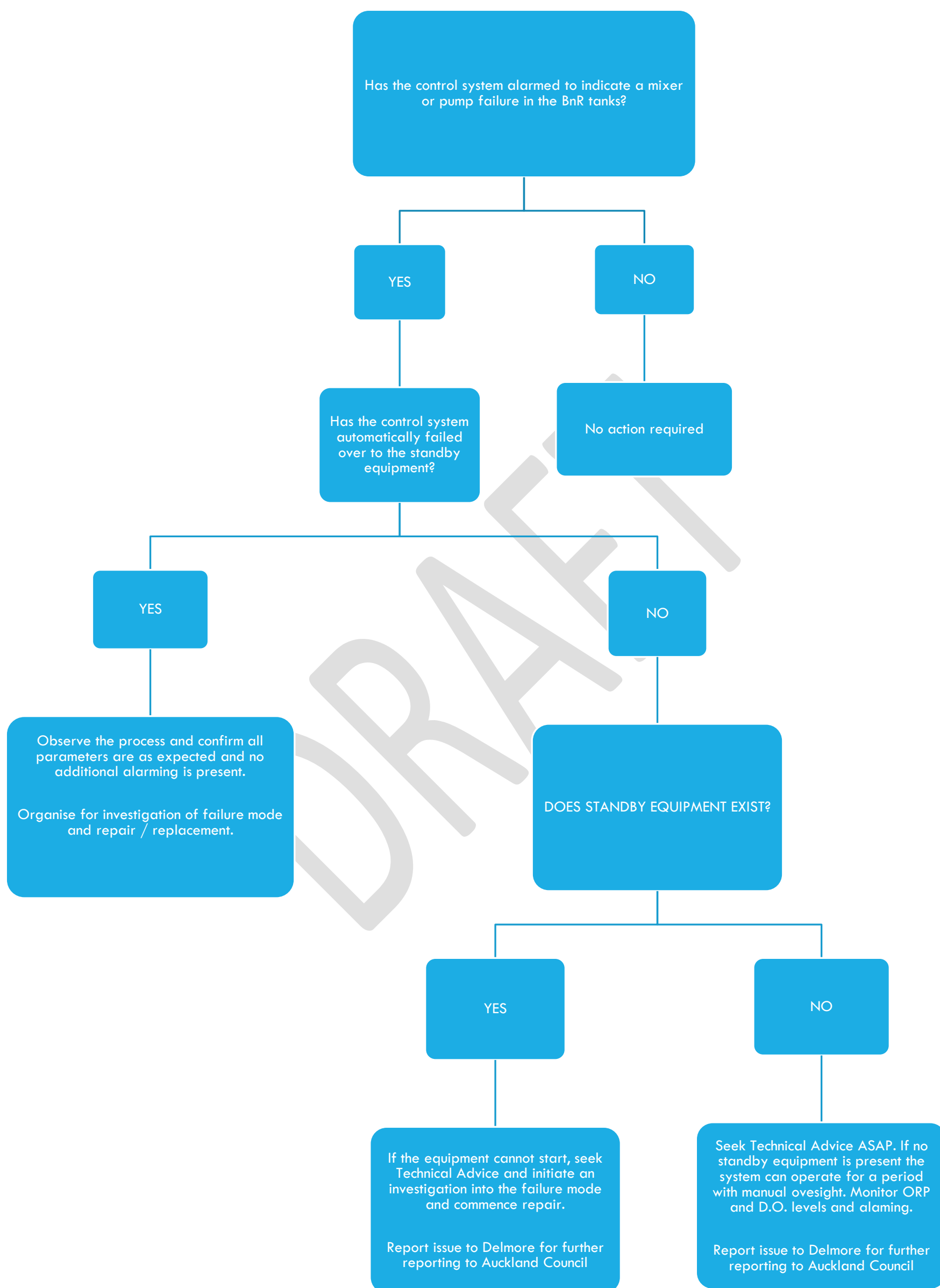
### 3.2. Contingency Procedures

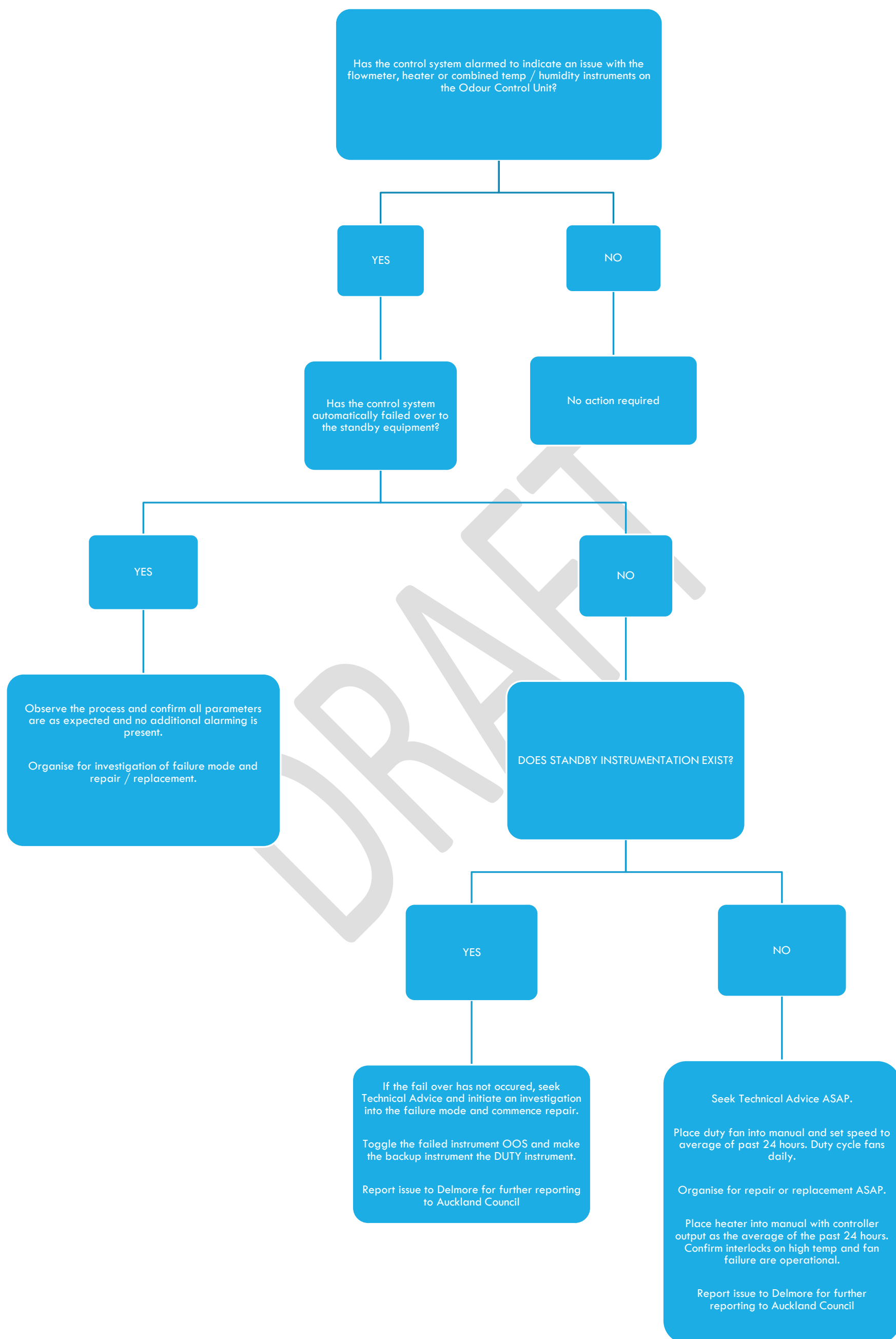
As the plant is largely automated and has been designed to include redundancy for critical elements, the control system will in most cases automatically respond to any plant breakdowns, equipment failures or malfunctions. Although the plant control system will manage most failures, flowcharts below outline a response to the failure of equipment or instrumentation which may impact the Odour Control Unit or equipment central to the protection against fugitive odours.













### 3.3. Compliance Monitoring Procedures

Table 3 below outlines the processes by which Resource Consent compliance is obtained.

Table 3 – Resource Consent conditions relevant to Odour management.

Condition Number	Wording	Compliance

### **3.4. Personnel Training and Induction**

Personnel operating the wastewater treatment plant on the Delmore wastewater treatment plant shall at a minimum hold experience in the operation of wastewater processes or shall be trained according to Apex's Operator Training Manual and working towards a formal certification. Refresher training and site-specific scenario awareness training is conducted by the Apex Technical and Operation team and is tailored according to the requirements of the operator and the plant. A training plan shall be created for each new operator with regular auditing and review by the appropriate management staff.

Induction shall be provided to all personnel and subcontractors working on the treatment plant to highlight hazards associated with the site and general controls on works. Works cannot be carried out before an induction is carried out.

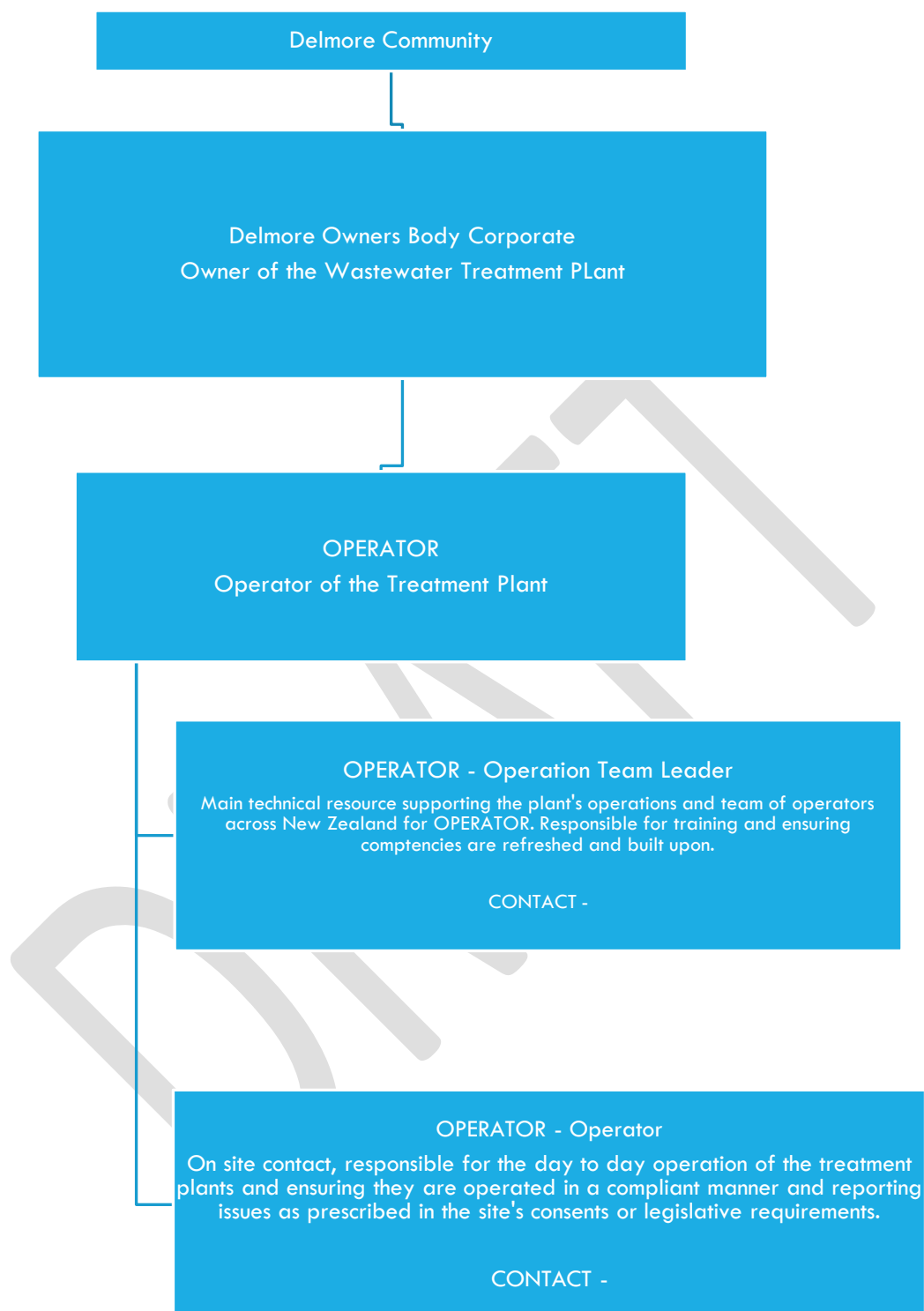
### **3.5. Responding to Complaints**

As a general rule, Apex Water shall not respond to complaints directly. Complaints shall be handled by Delmore or their nominated party. Apex Water staff will be briefed on interaction with the public and shall direct any verbal complaints received to the appropriate parties.

Apex Water at their discretion may hand out a copy of the generic complaints form shown in Appendix C to any individual complainant at the gate of the treatment compound. They may scan and pass this information onto their contact at Delmore. The generic complaint form includes a section where the bearing of the complainant (North-South-East-West) can be noted, alongside the direction of the wind, as measured at the treatment plant on day and time in question.

### **3.6. Roles and Responsibilities**

Apex Water is to abide by this OMM and makes sure every employee is introduced to it. Every employee must read and understand this OMM before starting to work in WwTP. It is up to employee's responsibility to ask the employer if something is not understandable. An employee's signature is needed as acknowledgment. All records are to be kept by the Operator and presented if needed. A summary of the roles and responsibilities held by the site are detailed below, with a hierarchy through to the plant owner.



### **3.7. Reviewing and Improving OMM**

The OMM will be reviewed every 2 years and updated. All staff must be introduced to any changes. This review shall be conducted and carried out in coordination with Delmore.

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