Domestic On-Site Wastewater Treatment & Land Disposal Assessment for a Proposed Recycled Steel Plant.

For:
National Green Steel Ltd.

At:
61 Hampton Downs Road,
Hampton Downs.

ORMISTON ASSOCIATES LTD
CONSULTANTS IN GEOTECHNICAL ENGINEERING, GEOLOGY & ENGINEERING GEOLOGY

Our Ref: 5554

Domestic On-Site Wastewater Treatment & Land Disposal Assessment for a Proposed Recycled Steel Plant at 61 Hampton Downs Road, Hampton Downs.

For: **National Green Steel Ltd.**
C/- Shearer Consulting Ltd.
PO Box 60240
Titirangi
AUCKLAND 0642

By: **Ormiston Associates Ltd.**
P.O. Box 47-822
Ponsonby
AUCKLAND 1144

Date: **May 2025 – Final Version**

TABLE OF CONTENTS

1. Executive Summary

This report describes an on-site wastewater treatment and land disposal assessment to support the establishment of a proposed recycled steel plant at 61 Hampton Downs Road, Hampton Downs. This project has been listed in the Fast-track Approvals Act (2024).

Based on the proposed layout and potential occupancy, the volume of domestic type wastewater generated by staff facilities at the development is calculated to be up to 10,000 litres per day. We recommend the use of an Innoflow Technologies Advantex recirculating textile filter (rtPBR) system to treat domestic type wastewater generated from staff facilities at the industrial facility. This report does not address industrial wastewater.

Soil conditions across the proposed land disposal area indicate the presence of category 4-5 soils (AS/NZS1547:2012[1]), and these are suitable to support on-site wastewater land disposal, via pressure compensating dripper irrigation. The proposed land disposal system meets the required setback distances as listed in AS/NZS1547:2012, including separation to groundwater, watercourses, water bores, buildings, and property boundaries.

The proposed on-site domestic wastewater treatment and land disposal methodology is in use at many commercial and industrial facilities across New Zealand, and is a proven and reliable solution.

We have determined that a Discretionary Activity consent will be required under rule 3.5.7.7 of the Waikato Regional Plan.

The establishment of an industrial development raises the issue of the cumulative effects of the on-site wastewater discharge. The conversion of farmland to industrial land represents a potentially significant reduction in nitrogen leaching.

Overall, given the soil conditions encountered, and the available clearances to sensitive receptors, the proposed development of the site is expected to be well supported by an on-site domestic wastewater treatment and land disposal system.

[1] Australian/New Zealand Standard 1547:2012 On-site domestic wastewater management.

2. Introduction

As requested, we have undertaken an on-site wastewater treatment and land disposal assessment to manage domestic wastewater production from a proposed recycled steel industrial facility to be located at 61 Hampton Downs Road, Hampton Downs. We understand that this project is listed within the proposed Fast-track Approvals Act.

This report outlines the investigation undertaken at the property and provides recommendations for an on-site wastewater treatment and land disposal system to manage domestic wastewater produced from staff facilities at the proposed steel plant. The discharge of treated effluent into the ground at this site will require a new discharge consent as the proposed peak daily discharge volume will exceed the Waikato Regional Plan permitted activity threshold. Building consent is also required from Waikato District Council. This report can be used in support of applications for all relevant consents.

Our brief was to provide the following:

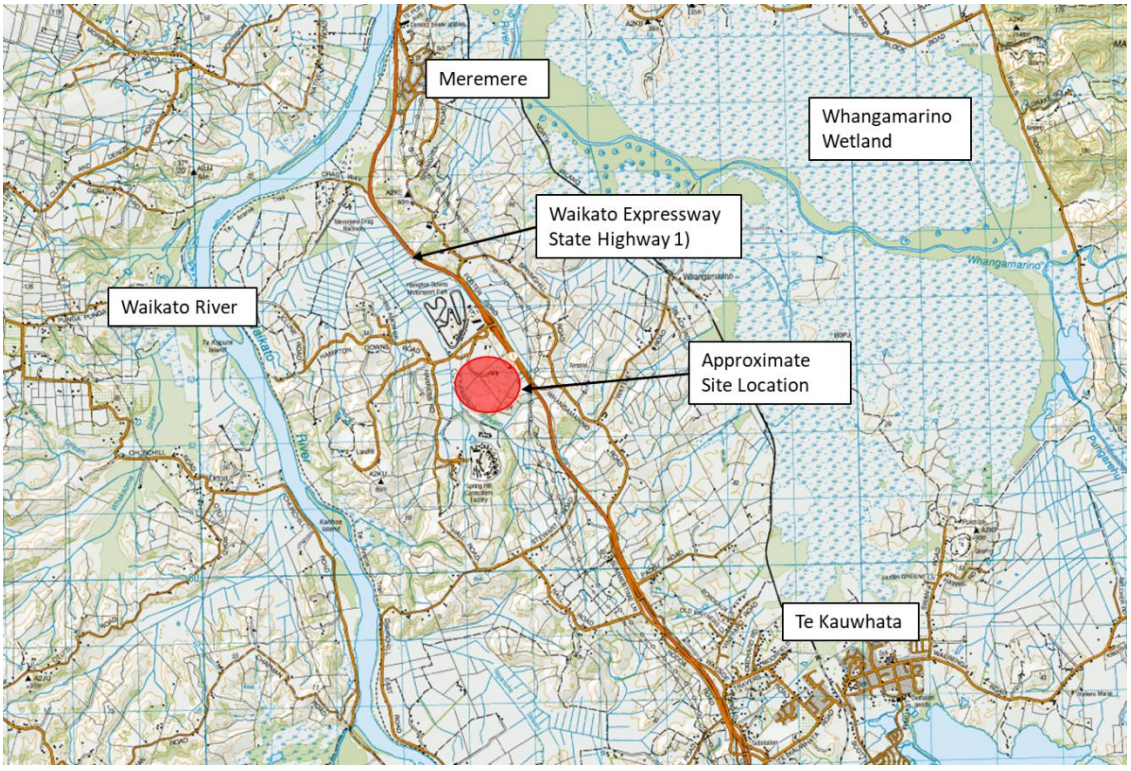
(1) An assessment of soil types at the location of the proposed treated effluent land disposal area.
(2) Recommendations on the most appropriate wastewater treatment system and component sizing.
(3) Recommendations on water conservation devices.
(4) An assessment of the peak daily wastewater discharge volume.
(5) Recommended peak loading rates for wastewater land disposal.
(6) An assessment of the primary and reserve wastewater land disposal area requirements.
(7) An assessment of effects on the environment.

3. Site Description

The property is located on the southern side of Harness Road and Hampton Downs Road, west of the Waikato Expressway and approximately 7 kilometres north of Te Kauwhata. The total site area is approximately 53.7704 hectares, in five separate legal lots, with the following descriptions:

- Lot 1 DPSA45893 (14.3327 Ha)
- Lot 2 DP310030 (0.8805 Ha)
- Lot 3 DP310030 (12.59 Ha)
- Lot 4 DP310030 (12.0 Ha)
- Lot 5 DP310030 (13.9597 Ha)

The approximate location of the site is shown on the **Location Map** below, with an aerial photo shown in Figure One.



Location Map
61 Hampton Downs Road

The site is currently operated as a farm. Access to the site is via a sealed access road which rises to the south from the Harness Road entranceway. The property adjoins the Springhill Corrections Facility to the west and south, and rural properties to the south and east (Figure 1).

Figure 1:
Aerial View of The Property and
Approximate Location of The Property Boundary.

The Waipapa Stream drains from south to north along the western site boundary, and crosses beneath Hampton Downs Road via a culvert. The area adjacent to Harness Road and Hampton Downs Road is low lying and poorly drained. Slopes begin to ascend to the south approximately 250 metres from Harness Road (see Figure 2). The southern part of the site forms a bowl-shaped gully drained by an ephemeral watercourse towards the northwest. The side slopes are moderately steep at 15 to 20° (see Figures 2, 3 and 4). The crest of the gully in the east of the site is occupied by outbuildings, stockyards and water tanks. Beyond this crest slopes descend to the east. The southern boundary with the Springhill Corrections facility is characterised by steeper slopes of 25° falling to the south.

We understand that it is proposed to earthwork the gully by cut and filling the floor to create a level platform for the proposed industrial facility.

Figure 2: View to south from Harness Road, low-lying area with gully system in background

Figure 3: View to south west showing gully side slopes and gully floor. Trees on horizon are the Corrections Facility boundary.

Figure 4: View to north from high ground in the south

4. Receiving Environment

Reference was made to Geological Map Sheet 4, Waikato (SW Edbrooke compiler 2005) IGNS (1:250,000) which indicates that adjacent to the Waipapa Stream the site is underlain by Holocene river deposits of the Tauranga Group, with the Amokura Formation of the Warkworth Subgroup (Waitemata Group) underlying the slopes immediately above the low lying area, and the Walton Subgroup Late Miocene to Middle Pleistocene river deposits underlying the highest elevations of the site.

4.1 Site Investigations

Soils investigations were carried out on 21st November 2024 under late spring conditions. Investigations were undertaken within potential primary and reserve treated effluent land disposal areas.

Investigations comprised a comprehensive walkover assessment of the proposed land disposal areas and the drilling of 7 x 50mm diameter hand auger boreholes. Boreholes EF1 to EF7 were drilled to a maximum depth of 1.2 metres in order to assess soil texture, depth to limiting horizons and shallow groundwater table, if present, within the proposed wastewater land disposal areas. The approximate locations of the boreholes are shown on the appended Site Plan Drawings No. 5577-1. Borehole intersections are summarised below (Table 1) and detailed in the following hand auger borehole soil logs.

The soils assessment has been undertaken with reference to the ***Australian/New Zealand Standard 1547:2012 On-site domestic wastewater management***.

Table 1 BOREHOLE SOIL HORIZON INTERSECTION SUMMARY			
Borehole Number	**Total Depth (metres from surface)**	**Depth of Topsoil (metres)**	**Groundwater Depth (metres from surface)**
EF 1	1.20	0.15	Dry
EF 2	1.20	0.30	Dry
EF 3	1.20	0.35	Dry
EF 4	1.20	0.25	Dry
EF 5	1.20	0.15	Dry
EF 6	1.20	0.10	1.15m
EF 7	1.20	0.50	Dry
Boreholes drilled on 21st November 2024.			

4.2 Soil Descriptions

All soils were assessed by an Engineering Geologist and categorised according to the methodology set out in AS/NZS 1547:2012. Borehole intersections within the potential wastewater land disposal areas are summarised as follows.

EF1

DEPTH (mm)	SOIL TEXTURE	SOIL CATEGORY
0 – 150	**TOPSOIL, Organic Silt**, dry, friable, non-plastic, light brown.	**3**
150 – 500	**SILT,** trace clay, slightly to non-plastic, light yellow brown, dark brown iron inclusions, dry.	**4**
500 – 1,200	**Silty CLAY,** stiff, moderately plastic, stiff, dark orange and light yellow-brown, dry-moist. @800mm light grey silty pockets	**5**
	TOTAL DEPTH 1,200mm	**Groundwater Dry**

EF2

DEPTH (mm)	SOIL TEXTURE	SOIL CATEGORY
0 – 300	**TOPSOIL – Organic Silt**, dry, friable, non-plastic, dark greyish black.	**3**
300 – 1,200	**Clayey SILT**, slightly plastic, stiff, dark orange and dark grey, dry-moist.	**4**
	TOTAL DEPTH 1,200mm	**Groundwater Dry**

EF 3

DEPTH (mm)	SOIL TEXTURE	SOIL CATEGORY
0 – 350	**TOPSOIL –Organic Silt**, dry-moist, friable, non-plastic, light brown.	**3**
350– 500	**Silty CLAY**, moderately plastic, light orange brown, dry-moist.	**5**
500 – 1,200	**CLAY,** moderately-highly plastic, soft, light orange brown with dark orange streaks ad mottling, dry-moist.	**5**
	TOTAL DEPTH 1,200mm	**Groundwater Dry**

EF 4

DEPTH (mm)	SOIL TEXTURE	SOIL CATEGORY
0 – 350	**TOPSOIL, Organic Silt**, dry, friable, non-plastic, dark brown.	**3**
350 – 700	**SILT, slightly clayey,** slightly plastic, light brown, iron and manganese modules, dry-moist.	**4**
700 – 1,200	**Silty CLAY,** stiff, moderately to highly plastic, dark orange and light grey-brown, dry-moist. @1,000mm light grey silty pockets	**5**
	TOTAL DEPTH 1,200mm	**Groundwater Dry**

EF 5

DEPTH (mm)	SOIL TEXTURE	SOIL CATEGORY
0 – 150	**TOPSOIL, Organic Silt**, dry, friable, non-plastic, dark brownish -black.	**3**
150 – 500	**Organic SILT/Peat,** non-plastic, moist. @500mm roots, saturated	**4**
	TOTAL DEPTH 500mm Unable to penetrate roots	**Groundwater Dry**

EF 6

DEPTH (mm)	SOIL TEXTURE	SOIL CATEGORY
0 – 100	**TOPSOIL, Organic Silt**, dry, friable, non-plastic, light brown.	**3**
100 – 1,200	**SILT,** slightly clayey, moderately plastic, dry-moist, dark grey and dark orange @800mm soft, moist @1000mm moist-wet	**4**
	TOTAL DEPTH 1,200mm	**Groundwater @ 1,150mm**

EF 7

DEPTH (mm)	SOIL TEXTURE	SOIL CATEGORY
0 – 500	**TOPSOIL, Organic Silt**, dry, friable, non-plastic, dark brownish black.	**3**
500 – 1,200	**SILT, organic,** non-plastic, dark grey with occasional small dark orange mottles, moist-wet	**4**
	TOTAL DEPTH 1,200mm	**Groundwater Dry**

4.3 Soil Categories

The boreholes drilled on the higher elevation parts of the site (EF1-EF4) intersected interbedded silts, clayey silts and clays (category 4-5 AS/NZS1547, Table E1). Topsoil depth varied from 100mm to 350mm depth.

The boreholes drilled in the low-lying part of the site (EF5-EF7) intersected alluvial silts, and peat (category 3-4 AS/NZS1547, Table E1). Topsoil depth varied from 100mm to 500mm depth. This area has been discounted for use as a wastewater disposal location due to the presence of high groundwater, highly organic soils and roots/vegetation within the soil profile.

Our wastewater disposal design irrigation/loading rate has been based on soil category 5, as this is the most restrictive soil capacity encountered within the soil profile, in accordance with AS/NZS 1547:2012 C.5.2.3.1.

4.4 Groundwater

Our boreholes were drilled in late spring (21 November 2024) and intercepted groundwater in the low lying part of the site at 1.15m depth. The boreholes drilled on the upper slopes did not intercept groundwater to 1.2m depth and we would expect groundwater levels in these higher elevation locations to be depressed.

4.5 Groundwater Bores

The nearest groundwater bores which are not part of the site are:

- 72_11941 located at 136 Hampton Downs Road, 330m north west from the property boundary and over 1,000m north-west from the proposed disposal area.
- 72_1350, 72_1355 and 72_1356 located within the Gull Fuel Stop some 530m to the north east from the property boundary and over 700m north of the proposed disposal area.

Water supply to the development will be via an on-site bore (72_12576 or 72_12575), which is approximately 300m west from the proposed reserve disposal area, and approximately 450m from the primary disposal area at the closest point.

4.6 Surface Water

The nearest mapped surface water body is the outlet of a farm dam to the east, which flows towards the Waikato Expressway and is likely to connect to the drainage network adjacent to the roadway and drain to the north towards the Waikato River. This dam is approximately 240m from the proposed disposal area, at its closest point.

Ephemeral watercourses draining to the small farm dam are located a minimum distance of 15m downslope from the proposed land disposal area.

A tributary of the Waipapa Stream is located to the southeast, approximately 375m from the proposed disposal area.

5. On-Site Wastewater Production

Domestic wastewater on site is expected to be generated from the staff kitchen (including a grease trap), and staff ablutions including shower facilities. The site is expected to produce a maximum daily discharge volume determined as follows:

- Peak occupancy of the site is up to 200 people per day.
- Water supply for potable purposes is via an on-site bore.
- Minimal numbers of visitors are expected.

Wastewater production rates used are based on Table H4 (Typical Domestic Wastewater Design Flow Allowances) of AS/NZS 1547:2012, which recommends a per capita flow allowance of 50 litres/person/day with bore water supply, and we have utilised this rate. (Table 2 below).

TABLE 2
DESIGN WASTEWATER FLOW ASSESSMENT

Source	Total People/Day	Flow Allowance/Person (l/p/d)	Total (Rounded) (Litres/Day)
Staff	200	50	10,000
DESIGN DAILY FLOW			**10,000 L/day**

Notes.
1. **Per Capita flow allowances sourced from AS/NZS1547:2012 Table H4.**

The calculated design daily peak flow volume is expected to be more conservative than actual wastewater production on site.

5.1 Water Conservation Devices

The following water conservation devices **should** be incorporated into the development to minimise wastewater production, but are not included in our calculation above:

- Restricted flush or dual flush (6/3 litre) toilet cisterns.
- Shower flow restrictors
- Aerated tap faucets.
- Water conserving washing machines.

6. On-Site Wastewater Collection and Treatment

6.1 Introduction

It is proposed to install a new on-site wastewater treatment and land disposal system to service the proposed manufacturing facility staff wastewater production.

The use of the proposed recirculating textile filter treatment system in an industrial facility complex for domestic type wastewater treatment is a proven and reliable solution. Ormiston Associates Ltd have designed and certified similar treatment systems for the following industrial and commercial facilities: Hobbiton Movie Set in Matamata, Waiotapu Thermal Wonderland in Rotorua, Trevelyan's Pack and Cool Ltd. in Te Puke, and the Retail and KFC outlet at Bombay, among many others. The Advantex textile filter technology is proven to be robust in these situations with high quality wastewater treatment being achieved.

The proposed wastewater treatment system is detailed below.

6.1.1 Peak Wastewater Strength

Wastewater is sourced from showers, kitchens, and toilets and can be expected to be higher in strength relative to standard domestic sourced wastewater due to the reduced dilution from greywater (showers, laundry, taps). The treatment system design makes allowance for the increased wastewater strength resulting from this lack of dilution.

The treatment system design has been undertaken by Innoflow Technologies Ltd. based on similar industrial sites and in particular on raw wastewater quality results obtained from the Visy cardboard box manufacturing facility at Hamilton Airport. Influent wastewater parameters have been set at:

- BOD_5: <500 mg/L
- TSS: <600 mg/L
- TKN: <160 mg/L

Innoflow Technologies Ltd. have assessed the proposed wastewater treatment system requirements based on the above influent parameters, and secondary treated effluent quality, to achieve the following treated effluent limits:

- BOD_5 = <20 mgO/L
- Total Suspended Solids = < 30mg/L

6.1.2 Cleaning Products

The wastewater treatment system performance relies on healthy aerobic bacteria that are attached to the textile fabric. Cleaning products can have a significant detrimental impact on the performance of a wastewater treatment system by killing the bacteria required for the treatment process. We recommend that only environmentally friendly cleaning products are used.

6.2 Proposed On-Site Wastewater Primary Treatment and Collection

Due to the usage of the facilities and high strength of the wastewater, a robust wastewater treatment system capable of managing the flow volume and strength variations with limited impact on treated effluent quality is recommended.

A grease trap is to be included at the staff kitchen to minimise carry-over of fats, oil and grease (FOG) into the main treatment system.

6.2.1 Pre-treatment - Grease Trap - Staff Kitchen (6,000 litres)

A 6,000 litre (6m³) triple chamber grease trap is proposed to be installed at the staff kitchen. Grease traps are designed to intercept oils, fats and greases (FOG) produced in the kitchen through food preparation and handling. All biological treatment processes are highly susceptible to moderate to high concentrations of FOG.

Removal efficiency of FOG from the effluent depends on the capability of the fatty matter to exchange heat with the surrounding liquid. The grease trap provides an environment in which the flow velocity of the effluent is decreased, allowing the fatty matter to cool, coagulate and float to the surface. It is important that the grease trap provides sufficient retention time to allow this heat exchange to occur.

The proposed Advantex recirculating textile wastewater treatment system comprises the following components detailed in Table 3 below.

6.2.2 Advantex Recirculating Textile Filter Advanced Secondary Treatment

The main treatment plant is designed to treat up to 10,000 litres per day and is to comprise the minimum capacities detailed in Table 3 and as discussed below.

TABLE 3 AX200 + AX40 RECIRCULATING TEXTILE FILTER WASTEWATER TREATMENT PLANT	
Component	**Total Volume (litres)**
Kitchen Grease Trap	**1 x 6,000 litres (6.0m³)**
Septic Tank	**1 x 25,000 litres (25m³)**
Pre-Anoxic Tank	**1 x 25,000 litres (25m³)**
Stage 1 Recirculation Tank	**1 x 10,000 litres (10m³)**
Stage 1 Advantex Textile Filters	**2 x AX100 Pods**
Stage 2 Recirculation Tank	**1 x 10,000 litres (10m³)**
Stage 2 Advantex Textile Filters	**2 x AX20 Pods**
Treated Effluent Tank	**1 x 10,000 litres (10m³)**
System Monitoring	**Discharge Water Meter with Remote Monitoring Panel & Data Logger**

The proposed treatment system is detailed below.

6.2.3 Primary Septic Tank Treatment (1 x 25,000 litres)

In order to provide the recommended septic tank hydraulic retention time for primary treatment it is proposed to install 1 x 25,000L septic tank. The total tank volume provides suitable retention time for the dry weather flow of 10,000 litres/day.

The septic tank is to include a Biotube effluent outlet filter and will discharge via the effluent outlet filter to the pre-anoxic tank. Primary treatment tanks including septic tanks and pre-anoxic tanks can be expected to reduce the incoming wastewater strength by approximately 50% prior to the recirculation tank.

6.2.4 Pre-Anoxic Tank (1 x 25,000 litre tank)

All primary treated effluent is to be discharged into the pre-anoxic tank comprising 25,000 litres. When the wastewater treatment system is operational a portion of the treated effluent from the recirculation tank is discharged back to the pre-anoxic tank and assists with the treatment process by balancing and lowering the effluent strength in the pre-anoxic tank and providing provides an environment for denitrifying part of the nitrified effluent in a

low oxygen environment prior to the recirculation tank aerobic environment. The system is however not configured for denitrification.

6.2.5 Stage 1 Recirculation Tank (1 x 10,000 litre tank)

Effluent from the pre-anoxic tank is to be discharged by gravity to the Stage 1 10,000L ($10m^3$) recirculation tank and pumped to the 2 x AX100 pods for Stage 1 of the treatment plant, which is a two-stage biological removal process. From the Stage 1 pods effluent is discharged to a second recirculation tank ($10m^3$) and additional Stage 2 polishing via 2 x AX20 textile pods. A set volume of effluent is timer dose loaded by pump from the recirculation tanks onto each textile filter. The timer operated pump is to include a float switch override and the tank is also to include a high-water level alarm to operate in the event of pump failure.

6.2.6 Stage 1 Recirculating Textile Filter AX100 rtPBR (2 x AX100 Pods = AX200)

The recirculating textile filter is also known as a recirculating textile packed bed reactor, (rtPBR). Packed bed reactors are biological and physical treatment systems, which provide additional treatment for screened, and primary treated wastewater producing an almost clear, almost odourless advanced secondary quality effluent suitable for irrigation into and onto the soil.

Primary treated and screened effluent is diluted in the recirculation tank by mixing with treated effluent from the textile filter which is timer dose loaded by pumping onto the textile filter as a series of controlled pulses over the day. Treatment occurs as the wastewater flows through the textile media as a thin film. The soluble and colloidal material is adsorbed onto the bacterial film which forms on the textile surface, and oxygen from the air in the open interstitial space is transferred across the thin film to the aerobic bacteria responsible for oxidation of the organic carbonaceous materials. Effluent is collected by under drains with gravity flow via the recirculation assembly to the recirculation tank or to the treated effluent tank.

Innoflow Technologies Ltd have recommended 2 x AX100 pods in Stage 1, with each pod having a surface area of approximately $10m^2$.

The proposed system has further advantageous features including:

- The AX100 pods utilise textile media as previously described, and hence has larger effective surface area than a sand filter, allowing a smaller footprint.

- The textile is contained within a watertight pod, to exclude stormwater and rainfall from the system.
- Additional AX100 units can be added to the treatment system in parallel if required in the future.

6.2.7 Stage 2 Recirculation Tank (1 x 10,000 litre tank)

Wastewater is to be discharged by gravity from the Stage 1 rtPBR into the Stage 2 Recirculation tank, which includes an Orenco Biotube pump vault, from where it is timer dose loaded onto the Stage 2 AX40 rtPBR. The pump is to be operated by timer with float switch override.

6.2.8 Stage 2 Recirculating AdvanTex Textile Filter AX20 (2 x AX20 pods = AX40)

The Stage 2 polishing treatment system comprises 2 x AX20 Textile Filters each with a surface area of approximately 2.0m². Wastewater is to be timer dose loaded by pumping via a distribution manifold onto the textile media where it is allowed to percolate down through the media to the under drain collection system. Wastewater gravity flows from the under drain via a splitter assembly either into the recirculation tank (80% to 100%) or 20% is diverted to the treated wastewater holding tank. The recirculation splitter assembly automatically controls a recycle ratio of 3:1 to 5:1. The splitter assembly is located in the recirculation tank and comprises a ball float to divert flow either to the treated wastewater chamber or directly to the Stage 2 Recirculation Tank depending on the water level in the tank.

6.2.9 Treated Effluent Tank (1 x 10,000 litre tank)

Treated effluent is to be discharged to the 1 x 10,000L (10m^3) treated effluent tank (TET) prior to pumping to the disposal systems. This provides 24 hours emergency storage.

6.2.10 Water Meter & Data Logger

Water meters are to be installed in line following the treated effluent tank with an accuracy of +/-5% to allow for monitoring of the discharge to the land disposal system. The water meter is to include a data logger to read and record the daily discharge flow.

6.2.11 Remote Monitoring and Management Control Panel

We recommend installing a remote monitoring and management system within the system control panel. This requires a dedicated land or mobile phone line for the main treatment

system and allows instant notification of the maintenance provider in the event of an alarm along with real time flow monitoring and pump operation. A remote monitoring panel will store daily discharge flow results for retrieval either remotely or directly from the panel on-site when required. This removes the need for staff to manually read the water meter.

6.2.12 Anti-Flotation Devices

The proposed wastewater treatment plant tanks may be buried below ground level and therefore there is a risk of floatation particularly for pump chambers. We recommend all buried or partially buried tanks include anti floatation measures which may comprise a flange around the base of the tank(s) or drainage installed to discharge to a lower elevation. All anti-flotation devices should be installed in accordance with the treatment plant supplier's requirements. Alternatively, tanks should be sited at ground level.

6.2.13 Other Wastewater Systems

Ormiston Associates Ltd. must be consulted in the event that it is proposed to install a wastewater system not specified above. Any changes to the proposed system may require an application to change the conditions of the discharge permit. Failure to do so could result in Ormiston Associates Ltd. being unable to provide certification of the installation.

7. Treated Effluent Land Disposal

Potential areas for land disposal of treated effluent were investigated and the approximate location of the preferred area identified as shown on the attached Drawing No. 5577-1. The proposed primary land disposal area is located in the north-eastern part of the site, on a ridge crest with slopes descending primarily to the north-east. (Figure 5). The proposed reserve disposal area is located to the south, also on the ridge crest.

Soil investigation boreholes indicate that the proposed treated effluent land disposal area is underlain by surficial organic Silt (Topsoil, Category 3) up to 300mm deep overlying silts, clayey silts and clay soils (Category 4-5) as detailed in hand auger borehole logs EF3 to EF4 presented above.

The boreholes were drilled in late spring / early summer and were dry to the maximum 1.2 metre depth of drilling.

Figure 5: Proposed Primary Disposal Area on ridge crest, view to South

7.1 Proposed Land Disposal System

We recommend irrigating treated effluent into the ground via subsurface Netafim **UniBioline** pressure compensating dripper irrigation lines (PCDI). Dripper irrigation lines are to be buried to 100-150mm in existing grassed areas, with a line spacing of 1.0 metre and emitter spacing of 0.5metres and a dripper rate of 1.6 L/Hr.

We recommend that the PCDI network is **loaded at a maximum areal loading rate of *3.0 litres/m²/day (3mm/day), based on Soil Category 5* (AS/NZS1547:2012) Table M1.**

This method utilises both soakage into the ground and evapotranspiration by vegetation cover. The low loading rate and pulse dose loading over an extended period minimises the potential for saturation of the ground.

Advantages of PCDI are:

1. Low loading rate minimises potential for ground saturation and wetting.
2. Maximises use of available land disposal areas.
3. PCDI lines can run generally along the contour.
4. Spreading treated effluent over an extensive area allows for better assimilation by the environment and provides for optimum reduction of remaining bacteria and nutrients.

7.1.1 Land Disposal Network Design

The disposal network system has been designed with the following parameters (Table 4).

TABLE 4 PRIMARY LAND DISPOSAL AREA CALCULATION	
Projected Daily Discharge Flow	**10,000 Litres**
Soil Areal Loading Rate	**3mm/day (3 litres/square metre/day)**
Network Calculation	**10,000 Litres/Day 3.0 Litres/m²/day**
Total Network Area Required	**3,334 m²**

Based on an areal loading rate of ***3.0 litres/m²/day***, and an **irrigation line separation of 1.0m** with irrigation line emitters at 0.5m intervals, a total linear length of **3,334m** of PCDI disposal network is required over an area of **3,334m²**.

The approximate location of the proposed primary land disposal area is identified on the appended Site Plan, Drawing No. 5577-1. The installers must confirm the location of the property boundary prior to installation of PCDI lines.

The disposal area must be fenced from the site with the installation of appropriate valve boxes and line markers for maintenance. The area can be established in grass and regularly mowed, or planted in appropriate species.

7.2 Sequencing Valve

The disposal field will be split into three equally sized smaller sectors and distribution to the land application system site will be achieved by use of automatic sequencing valve assemblies. These valves allow for distribution of treated effluent sequentially to multiple zones so as to reduce pumping requirements. This is particularly true where a distributing valve assembly is used instead of multiple pumps and/or electrically operated valves. Additionally, a reduction in long term operation and maintenance costs is realised due to a reduced size and/or number of pumps.

The valve itself has only a few moving parts, requires no electricity, and alternates automatically with each cycle. The sequencing valves operate on a hydraulic cam system. As water pressure is applied to the cam it lifts up and remains open, dosing only one sector, as the pressure drops once the pump stops, the cam rotates and closes ready to dose the next sector in the sequence. The sequencing valve will be installed at the highest point of the land application system so as to avoid any back pressure disturbing the cam operation.

7.3 Netafim Irrigation Network and Valves

For optimum operation of the UniBioline disposal network the following valves are to be incorporated.

(i) Air Release Valve (ARV)

An air release valve (ARV) is to be installed on the top end (most elevated point) of the main supply line from the pump chamber prior to the supply submain.

(ii) Dripper line Non Leakage Valve (DNL)

Dripper line Non Leakage (DNL) Valves are to be installed at each end of each of the laterals. DNL valves prevent the field draining past the location of the DNL after the pump switches off and pressure drops. If DNL valves are not installed there is a risk that

wastewater remaining in the lines will drain to the lowest point resulting in overloading of the soil in the lowermost portion of the field.

(iii) Manual Flush Taps

The advantage of manual flushing is the ability to achieve a higher water flow velocity in the distribution pipes for flushing solids/biological growth than is achievable with AFV's. A Manual Flush Valve (MFV) is required at the end of each line, which should return to the main header line and be identified by a permanent stake to allow for easy identification at the time of maintenance.

7.4 Reserve Disposal Area

Sufficient area is available for a primary disposal area and a reserve disposal area of at least 3,334m^2 or 100% of the primary area. (Refer to the attached Site Plan Drawing 5577-1.) Additional suitable area is available on the site. A reserve disposal area is required in the event of additional disposal area requirements in the future.

7.5 Stormwater Controls

No stormwater should be allowed to flow onto or have potential access to the septic tanks, treatment system, pump sump or treated effluent land disposal area.

7.6 System Maintenance & Maintenance Contract

The equipment suppliers will provide on-site training and operation manuals for on-going maintenance requirements. Maintenance of the treatment and disposal system is the owner's responsibility and it will be a condition of the discharge consent to have a maintenance contract with the suppliers/experienced drainlayer to undertake regular maintenance.

Maintenance requirements for septic tanks, with or without effluent outlet filters comprise regular desludging. Effluent Outlet Filters require washing down if regular maintenance checks indicate cleaning is required and are then placed back in the tank.

7.7 Management Plan

A condition of the discharge consent will be the requirement of a 'Management Plan' for the wastewater system. On completion of installation, Ormiston Associates Ltd. will prepare a Management Plan that outlines the wastewater system, monitoring requirements and people responsible for maintenance of the system. It should be noted that there will always be a risk of equipment failure however this is most likely to be an electrical problem.

All storage tanks including pumps have emergency storage above the high water level alarms allowing time from the alarm sounding for repair or replacement work to be completed.

7.8 Variations in Ground Conditions

We point out that the wastewater disposal method recommended in this report is based on site data from a limited number of discrete borehole locations. Natural variations in ground conditions can and will exist across the site. The nature and continuity of subsoil conditions away from the boreholes are inferred for the purpose of this design and it must be appreciated that actual conditions could vary considerably from the assumed model.

The movement of vehicular traffic over the proposed or completed disposal field should be avoided at all times as it may change the soils characteristics of the near surface soils, resulting in failure of part or all of the disposal field. No fill should be placed within the wastewater disposal area as this will impact on percolation/soakage, with fill soils likely to be different from those identified in our investigation, which may cause 'breakout' of wastewater. No site earthworks shall result in the disposal area being cut, filled or subject to temporary stockpiling of material, and these activities will adversely affect the natural soil structure.

Paths should not be constructed within disposal areas due to the health risk from faecal coliforms present within the treated effluent. For the same reasoning, fruit or vegetables that come into contact with the ground within the disposal area should not be consumed.

If required, modifications to the design to improve the soakage capacity of the primary disposal area may include the importing of topsoil within the disposal area. Should the primary disposal field not operate as designed it may be necessary to utilise the reserve disposal area.

7.9 Buried Services

The placement of buried services (e.g. power, telephone, drainage, etc.) within the primary disposal area should be avoided at all times. Installing service trenches within the disposal area increases the risk of wastewater 'tracking' down the trench, which may cause 'breakout' of wastewater.

7.10 Wastewater Installation Checklist

Following completion of the installation and commissioning of the wastewater system, the installer is to provide an 'as-built' plan to scale, detailing the location of all key components

of the wastewater system, including the location of the treatment system, water meter, the dripper irrigation field, field sectors and the fittings and valves associated with the dripper irrigation field.

In addition to showing the location of the wastewater system the plan should also indicate the setbacks from the following:

(i) Buildings
(ii) Property boundaries
(iii) Watercourses/open drains/surface water
(iv) Slopes
(v) Retaining structures
(vi) Stormwater discharges

8. Land Stability

The installation of the soakage beds is unlikely to create erosion or instability at this site. Slopes within the proposed wastewater disposal area are moderately to gently sloping.

9. Assessment of Effects on the Environment

A summary of the separation distances for limiting factors for the proposed wastewater treatment and disposal system is detailed in Table 5 below and outlined in the following sections.

TABLE 5
SUMMARY OF SEPARATION DISTANCES

Limiting Factors	Treatment System Separation Distance	Disposal System Separation Distance
Property Boundaries	>3.0m	>1.5m
Surface water (ponds, open water)	N/A	>240m
Ephemeral water courses	N/A	> 15m
Groundwater	N/A	> 1.2m
Wells, water bores: **Neighbouring bores:** **Site bore**	N/A	 > 700m >300m
Embankments/retaining walls	N/A	> 3.0m
Buildings	> 3.0m	>3.0m
Floodplains (1 in 100 & 1 in 20)	Outside 1 in 100	Outside 1 in 100

9.1 Proposed Treated Effluent Quality

The proposed on-site wastewater treatment and land disposal system is to cater for wastewater from domestic type facilities. Raw wastewater is to be treated to advanced secondary standard by primary septic tank treatment followed by recirculating textile filter treatment prior to ground disposal by dripper irrigation disposal. Proposed treated effluent quality is to be secondary standard:

- **$cBOD_5$** <20 mg/L
- **Total Suspended Solids** < 30 mg/L

9.2 Impact on Surface Water

Wastewater discharges can cause water quality problems in aquatic environments when:

- plant and weed growth accelerate in response to wastewater sourced nutrients,
- aquatic organisms are adversely affected by oxygen levels being reduced by the BOD load from the wastewater,

- aquatic organisms are adversely affected by the toxic effects of ammonia from wastewater,
- The presence of microbiological contaminants in wastewater can cause a risk to human and animal health.

Such outcomes are not necessarily attributed to any single on-site wastewater discharge, rather through the cumulative effects of discharges within a catchment.

In this case it is considered that the risk of adverse effects has been minimised as much as possible with the discharge of high quality secondary treated effluent. The disposal field is located approximately 240m from the nearest permanent watercourse. The disposal field is at least 15m from an ephemeral watercourse and it is considered that overland flow is unlikely given the disposal methodology and appropriate loading rate.

The separation distance complies with the minimum horizontal separation distance recommended by AS/NZS 1547:2012 of 15 metres (Table R1) and the recommended distance of 15 metres in category 4-5 soils of TP58[2] (Table 5.2). The surface water separation distance along with the high level of treatment and shallow land disposal method is concluded to be more than sufficient for protection of the resource. Further mitigation measures against surface flow could include planting between the downslope edge of the disposal system, and the boundary, and/or the installation of a low topsoil bund below the downslope edge.

9.3 Impact on Groundwater

The release of nitrates directly to groundwater can raise concentrations to levels with a potential to exceed drinking water standards. Ammonia, which is highly soluble and easily leached into groundwater, is toxic to aquatic life. Both nitrates and phosphates in soil or groundwater can reach water bodies such as streams, ponds and lakes. These nutrients can stimulate increased plant and algae growth and when present in natural water are significant factors in eutrophication. The die-off of additional vegetation or algal growth in the water; a result of the increased nutrient load, is then decomposed by bacteria that absorb oxygen in the water. This in turn has a significant impact on the degradation of water quality and alters sensitive aquatic ecosystems.

[2] Auckland Regional Council Technical Publication No. 58, On-site Wastewater Systems: Design and Management Manual Third Edition 2004 (TP58)

To reduce cumulative adverse effects, wherever practicable and especially where nutrients may impact on natural ground or surface waters, nutrients and in particular nitrogen components should be reduced in wastewater via the treatment process. In addition, the wastewater land distribution and application system methodologies should be designed to optimise further reduction in the soils prior to contact with water.

The proposed land disposal system will distribute highly treated effluent over an area at a loading rate appropriate for the soil types, site conditions and constraints. As previously described, our boreholes within the proposed disposal and reserve areas did not intersect groundwater to depths of 1.2m below the existing ground surface. This will provide a separation distance which exceeds the recommended vertical separation distances recommended by AS/NZS 1547:2012 of 0.6-1.5 metres, and the requirements of the WRP.

Therefore, given the separation distances available and the use of a secondary wastewater treatment plant, it is considered that groundwater quality is unlikely to be adversely affected by the proposed discharge.

Water Bores

In terms of groundwater quality protection for potable water supplies, the nearest mapped water bore, not part of the site, is located over 700m from the proposed disposal area. The site water bore (72_12576 or 72_12575) is located 300 m to the west of the reserve disposal area and 350m from the primary disposal area. The location of the disposal area therefore meets the recommended horizontal separation distances to a water bore recommended by AS/NZS 1547:2012 of 15-50 metres (Table R1) and the recommendations in TP58 requiring 20 metres separation to a water supply bore.

Based on the above information, the impact of the discharge on groundwater at the site is concluded to be less than minor.

9.4 Long Term Drainage Capacity

Domestic wastewater which has only received primary septic tank treatment can result in long term clogging of infiltration surfaces. Secondary treated effluent has a low total suspended solids level and biochemical oxygen demand minimising the impact on infiltration surfaces by reducing the level of biological breakdown of organic compounds which soils would normally be expected to complete. The aerobic nature of the treated effluent minimises the impact on receiving soils and can enhance long term acceptance as

indicated by the work of Bernhart (1973). We would not expect any reduction in soakage capacity as a result of application of this advanced secondary treated effluent into the soil.

9.5 Soils

Wastewater from domestic sources does not generally contain heavy metals and environmentally harmful compounds in concentrations likely to lead to soil contamination or problems that would render the soil unusable. It is considered that chemicals are generally diluted and removed in the treatment system or renovated by the microbial action in the soil itself. There is no evidence to suggest that the discharge has had any significant effects on the property or will affect any potential future use of soils, especially considering the land will in future be used for industrial purposes.

9.6 Amenity Values

Public Health

Wastewater discharges may contain very high concentrations of pathogens which may have human health-related effects if people are exposed to the effluent. Contact with effluent could occur if it were to run across the ground surface, or when partially treated effluent enters surface or groundwater. The potential for these types of effects typically arises when a system provides only limited treatment, when the system is not properly designed, installed, or maintained, or a combination of these factors. It is considered in this case that public health effects have been prevented by the wastewater treatment system and disposal area, particularly by the use of a high-quality treatment system, and the proposed subsurface disposal areas, which are remote from public access.

Odour

Offensive odours can emanate from processes which occur within the treatment and disposal of wastewater. Given the use of advanced treatment quality and the experience of similar sites, it is considered highly unlikely that odour production will occur. There is not expected to be any nuisance odour, however the treatment system vents can be fitted with carbon filters to scrub any odour.

Summary

Overall, we consider the potential effects of the discharge on ground and surface water quality, soil and amenity are less than minor. See Risk Assessment overleaf.

AS/NZS1547:2012 LAND DISPOSAL RISK ASSESSMENT EVALUATION TABLE

Site Feature And Critical Items	AS/NZS Setback Range (metres)	A Effluent Quality	B Surface water	C Ground water	D Slope	E Landscape Position	F Drainage	G Flood Risk	H Soil Cat	I Land form	J Disposal Method	Proposed Setback & Risk (metres)
Property Boundary (A,D,J)	**1.5 - 50**	BOD<20 **L**	NA	NA	<10% **L**	NA	NA	NA	NA	NA	Subsurface PCDI **L**	**>1.5m Low**
Buildings (A,D,,J)	**2.0 - >6**	BOD<20 **L**	NA	NA	<10% **L**	NA	NA	NA	NA	NA	Subsurface PCDI **L**	**>3m Low**
Surface Water A,B,D,E,F,G,J	**15 - 100**	BOD<20 **L**	Cat 5 >15m **L-M**	NA	NA	Gentle **L**	Cat 5 **L-M**	>1:20 **L**	NA	NA	Subsurface PCDI **L**	**>240m permanent >15m ephemeral Low (see text)**
Water Bore A,C,H,J	**15 - 50**	BOD<20 **L**	NA	SWL at 33.1m **L**	NA	NA	NA	NA	Cat 5 **L**	NA	Subsurface PCDI **L**	**>300m Low (see text)**
Recreational Areas, Pools A,E,J.	**3 - 15**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
In Ground Water tank A,E,J	**4 - 15**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Retaining Walls D,G,H	**3.0m or 45° angle from toe**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Groundwater A,C,F,H,I,J	**0.6 - >1.5**	BOD<20 **L**	NA	>1.2m **L**	NA	NA	Cat 5 **L-M**	NA	Cat 5 **L**	Plain **L**	Subsurface PCDI **L**	**>1.2m Low (see Text)**
Hardpan A.C.J	**0.5 - >1.5**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes.
Based on Tables R1 and R2 pages 185 and 187, AS/NZS1547:2012
Risk Level L = Lower, M = Medium, H = Higher
NA. Not Applicable

10. Status of Activities under the Waikato Regional Plan

Section 15 of the Resource Management Act, 1991 states that no person may discharge any contaminant to water or into or onto land in circumstances which may result in that contaminant entering water unless the discharge of the contaminant is expressly allowed by a rule in a regional plan (and in any relevant proposed regional plan) or by a resource consent.

The Waikato Regional Plan (WRP) became operative on 28 September 2007 therefore no other plans apply. In this instance, the discharge of wastewater to land is considered a Discretionary Activity under Rule 3.5.7.7 of the WRP, as the conditions of the Permitted Activity rules are not met due to the daily discharge volume exceeding 3,000 litres per day (Rule 3.5.7.6 condition (a)).

Table 6: Assessment of Activity Against Waikato Regional Plan Permitted Activity Rule 3.5.7.6

WRP 3.5.7.6 Condition	Assessment
a. The volume of effluent to be discharged shall not exceed three cubic metres per day averaged over any one month period.	a. **Does not comply**. Daily discharge volume is **10,000 litres per day**.
b. The design, construction, operation and maintenance of the system shall meet the following standards: i. pre-treatment of effluent to a standard not to exceed concentrations of 20g/m^3 of Biological Oxygen Demand and 30g/m^3 of suspended solids	b. Complies i. The recommended treatment system has a proven track record in similar situations and will meet the required standards.
ii. during times of normal wet winter groundwater level, there shall be at least 600 millimetres separation distance between the groundwater level and the bottom of the disposal trench or 300 millimetres between the groundwater level and dripper irrigation lines, where dripper irrigation lines are used and the design loading rate for effluent disposal is less than five millimetres/day.	ii. Groundwater was not intersected to 1.2m depth in the proposed disposal area which provides the required separation distance.
iii. there shall be no adverse change in groundwater quality as a result of the discharge, or in combination with other discharges	iii. Given the proposed high quality treatment and conservative disposal area loading rate, along with groundwater clearance, such effects are considered unlikely. iv. Given the proposed high quality treatment and

WRP 3.5.7.6 Condition	Assessment
iv. there shall be no adverse change in surface water quality as a result of the discharge, or in combination with other discharges v. there shall be no direct discharge of effluent into groundwater or surface water.	conservative disposal area loading rate, along with surface water clearance, such effects are considered unlikely. v. The system design proposed discharge to land.
c. The discharge shall not result in any objectionable effects from odour beyond the boundary of the subject property.	c. Complies The required property boundary clearances are met and the high quality treatment process are not expected to produce objectionable odour beyond the boundary.
d. The sewage disposal system shall not be sited within 30 metres of a Natural State Water Body or Fisheries Class Water Body as specified in the Water Management Class Maps, and 10 metres from any other surface water body.	d. Complies The separation distance to the nearest watercourse complies.
e. Written proof of compliance with this Rule shall be provided to the Waikato Regional Council on require in the form of either: i. certification by a person who is qualified and experienced in the field of onsite sewage treatment and disposal that the system will consistently satisfy the above standards taking into account the relevant site constraints, or ii. documentation which demonstrates achievement of the standards	e. Complies i. Certification via Producer Statement is available if required. ii. Documentation is available.
f. The discharge shall not occur within 20 metres of a Significant Geothermal Feature.	Not applicable

11. Policy Assessment

11.1 National Policy Statements, Plans and Other Legislation

Section 104(1)(b) of the Act sets out that when considering an application for resource consent, the Council shall have regard to any relevant provisions of national environmental standards and policy statements, regional policy statements, and plans or proposed plans. Having regard to this, the relevant statutory documents in this case, are addressed below.

11.1.1 National Environmental Standards and Policy Statements.

Currently there are ten NESs that have come into effect: the National Environmental Standards for Air Quality (where various standards have been in effect since October 2004), Sources of Human Drinking Water, Electricity Transmission Activities, Telecommunication Facilities, Assessing and managing contaminants in soil to protect human health, Commercial Forestry, Freshwater, Marine Aquaculture, Storing Tyres Outdoors and Greenhouse Gases from Industrial Process Heat.

The Freshwater NES is relevant to works and activities in and adjacent to "natural wetlands"; structures (culverts, weirs, flap-gates, dams and fords) in rivers; and various farming activities (including specified land use changes, intensive winter grazing, use of stockholding areas). This NES is not relevant to this application.

The National Policy Statement for Freshwater Management 2020 (NPSFW) came into force on 3 September 2020. It supersedes earlier versions of the NPSFW.

The NPSFW includes Te Mana o te Wai – a concept that "refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community."

As the consent sought is a minor activity, it is our opinion that should the application be granted, it will not be contrary to the Freshwater NPS.

11.2 Waikato Regional Policy Statement

The RPS is a high-level broad-based document containing objectives and policies the purpose of which is to provide an overview of the resource management issues of the region

and to achieve integrated management of the natural and physical resources of the Region. The Waikato Regional Council's new RPS was made operative on 20 May 2016. Numbering of the RPS was restructured on 30 September 2022 to relocate and renumber provisions. The restructuring does not change the outcomes or policy intent of the RPS.

Significant resource management issues in the RPS relating to this proposal are the state of resources (SRMR-I1), managing the built environment (SRMR-I4), the relationship of tangata whenua with the environment (te taiao) (SRMR-I5) and the health and wellbeing of the Waikato River catchment (SRMR-I6). There are a number of overlapping objectives under each of these relevant to this proposal. These are listed as follows:

- Integrated management of natural and physical resources (IM O1);
- Decision making (IM- O3);
- Ecosystem services (IM – O6);
- Relationship of tangata whenua with the environment (IM – O7);
- Sustainable and efficient use of resources (IM – O8);
- Mauri and values of fresh water bodies (LF – O1);
- Amenity (IM – O9);
- Values of soil (LF-O4).

Relevant policies include:

- Policy IM- P1 - Integrated approach
- Policy IM- P3 - Tāngata whenua
- Policy LF- P2 – Outstanding fresh water bodies and significant values of wetlands
- Policy LF -P3 - All fresh water bodies
- Policy LF – P4 - Catchment-based intervention
- Policy LF – P5 – Waikato River Catchment

These objectives and policies have been considered and measures have been recommended and undertaken to avoid, remedy or mitigate adverse environmental effects. We consider that the proposal is not inconsistent with the RPS.

11.3 Waikato Regional Plan and Proposed Plan

11.3.1 Proposed Waikato Regional Plan Change 1 – Healthy Rivers

The proposed plan change Decisions Version was notified on 22 April 2020. The plan change relates to the catchment of the Waikato and Waipa Rivers and gives effect to the National Policy Statement for Freshwater (2014) and Te Ture Whaimana o Te Awa o Waikato (The Vision and Strategy for the Waikato and Waipa rivers) which was adopted by

Government as part of Treaty Settlement legislation. The regional council has a legal requirement to give effect to both of these.

The proposed plan seeks to manage and require reductions in diffuse discharges of nitrogen, phosphorus, sediment and microbial pathogens. The plan change sets water quality targets for each sub-catchment to be reached over an 80-year time period. The plan change makes reference to point source discharges, which include on-site wastewater discharges. Policy 12 requires point source discharges to adopt the best practicable option to avoid or mitigate the adverse effects of the discharge.

In terms of the proposed on-site wastewater discharge, the proposed wastewater treatment system will provide high quality wastewater and the separation between the discharge and both groundwater and surface water has been maximised.

In terms of nitrogen loading, expected concentrations will be in the order of 100gTN/m^3 of wastewater, which equates to 1kg TN/day and 365 kg TN per year. Over the entire property this represents approximately 7 kgTN/ha/year, which is well within the farming baseline of 150 kgTN/ha/year.

The proposal effectively remains within the level of effects which would be permitted, similarly to remaining within a benchmark.

11.4 Other Matters

11.4.1 Waikato-Tainui Raupatu (Waikato River) Settlement Claims Act 2010

We have had particular regard to the Vision and Strategy (Schedule 2 of the Settlement Claims Act) as the embodiment of the settlement act, seeking to restore and protect the health and wellbeing of the Waikato River for future generations.

We understand that applications must now demonstrate some positive benefit contributing to the restoration of the Waikato River, proportionate to the activity in question. The planning report, included with the application, deals with the requirements of this Act.

In the case of the proposal, we consider that proportionally the effects of the discharge are small, especially given the high quality of treatment and that the property has been retired

from the previous use which included farming, and we consider that the Vision and Strategy is not compromised by the proposal.

11.4.2 Waikato-Tainui Environmental Plan

The purpose of the WTEP is 'to provide a map or pathway that will return the Waikato-Tainui rohe to the modern day equivalent of the environmental state that it was in when Kiingi Taawhiao composed his maimai aroha'. The plan sets out the overarching position of Waikato-Tainui on the environment and seeks to consolidate and describe Waikato-Tainui environmental issues, values, principles, knowledge, and perspective on, relationship with, and objectives for natural resources and the environment.

We have reviewed the plan, and consider that as the application includes discharge of highly treated wastewater to the ground that the aspirations of Waikato-Tainui in regard to fresh water are not negatively impacted by the proposal and that the activity does not compromise the aims and objectives of the Waikato-Tainui Environmental Plan.

11.5 Relevant Part 2 Considerations

All resource consent applications must be considered subject to Part 2 of the Resource Management Act 1991. Part 2 details the matters that must be considered for the sustainable management of natural and physical resources including matters of national importance, other matters, and the Treaty of Waitangi. The proposed activity has been considered in the context of the matters outlined in Part 2 of the Resource Management Act 1991, in particular sections 5 to 8. In our opinion, the activity does not compromise any of these issues and, therefore, the overall purpose of the Act.

12. Consultation

Regarding the potential effects of the proposed on-site wastewater discharge, we do not consider that any neighbouring parties are affected. All required setback distances have been met or exceeded. The wastewater treatment system is over 250 metres from the nearest building not part of the site.

The system has been designed specifically to mitigate the site constraints and discharge is to land which is in line with Mana Whenua preferences.

13. Possible Draft Resource Consent Conditions

The following proposed consent conditions are outlined below.

General

1. The discharge of wastewater to land authorised by this consent shall be undertaken in general accordance with the following application documentation:
   - References

   Subject to the resource consent conditions below which shall prevail in the event of any inconsistency between the aforementioned documentation and the conditions.

2. The consent holder shall pay to the Waikato Regional Council any administrative charge fixed in accordance with section 36 of the Resource Management Act 1991, or any charge prescribed in accordance with regulations made under section 360 of the Resource Management Act.

3. The consent holder shall ensure contractors and workers are made aware of the conditions of this resource consent and ensure compliance with those conditions.

Discharge of Wastewater

4. The maximum volume of treated wastewater discharged on-site must not exceed 10,000 litres per day (10.0 cubic metres per day) as measured over any 24-hour period.

5. The consent holder shall ensure that the quality of the treated effluent discharged to the ground shall comply with the following limits:

   a) The concentration of five-day Biochemical Oxygen Demand must not exceed 20 milligrams per litre (20mg/l BOD_5),
   b) The concentration of Total Suspended Solids must not exceed 30 milligrams per litre (30mg/l TSS).

   Note A: *All quality analyses shall be undertaken by an IANZ accredited or equivalent laboratory. All methods used shall be appropriate for the analyses undertaken.*

6. Treated effluent shall be discharged into the ground via subsurface pressure compensating dripper irrigation at an areal loading rate that does not exceed 3 millimetres per day (i.e. 3.0 litres per square metre) or the absorptive capacity of the soils, whichever is the lesser).

7. The discharges shall be uniformly distributed over the disposal system.

8. The consent holder shall ensure that a reserve wastewater disposal area of not less than one hundred percent (100%) of the duty disposal area shall be available all times. To this end the consent holder shall ensure that no permanent hard surface (for example concrete) shall be placed over the reserve disposal area for the duration of this consent.

9. The consent holder shall ensure that there is a minimum vertical separation distance of at least 600 millimetres of unsaturated soil between the base of any disposal system and the ground water table at all reasonable times. The term "at all reasonable times" implies that the specified vertical distance is maintained during the wettest months of the year immediately following a typical short duration rainfall event (e.g. a 6-month return period event).

10. There shall be no breakout (uncontrolled discharge) of wastewater onto the ground surface from any part of the wastewater treatment system or the disposal area that results in visible ponding of the wastewater on the ground surface and/or an overland discharge of wastewater.

11. Surface stormwater and stormwater runoff shall be directed away from the wastewater treatment system and disposal area, as extensively as practicable.

12. The treatment system shall be maintained in as watertight a condition as practicable to prevent the ingress of stormwater or groundwater into the system.

13. The consent holder shall ensure that there is no activity undertaken on top of the disposal area that may cause damage to the disposal system (e.g. stock grazing, deep rooting trees or car parking etc.).

14. The consent holder shall ensure that the wastewater disposal area is fenced. The consent holder shall maintain signs at the disposal area which include the words 'warning-health risk', along with 'sewage treatment area'.

15. The consent holder shall maintain a sign at the entrance to the Wastewater Treatment Plant which provides the appropriate contact telephone numbers in the event of an emergency, complaint or enquiry. The sign shall also include the words 'warning-health risk', along with 'sewage treatment area'.

16. The discharge shall not result in any objectionable effects from odour beyond the boundary of the subject property.

Site Management and Maintenance

17. Within one month of the completion of the installation of the new wastewater treatment system and the new disposal system, the consent holder shall submit to the Waikato Regional Council the following:
    (i) An 'as built' plan of the treatment and disposal system; and
    (ii) Verification from the installer of the system that it has been installed in accordance with the information submitted in support of the application and best practice.

18. Within one month of commissioning of the new wastewater treatment system, the consent holder shall to the satisfaction of Waikato Regional Council, provide evidence that a maintenance contract or maintenance programme for the system exists, and which is to be applied for the duration of consent.

19. The consent holder shall retain and update as necessary a Wastewater Management Plan for the site. The following matters shall be addressed, as a minimum:
    (i) An inspection programme designed to verify the correct functioning of all components of the wastewater treatment system; and
    (ii) A schedule or checklist of maintenance requirements for all reticulation, pump chambers and the wastewater treatment and disposal system. The

maintenance requirements shall also specify that the systems shall be maintained on a minimum six-monthly frequency; and

(iii) A copy of the names of the appropriate contact people in the event of system malfunction including contact telephone numbers; and,

(iv) Monitoring and reporting requirements, and

(v) A contingency plan for action to be taken in the event of wastewater breakout from the treatment system and/or disposal areas.

The Management Plan, along with any notification of any changes made to it, shall be provided to the Waikato Regional Council within 12 months of exercising the consent or making changes to the Management Plan.

20. The wastewater scheme shall be operated, maintained and managed by appropriately experienced personnel in accordance with the Management Plan pursuant to condition 19 of this consent.

21. The consent holder shall ensure contractors are made aware of the conditions of this resource consent and shall take all reasonable steps to ensure contractors are able to comply with those conditions.
Note: An example of a reasonable step to ensure contractors are able to comply with the conditions is to require them to be fully conversant with the Management Plan required by Condition 19.

22. There shall be no odour as a result of the activities authorised by this resource consent that causes an objectionable or offensive effect beyond the boundary of the site.

23. If an emission of odour occurs that has an objectionable or offensive effect, the consent holder shall provide a written report to the Waikato Regional Council within five days of being notified of such by the Waikato Regional Council. The report shall specify:
(i) the cause or likely cause of the event and any factors that influenced its severity;
(ii) the nature and timing of any measures implemented by the consent holder to avoid, remedy or mitigate any adverse effects; and
(iii) the steps to be taken in future to prevent recurrence of similar events.
Note: For the purpose of condition 19 of this resource consent, the Waikato Regional Council will consider an odour effect that is objectionable or offensive to have occurred if any appropriately experienced officer of the Waikato Regional Council deems it so after having regard to:
(i) the frequency, intensity, duration, offensiveness and location of the odour; and/or
(ii) receipt of complaints from neighbours or the public; or
(iii) relevant written advice or a report from an Environmental Health Officer of a territorial authority or health authority.

Monitoring

24. The consent holder shall ensure that a flow meter is available to record the quantity of wastewater discharged from the wastewater treatment system on a cumulative daily basis. The meter shall have a reliable calibration to flow, which shall be maintained to an accuracy of +/- 5%. The total flow discharged every day shall be recorded. Access to the meter shall be available to Waikato Regional Council staff at all reasonable times.

25. The consent holder shall sample the treated effluent every six months within the months of November and May. This sample shall be analysed for the following parameters:
    (i) Biochemical Oxygen Demand (BOD_5); and
    (ii) Total Suspended Solids (TSS)

    Refer Advice ***Note A***.

26. If sampling results show the effluent quality standards in condition 5 have not been met, the consent holder shall take all practicable measures to remedy the exceedance and shall repeat sampling as required by condition 25 until the discharge quality is within the limits required by condition 5.

Reporting

27. The consent holder shall provide to the Waikato Regional Council a written report by 30 September each year, addressing the following:
    (i) A summary of all monitoring results required by conditions of this resource consent for the year ending 30 June
    (ii) Critical analysis of the monitoring data collected and comments on any emerging trends
    (iii) Comment on compliance with the conditions of this resource consent
    (iv) Comment on the performance and adequacy of the disposal system, matters of compliance
    (v) Comment on the effects of the discharge on ground and surface water
    (vi) Any reasons for non-compliance or difficulties in achieving compliance with the conditions of this resource consent and a description of and a summary of the efficacy of any remedial works undertaken
    (vii) Reporting associated with Condition 5 of this consent
    (viii) Any other issue considered relevant to the consent holder.

28. The consent holder shall report to the satisfaction of the Waikato Regional Council, the wastewater volume and quality monitoring records required by conditions 24 and 25 via electronic means on a six-monthly basis for the duration of this consent.

Standard Review Condition and Advice Notes

14. Conclusions and Recommendations

We provide the following conclusions, opinions and recommendations based on the information obtained from the site investigation, discussions with the applicant and our site observations.

1. Design peak daily wastewater production for the proposed site is calculated to be up to **10,000 litres per day** based on peak design occupancy.

2. We recommend the Innoflow Technologies AX200 +AX40 two-stage recirculating textile packed bed reactor (rtPBR) system. The proposed wastewater treatment system comprises the following components.

   Grease Trap

   - 1 x 6,000 litre triple chamber grease trap is proposed to be installed at the staff kitchen.

   Primary Treatment

   - Septic Tank 1 x 25,000 litres ($25m^3$)

   Main Treatment System

   - Pre-Anoxic Tank 1 x 25,000 litres ($25m^3$)
   - Recirculation Tank 1 x 10,000 litres ($10m^3$)
   - Advantex Textile Filters 2 x AX100 Pods ($20m^2$)
   - Recirculation Tank 1 x 10,000 litres ($10m^3$)
   - Advantex Textile Filters 2 x AX20 Pods ($2.0m^2$)
   - Treated Effluent Tank 1 x 10,000 litres ($10m^3$)
   - System Monitoring: Discharge Water Meter with Remote Monitoring Panel & Data Logger
   - Treated effluent quality is to meet the following standards:
     - BOD_5 = <20 mg/L
     - Total Suspended Solids = < 30 mg/L

3. We recommend irrigation of treated effluent into the ground within the proposed primary land disposal area by dose loading pressure compensating dripper irrigation at an areal loading rate of up to **3.0 litres/m^2/day (3.0mm/day)**.

4. A **primary land disposal area of 3,334m^2** is identified and indicated on the appended site plan, incorporating a total of 3,334 linear metres of irrigation line spaced at 1.0 metre centres with emitters at 0.5metre centres.
   - The area is to be laid in three equal sectors and loaded via sequencing valve.
   - Dripper irrigation lines are to be buried to 100-150mm in grassed areas, which must be fenced.
   - The irrigation system is to be installed to the design requirements of the suppliers

5. A reserve area totalling 100% of the size of the primary disposal area is identified on the site plan.

6. No stormwater is to be discharged into the wastewater treatment and disposal system.

7. 24 hours emergency storage is provided in all pump chambers and high water level alarms are included in all pump chambers with an audible alarm installed at the treatment system and connected to the remote monitoring system.

8. Maintenance of the wastewater treatment and land disposal system is the owner's responsibility and we recommend a maintenance contract be taken with the equipment supplier.

9. We conclude that the proposed wastewater treatment and land disposal systems will have a less than minor effect and provide management for the peak daily wastewater production.

10. There are no parties that are considered to be adversely affected by the on-site wastewater discharge.

11. An assessment of the activities against the relevant rules, objectives and policies of the Waikato Regional Plan is included in this report. The activity is considered to be consistent with the relevant objectives and policies of these documents.

12. The applications were also assessed against the provisions of the RMA and found to be consistent with Part 2 of the RMA.

SUMMARY TABLE FOR PROPOSED WASTEWATER SYSTEM AT 61 HAMPTON DOWNS ROAD	
PROPERTY DETAILS	
Location	**61 Hampton Downs Road**
Legal Description	**Lot 1 DPSA45893, Lots 3, 4 and 5 DP310030**
Area	**52.8705 hectares**
Water Source	**Bore Water Supply**
WASTEWATER PRODUCTION	
Daily Wastewater Flow	**10,000 litres/day**
WASTEWATER TREATMENT PLANT	
Grease Trap	**1 x 6,000 litres**
Septic Tank	**1 x 25,000 litres**
Pre-Anoxic Tank	**1 x 25,000 litres**
Stage 1 Recirculation Tank	**1 x 10,000 litres**
Stage 1 AX100 Textile Pods	**2 x AX100 pods = AX200**
Stage 2 Recirculation Tank	**1 x 10,000 litres**
Stage 2 AX100 Textile Pods	**2 x AX20 pod = AX40**
Treated Effluent Tank	**1 x 10,000 litres**
Water meter	**+/-5% and Data logger**
High water level alarm	
Control Panel	**Remote Monitor Control Panel**
TREATED EFFLUENT DISPOSAL	
Land Disposal System	**Pressure compensating dripper irrigation**
Land Disposal System	**Dose loaded by automatic sequencing valve**
Treated Effluent Areal Application Rate	**3mm/d (3 litres/square metre/day)**
Primary Land Disposal Area	**3,340m^2**
Reserve Disposal Area Percentage	**100%**
DISCHARGE CONSENT REQUIRED	**YES**
BUILDING CONSENT REQUIRED	**YES**

15. Limitation

This report has been prepared for the sole benefit of **National Green Steel Ltd** as our client with respect to the brief for the presently proposed development and to be used in design by their appointed Consultants and support Resource Consent and Building Consent applications. It is not to be relied upon or used out of context by any other person without reference to Ormiston Associates Ltd.

The reliance by other parties on the information or opinions contained in the report shall, without prior review and agreement in writing, be at such parties sole risk.

ORMISTON ASSOCIATES LTD.

Trisha Simonson
Senior Engineering Geologist

A W Ormiston
Director

Proposed Wastewater Treatment System: Information Sheet Specification Drawings O&M Manual

ORMISTON ASSOCIATES LTD
CONSULTANTS IN GEOTECHNICAL ENGINEERING, GEOLOGY & ENGINEERING GEOLOGY

AdvanTex® Treatment Systems

AX100

Manufactured by **Orenco Systems®, Inc.**

Decentralized Wastewater Treatment for Commercial Properties and Communities

Applications:

- Municipal systems
- Subdivisions, apartments
- Golf course developments, resorts
- Manufactured home parks
- Parks, RV parks, campgrounds
- Schools, churches, businesses
- Rest areas, truck stops

Orenco Systems®, Inc.
814 Airway Avenue, Sutherlin, Oregon, USA 97479
Toll-Free: 800-348-9843 • +1-541-459-4449 • www.orenco.com

AdvanTex® AX100 Treatment System

Textile Media

The treatment medium is a uniform, engineered textile, which is easily serviceable and allows loading rates as high as 50 gpd/ft² (2000 L/d/m²).

Effluent Distribution

The treatment media is microdosed at regular intervals by high-quality, low horse-power pumps; proprietary spin nozzles distribute the effluent efficiently, optimizing treatment.

Laterals and Lids

Isolation valves, flushing valves, and hinged lids with gas springs allow easy access and servicing by a single operator.

Telemetry Controls

Orenco's telemetry-enabled control panels use a dedicated phone line, ensuring round-the-clock system supervision and real-time remote control.

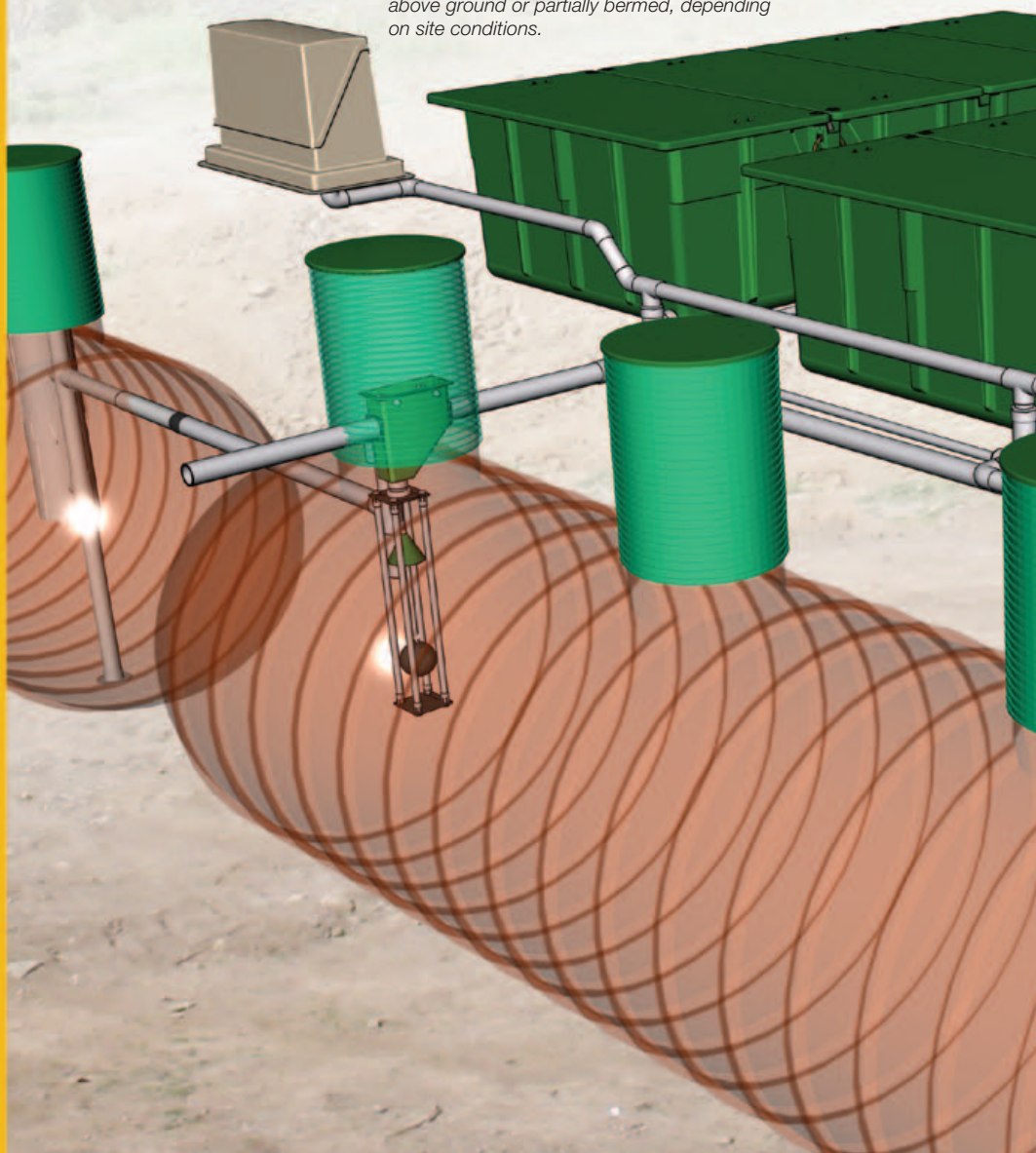
The Product

Orenco's patented* AdvanTex® Treatment Systems can make raw wastewater up to 98% cleaner, meeting stringent regulatory requirements. They can also reduce nitrogen significantly, depending on influent and configuration. Orenco's commercial-sized (AX100) AdvanTex Systems offer all the benefits of Orenco's residential line:

- Consistent, reliable treatment, even under peak flows
- Compact package, small footprint, for small sites
- Premanufactured package, including textile medium, for quality control
- Low maintenance requirements, low power use (<2 kWh per 1000 treated gallons)
- Low life-cycle costs
- Production of clear, odorless effluent that's ideal for reuse

AdvanTex Treatment Systems for supplemental BOD and ammonia reduction are also available. (www.orenco.com/systems/nitrogen_reduction.cfm)

Sample System Layout:
Tanks are buried. AX100 filter pods can be installed above ground or partially bermed, depending on site conditions.



AdvanTex® AX100 Treatment System

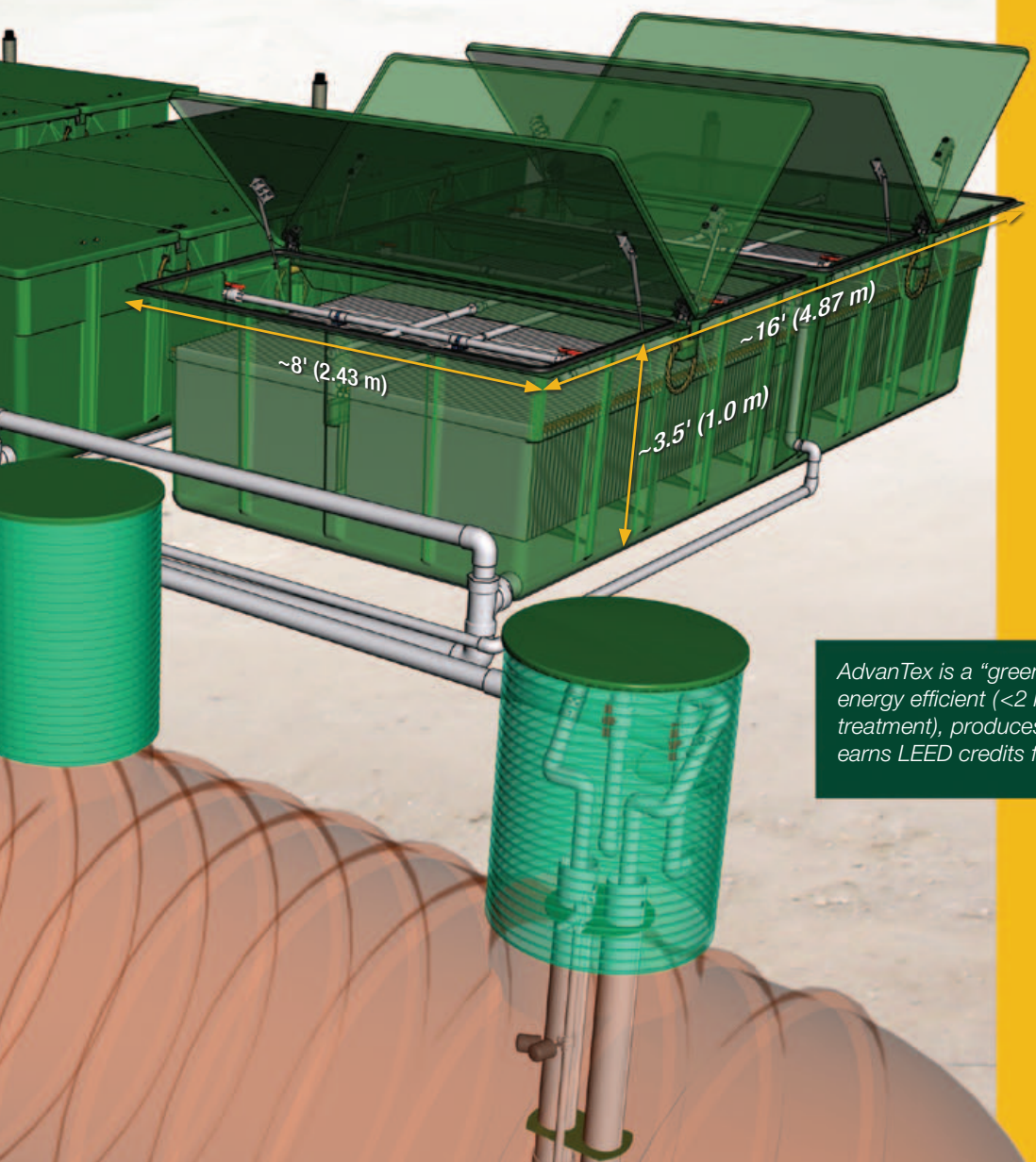
Decades of Research, Thousands of Installations

Orenco's AdvanTex recirculating filter unit is configured like a recirculating sand filter — a packed bed filter technology that Orenco engineers have helped to perfect since the 1970s. Like recirculating sand filters, AdvanTex is reliable and low-maintenance. It is superior to other packed bed filters, however, in its serviceability and longevity.

It is also superior in its treatment media. AdvanTex uses a highly efficient, lightweight textile that has a large surface area, lots of void space, and a high degree of water-holding capacity.

Consequently, AdvanTex Treatment Systems can provide treatment equivalent to that of sand filters at loading rates as high as 25-50 gpd/ft^2 (1000-2000 L/d/m^2). That means AdvanTex can treat high-volume commercial and multi-family flows in a very compact space.

Our textile-based, multi-pass treatment technology has undergone third-party testing and evaluation to ANSI Standards. About 30,000 residential-sized AdvanTex filters have been installed since 2000. And about 3,000 commercial-sized AX100 units are now in operation, including the installations described on the back page.



The Program

It takes more than a good product to solve onsite wastewater problems. It takes a comprehensive program … one that ensures a successful project every time and provides support for the life of the system. That's what Orenco Systems® has done. We've engineered a program, not just a product.

Orenco's commercial **AdvanTex** program includes …

- Authorized Dealers; trained Installers and Service Providers
- Training and plan reviews for Designers
- A comprehensive project checklist for successful system design, installation, start-up, and follow-up
- Round-the-clock system supervision via Orenco's remote telemetry controls
- A commitment to ongoing O&M, signed by system owners
- Web-based tracking of site and performance data on Dealer extranet
- Ongoing manufacturer support through Orenco's Sales Department
- Asset Management advice by dedicated post-sales Account Managers

AdvanTex is a "green" wastewater solution that is energy efficient (<2 kWh/1000 gal. for secondary treatment), produces re-use quality effluent, and earns LEED credits for your projects.

* NOTE: Covered by U.S. patent numbers 6,540,920; 6,372,137; 5,531,894; 5,480,561; 5,360,556

AdvanTex® AX100 Treatment System

Carefully Engineered by Orenco

Orenco Systems has been researching, designing, manufacturing, and selling leading-edge products for decentralized wastewater treatment systems since 1981. The company has grown to become an industry leader, with about 300 employees and 300 points of distribution in North America, Australasia, Europe, Africa, and Southwest Asia. Our systems have been installed in more than 70 countries around the world.

Orenco maintains an environmental lab and employs dozens of civil, electrical, mechanical, and manufacturing engineers, as well as wastewater treatment system operators. Orenco's technologies are based on sound scientific principles of chemistry, biology, mechanical structure, and hydraulics. As a result, our research appears in numerous publications and our engineers are regularly asked to give workshops and trainings.

Powered by Franklin Electric

c UL us LISTED

Orenco®
Orenco Systems®, Incorporated
814 Airway Avenue
Sutherlin, OR 97479 USA
T: 800-348-9843
T: 541-459-4449
F: 541-459-2884
www.orenco.com/systems/

ABR-ATX-AX100-1
Rev. 2.2, © 11/14
Orenco Systems®, Inc.

Malibu Restaurant and Residential Development

Ten AX100s at the top of a Malibu bluff are treating high-strength waste from a large (200+ seat) beachfront restaurant, 100 feet (30 m) below. This high-visibility tourist destination requires reliable, odor-free operation. Effluent sampling indicates excellent treatment, including nitrogen reduction. At an adjacent residential community, another system has been installed, consisting of 20 AX100s capable of treating up to 60,000 gpd (227,000 L/d) peak flows.

Mobile, Alabama Utility-Managed Subdivisions

Champion Hills is one of the many subdivisions in rural Mobile County served by Orenco's effluent sewers and treatment systems.

Since 2003, South Alabama Utilities (SAU) in Mobile County, Alabama, has become the subject of nationwide classes, presentations, and tours because of its ambitious and innovative solution for serving nearly 4,000 new customers in 47 new subdivisions in western Mobile County (as well as a number of new schools and commercial properties). How? By installing more than 60 miles (96.5 km) of interconnected Orenco Effluent Sewers that are followed by 141 AdvanTex AX100s located at 13 different treatment sites. All told, SAU has the capacity to treat nearly half a million gpd (1.9 million L/d) of effluent, at better than 10 mg/L BOD/TSS.

Under SAU's program, developers, builders, homeowners, and the utility all share the cost of extending wastewater infrastructure. Costs vary by development, but SAU currently charges homeowners about $35-40/month for service. Overall costs are about half the cost of conventional sewers.

Oregon Riverside Community

Since 2003, twelve AX100s have been providing advanced secondary wastewater treatment in Hebo, Oregon, for a small community collection system that discharges directly into Three Rivers, after UV disinfection. The average annual design flow is 17,000 gpd (64,400 L/d) with a peak daily design flow of 80,000 gpd (303,000 L/d) to account for I&I contributions from the collection system. Effluent BOD_5 and TSS are averaging 4.4 and 4.5 mg/L, respectively.

To order a complete design/engineering package for Orenco's Commercial AdvanTex Treatment Systems, contact your local Commercial AdvanTex Dealer. To find a Commercial Dealer, go to www.orenco.com/systems and click on "Locate a Dealer." Or call 800-348-9843 and ask for a systems engineer.

AdvanTex® O&M MANUAL

Start-Up and Maintenance of AdvanTex® AX100 & AX20 Commercial Wastewater Treatment Systems

COMMERCIAL O&M MANUAL

Orenco®

800-348-9843 • 541-459-4449
www.orenco.com
www.vericomm.net

Introduction

About Orenco

Since 1981, Orenco Systems®, Inc. has researched, designed, and manufactured leading-edge onsite and decentralized wastewater treatment technologies. We are one of the nation's leading manufacturers and suppliers of equipment for the collection and treatment of wastewater. At Orenco, we specialize in the manufacture of complete treatment systems for residential, commercial and community applications. Wastewater collection and treatment is our only job. When you purchase an Orenco system, you can be confident you have chosen the best equipment available.

Assistance

In addition to providing quality equipment, Orenco prides itself on its outstanding customer service and technical assistance. Should you have any questions regarding your system, components, instructions, or this O&M Manual, please contact us for assistance. Please include the name and location of your project or system with any correspondence, so we can quickly respond to your request.

When Your Equipment Arrives

Inspect your order for completeness and inspect each component for shipping damage. Check to be sure that the instructions and items supplied comply with your state and local regulations. Carefully read and follow all instructions. Be aware that improper system or component installation may void warranties.

Table of Contents

Introduction

Start-Up & Operation

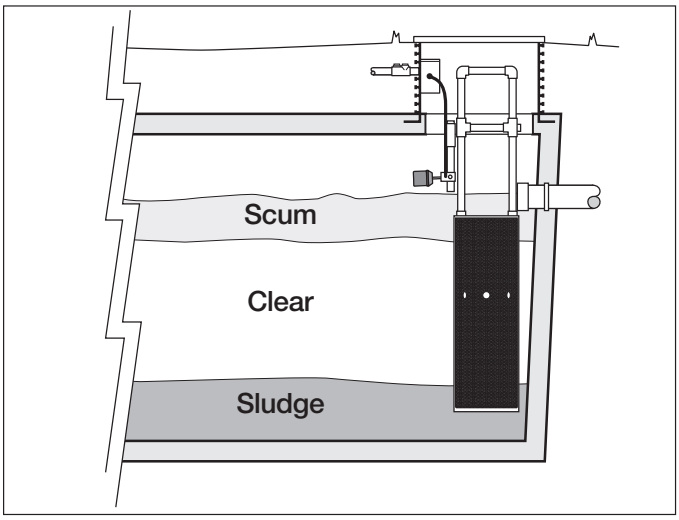
Maintenance

Appendices

About the AdvanTex Treatment System

Primary Tank

The primary tank provides passive primary wastewater treatment. There can be one or more primary tanks in parallel or series, depending on the size of the system. In certain applications, the primary tank may be preceded by a grease interceptor tank.



The primary tank is an enclosed, watertight receptacle designed to collect wastewater; segregate settleable and floatable solids (sludge and scum); accumulate, consolidate, and store solids; digest organic matter; and discharge treated effluent. BOD (biochemical oxygen demand) removals of greater than 65% and TSS (total suspended solids) removals of greater than 70% are easily accomplished. In the primary tank, wastewater separates into three distinct layers: a floating scum layer, a bottom sludge layer, and a clear zone in between, which is relatively free of large solids. An effluent filter or pump vault allows liquid effluent from the clear zone to be transported to the recirculation/blend or recirculation/blend and anoxic tank.

Anoxic Tank (if applicable)

The anoxic (low oxygen) tank enhances the denitrification of AdvanTex® filtrate. It is sized based on the design flow of the system. In systems that use an anoxic tank, it is generally located between the primary tank, flow splitter basin, and recirculation/blend tank in the treatment train.

The anoxic tank provides the ideal environment for carbonaceous microbes that reduce nitrates to nitrogen gas (denitrification) from AdvanTex filtrate returning from the flow splitter basin. The harmless nitrogen gas is released freely back into the atmosphere.

Recirculation/Blend Tank

The recirculation/blend tank reduces the strength of the effluent being applied to the AdvanTex filter. It is sized at 80 to 100% of the design flow. It is located after the primary treatment tank and before the AdvanTex textile filter.

The reduction in effluent strength is achieved by mixing treated filtrate from the AdvanTex filter with primary treated effluent at the recirc valve, located at the inlet of the recirculation/blend tank. A timer-controlled pump at the outlet end of the tank then sends the blended effluent to the AdvanTex filter.

AdvanTex® Textile Filter

The AdvanTex textile filter pod provides secondary wastewater treatment. There can be one or more AdvanTex pods, depending on the size of the system.

The filter is a sturdy, watertight fiberglass basin filled with an engineered textile material. The textile media has a very large surface area and void volume (for free flow of oxygen). Wastewater percolates both through and between the textile media. A visible biological film normally develops on the filter media within a few days of system start-up. Within the filter, aerobic conditions exist that are ideal for microbes that convert ammonia to nitrate (nitrification). BOD and TSS reductions occur almost immediately. Nitrification may take four to six weeks, depending on ambient temperature.

After percolating through the filter media, the effluent gravity-flows to the recirculating valve. On systems designed for enhanced nitrogen removal, the effluent first flows to a flow splitter basin where a percentage of the effluent is diverted to the inlet side of a primary tank or anoxic tank. The remainder flows to the recirc valve, where it is directed either into the recirculation/blend tank or discharged.

Start-up & Operation

Introduction

This section covers the start-up of an AdvanTex®-AX100 Treatment System in a commercial application. The formal start-up of an AdvanTex Treatment System should only be performed by trained personnel. As a trained member of the team performing the system start-up, you play a critical role in the operation of the system. The decisions made at the time of the start-up will determine the long-term maintenance needs of the system. Regulators, manufacturers, dealers, property owners, neighbors, and service providers all rely on a thorough start-up.

Before you start your system, please read this entire manual, as well as the engineering plans, and contact your Dealer if you have any questions. You'll save yourself time and money, and you'll reduce the potential for follow-up work. For information specific to your system, refer to your detailed engineering plans.

We recommend following the flow path through the treatment train, if possible, when performing the system start-up, beginning at the building outlets and ending at the final discharge point. By following this start-up sequence, the treatment train can be effectively inspected for proper operation and each step in the process can be given systematic attention.

Roles and Responsibilities

Prior to start-up, the Orenco Representative or AdvanTex Dealer will contact the Designer, Installer, and Service Provider to coordinate a start-up date. The date will be based on a status report provided by the Orenco Representative and the availability of all parties. The status report will include, but will not be limited to, verification of leak testing performed by the Installer, installation of all equipment, and the availability of power, phone line, and water at the site.

- The **AdvanTex Dealer** is expected to be on site and is either performing the start-up or acting as a coordinator and general resource during the installation and start-up of the system.
- The **Designer** is required at the site during start-up to answer questions concerning site-specific issues not covered in the plans, timer settings, and float settings.
- The **Installer** is required at the site during start-up to address any installation issues that arise.
- The **Service Provider** is required at the site during start-up to become familiar with the system, receive training on control panel and treatment system operation, and to learn correct sampling techniques for the system.

Safety Precautions

Before starting up, maintaining, or servicing any wastewater treatment system, observe the following precautions for the safety and health of all service personnel working with or around wastewater, effluent, and its associated equipment:

- Wear proper clothing that covers all parts of the body that will be exposed to wastewater or effluent.
- Wear personal protection equipment (PPE) such as rubber gloves and eye protection when handling or touching any equipment components that come in contact with wastewater or effluent.
- Turn off system power at the service entrance panel and set the circuit breakers in the panel to their "OFF" positions before removing any system components. If the control panel or service entrance panel is not within eyesight of the pumping system, use Lock Out/ Tag Out tags to ensure safety.
- Avoid driving over any part of the wastewater treatment system unless it's been equipped to withstand vehicle traffic. If the system is subject to possible traffic, put a barricade up to protect the system.
- Do not enter any tank access. Any work performed on the tank should be done from the outside. Gases and/or oxygen depletion in the tank can be fatal.
- Secure all tank access lids properly to the riser after all work is complete.
- Practice proper personal hygiene at all times.

Start-up & Operation (continued)

Recommended Tools and Equipment – Start-up

The following items are recommended for a smooth and successful start-up:

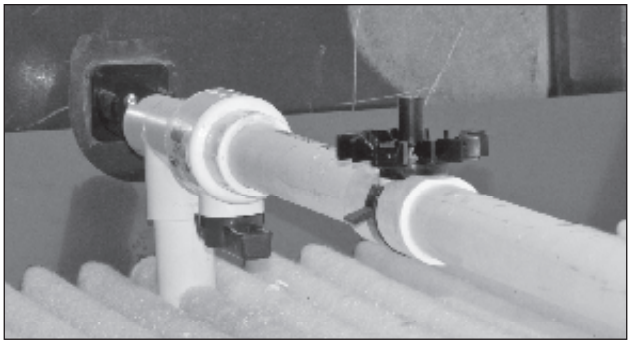
- A tool kit containing common tools and these additional items:
  - A cordless power drill with 1/2" nut driver and 3/16" hex-head bit
  - Voltmeter
  - Small electronics screwdrivers
  - Wire strippers/cutters
  - Cable ties
  - Tape measure
  - Adjustable pliers
- A laptop computer with Hyperterminal (PC) or ZTERM (MAC), to interface with the control panel if the control panel doesn't have a touch screen.
- A copy of the layout and a start-up checklist for the person performing the system start-up.
- Appropriate personal protection equipment (PPE) for each person involved in the start-up.

Pre-start-up Inspection

- **Site drainage:** Verify that all riser lids, external splice box lids, and AX pod lids are level and above grade.

- **Serviceability:** Verify that there is a minimum of two feet of space between AX pods. Check for a useable water source within hose distance of the system.
- **System layout:** Verify that the component layout in the plans or the system diagram matches the installed system and note any differences between the plans and the installed system.
- **Landscaping:** Check for landscape features that may cause long-term maintenance issues:
  - Trees planted on top of tanks
  - Trees that could shed snow onto critical components, such as control panels
  - Risers, external splice boxes, and pods covered in bark or other landscaping materials
- **Circuit breakers:** Open the control panel and verify that all of the circuit breakers are off.

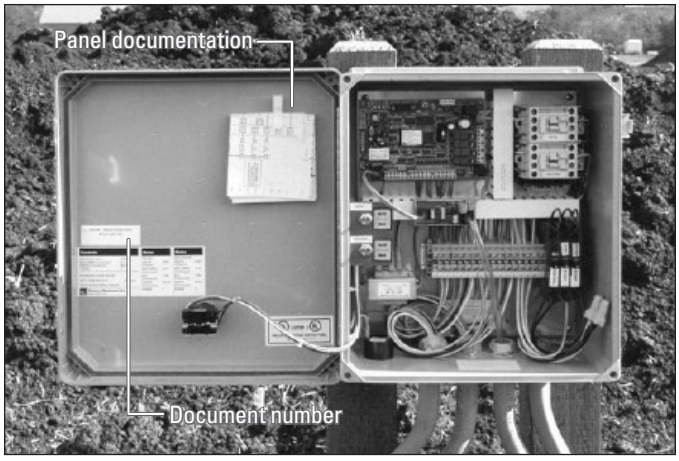
- **System access:** Remove lid bolts and open all lids.
- **AX100:** Verify that the lid bolt boxes and pressure gauges have been removed from the AX pods. If not, remove them at this time. Verify that the lateral inlet valves in the pods are open and the spray nozzle turbines are pointed up, as shown below.



 •

Inspection Points

Inspection Points – Control Panels

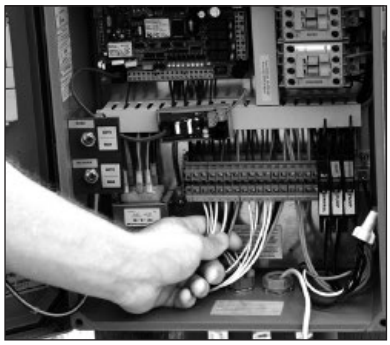


The system may have multiple control panels. Identify if there are control panels on the section of the system that you are about to start-up.

If the tank or basin has associated controls, perform the following start-up steps:

1. **Panel documentation:** Locate the panel-wiring diagram inside the panel and verify the document matches the document number found on the inside of the front panel door. If you can't find the wiring diagram, contact Orenco at (800) 348-9843 or (541) 459-4449 to have a copy e-mailed or faxed to you.

2. **Wiring installation:** Verify all of the main breakers are in the "OFF" position. Inspect the wire terminations in the panel by giving a light tug to all of the float wires, pump wires, pump power lines, and main power lines in the panel. If a wire comes loose, reattach the wire correctly.



WARNING: *Failure to identify a loose wire may cause intermittent failures, inconsistent panel operation and over-current conditions on the pumps.*

3. **Conduit seal installation:** Check for conduit seals on all conduit connections to the control panel.

WARNING: *Failing to seal the conduit may allow corrosive gasses to corrode major components. Orenco recommends conduit seals for all connections to the control panel to assure proper system operation and component longevity.*

4. **Power supply voltage:** Make sure the panel breakers are switched off, and check the power supply voltage at the panel.
   - On 120 V panels, measure voltage between L1 and ground. The voltage should be within ten percent of nominal.
   - On 230 V panels, measure the voltage between L1 and ground, and between L2 and ground. The voltage of each leg should be approximately 115 volts. Measure the voltage between L1 and L2. The voltage should be within ten percent of nominal.
   - On 208 V, 230 V, and 460 V 3-phase panels, measure the voltage between L1 & L2, L2 & L3, and L3 & L1. The voltage between each leg should be 208, 230 or 460 volts, respectively. If there is a voltage difference between line legs, it is an indication that the power source may be undersized. The voltage between each leg and ground on 208 volts should be approximately 120 volts. The voltage between each leg and ground on 460 volts should be approximately 277 volts. (Due to the variability in the ways 230 V, 3-phase power can be wired, there is not a standard test method.)

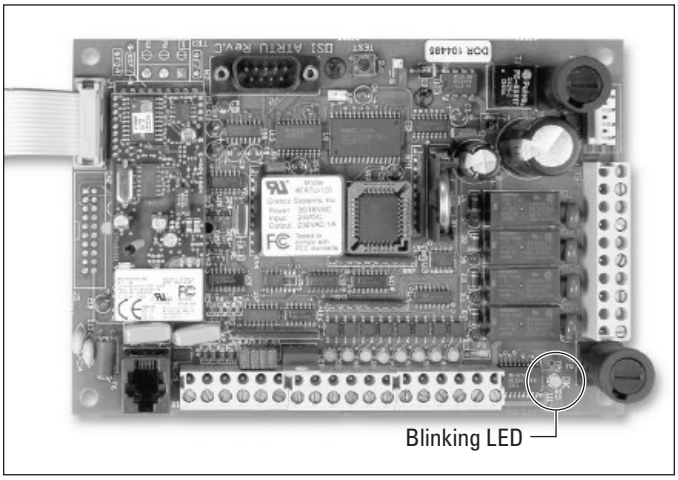
5. **Neutral and ground voltage:** Check for any voltage difference between each neutral (N) wire in the panel and ground. If there is a difference in voltage, use the wiring diagram to track down the source of the difference and correct it.

6. **Controls circuit:** Connect the controls circuit if it is not already connected. The controls circuit is now ready to be turned on. Do not turn on the pump circuit at this time.

WARNING: *Turning the pump circuit on at this time can damage the panel or the pump if the pumps and floats are miswired or if there isn't sufficient liquid in the tank.*

Inspection Points (continued)

7. **Panel operation:** Verify that the panel is powered up.
   - On TCOM and VCOM panels, an LED will light up indicating the board is operational. If the blinking light does not turn on, refer to the wiring diagram and verify the connections on the control circuit were properly terminated.



   - On MVP, Simplex, and Duplex panels, turn on the control circuit, then toggle the pump "AUTO-OFF-MAN" switch to "MAN." The motor contactor will visibly and audibly engage at this point. If the motor contactor does not engage and there are no alarm conditions, refer to the wiring diagram and verify the connections on the control circuit were properly terminated.

     NOTE: *For VCOM-equipped systems, place VCOM in test mode at this point.*

Inspection Points – Tanks and Basins

Not all tanks and basins have associated components as described below. Check the system plans to identify if there are associated components — such as splice boxes, floats, filters, or pump vaults — on each section of the system as you start it up.

1. **Tank:** Confirm with the installer that all tanks have passed watertightness testing. Verify the inlet and outlet of the tank and riser are properly installed.
2. **Basin:** Verify the inlet and outlet of the basin are properly installed and the effluent flows through in the correct direction.
3. **Riser:** Inspect the riser attachment and rubber grommets for a watertight seal.
4. **Splice box:** Inspect the splice box for correct wiring and the use of waterproof splice nuts. If there is water in the splice box, use a baster or sponge to remove the water.

WARNING: Failure to use waterproof wire nuts can cause intermittent or permanent float failure.

5. **Effluent filter and float:** Verify the effluent filter cartridge and float assembly are easy to remove for service and maintenance. The ability to easily remove these components is essential and depends upon careful installation in accordance with the instructions provided in Appendix B. Set components on a plastic tarp or plastic sheeting when they are out of the tank.
   a. Detach the float assembly from the housing, remove it from the tank, and lay it aside. Verify there is enough slack in the cord for easy removal.
   b. Pull the effluent filter cartridge out of the housing, and remove it from the tank. There should be ample clearance to allow unhindered removal of the cartridge from the housing and tank.
   c. Slide the filter housing out of the slide rail and remove the housing from the tank. (Slide rail models only.)
   d. Raise the high-level alarm float to simulate a high-level condition. Verify that the high-level signal is on by the audible alarm or the high-level alarm input LED on the circuit board in the panel.

      NOTE: *The audible alarm is delayed for 2 hours in TCOM control panels.*

   e. When the floats and filter cartridge are out of the tank, verify the handles are long enough for easy access. If they are not, adjust them to the necessary length.
   f. Reinstall the cartridge into the effluent filter housing and install the float assembly.

Inspection Points (continued)

6. **Biotube® pump vault filter and floats:** Verify the pump vault filter cartridge and float assembly are easy to remove for service and maintenance. The ability to easily remove these components is essential and depends upon careful installation in accordance with the instructions provided in Appendix B. Set components on a plastic tarp or sheeting when they are out of the tank.

   a. Detach the float assembly from the housing, remove it from the tank, and lay it aside. Verify there is enough slack in the cord for easy removal.

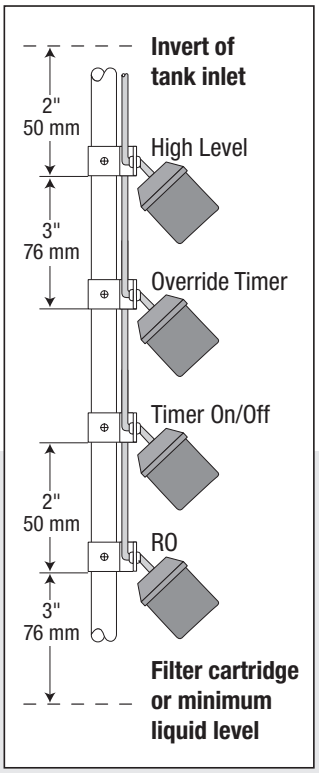
   b. Pull the filter cartridge out of the pump vault and remove the filter cartridge from the tank. There should be ample clearance to allow unhindered removal of the cartridge.

   c. Test the floats, starting with the lowest float on the assembly. Raise each float to the "up" position and verify that the signal is on for the correct float by the audible alarm and the alarm input LED on the circuit board in the panel. If your panel does not have alarm input LEDs, check voltage coming into the panel from the float you believe is activated.

   NOTE: *The audible alarm is delayed for 2 hours in TCOM control panels.*

   d. Check the float settings provided in the plans against the actual float settings. If the plans don't provide float settings and the engineer or system designer is unable to provide settings, set the floats based on the following rules:

- Demand Dose:
  - "Redundant Off" (RO) float is set 3 inches (76 mm) above the filter cartridge or the minimum liquid level of the pump, whichever is higher.
  - "Pump Off" float is set 2 inches (50 mm) above the "RO" float.
  - To calculate the "Pump On" float distance from the "Pump Off" float, divide the desired dose volume by the gallons per in. or liters per mm of the tank. Place the "Pump On" float that many inches above the "Pump Off" float.
  - "High Level" or "High Level/Lag Pump Enable" float is set at 2 inches (50 mm) below the invert of the tank inlet.
- Timed Dose:
  - "RO" float is set 3 inches (76 mm) above the filter cartridge.
  - "Timer On/Off" float is set 2 inches (50 mm) above the "RO" float.
  - "Override Timer" float is set 3 inches (76 mm) below "High Level" float.
  - "High Level" or "High Level/Lag Pump Enable" float is set at 2 inches (50 mm) below the invert of the tank inlet.



WARNING: *Pumps have a 30-second minimum run time. We recommend a drawdown differential of at least 30 seconds between the "Pump Off" float and "RO" float or the pumps may continue to run, resulting in a false low-level alarm.*

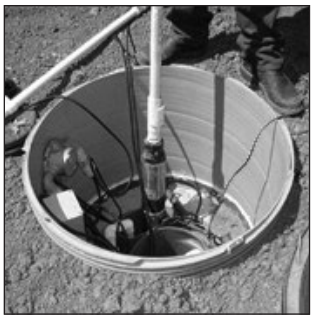
NOTE: *If you use the general float settings, you may need to return at a later time and adjust float settings after the system is in operation.*

Inspection Points (continued)

e. When the floats and filter cartridge are out of the tank, verify the handles are long enough for easy access. If they are not, adjust them to the necessary length.

f. Reinstall the cartridge in the pump vault. Leave the float assembly out of the tank or basin for use during pump run testing.

7. **Effluent pump:** Verify the pump is easy to remove for service and maintenance and that the pump flow rate and voltage are correct. The ability to easily remove the pump is essential and depends upon careful installation in accordance with the instructions provided in Appendix B. Set components on a plastic tarp or plastic sheeting when they are out of the tank.



a. Switch the pump breaker(s) in the control panel to the "OFF" position.

b. Verify the ball valve and cam-lock fitting or union on the discharge assembly is within 24 inches (610 mm) of the top of the riser.

c. Close the ball valve on the discharge assembly if there is one and disconnect the discharge assembly at the union or cam-lock fitting.

d. Verify there is enough slack in the pump cord for easy removal.

e. Pull the pump out of the vault by the discharge assembly and remove the pump from the tank.

WARNING: *Lifting or lowering the pump by the cord can damage the pump and cord.*

f. Check the voltage and phase values on the pump nameplate. Write them down in the start-up report. If there are pump motor stickers on the inside of the control panel door, check to see if they match the pump nameplate.

WARNING: *If the pump does not match the panel voltage and phase requirements, do not turn on the pump breakers.*

g. Reinstall the pump if the pump matches the panel voltage and phase requirements.

h. Reconnect the discharge assembly at the union or cam-lock fitting and open the discharge assembly ball valve.

i. Switch the pump breaker(s) in the control panel to the "ON" position when finished.

Inspection Points – Pumps

When the panel has been inspected and powered up, the float inputs have been tested, and all pump voltage and phase information has been verified, the pump(s) can be powered up and tested.

1. **Manual pump operation:**

a. Switch the pump breaker(s) in the control panel to the "ON" position.

b. Measure the static voltage of the pump(s) and enter the value(s) on the start-up checklist.

c. Toggle the pump "AUTO-OFF-MAN" switch to "MAN." The motor contactor will visibly and audibly engage at this point. If the motor contactor does not engage, check for an "RO" alarm condition. If there is no alarm condition, refer to the wiring diagram and verify the connections on the control circuit were properly terminated.

WARNING: *There is no motor protection in TCOM panels and panels without "RO" alarms. Before running a pump, always verify that there is sufficient liquid in the tank or basin.*

NOTE: *Refer to the "General Operating Instructions" section of the VCOM control panel documents to perform the "Manual Test" if you are starting up a pump controlled by a VCOM panel.*

d. Verify pump motor operation by checking the discharge plumbing assembly for vibration.

– No vibration in the discharge plumbing assembly indicates a pump wiring issue. Check the pump voltage and pump wiring terminations in the panel and in the splice box. Wires may be incorrectly terminated or wire insulation may be causing faulty contact between the wire and terminal lug.

– Vibration in the discharge plumbing assembly with low or no flow from the pump indicates closed valves or line breakages. On duplex pumping systems with two discharge plumbing assemblies connected together to a single line, verify that there are check valves on both pumps and that they are operating correctly. On three-phase systems, verify L1, L2 and L3 are wired correctly. A quick way to identify if the pump is wired correctly is to watch for clockwise torsion in the discharge plumbing assembly when the pump is first turned on.

Inspection Points (continued)

e. Measure and compare the dynamic (running) voltage of the pumps to the measured static (resting) voltage. Voltage drops indicate connection problems in the splice box or wiring that is too small for the pump.

f. Use an ammeter to measure the pump amperage. Make sure the amperage is within the range specified in the table below or listed on the pump nameplate. For non-Orenco pumps, consult the manufacturer's literature.

NOTE: *On TCOM panels with a current sensor option, pump amperage should match the value listed in the panel. If it does not match, inspect the three-position switch on the current sensor for the correct scaling factor.*

g. Set the high and low amperage ranges based on the reading.

Pump Amperage Chart

Pump Model	Low Amp Reading	High Amp Reading
PF100511	11.9	12.6
PF100512	6.0	6.4
PF10053200	3.5	3.9
PF100552	3.6	3.8
PF100712	7.8	8.4
PF10073200	4.9	5.2
PF100752	5.8	6.2
PF101012	9.0	9.8
PF10103200	5.1	5.6
PF101552	9.4	11.4
PF102012	10.0	12.2
PF102032	6.4	7.6
PF10203200	7.5	8.7
PF200511	11.0	12.5
PF200512	5.8	6.5
PF200532	2.5	2.9
PF20053200	3.3	3.8
PF201012	9.6	10.5
PF300511	10.7	11.8
PF20103200	5.0	5.9
PF20153200	6.0	7.2
PF201512	10.5	12.6
PF300512	5.6	6.2
PF30053200	3.3	3.7
PF300552	3.5	4.2
PF300712	7.4	8.6
PF300752	5.5	6.1
PF30073200	4.1	4.9
PF301012	9.3	10.4
PF301052	6.4	7.4
PF30103200	4.9	5.8
PF301512	10.1	12.6
PF30153200	5.5	6.9
PF301534	2.3	2.8
PF301552	8.1	9.3
PF302012	7.4	11.0
PF30203200	7.7	9.3
PF303012	12.6	16.8
PF303032	8.2	10.1
PF305012	20.1	25.8
PF305032	14.0	16.6

Pump Model	Low Amp Reading	High Amp Reading
PF30503200	15.4	18.6
PF500511	10.5	12.1
PF500512	5.4	6.2
PF500532	2.6	3.0
PF50053200	3.2	3.7
PF500534	1.3	1.5
PF500552	3.3	3.9
PF500712	7.3	8.5
PF500732	3.1	3.9
PF50073200	3.9	4.9
PF500734	1.4	1.8
PF501012	8.8	10.1
PF50103200	4.6	5.7
PF501034	1.8	2.2
PF501512	9.6	12.6
PF50153200	5.4	7.0
PF501552	8.0	9.1
PF503012	12.6	17.7
PF503032	8	10.4
PF50303200	10.1	13.1
PF503034	4.2	5.3
PF505012	17.3	26.4
PF505032	13.1	16.5
PF751512	11.4	12.3
P200511	12.6	13.8
P200512	6.1	7.1
P201512	11.2	12.2
P300512	5.8	6.5
P300712	7.4	8.3
P301012	9.1	10.3
P500511	11.2	12.7
P500512	5.8	6.5
P50053200	3.4	3.8
P500712	7.7	8.8
P50073200	3.8	4.8
P501012	9.4	11.2
P501512	10.6	13.1
P50153200	6.0	7.6
PEF3311	6.9	7.8

 •

Inspection Points (continued)

2. **Drawdown test:** Perform a drawdown test to set the pump flow rate in the control panel.
   a. Measure and record the distance from the top of the tank to the liquid level in the tank.
   b. Toggle the pump "AUTO-OFF-MAN" switch to the "MAN" position for sixty seconds.
   c. Toggle the pump "AUTO-OFF-MAN" switch to the "OFF" position; then measure and compare the difference in elevations. The difference in elevation in inches or millimeters, multiplied by the gallons per inch or liters per millimeter of the tank or basin will provide the correct flow rate in gallons per minute (gpm) or liters per minute (L/min). Follow the instructions provided with the control panel for entering the measured pump flow rate.

   NOTE: *This method will not work on recirculation/blend tanks if the flow is returning to the tank through the recirc valve or for dose tanks with transport lines that drain back.*
3. **Automatic pump operation:** Test the system using the floats to drive pump operation.
   - Demand dose:
     a. Toggle the "AUTO-OFF-MAN" switch to the "AUTO" position.
     b. Unclip the float assembly and remove it from the tank if it is not out already.
     c. Verify the automatic operation of the pumps by incrementally lifting the floats to simulate normal raising and lowering of the tank liquid level. The pumps should cycle on when you lift them and cycle off when you release them. On duplex systems, the pumps should alternate between lead and lag pumps and cycle off when the floats are dropped.

     NOTE: *An "On/Off" float works differently than a pair of "On" and "Off" floats. Verify the type of floats in your system before testing.*
     d. Lower the float assembly into the tank and clip the float assembly into the float bracket.
   - Timed dose:
     a. Toggle the "AUTO-OFF-MAN" switch to the "AUTO" position.
     b. Record the timer settings, then reduce the timer settings to 0.5 minutes "OFF," 0.5 minutes "ON," and 1.0 minutes "OVR OFF."
     c. Let the pump run through several cycles to confirm that the timers are operating correctly.
     d. Change the timer settings back to the settings specified by the engineer.

Inspection Points – System Timer Settings

1. **Recirc Timer Settings:** The method for calculating Recirculation/Blend Tank timer settings is provided below. Newer AX100 panels have the ability to adjust the timer setting based on actual flow data. See the instructions included with the control panel for setting information.
   - Pump On Time = 1.5 Minutes

     NOTE: *The standard Pump On Time for AX100 units is 1.5 minutes. Your system's needs may differ. Consult your site plans, engineer/designer, or Orenco for more details.*
   - Pump Off time = (1440 ÷ Cycles per Day) - Pump On Time

     Calculate Cycles per Day using the equation below:

$$\frac{\text{(Average Daily Flow)} \times \text{(Recirc Ratio)}}{\text{(Pump Flow Rate)} \times \text{(Pumps per Dose)} \times \text{(Pump On Time)}}$$

     NOTES:
     - *1440 is the number of available minutes in a 24-hour period.*
     - *The standard Recirc Ratio for AX100 units is 4 but it can range from 2 to 6, depending on the needs of the system.*
     - *The Pump Flow Rate is 48 gallons per minute (3 L/sec) when nozzle pressure measures 3.0 psi (20.6 kPa).*
2. **Discharge Timer Settings (Timed Dose Systems) :** The timer settings for the system are calculated based on the actual and expected flow. Equations are provided below.
   a. Identify Dose Volume
   - Dose Volume = Number of gallons desired per dose
     or
   - Dose Volume = (Number of Orifices) × (Loading Rate per Orifice)

   b. Identify Doses per Day
   - Number of doses per day = (Design Flow) ÷ (Dose Volume)

   c. Identify Time Interval Between Starts, in hours
   - Time Interval Between Starts = (Hours per Day) ÷ (Doses per Day)

   d. Identify Time On, in minutes
   - Time On = (Dose Volume) ÷ (Measured Pump gpm)

Inspection Points (continued)

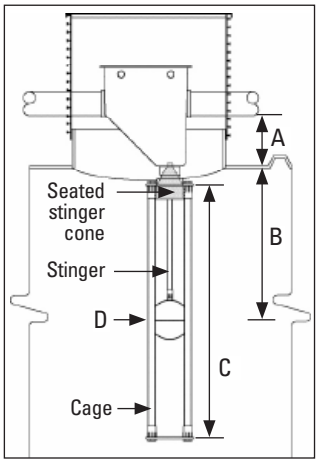
Inspection Points – Recirculation/ Blend Tank

Complete all of the inspections and checks described in the "Inspection Points – Tanks and Basins" section of this manual and then verify that the inspection points below are as follows:

1. **Recirc valve:** Verify the recirc valve is set so that the maximum water level in the tank matches the maximum liquid level as specified by the engineer. If the maximum liquid level is not on the plans, a general rule is to set it at 80% of the tank depth for straight-walled tanks or 80% of tank volume for curve-walled tanks.

2. **Stinger length:** Adjust the length of the recirc valve stinger based on installation instructions.

   a. Calculate the necessary stinger length adjustment using the equation (A+B)-16" or (A+B)-406 mm, where A is the distance from the MM valve invert to the top of the tank and B is the distance from the top of the tank to the 100% discharge level. If the stinger needs to be lengthened to near or beyond the length of the cage, the cage will also need lengthening.



   b. Stinger Adjustment Dimensions:

   - A = Distance from invert of MM valve to top of tank
   - B = Distance from top of tank to the liquid level where 100% bypass is desired, typically 80% of the tank's volume
   - C = Standard cage length: MM4 49 inches (1245 mm), fits stingers up to 36 inches (914 mm); MM6 57 inches (1448 mm), fits stingers up to 40 inches (1016 mm)
   - D = Middle of ball (at the 100% discharge level)

   NOTE: *There should be a minimum of 9 inches (229 mm) from the normal liquid level to the "RO" float.*

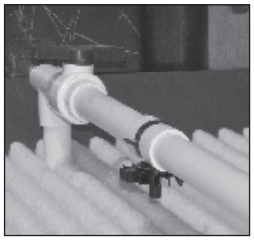
Inspection Points – AdvanTex® Filter Pods

Your system may include AX100 filter pods (shown) or AX20 filter pods. For AX20 inspection points, see the residential *Installation Manual* and residential *AdvanTex O&M Manual,* provided in Appendix B.

1. **Installation inspection:** Verify the AX100 pod has been properly installed. Improper installation is usually indicated by the conditions listed below:

   - Sidewall bowing — Check for any sidewall bowing in the pod. The bowing may cause excessive spacing between media sheets. If the spacing between the media sheets exceeds ½-inch (13 mm), cut the fiberglass rods for the correct media sheet spacing.
   - Lid misalignment — Lid bolts will only go into the holes if the lid is lifted slightly and the bolts are partially inserted prior to closing the lid.

2. **Manifolds and Laterals:** Flush the manifolds and laterals. See the *AX100 Treatment Systems Installation Manual* and *Field Maintenance Report Form* in Appendix B for more information.
   For proper operation after flushing the manifolds and laterals, turn the ball valves to their correct positions and turn the spray nozzle turbines to point down.



3. **System Pressure:** Verify the pressure gauge is set to zero. If it is not, open the seal at the top and let the pressure equalize with atmosphere. Install the pressure gauge, turn on the recirc pumps, and set to 3.0 psi (20.6 kPa).

   NOTE: *On systems plumbed in parallel, adjust the pressure in all three pods at the same time to 3.0 psi (20.6 kPa) using the gate valve on the pod manifold.*

4. **Pod drainage:** Verify that the pod drains easily. If the pod does not drain, check to see if the shipping plug has been removed from the pod outlet.

5. **Lid bolt installation:** When you have finished inspecting all pods, remove the pressure gauge and secure the lids on the pods with the included lid bolts.

Inspection Points (continued)

Inspection Points – Vent Fan Assembly

A current sensor monitors the vent fan operation. If the fan fails, this sensor will open and activate an alarm. Some vent fan assemblies are equipped with optional heater units for reliable performance in cold weather. Check your system plans to determine if your vent fan assembly includes a heater.

1. **Current sensor operation:** To test the current sensor, switch off the power to the fan and verify the visual alarm on the control panel is activated.

   NOTE: *TCOM control panels have a 12-hour delay in the audible alarm for the current sensor.*

2. **Optional heater unit:** There are two types of heater unit controls available for vent fan assemblies: a single set-point style and a multiple set-point style. If your system is equipped with an optional heater unit, check your system plans to determine the type of heater included in the vent fan assembly.
   - Single set point — Locate the heater inside the vent fan assembly enclosure, remove the heater cover in the vent fan assembly, and set the thermostat to 43° F (6° C).
   - Multiple set points — In the control panel, set the "Heater On" point at 35° F (1.6 °C), "Heater Off" point to 45°F (7.2 °C), "Fan On" point to 35°F (1.6 °C), and "Fan Off" point to 25°F (-3.8 °C).

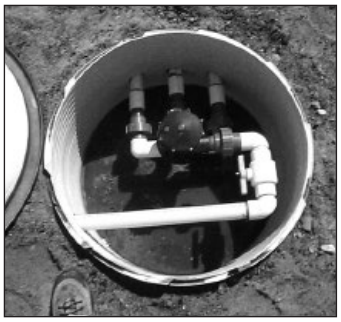
Inspection Points – Distribution Valve

To verify that the distribution valve is operational, the valve must be hydraulically loaded with the conditions under which it will operate. Use the system plans to find the location of all distribution valves in the system.

1. **Verify liquid level:** Make sure that the tank or basin that you are pumping from has sufficient liquid to perform the test.

   WARNING: *There is no motor protection in TCOM panels and panels without "RO" alarms. Before running a pump, always verify that there is sufficient liquid in the tank or basin.*

2. **Turn on pump:** Toggle the "AUTO-OFF-MAN" switch for the pump that pressurizes the distribution valve to "MAN."



3. **Leak inspection:** Once the distribution valve is pressurized, inspect the unions on the distribution valve for leaks. Tighten any unions that are leaking.

4. **Operation inspection:** Open and close the ball valve to test the operation of the distribution valve.
   - When the valve is closed and opened, the flow should transition from one leg of the valve to another. Observe the clear section of the leg to verify this transition. There may be flow in more than one leg, but there should only be full flow in one leg at any time.
   - When the ball valve is fully closed, the system will fully pressurize (deadhead condition). Incorrectly installed connections in the line may separate and require reinstallation before testing can be completed.
   - If the distribution valve does not rotate correctly, open the distribution valve and inspect for debris or breakage. If the problem is not a mechanical issue, review the plans for potential installation issues, including elevation.

Housekeeping

1. Verify that all control panels are turned on and all "AUTO-OFF-MAN" switches are toggled to "AUTO."
2. Close all control panels.
3. Close and bolt down all tank access lids and riser lids.

   WARNING: *AN UNBOLTED RISER LID OR OPEN TANK IS A SAFETY HAZARD! Tank and riser access lids must be properly secured at all times. If bolts are lost or damaged, contact Orenco immediately for replacements.*

4. Police the area for debris and tools.

Maintenance

Tools, Equipment, and Spare Parts List

Many of the recommended maintenance and troubleshooting procedures require specialized tools, equipment, and spare parts. Refer to the residential *AdvanTex O&M Manual*, provided in Appendix B, for a list of items to have on hand.

Record Keeping

Maintain a written log describing all activities relating to the AdvanTex system. This information is very valuable for analysis and trouble shooting if problems should occur. A *Field Service Report Form* and a *Field Maintenance Report Form* are provided in Appendix B for your convenience.

Maintenance Equipment

Safety and Hygiene

- Bleach/water solution
- Eye protection
- Hand cleanser
- Paper towels
- Plastic tarp
- Protective clothing
- Rags
- Rubber gloves
- Trash bags

Routine Inspection and Maintenance

- Biotube® filter cradle (OM-BIOTUBECRADLE)
- Beakers or bottles
- Calculator
- Channel lock pliers
- Dissolved oxygen (DO) meter or colorimetric ampoules
- 3/16" hex head drill bit
- Drill
- Electrical tester (voltage and amperage)
- Extension cord
- Extra lid bolts
- Laptop with null modem cable (TCOM & VCOM only)
- Hook for raising floats to test them
- pH meter or pH test strips
- Pressure gauge
- Sample bottles
- Sludge and scum measuring device (e.g. Nasco Sludge Judge®) for sludge and Orenco SMUG for scum
- Tape measure
- Telephone for testing dial tone – (TCOM & VCOM only)
- Test strips for nitrate, ammonia, alkalinity
- Turbidity meter
- Watch or stopwatch

Repairs

- Adhesive
- Backflow prevention device
- Extension cord
- Flashlight with spare batteries/bulb
- Float switches
- Hacksaw with spare blades
- Hammer
- Hand tools
- Heat gun (torch)
- Hole saw (vari-bits: 3/4" and 1-3/8")
- Hose with nozzle
- Inspection mirror (e.g. Prototek™ “Mirror on a Stick”)
- PVC cement and primer
- PVC fittings
- PVC pipe
- Screwdriver set
- Shovel Snake (building sewer)
- Spare parts for downstream components
- Waterproof wire nuts
- Wire stripping/crimping tool (10 to 22 AWG)
- Wrench (24" or 600 mm pipe wrench)
- Wrench (lid bolt)

Maintenance (continued)

Preventive Maintenance

As with any engineered system, such as a car or heat pump, your wastewater treatment system will work better and last longer if it is regularly maintained by a qualified service provider. The service provider should be present during installation, so he or she is familiar with the system, especially those service lines, conduits, and connections that get buried.

Your system will work better and last longer if you learn what not to put into the treatment system. There should be no disposal of toxics or chemicals into the system, such as restaurant degreasers, cleansers, wax strippers for linoleum, carpet shampoo and its waste products, and other toxics. As a general rule, nothing should go into any wastewater treatment system that hasn't been ingested, other than toilet tissue, mild detergents, and wash water. Every system user and qualified service provider should be familiar with the basic guidelines below:

- No septic additives
- No flammable or toxic products
- No excessive use of household cleaners or chlorine bleach
- No pool or spa products
- No disposing of pharmaceuticals
- No pesticides, herbicides, or agricultural chemicals or fertilizers
- No RV waste (unless the system is specifically designed and engineered to treat such waste)
- No surface runoff and storm water
- No excessive amounts of fats, oils and grease (FOG)
- No food byproducts
- No cigarette butts
- No paper towels, newspapers, sanitary napkins, diapers, disposable wipes, floss, gum or candy wrappers, etc.
- No chlorides or water softener backwash

Preventive maintenance should start with facility user and/or homeowner education. Orenco Systems®, Inc. can provide a manual of Do's and Don'ts to distribute upon request. To request multiple copies of this manual, contact Orenco Systems, Inc. at 1-800-348-9843.

With preventive maintenance and periodic inspections, the wastewater treatment system will function for decades.

Scheduled Maintenance

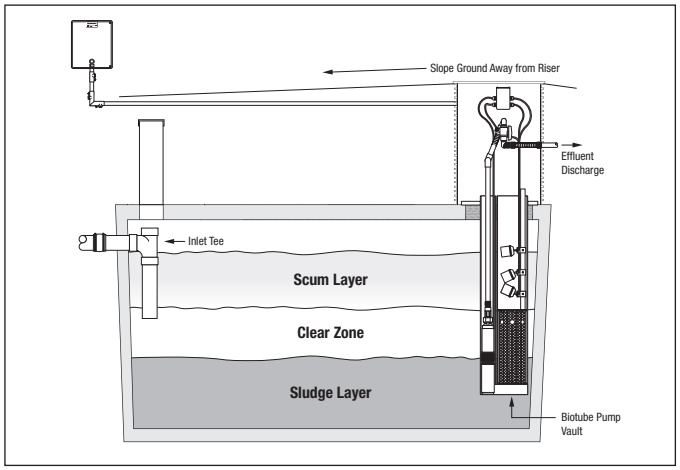
Scheduled maintenance should be performed in the time frames described in this section. A chart showing scheduled maintenance activities and times is included at the end of this section, for your convenience.

Monthly Maintenance

Once a month, during the first year of operation, make a visual inspection of the liquid levels in the septic, recirculation/blend, and dosing tanks. The liquid level should never be lower than the "Redundant Off" float. If liquid leaks out of the tank, the scum layer can drop to the level of the perimeter holes in the pump vaults and cause the screen to plug. A watertight tank is important and any leakage must be corrected.

During the first year of operation, check the Biotube® filter in the septic tank every month and clean when necessary. Follow the applicable instructions found in Appendix B for cleaning Biotube filters.

Once a month, during the first year of operation, the Biotube Pump



Vaults should be examined to determine if cleaning of the Biotube filter is necessary. If the liquid level inside the vault is discernibly different from the level outside the pump vault while the pump is running, cleaning is required. Remove the filter cartridge and clean it following the applicable instructions in Appendix B.

Once a month, read the hour meters and event counters for the recirculating/blend and dosing tank's pumps. Each pump should run approximately the same number of hours and turn on approximately the same number of times as their operating counterpart. If the run times or cycle times differ significantly between pumps, determine the cause of the discrepancy and take corrective measures.

If there is a distributing valve, manually cycle the valve through every outlet to confirm proper operation.

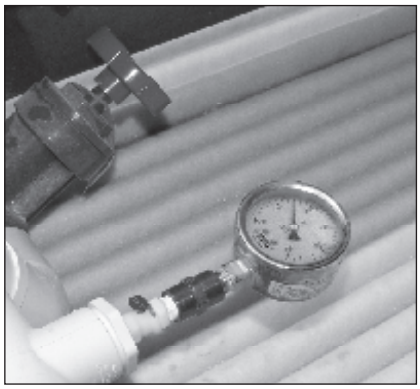
Maintenance (continued)

Quarterly Maintenance

Testing for Biochemical Oxygen Demand (BOD_5); Total Suspended Solids (TSS); Fats, Oils, and Grease (FOG); Ammonia (NH_3); Nitrate (NO_3); and pH should be done according to regulatory requirements. If testing is not required by the regulatory jurisdiction, samples should be taken quarterly for the first year to establish a baseline. Subsequent testing after the first year may be reduced based on the establishment of this baseline. Regular samples will provide valuable information for ongoing maintenance and troubleshooting. Effluent testing procedures may be found in the residential *AdvanTex O&M Manual* in Appendix B. All results obtained should be reported to the appropriate people, including Orenco's Engineered Systems Department.

For the first year only, check voltages and amperages of all pumps and record them on the *Field Maintenance Report Form* provided in Appendix B. Refer to the start-up voltages and amperages recorded in the "Start-up & Operation" section of this document. If the voltage drop or the amperage exceeds National Electric Code (NEC) requirements (see chart provided in "Inspection Points —Pumps" section of this document), have an electrician verify the service line and check the pump windings. If there is no discernible difference in voltage or amperage, this procedure may be performed annually.

Semi-Annual Maintenance



Inspect the spray of the nozzles in the AdvanTex pods. Look for reduced or uneven spray patterns as well as clogged spray nozzles or biological growth on the spray nozzles. Observe and measure the residual pressure. Refer back to the Start-up & Operation section for initial measurements of residual pressure. If the observed residual pressure exceeds the initial residual pressure (3 psi) more than 15-20%, it can be assumed that some of the nozzles are plugged and the laterals require flushing. To flush the laterals, open the ball valves at the end of one lateral. At the control panel, toggle the "AUTO-OFF-MAN" switch to "MAN" and let the pump run to flush any material from the lateral. Repeat for each lateral until all of the laterals have been flushed. Recheck the residual pressure to ensure the laterals have been sufficiently cleared.

If there is still a significant difference in initial and current residual pressure, use an Orenco AX lateral cleaning brush or a high-pressure washer to clean the laterals.

To clean out the spray nozzles, turning the laterals so the spray nozzle turbines are pointed up and then hosing each turbine off. For excessive buildup in the spray nozzles, remove the nozzles and replace them with clean nozzles. Soak the plugged nozzle in TSP or any other approved cleaning agent for 30 minutes. When a spray nozzle is clear, you can see the spray nozzle turbine spin freely and the spray distribute evenly across the textile media. If the nozzles are substantially plugged after six months, then it may be prudent to inspect the residual pressure every three months and adjust scheduled testing and flushing of the laterals accordingly.

Visually inspect the recirculating valve and verify that the liquid level in the tank is within the normal range. Consult the design plans for proper operating level. If the liquid level is low, the ball mechanism could be jammed in the seated position. Remove, disassemble, and inspect. If the liquid level is high, the valve may require cleaning because it is not making a tight seal when seated. Remove, disassemble, and inspect.

Maintenance (continued)

Annual Maintenance

Measure the scum and sludge accumulation in all tanks annually. Record scum and sludge measurements on a *Field Maintenance Report Form*.

1. **Measuring the scum layer:** Using a scum utility measuring gauge or similar tool, measure the thickness of the scum layer. With this measurement, determine if the distance from the bottom of the scum layer at the liquid's lowest normal level to the bottom of the outlet tee or to the top of the inlet holes for the pump vault is 3 inches (76 mm) or less. If so, it's time to pump out the contents from the tank (scum, sludge, and liquid) completely. After removing the septage contents from the tank, refill it with water to its normal operating level.

2. **Measuring the sludge layer:** Using a Sludge Judge® or similar tool, measure the thickness of the sludge layer. With this measurement, determine if the distance from the top surface of the sludge to the bottom of the outlet tee or inlet holes for the pump vault (PVU) is 6 inches (152 mm) or less. If so, again, it's time to pump out the contents from the tank (scum, sludge, and liquid) completely. If the tank is fitted with a pump vault or effluent filter discharge assembly, take the measurement from the top surface of the sludge layer to the bottom of the vault's inlet ports. After removing the septage from the tank, refill it with water to its normal operating level.

NOTE: *Turn the laterals in the AdvanTex® treatment unit 180 degrees (so the spray nozzle turbines face up) prior to flushing to prevent nozzle clogging while material is being pushed along the lateral to the flushing valve.*

Once a year, send copies of the complete activity log to the appropriate person. This information is very valuable for analysis and troubleshooting if problems should occur.

Check voltages and amperages of all pumps and record them on a *Field Maintenance Report Form*. Refer to the start-up voltages and amperages recorded in the "Start-up & Operation" section of this document. If the voltage drop or amperage exceeds NEC requirements, have an electrician verify the service line and check pump windings.

The pumping system should be inspected annually to ensure it is operating properly. Unscrew the stainless steel bolts that fasten the fiberglass lid over the pumping equipment. Remove the fiberglass lid for an inspection that includes these steps:

a. Verify there are no obvious holes or leaks in the riser or around the perimeter of the riser connection to the tank. Wetness or watermarks may be an indication of weeping.

b. Inspect the splice box to ensure it is free of water. Ensure the lid and connections are secure.

c. Verify the floats are in good condition and properly secured to the float tree. Verify the float cords are neatly wrapped inside the riser so that they cannot interfere with the operation of the floats.

d. Verify float operation. Refer to the float tests in the "Start-up & Operation" section of this document.

All TCOM control panels contain a lithium battery for backup. For good measure, we recommend you replace the battery every two years. Refer to "Battery Replacement" in the *Custom TCOM Control Panels and HyperTerminal Access Manual,* provided in Appendix F.

Maintenance (continued)

Scheduled Maintenance Reference Chart

NOTE: *All designer specifications and local regulatory requirements should be followed. This table provides Orenco's minimum recommended guidelines.*

Scheduled Maintenance Reference Chart		Recommended Activity Period					
		Monthly	Quarterly	Semi-annually	Annually	Biannually	
Activity	Visual Inspection of Tank Liquid Levels	•[1]	•				
	Check Biotube® Effluent Filters; Clean as Required	•[1]	•				
	Check Biotube® Pump Vault Filters; Clean as Required	•[1]	•				
	Record Elapsed Time Meters and Event Counters for All Pumps	•					
	Confirm Proper Operation of Automatic Distributing Valve (if applicable)	•					
	Sample Influent and Effluent Quality Parameters[2]		•[1]	•			
	Confirm and Record Pump Voltages and Amperages		•[1]		•		
	Inspect Distribution of Effluent in AdvanTex Pods; Clean as Required			•			
	Measure Inlet or Residual Pressures to AdvanTex Pods; Clean as Required			•			
	Inspect Recirculating Valve			•			
	Record Scum and Sludge Accumulation in Tanks				•		
	Flush Distribution Laterals in AdvanTex Pods				•		
	Inspect Pumping System Components; Clean as Required				•		
	Replace Lithium Battery in TCOM Control Panel (if applicable)					•	

[1] *This maintenance schedule is only required during the first year of system operation.*

[2] *Recommended guidelines only. Sampling should be scheduled according to regulatory requirements.*

Maintenance (continued)

Corrective Maintenance

An alarm is triggered when the liquid in the tank reaches a level that is either higher or lower than it should be, under normal operating conditions.

When responding to an alarm, first discern the type of alarm being activated. If it is due to pump failure, test each pump manually and locate the failed pump. To replace the pump, see the "Removing & Replacing Inoperative Pumps" section of this document. Remove the access riser lid and visually inspect the liquid level. If a high liquid level or low liquid level has caused the alarm, follow the appropriate procedures below.

High Liquid Level Alarm

1. Determine if the high water alarm is from higher than expected usage (i.e., special event, etc.). If there is a long-term increase in flows, then timer settings need to be adjusted accordingly.

2. When a high liquid level condition exists, the source of the problem is likely to be one of the following:

   a. Poor valve seal – Consult the design plans for proper operating level and visually inspect the recirculating valve to verify the liquid level in the tank is within the normal range. If the liquid level is high, the valve may require cleaning because it is not making a tight seal when seated. Remove, disassemble, and inspect.

   b. Control panel breakers tripped – Check the circuit breakers, switches, and fuses in the system control panel. If separate breakers in the main panel were used for the pumps and controls, also check these breakers. If a breaker is found to be tripped, reset the breaker. If the breaker trips immediately, check the wiring for a short or bad breaker. If the breaker or breakers don't trip again, then the problem has probably been found or has corrected itself. Test the automatic function of the system as shown in the "Start-up & Operation" section of this manual to verify proper operation.

   c. Faulty floats – If, after checking the circuit breakers, fuses, and switches, the pump still does not operate, toggle the "AUTO-OFF-MAN" switch to "MAN." If the pump engages, the problem is likely to be in the float system. (If the motor contactor engages but the pump doesn't run, go to step g, "Water in splice box or loose wires.") Pump the tank down to a level below the "Override Timer On/Off" float. Cycle the pump to simulate the timer on and off periods so the effluent is dosed to different zones of the AdvanTex® system. Toggle the "AUTO-OFF-MAN" switch to "AUTO." Do not leave a pump in the "MAN" position unattended. If you do, the pump can continue to operate without liquid, possibly drawing solids into the filter and causing potential failures. Isolate the float switches and check to ensure all floats are operating properly. If a float is found to be faulty, refer to the "Removing & Replacing Inoperative Floats" section in this document.

      IMPORTANT! *Before doing any work on either the wiring to the level control floats and pump or inside the pump control panel, switch off the power to the system at the service entrance panel and set the circuit breakers in the panel to their "OFF" positions.*

   d. Pump clogged or not clean – Check the pump for discharge flow. Close the ball valve, disconnect the union in the discharge plumbing assembly and turn the union so it is facing down. Engage the pump and visually inspect the approximate flow rate being discharged. If you are unsure of the discharge rate, measure the time it takes to fill a five-gallon bucket with the discharge. Check this value against the appropriate pump curve. If the flow rate is insufficient, the pump may need to be cleaned. Refer to the *Pump Repair Manual* provided in Appendix D.

   e. Valves closed – If the pump operates in the proper flow range, check all downstream valves to ensure that they are in the open position. If the valves are all open, test the discharge pressure of the pump. For proper pump testing methods, refer to the *Pump Repair Manual* provided in Appendix D.

Maintenance (continued)

f. Pump failure or bad electrical connection – Check the panel to verify the motor contactor engages. If it engages but the pump doesn't operate, then it is either a pump failure or a bad electrical connection.

g. Water in splice box or loose wires – Remove the access riser lid and the stainless steel screws from the splice box lid, being careful not to drop the screws into the tank. If the splice box was submerged, or if there is a crack in the conduit, there may be water in the splice box. If this is the case, remove the water with a baster, sponge, or other appropriate method. Carefully check the splices to ensure they are intact and remain watertight. If all splices are found to be watertight, replace the splice box lid. In the control panel, carefully tug on each wire going to the splice box. Correct any wires that are loose. Reactivate and retest the system.

h. Leaks in tank or system – If the system operates but can't keep up with the flow, check the system for watertightness. A leaking tank can infiltrate enough water to overcome the pump. Also check for leaking fixtures in the facility or home, though it is unlikely a leaky fixture could provide enough liquid to overcome the pump.

Low Liquid Level Alarm

1. Determine the actual flows in the system. If the flows are considerably less than the timer is set for, then adjust the timer settings to match current flows. If a low level exists in the drainfield pump basin, then ensure the minimum run time is appropriately set.

2. When a low liquid level condition exists, the source of the problem is likely to be one of the following:

   a. Ball valve mechanism jammed – Visually inspect the recirculating valve and verify the liquid level in the tank is within the normal range. Consult the design plans for proper operating level. If low, the ball mechanism could be jammed in the seated position. Remove, disassemble, and inspect.

   b. Tank siphoning – Inspect the liquid level in the tank. If the liquid level is below the "Redundant Off/Low Level Alarm" float, then it is likely that the problem is either a leaky tank or siphoning. Siphoning typically occurs when the system is pumping downhill. A system will not necessarily siphon every time it operates. It is dependent on the system design. A siphoning system can be retrofitted with an anti-siphon valve. Most siphoning problems will manifest in the first months of operation.

   c. Tank leaks – If the hydraulics of the system do not allow for siphoning, it is likely that the tank is leaking. Fill the tank to a normal operating level and return to inspect the tank at a later time. If the liquid level is below the normal operating level, the tank is leaking and needs to be repaired or replaced.

   d. Clogged pump vault cartridge – If the pump vault cartridge is clogged, the pump may be high cycling, causing the liquid level in the vault to drop faster than the liquid level in the tank. Remove the filter cartridge and clean it in accordance with the instructions provided in Appendix B.

Removing & Replacing Inoperative Floats

IMPORTANT! *Before doing any work on either the wiring to the level control floats and pump or inside the control panel, switch off the power to the system at the service entrance panel and set the circuit breakers in the panel to their "OFF" positions.*

1. Remove the float assembly from the vault. There is no need to move the settings of the floats to remove and replace a float. After noting the tether length, snap the inoperative float out of the holding collar.

2. Remove the stainless steel screws from the splice box lid, being careful not to drop the screws into the tank. If the splice box was submerged, or if there is a crack in the conduit, there may be water in the splice box. If this is the case, remove water with a baster, sponge, or other appropriate method. Loosen the cord grip at the splice box and identify the appropriate splice for the float. Cut out the splice and, if using a watertight wire nut for the common wires, remove the appropriate common wire.

3. Remove the inoperative float and replace it with a new one. Push the float cable through the watertight cord grip into the electrical splice box. Leave an adequate length of electrical cord coiled inside the riser to allow for easy removal of the float assembly. Do not remove the colored markers or the paper tags from the float cords, and do not try to thread the markers and tag through the cord grip. Tighten the cord grip by hand, then test the tightness of the cord grip by tugging on the cord. A cord is secure when the cord grip is tight enough to prevent slippage. An adequate length of cord should be left within the splice box to allow for future disconnecting and re-splicing.

Maintenance (continued)

4. Splice the float wires to the wires from the control panel following the wiring schematics provided in Appendix F. Attach the common wire with the other commons using the waterproof wire nut. It may be necessary to replace this wire nut with a new watertight wire nut. Always use watertight wire nuts or heat shrink splice kits for all connections!
5. Replace the float in the collar, using the same tether length, and return the assembly to the pump vault.
6. Reconnect power and test the unit per the instructions provided in the "Start-up & Operation" section of this manual.

Removing & Replacing Inoperative Pumps

IMPORTANT! *Before doing any work on either the wiring to the level control floats and pump or inside the control panel, switch off the power to the system at the service entrance panel and set the circuit breakers in the panel to their "OFF" positions.*

1. Close the ball valve on the discharge plumbing assembly, disconnect the union, and carefully remove the pump and attached plumbing from the tank. Disconnect the pump from the discharge plumbing assembly.
2. Remove the stainless steel screws from the splice box lid, being careful not to drop the screws into the tank. If the splice box was submerged, or if there is a crack in the conduit, there may be water in the splice box. If this is the case, remove the water with a baster, sponge, or other appropriate method. Loosen the cord grip at the splice box and identify the appropriate splice for the pump. Cut out the splices and label the wires.
3. Remove the inoperative pump and replace it with a new one of the same type. Push the pump cable through the watertight cord grip into the electrical splice box. Leave an adequate length of electrical cord coiled inside the riser to allow for easy removal of the pump. Tighten the cord grip by hand, not by tool; then test the tightness of the cord grip by tugging on the cord. A cable is secure when the cord grip is tight enough to prevent slippage. An adequate length of cord should be left within the splice box to allow for easy removal for future disconnecting and re-splicing.
4. Splice the pump wires to the appropriate wires from the control panel following the wiring schematics provided in Appendix F. Always use watertight wire nuts or heat shrink splice kits for all connections!
5. Reattach the discharge plumbing assembly and carefully lower the pump into the flow inducer alongside the Biotube® pump vault. Be careful not to lower the pump by the cable or to pinch the cable when lowering it into the flow inducer. Reconnect the union and open the ball valve.
6. Reconnect power and test the unit per the instructions provided in the "Start-up & Operation" section of this manual.

Notes

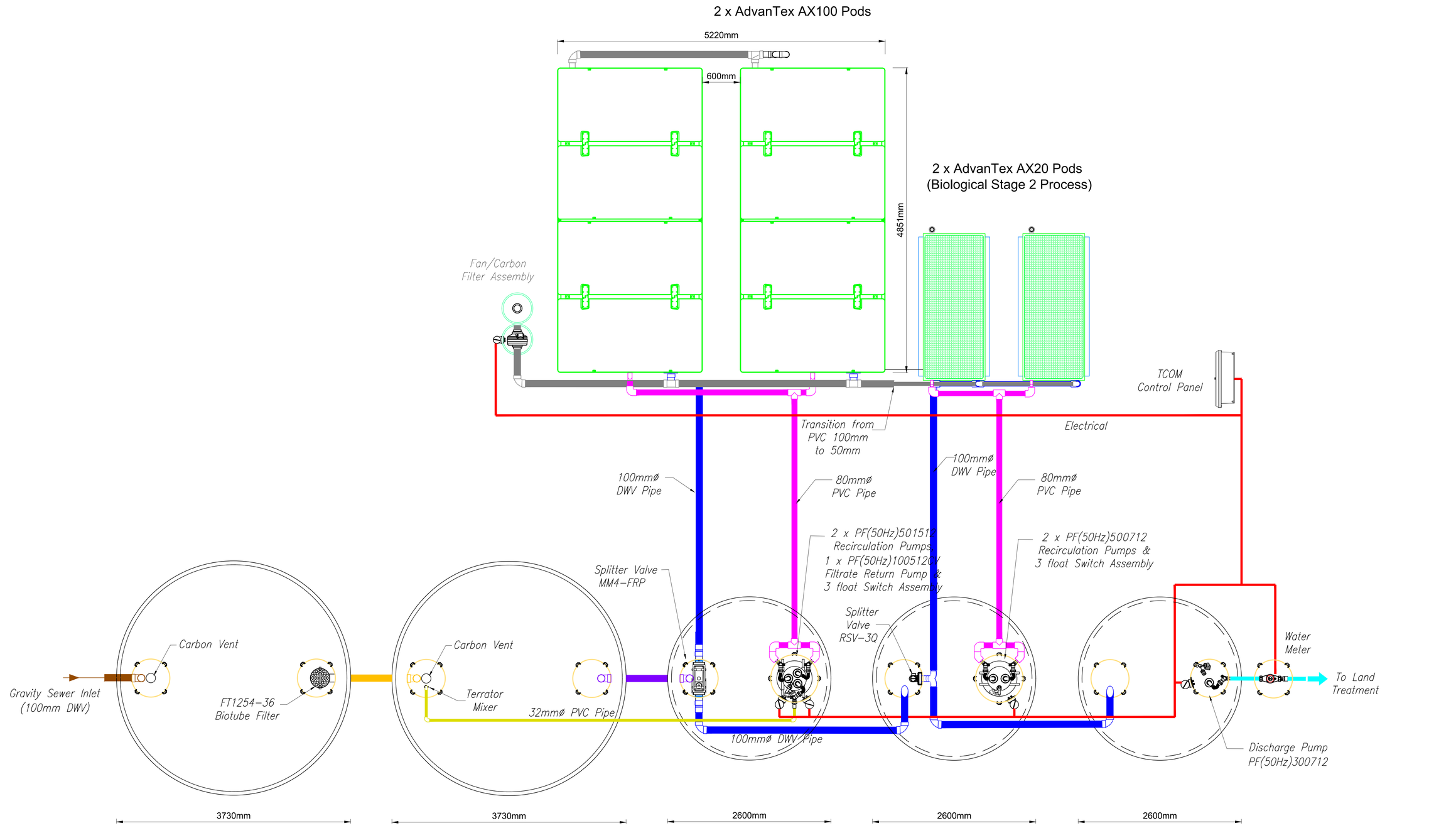
Notes (continued)

AdvanTex® Treatment System AXN Models meet the requirements of NSF-ANSI Standard 40 for Class I Systems.

COMMERCIAL O&M MANUAL

Orenco®
800-348-9843 • 541-459-4449
www.orenco.com
www.vericomm.net

 •



LEGEND:

- Screened Effluent
- Underdrain Collection
- Pod Dosing
- Pod Ventilation
- Discharge
- Electrical
- Tank Inter-connection (Low Level)
- Tank Inter-connection (High Level)
- Alkalinity
- Carbon

0 1 2 3 4 5

SCALE BAR 1:30

REV.	DESCRIPTION	DATE
–	–	–

DATE 25th March 2025

SCALE 1 : 30 (A1)

APPROVED

CHECKED

DESIGNED

STATUS Design

innoflow wastewater specialists
www.innoflowtechnologies.com

New Zealand
P.O. Box 300 572
North Shore City 0752
New Zealand
Freephone 0800 innoflow
Ph: + 64 9 426 1027
Fax: + 64 9 426 1047
info@innoflow.co.nz

Australia
P.O. Box 263
Ormeau
Queensland 4208
Australia
Freephone 0800 innoflow
Ph: + 61 7 5549 2416
Fax: + 61 7 5549 2416

CLIENT Ormiston Associates Ltd

PROJECT National Green Steel

TITLE AdvanTex Wastewater Treatment Plant Plan

DRAWING No. 28584202915-10

REVISION

Proposed Wastewater Disposal System: Pressure Compensating Dripper Irrigation Information Sheet

ORMISTON ASSOCIATES LTD

CONSULTANTS IN GEOTECHNICAL ENGINEERING, GEOLOGY & ENGINEERING GEOLOGY

UNIBIOLINE 16010 AS

HEAVY WALL, PRESSURE COMPENSATING & ANTI SIPHON 16mm LILAC DRIPPERLINE

APPLICATIONS

- Domestic & commercial onsite water re-use applications

FEATURES AND BENEFITS

- Patented TurboNet™ Dripper Technology - wide flow passage
- Pressure Compensated (PC) - self regulates to ensure uniform drip discharge
- Anti-Siphon (AS) dripper - prevents suck back
- Centrally mounted dripper with large inlet filter
- Mechanical root barrier
- Approved by the Smart WaterMark™

SPECIFICATIONS

- Pressure compensated (PC) & Anti-Siphon (AS) dripperline
- Operating Pressure: 100 kPa - 350 kPa
- Recommended filtration: 120 mesh (130 micron)
- Tubing colour: co-extruded lilac tube (indicates non-potable water)
- UV resistant Low Density Polyethylene (LDPE)
- Additional flow rates, spacings and pipe sizes are available on request. Minimum quantities apply.

DRIPPER TECHNICAL DATA

INSIDE DIAMETER (MM)	OUTSIDE DIAMETER (MM)	DRIPPER FLOW RATE (L/H)	DRIPPER SPACING (M)	PRESSURE RANGE (kPa)	COIL LENGTH (M)
14.2	16.2	1.6, 2.3 & 3.5	0.5, 0.6 & 1.0	100 - 350	100

TECHNICAL DATA

Maximum run length (m) on flat ground

NOMINAL FLOW RATE (L/H)	100 kPa	150 kPa	200 kPa	250 kPa	300 kPa
1.6 l/h @ 0.5m	N/A	122m	156m	179m	198m
2.3 l/h @ 0.6m	N/A	112m	143m	165m	181m
3.5 l/h @ 1.0m	N/A	129m	165m	190m	210m

SUITABLE FITTINGS

SAP	DESCRIPTION	SAP	DESCRIPTION
32500-013750	16mm Start Take-off to suit LDPE	32500-012500	16mm Elbow
00005-011500	16mm Elbow Take-off to suit LDPE	32500-011300	16mm Tee
45000-001650	16mm Take-off to suit LDPE	32500-010700	16mm Joiner
32500-013700	Straight Take-off with Grommet to suit PVC	76400-011750	16mm Herbie Clip Ratchet Clamp
00025-002400	Hold Down Stake (Asta)	00005-002200	16mm Ratchet Clamp
00005-008620	16mm Purple Shut-off Valve	76860-006400	150mm Round Box Valve - Green

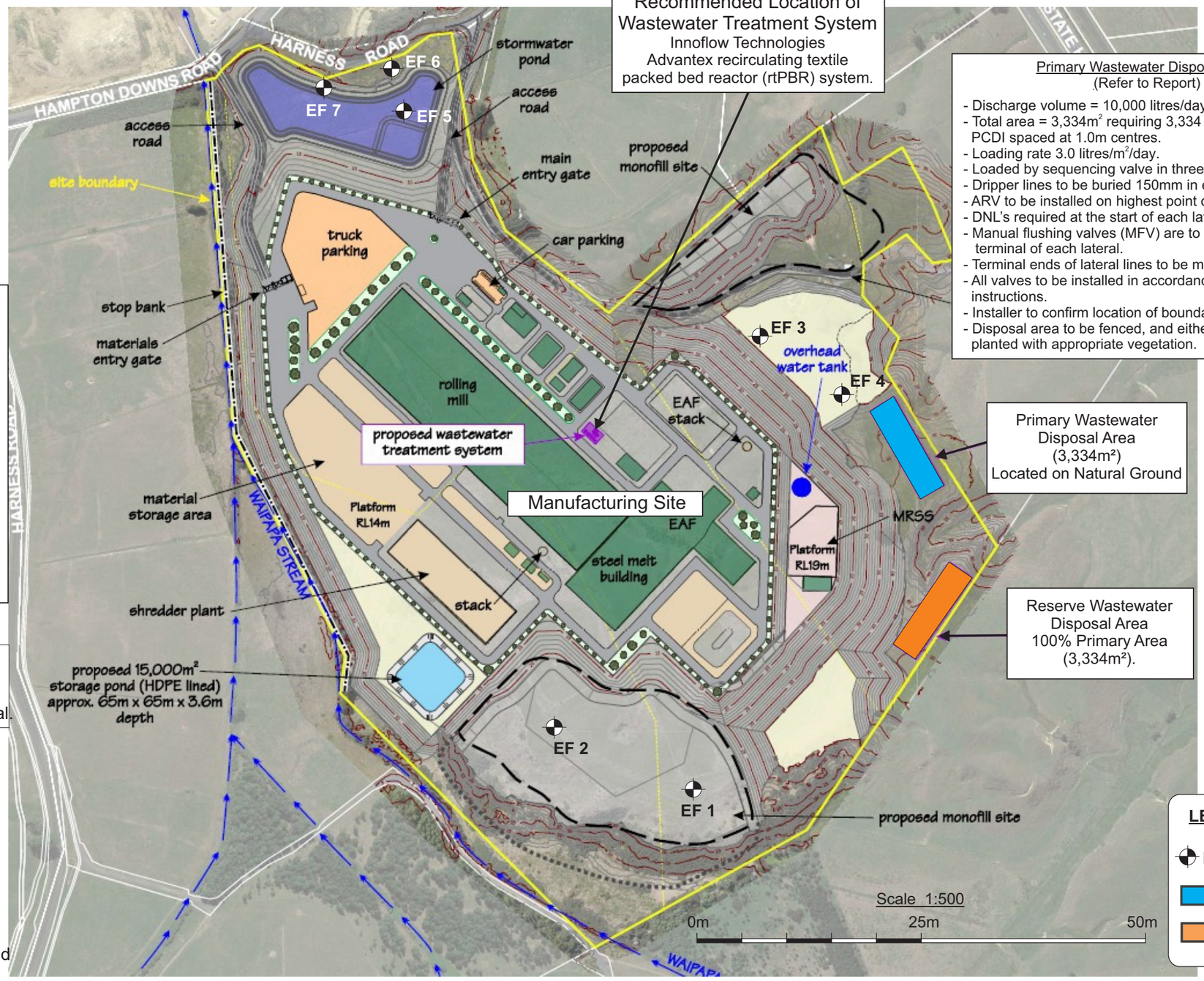
For more information, please contact Netafim at www.netafim.co.nz

Smart Approved WaterMark

WWW.NETAFIM.CO.NZ
EMAIL: AUCKLAND@NETAFIM.CO.NZ

NETAFIM™
GROW MORE WITH LESS

Drawings



Recommended Location of Wastewater Treatment System

Innoflow Technologies
Advantex recirculating textile packed bed reactor (rtPBR) system.

Primary Wastewater Disposal Field

(Refer to Report)

- Discharge volume = 10,000 litres/day
- Total area = 3,334m^2 requiring 3,334 linear metres of PCDI spaced at 1.0m centres.
- Loading rate 3.0 litres/m^2/day.
- Loaded by sequencing valve in three equal sectors.
- Dripper lines to be buried 150mm in existing topsoil.
- ARV to be installed on highest point on supply submain.
- DNL's required at the start of each lateral.
- Manual flushing valves (MFV) are to be installed at the terminal of each lateral.
- Terminal ends of lateral lines to be marked by permanent stake.
- All valves to be installed in accordance with manufacturers instructions.
- Installer to confirm location of boundaries prior to installation
- Disposal area to be fenced, and either regularly mowed, or planted with appropriate vegetation.

Wastewater Treatment Plant

(Refer to Report)

Design flow = 10,000 L/day
Innoflow Technologies recirculating textile packed bed reactor (rtPBR) system.
The proposed wastewater treatment system comprises the following components.

- 1 x 25,000 litre septic tanks with effluent outlet filter .
- 1 x 25,000 litre pre-anoxic tank.
- 1 x 10,000 litre recirculation tank1.
- 2 x AX100 recirculating textile filter pod (AX200) (Stage 1 Biological Process)
- 1 x 10,000 litre recirculation tank.
- 2 x AX20 recirculating textile filter pod (AX40) (Stage 2 Biological Process)
- 1 x 10,000 litre treated effluent tank.
- High water level alarms in all pump chambers
- Discharge water meter (+/-5% accuracy), data logger and remote monitoring connection.

Primary Wastewater Disposal Area (3,334m²) Located on Natural Ground

Reserve Wastewater Disposal Area 100% Primary Area (3,334m²).

NOTE: No fill or construction materials, temporary or permanent, are to be placed or stockpiled within proposed wastewater disposal areas without prior engineers approval.

NOTE: Plan based on drawing prepared and provided by Earthtech Ltd.

Final location of wastewater treatment plant and land disposal system to be confirmed on site.

LEGEND

- EF 1 — Approximate Location of Effluent Borehole
- Primary Land Disposal Area
- Reserve Land Disposal Area

ORMISTON ASSOCIATES LTD
CONSULTANTS IN GEOTECHNICAL ENGINEERING, GEOLOGY & ENGINEERING GEOLOGY
Level 2, 90 Symonds Street, Grafton, Auckland City
P O Box 47-822, Ponsonby, Auckland 1144, New Zealand
Ph (09) 302 2193 Fax (09) 302 2197 Email: mail@ormiston.co.nz

CLIENT: National Green Steel Ltd
LOCATION: 61 Hampton Downs Rd
TITLE: On-Site Domestic Wastewater Plan

SCALE: 1:5,000 @ A3
DRAWN: TLS
DATE: 21 May 2025
CHECKED: AWO

DRAWING NO
5577-1- V3
SHEET 1 OF 1