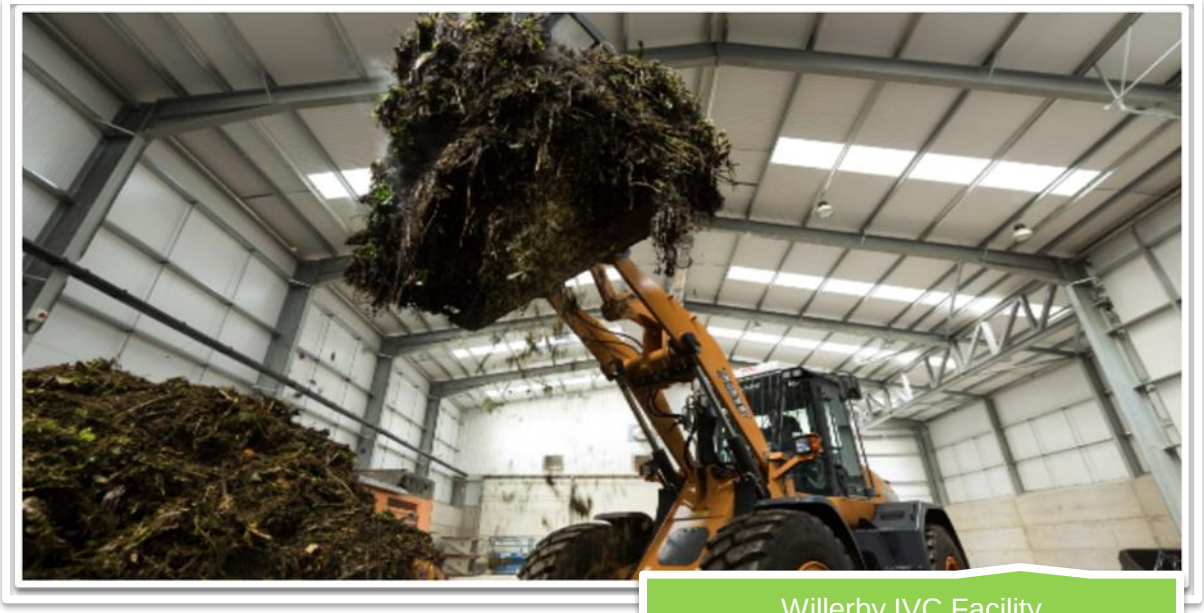
Drainage Management Plan

Issue 04

Produced for **Biowise Ltd**

Document Reference **BIO09**



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Version No.	Date	Description of change
03	28/03/2017	Initial plan
04	03/11/2020	Reviewed for submission of permit variation to increase capacity

CONTENTS

1.0 INTRODUCTION

1.1 Site Location

Biowise Ltd
Albion Lane,
Willerby,
Hull,
East Yorkshire,
HU10 6TS

Site Grid Reference: 500500, 431896 (IVC Facility)
Site Grid Reference: 501172, 431336 (ASP, OWC, Wood and Soils)

1.2 Description

The site is located in Willerby, 7km west of Hull and approximately 14km from the M62. Willerby is situated approximately 2km to the south east of the site and Beverley 8km to the north east. Access to the site is via Albion Lane.

The site is split by Westfield Road into a northern and southern portion of the site. The northern area consists of an in-vessel composting (IVC) facility treating food and green wastes through an enclosed vessel tunnel system. The southern area of the site consists of open windrow composting (OWC), aerated static pile composting (ASP), wood recycling and soils manufacture.

1.3 Site Setting

The Biowise facility lies within a groundwater Source Protection Zone (SPZ) 2 – Outer Zone (see Figure 1). The IVC is also located adjacent to high risk flood zone from rivers and seas (Figure 2). The control of water at the development is therefore paramount to prevent contamination of groundwater and surface water.

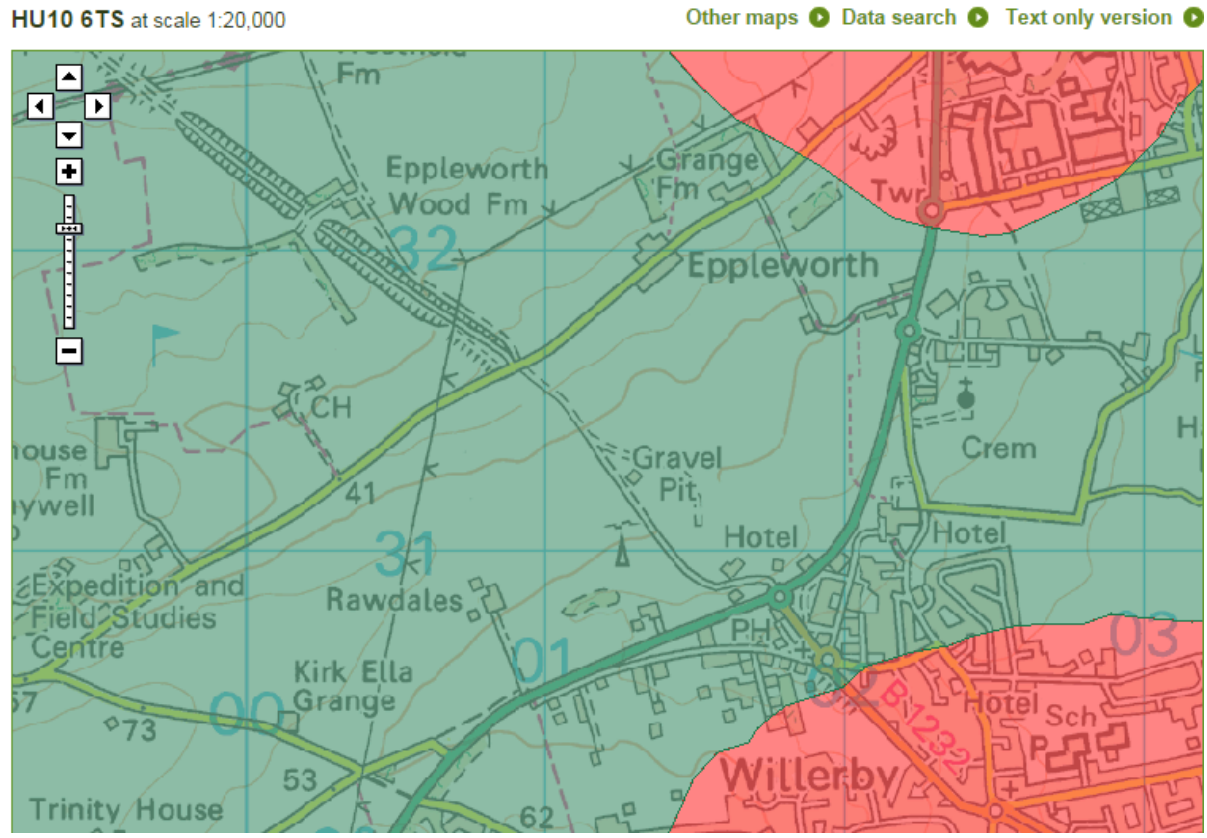


Figure 1 - Map of Groundwater Source Protection Zones

- Inner zone (Zone 1)
- Inner zone - subsurface activity only (Zone 1c)
- Outer zone (Zone 2)
- Outer zone - subsurface activity only (Zone 2c)
- Total catchment (Zone 3)
- Total catchment - subsurface activity only (Zone 3c)
- Special interest (Zone 4)

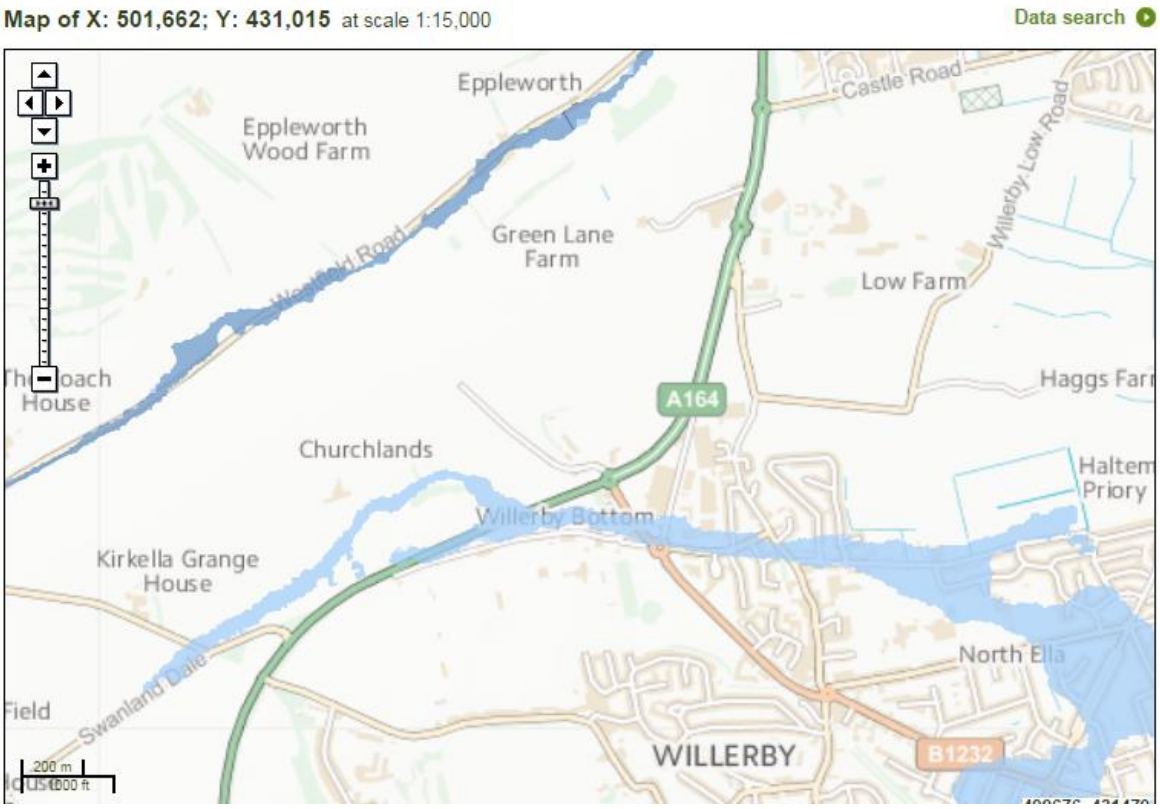
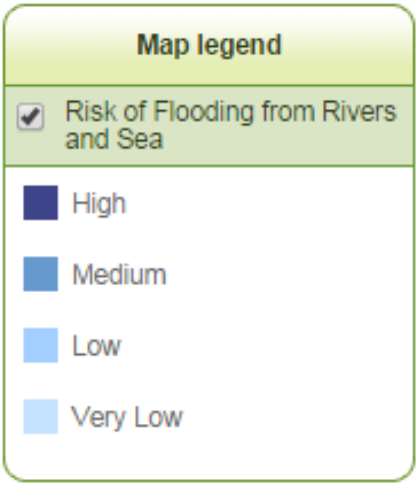


Figure 2 - Map of Flood Risk Areas



2.0 SOURCES OF LIQUID REQUIRING MANAGEMENT

The management of water at the Biowise facility incorporates several sources of water that actively fall within the control of this management plan. Sources of water that require management control include:

- Clean Water: surface water runoff from buildings and roadways within the site boundary as a result of direct precipitation.
- Leachate: surface water runoff from all areas of impermeable hard standing areas within the site boundary as a result of water use for vehicle wash-down etc.
- Leachate: internal runoff leachate from all processing areas within the IVC reception hall and processing tunnels.
- Leachate: all surface water runoff collected within the processing areas of the composting activity undertaken in open systems.
- Foul Water: from welfare facilities.

2.1 Overview of System

The table below clarifies the basic overview of how waters are managed on site at the different process areas.

Process Area	Clean Water	Leachate	Foul Water
IVC Facility	**Source:** Precipitation collected via roof drainage and roadways. **Management:** Direct to soakaway via interceptor. **Storage:** None.	**Source:** All process waters generated within the IVC, including leachate from reception hall and tunnels, waters from vehicle washdown and discharge from air scrubber. **Management:** Fully enclosed leachate management system. **Storage:** IVC Leachate Tank.	**Source:** Welfare facilities. **Management:** Discharge to soakaway via package treatment works. **Storage:** None.
OWC and ASP Facility	**N/A** All precipitation that lands on this portion of the site is considered leachate when generated from areas where waste is stored. **Storage:** OWC Leachate Tank (Boythorpe).	**Source:** All process waters generated on the impermeable surfaces where non-inert waste materials are processed. **Management:** Fully impermeable surfacing with sealed drainage system to leachate storage tank. **Storage:** OWC Leachate Tank (Boythorpe).	**Source:** Welfare facilities. **Management:** Tank storage and export via tanker to treatment works. **Storage:** Foul water tank.

3.0 WATER ARRANGEMENTS

There are no viable connections to either fresh water services or foul water sewage at the IVC facility so onsite sources for both required connections have been identified for the development. These sources include the installation of a freshwater borehole for supply of clean water, a soakaway for rainfall waters generated via roof drainage, roadway runoff, and a sewage package treatment for foul water.

3.1 Groundwater Abstraction

Groundwater is abstracted using a borehole well. Water is used for welfare on site for use in toilets, sinks, showers etc., washing down water for use in disinfecting vehicles, cleaning down the facility etc., and for use in a the event of a fire. The amount of water required for these operations is minimal and is well below the 20m^3/day licence limit.

The Bore-hole is on the N/E side of the old Hull to Barnsley railway cutting, 500m to the West of where the cutting intersects Westfield Road, Eppleworth (see IVC Site Layout Plan, reference Biowise_007). It is within the boundary of the Biowise IVC site to the North of the access road. The well-head stands in its own 'man-hole' constructed out of brick and concrete. It is surrounded by hard standing and is raised above ground level. The well-head is constructed of 150mm steel casing, the pipework has a bentonite seal and the head has a neoprene seal which is bolted down. The well itself is way above ground level as detailed in Figure 3.

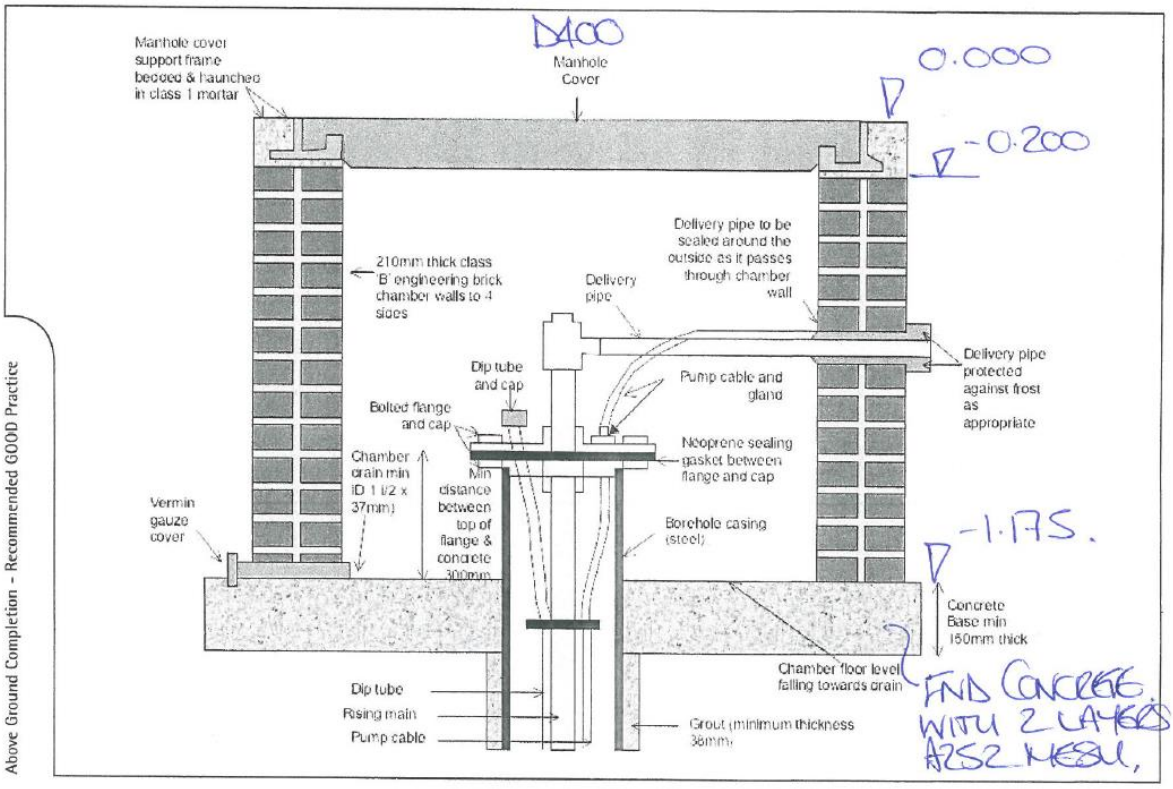


Figure 3 – Groundwater Well Installation Design

Water from the well is directed to the clean water storage tank (50m^3) which automatically regulates water abstraction by adjusting capacity between minimum and maximum levels within the tank. The tank is connected to the computer system which controls the levels and has alarms should minimum and maximum levels be breached.

3.2 Cellular Attenuation

Clean water that is collected via the roof drainage system of the IVC building and roadway runoff is directed to soakaway via an interceptor and cellular attenuation system. The attenuation system is positioned over limestone and identified by percolation test as a suitable location for discharge. No further mitigation for infiltration rate is required. Rainwater pipes from the roof drainage system are sealed at ground level and are completely segregated from all other internal drainage runs.

3.3 Package Treatment

A package treatment plant is included in the onsite water arrangements for foul water generated at the IVC facility. The treatment plant (Klargester Biodisc BA-X) is certified as suitable for discharge into a watercourse or soakaway to BS EN-12566. The treated water from the package treatment is directed to the cellular attenuation system for soakaway.

The soakaway tank has been sized to provide storage of water during storm events. The package treatment plant takes foul water from a single WC and hand wash facility, with a 12 person occupancy, therefore the anticipated discharge rates are small and deemed appropriate for the attenuation system.

3.4 Storage Tanks

There are several storage tanks on site for clean and dirty waters. These are identified on the separate Site Drainage Plans (Annex A). For reference the tank design details are provided below.

Tank	Capacity	Content	Location	Bunding
IVC Leachate Tank	Glass coated steel construction. Diameter: 3.405m Height: 5.588m, Capacity: 50.8m³.	Leachate from all internal IVC areas.	Adjacent to eastern process tunnels. See Drawing 35602-250E	"Second Skin" Glass coated steel construction. Diameter: 4.204m Height: 5.588m Capacity: 57.20m³
IVC Freshwater Tank	Glass coated steel construction. Diameter: 3.405m Height: 5.588m, Capacity: 50.8m³.	Freshwater fed by groundwater well.	Adjacent to western process tunnels. See Drawing 35602-250E	None.

OWC Leachate Tank (Boythorpe)	Glass coated steel construction. Diameter: 10.60m Height: 3.60m Capacity: 398m^3.	Leachate from all external hardstanding.	North of welfare facilities. See Drainage Plan.	Breezeblock retaining bund 110% of tank capacity.

Both leachate storage tanks do not suffer from sludge accumulation as the inputs are filtered through a screen prior to ingress. The contents of the tanks change often and any particulates are removed with the liquid.

The IVC freshwater tank, and both leachate tanks are fitted with level metres. This is an essential part of the management of the system and it is hooked up to the main computer system that monitors the process. There is also an alarm system which notifies site staff of any issue with level whether it be too high or too low.

3.5 Emergency Containment

As identified in section 3.4, both the IVC leachate tank and the OWC leachate tank are fully bunded in case of tank failure to at least 110% of the tank capacity. This ensures that all leachate water is fully contained should the tanks fail.

In the event of fire on site, the use of permanent and temporary bunding will be utilised in order to contain fire waters generated during firefighting. For the OWC processing pads, the concrete impermeable pads are partially bunded by impermeable concrete kerbing (min 1m height). Open sections allowing for ingress/egress can be closed off in case of fire by utilising temporary soil bunds. Soil is manufactured on site and so there is always a ready supply for the response to fire incidents. Based on industry guidelines[1] Biowise will deploy a minimum one metre thickness of soil across areas that are not bunded. A 1m depth of bunding therefore allows for 10,000m^3 of fire water to be contained on site.

In the event of fire on site at the IVC all fire waters will be contained within the integral drainage system. Should the fire waters be generated then all water will be contained and fed to the sump and IVC leachate tank. Biowise have an emergency contractor for the removal of fire waters (24/7/365) with vacuum pump. The vacuum pump will pump waters directly out of the sump should excessive fire waters be generated beyond the site capacity.

[1] CIRIA (2014) Containment systems for the prevention of pollution. Report C736.

4.0 OPERATIONAL DRAINAGE SYSTEM

4.1 IVC Drainage Arrangements

A plan showing the drainage system for managing surface water and leachate is provided within drawing referenced 35602-250E.

4.2 IVC Leachate

All operational areas are covered by impermeable concrete. The concrete has been constructed with falls to a drainage channel leading to a central sump for collection of all process waters and leachates that are captured from the reception hall and compost tunnels. A pump has been installed to direct the flow to a leachate storage tank (50m^3 capacity). The leachate generated within the IVC (reception hall and tunnels) is captured within this separate enclosed system. There is no discharge point from the leachate tank and it is totally segregated from the foul water and freshwater arrangements.

All internal process areas are connected to the internal drainage system. The reception hall includes all activities of waste storage, inspection, shredding, blending and amendment. Quarantined materials are also stored in the reception hall within a segregated area dependent upon internal layout of operations. This location is not fixed but is clearly segregated from all other materials should quarantine be required.

Disinfection and cleaning of wheels takes place inside the reception building. This operation is carried out before delivery vehicles exit the facility. Any waste water from this process is contained in a drain just inside the doors of the building. This drain is part of the reception hall drainage system and is fully contained and as part of the same leachate system.

4.3 IVC Water Re-Use

On site tanks are in place for the collection, separation and storage of leachate water. The IVC leachate tank is fully bunded to prevent leakage into the groundwater below.

Clean water from the freshwater storage tank only is redirected as required to add to incoming waste materials to achieve the required moisture content prior to composting. During the warm up phase leachate can be added to optimise moisture content from the leachate storage tank. For the sanitisation phase, freshwater is added from the IVC freshwater tank as a source of water. Post sanitisation during cool down, freshwater is added from the freshwater tank only, to prevent re-inoculation as required under ABPR. Leachate water is therefore only re-applied within the controlled environment of the compost tunnels, and only during the warm up phase from the IVC leachate tank.

4.4 OWC/ASP Leachate

All water that is generated on the open windrow composting pad and aerated static pile bays is considered leachate, either through direct precipitation onto the pad or water leaching from the stockpiled materials.

4.4.1 Required Storage

The total area of concrete on which all external processing activities take place, including material reception, shredding, composting and screening is calculated below:

- OWC processing pad: 4,600m^2
- ASP bays: 3,000m^2
- Oversize storage area: 1,200m^2
- Screening area: 1,250m^2
- **Total concreate area: 10,050m^2**

The required storage capacity for the site is calculated as follows:

Required Capacity (m^3) = Concrete Area (m^2) x 48hr M5 Rule Rainfall Depth (m)

Based upon the above calculation the required capacity for leachate storage would be 10,050m^2 x 0.04m = 402m^3.

4.4.2 Storage Capacity

The northern composting pad (ASP array) is laid to a 1 in 50 fall to Sump Pit A (24m^3 capacity) to the north west of the pad. The southern pad is also laid to a 1 in 50 fall to a Sump Pit B (8m^3 capacity) to the north west of the pad. Leachate is pumped from both sumps over the parabolic screen to the OWC Leachate Tank with a 398m^3 capacity. Only leachate generated at the OWC/ASP site is captured through this system. Arrangements for leachate at the IVC are dealt with separately as previously detailed.

Based on the calculation above, the site has 430m^3 of leachate storage capacity on site therefore the storage provisions are large enough to cope with a 48hr M5 worst case storm event producing 40mm of rainfall.

4.5 Monitoring

The processing area is inspected on a daily basis to ensure no cracking, pooling or prevention of free flowing runoff to the sump. The results of the inspections are recorded in the Site Diary together with any remedial actions that are taken. The frequency of inspection is increased at times of higher risk under the direction of the Site Manager.

The leachate tanks and soakaways are inspected no less frequently than weekly and always after rainfall events, and are emptied when the collected liquids reach 90% capacity as indicated by high level alarms present on each tank.

4.6 OWC/ASP Water Re-Use and Disposal

Leachate stored within the OWC leachate tank is re-circulated through the OWC/ASP composting processes only where the addition of moisture is identified through the operating procedures and critical limits of compost monitoring. Where this is carried out the leachate is added on a little and often basis across the profile of the batch at a maximum of 5m^3 at a time.

After each addition, the moisture level of the batch is re-assessed prior to any further liquid addition.

During winter months there is often a reduced requirement for moisture addition on open windrows which could lead to the OWC leachate tank reaching full capacity (90% of maximum volume). When this occurs the tank is pumped out and disposed of at a fully permitted waste water treatment facility. A contractor is notified as soon as capacity is reached and the tank is emptied within a maximum 48hrs of capacity being reached. This does not apply at the IVC which is fully enclosed preventing increased leachate generation during winter periods. However, should leachate need to be removed from the IVC leachate tank, a contractor is notified as soon as capacity is reached and the tank is emptied within a maximum 48hrs of capacity being reached.

5.0 SYSTEM MANAGEMENT

The following section outlines the site requirements for managing surface waters and keeping management procedures up to date and in line with current site activities.

5.1 Routine Maintenance

All drainage systems are regularly inspected and maintained by the site manager and recorded in the site diary, at least on a weekly basis.

Routine maintenance of the drainage system within the site includes the following:

- Clearance of growing or fallen vegetation,
- Repairing any damage caused by operational activities,
- Removal of any excess accumulations of sediment,
- Temporary repairs are carried out as appropriate, with permanent repair works commencing within 28 days of the defect being recognised,
- Cleaning of building gutters, gullies, drains and storage tanks.

All maintenance activities are recorded within the Site Diary.

5.2 Management Review

This Drainage Management Plan is kept up to date and in line with the Management System for the overall operational activities carried out on site. The plan is reviewed at least annually, or as required by changes in operational procedures or incidents that require review.

5.3 Emergencies

Emergency response to drainage and leachate system failures is provided within the Accident Management Plan.

ANNEX A: DRAINAGE PLANS

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