Operation & Maintenance Manual Stormwater Treatment Devices

Jordan Springs East Precinct

89914020

Prepared for
Lend Lease

11 October 2016

Cardno
Shaping the Future

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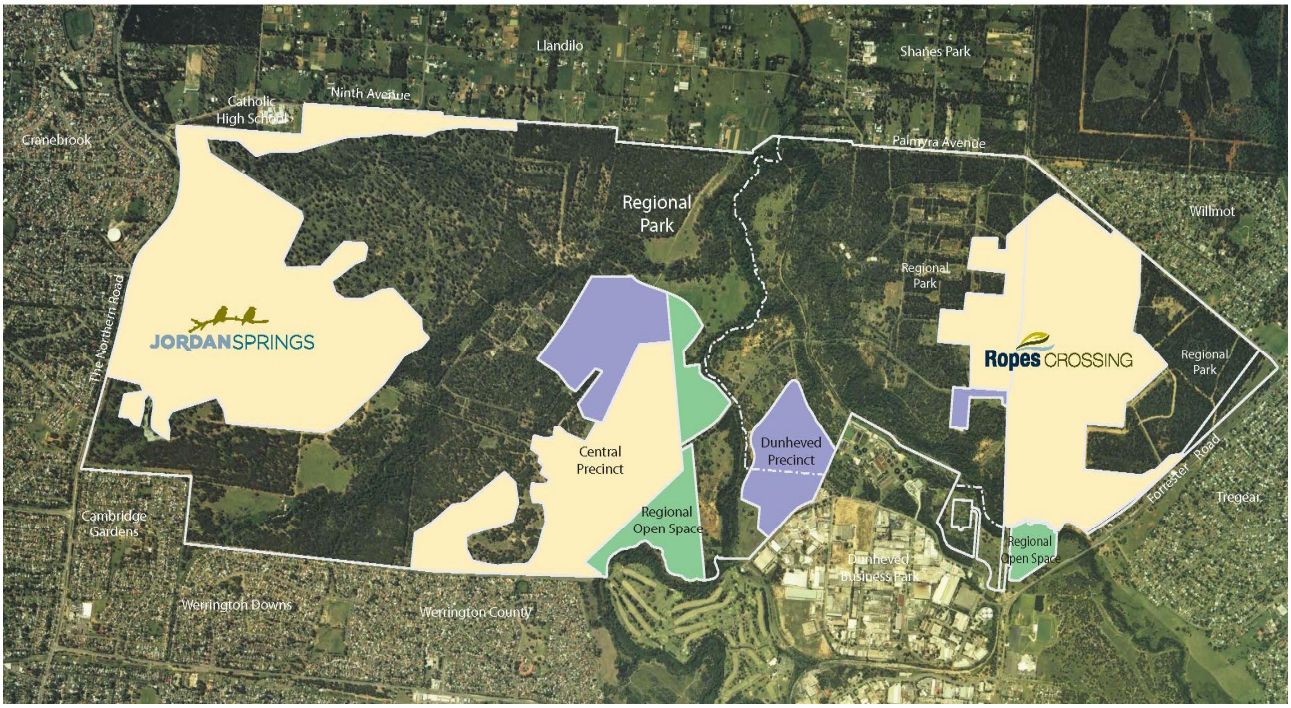
1 Introduction

1.1 Jordan Springs East Precinct Overview

The Jordan Springs East Precinct (formerly Central Precinct) forms part of the St Marys development site and covers an area of approximately 135 hectares. The St Marys development site is a former Australian Defence Industries (ADI) site and has been developed into Jordan Springs, Ropes Crossing and Jordan Springs East Precinct, South Creek to the east and existing urban development to the south. The locality of the site is shown in **Figure 1-1**.

Figure 1-1 Central Precinct Site Locality Plan



The overarching water quality strategy for Jordan Springs East Precinct is covered in *Jordan Springs East Precinct Stormwater Quality Management Report,* October 2016, Cardno. This reports should be read in conjunction with the overarching strategy.

1.2 Jordan Springs East Precinct Water Quality Infrastructure

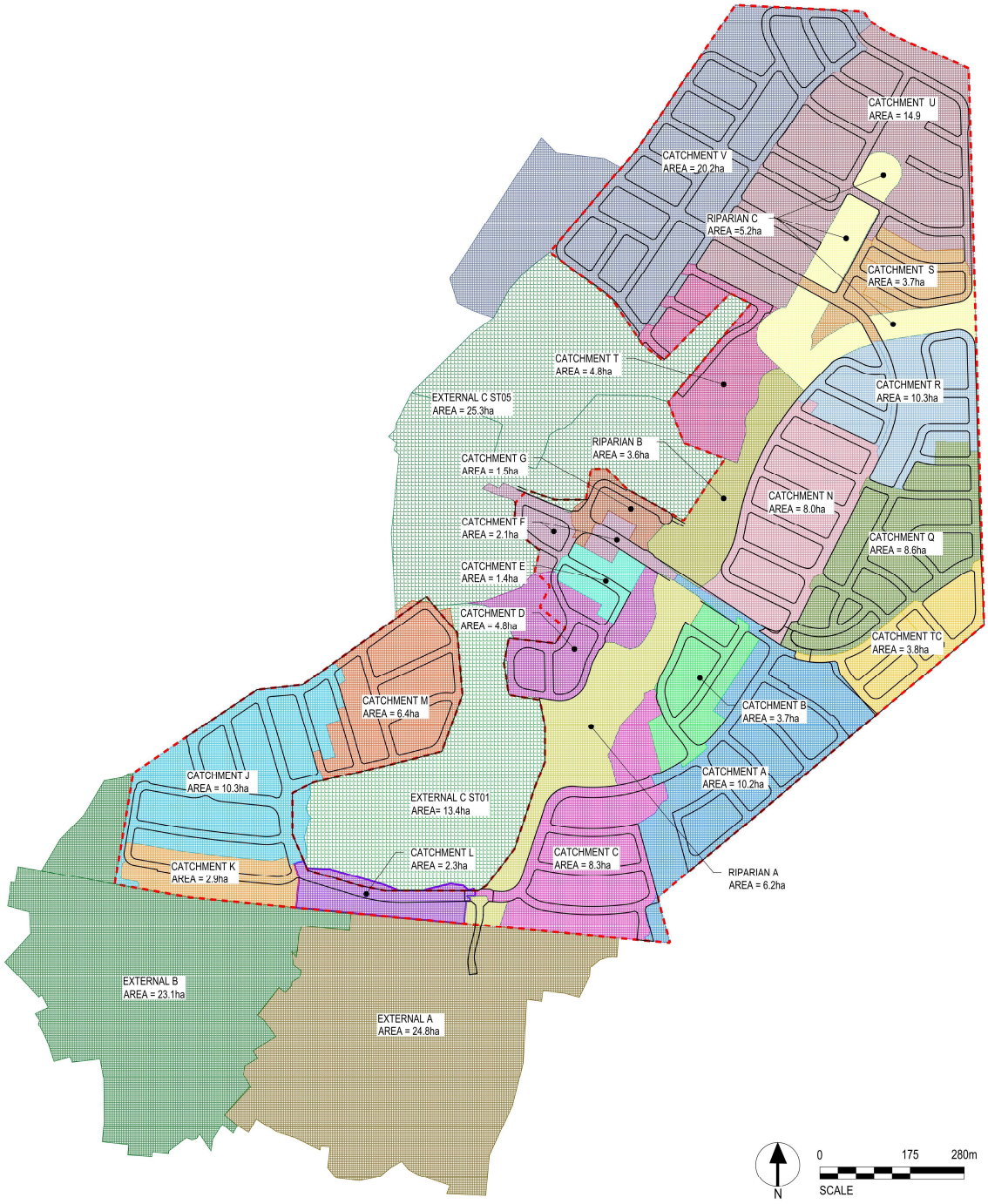
The water quality infrastructure within current development applications and proposed future infrastructure are summarised in **Table 1-1**.

Table 1-1 Water Quality Infrastructure Summary

Stage 1 Infrastructure	**Infrastructure Type and Quantity**	**Corresponding Maintenance Section**
Stormwater Pits	Approx. 300 street drainage pits	**Section** Error! Reference source not found.
Gross Pollutant Trap	Rocla CDS® - 7 units	**Section 2.3.3**
Bio-retention Basin	Filer media – 7260m^2	**Section 6 & 7**
Stage 2 Infrastructure	**Infrastructure Type and Quantity**	**Corresponding Maintenance Section**
Stormwater Pits	Approx. 210 street drainage pits	**Section** Error! Reference source not found.
Gross Pollutant Trap	Rocla CDS® - 2 units Humes HumeGard® - 2 units	**Section 2.3.3**
Bio-retention Basin	Filer media –1150m^2	**Section 6 & 7**
Stage 3A Infrastructure	**Infrastructure Type and Quantity**	**Corresponding Maintenance Section**
Stormwater Pits	Approx. 60 street drainage pits	**Section** Error! Reference source not found.
Gross Pollutant Trap	Rocla CDS® - 1 unit	**Section 2.3.3**
Future Infrastructure	**Infrastructure Type and Quantity**	**Corresponding Maintenance Section**
Stormwater Pits	Undetermined at this time	**Section** Error! Reference source not found.
Gross Pollutant Trap	Rocla CDS® - 9 units	**Section 2.3.3**
Bio-retention Basin	Filer media – approx. 9010m^2	**Section 6 & 7**

The catchment assessment for the precinct results in 19 urban catchments, each requiring treatment before discharging to receiving water courses. All urban catchments include a GPT device while 13 of the catchments include treatment via a bio-retention basin. The catchment breakdown in shown in **Figure 1-2**.

Figure 1-2 Jordan Springs East Precinct Stormwater Catchment Boundaries



1.2.2 Stage 1

Stage 1 of the Jordan Springs East Precinct covers an area of approximately 38 hectares. It generally extends from the centre of the Jordan Springs East Precinct towards the south-eastern boundary, shown in **Figure 1-3**. The expected yield is approximately 400 residential lots, split into nine sub-catchments (A, B, C, D, E, F, G, Rip A and External C ST01) shown in **Figure 1-2.**

In addition to the infrastructure included in **Table 1-1** the stormwater quality management strategy includes:

- Rainwater tanks on each residential lot
- Approximately 960m of riparian corridor

The treatment strategy for each catchment for Stage 1 is included in **Table 1-2**.

Table 1-2 Stage 1 relationship between catchments and bio-retention basins

Catchment	Area (ha)	Comment
External A	24.8	Stormwater runoff from the existing urban development will drain into the southern extent of the Jordan Springs East Precinct drainage corridor. The catchment is not included in the Jordan Springs East Precinct removal target assessment.
External C ST01	13.4	Stormwater runoff from the regional park will drain to the Jordan Springs East Precinct drainage corridor via suitably sized table drains.
Riparian A	6.2	Stormwater runoff from the open spaces and channel within this catchment will drain to the extent of the Stage 1 drainage corridor and be dispersed with the use of level spreaders to South Creek.
Catchment A	10.2	Stormwater runoff from the urban development and open spaces will drain to bio-retention Basin B. The basin will provide treatment to meet council's water quality targets.
Catchment B and C	12	Stormwater runoff from the urban development and open spaces will drain to bio-retention Basin C. The basin will provide treatment to meet council's water quality targets.
Catchment D and E	6.2	Stormwater runoff from the urban development and open spaces will drain to bio-retention Basin A. The basin will provide treatment to meet council's water quality targets.
Catchment F and G	3.6	Stormwater runoff will be treated by Gross Pollutant Traps before discharging into the drainage corridor.

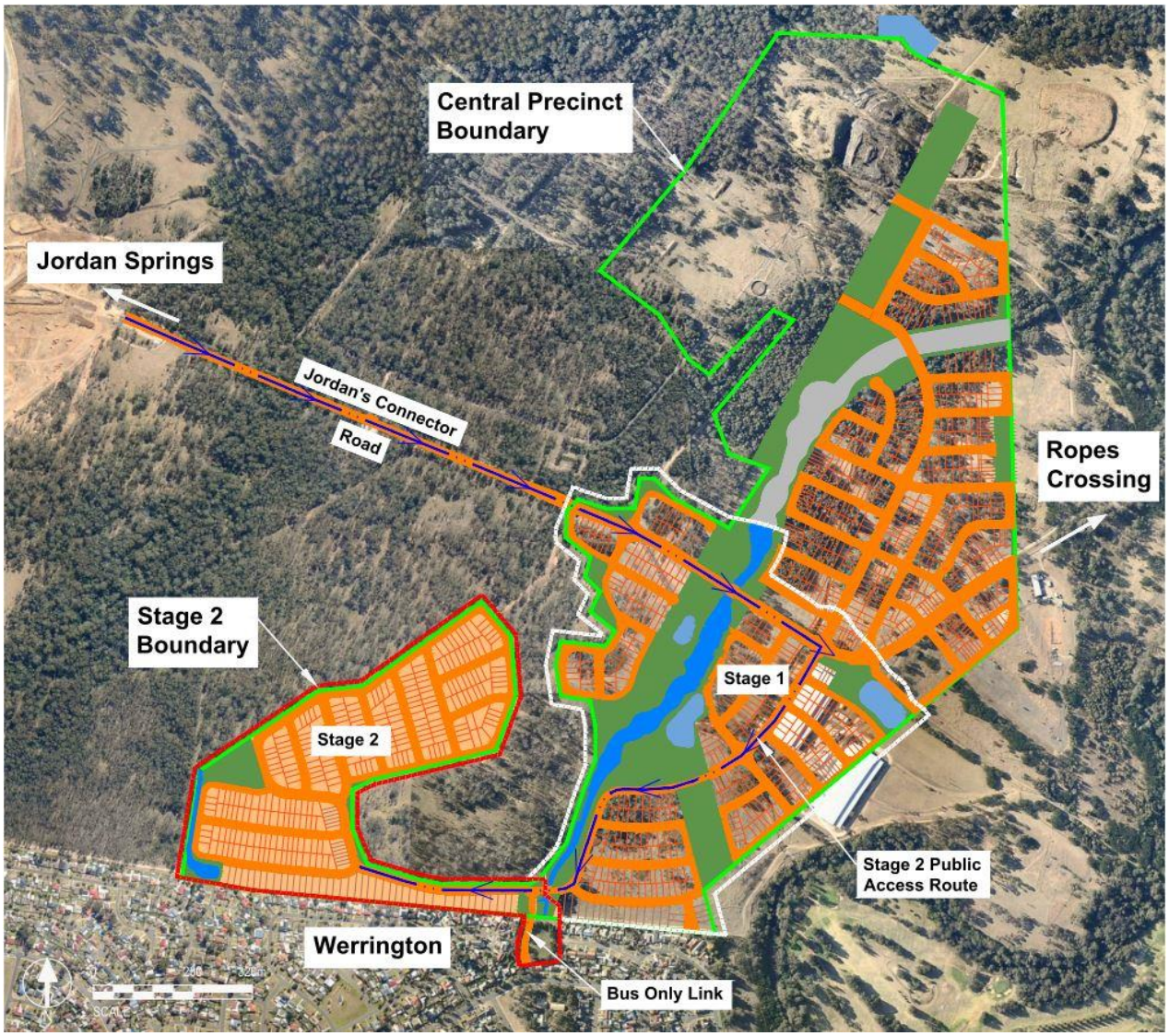
1.2.3 Stage 2

Stage 2 of Jordan Springs East Precinct covers an area of approximately 22 hectares. It generally extends from the south-western boundary towards Stage 1. The extent of Stage 2 is illustrated in **Figure 1-3** and it is expected that Stage 2 will yield approximately 280 residential lots. The proposed grading of the site divides Stage 2 into five sub-catchments. This includes one external catchment (External B) and four internal catchments (Catchment J, K, L and M) as shown in **Figure 1-2**.

Access to Stage 2 is indicated in **Figure 1-3** and will traverse Jordan Springs and Stage 1 of Jordan Springs East via the Jordan's Connector Road.

Stage 2 pre-developed site conditions are described in the *Civil Engineering & Infrastructure Report, Stage 2: Central Precinct (Cardno, 2015)*. The site is rural with a high percentage of pervious area and limited vegetation. An existing stormwater outlet enters the site at the south west boundary, exiting along the western boundary.

Figure 1-3 Stage 1 and 2 Extents



In addition to the infrastructure included in **Table 1-1** the stormwater quality management strategy for Stage 2 includes:

- Rainwater tanks on each residential lot
- Approximately 215m of drainage corridor

A summary of the individual catchment treatment is included in **Table 1-3**.

Table 1-3 Stage 2 relationship between catchments and bio-retention basins

Catchment	Area (ha)	Comment
External B	23.1	Stormwater runoff from the existing urban development will drain into Channel 2 with low flows being diverted via bio-retention Basin D. The catchment is not included in the Jordan Springs East Precinct removal target assessment.
Catchment J	10.3	Stormwater runoff from the urban development and open spaces will drain to the Regional Park via the downstream extent of Channel 2. The catchment will be treated via a proprietary GPT.
Catchment K	2.9	Stormwater runoff from the urban development will drain to bio-retention Basin D. The basin will provide treatment to meet council's water quality targets.
Catchment L	2.3	Stormwater runoff will be treated by a proprietary GPT before discharging into Stage 1 riparian corridor.
Catchment M	6.4	Stormwater runoff from the urban development will drain to Bio-retention Basin A via a connection to Stage 1 drainage. The basin will provide treatment to meet council's water quality targets.

1.2.4 Future Stages

The future stages of Jordan Springs East Precinct cover the remaining 75 hectares (approximately). The future stages include all area north of the Collector road. The proposed grading divides the development into eleven sub-catchments (N, Q, TC, R, S, T, U, V Riparian B, Riparian C and External C ST05) as shown in **Figure 1-2**.

In addition to the infrastructure included in **Table 1-1** the stormwater quality management strategy for future stages include:

- Rainwater tanks on each residential lot
- Approximately 660m of drainage corridor

A summary of the individual catchment treatment is included in **Table 1-4**.

Table 1-4 Future Stages relationship between catchments and bio-retention basins

Catchment	Area (ha)	Comment
External C ST05	25.3	Stormwater runoff from the regional park will drain to the Jordan Springs East Precinct drainage corridor via overland flow and drainage networks.
Riparian B	3.6	Stormwater runoff from the open spaces and channel within this catchment will drain to bio-retention Basin F, low flows will be treated to meet council's water quality targets.
Riparian C	5.2	Stormwater runoff from the open spaces and channel within this catchment will drain to the extent of the drainage corridor and be dispersed to South Creek.
Catchment N	8.0	Stormwater runoff will be treated by a proprietary GPT before discharging into the drainage corridor. Low flows will be treated in bio-retention Basin F.
Catchment Q	8.6	Stormwater runoff from the urban development will drain to bio-retention Basin E before discharging into Regional Open Space. The basin will provide treatment to meet council's water quality targets.
Catchment TC	3.8	Stormwater runoff from the town centre catchment will drain to GPTs. Half the catchment will drain to bio-retention Basin B. The basin provide treatment to meet council's water quality targets.
Catchment R	10.3	Stormwater runoff will be treated by Gross Pollutant Traps before discharging into the drainage corridor.
Catchment S	3.7	Stormwater runoff will be treated by Gross Pollutant Traps before discharging into the drainage corridor.
Catchment T	4.8	Stormwater runoff from the urban development will drain to bio-retention Basin F. The basin will provide treatment to meet council's water quality targets.
Catchment U	14.9	Stormwater runoff from the urban development will drain to bio-retention Basin G. The basin will provide treatment to meet council's water quality targets.
Catchment V	20.2	Stormwater runoff from the urban development will drain to bio-retention Basin G. The basin will provide treatment to meet council's water quality targets.

1.2.5 Manual Purpose

This Manual sets out the draft parameters for the Operation and Maintenance for the elements associated with the proposed water quality treatment devices and upstream stormwater infrastructure.

It is intended that this document addresses the requirements for the bio-retention basins, associated pit and pipe infrastructure and basin outlet structures. This Manual is separated into six (6) categories;

i) Pit and Pipe Network including Gross Pollutant Trap(s),

ii) Overland Flow Paths,

iii) Rip-Rap,

iv) Subsoil Drainage,

v) Bio-retention filter material,

vi) Basin Outlets.

The proposed bio-retention and detention basins have been designed to address water quality objectives and are proposed to treat the 3 month design flows prior to discharging into the existing watercourse and creek system. Incoming piped flows shall be pre-treated by passing through a Gross Pollutant Trap (GPT). Flows in excess of the 3 month ARI (200% AEP) will overflow the detention system via a weir structure and flow into the existing drainage network.

Adherence to this Operation and Maintenance Manual will assist in the effective operation of the water quality and quantity basins will maximise the water quality objectives and maximise the life expectancy of the facilities.

1.3 External Reports/ Studies

This report shall be read in conjunction with the following documents;

i) *Penrith City Council WSUD Technical Guidelines*, PCC, December2013;

ii) *Jordan Springs East Precinct Stormwater Quality Management Report,* Cardno, October 2016;

iii) *Civil Engineering & Infrastructure Report, Stage 1: Central Precinct,* Cardno, March 2015;

iv) *Civil Engineering & Infrastructure Report, Stage 2: Central Precinct*, Cardno, October 2015;

v) *St Marys Central Precinct Water Soils and Infrastructure Report*, SKM, May 2009

2 Pit and Pipe Network

2.1 General

The subsurface pit and pipe network is a critical component of the proposed works. The pipe work associated with the development accepts flows from proposed development site and road network catchments. Site specific pit and pipe work has been designed to convey these flows to the bio-retention basins and GPTs with low flows being treated.

2.2 Inspection Frequency and Procedure

The pit and pipe network, upstream of the proposed bio-retention basins shall be inspected at intervals after a major storm event and not exceeding twelve (12) months. Inspections should be undertaken by suitably qualified persons with an understanding and experience in the operation of similar systems.

Inspections should as a minimum;

i) Check that all grates, covers and lintels are in sound condition and are undamaged. Any signs of deterioration should be noted;

ii) Check all pits for accumulation of sediment, debris or litter;

iii) If pits are found to be affected by sediment, debris or litter, an assessment should be made as to whether the upstream and downstream pipes require cleaning;

iv) Inspect outlet headwall and ensure it is in a sound, undamaged condition;

v) Check the area immediately surrounding the outlet headwall for signs of scour and/or sediment collection. If evidence of scour is found, rock lining or similar scour protection may need to be installed or replaced. The accumulation of sediment at the headwall may be an indication of system problems further upstream and additional investigations should be undertaken.

2.3 Maintenance Frequency and Procedure

Maintenance of the pit and pipe system should be undertaken as required following the above inspections.

Typical maintenance procedures that would need to be undertaken include;

i) Remove sediment, debris and litter from pits including lintels;

ii) Remove sediment or other foreign material from pipes.

2.3.1 Removal of Sediment, Debris or Litter from Pits

Should sediment, debris or litter be detected within the stormwater pits, it is important that the foreign material be removed to ensure proper operation of the system.

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) Set up warning signs and/or tape around the works to inform passers-by that maintenance works are in progress and to stay clear. Traffic controls are to be installed in accordance with AS1742 and Council requirements;

iii) Open all grates and covers to ensure access is gained to all chambers of the pit;

iv) Remove any large debris or litter manually and dispose of off-site;

v) If possible, remove the accumulated sediment manually and dispose of off-site;

vi) If manual sediment removal is not possible, sediment will need to be removed by a vacuum truck and disposed of off-site;

vii) Following removal of the foreign material, the condition of the pit internally and any weir or diversion structure should be noted. Any damaged structure should be repaired;

viii) At the completion of the work the access grates and covers should be closed ensuring that all locking devices are securely in place;

ix) Remove all warning signage on completion of the works.

2.3.2 Removal of Sediment, Debris or Litter from Pipes

Should sediment, debris or litter be detected within the stormwater pipes, it is important that the foreign material be removed to ensure proper operation of the system.

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) Set up warning signs and/or tape around the works to inform passers-by that maintenance works are in progress and to stay clear. Traffic controls are to be installed in accordance with AS1742 and Council requirements;

iii) The removal of any foreign material is to be undertaken in stages with each stage clearing only a single reach of pipe;

iv) Open all grates and covers to ensure clear access is gained to upstream and downstream pipes;

v) Using a timber board or similar means, block off the outlet pipe from the downstream pit to prevent sediment from discharging further down the system;

vi) At the upstream pit, use pressurised water or a similar method to flush the accumulated material to the downstream pit. Note that non potable water may be suitable for this purpose;

vii) Using a vacuum truck or similar method to collect the flushing water and associated foreign material from the downstream pit;

viii) Repeat the above steps for downstream reaches of the pipe network;

ix) At the completion of the work the access grates and covers should be closed ensuring that all locking devices are securely in place;

x) Remove all warning signage on completion of the works.

Other non-routine maintenance operations that may need to be undertaken include;

i) Repair or replacement of pit grates and covers;

ii) Repair of damaged weirs or other diversion structures;

iii) Rectification or addition of scour protection at the outlet headwall.

2.3.3 Operation and Maintenance of Gross Pollutant Traps

Cleaning and maintenance of the GPTs will be carried out in accordance with the manufacturer's written guidelines. The GPTs have been designed and specified in conjunction with the Manufacturer. The relevant Manufacturer's operations and maintenance manual must be consulted and adhered to. A copy of the Manufacturers maintenance procedures is included in **Appendix B**.

2.4 Reporting Requirements

An example of an Inspection Maintenance Report is included in **Appendix A**. The report should, at a minimum, make note of the items listed in Section 2.2.

These reports should be kept on file as a record of when inspections were undertaken and what conditions were found on site.

3 Overland Flow Paths

3.1 General

Overland flow paths capture and direct surface flows discharging them to areas where they can be managed appropriately. Overland flow swales shall be provided upstream of the basin and downstream of the basin weir.

3.2 Inspection Frequency and Procedure

The overland flow paths should be inspected at intervals after major storm events and not exceeding twelve (12) months. Inspections should be undertaken by suitably qualified persons with an understanding and experience in the operation of similar systems.

Inspections should as a minimum;

i) Check for signs of scour or erosion along the length of the swale and in areas immediately around the swale. Eroded or scoured areas may be an indication of excessive velocities;

ii) Check for signs of sediment deposition. Sediment deposition may be caused by sediment laden stormwater and/or low flow velocities;

iii) Check to ensure the capacity of the swale has not been reduced by foreign materials such as litter or debris;

iv) Check for infestation by weeds or other foreign species;

v) Where applicable, vegetation of swales should be checked for health and height;

vi) The outlet of the swales should be checked for signs of scour or sediment accumulation.

3.3 Maintenance Frequency and Procedure

Maintenance of the overland flow swales may be separated into regular and routine tasks.

Regular maintenance includes frequently undertaken tasks such as mowing of vegetated swales.

Routine maintenance involves tasks that are undertaken as site conditions require and may include;

i) Removal of sediment build up;

ii) Removal of weeds and other foreign species;

iii) Restoration of the swales due to scour or erosion,

3.3.1 Mowing Vegetated Swales

Vegetated swales should be mowed at regular intervals to maintain swale capacity and improve aesthetics of the area.

During summer months it is recommended that the swales be mown at intervals not exceeding two (2) to three (3) weeks. During winter months mowing should be undertaken every four (4) to six (6) weeks. These intervals are approximate and may be varied to suit site conditions;

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) Set up warning signs and/or tape around the works to inform passers-by that maintenance works are in progress and to stay clear. Traffic controls are to be installed in accordance with AS1742 and Council requirements;

iii) Mowing is to be undertaken by push or ride-on mowers at the discretion of the maintenance contractor;

iv) Collected clippings are to be disposed of off-site;

v) Footpath and surrounding areas are to be swept or blown clean;

vi) Remove all warning signage on completion of the works.

3.3.2 Removal of Sediment Build-up

Should sediment or other foreign material accumulate or build up within the swales, it should be removed to ensure the capacity of the swales is not reduced;

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) Set up warning signs and/or tape around the works to inform passers-by that maintenance works are in progress and to stay clear. Traffic controls are to be installed in accordance with AS1742 and Council requirements;

iii) Collected sediment should be removed manually to minimise disturbance to the swale and surrounding area;

iv) Care should be taken to ensure minimal damage to the vegetation or lining of the swales and surrounding area during sediment removal;

v) Collected sediment is to be disposed of off-site;

vi) Remove all warning signage on completion of the works.

3.3.3 Removal of Weeds and Foreign Species

Weeds or foreign species that have begun growing within the swales should be removed to ensure the planted species is not starved of nutrients etc;

i) Set up warning signs and/or tape around the works to inform passers-by that maintenance works are in progress and to stay clear. Traffic controls are to be installed in accordance with AS1742 and Council requirements;

ii) Weeds or foreign species should be removed by hand or locally sprayed with a glyphosate based pesticide;

iii) If weeds are removed by hand, any loose soil that remains should be firmly re-compacted. Any remaining divots should be filled and compacted;

iv) If glyphosate is used the manufacturer's recommendations and safety procedures should be adhered;

v) Collected waste is to be disposed of off-site;

vi) Remove all warning signage on completion of the works.

3.3.4 Restoration of Swale Due to Scour or Erosion

Areas of swale that have been affected due to scour or erosion should be repaired to restore the integrity of the swale and minimise the risk of further damage;

i) Set up warning signs and/or tape around the works to inform passers-by that maintenance works are in progress and to stay clear. Traffic controls are to be installed in accordance with AS1742 and Council requirements;

ii) Fill areas affected with locally scoured organic soil. This fill should be compacted to match the shape and profile of the surrounding swale area;

iii) In vegetated swales, areas that have been restored should be sown with seeds to match the established vegetation. Sowing of seeds should be undertaken in accordance with the supplier's recommendations;

iv) Where the swale is rock lined, displaced rock should be collected and used over the area to be restored. Should additional rock be required, it shall have similar properties to that of the existing rock;

v) Remove all warning signage on completion of the works.

3.4 Reporting Requirements

An example of an Inspection Maintenance Report is included in **Appendix A**. The report should, at a minimum, make note of the items listed in Section 3.2.

These reports should be kept on file as a record of when inspections were undertaken and what conditions were found on site.

4 Rip-Rap at Outlets into Bio-retention Basins

4.1 General

Rip-rap at the upstream end of the bio-retention basins acts to remove scour and distribute flows across the filter material. Under performance of the rip-pap may cause localised scouring within the bio-retention basin and creation of preferential low flow paths that in turn, affect nutrient removal.

4.2 Inspection Frequency and Procedure

The rip-rap should be inspected at intervals not exceeding twelve (12) months. Inspections should be undertaken by suitably qualified persons with an understanding and experience in the operation of similar systems.

Inspections should as a minimum;

i) Check that the rip-rap is in sound condition and has not been damaged by debris or other means;

ii) Check for the accumulation of sediment or other foreign material;

iii) Check for signs of dislodgement or movement.

4.3 Maintenance Frequency and Procedure

Maintenance of rip-rap should be undertaken as required following the above twelve (12) monthly inspections.

Typical maintenance procedures that would need to be undertaken include;

i) Removal of sediment or other foreign material;

ii) Restoration of rip-rap scour protection as required.

4.3.1 Restoration of Scour Protection (Rip-Rap)

The rip-rap immediately upstream of the bio-retention basin minimises erosion within the basin. Any damage to the scour protection should be rectified to ensure satisfactory performance of the system.

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) If sediment has collected in the rip-rap that may have been displaced, manually remove sediment and dispose of off-site;

iii) Collect the rip-rap that has been displaced and reuse to restore the scour protection;

iv) If additional rock be required to complete the restoration, it shall have similar properties to that of the existing rock.

4.4 Reporting Requirements

An example of an Inspection Maintenance Report is included in **Appendix A**. The report should, at a minimum, make note of the items listed in Section 4.2.

These reports should be kept on file as a record of when inspections were undertaken and what conditions were found on site.

5 Subsoil Drainage

5.1 General

The subsurface pipe and pit network is a vital component of the bio-retention system. Subsoil drainage below the filter material collect filtered stormwater flows before discharging this water into the natural stream and creek system.

5.2 Inspection Frequency and Procedure

The subsoil network should be inspected at intervals not exceeding six (6) months. Inspections should be undertaken by suitably qualified persons with an understanding and experience in the operation of similar systems.

Inspections should as a minimum;

i) Check that all access and clean out points are intact and free from damage;

ii) Inspect the outlet points from the subsoil drainage to determine if sediment build up is present. If sediment has accumulated at the outlet it may be an indication that the system requires flushing.

5.3 Maintenance Frequency and Procedure

Maintenance of the pit and pipe system should be undertaken as required following the above six monthly inspections.

Typical maintenance procedures that would need to be undertaken include replacement of access and clean out points as required.

Additionally, the subsoil drainage system should be flushed not less than once during the first six months of operation and at intervals not exceeding twelve (12) months thereafter.

5.3.1 Flushing of Subsoil Drainage Lines

Accumulated sediment within the subsoil drainage system should be flushed at regular intervals to ensure proper operation of the subsoil network;

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) Set up warning signs and/or tape around the works area;

iii) Determine the discharge point of the subsoil pipe to be flushed;

iv) If the discharge point is a stormwater pit, use a timber board or similar means to block the pit outlet to prevent sediment from being discharged to the receiving waters;

v) If the subsoil drainage discharges to a headwall, provide sediment fencing or sand bags around the outlet to prevent sediment from being discharged to the receiving waters;

vi) Use a pressurised water hose or similar means to flush the accumulated sediment to its discharge point. Note that several clean out points may need to be accessed along the subsoil drainage line, Non potable water may be suitable for this purpose;

vii) Remove collected sediment from the discharge point manually or by using a vacuum truck. Dispose sediment off site;

viii) At the completion of the work the access grates and covers should be closed ensuring that all locking devices are securely in place;

ix) Remove all warning signage on completion of the works.

5.4 Reporting Requirements

An example of an Inspection Maintenance Report is included in **Appendix A**. The report should, at a minimum, make note of the items listed in Section 5.2.

These reports should be kept on file as a record of when inspections were undertaken and what conditions were found on site.

6 Bio-retention Filter Material

6.1 General

The bio-retention basins utilises a number of physical and biological processes to remove pollutants from stormwater. Sediment accumulation within the filter material affects the performance and as such, should be removed periodically.

6.2 Inspection Frequency and Procedure

The bio-retention basins should be inspected at intervals not exceeding six (6) months. Inspections should be undertaken by suitably qualified persons with an understanding and experience in the operation of similar systems.

Inspections should as a minimum;

i) Undertake a review of plant growth within the filter material zone. Plant growth should be uniform and vigorous. Check for areas where plant growth is slower or where plants have died. This may be an indication of contamination of the planting matrix or other sub surface problems. Take note of plant conditions, height etc.;

ii) Check for evidence of scour or preferential flow paths. If these exist it is likely that the flow is not evenly distributed;

iii) Sediment accumulation will occur over time within the base of the bio-retention basin. Once sediment has accumulated to approximately 100mm in depth, the based should be stripped and renewed.

6.3 Water Quality Sampling and Frequency

Water quality sampling must be undertaken for all the water quality parameters contained within the “Jordan Springs East Precinct Stormwater Quality Management Report” dated October 2016 prepared by Cardno. Samples are to be taken from the pollutant control points identified in the above specified report.

The frequency of sampling for pollutant control points must include quarterly sampling. Where prolonged drought conditions exist and water is not available for sampling on a quarterly basis, then a minimum of four (4) samples must be taken over a twelve (12) month period when water is available, with a minimum of two (2) months between sampling periods.

6.4 Maintenance Frequency and Procedure

Maintenance of the bio-retention basins base and filter material should be undertaken as required following the above six monthly inspections.

Typical maintenance procedures that would need to be undertaken include replacement of planting in localised areas and pruning or timing of existing vegetation.

Additionally, once 100mm of sediment has been accumulated it will be necessary to strip and replant the base area.

6.4.1 Replanting of Localised Areas

Areas of filter material where vegetation has died need to be replaced to ensure longevity of the basin and to maximise pollutant removal capacity.

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) Set up warning signs and/or tape around the works area;

iii) Access areas that require replanting and determine access points to minimise disturbance to filter material;

iv) Manually remove any dead or dying vegetation and dispose of off-site;

v) Replant the area with plant species to match those present within the filter material and in accordance with the Landscape Specification (by others);

vi) Dispose all pots, tubes etc. off site;

vii) Remove all warning signage only following completion of the works;

viii) Re-establish planting in accordance with the Landscape Specification and Landscape Operation and Maintenance Manual (by others).

6.4.2 Stripping and Replanting of Filter Material

Accumulated sediment should be stripped once a depth of 100mm is reached. Assuming upstream controls remain functioning, stripping of the filter material should only be required every ten (10) to twenty (20) years.

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) Set up warning signs and/or tape around the works area;

iii) Only machinery with a ground pressure less than 30KPa is permitted to access the filter material;

iv) Strip vegetation and accumulated sediment so that stripped levels of the upper and lower basin areas are uniformly graded;

v) Once machine stripping is complete and stripped levels have been verified, manually remove material from around the weir wall;

vi) Dispose of stripped material off site;

vii) Replant the filter material in accordance with the Landscape Specification and Landscape Operation and Maintenance Manual (by others);

viii) Re-establish vegetation in accordance with the Landscape Specification and Landscape Operation and Maintenance Manual (by others);

ix) Remove all warning signage only following completion of the works.

6.5 Reporting Requirements

An example of an Inspection Maintenance Report is included in **Appendix A**. The report should, at a minimum, make note of the items listed in Section 6.2.

For water quality sampling, a separate report is required including a discussion of the sampling results. A comparison of the results against the level of compliance is required. Where testing indicates non-compliance, then the report must include recommendations for corrective action.

Water quality sampling and monitoring reports must be submitted to Penrith City Council at the commencement of monitoring and six (6) months after the initial sampling.

These reports should be kept on file as a record of when inspections were undertaken and what conditions were found on site.

7 Bio-retention Basin Outlets

7.1 General

The weir outlet of the basin discharges water from the basin to the receiving waters once the ponding exceeds the extended detention for water quality.

7.2 Inspection Frequency and Procedure

The outlets should be externally inspected after a major storm event and at intervals not exceeding twelve (12) months. Inspections should be undertaken by suitably qualified persons with an understanding and experience in the operation of similar systems.

Inspections should as a minimum;

i) Check for debris, litter or other foreign material caught or trapped on/in the outlet. Make note of the size and type of debris to assist the maintenance crew in organising equipment and resources;

ii) Check for signs of damage or deterioration of the outlets.

iii) Inspect the area around the outlet for signs or erosion or scour;

iv) Check rip-rap for signs of dislodgement or movement.

7.3 Maintenance Frequency and Procedure

Maintenance of the outlet system should be undertaken as required following the above twelve monthly inspections.

Typical maintenance procedures that would need to be undertaken include;

i) Remove sediment, debris and litter from downstream scour protection;

ii) Remove sediment or other foreign material from the weir.

7.3.1 Removal of Sediment, Debris or Litter from Weir

Should sediment, debris or litter be detected within the outlets it is important that the foreign material be removed to ensure proper operation of the system;

i) Do not undertake maintenance works during periods of rain or when rain is likely;

ii) Set up warning signs and/or tape around the works;

iii) Remove any large debris or litter manually and dispose of off-site;

iv) If possible, remove the accumulated sediment manually and dispose of off-site;

v) If manual sediment removal is not possible, sediment will need to be removed by a vacuum truck and disposed of off-site;

vi) Following removal of the foreign material, the condition of the weir or diversion structure should be noted. Any damaged structure should be repaired;

vii) Remove all warning signage on completion of the works.

Other non-routine maintenance operations that may need to be undertaken include;

viii) Repair of damaged weirs or other diversion structures;

ix) Rectification or addition of scour protection at the outlet headwall.

7.4 Reporting Requirements

An example of an Inspection Maintenance Report is included in **Appendix A**. The report should, at a minimum, make note of the items listed in Section 7.2.

These reports should be kept on file as a record of when inspections were undertaken and what conditions were found on site.

8 Special Access Requirements

8.1 GPT Maintenance Access

All GPT's are located within 3m of a maintenance bay, external to a road way. For ease of maintenance, where achievable the GPT is located in the rear of a bus-bay type arrangement. In the instance where a bus-bay type arrangement is not achievable the GPT maintenance path is via a path separate to the road way. Maintenance access layouts for Stage 1 and Stage 2 are described and shown in **Section 8.1.1** to **Section 8.1.2**.

8.1.1 Stage 1 and 2: Bus-Bay Type Maintenance Bay

The access to maintenance bays are signposted for authorised vehicles only. Entry and exit from the maintenance areas is in a forward direction.

The access paths are shown in **Figure 8-1** to **Figure 8-7**.

Figure 8-1 Stage 1 West Road 001 GPT Maintenance Access

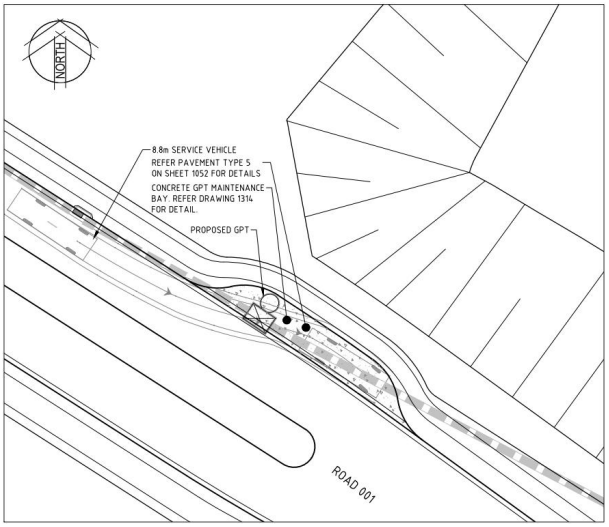


Figure 8-2 Stage 1 Road 002 GPT Maintenance Access

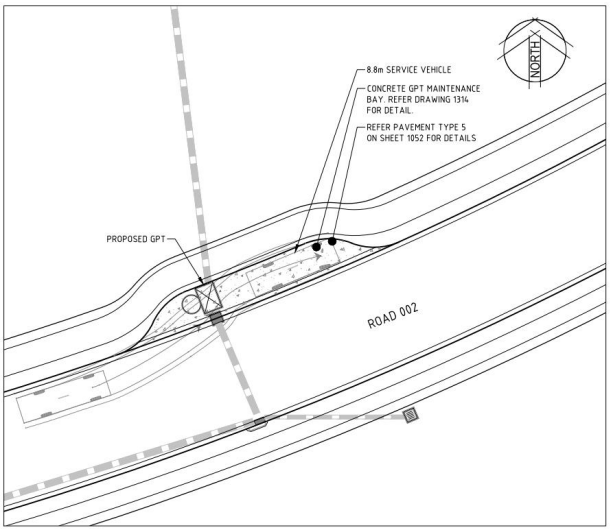


Figure 8-3 Stage 1 Road 009 GPT Maintenance Access

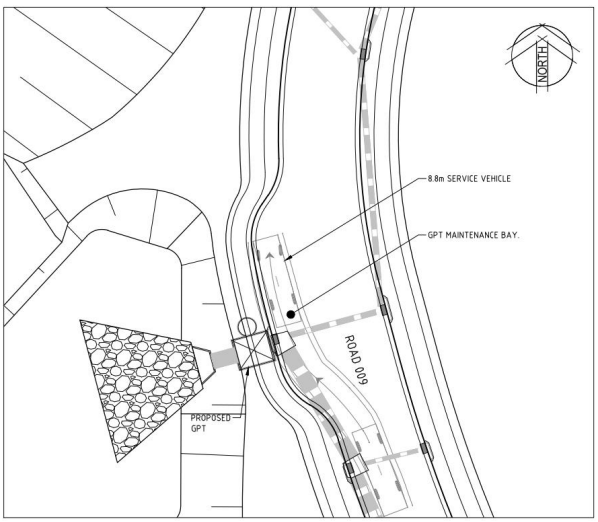


Figure 8-4 Stage 1 Road 011 GPT Maintenance Access

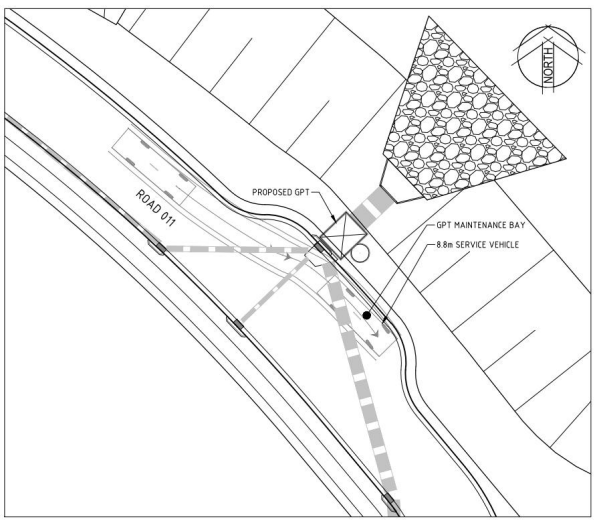


Figure 8-5 Stage 1 Road 060 GPT Maintenance Access

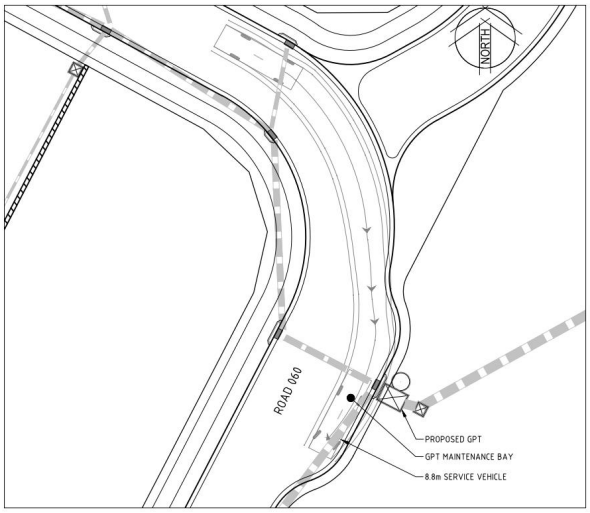


Figure 8-6 Stage 2 North Road 071 GPT Maintenance Access

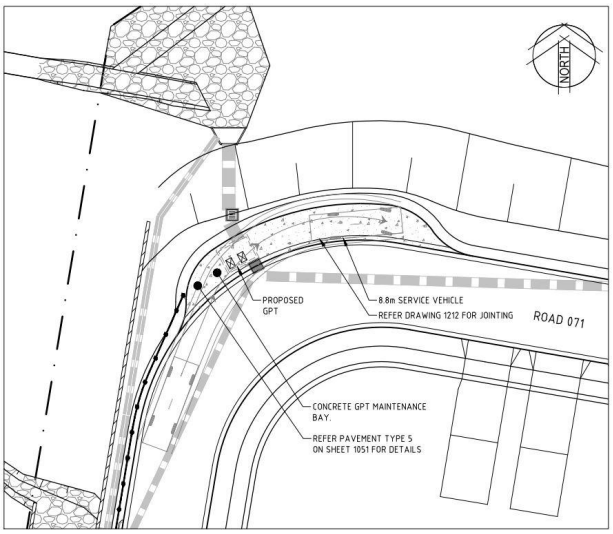
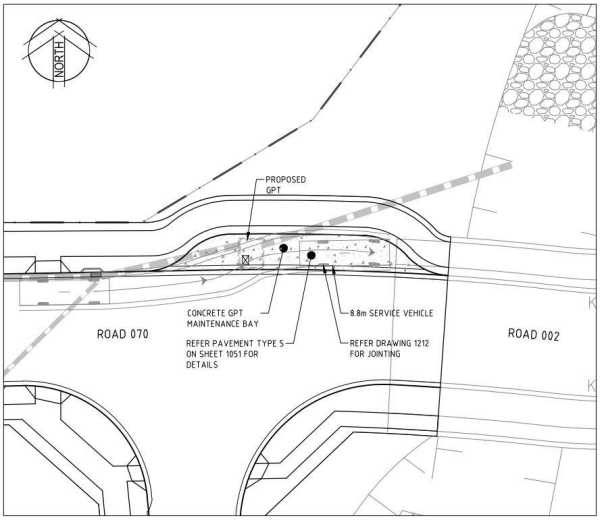


Figure 8-7 Stage 2 Road 002 & 070 GPT Maintenance Access



8.1.2 Stage 1 and 2: Off-Road Access Path Maintenance

Access to Stage 1 Road 061 GPT and Road 064 GPT are via vehicular layback. The maintenance for Road 061 access it shown in **Figure 8-8** and provides adequate space for 12.5 service vehicle to compete a turn to allow forward direction entry and exit. Stage 1 Road 064 GPT maintenance access is shown in **Figure 8-9**. The GPT is located adjacent to the Transgrid access, the maintenance access permits the service vehicle to park within the Transgrid access path and complete a full turn within the Transgrid easement to enter and exit in a forward direction.

Access to the southerly Stage 2 Road 071 GPT is via a vehicular crossing. When not in use the entry and exits are blocked with bollards to prevent private use. The access path is shown in **Figure 8-10.**

The GPT located on the southern boundary, for treatment of the upstream external catchment, is accessed via Billabong Glen at the northern extent of Werrington Downs. Access to the GPT is through a locked gate on the site boundary. This arrangement is shown in **Figure 8-11**.

Figure 8-8 Stage 1 Road 061 GPT Maintenance Access

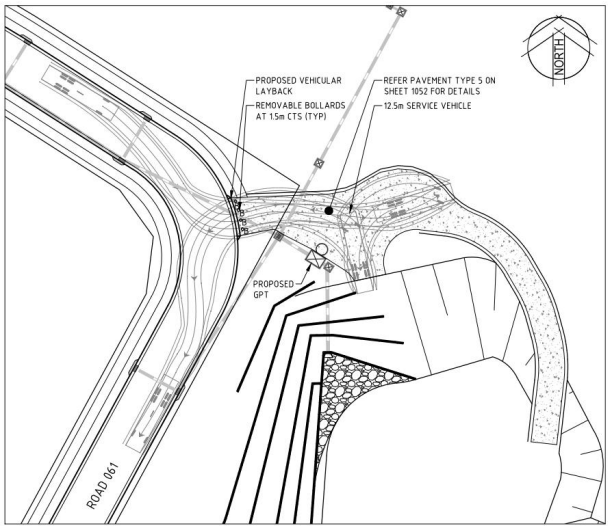


Figure 8-9 Stage 1 Road 064 GPT Maintenance Access

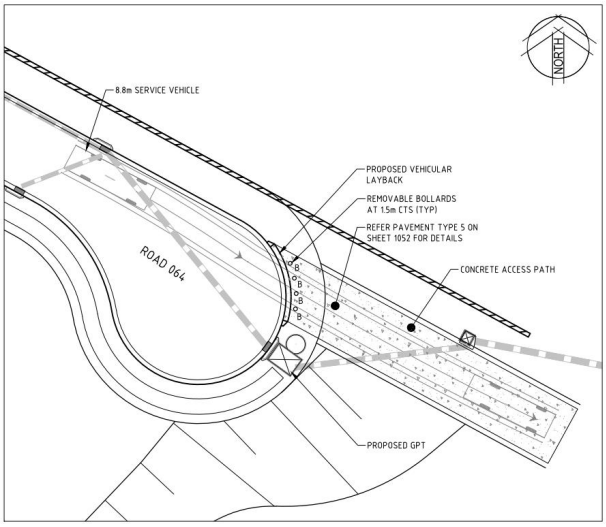


Figure 8-10 Stage 2 South Road 071 GPT Maintenance Access

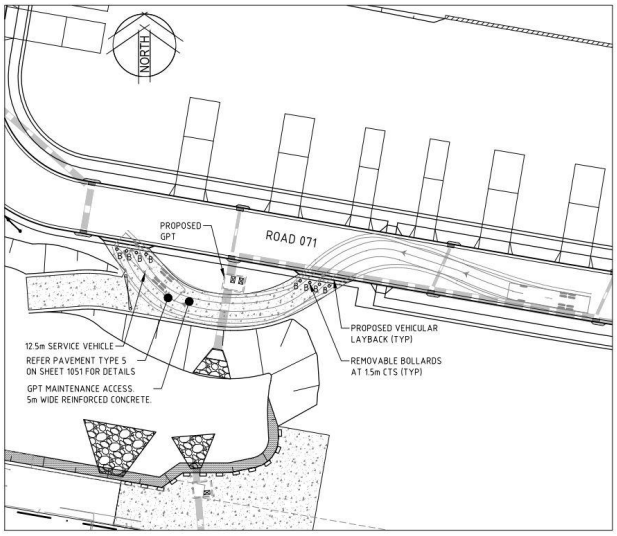
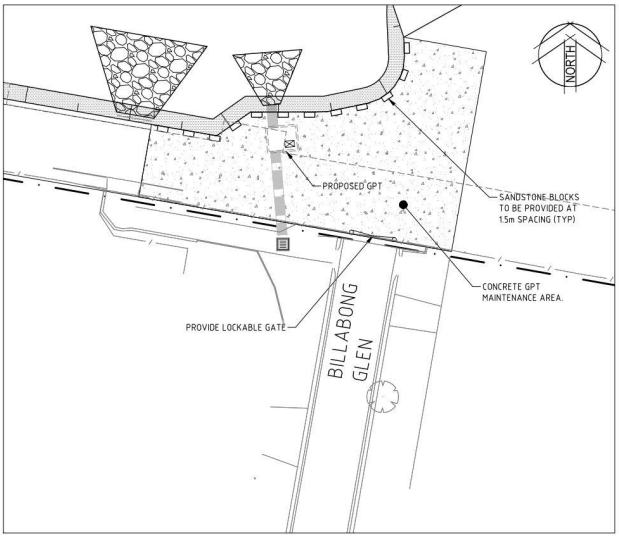


Figure 8-11 Stage 2 Billabong Glen GPT Maintenance Access



8.2 Basin Maintenance Access

Basins A, B, C and D are accessed via ramps and vehicular crossings directly from adjacent roads to the basin invert, indicated in **Figure 8-12** to **Figure 8-14**. Bollards are located at the vehicular crossings to prevent private access to the basin.

Figure 8-12 Basin A Maintenance Access

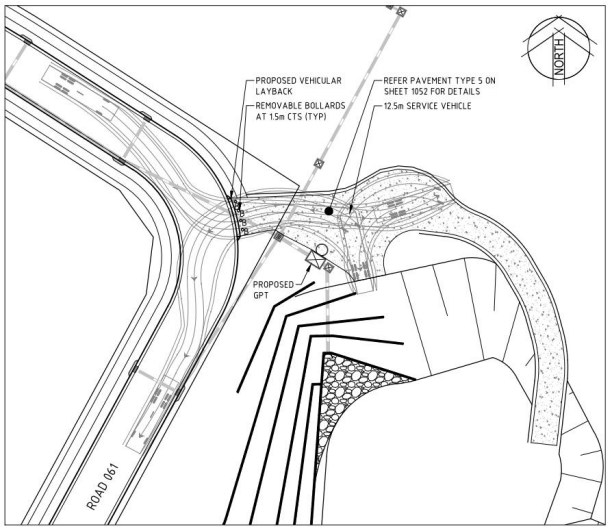


Figure 8-13 Basin B Maintenance Access

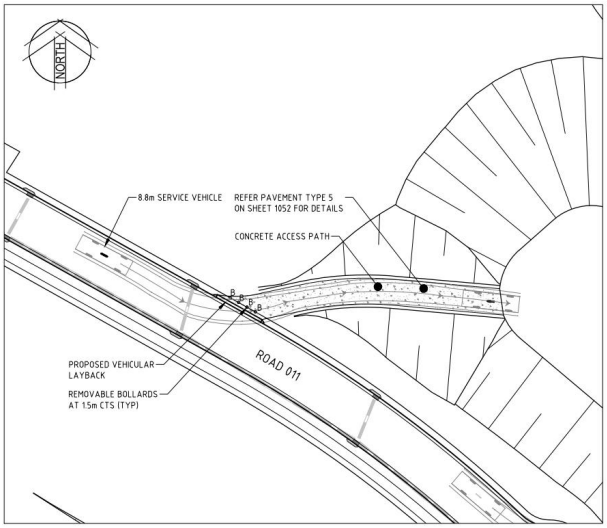
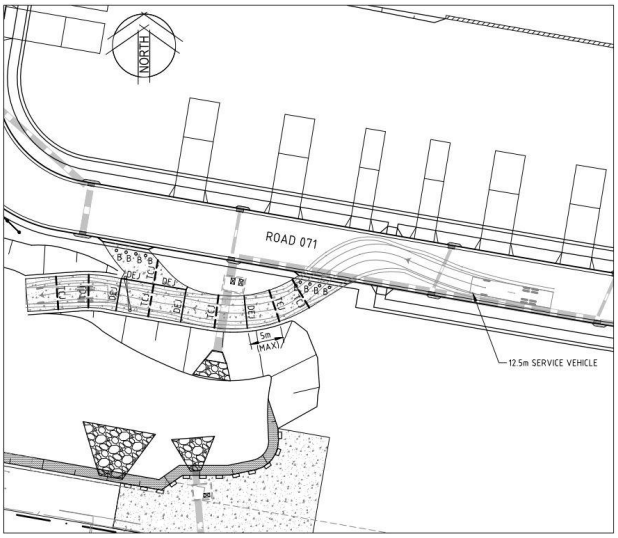


Figure 8-14 Basin D Maintenance Access



8.3 Future Stage Maintenance Access

At each future stage detailed design will be provided for bus-bay type arrangements for GPT access and ramp access for basin maintenance.

This Manual will be updated for each future construction certificate.

9 Summary of Maintenance Requirements

9.1 Every Six (6) Months

Subsoil Drainage - Check

i) Access and cleanout points;

ii) Outlet points.

Bio-retention Filter Material - Check

i) Plant growth and health;

ii) Sediment accumulation;

iii) Evidence of scour.

9.2 Every Twelve (12) Months

Pit and Pipe Network – Check

i) Pit grates and covers;

ii) Pits for sediment accumulation;

iii) Pipes for blockage by sediment;

iv) Headwall damage and evidence of scour.

Overland Flow Paths – Check

i) Signs of scour or erosion;

ii) Sediment deposition;

iii) Swale capacity has not been reduced;

iv) Weed infestation;

v) Vegetation health and height;

vi) Scour or sediment accumulation at outlet.

Rip-Rap - Check

i) Condition and for any damage;

ii) Sediment accumulation;

iii) Scour protection.

Bio-retention Basin Outlets- Check

i) Condition and for any damage;

ii) Sediment accumulation;

iii) Scour protection.

9.3 Every Ten (10) to Twenty (20) Years

Bio-retention Filter Material – As required

i) Strip sediment, vegetation and replace as required filter material and planting.

Please note that the above intervals are recommendations only and that actual frequencies may be adjusted to suit conditions found on site. It is however, recommended that the above maintenance intervals be adhered to for at least the establishment period, typically two (2) years.

9.4 Waste Disposal

Waste to be disposed of at approved waste disposal facilities.

Jordan Springs East Precinct

APPENDIX A

SAMPLE INSPECTION AND MAINTENANCE REPORT CHECKLIST

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BIOSWALE AND ASSOCIATED WORKS MAINTENANCE CHECKLIST

Inspection Frequency 6 monthly intervals

Location Central Precinct

Description Bio-detention basin and subsoil drainage

Site Visit by

Inspected Items	**Y**	**N**	**Action/Comments**
Inspected Items	**Y**	**N**	**Action/Comments**
Subsoil Drainage			
Access and clean out point in tact and free from damage or vandalism?			
Outlet points free from sediment accumulation?			
Bio-retention			
Plant growth uniform and vigorous?			
Filter media is free from scour or preferential flow paths?			
Sediment accumulation is less than 100mm within the bio-detention basin?			

Comments/Observations

BIOSWALE AND ASSOCIATED WORKS MAINTENANCE CHECKLIST

Inspection Frequency 12 monthly intervals

Location Central Precinct

Description Bioswale and associated works including outlet from basin

Site Visit by

Inspected Items	Y	N	Action/Comments
Pit and Pipe Network			
Pit grates and lids in sound, undamaged condition?			
Pits free from accumulated sediment, debris or litter?			
Pipes unaffected by sediment accumulation or other foreign materials?			
Weirs and other diversion devices free from damage/debris?			
Headwall in sound, undamaged condition?			
Area around headwall free from sediment and/or scour?			
Overland Flow Paths			
Overland flow paths free from erosion or scour?			
Swale free from sediment deposition?			
Channel unaffected by foreign materials or litter?			
Channel free from weed or foreign species infestation?			
Vegetation within swale healthy and of optimal height?			
Channel outlets free from scour or sediment deposition?			

Inspected Items	Y	N	Action/Comments
Rip-Rap			
Rio-rap is in sound condition and free from damage?			
Rip-rap is free of sediment accumulation or other foreign material?			
Scour protection in place and free from movement or dislodgement?			
Outlets			
Outlet structure is free from debris, litter or other foreign materials			
Outlet structure free from damage or deterioration?			
Area around outlet is free from scour/erosion?			

Comments/Observations

Jordan Springs East Precinct

APPENDIX B

GPT MAINTENANCE PROCEDURES

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Humes

Strength. Performance. Passion.

HumeGard® GPT
Inspection and maintenance guide

Issue 1

Purpose of this guide

This guide outlines the maintenance procedures and requirements for HumeGard® GPT units.

Where the contents of this guide differ from project specifications and drawings, supervisory personnel should consult with a Humes engineer. In the event of any conflict between the information in this guide and local legislative requirements, the legislative requirements will take precedence.

It is the responsibility of the site owner and its contractors to determine the site's suitable access and location for maintenance plant and equipment.

Nothing in this guide is to be construed as a representation, endorsement, promise, guarantee or warranty whether expressed or implied.

Humes makes no representation or warranty, implied or otherwise that, amongst others, the content of this guide is free from errors or omissions or in relation to the adequacy of the information contained in this guide and where appropriate you will seek verification from an independent third party before relying on any information in this guide. Humes is not liable or responsible to any person for any use or reliance of any information arising out of or in connection with this guide.

Safety advice

The HumeGard® GPT must be maintained in accordance with all relevant health and safety requirements, including the use of PPE and fall protection where required.

Confined space entry

Maintenance of the HumeGard® should not require entry, however, if entry into the unit is required, then the device is deemed a confined space. As such, if entering the unit, all equipment and training must comply to SHE regulations. It is the responsibility of the contractor or person/s entering the unit to proceed safely at all times.

Personal safety equipment

The contractor is responsible for the provision of appropriate personal protection equipment including, but not limited to safety boots, hard hat, reflective vest, protective eyewear, gloves and fall protection equipment. Make sure all equipment is used by trained and certified personnel, and is checked for proper operation and safety features prior to use.

Handling

The customer, or their contractor, is responsible for the removal of access lids from the HumeGard® unit. The customer or contractor should familiarise themselves with the device and site constraints, and particular attention should be given to safety hazards such as overhead power lines and other services in the vicinity when considering the position of plant and equipment.

Maintenance overview

To ensure ongoing long-term environmental protection HumeGard® needs to be maintained (generally annually). The actual on-going maintenance frequency requirements will be determined through quarterly inspections undertaken during the first year. However, only an annual maintenance period is anticipated for most HumeGard® units installed within drainage infrastructure.

Inspection can be performed by anyone, and procedures for inspection are provided in this document.

Generally, comprehensive maintenance is performed from the surface via vacuum truck. Companies capable of performing this maintenance can be found in the Yellow Pages or online by searching sewer cleaning or liquid waste removal.

Additionally large litter items may also be removed utilizing the optional stainless steel basket arrangement within the HumeGard®. Alternatively the litter can be removed during eduction/vacuum clean out, which will be required in order to remove the sediment component of the stormwater pollution.

HumeGard® operation

The HumeGard® GPT utilises the processes of physical screening and floatation/sedimentation to separate the litter and coarse sediment from stormwater runoff. It incorporates an upper bypass chamber with a floating boom (or broad-crested weir for small units) that diverts treatable flows into a lower treatment chamber for settling and capturing coarse pollutants from the flow. There are two types of HumeGard® - the super-critical version, which incorporates a broad-crested weir approach for treatment flow diversion, and a larger, standard version, which incorporates a floating boom arrangement to divert treatable flows.

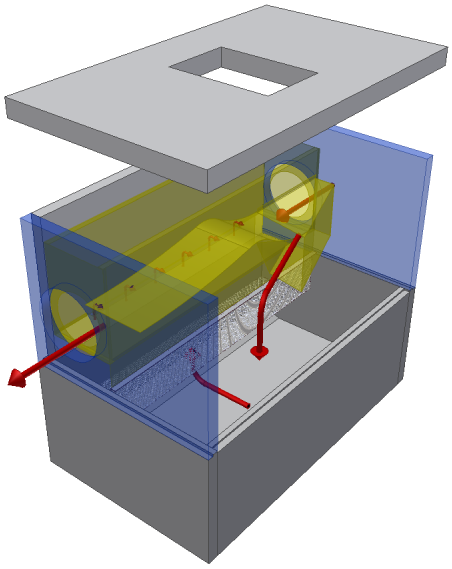
Super-critical HumeGard® (HG12 & HG15)

The super critical Humegard® consists of an internal broad crested weir and holding chamber.

A specially designed patented broad crested weir diverts material entrained in the flow into the adjacent holding chamber. This consists of the holding sump and another baffle/weir/channel arrangement designed to retain floating material while guiding flow through to the outlet.

- **Low/Treatment flow operation**
  During low to moderate flows, the weir diverts all flows into the sump area where pollutants are captured and retained. The velocity in this sump is controlled and never exceeds a maximum average velocity of 0.2m/s.
- **High/Bypass flow operation**
  During high flows, the weir diverts up to the treatable flowrate into the sump and any excess flow is able to flow over the hump and through to the outlet. This ensures that the previously caught pollutants are not disturbed, resuspended and diverted out of the outlet pipe.

Figure 1 – Super-critical HumeGard® GPT



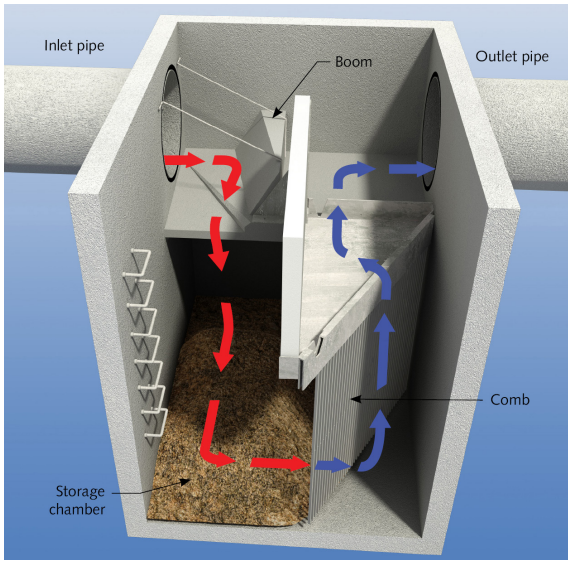
Standard HumeGard® (HG18 – HG45)

The standard HumeGard® consists of an internal separation channel and holding chamber.

A specially shaped boom, which is supported by hangers hinged to the upstream wall, diverts material entrained in the flow from the separator to the adjacent, off line, holding chamber. This consists of the holding sump and another baffle/weir/channel arrangement designed to retain floating material while guiding flow through to the outlet.

- **Low/Treatment flow operation**
  During low to moderate flows, the boom remains on the floor of the separation channel and imparts an upward and sideways motion to the incoming flow. This action causes deflection into the holding chamber, where heavy and saturated materials settle to the bottom of the sump, while buoyant material is trapped behind the baffle wall arrangement.
- **High/Bypass flow operation**
  During infrequent high flows, the boom lifts, which permits the flow to pass beneath it while continuing to deflect buoyant material to the holding chamber. Once the pipeline flows full, the boom lifts clear, allowing unobstructed flow through the unit, whilst at the same time retaining the floating materials on the upstream side of the device.

Figure 2 – Standard HumeGard® - low flow conditions



Maintenance frequency

It is recommended and good practice for an inspection of the HumeGard® to be carried out on a quarterly basis. The quarterly inspection is to check the operation of the boom, volume of pollutants in the holding sump, etc. But generally, only an annual maintenance period for cleaning is anticipated.

It is important during the quarterly inspections to check that the operation of the boom is satisfactory. The boom should not be impeded by large pieces of litter i.e. logs, etc. or have objects lodged underneath the boom or between it and the baffle plate that may prevent it from rising, or sitting flat on the false floor.

Cleaning maintenance frequency requirements will vary with the amount of stormwater pollution generated in your catchment (amount of litter, sediment, etc.). So it is recommended that as the 3-monthly inspections are performed, the frequency of maintenance be increased or reduced based on local conditions and pollutant capture rates.

The need for maintenance can be determined easily by inspecting the unit from the surface by:

- Checking if litter can be readily seen in the holding chamber once the cover has been removed.
- Using a dipstick or sludge judge (sediment sampling tube) to assess how much sediment or organic material has been captured in the bottom of the holding chamber. A sediment depth over 400mm would indicate cleaning is recommended to minimise the potential for scour.

Sediment sampling tubes are available for purchase from Humes (contact your local sales rep for more details).

Occasionally it may be beneficial to only remove captured litter and not siphon the entire contents of the holding chamber.

Maintenance procedure

Maintenance of Humegard® units is generally performed using vacuum/eduction trucks.

No entry into the unit is required for maintenance. The vacuum service industry is a well-established sector, that services underground tanks, sewers and catch basins.

HumeGard® units are cleaned by adhering to the following steps:

1. Complete a Job Hazard Analysis (JHA) and a Work Method Statement (WMS) before undertaking the maintenance procedure.
2. Prepare the site around the Humegard for cleaning. This involves establishing the job site (traffic control if required), assembling cleaning equipment, positioning the vacuum truck and ensuring correct equipment is available to use (including PPE).
3. Remove the rectangular lid above the holding chamber and conduct a visual inspection to assess the condition of the Humegard® and note if there are any blockages or lodged debris.
4. Lower the suction hose to the surface of the water in the holding tank and skim across the top to capture floating litter.
5. Lower the suction hose to the base of the holding chamber to remove sediment, organic matter and litter which has sunk.
6. Dislodge materials trapped in the screen using a water jet or brush/broom.
7. Remove the second rectangular access cover over the diversion boom and ensure there is no debris trapped underneath the boom.
8. Clean the interior of the pit using water jet.
9. Replace lids, ensuring they are firmly and securely in place.

It may be convenient on larger units to de-water some of the water in the holding chamber. This will minimise maintenance costs as disposal of essentially clean stormwater can be avoided. Often this can be done onto adjacent ground or into the council sewer system. However, this should only be done with the appropriate authorities' consent.

If a HumeGard® has been fitted with an optional removable basket, the basket can be used to periodically remove litter in between scheduled eduction/vacuum maintenance visits. The baskets must also be removed prior to vacuuming/educting the HumeGard® for the sediment load.

Maintenance cost

The costs to clean out a HumeGard® will vary based on the size of the unit, pollutant volume/type and transportation distances.

A typical cost (equipment and personnel) is estimated to be approximately $1500-$3500 (based on best information at time of installation) - exclusive of disposal costs.

This estimated cost is based on the clean out of a single unit. Economies of scale will be achieved where there are multiple units for a given location. The time to clean a single unit is approximately 3-4 hours (including transportation and cleaning).

Disposal costs are estimated to be in the order of $350-$600 dependent upon volume and type of pollutants removed from the holding sump.

Removal of hazardous material

A wide range of hazardous materials may be intercepted by the HumeGard® gross pollutant trap, although instances of this have been minimal. Hazardous materials may include high levels of heavy metals accumulated within the collected sediments, certain inorganic chemicals, used syringes, glass, and other matter.

As noted, the potential presence of hazardous material is primarily the reason why eduction is the preferred cleaning method, since this minimises the potential for maintenance personnel and nearby communities to come into contact with such material. Where baskets are required, the majority of the collected material will fall from the basket into the maintenance truck upon opening of the trap door. Any and all contact with the basket should be undertaken with suitable protective clothing, including heavy duty hand protection. If material is caught within the basket, it should be removed using suitable equipment.

Removal of this material by hand is not recommended. It is noted that it is not necessary to have the sumps/baskets completely clean. The removal of 95% of the material is satisfactory, and the prospect of completely removing every piece of material increases the occupational health and safety risks.

The presence of certain toxicants may need to be considered for the disposal of material and appropriate locations. If elevated levels of toxicants are suspected, then analytical screening of material should be completed to determine an appropriate disposal response according to local and state government regulations.

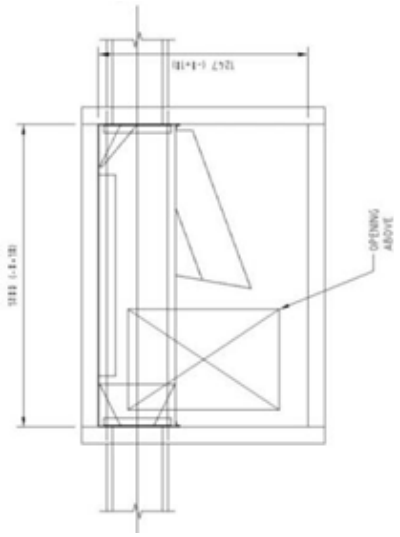
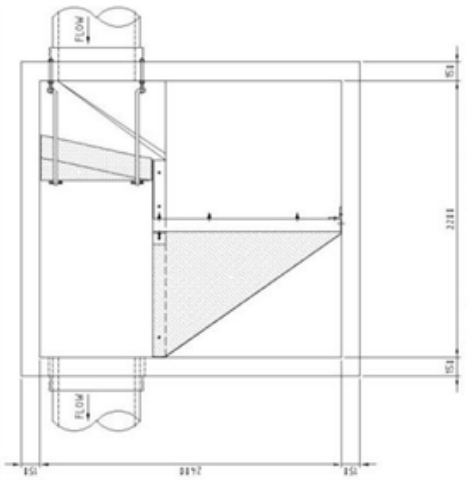
Example Job Safety Analysis (JSA)/Work Method Statement (WMS)

The following JSA/WMS is a guide only. It is the responsibility of the cleaning contractor or asset owner to develop their own JSA/WMS in line with their own WHS requirements and constraints. It also assumes that there will be no entry into the unit during maintenance.

Project/ Address:				**Date:**	
Job: Clean out of HumeGard unit				**Operator:**	
Risk Level:	1 - Extreme	2 - High	3 - Medium	4 – Low	5 - Negligible
Consequence:	Likely to cause very serious harm	Clear potential for serious harm	Similar to risk of driving a car	Little likelihood of any harm	Virtually Harmless
Response:	STOP THE JOB	STOP and Reassess to find better way	Control & ensure controls work	Monitor to ensure risk remains low	Continue work

PROCEDURE	POSSIBLE HAZARDS	INITIAL RISK	CONTROLS	PERSON RESPONSIBLE	END RISK
1. Preliminaries: • Confirm GPT locations and types • Familiarise with GPT technical manual	Nil	-	Refer to relevant manuals	Operator	-
2. Plan the Job: • Room to access & work on the GPT without impacting other property or vehicles • Consider water flows & if excessive note & move onto next job • Condition & status of GPT • Identify water fill point • Identify waste dump point	• Climbing in/out/around of truck • All GPT have a high risk of containing syringes	3 4	• Refer to safety plan on moving around vehicles • Wear PPE and never reach into or lift accumulated matter with hands. If a needle stick injury occurs, wash the affected area with soap & water & report the incident to the branch and seek medical attention ASAP.	Operator	4 5
3.Establish Job Site: • Over 60 km/hr will require traffic management • Within 6.4m of overhead power lines will require spotter	• Traffic • Pedestrians • Overhead power lines	3	• Devise a relevant Traffic Management WMS • Ensure barriers and signs redirect pedestrians • Ensure spotter is present	Operator	5
4. Assemble Cleaning Equipment • Position vacuum hose to remove debris from GPT	• Infection • Sharp edges • Manual handling • Falling equipment • High pressure water	3	• Personal hygiene (wash hands prior to smoking/eating) • Wear gloves & remove sharp edges/burrs on equipment • Follow a manual handling WMS • Store equipment securely on vehicle • Inspect vacuum hose fittings firmly secured • Inspect hose daily 7 ensure it has been tested (6 monthly) • Never cap jetting hose • Inspect jetting hose for damage • Never adjust pump pressures or regulators • Maximum reducer on 1" hose is ¾" • No reducers on ½" hose • Fittings to be firmly secured using a spanner	Operator	5
5. Open the GPT Cover • Remove lid using the manhole lifting procedure • If lid is mass concrete & exceeds safe lifting limits, use mechanical lifting device	• Manual Handling • Open Manholes	3	• Refer to a SWP for manual handling • Refer to a SWP for manhole lifting	Operator	5
6. Start Cleaning • Position bottom end of vacuum hose to remove debris from GPT • Run vacuum prior to remove debris • If there is any requirement to enter the pit for any reason, confined Space Entry Procedure is to be followed • Vacuum all material out of the sump until empty clear 7 clean • Dislodge materials trapped in the screen using water jet ot brush/broom • Remove access cover over diversion boom/weir, ensure there are no debris trapped underneath boom/around weir • Clean the interior of the pit using water jet &/or brush/broom • Vacuum all materials out of the pit	• Manual handling • Eye injury from flying debris • Noise • People inside exclusion zone • Confined Space Entry (If required)	3	• Follow a SMP for manual handling • Wear eye protection • Wear hearing protection • Stop operation until area clear. Only essential personnel within exclusion zone • Ensuring minim slack in hose to prevent whipping • Refer to confined space manuals and SWPs	Operator	5
7. Finish Cleaning • Replace lid ensuring it is fimly & securely in place • Ensure all waste is vacuumed and site is clean prior to packing up • Complete the CWS recording all details and any problems	• Manual handling	3	• Follow a SMP for manual handling	Operator	5

HumeGard® unit maintenance record

Customer details			
Company		Phone	
Contact name		Email	
Address		Date	
State		Operator name	
HumeGard® unit details			
Model		Type (circle one)	Small (weir) | Standard (boom)
Cleaning method (circle one)	Vacuum | Eduction	Lid type	
Plan view (circle one)			
Small HumeGard® (weir)		Standard HumeGard® (boom)	
			

Pollutant removal results			
Estimated volume of water removed (L)		Litter (%)	
Estimated volume of pollutants (m^3)		Vegetation (%)	
Percentage of pollutant content (%)		Sediments (%)	
Percentage of pollutant capacity (%)		**Total volume (%)**	

Any evidence of hydrocarbons (grease/oil) contamination?	YES	NO
Any evidence of sewage contamination?	YES	NO
Any evidence of any other unexpected contamination?	YES	NO
Describe unexpected contamination (if any):		
Any problems cleaning the HumeGard® unit (describe briefly):		
If problems were experienced were they thenresolved satisfactorily (describe briefly):		

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A Division of Holcim Australia

OPERATION AND MAINTENANCE MANUAL

Version: November 2014

CDS UNIT MODEL

PROJECT NUMBER

SITE ADDRESS

INSTALLER;

CDS UNIT OWNER

CDS Technologies is part of the Rocla Pipeline Company.
ABN 31000032191 www.rocla.com.au
72 Orchardleigh Street, PO Box 748 GUILDFORD NSW 216
Telephone (02) 8724 2861 Facsimile (02) 8724 2862

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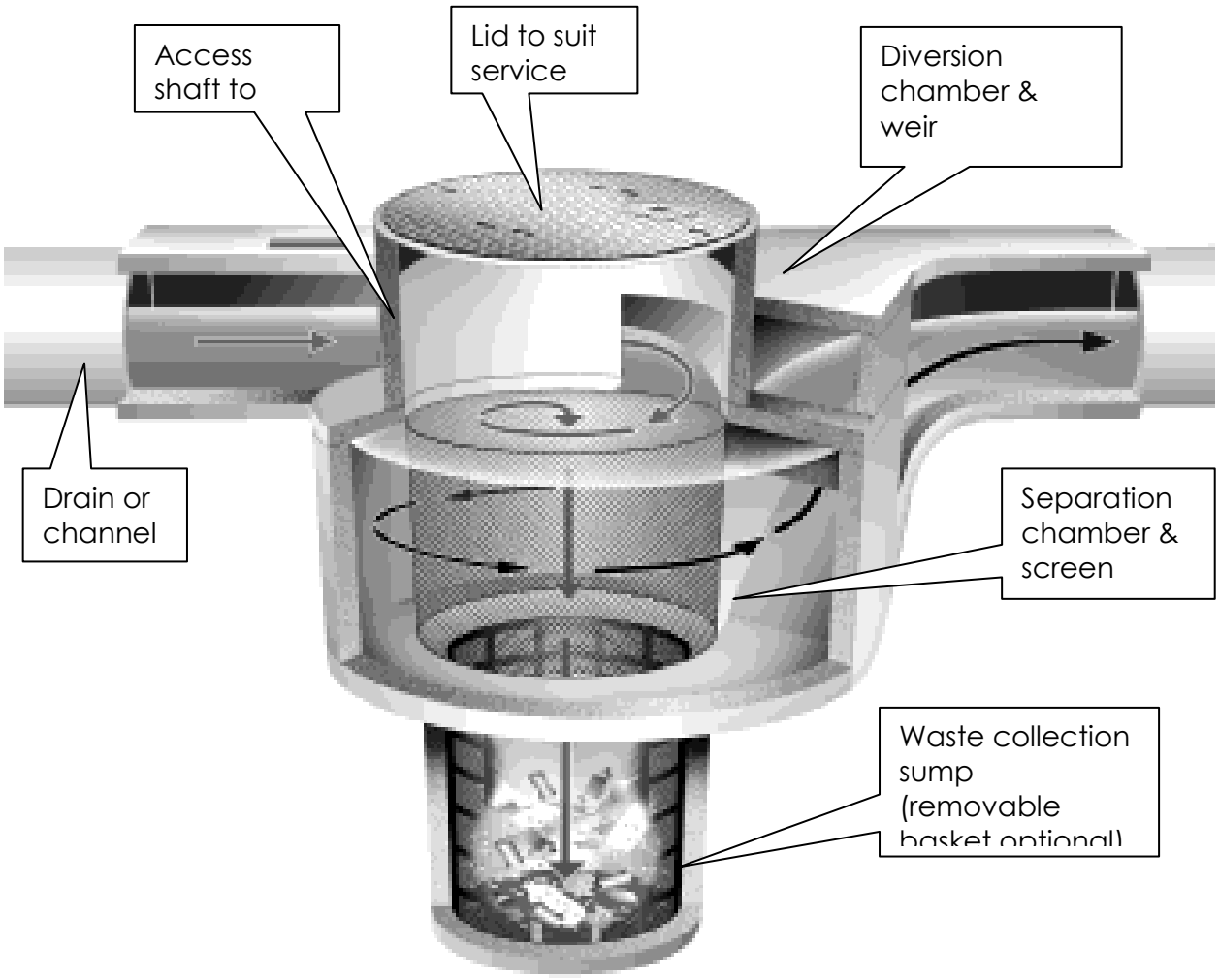
1 Preamble

1.1 CDS Technologies has been established to provide a cost-effective way to achieve environmental sustainability in water quality. The company is committed to its Clients and the environment, however its focus is on the development, manufacture, construction, installation, maintenance and repair of the CDS units.

1.2 The CDS owner may opt to perform their own cleaning or contract the cleaning to a pre-qualified contractor. Pre-qualified contractors are approved by CDS Technologies to perform inspections and cleaning in conformance with CDS Technologies Specification. They have demonstrated that they can meet all safety and environmental legislation and are adequately insured. These contractors can provide very competitive rates, provide valuable feedback on the CDS operation and will take the worry and effort out of the maintenance process.

1.3 Definitions

CDS For simplicity, the letters CDS will be taken to mean a CDS unit.



2 Inspections

2.1 Routine Inspections

2.1.1 Routine inspections are recommended to ensure the CDS is functioning correctly and indicate when cleaning is necessary. These should be carried out on a regular monthly basis. Additionally, it is recommended that a non-scheduled inspection be carried out after any heavy downpour or prolonged period of wet weather. These inspections are the responsibility of the CDS unit owner, unless other arrangements have been made with CDS Pty Ltd. Due to the efficiency of the CDS design, it is likely that they will collect large quantities of pollutants during significant rainfall events. Inspections after heavy rain are therefore even more important than scheduled inspections.

2.1.2 The routine inspection involves removing the access hatch in the CDS main lid and visually checking the visible part of the screen, the percentage of water surface occupied by floatables and measuring the level of accumulated debris in the sump.

2.1.3 This level can be calculated using a survey staff or weighted string line, by measuring the distance from the estimated top of the debris to the top of the lid. A chart is provided on the data sheet that allows the depth measurement to be converted into a percentage full. The data sheet is located in Appendix D. CDS can also provide simple Excell spreadsheet programs for constructed units on request.

2.1.4 When the accumulated material reaches the level of the top of the sump (100% full), it is recommended that it be emptied.

2.1.5 Should the trapped material be allowed to accumulate and rise into the separation chamber, i.e. above the bottom of the screen, the efficient operation of the unit will be compromised with subsequent flows possibly leading to screen blockage.

2.1.6 A standard report for a routine inspection is shown at Appendix A. This should be faxed to the CDS unit owner and CDS Technologies head office. This information helps in future CDS unit sizing and cleaning frequency estimations.

2.1.7 CDS Technologies should be informed if there is any damage or non-functionality observed with the CDS through the completion and forwarding of the 'Damage and Non-Functionality Report' included in Appendix A.

2.2 Annual Inspection

2.2.1 CDS recommends Annual Inspections involving dewatering the unit and checking the condition of the screen, area behind the screen , diversion chamber , weir, lids and any special features of the unit (Baskets can be excluded from this because they can be inspected at every cleanout).

2.2.2 The Damage or Non-Functionality Report (Appendix C) can be used to record any damage or wear and tear that will require attention.

2.2.3 This is also a good opportunity to apply grease to the frame of any cast iron lids and/or lubricate padlocks.

3 Recommended Cleaning Methods

3.1 There are several factors influencing the choice of cleaning method, the main factor being CDS unit size. Other factors include access, equipment availability, required frequency, cost any restrictions, eg units in tidal locations cannot generally be cleaned by eduction.

Unit Size (Screen Diameter mm)	Recommended Cleaning Method	Comments
500 (PL0506)	Suction	Unit not designed for basket; total volume of water and waste is well within range of standard eduction equipment
700 (P0708 series)	Suction	Unit not designed for basket; total volume of water and waste is well within range of standard eduction equipment
900 (P1000 Series)	Suction/basket	Suction is the most cost-effective method.
1500 (P1512 series)	Suction/basket	Suction is the most cost effective method.
2000 (P2000 series)	Suction/basket/ grab	Grab is the most cost effective method.
3000 (P3000 series)	Suction/grab	Grab is the most cost effective method.

3.2 The basket is available for purchase from CDS Technologies and consists of a fabricated fibreglass and steel lifting ring supporting a reinforced fabric basket and connected by SWR slings and shackles. The basket has stainless steel quick-release closures and buckles. A basket is preferred in units which are below low tide or where other methods are not feasible.

3.3 The following chapters detail procedures for each of the recommended methods with illustrations, and include safety information and related regulations.

4 Basket Cleaning

The following is a recommended procedure for emptying the CDS unit fitted with an optional collection basket (this procedure is shown in Figure 4.1). See also Hazard Analysis at Section 4.8.

For units fitted with an Oil Baffle the Oil must be removed using the methodology for Eduction Cleaning prior to the removal of the basket process. See Section 5.

4.1 Remove lid(s) from access chamber

CDS units in trafficked areas (roadways) are fitted with load-class lids (Gatic). The lids are usually multi-part and have tapered edges. Special lifting levers are required to remove them. Larger units in trafficked areas may have RSJ beams to support the lid structure. These also must be removed. If the lifting tackle for the basket is hanging from the RSJ, it must be disconnected and temporarily connected to the inside of the access shaft while the RSJ is removed.

CDS units in non-trafficked areas (parks or reserves) may be constructed from fibreglass, galvanised steel or timber and may be single or of multi part construction. Fibreglass lids on models F0908/0912 can be easily removed by hand after unlocking with a T bar key.

Galvanised and timber lids have adequate lifting points to assist in removal by crane.

When working in a roadway, utilise appropriate traffic control measures.

For safety reasons, any staff working over the open unit should wear a safety harness tied back to an immovable object.

4.2 Connect lifting tackle

Subject to access, the following crane capacities should be adequate to lift full baskets from the sumps of CDS units.

The estimate of the full basket weight can be obtained from the CDS unit Data Sheet.

900mm CDS	5 tonne capacity crane minimum
1500mm CDS	8 tonne capacity crane minimum
2000mm CDS	12 tonne capacity crane minimum
3000mm CDS	15 tonne capacity crane minimum

The crane needs to be able to raise the bottom of the basket, which is up to 7 metres below the lifting ring, over the side of the truck being used to transport the waste.

The crane should be located on suitably firm ground and

operated by a qualified crane operator and guided by a qualified dogman. All staff on the ground in the vicinity of the unit should wear hard hats.

The lifting ring, which is temporarily attached to the side of the CDS, is to be attached to the crane hook.

4.3 Lifting the basket

If the unit is especially full or there is a great deal of floating material on the surface, it is recommended that the basket be raised slowly to reduce turbulence in the separation chamber which can wash floatable items over the rim of the basket.

Floating material should be pushed towards the centre to ensure it is caught as the basket rises. If some floating material remains in the CDS unit, it will likely be removed next time or it is possible to create a backwash by "dunking" the basket under the surface and quickly back up again. If the basket is found to have a significant amount of material "nesting" on the lifting collar, it is recommended that this material be pushed down into the basket using a broom, rake, shovel or staff before removing the basket completely from the unit.

With the bottom of the basket raised above the water level, allow water to drain back into the CDS unit for a few minutes.

Lift and place basket into truck and allow it to settle to relieve tension in securing straps. Release the Quick-release couplings that hold the basket closed.

Raise basket and allow contents to discharge into truck.

Lower basket and remove any trapped contents. If material is tangled in lifting slings, remove it.

Waste should not be handled unless appropriate protective gloves are worn.

Close basket and secure straps with Quick-release couplings. Place and position basket back in the CDS unit. It is sometimes advisable to weight the basket with two or three bricks to prevent the fabric from billowing up.

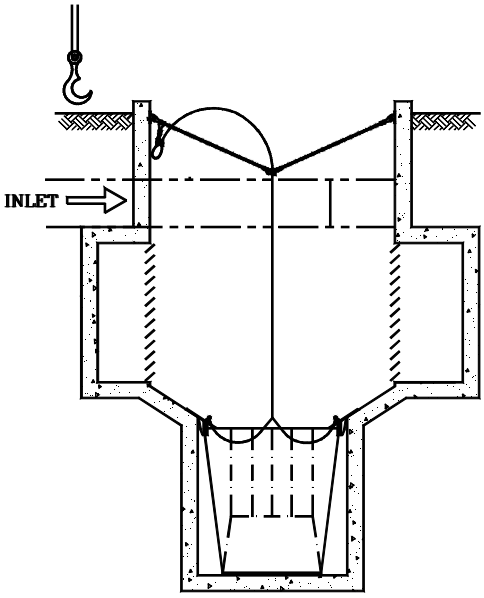
Check the separation screen for blockage or damage. Any material caught on the screen should be hosed or scrubbed off with a hard-bristle broom.

A significant quantity of material blocking the screen can be regarded as evidence of non-functionality and reported to CDS Technologies. If any damage is apparent, it should be reported to CDS as soon as practicable to enable a site inspection to be done. The phone number is listed on the CDS Data Sheet.

Replace lifting tackle and lids to their normal position.

NB It is important that the lifting cable hangs vertically down from the centre of the lid so as not to impede the circular flow of water in the CDS.

4.4	Disposal of Pollutants	Record the quantity of pollutants removed from the CDS with a visual assessment of the breakdown by type: • % silt and sediment • % litter • % vegetation A note should be made of any unusual or large items, eg. oil, paint, car tyres etc. Dispose of pollutant material at an approved tipping site, ie. a tip which is licensed by the Waste Authority in the relevant state. A record of the weight of the material extracted should be kept. The weight may be read by the crane, or the weigh station as the disposal truck enters the tip. The weight should be recorded on the CDS Cleanout Report (Appendix B). Care should be taken to: Cover the load en-route to the tip and to ensure that none of the litter from the load escapes from the truck. Adequately drain the material before leaving the site.
4.5	Tidy Site	Tidy the site of any debris prior to leaving.
4.6	Complete and Forward Cleaning Report	Complete Cleaning Report (Appendix B) and forward to the CDS unit owner. If there is any damage or non-functionality, complete Damage or Non-Functionality Report (Appendix C) and forward to the CDS Contact Person listed on the CDS Data Sheet.
4.7	Annual Clean and Inspection	On an annual basis the CDS should be pumped down as described in the section on Suction Cleaning, the basket removed, the sump pumped out and thoroughly cleaned of any debris that may have accumulated under the basket. The water from the sump is either disposed of appropriately to sewer or pumped upstream so that it can be released and retreated by the CDS unit. A close inspection should be carried out on the screen, basket, lifting tackle etc and any maintenance requirements should be reported. Inform CDS Technologies when this annual service is to occur if they are required to attend. Inspect the return channel behind the screen and remove any accumulated silt or other deposits, if present. Record details in the "Comments" section of the 'Clean Out Report'.



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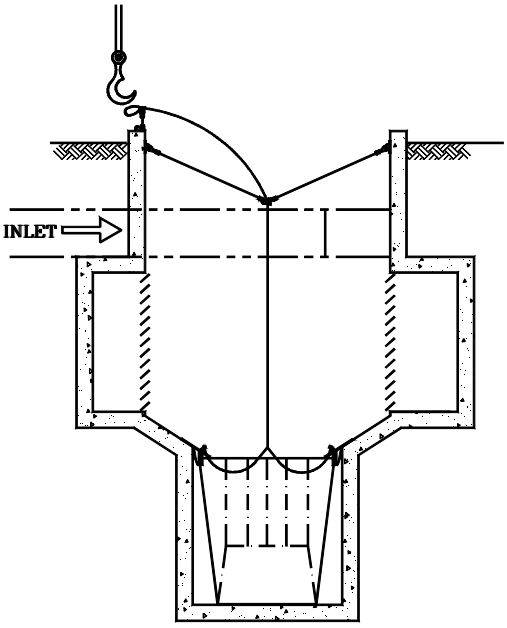

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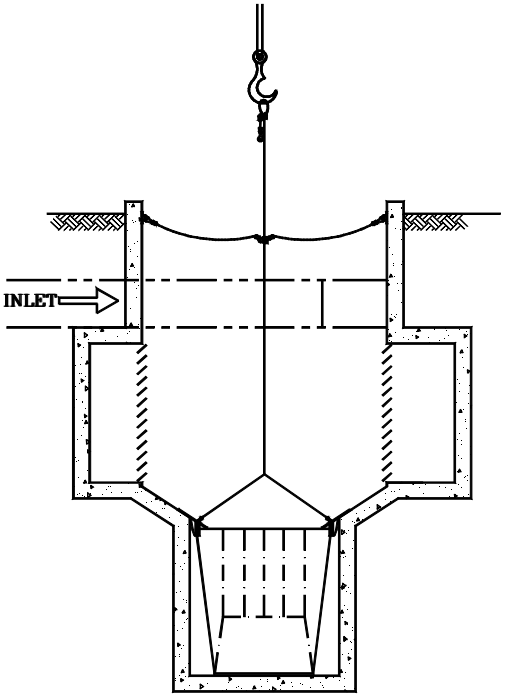

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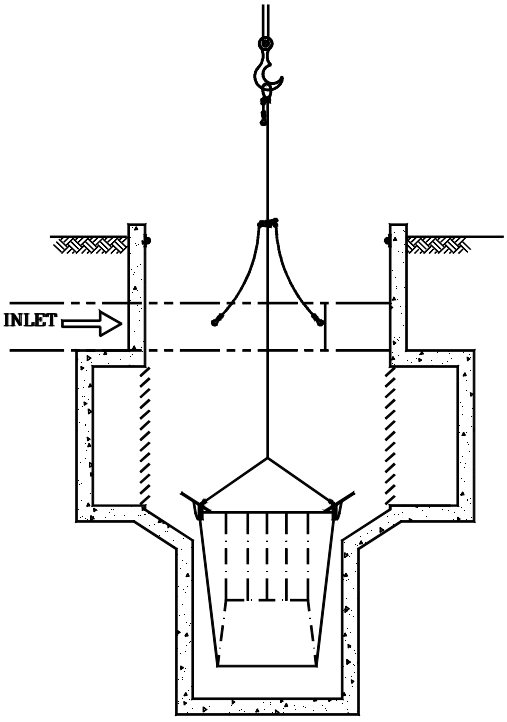

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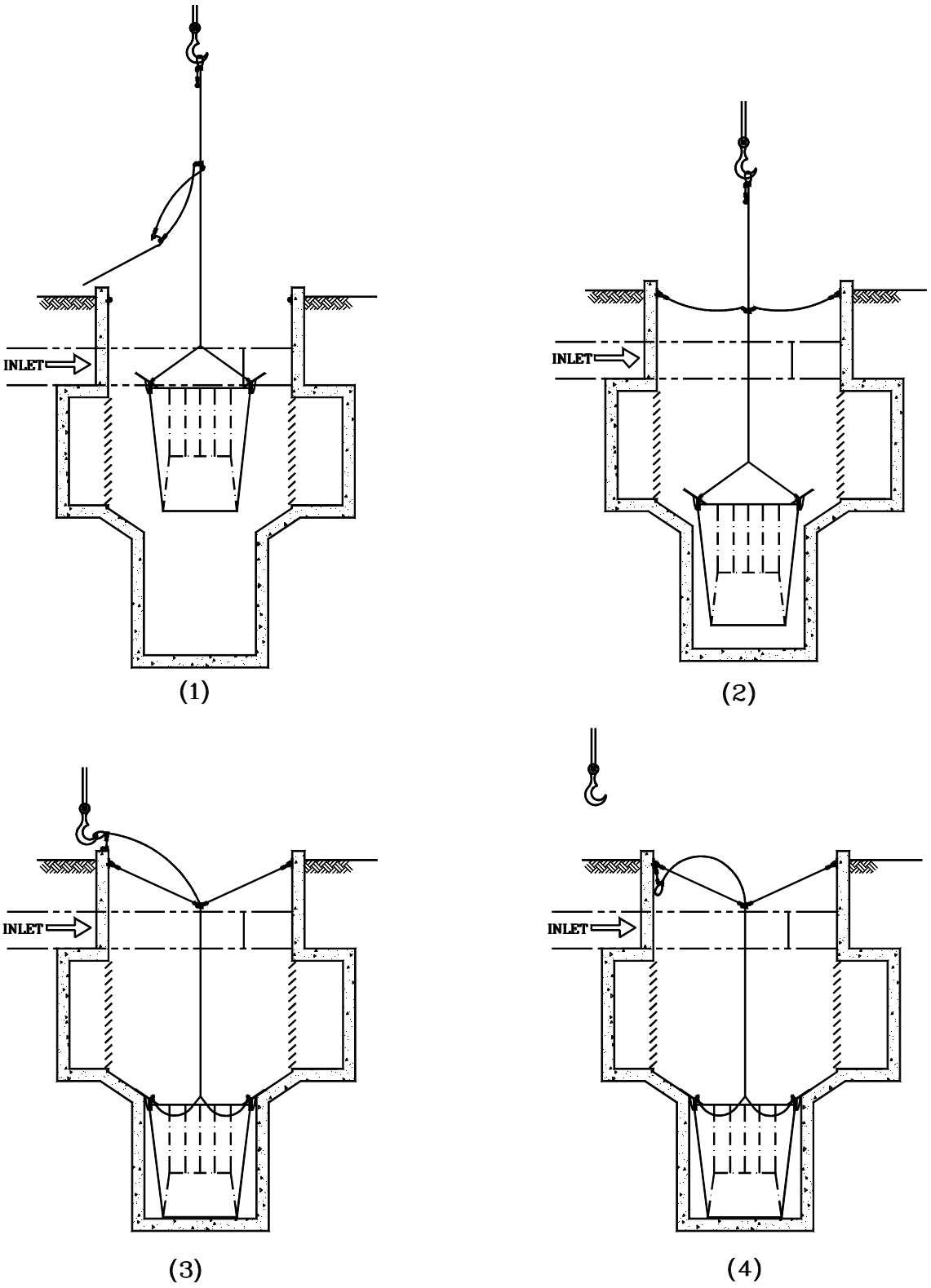
LIFTING OPERATION



LOWERING OPERATION

Figure

4.8 HAZARD ANALYSIS

Activity: Basket Cleaning of CDS Unit

Task	Possible Hazard	Hazard Control
Site Establishment	Traffic Hazards	Implement Traffic Control Plan Obtain Road Closure Approval if necessary
	Risk to Pedestrian	Care to be taken when driving cranes, trucks etc. through public areas. Use assistant to guide reversing vehicle and ward off pedestrians In high pedestrian traffic areas, erect barricades around open CDS unit
Remove CDS Lid	Manual Handling	Correct Manual Lifting Techniques PPE : Steel cap boots, hard hat, gloves Lifting tackle in good condition. Crane in good condition, qualified operators. Crane near overhead electrical cables 3m clearance required to overhead electrical cables
Remove Basket	Lifting Cable Breaks	Check basket lifting tackle for deterioration. Check cable as it emerges from under the water for deterioration. No person to stand under basket as it is removed.
	Person fall into CDS unit	It is not possible to remove the CDS basket whilst barriers are placed around CDS unit. Therefore special care must be taken whilst working around the open CDS unit.
Empty Basket into truck	Biological contamination Basket swings hitting employee	Wear gloves and wash hands afterwards with anti-bacterial soap. PPE, hard hat
Replace Basket	See Remove Basket	
Replace CDS lid	See Remove CDS Lid	

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5 SUCTION CLEANING

The following is a procedure for emptying the CDS unit using a truck-mounted suction unit (this procedure is shown in Figure 5.1). See Hazard Analysis at Section 5.8.

UNITS FITTED WITH OPTIONAL OIL BAFFLES

In the case of Units fitted with an Oil baffle the oil must be removed by eduction prior to de-watering.

Oil will be sitting on the surface at the fluid level inside the screen in the unit; this will be visible through the lid at surface level.

The eduction hose is carefully lowered into the oil, care being taken not to protrude below the oil level and the oil removed by suction.

The depth of the oil on the surface can be gauged by the oil residue on the dipping staff used to establish the level of pollution contained in the sump.

This oil will be securely quarantined or retained in a vessel for disposal

NB: Eduction or the use of absorbent material such as Oil Absorbent Pillows is the only way to remove the oil, the grab or basket method is still a clean out method for the remainder of the pollutant but the oil must be removed first.

Remove lid

5.1	Stop inflow	If necessary, the incoming flow can be blocked using a drop-board or sandbags stacked across the inlet. Ensure that the flow is low enough for a person to safely enter the chamber to place the drop-board. NB If working in a roadway, erect appropriate traffic control measures.
5.2	Pump down the separation chamber	Place a flex drive pump or suction hose in the outlet of the separation chamber, ie outside the screen. This water can be discharged downstream because it has passed through the screen, therefore it has undergone treatment. Other options that may be considered include pumping the water upstream of the inlet. It may be necessary to remove water removed from the unit and transport it by tanker to an approved disposal site or it may be discharged to sewer if approved by local water authority. Do not pump water from the inside of the screen directly downstream. Access to the outside of the screen is via the Diversion Chamber. The water level will drop to the top of the sump.
5.3	Remove debris by suction	Using a "Super sucker" type suction cleaner, remove the debris from the sump (Experience has shown that the common Council Road Sweeper Eductor is not nearly as

efficient at removing the debris).

For larger units, removal by suction may require the assistance of a suitably qualified "Confined Spaces" worker, lowered into the CDS unit to manually direct the nozzle of the suction hose and remove blockages. Any large items or sticks blocking the nozzle may be put to one side and removed manually on completion of the suction process.

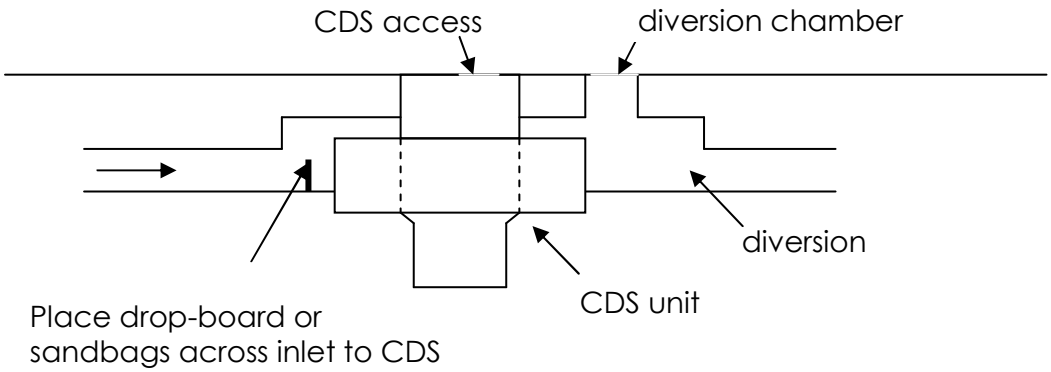
Confined spaces legislation requires that the employee in the unit be harnessed to a tripod-type hoist that is permanently manned above, while a third operator mans the suction machine.

5.4	Disposal of Pollutants	Record the quantity of pollutants removed from the CDS with a visual assessment of the breakdown by type: _____ % silt and sediment _____ % litter _____ % vegetation A note should be made of any unusual or large items, eg. oil, paint, car tyres etc. Dispose of pollutant material at an approved tipping site, ie. a tip which is licensed by the Waste Authority in the relevant state. The free water removed can be discharged back into the CDS unit to minimise transportation and disposal costs. The material should be weighed if possible. Weight should be measured when free water no longer drains out of the material. If this is not possible, an estimation of weight should be made.
5.5	Tidy Site	Tidy the site of any debris prior to leaving.
5.6	Complete and Forward Cleaning Report	Complete Cleaning Report (Appendix B) and forward to CDS owner. If there is any damage or non-functionality, complete Damage or Non-Functionality Report (Appendix C) and forward to the CDS Contact Person listed on the CDS Data Sheet.

Annually the CDS unit should be fully inspected inside and outside the screen to ensure no damage, algal growth or deposition of material has occurred. Any problems should be reported to the CDS owner and to CDS Technologies contact person.

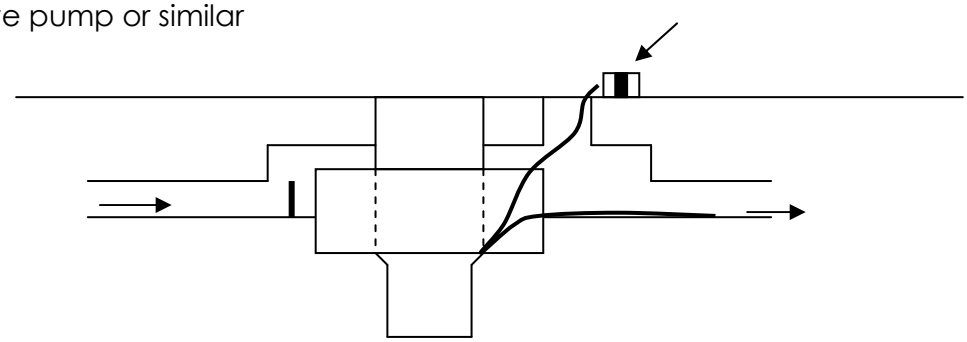
5.7 PROCEDURE

Stop Inflow

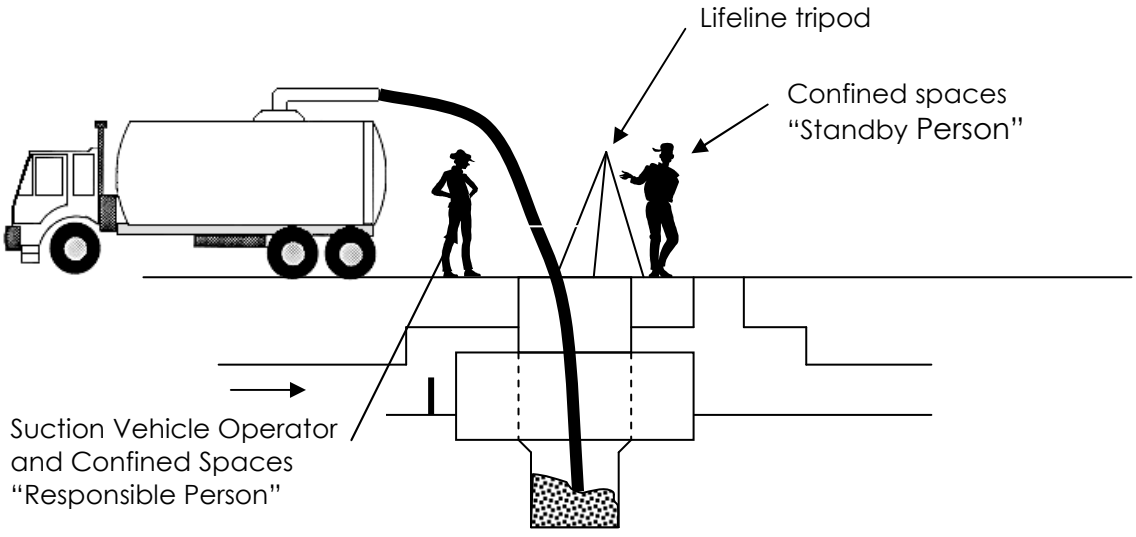


Pump down the separation chamber from the outside of the screen

Flexi-drive pump or similar



Remove debris by suction



NB: A person may be needed inside the CDS unit to guide the head of the suction hose.
All 3 staff in this method require Confined Spaces Training.

5.8 HAZARD ANALYSIS

Activity : Cleaning CDS units by vacuum loading

WHAT CAN GO WRONG	*HOW WILL IT BE MANAGED*
Proposed Work: Cleaning of C.D.S. units of various sizes by Vacuum Loading at various locations. <u>Consequences</u> Possible Road Work Entry into Confined Spaces	Field staff will be certified through AS2865 and safety inducted prior to commencing fieldwork. A supervisor will issue each crew with a work schedule for the day. The responsible person will ensure each site is handled with extreme care. Should roadwork be required, the crew will have the correct signs, barricades and appropriate dress.
Confined Space Category: Deterioration of air quality may occur within a confined space resulting in a category change. Illegal dumping of trade waste / chemicals may also result in confined space category changes.	The responsible person will ensure: Gas testing is undertaken for the duration of the work. If gas levels are above AS2865 allowable levels postpone work until reasonable levels can be achieved. Force ventilation equipment is available, on site, and can be used if required. Vacuum truck draws fresh air into chamber. Personnel entering the confined space will wear all the appropriate safety gear, including hard hat, steel capped boots, overall, eye protection, gloves and be connected to an approved lifeline/tripod set-up at all times whilst in the confined space. Remove other manhole lids in vicinity of work. Should trade waste chemicals become evident all work will cease, evacuation will proceed. Once evacuation is complete C.D.S. will be notified immediately. Self rescue unit to be worn.

WHAT CAN GO WRONG	*HOW WILL IT BE MANAGED*
Isolation of Work Site: Partial blockage/diversion boards, installed upstream to divert flows, may fail resulting in increased flow conditions.	The responsible person will ensure: Isolation of the work site by ensuring level of flow is at workable levels prior to confined space entry. The work can be done during low flow conditions. Flow levels are monitored upstream of the work location. Personnel entering the confined space will wear all the appropriate safety gear, including hard hat, steel capped boots, overall, eye protection, gloves and be connected to an approved lifeline/tripod set-up at all times whilst in the confined space.
Pre-entry Inspection: Air quality may exceed As2865 limits. Excessive flow conditions Presence of fumes, smells and noxious gases.	Gas detection will be undertaken prior to commencing confined space work. Gas detection is to continue for the entirety of the work. The work crew will complete an Entry Permit once they have tested for gas. Copy of Entry Permit to be forwarded to C.D.S. Should excessive flows be present work is not to proceed until such time that flows are at acceptable levels.

Access: Manhole/Access lid dimensions may not comply with Australian Standards. General public and road access routes may be interrupted. Suction hose restricts size of manhole.	The responsible person will ensure: Access will only be undertaken if it is possible, through the manhole opening. Entry will NOT take place into a manhole/confined space if these site-opening sizes do not conform to Australian Standards. The entrant will wear a safety harness. Appropriate signs and barricades will be used around the work area to ensure public and traffic routes are kept to a minimum. All tools, manhole lids and other equipment is to be kept within the barricaded area. Suction hose to be removed whilst assessing/egressing the manhole.
WHAT CAN GO WRONG	***HOW WILL IT BE MANAGED***
Methods of Work: Failure of safety equipment while in use. Noise may impact on the employees and the residents/public.	The responsible person will ensure: Daily inspection of all equipment will take place prior to work commencing. This will ensure equipment is maintained in good condition. Noise levels throughout this contract will comply with the EPA's Noise Control Manual. Personnel will have earplugs available for their use as and when required.
Suitable Workers: Unqualified workers without training working within a Confined Space.	All persons working on a cleaning project will have undertaken and are currently certified to work under AS2865. All staff is trained in the use of the equipment and materials to be used for this project. Other training will include and is not limited to a Safety Induction, First Aid/CPR Training.

	The responsible person will ensure: Only AS2865 certified person could enter a Confined Space to carry out work. All staff members working on-site are carrying their Confined Space tickets.
Rescue Precautions:	The responsible person will ensure: Each field crew will have undertaken a Safety Induction. Each crew will be equipped with a First Aid Kit and a mobile telephone.
Traffic & Public Access: Manholes are located on roads, footpaths and private property. The work may cause disruption to motorists and residents living in the area.	The responsible person will ensure: Traffic control measures including signs, barricades and witches hats are used on roadways. Barricades and pedestrian diversion shall be utilised on footpaths and on private property.

WHAT CAN GO WRONG	***HOW WILL IT BE MANAGED***
Illumination: Poor lighting may result in slips and falls.	The responsible person will ensure: Dolphin torches are used in the confined space in conjunction with miners lights fixed to the entry workers helmet. The stand-by person will have a 12v light that he/she can shine from above to help light up the area.
Ventilation: Fumes, smells and unacceptable gas levels.	The responsible person will ensure: Gas testing is undertaken for the duration of the work. If gas levels are above AS2865 allowable levels postpone work until reasonable levels can be achieved. Force ventilation equipment is available, on site, and can be used if required. Stand-by person will remain at the entry/exit point to allow emergency exit if required. Personnel entering the confined space will wear all the appropriate

	safety gear, including hard hat, steel capped boots, overalls, eye protection, gloves and be connected to an approved lifeline/tripod set-up at all times whilst in the confined space. Should air quality deteriorate work will cease, evacuation will proceed.
Contents / Hazard: Sharp objects, syringes and hazardous materials.	The responsible person will ensure: Site inspection, prior to commencing confined space work, is to take place. Retrieved hazardous materials and sharp objects or syringes are to be disposed of correctly.
Fire / Explosion Risk: Fuels and Oils	The responsible person will ensure: Confined space is evacuated immediately if the Lower Explosive Limit (LEL) exceeds 5% on Gas Detector.

WHAT CAN GO WRONG	***HOW WILL IT BE MANAGED***
Temperature: No hot work is expected.	N/A
Electrical Isolation: Possibility of electrocution.	The responsible person will ensure: Isolation of electrical equipment. All electrical equipment to be used is inspected prior to undertaking any work. All electrical equipment used in confined spaces shall be low-voltage.
Manual Handling of Manhole:	The responsible person will ensure: Mechanical lifting equipment shall be used. All manhole covers are put back on pits and manholes before leaving site.

6 CLAMSHELL (GRAB) CLEANING

The following is a procedure for emptying the CDS unit using a tipper-truck-mounted clamshell or grab bucket (this procedure is shown in Figure 6.1). This method is available for 2m & up diameter CDS units due to the physical size of the bucket. Currently only two of the units exists in Australia, based in Sydney and Melbourne, which can service all states. Contact your CDS representative to arrange for a quotation. See Hazard Analysis at Section 6.7.

For units fitted with an Oil Baffle the Oil must be removed using the methodology for Eduction Cleaning prior to the grab process. See Section 5.

6.1	Remove lids	See section 4.1
6.2	Remove debris by clamshell	Ensure clamshell does not contact screen as damage can occur. Clamshell should be perforated and should be lifted clear of water surface and allowed to drain. Using the clamshell, load the waste into the tipping body of the truck. The truck should be positioned so that water draining from the body drains back into the CDS. Drain waste thoroughly before proceeding to tip.
6.3	Scoop floating waste	Using a pool scoop, remove the floating litter from the surface of the water in the separation chamber. Replace lid.

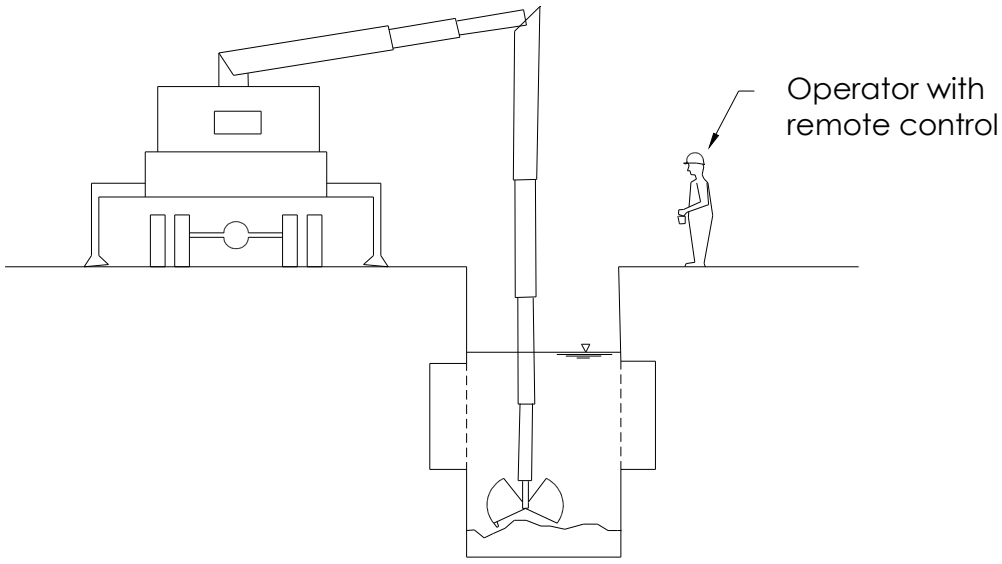


Figure 6.1 Clamshell bucket operation

6.4	Disposal of Pollutants	Record the quantity of pollutants removed from the CDS with a visual assessment of the breakdown by type: _____ % silt and sediment _____ % litter _____ % vegetation A note should be made of any unusual or large items, eg. oil, paint, car tyres etc. Dispose of pollutant material at an approved tipping site, ie. a tip which is licensed by the Waste Authority in the relevant state. Any free water removed can be discharged back into the CDS unit to minimise transportation and disposal costs. The material should be weighed if possible. Weight should be measured when the free water no longer drains out at the material. If this is not possible, an estimation of weight should be made.
6.5	Tidy Site	Tidy the site of any debris prior to leaving.
6.6	Complete and Forward Cleaning Report	Complete Cleaning Report (Appendix B) and forward to CDS owner. If there is any damage or non-functionality, complete Damage or Non-Functionality Report (Appendix C) and forward to the CDS Contact Person listed on the CDS Data Sheet.

Annually the CDS unit should be fully inspected inside and outside the screen to ensure no damage, algal growth or deposition of material has occurred. Any problems should be reported to the CDS owner and to CDS Technologies contact person.

6.7 HAZARD ANALYSIS 1

Activity : Grab Cleaning of CDS Unit

Task	Possible Hazard	Hazard Control
Site Establishment	Traffic Hazards	Implement Traffic Control Plan Obtain Road Closure Approval if necessary
	Risk to Pedestrian	Care to be taken when driving cranes, trucks etc. through public areas. Use assistant to guide reversing vehicle and ward off pedestrians In high pedestrian traffic areas, erect barricades around open CDS unit
Remove CDS Lid	Manual Handling	Correct Manual Lifting Techniques PPE : Steel cap boots, hard hat, gloves Lifting tackle in good condition. Crane in good condition, qualified operators. Crane near overhead electrical cables 3m clearance required to overhead electrical cables
	Person fall into CDS unit	Special care must be taken whilst working around the open CDS unit. Place barricade round open CDS unit. Place wire ladder into CDS unit fixed to truck.
Empty Bucket into truck	Biological contamination Bucket swings hitting employee	Wear gloves and wash hands afterwards with anti-bacterial soap. PPE, hard hat
Replace Basket	See Remove Basket	
Replace CDS lid	See Remove CDS Lid	

7 Safety Regulations

7.1 The safety regulations applying in the State or Territory are to be strictly adhered to.

7.2 The party performing the cleaning is to be fully aware of all applicable safety regulations and ensure that all staff are adequately trained in safe working practices.

7.3 These safety regulations include but are not limited to:

- 7.3.1 Occupational Health and Safety Legislation
- 7.3.2 Confined Spaces Legislation
- 7.3.3 Motor Traffic Legislation
- 7.3.4 Scaffolding and Lifts Regulations
- 7.3.5 Health Regulations dealing with handling of hazardous substances
- 7.3.6 Hazardous Substances Legislation
- 7.3.7 Manual Handling Regulations
- 7.3.8 Plant Operating Instructions
- 7.3.9 Traffic and Pedestrian Safety Standards.

7.4 Adequate insurances should be carried to cover Public Liability and Worker Injury.

8 Environmental Responsibility

8.1 CDS Technologies is committed to improving the environment with its products. It is essential therefore that the process of cleaning the CDS is performed in a manner, which is environmentally responsible. Simply, there must not be any waste left on the site or anything other than the treated water discharged into the environment. The waste must be disposed of in a best practice manner with regard to environmental legislation.

8.2 The party performing the cleaning must be aware of all environmental legislation applicable to these operations and ensure that all employees are trained in work practices complying with the legislation.

8.3 This legislation includes but is not limited to:

8.3.1 Local Government Regulations
8.3.2 Clean Waters Act
8.3.3 Waste Disposal Regulations
8.3.4 Litter Regulations

9 Documentation

9.1 There are only 3 documents generated by the inspection and cleaning of the CDS.

9.2 Inspection Report

Appendix A to be completed for each inspection and copy forwarded to CDS owner.

9.3 Cleaning Report

Appendix B is to be completed for each clean and forwarded to CDS owner.

9.4 Damage or Non-Functionality Report

Appendix C is to be completed upon observance of any damage or extraordinary occurrence affecting the normal operation of the CDS. Examples of these are:

9.4.1 damaged screen
9.4.2 damaged exclusion bars
9.4.3 damaged lids
9.4.4 screen blockage
9.4.5 repeated inlet blockage, and such like.

CDS Technologies will discuss with the CDS owner any remedial action required.

9.5 CDS Data Sheet

Appendix D - This contains relevant information about each CDS and includes contact phone numbers for CDS Contact Personnel including after hours numbers.

9.6 Any damage or non-functionality of the CDS unit should be reported on a Damage or Non-functionality Report (Appendix C) to CDS/Rocla

Inspection Form

Appendix A

Date: _____

Cleaning Contractor Company: _____

Phone No: _____ Fax No: _____

Inspection Person: _____

Unit Identification: _____

Percent cover of floatables on surface: _____

State of the screen (if visible): _____

Depth from base to lid: _____

Depth of accumulated solids: _____

Percent full: _____

Comments: _____

_____

_____

_____

Signed: _____

The report is to be faxed to the CDS owner.

CDS Clean Out Report

Appendix B

Date:

Cleaning Contractor Company:

Phone No:

Fax No:

Contact Person:

Unit Identification:

Address:

Method of Cleaning:

Time Taken:

Volume or mass of removed material:

Breakdown of material: _____Oil Quantity in litres

_____%silt and sand

____%litter

____%vegetation

Safety Procedures implemented in accordance with Hazard Analysis : Yes No

Comments:

Signed:

This report is to be faxed to the CDS owner.

Any damage or non-functionality of the CDS unit should be reported on a Damage or Non-functionality Report Appendix C to CDS /Rocla

Appendix C

Damage or Non-functionality Report

Date:_____

Unit Identification:

Address:_____

Company doing inspection/cleaning:

Contact Person:

Phone:_____Fax:

Nature of damage or problem:

Signed:_____

This report is to be faxed to CDS/Rocla

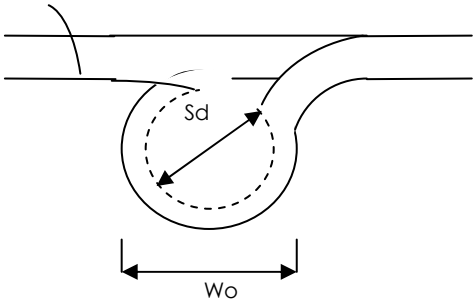
CDS Unit Data Sheet

Appendix D

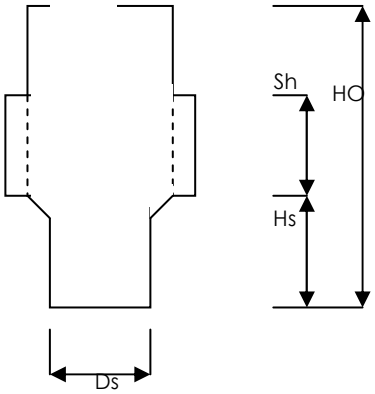
Name:		Unit Name:	
Address:		Unit No:	
		Unit Address:	
Contact Person:		Site:	
Phone:		Truck Instruction:	
Fax:		Keys:	
Mobile:		Lid Type:	
CDS Rep:		Lid Size:	
Phone:		Emptying Method(s):	Oil removed: Yes/No
After Hours:		Date Operational:	

Technical Data

Screen diameter (Sd) =
Screen height (Sh) =
Over all height (H0) =
Over all width (Wo) =
Sump diameter (Ds) =
Sump Height (Hs) =
Sump total volume (Vt) =
Unit weight of solid material (γ) 800t/m^3
Estimate weight of full basket =



Depth from Lid to Pollution	Volume m^3	Weight tonnes	Percent Full
Screen bot			> 100
Sump Top			100
			90
			80
			70
			60
			50
			40
			30
			20
			10
Base =	0.00	0.00	Base Sump



ADDITIONAL NOTES ON CLEANOUT PROCEDURES ETC

Jordan Springs East Precinct

APPENDIX C

MAINTENANCE COST ESTIMATES

Cardno
Shaping the Future

Maintenance Cost Estimates

Stage	Item	Column2	Quantity	Units	Rate	Subtotal	Column1	Column7	Comments
ST01	GPT								
	1.0	Supply and Install	7	Item	$74,000	$518,000			Includes estimated excavation and backfill cost for $20,000 per unit and average GPT unit cost of $54,000. Rate Shown is Indicative of 2016 prices and area subject to change in the future. Initial installation cost to be funded by the developer.
	2.0	Maintenance (12 Months)	1	Annual	$84,000	$84,000			$3000 per clean per unit, based on maufacturers rates. Assumed 4 cleans required per year.
ST01	Bio-Retention (x3 Basins)								
	1.0	Supply and Install	7250	m^3	$200	$1,450,000			Based on contractor tender rates for similar projects in PCC and BCC. Rate Shown is Indicative of 2016 prices and area subject to change in the future. Initial installation cost to be funded by the developer
	2.0	3 Year Establishment (156 wks per basin)	468	Week	$765	$358,020			Based on contractor tender rates for similar projects in PCC and BCC.
	3.0	17 Year Maintenance (204 mth per basin)	612	Month	$850	$520,200			Based on contractor tender rates for similar projects in PCC and BCC.
	4.0	Removal After 20 Years	3	Item	$10,000	$30,000			Based on contractor tender rates for similar projects in PCC and BCC.
ST02	GPT								
	1.0	Supply and Install	4	Item	$74,000	$296,000			Includes estimated excavation and backfill cost for $20,000 per unit and average GPT unit cost of $54,000. Rate Shown is Indicative of 2016 prices and area subject to change in the future. Initial installation cost to be funded by the developer.
	2.0	Maintenance (12 Months)	1	Annual	$48,000	$48,000			$3000 per clean per unit, based on maufacturers rates. Assumed 4 cleans required per year.
ST02	Bio-Retention (x1 Basins)								
	1.0	Supply and Install	1150	m^3	$200	$230,000			Based on contractor tender rates for similar projects in PCC and BCC. Rate Shown is Indicative of 2016 prices and area subject to change in the future. Initial installation cost to be funded by the developer
	2.0	3 Year Establishment (156 wks per basin)	156	Week	$765	$119,340			Based on contractor tender rates for similar projects in PCC and BCC.
	3.0	17 Year Maintenance (204 mth per basin)	204	Month	$850	$173,400			Based on contractor tender rates for similar projects in PCC and BCC.
	4.0	Removal After 20 Years	1	Item	$10,000	$10,000			Based on contractor tender rates for similar projects in PCC and BCC.

Maintenance Cost Estimates

Stage	Item	Column2	Quantity	Units	Rate	Subtotal	Column1	Column7	Comments
Future	GPT								
	1.0	Supply and Install	9	Item	$74,000	$666,000			Includes estimated excavation and backfill cost for $20,000 per unit and average GPT unit cost of $54,000. Rate Shown is Indicative of 2016 prices and area subject to change in the future. Initial installation cost to be funded by the developer.
	2.0	Maintenance (12 Months)	1	Annual	$108,000	$108,000			$3000 per clean per unit, based on maufacturers rates. Assumed 4 cleans required per year.
Future	Bio-Retention (x3 Basins)					$0			
						$0			
	1.0	Supply and Install	9010	m^3	$200	$1,802,000			Based on contractor tender rates for similar projects in PCC and BCC. Rate Shown is Indicative of 2016 prices and area subject to change in the future. Initial installation cost to be funded by the developer
	2.0	3 Year Establishment (156 wks per basin)	468	Week	$765	$358,020			Based on contractor tender rates for similar projects in PCC and BCC.
	3.0	17 Year Maintenance (204 mth per basin)	612	Month	$850	$520,200			Based on contractor tender rates for similar projects in PCC and BCC.
	4.0	Removal After 20 Years	3	Item	$10,000	$30,000			Based on contractor tender rates for similar projects in PCC and BCC.