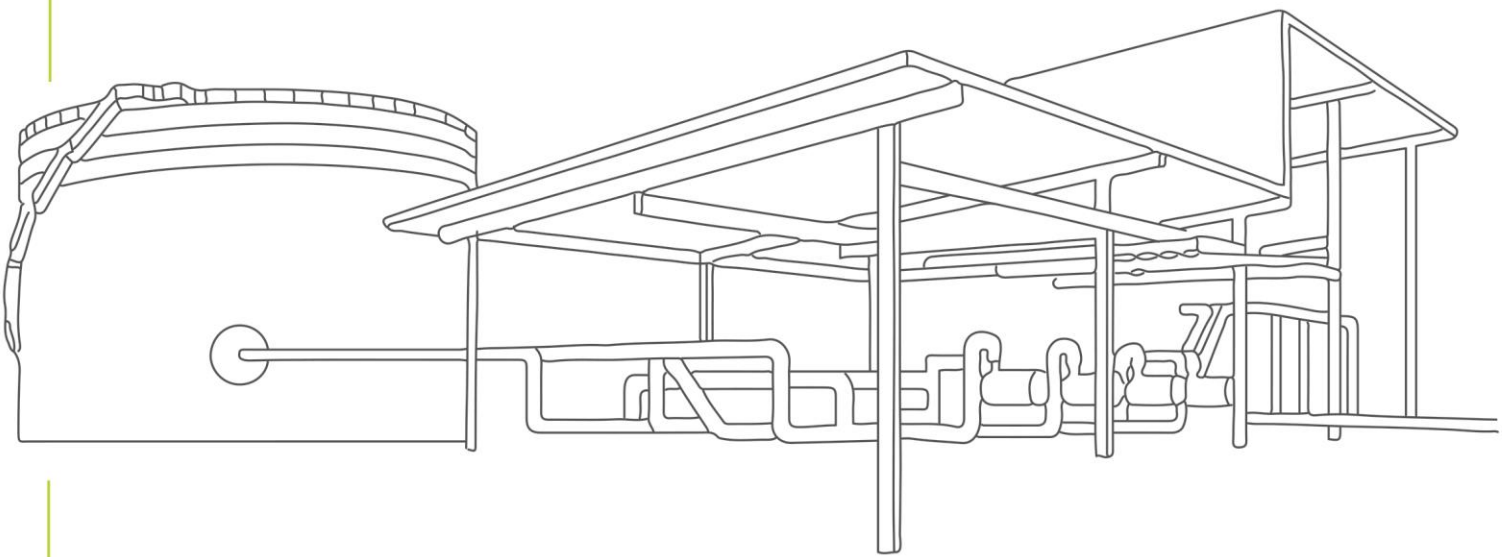
SITE BASED STORMWATER MANAGEMENT PLAN

MANILDRA GROUP - PORT FACILITIES, BULK LIQUID STORAGE, PORT KEMBLA

FORESHORE ROAD, PORT KEMBLA NSW 2505



Project Group

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PROJECT MANAGERS | PLANNERS | DESIGNERS | ENGINEERS

SITE BASED STORMWATER MANAGEMENT PLAN

Manildra Group - Port Facilities, Bulk Liquid Storage, Port Kembla

Foreshore Road, Port Kembla NSW 2505

CLIENT: Manildra Group (Manildra)

ADDRESS: Foreshore Road, Port Kembla, 2505

TFA REFERENCE: 20399

TFA CONTACT: Juan Avella

Document Control

REVISION	DATE	PREPARED BY	REVIEWED BY	COMMENTS
A	7-July-2021	L. Salinas	J. Avella	Issue for NSW Ports
B	20-July-2021	L. Salinas	J. Avella	Issue for NSW Ports
C	19-August-2021	L. Salinas	J. Avella	DA issue
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H	22-February-2022	L. Salinas	J. Avella	Correction on equivalent PKHD level in section 2.0 amended

TfA Project Group

BRISBANE (HEAD OFFICE)
166 Knapp Street
Fortitude Valley QLD 4006
H/O Phone: +61 7 3854 2900
Fax: +61 7 3854 2999

SYDNEY
Suite 315
33 Lexington Drive
Bella Vista NSW 2153
NSW Phone: +61 2 8814 5219
Australia Wide: 1300 794 300

MELBOURNE
Suite 1401
401 Docklands Drive
Docklands VIC 3008
VIC Phone: +61 3 9640 0206
Website: www.tfa.com.au

PERTH
Level 3
1060 Hay Street
West Perth WA 6005
WA Phone: +61 8 9480 0430
ABN: 34 612 132 233

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1.0 INTRODUCTION

This Site Based Stormwater Management Plan (SBSMP) has been prepared by TFA Project Group on behalf of Manildra Group (Manildra) for the proposed Port Facilities, Bulk Liquid Storage and Pipelines project at Foreshore Road and Christy Drive, Port Kembla NSW 2505. The development works consist of the installation of 6 x 4ML above ground storage tanks (24ML in total) within a bunded area to receive Ethanol (delivered via road tanker) and to transfer the product from the tanks to ships for export. The facilities include bitumen driveways, landscape and miscellaneous infrastructure.

The purpose of this document is to verify that stormwater has been considered as part of the development works and that it is possible to comply with the Port of Kembla Development Code June 2016.

The SBSMP addresses both the construction and operational phases of the development. Table 1 below shows additional details of the proposed development. The proposed terminal site layout plan is shown in **Appendix A**.

Table 1: Details of proposed development

Leasee	Manildra Group (Manildra)
Lessor	NSW Ports
Address	Foreshore Road, Port Kembla, 2505
Property Description	The project is within Lot 6 DP1236743 and Lot 2 on DP1182823
Area of Development	14,463 m^2
Stormwater Risk Classification	High Risk (Due to the transfer and storage on site of Ethanol which have the potential to cause harm to the environment if released)
Existing Land Use	General storage and soil stockpile facility

This report indicates ground levels in AHD (Australian Height Datum) and PKHD (Port Kembla Height Datum) which is widely used in Port of Kembla. PKHD is 872mm above AHD levels approximately.

2.0 SITE DESCRIPTION

The site is located on the east coast of NSW at Foreshore Road, Port Kembla. The proposed development will only form part of a small portion of Lot 6 DP1236743 and Lot 2 on DP1182823 and is within the Wollongong City Council local government area (LGA). The site is in the vicinity of Blue Scope Steel company and other associated heavy industrial businesses, which form the industrial area of Port Kembla. The site is ideally situated to access truck freight routes and to receive/export products by sea.

The development site has existing surface levels approximately between RL 1.60m AHD (2.47m PKHD) to RL 3.2m AHD (4.07m PKHD) and has a 15 metres high stockpile located east which occupies almost half of the proposed development area. The ground generally falls outwards from this stockpile to the north and west towards the harbour and a concrete canal. The site does not have a stormwater network, consequently, it is assumed that runoff generated from the site currently runs unmitigated to the harbour and the canal.

The proposed works includes a 6 metres wide service road located west of the canal to allow safe access of maintenance and fire vehicles to site. Refer Section 3.2 of this report for the stormwater management strategy for this area.

In the post-development scenario, the stockpile will be removed and the site levelled to incorporate a water sensitive urban drainage design (WSUD) and Ethanol spill management approach. Refer to the next section for the proposed drainage philosophy and **Figure 1** for current site conditions.

Figure 1: Current site conditions (Source: SIX Maps)

3.0 PROPOSED SITE DRAINAGE LAYOUT

The proposed stormwater management system separates the Ethanol processing, transfer and storage areas from the rest of the site aiming to minimise the risk of any possible product spill entering the site's stormwater network and/or Port Kembla's harbour.

The proposed Ethanol Spills Management System and the stormwater system are in accordance with the aims and principles of water sensitive urban design (WSUD) and the Port Kembla Development Code June 2016.

3.1 Proposed Ethanol Spills Management

3.1.1 Spill Assessment and Response

The proposed six ethanol storage tanks will be isolated by a perimetral 1.8m high concrete main bund wall. Within this bund wall 0.6m high intermediate concrete bund walls will subdivide this isolated catchment into three bunded zones. Two Ethanol storage tanks will be on each subdivided bunded zone and will have sufficient capacity to contain spills plus rainwater.

Each bunded zone will fall towards a valved collection pit which isolates completely each bunded area. The collection pits will be located along the main bund walls to facilitate the operation of the valves without entering the main compound.

The site operator will visually inspect the flows contained within the bund to confirm no ethanol is present before opening the valves. After actioning the valves, the flows will be directed to a main collection chamber for Testing and detection of ethanol to determine the final destination of the water accumulated in the bund. Should the results prove that no ethanol is present in the water, the operator will activate a pump to empty the bund and send the water towards a Humes's Humegard GPT unit for stormwater treatment. In the event that the test results detect the presence of ethanol, water will be pumped into 2 x 236 kL slops tanks located within the main compound for storage and subsequent removal.

This controlled discharged is aimed at ensuring that major spills are captured and disposed accordingly.

Ethanol loading and unloading gantries plus the pump & pig launcher/receiver will be concrete surfaced and covered by awnings as well as bunded to prevent stormwater runoff from other catchments flowing into these areas and to ensure that any spills are contained within the bund. Any potential spills within these areas will be captured and conveyed by gully pits and underground pipes to a 45 kL Holding Tank. The Holding Tank will have the capacity to contain a full isotainer (26kL) spill plus wind blow rain. Flows from the Holding Tank will be pumped to the Slops tanks by an air pump located on the Iso Wash Bay area. This Holding Tank will be fitted with an alarm system to alert the operator when 3 kL level has been reached and its content needs to be pumped into the slops tanks.

The Iso Wash Bay area will be also concrete surfaced, covered by an awning and bunded to prevent stormwater runoff entering this zone. Spills generated in this area will be captured by a central trench drain draining towards a concrete pit with 1kL combined capacity. An air pump will direct contained flows from the concrete pit to the Slops tanks when it reaches 500L.

The Wet Scrubber Tank located next to the pump shed will be on a bunded concrete area with a central pit. This pit will be fitted with a valve which will remain closed at all times and only will release flows to the proposed stormwater system when there is no evidence of spills. If Ethanol is detected, the retained flows will be drained to the slops tank and transported to Nowra for reprocessing.

Refer to **Appendix B** for the conceptual site drainage plan.

3.2 Proposed Stormwater Management

As a result of the fall of the land, and size of the site, the area outside of the tanks and pump bunds will be divided in two main catchments (A & B). Stormwater generated from these catchments will be captured and conveyed via underground pipes and pits towards a Humegard unit (one unit per catchment) for the treatment of flows up to the 3 month ARI storm event (capturing gross pollutants, sediments, silt, total suspended solids, some nutrients and oil and grease). The Humegard unit will have the capacity to bypass flows above the 3 month ARI storm event and up to 100 years ARI event directing them to the site's stormwater system. Both catchments will discharge into the existing canal side wall. Catchment A's stormwater system proposed lawful point of discharge (L.P.D.1) will be located north of the site and Catchment B's L.P.D.2 will be located south of the site.

The proposed stormwater system will be designed to cater for an up to 20 year ARI storm event within the piped system and flows over a 20 year ARI event will drain as overland flow on an unobstructed flow path discharging to the adjacent canal.

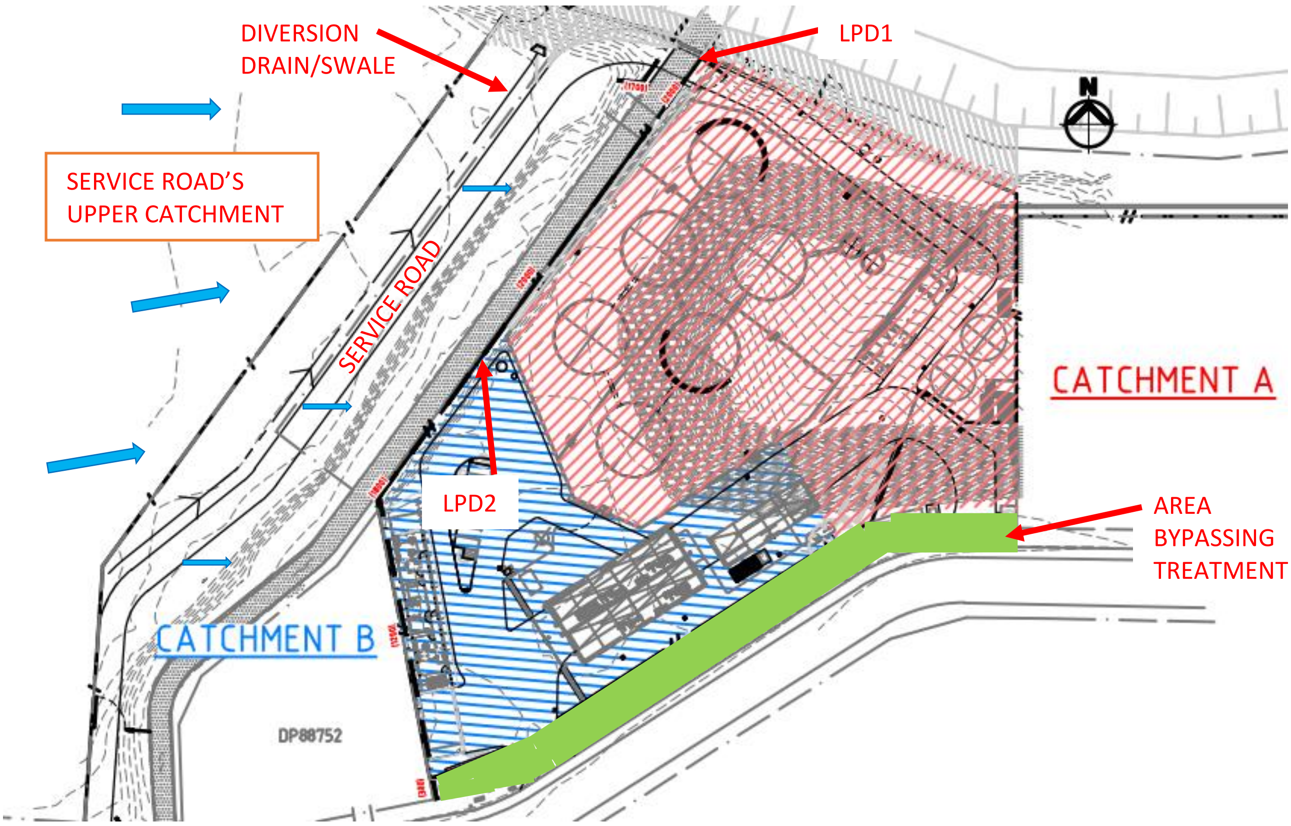
It should be noted that flows over a 20 years ARI event will not be catered for considering the proximity of the site to the adjacent waterway.

Concrete gully pits will be strategically located at low points to capture rainfall. A minimum of 1:100 fall across the site towards these pits will be implemented to avoid ponding of water and prevent biosecurity issues.

The majority of the site roof water will be captured and stored in rainwater tanks for reuse in landscape irrigation.

On the main site area, East of the canal, only the landscaped buffer zone along the southern site boundary will bypass the site's stormwater system due to the site characteristics. The rest of the site's stormwater will be treated. Refer **Figure 2** below for details and **Appendix B** for the proposed Conceptual Site Stormwater Management Plan.

Figure 2: Proposed catchment characteristics



On the western side of the canal, runoff generated from the western side of the Service Road will be diverted north towards the harbour via an open diversion channel/swale running parallel to the road and discharging to the harbour. The service road will generally follow the current fall of the land and be sloped slightly towards the east, causing minimal impact to the existing catchment conditions. Consequently, stormwater runoff from the road and land east of the road will continue to discharge into the existing canal. All unpaved areas will be sewn with suitable grass. Refer **Appendix B** for Conceptual Stormwater Management Plan.

4.0 FLOODING

Based on the information obtained from the Wollongong City Council on 29 July 2021. The extracted image shown in **Figure 3** below indicates the site's 1% AEP Flood Event extent. Flood levels are expected to rise to RL 3.00m AHD (3.87m PKHD) and potentially cause some inundation to the western side of the site.

Figure 3: 1% AEP Flood Extent (Source: Flood Level Information advice certificate 202100871 Wollongong City Council)

Current surface levels across the flat sections of the site (excluding the stockpile and the embankment along the canal) vary between RL 2.00m AHD (2.87m PKHD) and RL 3.20m AHD (4.07m PKHD) approximately. Consequently, the site will be raised/filled to ensure that all buildings including offices load in/out gantry, wash bund, etc. have finished surface levels above the 1% AEP flood level (3.00m AHD/ 3.87m PKHD minimum) thereby protecting major equipment and buildings and achieving an adequate degree of flood immunity.

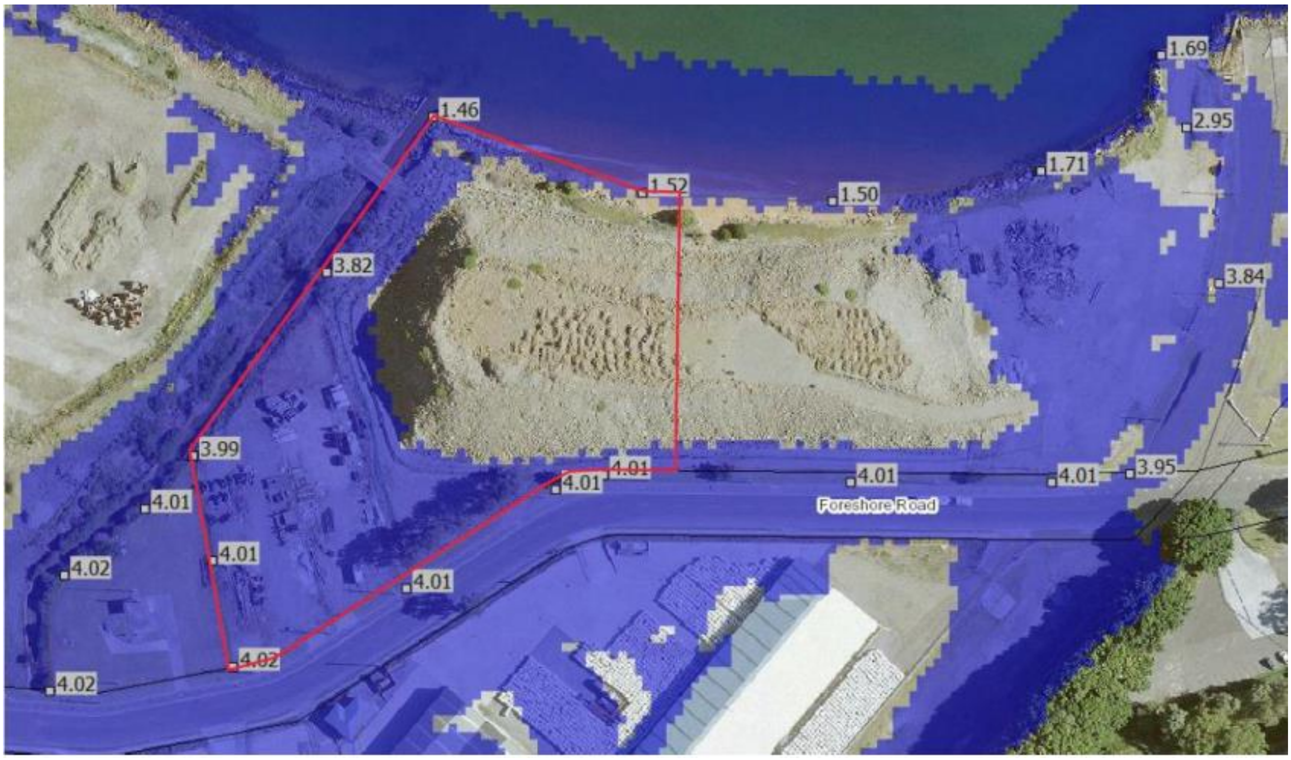
Surrounding driveways and landscape areas within the site may experience minor inundation (e.g., up to 300mm flood depth) during a 1% AEP flood event, however, it should be noted that in such case, the site will be potentially inaccessible given all adjacent roads will be flooded and therefore all operations within the site likely to be shut down.

The main tank compound floor will be protected by the proposed 1.8m high bund wall which will prevent any flood waters from entering the tank compound. In addition, the tanks' base floor level will be set to RL 3.00m AHD (3.87 PKHD) minimum.

Some overland flow during a 1% AEP flood event will traverse the site with the majority of the overland flow continuing to travel along the external roadways.

Based on **Figure 4** below, during the Probable Maximum Flood Event (PMF) flood levels are expected to rise to RL 4.00m AHD (4.87m PKHD) approximately and potentially cause inundation of the majority of the site.

Figure 4: 1% AEP Flood Extent (Source: Flood Level Information advice certificate 202100871 Wollongong City Council)



Proposed surface levels across the site will vary between RL 2.45m AHD (3.32m PKHD) and RL 3.00m AHD (3.87m PKHD) approximately and therefore flood depths are likely to reach up to 1.55m approximately during a PMF event.

It should be noted that it is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years) consequently, it is not considered practical to design the site to achieve such level of immunity. Notwithstanding this, the main tank compound will be also protected from the PMF waters due to the presence of the proposed 1.8m high bund wall

The site civil design (earthworks and grading) will ensure that an adequate level of flood immunity is achieved for the 1% AEP flood event as well as provide unobstructed stormwater overland flow paths during a PMF in accordance with the requirements of Section 11.2.2 of the Port Kembla Development Code – June 2016. Refer to **Appendix D** for the Flood information provided by Council.

5.0 WATER QUALITY ASSESSMENT

The purpose of this section is to the assess the nature and degree of water quality impacts from the development on receiving environments. The assessment includes the characterisation of potential pollutants and the proposed treatment measures that avoid stormwater runoff (containing possible spills) generate any adverse impact (if released) on upstream or downstream environments due to the proposed development both during and after construction.

5.1 Construction Phase

Impacts on receiving waters and surrounding areas will be minimised during the construction phase with measures outlined in this Site Based Stormwater Management Plan (SBSMP) and the Erosion and Sediment Control Plan to be developed for the construction works.

5.1.1 Pollutants

Typical pollutants generated during the construction phase of the development are shown below in Table 2.

Table 2: Pollutant typically generated during the construction phase

Pollutant	**Sources**
Litter	Paper, construction packaging, food packaging, cement bags, off-cuts
Sediment	Unprotected exposed soils and stockpiles during earthworks and building
Hydrocarbons	Fuel and oil spills, leaks from construction equipment
Toxic materials	Cement slurry, asphalt prime, solvents, cleaning agents, wash-waters
pH altering substances	Acid sulphate soils, cement slurry and wash-waters

5.1.2 Performance objectives

The objectives are:

- Minimise the amount of sediment entering waterways and stormwater drains;
- Minimise or prevent environmental harm to waterways and associated ecosystems;
- Minimise localised flooding caused by sediment runoff;
- Minimising exposure of soils

Table 3: Construction phase performance criteria

Indicator	**Water Quality Objectives**
pH	6.5 – 8.5
Suspended Solids	Annual Mean < 10mg/L
Oils and Grease	No visible films or odour
Litter/ Gross pollutants	No anthropogenic (man-made) materials greater than 5mm in any dimension
Dissolved oxygen	80-100% saturation

5.1.3 Monitoring and Maintenance

The general requirement of monitoring during the construction phase will be:

- Work activities are restricted to designated construction areas;
- Earthworks and site clearing are undertaken in accordance with the Erosion and Sediment Control Plan;
- Erosion and sediment control devices are to be constructed/installed in accordance with the Erosion and Sediment Control Plan;
- Inspection of sediment fences, erosion and sediment control structures/devices on a weekly basis as well as after any rain event exceeding 25mm in 24hrs;
- Stormwater discharges from the site are not having any adverse effect on the downstream environment;
- Monitoring and recording of the performance of the drainage control devices including water quality testing where required;
- Any failure in the stormwater system shall be immediately rectified to prevent uncontrolled discharge from the site;
- Any failure to the stormwater system causing damage to surroundings should implement immediate remedial work to the damaged area.

5.1.4 Responsibility and reporting

- The contractor shall be responsible for monitoring the performance of all drainage control and erosion and sediment control devices;
- Records of any failures to devices should be kept and reported to the Construction Manager;
- Regular inspections of the devices shall be reported to the Construction Manager;
- Inspections of the devices after heavy rainfall shall be reported to the Construction Manager;

5.2 Operational Phase

5.2.1 Pollutants

The key pollutants typically generated during this phase for the entire catchment are shown in Table 4.

Table 4: Pollutant typically generated during the operational phase

Pollutant	Potential Source
Litter / Gross Pollutants	Waste materials, food, food packaging etc.
Ethanol	Ethanol spills from (tanks' bunded areas, loading/unloading areas, or/and on pump bunded areas)
Nutrients (N & P)	Nitrogen, Phosphorus
Sediments	Aggregates bins, wind deposits and truck trails
Surfactants	Detergents, cleaning agents

5.3 Ethanol Spill Handling

Ethanol product is completely soluble in water therefore there are not effective methods to remove or separate spills from stormwater. Consequently, the most effective system to manage spills on this development will be to bund and isolate high risk areas (gantry bays, pump bunds and tank storage areas), and test stormwater captured before releasing to downstream environments.

It is relevant to note that we acknowledge the impacts on health and safety of people in an Ethanol spill event. However, no health and safety (life safety) aspects or response actions to prevent harm to people or operators have been discussed in this report as this document is focused on stormwater impacts on the environment only.

5.3.1 Loading/Unloading Gantry Bays, Pump Bunds and Wet Scrubber Bund

The Ethanol loading/unloading catchment area comprises the unloading bay and pump bund. These areas will be concrete surfaced, bunded and covered by a roof to minimise the amount of windblown rain entering this isolated area. As previously mentioned, each bunded area will drain into a central collection pit within the bund which will capture and convey spills into an underground holding tank with a 45kL capacity via underground pipes and pits.

The Holding tank will have a contents level probe to alert the remote operator when the tank contents reach 27kL. The tank will have its contents pumped into the slops tanks located within the main tank compound for removal.

The Wet Scrubber Tank will be located within a concrete surfaced bunded area. Stormwater and any possible spills will be captured by a central valved pit which will be closed at all times and only will release flows (stormwater) to the stormwater system when no ethanol is detected. If Ethanol is found the retained flows will be removed from site.

5.3.2 Tank's Storage Bunded Area

Captured Ethanol spills on the bund area will be pumped out to a 2 x 236m^3 Slop tanks as previously discussed in Section 3.1.1.

If testing does not detect the presence of Ethanol in the stormwater contained within the main bund, clean stormwater generated from this catchment will be released to the site's stormwater system for treatment via the proposed Humegard unit.

5.4 Proposed Stormwater Treatment

5.4.1 Treatment Philosophy

Waterways and other aquatic environments are valued by the community for their social, cultural, economic and environmental benefits. Stormwater runoff, contaminated with nutrients, sediment and other pollutants adversely impacts theses valued resources. Water Sensitive Urban Design (WSUD) is a holistic approach to the planning and design of urban landscapes that minimises theses negative impacts. This approach is used on this project to select the treatment options that considers the economical, civil, landscape and ecological aspects of the site.

The treatment train shown in **Figure 5** and **Figure 6** show the site drainage treatment philosophy.

5.4.1.1 Source controls

Rubbish bins can be an effective source control for litter and are appropriate for most developments. Bins will be placed in appropriate areas (such as site office areas amenity areas) to encourage thoughtful waste disposal.

5.4.1.2 Catchment A & B – Gross Pollutant Trap (GPT) Humes Humegard

A Humes Humegard is proposed to treat the stormwater generated from both catchments. A GPT is a treatment device designed to separate and capture litter, vegetation matter, gross pollutants, sediments, silts, total suspended solids, some nutrients and oil & grease from stormwater runoff. GPTs are often used as the first treatment element in a treatment train.

The Humegard unit incorporates a unique floating boom and bypass chamber to enable the continued capture of floating material, even during peak flows. This unit claims to remove 49% of Total Suspended Solids (TSS), 40% of Total Phosphorus (TP), 90% of Gross Pollutants (GP), 29% of Total Nitrogen and 90% of Hydrocarbons.

Catchment A comprises the bunded area housing the 6 Ethanol tanks and the northern areas surrounding this bund. A Humegard HG15 unit is proposed to treat stormwater generated from this catchment. **Figure 5** indicates Catchment A treatment philosophy.

Catchment B comprises the southern areas of the site. A Humegard HG15 unit is proposed to treat stormwater generated from this catchment. **Figure 6** indicates Catchment B treatment philosophy.

Refer to **Appendix C** for details of the Humegard HG15.

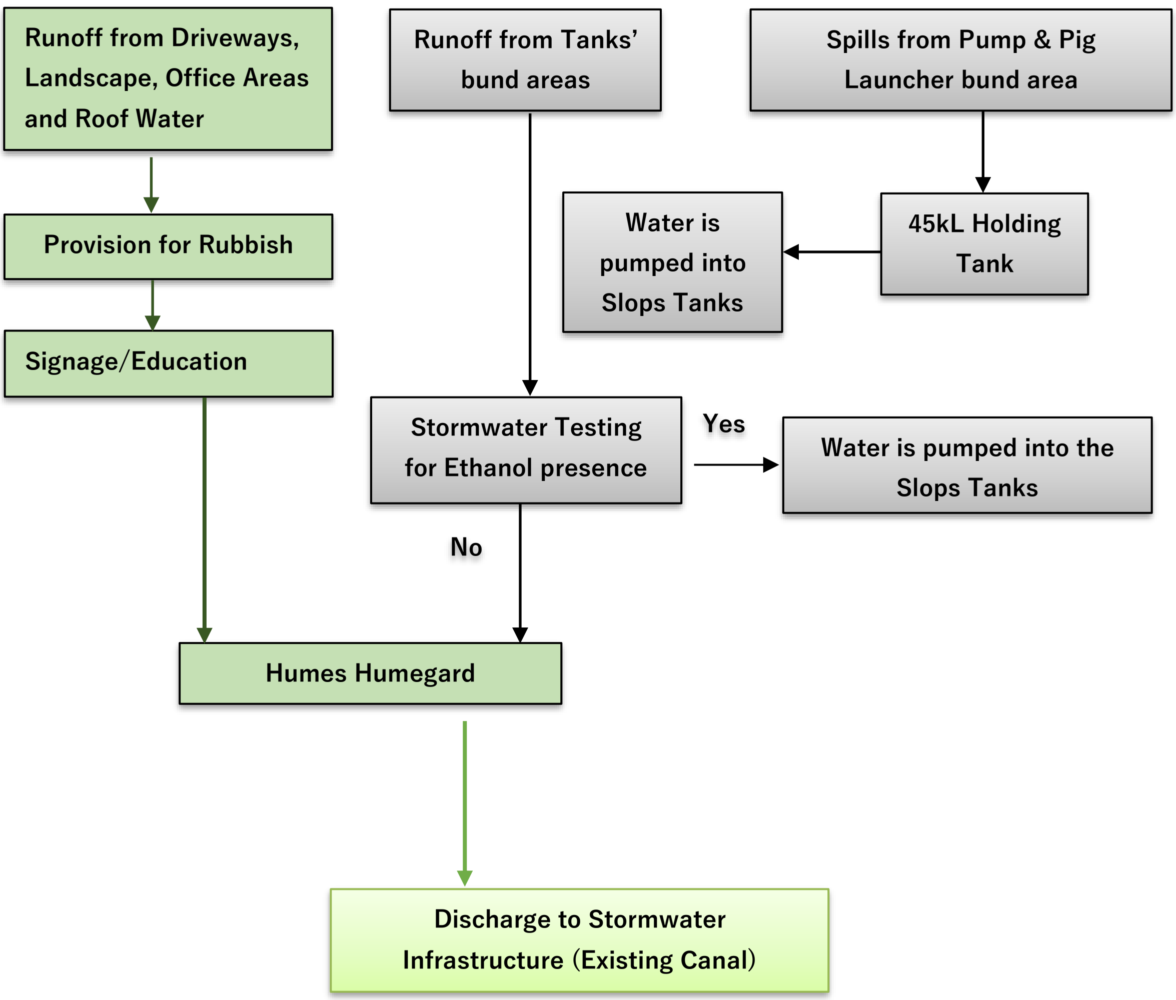


Figure 5: Catchment A Drainage Treatment Philosophy

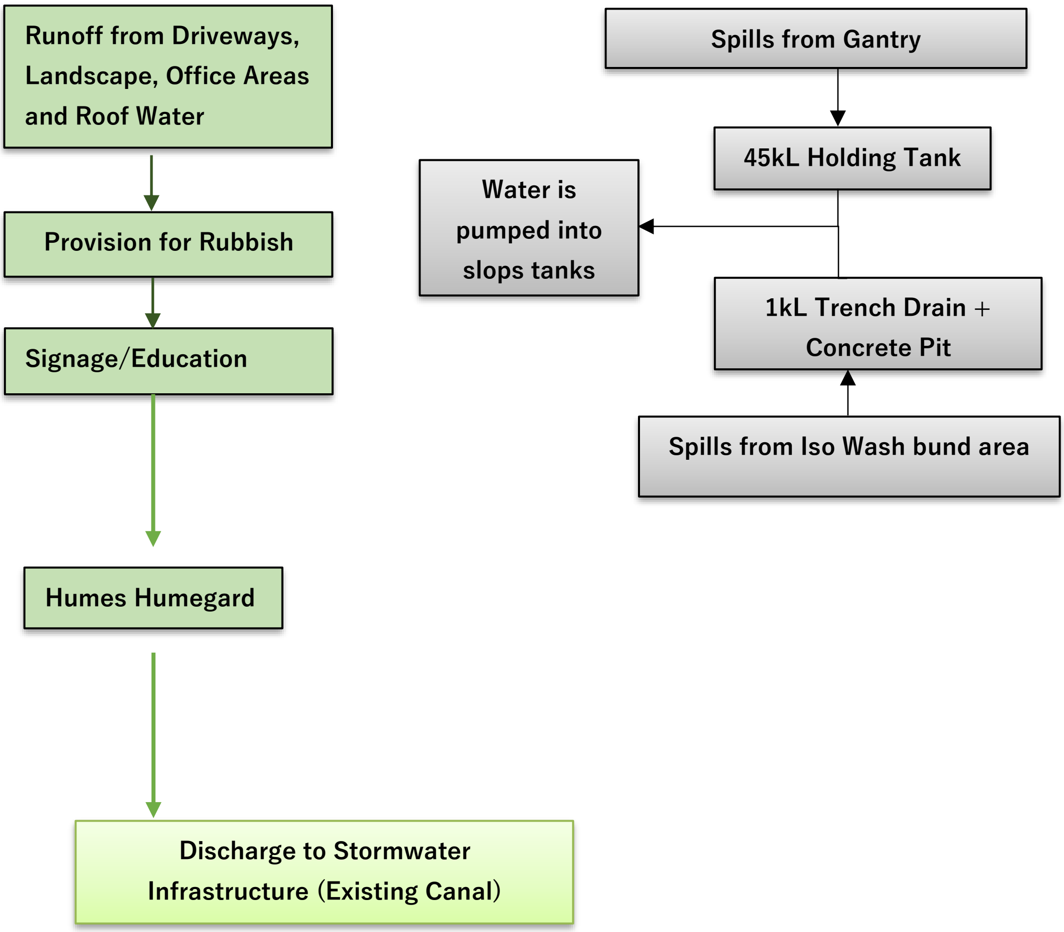


Figure 6: Catchment B Drainage Treatment Philosophy

6.0 SITE MAINTENANCE AND MANAGEMENT PROCEDURES

A regular cleaning/maintenance program will be established for emptying of rubbish bins located around the site, removal of general litter from the site, inspection & cleaning of stormwater gully pits, bunded areas, and the Humegard units. The maintenance plan will address the following:

- Inspection frequency;
- Maintenance frequency;
- Data collection/storage requirements;
- Detailed cleanout and inspection procedures covering aspects such as equipment needs, maintenance techniques, occupational health and safety, environmental management considerations, disposal requirements of pollutants collected and access issues.

6.1 Maintenance Plans for Stormwater Treatment Devices

All stormwater quality improvement systems require maintenance in order to function properly Table 5 shows the basic maintenance requirements for each type of stormwater quality improvement system to be used on the project.

Table 5: Maintenance Requirements

Control	Maintenance Requirement	Maintenance Period
Humes Humegard HG15	The design of the Humegard means that maintenance is best performed by vacuum suction cleaning to remove and safe dispose pollutants/sediments accumulated which avoids entry into the unit.	Inspections should be performed twice a year at a minimum. Vacuum cleaning annually (inspect after major spill)

7.0 LIFECYCLE COSTS

A lifecycle cost analysis is not part of the scope of this report. All the recommended water quality treatment infrastructure lies within the development site and it shall be maintained and serviced by the owners of the development at no cost to the Port Kembla.

8.0 CONCLUSION

A Site Based Stormwater Management Plan has been prepared with respect to the proposed Port Facilities, Bulk Liquid Storage and Pipelines development. The location of the site is shown on Figure 1 and the proposed development site layout is shown in **Appendix A**.

Stormwater Quality- Construction Phase

- An Erosion and Sediment Control Plan aimed at minimising unacceptable impacts during the construction phase will be developed in accordance with the Port Kembla Development Code June 2016 and relevant Australian Standards aiming to minimise unacceptable impacts from occurring during the construction phase.

Stormwater Quality- Operational Phase

- The site will be divided in two separate catchments. Each catchment will have a dedicated Humes Humegard unit (or approved equivalent GPT) to treat the stormwater generated from each catchment (capturing gross pollutants, sediments, silt, total suspended solids, some nutrients and oil and grease) up to a 3 month ARI storm event preventing these pollutants from entering Port Kembla's harbour. Flows above this value will internally bypass treatment.
- Stormwater generated from the storage tanks' bunded area will drain into a main collection chamber located within the bund compound. Testing for the detection of ethanol will be carried out at the chamber to determine the final destination of the water accumulated. Should the results prove that no ethanol is present in the water, the operator will activate a set of pumps to empty the bund and send the water towards catchment A's Humegard for treatment. **Appendix C** for the proposed Conceptual Site Stormwater Management Plan.
- The majority of the site roof water will be captured via rainwater tanks for irrigation purposes.

Flooding

- The site will be raised/filled to ensure that all buildings including offices load in/out gantry, wash bund, etc. have finished surface above the 1% AEP flood level (3.00m AHD/ 3.87m PKHD minimum) to ensure that an adequate level of flood immunity is achieved. In addition, the site grading will also provide unobstructed stormwater overland flow paths during a PMF in accordance with the requirements of Section 11.2.2 of the Port Kembla Development Code – June 2016. Refer Section 4 of this report and **Appendix D** for details

This Site Based Stormwater Management Plan has demonstrated that adequate stormwater and Ethanol spills management principles and techniques will be employed during the construction and operational phases of the development and they will not result in any adverse impacts on external catchments satisfying the requirements of the Port of Kembla Development Code June 2016. The methods proposed are considered to be current best management practice for a development of this type, on this site.

Yours faithfully

Leo Salinas
BEng, MIEAust, CPEng, NER
Civil Engineer
For and on behalf of TfA Group

Reviewed by

Juan Avella
BEng, MIEAust, CPEng, NER
Director Civil/Structural Engineering
For and on behalf of TfA Group

APPENDIX A – PROPOSED DEVELOPMENT LAYOUT

PROJECT MANAGERS | PLANNERS | DESIGNERS | ENGINEERS

TfA Project Group

ACN 612 132 233
Ph: 61 7 3854 2900 Aust Wide: 1300 794 300
Email: enquiry@tfa.com.au Web: www.TfA.com.au

REV	DATE	BY	DESCRIPTION	CHK	APP
A	24.06.21	LCC	PRELIMINARY ISSUE	BV	BP
B	26.07.21	P	PRELIMINARY ISSUE	BV	BP
C	29.07.21	LCC	D.A. ISSUE	BV	BP
D	29.09.21	LCN	RE-ISSUE FOR DA	BV	

PROJECT CLIENT

MANILDRA GROUP
100% AUSTRALIAN OWNED

PROJECT DETAILS

MANILDRA GROUP
PORT KEMBLA
BULK LIQUIDS FACILITY
FORESHORE ROAD
PORT KEMBLA, NSW

DRAWING TITLE

PROPOSED SITE LAYOUT

STATUS

D.A. ISSUE

DATE CREATED	ORIGINAL SCALE	SHEET
24.06.21	1:500	A1

DO NOT SCALE THIS DRAWING. CONFIRM ALL DIMENSIONS ON SITE.

DRAWING NO	REV
20399-DA-A01-D	D

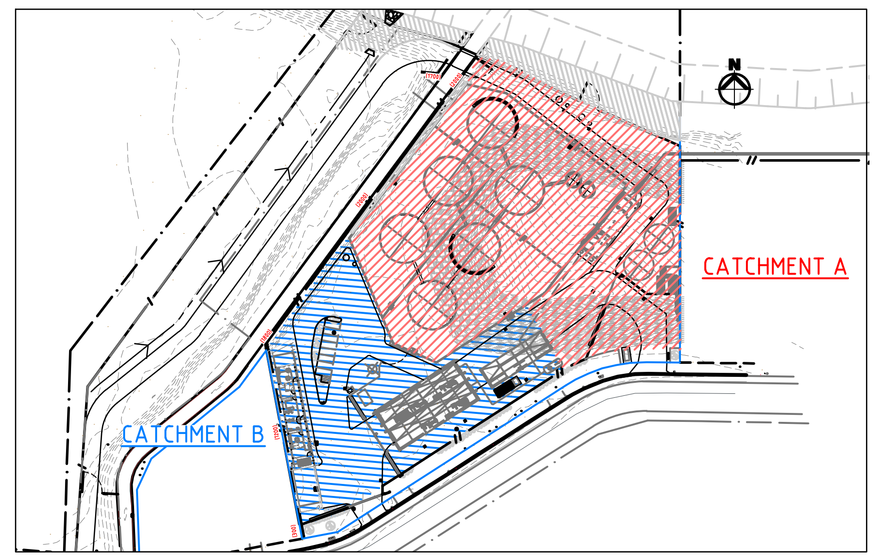
APPENDIX B – CONCEPTUAL STORMWATER MANAGEMENT PLAN

STORMWATER CATCHMENT LEGEND:

- MAIN COMPOUND BUND/CATCHMENT (pink)
- HOLDING TANK CATCHMENT (yellow)
- TREATED CATCHMENT (green)
- UNTREATED CATCHMENT (light blue)
- ISO TANKS WASH BUND CATCHMENT (orange)
- PUMPS & PIG LAUNCHER BUND CATCHMENT (blue)

DRAINAGE & GRADING LEGEND:

SW	UNDERGROUND STORMWATER DRAINAGE
RW	UNDERGROUND RAINWATER
V	UNDERGROUND VALVED CONTROLLED DRAINAGE
	UNDERGROUND DRAINAGE TO HOLDING TANK
	PROPERTY BOUNDARY
	PROPOSED RETAINING WALL
	EXISTING MINOR CONTOURS (0.2m INTERVALS)
15.00	EXISTING MAYOR CONTOURS (1m INTERVALS)
P	PUMP DISCHARGE TO SLOPS TANKS (INDICATIVE ONLY)
P	PUMPED DISCHARGE TO HUMES HUMEGARD
/	SECURITY FENCE
GP	STORMWATER GULLY PIT
GP1	STORMWATER/ETHANOL SPILLS GULLY PIT
VP	COLLECTION PIT
DP	DOWNPIPE
MH	STORMWATER MANHOLE
TD	TRENCH DRAIN.
RWT	RAINWATER TANKS FOR IRRIGATION PURPOSES
(1000)	APPROXIMATE RETAINING WALL HEIGHT
→	DIRECTION OF SURFACE FALL
HT	HOLDING TANK
PS	MAIN COLLECTION CHAMBER
WS	WET SCRUBBER TANK IN A CONCRETE SURFACED BUNDED AREA WITH A VALVED PIT
HW	PROPOSED HEADWALL



MAIN CATCHMENT PLAN

0 10 20 30 40 50m
SCALE 1:1000

NAME: JUAN D. AVELLA DATE: 05.10.2021
PROFESSIONAL QUALIFICATION: MIEAust, CPEng, NER
SIGNATURE:

REV	DATE	BY	DESCRIPTION	CHK	APP
A	14.05.2021	LS	PRELIMINARY ISSUE		
B	19.07.2021	LS	DRAINAGE SYSTEM REVISED		
C	18.08.2021	LS	D.A. ISSUE		
D	05.10.2021	LS	TREATMENT AREAS UPDATED. DIVERSION DRAIN/SWALE ADDED		
E	07.10.2021	LS	HUMES HUMEGARD ADDED INSTEAD OF SPEL VORTCEPTOR		
F	12.10.2021	LS	TREATMENT AREA EXTENDED TO NORTH BOUNDARY		

PROJECT MANAGERS | PLANNERS | DESIGNERS | ENGINEERS

TfA Project Group

ACN 612 132 233
Ph: 61 7 3854 2900 Aust Wide: 1300 794 300
Email: enquiry@tfa.com.au Web: www.TFA.com.au

PROJECT CLIENT: MANILDRA GROUP 100% AUSTRALIAN OWNED

PROJECT DETAILS: MANILDRA GROUP PORT KEMBLA BULK LIQUIDS FACILITY FORESHORE ROAD PORT KEMBLA, NSW

DRAWING TITLE: CONCEPTUAL STORMWATER MANAGEMENT PLAN

STATUS: D.A. ISSUE

DATE CREATED	ORIGINAL SCALE	SHEET
14.05.2021	1:1000	A3

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DRAWING NO	REV
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APPENDIX C – STORMWATER TREATMENT DEVICES

Humes

Strength. Performance. Passion.

HumeGard® GPT Technical manual

Issue 6

Contents

HumeGard® GPT

The HumeGard® system is a Gross Pollutant Trap (GPT) that is specifically designed to remove gross pollutants and coarse sediments ≥ 150 microns, from stormwater runoff. A wide range of models are available to provide solutions for normal and super-critical flow conditions.

The HumeGard® GPT incorporates a unique floating boom and bypass chamber to enable the continued capture of floating material, even during peak flows. The configuration also prevents re-suspension and release of trapped materials during subsequent storm events.

The HumeGard® GPT is designed for residential and commercial developments where litter and sediment are the target pollutants. It is particularly useful in retrofit applications or drainage systems on flat grades where low head loss requirements are critical, and in high backwater situations.

The value of the HumeGard® GPT has proven it to be one of the most successful treatment devices in Australia today:

- **The system provides high performance with negligible head loss**
  The HumeGard® GPT has a head loss 'k' factor of 0.2, important for retrofit and surcharging systems.
- **It captures and stores a large volume of pollutants**
  For pollutant export rates reported by Australia Runoff Quality (1 m^3/hectare/year), the HumeGard® GPT is sized for maintenance intervals up to annual durations.
- **It uses independently proven technology**
  The system was developed and tested by Swinburne University of Technology, Australia, in 1998, to demonstrate compliance with operational criteria from the Victorian EPA. The ability of the HumeGard® to capture and retain Total Suspended Solids (TSS), Total Phosphorous (TP), and Total Nitrogen (TN), was tested in 2015 by Sunshine Coast University.
- **It has low operational velocities**
  Flow velocity in the storage chamber is <0.2 m/s to ensure the comb self-cleans and improves settling of coarse sediment.
- **It retains floating material even in bypass**
  All GPTs bypass at high flows. The floating boom will capture and retain floating materials even when bypass occurs.
- **It provides cost effective treatment for litter and coarse sediments**
  The system's large capacity and long maintenance intervals reduces the overall lifecycle costs in comparison with other treatment measures.
- **It can reduce the footprint of the stormwater treatment train**
  Installation of a HumeGard® GPT prior to vegetated treatment measures can assist in reducing their overall footprint.
- **It maximises above ground land use**
  The HumeGard® GPT is a fully trafficable solution, so it can be installed under pavements and hardstands to maximise land use on constrained sites. Further, customised HumeGard® models can be designed to accommodate almost any design loads.
- **It is easy to maintain**
  Cleanout of the HumeGard® GPT can be performed safely and effectively from the surface using a vacuum truck. A full maintenance procedure is provided as a separate document.
- **It is made from quality componentry**
  All internal metal components are made from 304 stainless steel or fibreglass, and the system undergoes rigorous quality control prior to dispatch. The standard HumeGard® has a design life of 50 years.

System 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 that diverts treatable flows into a lower treatment chamber for settling and capturing coarse pollutants from the flow.

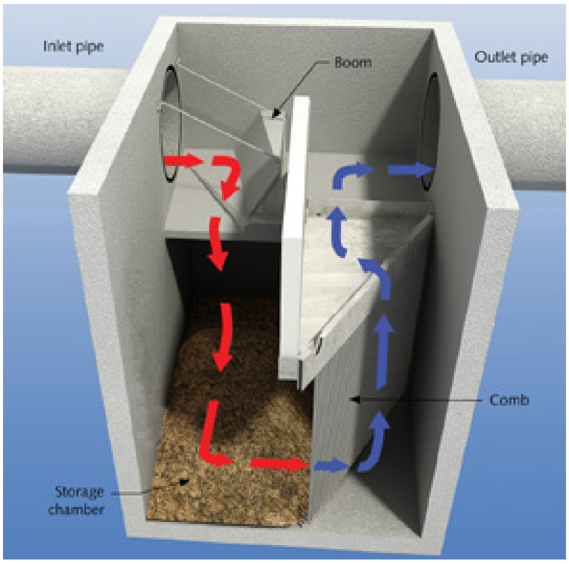
Bypass chamber

1. Stormwater flows into the inlet (boom) area of the bypass chamber (refer to Figure 1).
2. During flows up to and including the design treatment flowrate, the angled boom, acting as a weir, directs the total flow into the storage/ treatment chamber.
3. The treatment flow rate will be exceeded once the depth of flow entering the HumeGard® has reached 50% of the height of the boom. Even during these higher flow conditions, the angled boom continues to direct all floating litter from the bypass chamber into the storage/treatment chamber. The inlet area of the bypass chamber floor is angled towards the treatment chamber to ensure the bed load sediment material continues to be directed into the storage chamber even when the boom is floating.
4. At peak design flows, the boom remains semi-submerged and enables excess flow to pass underneath, regulating the flow into the storage/ treatment chamber. This ensures that higher flows, which could otherwise scour and re-suspend previously trapped materials, are not forced into the storage/treatment chamber. The floating boom bypass ensures previously trapped floating materials are retained. Each HumeGard® GPT is designed to achieve an operating velocity below 0.2 m/s through the storage chamber to ensure the settling of coarse sediment and keep the comb clean.

Treatment chamber

1. Once diverted into the treatment chamber, the flow continues underneath the internal baffle wall, passes through the stainless steel comb and flows over the flow controlling weir to the outlet.
2. Pollutants with a specific gravity less than water (S.G.<1) remain floating on the water surface in the storage/treatment chamber. Sediment and other materials heavier than water (S.G.>1) settle to the bottom of the chamber. The design and depth of the chamber minimises turbulent eddy currents and prevents re-suspension of settled material. The comb prevents any neutrally buoyant litter in the treatment chamber from escaping under the baffle wall.

Figure 1 – Operation during design flow conditions



Independent verification testing

Laboratory and field testing of the HumeGard® GPT for hydraulic performance and litter capture was conducted in Australia by Swinburne University of Technology, during 1996 and 1998.

Laboratory and field testing (Waste Management Council of Victoria 1998, Trinh 2007, Woods 2005, Swinburne University of Technology 2000) has proven the performance outlined in Table 1 below.

Further field testing was conducted by the University of the Sunshine Coast from 2013 to 2015, including a minimum of 15 qualifying storm events, to determine TSS, TP and TN removal efficiencies, which are also outlined in Table 1 below.

Table 1 – HumeGard® GPT performance summary

Pollutant	Removal efficiency	Details
Gross pollutants (litter, vegetation)	90%	Annually
TSS	49%	Annually (including bypass)
Hydrocarbons	90%	In an emergency spill event
TP	40%	Particulate-bound
TN	26%	Particulate-bound

Notes:

1. Nutrient removal is influenced by individual catchment characteristics and partitioning between dissolved and particulate nitrogen.
2. For further details on performance testing contact Humes.
3. Gross pollutant traps are not specifically designed to capture hydrocarbons, though may do so during emergency spill events. When this occurs, maintenance is required immediately.
4. The unique design of the HumeGard® floating boom allows it to be modified to treat higher flows and capture more gross pollutants and sediment on request.

System options

A wide range of sizes are available to suit catchment pollutant generation rates and Water Quality Objectives (WQO). Table 2 below presents the standard model dimensions and total storage chamber volume. We recommend that designers contact Humes Water Solutions for detailed sizing on each project and for advice with larger units.

Pollutant export rates detailed in Australian Runoff Quality (Engineers Australia 2006) suggests that a typical urban catchment will produce 1 m^3/hectare/year of gross pollutants and sediment. Humes Water Solutions advises that this be taken into account when selecting an appropriate model.

Table 2 – HumeGard® model range and dimensions

HumeGard® model	Treatment flow rate (L/s)	Storage chamber volume (m^3)	Pipe DN @ max. pipe grade %		
			0 - 1%	> 1 - 2.5%	> 2.5% - 5%
HG12	85	3	375	300	300
HG12A	100	3	450	375	375
HG15	130	3	525	450	450
HG15A	150	3	600	525	525
HG18	600	3	675	600	600
HG24	1,050	8	750	675	675
HG27	1,110	7	900	825	750
HG30	1,330	12	1050	900	825
HG30A	1,160	11	900	900	825
HG35	1,540	12	1050	1,050	900
HG35A	1,370	11	1050	900	900
HG40	1,910	16	1,200	1,200	900
HG40A	1,750	14	1,200	1,050	1,050
HG40B	1,580	12	1,200	1,050	900
HG45	1,960	19	1,500	1,350	1,200
HG45A	1,780	19	1,350	1,350	1,200
HG50 and above	Custom				

Notes:

1. The unique design of the HumeGard® floating boom allows it to be modified to treat a wide range of flowrates. Contact Humes for details on the model to suit your project.
2. HumeGard® can be modified to suit a box culvert, larger pipe or skewed outlet. Please contact your Humes Water Solutions Manager.
3. HumeGard® should be sized for either pipe diameter or treatment flow rate.
4. Units listed are standard configurations. Custom units can be provided to meet specific project requirements.
5. For confirmation of HumeGard® sizing or to discuss project specific requirements please contact your Humes Water Solutions Manager.
6. Refer to current Humes Terms and Conditions of Sale.
7. Australian Rainfall Quality recommend a pollutant export rate for a typical residential catchment is up to 1m^3/ha/yr of mixed waste and sediment.
8. HumeGard® can be modified to suit typical tail-water effects from downstream areas such as basins. Please contact Humes for design advice.
9. HumeGard® can be modified to suit high groundwater conditions. Please contact Humes for design advice.

Variants

A number of additional innovations have been made to the HumeGard® GPT to facilitate their effective operation in a wider range of applications:

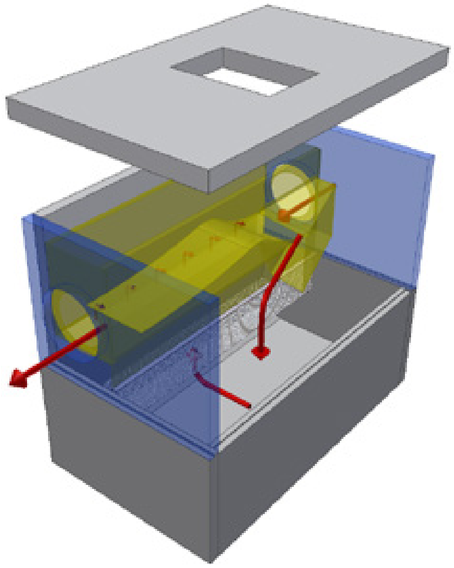
- Super-critical HumeGard® GPT – designed to operate under supercritical flow conditions in steep, high velocity drainage networks.
- Angled HumeGard® GPT – designed to replace a 45° or 90° junction in a drainage network.
- Dual outlet HumeGard® GPT – designed to divert the treatment flow to downstream natural Water Sensitive Urban Design (WSUD) elements such as wetlands and bio-retention whilst bypassing excess flows through a second outlet.

- **Super-critical HumeGard® GPT**

  The super-critical HumeGard® GPT (refer to Figure 2) was borne out of the original HumeGard® GPT, with modifications to deliver even greater performance under super-critical flow conditions. This model replaces the floating boom with a broad-crested weir that diverts the treatment flows into the treatment chamber under super-critical flow (Fr>1) conditions without creating hydraulic jumps and adversely impacting on performance.

  Flow into the treatment chamber passes through a stainless steel screen at a velocity <0.2 m/s and exits the device via a slot beneath the broad-crested weir (refer to the red arrows in Figure 2). The inserts in these models are manufactured from fibreglass for increased durability. The stainless steel screen can be shaped with a curved profile upon request. When the treatment flow rate is exceeded, the excess flow bypasses over the broad-crested weir to the outlet. This maintains the treatment flow into the chamber but protects against scour of captured material.

Figure 2 – Super-critical HumeGard® GPT



- **Angled HumeGard® GPT**
  The angled HumeGard® GPT (refer to Figure 3), was developed to facilitate the replacement of junction pits while still providing the treatment capabilities of the original HumeGard® device. These units simply alter the outlet location to allow for a change of pipe direction of 45° or 90°. The Angled HumeGard® GPT can be supplied in any of the standard unit sizes, however, the designer must allow for a minor head loss factor 'k' of 1.3 instead of 0.2 (which applies to the standard HumeGard® GPT design).

- **Dual Outlet HumeGard® GPT**
  The Dual Outlet HumeGard® GPT has been designed to operate as a diversion structure upstream of natural WSUD options such as constructed wetlands, ponds, lakes, and bio-retention systems.

  The units are designed such that one outlet conveys the treated flow into the natural WSUD measure and the standard outlet bypasses the excess flow around the downstream system (refer to Figure 4). Dual Outlet HumeGard® units are available in the same sizes as the standard HumeGard® units (refer Table 2 on page 4).

Figure 3 – Angled HumeGard® GPT

Figure 4 – Dual Outlet HumeGard® GPT

Inundation/tidal applications

The boom of the HumeGard® GPT enables the capture of floating pollutants even at peak flows, often when other fixed weir devices are in bypass mode. This unique feature also makes the HumeGard® GPT ideal for applications that are subject to both tidal and tail water effects.

In tidal applications the floating boom effectively traps the floating pollutants and prevents the loss of the gross pollutants from the system. In fixed weir devices, previously trapped floating litter may be backwashed out of the GPTs during the rising phase, to later bypass the GPT during the falling phase of the tide. As this happens twice daily, spring tides could quickly empty devices relying upon a fixed weir.

Marine grade 316 stainless steel is used for all internals in devices installed in tidal applications. In acidic/aggressive environments, these may also be epoxy-coated. Contact Humes Water Solutions for specific designs to suit these applications.

A plinth can also be added to the false floor under the boom to ensure sediment loads are captured and retained during inundation.

Design information

To design a system suitable for your project it is necessary to review the configuration of the stormwater system, the location and purpose of other stormwater management (WSUD) controls, the catchment area and the hydrology.

Configuration of the stormwater system

The configuration of the stormwater system is important since the HumeGard® GPT operates with an "in-line", 45° or 90° alignment. Inlet pipe grades between 0.5% and 5% are recommended for at least five pipe diameters upstream of the HumeGard® GPT. The pipe grade and flow velocity will determine whether a super-critical unit is required.

Location in the stormwater system

Depending upon the site, the GPT can be oriented to have the treatment chamber on the left or right side of the pipe to suit constraints. Humes Water Solutions can work closely with stormwater designers to select the appropriate location and orientation for their system.

Catchment area

Research presented in Australian Runoff Quality (Engineers Australia 2006) concluded that roughly 1 m^3/hectare/year of gross pollutants and sediment could be expected from a typical residential catchment. Therefore, GPTs designed for an annual maintenance interval should have a pollutant storage capacity roughly equal to the number of hectares of catchment it treats (e.g. 10 hectare catchment = 10 m^3 pollutant storage).

Sizing HumeGard® GPTs

The large storage volumes of the HumeGard® GPT enables more pollutants to be captured before maintenance is required, which greatly reduces its lifecycle costs. In accordance with accepted hydraulic principles the larger volumes in the HumeGard® GPT results in lower velocities through the device, minimising scour and re-suspension of sediment.

Humes Water Solutions has developed a design request form (see page 30) for stormwater designers to complete and return to obtain a detailed design of the appropriate device.

MUSIC/pollutant export model inputs

Many local authorities utilise MUSIC or other pollutant export models to assist in stormwater treatment train selection, and recommend generic inputs for GPTs. Considering these against the independent research results, the following conservative removal efficiencies (refer to Table 3 below) are recommended for the HumeGard® GPT on an annual basis (i.e. no bypass).

Table 3 – MUSIC inputs for HumeGard® GPTs

Pollutant	Removal efficiency
Gross pollutants (litter, vegetation)	90%
TSS	49%
TP	40%
TN	26%

System installation

The installation of the HumeGard® unit should conform to the local authority's specifications for stormwater pit construction. Detailed installation instructions are dispatched with each unit.

The HumeGard® unit is installed as follows:

1. Prepare the excavation according to plans.
2. Prepare the compacted aggregate base.
3. Install the main treatment chamber section.
4. Install the main bypass chamber section/s (if required).
5. Fit the stainless steel comb (if required).
6. Connect the inlet and outlet pipes.
7. Place the main chamber lid.
8. Install the frame and access covers.
9. Backfill to specified requirements.

Top:
Preparing the aggregate base (Step 2)

Middle:
Installing the main bypass chamber (Step 4)

Bottom:
Placing the main chamber lid (Step 7)

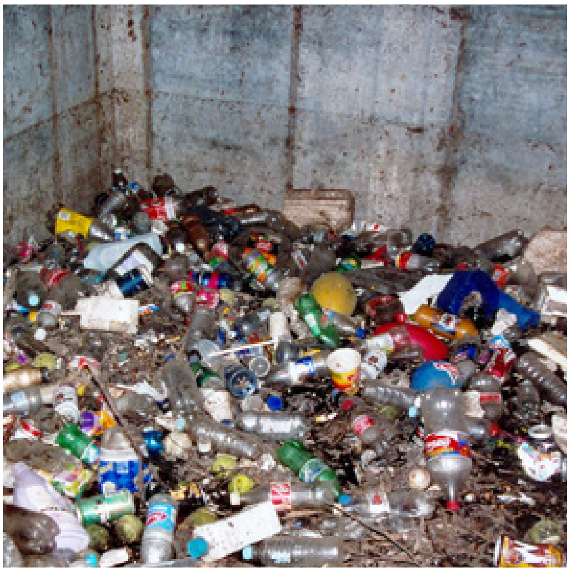
System maintenance

The design of the HumeGard® GPT means that maintenance is best performed by vacuum trucks which avoids entry into the unit.

Additional access covers can be designed upon request.

A typical maintenance procedure includes:

1. Remove access covers.
2. With a vacuum hose, remove the floating litter from the treatment chamber.
3. Determine the depth of water and sediment layers.
4. Insert sluice gate into the upstream manhole.
5. Decant water from the treatment chamber into the upstream manhole until the sediment layer is exposed.
6. Remove the sediment layer with the vacuum hose; jet with a high pressure hose if required.
7. Remove sluice gate from the upstream manhole and allow water to return to the HumeGard® GPT.
8. Replace access covers.



Left:
Floating litter captured in the treatment chamber

FAQs

- **Can the boom become stuck?**
  The boom can weight up to hundreds of kilograms depending on the model, with the smallest boom in the HG18 weighing in at 35 kg. Unless there is a large branch, car wheel, or other large item carried through the drainage network, the mass of the boom will ensure it returns to the floor.
- **Will the gross pollutants bypass when the boom floats?**
  All treatment measures are designed to treat a specific flow. Once this is exceeded, any entrained pollutants in the flow will bypass the treatment chamber. Often this is less than 5% of the annual load. A significant quantity of gross pollutants are buoyant when entering a GPT and, unlike fixed weir systems which bypass these floatable items, the HumeGard® boom provides continuous treatment of them, even in bypass.
- **Will the retention of water in the treatment chamber lead to the release of nutrients as pollutants break down?**
  Over time, captured organic materials will breakdown and release nutrients in all treatment measures whether natural or manufactured. As part of a treatment train, downstream vegetated measures can remove the small proportion of nutrients released during dry weather flows. A regular maintenance program will reduce the amount of breakdown occurring.
- **What is the design life of a HumeGard® GPT?**
  The entire product is designed to last a minimum of 50 years.
- **Why is the HumeGard® GPT larger than other GPTs?**
  The design of the HumeGard® GPT is to ensure a velocity through the treatment chamber <0.2 m/s to ensure the comb self-cleans and the coarse sediments settle in the sump. From engineering principles, a larger cross-sectional area is required to reduce the loading rate. As proven by Stokes Law, lower chamber velocities mean smaller sediment particles can be captured.
- **Why would I use a HumeGard® GPT upstream of a biofilter?**
  Using a HumeGard® GPT upstream of a biofilter acts as a sediment forebay and removes litter, containing it to a confined location for easy removal by a vacuum truck. This protects the biofilter, lengthens its lifespan and reduces the ongoing maintenance costs.

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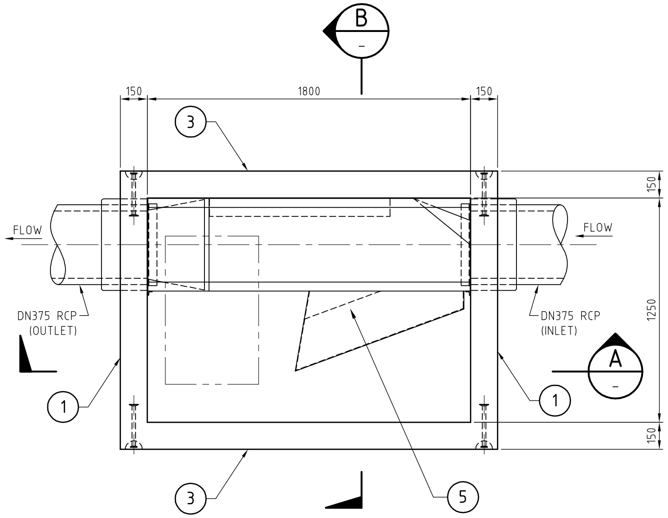
- Engineers Australia (2006) “Australian Runoff Quality”.
- Lucke, T. 2015, Characterisation of Water Quality Improvement Processes by GPTs at University of the Sunshine Coast (Humegard HG27 Monitoring Program), School of Science and Engineering, University of the Sunshine Coast, QLD, Australia.
- Nichols P., & Lucke T., 2016, Field Evaluation of the Nutrient Removal Performance of a Gross Pollutant Trap (GPT) in Australia, Sustainability, 8, 669; doi:10.3390/su8070669

Appendix

HumeGard® GPT technical drawings

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	—	RM

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG12-20
2	BASE SLAB	HG12-21
3	SIDE WALL	HG12-22
4	PRECAST LID	HG12-07
5	GRP INSERT ASSEMBLY DETAILS	HG12A/L-08



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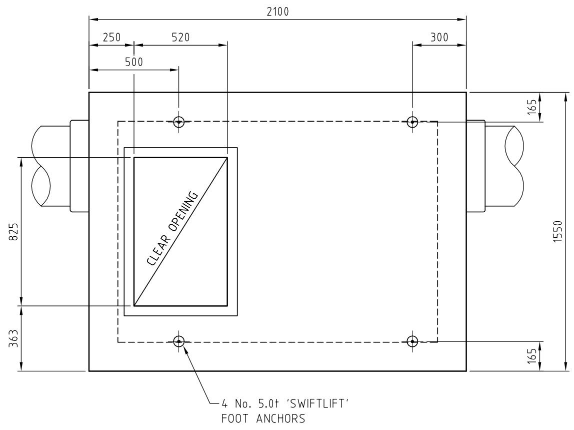

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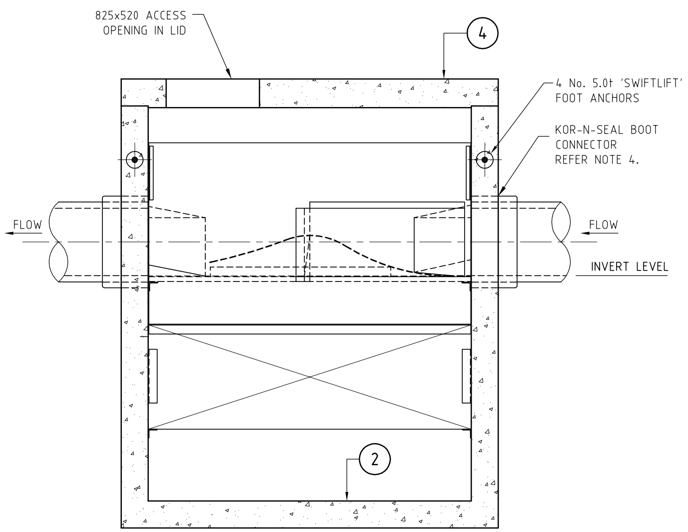

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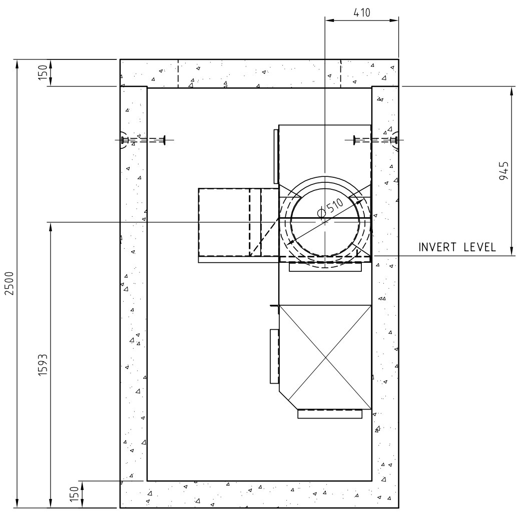

SECTION B
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NOTES

1. GRP INSERT MANUFACTURED FROM 5mm GRP.
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.0t (WITHOUT LID)
   LID = 1.2t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S106-20WP
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

DSN.	WST	02-09-10
DWN.	MZ	02-09-10
CKD.	RM	—
APP.	WST	—

SUPERSEDES HG12A/L-01 ISSUE 1

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG12A/L
DN375/DN375 RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
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3	SIDE WALL	HG12-22
4	PRECAST LID	HG12-07
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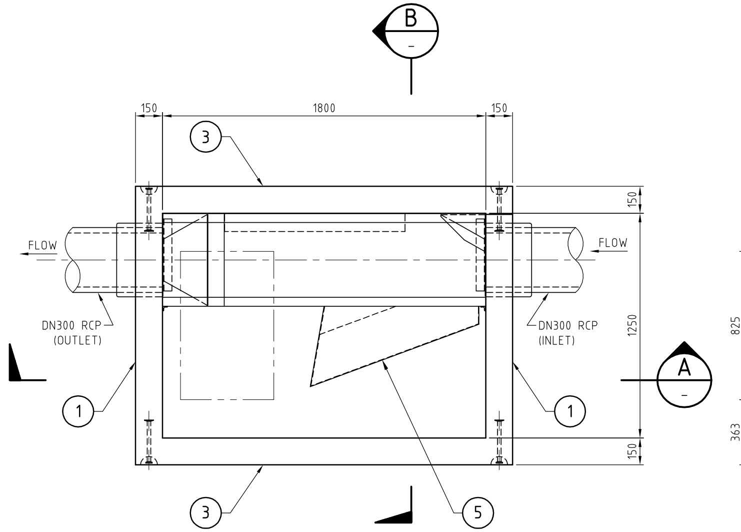

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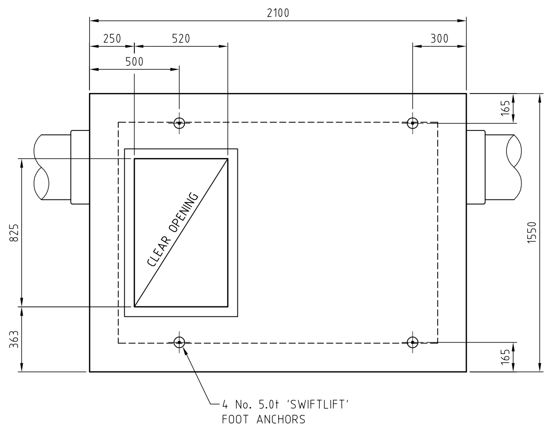

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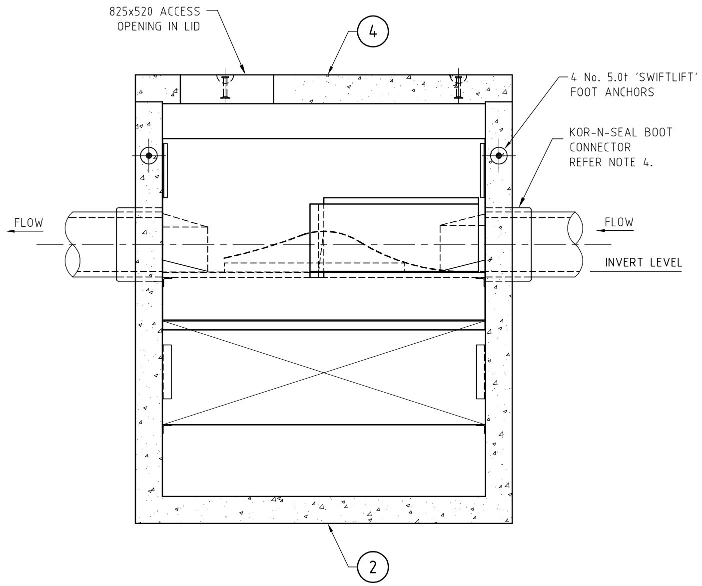

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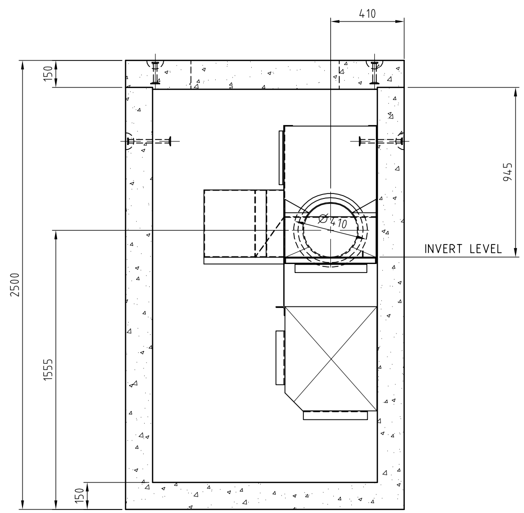

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NOTES

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3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.0t (WITHOUT LID)
   LID = 1.2t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S106-16WP

. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES
BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

DSN.	WST	14-03-07
DWN.	MZ	14-03-07
CKD.	RM	—
APP.	WST	—

SUPERSEDES HG12/L-01 REV 1

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG12/L
DN300/DN300 RCP
GENERAL ASSEMBLY

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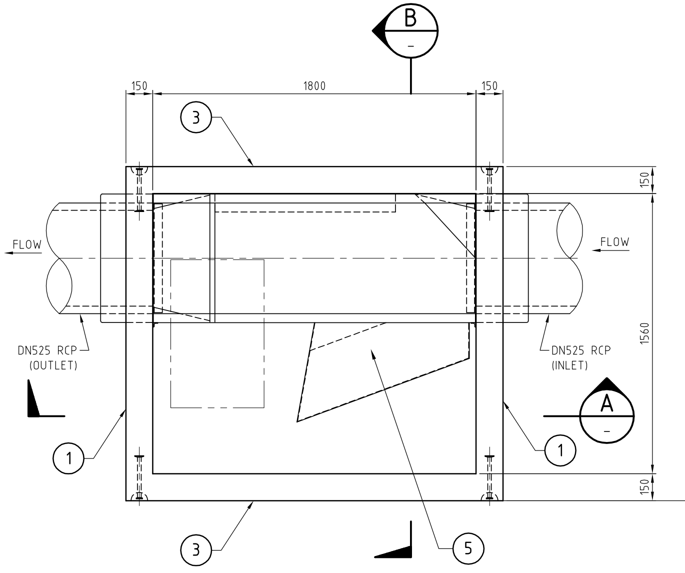

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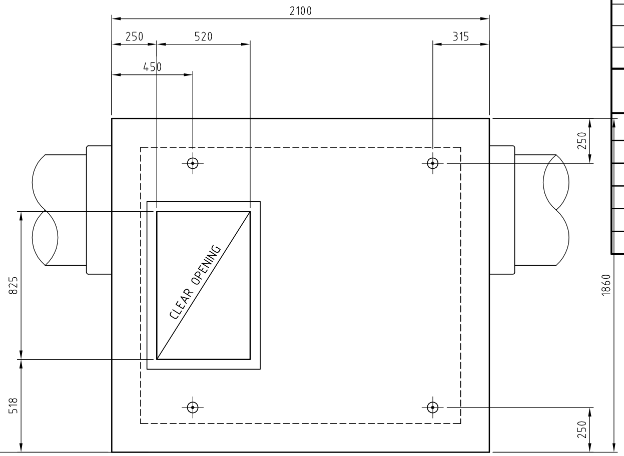

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2	BASE SLAB	HG15-21
3	SIDE WALL	HG15-22
4	PRECAST LID	HG15-07
5	GRP INSERT ASSEMBLY DETAILS	HG15A/L-08

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1. GRP INSERT MANUFACTURED FROM 5mm .
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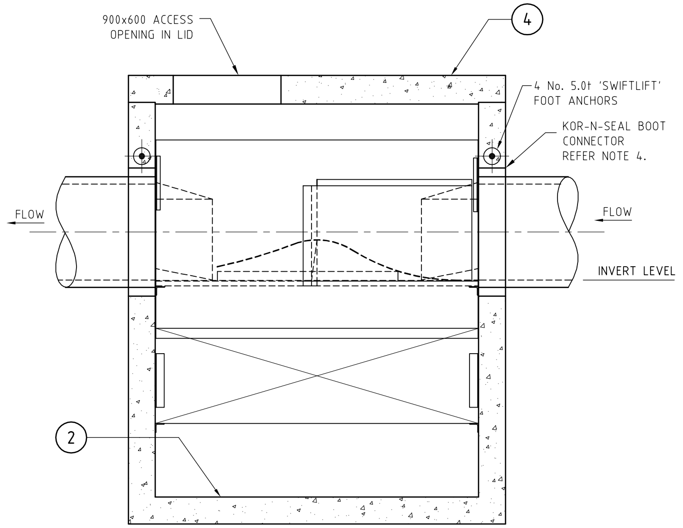
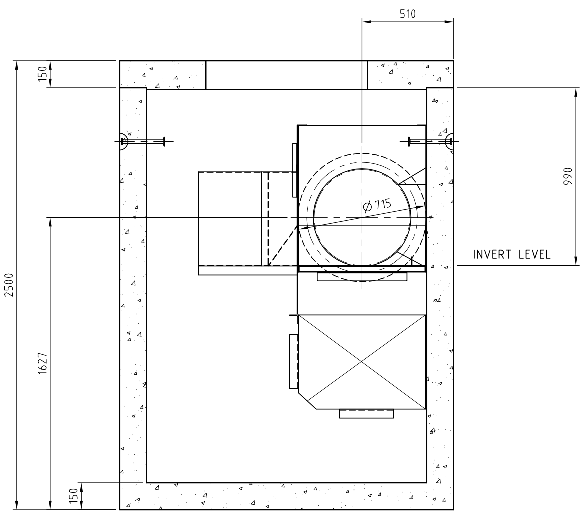
   LID = 1.4t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S206-28
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE.



SECTION A
SCALE 1:20



SECTION B
SCALE 1:20

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL SERVICES
BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

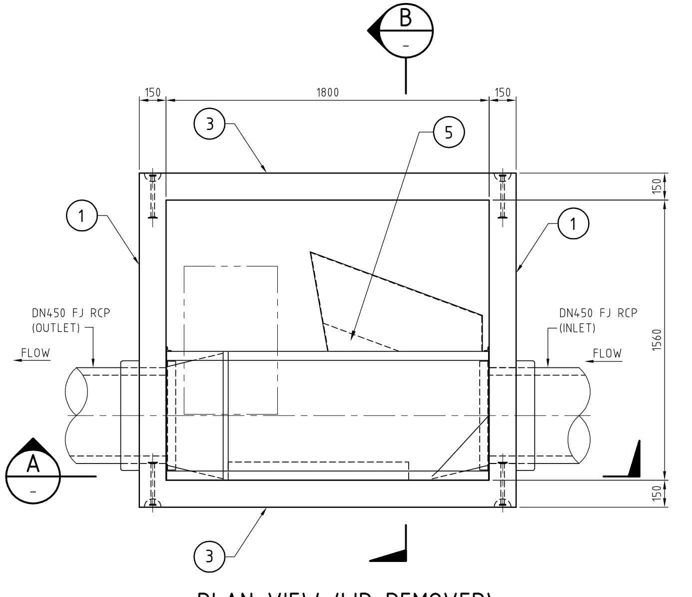
DSN.	WST	07-09-10
DWN.	MZ	07-09-10
CKD.	RM	—
APP.	WST	—
SUPERSEDES	HG15A/L-01 ISSUE 1	

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG15A/L
DN525/DN525 RCP
GENERAL ASSEMBLY

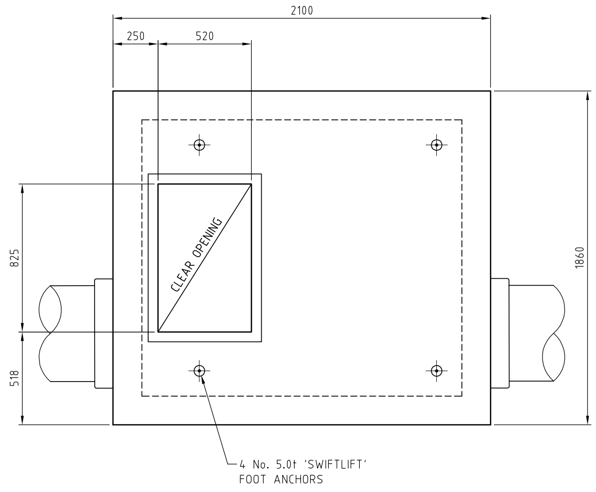
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG15A/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	GENERAL REVISION	MZ	——	DFW

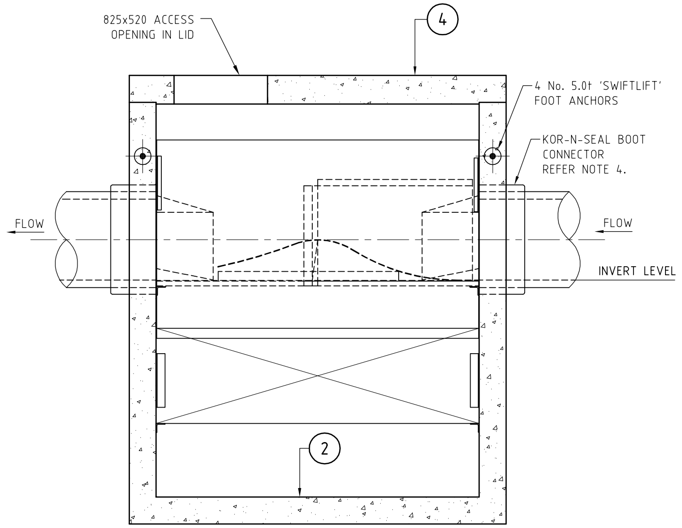
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG15-20
2	BASE SLAB	HG15-21
3	SIDE WALL	HG15-22
4	PRECAST LID	HG15-07
5	GRP INSERT ASSEMBLY DETAILS	HG15/R-08



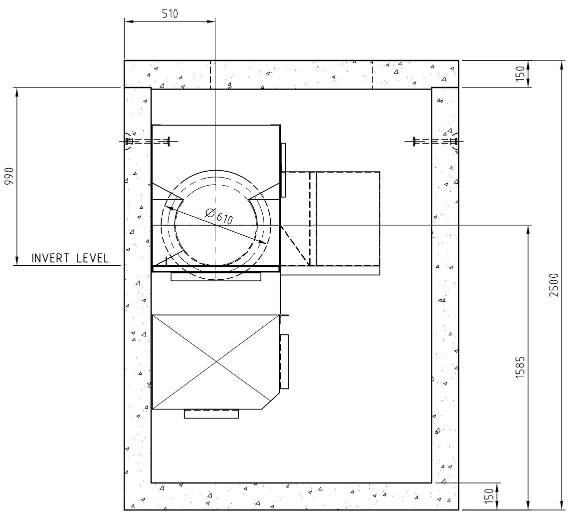
PLAN VIEW (LID REMOVED)
SCALE 1:20



PLAN ON LID
SCALE 1:20



SECTION A
SCALE 1:20



SECTION B
SCALE 1:20

NOTES

1. GRP INSERT MANUFACTURED FROM 5mm GRP.
2. ALL CONCRETE COMPONENTS TO BE HANDLED VIA CAST-IN SWIFTLIFT ANCHORS AT ALL TIMES.
3. UNIT MASS: CHAMBER (ASSEMBLED) = 7.7t (WITHOUT LID)
   LID = 1.5t
4. KOR-N-SEAL BOOT CONNECTOR P/N = S106-24WP
5. SEE DRAWING HG-CAST 2 FOR CASTING SEQUENCE

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH M1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

CEMEX Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	10-07-08
DWN.	MZ	10-07-08
CKD.	DFW	——
APP.	WST	——

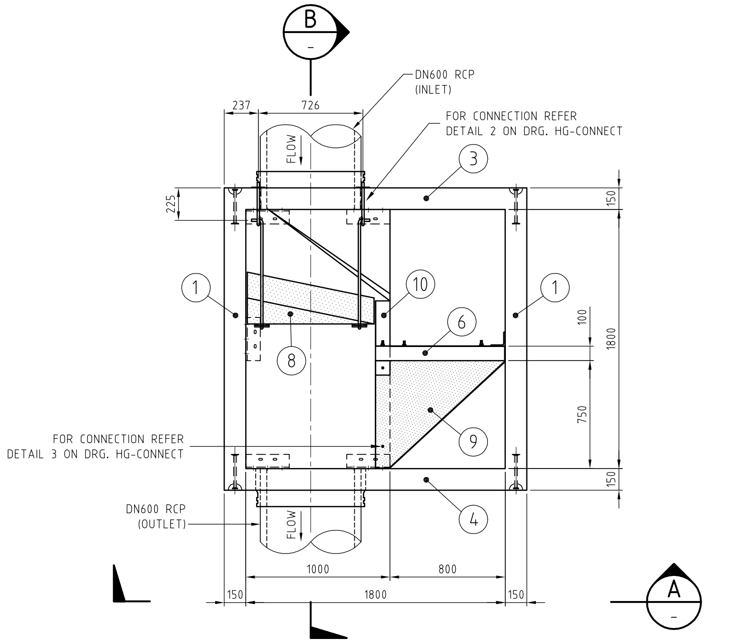
SUPERSEDES HG15/R-01 REV 1

HUMES
STANDARD DRAWING
HUMEGARD HG15/R
DN450/DN450 FJ RCP
GENERAL ASSEMBLY

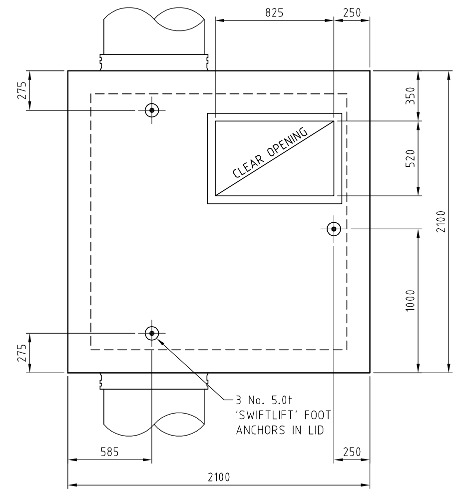
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG15/R-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
3	REFERENCE DWG No. REVISED - REISSUED FOR MANUFACTURE	MZ	24-11-10	RM

ITEM No	DRAWING DESCRIPTION	DWG No
1	END WALL	HG18-02
2	BASE SLAB	HG18-03 (3)
3, 4	SIDE WALL	HG18-04
5	FALSE FLOOR	HG18/L-05
6	CONCRETE BAFFLE WALL	HG18/L-05
7	PRECAST LID	HG18/L-06
8	FLOATING BOOM	HG18/L-07
9	WEIR	HG18/L-08
10	BAFFLE SIDE WALL	HG18/L-09
11	COMB	HG18/L-10



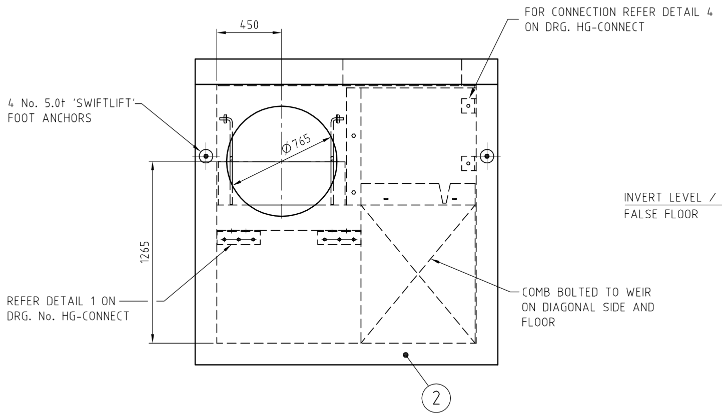
PLAN VIEW (LID REMOVED)
SCALE 1:25



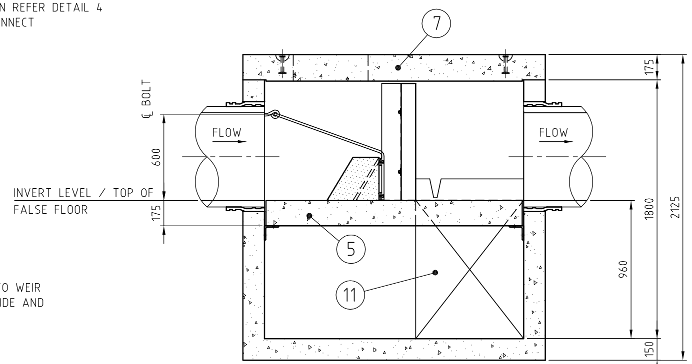
PLAN ON LID
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 7.8 t (WITHOUT LID).
   MASS OF LID = 1.9 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-30L (INLET & OUTLET)



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

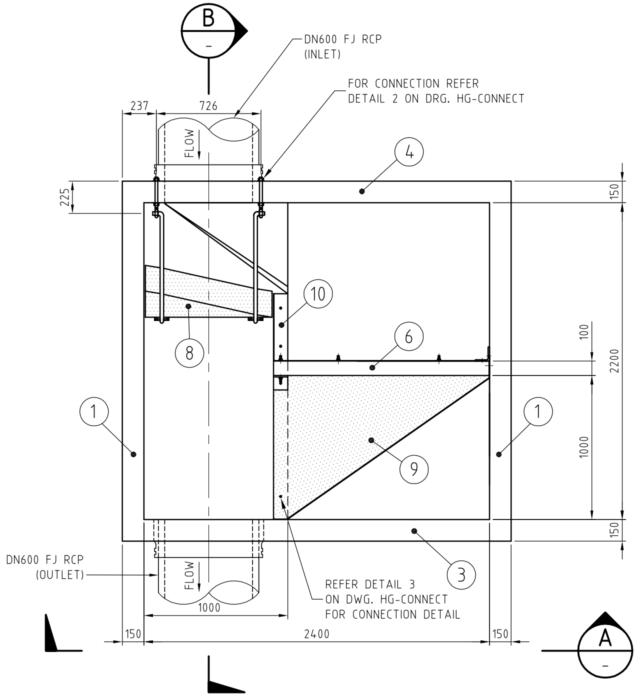
Humes TECHNICAL SERVICES BRISBANE, QUEENSLAND

DSN.	WST	24-11-10
DWN.	MZ	24-11-10
CKD.	RM	24-11-10
APP.	WST	24-11-10

SUPERSEDES HG18/L-01 REV. 2

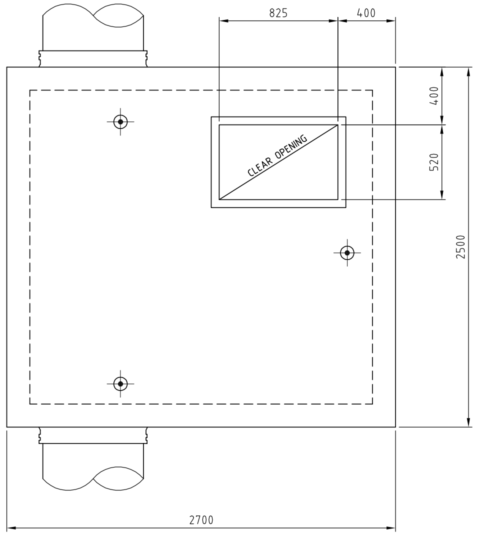
HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG18/L
DN600/DN600 RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG18/L-01	3



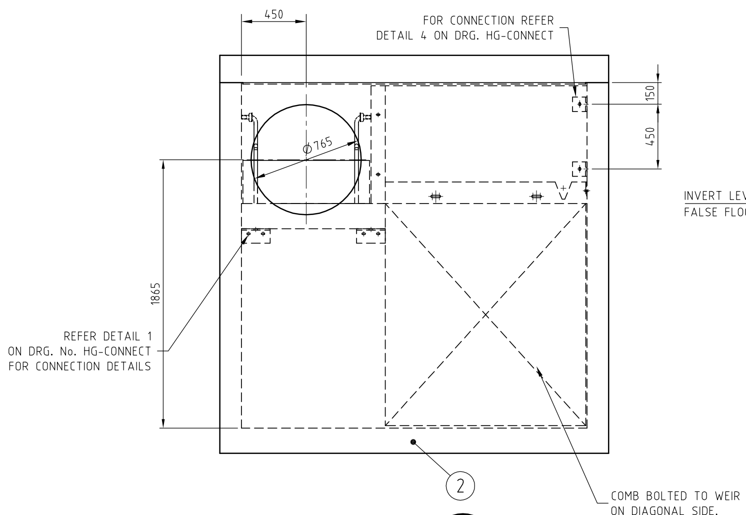
PLAN VIEW (LID REMOVED)

SCALE 1:25



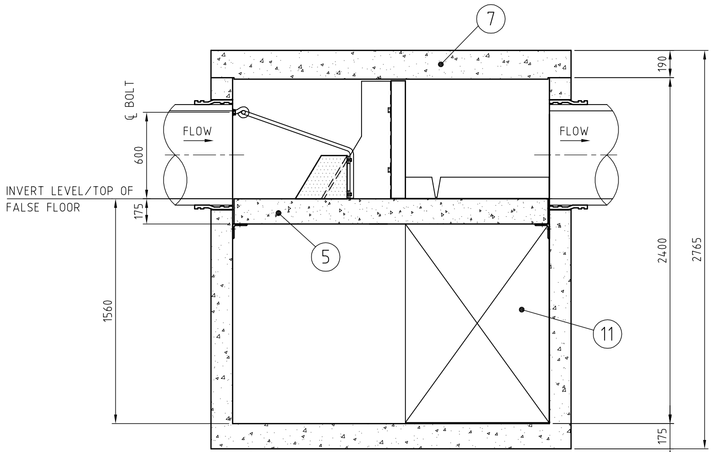
PLAN ON LID

SCALE 1:25



VIEW A

SCALE 1:25



SECTION B

SCALE 1:25

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG24/L-02
2	BASE SLAB	HG24/L-03
3, 4	SIDE WALL	HG24/L-04
5	FALSE FLOOR	HG24/L-05
6	CONCRETE BAFFLE WALL	HG24/L-05
7	PRECAST LID	HG24/L-06
8	FLOATING BOOM	HG24/L-07
9	WEIR	HG24/L-08
10	BAFFLE SIDE WALL	HG24/L-09
11	COMB	HG24/L-10
	SITE LAYOUT	HG24/L-11

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 13.0 t (WITHOUT LID).
   MASS OF LID = 3.2 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-30L (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

Rinker Australia Pty Limited ABN 87 099 732 297

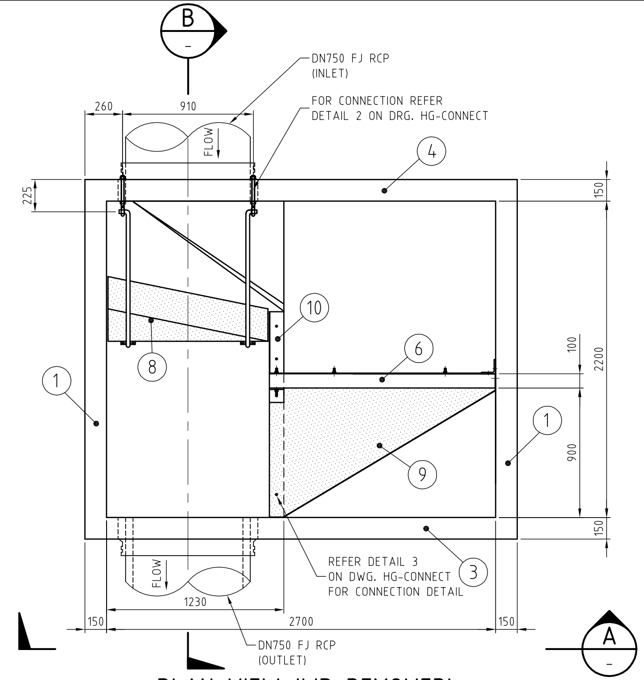
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES
STANDARD DRAWING
HUMEGARD HG24/L DN600/DN600 FJ RCP
GENERAL ASSEMBLY

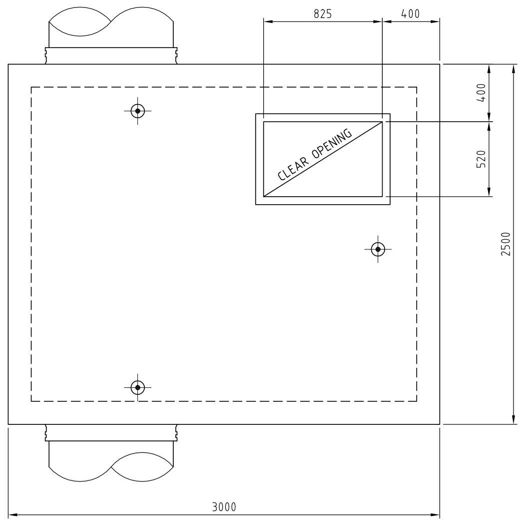
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG24/L-01 REV. 0	1:1	A2	HG24/L-01	1

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW

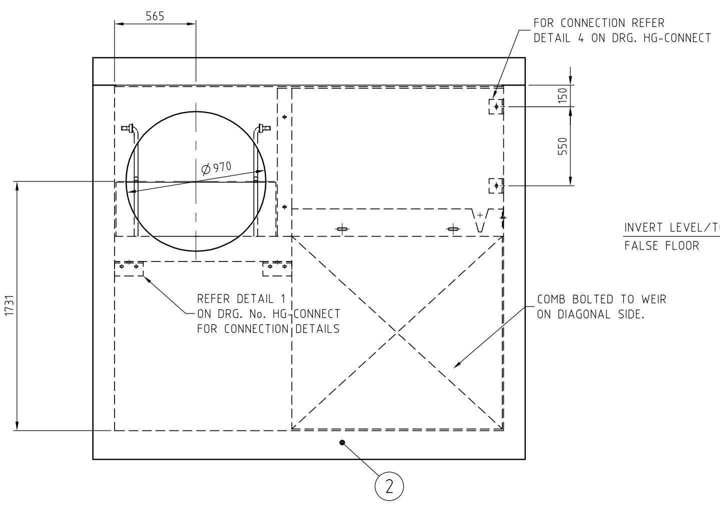
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG27/L-02
2	BASE SLAB	HG27/L-03
3, 4	SIDE WALL	HG27/L-04
5	FALSE FLOOR	HG27/L-05
6	CONCRETE BAFFLE WALL	HG27/L-05
7	PRECAST LID	HG27/L-06
8	FLOATING BOOM	HG27/L-07
9	WEIR	HG27/L-08
10	BAFFLE SIDE WALL	HG27/L-09
11	COMB	HG27/L-10
	SITE LAYOUT	HG27/L-11



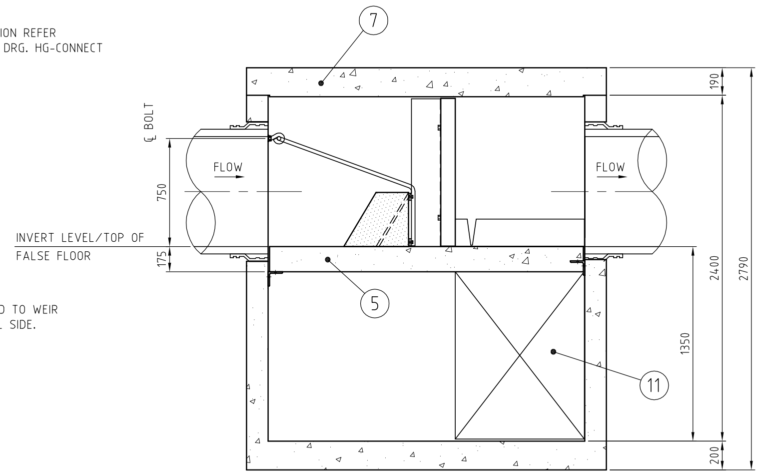
PLAN VIEW (LID REMOVED)
SCALE 1:25



PLAN ON LID
SCALE 1:25



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 14.4 t (WITHOUT LID).
   MASS OF LID = 3.6 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-38 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

Rinker Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	SG	12-03-07

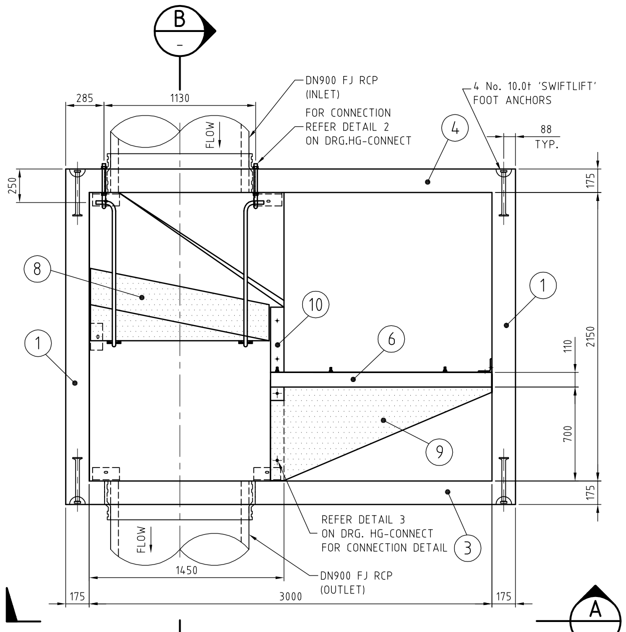
SUPERSEDES HG27/L-01 REV. 0

HUMES
STANDARD DRAWING
HUMEGARD HG27/L DN750/DN750 FJ RCP
GENERAL ASSEMBLY

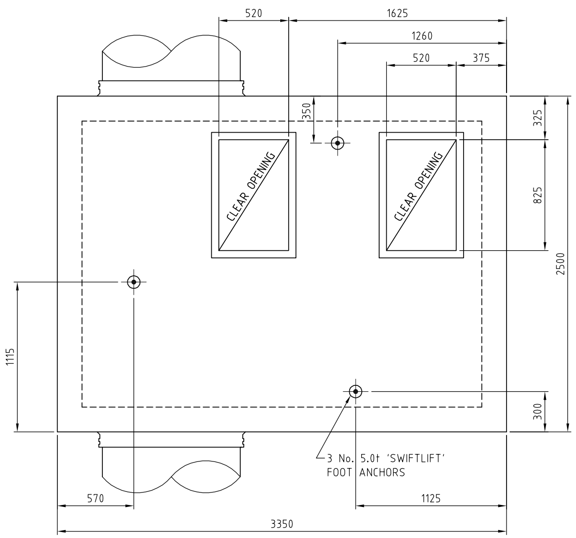
PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG27/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	REFERENCE DWG No. REVISED, REISSUED FOR MANUFACTURE	MZ	—	RM

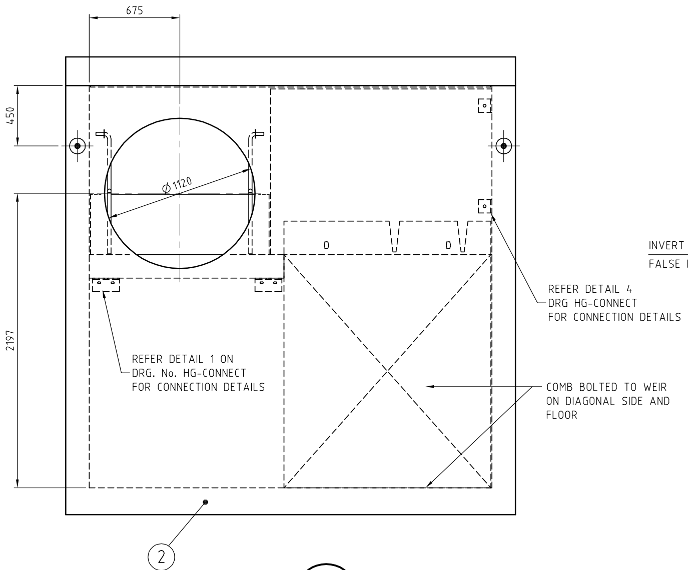
ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG30A-02
2	BASE SLAB	HG30-04
3, 4	SIDE WALL	HG30A-05
5	FALSE FLOOR	HG30A/L-07
6	CONCRETE BAFFLE WALL	HG30A/L-07
7	PRECAST LID	HG30A/L-08
8	FLOATING BOOM	HG30A/L-09
9	WEIR	HG30A/L-10
10	BAFFLE SIDE WALL	HG30A/L-11
11	COMB	HG30A/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST



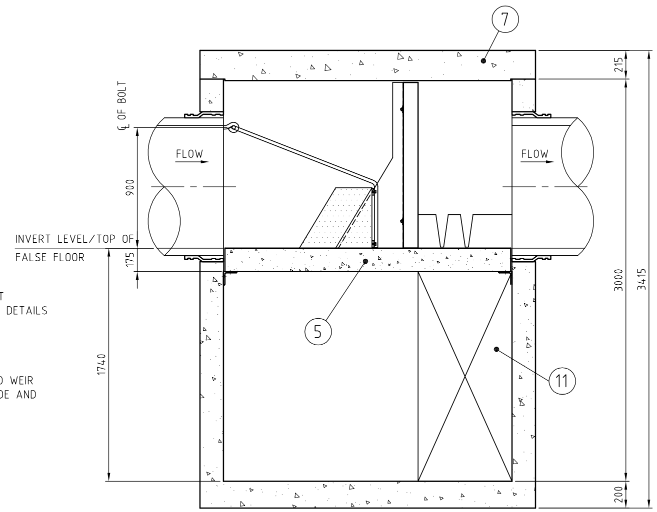
PLAN
SCALE 1:25



PLAN ON LID
SCALE 1:25



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 20.2 t (WITHOUT LID).
   MASS OF LID = 4.3 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3)
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

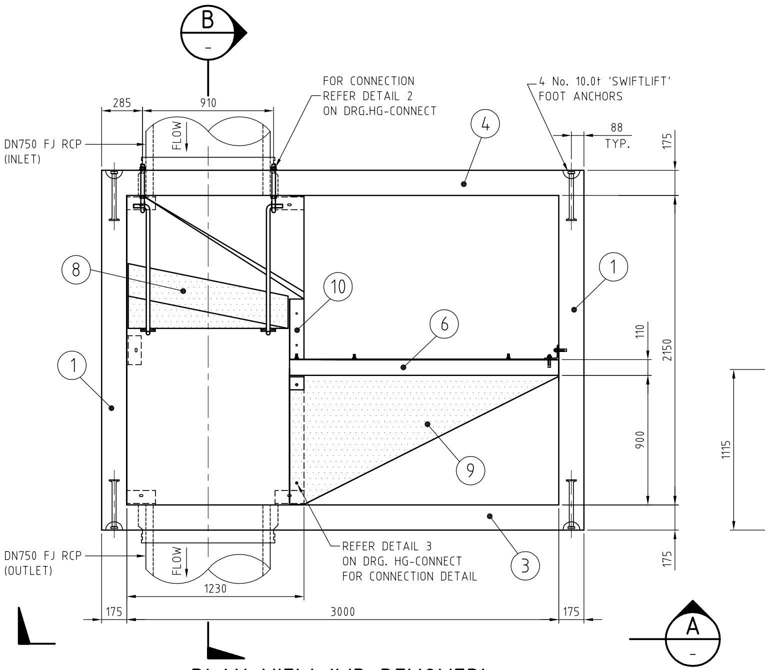
SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

Humes TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

DSN.	DFW	06-08-08
DWN.	MZ	06-08-08
CKD.	DFW	—
APP.	WST	—

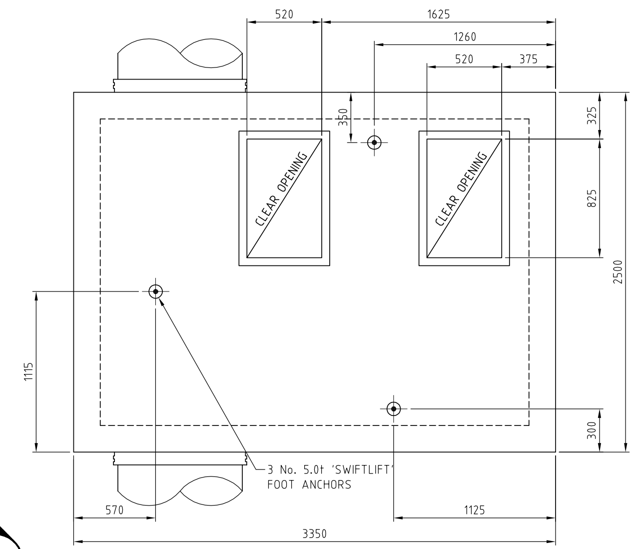
HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG30A/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. No.	ISSUE
HG30A/L-01 REV 1	1:1	A2	HG30A/L-01	2



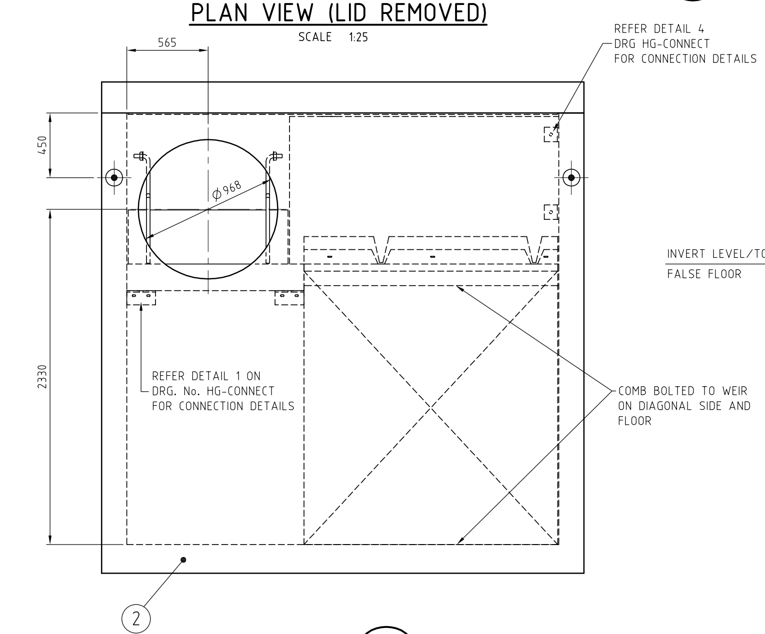
PLAN VIEW (LID REMOVED)

SCALE 1:25



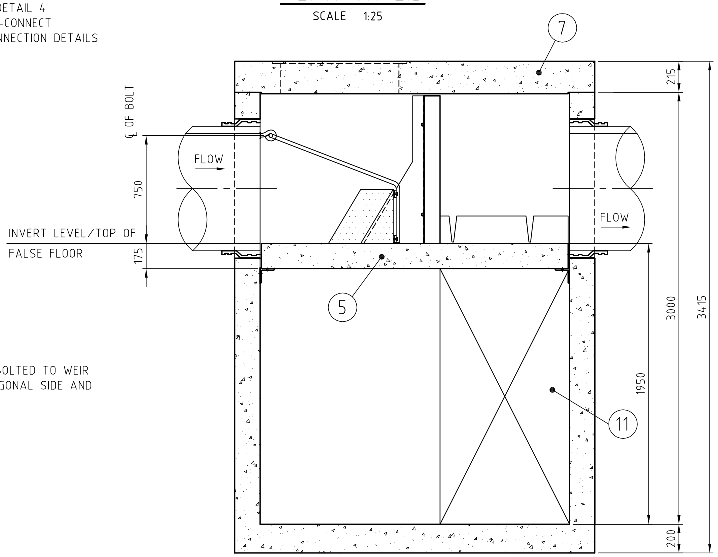
PLAN ON LID

SCALE 1:25



VIEW A

SCALE 1:25



SECTION B

SCALE 1:25

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
2	REFERENCE DWG No. REVISED, REISSUED FOR MANUFACTURE	MZ	—	RM

ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG30-02
2	BASE SLAB	HG30-04
3, 4	SIDE WALL	HG30-05
5	FALSE FLOOR	HG30/L-07
6	CONCRETE BAFFLE WALL	HG30/L-07
7	PRECAST LID	HG30-08
8	FLOATING BOOM	HG30/L-09
9	WEIR	HG30/L-10
10	BAFFLE SIDE WALL	HG30/L-11
11	COMB	HG30/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 20.3 t (WITHOUT LID).
   MASS OF LID = 4.3 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3)
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-38 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

CEMEX Australia Pty Limited ABN 87 099 732 297

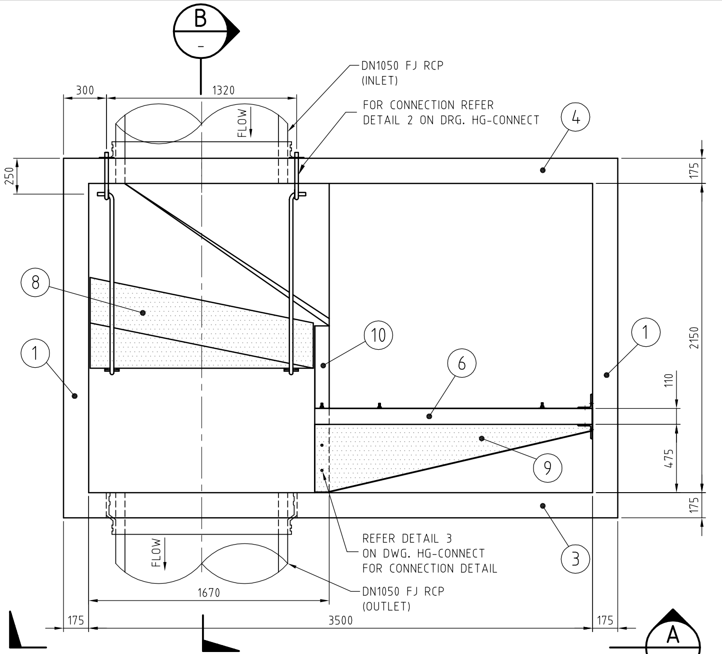
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG30/L
DN750/DN750 FJ RCP
GENERAL ASSEMBLY

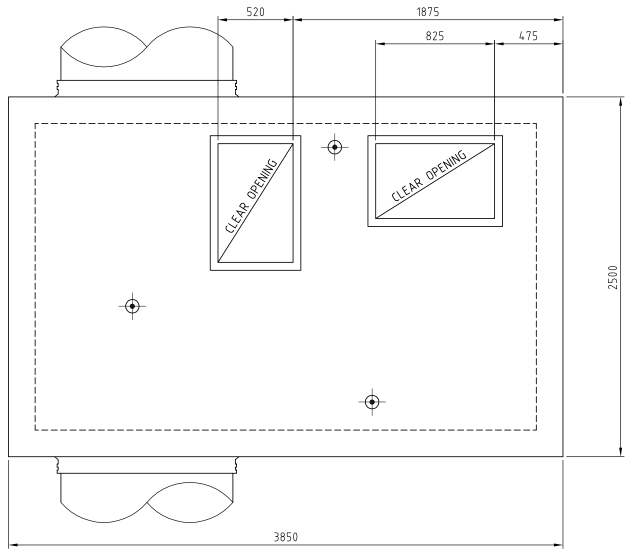
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG30/L-01 REV 1	1:1	A2	HG30/L-01	2

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW

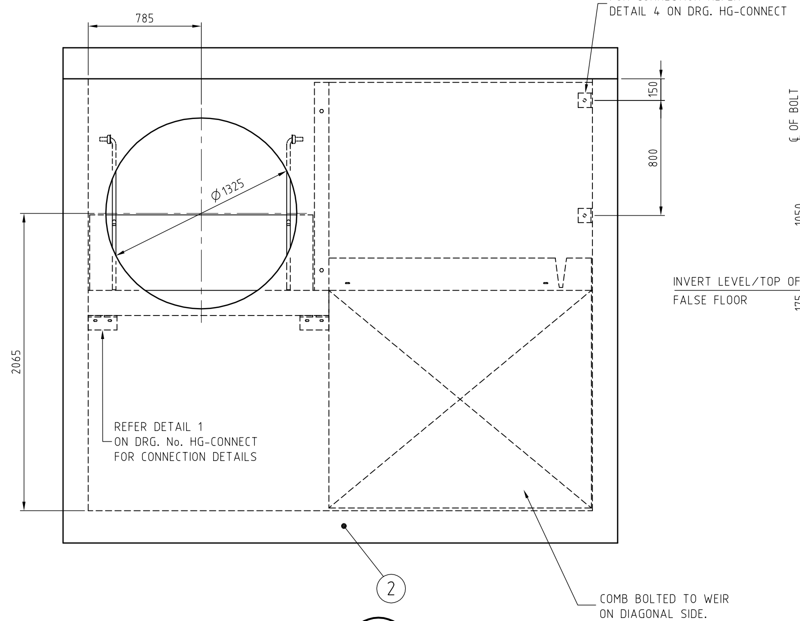
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL	HG35A/L-02
2	BASE SLAB	HG35A/L-04
3, 4	SIDE WALL	HG35A/L-05
5	FALSE FLOOR	HG35A/L-07
6	CONCRETE BAFFLE WALL	HG35A/L-07
7	PRECAST LID	HG35A/L-08
8	FLOATING BOOM	HG35A/L-09
9	WEIR	HG35A/L-10
10	BAFFLE SIDE WALL	HG35A/L-11
11	COMB	HG35A/L-12
	SITE LAYOUT	HG35A/L-13



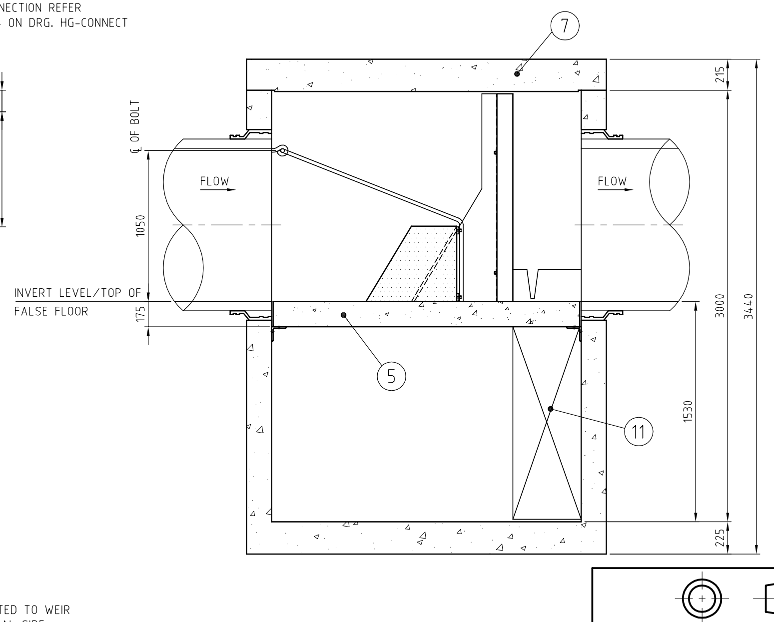
PLAN VIEW (LID REMOVED)
SCALE 1:25



PLAN ON LID
SCALE 1:25



VIEW A
SCALE 1:25



SECTION B
SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 22.9 t (WITHOUT LID).
   MASS OF LID = 5.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-52 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes TECHNICAL (DESIGN) SERVICES BRISBANE, QUEENSLAND

Rinker Australia Pty Limited ABN 87 099 732 297

DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

SUPERSEDES HG35A/L-01 REV 0

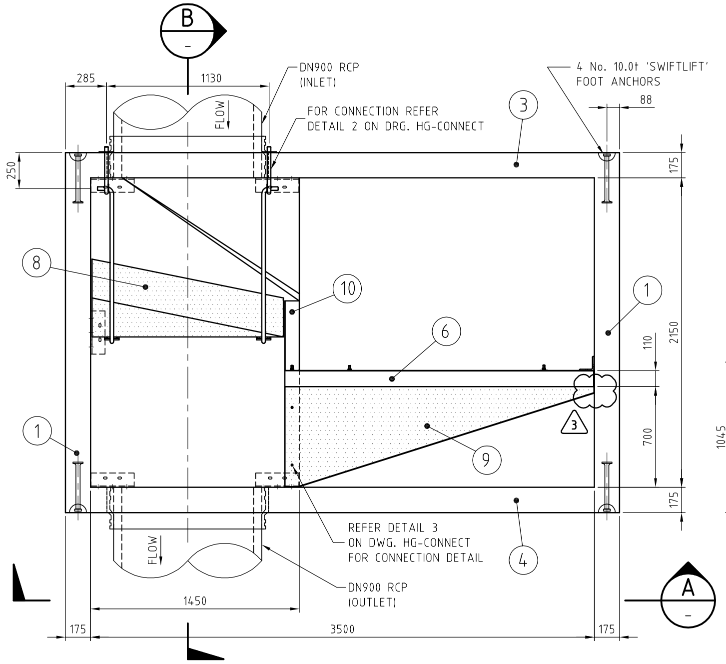
HUMES STANDARD DRAWING
HUMEGARD HG35A/L
DN1050/DN1050 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG35A/L-01	1

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
3	REFERENCE DWG No. REVISED, BRACKET REMOVED, REISSUED FOR MANUFACTURE	MZ	—	RM

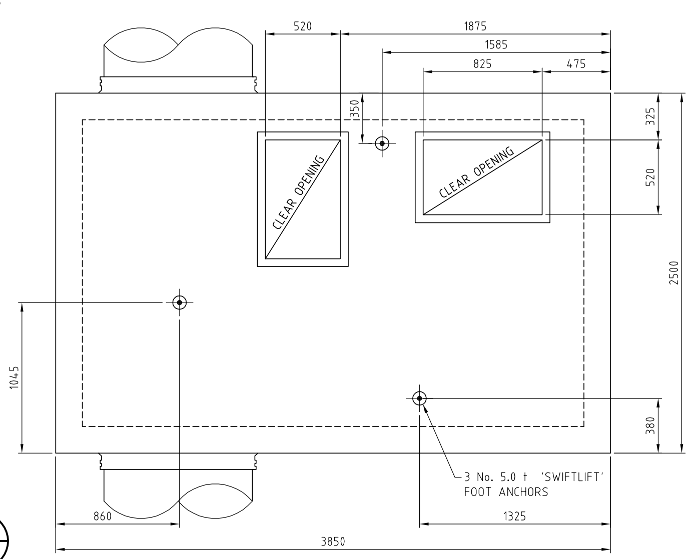
ITEM No.	DRAWING DESCRIPTION	DWG No.
1	END WALL	HG35-02
2	BASE SLAB	HG35-04
3, 4	SIDE WALL	HG35-05
5	FALSE FLOOR	HG35/L-07
6	CONCRETE BAFFLE WALL	HG35/L-07
7	PRECAST LID	HG35-08
8	FLOATING BOOM	HG35/L-09
9	WEIR	HG35/L-10
10	BAFFLE SIDE WALL	HG35/L-11
11	COMB	HG35/L-12
	CONNECTION DETAILS	HG-CONNECT
	CASTING SEQUENCE	HG-CAST

3



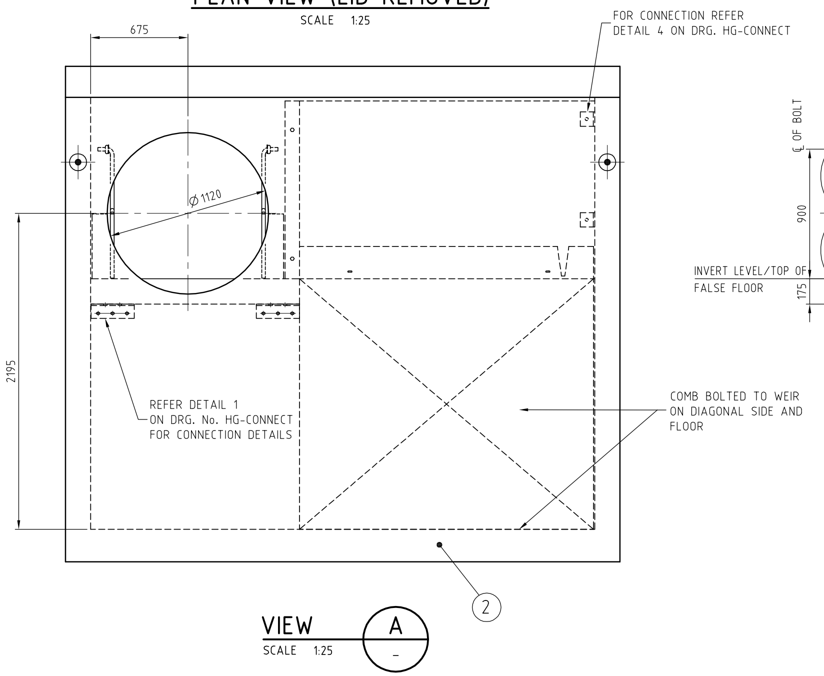
PLAN VIEW (LID REMOVED)

SCALE 1:25



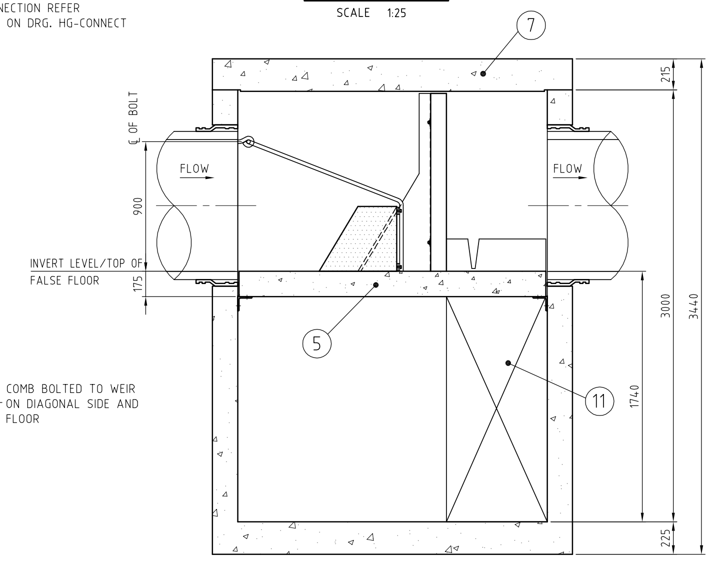
PLAN ON LID

SCALE 1:25



VIEW A

SCALE 1:25



SECTION B

SCALE 1:25

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF COMPLETE UNIT = 22.8 t (WITHOUT LID).
   MASS OF LID = 5.0 t
   (SELF WEIGHT CONCRETE @ 2500 kg/m3
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

SITE LIFT:
LID - 3 No. 5 t SWIFTLIFT FOOT ANCHORS
HUMEGARD UNIT - 4 No. 10 t SWIFTLIFT FOOT ANCHORS

Humes
TECHNICAL SERVICES
BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

DSN.	WST	25-11-10
DWN.	MZ	25-11-10
CKD.	RM	—
APP.	WST	—

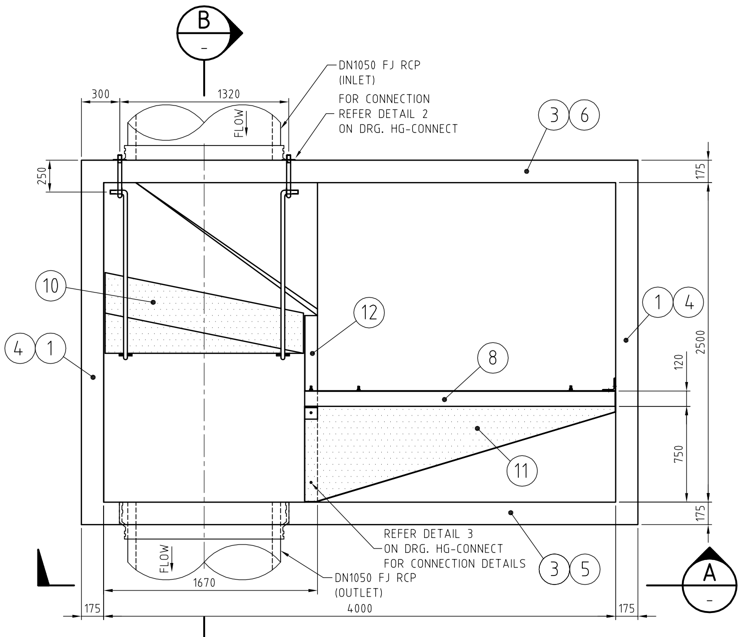
SUPERSEDES HG35/L-01 REV 2

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG35/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

PLOT SCALE	SIZE	DRG. NO.	ISSUE
1:1	A2	HG35/L-01	3

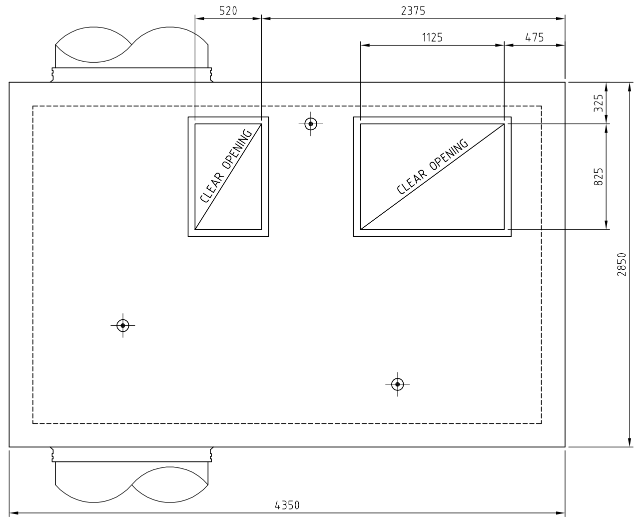
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
1	GENERAL REVISION	MZ	—	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12



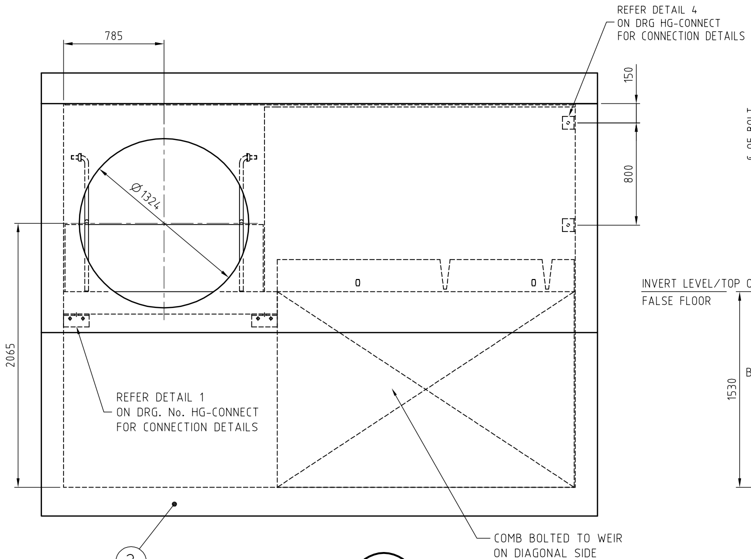
PLAN VIEW (LID REMOVED)

SCALE 1:20



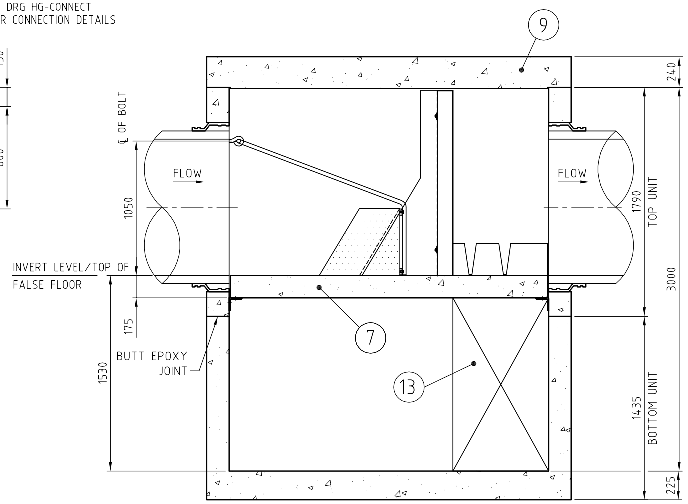
PLAN ON LID

SCALE 1:20



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 14.8 t
   MASS OF TOP UNIT = 12.9 t
   MASS OF LID = 7.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

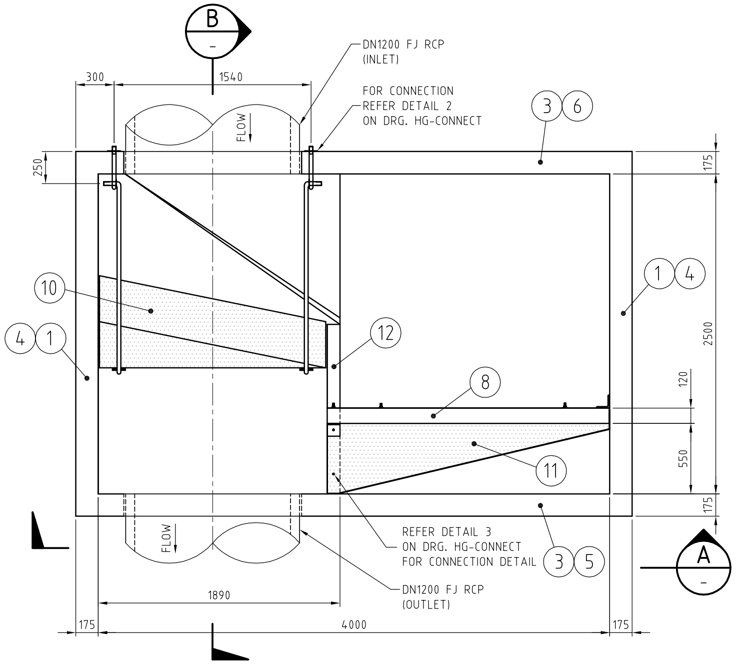
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES
STANDARD DRAWING
HUMEGARD HG40A/L
DN1050/DN1050 FJ RCP
GENERAL ASSEMBLY

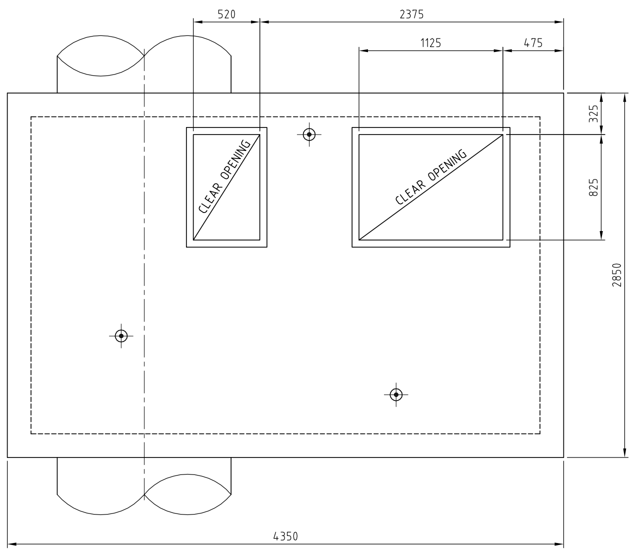
SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
	1:1	A1	HG40A/L-01	1

ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
0	ISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
1	GENERAL REVISION	MZ	—	DFW

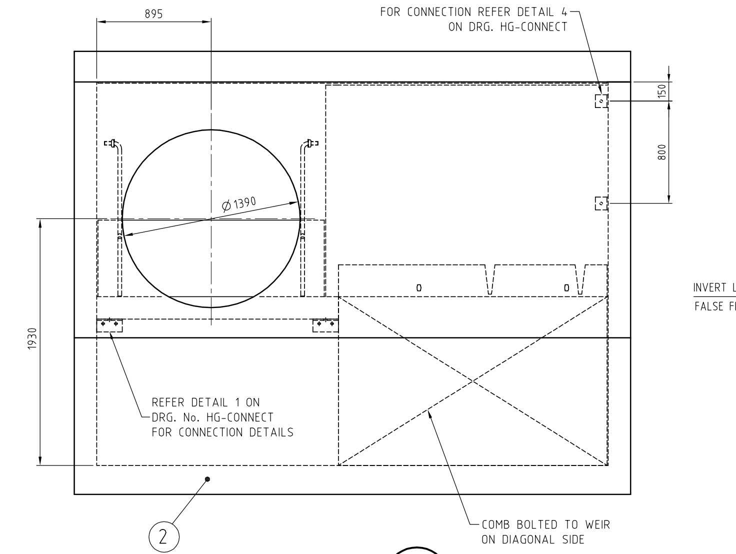
ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12



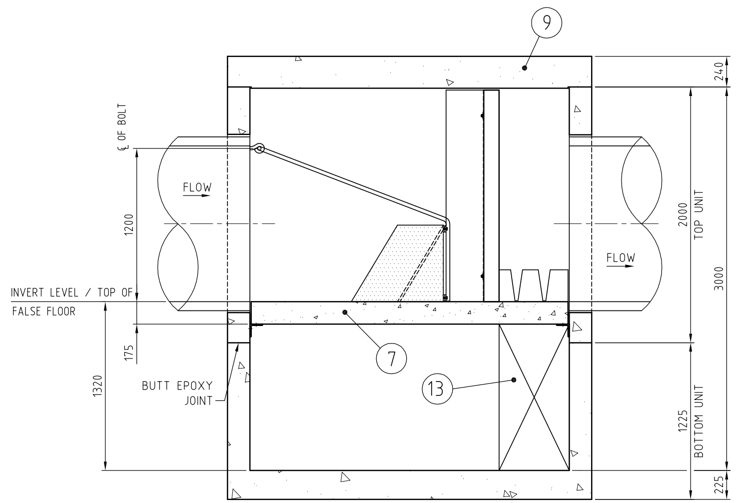
PLAN VIEW (LID REMOVED)
SCALE 1:20



PLAN ON LID
SCALE 1:20



VIEW A
SCALE 1:20



SECTION B
SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 13.4 t
   MASS OF TOP UNIT = 14.4 t
   MASS OF LID = 7.0 t
6. PIPE HOLE SIZE ALLOWS FOR PIPE MORTAR CONNECTION.

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

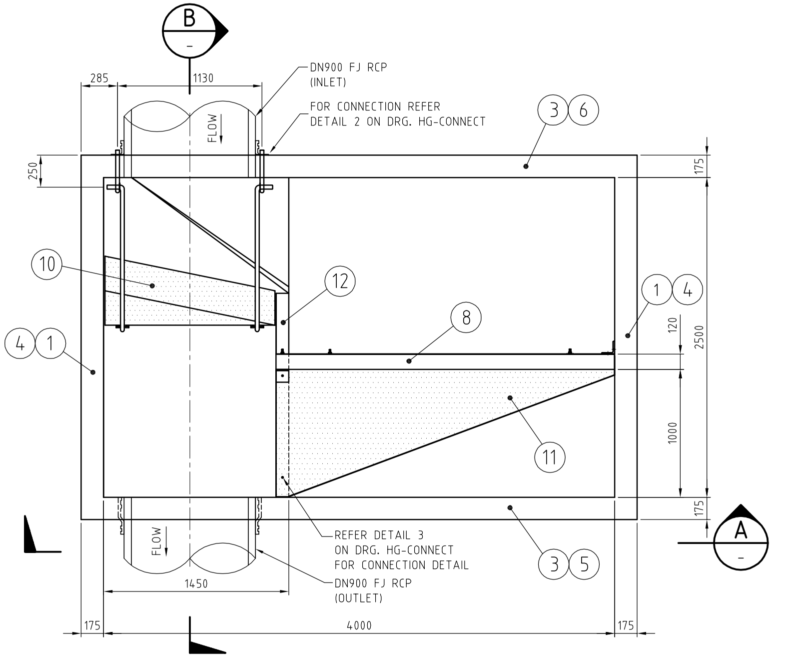
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES STANDARD DRAWING
HUMEGARD HG40B/L
DN1200/DN1200 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG40B/L-01 REV. C	1:1	A1	HG40B/L-01	1

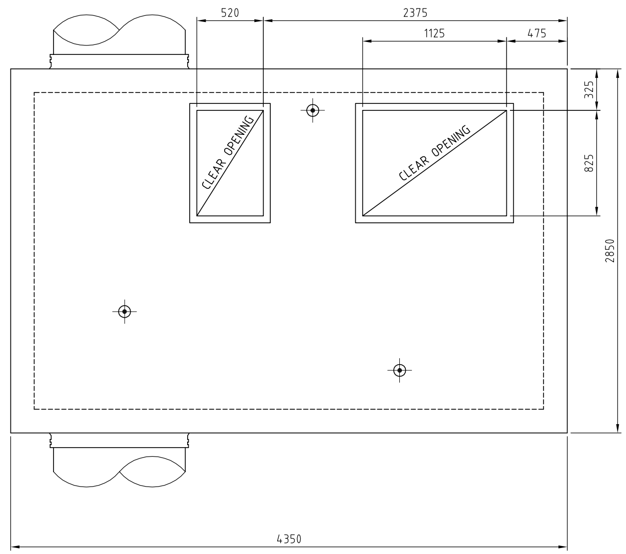
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION - REISSUED FOR MANUFACTURE	MZ	12-03-07	DFW
2	ITEM NUMBERS REVISED, REISSUED FOR MANUFACTURE	MZ	—	DFW

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG40B/L-02
2	BASE SLAB	HG40B/L-04
3	SIDE WALL - BOTTOM UNIT	HG40B/L-05
4	END WALL - TOP UNIT	HG40B/L-03
5,6	SIDE WALL - TOP UNIT	HG40B/L-06
7	FALSE FLOOR	HG40B/L-07
8	CONCRETE BAFFLE WALL	HG40B/L-07
9	PRECAST LID	HG40B/L-08
10	FLOATING BOOM	HG40B/L-09
11	WEIR	HG40B/L-10
12	BAFFLE SIDE WALL	HG40B/L-11
13	COMB	HG40B/L-12



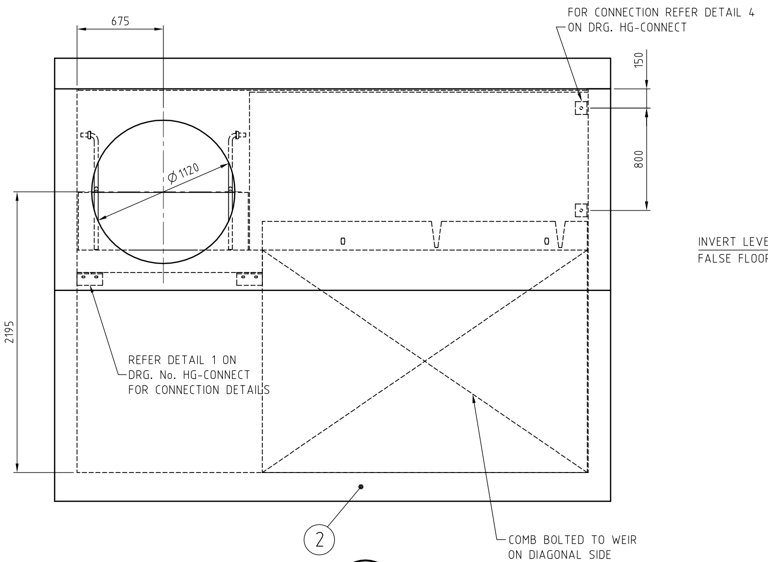
PLAN VIEW (LID REMOVED)

SCALE 1:20



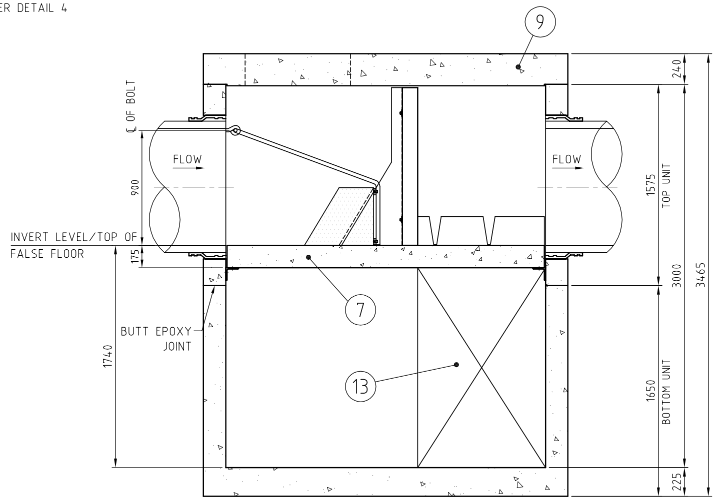
PLAN ON LID

SCALE 1:20



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 16.2 t
   MASS OF TOP UNIT = 11.6 t
   MASS OF LID = 7.0 t
6. KOR-N-SEAL BOOT CONNECTOR P/N = S206-44 (INLET & OUTLET)

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL (DESIGN) SERVICES
BRISBANE, QUEENSLAND

CEMEX Australia Pty Limited ABN 87 099 732 297

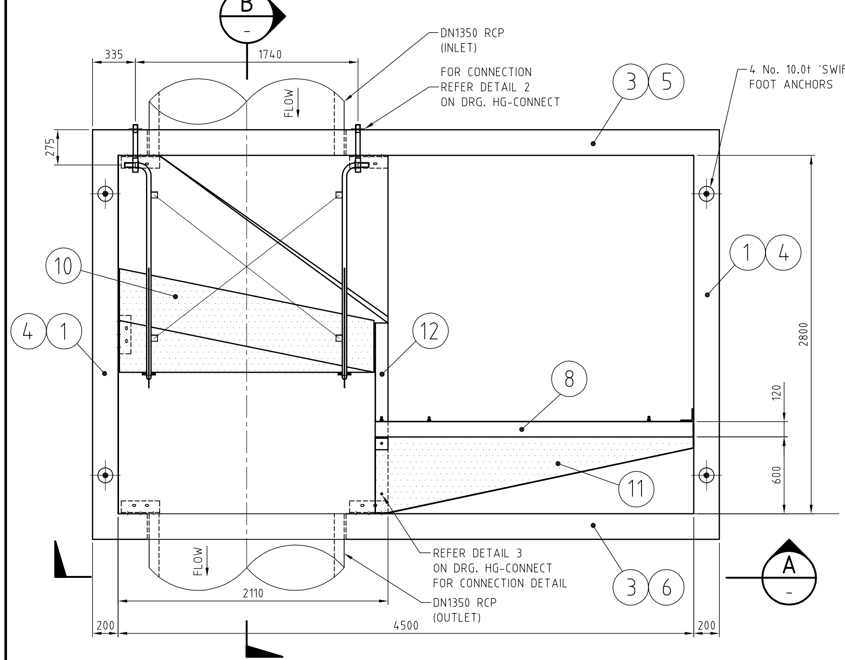
DSN.	DFW	12-03-07
DWN.	MZ	12-03-07
CKD.	DFW	12-03-07
APP.	DFW	12-03-07

HUMES
STANDARD DRAWING
HUMEGARD HG40/L
DN900/DN900 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG40/L-01 REV. 1	1:1	A1	HG40/L-01	2

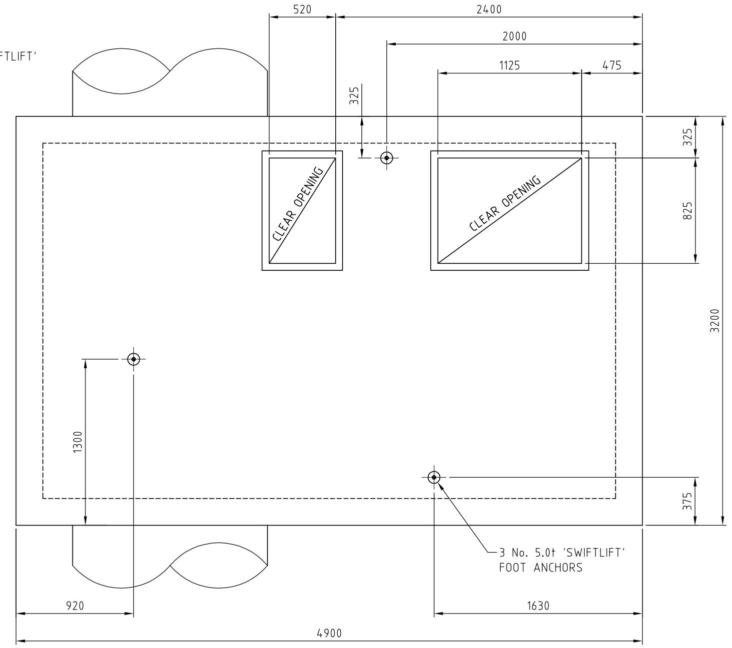
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	15-12-10	RM

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG45A-02
2	BASE SLAB	HG45A-04
3	SIDE WALL - BOTTOM UNIT	HG45A-05
4	END WALL - TOP UNIT	HG45A-03
5,6	SIDE WALL - TOP UNIT	HG45A-06
7	FALSE FLOOR	HG45A/L-07
8	CONCRETE BAFFLE WALL	HG45A/L-07
9	PRECAST LID	HG45A/L-08
10	FLOATING BOOM	HG45A/L-09
11	WEIR	HG45A/L-10
12	BAFFLE SIDE WALL	HG45A/L-11
13	COMB	HG45A/L-12



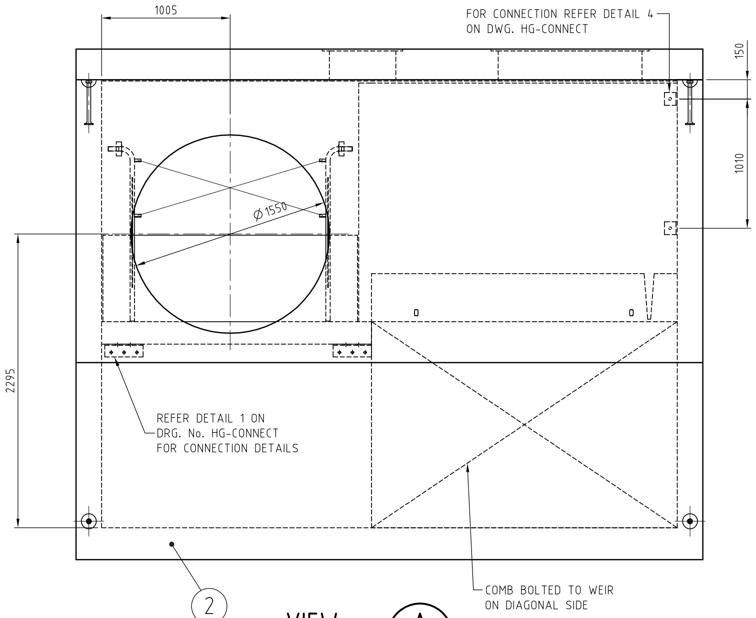
PLAN VIEW (LID REMOVED)

SCALE 1:20



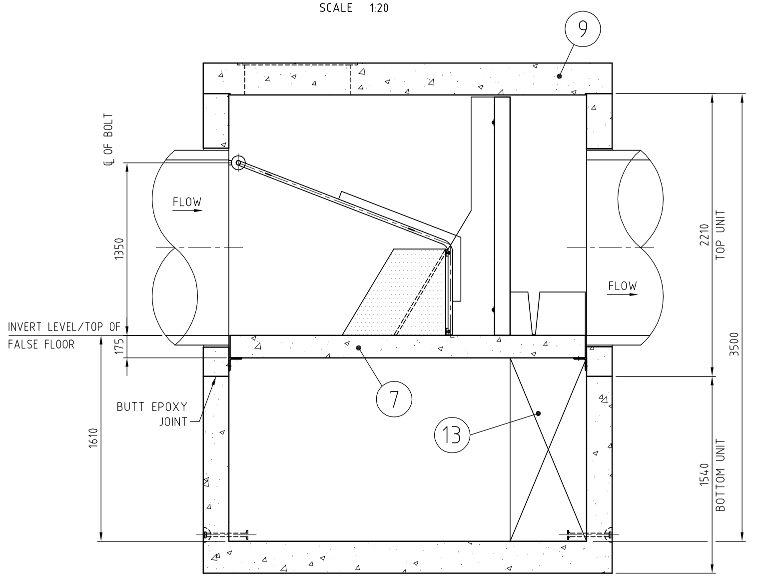
PLAN ON LID

SCALE 1:20



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 20.7 t
   MASS OF TOP UNIT = 19.7 t
   MASS OF LID = 9.1 t
6. PIPE HOLE SIZE ALLOWS FOR PIPE MORTAR CONNECTION.

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL SERVICES
BRISBANE, QUEENSLAND

Holcim (Australia) Pty Ltd ABN 87 099 732 297

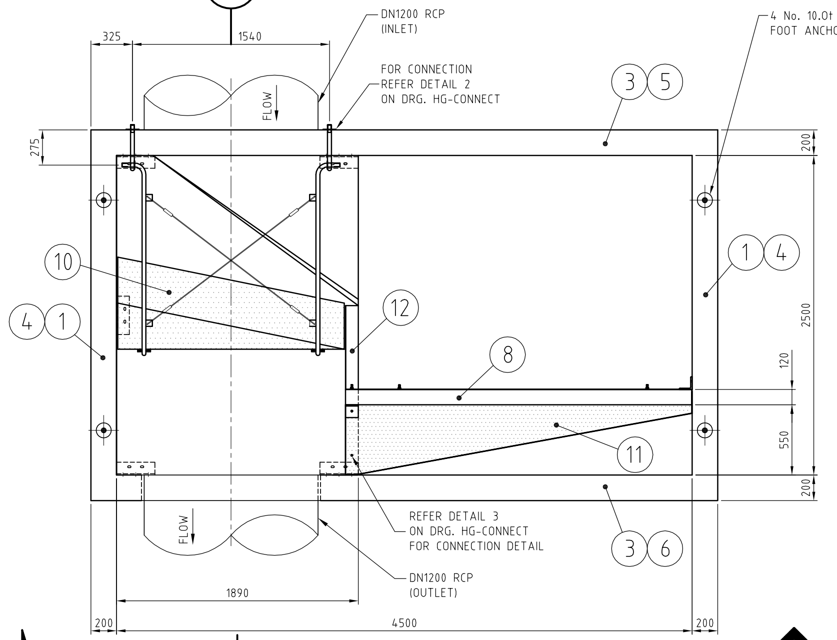
DSN.	WST	07-12-10
DWN.	MZ	07-12-10
CKD.	RM	15-12-10
APP.	WST	15-12-10

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG45A/L
DN1350/DN1350 RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. No.	ISSUE
HG45A/L-01 REV. 0	1:1	A1	HG45A/L-01	1

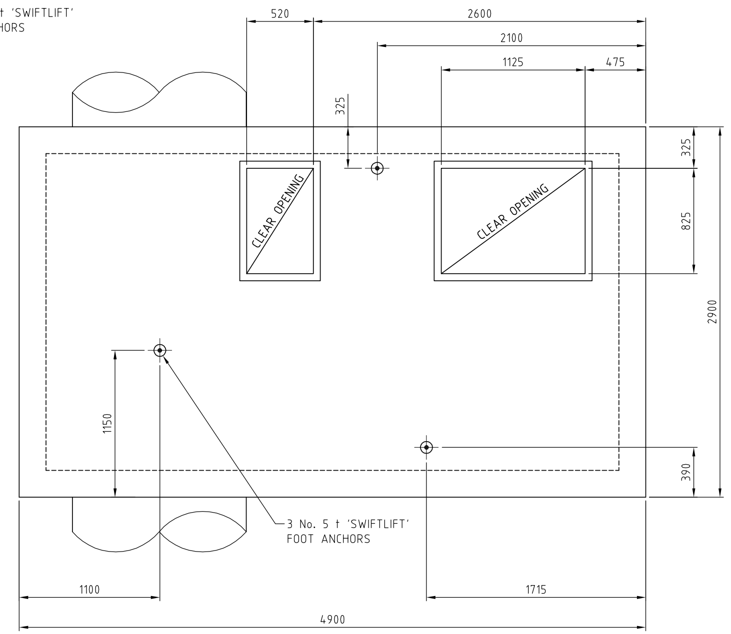
ISSUE	DETAILS OF ALTERATIONS	DWN	DATE	CKD
1	GENERAL REVISION, REISSUED FOR MANUFACTURE	MZ	15-12-10	RM

ITEM No	DWG DESCRIPTIONS	DWG No
1	END WALL - BOTTOM UNIT	HG45-02
2	BASE SLAB	HG45-04
3	SIDE WALL - BOTTOM UNIT	HG45-05
4	END WALL - TOP UNIT	HG45-03
5,6	SIDE WALL - TOP UNIT	HG45-06
7	FALSE FLOOR	HG45/L-07
8	CONCRETE BAFFLE WALL	HG45/L-07
9	PRECAST LID	HG45/L-08
10	FLOATING BOOM	HG45/L-09
11	WEIR	HG45/L-10
12	BAFFLE SIDE WALL	HG45/L-11
13	COMB	HG45/L-12



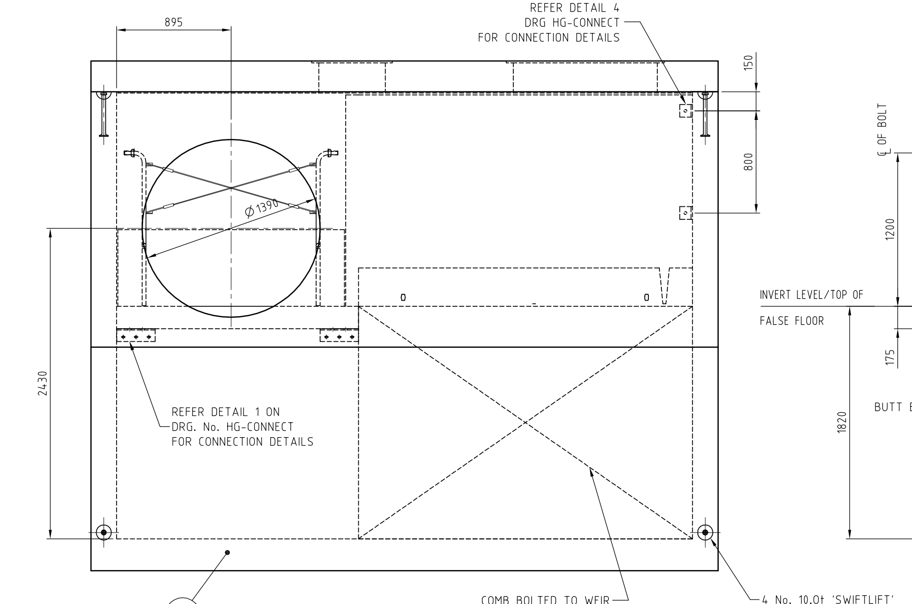
PLAN VIEW (LID REMOVED)

SCALE 1:20



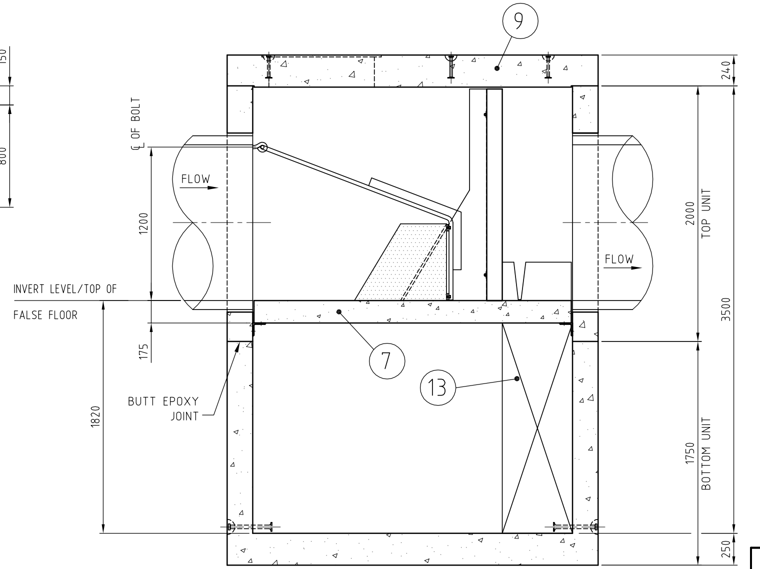
PLAN ON LID

SCALE 1:20



VIEW A

SCALE 1:20



SECTION B

SCALE 1:20

NOTES:

1. WHEN LIFTING ENTIRE UNIT FROM FOOT ANCHORS, SPREADER BEAM MUST BE USED TO ENSURE 4 POINT LIFT.
2. ALL METAL COMPONENTS ARE TO BE MADE FROM 304-GRADE STAINLESS STEEL.
3. SEE DRAWING HG-CAST FOR CASTING SEQUENCE.
4. SEE DRAWING HG-CONNECT FOR ALL CONNECTION DETAILS.
5. MASS OF BOTTOM UNIT = 20.8 t
   MASS OF TOP UNIT = 17.3 t
   MASS OF LID = 8.1 t
6. PIPE HOLE SIZE ALLOWS FOR PIPE MORTAR CONNECTION.

DESIGN BASIS

1. DESIGN SPECIFICATION AS3600 CONCRETE STRUCTURES.
2. DESIGN LOADS 0-2m FILL WITH SM1600 VEHICLE LOAD TO AS5100 BRIDGE DESIGN.
3. DESIGN FOR UP TO B2 EXPOSURE CLASSIFICATION TO AS3600 CONCRETE STRUCTURES.

Humes

TECHNICAL SERVICES
BRISBANE, QUEENSLAND

DSN.	WST	01-12-10
DWN.	MZ	01-12-10
CKD.	RM	15-12-10
APP.	WST	15-12-10

HUMES WATER SOLUTIONS
STANDARD HUMEGARD
HUMEGARD HG45/L
DN1200/DN1200 FJ RCP
GENERAL ASSEMBLY

SUPERSEDES	PLOT SCALE	SIZE	DRG. NO.	ISSUE
HG45/L-01 REV 0	1:1	A1	HG45/L-01	1

Precast solutions

Top:
StormTrap® system

Middle:
RainVault® system

Bottom:
Segmental shaft

Stormwater

Stormwater treatment

Primary treatment

HumeGard® Gross Pollutant Trap

Secondary treatment

HumeCeptor® hydrodynamic separator

Detention and infiltration

StormTrap® system

Soakwells

Harvesting and reuse

RainVault® system

ReserVault® system

RainVault® Mini system

Precast concrete cubes

Segmental shafts

Stormwater drainage

Steel reinforced concrete pipes – trench

Steel reinforced concrete pipes – salt water cover

Steel reinforced concrete pipes – jacking

Box culverts

Uniculvert® modules

Headwalls

Stormwater pits

Access chambers/Manholes

Kerb inlet systems

Floodgates

Geosynthetics

Sewage transfer and storage

Bridge and platform

Tunnel and shaft

Walling

Potable water supply

Irrigation and rural

Traffic management

Cable and power management

Rail

Contact information

National sales 1300 361 601
humes.com.au
info@humes.com.au

Head Office

18 Little Cribb St
Milton 4064 QLD
Ph: (07) 3364 2800
Fax: (07) 3364 2963

Queensland

Ipswich/Brisbane
Ph: (07) 3814 9000
Fax: (07) 3814 9014

Rockhampton
Ph: (07) 4924 7900
Fax: (07) 4924 7901

Townsville
Ph: (07) 4758 6000
Fax: (07) 4758 6001

New South Wales

Grafton
Ph: (02) 6644 7666
Fax: (02) 6644 7313

Newcastle
Ph: (02) 4032 6800
Fax: (02) 4032 6822

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Fax: (02) 9625 5200

Tamworth
Ph: (02) 6763 7300
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Fax: (08) 8168 4549

Western Australia

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Ph: (08) 9351 6999
Fax: (08) 9351 6977

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Ph: (08) 8984 1600
Fax: (08) 8984 1614

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A Division of Holcim Australia

APPENDIX D – FLOOD INFORMATION

wollongong
city of innovation

WOLLONGONG CITY COUNCIL

Address 41 Burelli Street Wollongong • **Post** Locked Bag 8821 Wollongong DC NSW 2500
Phone (02) 4227 7111 • **Fax** (02) 4227 7277 • **Email** council@wollongong.nsw.gov.au
Web www.wollongong.nsw.gov.au • ABN 63 139 525 939 - GST Registered

CERTIFICATE	**202100871**
Issued	29 July 2021
Fee	**$93.00**
Receipt	6974630
Your Reference MANILDRA PORT KEMB:207022	
Council Property Reference	469126

Mr L Salinas
PO Box 2339
FORTITUDE VALLEY QLD 4006

FLOOD LEVEL INFORMATION ADVICE

Dear Sir/Madam

Reference is made to your request for flood level information concerning the property below

Description	Lot 6 DP 1236743
Location	Lot 6 Foreshore Road PORT KEMBLA NSW 2505

Historical Flood Levels

You are advised that Council has no historical recorded flood levels on or immediately adjacent to the subject lot. As Council's records are not complete, this does not mean that flooding has not occurred in the past or will not occur in the future.

Flood Level Information

Attached are extracts from the Allans Creek Flood Study dated December 2019 indicating the anticipated 20% AEP (Annual Exceedance Probability), 1% AEP and PMF (Probable Maximum Flood) flood levels in the vicinity of the subject property.

Surveyed ground levels of the property and buildings to AHD (Australian Height Datum) should also be obtained. This information along with the 1% AEP and PMF flood levels will enable you to determine the effect/depth of flooding, if any, on this property.

Flood Risk Precinct

Council has recently undertaken a review of its Flood Study for this area. The Flood Risk Precinct classification determined by the Allans Creek Flood Study, Floodplain Risk Management Study and Plan Addendum 1 dated September 2008 are under review, however the outcomes from this review are not yet available. You may wish to engage a suitably qualified Civil Engineer, experienced in hydraulics and floodplain management, to determine the applicable Flood Risk Precinct classification for the subject property.

Other Relevant Information

Please note that flood information may change due to Council's flood study and Floodplain Risk Management Study currently being reviewed. As part of the review, design parameters for these studies are changing, and therefore the flood levels, velocities and flood risks may vary from the current flood study.

Disclaimer

Council does not warrant the accuracy of the information provided by Council in response to this request. A suitably qualified Civil Engineer experienced in hydraulics and floodplain management should be engaged to assist in the interpretation of the information provided by Council.

Flood Policies

For information on Council's requirements for development on flood affected lands, you are advised that this information is contained in Councils Wollongong Development Control Plan 2009, the NSW

Government's Floodplain Development Manual 2005 and the relevant flood studies and floodplain risk management studies and plans. These documents are available in Council's Reference Library on Level 1 of the Council Administration Building in Burelli Street, Wollongong. The Wollongong DCP 2009 and Council adopted flood studies are also available on Councils web site. Alternatively you may wish to engage the services of a suitably qualified Civil Engineer experienced in hydraulics and floodplain management who will advise you of your development opportunities.

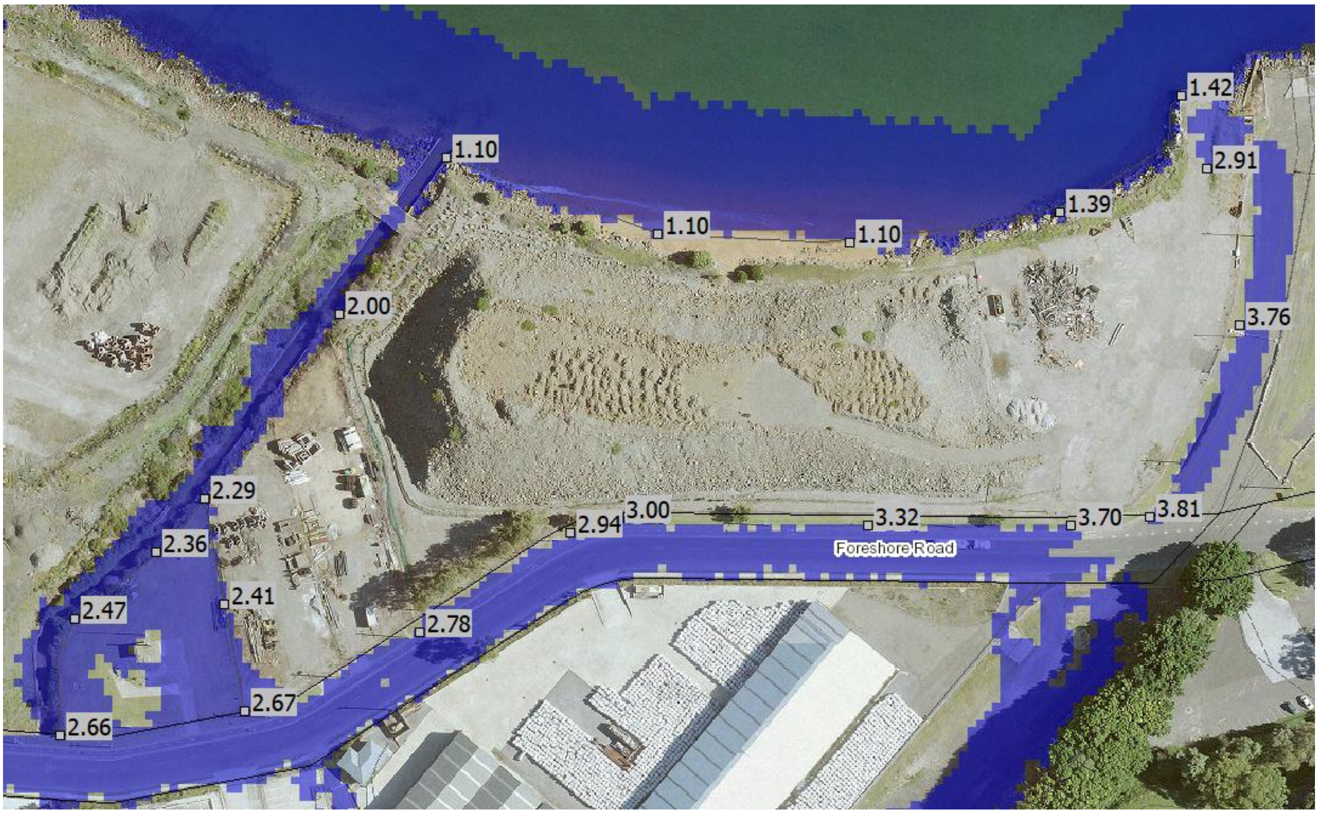
If you have any questions please contact me on the telephone number below.

This letter is authorised by

Floodplain Management Team
Wollongong City Council
Telephone (02) 4227 7111

Extracts from the Allans Creek Flood Study dated December 2019:

20% AEP flood levels



1% AEP flood levels

PMF flood levels