



CRIMSON METALS PTY LTD

MT GIBSON GOLD PROJECT

WASTEWATER TREATMENT PLANT

OVERVIEW

AND

DESIGN CAPACITY

JOB No. 7981

May 2024

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1 INTRODUCTION

At the request of Crimson Metals Pty Ltd, a design has been undertaken for the Mt Gibson Gold Project wastewater treatment plant (WWTP).

This report includes calculations for actual sewage flows and summarises the findings of these calculations.

2 WASTEWATER TREATMENT PLANT OVERVIEW

The WWTP will take sewage flows from the village, as well as the administration facilities.

The Mt Gibson village will have accommodation for up to 500 personnel.

The Mt Gibson administration facilities will have 140 people on day shift and 40 people on night shift.

Raw sewage discharged from the plumbing fixtures throughout the village and administration facilities will be a combination of black and grey water flows.

Raw sewage will be plumbed to pump pits where macerator pumps will transfer the sewage to a larger sewage transfer station which will pump to the WWTP.

The WWTP will consist of a coarse solids separation tank which will discharge into stabilisation ponds.

A weir in the primary stabilisation pond will allow effluent to overflow into the secondary stabilisation pond.

Effluent will be periodically discharged into an evaporation basin by means of a pump and system of irrigation sprays.

Drawing No. 345-L-001 included in Appendix A shows the arrangement of the village sewage transfer station, administration facilities sewage transfer station and main sewage pipe routes in relation to the WWTP.

Drawing Nos. 345-L-002, 345-L-003 & 345-L-004 shows the layout and details of the WWTP.

3 DESIGN CAPACITY OF SEWAGE SYSTEM

3.1 Village Sewage Transfer Station

There will be a sewage transfer station at the village. The pumps in the sewage transfer station will be duty-standby Flygt NP3153.182 grinder pumps with SH273 impellers.

A 110 OD PN12.5 pipeline will deliver sewage from the village sewage transfer station approximately 2000m to the WWTP.

3.2 Administration Facility Sewage Transfer Station

There will be a sewage transfer station at the administration facility. The pumps in the sewage transfer station will be duty-standby Flygt MP3127.170 grinder pumps with HT252 impellers.

A 110 OD PN12.5 pipeline will deliver sewage from the administration facility sewage transfer station approximately 6300m to the WWTP.

3.3 Stabilisation Ponds

The WWTP will only treat sewage from the Mt Gibson village and administration facility. There are no additional municipal wastes treated.

The bank widths of the stabilisation ponds will be 3m which exceeds the minimum required width of 2.4m dictated by the *Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974*.

The external and internal slope of the stabilisation pond sides will be 1 in 3 which complies with the *Health Regulations*.

The banks of the primary stabilisation ponds will be 1.5m higher than the base of the ponds, with overflow channels into the secondary ponds at 1m high. The secondary stabilisation ponds will be of similar construction, with overflow channels into the evaporation/irrigation basin. This is in line with the recommended freeboard of 400mm given in the Department of Water's *Water Quality Protection Note 39*.

With WWTP layout as per Drawing No. 345-L-002, and with the ponds filled to a depth of 1m, the following is available:

Primary Pond Area: = 3617 m²

Primary Pond Volume: = 3239 m³

Secondary Pond Area: = 2727 m²

Secondary Pond Volume: = 2404 m³

3.4 Evaporation / Irrigation Basin

With the WWTP layout as per Drawing No. 345-L-002, the following is available:

Evaporation Basin Area: = 24,192 m²

4 CALCULATED INFLOWS

4.1 Village Sewage Transfer Station

Based on 500 rooms in the village, a 70% occupancy rate and 200 litres per person per day, the daily sewage volume is expected to be $500 \times 0.7 \times 200 = 70,000$ litres.

Using this figure, the average pumping rate for the village sewage transfer station is $70,000 \text{ litres} \div 24 \text{ hours} \div 60 \text{ minutes} \div 60 \text{ seconds} = 0.81 \text{ litres/second}$.

Based on pumping approximately 2km from the village to the WWTP through a 110 OD PN12.5 pipeline, the maximum flow rate for the existing transfer pumps will be approximately 10 litres per second.

This is approximately 12 times the average flow rate, so the transfer pumps are OK for peak loading.

4.2 Administration Facility Sewage Transfer Station

Based on 140 people on day shift, 40 people on night shift and 30 litres per person per shift, the daily sewage volume is expected to be $140 \times 30 + 40 \times 30 = 5400$ litres

Using this figure, the average pumping rate for the village sewage transfer station is $5400 \text{ litres} \div 24 \text{ hours} \div 60 \text{ minutes} \div 60 \text{ seconds} = 0.063 \text{ litres/second}$.

Based on pumping approximately 6.3km from the administration facility to the WWTP through a 110 OD PN12.5 pipeline, the maximum flow rate for the existing transfer pumps will be approximately 4 litres per second.

This is approximately 63 times the average flow rate, so the transfer pumps are OK for peak loading.

4.3 Stabilisation Ponds

The combined sewage outflows from the village and administration facilities are 70,000 litres + 5400 litres = 75,400 litres, which equates to 2,293 kL/month.

To determine the required monthly discharge to the irrigation basin, the calculated monthly sewage outflow from the village and administration facility was combined with the historical mean monthly rainfall data and the historical monthly pan evaporation rates for Paynes Find (approximately 70km north-east of the Mt Gibson Gold Project), as shown below:

Monthly Influent Volume					2293	kL
Total Primary & Secondary Stabilisation Pond Area					6344	m ²
Month	Historical Gross Evaporation (mm)	Historical Gross Evaporation (kL)	Historical Mean Rainfall (mm)	Historical Mean Rainfall (kL)	Net Evaporation (Evap'n - R'fall) (kL)	Calculated Excess Requiring Discharge (kL)
Jan	372.0	2360.0	20.6	130.7	2229.3	64.1
Feb	307.9	1953.5	24.7	156.7	1796.8	496.6
Mar	272.8	1730.6	26.9	170.7	1560.0	733.4
Apr	168.0	1065.8	24.8	157.3	908.5	1385.0
May	114.7	727.7	35.4	224.6	503.1	1790.3
Jun	75.0	475.8	39.8	252.5	223.3	2070.1
Jul	77.5	491.7	35.0	222.0	269.6	2023.8
Aug	99.2	629.3	27.5	174.5	454.9	1838.6
Sep	150.0	951.6	14.1	89.5	862.1	1431.3
Oct	210.0	1332.2	10.7	67.9	1264.4	1029.1
Nov	291.0	1846.1	12.6	79.9	1766.2	527.2
Dec	347.2	2202.6	12.1	76.8	2125.9	167.5
Annual Total	2485.3	15766.9	284.2	1803.0	13963.9	13557.1
Monthly Avg	207.1	1313.9	23.7	150.2	1163.7	1129.8
Daily Avg	6.8	43.2	0.8	4.9	38.3	37.1

Figure 1 - Primary & Secondary Stabilisation Ponds

With a total primary pond volume of 3,239 m³, the detention time will be 3,239 m³ ÷ 75.4 m³/day = 43.0 days.

With a total secondary pond volume of 2,404 m³, the detention time will be a further 2,404 m³ ÷ 75.4 m³/day = 31.9 days.

4.4 Evaporation / Irrigation Basin

Using a similar methodology to that of the stabilisation ponds, and using the monthly Calculated Excess Requiring Discharge volumes from Figure 2, the capacity of the Evaporation / Irrigation Basin is shown below:

Total Evaporation Basin Area						24192	m ²
Month	Historical Gross Evaporation (mm)	Historical Gross Evaporation (kL)	Historical Mean Rainfall (mm)	Historical Mean Rainfall (kL)	Net Evaporation (Evap'n - R'fall) (kL)	Treated Water Discharge from Ponds (kL)	Treated Water - Net Evaporation (kL)
Jan	372.0	8999.4	20.6	498.4	8501.1	64.1	-8436.9
Feb	307.9	7449.3	24.7	597.5	6851.8	496.6	-6355.1
Mar	272.8	6599.6	26.9	650.8	5948.8	733.4	-5215.4
Apr	168.0	4064.3	24.8	600.0	3464.3	1385.0	-2079.3
May	114.7	2774.8	35.4	856.4	1918.4	1790.3	-128.1
Jun	75.0	1814.4	39.8	962.8	851.6	2070.1	1218.5
Jul	77.5	1874.9	35.0	846.7	1028.2	2023.8	995.6
Aug	99.2	2399.8	27.5	665.3	1734.6	1838.6	104.0
Sep	150.0	3628.8	14.1	341.1	3287.7	1431.3	-1856.4
Oct	210.0	5080.3	10.7	258.9	4821.5	1029.1	-3792.4
Nov	291.0	7039.9	12.6	304.8	6735.1	527.2	-6207.8
Dec	347.2	8399.5	12.1	292.7	8106.7	167.5	-7939.2
Annual Total	2485.3	60125.0	284.2	6875.4	53249.6	13557.1	-39692.6
Monthly Avg	207.1	5010.4	23.7	572.9	4437.5	1129.8	-3307.7
Daily Avg	6.8	164.7	0.8	18.8	145.9	37.1	-108.7

Figure 2 - Evaporation Basin

As the Net Evaporation for the 12 month period greatly exceeds the Treated Water Discharge from Ponds for the same period, the Evaporation / Irrigation Basin has sufficient capacity for the hydraulic loading. There may be some temporary local pooling during the winter months.

The soil characteristic of the evaporation / irrigation field will be sandy clay loam, and it will be located more than 500m from sensitive water resources. Consequently, *WQPN22* specifies limits for the application rates of Nitrogen and Phosphorus to 480 kg/ha/year and 120 kg/ha/year, respectively.

Based on data for similar facilities at other mine-sites, the expected concentrations of Nitrogen and Phosphorus are 30 mg/L and 7.5 mg/L, respectively. Using these figures, combined with the projected annual total Treated Water Discharge from Ponds volume from Table 2, and the evaporation / irrigation field area of 2.4 hectares, the projected discharge concentrations of Nitrogen and Phosphorus are:

$$\text{Nitrogen concentration} = 13,557,100 \times 0.000030 / 2.4 = 169.5 \text{ kg/ha/yr}$$

$$\text{Phosphorus concentration} = 13,557,100 \times 0.0000075 / 2.4 = 42.4 \text{ kg/ha/yr}$$

The projected discharge nutrients to the evaporation / irrigation field are significantly less than those specified in *WQPN22*. Consequently, the evaporation / irrigation field is adequate.

5 FINDINGS & RECOMMENDATIONS

5.1 Village Sewage Transfer Station

The new Village Sewage Transfer Station is adequate to deal with the proposed sewage flows.

5.2 Administration Facility Sewage Transfer Station

The new Administration and Mine Services Area Sewage Transfer Station is adequate to deal with the proposed sewage flows.

5.3 Stabilisation Ponds

Based on the calculated sewage flows, as well as the mean rainfall and evaporation rates, the stabilisation ponds will be of sufficient capacity.

The WWTP will be surrounded by a 2.2m high wire mesh fence, with a locked access gate, in compliance with the *Health Regulations*.

The stabilisation ponds will be lined with 1.6mm HDPE, which exceeds the permeability requirement in *WQPN39* and has an approximate UV lifetime of 20 years.

Maintenance will be carried out to ensure there will be no vegetation on the banks of the ponds.

5.4 Evaporation / Irrigation Basin

Based on the treated water discharge from the stabilisation ponds, as well as the mean rainfall and evaporation rates, the evaporation / irrigation basin will be of sufficient capacity.

The discharge nutrients also fall within the limits specified in *WQPN22*.

Crimson Metals Pty Ltd will implement a monitoring regime for the WWTP as follows:

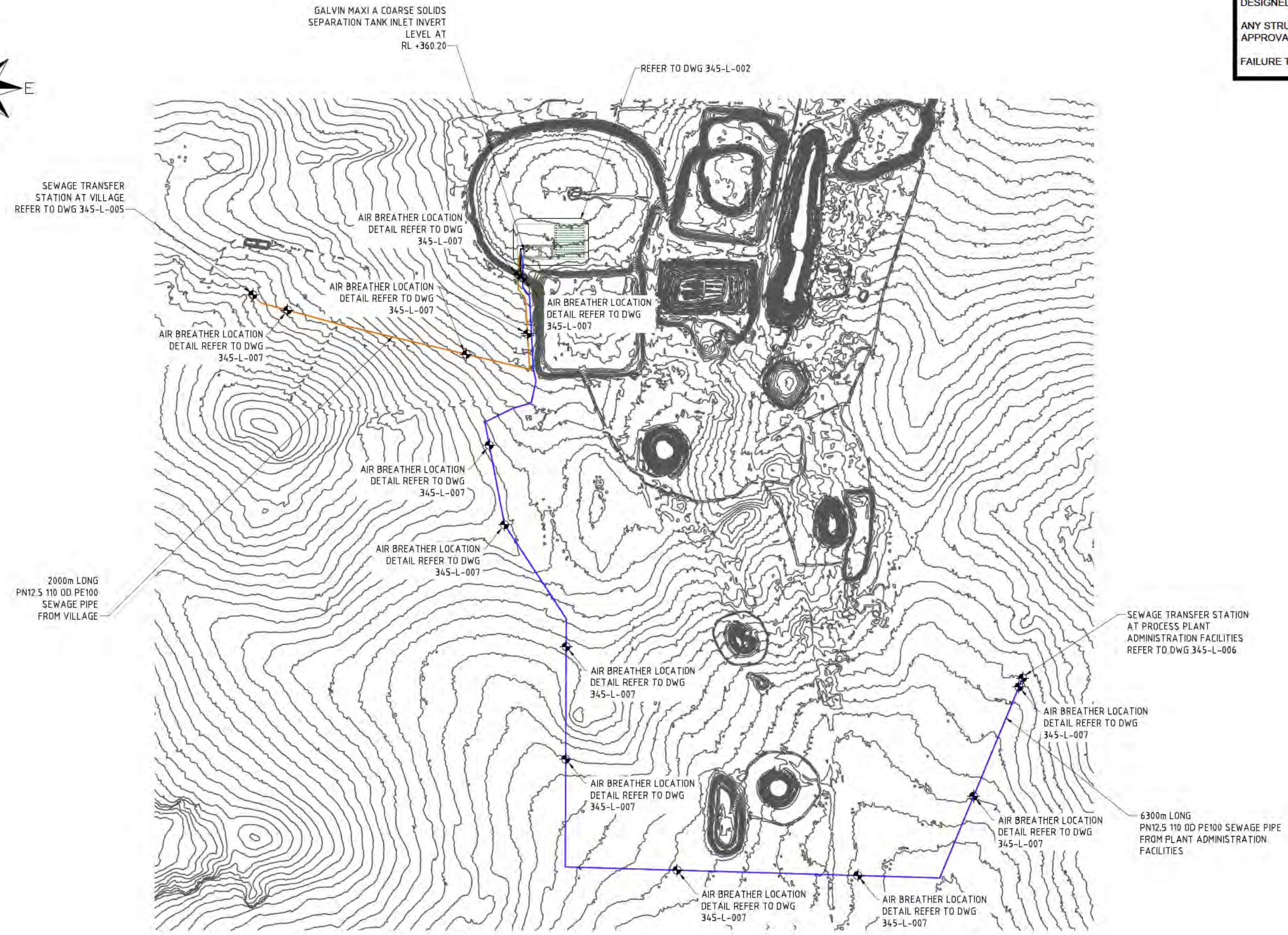
- Quarterly samples taken from the sampling point at the stabilisation ponds (refer to drawing 345-L-001) to ensure that the Phosphorus and Nitrogen concentrations comply with *WQPN22*
- Accurate monthly measuring of flows at the discharge of the village sewage transfer station and at the discharge of the stabilisation ponds
- Egress points for fauna
- Weekly inspections of the stabilisation pond banks and HDPE liner, as well as the sprinklers to make sure that they're spraying correctly
- The solids separation tank will be regularly inspected and pumped out by a licensed sewage contactor when it reaches $\frac{3}{4}$ full

Appendix A

Drawings

Wilshaw Drawing Number	Revision	Title
345-L-001	0	Mt Gibson – Wastewater Treatment Plant – Layout
345-L-002	0	Mt Gibson – Stabilisation Ponds & Irrigation – Layout
345-L-003	0	Mt Gibson – Stabilisation Ponds – Details
345-L-004	0	Mt Gibson – Irrigation Area – Sprinkler Detail
345-L-005	0	Mt Gibson – Village Pump Station – Details
345-L-006	0	Mt Gibson – Admin Pump Station – Details
345-L-007	0	Mt Gibson – Air Breather Valve – Details

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345-L-007	AIR BREATHER VALVE DETAIL
345-L-006	ADMINISTRATION FACILITIES PUMP STATION DETAILS
345-L-005	VILLAGE PUMP STATION DETAILS
345-L-004	SPRINKLER DETAIL
345-L-003	STABILISATION PONDS DETAILS
345-L-002	STABILISATION PONDS & IRRIGATION AREA LAYOUT
DRAWING No.	REFERENCE DRAWING

No.	BY	DATE	REVISION
0	BG	21.02.23	ISSUED FOR CONSTRUCTION
D	BG	15.02.23	TRENCH ADDED ON SOUTH WEST SIDE OF STABILISATION POND
C	BG	31.01.23	POND VOLUME INCREASED AND CHANGED PIPE SIZE
B	BG	23.11.22	IRRIGATION AREA PIPES REVISED
A	BG	18.11.22	ISSUED FOR CLIENT REVIEW

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DRAWN	BG	NOV 2022

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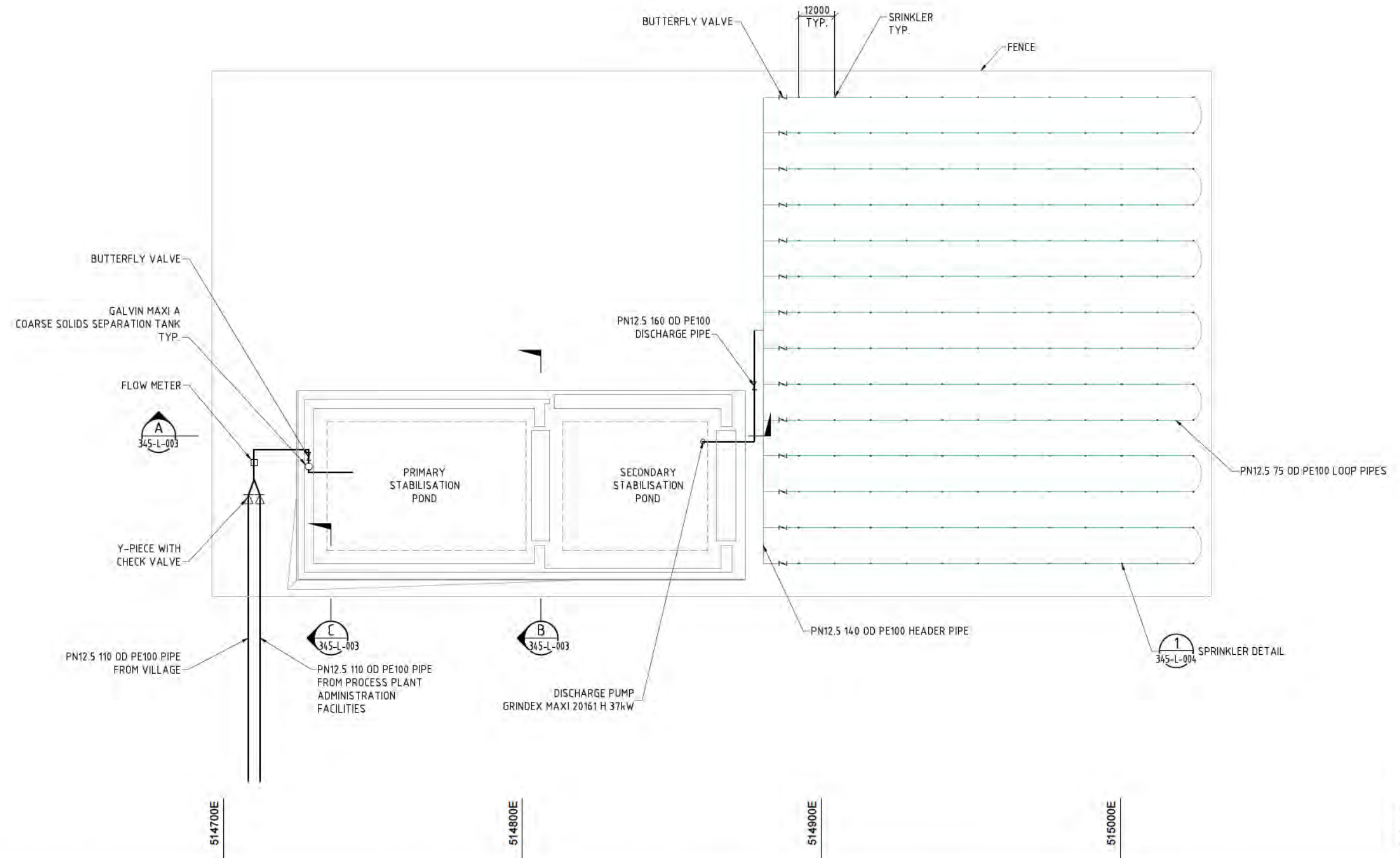
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TITLE	MT GIBSON WASTE WATER TREATMENT PLANT LAYOUT

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345-L-005	VILLAGE PUMP STATION DETAILS
345-L-004	SPRINKLER DETAIL
345-L-003	STABILISATION PONDS DETAILS
345-L-001	WASTE WATER TREATMENT PLANT LAYOUT

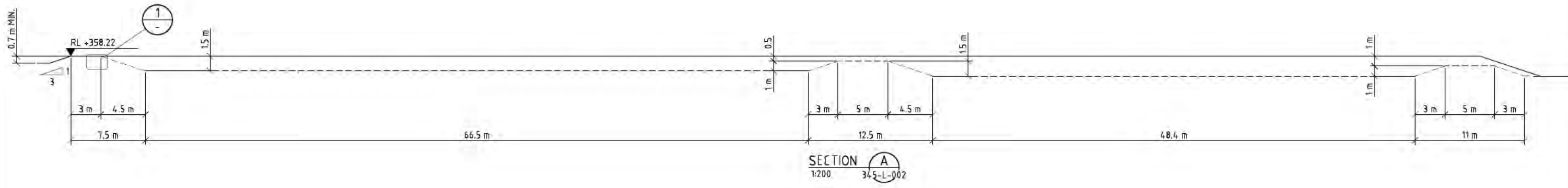
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D	BG	15.02.23	TRENCH ADDED ON SOUTH WEST SIDE OF STABILISATION POND
C	BG	31.01.23	POND VOLUME INCREASED AND CHANGED PIPE SIZE
B	BG	23.11.22	IRRIGATION AREA PIPES REVISED
A	BG	18.11.22	ISSUED FOR CLIENT REVIEW

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DESIGNED		
DRAWING CHECKED	CG	
DRAWN	BG	NOV 2022

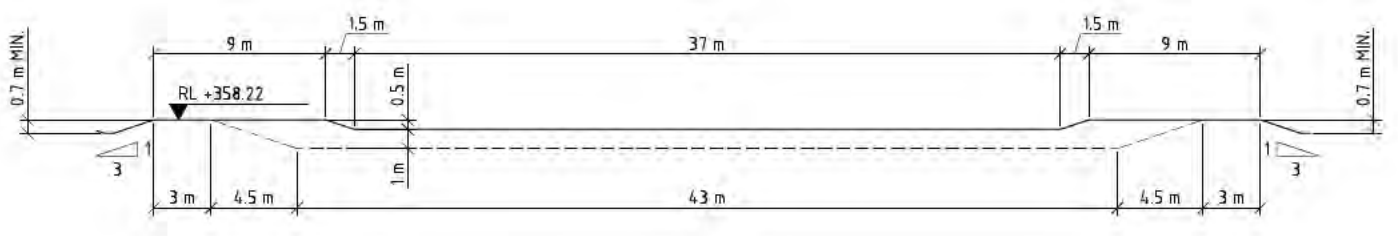

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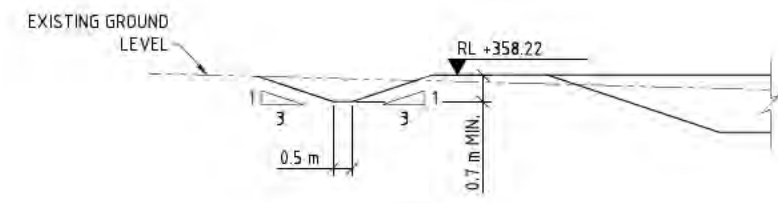
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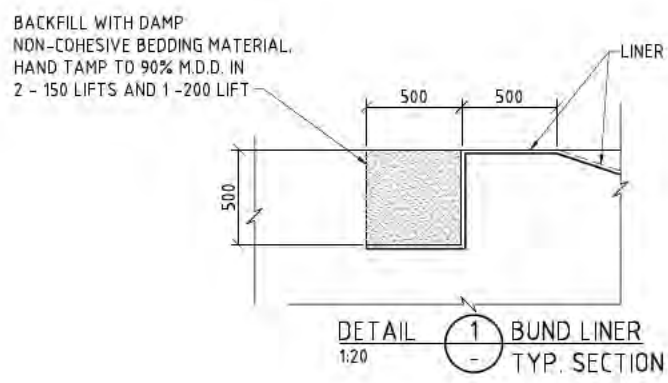
SECTION B
1:200 345-L-002



SECTION C
1:500 345-L-002

STABILISATION PONDS		
①	PRIMARY POND VOLUME	= 3239m ³
	PRIMARY POND SURFACE AREA	= 3617m ²
②	SECONDARY POND VOLUME	= 2404m ³
	SECONDARY POND SURFACE AREA	= 2727m ²

EVAPORATION / IRRIGATION BASINS		
①	EVAPORATION BASIN AREA	= 24192m ²



DETAIL 1 BUND LINER
1:20 TYP. SECTION

GENERAL NOTES:

- BUND WALLS AND FLOOR BUND WALLS SHOULD BE CONSTRUCTED USING SUITABLE LOCAL CLAY MATERIAL IMPORTED, SPREAD AND COMPACTED IN LAYERS. COMPACTION SHALL BE DEEMED ADEQUATE FOR 500 mm THICK LAYERS WHEN PROOF ROLLED WITH A MINIMUM OF FIVE (5) PASSES OF A SINGLE DRUM PEDESTRIAN SIZE VIBRATING ROLLER WITH TOTAL MASS NOT LESS THAN 350 kg. AFTER THE BUND WALLS HAVE BEEN CONSTRUCTED TO THE MINIMUM REQUIRED HEIGHT THE SIDES SHALL BE CAREFULLY SHAPED TO PRODUCE A UNIFORMLY GRADED, FLAT SURFACE TO THE DIMENSIONS AND SHAPES SHOWN ON THE DRAWINGS. EXCAVATE AROUND THE PERIMETER OF THE BUND WALL TO PROVIDE A SUITABLE KEY FOR THE IMPERVIOUS MEMBRANE. ANY DAMAGE OR PENETRATION OF THE LINER MUST BE MADE GOOD BY LINER INSTALLATION CONTRACTOR.
- BUND PREPARATION AND LINER INSTALLATION TO BE AS PER SUPPLIER/INSTALLERS INSTRUCTION.
LINER PERMEABILITY TO BE LESS THAN 10⁻⁹
LINER TO BE UV STABILISED/RESISTANT
LIFE EXPECTANCY OF LINER TO BE 15 YEARS OR GREATER.
FOLD THE FREE EDGES OF THE BUND LINER DOWN INTO THE ANCHOR TRENCH AND BACK FILL AS SHOWN.

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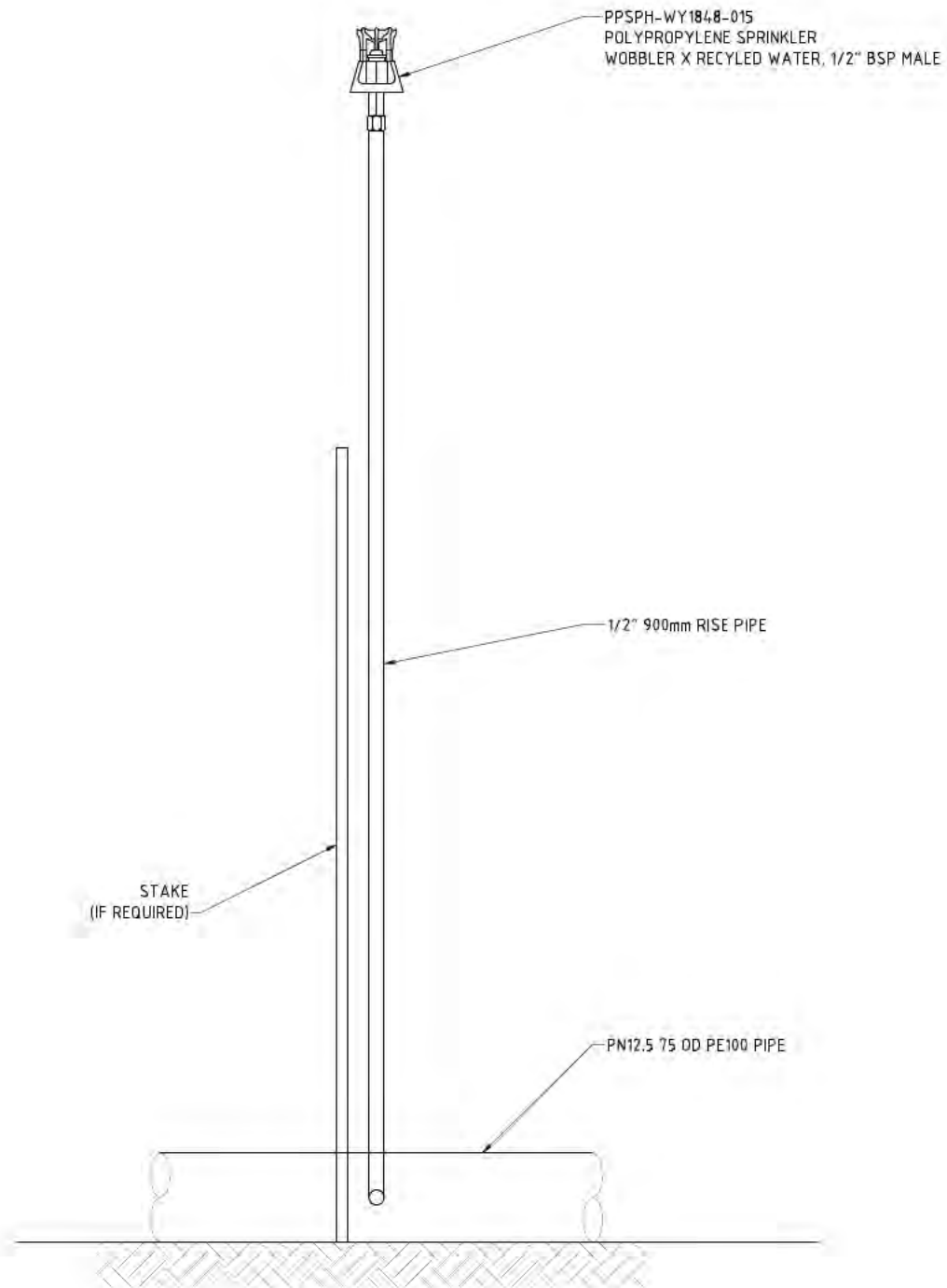
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345-L-002	STABILISATION PONDS & IRRIGATION AREA LAYOUT	A	BG	18.11.22	ISSUED FOR CLIENT REVIEW		
345-L-001	WASTE WATER TREATMENT PLANT LAYOUT						

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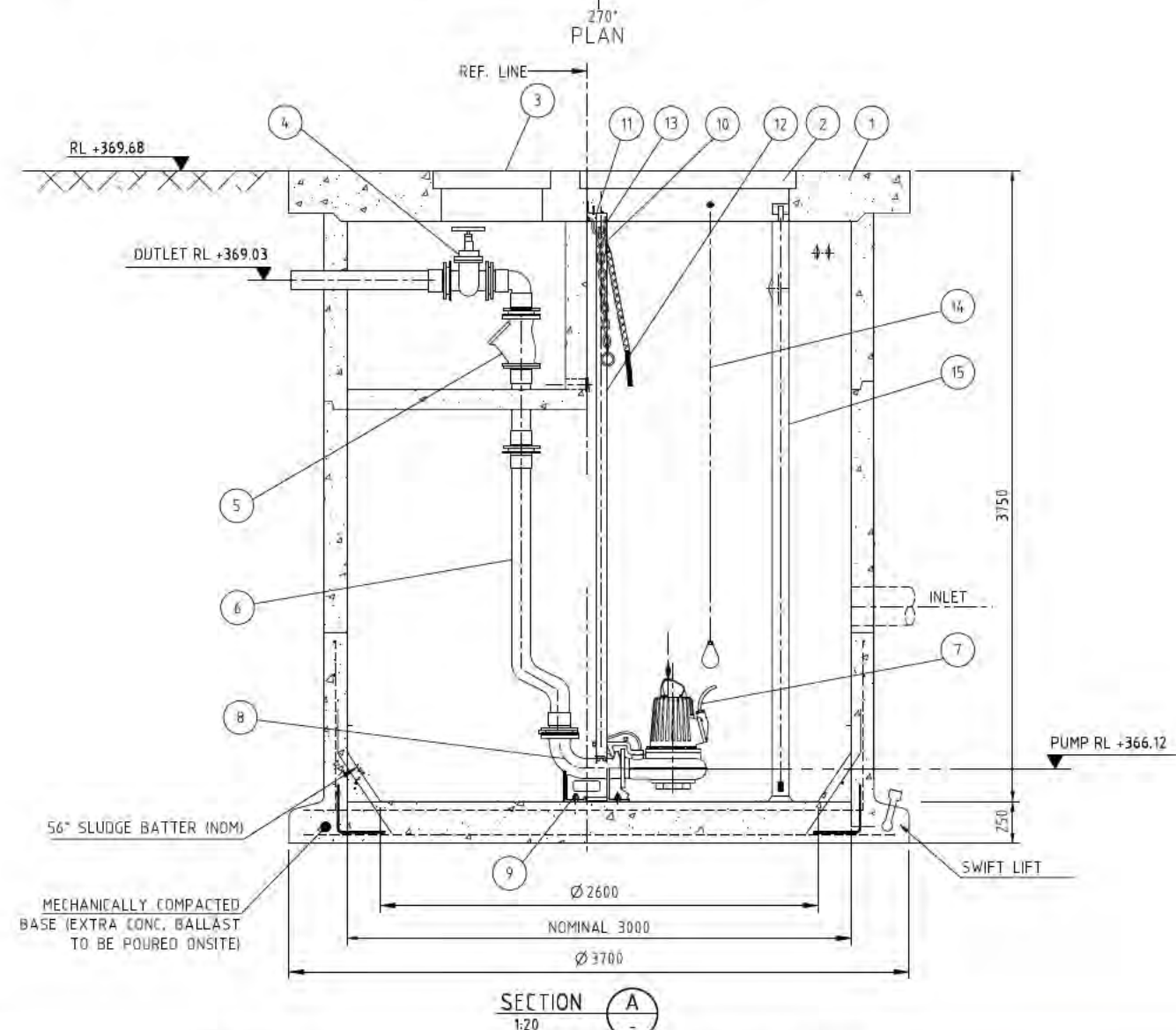
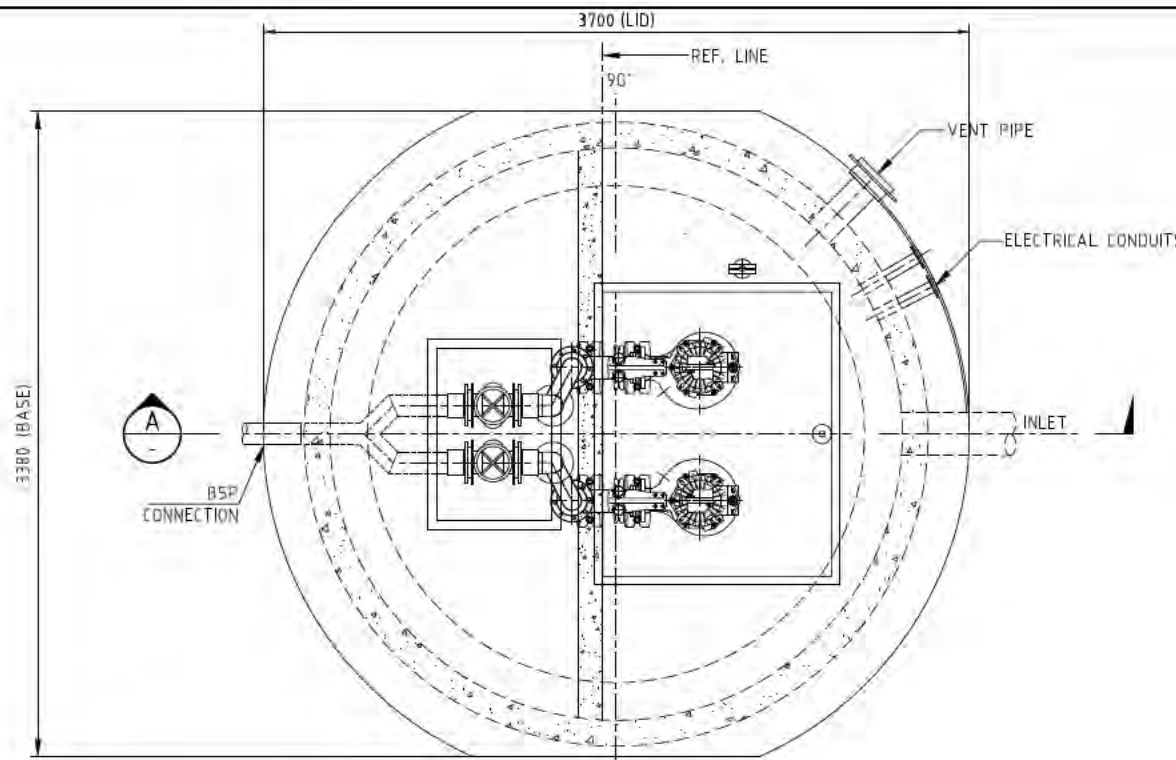
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TITLE	MT GIBSON WASTE WATER TREATMENT PLANT IRRIGATION AREA SPRINKLER DETAIL

SCALE	UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN MILLIMETRES.
JOB No. 7981	FILE NAME 345L001.dwg
DRAWING No. 345-L-004	REV No. 0
- DO NOT SCALE - - IF IN DOUBT ASK -	



ITEM DESCRIPTION	
1	PRECAST CONCRETE COVER SLAB
2	HEAVY DUTY CLASS D CAST IRON ACCESS HATCH 1200x1490
3	SEPARATE VALVE ACCESS HATCH HEAVY DUTY CLASS D CAST IRON 600x900
4	GATE VALVE
5	CHECK VALVE
6	RAISING MAIN & FITTING
7	NP3153.1B2 5H 273 IMPELLER 11kW
8	FLYGT DISCHARGE CONNECTION
9	SS316 ANCHOR FIXING
10	LIFTING CHAIN
11	UPPER GUIDE BAR BRACKET
12	GUIDE BAR
13	CHAIN & CABLE HOOKS
14	HIGH LEVEL ALARM ENMID
15	LEVEL TRANSDUCER C/W DRAFT TUBE & FITTINGS

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345-L-007	AIR BREATHER VALVE DETAIL
345-L-006	ADMINISTRATION FACILITIES PUMP STATION DETAILS
345-L-004	SPRINKLER DETAIL
345-L-003	STABILISATION PONDS DETAILS
345-L-002	STABILISATION PONDS & IRRIGATION AREA LAYOUT
345-L-001	WASTE WATER TREATMENT PLANT LAYOUT
DRAWING No.	REFERENCE DRAWING

No.	BY	DATE	REVISION
0	BG	21.02.23	ISSUED FOR CONSTRUCTION
1	BG	07.02.23	ISSUED FOR CLIENT REVIEW

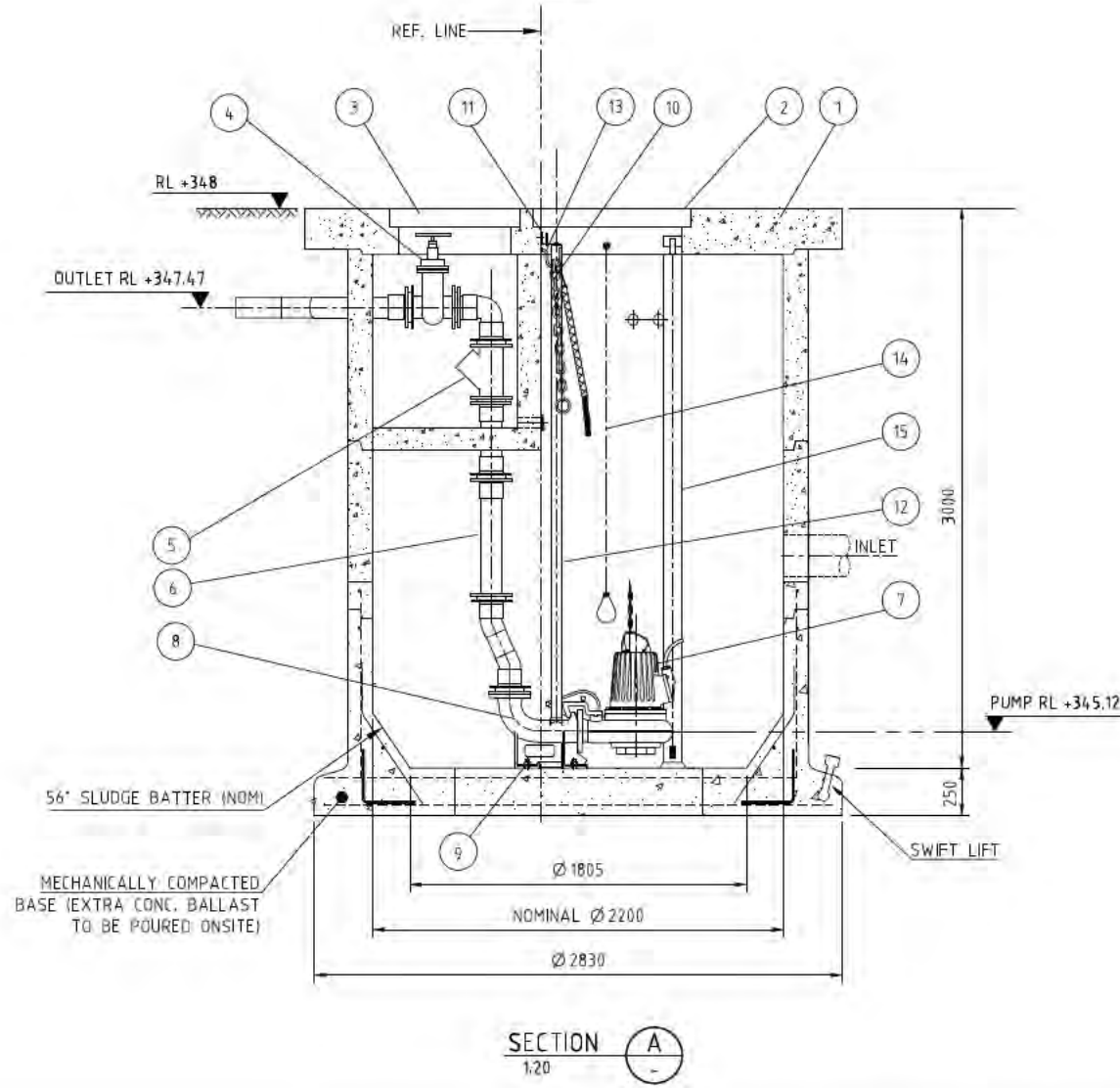
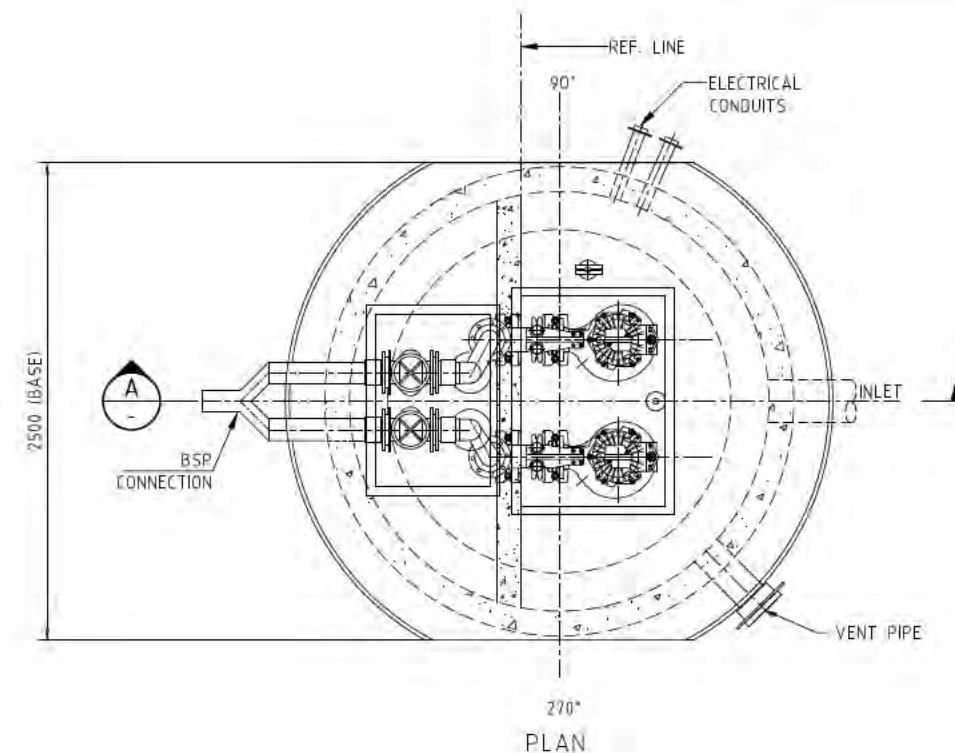
PROJECT APPROVED	BY	DATE
DESIGN APPROVED		
DESIGNED		
DRAWING CHECKED	CG	
DRAWN	BG	FEB 2023

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CLIENT	CRIMSON METALS PTY LTD
TITLE	MT GIBSON WASTE WATER TREATMENT PLANT VILLAGE PUMP STATION DETAILS

SCALE	1:20
JOB No.	7981
FILE NAME	345L001.dwg
DRAWING No.	345-L-005
REV No.	0
- DO NOT SCALE - - IF IN DOUBT ASK -	



ITEM	DESCRIPTION
1	PRECAST CONCRETE COVER SLAB
2	HEAVY DUTY CLASS 'D' CAST IRON ACCESS HATCH 750x1100
3	SEPARATE VALVE ACCESS HATCH HEAVY DUTY CLASS 'D' CAST IRON 600x900
4	GATE VALVE
5	CHECK VALVE
6	RAISING MAIN & FITTING
7	MP 3:27.170 HT 252 IMPELLER 7.4kW
8	FLYGT DISCHARGE CONNECTION
9	SS316 ANCHOR FIXING
10	LIFTING CHAIN
11	UPPER GUIDE BAR BRACKET
12	GUIDE BAR
13	CHAIN & CABLE HOOKS
14	HIGH LEVEL ALARM F/M13
15	LEVEL TRANSUCER C/W DRAFT TUBE & FITTINGS

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345-L-007	AIR BREATHER VALVE DETAIL
345-L-005	VILLAGE PUMP STATION DETAILS
345-L-004	SPRINKLER DETAIL
345-L-003	STABILISATION PONDS DETAILS
345-L-002	STABILISATION PONDS & IRRIGATION AREA LAYOUT
345-L-001	WASTE WATER TREATMENT PLANT LAYOUT
DRAWING No.	REFERENCE DRAWING

No.	BY	DATE	REVISION
0	BG	21.02.23	ISSUED FOR CONSTRUCTION
1	BG	07.02.23	ISSUED FOR CLIENT REVIEW

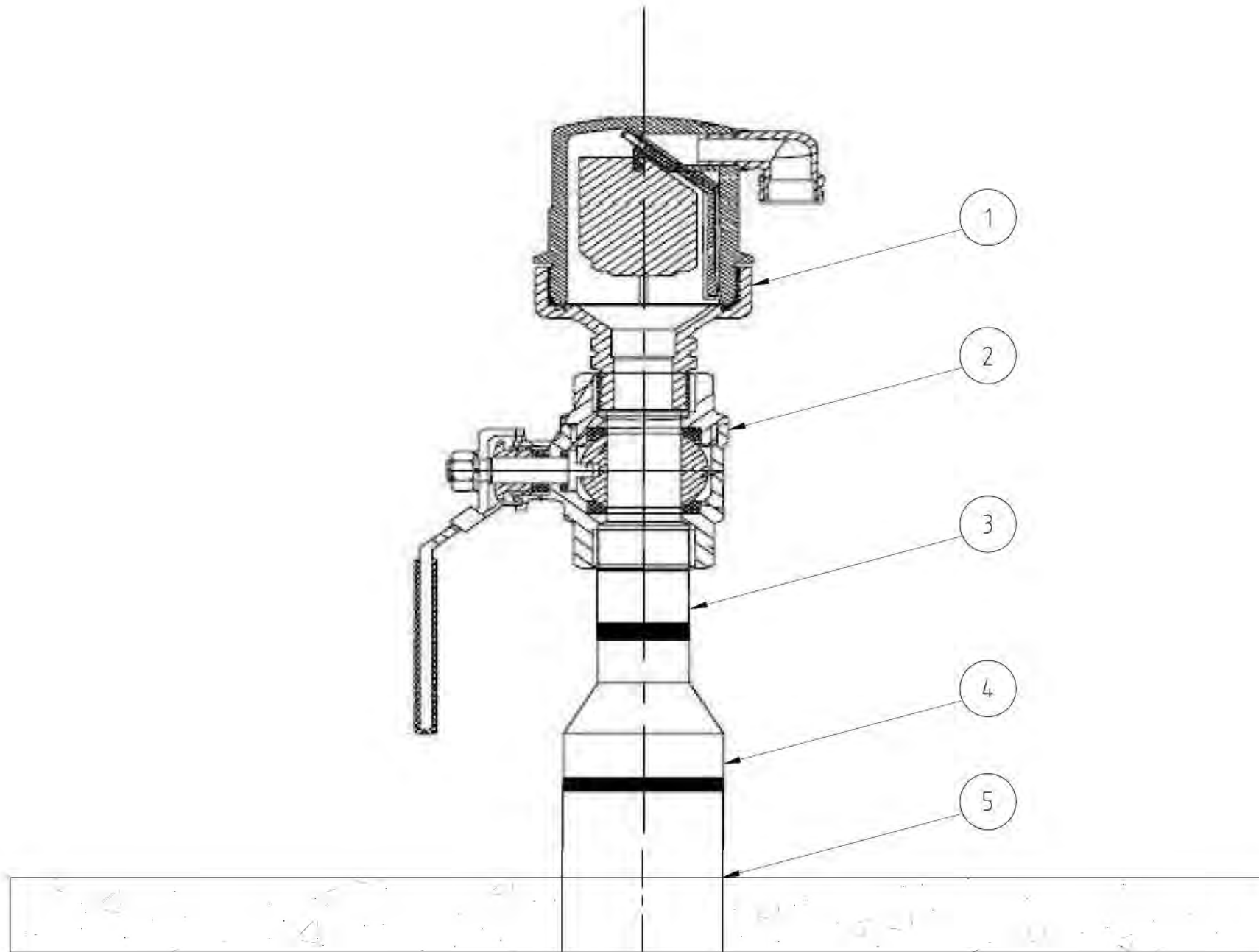
PROJECT APPROVED	BY	DATE
DESIGN APPROVED		
DRAWING CHECKED	CG	
DRAWN	BG	FEB 2023

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CLIENT	CRIMSON METALS PTY LTD
TITLE	MT GIBSON WASTE WATER TREATMENT PLANT ADMINISTRATION FACILITIES PUMP STATION DETAILS

SCALE	1:20
JOB No.	7981
FILE NAME	345L001.dwg
DRAWING No.	345-L-006
REV No.	0
- DO NOT SCALE - - IF IN DOUBT ASK -	

PART NO	QTY	PIPE SIZE	MATERIAL DESCRIPTION
1	1	DN53	STANDARD PN16 AIR VALVE A-D-040-50, 50MM BSP THREAD
2	1	DN53	316 SS BALL VALVE, WATER SERVICE, LOCKABLE, BSP
3	1	DN53	PE/TE MALE BSP THREAD ADAPTER PN12 5/8"DRIBBLE WATER 50 BSP
4	1	DN110xDN53	PN12 5/8"DRIBBLE, BUTT WELD CONCENTRIC REDUCER
5	1	DN110	PN12 5/8"DRIBBLE, BUTT WELD TEE



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0 10 20 30 40 50 60 70 80 90 100mm

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345-L-006
345-L-005
345-L-004
345-L-003
345-L-002
345-L-001

ADMINISTRATION FACILITIES PUMP STATION DETAILS
VILLAGE PUMP STATION DETAILS
SPRINKLER DETAIL
STABILISATION PONDS DETAILS
STABILISATION PONDS & IRRIGATION AREA LAYOUT
WASTE WATER TREATMENT PLANT LAYOUT

No.	BY	DATE	REVISION
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PROJECT APPROVED	BY	DATE
DESIGN APPROVED		
DESIGNED		
DRAWING CHECKED	CG	
DRAWN	BG	FEB 2023

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CLIENT
CRIMSON METALS PTY LTD

TITLE
**MT GIBSON
WASTE WATER TREATMENT PLANT
AIR BREATHER VALVE
DETAIL**

SCALE	UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN MILLIMETRES.
JOB No. 7981	FILE NAME 345L001.dwg
A1	REV No. 0
DRAWING No. 345-L-007	
- DO NOT SCALE - - IF IN DOUBT ASK -	