Cockatoo Swamp De-watering Pipeline

Melbourne Water

Cockatoo Swamp De-watering Pipeline

| Rev 5

16 January 2017

Document history and status

Revision	Date	Description	By	Review	Approved
A	28-09-2016	Pipeline Design	JJ	JM	NL
B	31-10-2016	Pipeline Design	JJ	NL	NL
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1	03-11-2016	Pipeline Design	JJ	NL	NL
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Distribution of copies

Revision	Issue approved	Date issued	Issued to	Comments
A	NL	28-09-2016	Edwina Manifold	Issued for review
0	NL	31-10-2016	Edwina Manifold	Final
1	NL	04-11-2016	Edwina Manifold	Revised cost
2	NL	18-11-2016	Edwina Manifold	Final
3	NL	08-12-2016	Edwina Manifold	Revised pump suction inlet arrangement
4	NL	23-12-2016	Edwina Manifold	Revised sediment extraction area
5	NL	16-01-2016	Edwina Manifold	Additional costs for construction

Cockatoo Swamp De-watering Pipeline

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Contents

Executive Summary

The Cockatoo Swamp is located within the Yellingbo Nature Conservation Reserve (YNCR). The YNCR is a highly sensitive area, providing habitat for various threatened flora and fauna species. The YNCR supports the only known extent of the Sedge-rich Eucalyptus camphora Swamp vegetation community (Listed as threatened under the Victorian Flora and Fauna Guarantee Act 1988). This protected vegetation provides some of the last known habitat for Victoria's state mammalian emblem, the Leadbeater's Possum and the state avian emblem, the Helmeted Honeyeater. Both these species are listed as Critically Endangered (Commonwealth Environment Protection and Biodiversity Conservation Act 1999). Due to historic agricultural land practices, the Cockatoo Swamp vegetation has experienced significant dieback, measurable since the 1990s. This dieback is leading to the depletion of the protected vegetation community, and hence, the depletion of available habitat for the threatened species that occur within the YNCR. This pipeline has been designed to appropriately de-water the Cockatoo Swamp in order to reduce excess inundation and the subsequent dieback, hence promoting regeneration of the protected vegetation and habitat for the sensitive threatened species

Previous studies have indicated that water logging is the main cause for the dieback and hydraulic modelling revealed that water drained from the creek, at the inlet (alignment option 4) at the rate of 20 ML/d, would benefit the vegetation in this area and surrounds.

After several discussion and workshops, it was decided by all stakeholders to conduct a trial on a temporary basis for four months of the year (Jan to April) for three years, to study the benefits before implementing a permanent solution.

The proposed Cockatoo Swamp temporary de-watering system consists of an inlet, suction pipeline, pumping, discharge pipeline and an outlet. A floating suction has been considered, to avoid the need of a wet well (permanent structure) and cofferdam to isolate the area required for construction. The suction pipeline and discharge pipeline will be laid above ground, alongside the proposed access track and existing access road. A silenced and 110% bunded diesel operated pump set will be utilised to drain the water. The pumped water will be discharged into the creek downstream of the area of interest, using sand bag in order to dissipate energy and avoid bank erosion/scouring.

As the pipelines are laid above ground the need for clearing of vegetation is very minimal.

Considering the temporary arrangement and cost effectiveness, hiring the required equipment (pump units and pipelines) has been recommended. The cost for hiring and operating the scheme for four months in a year has been estimated to be **$299,970.00** with an additional fixed cost of **$48,330.00** over the life of the project.

Important note about your report

The sole purpose of this report is to provide design information that required for getting permits to construct and implement the scheme.

In preparing this report, Jacobs has relied upon, and presumed accurate, certain information (or absence thereof) provided by the Client and other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from a variety of sources. The sources are identified at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose of the project and by reference to applicable standards, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Melbourne Water, and is subject to, and issued in connection with, the provisions of the agreement between Jacobs and Melbourne Water. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction

1.1 Project background

The Cockatoo Swamp is located within the Yellingbo Nature Conservation Reserve (YNCR). The YNCR is a highly sensitive area, providing habitat for various threatened flora and fauna species. The YNCR supports the only known extent of the Sedge-rich Eucalyptus camphora Swamp vegetation community (Listed as threatened under the Victorian Flora and Fauna Guarantee Act 1988). This protected vegetation provides some of the last known habitat for Victoria's state mammalian emblem, the Leadbeater's Possum and the state avian emblem, the Helmeted Honeyeater. Both these species are listed as Critically Endangered (Commonwealth Environment Protection and Biodiversity Conservation Act 1999). Due to historic agricultural land practices, the Cockatoo Swamp vegetation has experienced significant dieback, measurable since the 1990s. This dieback is leading to the depletion of the protected vegetation community, and hence, the depletion of available habitat for the threatened species that occur within the YNCR. This pipeline has been designed to appropriately de-water the Cockatoo Swamp in order to reduce excess inundation and the subsequent dieback, hence promoting regeneration of the protected vegetation and habitat for the sensitive threatened species.

Previous study indicated that waterlogging in the lower swamp is the major cause of dieback and lack of regeneration. Jacobs has been commissioned to assist Melbourne Water to improve hydrological conditions within Cockatoo Swamp and hence mitigate historic impacts to Cockatoo Swamp that are affecting dieback impacts to the protected vegetation and the threatened species habitat.

The hydraulic modelling based on terrain and channel data revealed that an extraction rate 20 ML/d would benefit the vegetation in this area and surrounds by reducing excess inundation that results in dieback. Inlet and outlet locations were also considered in the modelling. Jacobs presented modelling results in four workshops and was accepted by all stakeholders.

In the functional design phase, three options of pipeline as follows were considered.

1. A trenched pipeline located within the road
2. A combination of trenched and bored pipeline
3. An above ground pipeline located next to the road

Due to high capital investment, MW and stakeholders decided to operate the scheme on a temporary basis for four months of the year (Jan to April) for three years, to study the benefits before implementing a permanent solution. Therefore, an above ground pipeline option has been adopted.

2. Design Features

The Cockatoo Swamp de-watering system consists of:

- Inlet
- Suction pipeline
- Pumping
- Discharge Pipeline
- Outlet

2.1 Inlet

Alignment 4, identified by the Working Group on site on 7 September 2015, has been adopted as the inlet location. This is located at Easting 367562.539 and Northing 5810025.864 in the Cockatoo Swamp.

A floating suction with a strainer has been considered due to high silt condition of the creek. The advantage of the floating suction is that the inlet location can be adjusted as required, and the need of a wet well (permanent structure) and cofferdam to isolate the area required for construction can be avoided, thus causing less disruption to the creek and surrounding area.

It is to be noted that the pump is capable of handling solids up to 80mm. In order to avoid any maintenance issues that causes blockage on the floating suction line, the suction line will be inserted in to a galvanized iron box that has perforation and covered with shade cloth which will act as a suction screener. Refer Figure.1 below for visualisation.

The pump maintenance crew from the hiring company will inspect the suction inlet regularly and carry out necessary clean up if required to ensure smooth running of the pump. This arrangement will have less cost and disruption to the creek and surrounding area. Even a wet well permanent structure will also require some sort of screening and maintenance. Refer the drawing IS121900 –ECC-DG-0105 for details.

Note that Figure.1 presents a similar inlet arrangement that is proposed for this project, but this level of site impact is much higher than will occur at Cockatoo Swamp.

Figure 1: Inlet arrangement of a similar project

2.1.1 Inlet excavation

It is beneficial for the proper installation of the floating suction to remove the silt to a width of 3m and to a depth up to the hard bed from the bank to the middle of the channel (approximately 14m). Removed silt is expected to be very wet and soft and will be stored temporarily on site within a strawbale structure for 1-2 days in order to drain. Once drained the silt will be removed from the project site and disposed of in an appropriate landfill facility. (Note that the silt does not need to be completely dry prior to removal, but that drier material is easier to transport.) Refer the drawing IS121900 –ECC-DG-0106 for details.

When excavating sediment from Cockatoo Creek, measures are to be implemented to ensure maintenance of water quality and prevention of the mobilisation of sediment downstream. To prevent sediment pollution of waterways, the Works shall be carried out in accordance with EPA Publication No 480 “Environmental Guidelines for Major Construction Sites” and EPA Publication No 275 “Construction Techniques for Sediment Pollution Control”. It is anticipated this will include provision of silt curtains to prevent sediment mobilisation downstream. The curtains may consist of one of the following:

1. A curtain which covers the full width of the stream, and is maintained on a daily basis capturing any sediment which might pass downstream

2. A silt curtain which captures the zone where excavation is to occur, and maintains flow through the remaining cross section of the creek. Care must be taken when constructing this option that the curtain does not collapse due to the capture of flows. This curtain will be maintained on a daily basis.

2.2 Suction Pipeline

DN 200 highly flexible corrugated rubber hose with cuffed ends for ease of inserting hose fittings will be used as the suction pipe. It is abrasion and weather resistant. It has a pressure rating of 10 bar.

The hose will be laid above ground.

2.3 Pumping

2.3.1 Flow

As per the hydraulic modelling conducted in the functional design, it is required to pump water at the rate of 20 ML/d from the creek, in order to provide the required water level reduction.

Due to the high rate of discharge and requirement for a silenced and bunded pump set for environmental protection, two pump sets (each capable of delivering 10 ML/d) has been considered. The advantage is that it will give flexibility to run the test at lower capacity, if required.

A battery operated electromagnetic flow meter will be installed on the delivery line. The telemetry is web based and the flow can be monitored remotely. The flow will be measured every hour and will be transmitted once a day. The flow meter battery has a life of 5 years and telemetry battery has a life of 3 years if flow measurement is transmitted once a day. If more recordings are required to be downloaded, battery life will reduce accordingly.

2.3.2 Head

Maximum practical suction head is limited to be not more than 7 to 8 m. The actual suction head is within 2 m and there is enough NPSH available for the pump to operate without cavitation.

Delivery head required is the sum of difference in elevation, friction loss in the discharge pipeline and losses in the valves and fittings. This is estimated to be 25 m.

2.3.3 Pump selection

A centrifugal pump model Sykes QSCP220i with diesel engine model Perkins 1104C-44TA that meets the above requirement of flow and head has been selected. It has rated power of 83.5 kW (112 hp) at 1800 engine rpm and has the following features:

- Mechanical seals in self-contained coolant bath for long life.
- Fuel tank fully bunded to a capacity of 110%. Bunding is a wall or structure within the storage tank designed to prevent spillage of the fuel.
- Automatic self-priming system.
- Silenced to a noise rating of 69 dB at 1 m.
- Capable of handling solids up to 80 mm
- Fuel tank built into skid
- Pump, engine and fuel tank are all consolidated in to one unit as shown in the picture below.

Figure 2: Pump and diesel engine in one unit

A diesel operated pump is considered due to non-availability of electric power in the site and huge capital cost involved in running cable from the nearest power pole, which is more than a kilometre from the inlet location.

The fuel consumption at best efficiency point is approximately 6.5 litres per hour @ 1400 rpm and it has a fuel tank that has a capacity of 340 litres. Since it is required to refuel in every 48 hrs, it has been decided to use 10,000 litre fuel cell. One cell can be used for both the pumps and it will have enough capacity to operate two pumps for almost one month. This can avoid the need for refuelling every other day. The foot print of the fuel cell is 2.3 m x 5.7 m. The fuel cell is 110% bunded.

A level control will be installed to shut off pump automatically if water level drops down thus protecting the pump from dry running.

Pumps impeller and wearplate are constructed of 316 stainless steel, the shaft is made of 431 stainless steel and housing is constructed of cast iron.

The unit's dimensions are:

- Overall length ……..2800mm
- Overall width ……1150mm
- Weight without fuel ……..2600 kg

The pump unit will be located above ground as near as possible to the water course. An area of 100 m^2 will be required to accommodate two pump units and fuel cell.

2.4 Discharge Pipeline

2 nos of DN200 lay flat hose made of extruded nitrile and reinforced with circular woven polyester/nylon will be utilised for discharging the water.

The hose has a pressure rating of 10 bar i.e. 100m which is more than double the working pressure of the system.

All hose connectors are Bauer fittings and have a pressure rating of 12 bar.

The discharge pipeline (2 nos of DN200) will be laid above ground parallel to the access track from the pump unit at RD 725 up to the access road at RD665 and then run parallel to the access road up to RD 23 before turning in to the existing bush, for discharge to the creek. Refer to the drawings in Appendix A.

2.5 Outlet

The outlet is located at Easting 367383.672 and Northing 5810569.382

The pumped water will be discharged in to the creek, with the outlet surrounded by 15 -20 sand bags covered with a sheet of geotextile fabric that is held in place with star pickets in order to dissipate energy and avoid any bank erosion/scouring. The total area of the outlet will be approximately 1m x 2m. The velocity at the outlet is expected to be 3.66 m/s.

No vegetation clearing is required for the outlet installation.

2.6 Project Visualisation

Refer to the picture below of a similar set up for visualisation of the scheme.

Figure 3: Project visualisation for pump and suction set up

3. Vegetation Clearance

Areas of vegetation clearance are very minimal as pipes are laid above ground, beside the proposed access track and existing road. Vegetation will be slashed to a height of 0.1m, with material to be used on site by Parks Victoria.

Areas where clearance is required are:

1. 75 m long by 4 m wide corridor to provide access to deliver and install pump unit near the water course from RD 655 to RD 727 and then deliver diesel for the operation of the pump unit. Refer the drawing IS121900 –ECC-DG-0104.

2. 100 m^2 for the installation of pump units including 10,000L fuel cell. Refer the drawing IS121900 –ECC-DG-0105

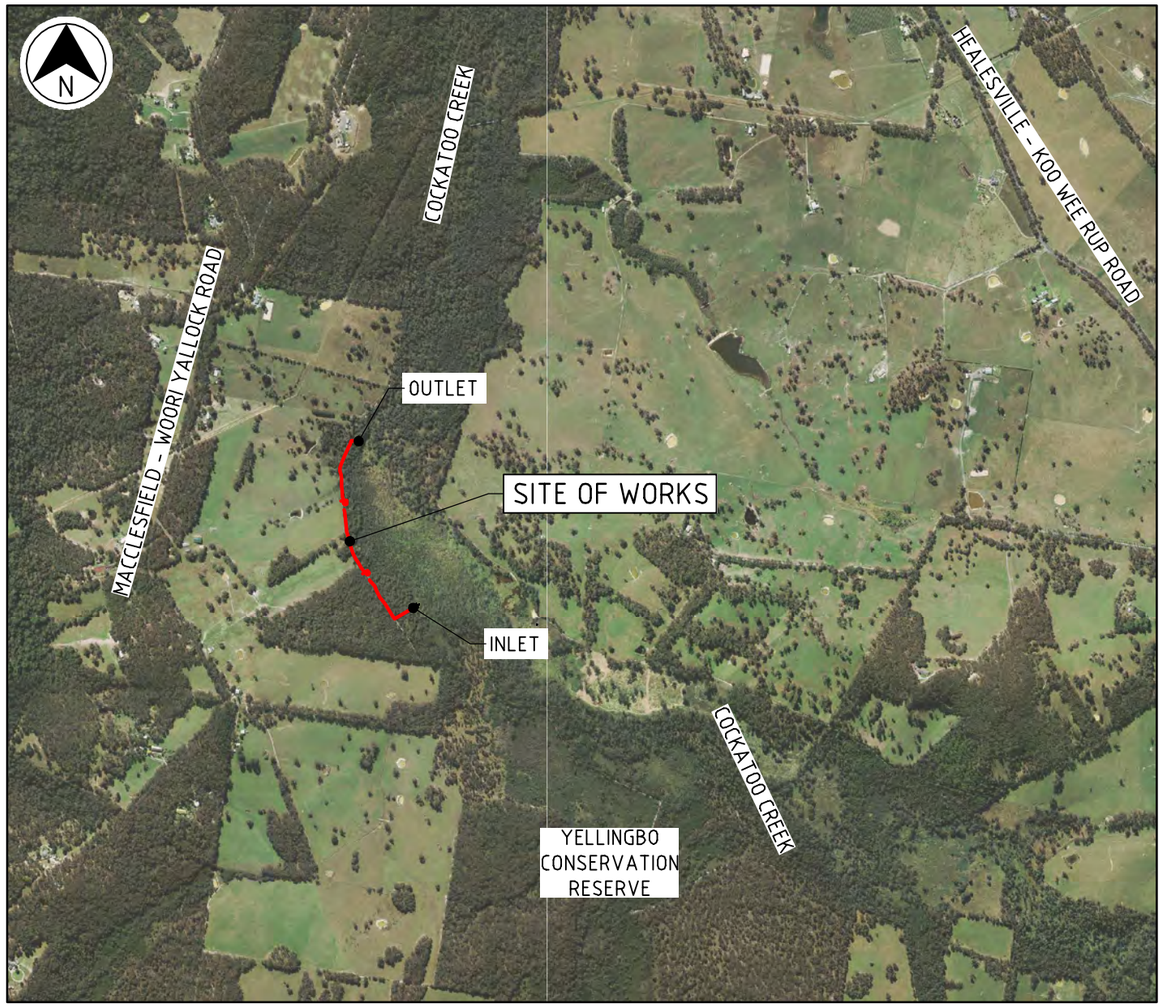
In all other areas, it is assumed that the hose will be laid above the existing natural surface.

Note that the width of the access track is required to be 4 m to allow for movement of the excavator. In subsequent years when silt excavation is not required, the access track width can be reduced to 3 m.

Appendix A. Design Drawings

COCKATOO CREEK SWAMP

HYDROLOGY IMPROVEMENT -PIPELINE DESIGN



LOCATION PLAN
NTS

DRAWING LIST

IS121900-ECC-DG-0101	DRAWING INDEX AND LOCATION PLAN	SHEET 01 OF 01
IS121900-ECC-DG-0102	SHEET LAYOUT AND NOTES	SHEET 01 OF 01
IS121900-ECC-DG-0103	PLAN AND LONG SECTION	SHEET 01 OF 02
IS121900-ECC-DG-0104	PLAN AND LONG SECTION	SHEET 02 OF 02
IS121900-ECC-DG-0105	SILT REMOVAL DETAILS (DURING CONSTRUCTION)	SHEET 01 OF 01
IS121900-ECC-DG-0106	SILT REMOVAL DETAILS (DURING OPERATION)	SHEET 01 OF 01

1

ISSUED FOR CONSTRUCTION

REV	DATE	DRAWN	REV'D	APP'D	REVISION
1	21.12.16	SO	JJ	NL	ISSUED FOR CONSTRUCTION
0	31.10.16	DP	JJ	NL	ISSUED FOR CONSTRUCTION
A	28.09.16	DP	JJ		ISSUED FOR INFORMATION

DRAWING NUMBER	REFERENCE DRAWING TITLE

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CLIENT: MELBOURNE WATER
PROJECT: COCKATOO CREEK SWAMP HYDROLOGY IMPROVEMENT

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
D.PARTE	S. ORR	N. LOGAN	N. LOGAN
DESIGNED	DESIGN REVIEW	DATE 31.10.16	DATE 31.10.16
J. JOHN	J. JOHN		

TITLE: COCKATOO SWAMP DEWATERING 1
DRAWING LIST AND LOCATION PLAN

SCALE	DRAWING No	REV
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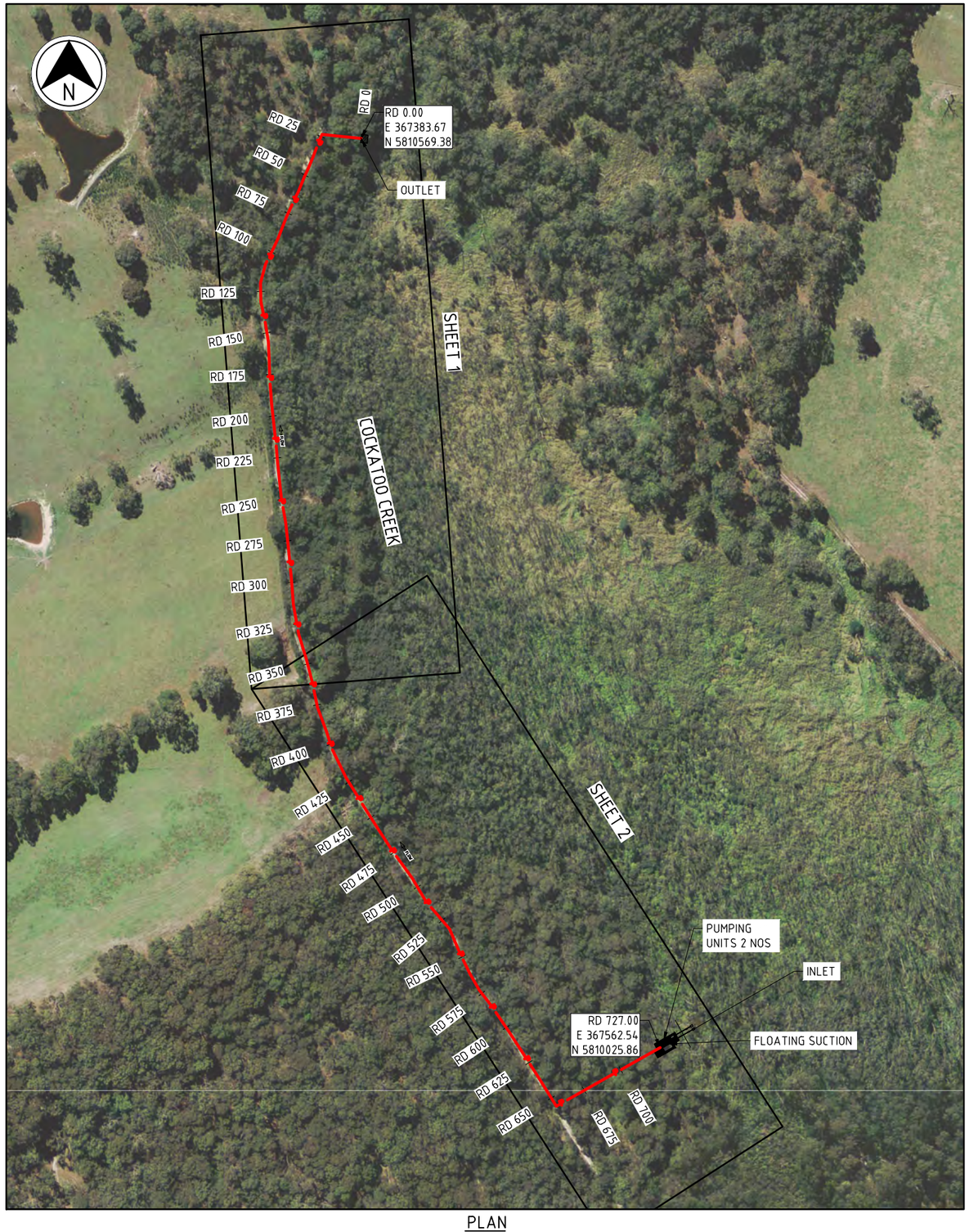

PLAN
SCALE 1:1500

GENERAL NOTES

G1. THE FOLLOWING DRAWINGS PRESENT A GENERAL ALIGNMENT FOR THE LOCATION OF A DRAINAGE PIPELINE IN COCKATOO CREEK SWAMP. THE DRAWINGS IDENTIFY POTENTIAL INLET LOCATIONS, WITH PIPELINE ALIGNMENT AND OUTLET LOCATION. THE INLET SHOULD BE LOCATED IN A STABLE REACH OF THE CREEK, WITH ADEQUATE CAPACITY TO ALLOW FOR ONGOING INFLOW TO THE PIPELINE. THE LOCATION SHOULD ALSO MINIMISE THE RISK OF SEDIMENT BUILD UP WITHIN THE PIPELINE.

2 G2. THE ENTIRE PIPELINE WILL BE LAID ABOVE GROUND ON THE EDGE OF THE ACCESS TRACK AND NOT DISTURBING VEGETATION.

G3. ALL WORKS TO SATISFACTION OF STATUTORY AUTHORITIES.

G4. DRAWINGS TO BE READ IN CONJUNCTION WITH MELBOURNE WATER STANDARD DRAWINGS AND SPECIFICATIONS UNLESS NOTED OTHERWISE.

G5. CONTRACTOR TO CLARIFY THE EXTENT OF SEDIMENTS ONSITE AND LIAISE WITH MELBOURNE WATER FOR EROSION AND SEDIMENT CONTROL.

ENVIRONMENTAL NOTES

2 E1. ECOLOGIST REPORT TO BE OBTAINED IDENTIFYING IMPACT UPON EXISTING VEGETATION AND MITIGATION STRATEGY WHERE POSSIBLE.

E2. ENVIRONMENTAL AND STORMWATER MANAGEMENT PLANS MUST BE DEVELOPED AND SUBMITTED FOR REVIEW.

E3. ALL DISTURBED AREAS MUST BE REINSTATED TO THE SATISFACTION OF THE RESPONSIBLE AUTHORITY.

E4. SITE ACCESS ROUTES AND STAGING AREAS MUST BE CLEARLY IDENTIFIED AND INCLUDED IN EMP.

E5. FINAL DRAIN ALIGNMENT TO MINIMIZE DISTURBANCE TO VEGETATION.

MAPPING AND SURVEY NOTES

M1. ALL LEVELS ARE IN METRES (UNO).

M2. ALL COORDINATES ARE GDA 94 MGA ZONE 55 (UNO)

M3. ALL LEVELS AND COORDINATES MUST BE VERIFIED ON SITE.

M4. TBM AND PSM UTILIZED DURING PROJECT MUST BE CLEARLY IDENTIFIED AND DETAILS PROVIDED.

CULTURAL HERITAGE NOTES

C1. INVESTIGATION AND CONSTRUCTION WORKS MUST BE UNDERTAKEN IN ACCORDANCE WITH APPLICABLE LEGISLATION.

SCALE 1:1500 (A1) 0 30 60 90 120 150m
30 15

ISSUED FOR CONSTRUCTION

REV	DATE	DRAWN	REV'D	APP'D	REVISION
2	23/12/16	TW	JJ	NL	ISSUED FOR CONSTRUCTION
1	08.12.16	SO	JJ	NL	ISSUED FOR CONSTRUCTION
0	31.10.16	DP	JJ	NL	ISSUED FOR CONSTRUCTION
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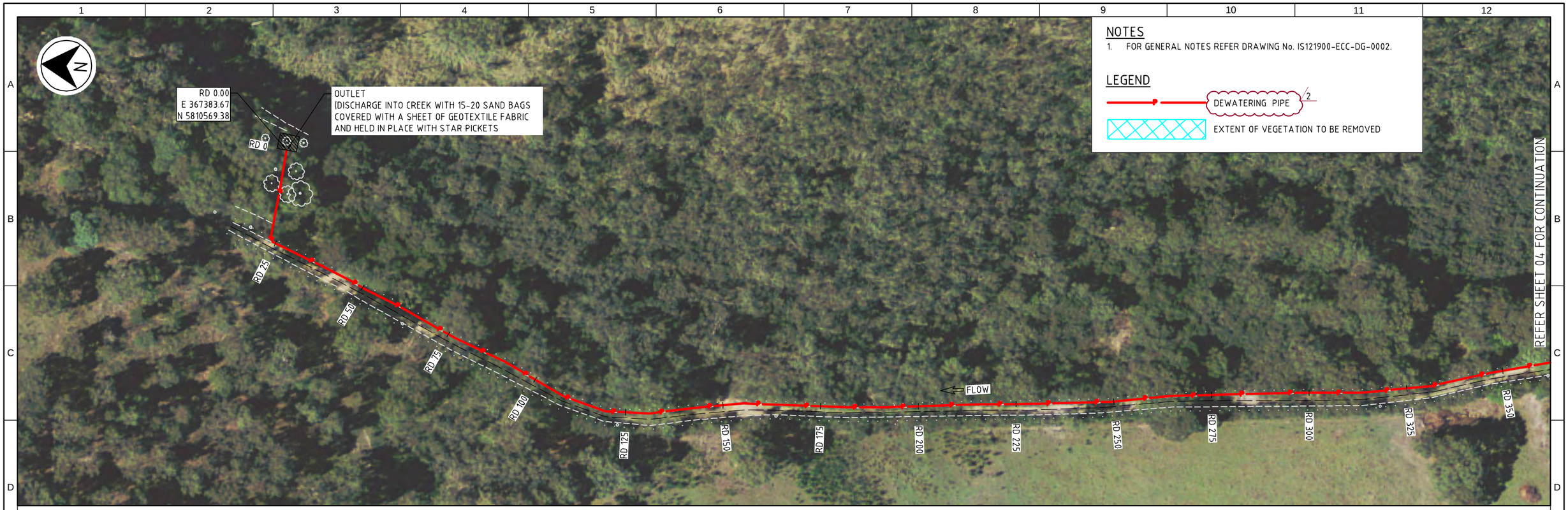
CLIENT: MELBOURNE WATER			
PROJECT: COCKATOO CREEK SWAMP HYDROLOGY IMPROVEMENT			
DRAWN: D. PARTE	DRAWING CHECK: T. GIBELLINI	REVIEWED: N. LOGAN	APPROVED: N. LOGAN
DESIGNED: J. JOHN	DESIGN REVIEW: J. JOHN	DATE: 31.10.16	DATE: 31.10.16

TITLE: COCKATOO SWAMP DEWATERING
SHEET LAYOUT AND NOTES

SCALE	DRAWING No	REV
AS SHOWN	IS121900-ECC-DG-0102	2

A1



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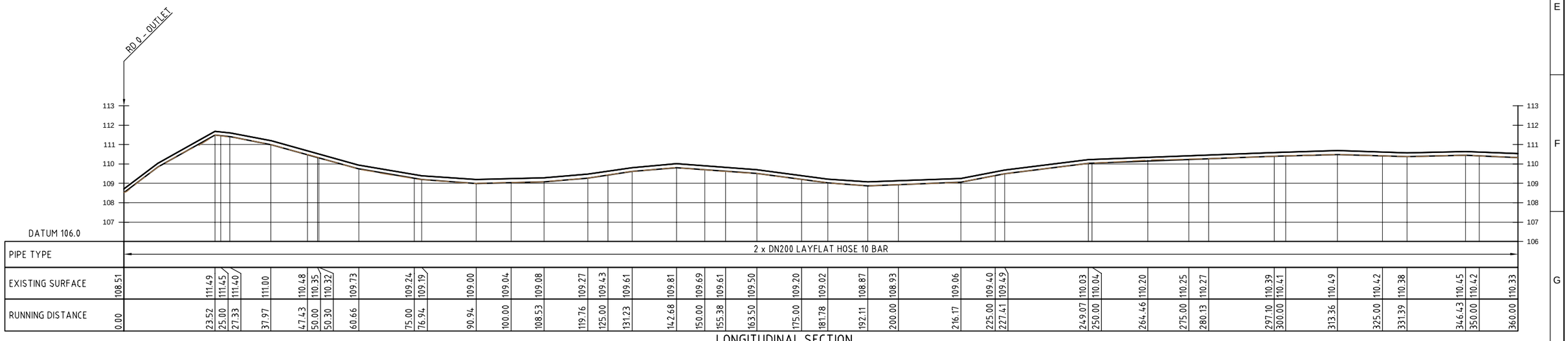

LONGITUDINAL SECTION
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SCALE 1:500 (A1) 0 10 20 30 40 50m

ISSUED FOR CONSTRUCTION

REV	DATE	DRAWN	REV'D	APP'D	REVISION
2	08.12.16	SO	JJ	NL	ISSUED FOR CONSTRUCTION
1	18.11.16	DP	JJ	NL	ISSUED FOR CONSTRUCTION
0	31.10.16	DP	JJ	NL	ISSUED FOR CONSTRUCTION
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CLIENT	MELBOURNE WATER
PROJECT	COCKATOO CREEK SWAMP HYDROLOGY IMPROVEMENT
DRAWN	D. PARTE
DRAWING CHECK	S. ORR
REVIEWED	N. LOGAN
APPROVED	N. LOGAN
DESIGNED	J. JOHN
DESIGN REVIEW	J JOHN
DATE	31.10.16
DATE	31.10.16

TITLE
COCKATOO SWAMP DEWATERING
PLAN AND LONGITUDINAL SECTION
SHEET 01 OF 02 2

SCALE	DRAWING No	REV
AS SHOWN	IS121900-ECC-DG-0103	2

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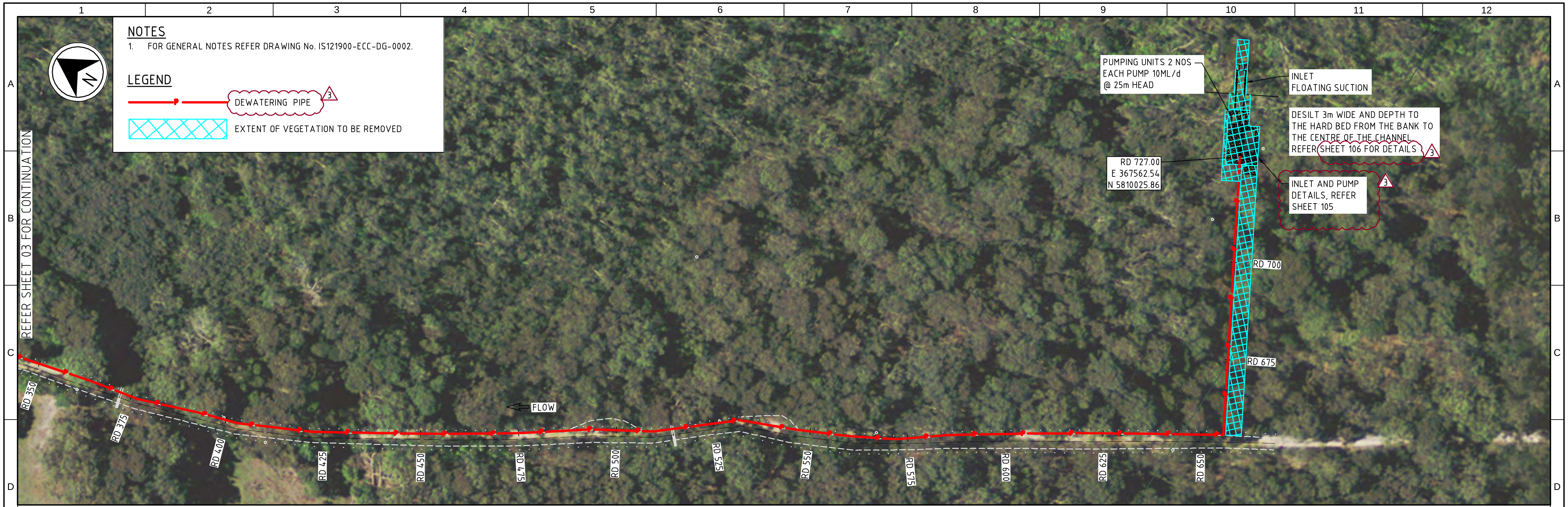
LOCATION: C:\users\ssorr\appdata\local\projectwise\jacobs_anz_eldms\72367\IS121900-ECC-DG-0103.dwg

NOTES

1. FOR GENERAL NOTES REFER DRAWING No. IS121900-ECC-DG-0002.

LEGEND

- DEWATERING PIPE 3
- ▨ EXTENT OF VEGETATION TO BE REMOVED



PLAN

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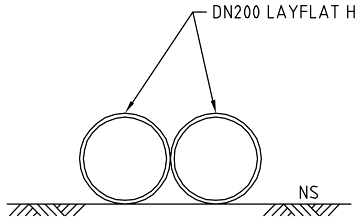
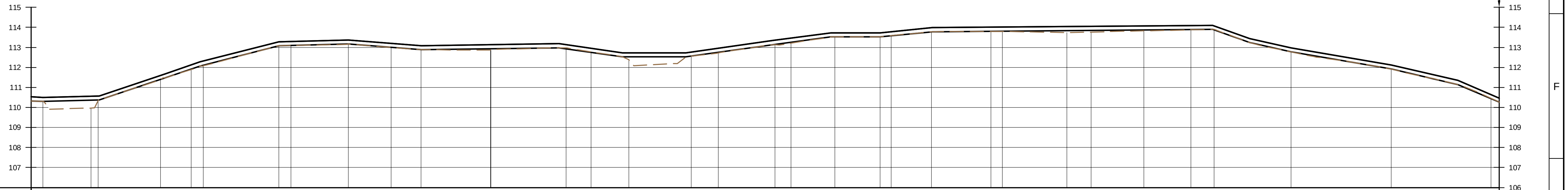


TYPICAL HOSE LAYING CROSS SECTION

NTS



DATUM 106.0

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RUNNING DISTANCE	360.00	362.99	375.00	376.75	392.34	400.00	403.07	421.94	425.00	439.31	450.00	457.47	474.88	475.00	493.74	500.00	509.42	525.00

EXISTING SURFACE	112.72	113.14	113.21	113.52	113.53	113.58	113.78	113.79	113.79	113.74	113.76	113.83	113.87	113.90	112.78	111.92	110.46	110.26
RUNNING DISTANCE	531.85	546.02	550.00	560.98	572.24	575.00	585.07	600.00	602.87	618.92	625.00	638.21	650.00	655.78	675.00	700.00	725.00	727.00

LONGITUDINAL SECTION

SCALE 1:500H 1:100V

SCALE 1:100 (A1) 2 1 0 2 4 6 8 10m

SCALE 1:500 (A1) 10 8 6 4 2 0 10 20 30 40 50m

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REV	DATE	DRAWN	REV'D	APP'D	REVISION
3	19.12.16	SO	JJ	NL	ISSUED FOR CONSTRUCTION
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CLIENT MELBOURNE WATER

PROJECT COCKATOO CREEK SWAMP
HYDROLOGY IMPROVEMENT

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
DP	SO	N. LOGAN	N. LOGAN
DESIGNED	DESIGN REVIEW	DATE 31.10.16	DATE 31.10.16
JJ	JJ		

TITLE
COCKATOO SWAMP DEWATERING 3
PLAN AND LONGITUDINAL SECTION
SHEET 02 OF 02 3

SCALE AS SHOWN
DRAWING No IS121900-ECC-DG-0104
REV 3

A1

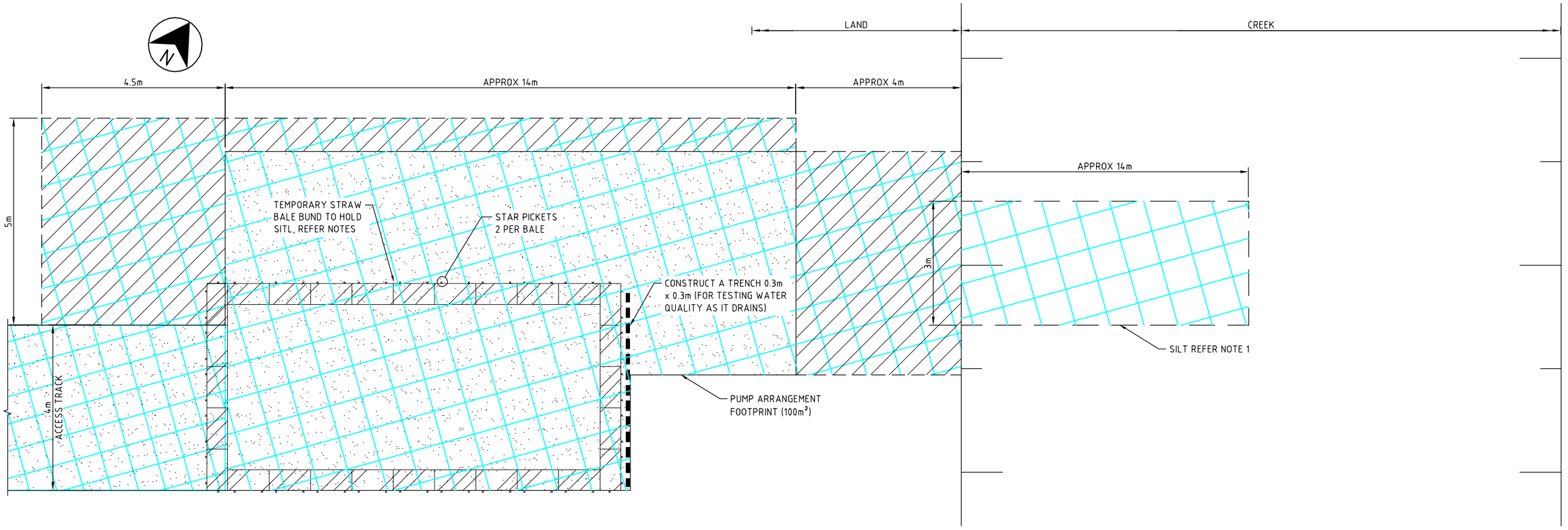
DATE: 19/12/2016 4:12:52 PM LOGIN NAME: ORR, STEPHEN G
LOCATION: C:\users\sorr\appdata\local\projectwise\jacobs_anz_ie\dms72367\IS121900-ECC-DG-0104.dwg

NOTES

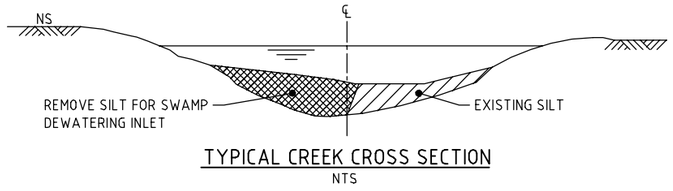
1. REMOVE SILT TO A WIDTH OF 3m, DEPTH UP TO APPROX 1m FROM THE BANK TO THE DEEPEST SECTION OF THE CREEK (APPROX 14m).
2. PLACE THE SILT IN THE DESIGNATED STOCKPILE AREA.
3. STACK TWO STRAW BALES ONE ABOVE THE OTHER APPROXIMATELY 1m HIGH, MAKING A 10m x 5m ENCLOSURE, REINFORCED WITH STAR PICKETS.
4. ALLOW THE SILT TO DEWATER BEFORE CARTING IT TO A LICENCED WASTE DISPOSAL FACILITY.
5. USE LONGREACH EXCAVATOR AND STAY 4m AWAY FROM CREEK BANK.
6. EXCAVATOR SWING RESTRICTED TO APPROVED CLEARED AREA, AS FLAGGED IN FIELD AND EMP.
7. VEGETATION CLEARING = SLASHING TO A MINIMUM HEIGHT OF 100mm.

LEGEND

- EXTENT OF VEGETATION TO BE CLEARED
- AREA FOR PUMP AND FUEL CELL
- TEMPORARY CLEARANCE AREA FOR EXCAVATOR



PLAN
NTS



TYPICAL CREEK CROSS SECTION
NTS

ISSUED FOR CONSTRUCTION

REV	DATE	DRAWN	REV'D	APP'D	REVISION
0	19.12.16	SO	JJ	NL	ISSUED FOR CONSTRUCTION
A	06.12.16	DP	JJ	NL	ISSUED FOR INFORMATION

DRAWING NUMBER	REFERENCE DRAWING TITLE

Melbourne Water

JACOBS
ABN 37 001 024 095 and ACN 001 024 095
Jacobs Group (Australia) Pty Ltd
11th Floor, 452 Flinders Street
MELBOURNE, VIC 3000
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Tel: +61 3 8668 3000
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Web: www.jacobs.com

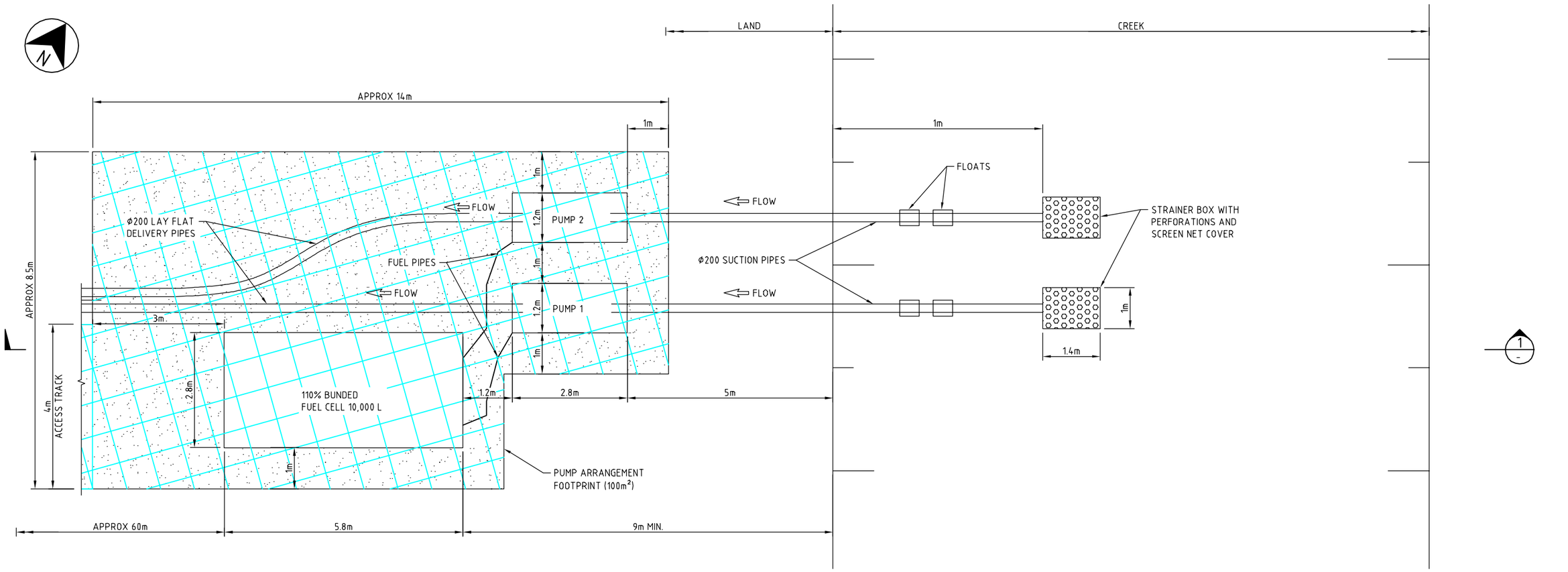
CLIENT: MELBOURNE WATER
PROJECT: COCKATOO CREEK SWAMP HYDROLOGY IMPROVEMENT

DRAWN	DRAWING CHECK	REVIEWED	APPROVED
D. PARTE	S. ORR	N. LOGAN	H. LOGAN
DESIGNED	DESIGN REVIEW	DATE 06.12.16	DATE 06.12.16
J. JOHN	N. LOGAN		

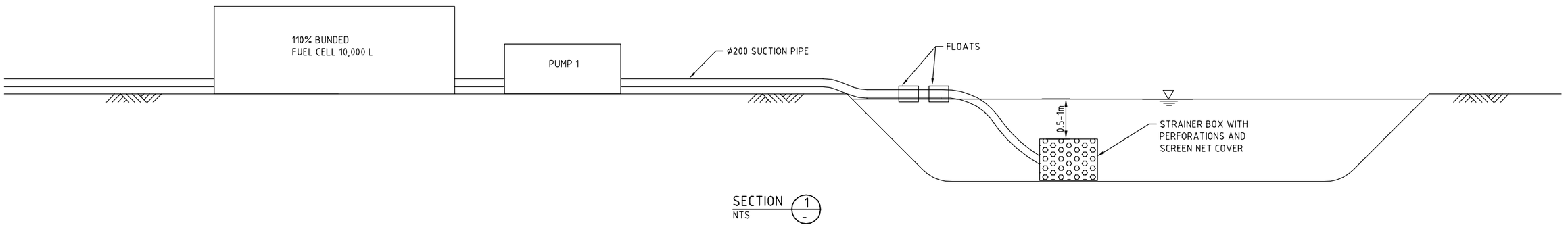
TITLE: COCKATOO SWAMP DEWATERING SILT REMOVAL DETAILS (DURING CONSTRUCTION)

SCALE	DRAWING No	REV
AS SHOWN	IS121900-ECC-DG-0105	0

DATE: 19/12/2016 4:22:41 PM LOGIN NAME: ORR, STEPHEN G
LOCATION: C:\users\sorr\appdata\local\projectwise\jacobs_anz_eu\ms72367\IS121900-ECC-DG-0105.dwg



PLAN
NTS



SECTION 1
NTS

LEGEND

EXTENT OF VEGETATION TO BE CLEARED

AREA FOR PUMP AND FUEL CELL

ISSUED FOR CONSTRUCTION

REV	DATE	DRAWN	REV'D	APP'D	REVISION
0	19.12.16	SO	JJ	NL	ISSUED FOR CONSTRUCTION
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DESIGNED	DESIGN REVIEW	DATE 06.12.16	DATE 06.12.16
J. JOHN	H. LOGAN		

TITLE: COCKATOO SWAMP DEWATERING SILT REMOVAL DETAILS (DURING OPERATION)

SCALE	DRAWING No	REV
AS SHOWN	IS121900-ECC-DG-0106	0

DATE: 19/12/2016 4:06:47 PM LOGIN NAME: ORR, STEPHEN G
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