Government of Western Australia
Department of Water and Environmental Regulation

Works Approval

Works Approval Number	W6330/2019/1
Works Approval Holder	Koojan Downs Pty Ltd
ACN	628 244 628
Registered business address	80 Birdwood Parade DALKEITH WA 6009
DWER File Number	DER2019/000581
Duration	14/08/2020 to 13/08/2025
Date of issue	14/08/2020
Premises details	Koojan Downs Lot 3559 on Deposited Plan P206175 Volume 1853 Folio 164 Lot 102 on Deposited Plan P76331 Volume 2926 Folio 104 Lot 103 on Deposited Plan P76331 Volume 2926 Folio 105 Lot 3556 on Deposited Plan P206191 Volume 1396 Folio 201 As shown in the premises map in Schedule 1

Prescribed premises category description (Schedule 1, *Environmental Protection Regulations 1987*)	**Assessed production capacity**
Category 1: Cattle feedlot	40,000 animals (37,500 SCU equivalent) at any time
Category 23: Animal feed manufacturing	Not more than 320,000 tonnes of feed produced per year

This works approval is granted to the works approval holder, subject to the following conditions, on 14 August 2020, by:

Chris Malley
Digitally signed by Chris Malley
Date: 2020.08.14 16:45:01 +08'00'

A/Manager, Process Industries
an officer delegated under section 20 of the Environmental Protection Act 1986 (WA)

Interpretation

In this works approval:

(a) the words ‘including’, ‘includes’ and ‘include’ in conditions mean “including but not limited to”, and similar, as appropriate;

(b) where any word or phrase is given a defined meaning, any other part of speech or other grammatical form of that word or phrase has a corresponding meaning;

(c) where tables are used in a condition, each row in a table constitutes a separate condition;

(d) any reference to an Australian or other standard, guideline or code of practice in this works approval means the version of the standard, guideline or code of practice in force at the time of granting of this works approval and includes any amendments to the standard, guideline or code of practice which may occur from time to time during the course of the works approval;

(e) unless specified otherwise, any reference to a section of an Act refers to that section of the EP Act; and

(f) unless specified otherwise, all definitions are in accordance with the EP Act.

NOTE: This works approval requires specific conditions to be met but does not provide any implied authorisation for other emissions, discharges, or activities not specified in this works approval.

Works approval conditions

The works approval holder must ensure that the following conditions are complied with:

Construction phase

Infrastructure and equipment

1. The works approval holder must construct the infrastructure listed in Table 1:

(a) in accordance with the corresponding design and construction requirements; and

(b) at the corresponding infrastructure location;

as set out in Table 1 .

Table 1: Infrastructure design and construction / installation requirements

Infrastructure	Design and construction requirements	Infrastructure location as indicated in Schedule 1
Feedlot – feeding pens, holding pens, catch drains / main drains and roadway	(a) 244 open cattle pens of feed bunk length of 48 m and depth of 54.5 m (approximately 2,877 m^2 each) with a total area of 701,988 m^2 (70.2 ha).12 smaller pens approximately 1,570 m^2 with a total area of 18,840 m^2 (1.88 ha). (b) Pens, catch drains and main drains are to be constructed such that they are lined to achieve permeability of at less than or equal to 1 x 10^{-9} m/s. (c) Slope of 3% across the cattle feedlot towards the catch drains / main drains. (d) Feed bunks for each row constructed in-situ as continuously formed 6 m long concrete sections with length of bunk space to be 300 mm. The feed bunk will be placed over compacted gravel base with a minimum thickness of 100 mm. (e) Concrete aprons along the feed bunks will be constructed in-situ and extend 3 m into the pen and be suitably reinforced to withstand the loading of pen cleaning equipment. (f) Catch drains / main drains will direct all runoff from the cattle feedlot to the sedimentation basin. (g) Prefabricated concrete water troughs of suitable length will be placed at the required location along the dividing fence between each pen, situated towards the rain end of each pen.	Site layout map Feeding pens, holding pens, catch drains / main drains and roadway
Sedimentation basin, including outlet weir, pipes and spill drain	(a) Sedimentation basin will be sloped to direct water to the holding pond. (b) The sedimentation basin will be clay lined to achieve a permeability of less than or equal to 1 x 10^{-9} m/s. (c) Sedimentation basins are designed with system volumes of between 1,775 m^3 and 5,000 m^3. In Stage 1 the three proposed basins have volumes of 5,000 m^3, 3,500 m^3 and 2,000 m^3. (d) Sedimentation basins will have a maximum water depth of less than 1 m and designed to drain completely to bed level with a 0.9 m freeboard. (e) Control outlet weir will be constructed on a 200 mm reinforced concrete slab.	Site layout map Sedimentation basins, weir.
Holding ponds	(a) The holding ponds must be constructed such that it has a minimum containment volume, excluding a 900 mm freeboard, of 80 ML (P1), 6 ML (P2) and 54 ML (P3).	General layout map – proposed cattle feedlot: P1, P2 and P3

Infrastructure	Design and construction requirements	Infrastructure location as indicated in Schedule 1
	(b) A minimum 150 mm thickness compacted subgrade that is smooth and free of stones and proof-rolled to identify and troubleshoot zones that require subgrade improvement. (c) A compacted clay liner with a minimum thickness of 450 mm constructed in three layers of 150 mm following compaction with an in-situ coefficient of permeability of less than 1 x 10^{-9} m/s. (d) The material used as a clay liner must be well graded, of low permeability and tested for its conformance against the particle size distribution, plasticity index and other characteristics listed in Schedule 3. (e) The finished liner thickness must be surveyed to confirm it meets the design specifications and be tested in-situ to ensure it meets specified permeability criteria in AS 1289.6.7.3.	
Solid waste stockpile and composting area	(a) Surface area of 60,000 $m^{2.}$ (b) A minimum 150 mm thickness compacted subgrade that is smooth and free of stones and proof-rolled to identify and troubleshoot zones that require subgrade improvement. (c) A compacted clay liner with a minimum thickness of 300 mm constructed in two layers of 150 mm following compaction with an in-situ coefficient of permeability of less than 1 x 10^{-9} m/s. (d) Diversion banks upslope of the area that prevent upslope runoff from entering the area. (e) Bunded to prevent any runoff exiting the area and sloped to direct any runoff within the area to a sedimentation basin and holding pond.	Site layout map Solid waste stockpile and composting area
Effluent Utilisation Area	(a) Self-propelled centre pivot irrigation system for each effluent utilisation area consisting of a series of towers, spans, pipes, droppers and sprinklers that operates in a circular pattern rotating around a fixed central pivot point (b) The irrigation system to be designed to achieve high uniformity in effluent application over respective Effluent Utilisation Areas and limit wind drift. (c) The irrigation system must be operated by a programmable and automated system that incorporates in-field and weather monitoring with manual override.	Effluent and solid waste utilisation area map Effluent Utilisation Areas
Grain storage and processing facility	Refer to Maps A, B and C in the Schedule 1: Feedmill design and layout map.	Site layout map Grain storage and processing facility
Flow meters	Flow meters are installed to continuously measure and record the discharge of effluent from the ponds.	-
Weather station	Onsite automatic weather station (AWS) – capable of recording daily rainfall (rain gauge), temperature and wind direction. Class A Evaporation pan (Australian Bureau of Meteorology Class A type) capable of recording daily pan evaporation rates (daily manual readings).	-

2. The works approval holder must design, construct and install groundwater monitoring bores in accordance with the requirements in Table 2

Table 2: Infrastructure requirements – groundwater monitoring bores

Infrastructure / waste disposal area	Design and construction / installation requirements	Monitoring bore location(s)	Timeframe
Feedlot holding pens including sedimentation basins • At least one groundwater monitoring bore per feedlot holding pen complex Holding ponds • At least two groundwater monitoring bores per holding pond Effluent utilisation areas • At least three groundwater monitoring bores in total	(a) Designed and constructed in accordance with ASTM D5092/DM5092M016: Standard practice for design and installation of groundwater monitoring bores. (b) Bores must be constructed with a screened interval within the shallow water table. (c) Soil samples must be collected and logged during the installation of the monitoring bores. (d) A record of the geology encountered during drilling must be described and classified in accordance with the Australian Standard Geotechnical Site Investigations AS 1726. (e) Bores construction details must be documented within a bore construction log to demonstrate compliance with ASTM D5092/D5092M-16. The construction logs shall include elevations of the top of casing position to be used as the reference point for water-level measurements and the elevations of the ground surface protective installations. (f) All installed monitoring bores must be developed after drilling to remove fine sand, silt, clay and any drilling mud residues from around the bore screen to ensure the hydraulic functioning of the bore. A detailed record should be kept of bore development activities and included in the bore construction log. (g) The vertical (top of casing) and horizontal position of each monitoring bore must be surveyed and subsequently mapped by a suitably qualified surveyor. (h) A bore location map (using aerial image overlay) must be prepared and include the location of all monitoring bores in the monitoring network and their respective identification numbers.	Sited with regard to the Department's *Water Quality Protection Note 30 Groundwater Monitoring Bores* (DoW, 2006) – Recommendations – Siting of monitoring bores; and sited and spaced to enable detection of any potential seepage from specified infrastructure and waste disposal areas	Must be constructed, developed (purged), determined to be operational prior to the commencement of time limited operations

Compliance reporting

3. The works approval holder must within 30 calendar days of an item of infrastructure required by conditions 1 and 0 being constructed:

(a) undertake an audit of their compliance with the requirements of conditions 1 and 0; and

(b) prepare and submit to the CEO an Environmental Compliance Report on that compliance.

4. The Environmental Compliance Report required by condition 3, must include as a minimum the following:

(a) certification by a Qualified Professional Engineer that the holding ponds as specified in condition 1 have been constructed in accordance with the corresponding requirements specified in condition 1;

(b) as constructed plans for each item of infrastructure or component of infrastructure as specified in condition 1;

(c) a groundwater monitoring bore construction report evidencing compliance with the requirements of condition 0; and

(d) be signed by a person authorised to represent the works approval holder and contains the printed name and position of that person.

Time limited operations phase

Commencement and duration

5. The works approval holder may only commence time limited operations for an item of infrastructure identified in condition 1 where the Environmental Compliance Report as required by conditions 3 and 4 has been submitted by the works approval holder for that item of infrastructure.

6. The works approval holder may conduct time limited operations for an item of infrastructure specified in condition 1 (as applicable):

(a) for a period not exceeding 180 calendar days from the day the works approval holder meets the requirements of condition 5 for that item of infrastructure; or

(b) until such time as a licence for that item of infrastructure is granted in accordance with Part V of the *Environmental Protection Act 1986*.

Infrastructure requirements during time limited operations

7. During time limited operations the works approval holder must ensure that the premises infrastructure listed in Table 3 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirements set out in Table 3.

Table 3: Infrastructure requirements during time limited operations

Infrastructure	Operational requirements	Infrastructure location as indicated in Schedule 1
Feedlot pens and drains	(a) Spills and cleaning runoff from water troughs must be directed to the sedimentation basins. (b) Pens and drains must be cleaned and maintained at the following intervals: (i) Removal of spilt feed / feed residues every two days; (ii) Elimination of wet patches in pens weekly; (iii) Repairs to potholes in pens weekly; (iv) Pen cleaning at intervals not exceeding 10 weeks; (v) Pen surface inspections after runoff events and repaired as required within 48 hours; and (vi) Diversion bunks and drains inspections after runoff events and repaired or maintained as required within 48 hours.	General layout map – proposed cattle feedlot
Sedimentation basins	(a) Sedimentation basins must be inspected after each runoff event. (b) Solid waste buildup in the basins must be routinely removed to ensure the ongoing efficacy of the basins in reducing the carryover of sediments to the holding ponds. (c) The weeping outlet weir must be routinely cleaned and otherwise blockages removed from slats as required. (d) An embankment freeboard of 0.9 m above the top water level. (e) The basin can cater for the peak flow rate from a design storm having an ARI of 1 in 20 years; using runoff coefficients of 0.8 from feeding pens, roadways and other hard stand areas and 0.4 for grassed areas within the controlled drainage area.	
Holding ponds	(a) Maintain a minimum freeboard of 1 m between the crest of the discharge weir and the crest of the holding pond embankment. (b) Stormwater runoff is prevented from entering the holding ponds. (c) Holding ponds must be able to retain runoff from a 95th percentile wet year without discharging via the weir. (d) Vegetation and floating debris (emergent or otherwise) is prevented from encroaching onto pond surfaces or inner pond embankments.	
Solid waste stockpile and composting area	(a) Unless otherwise removed from the premises, collected manures, spilt feed and pond or basin sludge / sediment must only be stored within the solid waste stockpile and composting area. (b) Unless otherwise removed from the premises, deceased animals must be composted within the solid waste stockpile and composting area. (c) Composting of deceased animals is to occur such that: (i) at least 300 mm of carbon source material such as sawdust or straw is placed at the base as a bedding; (ii) a carcass is placed on the bedding and covered with at least 500 mm of manure on all sides; (iii) composting occurs in windrows no more than two levels of deceased animal high (iv) windrows are shaped to an apex at the top to shed rainfall (v) windrows are initially turned after no longer than 4 weeks of carcass decomposition and thereafter no longer than every 3 months until the maturation phase; and (vi) windrows are no greater than 2 m high, 3 m wide and are angled to promote drainage towards the sedimentation basins.	

Time limited operations - monitoring

8. The works approval holder must monitor and record the results of ambient groundwater during the construction phase and time limited operations phase for concentrations of the identified parameters in accordance with Table 4.

Table 4: Monitoring of groundwater requirements

Parameter	Monitoring location	Unit	Frequency	Averaging period	Sample method	Analysis method
Standing water level	In accordance with conditions 0 and 4	m(AHD) m (BGL)	Three-monthly commencing within 30 days of groundwater bore installation	Spot, in-field measurement	-	-
pH		-				
Electrical conductivity		µS/cm				
Total nitrogen, Ammonia nitrogen		mg/L		Spot sample	AS 6557.1 AS 5667.11	Submitted to and tested by a laboratory with current NATA accreditation for the specified method and parameter being measured
Total phosphorus						
Total dissolved solids						
Biological oxygen demand						
Na, K, Ca, Mg, Cl, SO_4, HCO_3 and As						

9. The works approval holder must monitor and record cattle numbers in accordance with the requirements of Table 5.

Table 5: Monitoring and recording of inputs and outputs

Input / output	Parameter	Unit	Frequency
Cattle	(a) Cattle entering the feedlot (b) Cattle exiting the feedlot (c) Cattle in pens (d) Deceased animals	Individual animal count	Daily total

Time limited operations – specified actions

10. The works approval holder must not irrigate effluent or apply solid wastes to land on the premises during time limited operations.

11. The works approval holder must submit to the CEO a soil monitoring strategy within 30 calendar days of the completion date of time limited operations or 30 days before the expiration date of the works approval, whichever is the sooner.

12. The works approval holder must ensure the soil monitoring strategy required by condition 11:

(a) details a proposed soil monitoring program for the effluent and solid waste utilisation areas shown in the Effluent and solid waste utilisation area map in Schedule 1 including but not necessarily limited to:

(i) soil monitoring locations
(ii) soil monitoring parameters
(iii) soil monitoring sampling methods including at least one soil surface and four depth increments at each location

(iv) soil sample analysis methods
(v) soil monitoring frequencies
(vi) scientific reasoning for parts (i) to (v) on the basis of site specific soil investigations, nutrient irrigation management plans and solid waste disposal management plans.

(b) is prepared with reference to soil monitoring strategy development guidance within *Environmental Guidelines: Use of Effluent By Irrigation*, NSW DEC 2004

Time limited operations – reporting

13. The works approval holder must submit to the CEO a report on time limited operations within 30 calendar days of the completion date of time limited operations or 30 days before the expiration date of the works approval, whichever is the sooner.

14. The works approval holder must ensure the report required by condition 13 includes the following:

(a) A summary of ambient groundwater results obtained during time limited operations under condition 8; and

(b) A summary of cattle numbers obtained during time limited operations under condition 9.

Records and reporting (general)

15. The works approval holder must maintain accurate and auditable books including the following records, information, reports, and data required by this works approval:

(a) the works conducted in accordance with condition 1 of this works approval; and

(b) complaints received under condition 17 of this works approval.

16. The books specified under condition 15 must:

(a) be legible;

(b) if amended, be amended in such a way that the original version(s) and any subsequent amendments remain legible and are capable of retrieval;

(c) be retained by the works approval holder for the duration of the works approval; and

(d) be available to be produced to an inspector or the CEO as required.

17. The works approval holder must record the following information in relation to complaints received by the works approval holder (whether received directly from a complainant or forwarded to them by the department or another party) about any alleged emissions from the premises:

(a) the name and contact details of the complainant, (if provided);

(b) the time and date of the complaint;

(c) the complete details of the complaint and any other concerns or other issues raised; and

(d) the complete details and dates of any action taken by the works approval holder to investigate or respond to any complaint.

Definitions

In this Works Approval, the terms in Table 6 have the meanings defined.

Table 6: Definitions

Term	Definition
AHD	means Australian Height Datum
AS 1289	means *Australian Standard AS 1289: Methods for testing soils for engineered purposes*
AS 1726	means the Australian Standard AS 1726 Geotechnical site investigations, as amended from time to time
AS 5667.1	means the Australian Standard AS/NZS 5667.1 Water quality – sampling – guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples, as amended from time to time
AS 5667.11	means the Australian Standard AS/NZS 5667.11 Water quality – sampling – guidance on sampling groundwater, as amended from time to time
ASTM D5092/D5092M16	means the ASTM international standard for Standard practice for design and installation of groundwater monitoring wells (Designation: ASTM D5092/D5092M-16), as amended from time to time.
AWS	Automatic weather station is a standalone set of equipment constructed to measure and record specific attributes of the ambient environment.
BGL	means below ground level
bore	has the same meaning as 'well' given in ASTM D5092/D5092M16
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department administering the *Environmental Protection Act 1986* Locked Bag 10 Joondalup DC WA 6919 or: info@dwer.wa.gov.au
condition	means a condition to which this works approval is subject under s.62 of the EP Act.
daily rainfall	refers to the observation and recording of rain captured in the onsite rain gauge, measured in millimetres and observed and recorded at a regular time once every 24 hours.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
Environmental Compliance Report	means a report to satisfy the CEO that the conditioned infrastructure and/or equipment has been constructed and/or installed in accordance with the works approval.
EP Act	means the *Environmental Protection Act 1986* (WA).
freeboard	means the distance between the maximum water surface elevations and the top of retaining banks or structures at their lowest point.
mg/L	milligrams per litre
premises	refers to the premises to which this works approval applies, as specified at the front of this works approval and as shown on the map in Schedule 1 to this works approval.
Qualified professional engineer	means a person who: (a) holds a tertiary academic qualification specialising in geotechnical or civil engineering; and (b) has a minimum of 3 years of experience working in the area of geotechnical

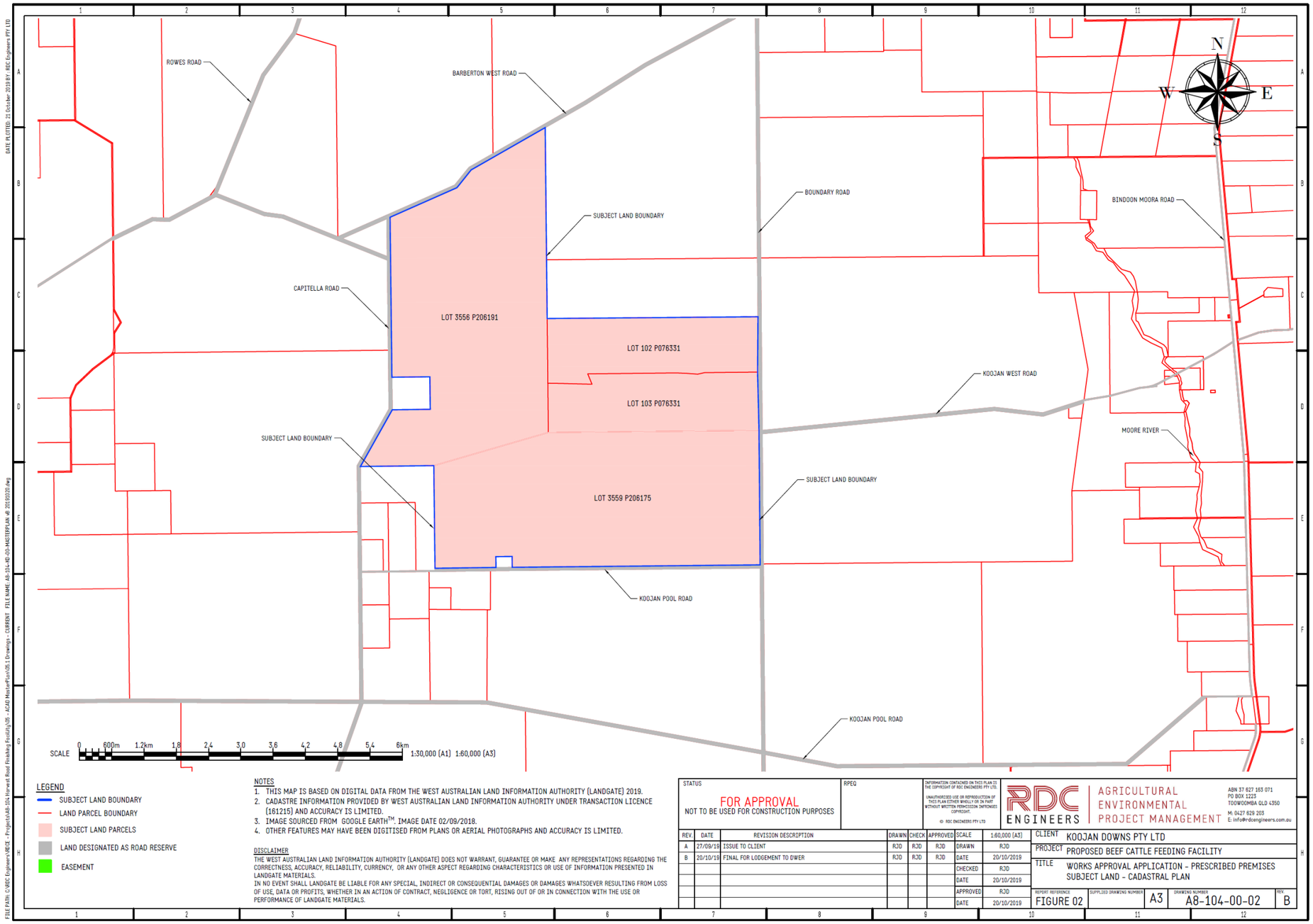
Term	Definition
	or civil engineering; or is otherwise approved by the CEO to act in this capacity.
SCU	means a Standard Cattle Unit which is equivalent to an animal with a liveweight of 600 kg and calculated using the method in the *National Beef Cattle Feedlot Environmental Code of Practice*, Meat & Livestock Australia Limited, June 2012.
Time limited operations	refers to the operation of the infrastructure and equipment identified under this Works Approval that is authorised for that purpose, subject to the relevant Conditions.
wastewater	Water generated from the operations of the feedlot that includes liquid effluent and contaminated stormwater
works	refers to the Works described in Schedule 2, at the locations shown in Schedule 1 of this works approval to be carried out at the premises, subject to the Conditions.
works approval	refers to this document, which evidences the grant of the works approval by the CEO under s.54 of the EP Act, subject to the conditions.
works approval holder	refers to the occupier of the premises being the person to whom this works approval has been granted, as specified at the front of this works approval.
µS/cm	microSiemens per centimeter

END OF CONDITIONS

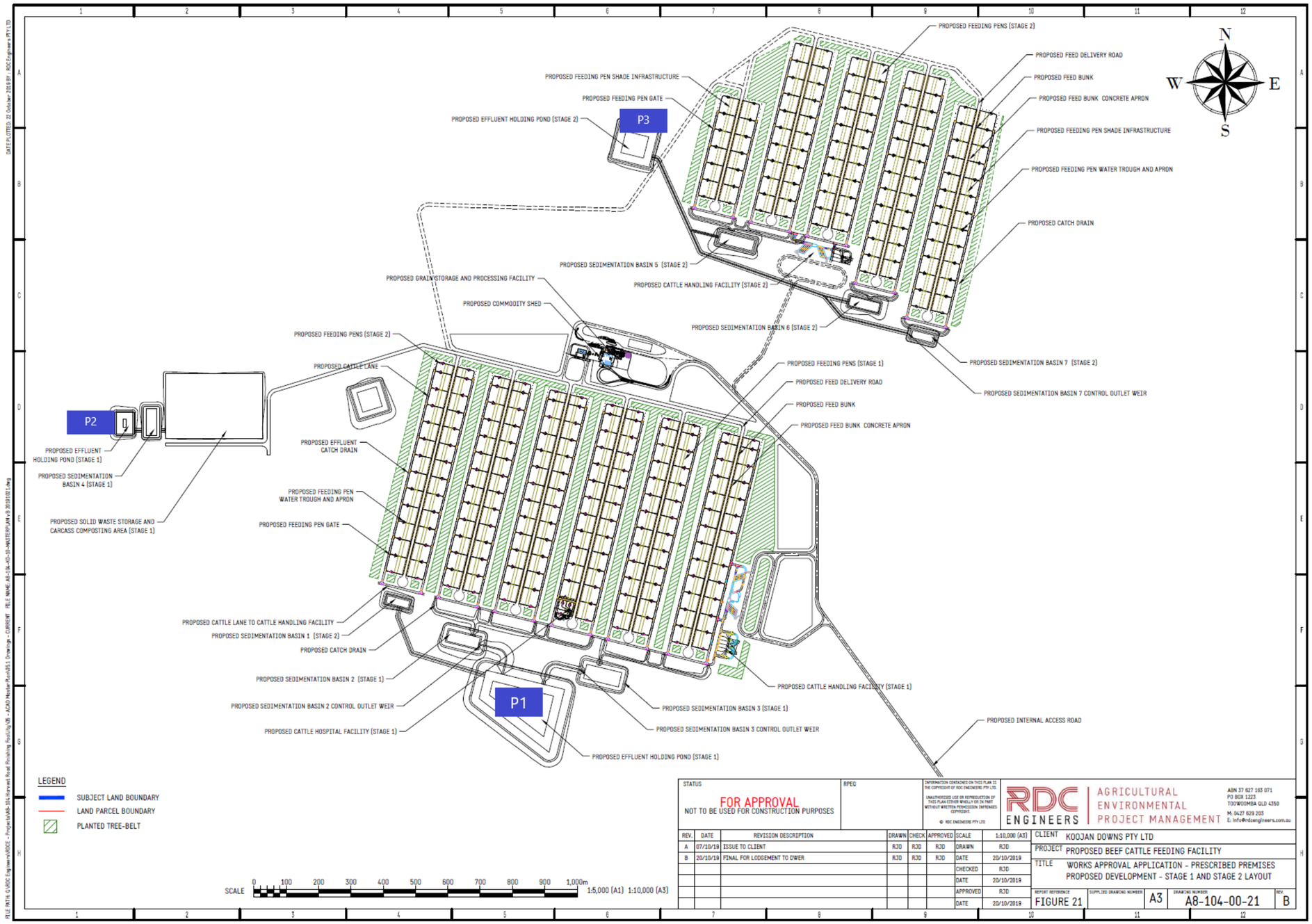
Schedule 1: Maps

Premises map

The boundary of the prescribed premises is shown in pink in the map below.

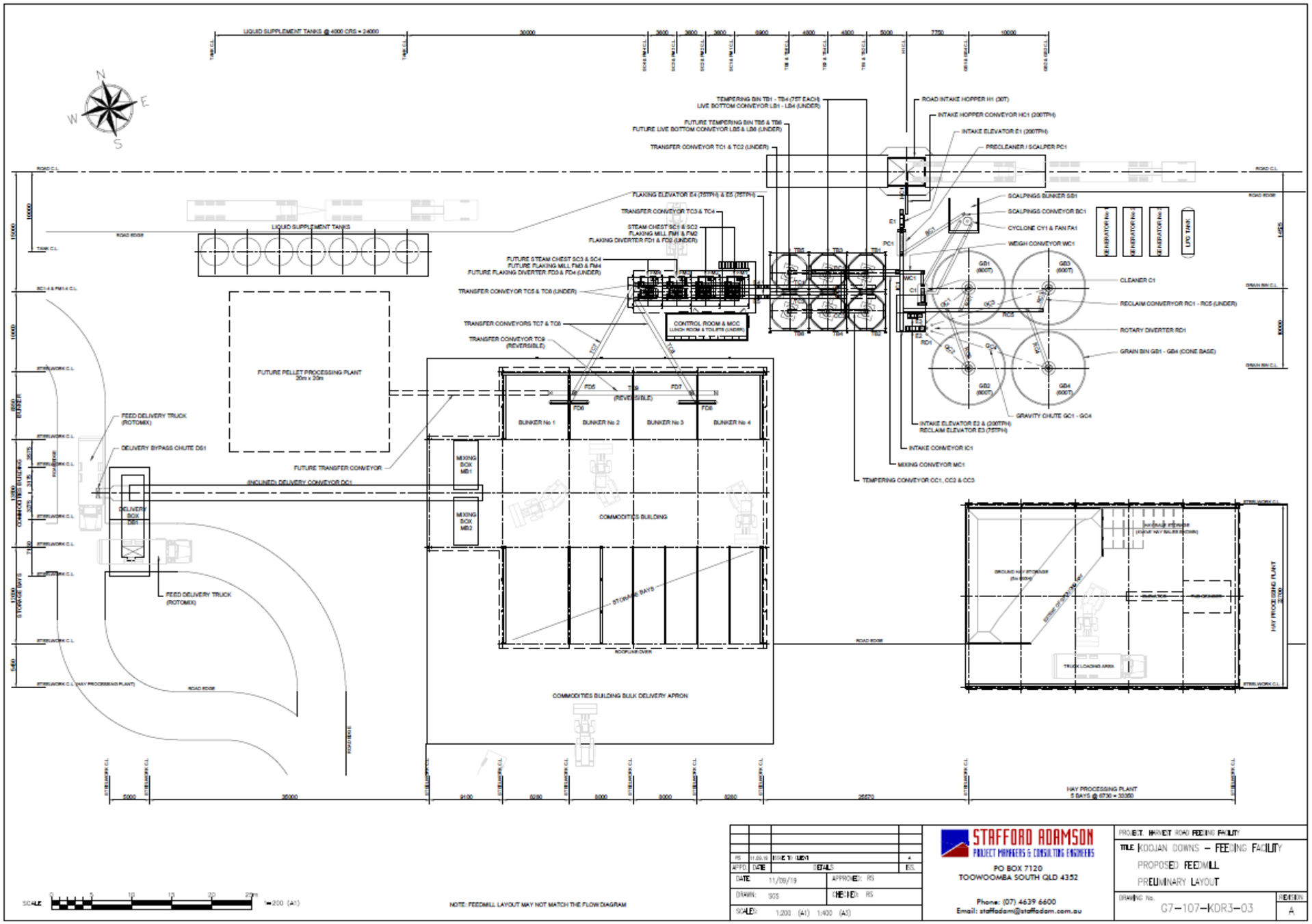


Site layout map

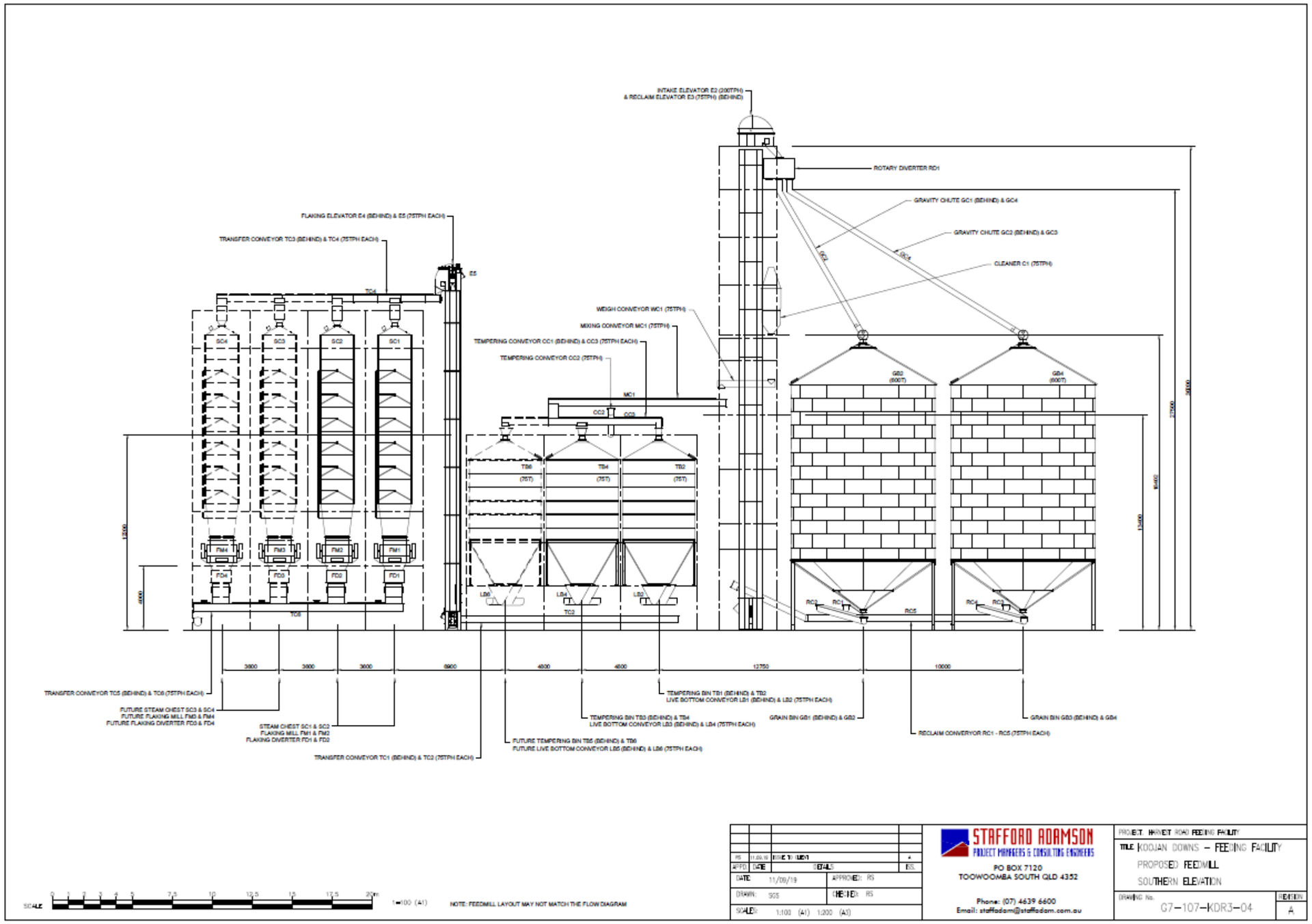


Feedmill design and layout maps

MAP A



MAP B


INTAKE ELEVATOR E2 (200TPH)
& RECLAIM ELEVATOR E3 (75TPH) (BEHIND)
ROTARY DIVERTER RD1
GRAVITY CHUTE GC1 (BEHIND) & GC4
GRAVITY CHUTE GC2 (BEHIND) & GC3
CLEANER C1 (75TPH)
FLAKING ELEVATOR E4 (BEHIND) & E5 (75TPH EACH)
TRANSFER CONVEYOR TC3 (BEHIND) & TC4 (75TPH EACH)
WEIGH CONVEYOR WC1 (75TPH)
MIXING CONVEYOR MC1 (75TPH)
TEMPERING CONVEYOR CC1 (BEHIND) & CC3 (75TPH EACH)
TEMPERING CONVEYOR CC2 (75TPH)
GD2 (600T)
GD4 (600T)
SC4
SC3
SC2
SC1
FM4
FM3
FM2
FM1
FD4
FD3
FD2
FD1
TB6 (75T)
TB4 (75T)
TB2 (75T)
LB6
LB4
LB2
RC3
RC1
RC5
RC4
RC2
3600
3600
3600
8900
4800
4800
12750
10000
TRANSFER CONVEYOR TC5 (BEHIND) & TC6 (75TPH EACH)
FUTURE STEAM CHEST SC3 & SC4
FUTURE FLAKING MILL FM3 & FM4
FUTURE FLAKING DIVERTER FD3 & FD4
STEAM CHEST SC1 & SC2
FLAKING MILL FM1 & FM2
FLAKING DIVERTER FD1 & FD2
TRANSFER CONVEYOR TC1 (BEHIND) & TC2 (75TPH EACH)
FUTURE TEMPERING BIN TB5 (BEHIND) & TB6
FUTURE LIVE BOTTOM CONVEYOR LB5 (BEHIND) & LB6 (75TPH EACH)
TEMPERING BIN TB3 (BEHIND) & TB4
LIVE BOTTOM CONVEYOR LB3 (BEHIND) & LB4 (75TPH EACH)
TEMPERING BIN TB1 (BEHIND) & TB2
LIVE BOTTOM CONVEYOR LB1 (BEHIND) & LB2 (75TPH EACH)
GRAIN BIN GB1 (BEHIND) & GB2
RECLAIM CONVEYOR RC1 - RC5 (75TPH EACH)
GRAIN BIN GB3 (BEHIND) & GB4
SCALE 1:100 (A1)
NOTE: FEEDMILL LAYOUT MAY NOT MATCH THE FLOW DIAGRAM
STAFFORD ADAMSON
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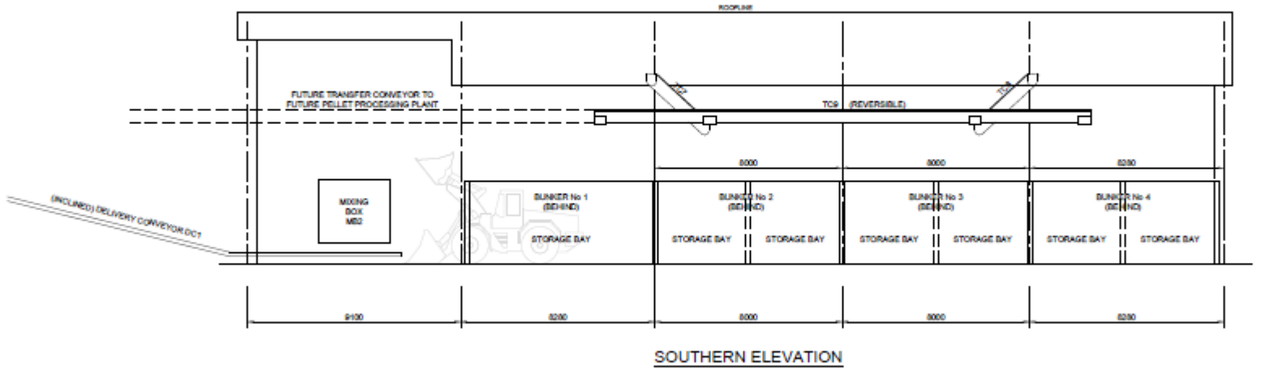
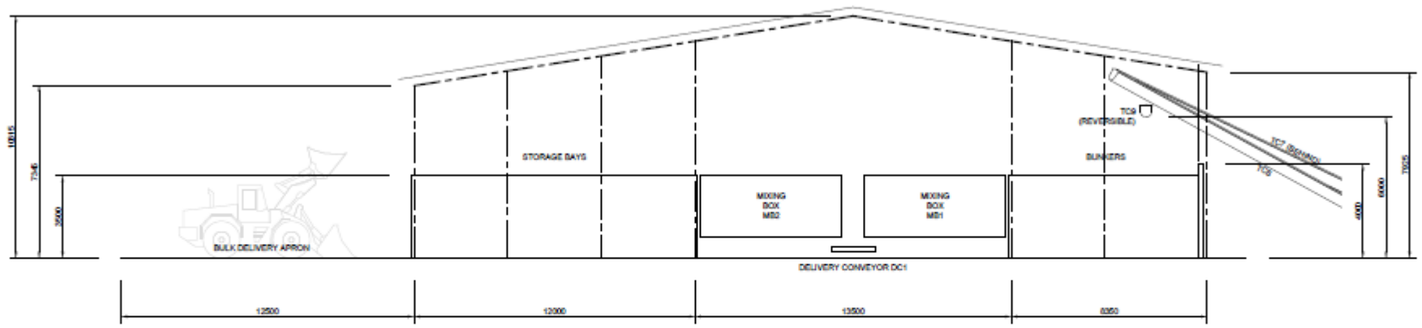
PROJECT: HARVEST ROAD FEEDING FACILITY
TITLE: KOOJAN DOWNS – FEEDING FACILITY
PROPOSED FEEDMILL
SOUTHERN ELEVATION
DRAWING No. G7–107–KDR3–04
REVISION A
DATE: 11/09/19
APPROVED: RS
DRAWN: SGS
CHECKED: RS
SCALE: 1:100 (A1) 1:200 (A3)

MAP C



SOUTHERN ELEVATION



EASTERN ELEVATION

SCALE: 0 1 2 3 4 5 7.5 10 12.5 15 17.5 20m 1:100 (A1)

RS	11.09.19	ISSUE TO CLIENT		A
APPD	DATE	DETAILS		ISS.
DATE:	11/09/19	APPROVED: RS		
DRAWN:	SDS	CHECKED: RS		
SCALE:	1:100 (A1) 1:200 (A3)			

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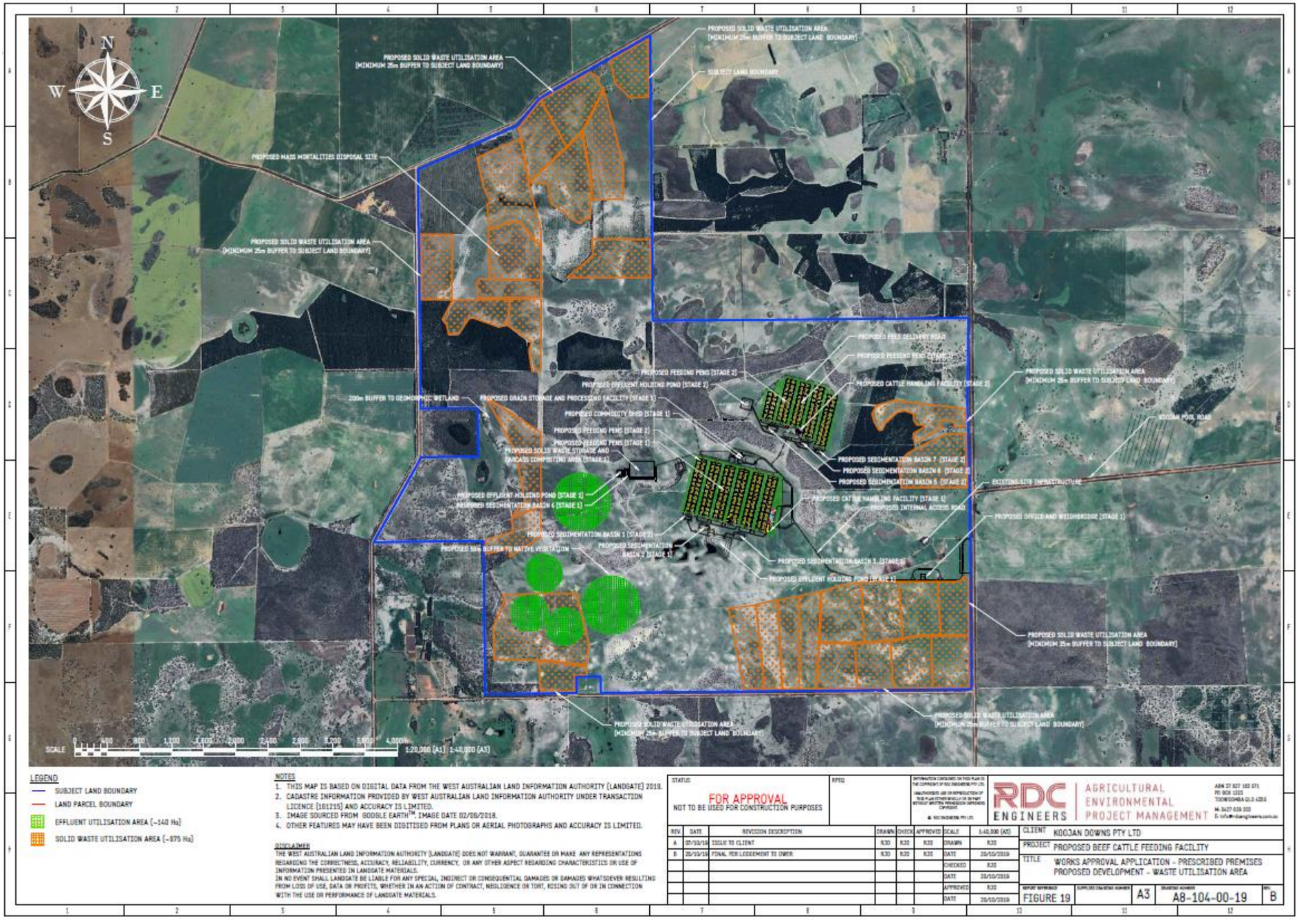
PROJECT: HARVEST ROAD FEEDING FACILITY
TITLE: KOOJAN DOWNS – FEEDING FACILITY
PROPOSED COMMODITIES BUILDING
SOUTHERN & EASTERN ELEVATIONS
DRAWING No.: G7–107–KDR3–06
REVISION: A

Effluent and solid waste utilisation area map



Schedule 2: Clay liner characteristics

Item	Test method	Pre-qualification testing frequency	Frequency of field compliance testing	Acceptance criteria
Particle size distribution (PSD)	AS 1289 3.6.1	3 per material source	3 per pond liner	As provided below
Particles passing 53-mm sieve	AS 1289 3.6.1			100%
Particles passing 19-mm sieve	AS 1289 3.6.1			>90%
Particles passing 2.36-mm sieve	AS 1289 3.6.1			>70%
Particles passing 0.075-mm sieve	AS 1289 3.6.1			>30%
Maximum particle size	AS 1289 3.6.1			40 mm
Atterberg Limits	AS 1289 3.1.2, 3.2.1, 3.3.1, 3.4.1	3 per material source	3 per pond liner	As provided below
Plasticity Index	AS 1289 3.3.1			≥10% and above Casagrande A line
Liquid Limit	AS 1289 3.1.2			30–60%
Permeability (remoulded)	AS 1289 6.7.3	2 tests per material source		≤1 x 10^{-9} m/sec (300-mm thick clay pad liner
Permeability on undisturbed tube samples collected from the completed pad liner	AS 1289 6.7.3		2 tests per constructed pad liner	≤1 x 10^{-9} m/sec (300-mm thick clay pad liner
Emerson Class Number	AS 1289 3.8.1	3 per pad liner	3 per pad liner	>4
Calcium Carbonate content	USEPA	3 per pad liner	3 per pad liner	<15%

Item	Test Method	Pre-qualification testing frequency	Frequency of Field Compliance Testing	Acceptance criteria
Dry Density	AS 1289 5.1.1 or 1289 5.7.1		As provided in Table 8.1 of AS 3798–2007	Minimum dry density ratio of 95% relative to standard or a minimum Hilf density ratio of 95% standard
Moisture Content	AS 1289 5.1.1 or AS 1289 5.7.1		Same as for Dry Density testing	0% to +3% of the Standard Optimum Moisture Content (SOMC) or within a Hilf moisture variation of 0% to +3%