



APPENDIX 13 ENGINEERING REPORT



Planning | Surveying | Engineering | Environmental

ENGINEERING & INFRASTRUCTURE REPORT

Client: New Zealand Clean Energy

Project Site: Cornwall Road, Masterton

APPLICATION PRÉCIS

CLIENT	New Zealand Clean Energy
SITE LOCATION	Cornwall Road, Masterton
LEGAL DESCRIPTION	Pt1 DP46533, Pt2 – Pt4 DP2099, Lot1 DP3447, Lot1 DP17189, Lot1 DP19148, Lot1-2 DP27627
TERRITORIAL AUTHORITY	Carterton District Council

DOCUMENT CONTROL


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OFFICE OF ORIGIN	Hamilton

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1.0 Introduction

CKL has been engaged by New Zealand Clean Energy (NZCE) to prepare an Engineering & Infrastructure Report in support of a resource consent application for a proposed Agrivoltaic Development at 3954A State Highway 2, Waingawa.

The scope of this report details the following:

- Earthworks and erosion and sediment control
- Roading and access
- Stormwater management
- Wastewater reticulation and disposal
- Water supply and utility services

Preliminary civil engineering design has also been undertaken for the purposes of resource consent to detail the required engineering works for the proposed subdivision.

2.0 Background

2.1 Existing Site

The development site comprises an area of approximately 138 hectares and is located at Cornwall Road, Masterton (refer Site Location Plan, Appendix 1). It is currently in pasture with some trees, along with a Council Water Race bisecting the site from north to south, with grazing for sheep across most of the site. A portion of the site adjacent to State Highway 2 has residential buildings with various other farm sheds and ancillary buildings. In general, the site is flat gently sloping towards the southern boundary of the site, with approximately 7m fall over the entire length of the site. Approximately 1700m from northern corner to southern corner.

The existing Council Water Race enters the property on the State Highway 2 boundary before heading east then south through the site before exiting on the southern road boundary of Hughes Line.

2.2 Proposed Development

The proposal entails the establish an approximately 138ha agrivoltaic development, also known as a solar farm, within the subject site. This project will include erecting solar panels (photovoltaic modules), inverters, transformers, battery energy storage system (BESS), a substation, and a site office. This will include erecting solar panels (photovoltaic modules), inverters, transformers, battery energy storage system (BESS), a substation, and a site office.

Site works associated with the construction of the development, including earthworks, tree trimming and, in places, removal, will also be required to enable the agrivoltaic development to be established. This will also include the construction of internal access routes, a designated site parking, and a laydown area. Furthermore, it is proposed to build hardstand areas specifically for the substation and BESS units. The proposal includes the construction of two new internal culvert crossings, along with the upgrading of an existing culvert crossing.

A new site entrance is to be constructed from Cornwall Road, as per the site plan. The proposed site plan is attached in Appendix 1.

3.0 Earthworks and Erosion & Sediment Control

3.1 Earthworks

The site earthworks are limited to the removal of topsoil, to form the internal access tracks along with hard stand areas off Cornwall Road. The total area of topsoil strip is likely to be an area of approximately 5.8 ha for the internal access roads and 5.0 ha for the hard stand areas adjacent to Cornwall Road. The total estimated earthworks volumes associated with the development are presented in [Table 1 : ESTIMATED EARTHWORKS VOLUMES](#) below.

Table 1 : ESTIMATED EARTHWORKS VOLUMES

Earthworks	Volume (m³)
Topsoil Strip – Access Tracks	17,550m ³
Topsoil Strip – Hardstand areas	15,000m ³

All estimated earthworks volumes are solid measure quantities. This shall be confirmed at detailed design stage.

The stripped topsoil from the access tracks will be spread locally over the existing paddocks to disperse of the material over a large area. These areas will then be stabilised with grass. No topsoil will be spread adjacent to the water race. All topsoil stripping and spreading is to be at least 3.0m clear of the water race banks.

Excess topsoil will be utilised to construct Noise bunds around and within the BESS area as required.

No other earthworks are assumed to be required due to the nature of solar panel construction (methodology proposes piling of the solar panel supporting structures). There will be no excavation associated with installation of the piles.

Cabling will be run in underground ducts in a network trench. The exact location and layout of the trenches is yet to be detailed. The trenches will be backfilled with the excavated material and the surface topsoiled / grassed immediately after.

New materials will be imported to site for the construction of civil works including access track pavements and hard stand areas. This will include mostly metal aggregates and concrete required for strip footings under the Battery Energy Storage System (BESS) units.

3.2 Erosion & Sediment Control

3.2.1 General

In accordance with industry best practice and resource consent requirements, implementation of erosion and sediment controls during the earthworks operation will be undertaken during the construction works.

Erosion and sediment control and site stabilisation during earthworks will be undertaken in accordance with the methodologies of Greater Wellington Regional Council Guideline Document “Erosion and Sediment Control Guide for Land Disturbing Activities in the Wellington Region” February 2021.

Earthworks undertaken in accordance with these guidelines will act to minimise and/or mitigate any adverse environmental effects of sediment discharge during the works through appropriate use and design of erosion and sediment control techniques and measures.

The proposed erosion and sediment control methodology is detailed in the following sections. It is noted that the methodology may be subject to change depending on the Contractor’s construction operation and phasing, which will be discussed with Council at the time of works.

3.2.2 Proposed Controls

The proposed erosion and sediment controls are as follows:

- **Silt Fences/Filter Socks**
Silt fences will be installed around the hard stand perimeter to control any sediment discharges from the site and will be retained until sufficient stabilisation is achieved over the site.
- **Super Silt Fences**
Super silt fences will be installed if required where high risk areas are involved.
- **Stabilised Construction Access**
A stabilised construction access will be installed as a primary access point to the site. The position will be confirmed onsite with the Contractor at the time of works. Facilities to enable wash down of vehicles i.e., water blaster as a minimum, may be used to ensure vehicles’ tyres are cleaned down prior to exiting the site onto the adjacent roads to ensure sediment is not transported offsite.
- **Retention of Existing Vegetated Areas**
Where possible, existing vegetation will be maintained over the site to minimise the amount of bare earth exposed or to provide a buffer/filtration strip.
- **Diversion Bunds**
Clean water diversion drains will be installed if required to divert any clean water away from work areas.
- **Decanting Earth Bunds**
Decanting Earth Bunds will be installed if required for areas that are identified as requiring a higher level of treatment. A decanting earth bund (DEB) is an impoundment

area formed by a temporary bund to provide an area where ponding can occur, and sediment can settle before runoff is discharged from site.

- **Site Stabilisation**

Once the subgrade levels are achieved, progressive site stabilisation will be undertaken and shall comprise:

- Re-topsoiling in conjunction with grass seeding to establish grass cover over disturbed areas.
- Where necessary, areas will be stabilised by applying straw mulch in conjunction with topsoiling and grass seeding.
- Roothing aggregates will be placed over Access Tracks, hardstand areas and accessway areas as soon as practicable.

Site stabilisation will reduce the time bare earth is exposed to erosive forces and ability for generation of sediment laden runoff. Perimeter controls will remain in place until adequate stabilisation is achieved over the site.

3.3 Earthworks and Erosion & Sediment Control Methodology

It is expected that the main earthworks/site works operation will be undertaken over approximately 2-3 months, noting that these works will involve both the access tracks and hard stand areas. (Note: installation of the solar panels will take longer than this and expected to take place after the establishment of all the internal roading). The erosion and sediment control methodology during the proposed works will be confirmed by the Contractor on site prior to commencement of site works. However, the methodology will generally comprise the following:

1. Install the stabilised construction entrance(s) to the site. Install silt fences as necessary on site including around the proposed hard stand areas.
2. Strip topsoil and complete minor earthworks to construct the access tracks.
3. Strip topsoil and complete minor earthworks to construct hard stand areas for site office, Laydown area, BESS units and Substation.
4. Where possible, respread topsoil to completed areas or mulch out.
5. Once all working areas are sufficiently stabilised, decommission all erosion and sediment control devices and reinstate these areas to complete final works.

3.4 USLE Calculations

The calculation of the net sediment yield from the earthwork's operation has not been undertaken for this site due to the earthworks being limited to generally topsoil strip only.

3.5 Earthworks Risk Assessment

The soil types on site are generally well draining and comprise silty loam over sandy gravels. Given the nature of the soils, the flat topography and lack of natural surface water on site, overall risk and potential effects of sediment laden runoff are relatively low.

The following risks and proposed mitigation are detailed in Table 2 : EARTHWORKS RISKS AND MITIGATION

Table 2 : EARTHWORKS RISKS AND MITIGATION

Factor	Risk	Mitigation
Proximity to existing water race	Sediment laden runoff enters existing water race.	Closely monitor discharge points to check any presence of sediment plumes. Maintain vegetative buffer strips. Ensure minimum 3.0m width from track works and no disturbance to the existing grass along both banks of the water race.
Poor erosion and sediment controls and lack of maintenance	Poor implementation or under performance of erosion and sediment controls may contribute to increased sediment yield or non-control of runoff.	Undertake regular monitoring and maintenance on a daily basis/prior to forecast inclement weather to ensure all controls are in place and operating efficiently. Rectify issues promptly.
Works duration	Increased construction period may raise net sediment yield where earthworks areas are exposed for longer than anticipated	Maximise productivity to minimise time sites are open. Progressively stabilise completed earthworks areas with topsoil/grass and subgrades with metal as soon as practicable.
Construction Dust	Dust generation from construction activities	Watering of Haul roads and manoeuvring areas during dry and/or windy periods. Suspension of operations should the weather conditions become unfavourable.

3.6 Monitoring and Maintenance

Monitoring of the erosion and sediment control measures will typically be undertaken by the Contractor's site project manager/ foreman with compliance monitoring undertaken by the Council Site EMA. It is expected that monitoring will also be undertaken by the Consultant project manager. Monitoring and maintenance will typically include:

- Inspection of all perimeter controls including the silt fences followed by removal of any sediment accumulations and repair to silt fences where required.
- Review of weather forecasts to programme/stage the works around any forecast inclement weather i.e., minimise area of stripping/excavation and subsequent basecourse preparation where poor weather is forecast, and make the site safe prior to rain.

It is expected that the Contractor will generally undertake daily inspections of the erosion and sediment controls as part of operation of the site with increased monitoring undertaken prior to inclement weather. Where monitoring identifies any further controls, coordination of such works will be undertaken between the Contractor and Contract Engineer in liaison with the Council Site Representative/EMA to ensure that sufficient controls are being implemented throughout the earthworks/site works operation.

3.7 Construction Aspects

Construction aspects include the following:

- **Construction access and traffic safety:** It can be expected that there will be an increase in construction traffic during works with increased use of Cornwall Road due to both construction traffic and workers and during removal of any surplus materials offsite. This will only be temporary in nature and will employ traffic management controls as appropriate throughout the course of the construction to minimise adverse impacts on adjacent landowners.
- **Vehicle movements:** Plant will be brought to and from site for construction activities as well as deliveries of construction materials, which are difficult to quantify. However, the majority of works will be contained within the site, and it is noted that adjacent dwellings are very limited.
- **Machinery refuelling:** It is expected that mobile tanker machinery refuelling will be undertaken as per common practice rather than having an onsite refuelling station/tank. Typically, it can be expected that refuelling will occur within the works areas, thus any spillages can be contained by the sediment controls. Should any soils become exposed to spilt fuel, these will duly be removed to an appropriate offsite disposal facility.
- **Site depot/storage:** A designated site depot and storage area will be confirmed onsite in consultation/agreement with the appointed Contractor. It is expected that machinery and materials will be stored in this designated area.
- **Dust management:** Given the proximity to existing residential properties and public roads, precautions will be taken to prevent dust nuisances. Such methods will include the watering of haul roads and manoeuvring areas during dry and/or windy

periods. Precautions will also include that should weather conditions create a dust nuisance, operations will be suspended until favourable weather conditions return. Once each phase of earthworks is completed, exposed earth will be stabilised with topsoil to ensure clay subgrades are covered in a timely manner to manage the risk of them drying out and creating a dust nuisance.

- Noise: The effects from noise are expected to be negligible and generally in accordance with Operative Plan criteria. Construction noise will typically be associated with the construction phase and is therefore only temporary during the works.
- Hours of operation: The hours of operation are expected to be as per the Operative Plan criteria.

3.8 Existing Earth Bunds

There are various large earth bunds on site in the northern half of the site which are considered to be contaminated due to the previous use and storage of effluent on site. There four identifiable bunds as indicated below.



The estimated volume of the material contained is approximately 30,000m³ which will need to be disposed of offsite to a Licenced Landfill. Depending on the level of contamination will require a specific methodology for removal. See separate report for Remediation & Management of contaminated material.

4.0 Rooding and Access

4.1 Existing

The site is fronted by State Highway 2 to the north, Cornwall Road on the east and Hughes Line to the south. Two existing vehicle crossings are in place along State Highway 2 with farm gate access off Hughes Line and Cornwall Road.

4.2 Proposed

New rooding and access will be constructed as part of the development and shall comprise the following:

- Internal access tracks running around the perimeter of the site and north south tracks through the internal portion of the site. The access tracks will be 5.0m wide with a metalled pavement consisting of approximately 300mm – 500mm thick metalled layers.
- New vehicle crossing / entrance off Cornwall Road to be constructed to council specifications. Location to be confirmed by traffic engineer.
- Hard stand area for Carparking, site office, construction laydown, substation, BESS area
- Two additional emergency vehicle access points along Hughes Line as requested by FENZ.

Refer to Traffic engineer report for further information.

4.3 Fire Fighting Access

Additional emergency access points will be required off both SH2 and Hughes Line to allow for fire appliances. The location of these will be further discussed in the Traffic engineers report. The internal access tracks will therefore need to be constructed to allow for the operational requirements of fire appliances to manoeuvre around the site. This will require tracking curves to be looked at for each intersection and crossing point to ensure sufficient clearance from panels and other structures. This will be addressed at detailed design.

5.0 Stormwater Management Strategy

5.1 Existing Stormwater System

The site does not have a reticulation system other than the existing council water race which is a force feed drain from the north. The site is relatively flat and any stormwater runoff is dispersed overland on existing paddocks soaking to ground.

5.2 Proposed Stormwater System

5.2.1 Site Drainage

As the site generally provides for good infiltration, water will generally soak to ground, with compacted areas able to discharge to areas alongside. Therefore, given the buffers and setbacks in place between the solar arrays and site boundaries, runoff of stormwater beyond site boundaries will be generally avoided, or there will be sufficient area for the installation of any possible soakage swales. The only areas that will require possible drainage is the BESS area, carparking and laydown area. Given the flat nature of the site it is envisaged the flows will runoff to existing grassed areas.

The site office roof runoff will discharge to ground via overflow from the rainwater tank.

5.2.2 Existing Culverts

The site has various existing culverts to provide farm access across the existing Council water race. The water race enters and exits the site through 450mmØ culverts with all internal existing culverts being 450mm - 600mmØ.

An existing northern culvert in the north/south water race will be upgraded with new pipes to ensure the proposed crossing point is able to take heavy vehicle loads. Two other new culverts will also be installed at the northern and southern ends of the water race to create two independent crossing points separate from the existing farm crossings. It is anticipated that new pipes and wingwalls will be constructed along with compacted suitable fill over the pipes to form an embankment crossing.

5.3 Flood Risk Assessment

Refer separate CKL Stormwater Management and Flood Risk Assessment Report for further details on flood modelling and management assessment.

6.0 Wastewater Disposal

6.1 Existing Wastewater System

The subject site does not have an existing connection to the wastewater network. The existing dwellings utilise septic tanks for disposal.

6.2 Proposed Wastewater System

The proposed site office will require some form of disposal if kitchen facilities are to be provided along with toilets. It is proposed to install a rainwater tank to collect water from the roof and provide water to the office. Toilet facilities will be provided via a portable toilet that is serviced monthly or as required depending on staff numbers. Alternatively, wastewater will be held in a holding tank and disposed off-site.

7.0 Water Supply and Utility Services

7.1 Water Supply

No public water supply is available. Rainwater tanks will be used to collect roof water to supply the site office for potable and on potable purposes. Treatment of water will occur through a “packaged treatment system” prior to consumption.

7.2 Fire Fighting and Panel Cleaning

Additional static water tanks will be required around the site for panel cleaning maintenance to be carried out along with firefighting capacity. The proposal is to provide dual 30,000 litre tanks positioned around the site in optimal locations to allow fighting to reach all areas. The area will be equipped with a hardstand to provide access for a fire appliance to connect to the tanks and be clear of the access track. The tanks will be interconnected with a 100mm pipe along with a FENZ 100mm female suction coupling at the outlet.

The tanks will be filled by either water tankers brought to site or filled via the on-site water bore. This is yet to be decided. Any depletion of the tanks supply will require immediate refill after each event.

7.3 Utility Services

Power and telecommunication are located within the road reserve adjacent to the site and will be extended to serve the site office as required.

The main substation is immediately adjacent on Cornwall Road and will form the connection between the Solar Farm substation and main power network substation.

8.0 Summary

NZCE is proposing a Agrivoltaic Facility within the site that requires the installation of solar panels, internal roading, service area containing parking, site office, laydown area and BESS units.

The earthworks on site are limited to topsoil stripping to construct access tracks and hardstand areas. To prevent and mitigate any adverse environmental effects during the earthwork's operation, erosion and sediment controls will be implemented in accordance with GWRC guidelines.

The site is relatively flat, and any runoff is dispersed overland onto existing paddocks soaking to ground.

Wastewater & water are limited to the site office with options available for a portable toilet or on-site holding tanks along with rain tanks for water collection and use.

Firefighting storage capacity will be supplied via multiple dual water tanks located across the site with suitable access for emergency vehicles. The tanks will also be used for panel maintenance when the panels require washing. Tanks will require immediate refill after each event.

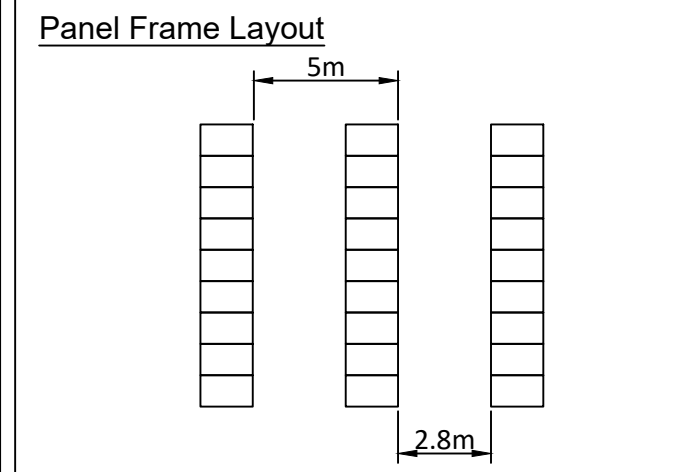
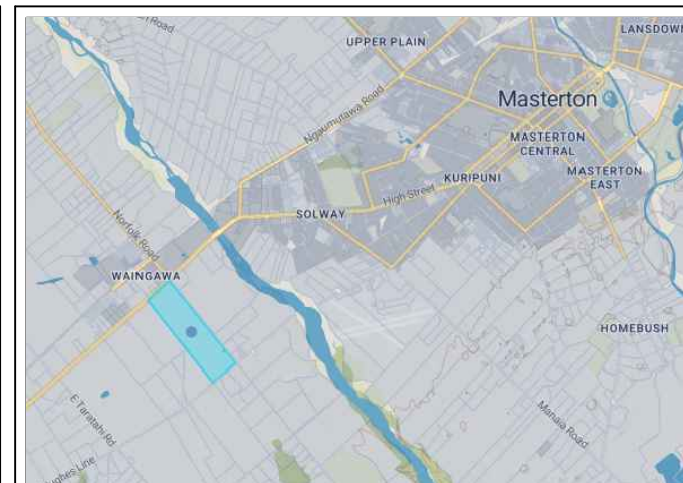
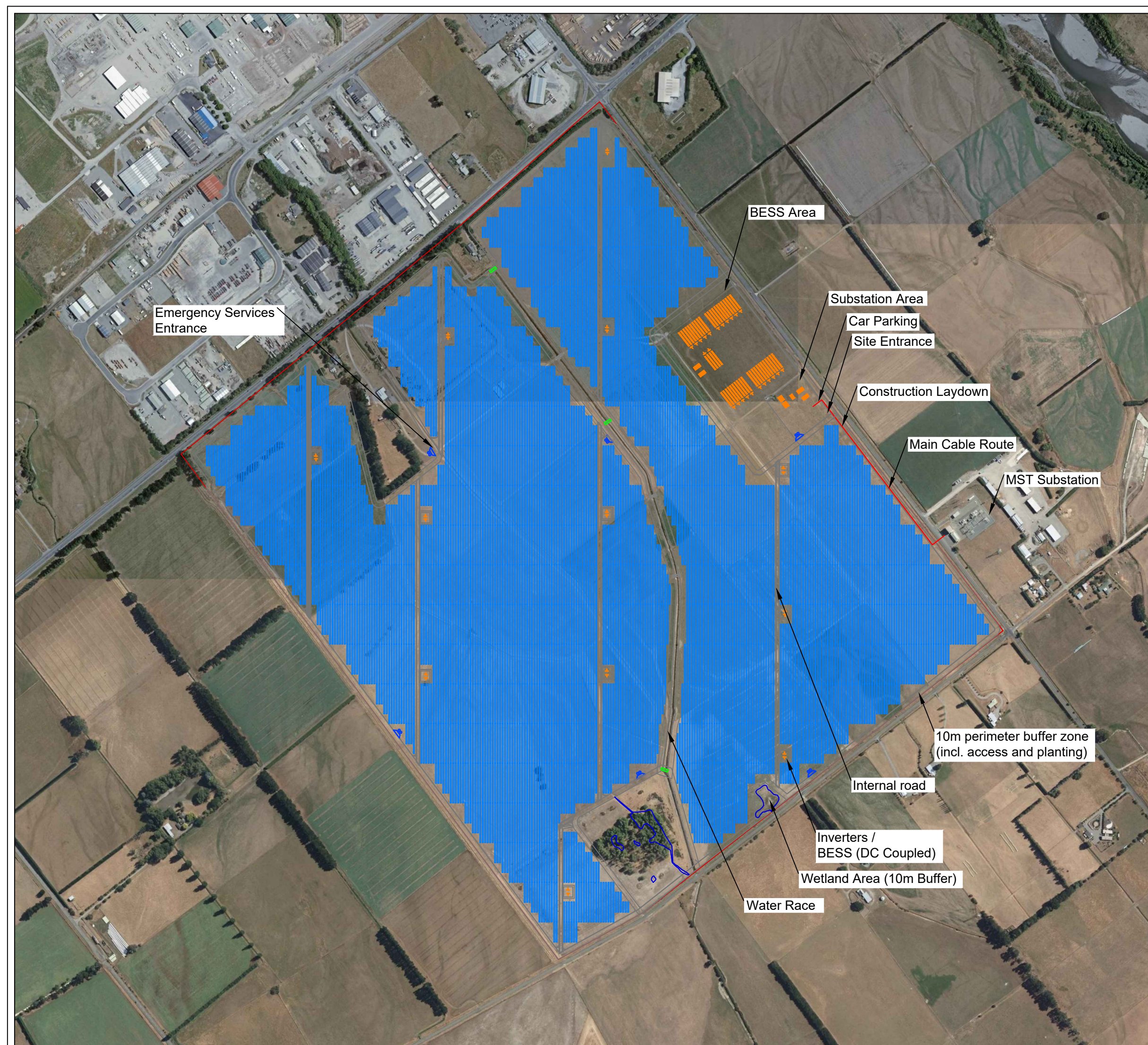
New utility services will be installed to service the site as required.

9.0 Limitations

This report has been prepared solely for the benefit of our client with respect of the particular brief and it may not be relied upon in other contexts for any other purpose without the express approval by CKL. Neither CKL nor any employee or sub-consultant accepts any responsibility with respect to its use, either in full or in part, by any other person or entity. This disclaimer shall apply notwithstanding that the report may be made available to other persons including Council for an application for permission, approval or to fulfil a legal requirement.

APPENDIX 1

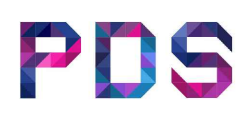
Engineering Plan



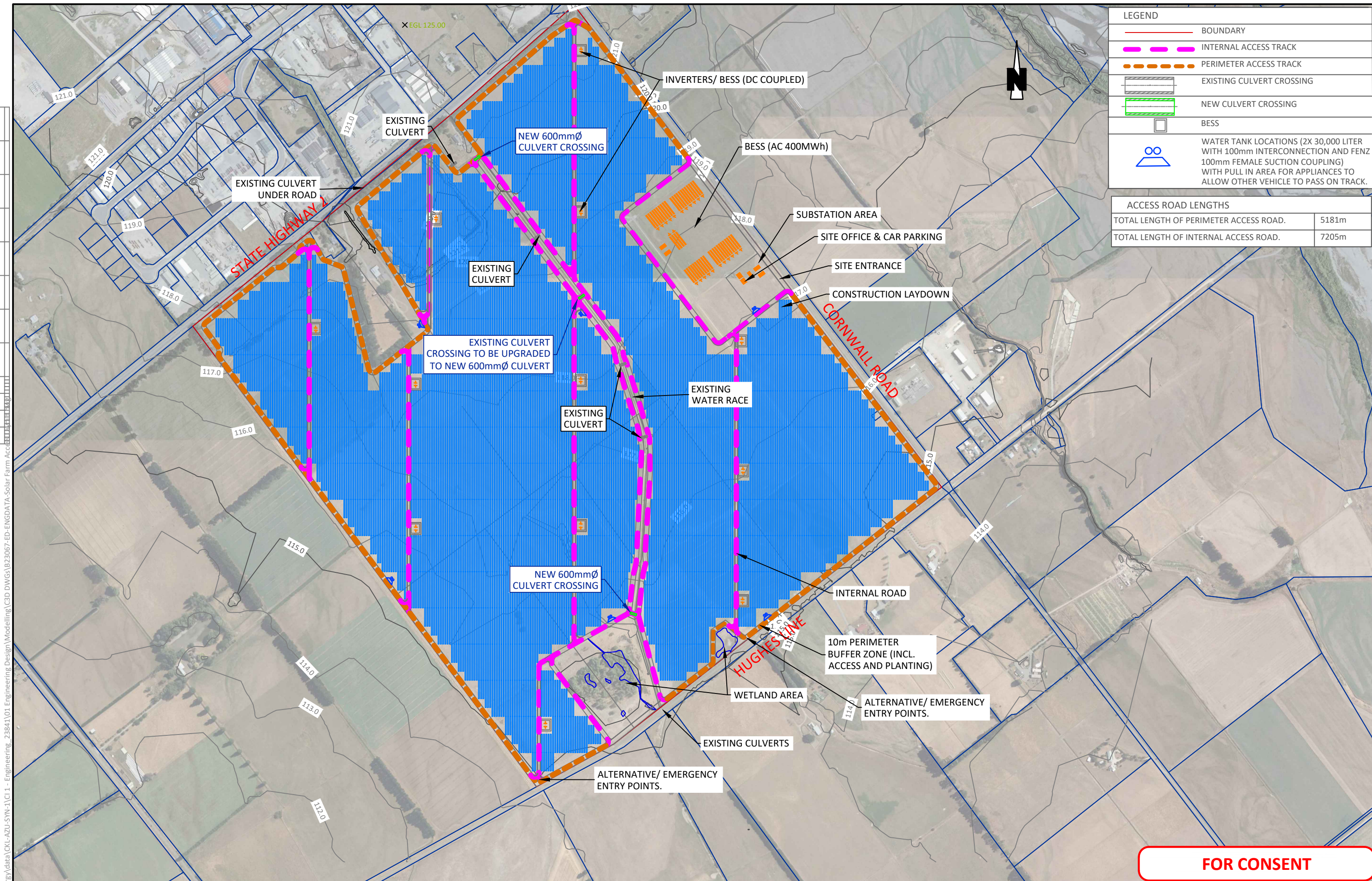
Title	Plot Plan
Project	Masterton
Location	Cornwall Road Masterton New Zealand
DC Capacity	95,090 kW
-	-



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Drawing prepared by Project Delivery Services



LEGEND	
	BOUNDARY
	INTERNAL ACCESS TRACK
	PERIMETER ACCESS TRACK
	EXISTING CULVERT CROSSING
	NEW CULVERT CROSSING
	BESS
	WATER TANK LOCATIONS (2X 30,000 LITER WITH 100mm INTERCONNECTION AND FENZ 100mm FEMALE SUCTION COUPLING WITH PULL IN AREA FOR APPLIANCES TO ALLOW OTHER VEHICLE TO PASS ON TRACK.)

ACCESS ROAD LENGTHS	
TOTAL LENGTH OF PERIMETER ACCESS ROAD.	5181m
TOTAL LENGTH OF INTERNAL ACCESS ROAD.	7205m

FOR CONSENT



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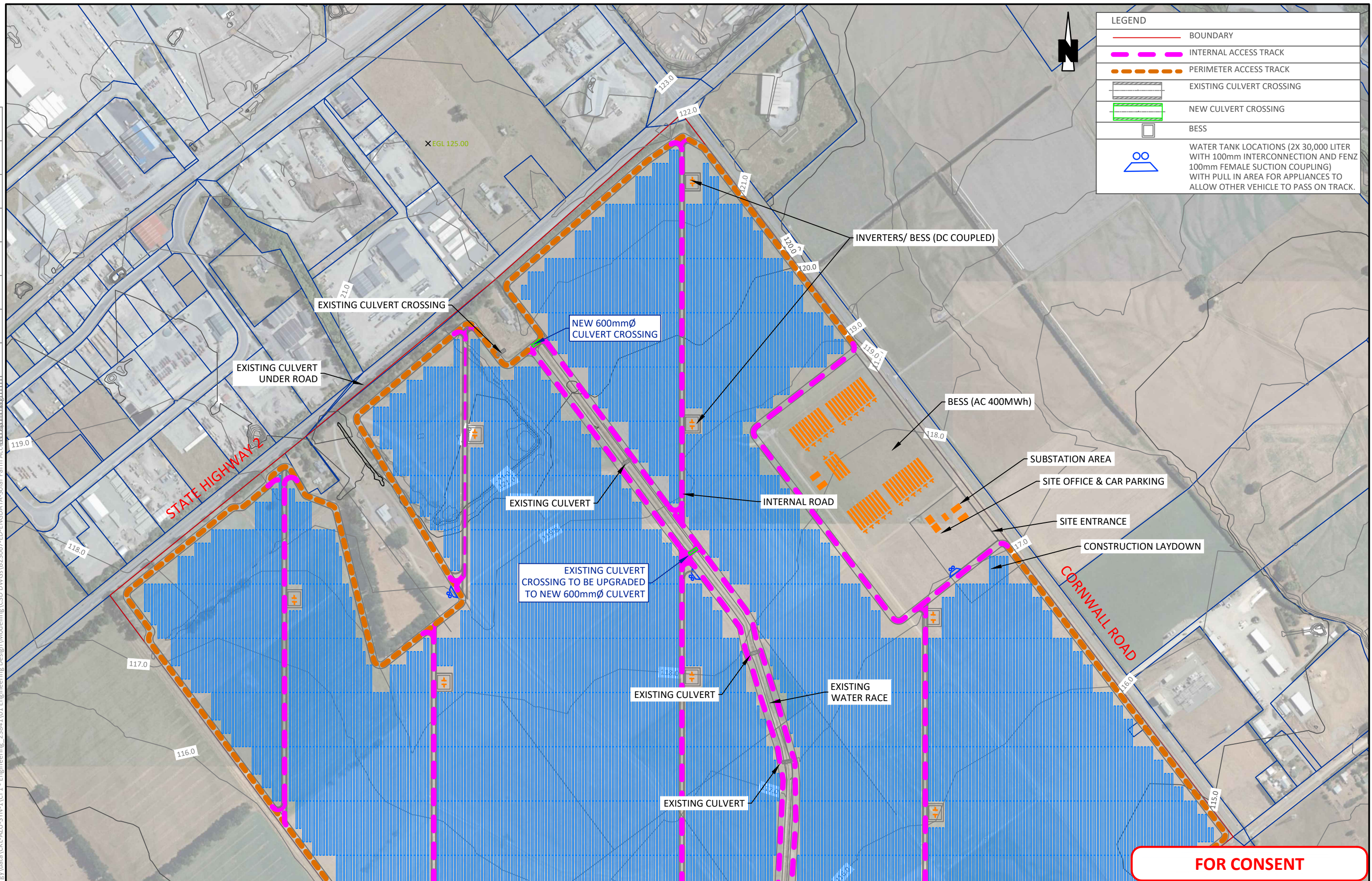
**SOLAR FARM
 NZ CLEAN ENERGY
 CORNWALL ROAD, MASTERTON**

**OVERALL LAYOUT
 ACCESS ROUTES**

Issue	Description	Checked	Date	Designed:	Date	Scale:
1	Culverts amended	GCW	13.10.23	RRC	09.10.23	1:7500 (A3 Original)
2	Revised Layout	GCW	06.11.23	RRC	09.10.23	
3	Revised Layout	GCW	08.11.23	Checked: GCW	09.10.23	
4	Culverts amended	GCW	14.11.23			
5	Track amended around Wetland	GCW	29.11.23			

Job No: **B23067** Dwg No: **3000** Rev: **5**

LEGEND	
	BOUNDARY
	INTERNAL ACCESS TRACK
	PERIMETER ACCESS TRACK
	EXISTING CULVERT CROSSING
	NEW CULVERT CROSSING
	BESS
	WATER TANK LOCATIONS (2X 30,000 LITER WITH 100mm INTERCONNECTION AND FENZ 100mm FEMALE SUCTION COUPLING) WITH PULL IN AREA FOR APPLIANCES TO ALLOW OTHER VEHICLE TO PASS ON TRACK.



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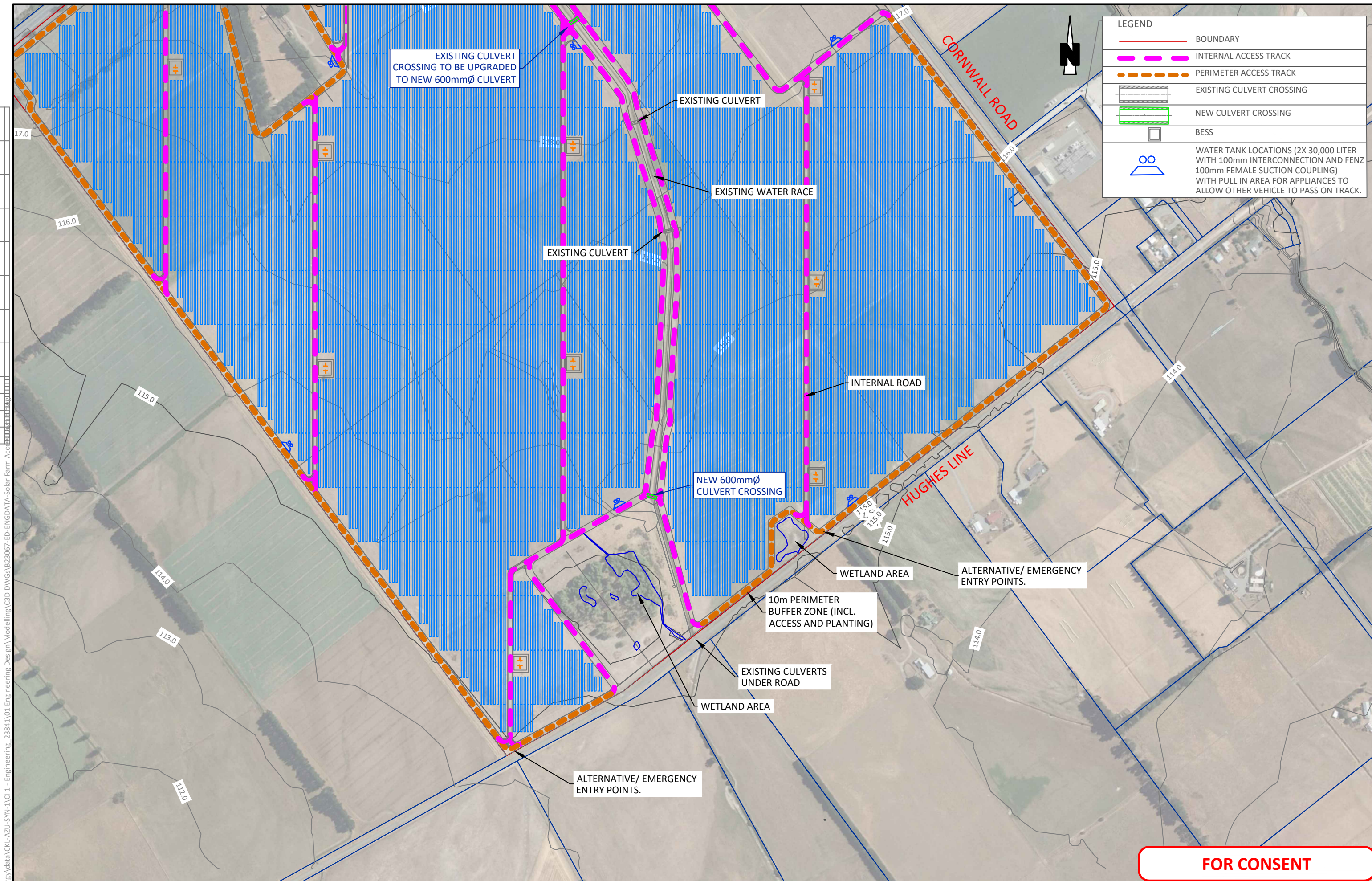
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**SOLAR FARM
NZ CLEAN ENERGY
CORNWALL ROAD, MASTERTON**

**SITE LAYOUT SHEET 1
ACCESS ROUTES**

Issue	Description	Checked	Date	Date	Scale:
1	Culverts amended	GCW	13.10.23	Designed: RRC 09.10.23	1:5000 (A3 Original)
2	Revised Layout	GCW	06.11.23	Drawn: RRC 09.10.23	
3	Revised Layout	GCW	08.11.23	Checked: GCW 09.10.23	
4	Culverts amended	GCW	15.11.23		
				Job No:	Dwg No:
				B23067	3001
				Rev:	4

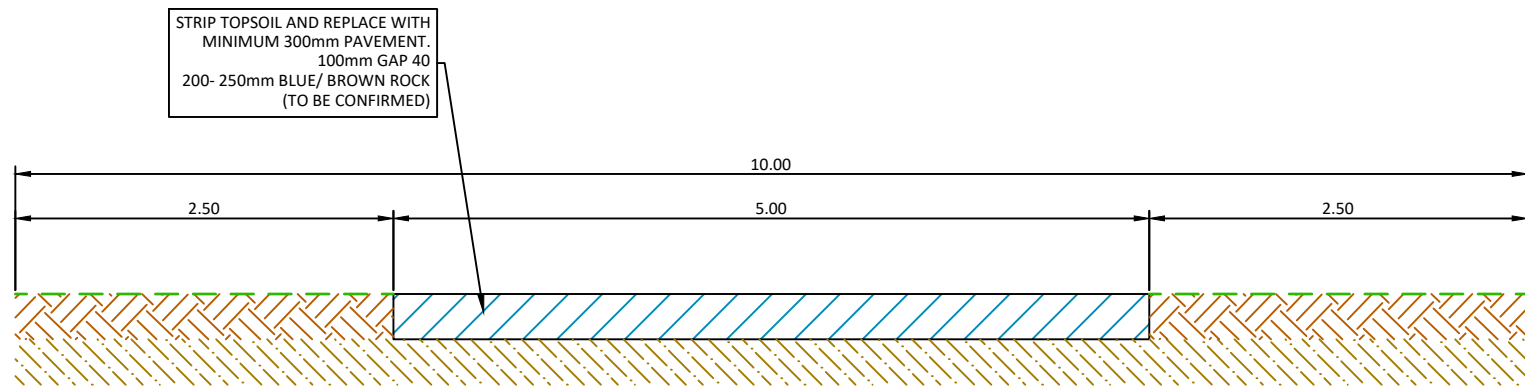
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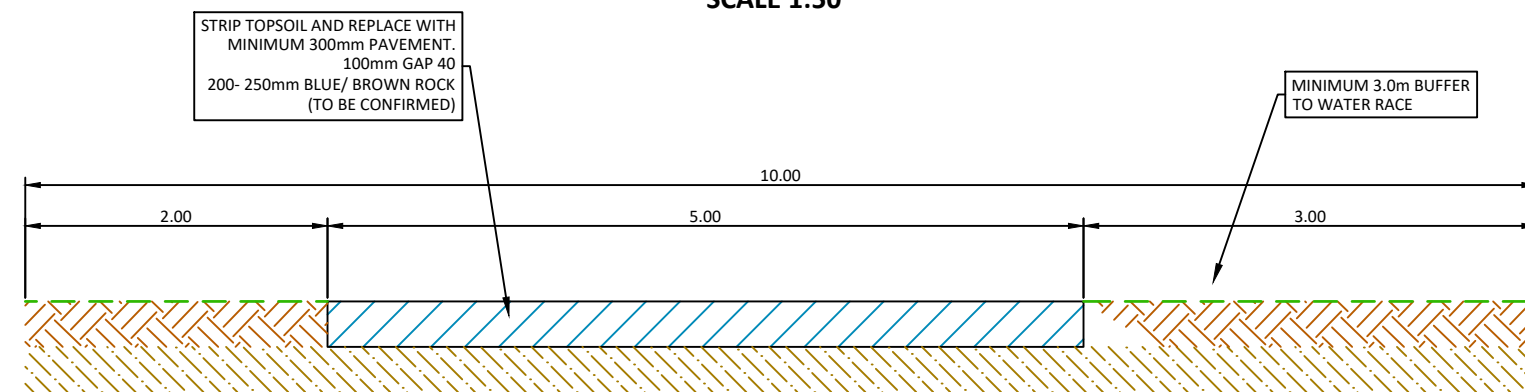
LEGEND	
	BOUNDARY
	INTERNAL ACCESS TRACK
	PERIMETER ACCESS TRACK
	EXISTING CULVERT CROSSING
	NEW CULVERT CROSSING
	BESS
	WATER TANK LOCATIONS (2X 30,000 LITER WITH 100mm INTERCONNECTION AND FENZ 100mm FEMALE SUCTION COUPLING) WITH PULL IN AREA FOR APPLIANCES TO ALLOW OTHER VEHICLE TO PASS ON TRACK.

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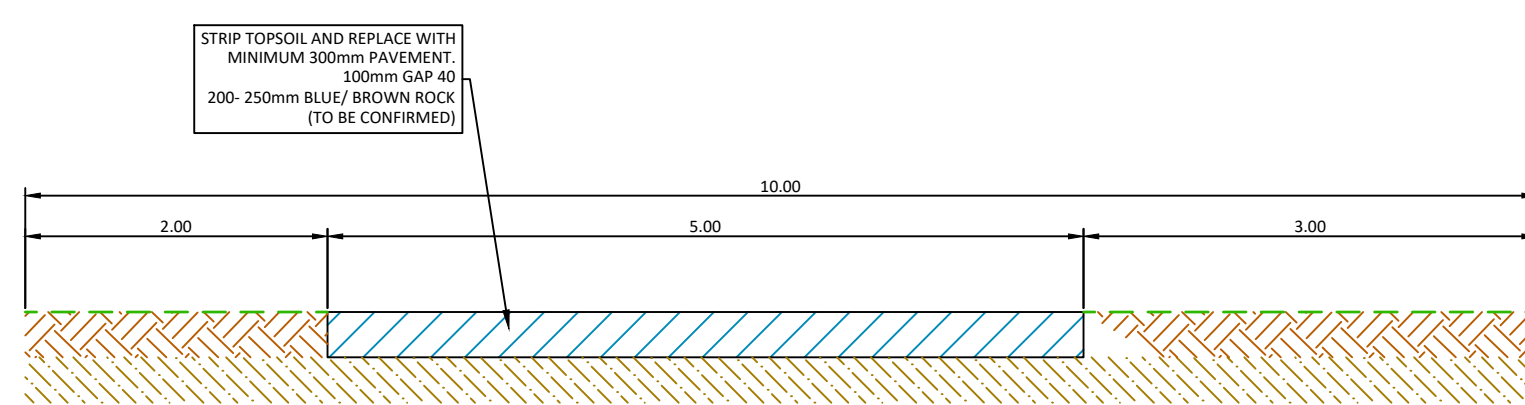
Issue	Description	Checked	Date	Designed:	Date	Scale:
1	Culverts amended	GCW	13.10.23	RRC	09.10.23	1:5000 (A3 Original)
2	Revised Layout	GCW	06.11.23	RRC	09.10.23	
3	Revised Layouts	GCW	18.11.2023	Checked: GCW	09.10.23	
4	Culverts amended	GCW	15.11.23			
5	Track amended around wetland	GCW	29.11.23			
				Job No:	Dwg No:	Rev:
				B23067	3002	5



**INTERNAL SERVICE/ ACCESS TRACK
SCALE 1:50**



**ACCESS TRACK ADJACENT TO WATER RACE
SCALE 1:50**



**PERIMETER SERVICE/ ACCESS TRACK
SCALE 1:50**

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**TYPICAL SECTIONS
ACCESS ROUTES**

Issue	Description	Checked	Date	Designed:	Date	Scale:
1	Additional section added	GCW	13.10.23	RRC	09.10.23	1:50
				RRC	09.10.23	(A3 Original)
				GCW	09.10.23	
				Job No:	Dwg No:	Rev:
				B23067	3004	1

