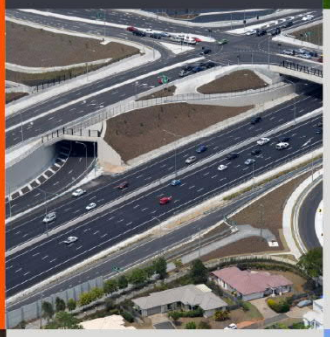
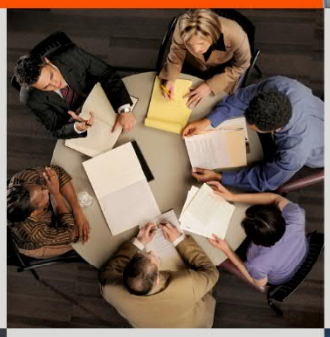
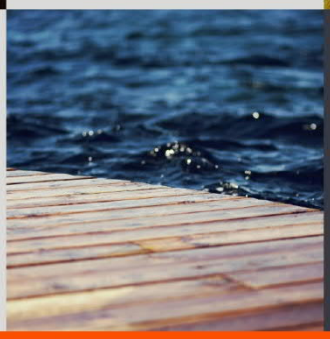




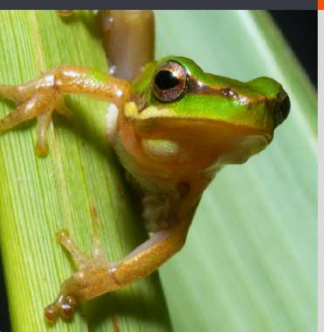


ENGINEERING
ASSESSMENT

1 Dingo Lane, Myocum, NSW 2481
Lot 15 on DP1178892

Byron Shire Council
By Planit Consulting Pty Ltd

September 2020



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Project Name	Dingo Lane Solar Farm
Client	Byron Shire Council
Client Project Manager	Josh Townsend
Authors	Jake Bentley
Planit Reference	J6558- DINGO_LN-EA01-REVA

Disclaimer

Contents

Figures

Tables

1 Executive Summary

This Engineering Assessment (EA) has been prepared in support of Byron Shire Council's proposed solar farm at 1 Dingo Lane, Myocum, NSW 2481 which falls within the Byron Shire Council (BSC) Local Government Area. Planit was engaged by Byron Shire Council (BSC) to assess and report on thecivil engineering matters associated with this development.

Acid Sulfate Soils were found onsite and accordingly appropriate management of soils during the construction is required.

The area is subject to flooding and accordingly flood mapping of the site has been carried out to identify flood levels. These flood levels have been considered as part of the design.

Minor bulk earthworks are proposed to accommodate proposed turn around areas, passing bays and the inverter and storage areas. It is proposed to keep topography generally consistent between the existing and proposed scenarios.

A Stormwater quantity assessment determined that no detention is required. Stormwater treatment devices are not proposed during the operation phase given that the site achieves full re-establishment of vegetation post constrction. To achieve appropriate revegetation during the construction phase and minimise scour and sedimentation, sediment and erosion controls are proposed.

No water or sewer infrastructure is proposed as part of the project and therefore no new connections are required.

Relocation of a telecommunications cable is required.

All power components are to be located above the 1% AEP flood level. Augmentation of the power network is anticipated.

2 Introduction

2.1 Project Background

This Engineering Assessment (EA) has been prepared in support of Byron Shire Council's proposed solar farm at 1 Dingo Lane, Myocum, NSW 2481 which falls within the Byron Shire Council (BSC) Local Government Area. Planit was engaged by Byron Shire Council (BSC) to assess and report on the civil engineering matters associated with this development.

The proposed development involves construction of approximately 11Ha of solar panels and associated infrastructure including solar inverter, viewing platform, access roads and parking. Refer to Table 1 below for additional development detail. The proposed project site is presented in Figure 1 below, Additionally, refer to Appendix C for the sites concept civil plans and the Plan of Subdivision is provided in Appendix A.

Table 1 – Site Details Summary

Component	Details
Applicant	Byron Shire Council (BSC)
Street Address	1 Dingo Lane, Myocum, NSW 2481
Local Government Area	Byron Shire Council (BSC)
Climatic Region	Subtropical
Zoning	RU2 – Rural Landscape
Proposed development type	Solar Farm
Site Area	40Ha
Map Reference	Lot 15 on DP1178892

Figure 1- Proposed Solar Farm

2.2 Project Scope

This report presents the results of an assessment of:

- The subject site including:
  - Locality.
  - Existing Services.
  - Legislation.
  - Topography.
  - Soil characteristics.
- Preliminary earthworks design including:
  - Bulk earthworks.
  - Service trenching requirements.
  - Preliminary driveway and crossover design.
- Stormwater management including:
  - Analyses of the existing site and proposed project.
  - Hydraulic calculations and modelling to determine the required detention storage.
  - Provide recommendations for stormwater conveyance.
  - Provide stormwater quality comments.
- Services assessment including:
  - Potable water.
  - Sewer.
  - Power.
  - Telecommunication.

To accompany and further detail the proposed design civil plans are presented in Appendix C.

3 Civil Site Assessment

3.1 Site Description

The subject site (Figure 2) currently contains:

- General grazing farmland.
- Scattered vegetation.
- Access road.
- Residence at the southern end of the site.

The proposed development includes the following:

- Approximately 11 Ha of solar panel arrays.
- Solar inverter.
- Access road and parking for 5 cars and 1 coach bus.
- Viewing platform.
- Landscape screening.
- Security fencing.
- Retained residence and associated access.

The surrounding areas of the site include:

- Dingo Lane (BSC owned road) bounds the site to the north.
- General grazing farmland to the west.
- Macadamia plantation to the south.
- Resource recovery to the south east.
- Quarry to the east.
- General grazing famrland to the north east.

It should be noted that the speed limit in the surrounding area is 80km/h.

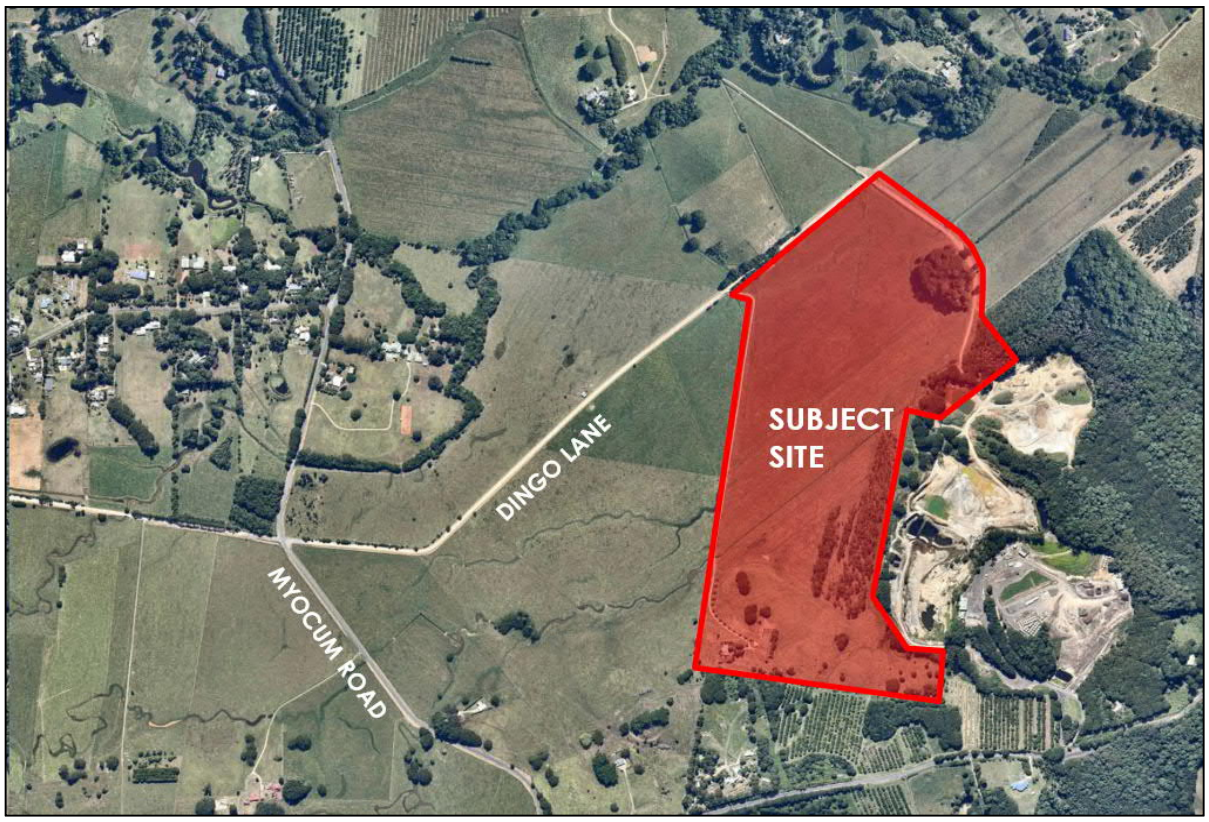

Figure 2- Subject Site

3.2 Existing Services

To confirm the locations of existing services, a 'Dial Before You Dig' (DBYD) search has been requested within the vicinity of the development area, the results of which are included in Appendix B. In addition, a site survey has been complected and is avaliable in Appendix A.

Survey Information and dial before you dig records indicate the following services within the proximaty to the subject site:

- Stormwater:
  - There is stormwater infrastructure located on the development site. Currently there is a driveway present with culvert crossings in 4 locations to convey water form upstream.
- Water:
  - There is no council owned potable water infrastructure within vicintity of the subject site with the current residence been serviced via an onsite rain water tank.
- Sewer:
  - There is no council owned sewer infrastructure within vicintity of the subject site with the current residence been serviced via an onsite system.
- Power:
  - Overhead power is located within the vicinity of the subject site with the existing onsite residence serviced via this service.
- Telecommunications:
  - Records indicate that telecommunication serives are located within the subject site. It is assumed that the cable is live and servicing the existing onsite residence, however, this is to be confirmed.

For locations of services, refer to Appendix A for the site specific survey and Appenidx B for the DBYD records.

3.3 Engineering Constraints

All civil works shall be in accordance with the BSC Engineering Specifications including the Subdivision Specifications and Standard Drawings as well as all codes and standards referenced in these documents.

The site is mapped as having presence of Acid Sulfate Soils (Class 4) below the surface (Figure 3). Accordingly, Australian Soil Concrete Testing (A.S.C.T.) were engaged to carry out an ASS investigation to determine the presence of ASS below the surface.

The ASS investigation concluded that the soils consist of Potential Acid Sulfate Soils (PASS) and Actual Acid Sulftae Soils (AASS) and require management via liming application upon excavation. Refer to Appendix D for the ASS investigation.

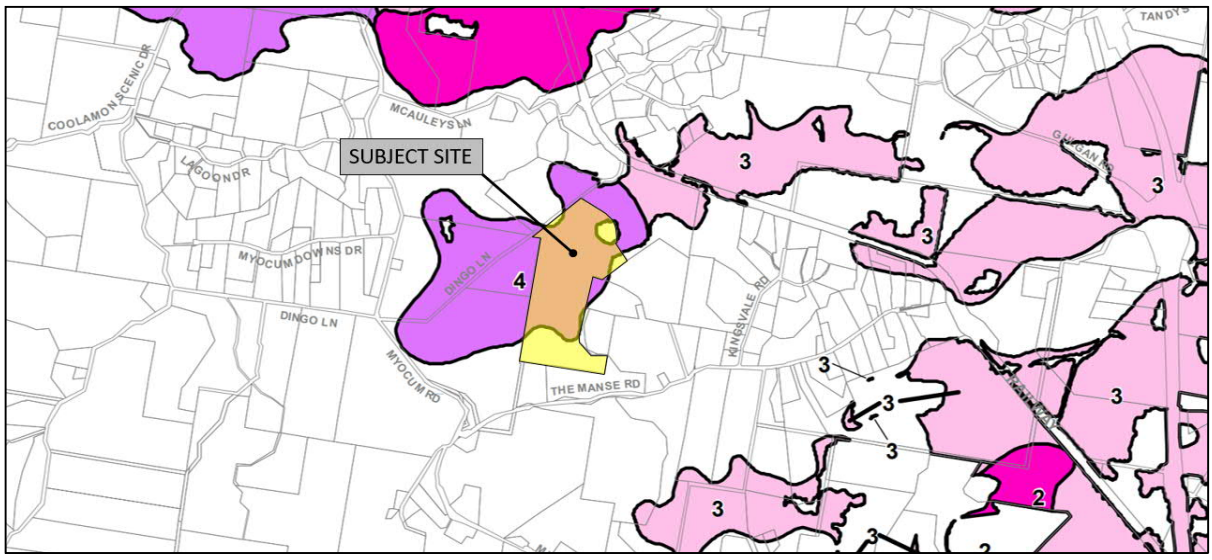

Figure 3- Subject Site Presence of Acid Sulphate Soils

To site is located within land subject to flooding. Accordingly, BMT have completed flood mapping for the subject site (extract shown in Figure 4).

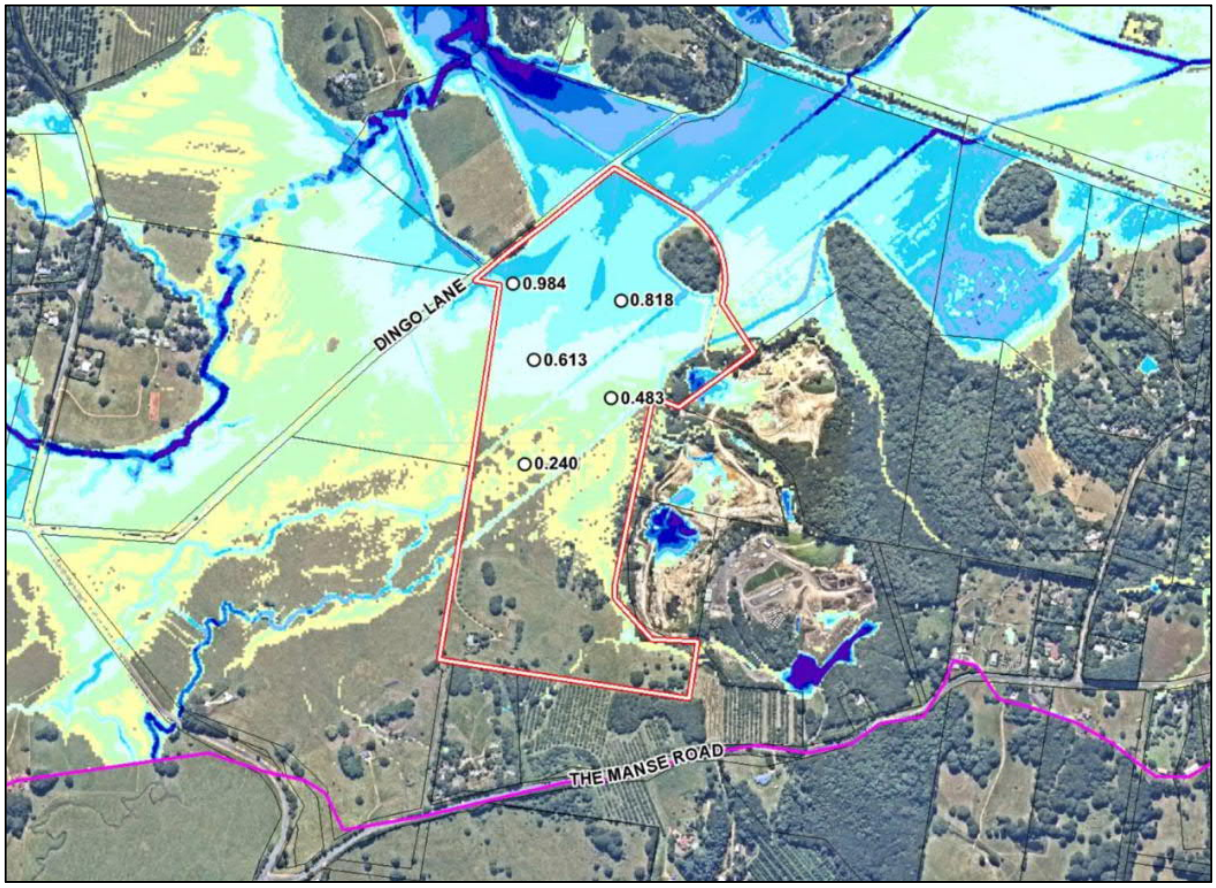

Figure 4- BMT Flood Mapping 1% AEP Water Depths

Refer to Appendix E for BMT's flood mapping 1% AEP water levels, depths, and velocities.

4 Earth and Roadworks

4.1 Bulk Earthworks

Two small sections of roadway are proposed as part of the project, they include:

- New section at site entrance to allow for the manoeuvring of a coach and providing car parking spaces for educational purposes (i.e. university field trips).
- New section of roadway around the solar inverter and storage area in the south area of the subject site.

In addition, passing bays are proposed along the existing driveway.

Based on the new sections of roadway and passing bays, it is anticipated that earthworks volumes shall be minimal with only minor cutting and filling.

4.2 Service Trenching

Assuming the Telecommunication cable is live, service trenching will be required to relocate the telecommunications cable passing through the subject site. The new alignment is proposed to follow the existing driveway and connect back to the previous alignment.

In addition, service trenching will be required to connect the internal solar infrastructure to the inverter and also connect the solar farm to the electricity grid.

Refer to Appendix C for the site civil plans.

4.3 Driveway Access

New circulation driveways shall be designed and constructed in accordance with AS2890 and NRLG standards and specifications.

Key design parameters include but not limited to:

- Driveways with low traffic volumes are required to be a minimum width of 3m and provide passing opportunities every 30m. It should be noted that the use of the driveway past the viewing platform will be minimum with only authorised personnel and the tenants at the existing residence will be utilising this driveway, in addition the driveway is straight meaning sightlines to approaching vehicles can be seen from over 30m away and accordingly there is opportunity to increase the passing opportunity interval.
- Maximum Grade – 1 in 6 (desirable) 1 in 4 (absolute maximum).
- Maximum carpark grade - 10%.
- Coach turn around area to ensure coach can enter and exit the site in a forward motion while tyres remain on the pavement.
- Solar inverter turn around area to ensure a Light Rigid Vehicle can enter and exit the site in a forward motion while tyres remain on the pavement.

For additional detail regarding the proposed driveway, refer to Planit's Traffic Impact Statement (J6558-DINGO_LN-TIS01).

5 Stormwater Management

5.1 Stormwater Conveyance

The subject site topography has areas of steep grade (>10%) in the southern area of the lot and areas of shallow grade (<1%) in the northern areas of the site. There is stormwater infrastructure located on the development site. Currently there is a driveway present with culvert crossings in 4 locations to convey water form upstream. Refer to Figure 5 below for a visual of the exisitng flow paths. Note that these flow paths shown below are subject to flooding and become inundated in major events.

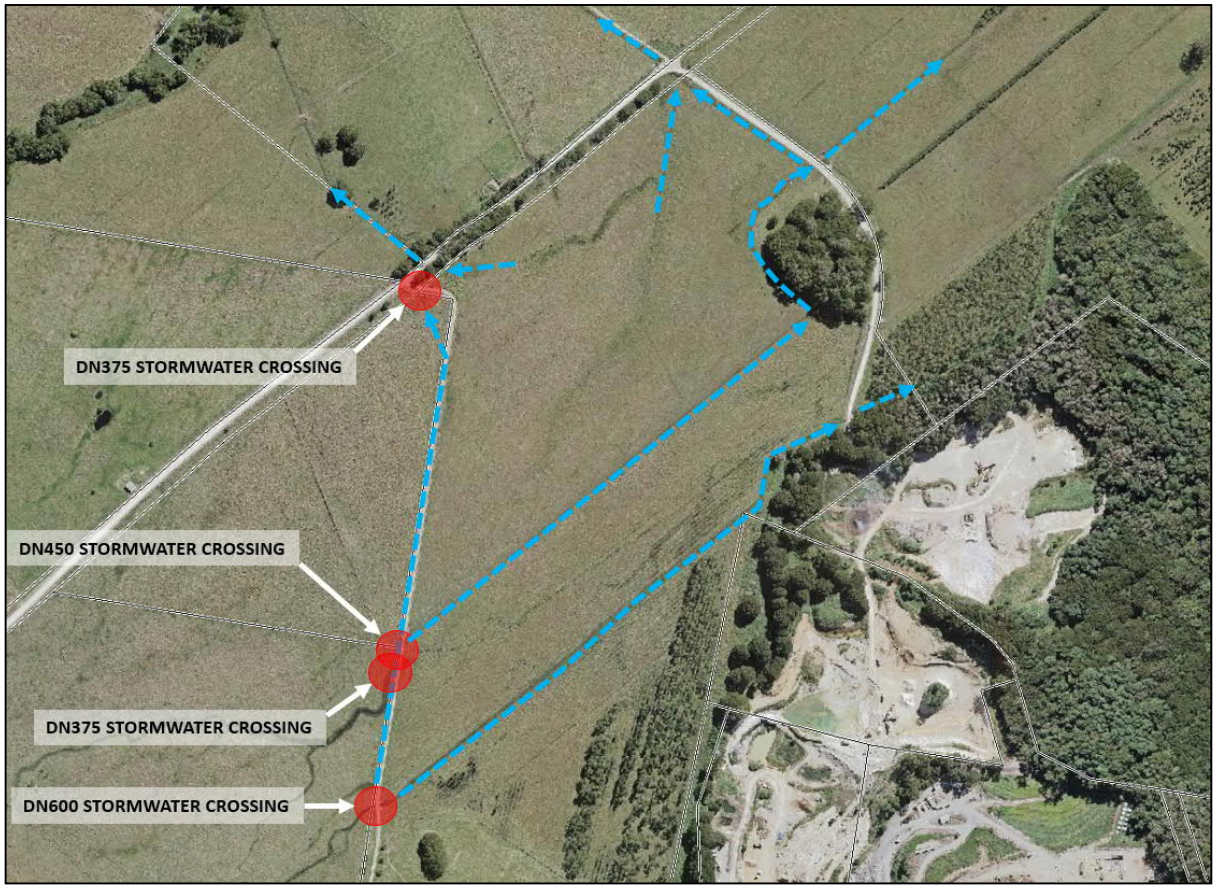

Figure 5- Existing Site Conveyance

It should be noted that the proposed solar farm shall be generally be located in the shallow low lying areas with only the inverter to be located on the steeper slope to ensure it is located above the 1% AEP flood event.

In addition, the proposed project finished surface levels are to remain generally consistent with the existing topography as to minimise the impact to upstream and downstream waterways/infrastructure. Refer to Figure 6 below for a concept layout of the proposed solar farm.

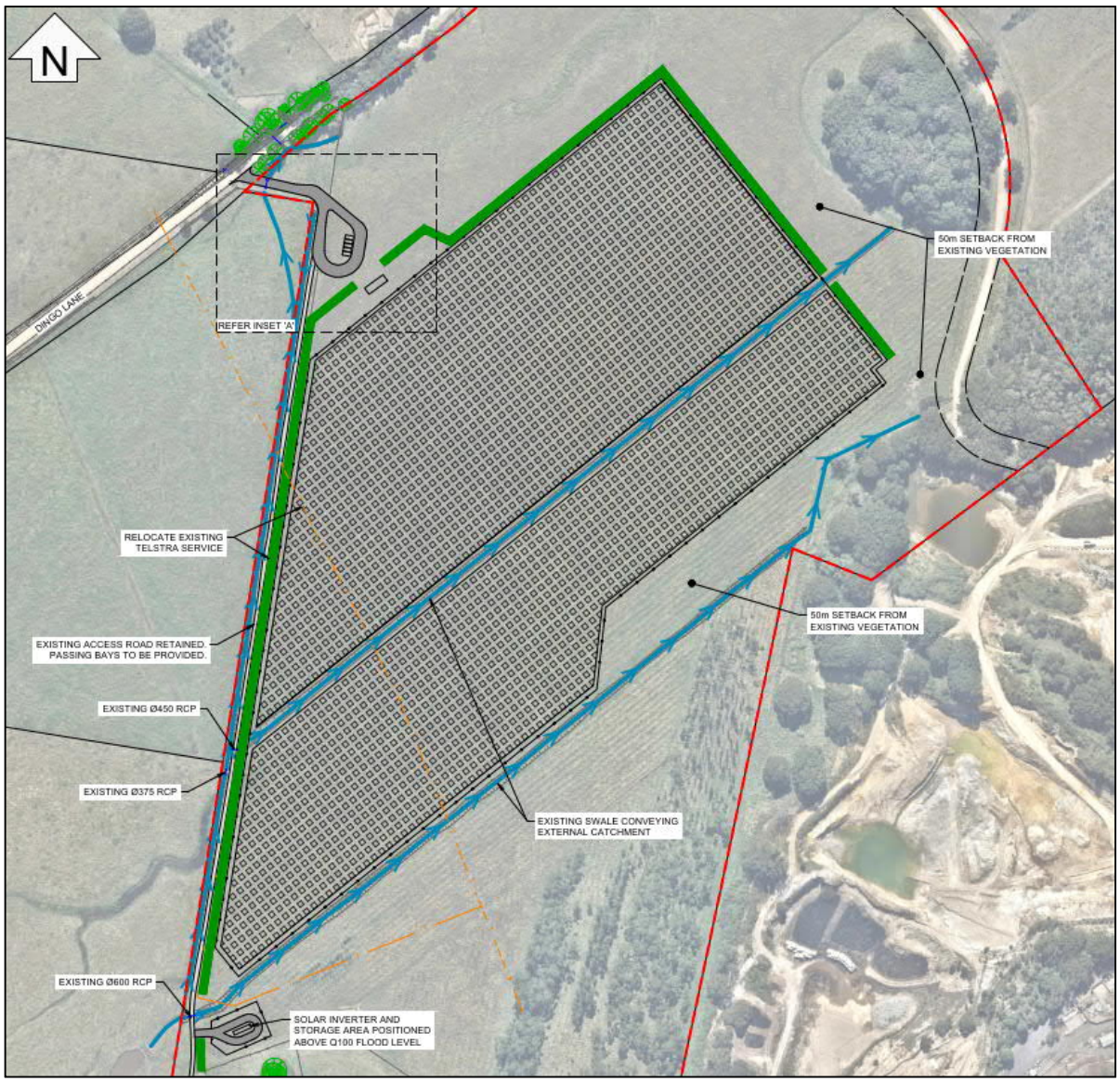

Figure 6- Proposed Site Conveyance

5.2 Stormwater Quantity Assessment

It is proposed to increase the impervious area of the subject site and accordingly a stormwater quanitity assessment has been carried out to determine detention requirements. Based on the proposed design, it is anticipated to increase the impervious area as per Table 2 below.

Table 2 – Site Surface Breakdown

Scenario	area (ha)	Solar Farm area @ 50% impervious area (ha)	Coach turn around hardstand (ha)	Inverter hardstand (ha)	Total impervious area (ha)	Total % impervious
*Existing	24.55	0	0	0	0	0%
Proposed	24.55	11.00	0.15	0.06	5.71	23%

*The existing gravel driveway is considered as 0% imp

To determine detention and conveyance requirements for the site, a hydraulic assessment was carried out using DRAINS software. Refer below for inputs for the DRAINS model.

Model type
Horton/ILSAX model has been utilised with parameters as per Figure 7 below.

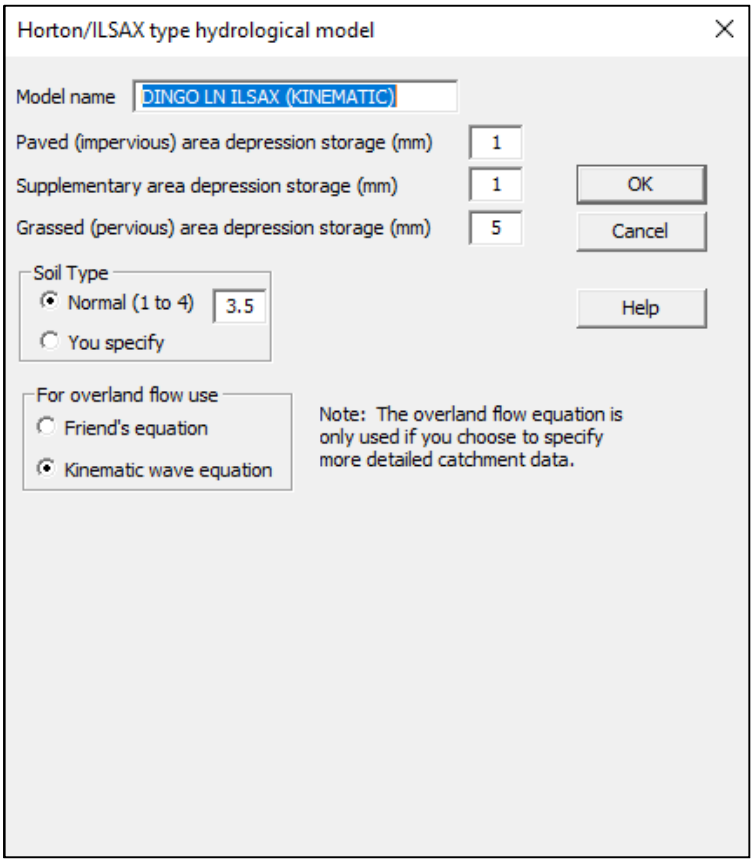

Figure 7- Hydraulic Model Parameters

Notes:

1. 3.5 has been assigned as the soil type as geotechnical information suggests silty clay soils.
2. The time of concentrations have been calculated within DRAINS using the Kinematic wave equation as the site is generally uniform in slope and roughness.

Rainfall data
Rainfall data was collected from the ARR data hub at the following latitude and longitude:

- Latitude: -28.588
- Longitude: 153.508

Catchments

To quantity the peak flow rates from the existing and proposed sites, a lumped catchment approach was carried out. Catchments have been assigned as per Figure 8 below.

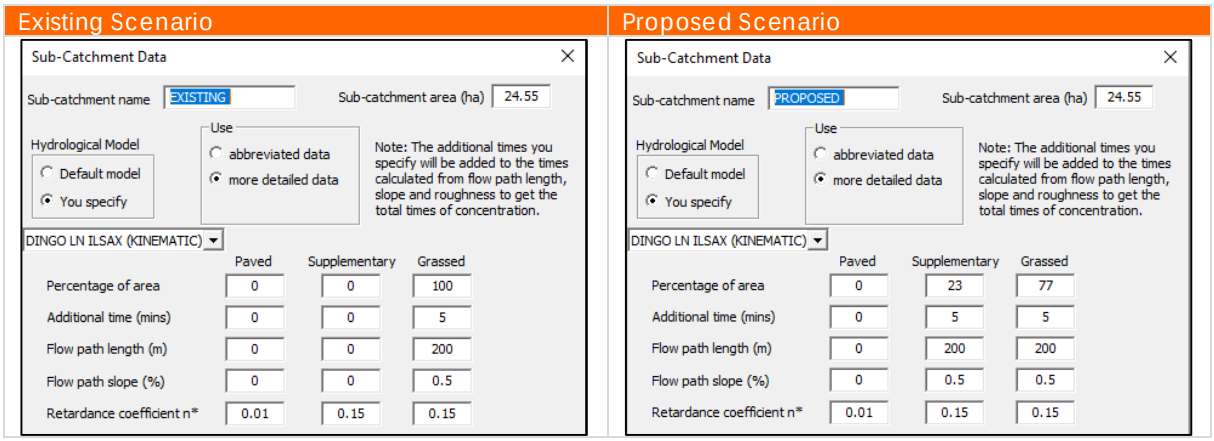

Figure 8- DRAINS Catchments

Notes:

1. Refer to Figure 9 below for the definition of each surface type (Paved, Supplementary, and Grassed areas).
2. Assigned parameters to determine the time of concentrations have been assigned as the following in accordance with QUDM:
   - 200m is assumed to be the maximum sheet flow length before forming concentrated flows.
   - Flow path slope has been assigned based on site conditions.
   - Retardance coefficient has been assigned in accordance with Table 4.6.5 of the QUDM.
   - 5 minutes of additional time has been added to account for travel times of concentrated flows (based on speed relationship (3m/s over 1000m)).
3. As minimal earthworks are proposed, stormwater runoff shall generally be as per the existing conditions.
4. It is assumed rainfall that lands on solar panels will run off to the ground and form sheet flow as the existing topography is relatively flat (<1%).

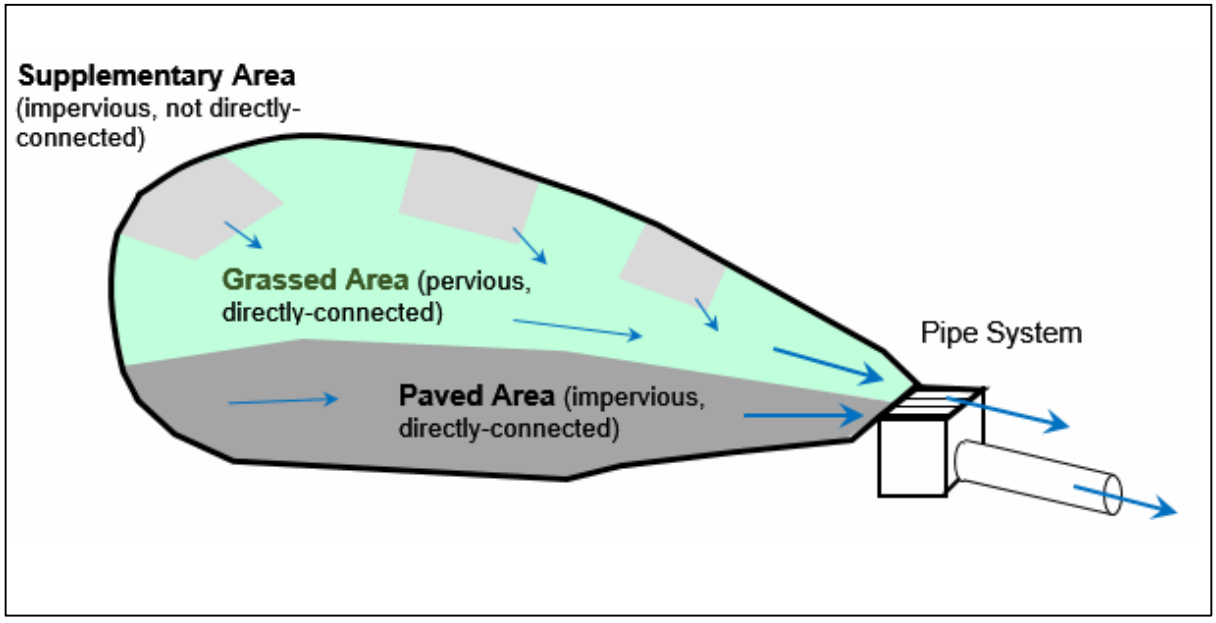

Figure 9- Surface Type Definition

Results

Results from the hydraulic assessment reveal peak flow rates generated from each scenario. Refer to Table 3 below for a comparison below the pre and post development flow rates for equivalent storm events from the minor to major events (20% AEP to the 1% AEP). In addition refer to Figure 10 and 11 for the minor and major peak flow charts.

Table 3 – Existing and Proposed Scenario Peak Flow Rate Comparison

Scenario	20% AEP (m3/s)	10% AEP (m3/s)	5% AEP (m3/s)	2% AEP (m3/s)	1% AEP (m3/s)
Existing	2.590	3.410	4.270	5.430	6.330
Proposed	2.550	3.240	3.970	5.060	5.840
Impact	-0.040	-0.170	-0.300	-0.370	-0.490

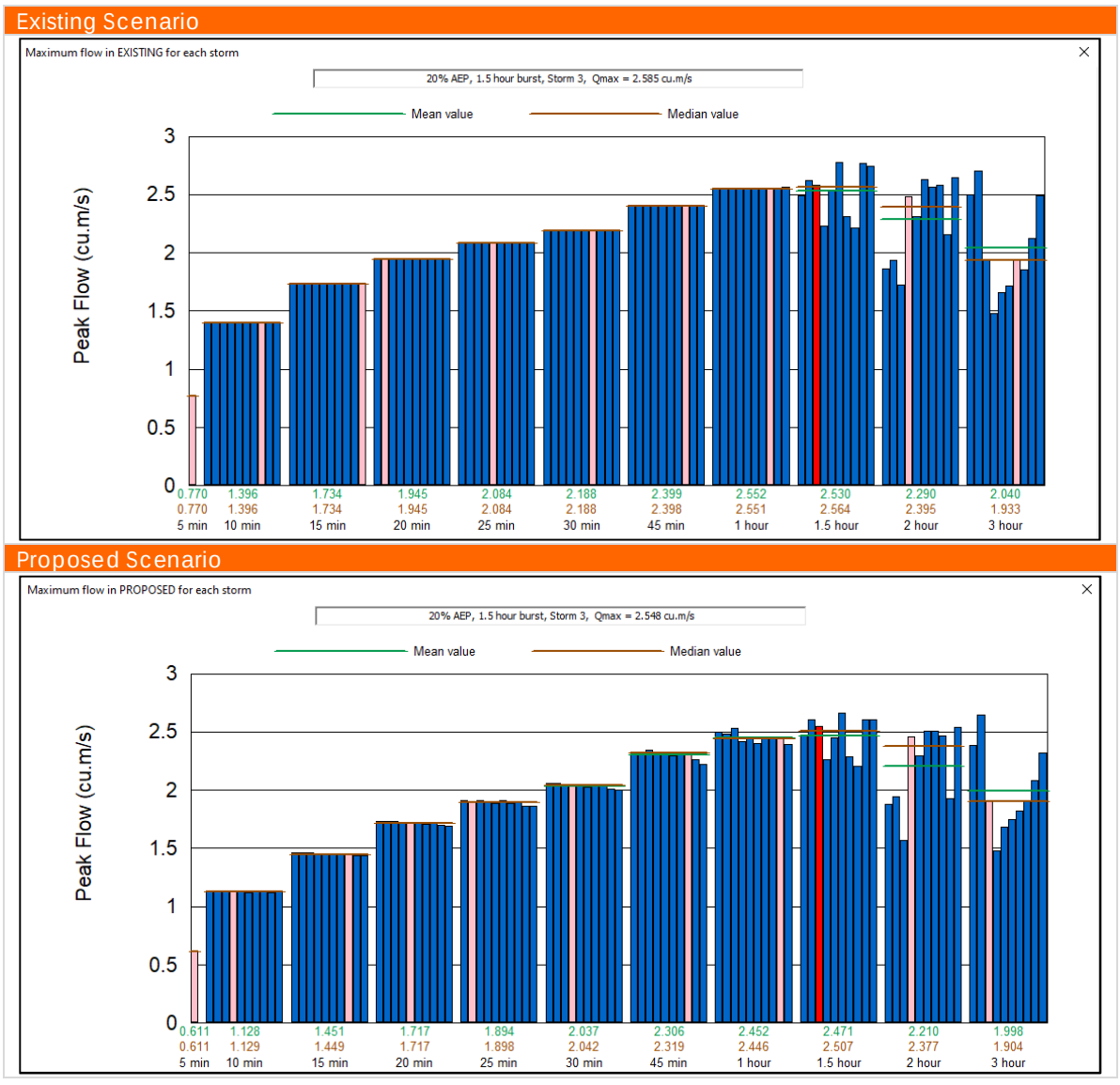

Figure 10- Minor Event (20% AEP) Peak Flow Chart

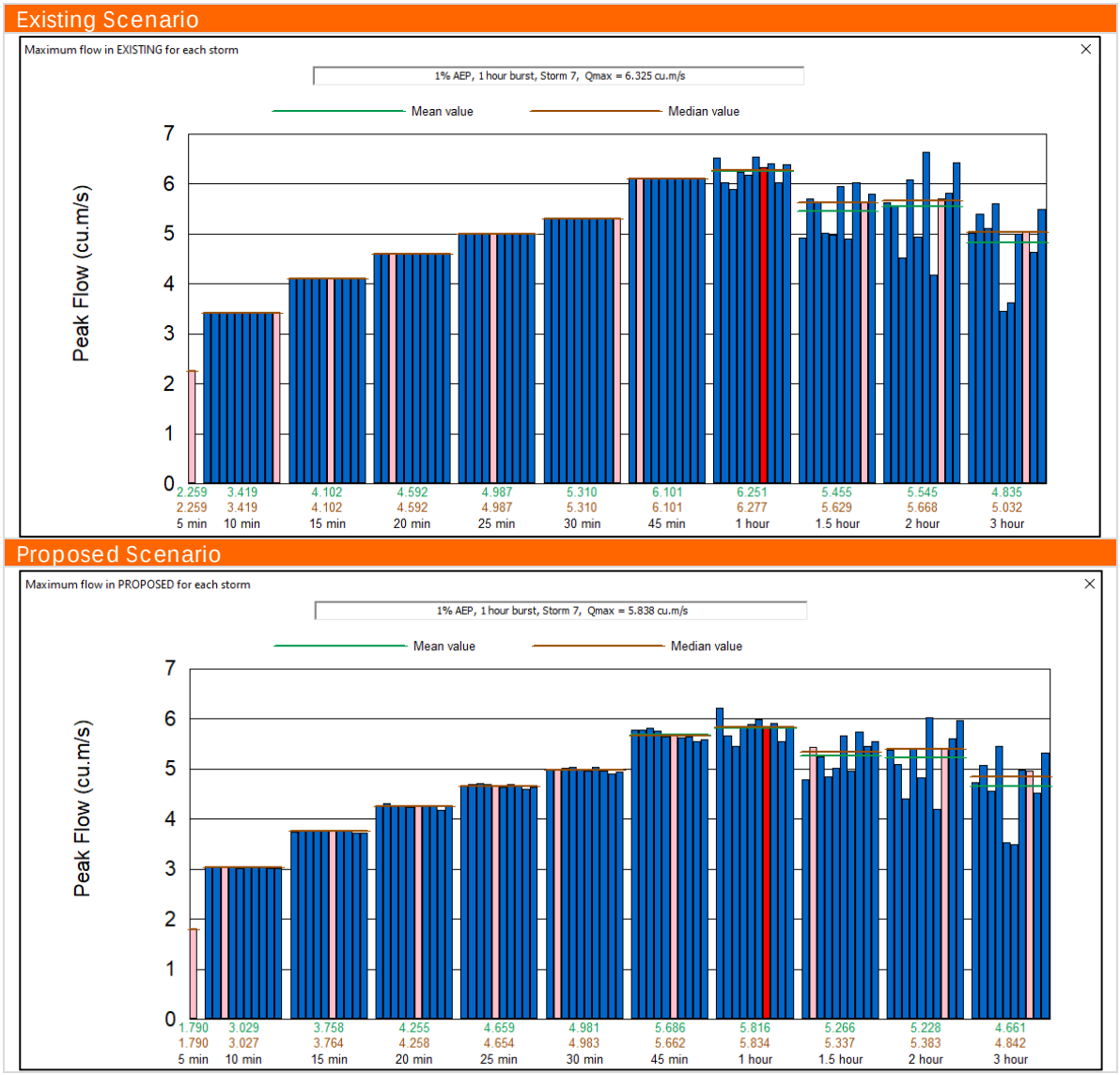

Figure 11- Major Event (1% AEP) Peak Flow Chart

Results from the hydraulic assessment reveal a reduced peak flow for the major and minor events. Based on the results, the supplementary areas and grassed areas become less concentrated due to the different surface types. Accordingly, the hydraulic assessment concluded that no detention is required and upon completion of the project (operation phase) stormwater runoff characteristics shall be generally as per the existing scenario.

5.3 Stormwater Quality Assessment (Operational)

The proposed solar farm is not expected to experience extensive traffic movements (refer to Planit's Traffic Impact Statement (J6558-DINGO_LN-TIS01), nor does the project propose a high percentage of indirectly connected hardstand areas (refer to section 5.2 of this document). Therefore, pollutant loading on roadways will be minimal and allowed to flow over grass (receiving treatment) prior to discharging offsite. In addition, solar panels will not collect extensive quantities of pollutants and runoff from solar panels will be required to sheet flow over grass (receiving treatment) and discharge offsite.

Based on the proposed solar farm and the above assumptions, it is not proposed to install stormwater treatment devices as any impact to water quality downstream shall be negligible.

Although no stormwater treatment devices are proposed during the operation phase of the project, during construction, sediment and erosion control measures will be required to ensure vegetation onsite is re-established to avoid scour and erosion of streams.

Refer to section 5.4 below for details of the proposed controls to be implemented during the construction phase.

5.4 Stormwater Quality Assessment (Construction)

The aim of the following controls is to achieve a no worsening impact of stormwater quality and achieve no reduction in the environmental values of the downstream receiving waters caused by construction activities on the subject site during the construction of the development.

Stormwater quality during construction activities shall be achieved through the implementation of Erosion and Sediment Controls in accordance with the requirements of the Landcom 'Soils and Construction Volume 1 – Managing Urban Stormwater: Soils and Construction' (i.e. Blue Book). The measures are to be implemented before the commencement of any subdivision works and should be inspected regularly, and after heavy storm events to ensure they are achieving their desired purpose. The measures to be used on site include:

- Minimise the number of site access points and provide stabilised site access.
- Stabilised site access to be provided at access to shake down all vehicles entering and leaving the site, minimising the transport of sediment off-site. All vehicles must use the designated site access to enter or leave the site.
- Installation of downstream sediment barriers prior to commencement of any works.
- Sediment fences are to be installed downstream of works and exposed soils to ensure contaminated run-off is filtered and sediment captured before it can make its way into the downstream receiving environment.
- Turf Strips where required.
- Cut-off drains are to be formed at the top of batter slopes (Cut-off drains will allow the discharge of water to be conveyed and directed to the most desirable points of discharge to ensure suitable sediment treatment is achieved).
- External catchment is to be conveyed around the area of works and discharged at appropriate location.
- Stabilise and protect earthwork areas immediately once earthwork profiles are achieved.
- Stockpile materials in protected locations away from overland flow paths and protected by sediment fence boundaries.
- Stockpile locations will be located in an elevated, level area nominally 5m away from any water body or channel. Upslope protection measures (i.e. sandbags or equal) are to be used to divert run-off in the event of rain, and sediment fences are to be installed downstream of any erodible stockpile. At the end of each day or in the event of rain or high winds, stockpiles are to be covered and secured. Appropriate locations of stockpiles are to be determined by the site manager at the time of construction.
- Sediment fence to be used on low side of any areas of soil disturbance (e.g. road formation, house pad, soil stockpiles, etc).
- Rock filter dams and gypsum filled bags, flock blocks or equivalent placed on low side of check dam spillway, are to be provided in key locations to treat stormwater run-off from the works area.
- Site is to be watered during the construction phase to minimise the generation of dust onsite.
- When wind speeds reach 35km/h, all dust generating construction activities must cease onsite.

The following inspection program shall be established by the Site Contractor and monthly Check Sheet reports shall be submitted to the Supervising Engineer:

- Daily inspection of the site Stabilised Access point and amendments as necessary.
- Formal weekly inspection of erosion and sediment controls.
- Inspections after 10mm rainfall events in 24 hours.
- Testing runoff after significant rainfall events to ensure a max. discharge of 50mg/L suspended solids.

In addition to the inspection details, the following information will be recorded:

- List frequency and method of removal of material from stabilised access point.
- Volume of material removed from in/around sediment controls.
- Location of site where materials are disposed.
- Any repairs/additions as appropriate.

Refer to Appendix C for the proposed sediment and erosion control plan, including locations of proposed treatment devices.

6 Services Assessment

Potable Water
No amenities are proposed as part of the project with the existing residence having access to water. Accordingly, there is no potable water provisions for the site and a connection is not required.

Sewer
No amenities are proposed as part of the project with the existing residence having assumed to have an onsite system. Accordingly, there is no provisions for additional sewer connections.

Power
The solar farm shall be connected to the existing infrastructure available in the south area of the subject site. It is expected that augmentation/modification to the existing infrastructure will be required as part of this project, however this is to be confined by the service provider.

It should be noted that all power components (i.e. solar panels, cables, joints etc.) shall be kept above the 1% AEP flood level. Refer to Appendix E for BMT's 1% AEP flood mapping.

Telecommunications
As records indicate a telecommunication cable crossing the subject site in the area where the solar panels are proposed, it is proposed to realign the cable to avoid possible clashes with solar panels. It is proposed to relocate this cable as per Figure 12 below.

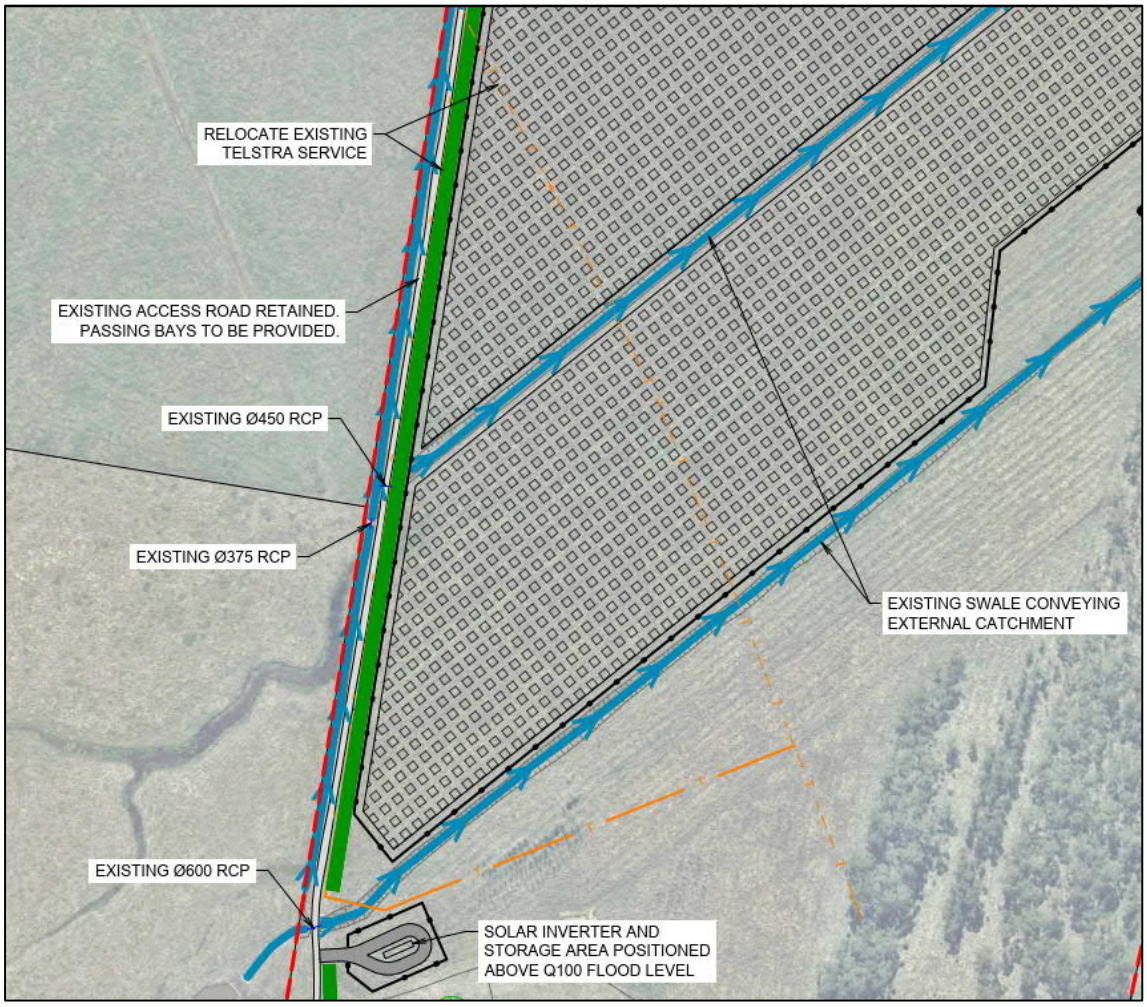

Figure 12- Proposed Telecomunicatons Cable Realignment

7 Conclusion/Recommendations

The assessment outlines the constraints of the site and the proposed strategy to successfully complete earthworks, convey stormwater, and provide water, sewer, electricity, and telecommunication connections to the proposed development. Additionally, a Stormwater Management Plan has been prepared and is presented in Section 5 of this document, detailing treatment and detention requirements to minimise the impacts of the project both during its construction and operational phase.

Planit has designed this project in accordance with Byron Shire Council standards (including Northern River Local Government Development design/construction manuals and standard drawings), Queensland Urban Drainage Manual (QUDM), and the 'Blue Book'. Accordingly, Planit recommends the following:

Earthworks/Road works:

- Minor earthworks to accommodate the proposed coach turn around area, the solar inverter roadway and passing bays on the existing driveway.
- Topography within the solar array area to remain consistent with the existing scenario as to minimise the impact of site hydraulics.
- Construction of compliant access driveways for the site from Dingo Lane.

Stormwater:

- Hydraulic assessment determined that detention is not required.
- Sediment and erosion control devices are required during the construction of the project to ensure full re-vegetation upon completion of the project.
- Stormwater treatment during the operation phase is not required given that vegetation achieved full re-establishment.

Additional Services:

- Ensure the inverter and all electrical components will be constructed above the 1% AEP flood event.
- Service trenching to relocate telecommunications cable and provide connections to power.
- No sewer or water infrastructure is proposed and therefore no additional sewer or water connections are required.

Based on the assessment undertaken, it is believed that the proposed development can readily be serviced in a sustainable way.

Appendix A

Site Survey

Appendix B

Dial Before You Dig (DBYD)

Appendix C

Civil Plans

Appendix D

Acid Sulfate Soil Investigation

Appendix E

BMT 1% AEP Flood Mapping