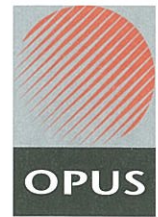


9 September 2010

Wrenn Pty Ltd
co:- Planit Consulting Pty Ltd
PO Box 1623
KINGSCLIFF NSW 2487



N-T0028.00 20100719 JL Investigation

Attention: Adam Smith

PROPOSED REZONING - 225 TERRANORA ROAD, TERRANORA CIVIL ENGINEERING INVESTIGATION

Wrenn Pty Ltd has commissioned Opus International Consultants to prepare a civil engineering investigation for the proposed rezoning of 225 Terranora Road, Terranora.

The assessment addresses the following issues:

- Access assessment
- Water demand impacts
- Wastewater generation impacts
- Stormwater management

DEVELOPMENT LOCATION

The existing property is described as Lot 16 DP 856265 in the Suburb of Banora Point, County of Rous in the Shire of Tweed. The locality is illustrated in Figure 1.0.

The subject site is bounded by residential lots to the north and rural lots to the east, south and west. The lot ranges in character from vegetation to open grassed areas. The terrain is steep with levels in the site ranging from R.L 80m AHD in the north west corner to R.L 2 m in the south east corner. The site slopes from north to south ranging from 16% - 30% with some isolated sections at 50%. A ridge exists within the access easement at an approximate level of 75m AHD where the easement grades towards Terranora Road to the north at approximately 7% and to the lot to the south as previously described. Figure 2.0 illustrates the existing surface and features.

The lot is zoned 7d Environmental protection (scenic/escarpment) under the Tweed Shire Council Local Environment Plan 2000 and RU2 - Rural Landscape and E2 - Environmental conservation under the Draft Tweed Shire Council Local Environment Plan 2010.



DESCRIPTION OF PROPOSAL

The development is for rezoning of the subject site, conceptually as an 11 lot subdivision of existing Lot 16 DP 856265. The proposed subdivision will provide eight (8) residential allotments of 4000m², one (1) residential allotment of 4600m², and two residual lots; one a communal area and the other for environmental conservation. Access to the lot is proposed from the access handle of Lot 2 DP 528642. The layout of the proposed development is shown in Figure 3.0.

ACCESS ASSESSMENT

Assessment of the proposed access into the development has been undertaken utilising the access handle of Lot 2 DP 528642. This has been negotiated between the proponent of the subject site and the owner of the adjoining property to the east. The conceptual development layout plan includes 221 Terranora Road and demonstrates the proposed access with a Local Access Street in accordance with the Tweed Shire Council Road Works Standards SD.001 can service the subject site.

The proposed access has been assessed based on Tweed Shire Council specifications and Australian Standards for sight distances. The proposed development has direct access off Terranora Road from the access easement. Terranora Road has a designated speed of 60km/h. Tweed Shire Council Development Design Specification D1-Road Design specifies a minimum site distance of 70 metres. Australian Standard 2890.1 Off-Street Car Parking specifies a minimum desirable site distance of 83 metres and a minimum sight stopping distance of 65 metres. Sight distance to the east is approximately 135 metres and to the west approximately 165 metres. The sight distance exceeds Tweed Shire Council's minimum sight distance of 70 metres in both directions and in particular exceeds the desirable sight and minimum stopping distances for Australian Standards. Sight distances are illustrated on sketch plan. N-T0028.00 SK-20100818 Preliminary Access Assessment attached.

Terranora Road is an Arterial Road as defined from the Tweed Shire Councils local traffic counts. Traffic counts were conducted by Tweed Shire Council on Terranora Road at the intersection of Fraser Drive located east of the site on the 12/02/09 and 02/03/06 with 3460 and 3292 vehicles counted per day respectively. The proposed development will increase daily vehicles for the site from 9 to 81 vehicles per day based on Section 3.6.1 of the Guide to Traffic Generating Developments – Roads and Traffic Authority V2.2 (2002). The total development incorporating 221 Terranora Road would increase daily vehicle from 18 to 153 vehicles per day.

Tweed Shire Councils standard drawing S.D.001 indicates that an urban road of 7.5m wide has a traffic design capacity of 3000 vehicles per day. The existing Arterial Road is currently over the design functional capacity and during our conversation with Council's John Zawadzki indicated that there are no future upgrades for Terranora Road. The impact of increased vehicular traffic into the site is small in comparison to the degree of estimated accuracy of the traffic data. Traffic counts at the intersection of Fraser Drive and Terranora Road do not reflect the true nature of vehicular traffic at the sites frontage. The counts are expected to be greater at the intersection of Fraser Drive and Terranora Road as Fraser Drive serves a large number of residential allotments that regularly use the intersection. Council may request a site specific traffic count be undertaken.

Terranora Road has double solid painted lines on the crown to delineate the east – west traffic lanes adjacent to the proposed access. Conversation with Tweed Shire Councils Traffic Engineer John Zawadzki on the 14th August 2009 indicated that the double lines were most likely a case of restricting overtaking and in New South Wales commuters are allowed to cross the double lines to gain access to their driveways. The combined development would warrant a dedicated intersection for access to the site, similar to the intersection layout for The Parapet immediately to the west. The site intersection could be achieved with pavement widening within the Terranora Road road reserve and continuation of the right-turn lane and left-turn lane provision from The Parapet intersection to facilitate access to the site.

WATER DEMANDS & IMPACTS

EXISTING WATER RETICULATION

An existing 150mm diameter water main runs along the northern side of Terranora Road as detailed in Figure 2.0. Consultation with Tweed Shire Council has identified that the reservoir level serving the main is at R.L 165.38m AHD.

PROPOSED WATER RETICULATION

The water service demands for the proposed subdivision will be supplied by connection to the existing facilities in Terranora Road. To provide the development with a water service a 100mm diameter main is proposed to be located within the access easement and new road reserve and looped within the proposed cul-de-sac.

Tweed Shire Councils Design Specification D11 Water Design contains peak daily and instantaneous demands to be used as a guide for assessing the design demands for proposed development works. The demand rates for Peak Instantaneous and Peak Daily are 0.15L/Sec and 4kL/d respectively per Equivalent Tenements (ET). These rates were used to approximate the additional water demand on the 150mm diameter main in Terranora Road as a result of the proposed development. The proposed subdivision will result in the following demands.

Additional demand on 150mm diameter main in Terranora Road

- i) Peak Instantaneous Demand on main.
9 Houses @ 0.15 L/sec = 1.35 L/sec
- ii) Peak Daily Demand on main.
9 Houses @ 4 kL/d = 36 kL/d

The impacts of the minor increase in water demand on the 150mm diameter main would be insignificant due to the limited additional flows required for the development. The proposed watermain would require a pressure reducing valve due to the topography to provide Council compliant mains pressure for the development.

WASTEWATER GENERATION IMPACTS

EXISTING SEWER RETICULATION

An existing gravity 150mm sewer main is located within the frontage of lots on the southern side of The Parapet and Terranora Road. The main crosses Terranora Road in the front of Lot 18 DP 863169. The main flows east from The Parapet into Terranora Road then north where it crosses Terranora Road and flows onto Buncrana Terrace. The 150mm diameter sewer line in Terranora Road services eleven (11) lots before crossing Terranora road and flowing north along Buncrana Terrace.

PROPOSED SEWER RETICULATION

The topography of the site does not allow the proposed development to be serviced by gravity sewer. The proposed lots will be provided with a sewer service comprising of a pressure sewer arrangement as Tweed Shire Council will not accept ownership of pump stations for development less than 50 lots. A preliminary sizing of the pressure sewer main and pumping units is provided from NOV Mono. The recommended arrangement is a 900 litre tank unit, with a shut off head of 80m, requiring a 50mm diameter pressure main. A flush point is proposed at the end of the pressure sewer line for the purpose of maintenance and flushing during the low flows before each lot is established and occupied. The proposed pumping units would sufficiently provide a sewer service for the proposed lots. The manufacturers details are provided as Appendix A.

Each lot will be provided with an individual pumping unit which discharges sewer flows to a pressure main within the new road reserve. The pressure main will discharge to an outlet pit within the access easement. Sewer flows will then flow via gravity sewer within the road reserve before linking into the Council network at the existing manhole located in the frontage of Lot 18 DP863169. The proposed pressure sewer system is detailed in Figure 3.0.

The Sewerage Code of Australia WSA 02 - 2002 by Water Service Association of Australia (WSAA) provides calculations for determination of sewer loads. Tweed Shire Council's Revenue Policy Fees and Charges 2010/2011 specify 3.2 people per ET. Calculations were performed using WSAA methods and Tweed Shire Council data. The proposed nine (9) lots will result in the following average dry weather flows (ADWF), peak dry weather flows (PDWF) and design flows as detailed below.

ADWF (L / S)	0.06
PDWF (L / S)	0.31
DESIGN FLOW (L / S)	0.99

Table 1.0 Proposed development flows

A telephone conversation with Council's Water and Sewer Design Engineer Peter Pennycuik on 21st July 2010 has indicated that the existing 150mm sewer is likely to have sufficient capacity to cater for the proposed development due to the existing topography longitudinal grades along the sewer path. However it was recommended that prior to application for a development consent further assessment of the receiving 150mm main be

conducted to confirm the downstream capacity as the length of 150mm diameter sewer is significant before it discharges into a trunk sewer main.

To reduce impacts on the receiving sewer network and avoid upgrading of the main if required as a result of further assessment of the downstream network, a timed discharge arrangement may be provided with the pumping units set to discharge at off peak times when there is less flow in the receiving network, therefore reducing the impact.

STORMWATER MANAGEMENT

EXISTING DRAINAGE

Drainage patterns in this area are well defined. The proposed allotments fall from north to south away from Terranora Road. A ridge exists within the access easement where the easement grades towards Terranora Road to the north. There is no existing piped drainage system servicing the existing site.

PROPOSED DRAINAGE NETWORK

The proposed drainage network includes kerb and channel, gully inlet pits and piped drainage for the proposed new driveway and internal road. The new road drainage will be outlet to a natural gully on the residual environmental area. Roofwater from the proposed lots that fall to the internal road will have kerb adaptors while lots that fall away from the road will have surcharge / infiltration pits to spread flows onto the residual environmental area. The proposed outlets will be to defined gullies or have suitable level spreaders to preserve the existing drainage patterns.

STORMWATER QUALITY

Development of the site is expected to increase the concentrations of suspended solids, nitrogen and phosphorous in stormwater runoff compared to the existing undeveloped catchment if untreated. Pollutants from residential areas generally comprise of gross pollutants (trash and sediments) biological pollutants (decaying vegetable matter and animal excreta) and nutrients (nitrogen and phosphorus).

The Tweed Shire Council recommends the Stormwater Treatment Objectives presented in Tweed Urban Stormwater Quality Management Plan, Table 5.4. A design storm of 40% of the 1-year ARI can be used for event calculations.

Tweed Shire Council specify deemed to comply stormwater treatment requirements in Tweed Shire Council Design Specification D7 – Stormwater Quality is not required for roof water where it is not mixed with surface runoff. A pollution control device, Gross Pollutant Trap, such as a Humeceptor or equivalent may be suitable for treatment of surface runoff from the site for a 3 month ARI storm event as required by Tweed Shire Council Design Specification D7. For pollutants generated from exposed catchments, the deemed to comply requirements from Design Specification D7 is 11m³ storage volume per impervious hectare for a proprietary treatment device. This consists of 9m³ storage for sediments and 2m³ storage for oil and grease per impervious hectare. The performance of the device would achieve the performance criteria set by Tweed Shire Council, specified in the Tweed Urban Stormwater Quality Management Plan (2000). The required proprietary device

sizing is given in Table 2.0 below based on 4 allotments roof areas (250m² each) and road pavement area of approximately 2100m² (350 metres at 6 metres wide).

Pavement & Roof Area (m²)	Sediment Treatment Volume Requirement (m³)	Oil Storage Requirement (m³)	Suitable Humeceptor Model
3100	2.79	0.62	STC 5

Table 2.0 Proposed Stormwater Treatments

The pollutant levels following treatment by the STC 5 are expected to achieve the recommended targets. The potential adverse impact of the proposed development on water quality will be mitigated by the treatment structure.

CONCLUSIONS

We conclude that the development does not have a significant impact on the existing traffic environment given the small scale subdivision of 9 lots proposed and sight distance in both directions meet Tweed Shire Council and Australian Standards for sight distance. The existing road geometry does not limit site access provision.

The proposed development can be provided with water reticulation. The proposed watermain would require a pressure reducing valve due to the topography to provide Council compliant mains pressure for the development.

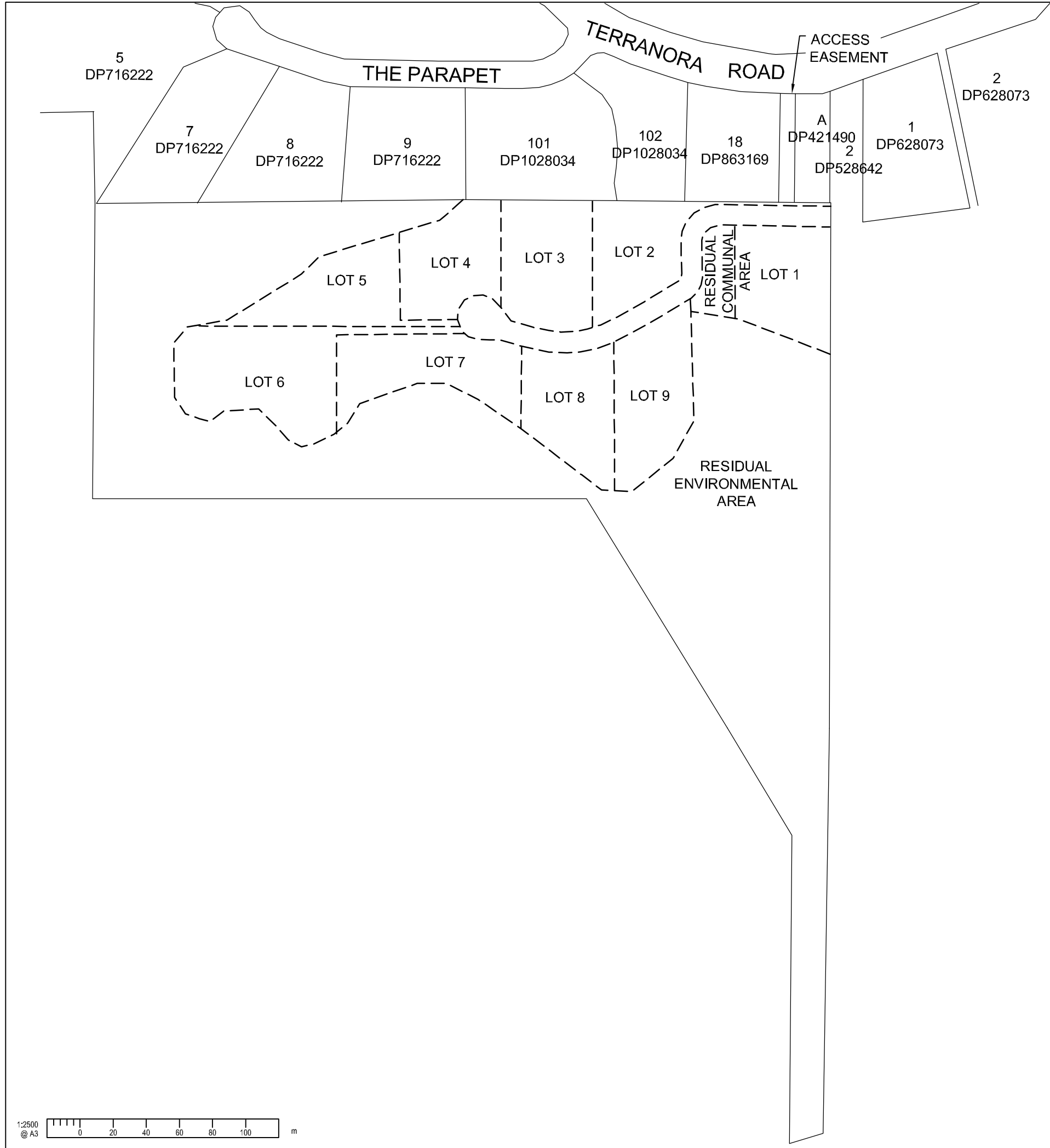
The proposed development can be provided with sewer reticulation via a pressure sewer main. Further investigation of the receiving sewer network may be required as part of a Development Application and a timed discharge pressure sewer provided if necessary.

Stormwater drainage will be outlet to the residual environmental area. The proposed outlets will be to defined gullies or have suitable level spreaders to preserve the existing drainage patterns. The provision of a device such as a Humeceptor would provide the deemed to comply stormwater treatment.

Yours Faithfully



JON LINDSAY
Civil Engineer

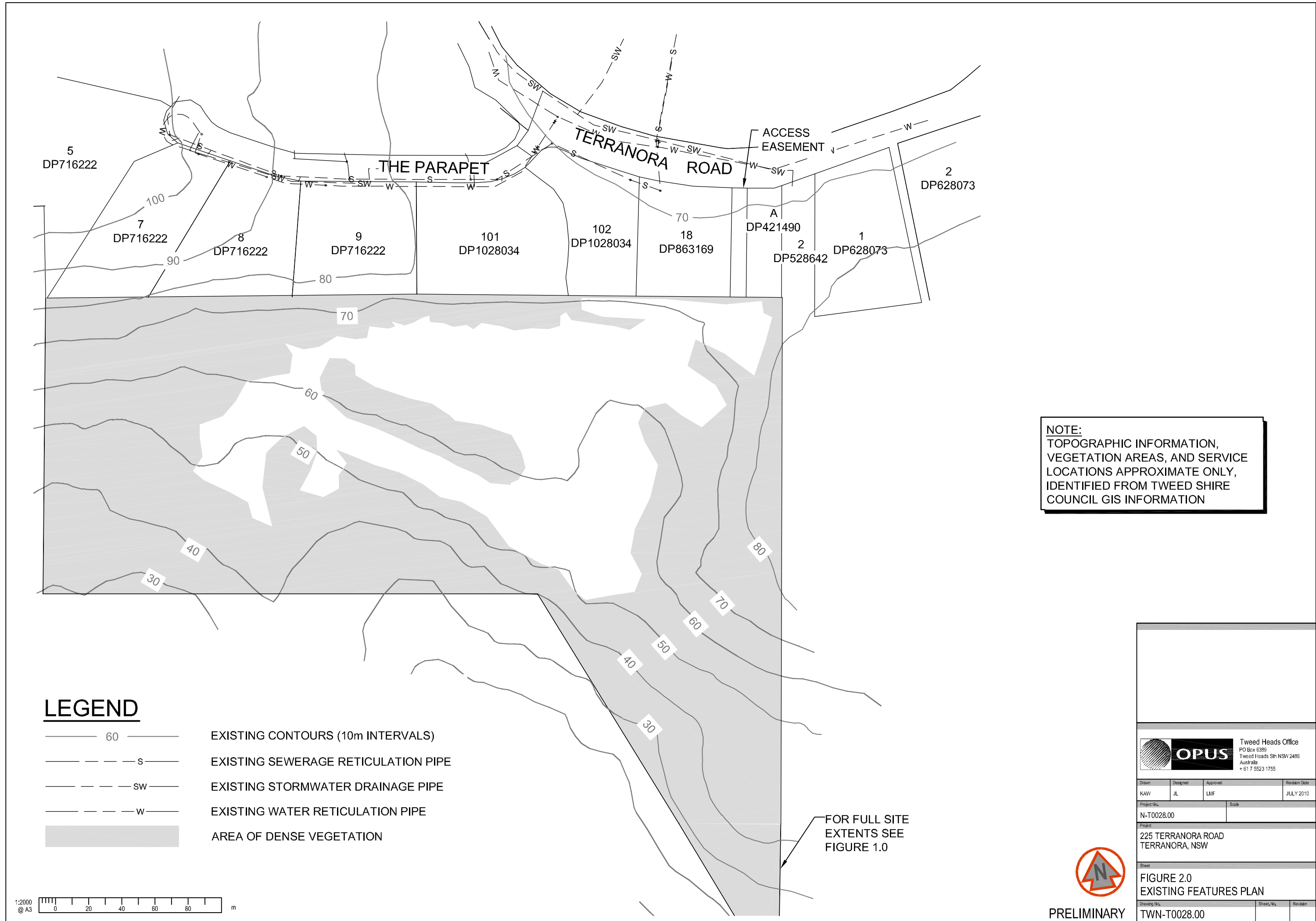


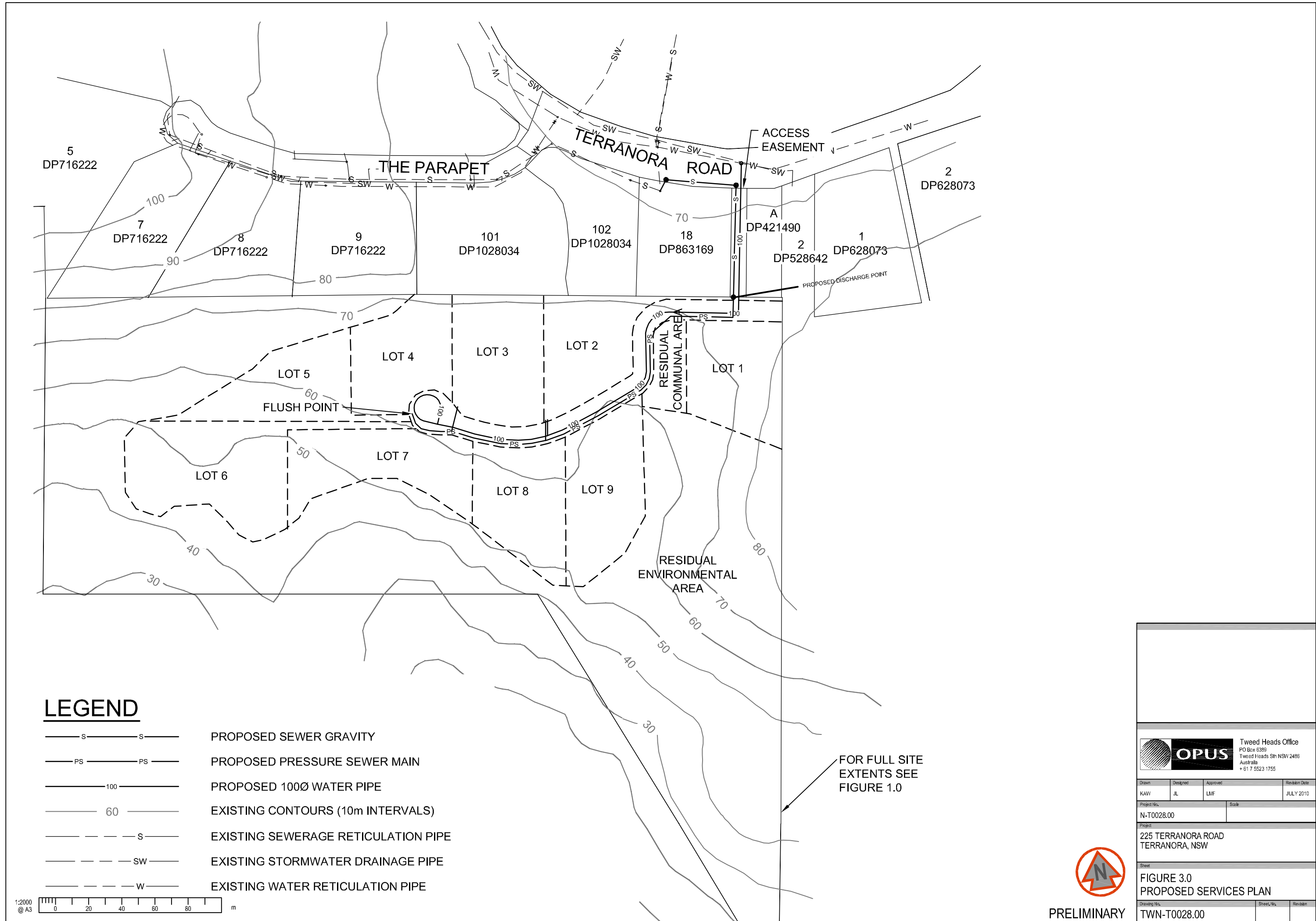
LOCALITY MAP
N.T.S



PRELIMINARY

		Tweed Heads Office PO Box 6386 Tweed Heads Sth NSW 2486 Australia + 61 7 5523 1755	
Drawn	Designed	Approved	Revision Date
KAW	JIL	LMF	JULY 2010
Project No.		Scale	
N-T0028.00		1:2500 @ A3	
Project			
WRENN PTY LTD 225 TERRANORA ROAD, TERRANORA, NSW			
Sheet			
FIGURE 1.0 SITE PLAN AND LOCALITY MAP			
Drawing No.	Sheet No.	Revision	
TWN-T0028.00			







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KAW	JL	LMF	JULY 2010
Project No.		Scale	
N-T0028.00			
Project			
225 TERRANORA ROAD TERRANORA, NSW			
Sheet			
FIGURE 3.0 PROPOSED SERVICES PLAN			
Drawing No.	Sheet No.	Revision	
TWN-T0028.00			



PRELIMINARY

FOR FULL SITE
EXTENTS SEE
FIGURE 1.0



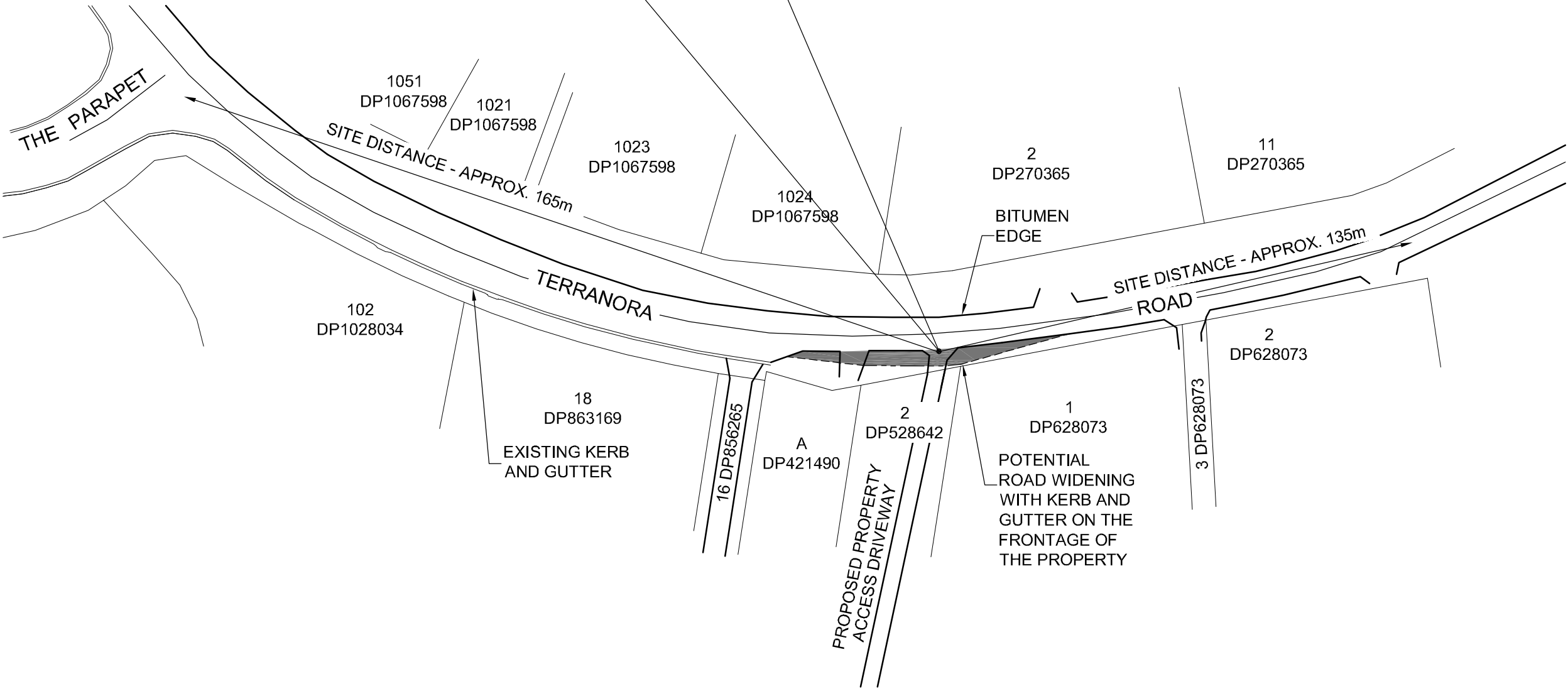
SITE DISTANCE LOOKING WEST (165m)



SITE DISTANCE LOOKING EAST (135m)



LOCALITY PLAN
N.T.S



1:1000
@ A3

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Drawn	Designed	Approved	Revision Date
KAW		LMF	AUG 2010

Project No.	Scale
N-T0028.00	1:1000 @ A3

Project
225 TERRANORA ROAD
TERRANORA, NSW

Sheet
PRELIMINARY ACCESS ASSESSMENT

Drawing No.	Sheet No.	Revision
SK20100909		