

SITE BASED STORMWATER MANAGEMENT & CIVIL ENGINEERING REPORT

PLANS AND DOCUMENTS

referred to in the ULDA

APPROVAL dated 1 / 6 / 12

FOR THE PROPOSED COMMERCIAL TOWER DEVELOPMENT

LOCATED AT 153 CAMPBELL STREET, BOWEN HILLS

PREPARED FOR CENTURIA PROPERTY FUNDS LTD

FEBRUARY 2012

Bornhorst & Ward Project No. 12033

If you have any queries regarding this report please contact: Nicholas Rozis

Revision	Date	Description	Author	Rev.	App.
A	28-02-2012	Draft issue	TM		
B	19-03-2012	Issue for Information	TM	NR	NR

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CONTENTS:**Page No.**

1. INTRODUCTION	1
2. SITE CHARACTERISTICS	1
2.1 LOCATION	1
2.2 EXISTING SITE USE	2
2.3 PROPOSED SITE USE	2
2.4 TOPOGRAPHY AND SITE DRAINAGE	3
3. STORMWATER MANAGEMENT	4
3.1 SITE FLOODING & INUNDATION	4
3.1.1 Flood Sources & Data	4
3.1.2 Flood Freeboard	5
3.1.3 Flood Free Access	5
3.2 EXISTING AND DEVELOPED SCENARIOS	6
4. STORMWATER QUANTITY	6
4.1 PEAK FLOW CALCULATIONS	6
4.2 STORMWATER QUANTITY MITIGATION	7
4.3 EXISTING INFRASTRUCTURE	7
4.4 PROPOSED INFRASTRUCTURE	7
5. STORMWATER QUALITY	8
5.1 SITE CHARACTERISTICS AND IMPACTS	8
5.2 PROPOSED TREATMENT TRAIN	8
5.3 WATER QUALITY MONITORING PROGRAM	9
5.4 EROSION & SEDIMENT CONTROLS	9
5.4.1 Pre-Construction	9
5.4.2 During Construction	10
5.4.3 Post Construction	10
6. EXISTING AND PROPOSED CIVIL WORKS AND INFRASTRUCTURE	10
6.1 EARTHWORKS	10
6.2 SEWERAGE	10
6.3 POTABLE WATER	11
6.4 TELECOMMUNICATIONS	11
6.5 ELECTRICITY	11
6.6 GAS	11
7. SUMMARY	12

LIST OF FIGURES

Figure 1: Google Locality Map – 153 Campbell Street, Bowen Hills (accessed 24/02/2012)	2
Figure 2: NearMap Aerial Image – 153 Campbell Street, Bowen Hills (accessed 24/02/2012)	3
Figure 3: NearMap Aerial Image – Site Flooding [2011-01-14] (accessed 24/02/2012)	4
Figure 4: Stormwater Quality Treatment Measures	8
Figure 5: Proposed Treatment Train	9

LIST OF TABLES

Table 1: Pre & Post Development Run-off Rates	6
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APPENDICES

Appendix A	Architectural Drawings
Appendix B	Bornhorst & Ward Development Drawings
Appendix C	Survey information and Existing Infrastructure Plans
Appendix D	BCC FloodWise Property Report
Appendix E	Hydraulic Calculations
Appendix F	State Planning Policy 4/10 – Healthy Waters Code
Appendix G	Water Quality Treatment Device Maintenance Plans

1. INTRODUCTION

A Commercial tower development has been proposed for the property at 153 Campbell Street, Bowen Hills, as described by Lot 9 on RP137760. The proposed development is shown on the attached Woodhead design plans in Appendix A. The proposal consists of a multi-storey commercial tenancy tower with multiple basement car parking levels, and all associated services and infrastructure.

A previous development application has been approved on the subject site however; the original proposal has been altered and now involves the redevelopment of the existing site swimming pool and tennis court areas only.

The following document reports on the engineering investigation relating to the proposed development and considers the effects that this development may cause on the neighbouring properties and the services and works required for the proposal. The engineering requirements will be in accordance with Brisbane City Council (BCC) Guidelines, State Planning Policy 4/10 – Healthy Waters and the Queensland Urban Drainage Manual (QUDM). This report outlines the preliminary design methodology and calculations in support of a Development Application.

Consultant Team:

Property Owner/Client:	Centuria Property Funds Limited
Architect:	Woodhead
Town Planner:	RPS Group
Civil Engineer:	Bornhorst + Ward Consulting Engineers (B+W)
Surveyor:	Norris Clarke & O'Brien (NCO)

2. SITE CHARACTERISTICS

2.1 LOCATION

The development property (Lot 1 on SP193899) is bound by Bowen Bridge Road to the west, Campbell Street to the south, a residential unit development to the east and another residential unit development and the Enoggera Creek to the north. Vehicle access to the site is via an existing crossover to Campbell Street.

As indicated in Figure 1 the development site is only a portion of Lot 1 on SP193899 (locality discussed above) in the northeast corner of this property. The development site is bound to the east by an existing commercial development on the remainder of the lot, The Enoggera Creek to the north and an existing residential development to the east and south. Refer to Figure 1 below.

Street Address:	153 Campbell Street, Bowen Hills 4006
RP Description:	Lot 1 on SP193899

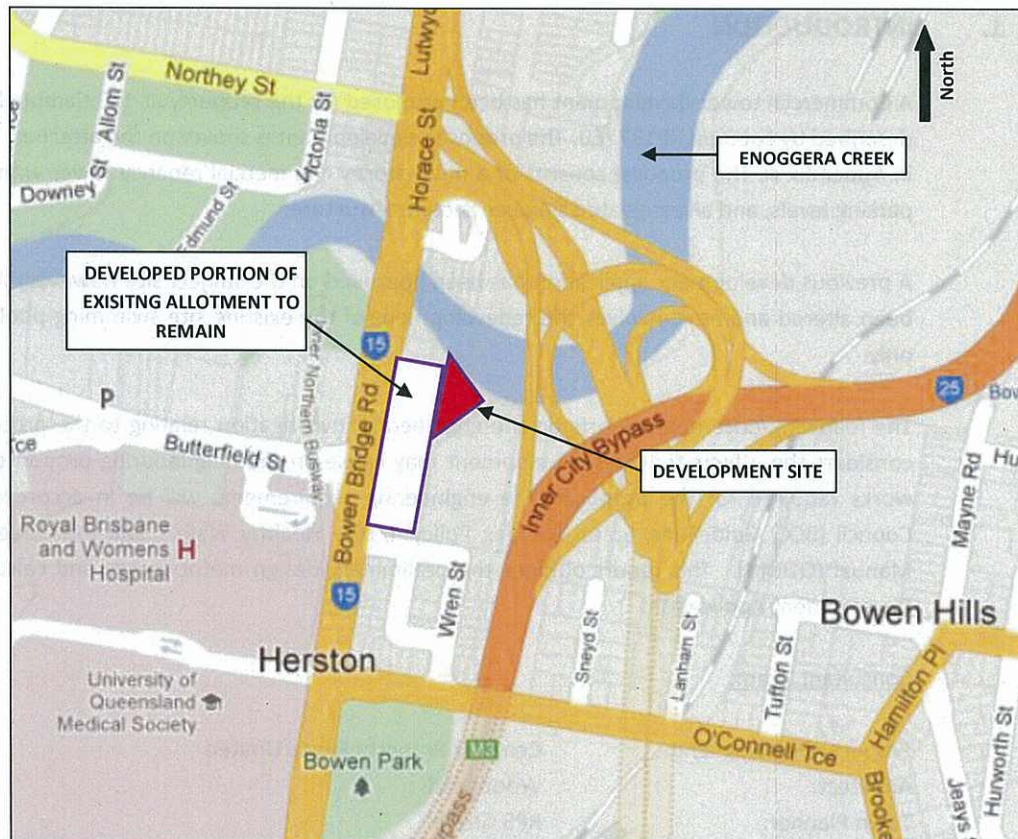


Figure 1: Google Locality Map – 153 Campbell Street, Bowen Hills (accessed 24/02/2012)

2.2 EXISTING SITE USE

The existing property is currently occupied by two multi-storey commercial buildings located in “developed portion of the existing allotment to remain” indicated in Figure 1 above. There is also an existing car parking basement located below these unit buildings which is accessed via a crossover to Campbell Street at the southern end of the site. In the northeast corner of the site there is an existing outdoor pool and tennis court. Refer to Figure 2.

There are several existing easements over the site. There are three existing easements along the river frontage; F on RP861388, B on RP152648 and D on RP207249. There is an easement (A on RP46667) over a 900mm diameter drainage line along the southeast property boundary starting within the neighbouring property to the south terminating at the Enoggera Creek. The final easement runs north from the start of aforementioned easement within the neighbouring property terminating at Enoggera Creek. Refer to the Norris Clarke O'Brien Detailed Survey in Appendix C.

2.3 PROPOSED SITE USE

As discussed previously, the proposed development site is located on the north eastern side of the existing commercial allotment (Lot 1 on SP193899), as shown in Figures 1 and 2. It is proposed to redevelop the site and to construct a new multi-storey commercial office building including parking and associated infrastructure in place of the existing tennis court and pool. Refer to the Woodhead architectural plans in Appendix A for details.

Access to the proposed new structure will be obtained via the existing crossover and basement parking circulation driveway on the "developed portion of existing allotment to remain".



Figure 2: NearMap Aerial Image – 153 Campbell Street, Bowen Hills (accessed 24/02/2012)

2.4 TOPOGRAPHY AND SITE DRAINAGE

The development site has an area of approximately 2400m² and ranges in level from RL2.15m AHD at the northern corner of the site (river) to RL2.81m AHD in the landscaped areas around the pool. The site is generally flat with levels averaging at RL2.40m AHD (including adjoining, existing basement levels). There is an existing shotcrete (sprayed concrete) wall along the Enoggera Creek boundary of the development site. The wall has an approximate height of 2.5m and is sloped at approximately 1 in 1.

Runoff from the development site currently drains north discharging directly into Enoggera Creek via overland flow and the existing piped drainage network. Runoff from the remainder of Lot 1 on SP193899 and an external catchment to Bowen Bridge Road also discharges to Enoggera Creek via piped drainage through the development site and remainder of the existing onsite development. Refer to the BCC eBiMap Drainage Plan in Appendix C.

3. STORMWATER MANAGEMENT

Under the Brisbane City Council Land Use Development Guidelines, several design elements were identified in relation to stormwater management issues. Brisbane City Council must be satisfied that:

- The proposed development can be drained;
- The stormwater management system can follow the features and functions of the natural drainage system;
- The volume, timing velocity and pollutant load of stormwater has no adverse effect on any surrounding properties or receiving waters; and
- Suitable provision is made in the design layout to accommodate for major drainage.

All stormwater discharge must comply with Brisbane City Council's Stormwater Management Code. The State Planning Policy 4/10 – Healthy Waters, requires the Environmental values of neighbouring waterways to be protected and the impacts of the development be demonstrated. This includes the control of water quality, flow velocities and flow volumes discharging from the site.

3.1 SITE FLOODING & INUNDATION

Due to the proximity of the development site to Enoggera Creek and reported flooding in the area a review of flood requirements has been undertaken. Aerial photography obtained by NearMap online mapping during the January 2011 flooding shows that the local area was inundated during the peak with silt deposits across the tennis court and pool. Refer to Figure 3 below.

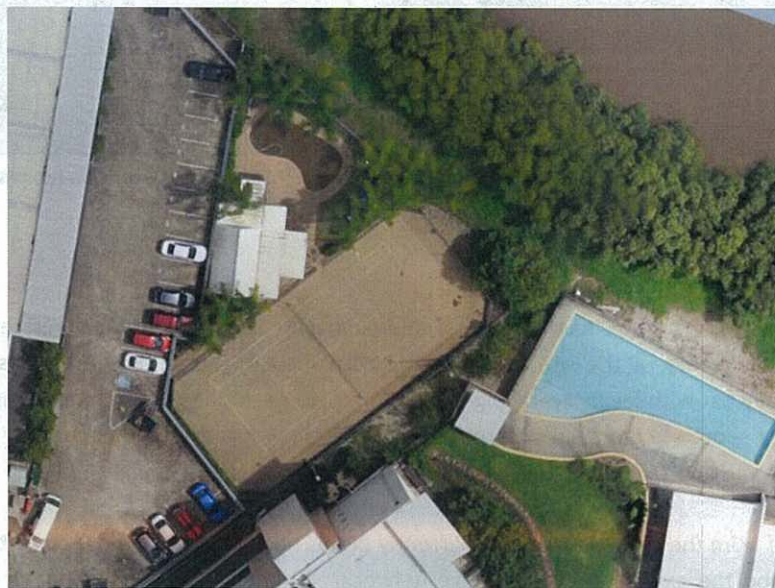


Figure 3: NearMap Aerial Image – Site Flooding [2011-01-14] (accessed 24/02/2012)

3.1.1 Flood Sources & Data

A BCC FloodWise Property Report has been obtained from council; refer to report in Appendix D. The flood report indicates that the development site is subject to minor (up to 50 year ARI) flooding from storm tide and major (100 year ARI) flooding from the adjacent Enoggera Creek. The extract below summarises the flood levels.

Estimated Peak Flooding Levels

ARI (Years)	% chance	Level (AHD)	Source
5	20%	1.9 m	STORM TIDE
20	5%	2.1 m	STORM TIDE
50	2%	2.2 m	STORM TIDE
100	1%	4.4 m	CREEK/WATERWAY
January 2011		2.7 m	RIVER

These levels support the NearMap aerial photography from January 2011 and the BCC eBiMap flood mapping. Refer to the BCC eBiMap Flood Map in Appendix D.

3.1.2 Flood Freeboard

The Defined flood Level (DFL) for the development site according to the BCC FloodWise Property Report is set at RL4.4m AHD which is the 100 year recurrence interval event for Enoggera Creek. This flood level has been used to set the finished floor levels for the proposed development in accordance with Brisbane City Council's Subdivision and Development Guidelines, Chapter 1 – Flood affected land.

Table A1.3 from the reference material was used to determine the 'Building Code of Australia – Building Classification' for the habitable areas of the structure. All habitable areas are class A and the car parking (basement) area is Class C. Table A1.2 was then used to determine the appropriate freeboard requirements for habitable and non habitable areas as 0.5m and 0.0m respectively. Minimum finished floor levels are outlined below:

Commercial space	Minimum FFL = 4.4m + 0.0m	= RL4.4m AHD
Non-habitable space	Minimum FFL = 4.4m + 0.0m	= RL4.4m AHD

A minimum finished floor level of 4.4 is therefore to be provided to all areas of the proposed building. The lowest basement level is to have a finished floor level of -3.40m AHD. To provide freeboard to this floor the basement entrance will be located at RL4.4m AHD to ensure that flood waters cannot enter the proposed basement in any flood event up to a 100 year ARI. The basement walls are to be designed to be water-proof as required. The proposed basement entrance arrangement is shown on the Woodhead Architectural Plans in Appendix A.

3.1.3 Flood Free Access

As discussed previously the proposed development is to be accessed via the existing basement driveway for Lot 1 on SP193899 which services the existing commercial premises. The access crossover is Campbell Street located adjacent to the Campbell Street and Walden Lane intersection. During major flood events this intersection is inundated and no longer trafficable preventing vehicle access to the proposed structure.

As indicated on the BCC eBiMap Flood Map in Appendix D, this situation is not uncommon in the surrounding area with a large number of sites inaccessible during major flooding (including the hospital). It is assumed on

this basis that the proposed development is acceptable given that flood immunity has been provided without flood free access.

3.2 EXISTING AND DEVELOPED SCENARIOS

Currently the development site discharges stormwater unmitigated via existing below ground drainage and overland flow directly into Enoggera Creek.

It is intended to maintain this drainage methodology with the addition of stormwater quality measures in the developed phase. Roofwater will discharge to a rainwater tank for onsite potable reuse and runoff from external paved areas will be captured in field inlets fitted with gross pollutant traps (GPTs).

4. STORMWATER QUANTITY

4.1 PEAK FLOW CALCULATIONS

The Rational Method as outlined in the Queensland Urban Drainage Manual was used to determine the peak flow rate corresponding to the minor and major storm events for this development. Brisbane City Council Subdivision and Development Guidelines were used to identify the design storm events for this development as:

Minor (piped flow)	- 1 in 10 year ARI (new use centre, including commercial)
Major (overland flow)	- 1 in 100 year ARI

The modelling of stormwater runoff quantity was considered for the existing and fully developed phases of the development. The following table is a summary of the stormwater discharge from the site for both scenarios. Detailed calculations can be reviewed in Appendix D.

Table 1: Pre & Post Development Run-off Rates

	Parameter	Existing Site	Developed Site	Difference
Catchment Details	Area (Ha)	0.243	0.243	0.000
	Fraction Impervious (fi)	85%	90%	+ 5%
	Coefficient of Runoff (C_{10})	0.87	0.88	+ 0.01
	Time of Concentration (min)	5.0	5.0	0.0
	2 year Rainfall Intensity (mm/hr)	148.9	148.9	-
	10 year Rainfall Intensity (mm/hr)	215	215	-
	100 year Rainfall Intensity (mm/hr)	327	327	-
Discharge	1 in 2 year ARI (m^3/s)	0.074	0.075	+ 0.001
	1 in 10 year ARI (m^3/s)	0.126	0.128	+ 0.002
	1 in 100 year ARI (m^3/s)	0.220	0.220	0.000

The fraction impervious value for the existing site was calculated at 85% based on a review of aerial photography and site survey information obtained. The developed site fraction impervious was calculated at 90% based on the proposed architectural site layout plan.

In order to find the coefficients of runoff for the existing conditions and the proposed development, the 60 minute, 10 year ARI rainfall intensity is required. From Table B2.3 Rainfall Intensity for Brisbane, of the Brisbane City Council Subdivision and Development Guidelines, this was found to be 70mm/hr. In accordance with the Queensland Urban Drainage Manual, the coefficients of runoff for the existing and developed conditions were found to be 0.87 and 0.88, respectively.

The time of concentration for both existing and developed conditions was evaluated at the common discharge of the site; the Enoggera Creek. Due to the developed nature and high fraction impervious of both the existing and developed site, the time of concentration has been taken as five minutes for both cases.

4.2 STOMRWATER QUANTITY MITIGATION

As indicated in Table 1, the proposed development will result in a minor increase of 1 to 2L/s from the existing to developed site runoff rates during minor storms (1 in 2-10 year ARI). This increase is considered negligible and given the site location adjacent to Enoggera Creek (at its downstream end) it is proposed to discharge runoff from the development site without detention as these flows will not impact upon the Enoggera Creek catchment peak flow. It should also be noted that the site is within a flood zone, as discussed in Section 3.1, so on/below-ground detention storage will not be operational during major rainfall events.

4.3 EXISTING INFRASTRUCTURE

BCC eBiMap drainage plans have been obtained which indicate that there is significant existing drainage infrastructure within the development site and in the surrounding road reserves. Refer to the BCC eBiMap drainage Plans and NCO Detailed Survey in Appendix C for details. The significant drainage lines through the site include;

- a 1200mm and a 900mm diameter line which drain northeast through the site beneath the existing northern building onsite; and
- a 600mm diameter line which drains northeast through the site passing below the existing pool and tennis court area (proposed building location).

These lines are all constructed below the existing basement level discharging directly to Enoggera Creek using the existing shotcrete wall as a headwall.

There is also an external drainage network in Bowen Bridge Road which captures runoff via gully pits and property connections. This drainage network discharges via a 900mm diameter line in a northeast direction through Lot 1 on SP193899 adjacent to the proposed development boundary.

4.4 PROPOSED INFRASTRUCTURE

There are multiple existing drainage pits/inlets across the proposed development site. The existing pits which fall within the building footprint are to be removed as part of the demolition works. Where pits have drainage lines leaving the building works area, these drainage lines are to be removed from the building area and capped at the site boundary.

There is an existing 600mm diameter drainage line from the existing developed portion of the subject property which drains through the proposed works area. This is a private drainage line. Existing levels of this drainage line locate it within the proposed building basement; therefore it is to be redirected around the structure. Refer to the Proposed Drainage Plan (SK-C030) in Appendix B.

To connect existing drainage lines to the redirected drainage, line Junction pits will be required at locations where these lines enter the proposed new building site. A new outlet to Enoggera Creek is to be constructed from the development site for the proposed new line. Refer to the Proposed Drainage Plan (SK-C030) in Appendix B.

A preliminary site stormwater quality treatment plan has been prepared; refer to Section 5.2 for the proposed treatment train. Roofwater runoff from the site is to be captured in rainwater tanks for onsite reuse to supplement potable supply. Runoff from paved areas is to be captured onsite in field inlets with all runoff passing through gross pollutant traps (GPTs) with hydrocarbon removal capabilities. For additional details of design and sizing of stormwater quality infrastructure refer to the following section of the report.

5. STORMWATER QUALITY

All references to quality designs and requirements have been made to Queensland Water Quality Guidelines, Department of Environment and Resource Management's Healthy Waters Guidelines – State Planning Policy 4/10 and the 'Water By Design' Stormwater Quality Guidelines. The State Planning Policy 4/10 Health Waters Planning Code has been completed and is included in Appendix F.

5.1 SITE CHARACTERISTICS AND IMPACTS

The proposed development is such that the majority of the site is covered by roof area, with a 6.0m wide landscaped strip along the Creek frontage. It is hence expected that the generation of pollutants will be low. It is proposed to target gross pollutants as these will be the most prominent pollutants on this site. Best management practices will be applied to mitigate the pollutant discharge from the site.

Under Section 2.7 of the State Planning Policy 4/10 Healthy Waters, the policy is not applicable to the proposed development as the site area is less than 2500m². It is proposed to provide stormwater quality treatment for the proposed development through 'Stormwater Quality Best Management Practices' (SQBMPs) as outlined in section 4.12 & 4.13 of the State Planning Policy 4/10 Guideline.

5.2 PROPOSED TREATMENT TRAIN

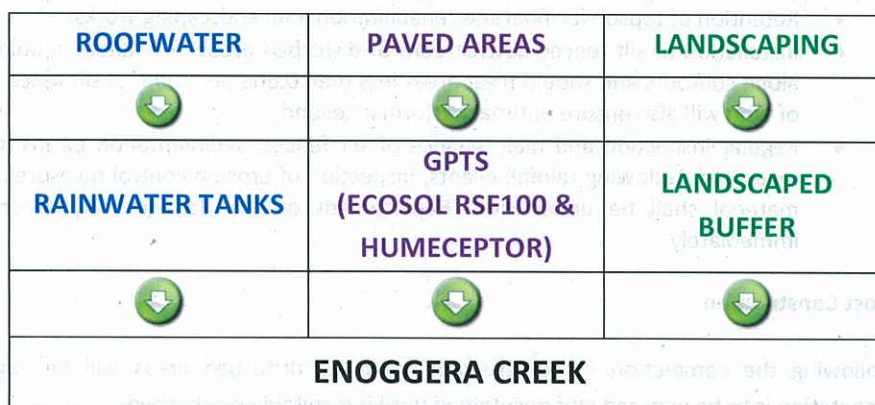
Based on the expected range of pollutants a number of SQBMPs are to be included in the site drainage system, with information on available SQBMPs primarily sourced from Healthy Waters Guidelines. Each has been reviewed for its suitability for this location. For this particular development the following treatment options are to be incorporated into the stormwater quality treatment train:

Figure 4: Stormwater Quality Treatment Measures

SQBMP Description	Discussion
Rainwater Tanks	Rainwater tanks capture roofwater for onsite reuse to supplement potable water consumption.

Gross Pollutant Traps (Litter baskets and stormwater filters)	A GPT is a treatment device designed to capture coarse sediment, trash, vegetation matter and free oil and grease. GPTs also help to remove pollutants such as nitrogen and phosphorus, which attach themselves to the larger coarse sediment particles. It is proposed to use an Ecosol Humeceptor or an equivalent product for this purpose.
Humceptor & Ecosol RSF100	Litter baskets are an at source treatment device placed to remove gross pollutants. These devices highly effective at gross pollutant removal with some limited sediment removal. It is proposed to use Ecosol RSF100 or an equivalent product for this purpose.

Figure 5: Proposed Treatment Train



Based on the expected developed site discharge pollutants and the development drainage works we believe the at the proposed stormwater quality treatment train will yield acceptable post development pollutant discharges. Maintenance details of the proposed Humeceptor GPT are included in Appendix G for reference.

5.3 WATER QUALITY MONITORING PROGRAM

As this development does not discharge to particularly sensitive waterways or propose to use untried/uncertain stormwater quality best management practices, no proposal for water quality monitoring has been made. The measures proposed for water quality treatment are reasonably well understood and demonstrated in Brisbane. Hence it is anticipated that they are acceptable.

5.4 EROSION & SEDIMENT CONTROLS

A comprehensive Erosion and Sediment Control Plan including a construction process will be prepared for this development during the detailed design phase. The ESCP designs will be in accordance with the Institution of Engineers reference material and Brisbane City Council's Guidelines.

5.4.1 Pre-Construction

Before construction activities begin, the following measures need to be implemented to ensure minimal disturbance and adverse water quality impacts. These measures may be adopted in a staged approach, and may be implemented prior to the commencement of construction.

- Sediment fences will be constructed on the upstream edges of the designated buffer areas and at the base of fill embankments.
- Designation of areas for plant and construction material storage. These areas should be somewhat removed from waterways and run-off from these areas will be directed to a holding pond in case of spillage.
- Provision of a shakedown grid at the entry / exit to the construction zone.
- Education of site personnel to the sediment and erosion control measures implemented on site.

5.4.2 During Construction

Measures to mitigate water quality impacts during construction will include:

- Construction activities confined within the necessary disturbance area(s);
- Retention of topsoil for final site rehabilitation and landscaping works;
- Installation of silt fences downstream of disturbed areas. Silt fences should be located continuously along contours and should treat areas less than 0.6ha per 100m of silt fence. A maximum slope length of 60m will also ensure optimal performance; and
- Regular inspection and maintenance of silt fences, sedimentation basins and other erosion control measures. Following rainfall events, inspection of erosion control measures and removal of collected material shall be undertaken. Replacement of any damaged equipment should be performed immediately.

5.4.3 Post Construction

Following the completion of construction works all disturbed areas will be vegetated and landscaped. Vegetation is to be watered and maintained until it is suitably established.

6. EXISTING AND PROPOSED CIVIL WORKS AND INFRASTRUCTURE

6.1 EARTHWORKS

Based on the finished floor level (FFL) of the proposed structure approximately 5-6 metres of excavation will be required to construct the carpark basement. No significant filling is proposed as part of the development, therefore the bulk of excavated material is to be removed from the site. Minor excavation and filling will also be required to construct services as part of the development and to landscaping areas. All earthworks will be undertaken in accordance with BCCs Subdivision and Development Guidelines.

6.2 SEWERAGE

There is an existing 150mm diameter sewer main running south along Bowen Bridge road which services the existing development on Lot 1 on SP193899. This line drains into a 300mm diameter line which continues south joining with a 300mm and a 375mm diameter sewer line at the Campbell Street and Bowen Bridge Road intersection. The sewer reticulation then continues east along Campbell Street via a 450mm diameter sewer. Refer to the BCC eBiMap Sewer and Water Plan in Appendix C.

It is proposed to service the development by extending the internal plumbing system from the existing onsite buildings to provide a shared service connection. The design of this internal system will be undertaken by the hydraulic consultant in accordance with the relevant Australian Standards.

The final connection arrangement will be discussed with QUU to ensure the existing infrastructure servicing the site has sufficient capacity to cater for the proposal.

6.3 POTABLE WATER

There is an existing QUU 225/150mm diameter water service along the full frontage of Lot 1 on SP193899. Refer to the BCC eBiMap Sewer and Water Plan in Appendix C. This main services the existing development on Lot 1 on SP193899.

It is proposed to service the new structure by extending the internal plumbing system from the existing onsite buildings to provide a shared service connection. The design of this internal system will be undertaken by the hydraulic engineering consultant in accordance with the relevant Australian Standards.

Given the built up nature of the area, specifically the development site it is anticipated that the existing infrastructure has sufficient capacity to cater for the proposed development. The final connection arrangement will be discussed with QUU to ensure the existing infrastructure servicing the site has sufficient capacity to cater for the proposal.

6.4 TELECOMMUNICATIONS

Telstra and Optus operate extensive telecommunications infrastructure in the vicinity of the development site. Refer to the 'Dial Before You Dig' Plans in Appendix C. The development site currently shares a connection with the remainder of Lot 1 on SP193899. The final connection will require confirmation and approval from the chosen service provider.

6.5 ELECTRICITY

Energex operates extensive electrical infrastructure in the vicinity of the development site. Refer to the Energex 'Dial Before You Dig' Plan in Appendix C. The development site currently shares a connection with the remainder of Lot 1 on SP193899. The final connection will require confirmation and approval from Energex.

6.6 GAS

Energex operates extensive electrical infrastructure in the vicinity of the development site. Refer to the APA Gas 'Dial Before You Dig' Plan in Appendix C. Any connection to this infrastructure will require confirmation and approval from APA Gas.

7. SUMMARY

The investigations and reporting relating to the proposed commercial tower development at 153 Campbell Street, Bowen Hills, as described by Lot 1 on SP193899, have shown the following:

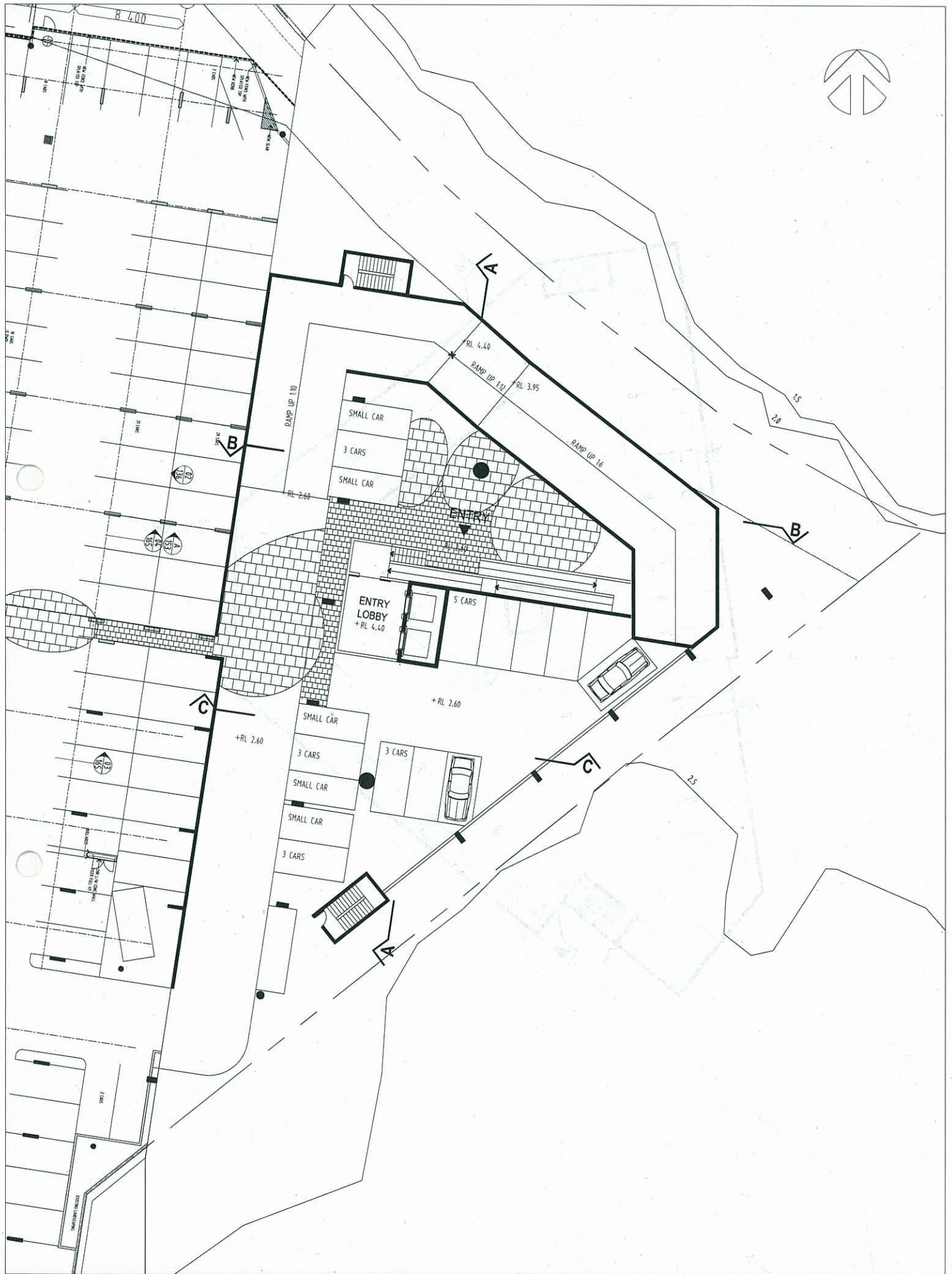
- A Brisbane City Council FloodWise Property Report was obtained for the development site which indicates that the development site is inundated to RL4.4m AHD during a major storm event due to flooding from Enoggera Creek.
- Minimum freeboard requirements to finished floor levels (FFL) for the development have been set based on this defined flood level (DFL) and BCC Subdivision and Development Guidelines. The minimum freeboard levels are as follows:
 - habitable area (category A) = 4.9m AHD
 - non-habitable area (category C) = 4.4m AHD
- Flood free access to the structure is not achievable during major flooding as the surrounding road reserves are inundated. This is believed to be acceptable as this is the case for all surrounding properties in the area.
- An existing drainage line through the proposed building zone is to be redirected through the existing carpark area to Enoggera Creek which is the existing point of discharge. All site drainage from the development is to be discharged to Enoggera Creek via the existing shotcrete wall as per the current drainage scenario.
- The State Planning Policy 4/10 – Healthy Waters, does not apply to this development as the works area is less than 2500m². Stormwater Quality Best Management Practices are to be adopted including rainwater reuse tank and gross pollutant traps.
- Sewer and potable water connections for the proposed development are to be extended through the existing onsite development as a shared connection arrangement. These works are to be designed by the hydraulic engineer.
- There is existing electricity, communications and gas infrastructure in the vicinity of the site to service the proposed development.

It has been shown that the proposed development can be constructed and serviced in accordance with the Brisbane City Council Subdivision and Development Guidelines and the Stormwater Management Plan has demonstrated that adequate treatment of stormwater quantity and quality is possible under the proposed plan.

APPENDIX A

ARCHITECTURAL DRAWINGS







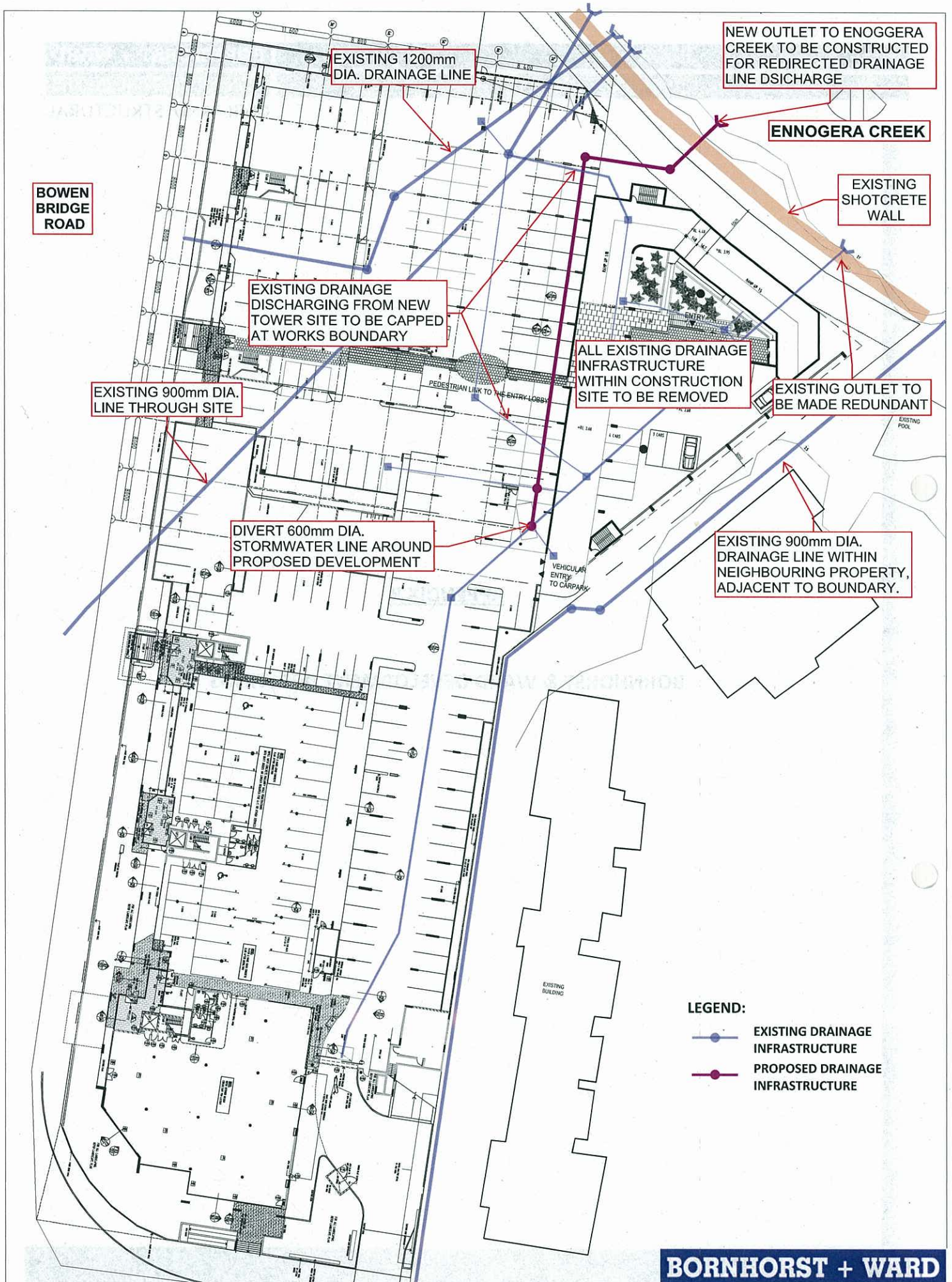
BORNHORST + WARD

CONSULTING ENGINEERS

CIVIL AND STRUCTURAL

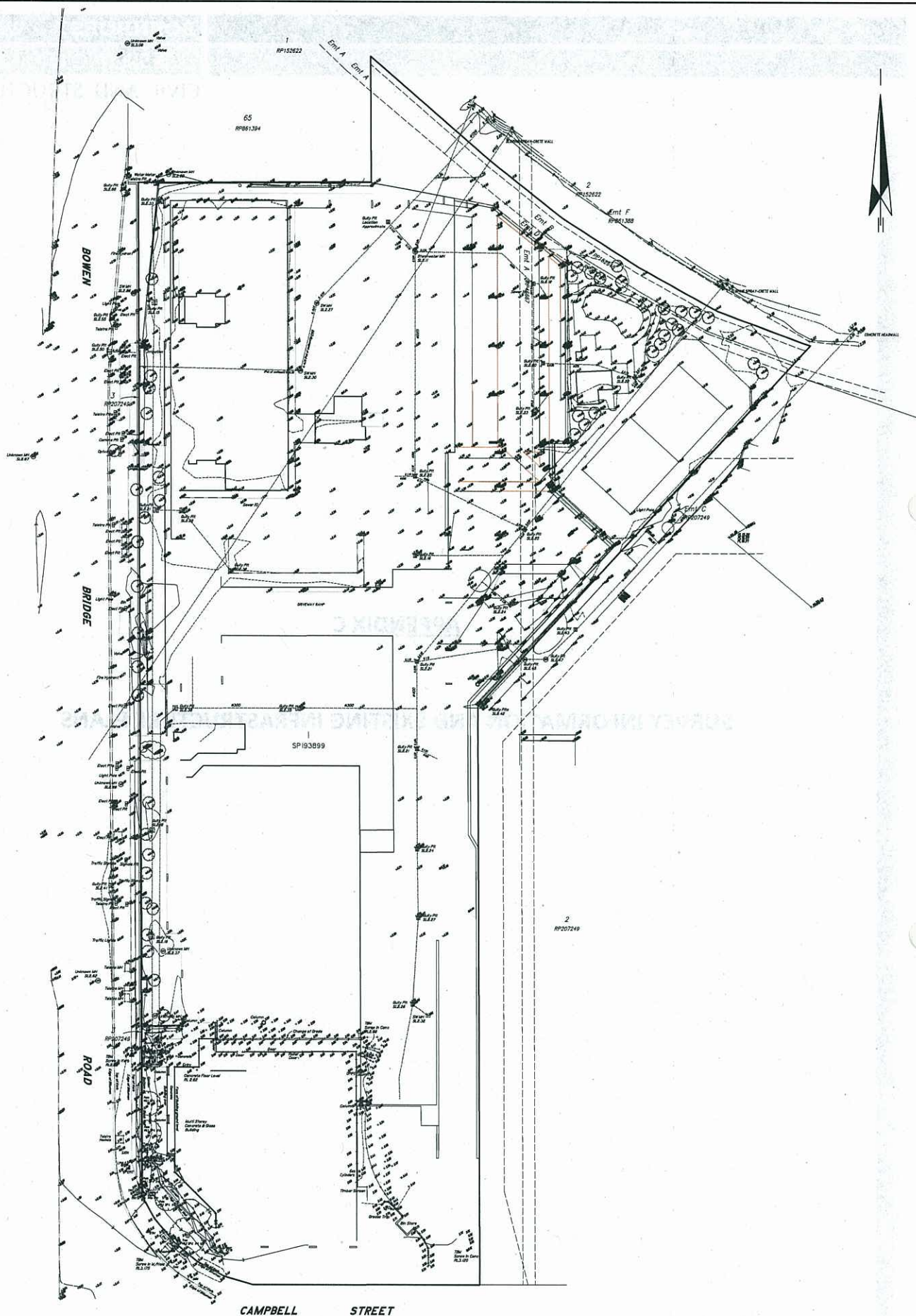
APPENDIX B

BORNHORST & WARD DEVELOPMENT DRAWINGS



APPENDIX C

SURVEY INFORMATION AND EXISTING INFRASTRUCTURE PLANS



Datum for Levels AHD
 Levelled from PSM No.133854.....RL3.805m AHD

ALL SERVICES ARE BY RECORDS ONLY.

- - - - - A/G POWER
 - - - - - U/G POWER
 - - - - - U/G TELSTRA
 - - - - - U/G GAS
 - - - - - U/G SEWERAGE
 - - - - - U/G WATERMAIN
 - - - - - U/G STORMWATER

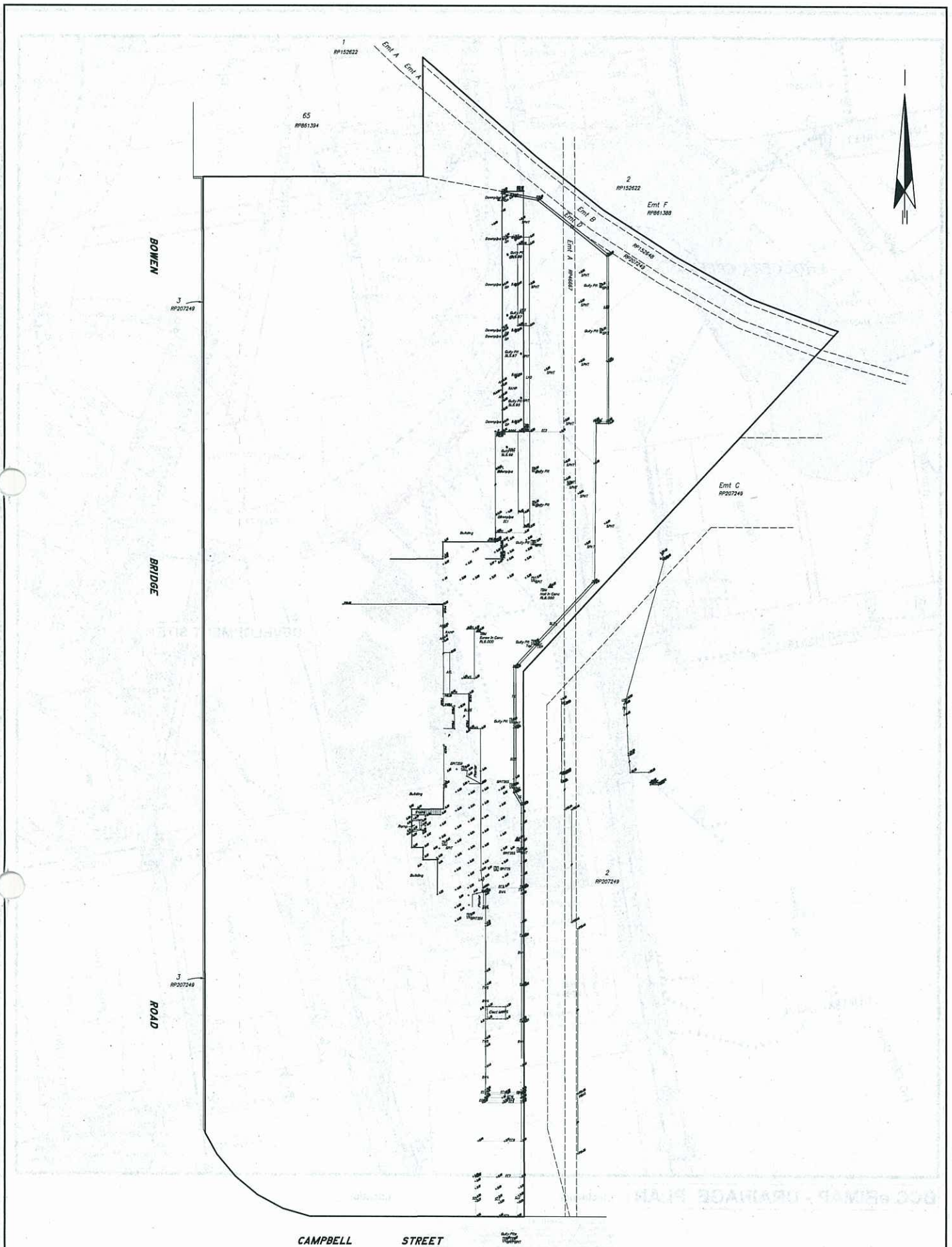
ISSUE	DESCRIPTION	DATE	SIGNED
A	ORIGINAL ISSUE	01/03/12	

NOTE:
 This plan has been prepared from a combination of field survey and existing records for the purpose of defining the boundaries of the lot and should not be used for any other purpose. The lot boundaries shown here were not marked by the author at the time of survey and have been determined by plan dimensions only and are not to be relied upon. Services shown here have been located where possible by field survey. If not able to be located or shown, services have been plotted from the records of relevant authorities where available and have been noted accordingly on this plan. Where such records either do not exist or are considered inadequate, a notation has been made hereon. Prior to any construction, excavation or other work on the site, the relevant authority should be contacted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

DETAIL SURVEY
 LAND at BOWEN BRIDGE ROAD
 BOWEN HILLS
 LOT 1 on SP193899
 Parish of North Brisbane
 County of Stanley

Norris Clarke & O'Brien Pty Ltd
 Licensed Surveyors
 Town Planners
 Development Consultants
 Level 1, 107 Quay Street
 Brisbane QLD 4000
 ph: 3221 9640 fax: 3221 3391
 email: info@ncob.com.au
 ACN 055 870 770 ABN 15 055 870 770
 COMP FILE: 653301-A.DWG
 Date 01/03/2012 Ref: 653302-GND

SERVICES BY RECORDS
 Norris Clarke & O'Brien take no responsibility for the location of any non-visible services. All services are shown by records only where records are available. A service location survey should be performed prior to earthworks.



Datum for Levels AHD
 Levelled from PSM No.133854.....RL3.805m AHD

ALL SERVICES ARE BY RECORDS ONLY.

1	1	A/G POWER
1	1	U/G POWER
1	1	U/G TELSTRA
1	1	U/G GAS
1	1	U/G SEWERAGE
1	1	U/G WATERMAIN
1	1	U/G STORMWATER

ISSUE	DESCRIPTION	DATE	SIGNED
A	ORIGINAL ISSUE	01/03/12	

NOTE:
 This plan has been prepared from a combination of field survey and existing records for the purpose of depicting new constructions on the land and should not be used for any other purpose. The title boundaries shown herein were not marked by the surveyor at the time of survey and have been determined by other means and are not to be relied upon. Services shown herein have been located where possible by field survey. It is not to be relied upon for any other purpose. Where such records either do not exist or are considered inadequate, a notation has been made herein. Prior to any demolition, excavation or construction on the site, the relevant authority should be consulted for possible location of further underground services and detailed locations of all services. This note is an integral part of this plan.

DETAIL SURVEY

Description
LAND at BOWEN BRIDGE ROAD
BOWEN HILLS
LOT 1 on SP193899
Parish of North Brisbane
County of Stanley

Scale in Metres
1:300 at A1

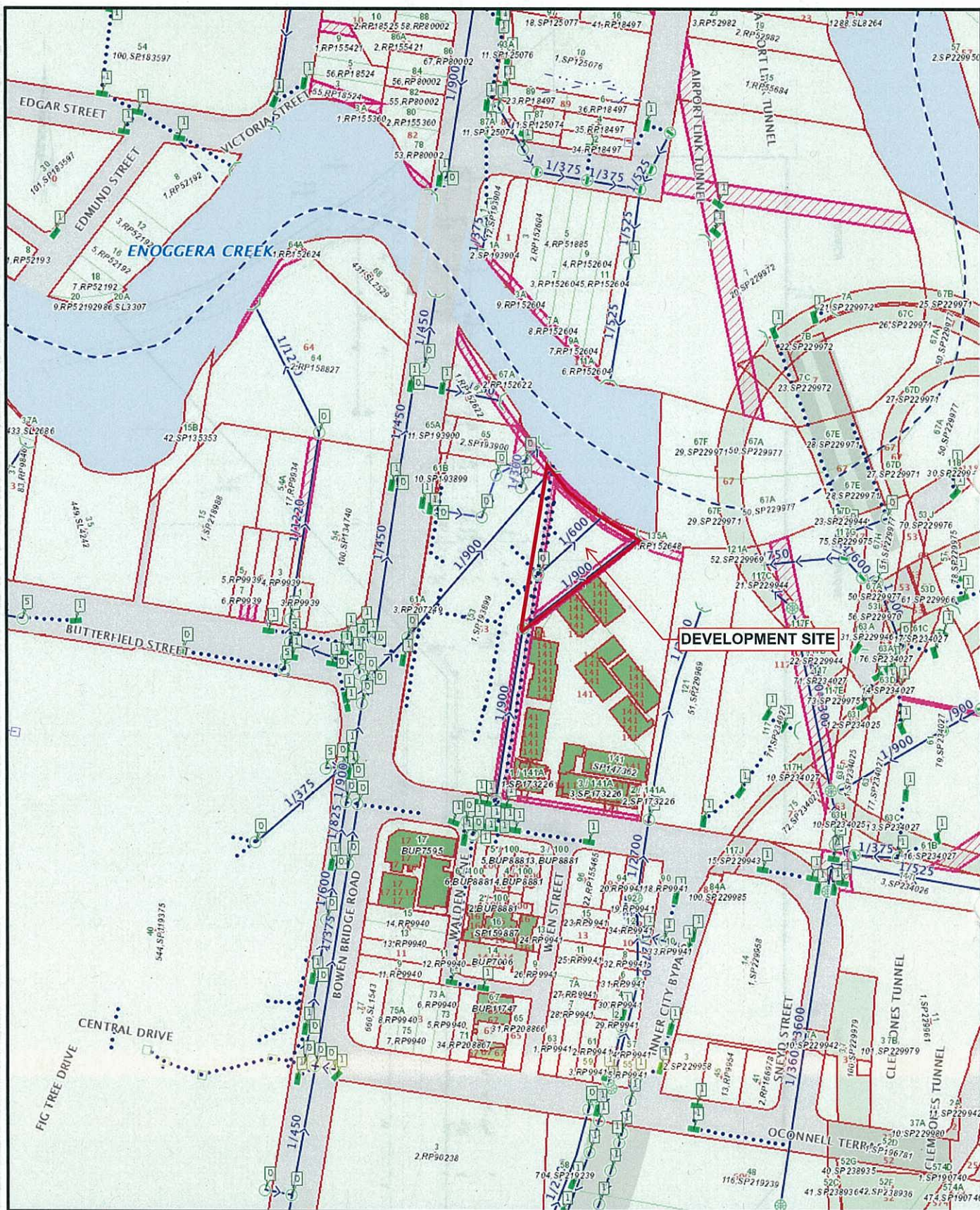
Norris Clarke & O'Brien Pty Ltd
 Licensed Surveyors
 Town Planners
 Development Consultants

NCD

Level 1 - 107 Quay Street
 Brisbane QLD 4000
 ph: 3221 9640 fax: 3221 3391
 e-mail: info@ncd.com.au
 ACN 056 870 770 ABN 15 056 870 770

COMPTON 653301-A.DWG
 Date 01/03/2012 Rev 653302-GND

SERVICES BY RECORDS
 Norris Clarke & O'Brien take no responsibility for the location of any non-visible services. All services are shown by records only where records are available. A service location survey should be performed prior to earthworks.



BCC eBIMAP - DRAINAGE PLAN

Disclaimer :

Location :

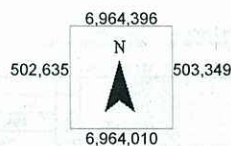
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Caution: This map may contain the locations of abandoned underground asbestos pipes. Council gives no warranty to the completeness or accuracy of these records. Appropriate care needs to be taken in all cases.

Scale = 1:2,000

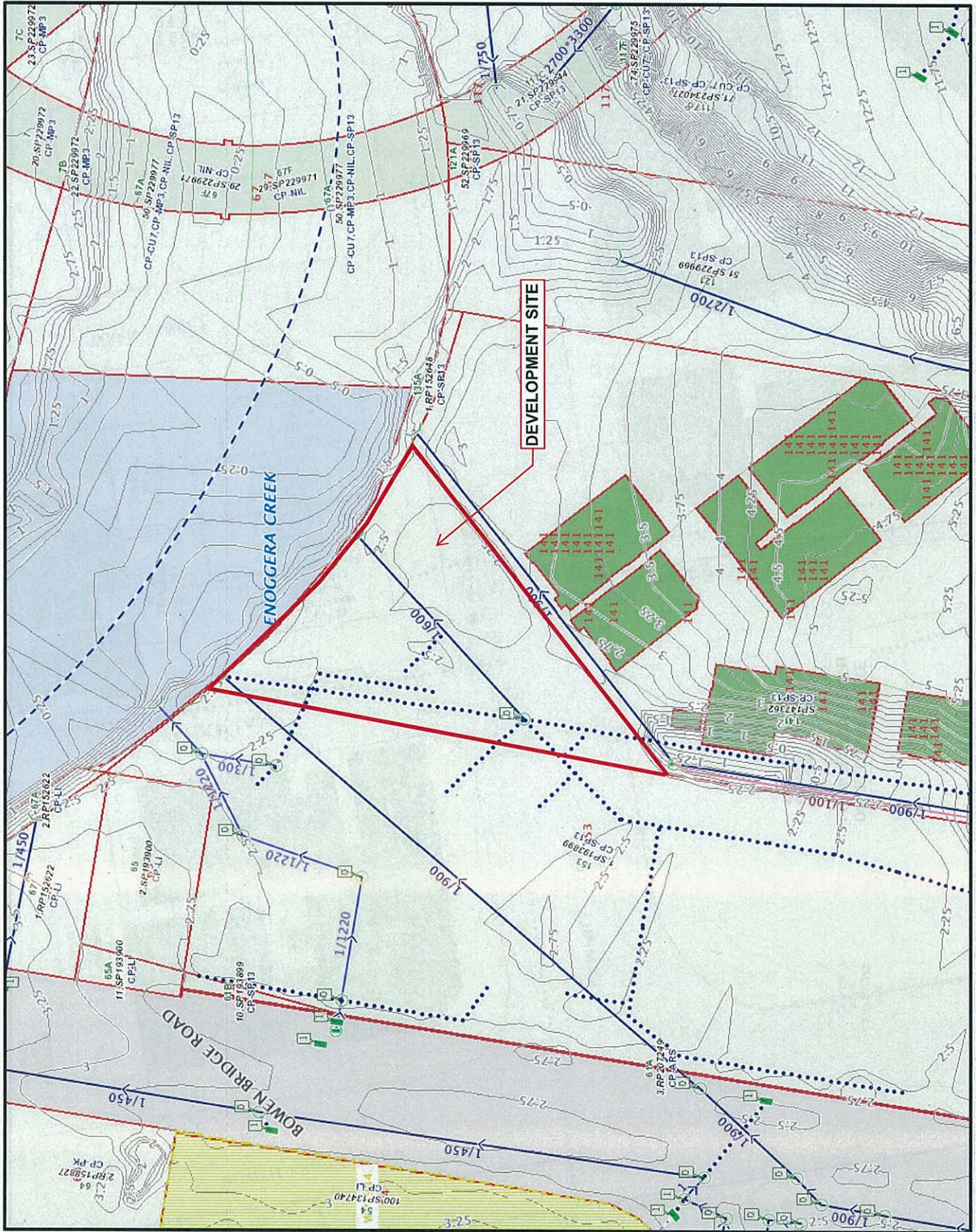
Metres 50 100



Copyright BCC, 2006



BCC eBIMAP - DRAINAGE PLAN (LOCAL SITE)



Scale = 1:750
Metres 10 20 30

Location :

6,964,295
503,123
N
502,950
6,964,163

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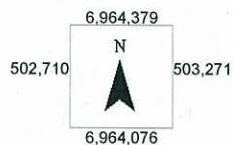


Location :

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Scale = 1:1,000

Metres 20 40



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Quebec
The spirit has personality

LEGEND

Water Device			Sewer Main Flow Arrow (Existing)
	Booster Pump		Sewer Main Flow Arrow (Other)
	Branch Fitting		Sewer Main Flow Arrow (Future)
	Device	Sewer Device Number	
	End Fitting		Septic Tank
	Valve	Sewer Device	
	Pressure Reducing Valve		End Joint (Existing)
	Shut Valve		Outlet (Existing)
	Pressure Gauge		Maintenance Hole (Existing)
Water Proposed Work			Pump Station (Existing)
	Water Reservoir		Treatment Plant (Existing)
	Water AC Label		Overflow (Existing)
	Water Service Asbuilt		End Joint (Other)
Water Reticulation Main			Outlet (Other)
	Reservoir Booster Zone		Maintenance Hole (Other)
	Reservoir Booster Zone		Pump Station (Other)
	Reservoir Booster Zone		Treatment Plant (Other)
	Reservoir Booster Zone		Overflow (Other)
	Reservoir Booster Zone		End Joint (Future)
	Reservoir Booster Zone		Outlet (Future)
	Reservoir Booster Zone		Maintenance Hole (Future)
	Reservoir Booster Zone		Pump Station (Future)
	Reservoir Booster Zone		Treatment Plant (Future)
	Reservoir Booster Zone		Overflow (Future)
	Reservoir Booster Zone	Sewer AC Label	
	Reservoir Booster Zone	Sewer PC Label	
	Reservoir Booster Zone	Sewer Pipe Label	
	Reservoir Booster Zone	Sewer Leader	
	Reservoir Booster Zone	Sewer Pipe	
	Reservoir Booster Zone		Gravity (Existing)
	Reservoir Booster Zone		Pressure Main (Existing)
	Reservoir Booster Zone		Property Connection (Existing)
	Reservoir Booster Zone		MH Stub (Existing)
	Reservoir Booster Zone		Gravity (Other)
	Reservoir Booster Zone		Pressure Main (Other)
	Reservoir Booster Zone		Property Connection (Other)
	Reservoir Booster Zone		MH Stub (Other)
	Reservoir Booster Zone		Gravity (Future)
	Reservoir Booster Zone		Pressure Main (Future)
	Reservoir Booster Zone		Property Connection (Future)
	Reservoir Booster Zone		MH Stub (Future)
Water Trunk Main Label		Sewer Drainage Plan	
Water Trunk Main		Sewer Offset	
	Reservoir Booster Zone		Offset
	Reservoir Booster Zone	Sewer Fence Chainage	
	Reservoir Booster Zone	Sewer Tie	
	Reservoir Booster Zone		Tie Line
	Reservoir Booster Zone	Contours 1m 2009 Labels	
	Reservoir Booster Zone	Contours 1m 2009	
	Reservoir Booster Zone	Contours 0.5m 2009	
	Reservoir Booster Zone	Contours 0.25m 2009	
	Reservoir Booster Zone	Parcel Outside Brisbane	
	Reservoir Booster Zone	Street Name 500	
	Reservoir Booster Zone	Parcel Sealed	
	Reservoir Booster Zone	Parcel Rail	
	Reservoir Booster Zone	Property Holding	
	Reservoir Booster Zone	Parcel	
	Reservoir Booster Zone	Road Connector	
	Reservoir Booster Zone	Parcel Road	
	Reservoir Booster Zone	Parcel Creek	
	Sewer Door	Sewer Device Rehab	
	Sewer Device Rehab	Sewer Pipe Rehab	
	Sewer Pipe Rehab	Sewer Main Flow Arrow (cont)	

For Emergency Situations
Please call 13 19 62

PAPER SIZE A3

All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX Energy DBYD map, then ENERGEX shall be contacted immediately.



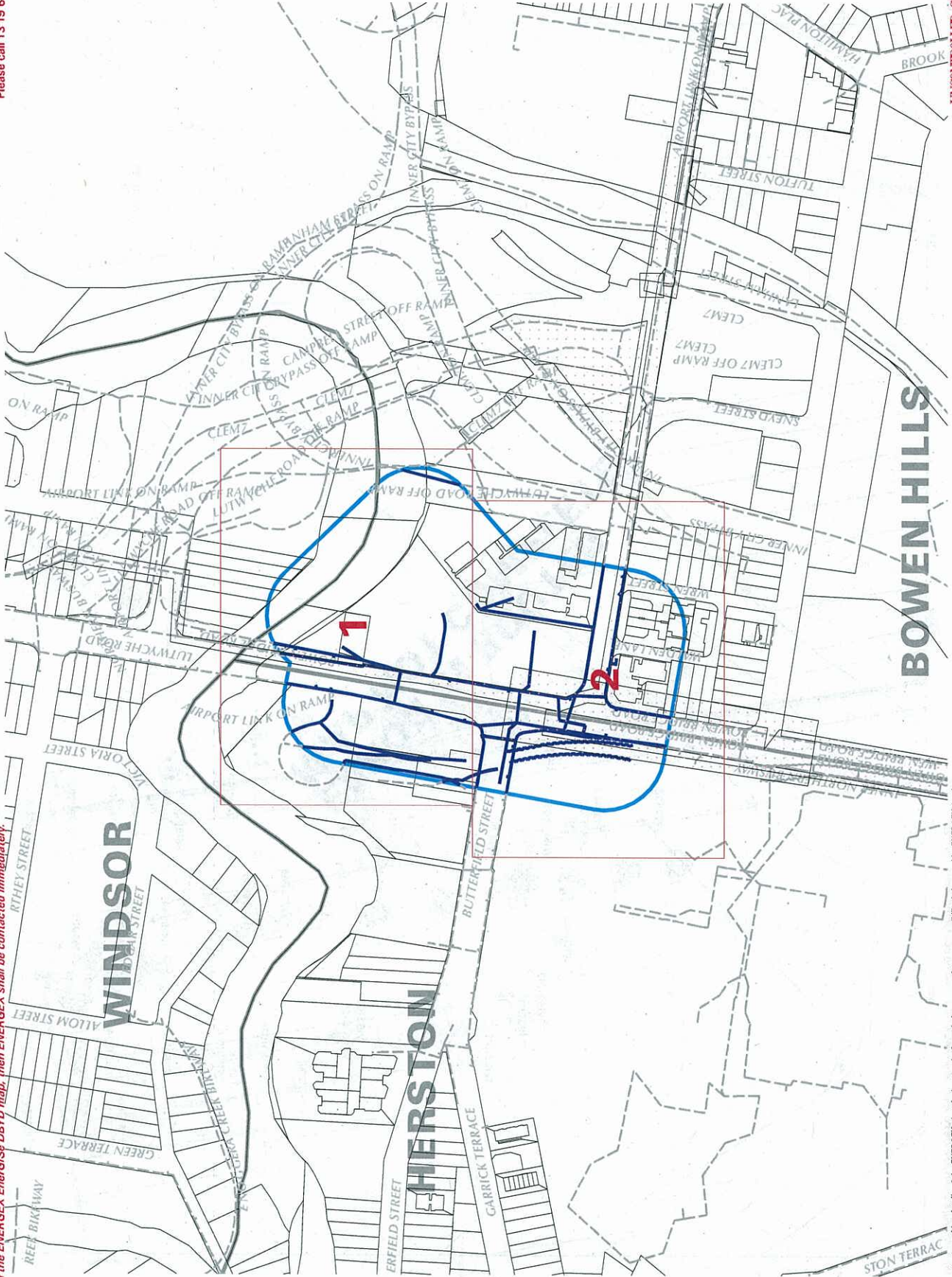
Date: 28 Feb 12 Time: 11.30.16
Requested By: DBYD
NOT TO SCALE

Enquiry No: 24350631

KEY MAP

Enquiry Area

LOCALITY DIAGRAM



BOWEN HILLS

This output provides details of the ENERGEX electrical network. As variations may exist no responsibility is incurred by ENERGEX for the accuracy or completeness of the information provided. Exact positions of cables and electrical connectivity should be confirmed on site.

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All underground cables shall be treated as being energised. Where a cable is located that is not represented on the ENERGEX EnerGISE DBYD map, then ENERGEX shall be contacted immediately.

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Please call 13 19 62



energex
EnerGISE
DBYD

Date: 28 Feb 12 Time: 11:30:31
Requested By: DBYD
SCALE 1:1000

Enquiry No: 24350631
STRIP No: 1

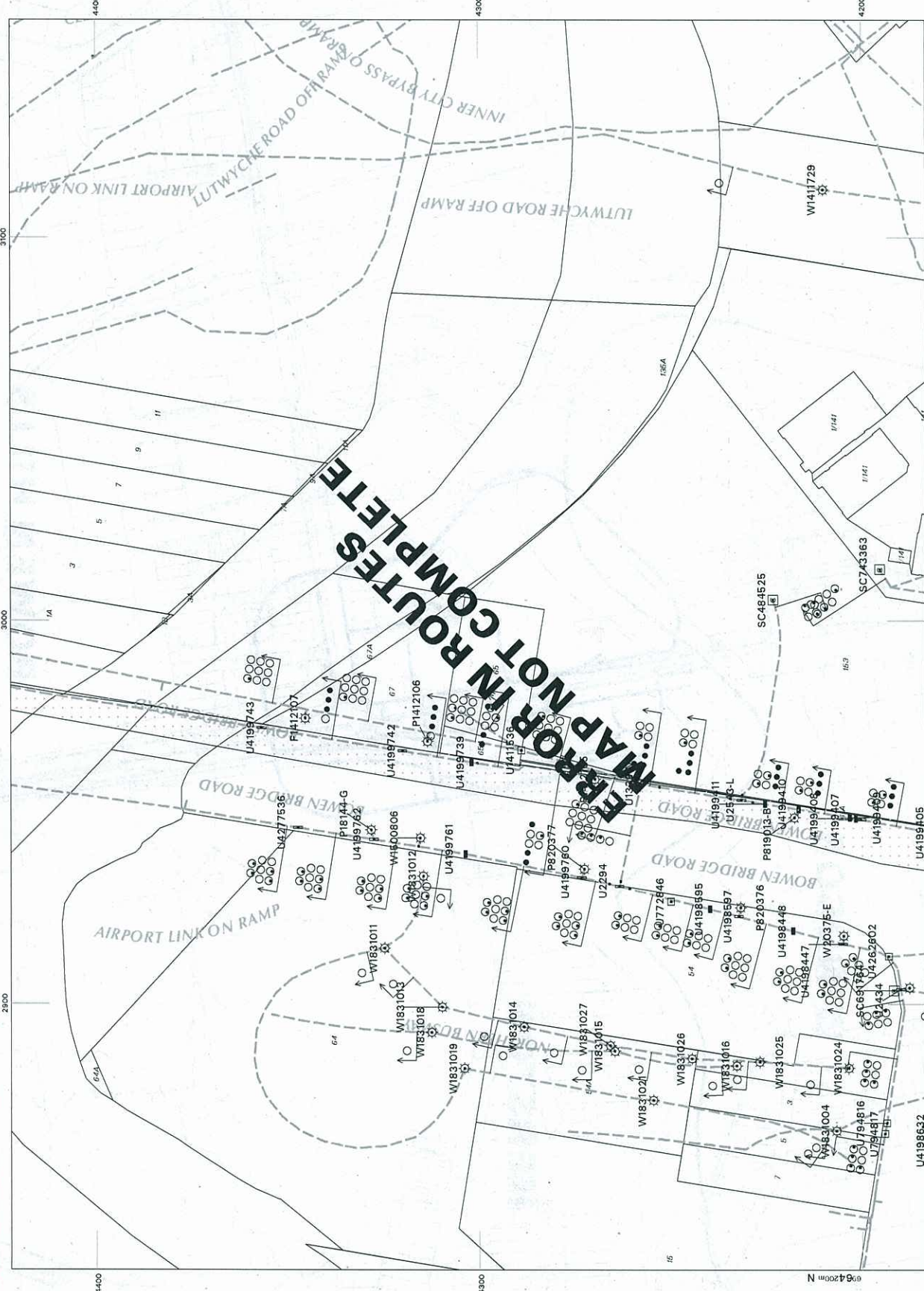
Ground Transformer Cable Voltage Less Than 33kV Cable Voltage 33kV or Higher Ring Main Unit Metering Unit Link Pillar Service Pillar Junction Pillar Pit Cable Joint Cable Termination Cable Marker Street Light Pole Earth Works Order Polygon	Direct Lay Cable Conduit Multi-Section Duct Trench Cable Tray Tunnel
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INDEX TO SHEETS



LOCALITY DIAGRAM



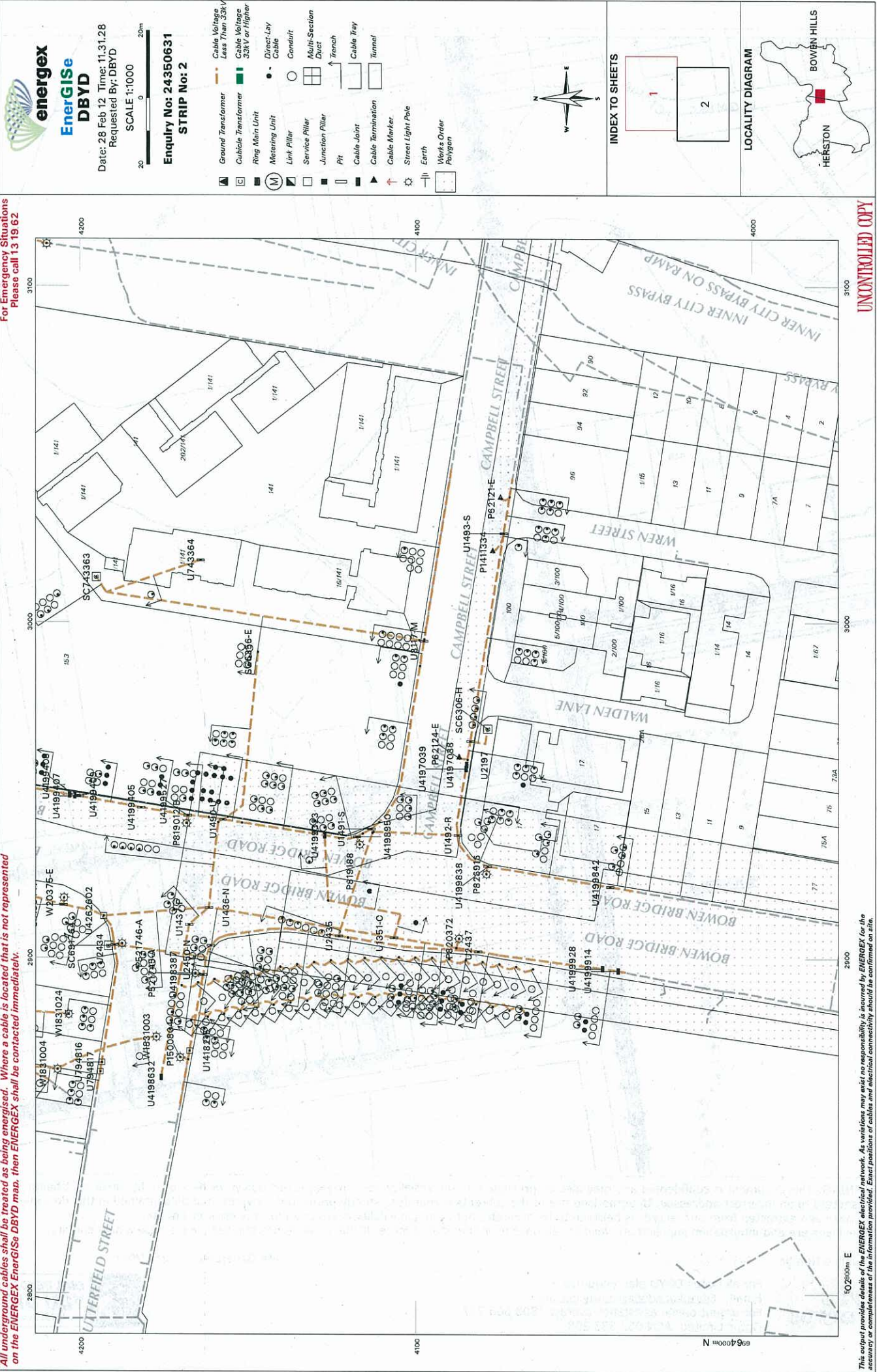
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