

Civil



TaylorThomsonWhitting

Stormwater, Civil and Flood Risk Assessment for Development Application Crown Street East Redevelopment, Wollongong

for Belmorgan Property Development

September 2007

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Table of Contents

	Page
1.0 INTRODUCTION	1
2.0 EXISTING DEVELOPMENT	1
3.0 PROPOSED DEVELOPMENT	1
4.0 STORMWATER DRAINAGE SYSTEM	2
4.1 External Council System Adjacent to the Site	2
4.2 Internal Site Stormwater System	4
5.0 RESULT OF STUDY	5
5.1 100 Year Storm	5
6.0 RECOMMENDATION	6

ATTACHMENTS:

Appendix A	(i) Catchment Plan
Appendix B	(i) Site Location
Appendix C	(i) HEC-RAS flow layout (ii) Flood Levels (iii) Flood Extent (iv) Detailed Results
Appendix D	Roadworks, Stormwater and Erosion Control Drawings.

1. INTRODUCTION

This report is submitted by Engineering Consultancy firm Taylor Thomson Whitting (TTW) who have been engaged by Belmorgan Development to investigate storm water drainage civil works, erosion and sediment control and flooding issues for the proposed Crown Street East Redevelopment, Wollongong.

2. EXISTING DEVELOPMENT

The site is located on both sides of Corrimal Street. The western side is bounded by Crown St to the north, Burelli St to the south and Corrimal St to the east. Likewise, the Eastern side is bounded by Crown St to the north, Burelli St to the south and Corrimal St to the west – refer **Appendix B**.

The total site area is approximately 1.75ha. The site falls from North to South and is located in an area which is not known for being flood prone.

The existing development is an impervious commercial site.

3. PROPOSED DEVELOPMENT

The proposed development involves the removal of existing structures to facilitate the construction of the proposed Crown Street East Redevelopment and its associated works.

The civil engineering design intent for the proposed development is to provide stormwater drainage, road works, erosion and sediment control in accordance with best practice principles.

The use of recycled road and drainage products such as recycled concrete road base and drainage media will be recommended to minimise the use of high energy consuming building products.

The catchment plan for the locality and the site location plan is shown in **Appendix A** and **B** respectively.

We have investigated the potential ingress of stormwater to the proposed underground car park, loading dock and the street level retail area by overland flow passing in each of the streets adjacent to the site.

The main vehicular access point to the proposed underground car park is via ramp off Burelli Street. The entry to the loading dock for the eastern part of the development is off Crown Street and exits to Burelli St. Similarly, the entry/exit to the loading dock for the western side of the development is through Town Hall Place.

We propose that the car park entrances and any retail floor space entrances at street level are set to be at least 0.15 metres and 0.20 metres respectively above the 1 in 100 year ARI flood level calculated at each entrance.

The 0.15m and 0.20m freeboard proposed is based on;

- i) Maintaining adequate access grades for the entrances to the retail and basement areas while providing suitable flood protection
- ii) Adequate street grades on Corrimal Street, Burelli Street and Crown Street providing good hydraulic capacity adjacent the site
- iii) The site floor is approximately 2.0 to 2.5m above the golf course flood zone. The receiving system at the golf course can rise significantly before having any effect at the proposed development.
- iv) The capacity of the street piped drainage system has not been included in the overland flow assessment. This adds a factor of safety.

As the proposed habitable floor levels will be above the 1 in 100 year storm event flood levels, a flood management plan shall not be prepared.

The proposed development will result in no worsening of the existing Council stormwater system for both the piped system and the street overland flow system.

Stormwater drainage from the site is to drain directly to council's stormwater pipe network adjacent to the site. The site system includes rainwater reuse storage in accordance with Council Policy.

The overland flow calculations have been included in **Appendix C** of this report. The information in this report should be read in conjunction with these calculations and the Stormwater Drainage Drawings prepared for this DA.

4. STORMWATER DRAINAGE SYSTEM AND OVERLAND FLOW ISSUES

4.1 External Council System Adjacent to the Site

Currently there is an existing 375-600mm diameter stormwater pipe network adjacent to the site, which then conveys flows to a 2x750x2100mm box culverts stormwater outlet near the intersection of Corrimal and Stewart Streets. The stormwater system captures an upstream commercial district catchment of approximately 21.5 ha which is considered to be 100% impervious in accordance with Council's design guide. Wollongong City Council has advised that the site and its immediate vicinity are not known to be subject to flooding.

TTW have undertaken calculations to provide some background information on local flooding. The rational method was used to analyse the overland flow in the 100 year ARI.

The table below summarises flows currently passing adjacent to the site (refer to **Appendix C** for Rational Method calculation).

Table 1 – Current flow rate of Stormwater in the road pavements acting as channels.

ARI (average recurrence interval)	100 year
Crown Street (West of Crown/Corrimal Intersection) (m ³ /s)	4.64
Crown and Corrimal Streets Intersection (m ³ /s)	6.84
Burelli Street (West of Crown/Corrimal Intersection) (m ³ /s)	4.79
Burelli and Corrimal Streets Intersection (m ³ /s)	13.23
Stewart and Corrimal Streets Intersection (m ³ /s)	15.92

These flow rates were used to calculate the likely flood levels during the 100year ARI storm event using the HEC-RAS model. A HECRAS flow model was developed, generating flow profiles along Crown, Corrimal, and Burelli Streets and providing an estimate of overland flow that is likely to occur from overtopping the above-mentioned pavement levels. The layout of the flow model, flood levels adjacent to the site, typical cross sections, detailed results and extent of flooding for both the existing and post-development conditions are shown in **Appendix C**.

4.2 Internal Site Stormwater System

The proposed internal site stormwater drainage system is designed to comply with Wollongong City Council's design requirements for the area and connects to the existing Council stormwater system.

The proposed works are primarily on areas of the site that are already fully impervious. The focus of the internal stormwater design is to connect the new works into the existing system without impediment to the stormwater flow.

Provision for Onsite Detention (OSD) is not necessary as the proposed development does not increase the impervious area by more than 100sq.m. as per Council's "On-Site Stormwater Detention Code, June 2006".

The design is intended to include water sensitive urban design practice in the form of stormwater reuse storage to maximise stormwater recycling in accordance with Wollongong Council's rainwater storage policy. 111,000 litres storage would be required for stages 1 and 2. 40,000 litres rainwater storage would be required for stage 3. The intent is to use the stored rainwater for irrigation of landscape zones and toilet flushing on the retail level of the development.

The design includes a silt and oil arrestor unit such as a Rocla CDS unit or equivalent for each site to filter stormwater discharge for the completed works.

Construction soil and water management plans have been designed and documented in accordance with the Managing Urban Stormwater – Soils and Construction Manual by the NSW Dept of Housing (**Refer Appendix E**).

5. RESULT OF STUDY

5.1 The 100-Year Storm

The existing development is a 100% impervious commercial site. The proposed development does not make this drainage condition any worse.

The proposed streetscape works do not have a detrimental impact on the existing flood levels for the proposed development or for neighbouring developments according to our analysis.

For flood levels adjacent to the site refer to **Appendix C**.

6. CONCLUSION AND RECOMMENDATION

Based on our calculations, it is our opinion that;

- the proposed development does not have any hydraulic effect during the 100 year storm based on our analysis.
- downstream properties would not be affected by the proposed development based on our analysis.
- in the event of the 1 in 100 year storm the underground carpark and loading dock will be flood-free with freeboard at entries/exit of around 0.15m and retail shops of 0.20 minimum.
- the overland flow capacity of Corrimal Street between Crown and Burelli Street will slightly increase and reduce flood velocity.

Our recommendation is as follows:

1. The new internal stormwater system for each development is to match into the existing council stormwater system with water quality control devices at the connection points.
2. Provide rainwater reuse storage in accordance with Council's policy requirements.

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APPENDIX A

- Catchment Plan (as per DA2004/1565)**

CATCHMENT PLAN

- X - SITE AREA
- EXTENT OF CATCHMENT

- A - CATCHMENT NODE
- 1.0 ha - CATCHMENT AREA FOR NODE x.

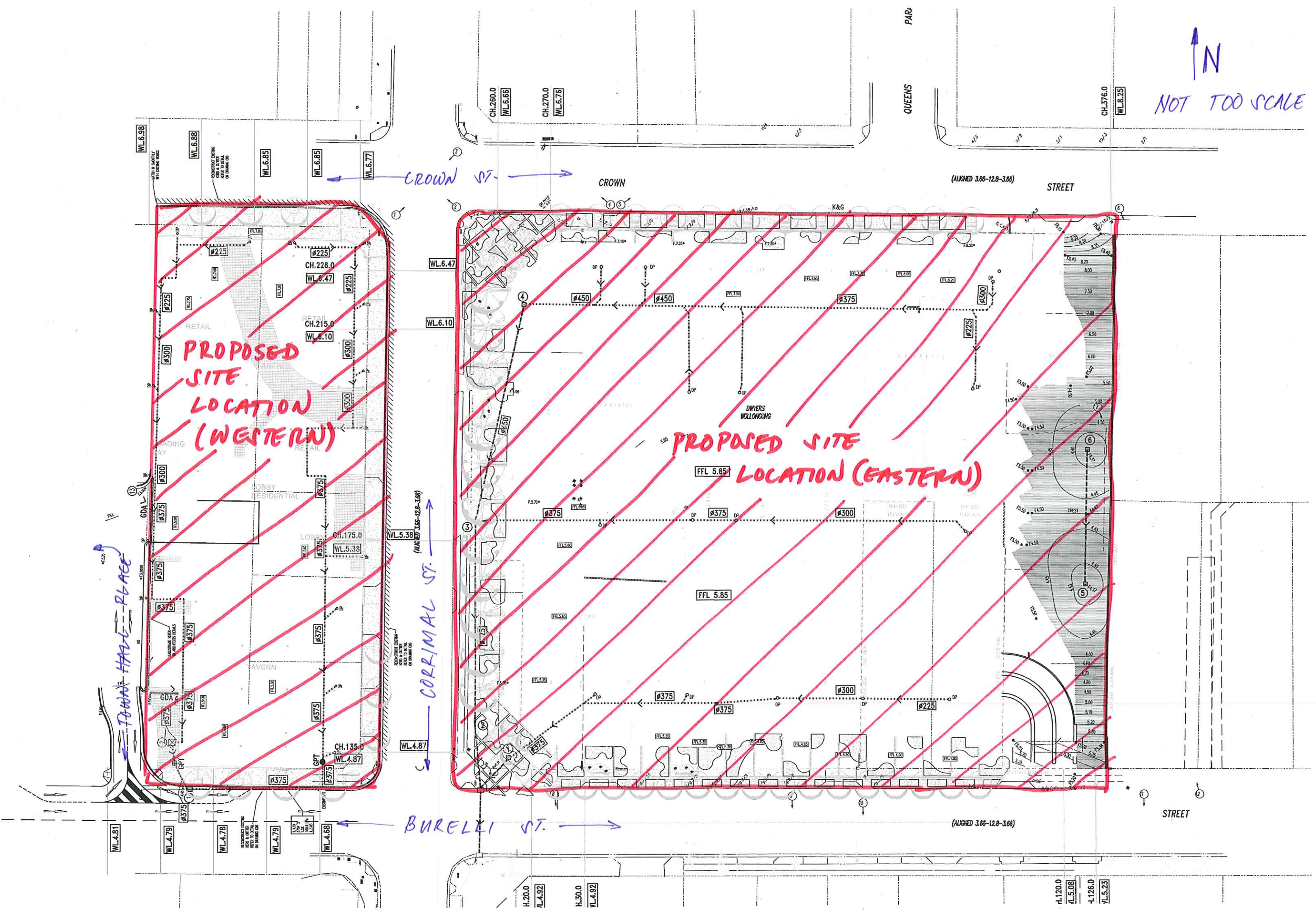


APPENDIX B

- Site Location



NOT TOO SCALE



APPENDIX C

- HEC-RAS Model Layout**
- Flood Levels**
- Flood Extents**
- HEC-RAS Detailed Results**

HEC-RAS Plan-100 Profile: Q100													
River	Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Chl W.S. (m)	E. of Elev (m)	E.G. Slope (m/m)	Vel Chl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
CORRIMAL ST DS	1	100	Q100	13.23	4.26	4.68	4.74	4.92	0.004731	2.26	7.25	30.61	1.36
CORRIMAL ST DS	1	95.9090*	Q100	13.23	4.24	4.66	4.71	4.89	0.004623	2.23	7.36	30.61	1.34
CORRIMAL ST DS	1	91.8181*	Q100	13.23	4.21	4.63	4.68	0.004525	2.21	7.47	7.53	30.61	1.33
CORRIMAL ST DS	1	87.7272*	Q100	13.23	4.18	4.61	4.67	4.83	0.004422	2.18	7.56	30.62	1.31
CORRIMAL ST DS	1	83.6363*	Q100	13.23	4.15	4.59	4.63	4.8	0.004281	2.15	7.71	30.62	1.29
CORRIMAL ST DS	1	79.5454*	Q100	13.23	4.13	4.57	4.61	4.77	0.004108	2.12	7.86	30.63	1.27
CORRIMAL ST DS	1	75.4545*	Q100	13.23	4.11	4.55	4.59	4.74	0.003911	2.08	8.03	30.63	1.24
CORRIMAL ST DS	1	71.3636*	Q100	13.23	4.07	4.53	4.55	4.71	0.003689	2.03	8.23	30.64	1.2
CORRIMAL ST DS	1	67.2727*	Q100	13.23	4.04	4.51	4.53	4.68	0.00344	1.96	8.46	30.64	1.16
CORRIMAL ST DS	1	63.1818*	Q100	13.23	4.02	4.49	4.51	4.65	0.003189	1.92	8.72	30.64	1.12
CORRIMAL ST DS	1	59.0909*	Q100	13.23	3.99	4.47	4.48	4.62	0.002894	1.86	8.92	30.65	1.07
CORRIMAL ST DS	1	55	Q100	13.23	3.96	4.41	4.45	4.6	0.004442	2.11	7.94	30.65	1.3
CORRIMAL ST DS	1	50*	Q100	13.23	3.93	4.39	4.42	4.57	0.003834	2.04	8.31	30.56	1.22
CORRIMAL ST DS	1	45*	Q100	13.23	3.91	4.37	4.39	4.54	0.003444	1.99	8.59	30.48	1.17
CORRIMAL ST DS	1	40*	Q100	13.23	3.88	4.36	4.36	4.51	0.003048	1.93	8.92	30.39	1.11
CORRIMAL ST DS	1	35*	Q100	13.23	3.85	4.3	4.34	4.5	0.004167	2.15	8.08	30.3	1.28
CORRIMAL ST DS	1	30*	Q100	13.23	3.81	4.26	4.3	4.47	0.003387	1.72	10.22	30.22	0.91
CORRIMAL ST DS	1	25*	Q100	13.23	3.78	4.36	4.28	4.45	0.00314	1.59	11.28	30.13	0.79
CORRIMAL ST DS	1	20*	Q100	13.23	3.74	4.36	4.26	4.44	0.003117	1.47	12.22	30.05	0.71
CORRIMAL ST DS	1	15*	Q100	13.23	3.71	4.35	4.23	4.43	0.003093	1.39	13.13	29.96	0.64
CORRIMAL ST DS	1	10*	Q100	13.23	3.68	4.36	4.2	4.43	0.002732	1.32	13.99	29.87	0.59
CORRIMAL ST DS	1	14.99999*	Q100	13.23	3.64	4.36	4.18	4.42	0.000614	1.26	14.83	29.79	0.54
CORRIMAL ST DS	1	0	Q100	15.92	3.61	4.31	4.19	4.42	0.001002	1.59	14.3	29.7	0.69
BURELLI ST WEST	1	60	Q100	4.79	4.44	4.72	4.8	4.96	0.001017	2.2	2.29	17.48	1.78
BURELLI ST WEST	1	55	Q100	4.79	4.41	4.79	4.72	4.77	0.000715	1.96	2.65	18.54	1.5
BURELLI ST WEST	1	50	Q100	4.79	4.42	4.81	4.76	4.87	0.001183	1.12	4.63	20.15	0.67
BURELLI ST WEST	1	45	Q100	4.79	4.42	4.81	4.76	4.85	0.000877	0.98	5.32	22.2	0.58
BURELLI ST WEST	1	40	Q100	4.79	4.41	4.79	4.79	4.85	0.001234	1.15	4.48	19.5	0.7
BURELLI ST WEST	1	35	Q100	4.79	4.4	4.78	4.78	4.84	0.001063	1.07	4.82	20	0.64
BURELLI ST WEST	1	30	Q100	4.79	4.39	4.78	4.78	4.83	0.000848	1	5.22	20.8	0.58
BURELLI ST WEST	1	25	Q100	4.79	4.37	4.79	4.79	4.82	0.000444	0.78	7.08	27.8	0.43
BURELLI ST WEST	1	20	Q100	4.79	4.37	4.79	4.79	4.82	0.000402	0.8	6.95	28.8	0.44
BURELLI ST WEST	1	15	Q100	4.79	4.43	4.74	4.74	4.81	0.001876	1.26	4.49	29.4	0.83
BURELLI ST WEST	1	10	Q100	4.79	4.42	4.68	4.71	4.79	0.004725	1.59	3.73	38.27	1.34
BURELLI ST WEST	1	5	Q100	4.79	4.41	4.67	4.69	4.77	0.003839	1.34	3.56	33.78	1.11
BURELLI ST	1	120	Q100	0.1	5.05	5.23	5.23	5.25	0.00481	0.98	0.18	13.9	0.97
BURELLI ST	1	120	Q100	0.1	4.9	5.08	5.1	5.17	0.042336	1.37	0.07	8.69	2.7
BURELLI ST	1	115*	Q100	0.1	4.83	5.01	5.02	5.05	0.014076	0.85	0.12	10.87	1.59
BURELLI ST	1	110	Q100	0.1	4.78	4.84	4.86	4.93	0.03873	1.32	0.08	2.85	2.59
BURELLI ST	1	105*	Q100	0.1	4.7	4.83	4.78	4.83	0.000149	0.14	0.72	12.64	0.19
BURELLI ST	1	100	Q100	0.84	4.65	4.78	4.78	4.82	0.004119	0.86	0.96	12.69	1.02
BURELLI ST	1	95*	Q100	0.84	4.59	4.72	4.74	4.78	0.009513	1.13	0.74	12.62	1.48
BURELLI ST	1	90	Q100	0.84	4.54	4.67	4.68	4.73	0.007129	1.03	0.81	12.65	1.3
BURELLI ST	1	85*	Q100	0.84	4.53	4.69	4.67	4.71	0.001825	0.88	1.24	14.04	0.7
BURELLI ST	1	80	Q100	0.84	4.51	4.68	4.65	4.7	0.000976	0.56	1.57	15.9	0.53
BURELLI ST	1	75*	Q100	0.84	4.51	4.67	4.65	4.68	0.001328	0.62	1.37	14.16	0.61
BURELLI ST	1	70	Q100	0.84	4.51	4.64	4.64	4.68	0.004128	0.87	0.96	12.78	1.02
BURELLI ST	1	65*	Q100	0.84	4.48	4.62	4.62	4.65	0.003561	0.84	1	12.76	0.95
BURELLI ST	1	60	Q100	0.84	4.44	4.57	4.58	4.63	0.007351	1.04	0.8	12.64	1.32
BURELLI ST	1	55*	Q100	0.84	4.43	4.56	4.57	4.62	0.000737	1.14	0.7	12.62	1.43
BURELLI ST	1	50	Q100	0.84	4.41	4.54	4.56	4.61	0.009406	1.12	0.74	12.61	1.48
BURELLI ST	1	45*	Q100	0.84	4.39	4.56	4.55	4.58	0.002079	0.71	1.23	14.62	0.75
BURELLI ST	1	40	Q100	0.84	4.37	4.56	4.52	4.57	0.001191	0.59	1.53	15.39	0.58
BURELLI ST	1	35*	Q100	0.84	4.35	4.55	4.51	4.57	0.009002	0.55	1.62	15.64	0.51
BURELLI ST	1	30	Q100	0.84	4.34	4.55	4.49	4.56	0.000625	0.49	1.8	16.1	0.43
BURELLI ST	1	25*	Q100	0.84	4.34	4.54	4.5	4.56	0.001003	0.56	1.51	14.72	0.54
BURELLI ST	1	20	Q100	0.84	4.32	4.52	4.52	4.52	0.000007	0.12	2.07	20.87	0.16
CORRIMAL ST	1	376	Q100	0.5	8.05	8.25	8.27	8.32	0.006703	1.29	0.49	5.49	1.34
CORRIMAL ST	1	373*	Q100	0.5	8	8.18	8.22	8.29	0.010724	1.54	0.42	5.22	1.67
CORRIMAL ST	1	370	Q100	0.5	7.95	8.13	8.17	8.25	0.003325	1.95	0.4	5.29	1.81
CORRIMAL ST	1	365*	Q100	0.5	7.87	8.05	8.09	8.18	0.012379	1.67	0.36	5.11	1.67
CORRIMAL ST	1	360	Q100	0.5	7.78	8.09	8.03	8.1	0.000873	0.5	1.21	11.66	0.49
CORRIMAL ST	1	355*	Q100	0.5	7.85	8.06	8.06	8.09	0.003169	0.75	0.76	12.85	0.89
CORRIMAL ST	1	350	Q100	0.5	7.78	7.99	8.05	8.05	0.014662	1.35	0.39	8.55	1.82
CORRIMAL ST	1	345*	Q100	0.5	7.7	7.89	7.92	7.97	0.015273	1.28	0.43	10.24	1.83
CORRIMAL ST	1	340	Q100	0.5	7.61	7.81	7.83	7.88	0.019049	1.2	0.47	13.91	1.96
CORRIMAL ST	1	335*	Q100	0.5	7.5	7.69	7.72	7.79	0.014739	1.42	0.4	8.53	1.85
CORRIMAL ST	1	330	Q100	0.5	7.4	7.58	7.62	7.71	0.016575	1.61	0.33	6.53	1.99
CORRIMAL ST	1	325*	Q100	0.5	7.3	7.48	7.51	7.6	0.022145	1.55	0.35	8.43	2.2
CORRIMAL ST	1	320	Q100	0.5	7.22	7.4	7.42	7.49	0.019123	1.33	0.4	10.56	2.01
CORRIMAL ST	1	315*	Q100	0.5	7.16	7.34	7.36	7.41	0.013454	1.12	0.48	12.21	1.68
CORRIMAL ST	1	310	Q100	0.5	7.1	7.28	7.3	7.34	0.009966	1.02	0.52	12.29	1.47
CORRIMAL ST	1	305*	Q100	0.5	7.04	7.27	7.24	7.28	0.003975	0.5	1.09	12.88	0.52
CORRIMAL ST	1	300	Q100	1.18	6.98	7.22	7.22	7.27	0.003025	0.98	1.38	15.16	0.93
CORRIMAL ST	1	295*	Q100	1.18	6.92	7.11	7.15	7.24	0.015493	1.82	0.86	16.39	1.43
CORRIMAL ST	1	290	Q100	1.18	6.75	6.97	7.03	7.16	0.014187	1.96	0.72	9.14	1.96
CORRIMAL ST	1	285*	Q100	1.18	6.66	6.9	6.95	7.08	0.012596	1.98	0.71	8.26	1.88
CORRIMAL ST	1	280	Q100	1.18	6.56	6.82	6.89	7.01	0.012013	2.03	0.69	7.2	1.85
CORRIMAL ST	1	275*	Q100	1.18	6.53	6.79	6.85	6.96	0.010165	1.89	0.78	8.16	1.71
CORRIMAL ST	1	270	Q100	1.18	6.5	6.76	6.81	6.91	0.009463	1.82	0.93	12.59	1.65
CORRIMAL ST	1	265*	Q100	1.18	6.44	6.7	6.74	6.86	0.011328	1.95	0.84	14.68	1.8
CORRIMAL ST	1	260	Q100	1.18	6.39	6.66	6.71	6.81	0.009211	1.86	0.84	8.69	1.64
CORRIMAL ST	1	259.44*	Q100	1.18	6.39	6.66	6.7	6.81	0.00885	1.81	0.86	8.9	1.61
CORRIMAL ST	1	258.88*	Q100	1.18	6.39	6.66	6.7	6.8	0.008535	1.77	0.88	9.13	1.58
CORRIMAL ST	1	258.32*	Q100	1.18	6.38	6.66	6.7	6.79	0.008435	1.75	0.89	9.33	1.57
CORRIMAL ST	1	257.76*	Q100	1.18	6.38	6.65	6.69	6.79	0.00816	1.71	0.91	9.55	1.54
CORRIMAL ST	1	257.2*	Q100	1.18	6.38	6.65	6.69	6.78	0.007818	1.67	0.93	9.78	1.51
CORRIMAL ST	1	256.64*	Q100	1.18	6.4	6.67	6.69	6.76	0.005105	1.41	1.11	10.34	1.24
CORRIMAL ST	1	256.08*	Q100	1.18	6.4	6.67	6.69	6.75	0.004145	1.36	1.15	10.62	1.19
CORRIMAL ST	1	255.52*	Q100	1.18	6.4	6.67	6.69	6.75	0.004338	1.3	1.19	10.91	1.14
CORRIMAL ST	1	254.96*	Q100	1.18	6.4	6.67	6.68	6.74	0.003995	1.25	1.24	11.2	1.1
CORRIMAL ST	1	254.4*	Q100	1.18	6.4	6.67	6.68	6.74					

**Preliminary Flows - 100 year ARI
Wollongong**

$C^*_{10} = 0.72$
 $F_y = 1.2$
 $ARI = 100$ years
 $I_{5min} = 291.05$ mm/hr
 $I_{7.8min} = 255$ mm/hr
 $I_{8.17min} = 251.18$ mm/hr

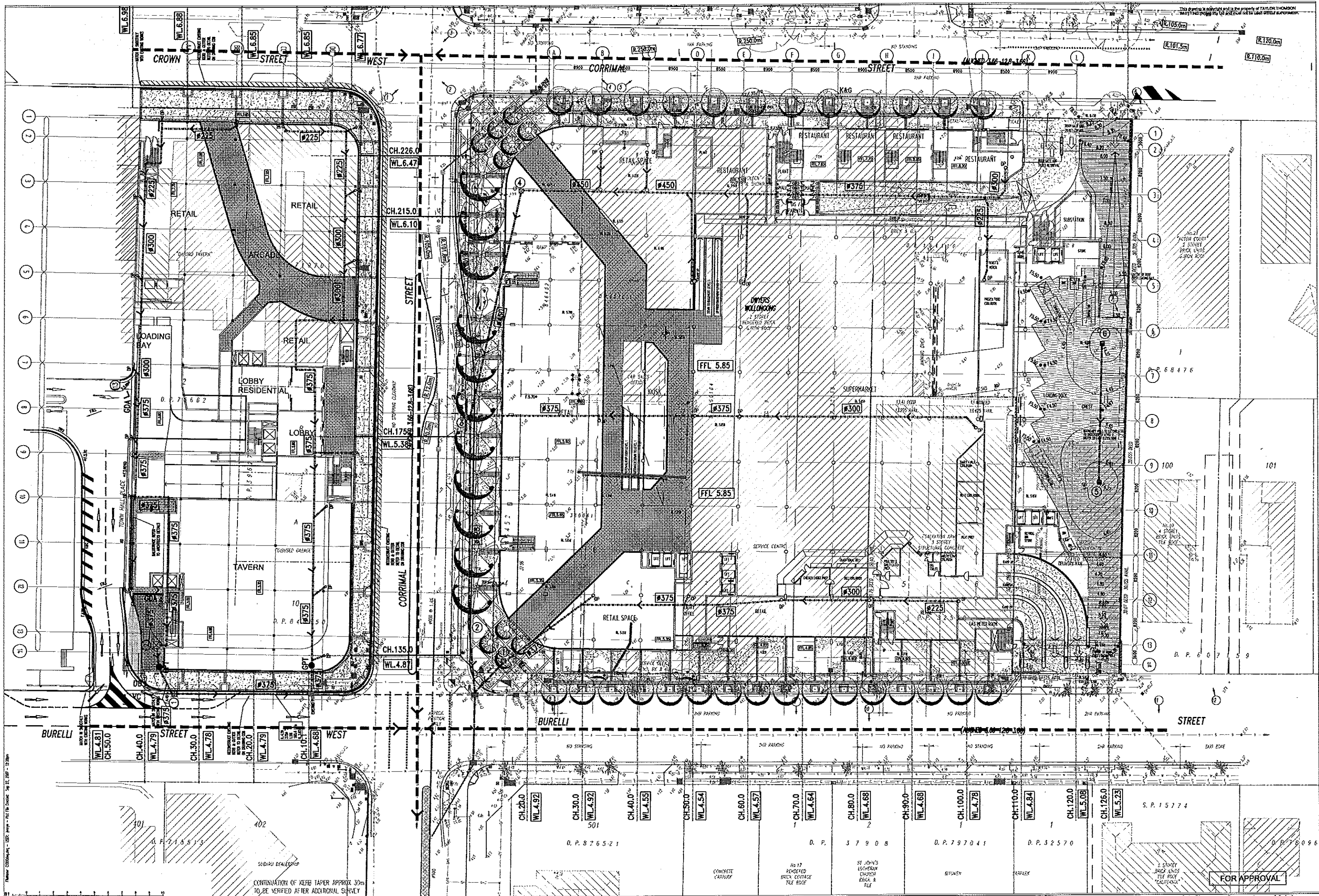
ARI	Fy
1	0.8
2	0.85
5	0.95
10	1
20	1.05
50	1.15
100	1.2

Node	Tc	I	Area	% Impervious	C	Node Inflow
A	12	220.3	19200	100%	1.00	1174.9
B	12	220.3	16680	100%	1.00	1020.7
C	12	220.3	75880	100%	1.00	4643.4
D	12	220.3	78200	100%	1.00	4785.4
E	12	220.3	12600	100%	1.00	771.1
F	12	220.3	13680	100%	1.00	837.1
G	12	220.3	43920	100%	1.00	2687.7
Total site area =			260160	sq.m		

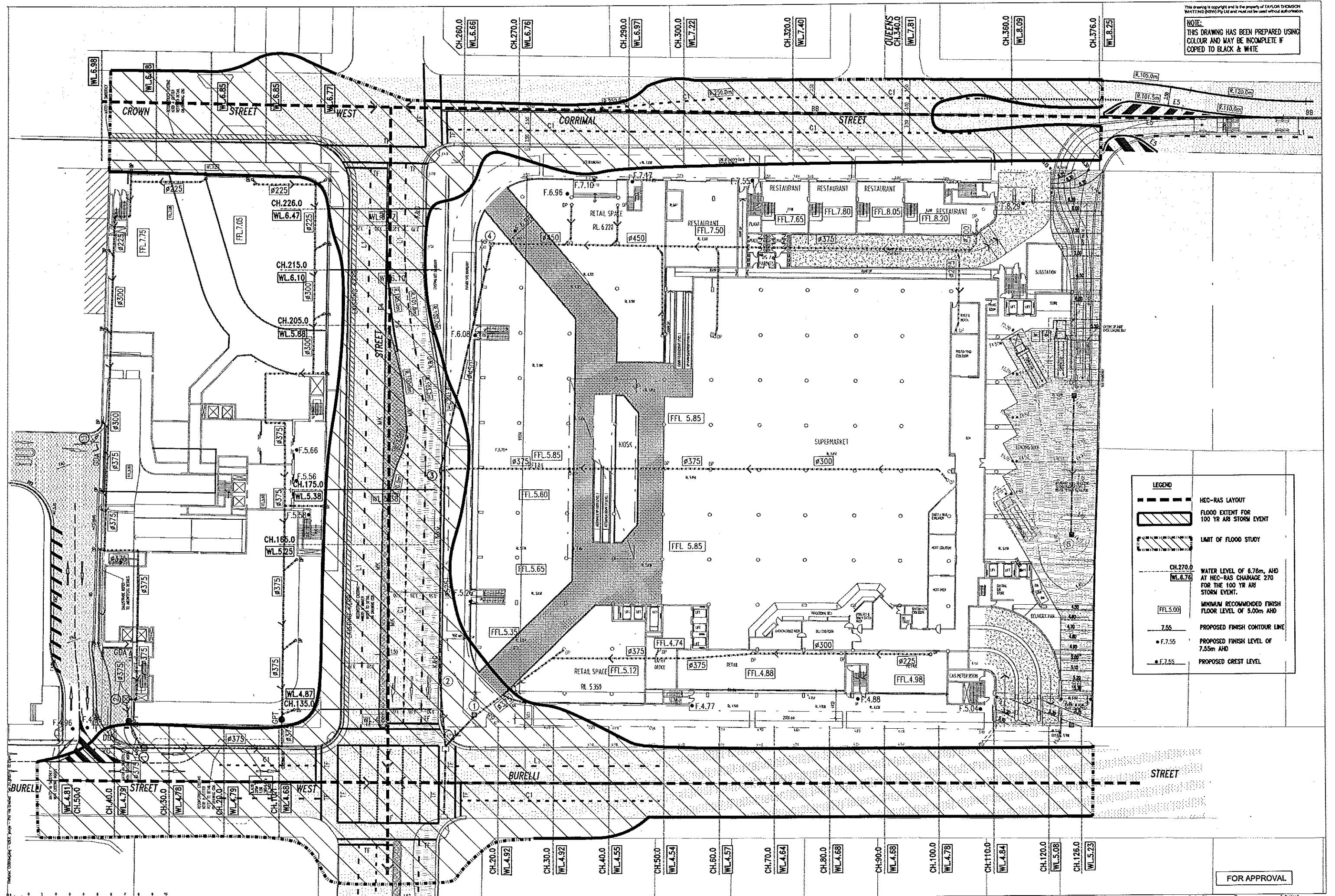
CUMMULATIVE FLOW	
Node	Node Inflow
A	1174.9
A+B+C	6839.1
F	837.1
A+B+C+D+E+F	13232.7
A+B+C+D+E+F+G	15920.3

APPENDIX D

Road Works, Stormwater and Erosion Control drawings

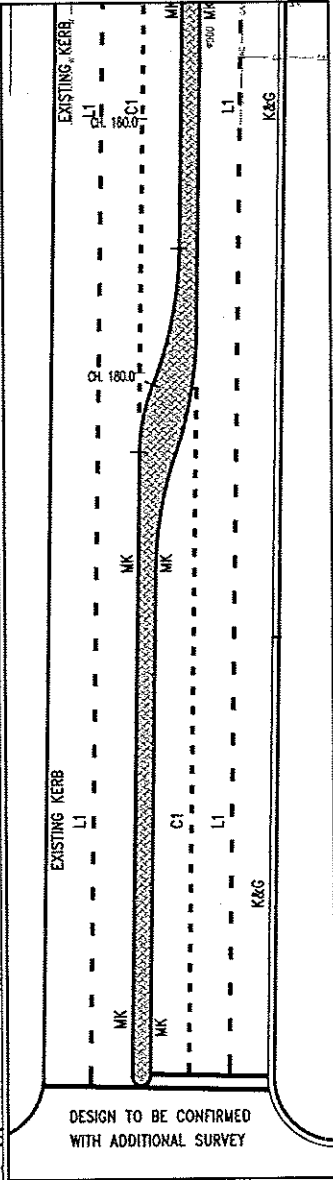
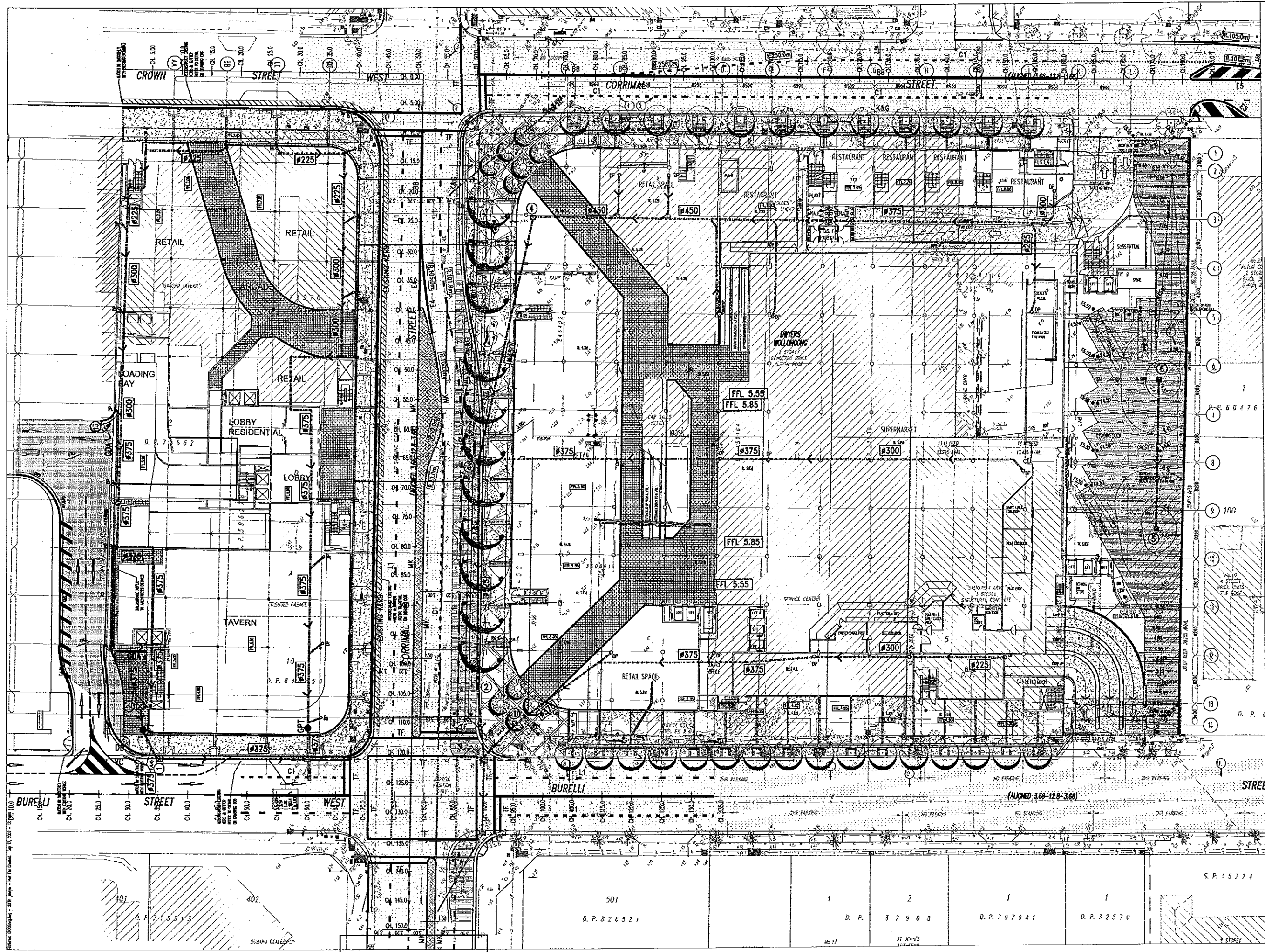


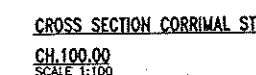
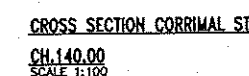
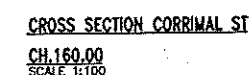
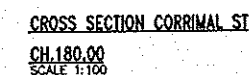
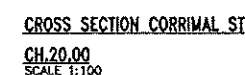
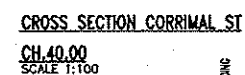
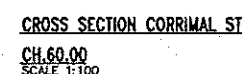
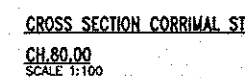
NOTE:
THIS DRAWING HAS BEEN PREPARED USING
COLOUR AND MAY BE INCOMPLETE IF
COPIED TO BLACK & WHITE



LEGEND

- HEC-RAS LAYOUT
- FLOOD EXTENT FOR 100 YR ARI STORM EVENT
- LIMIT OF FLOOD STUDY
- CH.270.0 W.L.6.76 WATER LEVEL OF 6.76m, AHD AT HEC-RAS CHARGE 270 FOR THE 100 YR ARI STORM EVENT.
- F.F.L.5.00 MINIMUM RECOMMENDED FINISH FLOOR LEVEL OF 5.00m AHD
- 7.55 PROPOSED FINISH CONTOUR LINE
- F.7.55 PROPOSED FINISH LEVEL OF 7.55m AHD
- F.7.55 PROPOSED CREST LEVEL



[illegible]

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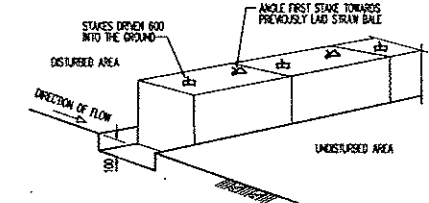
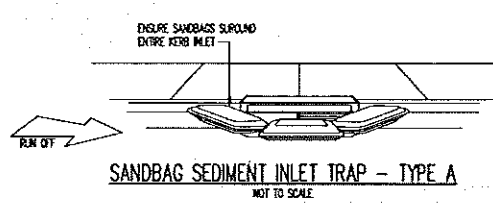
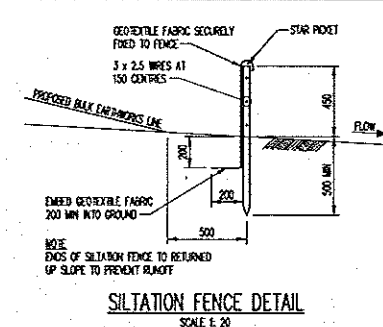
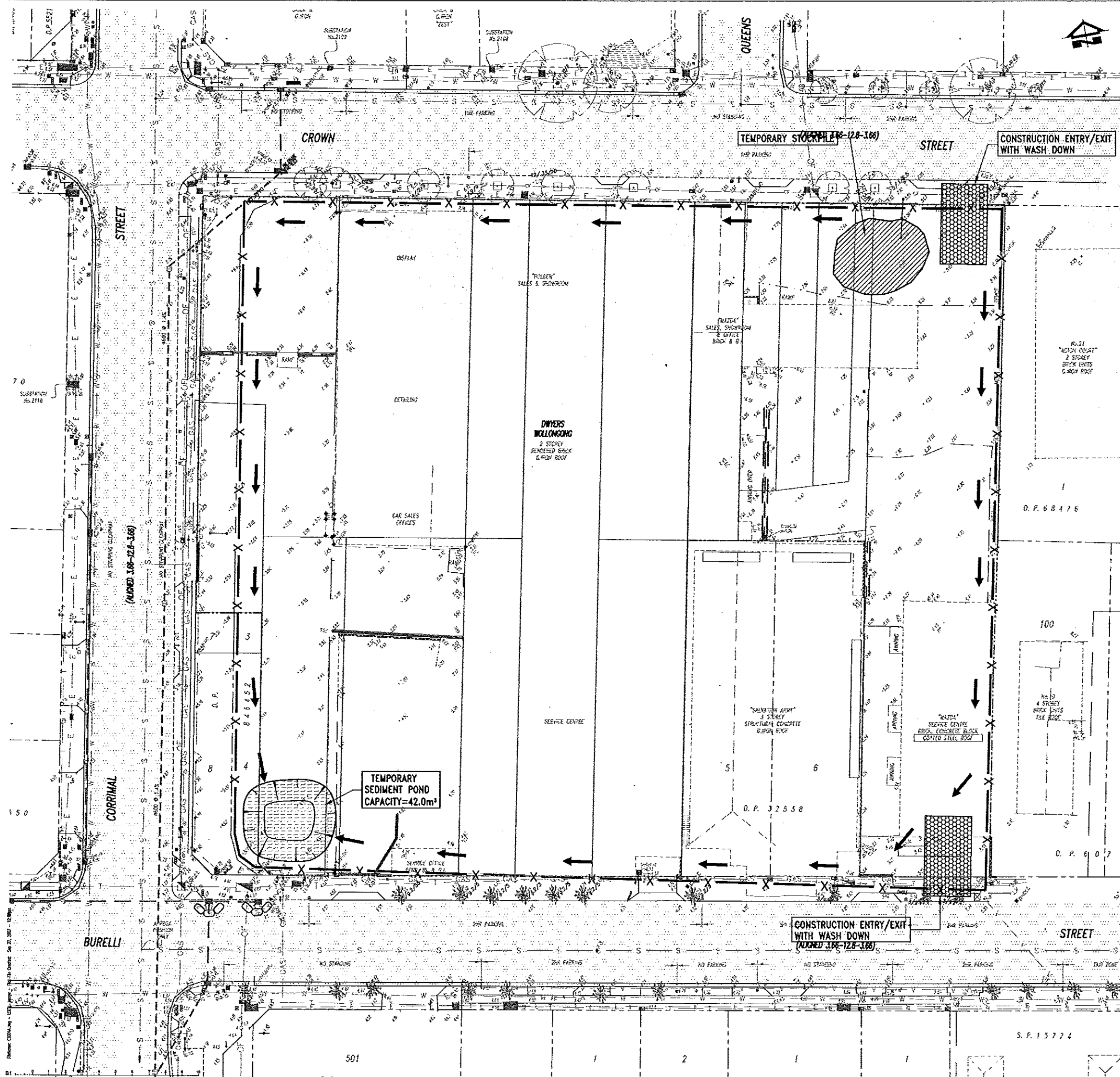
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**ROAD DESIGN
CROSS SECTIONS
CORRIMAL STREET**

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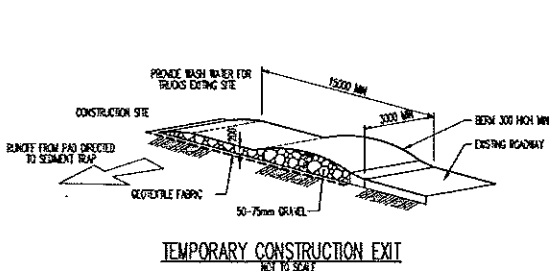
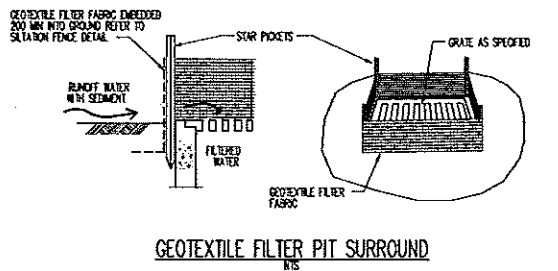
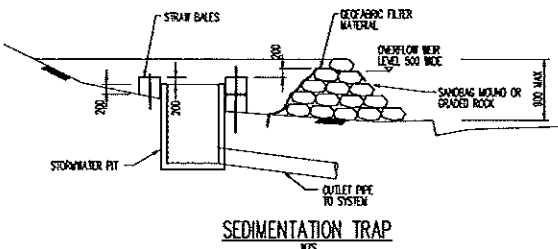
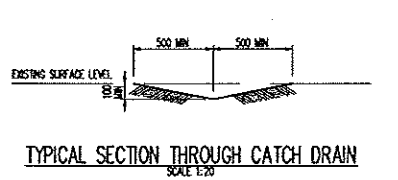
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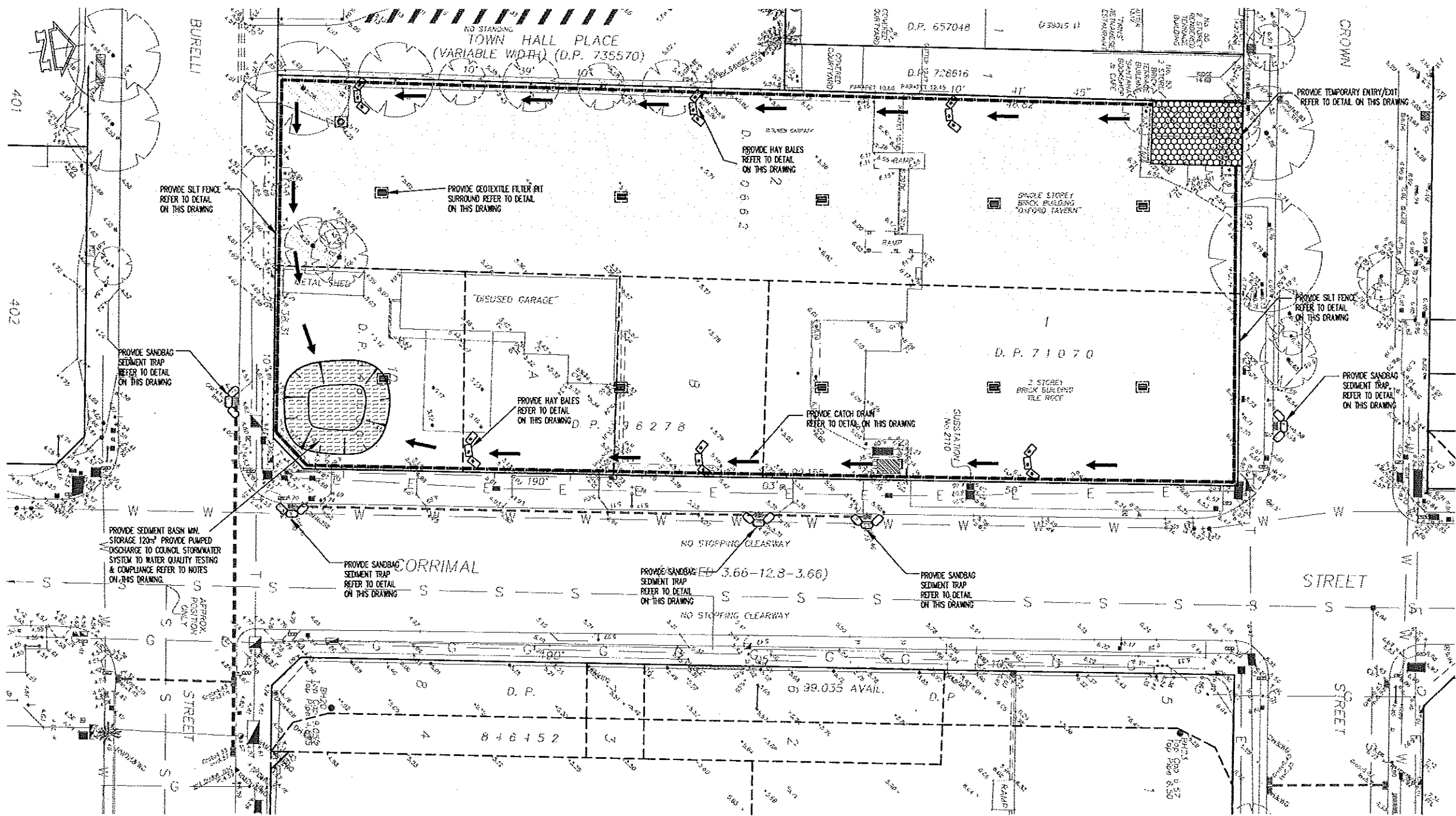
Job No	Drawing No	Revision
061604	C1003	P1

Plot File Created: Sep 27, 2007 - 12:20pm



- ### EROSION AND SEDIMENT CONTROL NOTES
- All work shall be generally carried out in accordance with:
 - Local authority requirements.
 - EPA - Pollution control manual for urban stormwater.
 - Department of conservation and land management manual - "Urban Erosion & Sediment Control".
 - Erosion and sediment control drawings and notes are provided for the whole of the works. Should the Contractor stage their work then the design may require to be modified. Variations to these details may require to be approved by the relevant authorities. The erosion and sediment control plan shall be implemented and adapted to meet the varying situations as work on site progresses.
 - Monitor all erosion and sediment control devices to the satisfaction of the superintendent and the local authority.
 - When stormwater pits are constructed prevent silt runoff entering the pits unless silt flows are controlled around pits.
 - Minimize the area of site being disturbed at any one time.
 - Protect all stockpiles of materials from scour and erosion. Do not stockpile loose material in roadways, near drainage pits or in watercourses.
 - All soil and water control measures are to be put back in place at the end of each working day, and modified to best suit site conditions.
 - Control water from upstream of the site such that it does not enter the disturbed site before any erosion control pits.
 - All construction vehicles shall enter and exit the site via the temporary construction entry/exit.
 - All vehicles leaving the site shall be cleaned and inspected before leaving.
 - Maintain all stormwater pipes and pits clear of debris and sediment, keep stormwater system and clean out after each storm event.
 - Once out of erosion and sediment control devices after each storm event.
- ### SEQUENCE OF WORKS
- Prior to commencement of excavation the following soil management devices must be installed.
 - Construct silt fences below the site and across all potential runoff sites.
 - Construct temporary construction entry/exit and divert runoff to suitable control systems.
 - Construct measures to divert upstream flows into existing stormwater system.
 - Construct sedimentation traps/basins including outlet control and overflow.
 - Construct turf lined swales.
 - Provide sandbag sediment traps upstream of existing pits.
 - Construct geotextile filter pit around around all proposed pits as they are constructed.
 - On completion of pavement provide sand bag inlet sediment traps around pits.
 - Provide and maintain a strip of turf on both sides of all roads after the construction of kerbs.
- ### EROSION AND SEDIMENT CONTROL LEGEND
- Butter
 - Siltation fence
 - Stormwater pit with Geotextile filter surround
 - Catch drain
 - Sandbag sediment trap





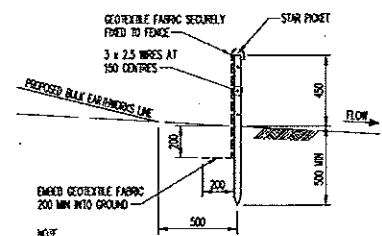
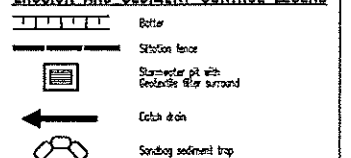
EROSION AND SEDIMENT CONTROL NOTES

1. All work shall be carried out in accordance with:
 - (A) Local authority requirements,
 - (B) EPA - Pollution control manual for urban stormwater,
 - (C) Department of conservation and land management manual - Urban Erosion & Sediment Control.
2. Erosion and sediment control drawings and notes are provided for the whole of the works. Should the Contractor stage these works then the design may require to be modified. Variation to these details may require to be approved by the relevant authority. The erosion and sediment control plan shall be implemented and adapted to meet the varying situations as work on site progresses.
3. Maintain all erosion and sediment control devices to the satisfaction of the superintendent and the local authority.
4. When stormwater pits are constructed prevent site runoff entering the pits unless all forces are erected around pits.
5. Within the area of site being disturbed at any one time.
6. Protect all stockpiles of materials from scour and erosion. Do not discharge loose material in roadways, near drainage pits or in watercourses.
7. All soil and water control measures are to be put back in place at the end of each working day, and modified to best suit site conditions.
8. Control water from upstream of the site such that it does not enter the disturbed site.
9. All construction vehicles shall enter and exit the site via the temporary construction entry/exit.
10. All vehicles leaving the site shall be cleaned and inspected before leaving.
11. Maintain all stormwater pipes and pits clear of debris and sediment. Inspect stormwater system and clean out after each storm event.
12. Open up all erosion and sediment control devices after each storm event.

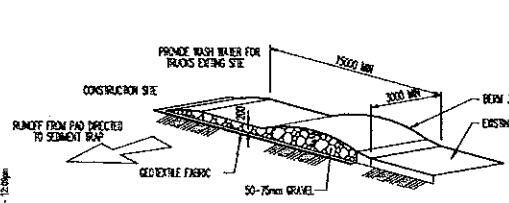
SEQUENCE OF WORKS

1. Prior to commencement of excavation the following soil management devices must be installed.
 - 1.1. Construct all fences below the site and across all potential runoff lines.
 - 1.2. Construct temporary construction entry/exit and divert runoff to suitable control systems.
 - 1.3. Construct measures to divert upstream flows into existing stormwater system.
 - 1.4. Construct sedimentation traps/basins including outlet control and overflow.
 - 1.5. Construct full final pads.
 - 1.6. Install silt fencing upstream of existing pits.
 - 1.7. Construct geotextile filter pit surround around all proposed pits as they are constructed.
2. On completion of pavement, provide sand bag barb inlet sediment traps around pits.
3. Provide and maintain a strip of turf on both sides of all roads after the construction of kerbs.

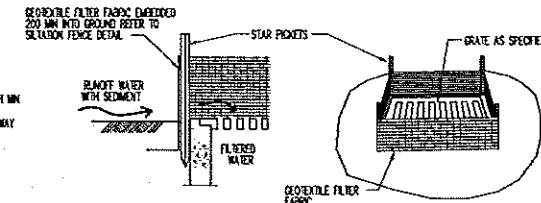
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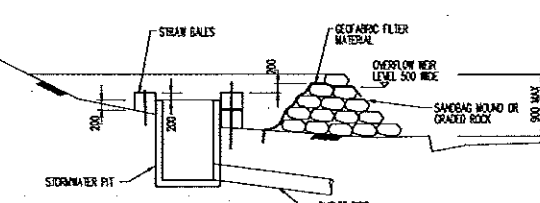
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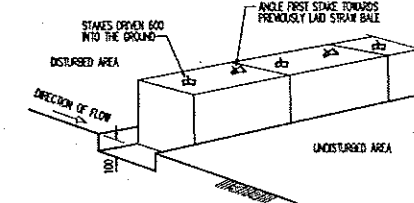
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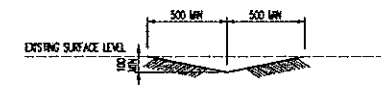
GEOTEXTILE FILTER PIT SURROUND
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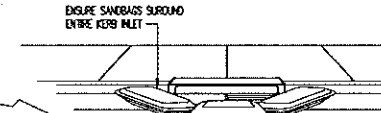
SEDIMENTATION TRAP
NOT TO SCALE



STRAW BALE SEDIMENT FILTER
NOT TO SCALE



TYPICAL SECTION THROUGH CATCH DRAIN
SCALE 1:20



SANDBAG SEDIMENT INLET TRAP - TYPE A
NOT TO SCALE

Rev	Description	Eng	Draw	Date	Rev	Description	Eng	Draw	Date
P3	ISSUE FOR APPROVAL	SR	JW	26.08.07					
P1	ISSUE FOR CA	NR	DA	15.01.05					
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CLIENT
BELMORGAN PROPERTY DEVELOPMENT
PO BOX 498 WARRAWONG NSW 2502

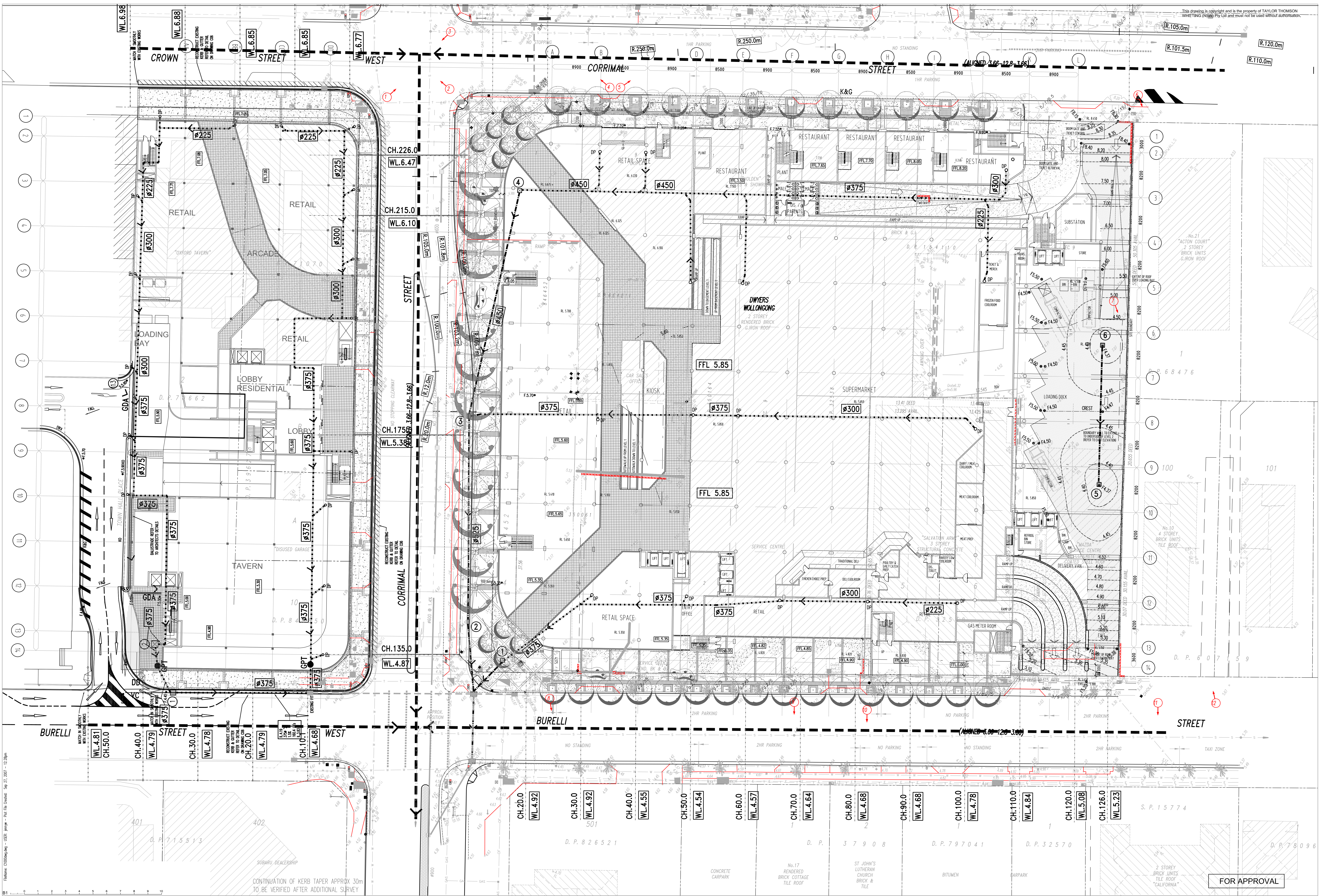
TaylorThomsonWhitting
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Taylor Thomson Whitting (Pty) Ltd A.C.N. 112 533 777

Project
CROWN STREET EAST REDEVELOPMENT WOLLONGONG

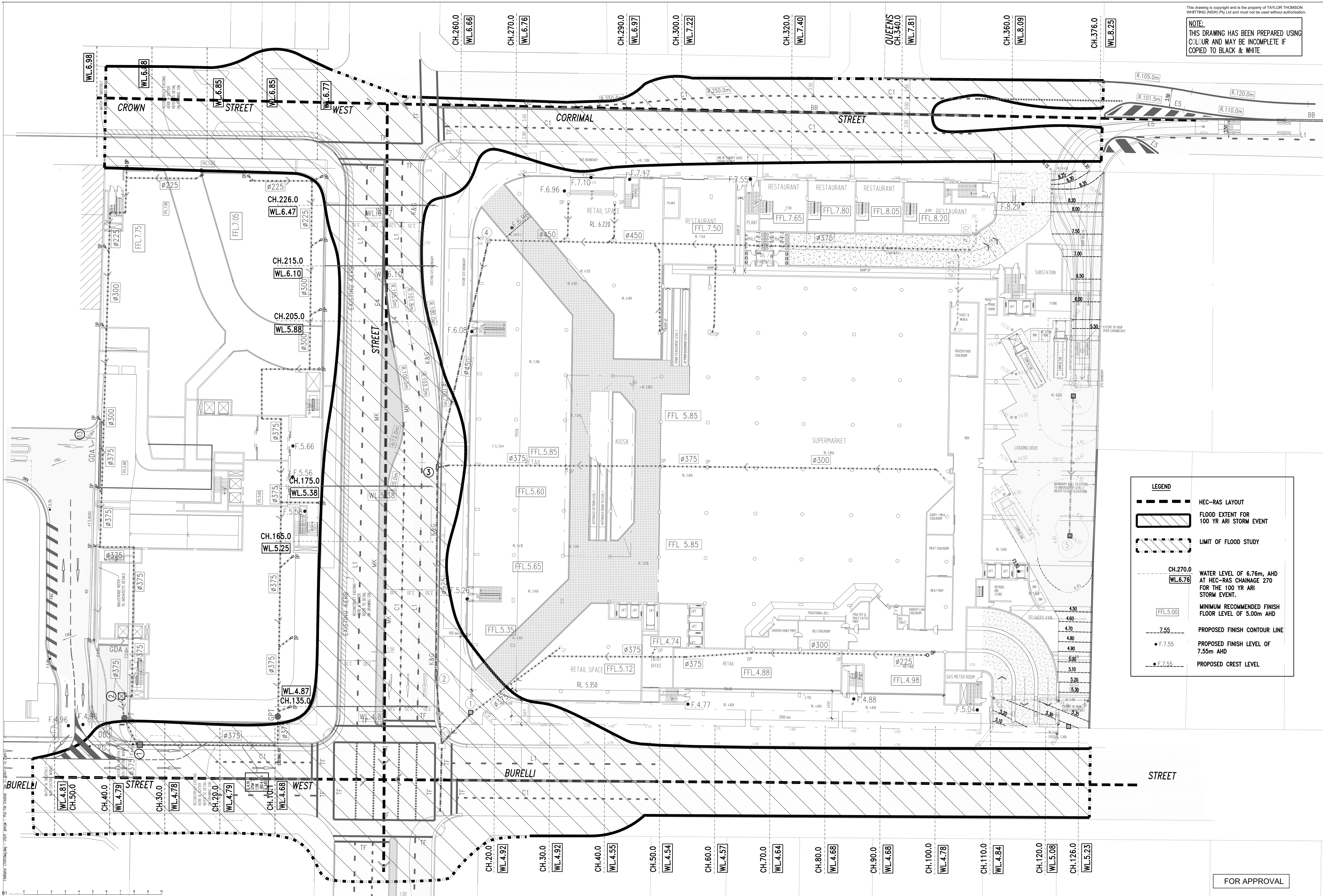
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Job No
C1005
Revision
P3
Plot File Created: Sep 27, 2007 - 12:00pm

FOR APPROVAL



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FOR APPROVAL

P2 ISSUE FOR APPROVAL		SB	JW	26.09.07										
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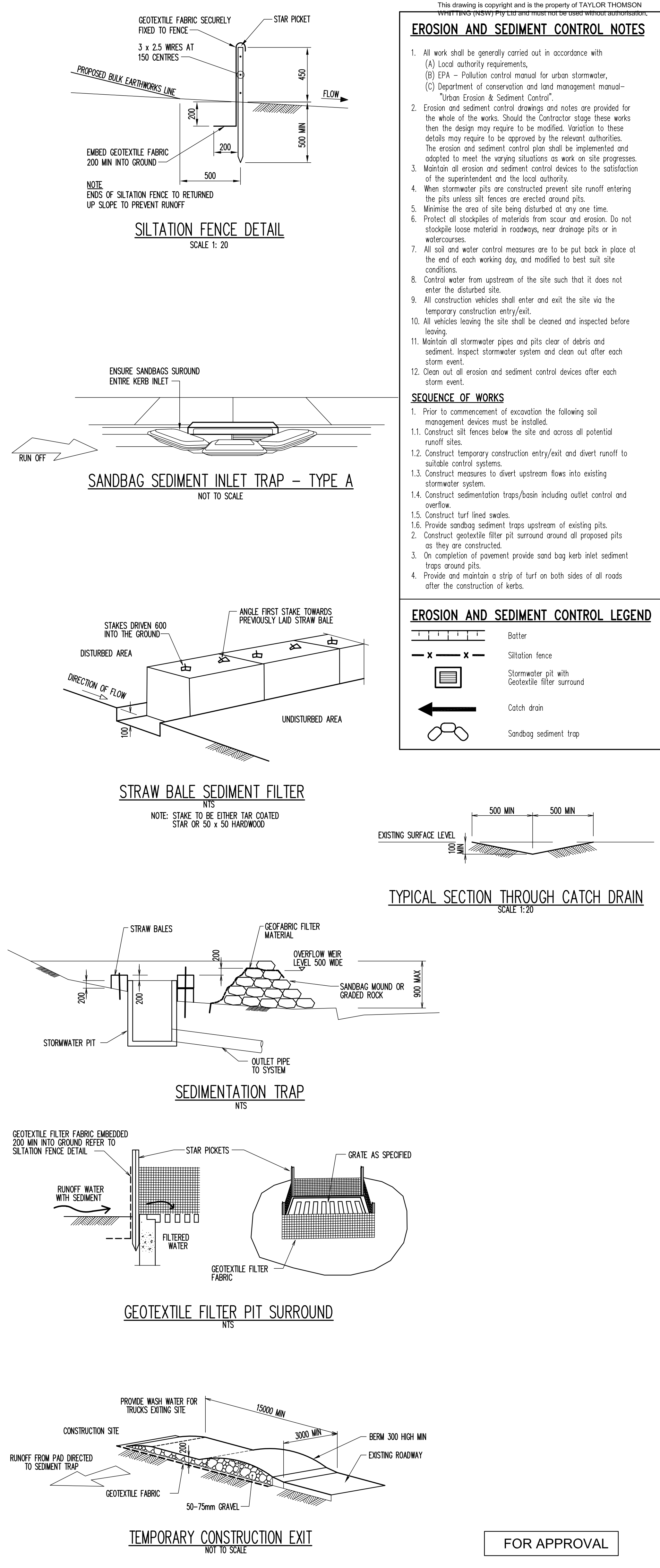
CLIENT
BELMORGAN PROPERTY
DEVELOPMENT
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Taylor Thomson Whitting (NSW) Pty Ltd A.C.N. 113 578 377

Project
CROWN STREET EAST
REDEVELOPMENT
WOLLONGONG

Sheet Subject
FLOOD EXTENTS

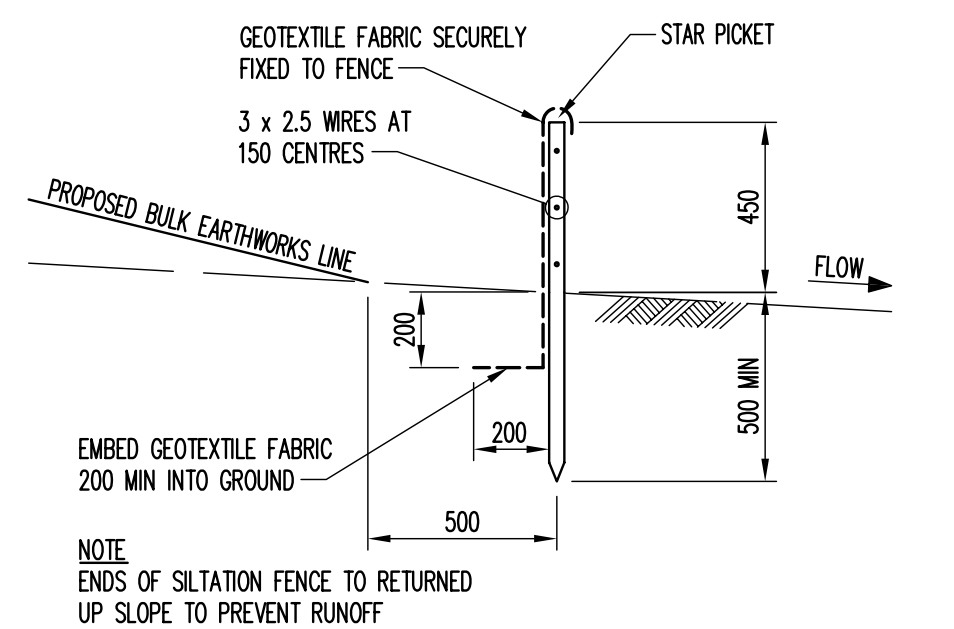
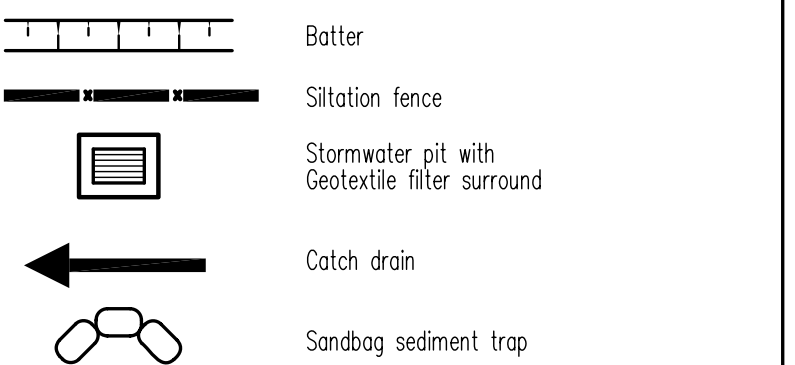
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Revision
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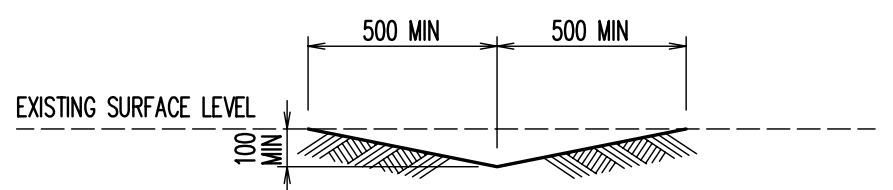
FOR APPROVAL

- ### SEQUENCE OF WORKS

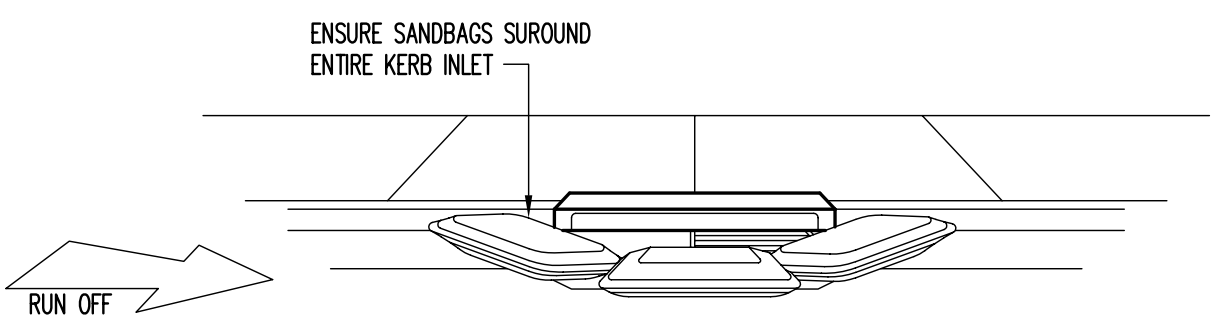
- ### EROSION AND SEDIMENT CONTROL LEGEND



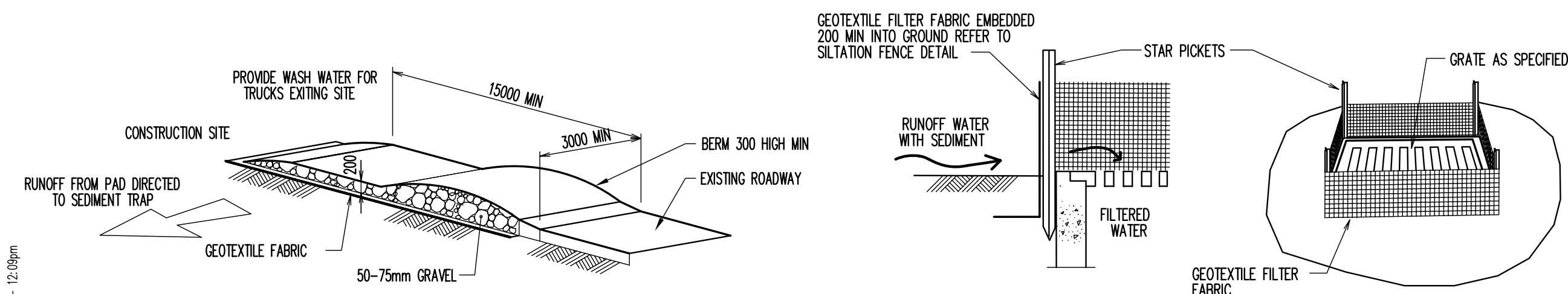
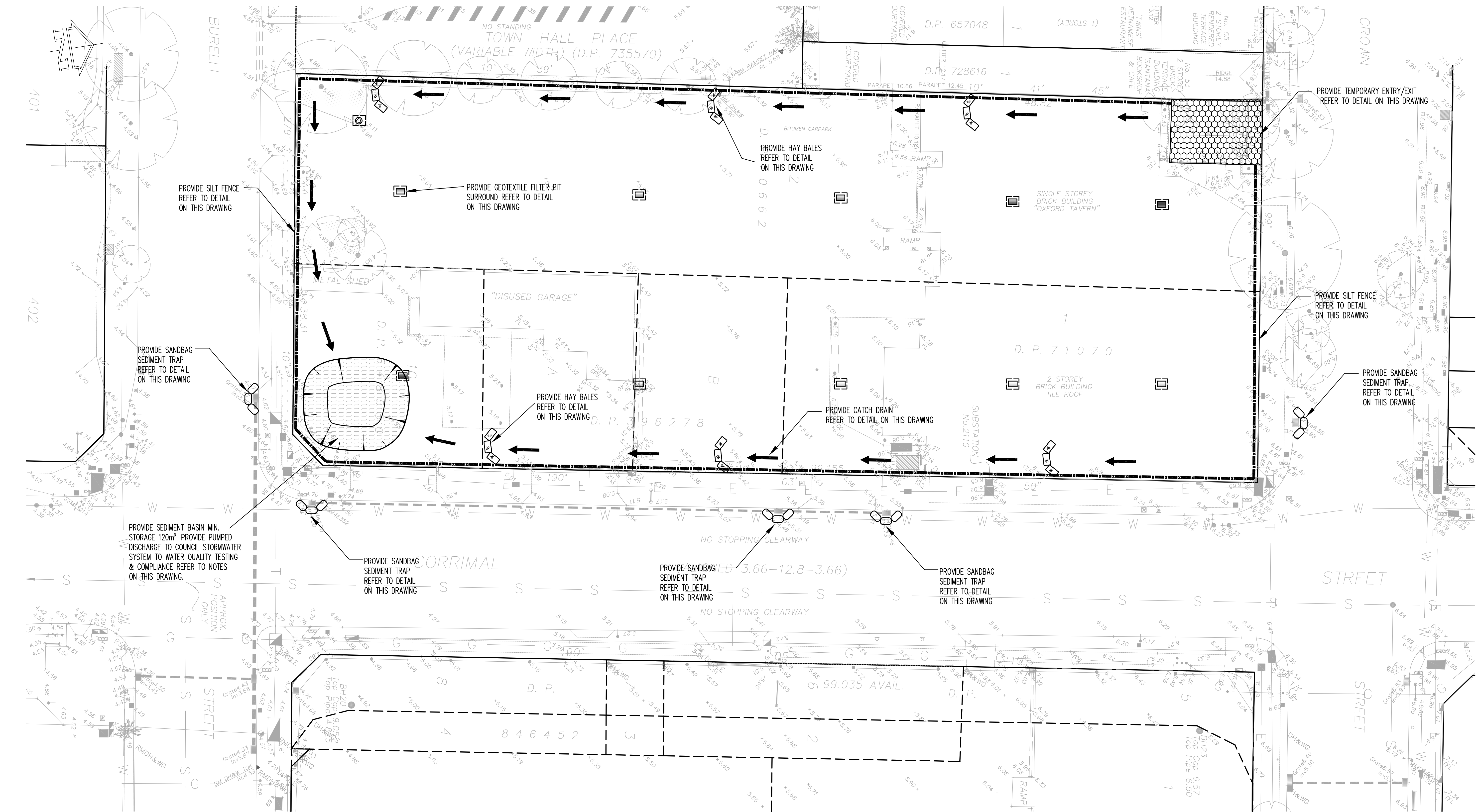
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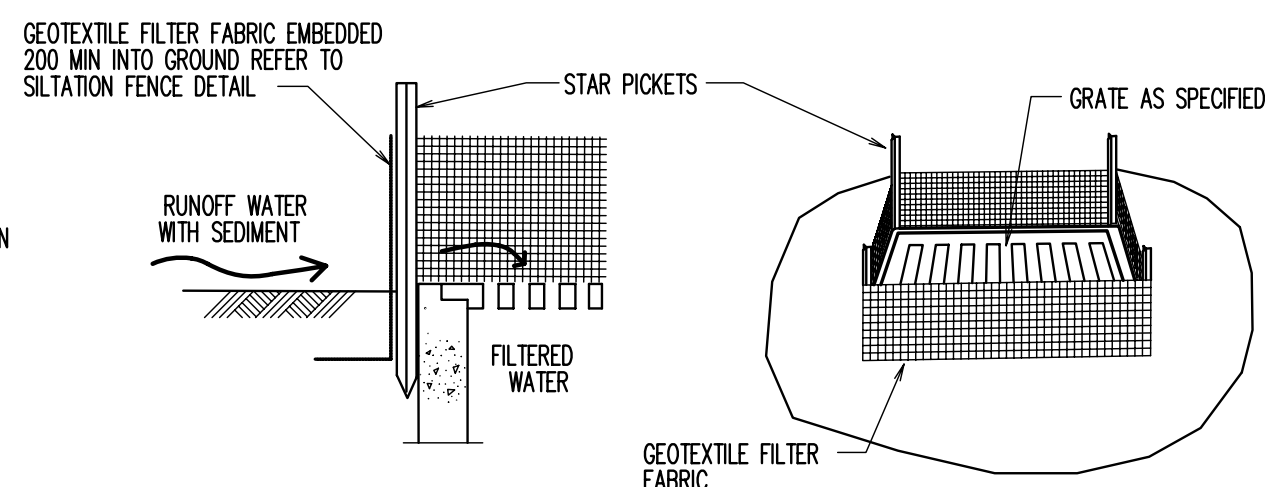
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SCALE 1:20



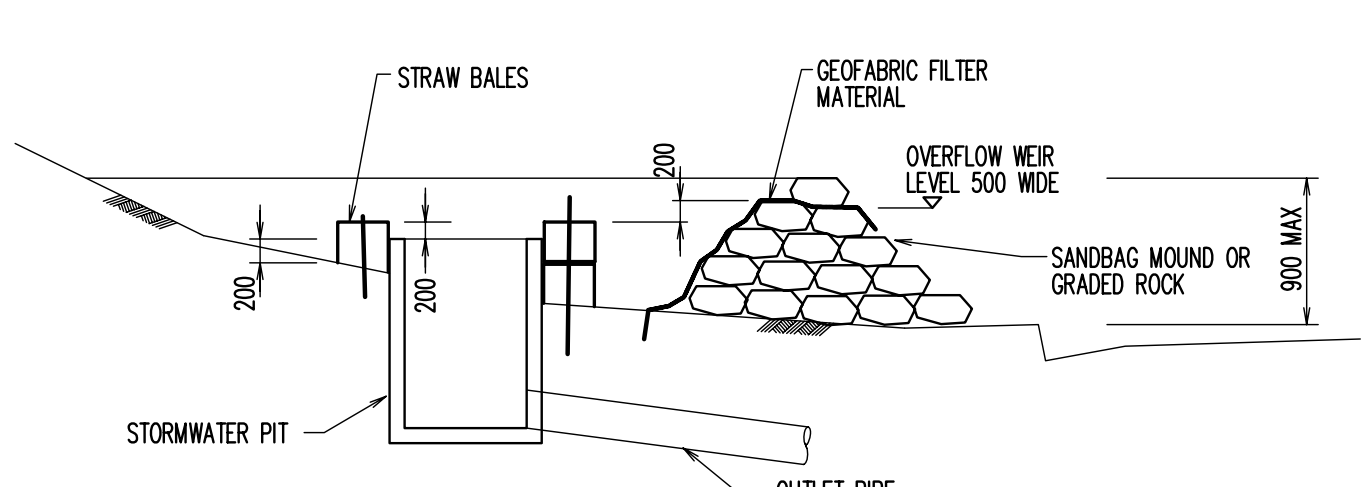
SANDBAG SEDIMENT INLET TRAP – TYPE A
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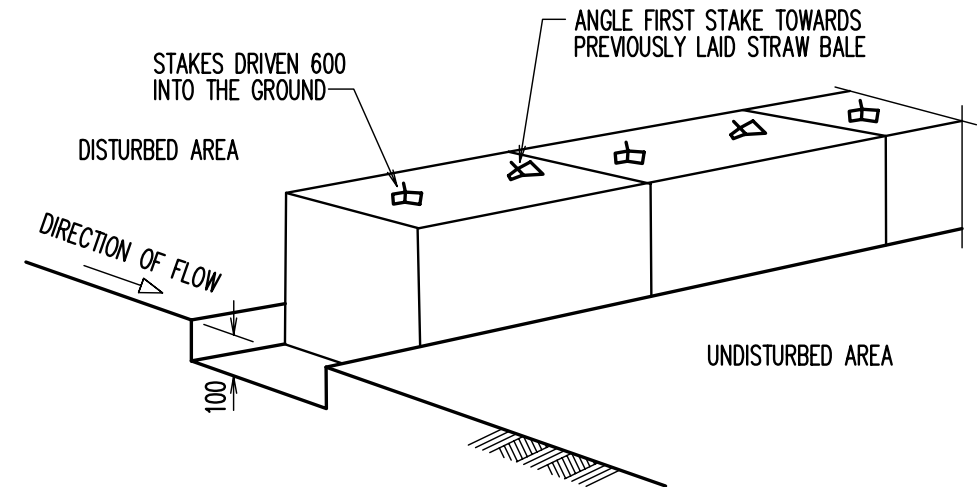
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GEOTEXTILE FILTER PIT SURROUND

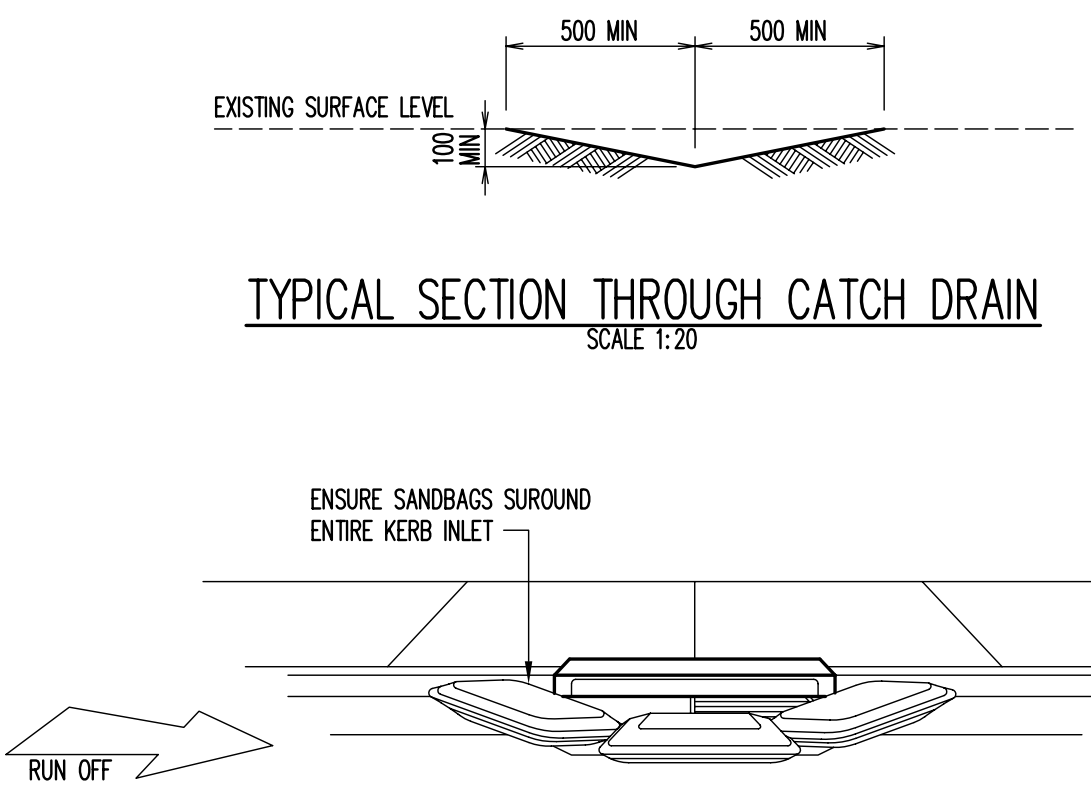


SEDIMENTATION TRAP
NTS



STRAW BALE SEDIMENT FILTER

NOTE: STAKE TO BE EITHER TAR COATED
STAR OR 50 x 50 HARDWOOD



SANDBAG SEDIMENT INLET TRAP – TYPE A
NOT TO SCALE

FOR APPROVAL

[illegible]

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Sheet Subject

**EROSION AND SEDIMENT
CONTROL PLAN STAGE 3**

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