Failford Road to Tritton Road

Review of environmental factors - Appendix F

Hydraulic investigations of pavement runoff

May 2008

PACIFIC HIGHWAY UPGRADE

FROM

Failford Road to Tritton Road

HYDRAULIC INVESTIGATION

OF

TRANSVERSE DRAINAGE STRUCTURES

March 2006

PACIFIC HIGHWAY UPGRADE - HYDRAULIC INVESTIGATION OF PAVEMENT RUNOFF

Introduction

The RTA Bridge section, at the request of the RTA Hunter Region, has undertaken the concept checking and analysis of the transverse drainage structures along the Pacific Highway. This is part of the Pacific Highway Upgrade along the section from Failford Road to Tritton Road.

There are 14 transverse drainage structures along this section of the Pacific Highway from chainage 146,590 to 150,600. Due to the road upgrade all of the existing transverse drainage structures will be extended. Included in the upgrade works will be 5 new culverts located at 2 junctions.

The existing and proposed structures were analysed for the 1 in 50 year ARI and 1 in 100 year ARI flood events.

Assumptions and Information

The following information and assumptions were used for this investigation.

- The plans, longsection of drainage structures and topographic maps were supplied by Brad Spalding of the Hunter Region Technical Services.
- The runoff coefficient for the catchment upstream of the highway of 0.5 was obtained from ARR Vol 2.
- The transverse drainage structures were analysed for the 1 in 50 year and 1 in 100 year flood in accordance to the Upgrading the Pacific Highway Design Guidelines.
- The catchment areas upon which the design flows were supplied by Hunter Region Technical Services. This information was reviewed and checked by the Bridge Engineering Section.
- It was assumed the culverts would be inlet controlled.
- For the structures where the culvert size varied, the analysis was performed under the assumption that the entire length of culvert was the smallest size.

Catchment Information

The following steps were followed in determining the catchment flow for each of the drainage structures.

A) The catchment areas determined were based on 10m contour plans and 1m contours plans within the road boundaries. These were provided by the Hunter Region Technical Services.

B) Flows for the 1 in 50 year ARI and 1 in 100 year ARI floods were determined for each catchment area using the Rational Method.

C) The culverts were analysed for the flows based on the 1 in 50 and 1 in 100 year ARI flood events.

Conclusion

Blockage was not considered in this analysis as most of the drainage structures have relatively small openings. If a 50 percent blockage was to be considered in analysis it would be expected that the 1 in 100 year ARI flood level would overtop the highway. In the existing drainage structures no blockage is evident to date. The impact of flooding due to blockage would affect mainly grazing country.

The Probable Maximum Flood was not considered in this analysis as there is a low risk, in terms of impact, upstream of the highway.

For the analysis consideration was given to interaction between catchment areas depending on the levels of crests. It was found in this analysis of the existing structures that the velocity exceeded 3 m/s on 7 out of 14 of the structures for the 1 in 100 year ARI flows. The analysis for the proposed extension of existing structures indicates that 10 of the 14 culverts had a velocity exceeding 3 m/s. On the table for results it is mentioned that all 10 will require energy dissipaters in order to prevent scour at the outlet of the structures, however for the cases of T6, T11 and T15 this may be reviewed. If the existing structures do not currently display evidence of scour or erosion at the outlet, then energy dissipaters may not be required. This is due to the results indicating that the extended culverts improve on the existing flow velocities.

All structures were analysed with the invert levels on natural ground surface. It was found for culvert DT4 that lowering of the upstream invert resulted in a decrease in flow velocity, however an energy dissipater is still recommended. Drop structures at the outlet are not recommended as an alternative to energy dissipaters.

It was noted that for the extension of culverts, culvert T4 exceeds 100m in length. For safety reasons another arrangement for this culvert may be required.

In terms of the 1 in 100 year flood level encroaching or overtopping the highway, it was found that only one of the culverts encroached on the road as well as overtopping the road. This occurred on culvert T18 which is the service road.

The summary of the results are shown in Table 1.

Fiona Chan
Project Engineer
Bridge Section

Attachments

- Table 1 – Summary of the design flows contributing to the transverse drainage structures and results from analysis.
- Catchment Plan
- Location plans of Drainage Structures.
- Existing and Proposed Drainage Structure Sections
- Intensity Rainfall Duration (IFD) Table

Pacific Highway Between Taree and Nabiac

TRANSVERSE DRAINAGE STRUCTURES

DATE: 28-Mar-06

For Concept Design

C_{50} = 0.540 C_{100} = 0.566

		Culvert Size	Inlet Invert	Outlet RL	Length	Slope	Area	$^{50}I_{Tc}$	$^{100}I_{Tc}$	Q_{50}	Q_{100}	Edge of Road RL	Road High point RL	FL 50 u/s	Velocity for 1 in 50 yr	FL 100 u/s	Velocity for 1 in 100 yr	Freeboard to edge of road	Overtopping road high point	Crest breach height	Q to reach Crest	Velocity at Crest ht.
Existing	T1	3 X 2.4w X 0.6h RCBC					0.249	118.110	135.235	4.407	5.291											
Existing	T2	3 x 2.1w x 0.9h RCBC					0.506	102.894	117.860	7.815	9.387											
Existing	T3	600 RPC					0.023	179.205	204.944	0.619	0.742											
Existing	T4	600 RCP	23.070	20.955	74.295	0.028	0.015	173.247	198.148	0.754	0.904	24.348	25.333	24.836	3.712	25.898	4.263	Encroaches	Overtops	23.900	0.530	2.752
Prposed	T4	600 RCP	23.070	22.058	39.119	0.026	0.015	192.023	219.557	0.432	0.518	24.348	26.078	24.377	2.576	25.087	3.044	Overflows to T3		23.900	0.370	2.231
Proposed	T4	750 RCP	21.918	19.887	80.072	0.025	0.014	194.375	222.238	0.408	0.490	24.485	26.078	22.876	2.804	23.036	3.285	1.449		-	-	-
Existing	T5	3 X 1200 RCP	19.641	18.684	60.611	0.016	0.386	107.815	123.478	6.247	7.502	26.075	27.000	20.927	2.557	21.092	2.855	4.983		-	-	-
Proposed	T5	3 X 1200 RCP	20.296	18.437	91.571	0.020						26.075	27.688	21.582	3.147	21.746	3.148	4.329		-	-	-
Existing	T7	2 X 2.1w X 2.1h RCBC	22.037	21.863	52.965	0.003	1.062	87.434	100.207	13.938	16.751	27.211	27.424	23.723	2.600	23.943	2.785	3.268		-	-	-
Proposed	T7	2 X 2.1w X 2.1h RCBC	22.037	21.771	81.000	0.003						27.211	27.424	23.723	2.601	23.943	2.785	3.268		-	-	-
Existing	T6	1050 RCP Replaced by 1.5	21.703	20.311	84.802	0.016	0.339	110.001	125.974	5.597	6.722	24.498	25.111	25.147	5.504	25.157	5.543	Encroaches	Overtops	-	-	-
Proposed	T6 - 36m	1500 RCP	21.703	20.902	35.912	0.022				5.262	6.319	24.498	24.642	23.903	4.158	24.353	4.828	0.145		-	-	-
Proposed	T6 - 73m	1800 RCP	20.500	20.104	73.000	0.005				5.597	6.722	24.498	25.164	22.397	3.017	22.644	3.485	1.854		-	-	-
Existing	T8	600 RCP	31.021	29.013	32.148	0.062	0.028	174.183	199.216	0.732	0.878	33.850	34.076	32.162	3.771	32.460	4.413	1.390		31.880	0.560	3.036
Proposed	T8	600 RCP	31.021	28.870	57.300	0.038						33.850	34.077	32.862	3.720	33.617	4.125	0.233		31.880	0.560	3.138
Existing	T9	450 RCP	37.257	36.751	26.700	0.019	0.016	189.680	216.886	0.456	0.546	39.345	39.561	39.213	3.776	39.566	4.117	Encroaches	Overtops	38.190	0.310	2.742
Proposed	T9	450 RCP	37.257	35.325	55.860	0.035						39.345	39.561	39.333	3.756	39.568	3.921	Overflows to T8		38.190	0.355	3.072
Existing	T10	525 RCP	35.904	34.905	33.086	0.030	0.073	147.384	168.651	1.615	1.938	38.850	39.060	39.083	5.333	39.088	5.387	Encroaches	Overtops	37.270	0.580	3.602
Proposed	T10	525 RCP	35.904	33.565	57.110	0.041						38.850	39.060	39.084	5.094	39.089	5.144	Overflows to T11		37.270	0.630	3.847
Existing	T11	900 RCP	32.038	29.961	45.009	0.046	0.056	153.685	175.837	1.292	1.550	36.320	36.369	33.159	3.296	33.339	3.688	2.981		-	-	-
Proposed	T11	900 RCP	32.038	29.330	77.000	0.035						36.320	36.369	33.163	3.137	33.344	3.693	2.976		-	-	-
Existing	T12	1050 RCP	30.420	28.792	54.414	0.030	0.172	126.825	145.189	3.274	3.931	32.171	33.997	32.694	4.847	33.334	5.628	Encroaches		30.900	0.626	3.234
Proposed	T12	1050 RCP	30.420	27.817	83.300	0.031						32.171	34.111	32.693	4.874	33.333	5.650	Overflows to T14		30.900	0.644	3.417
Existing	T13	450 RCP	29.378	29.017	34.743	0.010	0.036	167.196	191.247	0.903	1.084	32.580	32.613	32.629	4.505	32.645	4.606	Encroaches		30.800	0.365	2.876
Proposed	T13	450 RCP	29.378	27.857	62.640	0.024						32.580	32.613	32.630	4.174	32.634	4.222	Overflows to T14		30.800	0.400	3.041
Existing	T14	2 X 2.7w X 2.1h RCBC	28.364	28.265	21.095	0.005	0.800	93.323	106.933	11.206	13.465	32.000	32.020	29.597	2.127	29.758	2.286	2.242		-	-	-
Proposed	T14	2 X 2.7w X 2.1h RCBC	28.364	28.246	52.000	0.002						32.000	32.020	29.597	2.188	29.758	2.348	2.242		-	-	-
Existing	T15	450 RCP	28.079	27.025	35.433	0.030	0.012	199.508	228.088	0.359	0.431	29.529	29.529	28.949	2.987	29.449	3.457	0.080		29.300	0.410	3.322
Proposed	T15	450 RCP	28.079	26.147	64.820	0.030						29.529	29.529	29.070	2.989	29.534	3.274	Overflows to T16		29.300	0.377	3.113
Existing	T16	2 X 2.1w X 1.2h RCBC	10.292	9.975	43.580	0.007	0.567	100.669	115.320	8.568	10.292	13.262	13.588	11.511	2.359	11.670	2.616	1.592		-	-	-
Proposed	T16	2 X 2.1w X 1.2h RCBC	10.695	9.975	49.853	0.014						13.262	13.588	11.914	2.714	12.073	2.725	1.189		-	-	-
Existing	T18	600 RCP	24.986	24.620	17.583	0.021	0.027	175.140	200.307	0.710	0.851	27.086	27.205	26.611	3.733	27.140	4.345	Encroaches		-	-	-
Proposed	T18	600 RCP	25.040	24.502	30.220	0.018						27.219	27.205	26.893	3.617	27.419	4.114	Encroaches	Overtops	-	-	-
Proposed	DT1	900 RCP	18.107	16.875	39.650	0.031	Flows from Areas DT1 + DT2+ T3 =			0.984	1.180	25.729	25.729	19.052	2.840	19.173	2.847	6.556		-	-	-
Proposed	DT2	450 RCP	23.596	20.358	43.480	0.074	0.005	223.585	255.529	0.168	0.201	29.023	29.062	24.058	3.103	24.116	3.101	4.907		-	-	-
Proposed	DT3	600 RCP	22.608	22.220	30.950	0.013	0.007	215.265	246.047	0.226	0.271	25.887	25.887	23.072	1.468	23.132	1.577	2.755		-	-	-
Proposed	DT4	1200RCP	30.700	28.879	51.512	0.041	Flows from Areas DT4 + T10 =			2.539	3.046	38.696	38.872	32.160	3.712	32.374	3.697	6.322		-	-	-
Proposed	DT5	450 RCP	25.554	24.623	28.600	0.041	0.005	223.585	255.529	0.168	0.201	27.431	27.431	26.016	1.899	26.074	1.896	1.357		-	-	-

DT1 Catchment area only	0.006	219.208	250.542	0.197	0.237
DT4 Catchment area only	0.037	166.393	190.331	0.924	1.108

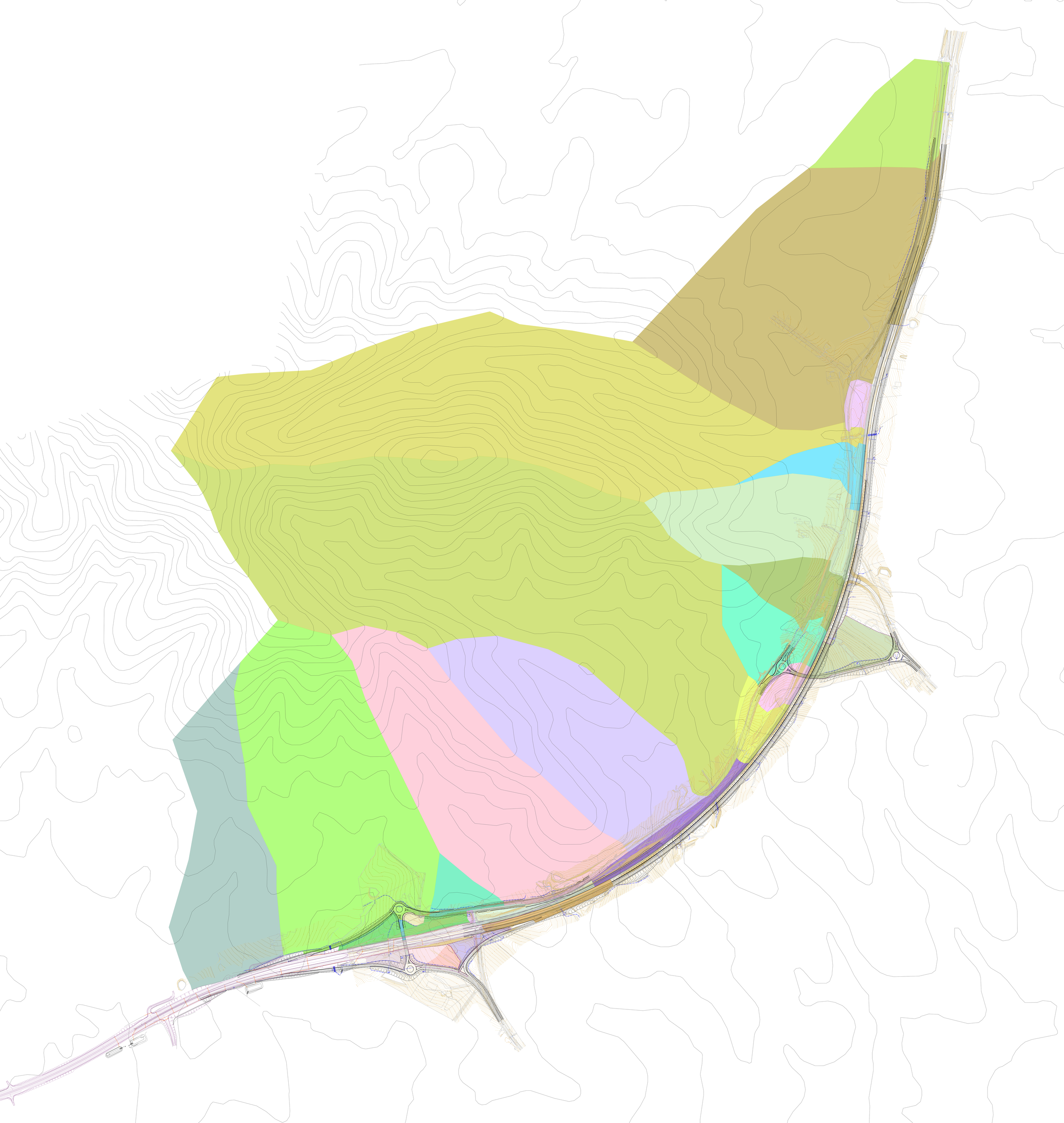
LEGEND

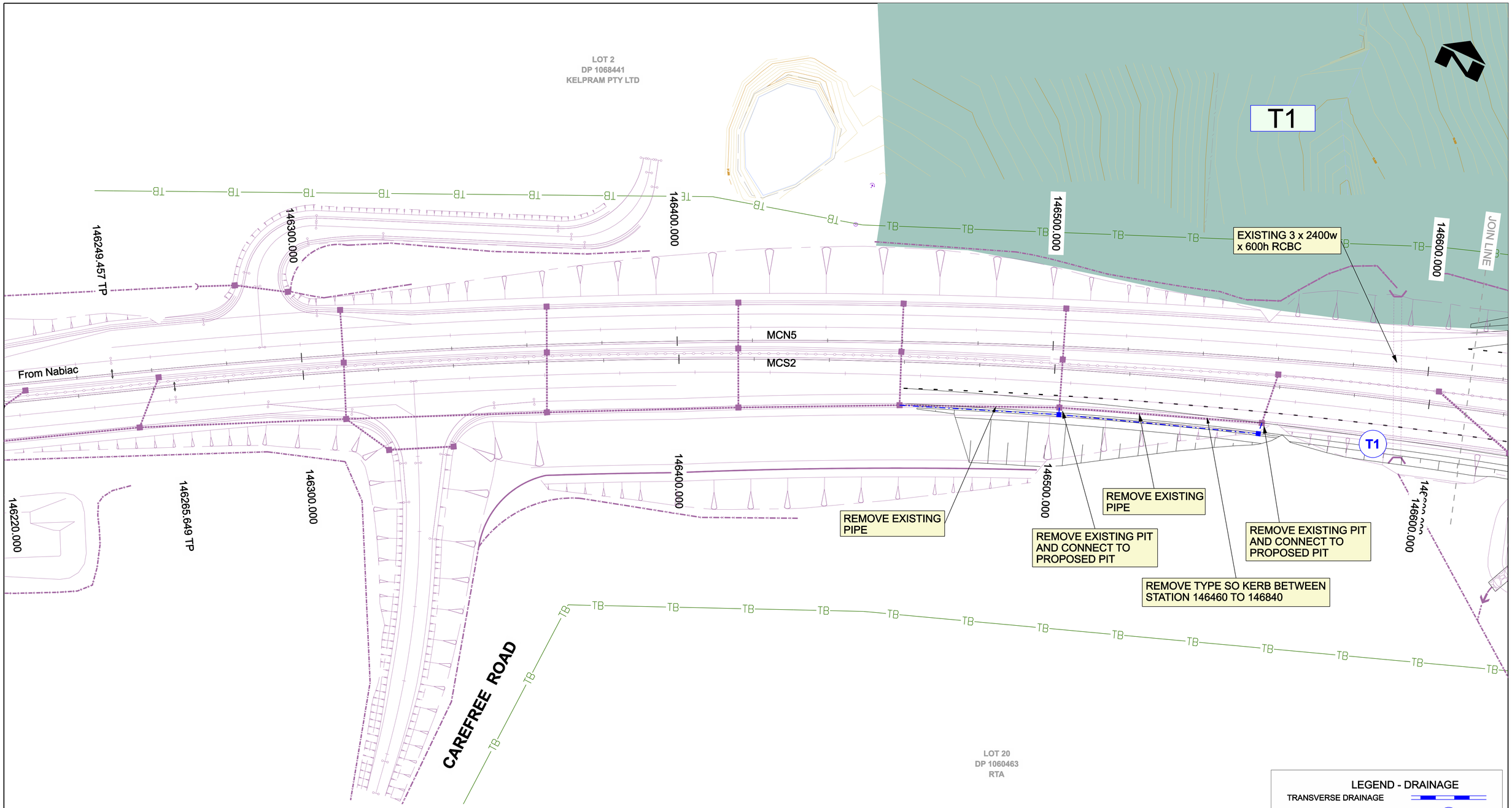
╬ Recieves flows from other catchments

▲ Overflows to other catchments

* No interaction with other culvert catchments

		1 in 50 yr			1 in 100 yr					
		Flow at Inlet	U/S Flood Level	Velocity	Flow at Inlet	U/S Flood Level	Velocity	Freeboard to edge of road 1 in 50 yr Event	Freeboard to edge of road 1 in 100 yr Event	Comments
Existing	T1									Not in Scope
Existing	T2									Not in Scope
Existing	T3	╬			╬					Not in Scope
Existing	T4	0.530 ▲	23.900	2.752	0.530 ▲	23.900	2.752	0.448	0.448	Overflow to Catchment T3 will occur when crest of RL23.900 is breached.
Proposed	T4	0.370 ▲	23.900	2.231	0.370 ▲	23.900	2.231	0.448	0.448	
Proposed	T4	0.778 ╬	22.828	2.559	0.860 ╬	22.893	2.860	1.657	1.592	
Existing	T5	6.247 *	20.927	2.557	7.502 *	21.092	2.855	5.148	4.983	Velocity increased due to length of pipe increasing in proposed. Energy Dissipater is required.
Proposed	T5	6.247 *	21.582	3.147	7.502 *	21.746	3.148	4.493	4.329	Excavation and re-shaping of creek required for 55m downstream of outlet.
Existing	T7	13.938 *	23.723	2.600	16.751 *	23.943	2.785	3.488	3.268	Excavation and re-shaping of creek is required D/S to be connected to existing watercourse.
Proposed	T7	13.938 *	23.723	2.601	16.751 *	23.943	2.785	3.488	3.268	
Existing	T6	5.915 ╬	25.150	5.517	7.276 ╬	25.161	5.547	Encroaches	Encroaches	Analysis indicates that the Existing structure encroaches the road, this is based on Catchment T6 and T6B entering culvert 1050 dia.
Proposed	T6 - 36m	5.535 ╬	23.881	4.121	6.828 ╬	24.400	4.890	0.617	0.098	Proposed culvert will have a break in pipe of 34m.
Proposed	T6 - 73m	5.870 ╬	22.458	3.112	7.231 ╬	22.753	3.811	2.040	1.745	Culvert T6 will receive overflow from Catchments T9 and T8. Energy Dissipater required.
Existing	T8	0.560 ▲	31.880	3.036	0.560 ▲	31.880	3.036	1.970	1.970	Overflow to Catchment T6 will occur when crest of RL 31.880 is breached, T8 will also receive overflow from catcment T9.
Proposed	T8	0.560 ▲	31.880	3.138	0.560 ▲	31.880	3.138	1.970	1.970	Energy Dissipater will be required D/S of outlet.
Existing	T9	0.310 ▲	38.190	2.742	0.310 ▲	38.190	2.742	1.155	1.155	Overflow to Catchment T8 will occur when crest of RL 38.190 is breached.
Proposed	T9	0.355 ▲	38.190	3.072	0.355 ▲	38.190	3.072	1.155	1.155	
Existing	T10	0.580 ▲	37.270	3.602	0.580 ▲	37.270	3.602	1.580	1.580	Overflow to Catchment T11 will occur when crest of RL 37.27 is breached.
Proposed	T10	0.630 ▲	37.270	3.847	0.630 ▲	37.270	3.847	1.580	1.580	Energy Dissipater will be required D/S of outlet.
Existing	T11	2.327 ╬	34.193	5.257	2.908 ╬	35.598	6.283	2.127	0.722	Excavation and reshaping of creek to be connected to existing watercourse.
Proposed	T11	2.277 ╬	34.564	4.983	2.858 ╬	35.891	5.718	1.756	0.429	Culvert T11 will receive overflow from Catchment T10. Energy Dissipater required due to high flow velocity.
Existing	T12	0.626 ▲	30.900	3.234	0.626 ▲	30.900	3.234	1.271	1.271	Overflow to Catchment T13 will occur when crest of RL 30.900 is breached.
Proposed	T12	0.644 ▲	30.900	3.417	0.644 ▲	30.900	3.417	1.271	1.271	Energy Dissipater will be required D/S of outlet.
Existing	T13	0.365 ▲	30.800	2.876	0.365 ▲	30.800	2.876	1.780	1.780	Overflow to Catchment T14 will occur when crest of RL30.800 is breached. T13 will also be receive overflow from
Proposed	T13	0.400 ▲	30.800	3.041	0.400 ▲	30.800	3.041	1.780	1.780	T12.
Existing	T14	14.393 ╬	29.821	2.346	17.489 ╬	30.093	2.532	2.179	1.907	Culvert 14 will receive overflow from catchments T12 and T13.
Proposed	T14	14.340 ╬	29.818	2.405	17.436 ╬	29.758	2.348	2.182	2.242	The culvert height may be reduced to 1500mm.
Existing	T15	0.359 *	28.949	2.987	0.431 *	29.300	3.322	0.580	0.229	Overflow to Catchment T16 will occur when crest of RL 29.300 is breached, however this will be only be for the 1 in 100 yr event.
Proposed	T15	0.359 *	29.070	2.989	0.431 *	29.300	3.113	0.459	0.229	Energy Dissipater will be required D/S of outlet.
Existing	T16	8.568 *	11.511	2.359	10.313 ╬	11.670	2.616	1.751	1.592	Ok
Proposed	T16	8.568 *	11.914	2.714	10.292 *	12.073	2.725	1.348	1.189	
Existing	T18	0.710 *	26.611	3.733	0.851 *	27.140	4.345	0.475	Encroaches	Overtopping of the service road will occur for this culvert.
Proposed	T18	0.710 *	26.893	3.617	0.851 *	27.419	4.114	0.326	Encroaches	Energy Dissipater will be required D/S of outlet.
Proposed	DT1	0.984 *	19.052	2.840	1.180 *	19.173	2.847	6.556		Ok
Proposed	DT2	0.168 *	24.058	3.103	0.201 *	24.116	3.101	4.946		Energy Dissipater will be required D/S of outlet.
Proposed	DT3	0.226 *	23.072	1.468	0.271 *	23.132	1.577	2.755		Ok
Proposed	DT4	2.539 *	32.160	3.712	3.046 *	32.374	3.697	6.498		Energy Dissipater will be required D/S of outlet.
Proposed	DT5	0.168 *	26.016	1.899	0.201 *	26.074	1.896	1.357		Ok





SEE SHEETS XX TO XX FOR
UTILITY DETAILS FROM SURVEY

DIAL 1100 BEFORE YOU DIG

Utility information shown on the plans does not depict any more than the presence of a service, based on available documentary evidence. The presence of a utility service, its size and location should be confirmed by field inspection, prior to the commencement of roadworks and the relevant utility plans obtained by dialling 1100 or Fax 1300 652 077 (Dial before you dig).
Caution should be exercised when working in the vicinity of all utility services.

LEGEND - DRAINAGE

- TRANSVERSE DRAINAGE
- TRANSVERSE STRUCTURE No. (T6)
- DRAINAGE PIPE
- DRAINAGE PIT
- DRAINAGE HEADWALL
- CATCH DRAIN
- DIVERSION CHANNEL
- SEDIMENTATION BASIN
- BUNDACREE CREEK TO POSSUM BRUSH WORKS

PRELIMINARY DRAWINGS
NOT FOR CONSTRUCTION. 28/03/06

No.	Amendment Description	Initials	Date
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RTA
TECHNOLOGY & TECHNICAL SERVICES
HUNTER TECHNICAL SERVICES
PROJECT DESIGN

ROADS AND TRAFFIC AUTHORITY OF NSW

SH10 PACIFIC HIGHWAY
THE GREAT LAKES AND GREATER TAREE CITY COUNCILS
FAILFORD ROAD TO TRITTON ROAD - CONCEPT DESIGN
DRAINAGE PLANS WITH CATCHMENTS
FOR HYDRAULIC INVESTIGATION

FILE No.	DRAWING	SHEET No.
*/***.****	*.DGN	

REGISTRATION NUMBER
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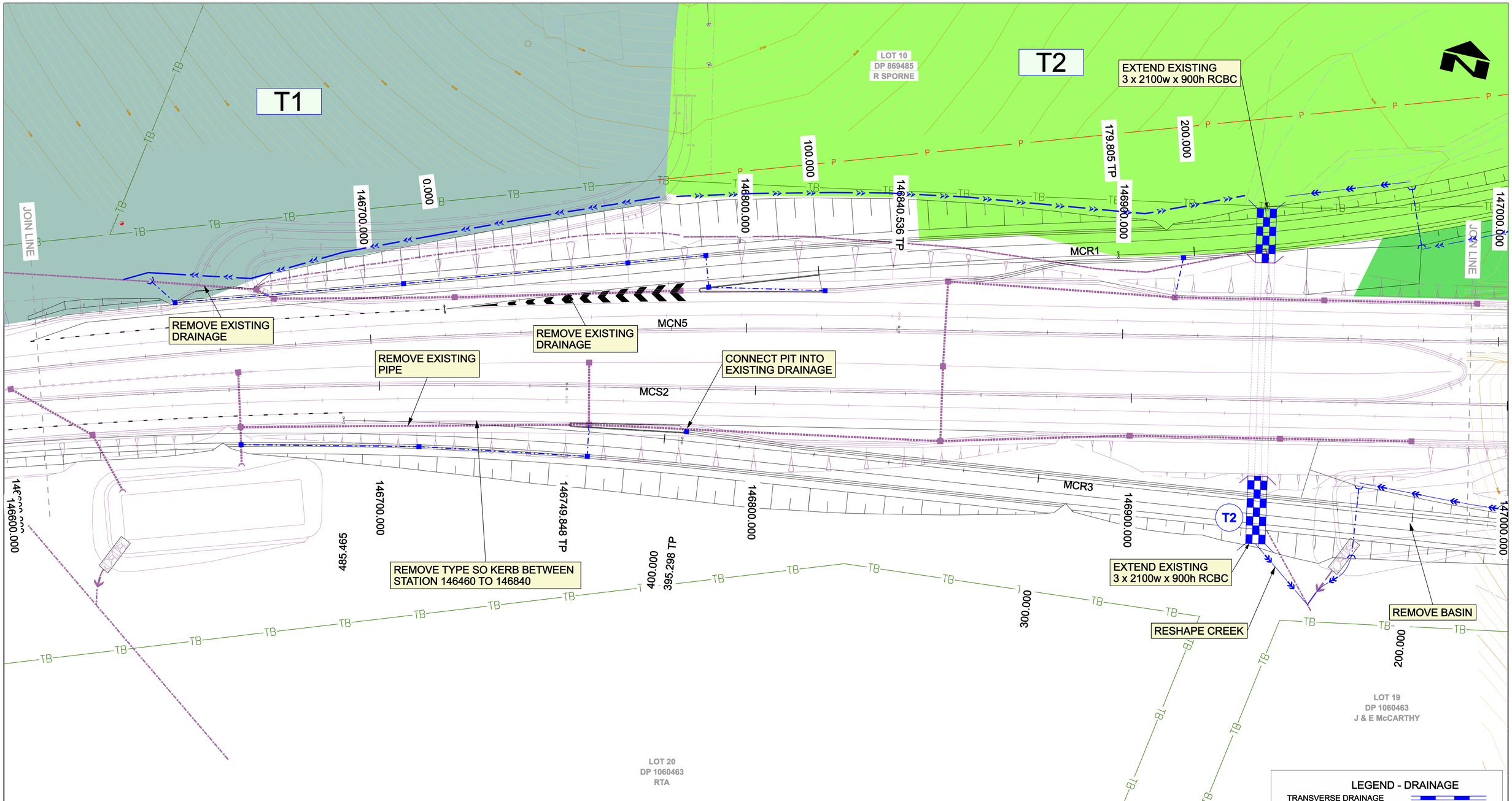

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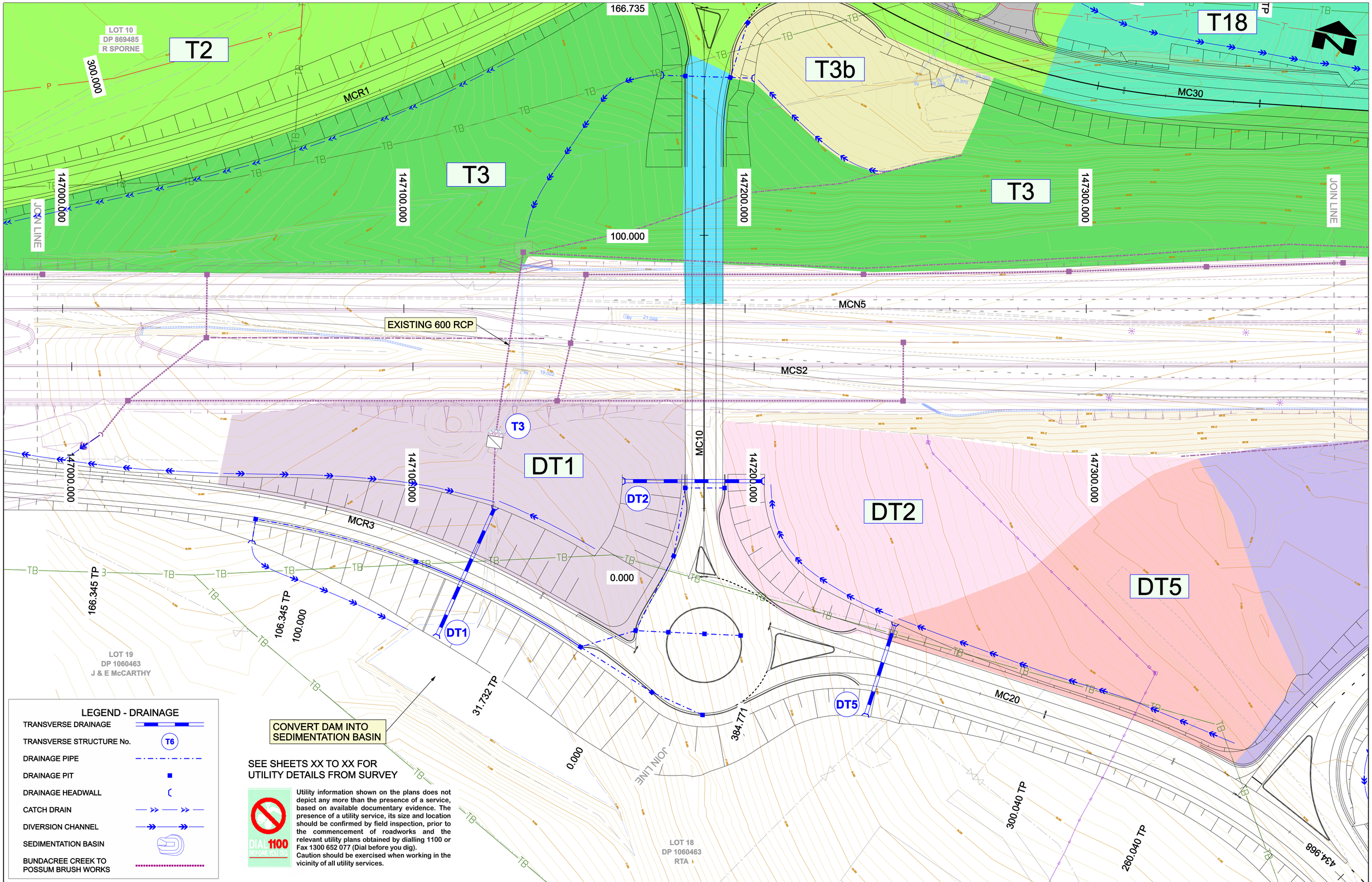

LEGEND - DRAINAGE

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- DRAINAGE PIT
- DRAINAGE HEADWALL
- CATCH DRAIN
- DIVERSION CHANNEL
- SEDIMENTATION BASIN
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HUNTER TECHNICAL SERVICES
PROJECT DESIGN

ROADS AND TRAFFIC AUTHORITY OF NSW

SH10 PACIFIC HIGHWAY
THE GREAT LAKES AND GREATER TAREE CITY COUNCILS
FAILFORD ROAD TO TRITTON ROAD - CONCEPT DESIGN
DRAINAGE PLANS WITH CATCHMENTS
FOR HYDRAULIC INVESTIGATION

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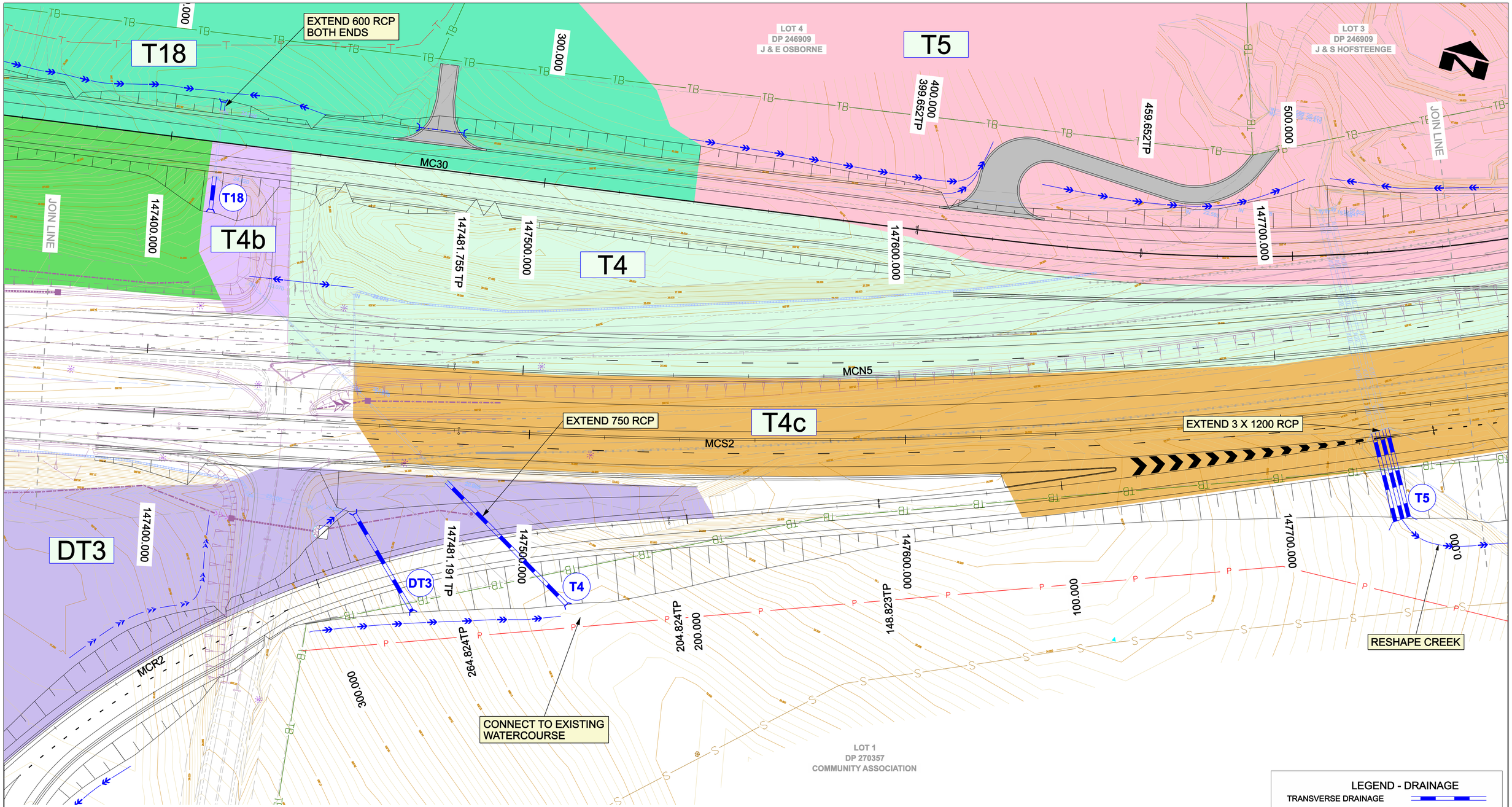

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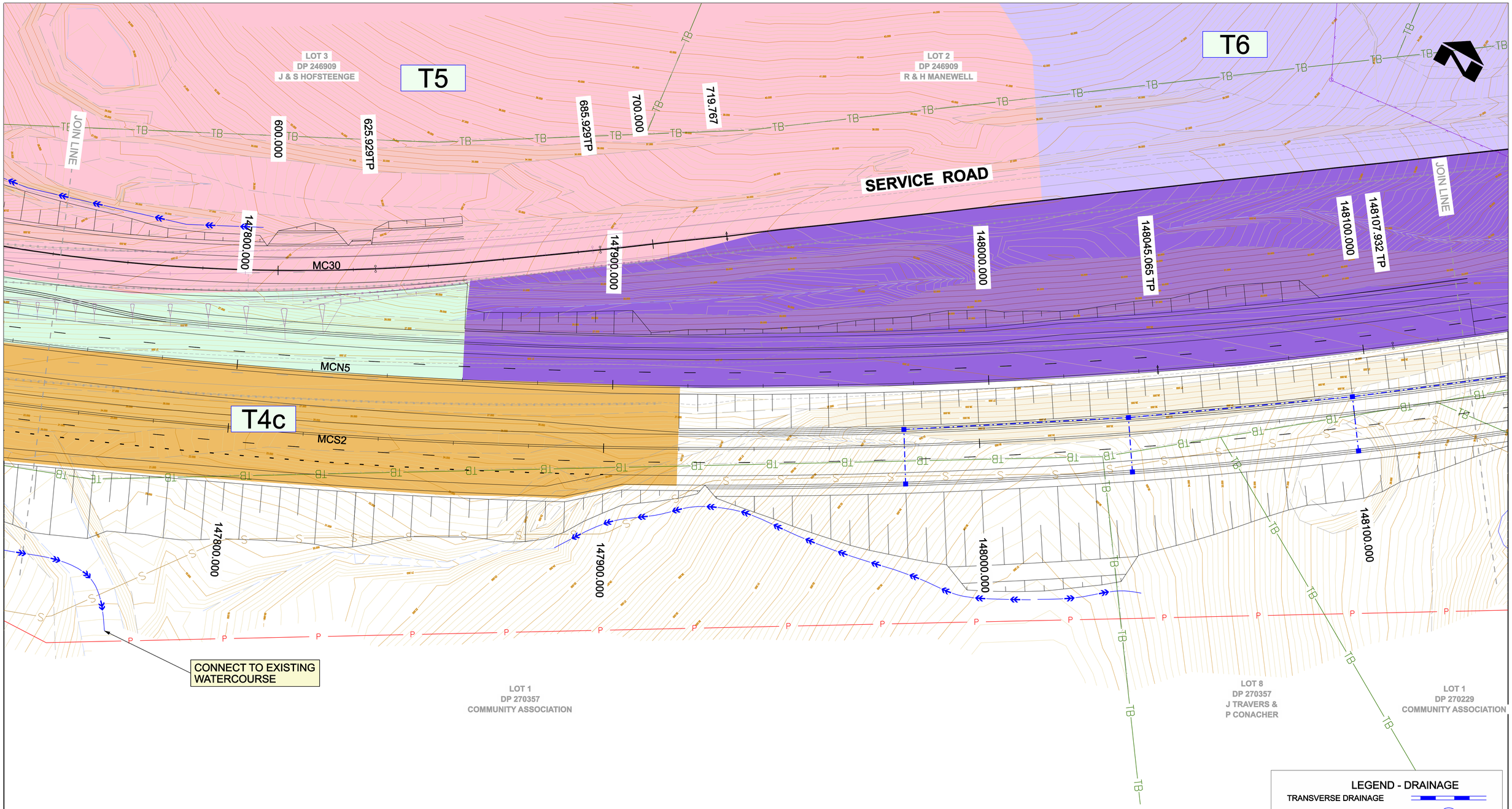

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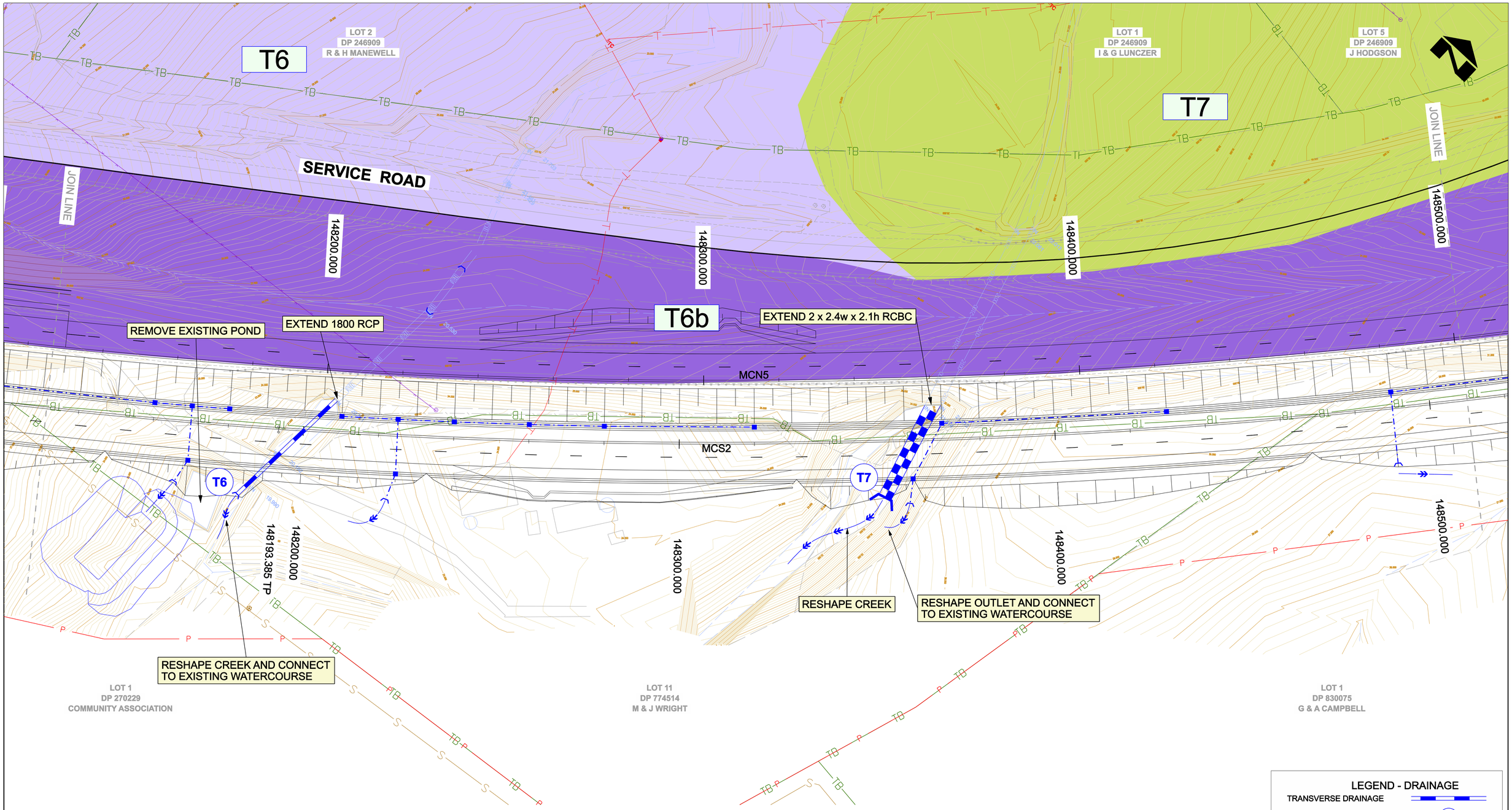

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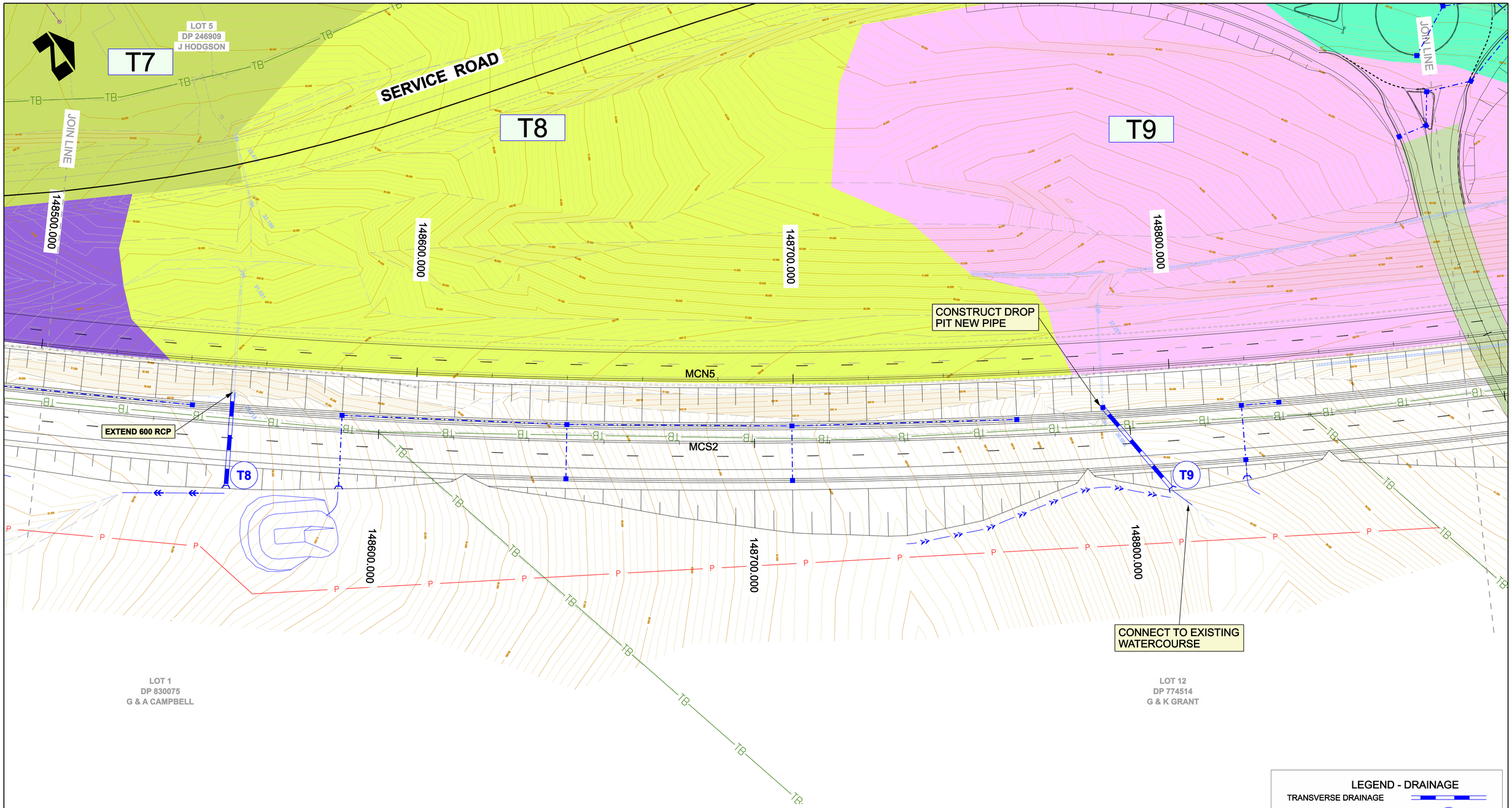

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SHEET No.

SERVICE ROAD

T9

T10

T11

T12

JOIN LINE

JOIN LINE

367.814

148900.000

149000.000

149100.000

149200.000

300.000

EXTEND EXISTING
900 RCP

MCN5

MCS2

T10

T11

237.101TP

EXTEND EXISTING
525 RCP

148900.000

149000.000

149100.000

149200.000

200.000
197.101TP

CONNECT TO EXISTING
WATERCOURSE

REMOVE EXISTING
DRAINAGE 900 RCP

BULLOCKY WAY

MC00

DT4

LOT 12
DP 774514
G & K GRANT

LOT 13
DP 774514
D CHISHOLM &
T VERCOE

DT4

100.000

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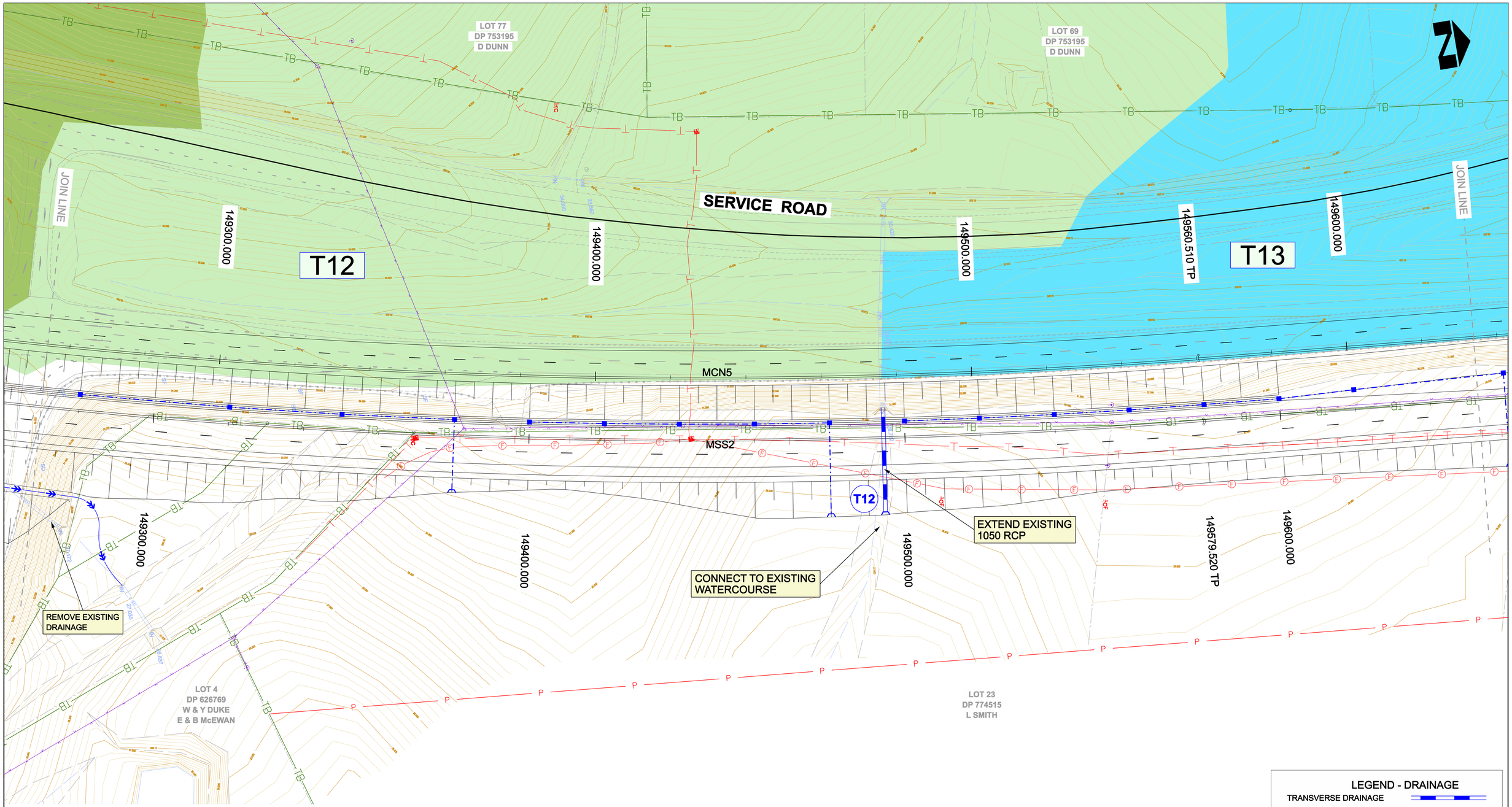

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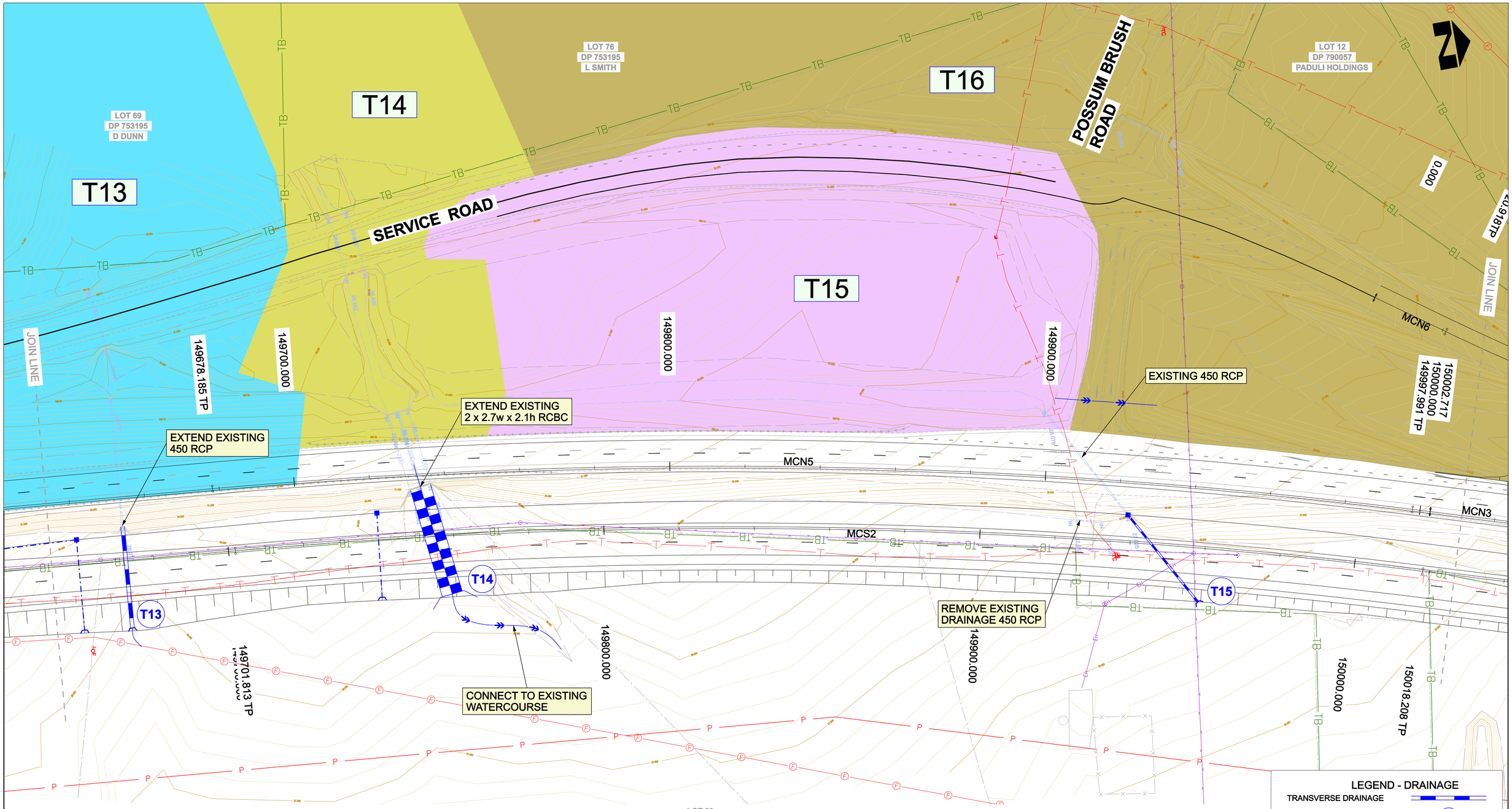

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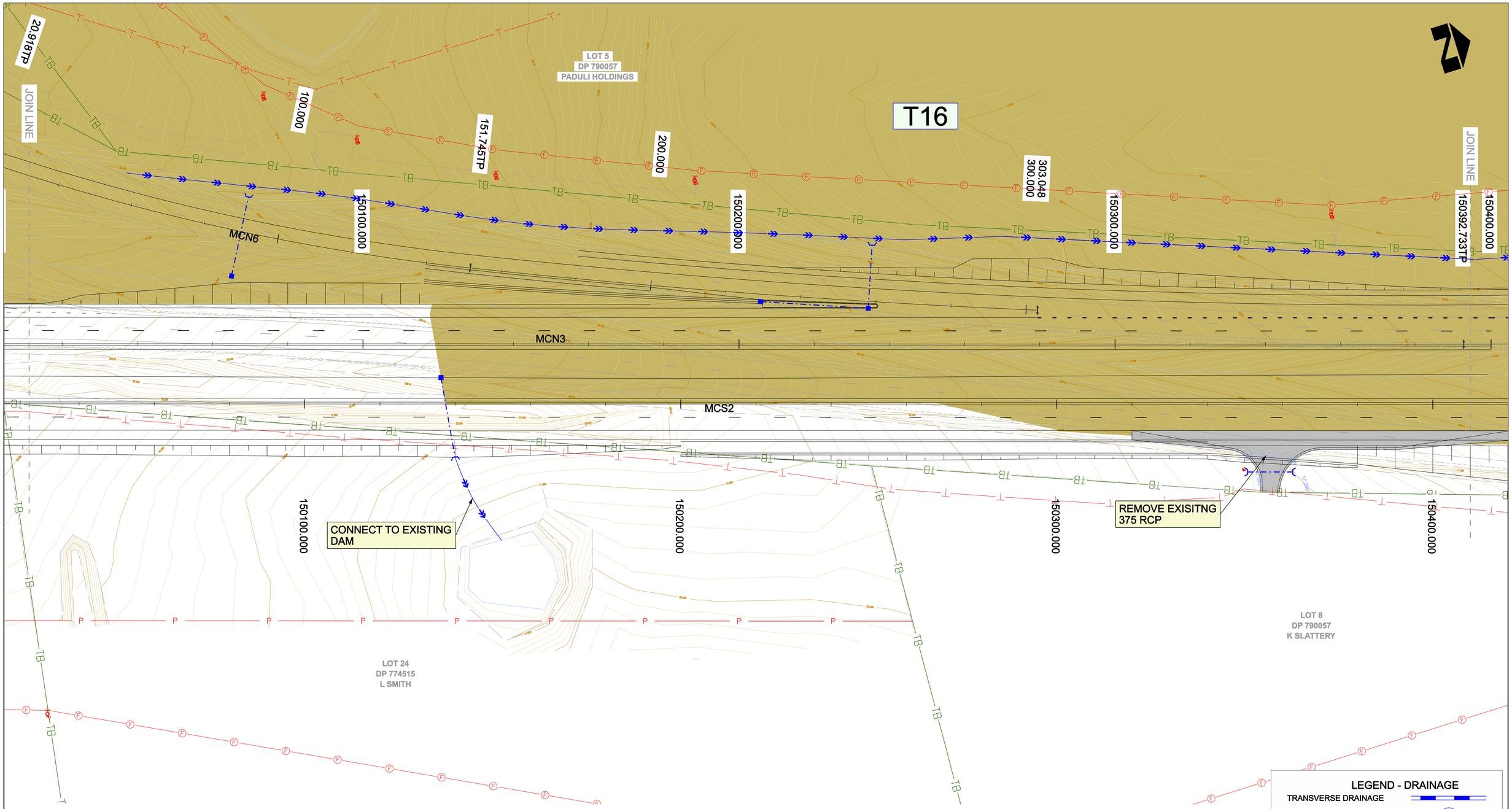

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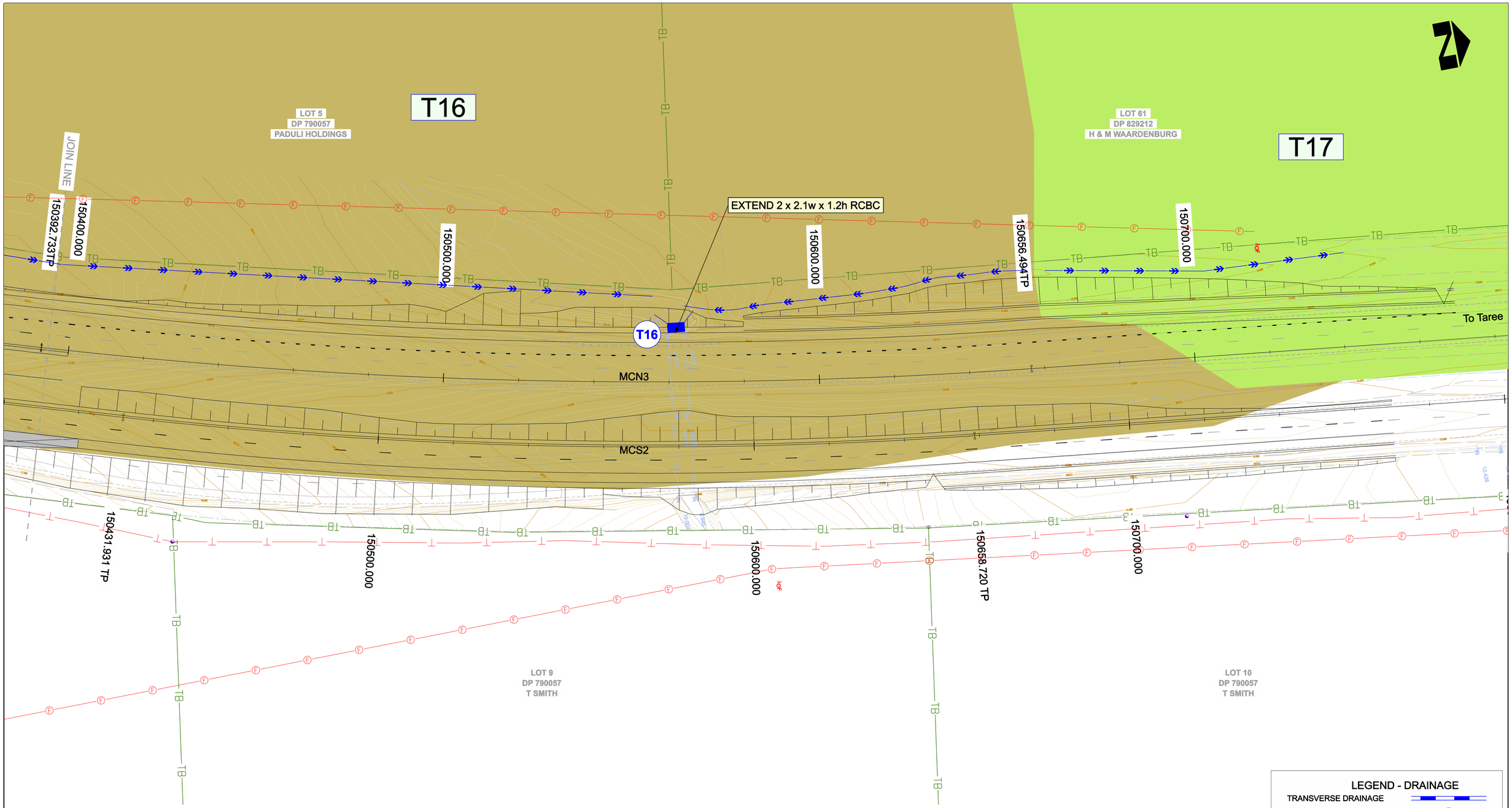

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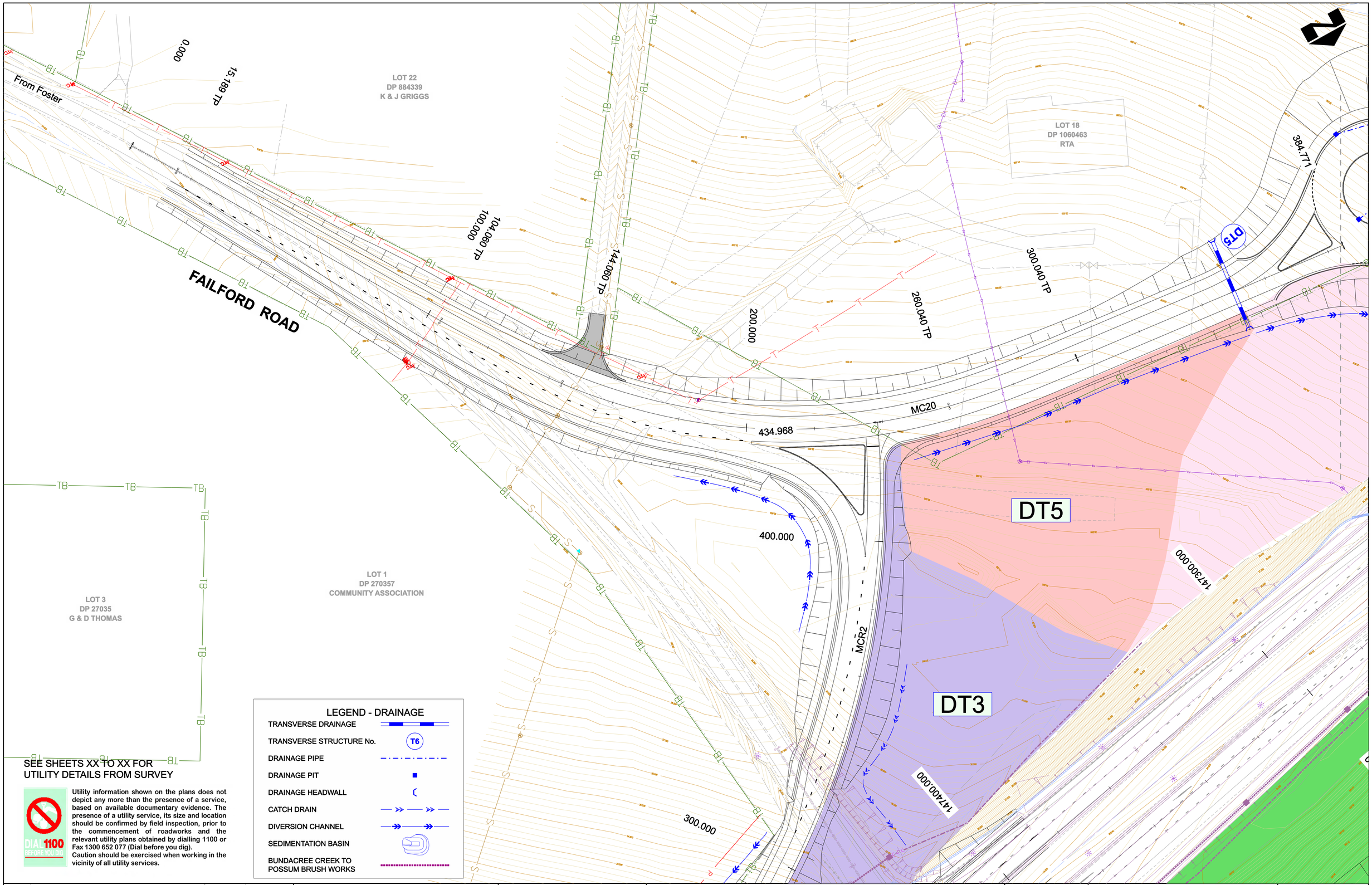

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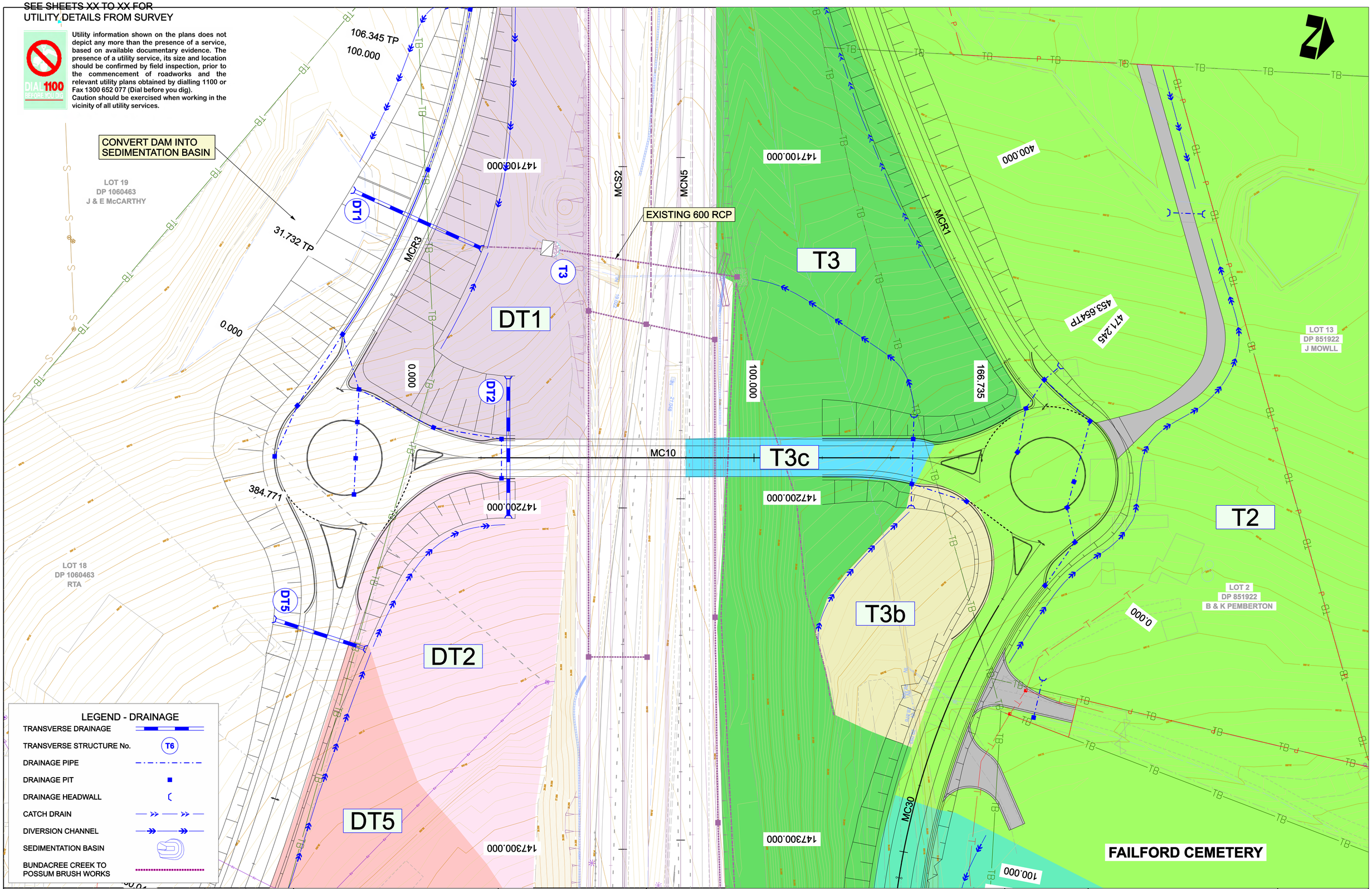

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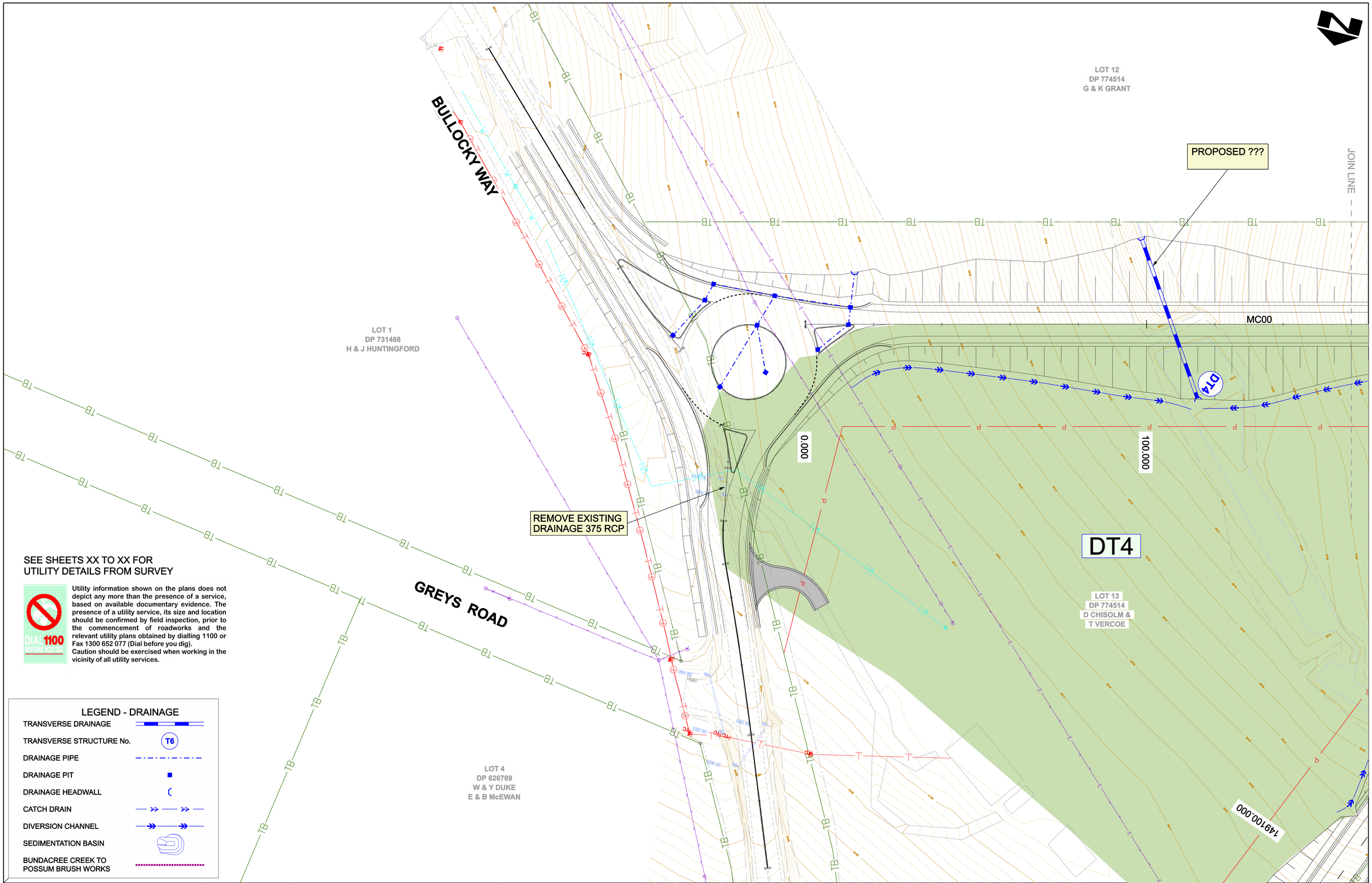

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DRAWING *.DGN

REGISTRATION NUMBER
**** *** ** ****
. . .

SHEET No.

JOIN LINE

LOT 12
DP 774514
G & K GRANT

SERVICE ROAD

T9

T8

T7

T10

DT4

LOT 13
DP 774514
D CHISOLM &
T VERCOE

LOT 5
DP 246909
J HODGSON

LOT 70
DP 753195
B CONROY

MC00

MCS2

MCN5

200.000
197.101TP

237.101TP

300.000

367.814

148900.000

149000.000

CONNECT TO EXISTING
WATERCOURSE

EXTEND EXISTING
525 RCP

SEE SHEETS XX TO XX FOR
UTILITY DETAILS FROM SURVEY

Utility information shown on the plans does not depict any more than the presence of a service, based on available documentary evidence. The presence of a utility service, its size and location should be confirmed by field inspection, prior to the commencement of roadworks and the relevant utility plans obtained by dialling 1100 or Fax 1300 652 077 (Dial before you dig).
Caution should be exercised when working in the vicinity of all utility services.

DIAL 1100 BEFORE YOU DIG

LEGEND - DRAINAGE

- TRANSVERSE DRAINAGE
- TRANSVERSE STRUCTURE No. (T6)
- DRAINAGE PIPE
- DRAINAGE PIT
- DRAINAGE HEADWALL
- CATCH DRAIN
- DIVERSION CHANNEL
- SEDIMENTATION BASIN
- BUNDACREE CREEK TO POSSUM BRUSH WORKS

PRELIMINARY DRAWINGS
NOT FOR CONSTRUCTION. 28/03/06

No.	Amendment Description	Initials	Date
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SCALES

0 25 50

1:1000

Coordinate System: MGA Zone 56 | Height Datum: A.H.D.

RTA

TECHNOLOGY & TECHNICAL SERVICES
HUNTER TECHNICAL SERVICES
PROJECT DESIGN

ROADS AND TRAFFIC AUTHORITY OF NSW

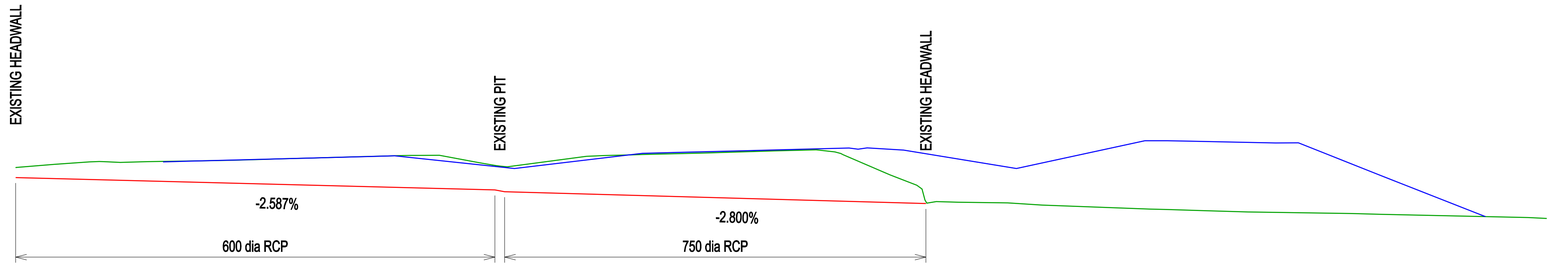
SH10 PACIFIC HIGHWAY
THE GREAT LAKES AND GREATER TAREE CITY COUNCILS
FAILFORD ROAD TO TRITTON ROAD - CONCEPT DESIGN
DRAINAGE PLANS WITH CATCHMENTS
FOR HYDRAULIC INVESTIGATION

FILE No. */***.****

DRAWING *.DGN

REGISTRATION NUMBER
**** *** ** ****
. . .

SHEET No.



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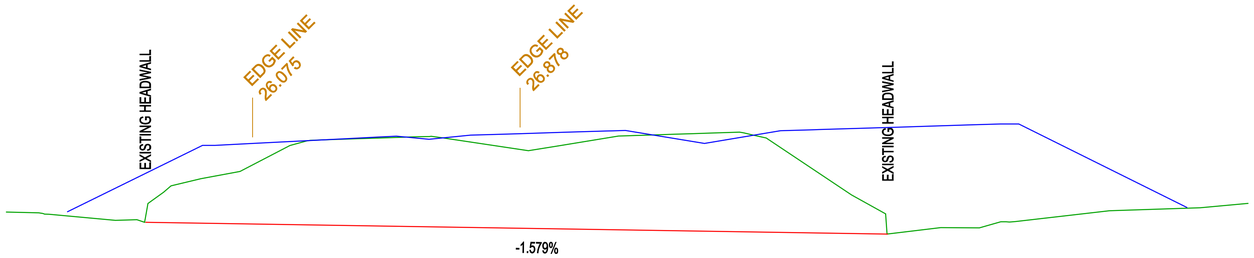

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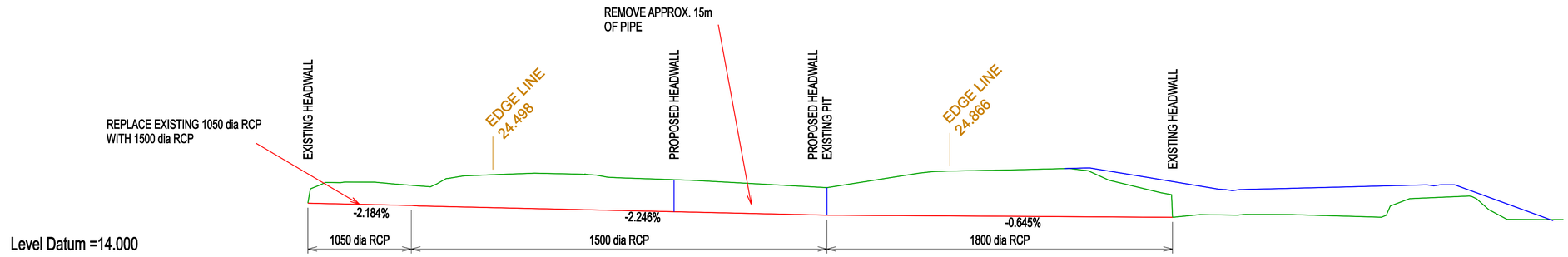
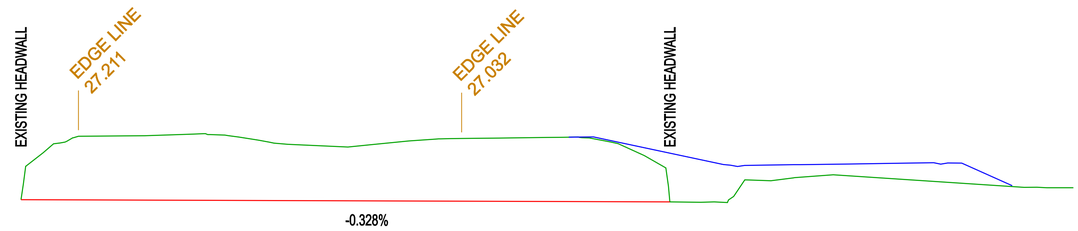

REMOVE APPROX. 15m
OF PIPE
REPLACE EXISTING 1050 dia RCP
WITH 1500 dia RCP
EXISTING HEADWALL
EDGE LINE
24.498
PROPOSED HEADWALL
PROPOSED HEADWALL
EXISTING PIT
EDGE LINE
24.866
EXISTING HEADWALL
-2.184%
-2.246%
-0.645%
Level Datum =14.000
1050 dia RCP
1500 dia RCP
1800 dia RCP

| | | |



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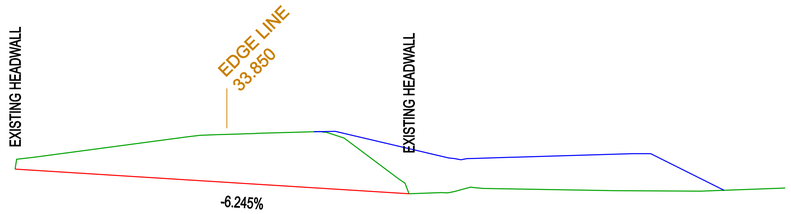

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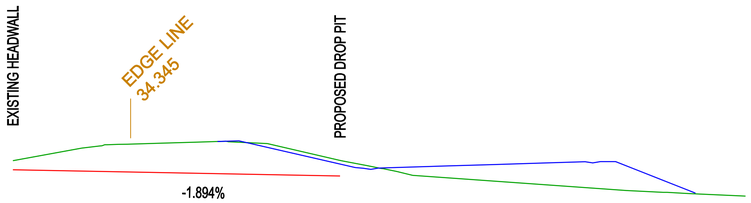

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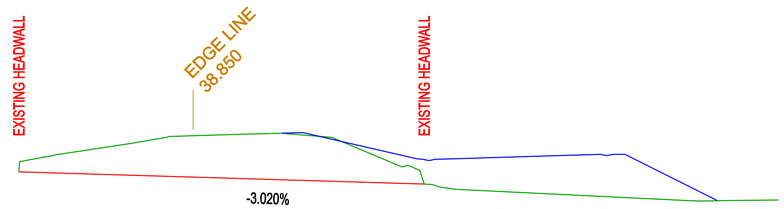

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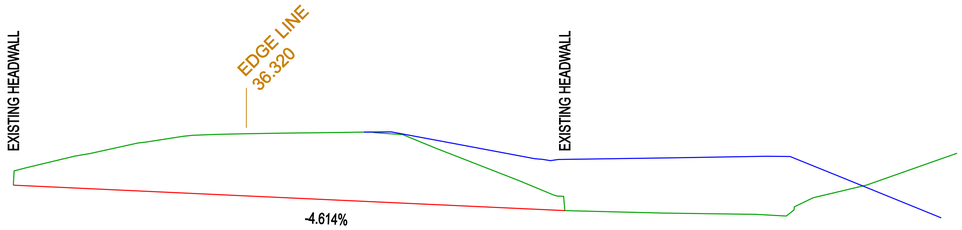

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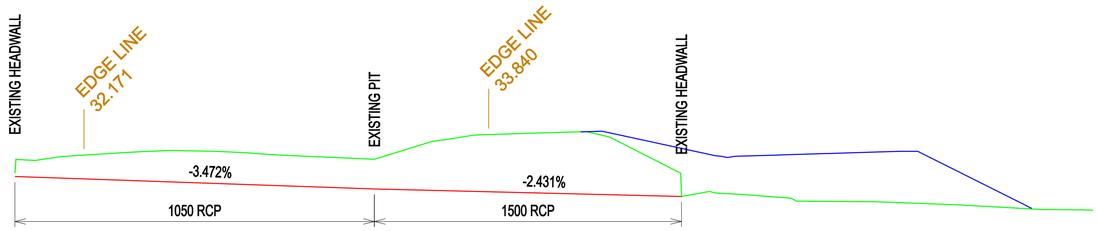

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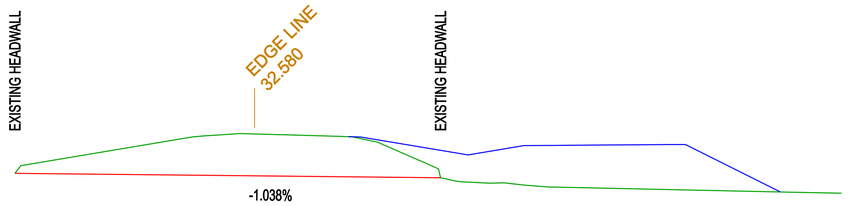

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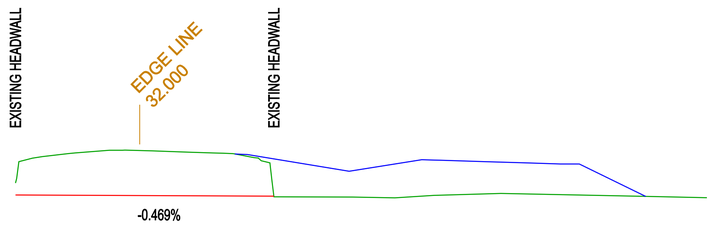

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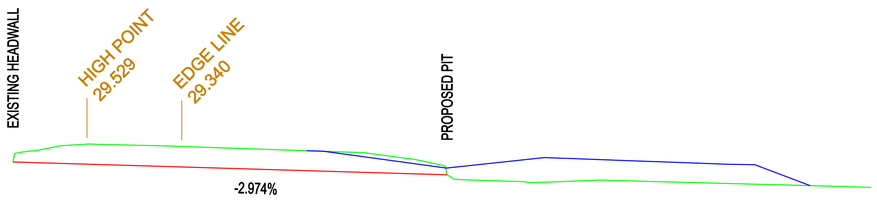

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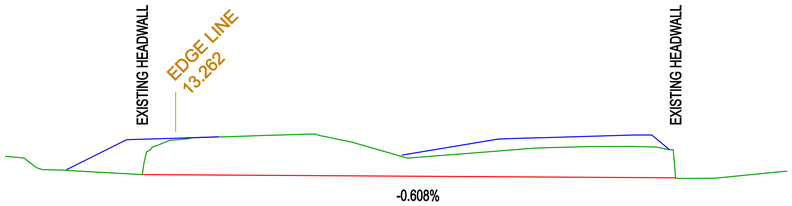

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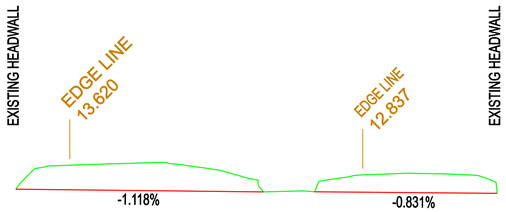

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EXISTING LEVELS	13.370	13.575	13.656	13.737	13.770	13.848	13.662	13.394	13.224	12.544	11.443	11.530	12.038	12.405	12.672	12.837	12.873	12.962	12.922	12.892	12.794	12.293	12.293
INVERT	11.669										11.443			11.455									11.331
DISTANCE	0.000										20.208			24.395									39.298

TRANSVERSE CULVERT - T17
Exisitng 2 x 600 dia RCP

No.	Amendment Description	Initials	Date
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PRELIMINARY DRAWINGS
NOT FOR CONSTRUCTION. 03/03/06

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SCALES

0 10 20 25 50

1:500

Coordinate System: MGA Zone 56 | Height Datum: A.H.D.

RTA

TECHNOLOGY & TECHNICAL SERVICES
HUNTER TECHNICAL SERVICES
PROJECT DESIGN

ROADS AND TRAFFIC AUTHORITY OF NSW

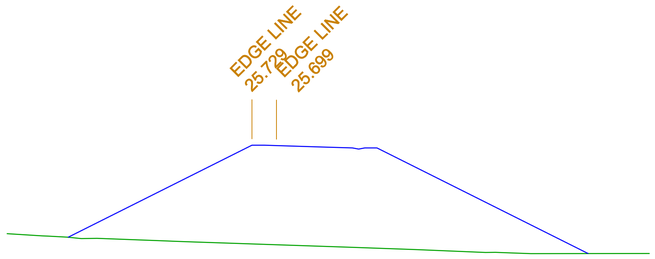
SH10 PACIFIC HIGHWAY
THE GREAT LAKES AND GREATER TAREE CITY COUNCILS
FAILFORD ROAD TO TRITTON ROAD - CONCEPT DESIGN
TRANSVERSE DRAINAGE PROFILES

FILE No. */***.****

DRAWING *.DGN

REGISTRATION NUMBER
**** *** ** ****
. . .

SHEET No.



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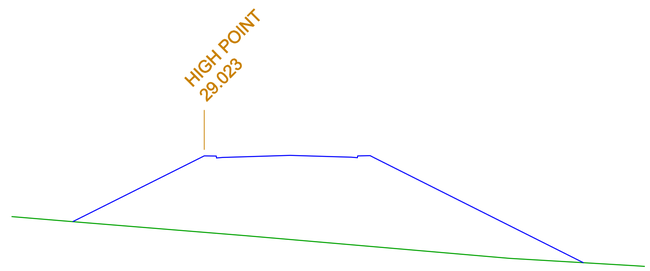

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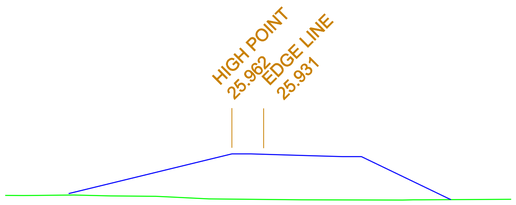

Level Datum =17.000

PROPOSED LEVELS				22.720							25.962	25.931		25.818	25.742	25.742			22.226			
EXISTING LEVELS	22.559	22.571		22.608		22.537		22.502	22.446		22.293			22.218				22.198	22.213			22.254
INVERT	22.000																					22.000
DISTANCE	0.000																					41.300

TRANSVERSE CULVERT - DT3
Proposed structure to be sized

PRELIMINARY DRAWINGS
NOT FOR CONSTRUCTION. 03/03/06

No.	Amendment Description	Initials	Date
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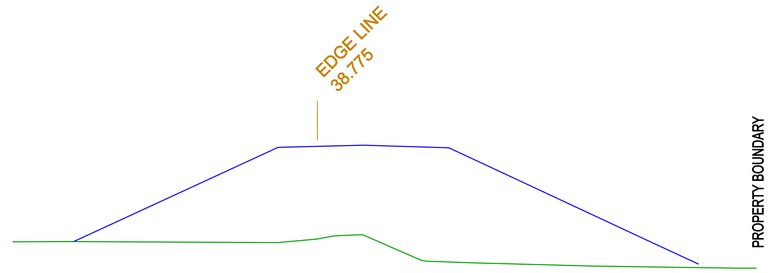
SCALES
0 10 20 25 50
1:500

Coordinate System: MGA Zone 56 | Height Datum: A.H.D.

RTA
TECHNOLOGY & TECHNICAL SERVICES
HUNTER TECHNICAL SERVICES
PROJECT DESIGN

ROADS AND TRAFFIC AUTHORITY OF NSW
SH10 PACIFIC HIGHWAY
THE GREAT LAKES AND GREATER TAREE CITY COUNCILS
FAILFORD ROAD TO TRITTON ROAD - CONCEPT DESIGN
TRANSVERSE DRAINAGE PROFILES

FILE No. */***.****
DRAWING *.DGN
REGISTRATION NUMBER **** *** ** ****
SHEET No.



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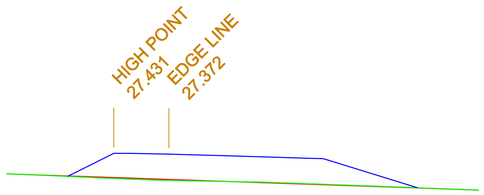

Level Datum =19.000

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Design Rainfall using Australian Rainfall and Runoff
Civil and Environmental Engineering
University of Wollongong
Program DESrain

Nabiac to Taree nr Failford

2 year 1 hour =		37	mm/hr
2 year 12 hour =		8.15	mm/hr
2 year 72 hour =		2.54	mm/hr
50 year 1 hour =		69	mm/hr
50 year 12 hour =		16	mm/hr
50 year 72 hour =		5.8	mm/hr
F2 factor	=	4.335	
F50 factor2 hour	=	16.15	
Skew coeff G	=	0.5	

		1	2	5	10	**20**	50	**100**	200	500 years
5 min		89.15	115.74	147.38	168.41	**197.61**	239.07	**273.18**	310.08	363.6
	6	83.6	108.55	138.28	158.05	**185.5**	224.48	**256.55**	291.26	341.6
	10	68.39	88.85	113.34	129.65	**152.27**	184.41	**210.88**	239.55	281.14
	15	57.14	74.27	94.86	108.58	**127.61**	154.66	**176.95**	201.1	236.17
	20	49.8	64.75	82.77	94.8	**111.47**	135.17	**154.72**	175.9	206.67
	30	40.47	52.65	67.4	77.26	**90.9**	110.33	**126.35**	143.73	169
	45	32.45	42.25	54.16	62.14	**73.17**	88.88	**101.86**	115.94	136.42
1 hr		27.57	35.91	46.08	52.9	**62.33**	75.77	**86.87**	98.92	116.46
	1.5	21.63	28.22	36.35	41.81	**49.35**	60.12	**69.03**	78.72	92.84
	2	18.16	23.71	30.61	35.27	**41.68**	50.86	**58.46**	66.73	78.81
	3	14.14	18.49	23.97	27.67	**32.76**	40.06	**46.12**	52.72	62.38
	4.5	11	14.4	18.73	21.67	**25.71**	31.51	**36.33**	41.6	49.3
	6	9.2	12.06	15.73	18.23	**21.65**	26.58	**30.68**	35.16	41.73
	9	7.17	9.41	12.32	14.3	**17.02**	20.93	**24.2**	27.78	33.03
	12	6	7.89	10.36	12.04	**14.35**	17.68	**20.47**	23.51	28
	18	4.65	6.15	8.18	9.59	**11.51**	14.3	**16.65**	19.24	23.07
	24	3.88	5.15	6.92	8.15	**9.84**	12.29	**14.37**	16.68	20.09
	30	3.35	4.47	6.05	7.17	**8.68**	10.9	**12.79**	14.88	18
	36	2.97	3.97	5.41	6.43	**7.82**	9.86	**11.59**	13.53	16.42
	48	2.44	3.27	4.51	5.4	**6.6**	8.37	**9.89**	11.59	14.15
	72	1.81	2.44	3.43	4.14	**5.1**	6.53	**7.77**	9.17	11.29