

VACO INVESTMENTS LTD

SUBDIVISION OF 47 MILLBROOK ROAD, WAIPU

CIVIL INFRASTRUCTURE - RESOURCE CONSENT



LOCALITY PLAN

N.T.S.

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CKL PROJECT NO: **A21235-1**
DATE OF ISSUE: **08/09/2023**
ISSUED FOR RESOURCE CONSENT

Safety in Design Risk Assessment

Design life cycle		Investigation and design	Setup, construction and commissioning	Operation	Maintenance	Disposal				Date	9/12/2022	Revision number	1		
Job name		47 Millbrook Road, Waipu			Job number	A21235			Design						
People involved in risk assessment		LC, SJ													
HAZARD IDENTIFIED		INITIAL RISK ASSESSMENT					RESIDUAL RISK ASSESSMENT								
Item	Design reference	Design life cycle	Hazards	Risk	Existing control measures	Initial risk rating			Potential control measures	Responsibility	By when	Decision/status	Residual risk rating		
						Consequence	Likelihood	Risk rating					Consequence	Likelihood	Risk rating
1	Access/egress	Investigation and design	Traffic, deep manholes	Injury	Traffic management plan	MAJOR	UNLIKELY	MEDIUM	Investigation carried out during construction phase when more stringent traffic management can be implemented	Contractor	Construction phase	Residual risk to be managed	MAJOR	UNLIKELY	MEDIUM
2	Biological	Operation	Exposure to pathogens in wastewater	Getting sick	Vaccination, standard operating procedures	MINOR	RARE	LOW		Asset owner (WSL)	During asset life	Residual risk to be managed	MINOR	RARE	LOW
3	Commissioning	Setup, construction and commissioning	Stormwater or sewage spilling to environment	Contamination, injury	Construction methodology including flow control	MODERATE	UNLIKELY	MEDIUM	Controls to be developed by Contractor	Contractor	Construction phase	Residual risk to be managed	MODERATE	UNLIKELY	MEDIUM
4	Community/public interaction	Setup, construction and commissioning	Works within road reserve and around traffic, including vehicles and pedestrians	Injury	Traffic management plan	MODERATE	UNLIKELY	MEDIUM	Liaise with Auckland Transport	Contractor	Construction phase	Residual risk to be managed	MODERATE	UNLIKELY	MEDIUM
5	Confined space	Operation	Atmosphere	Injury, suffocation	Restricted access by competent personnel only, standard operating procedures	CRITICAL	RARE	MEDIUM		Asset owner (Auckland Council)	During asset life	Residual risk to be managed	CRITICAL	RARE	MEDIUM
6	Construction method	Setup, construction and commissioning	Deep excavation, working at heights, works within road reserve	Injury	Competent Contractor, traffic management plan	MODERATE	UNLIKELY	MEDIUM		Contractor	Construction phase	Residual risk to be managed	MODERATE	UNLIKELY	MEDIUM
7	Corrosion	Maintenance	Asset failure	Sewage spilling to environment	Asset management	MODERATE	RARE	LOW		Asset owner (Auckland Council)	During asset life	Residual risk to be managed	MODERATE	RARE	LOW
8	Ventilation	Operation	Lack of ventilation	Suffocation	Confined space restricted access, standard operating procedures	CRITICAL	RARE	MEDIUM	Competent personnel only	Asset owner (Auckland Council)	During asset life	Residual risk to be managed	CRITICAL	RARE	MEDIUM
9	Extreme weather	Operation	Flooding	Property damage, injury	Designed for 100 year storm events with redundant inlet capacity	MINOR	UNLIKELY	LOW		Asset owner (Auckland Council)	During asset life	Residual risk to be managed	MINOR	UNLIKELY	LOW
10	Ground conditions	Setup, construction and commissioning	Collapse of excavation, hard rock encountered during construction	Injury, difficult to construct	Temporary works, competent Contractor	MAJOR	UNLIKELY	MEDIUM	Controls to be developed by Contractor	Contractor	Construction phase	Residual risk to be managed	MAJOR	UNLIKELY	MEDIUM
11	High pressure	Setup, construction and commissioning	Asset failure	Stormwater and sewage spilling to environment, injury	Quality assurance and quality control	MODERATE	RARE	LOW		Contractor	Construction phase	Residual risk to be managed	MODERATE	RARE	LOW
12	High pressure	Operation	Asset failure	Stormwater and sewage spilling to environment, injury	Design in accordance with relevant standards and code of practices	MODERATE	RARE	LOW		Asset owner (Auckland Council)	During asset life	Residual risk to be managed	MODERATE	RARE	LOW
13	Lighting	Maintenance	Insufficient light	Injury	Standard operating procedures	MODERATE	RARE	LOW		Asset owner (Auckland Council)	During asset life	Residual risk to be managed	MODERATE	RARE	LOW
14	Maintainability	Investigation and design	Restricted access, unable to repair	Reduced asset life	Design in accordance with relevant standards and code of practices	MODERATE	RARE	LOW	Liaise with Auckland Council & Auckland Transport	CKL	Detailed design	Residual risk to be managed	MINOR	RARE	LOW
15	Manual handling	Maintenance	Lifting of manhole lids	Injury	Standard operating procedures	MINOR	UNLIKELY	LOW		Asset owner (Auckland Council)	During asset life	Residual risk to be managed	MINOR	UNLIKELY	LOW
16	Noise	Setup, construction and commissioning	Environmental noise	Public complaints	Specified work hours	MINOR	UNLIKELY	LOW		Contractor	Construction phase	Residual risk to be managed	MINOR	UNLIKELY	LOW
17	Public interference	Setup, construction and commissioning	Property damage	Reduced asset life, injury	Restricted access to construction site with security fencing	MAJOR	UNLIKELY	MEDIUM	Warning signs, provide alternative pedestrian paths and public communications	Contractor	Construction phase	Contractor to implement and monitor security of construction site	MODERATE	RARE	LOW
18	Safety factor	Investigation and design	Asset failure, excavation instability	Reduced asset life, injury, damage to third party assets	Design in accordance with relevant standards and code of practices, including temporary works	MODERATE	RARE	LOW		CKL	Detailed design	Residual risk to be managed	MINOR	RARE	LOW
19	Overhead/underground services	Investigation and design	Damage to third party assets	Property damage and injury	Indicative location of services shown on design drawings and required clearance	MINOR	UNLIKELY	LOW		CKL	Detailed design	Residual risk to be managed	MINOR	UNLIKELY	LOW
20	Overhead/underground services	Setup, construction and commissioning	Damage to third party assets	Property damage and injury	Expose and confirm location of services	MINOR	UNLIKELY	LOW		Contractor	Construction phase	Residual risk to be managed	MINOR	UNLIKELY	LOW
21	Temporary works	Setup, construction and commissioning	Collapse of excavation, working at heights, confined space	Injury	Construction methodology	CRITICAL	UNLIKELY	HIGH	Controls to be developed by Contractor	Contractor	Construction phase	Contractor to provide construction methodology	CRITICAL	UNLIKELY	HIGH
22	Dust	Operation	Risk of foreign object in eyes and respiratory	Injury	PPE, administration controls	MINOR	POSSIBLE	MEDIUM	Wear safety glasses and a P2 dust mask when dust is present, be aware of surroundings	Contractor	Construction phase	Residual risk to be managed	MINOR	POSSIBLE	MEDIUM
23	Pressure Testing	Setup, construction and commissioning	Risk of fittings/ends blowing off, pipe burst, or thrust block movement	Injury	Administration controls	MAJOR	UNLIKELY	MEDIUM	Stay away from direct line of pipe. When conducting air testing take care of test plugs blowing out. No entry to manholes under pressure. Stand clear of fittings and test apparatus. Be aware of the water pressures behind some of the valves, etc. and do not alter any settings. Observe lockout procedures stringently.	Contractor	Construction phase	Residual risk to be managed	MAJOR	UNLIKELY	MEDIUM

FOR CONSENT

 <p>CKL OFFICE AUCKLAND A: 25 Broadway, Newmarket P: 09 524 7029 E: Auckland@ckl.co.nz</p>	<p>WAIPU GATEWAY SERVICE CENTRE VACO INVESTMENTS LTD 47 MILLBROOK ROAD, WAIPU</p>	<p>SAFETY IN DESIGN REGISTER</p>	Issue	Description	Checked	Date	Date	Scale:
			1	RESOURCE CONSENT	LC	09.12.2022	Designed: RB 09.12.2022 Drawn: LD 09.12.2022 Checked: LC 09.12.2022	N/A
			Job No: A21235		Dwg No: 0300		Rev: 1	

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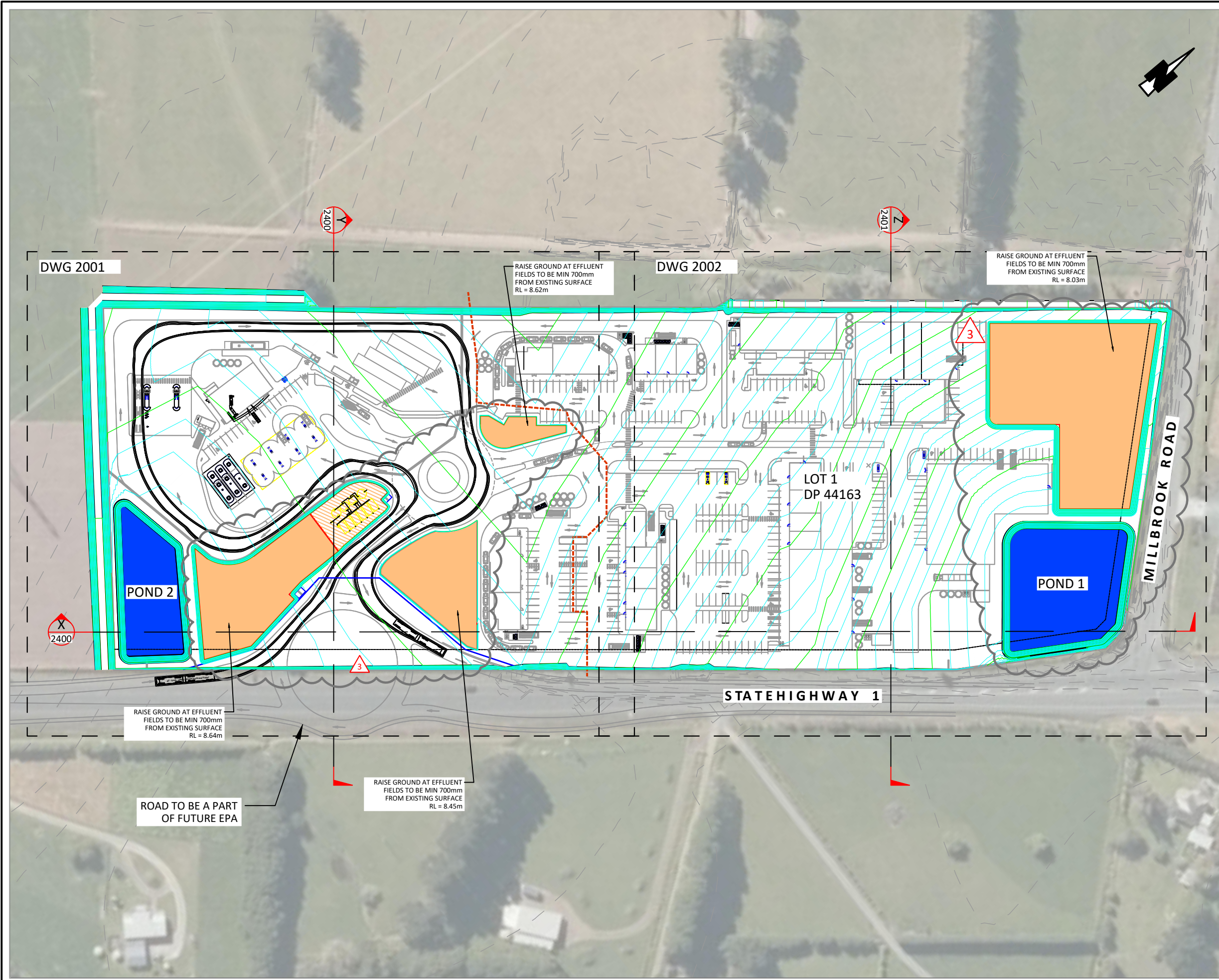
EARTHWORKS NOTES:

1. ALL WORKS TO COMPLY WITH THE RELEVANT LOCAL AUTHORITY STANDARDS.
2. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE OPERATIONAL PRIOR TO ANY WORKS COMMENCING AND SHALL BE INSTALLED IN ACCORDANCE WITH AC GD005 'EROSION AND SEDIMENT CONTROL GUIDE FOR LAND DISTURBING ACTIVITIES'.
3. REFER TO EARTHWORKS SPECIFICATION FOR EARTHFILL REQUIREMENTS AND STANDARDS OF COMPACTION. ALL EARTHWORKS TO BE UNDERTAKEN IN ACCORDANCE WITH GEOTECHNICAL INVESTIGATION REPORT, CONTRACTOR TO VIEW THE REPORT TO INFORM THEMSELVES.
4. ALL MATERIAL DEEMED BY THE ENGINEER TO BE UNSUITABLE SHALL BE EXCAVATED AND REPLACED WITH ENGINEERED FILL. ALL SURFACES SHALL BE SURVEYED AFTER CLEARING OPERATIONS (PRIOR TO REMOVAL OF UNSUITABLE) AND THEN AGAIN AFTER UNSUITABLE REMOVAL FOR VOLUMES.
5. ALL SURFACES SHALL BE SURVEYED AFTER CLEARING/STRIPPING OPERATIONS (PRIOR TO BULK EARTHWORKS) AND THEN AGAIN AFTER EARTHWORKS FOR VOLUMES.
6. THE LOCATIONS OF ALL STOCKPILES ARE WHOLLY THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE LOCATED CLEAR OF ALL EARTHWORKS OPERATIONS AND AWAY FROM GEOTECHNICALLY UNSTABLE LAND. NO PAYMENT SHALL BE MADE FOR RELOCATION OF ANY STOCKPILES THAT HAVE BEEN FOUND TO HAVE BEEN PLACED IN THE INCORRECT LOCATION.
7. ALL SETOUT TO BE UNDERTAKEN BY THE CONTRACTOR.
8. IT IS THE CONTRACTORS RESPONSIBILITY FOR HEALTH & SAFETY & SECURITY ON SITE, APPROPRIATE FENCING AND SIGNAGE SHALL BE ERECTED AND MAINTAINED AT ALL TIMES TO KEEP THE GENERAL PUBLIC OFF SITE.
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18. ANY EXCAVATIONS OVER 500mm IN HEIGHT SHALL BE BATTERED TO A 1:3 SAFE SLOPE.

LEGEND:

- PROPOSED CONTOUR MAJOR (0.5m) ————
- PROPOSED CONTOUR MINOR (0.05m) ————
- EXISTING CONTOUR MAJOR (1.0m) - - - - -
- EXISTING CONTOUR MINOR (0.5m) - - - - -
- STAGE BDY ————

FOR CONSENT



DWG 2001

DWG 2002

LOT 1
DP 44163

MILLBROOK ROAD

STATE HIGHWAY 1

POND 2

POND 1

ROAD TO BE A PART
OF FUTURE EPA

X
2400

Y
2400

Z
2401

RAISE GROUND AT EFFLUENT
FIELDS TO BE MIN 700mm
FROM EXISTING SURFACE
RL = 8.62m

RAISE GROUND AT EFFLUENT
FIELDS TO BE MIN 700mm
FROM EXISTING SURFACE
RL = 8.03m

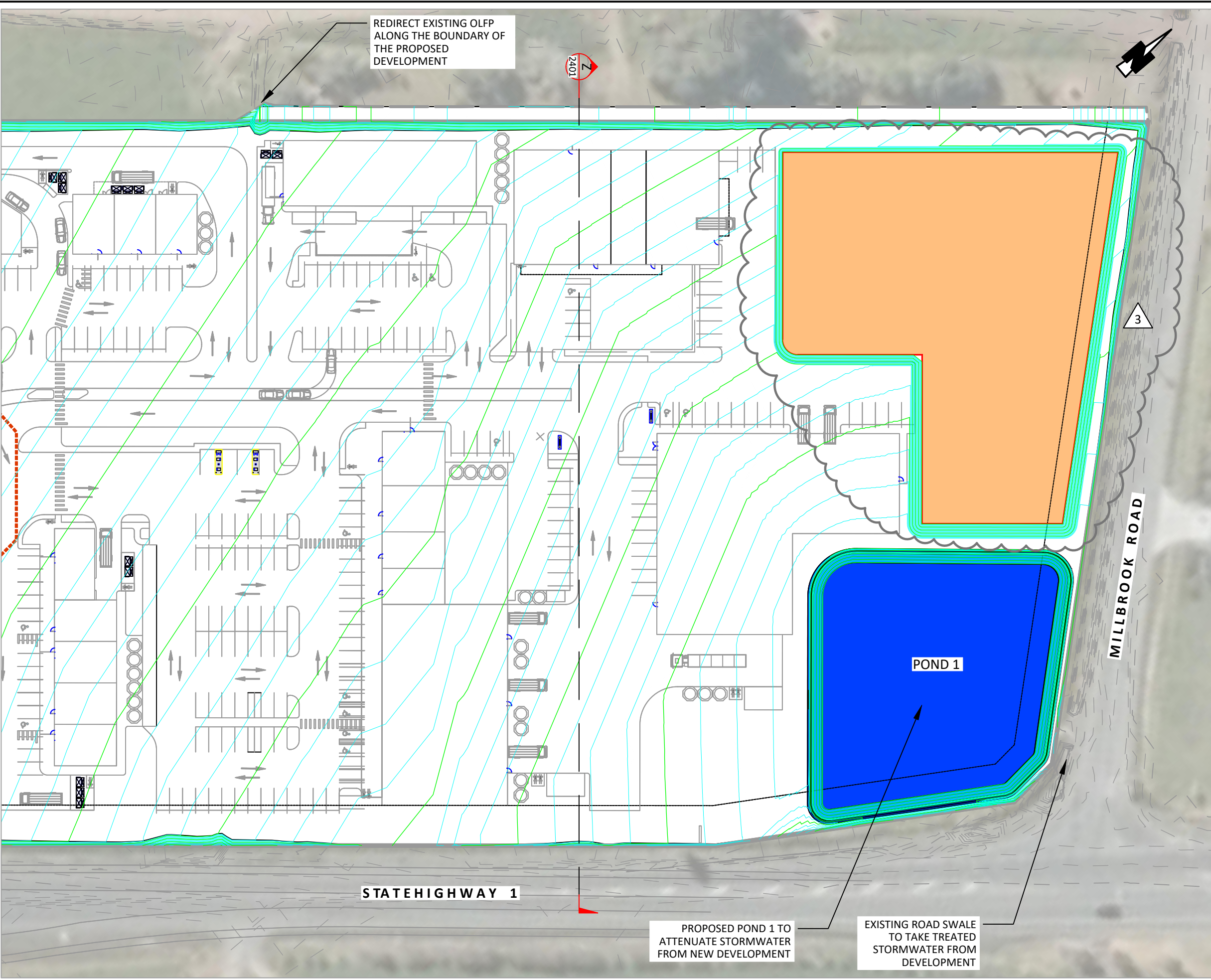
RAISE GROUND AT EFFLUENT
FIELDS TO BE MIN 700mm
FROM EXISTING SURFACE
RL = 8.64m

RAISE GROUND AT EFFLUENT
FIELDS TO BE MIN 700mm
FROM EXISTING SURFACE
RL = 8.45m

Issue	Description	Checked	Date	Designed	RS	Date	Scale:
1	RESOURCE CONSENT	LC	2022.12.09	Designed:	RS	16.11.2022	1:1500 (A3 Original)
2	RESOURCE CONSENT	LC	2023.02.16	Drawn:	LD	16.11.2022	
3	RESOURCE CONSENT	LC	08/09/23	Checked:	LC	08/09/23	

Job No: A21235 2000-1
Dwg No: 3
Rev: 3

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FOR CONSENT

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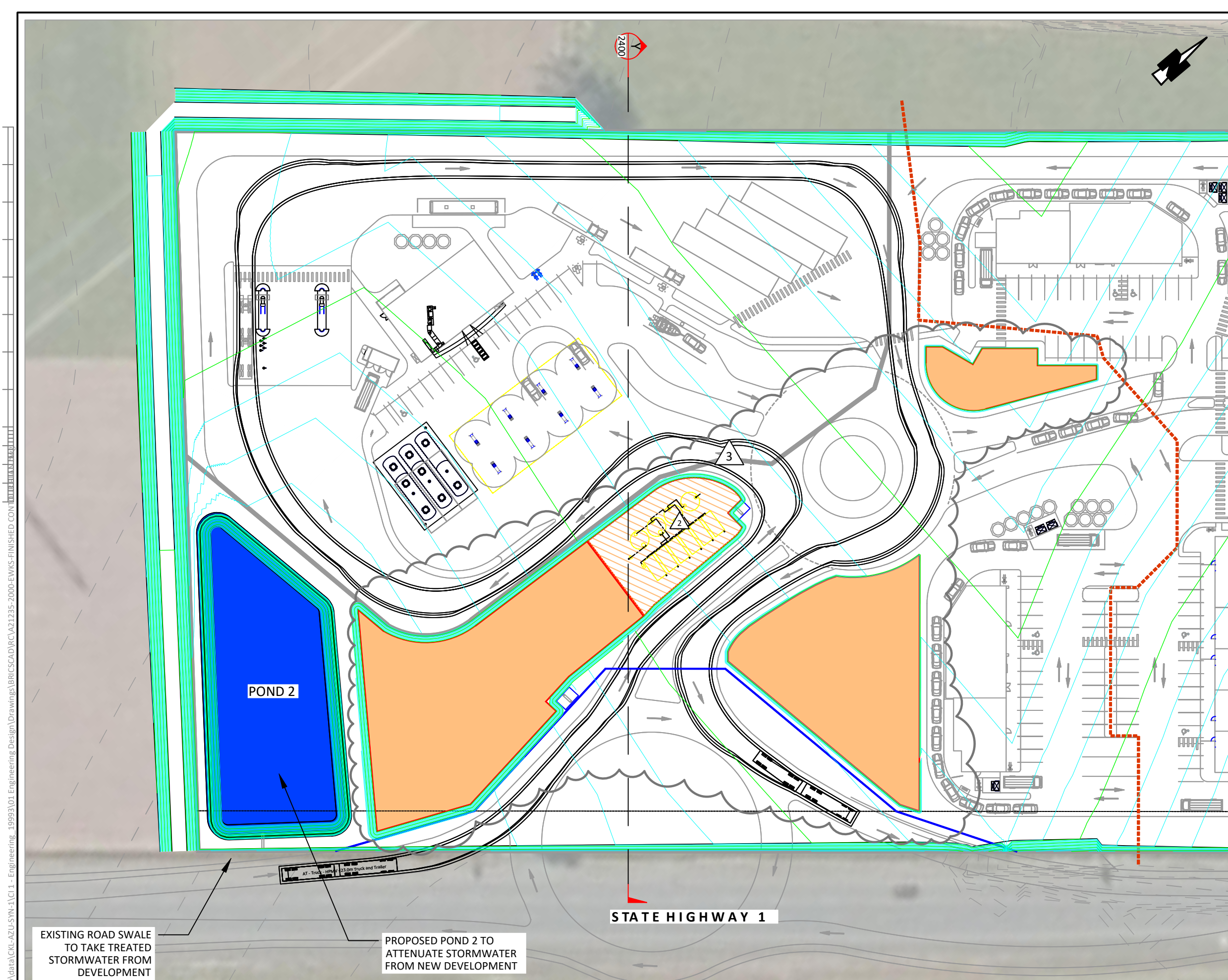
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 E: Auckland@ckl.co.nz

WAIPU GATEWAY SERVICE CENTRE
VACO INVESTMENTS LTD
 47 MILLBROOK ROAD, WAIPU

EARTHWORKS
FINISHED CONTOURS
SHEET 1

Issue	Description	Checked	Date	Designed	Date	Scale:
1	RESOURCE CONSENT	LC	2022.12.09	RS	16.11.2022	1:750 (A3 Original)
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Job No: Dwg No: Rev:
A21235 2001-1 3



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STAGE BDY	—————

FOR CONSENT

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Job No: _____ Dwg No: _____ Rev: _____
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10. ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE APPROVED RESOURCE CONSENT AS WELL AS ARBORICULTURAL REPORT AND/OR IN ACCORDANCE WITH ACCEPTED ARBORICULTURAL PRACTICES.
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16. IN THE EVENT ITEMS OF ARCHAEOLOGICAL INTEREST ARE FOUND DURING WORKS, THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY AND NO DAMAGE IS TO OCCUR TO ANY SUCH ITEMS IN THE MEANTIME.
17. IN THE EVENT ASBESTOS IS ENCOUNTERED THE ENGINEER IS TO BE ALERTED IMMEDIATELY AND NO WORKS ARE TO TAKE PLACE AROUND THE CONTAMINATED ZONE UNTIL CLEARED IN A COMPLIANT MANNER.
18. ANY EXCAVATIONS OVER 500mm IN HEIGHT SHALL BE BATTERED TO A 1:3 SAFE SLOPE.
19. ADDITIONAL FILL MAY BE REQUIRED TO ACCOMMODATE FUTURE WW FIELDS AND SPECIFICATIONS, DETAILED AT FUTURE STAGE.

LEGEND:

- 0.50 ISOPACH CUT CONTOUR 0.50m INTERVAL
- 0.50 ISOPACH FILL CONTOUR 0.50m INTERVAL
- 0.00 ISOPACH CONTOUR - ZERO CUT/FILL
- PROPOSED SITE BOUNDARY

PROPOSED OVERALL EARTHWORK VOLUMES (TOTAL APPROX AREA = 61963m ²)		
CUT (m ³)	FILL (m ³)	BALANCE (m ³)
-3700	21100	17400

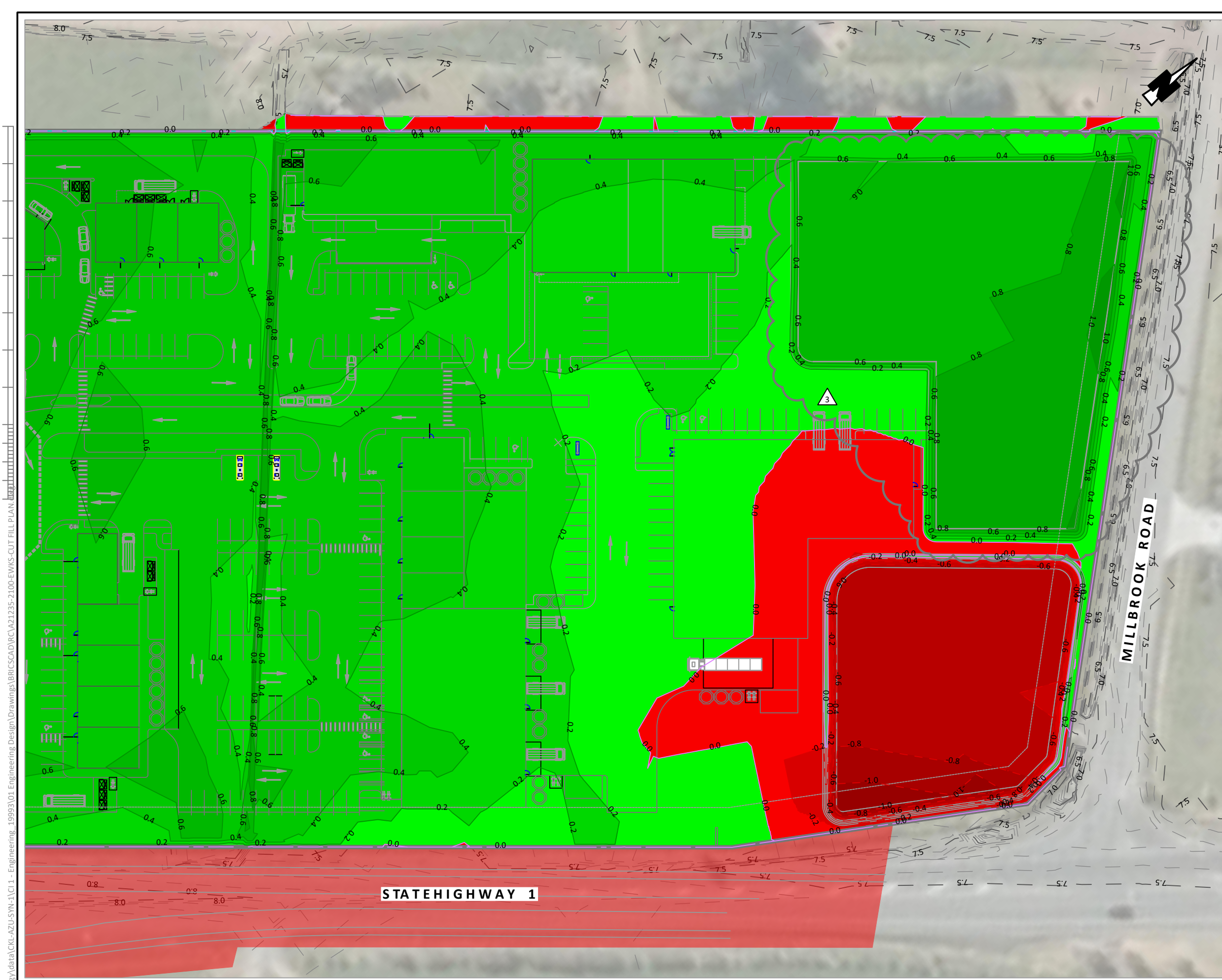
NOTE: VOLUMES SHOWN ARE SOLID MEASURE BASED ON EXISTING SURFACE VS. DESIGN SURFACE ONLY. IE NOT SUBGRADE

FOR CONSENT

Issue	Description	Checked	Date	Designed	Date	Scale:
1	RESOURCE CONSENT	SJ	2022.12.09	RS	16.11.2022	1:1500 (A3 Original)
2	RESOURCE CONSENT	LC	2023.02.16	LD	16.11.2022	
3	RESOURCE CONSENT	LC	08/09/23	LC	08/09/23	

Job No: **A21235 2100-1** Dwg No: **3** Rev:

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- EARTHWORKS NOTES:**
1. ALL WORKS TO COMPLY WITH THE RELEVANT LOCAL AUTHORITY STANDARDS.
 2. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE OPERATIONAL PRIOR TO ANY WORKS COMMENCING AND SHALL BE INSTALLED IN ACCORDANCE WITH AC GD005 'EROSION AND SEDIMENT CONTROL GUIDE FOR LAND DISTURBING ACTIVITIES'.
 3. REFER TO EARTHWORKS SPECIFICATION FOR EARTHFILL REQUIREMENTS AND STANDARDS OF COMPACTION. ALL EARTHWORKS TO BE UNDERTAKEN IN ACCORDANCE WITH GEOTECHNICAL INVESTIGATION REPORT, CONTRACTOR TO VIEW THE REPORT TO INFORM THEMSELVES.
 4. ALL MATERIAL DEEMED BY THE ENGINEER TO BE UNSUITABLE SHALL BE EXCAVATED AND REPLACED WITH ENGINEERED FILL. ALL SURFACES SHALL BE SURVEYED AFTER CLEARING OPERATIONS (PRIOR TO REMOVAL OF UNSUITABLE) AND THEN AGAIN AFTER UNSUITABLE REMOVAL FOR VOLUMES.
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 6. THE LOCATIONS OF ALL STOCKPILES ARE WHOLLY THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE LOCATED CLEAR OF ALL EARTHWORKS OPERATIONS AND AWAY FROM GEOTECHNICALY UNSTABLE LAND. NO PAYMENT SHALL BE MADE FOR RELOCATION OF ANY STOCKPILES THAT HAVE BEEN FOUND TO HAVE BEEN PLACED IN THE INCORRECT LOCATION.
 7. ALL SETOUT TO BE UNDERTAKEN BY THE CONTRACTOR.
 8. IT IS THE CONTRACTORS RESPONSIBILITY FOR HEALTH & SAFETY & SECURITY ON SITE, APPROPRIATE FENCING AND SIGNAGE SHALL BE ERECTED AND MAINTAINED AT ALL TIMES TO KEEP THE GENERAL PUBLIC OFF SITE.
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- 0.50 ISOPACH FILL CONTOUR 0.50m INTERVAL
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- PROPOSED SITE BOUNDARY

FOR CONSENT



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Planning | Surveying | Engineering | Environmental

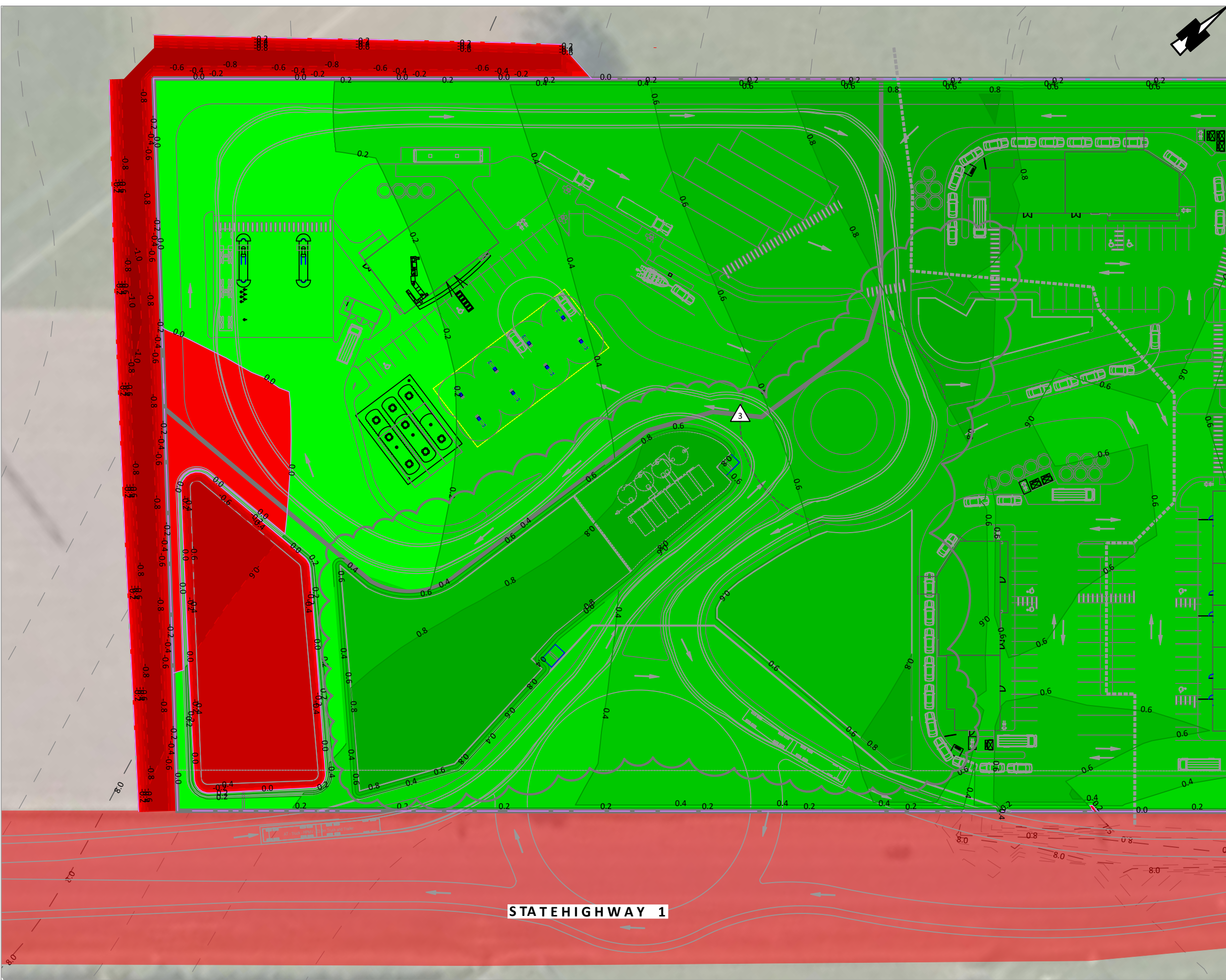
WAIPU GATEWAY SERVICE CENTRE
VACO INVESTMENTS LTD
47 MILLBROOK ROAD, WAIPU

EARTHWORKS
CUT-FILL
SHEET 1

Issue	Description	Checked	Date	Designed	Date	Scale:
1	RESOURCE CONSENT	SJ	2022.12.09	RS	16.11.2022	1:750 (A3 Original)
2	RESOURCE CONSENT	LC	2023.02.16	LD	16.11.2022	
3	RESOURCE CONSENT	LC	08/09/23	LC	08/09/23	

Job No: **A21235 2101-1** Dwg No: **3** Rev:

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LEGEND:

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- 0.50 ISOPACH FILL CONTOUR 0.50m INTERVAL
- 0.00 ISOPACH CONTOUR - ZERO CUT/FILL
- PROPOSED SITE BOUNDARY

FOR CONSENT



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 E: Auckland@ckl.co.nz

WAIPU GATEWAY SERVICE CENTRE
VACO INVESTMENTS LTD
 47 MILLBROOK ROAD, WAIPU

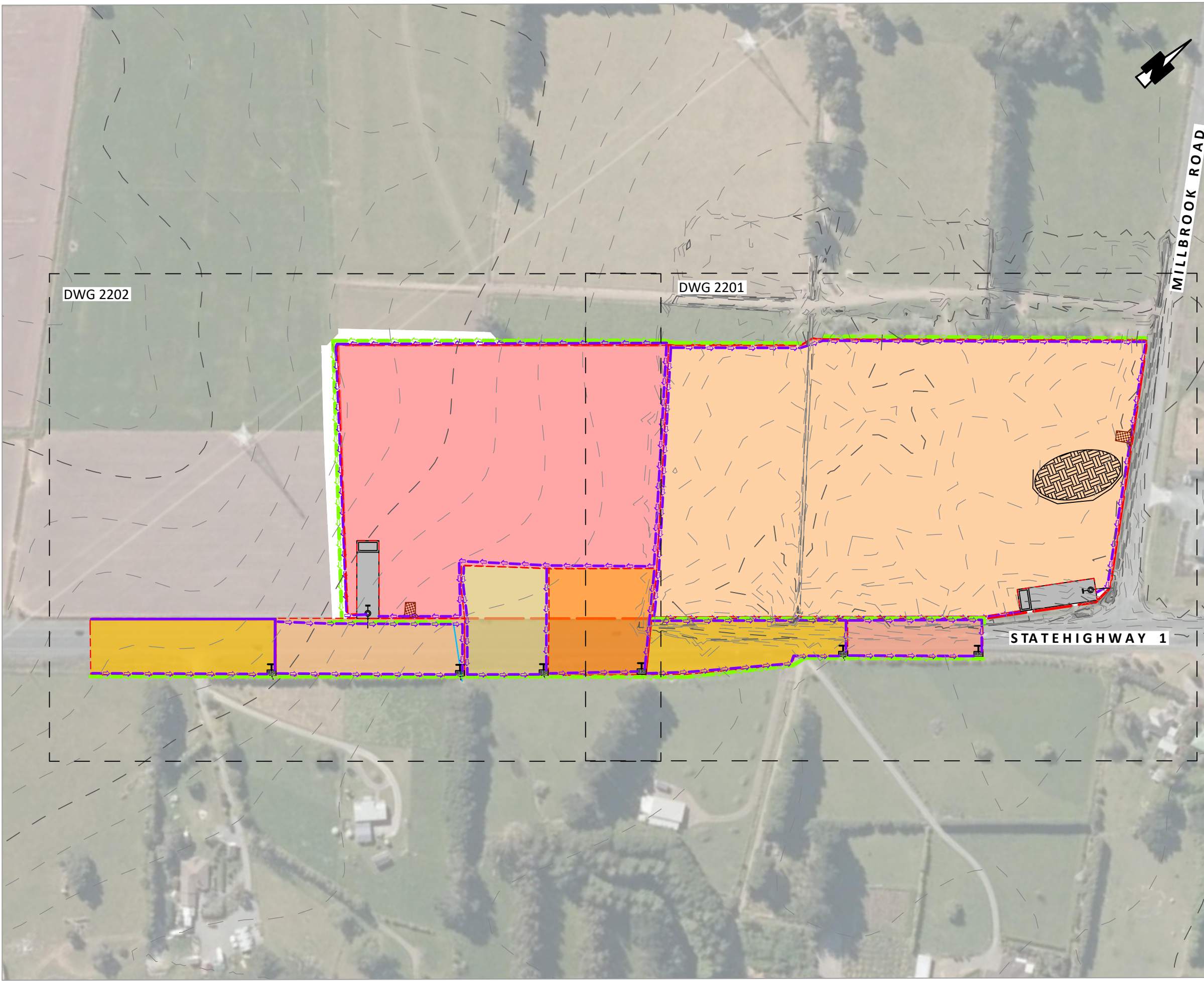
EARTHWORKS
CUT-FILL
SHEET 2

Issue	Description	Checked	Date	Designed	Date	Scale:
1	RESOURCE CONSENT	SJ	2022.12.09	RS	16.11.2022	1:750 (A3 Original)
2	RESOURCE CONSENT	LC	2023.02.16	LD	16.11.2022	
3	RESOURCE CONSENT	LC	08/09/23	LC	08/09/23	
				Job No:	Dwg No:	Rev:
				A21235 2102-1 3		

Planning | Surveying | Engineering | Environmental

EROSION AND SEDIMENT CONTROL NOTES:

1. ALL EROSION AND SEDIMENT CONTROL SHALL COMPLY WITH THE 'EROSION AND SEDIMENT CONTROL GUIDE FOR LAND DISTURBING ACTIVITIES IN THE AUCKLAND REGION' AC GUIDELINE DOCUMENT GD005 AND ANY AMENDMENTS .
2. ALL EROSION AND SEDIMENT CONTROL MEASURES MUST BE OPERATIONAL AND ASBULTS PROVIDED AND APPROVED BY THE ENGINEER/SITE E.M.A PRIOR TO ANY OTHER WORKS COMMENCING ON SITE. THE CONTRACTOR SHALL ARRANGE FOR AND ATTEND A PRE-COMMENCEMENT MEETING ON-SITE WITH THE ENGINEER AND THE COUNCIL E.M.A./COMPLIANCE OFFICER.
3. A COPY OF THE EROSION & SEDIMENT CONTROL MANAGEMENT PLAN SHALL BE AVAILABLE ON THE SITE DURING WORK HOURS AND ALL PERSONNEL INVOLVED IN EARTHWORK ACTIVITIES ON THE SITE (INCLUSIVE OF SUB-CONTRACTORS) SHALL BE FAMILIAR WITH THE CONSENT AND PLAN REQUIREMENTS AS THEY RELATE TO EROSION AND SEDIMENT CONTROL.
4. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR ENSURING THAT THE SITE HAS EFFECTIVE EROSION & SEDIMENT CONTROLS OPERATING AT ALL TIMES AND COMPLIES WITH ALL APPLICABLE CONDITIONS OF THE RESOURCE CONSENT.
5. ALL CLEANWATER RUNOFF FROM STABILISED SURFACES INCLUDING CATCHMENT AREAS ABOVE THE SITE SHALL BE DIVERTED AWAY FROM EARTHWORK AREAS VIA STABILISED SYSTEM, SO AS TO PREVENT SURFACE EROSION.
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10. ALL SRP OUTLETS/SPILLWAYS MUST DISCHARGE AT A CWD CHANNEL OR NATURAL GULLY WITH SOME EROSION PROTECTION AND BE CONTAINED WITHIN THE SITE EXTENTS. PLAN SHOWS OUTLETS OUTSIDE BOUNDARIES FOR CLARITY ONLY.
11. ALL RIPARIAN MARGINS BEING RETAINED ARE TO BE PROTECTED WITH SUPER SILT FENCES FOR THE DURATION OF THE EARTHWORKS
12. CONTRACTOR TO ENSURE EARTHWORKS TO SUBGRADE LEVEL IS COMPLETED INCLUDING ANY CONTAMINATION REMOVAL BELOW THE STOCKPILE LOCATIONS AND SIGNED OFF PRIOR TO PLACEMENT



EROSION & SEDIMENT CONTROL LEGEND:

- - - - - EARTHWORKS CATCHMENT
- - - - - CLEANWATER DIVERSION DRAIN (CWD)
- - - - - DIRTYWATER DIVERSION DRAIN (DWD)
- SUPER SILT FENCE
- STABILISED AREA
- 18.0 — EXISTING CONTOURS MAJOR (1.0m)
- EXISTING CONTOURS MINOR (0.2m)

FOR CONSENT



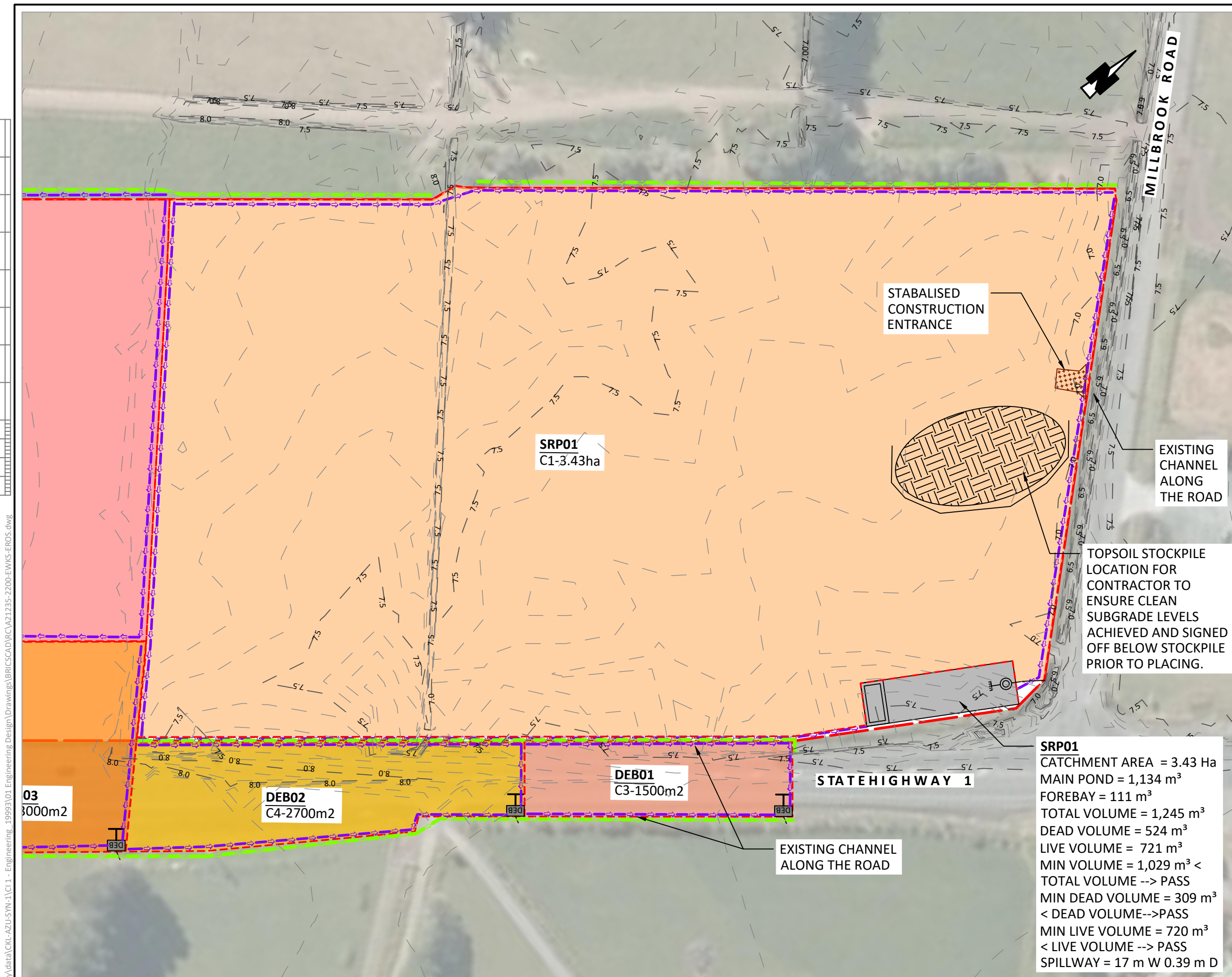
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EROSION AND SEDIMENT
CONTROL PLAN
OVERVIEW PLAN

Issue	Description	Checked	Date	Date	Scale:
1	RESOURCE CONSENT	LC	09.12.2022	Designed: RB 09.12.2022 Drawn: LD 09.12.2022 Checked: LC 09.12.2022	1:1500 <small>(A3 Original)</small>
				Job No: A21235 Dwg No: 2200 Rev: 1	

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EROSION AND SEDIMENT CONTROL NOTES:

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SRP01
 CATCHMENT AREA = 3.43 Ha
 MAIN POND = 1,134 m³
 FOREBAY = 111 m³
 TOTAL VOLUME = 1,245 m³
 DEAD VOLUME = 524 m³
 LIVE VOLUME = 721 m³
 MIN VOLUME = 1,029 m³ < TOTAL VOLUME --> PASS
 MIN DEAD VOLUME = 309 m³ < DEAD VOLUME --> PASS
 MIN LIVE VOLUME = 720 m³ < LIVE VOLUME --> PASS
 SPILLWAY = 17 m W 0.39 m D

EROSION & SEDIMENT CONTROL LEGEND:

- EARTHWORKS CATCHMENT
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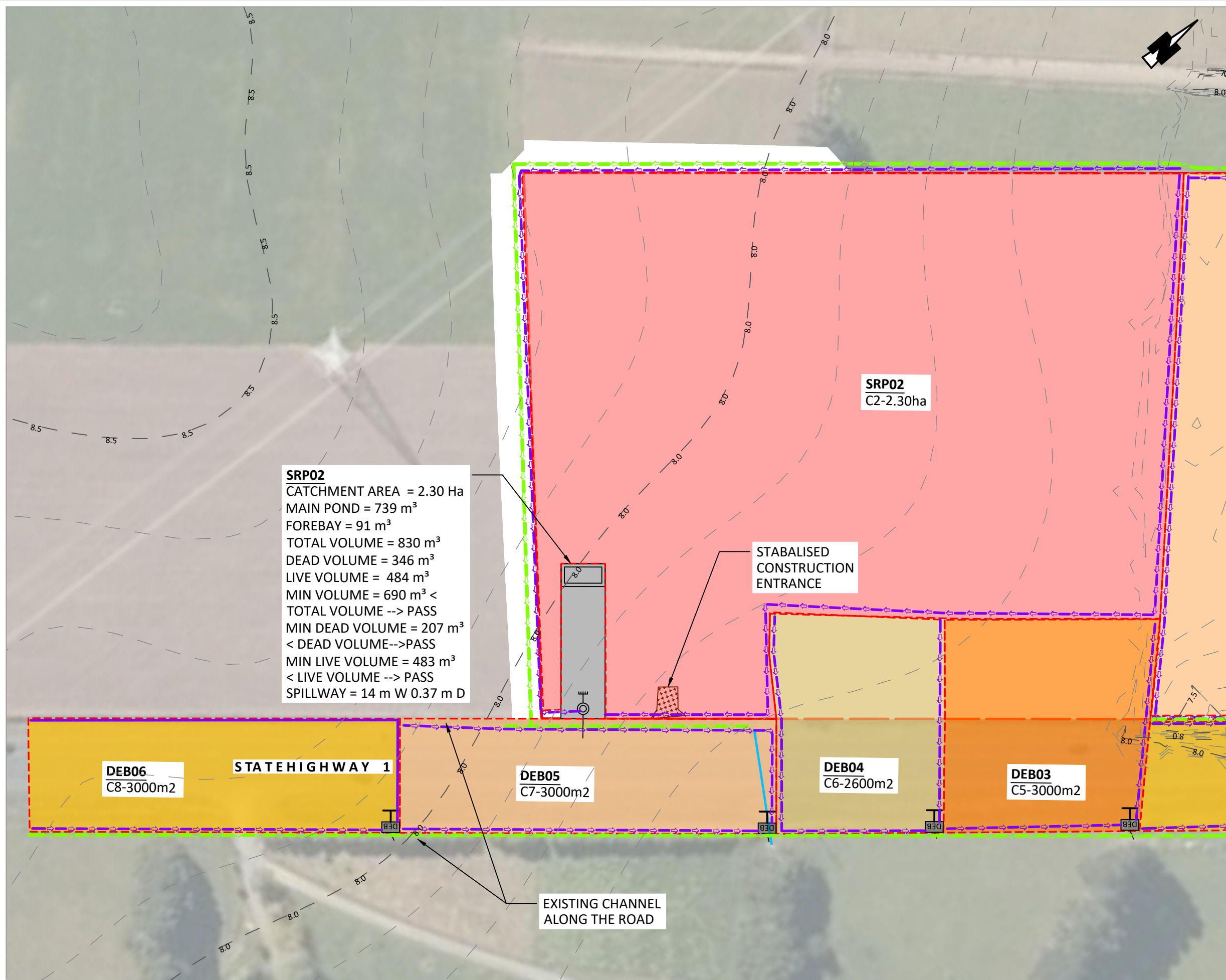
FOR CONSENT

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Issue	Description	Checked	Date	Designed	Date	Scale
1	RESOURCE CONSENT	LC	09.12.2022	RB	09.12.2022	1:750
				LD	09.12.2022	(A3 Original)
				LC	09.12.2022	

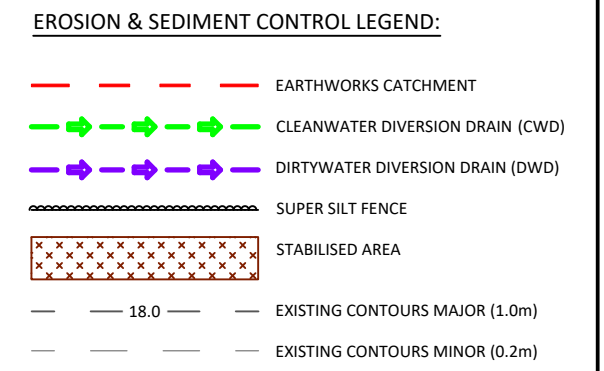
Job No: **A21235** Dwg No: **2201** Rev: **1**

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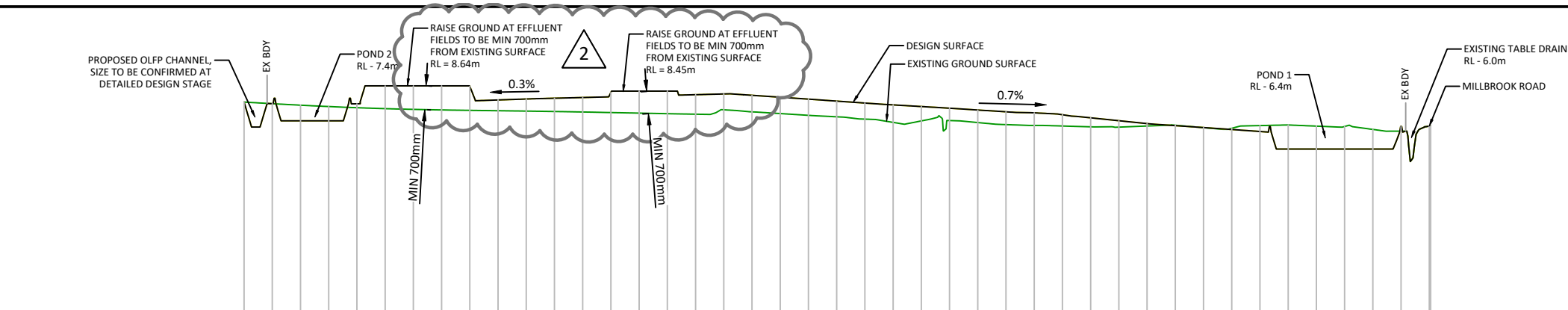
SRP02
 CATCHMENT AREA = 2.30 Ha
 MAIN POND = 739 m³
 FOREBAY = 91 m³
 TOTAL VOLUME = 830 m³
 DEAD VOLUME = 346 m³
 LIVE VOLUME = 484 m³
 MIN VOLUME = 690 m³ < TOTAL VOLUME --> PASS
 MIN DEAD VOLUME = 207 m³ < DEAD VOLUME --> PASS
 MIN LIVE VOLUME = 483 m³ < LIVE VOLUME --> PASS
 SPILLWAY = 14 m W 0.37 m D

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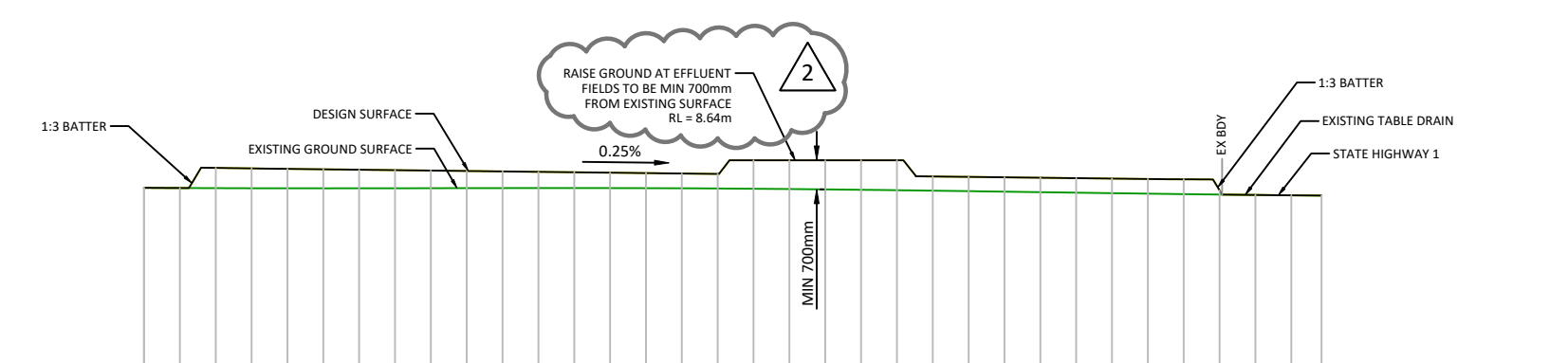
FOR CONSENT

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				LD	09.12.2022	(A3 Original)
				LC	09.12.2022	
				Job No:	Dwg No:	Rev:
				A21235	2202	1



DATUM RL 0.0																																																																																				
CUT -	0.000																																																																																			
FILL +	-0.004																																																																																			
DESIGN SURFACE LEVEL	8.063	8.002	7.400	-0.505	8.003	8.638	8.07	8.638	8.833	8.638	8.853	8.620	8.850	8.138	8.172	8.428	8.200	8.471	8.225	8.513	8.405	8.713	8.452	8.779	8.452	8.799	8.325	8.691	8.560	8.350	8.587	8.304	8.587	8.235	8.579	8.168	8.574	8.097	8.555	8.029	8.569	7.964	8.620	7.906	8.510	7.846	8.436	7.782	8.443	7.719	8.454	7.682	8.445	8.400	7.615	8.400	7.505	8.319	7.403	8.227	7.300	8.084	7.229	-0.015	7.161	8.004	7.092	-0.044	7.022	-0.209	6.400	-0.852	6.400	-0.811	6.400	-0.799	6.400	-0.695	7.200	0.166	7.214	0.000	7.223	0.000
EXISTING SURFACE LEVEL	8.06	8.01	7.95	7.91	7.86	7.83	7.81	7.79	7.77	7.76	7.74	7.73	7.71	7.69	7.67	7.65	7.63	7.59	7.54	7.46	7.34	7.40	7.41	7.34	7.27	7.24	7.22	7.19	7.18	7.18	7.19	7.24	7.16	7.14	7.14	7.23	7.25	7.21	7.20	7.09	7.03	7.21	7.22																																									
CHAINAGE	0.00	10.00	20.00	30.00	40.00	50.00	60.00	70.00	80.00	90.00	100.00	110.00	120.00	130.00	140.00	150.00	160.00	170.00	180.00	190.00	200.00	210.00	220.00	230.00	240.00	250.00	260.00	270.00	280.00	290.00	300.00	310.00	320.00	330.00	340.00	350.00	360.00	370.00	380.00	390.00	400.00	410.00	420.00	420.49																																								

LF SECTION X-X
SCALE 1000 H
100 V



DATUM RL 2.0																																																	
CUT -	0.000																																																
FILL +	0.000																																																
DESIGN SURFACE LEVEL	7.869	7.869	7.864	8.426	8.411	8.398	8.386	8.374	8.362	8.351	8.339	8.327	8.315	8.304	8.292	8.280	8.268	8.256	8.256	8.638	8.638	8.813	8.638	8.824	8.836	8.397	8.174	8.398	8.162	8.400	8.150	8.403	8.139	8.405	8.127	8.407	8.115	8.409	8.107	8.414	8.116	7.797	8.116	7.670	8.000	7.660	8.000	7.653	8.000
EXISTING SURFACE LEVEL	7.87	7.87	7.86	8.426	8.411	8.398	8.386	8.374	8.362	8.351	8.339	8.327	8.315	8.304	8.292	8.280	8.268	8.256	8.256	8.638	8.638	8.813	8.638	8.824	8.836	8.397	8.174	8.398	8.162	8.400	8.150	8.403	8.139	8.405	8.127	8.407	8.115	8.409	8.107	8.414	8.116	7.797	8.116	7.670	8.000	7.660	8.000	7.653	8.000
CHAINAGE	29.98	30.00	35.00	40.00	45.00	50.00	55.00	60.00	65.00	70.00	75.00	80.00	85.00	90.00	95.00	100.00	105.00	110.00	115.00	120.00	125.00	130.00	135.00	140.00	145.00	150.00	155.00	160.00	165.00	170.00	175.00	180.00	185.00	190.00	194.22														

LF SECTION Y-Y
SCALE 500 H
100 V

FOR CONSENT

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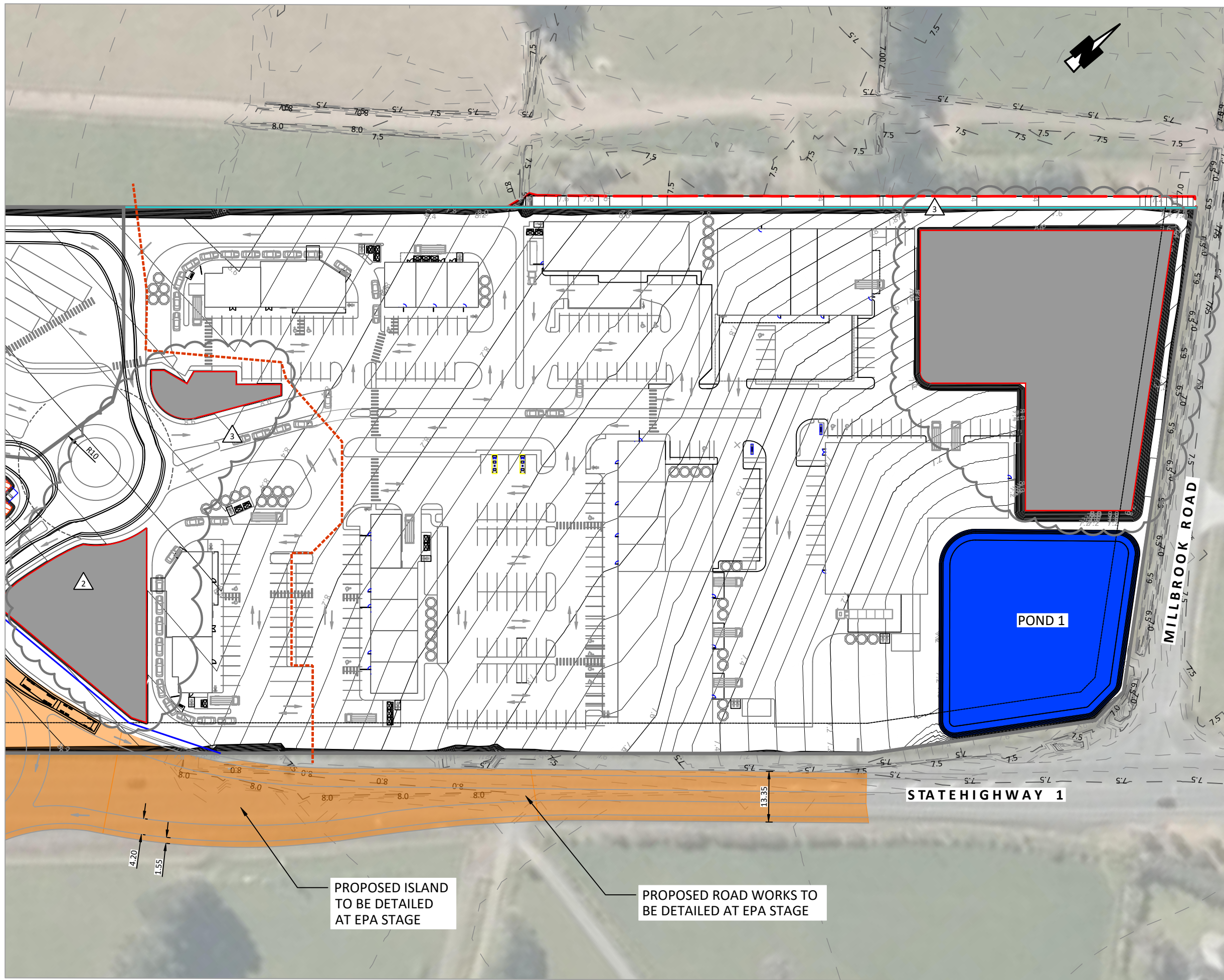


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Hamilton Office:
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Te Awamutu Office:
A: 103 Market Street, Te Awamutu
P: 07 871 6144

WAIPU GATEWAY SERVICE CENTRE
VACO INVESTMENTS LTD
47 MILLBROOK RD, WAIPU

EARTHWORKS
LANDFORM SECTIONS
SHEET 1

Issue	Description	Checked	Date	Designed	Date	Scale
1	RESOURCE CONSENT	LC	09.12.2022	RB	09.12.2022	AS SHOWN
				RB	09.12.2022	(A3 Original)
Job No:		Dwg No:		Rev:		
A21235		2400		2		



ROADING AND PAVEMENT NOTES:

1. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH AUCKLAND COUNCIL AND AUCKLAND TRANSPORT (ATCOP) ENGINEERING STANDARDS.
2. ALL EXTRUDED/INSITU CONCRETE TO BE MIN. 20 MPa STRENGTH AT 28 DAYS.
3. ALL UNDERCHANNEL DRAINS TO BE LAID IN TNZ F/2 DRAINAGE MATERIAL AND HAVE FREE-FLOWING OUTLET TO NEAREST DOWNSTREAM CATCHPIT.
4. ALL FOOTPATHS TO COMPRISE 100mm THICK 20MPa BROOM FINISH CONCRETE ON MIN. 100mm COMPACTED DEPTH GAP40 BASECOURSE.
5. ALL REINFORCING SHALL BE PLACED ON APPROVED CHAIRS AND IS TO BE PLACED CENTRALLY OR AS PER DESIGN PLANS.
6. ALL FOOTPATH/ACCESSWAY SAWCUTS ARE TO COINCIDE WITH KERB SAWCUTS AT 3m CRS TYP. UNLESS NOTED OTHERWISE.
7. PAVEMENT DESIGN IS PROVISIONAL ONLY AND INSITU SUBGRADE STRENGTH SHALL BE CONFIRMED VIA SCALA PENETROMETER TESTING FOLLOWING GULLETING OF THE CARRIAGEWAYS TO CONFIRM FINAL PAVEMENT THICKNESS AND ANY SUBGRADE IMPROVEMENT WORKS i.e. UNDERCUTTING OR STABILISATION. THE ENGINEER IS TO INSPECT, TEST AND APPROVE ALL SUBGRADES PRIOR TO AGGREGATE PLACEMENT.
8. LIME/CEMENT REACTIVITY TESTS ARE TO BE COMPLETED PRIOR TO STABILISING TO CONFIRM APPLICATION RATE, CONFIRM WITH THE ENGINEER.
9. ALL SUBGRADES SHALL BE TRIMMED WITHIN +/- 10mm TOLERANCE TO DESIGN LEVELS AND SHALL BE STRUNG AND APPROVED PRIOR TO METAL COURSE PLACEMENT.
10. VEHICLE CROSSING LOCATIONS AS SHOWN SERVING DEVELOPMENT LOTS (ASIDE FROM ROWS) AND ARE INDICATIVE ONLY (UNLESS NOTED OTHERWISE). THE POSITIONS SHOWN ARE ONLY FOR THE PURPOSE OF THE STREETScape LAYOUT. LOT VEHICLE CROSSINGS SHALL BE INSTALLED INDIVIDUALLY BY THE LOT OWNER AT THE TIME OF BUILDING DEVELOPMENT.

ROADING LEGEND:



PROPOSED ISLAND TO BE DETAILED AT EPA STAGE

PROPOSED ROAD WORKS TO BE DETAILED AT EPA STAGE

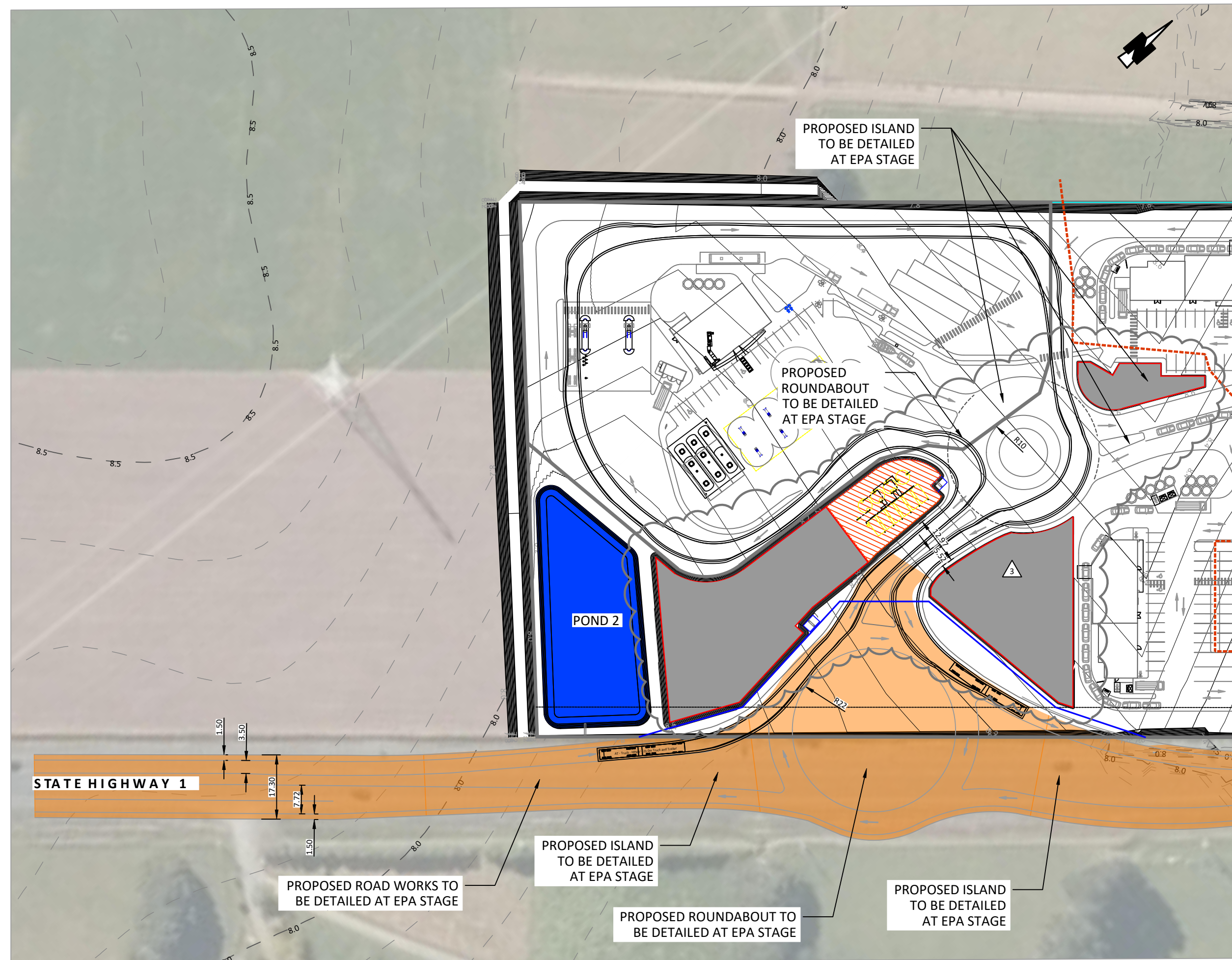
FOR CONSENT

Issue	Description	Checked	Date	Designed	RS	Date	Scale:
1	RESOURCE CONSENT	LC	2022.12.09	Designed:	RS	01.12.2022	1:750 (A3 Original)
2	RESOURCE CONSENT	LC	2023.02.16	Drawn:	LD	01.12.2022	
3	RESOURCE CONSENT	LC	08/09/23	Checked:	LC	08/09/23	

Job No: Dwg No: Rev:
A21235 3001-1 3

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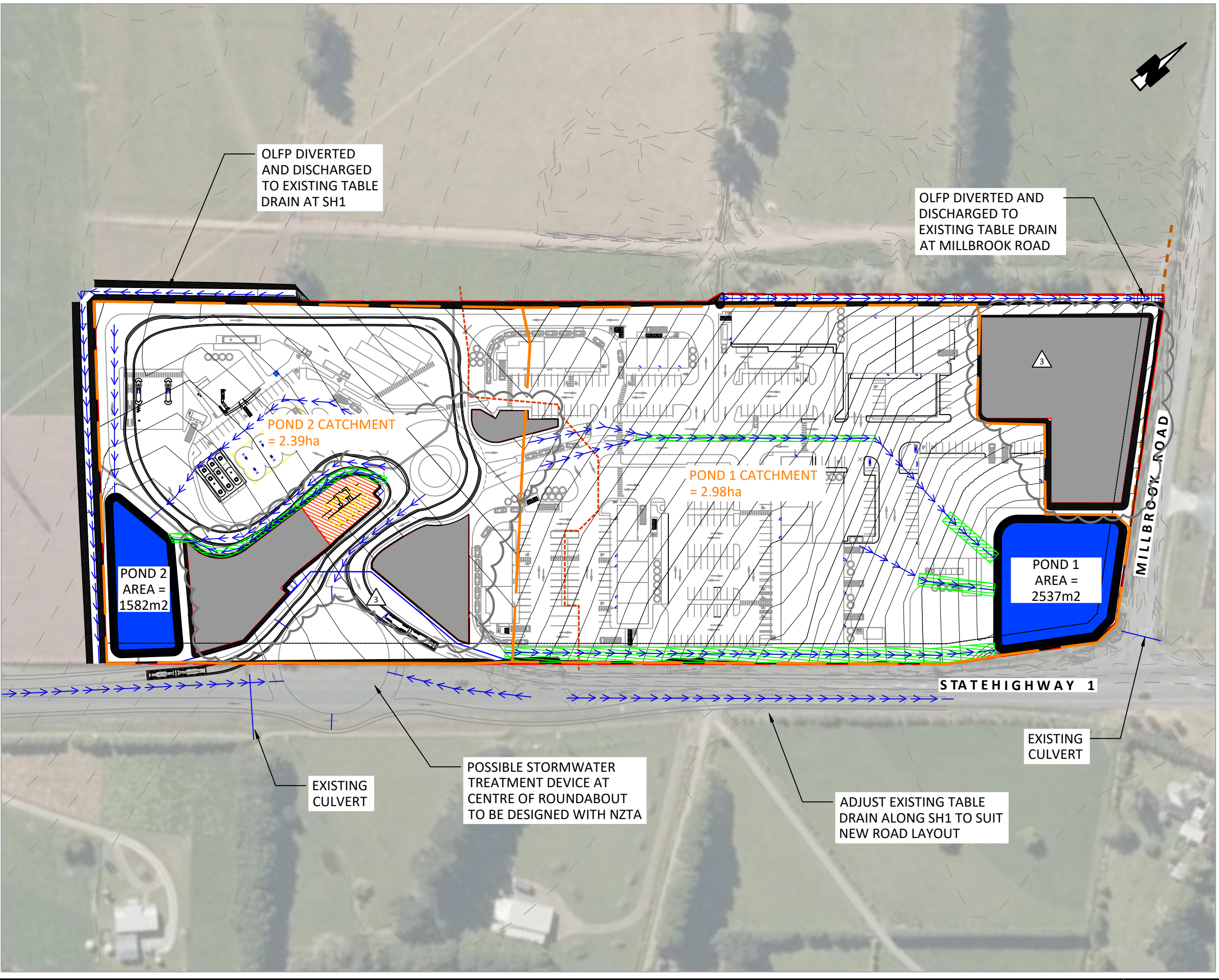


FOR CONSENT

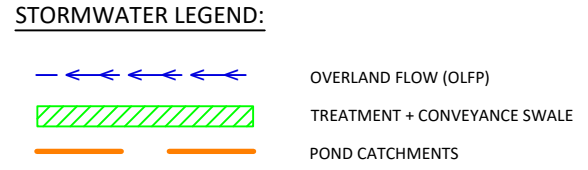
Issue	Description	Checked	Date	Designed	Date	Scale:
1	RESOURCE CONSENT	LC	2022.12.09	RS	01.12.2022	1:750
2	RESOURCE CONSENT	LC	2023.02.16	LD	01.12.2022	
3	RESOURCE CONSENT	LC	08/09/23	LC	08/09/23	(A3 Original)

Job No: A21235 3002-1
 Dwg No: 3
 Rev:

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- ### STORMWATER NOTES:
1. ALL WORKS AND MATERIALS TO COMPLY WITH AUCKLAND COUNCIL CODE OF PRACTICE FOR LAND DEVELOPMENT AND SUBDIVISION AND ANY AMENDMENTS.
 2. ALL PRIVATE DRAINAGE WORKS TO COMPLY WITH THE NEW ZEALAND BUILDING CODE.
 3. ALL DRAINAGE WORKS SHALL BE CARRIED OUT UNDER THE SUPERVISION OF A REGISTERED DRAIN LAYER AND IN ACCORDANCE WITH CURRENT HEALTH AND SAFETY PRACTICES. WHERE REQUIRED, DRAINAGE WORKS ARE TO BE UNDERTAKEN BY AN APPROVED LICENSED CONTRACTOR (A.L.C.).
 4. ALL MANHOLES ARE TO BE MIN. DN 1050 WITH D.I. LID AND COVERS UNLESS SHOWN OTHERWISE.
 5. MANHOLE COVER HINGES WILL BE ORIENTED UPSTREAM FOR ALL MANHOLES LOCATED WITHIN OVERLAND FLOW PATHS
 6. ALL MANHOLE LIDS IN TRAFFICABLE AREAS TO HAVE HEAVY DUTY CLASS E LIDS AND FRAMES.
 7. WHERE SW CASCADES ARE PRESENT, MANHOLES TO BE FINISHED IN 30MPa CONCRETE.
 8. ALL ROAD CATCHPITS TO COMPRISE STANDARD SEMI-RESSESSED IN ACCORDANCE WITH TDM STANDARD DRAWING RD0020. WHERE LOCATED IN CYCLE LANES, CATCHPITS ARE TO INCLUDE CYCLE-FRIENDLY GRATES.
 9. ALL CP LEADS ARE TO BE MIN. DN225 CLASS 4 PIPE UNLESS SHOWN OTHERWISE.
 10. ALL ORDINARY TRENCH BACKFILL SHALL COMPRISE SUITABLE EARTHFILL FREE OF TOPSOIL/ORGANICS AND SHALL BE WELL COMPACTED IN LAYERS NOT EXCEEDING 200mm TO ACHIEVE MINIMUM SHEAR STRENGTHS OF 100 kPa/MAX. 10% AIR VOIDS OR AS PER THE EARTHWORKS SPECIFICATION.
 11. ALL PIPE CROSSINGS UNDER CARRIAGeways/TRAFFIC AREAS TO BE HARDFILL BACKFILLED WITH APPROVED GAP65 TO 1.0m BEYOND EXTENT OF CARRIAGeway. TRENCH HARDFILL BACKFILL TO BE WELL COMPACTED TO ACHIEVE MIN. CLEGG HAMMER CIV = 25.
 12. WHERE CLEARANCE BETWEEN PIPELINE CROSSOVERS IS LESS THAN 100mm THE GAP IS TO BE POLYSTYRENE PACKED IN ADDITION TO HARDFILLING OF CROSSOVERS.
 13. ALL EXISTING BERMS, CARRIAGeways AND CROSSINGS TO BE RE-INSTATED AS PER COUNCIL/CONTROLLING AUTHORITY REQUIREMENTS.



FOR CONSENT

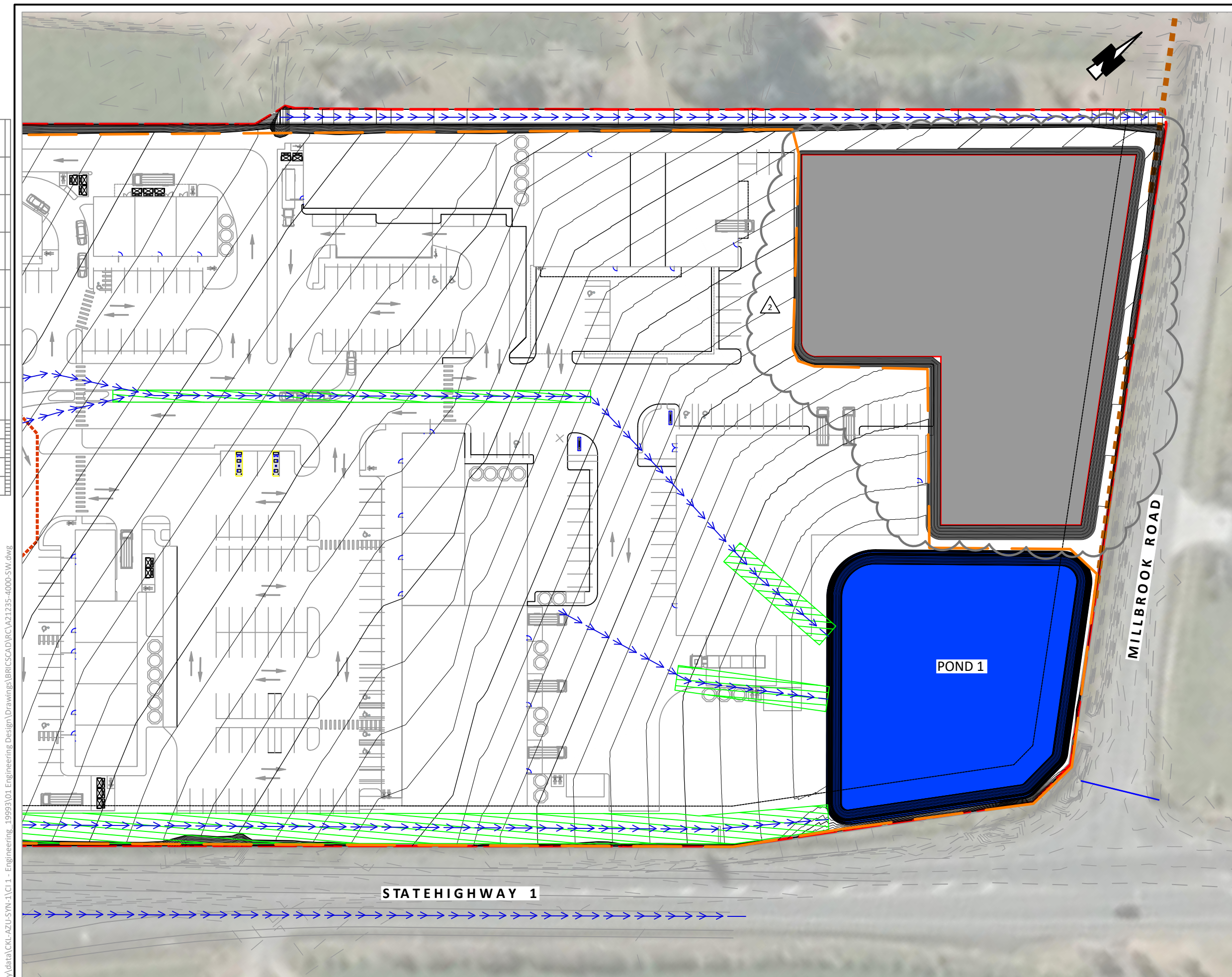
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 E: Auckland@ckl.co.nz

WAIPU GATEWAY SERVICE CENTRE
 VACO INVESTMENTS LTD
 47 MILLBROOK ROAD, WAIPU

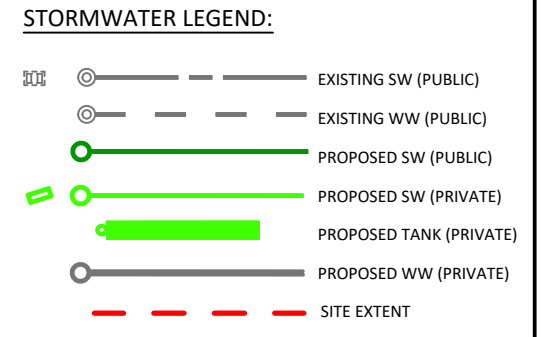
STORMWATER
 LAYOUT
 OVERVIEW PLAN

Issue	Description	Checked	Date	Designed	RS	Date	Scale:
1	RESOURCE CONSENT	LC	2022.12.09	Designed:	RS	01.12.2022	1:1500
2	RESOURCE CONSENT	LC	2023.02.16	Drawn:	LD	01.12.2022	
3	RESOURCE CONSENT	LC	08/09/23	Checked:	LC	08/09/23	(A3 Original)

Job No: _____ Dwg No: _____ Rev: _____
A21235 4000-1 3



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FOR CONSENT



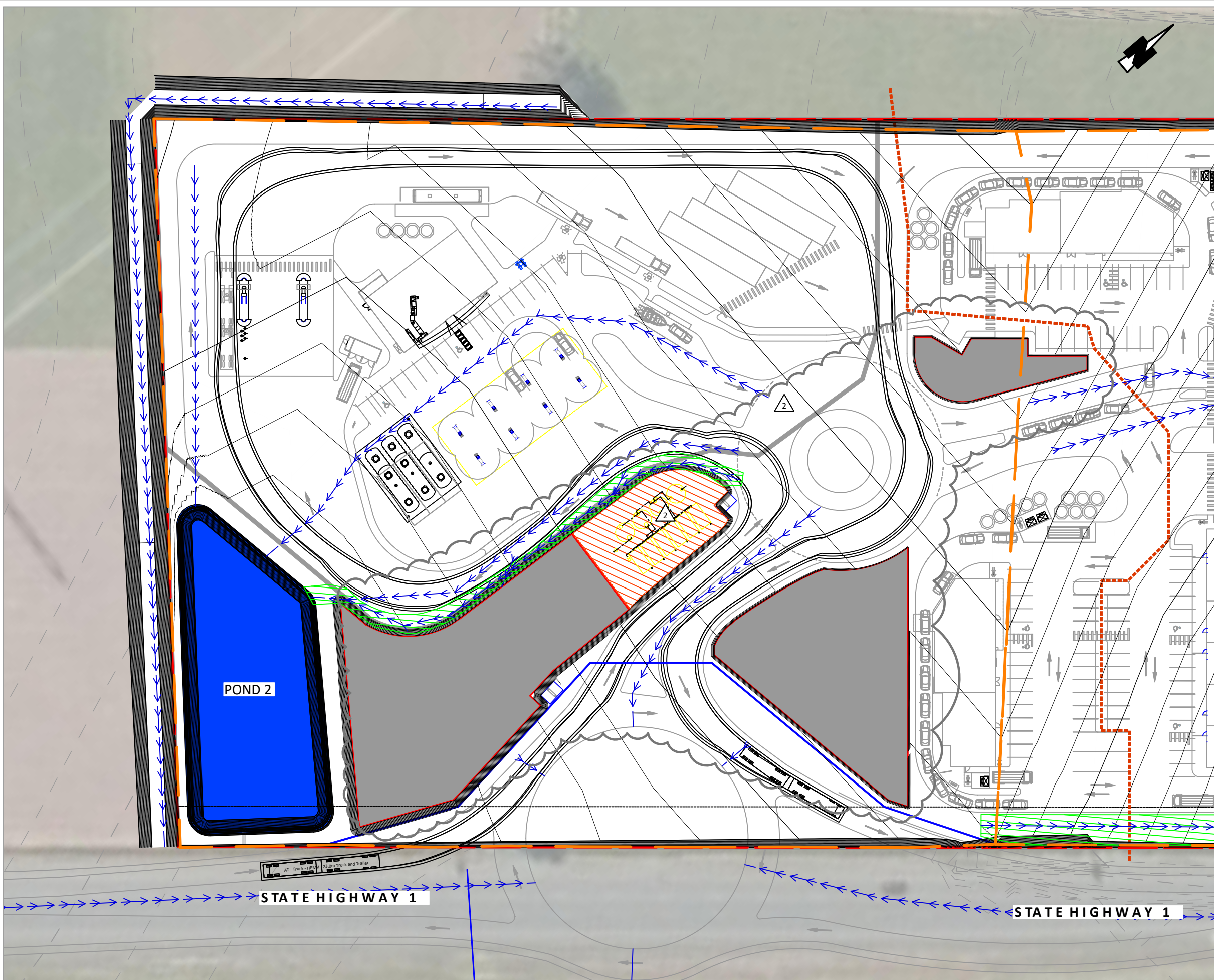
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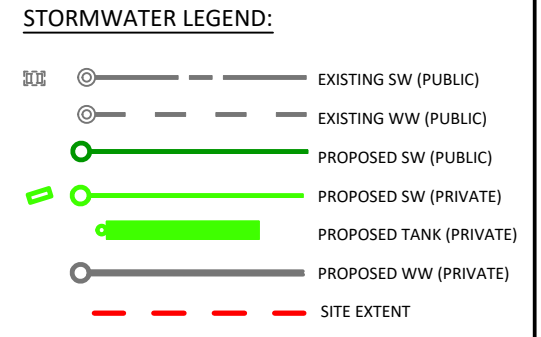
WAIPU GATEWAY SERVICE CENTRE
VACO INVESTMENTS LTD
 47 MILLBROOK ROAD, WAIPU

STORMWATER LAYOUT PLAN
SHEET 1

Issue	Description	Checked	Date	Designed	RS	Date	Scale:
1	RESOURCE CONSENT	LC	2022.12.09	RS	RS	01.12.2022	1:750 (A3 Original)
2	RESOURCE CONSENT	LC	08/09/23	LD	LD	01.12.2022	
Job No: A21235 4001-1							Rev: 2



- STORMWATER NOTES:**
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FOR CONSENT

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WAIPU GATEWAY SERVICE CENTRE
VACO INVESTMENTS LTD
 47 MILLBROOK ROAD, WAIPU

STORMWATER
LAYOUT PLAN
SHEET 2

Issue	Description	Checked	Date	Designed:	RS	Date	Scale:
1	RESOURCE CONSENT	LC	2022.12.09	LD	RS	01.12.2022	1:750 (A3 Original)
2	RESOURCE CONSENT	LC	08/09/23	LD	LD	01.12.2022	
				Checked:	LC	08/09/23	
				Job No:	A21235 4002-1		
				Dwg No:	2		
				Rev:			

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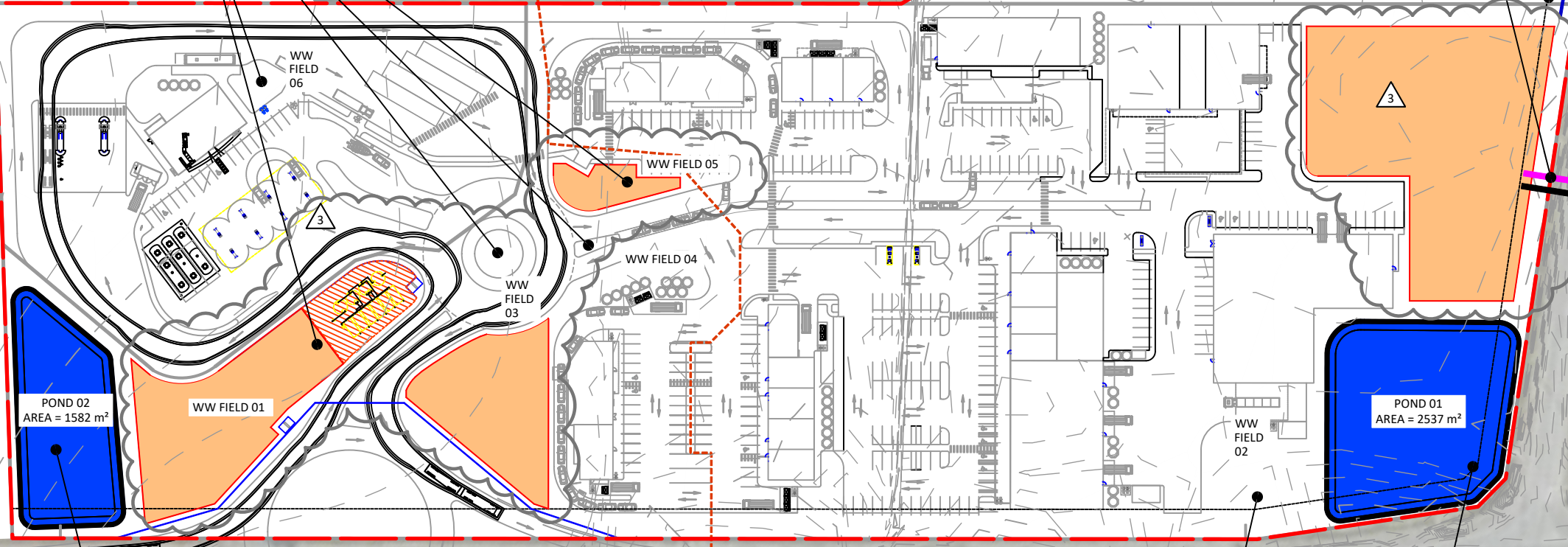
1. ALL WORKS TO COMPLY WITH THE RELEVANT LOCAL AUTHORITY STANDARDS.
2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE ALL SERVICES PRIOR TO ANY EXCAVATION.
3. IT IS THE CONTRACTORS RESPONSIBILITY FOR HEALTH & SAFETY & SECURITY ON SITE, APPROPRIATE FENCING AND SIGNAGE SHALL BE ERRECTED AND MAINTAINED AT ALL TIMES TO KEEP THE GENERAL PUBLIC OFF SITE.
4. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE MAINTAIN AND PROTECT ALL LIVE SERVICES PRIOR TO WORKS COMMENCING.
5. CONTRACTOR TO PILOT ANY SERVICES LOCATED IN THE BERM AND ADVISE LOCATION AND DEPTHS TO THE ENGINEER FOR A SOLUTION TO BE DETERMINED WITH RESPECTIVE UTILITY PROVIDERS PRIOR TO EARTHWORKS.
6. ANY WORK OUTSIDE OF PROPERTY EXTENTS SHALL BE ON INSTRUCTION BY THE ENGINEER PRIOR TO COMMENCING WORKS.
7. SUITABLE TRAFFIC MANAGEMENT SHALL BE ADOPTED FOR WORKS IN THE BERM TO BE ARRANGED BY THE CONTRACTOR.
8. IN THE EVENT ITEMS OF ARCHAEOLOGICAL INTEREST ARE FOUND DURING WORKS, THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY AND NO DAMAGE IS TO OCCUR TO ANY SUCH ITEMS IN THE MEANTIME.
9. IN THE EVENT ASBESTOS IS ENCOUNTERED THE ENGINEER IS TO BE ALERTED IMMEDIATELY AND NO WORKS ARE TO TAKE PLACE AROUND THE CONTAMINATED ZONE UNTIL CLEARED IN A COMPLIANT MANNER.
10. ANY EXCAVATIONS OVER 500mm IN HEIGHT SHALL BE BATTERED TO A 1:3 SAFE SLOPE.

WASTEWATER EFFLUENT FIELDS DESIGNED AND CONFIRMED AT BUILDING CONSENT STAGE

WATERMAIN EXTENSION IN EASEMENT, SHOWN AS DN100mm TO BE CONFIRMED. UNDER FUTURE DETAILED DESIGNS

OLFP CHANNEL TO DISCHARGE AT MILLBROOK ROAD AS PER EXISTING, SIZE TO BE CONFIRMED AT DETAILED DESIGN STAGE

POWER COMMS SUPPLY CONNECTION TO MAINS IN SH1, CONFIRMED AND DETAILED AT BUILDING CONSENT STAGE



STATE HIGHWAY 1 (SH1)

WASTEWATER EFFLUENT FIELDS DESIGNED AND CONFIRMED AT BUILDING CONSENT STAGE

SW POND DISCHARGE VIA EXISTING SW TABLE DRAIN, CONFIRMED AT BUILDING CONSENT STAGE

SW POND DISCHARGE VIA EXISTING SW TABLE DRAIN, CONFIRMED AT BUILDING CONSENT STAGE

EXTENSION OF WATERMAIN TO OUTSIDE 45 THE BRAIGH, DETAILED AT EPA STAGE

FOR CONSENT



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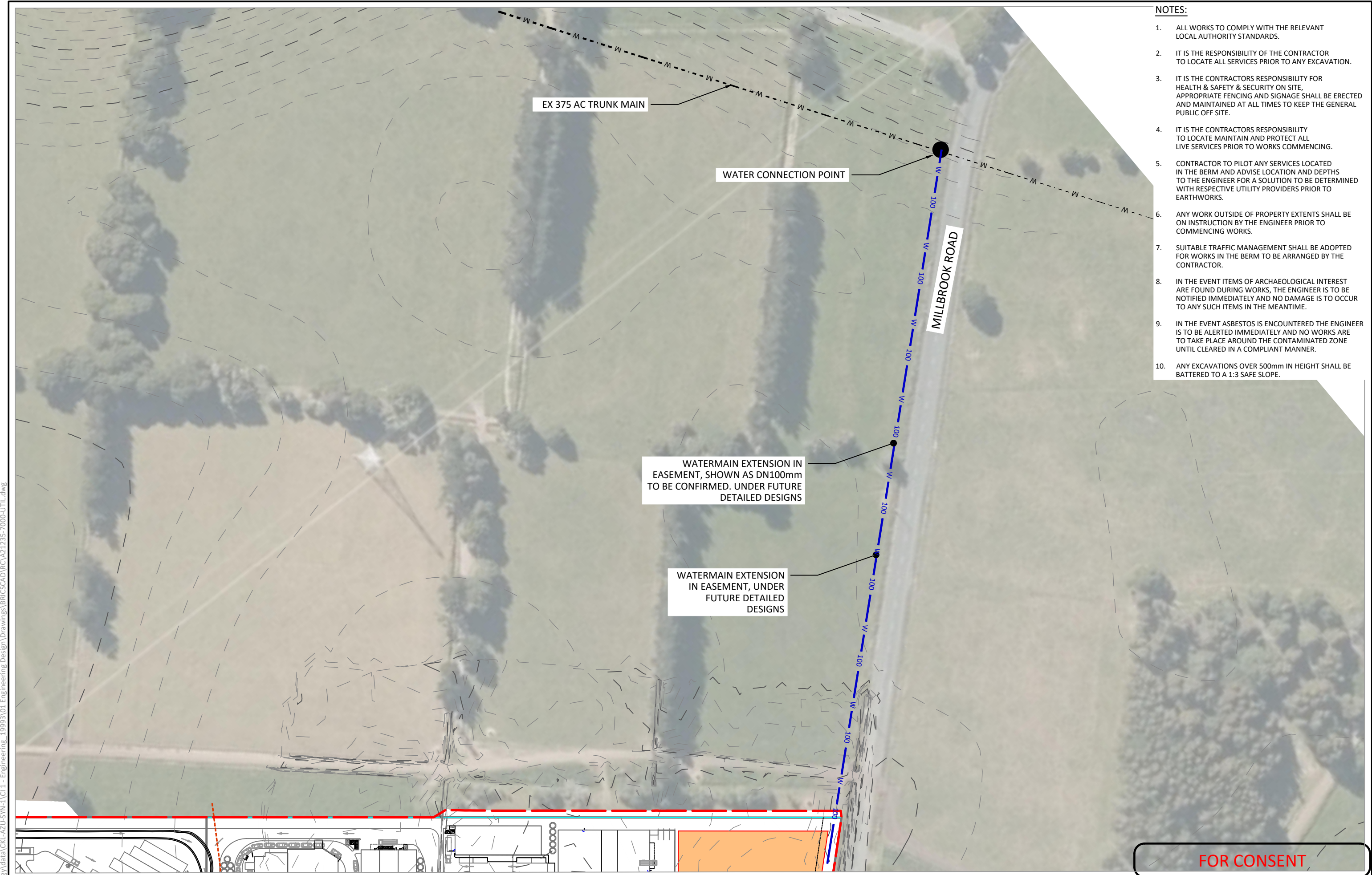
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AUCKLAND
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WAIPU GATEWAY SERVICE CENTRE
VACO INVESTMENTS LTD
47 MILLBROOK ROAD, WAIPU

UTILITY SERVICES
LAYOUT OVERVIEW

Issue	Description	Checked	Date	Designed	Date	Scale:
1	RESOURCE CONSENT	SJ	09.12.2022	RS	16.11.2022	1:1500 (A3 Original)
2	RESOURCE CONSENT	LC	2023.02.16	LD	16.11.2022	
3	RESOPURCE CONSENT	LC	08/09/23	LC	08/09/23	
				Job No:	Dwg No:	Rev:
				A21235 7000-1 3		

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1. ALL WORKS TO COMPLY WITH THE RELEVANT LOCAL AUTHORITY STANDARDS.
 2. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE ALL SERVICES PRIOR TO ANY EXCAVATION.
 3. IT IS THE CONTRACTORS RESPONSIBILITY FOR HEALTH & SAFETY & SECURITY ON SITE, APPROPRIATE FENCING AND SIGNAGE SHALL BE ERECTED AND MAINTAINED AT ALL TIMES TO KEEP THE GENERAL PUBLIC OFF SITE.
 4. IT IS THE CONTRACTORS RESPONSIBILITY TO LOCATE MAINTAIN AND PROTECT ALL LIVE SERVICES PRIOR TO WORKS COMMENCING.
 5. CONTRACTOR TO PILOT ANY SERVICES LOCATED IN THE BERM AND ADVISE LOCATION AND DEPTHS TO THE ENGINEER FOR A SOLUTION TO BE DETERMINED WITH RESPECTIVE UTILITY PROVIDERS PRIOR TO EARTHWORKS.
 6. ANY WORK OUTSIDE OF PROPERTY EXTENTS SHALL BE ON INSTRUCTION BY THE ENGINEER PRIOR TO COMMENCING WORKS.
 7. SUITABLE TRAFFIC MANAGEMENT SHALL BE ADOPTED FOR WORKS IN THE BERM TO BE ARRANGED BY THE CONTRACTOR.
 8. IN THE EVENT ITEMS OF ARCHAEOLOGICAL INTEREST ARE FOUND DURING WORKS, THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY AND NO DAMAGE IS TO OCCUR TO ANY SUCH ITEMS IN THE MEANTIME.
 9. IN THE EVENT ASBESTOS IS ENCOUNTERED THE ENGINEER IS TO BE ALERTED IMMEDIATELY AND NO WORKS ARE TO TAKE PLACE AROUND THE CONTAMINATED ZONE UNTIL CLEARED IN A COMPLIANT MANNER.
 10. ANY EXCAVATIONS OVER 500mm IN HEIGHT SHALL BE BATTERED TO A 1:3 SAFE SLOPE.

FOR CONSENT

C:\ProgramData\12DSystem\data\CKL-AZU-SYN-1\CL1 - Engineering - 19993\01 - Engineering - Design\Drawings\BRI\CSCAD\RC\A21235-7000-UTIL.dwg



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WAIPU GATEWAY SERVICE CENTRE
VACO INVESTMENTS LTD
 47 MILLBROOK ROAD, WAIPU

UTILITY SERVICES
LAYOUT SHEET 2

Issue	Description	Checked	Date	Designed	Date	Scale:
1	RESOURCE CONSENT	SJ	2022.12.09	RB	09.12.2022	1:1500 (A3 Original)
2	RESOURCE CONSENT	LC	2023.02.16	LD	09.12.2022	
				LC	09.12.2022	
				Job No:	Dwg No:	Rev:
				A21235 7001-1		2

Job Name	47 Millbrook Road, Waipu	File Name	A21235-EV- -SMP2.xlsx
Job No.	A21235	Sheet Name	Area summary
Date	8/09/2023	File Path	C:\ProgramData\12DSynergy\data\CKL-AZU-SYN-1\CI 1 - Engineering_19
By	FDP	Checked	

Total Area summary

Coverage	Pre-development (ha)		Post-development (ha)	
Roof	0.000	0%	0.765	13%
Impervious	0.000	0%	3.098	52%
Grass/pervious	5.913	100%	2.051	35%
TOTAL AREA	5.913	100%	5.913	100%

Pre- Sub Catchments summary

Coverage	Stage 1 (ha)	Stage 2 (ha)
Impervious	0.000	0.000
Pervious	2.255	3.486
TOTAL AREA	2.255	3.486

*excludes roundabout not falling to a pond

Post- SubCatchment summary

Coverage	Stage 1 (ha)	Stage 2 (ha)
Roof	0.177	0.588
Other Impervious	1.109	1.816
Pervious draining to pond	0.836	0.836
Pervious direct discharge	0.133	0.246
TOTAL AREA	2.255	3.4860

Pre- Sub Catchments summary (HEC)

Coverage	Stage 1 (km2)	Stage 2 (km2)
Impervious	0.00000	0.00000
Pervious	0.02255	0.03486
TOTAL AREA	0.02255	0.03486

Post- SubCatchment summary (HEC)

Coverage	Stage 1 (km2)	Stage 2 (km2)
Roof	0.0018	0.0059
Impervious	0.0111	0.0182
Total Imp	0.0129	0.0240
Pervious draining to pond	0.0084	0.0084
Pervious direct discharge	0.0013	0.0025
TOTAL AREA	0.0225	0.0349

Job Name 47 Millbrook Road, Waipu
 Job No. A21235
 Date 30/11/2021
 By CL

File Name A21235-EV--SMP2.xlsx
 Sheet Name Culvert
 File Path C:\ProgramData\12DSynergy\data\CKL-AZU-SYN\1\CI 1 - Engineering_19993\01 Engineering Design\Calculations\Stormwater & WW
 Checked

Catchment Breakdowns and Peak Flow Calculation for Existing Pipe Network

Assumptions:

Runoff Coefficient (c): c=0.95 for roof
 c=0.9 for driveway
 c=0.3 for permeable surfaces

Roughness factor (k): k = 0.6 (conservative value for existing concrete & plastic pipes)
 See NZS4404 Table 4.2 for more details

Design rainfall: 10yr 10min +CC 107 mm/hr

Colebrook-White Equation for Pipe Velocity

$$V = \frac{1.49 R^{2/3}}{n} \left[1 + \frac{0.000147 R^{0.78} S^{0.04}}{1 + 0.000147 R^{0.78} S^{0.04}} \right]$$

with $S_f = \frac{V^2}{2gR}$

V = mean velocity [m/s]
 R = Hydraulic Radius [m]
 n = surface roughness [s/m]
 S = slope of channel [m/m]
 S_f = friction slope [m/m]
 g = acceleration due to gravity [m/s²]
 L = length between the head loss [m]
 h = head loss [m]

Catchment Details

Catchment	Description	Area	% Impervious	Impervious Area	Pervious Area	Roof Area	Other Impervious Area	Pervious Area	Weighted c	Peak Flow from Catchment (L/s)
A	SH1 Culvert	7320	60%	4392	2928.00	45%	15%	40%	0.68	148.9
B	SH 1 culvert?	125000	0%	0	125000.00	0%	0%	100%	0.30	1117.8

Pipe Capacity

Pipe	Roughness Factor	Pipe size(mm)	Pipe Slope (%)	Velocity (m/sec)	Capacity (Q = VA)	Peak Flow from Catchment (L/s)	Does pipe have sufficient capacity?
SH 1 Culvert	0.6	600	1.77	3.24	915.6	148.9	YES
SH 1 Culvert	0.6	600	1.77	3.24	915.6	1117.8	NO

Table 4.2 – Guide to roughness coefficients for gravity stormwater pipes concentrically jointed and clean

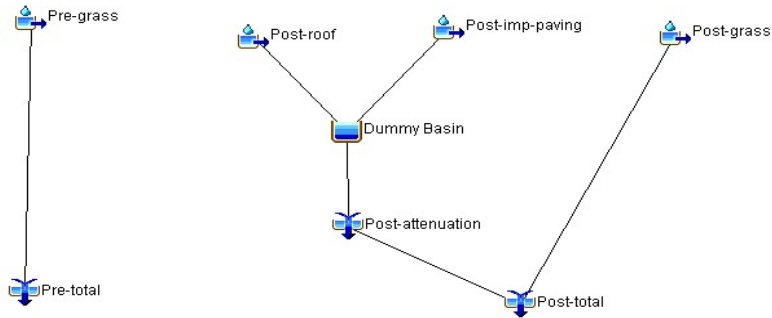
Description	Colebrook-White coefficient k (mm)	Manning roughness coefficient (n)
Circular pipes		
PVC	0.003 – 0.015	0.008 – 0.009
PE	0.003 – 0.015	0.008 – 0.009
Vitreous clay	0.15 – 0.6	0.010 – 0.013
Concrete – machine made to AS/NZS 4058	0.03 – 0.15	0.009 – 0.012
Corrugated metal	–	0.012 – 0.024
GRP (glass reinforced plastic)	0.003 – 0.015	0.008 – 0.009
Culverts		
Concrete pre-cast (pipes and boxes)	0.6	0.016
Open channel		
Straight uniform channel in earth and gravel in good condition	–	0.0225
Unlined channel in earth and gravel with some bends and in fair condition	–	0.025
Channel with rough stony bed or with weeds on earth bank and natural streams with clean straight banks	–	0.030
Winding natural streams with generally clean bed but with some pools and shoals	–	0.035
Winding natural streams with irregular cross section and some obstruction with vegetation and debris	–	0.045
Irregular natural stream with obstruction from vegetation and debris	–	0.060
Very weedy irregular winding stream obstructed with significant overgrown vegetation and debris	–	0.100
NOTE – Refer to AS 2200 table 2 and notes, and Metcalfson: Hydraulic data and formulae (Lamont).		

Job Name	47 Millbrook Road, Waipu	File Name	A21235-EV--SMP2.xlsx
Job No.	A21235	Sheet Name	HEC HMS model
Date	30/11/2021	File Path	C:\ProgramData\12DSynergy\data\CKL-AZU-SYN-1\CI 1
By	FDP	Checked	

Assumptions

Land use	Pervious	Impervious
SCS Curve Number	74.0	98.0
Initial Abstraction, Ia mm	5.0	0.0
Time of Concentration (tc) min		10.0
Time of Concentration for SCS min		6.7

Basin model



Model result - Pre Development

Storm ARI	Stage 1 (m3/s)	Stage 2 (m3/s)	Total (m3/s)
5YR	0.393	0.609	1.002
100YR	0.877	1.361	2.238
80% 100YR	0.702	1.089	1.790

Model result - Pre Development

Storm ARI	Stage 1 (m3/s)	Stage 2 (m3/s)	Total (m3/s)
5YR	0.326	0.491	0.817
100YR	0.690	1.026	1.716

Pond Details

	Stage 1 Pond	Stage 2 Pond
100yr Peak Volume (m3)	706	1253
Peak elevation (mRL)	7.96	6.98
Bottom of pond (mRL)	7.40	6.40
Peak depth (m)	0.56	0.58

Global Summary Results for Run "Pre and post-5yrCC"

Project: Waipu2 Simulation Run: Pre and post-5yrCC

Start of Run: 01Jan2000, 00:00 Basin Model: Pre and Post-80%Attenuation
 End of Run: 02Jan2000, 00:00 Meteorologic Model: Met-5yrCC
 Compute Time: 23Nov2022, 14:27:20 Control Specifications: Control 1

Show Elements: All Elements Volume Units: MM 1000 M3 Sorting: Hydrologic

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (MM)
Post-Stage 1 Imp	0.0129	0.33041	01Jan2000, 12:02	144.49
Post-Stage 1 Perv	0.0084	0.14655	01Jan2000, 12:03	89.33
Catchment 1 Pond	0.0213	0.31052	01Jan2000, 12:09	120.64
Post-Stage 1 Perv...	0.0013	0.02268	01Jan2000, 12:03	89.33
Pre-Stage 2	0.0349	0.60887	01Jan2000, 12:03	89.33
Pre-Stage 1	0.0225	0.39254	01Jan2000, 12:03	89.33
Pre-total	0.0574	1.00140	01Jan2000, 12:03	89.33
Post-Stage 2 Imp	0.0240	0.61472	01Jan2000, 12:02	144.49
Post-Stage 2 Perv	0.0084	0.14655	01Jan2000, 12:03	89.33
Catchment 2 Pond	0.0324	0.46252	01Jan2000, 12:10	127.57
Post-Catchmet 2...	0.0025	0.04362	01Jan2000, 12:03	89.33
Post-Total Stage 2	0.0349	0.49093	01Jan2000, 12:09	124.83

Global Summary Results for Run "Pre and post-100yrCC"

Project: Waipu2 Simulation Run: Pre and post-100yrCC

Start of Run: 01Jan2000, 00:00 Basin Model: Pre and Post-80%Attenuation
 End of Run: 02Jan2000, 00:00 Meteorologic Model: Met-100yrCC
 Compute Time: 18Nov2022, 13:31:27 Control Specifications: Control 1

Show Elements: All Elements Volume Units: MM 1000 M3 Sorting: Hydrologic

Hydrologic Element	Drainage Area (KM2)	Peak Discharge (M3/S)	Time of Peak	Volume (MM)
Post-Stage 1 Perv	0.0084	0.32751	01Jan2000, 12:03	201.05
Catchment 1 Pond	0.0213	0.65266	01Jan2000, 12:09	238.34
Post-Stage 1 Perv...	0.0013	0.05069	01Jan2000, 12:03	201.05
Pre-Stage 2	0.0349	0.95896	01Jan2000, 12:03	201.05
Pre-Stage 1	0.0225	0.87725	01Jan2000, 12:03	201.05
Pre-total	0.0574	2.23796	01Jan2000, 12:03	201.05
Post-Stage 2 Imp	0.0240	1.12467	01Jan2000, 12:02	267.91
Post-Stage 2 Perv	0.0084	0.32751	01Jan2000, 12:03	201.05
Catchment 2 Pond	0.0324	0.95896	01Jan2000, 12:09	246.61
Post-Catchmet 2...	0.0025	0.09747	01Jan2000, 12:03	201.05
Post-Total Stage 2	0.0349	1.02693	01Jan2000, 12:08	243.34
Post-total Stage 1	0.0226	0.69008	01Jan2000, 12:08	236.19

Summary Results for Reservoir "Catchment 1 Pond"

Project: Waipu2 Simulation Run: Pre and post-100yrCC
 Reservoir: Catchment 1 Pond

Start of R... 01Jan2000, 00:00 Basin Model: Pre and Post-80%Attenuator
 End of R... 02Jan2000, 00:00 Meteorologic Model: Met-100yrCC
 Compute TI... 18Nov2022, 13:31:27 Control Specifications: Control 1

Volume Units: MM 1000 M3

Computed Results

Peak Inflow: 0.93176 (M3/S)	Date/Time of Peak Inflow: 01Jan2000, 12:02
Peak Discharge: 0.65266 (M3/S)	Date/Time of Peak Discharge: 01Jan2000, 12:09
Inflow Volume: 241.55 (MM)	Peak Storage: 0.70595 (1000 M3)
Discharge Volume: 238.34 (MM)	Peak Elevation: 7.9585 (M)

Summary Results for Reservoir "Catchment 2 Pond"

Project: Waipu2 Simulation Run: Pre and post-100yrCC
 Reservoir: Catchment 2 Pond

Start of R... 01Jan2000, 00:00 Basin Model: Pre and Post-80%Attenuator
 End of R... 02Jan2000, 00:00 Meteorologic Model: Met-100yrCC
 Compute TI... 18Nov2022, 13:31:27 Control Specifications: Control 1

Volume Units: MM 1000 M3

Computed Results

Peak Inflow: 1.45192 (M3/S)	Date/Time of Peak Inflow: 01Jan2000, 12:02
Peak Discharge: 0.95896 (M3/S)	Date/Time of Peak Discharge: 01Jan2000, 12:09
Inflow Volume: 250.58 (MM)	Peak Storage: 1.25270 (1000 M3)
Discharge Volume: 246.61 (MM)	Peak Elevation: 6.9751 (M)



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Job Name Iona Road, Havelock North File Name A21235-EV- -SMP2.xlsx
 Job No. A18259 Sheet Name HIRDS
 Date 30/11/2021 File Path C:\ProgramData\12DSynergy\data\CKL-AZU-SYN-1\CI 1 - Engineering_1999
 By CL Checked

24 hr Rainfall Depth

Reference: HBRC Waterways Design Guidelines Stormwater Management

ARI	Hirids Rainfall Depth (mm) *	Climate change Factor	Rainfall Depth +CC (mm)
5YR	125.0	20.00%	150.0
10yr	148.0	20.00%	177.6
100yr	228.0	20.00%	273.6

HIRDS V4 Depth-Duration-Frequency Results

Site Name: 47 millbrook road, waipu

Coordinate System: WGS84

Longitude: 174.4243

Latitude: -35.9827

Rainfall depths (mm) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h
1.58	0.633	8.79	13.3	16.8	24.2	33.8	53.9	69.3	86.5
2	0.5	9.67	14.7	18.5	26.6	37.2	59.3	76.3	95.2
5	0.2	12.7	19.3	24.3	35.1	49	78.1	101	125
10	0.1	15	22.8	28.7	41.4	57.8	92.1	119	148
20	0.05	17.4	26.4	33.2	47.9	66.9	107	137	171
30	0.033	18.8	28.5	35.9	51.8	72.4	115	148	185
40	0.025	19.8	30.1	37.8	54.6	76.3	122	156	195
50	0.02	20.6	31.3	39.4	56.8	79.4	126	163	203
60	0.017	21.3	32.3	40.6	58.6	81.9	130	168	209
80	0.012	22.3	33.9	42.6	61.4	85.9	137	176	220
100	0.01	23.1	35.1	44.1	63.7	89	142	182	228
250	0.004	26.4	40.1	50.4	72.7	102	162	208	260

Rainfall intensities (mm/hr) :: Historical Data

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h
1.58	0.633	52.7	40	33.5	24.2	16.9	8.98	5.78	3.6
2	0.5	58	44	36.9	26.6	18.6	9.88	6.36	3.97
5	0.2	76.4	58	48.6	35.1	24.5	13	8.38	5.22
10	0.1	90.2	68.4	57.4	41.4	28.9	15.4	9.88	6.16
20	0.05	104	79.2	66.4	47.9	33.5	17.8	11.4	7.13
30	0.033	113	85.6	71.8	51.8	36.2	19.2	12.4	7.71
40	0.025	119	90.3	75.7	54.6	38.2	20.3	13	8.13
50	0.02	124	93.9	78.7	56.8	39.7	21.1	13.6	8.46
60	0.017	128	96.9	81.2	58.6	40.9	21.7	14	8.73
80	0.012	134	102	85.2	61.4	42.9	22.8	14.7	9.15
100	0.01	139	105	88.2	63.7	44.5	23.6	15.2	9.48
250	0.004	158	120	101	72.7	50.8	27	17.4	10.8



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Job Name 47 Millbrook Road, Waipu
Job No. A21235
Date 8/09/2023
By FDP

File Name A21235-EV- -SMP2.xlsx
Sheet Name Pond Stage Storage
File Path C:\ProgramData\12DSynergy\data\CKL-AZU-SYN-1\CI 1 - Engineering_19993\0
Checked

Pond Storage-Elevation

Stage 1 Pond (Pond 2)

Elevation	Storage (m3)	Storage (1000m3)
7.4	0	0.0000
7.5	115.63	0.1156
7.6	235.85	0.2359
7.7	360.72	0.3607
7.8	490.28	0.4903
7.9	624.60	0.6246
8	763.73	0.7637

Stage 2 Pond (Pond 1)

Elevation	Storage (m3)	Storage (1000m3)
6.4	0	0.0000
6.5	204.98	0.2050
6.6	415.25	0.4152
6.7	630.87	0.6309
6.8	851.90	0.8519
6.9	1078.39	1.0784
7	1310.39	1.3104



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Client : [Company Name]
 Site address : [Site Address]
 Job name : [Job Name]
 Job number : [Job Number]

MANNINGS OPEN CHANNEL FLOW CALCULATION SHEET

Date	File Name	Southern OLFP
By	Sheet Name	A21235-EV- -SMP2.xlsx
	Checked	

Channel ID:	XS 1
Channel Type:	Trapezoidal

Input Data:

Channel Longitudinal Slope S =	0.07%	
Base width b =	3.000	m
Channel side slope Z =	3	H:1V
Design flow depth d =	0.700	m
Manning Material	Pasture, no brush high grass	
Manning number n =	0.03	

Calculated Parameters:

X-sectional Flow Area A =	3.570	m ²
Wetted Perimeter P =	7.4272	m
Hydraulic radius R =	0.481	m

Check Flow Rates:

Design Flow Rate Q _d =	1.892	m ³ /s	
Calculated Channel Capacity Q _c =	1.890	m ³ /s	Channel capacity less than design flow

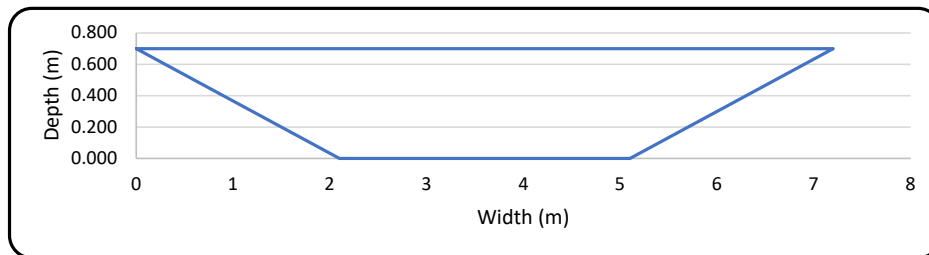
Freeboard:

Proposed freeboard =	0.000	m
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Final Channel Geometry:

Total depth =	0.700	m
Base width =	3.000	m
Top width =	7.200	m

Channel Cross Section:



Job Name 47 Millbrook Road, Waipu
 Job No. A21235
 Date 30/11/2021
 By CL

File Name A21235-EV--SMP2.xlsx
 Sheet Name Upstream OLPF
 File Path C:\ProgramData\12DSynergy\data\CKL-AZU-SYN-1\CI 1 - Engineering_19993\01 Engineering Design\Calculations\Stormwater & WW
 Checked

Catchment Breakdowns and Peak Flow Calculation for Existing Pipe Network

Assumptions:

Runoff Coefficient (c):

c=0.95 for roof

c=0.9 for driveway

c=0.3 for permeable surfaces

Roughness factor (k):

k = 0.6 (conservative value for existing concrete & plastic pipes)

See NZS4404 Table 4.2 for more details

Design rainfall:

100yr 10min +CC

167 mm/hr

Colebrook-White Equation for Pipe Velocity

$$V = \frac{2.303}{f} \sqrt{2g \cdot D \cdot S_f} \log \left(\frac{3.7D}{k_s + \frac{2.63V}{gS_f}} \right)$$

with $S_f = \frac{fV^5}{148.6D^5}$

f = friction factor (unitless)
 D = hydraulic diameter (m)
 k_s = surface roughness (m)
 V = flow velocity (m/s)
 g = gravity (9.81 m/s²)
 S_f = friction slope (unitless)

Catchment Details

Catchment	Description	Area	% Impervious	Impervious Area	Pervious Area	Roof Area	Other Impervious Area	Pervious Area	Weighted c	Peak Flow from Catchment (L/s)
A	Southern OLPF	136000	0.0%	0	136000.00	0.0%	0%	100%	0.30	1891.9
B	Eastern OLPF	104000	0.0%	0	104000.00	0.0%	0%	100%	0.30	1446.8

Table 4.2 – Guide to roughness coefficients for gravity stormwater pipes concentrically jointed and clean

Description	Colebrook-White coefficient k (mm)	Manning roughness coefficient (n)
Circular pipes		
PVC	0.003 – 0.015	0.008 – 0.009
PE	0.003 – 0.015	0.008 – 0.009
Vitreous clay	0.15 – 0.6	0.010 – 0.013
Concrete – machine made to AS/NZS 4058	0.03 – 0.15	0.009 – 0.012
Corrugated metal	–	0.012 – 0.024
GRP (glass reinforced plastic)	0.003 – 0.015	0.008 – 0.009
Culverts		
Concrete pre-cast (pipes and boxes)	0.6	0.016
Open channel		
Straight uniform channel in earth and gravel in good condition	–	0.0225
Unlined channel in earth and gravel with some bends and in fair condition	–	0.025
Channel with rough stony bed or with weeds on earth bank and natural streams with clean straight banks	–	0.030
Winding natural streams with generally clean bed but with some pools and shoals	–	0.035
Winding natural streams with irregular cross section and some obstruction with vegetation and debris	–	0.045
Irregular natural stream with obstruction from vegetation and debris	–	0.060
Very weedy irregular winding stream obstructed with significant overgrown vegetation and debris	–	0.100
NOTE – Refer to AS 2200 table 2 and notes, and Metrication: Hydraulic data and formulae (Lamont).		



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Client : [Company Name]
 Site address : [Site Address]
 Job name : [Job Name]
 Job number : [Job Number]

MANNINGS OPEN CHANNEL FLOW CALCULATION SHEET

Date	File Name	Western OLFP
By	Sheet Name	A21235-EV- -SMP2.xlsx
	Checked	

Channel ID:	XS 1
Channel Type:	Trapezoidal

Input Data:

Channel Longitudinal Slope S =	0.48%	
Base width b =	3.000	m
Channel side slope Z =	3	H:1V
Design flow depth d =	0.360	m
Manning Material	Pasture, no brush high grass	
Manning number n =	0.03	

Calculated Parameters:

X-sectional Flow Area A =	1.469	m ²
Wetted Perimeter P =	5.2768	m
Hydraulic radius R =	0.278	m

Check Flow Rates:

Design Flow Rate Q _d =	1.447	m ³ /s	
Calculated Channel Capacity Q _c =	1.452	m ³ /s	Channel size sufficient

Freeboard:

Proposed freeboard =	0.090	m
----------------------	-------	---

Final Channel Geometry:

Total depth =	0.450	m
Base width =	3.000	m
Top width =	5.700	m

Channel Cross Section:

