

**LANDEV Consulting**

info@landev.co.nz

www.landev.co.nz

1790 Great North Road, Avondale



**Infrastructure Assessment Report**

52 Kaurilands Road, Titirangi

Date: 27/09/2021

Rev: A

Prepared By: Osama Abdullatif  
Civil Engineer, BE(Hons), CPEng.

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## 1.0 Introduction

LANDEV was engaged by MAQ Enterprises to undertake an infrastructure assessment report for a new development at 52 Kaurilands Road, Titirangi. This report will support applications for resource consent to enable the development and will inform any subsequent detailed design process.

## 2.0 Site Description

The property (legally described as PT LOT 1 DP 34220) has an area of 809 m<sup>2</sup> and is located in Titirangi, approximately 180 m northwest of Titirangi Baptist Church. It has a triangular shape and is occupied by a Single residential dwelling.

Location: 52 Kaurilands Road, Titirangi

Legal Description: PT LOT 1 DP 34220

Size: 809 m<sup>2</sup>

Zoning: Residential - Mixed Housing Suburban Zone

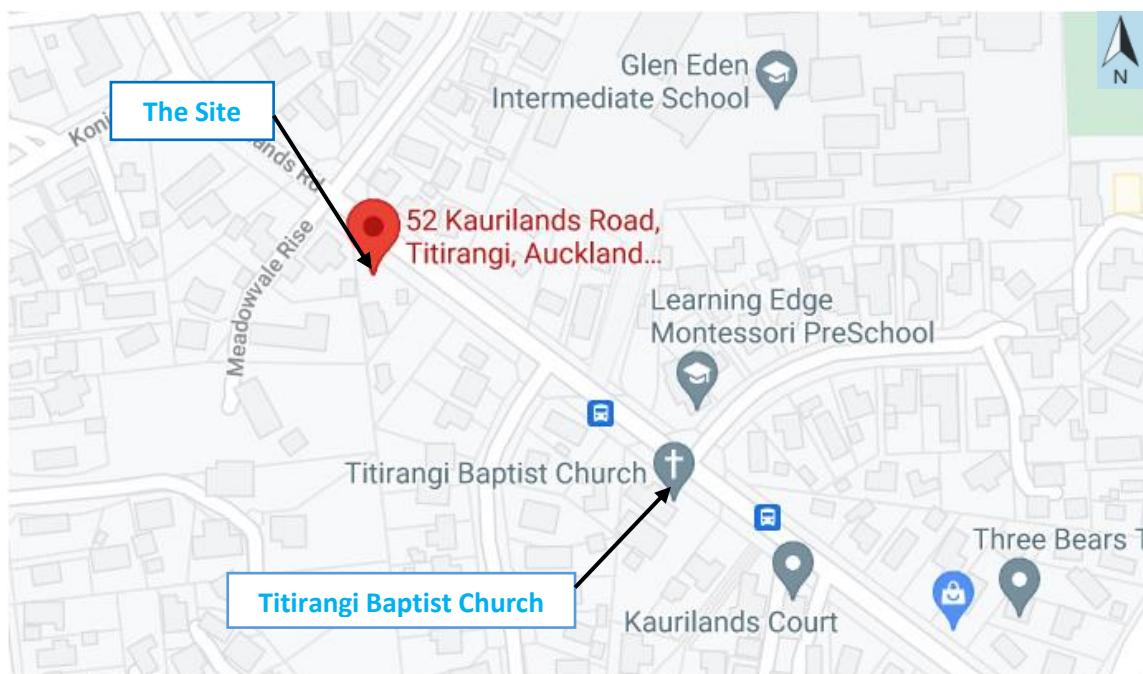


Figure 1: Locality Map (image source: Google Maps)

The site has a steep slope towards the east. The zone is classified as Residential - Mixed Housing Suburban Zone as per the Auckland Unitary Plan Operative in Part (AUP OiP).



Figure 2: Map of Site location (image source: Auckland Council Geomaps)

### 3.0 Proposal Summary

The proposed development involves removing the existing dwelling and constructing three new dwellings in a 3-lot subdivision as shown in Figure 3. The existing vehicle crossing is to be removed and replaced with two new vehicle crossings. The new vehicle crossings and driveway are proposed to ensure compliance to Auckland Council standards.

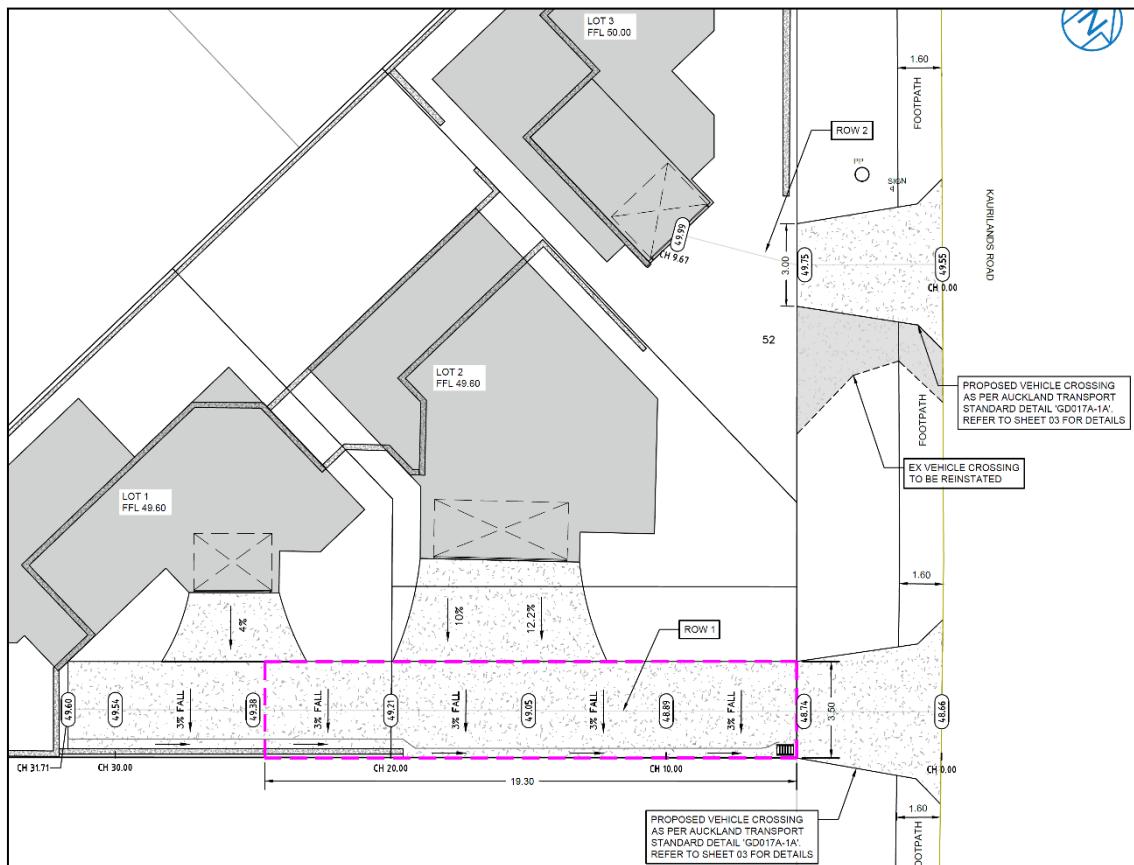


Figure 3: Proposal Scheme Plan

### 4.0 Earthworks

The earthworks volumes are estimated to be 600 m<sup>3</sup> of cut and 58 m<sup>3</sup> of fill over a total area of 560 m<sup>2</sup>. An earth works cut and fill plan as well as proposed contours plan are included in appendix 4.

### 5.0 Erosion and Sediment Controls

The use of silt fences to control and trap any dirty runoff from within the development is proposed during the earthworks. Considering the volume of earthworks involved, the adverse effects will be less than minor. Refer to Appendix 4 for erosion and sediment control plans.

## **6.0 Council Requirements**

Auckland Unitary Plan (operative in part) E8.4.1 Activity table states that the proposed development must meet the following standards:

- The design of the proposed stormwater management device(s) must be consistent with any relevant district plan that addresses or addressed stormwater matters.
- The diversion and discharge must not cause or increase scouring or erosion at the point of discharge or downstream.
- The diversion and discharge must not result in, or increase, the following:
  - (a) Flooding of other properties in rainfall event up to the 10% AEP (1 in 10 year);
  - (b) Inundation of buildings on other properties in events up to the 1% AEP (1 in 100 year).
- The diversion and discharge must not cause or increase nuisance or damage to other properties.

## **7.0 Stormwater Management**

### **7.1 Existing Stormwater Infrastructure**

Roof and hardstand runoff from the existing dwelling currently are not connected to the public network for 52 Kaurilands Road. This will not be adequate for the proposed development and hence public stormwater extension is required. Council requires a stormwater connection for each property in order for subdivision to occur.

### **7.2 Proposed best practical stormwater management**

The best practical option for stormwater disposal for the proposed development is through extending the public stormwater network as indicated in the plans shown in Appendix 4. This involves:

- A new 1050mm dia public manhole SWMH01 is proposed within vehicle crossing.
- A new 225mm dia CLASS 4 public line connecting the existing stormwater manhole to proposed SWMH01 as shown in Figure 4 below.
- A new 150mm dia PVC SN16 public line extending from SWMH01 and terminating within ROW (1m away from vehicle crossing).
- A new 150mm dia PVC SN16 private line extending from proposed 150mm dia public line and terminating in front of LOT1.
- A 100mm dia connection for each dwelling.
- Runoff from common area will be collected by a private catchpit as indicated in the proposed engineering plan (Refer to Appendix 4).
- Pervious area discharge in sheet flow format as per the existing situation.

### 7.3 Peak Flow

The predevelopment peak stormwater discharge from the property resulting from the 10% AEP rainfall event is 11.86 litres/sec, while the post development peak stormwater discharge from the property resulting from the 10% AEP rainfall event is 14.73 litres/sec (Refer to Appendix 1 for calculations).

The public existing stormwater pipe capacity have been checked. The capacity calculations demonstrate that the stormwater line has sufficient capacity as demonstrated in Appendix 1.

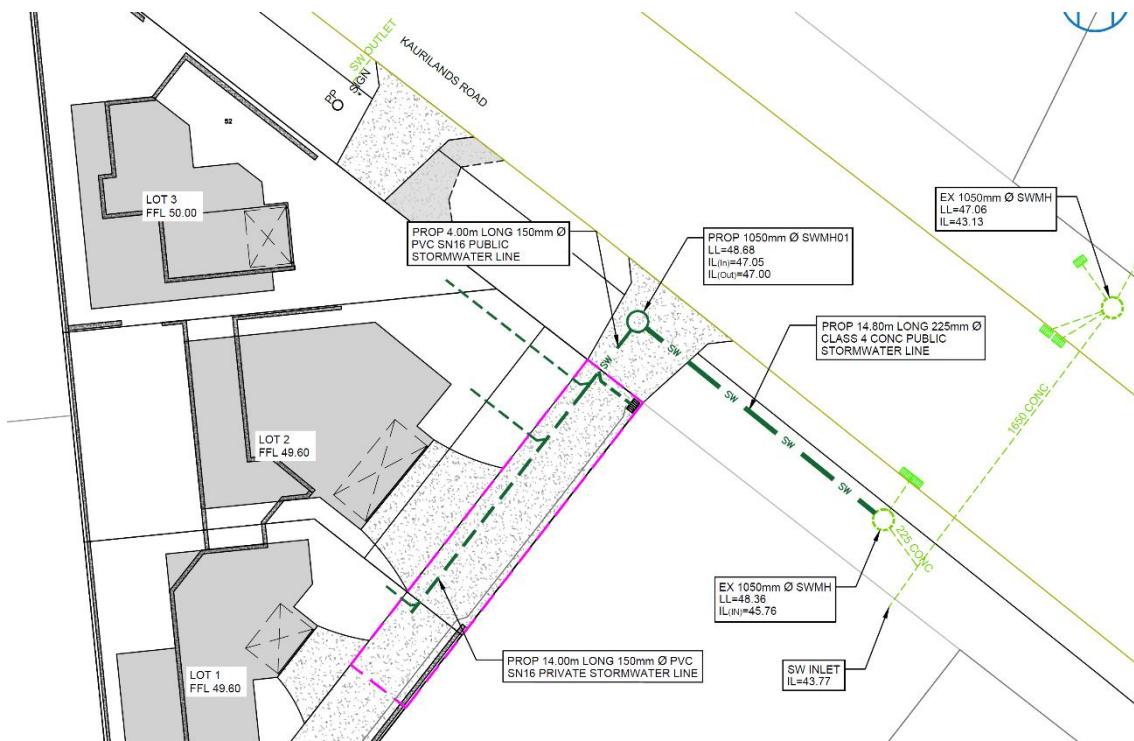


Figure 4: Proposed Stormwater Connection Plan

## 8.0 Wastewater Management

### 8.1 Existing Wastewater

The existing dwellings' disposal of wastewater is via an existing connection which traverses the site as per figure 5 below.

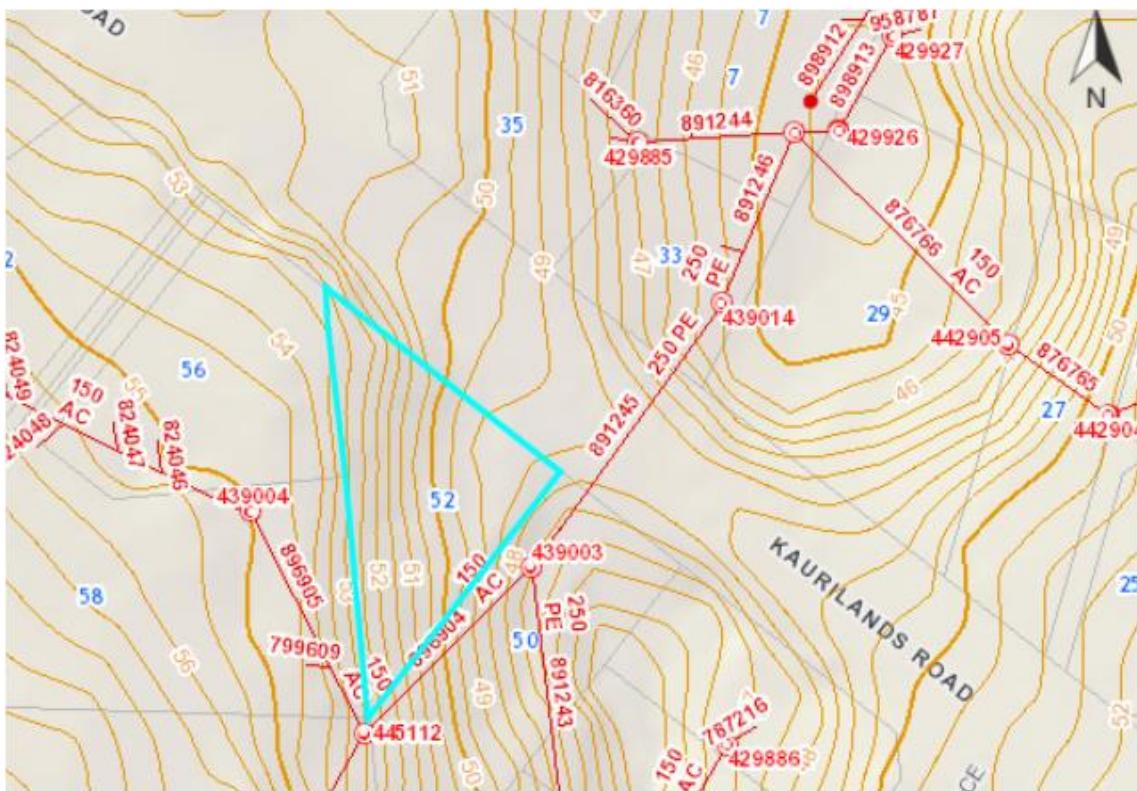


Figure 5 - Existing wastewater infrastructure (image source: Auckland Council Geomaps)

### 8.2 Proposed Wastewater

In order to service the proposed new development, the following is proposed:

- A new 1050mm dia public wastewater manhole.
- A new public 150mm dia PVC SN16 pipe.
- A 100mm dia connection for each lot.

Refer to figure 6 and Appendix 4 for engineering Plans.

The 150mmØ wastewater pipe is classified as a critical asset by Watercare. If works are to occur within 10m of this asset, written approval is required by Watercare to carry out any construction, excavation or building works within this zone. This requires a works Over Application to be submitted to Watercare with appropriate plans, bridging and cross section details as required.

The wastewater flows from the existing dwelling connection is domestic waste with an estimated PWWF of 0.04 L/s. The proposed subdivision and development of new units will increase the catchment's PWWF to 0.13 L/s.

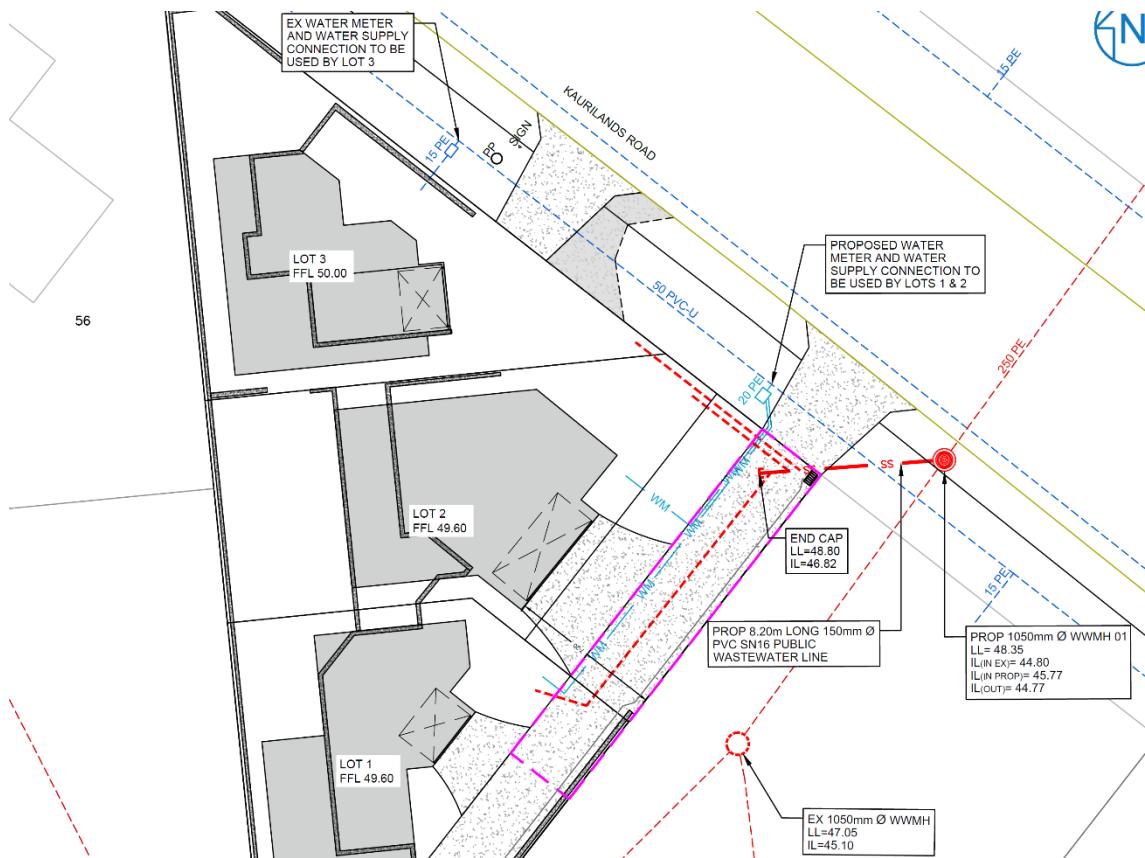


Figure 6: Proposed wastewater connections plan.

All sanitary drainage will be designed and constructed in accordance with Watercare Water and Wastewater Code of Practice for Land Development and Subdivision, and the requirements of the New Zealand Building Code.

## 9.0 Water Supply and Firefighting

There is a 50mm Dia PVC-U water main in front of 52 Kaurilands Road that will service the proposed 3-lot subdivision. It is anticipated that this will be sufficient to serve the development. Each dwelling will require its own water metre. One metre bank will be installed in the berm to serve Lots 1 and 2 as illustrated in appendix 4 water supply layout plan. The existing water connection will be utilised to serve Lot 3.

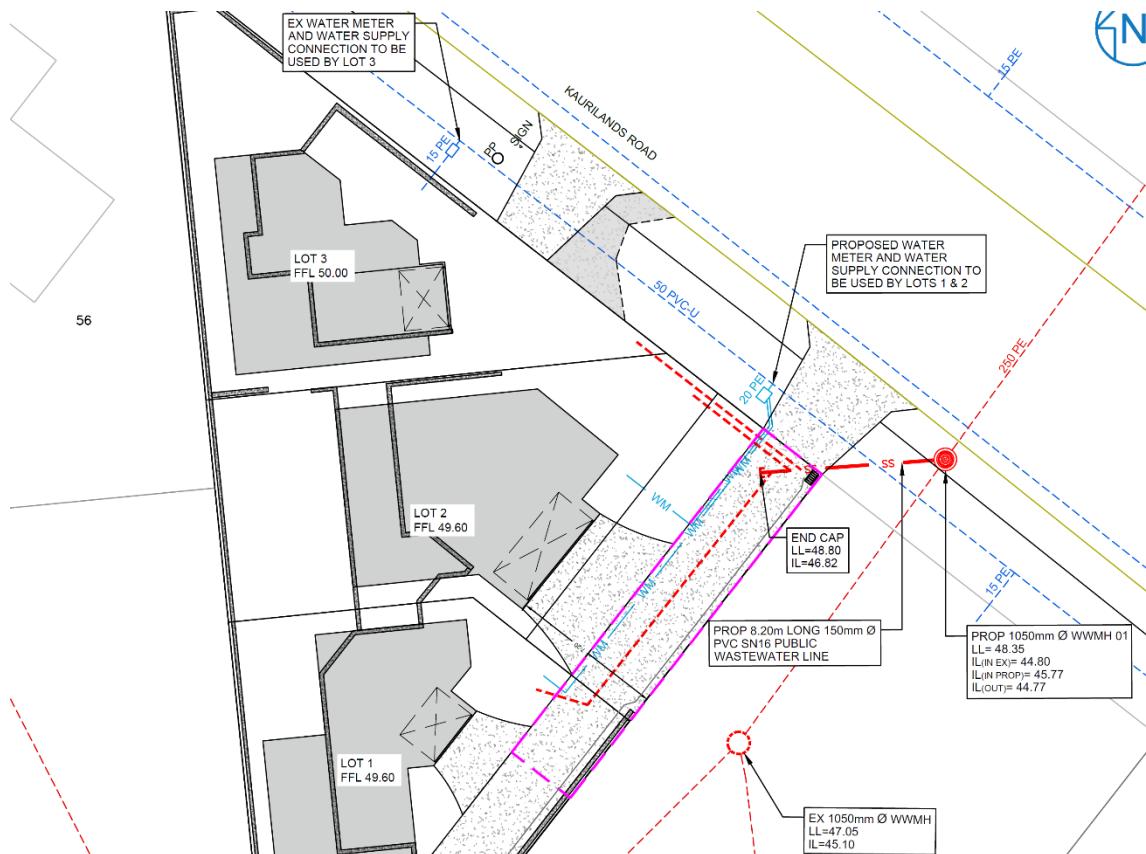


Figure 7: Existing Water Supply infrastructure (image source: Auckland Council Geomaps)

The fire hydrant is within the requisite distance for residential properties refer to Fire Water Classification in Appendix 3.

## 10.0 Conclusion

It is concluded that with the proposed engineering design for infrastructure, the proposed development can proceed with less than minor effects.

## 11.0 Limitations

This report has been prepared for the sole benefit of MAQ Enterprises in support of a Consent application for the proposed development. It is not to be relied upon or used out of context by any other person without reference to LANDEV Consulting.

We trust that the above is satisfactory to your needs. Should you have any queries please contact this office.

## 12.0 Appendices

### Appendix 1 – Stormwater Calculations

#### Downstream pipe capacity check

#### TP108 On Site Analysis

##### Upstream catchment areas

Total Area	$m^2$	2698	
Total impervious	$m^2$	1619	60%
Total pervious	$m^2$	1079	

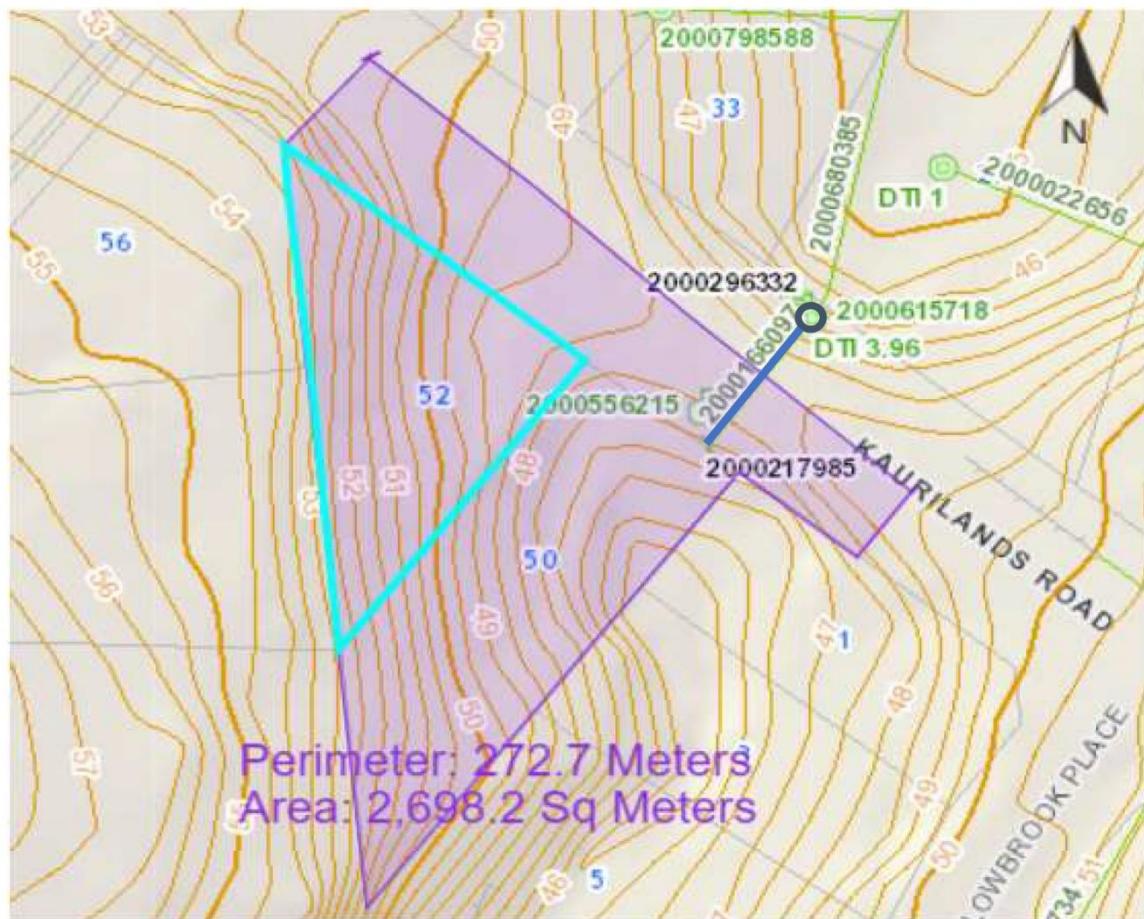
##### Flow analysis

Design storm	Post	
Total Area	ha	<b>10yr+CC</b>
Impervious Area	ha	<b>0.2698</b>
Pervious Area	ha	0.1619
% Impervious	%	0.1079
Catchment Slope ( $S_c$ )	$m/m$	60.0%
Catchment Length (l)	km	0.12
Channelisation Factor (C)		0.061
Hydrological Soil Group		0.6
SCS Curve Number (CN)		Group C
24-Hour Rainfall Depth ( $P_{24}$ )	mm	74
Weighted Curve Number		156.2
Initial Abstraction (Ia) weighted	mm	88.40
$t_c$	hours	2.00
$t_p$	hours	0.17
Storage (S)	mm	0.11
$c^* = (P_{24} - 2I_a) / (P_{24} - 2I_a + 2S)$		33
$q^*$ (from Fig. 6.1)	Apprx	0.695
Peak Flowrate ( $q_p$ )	$m^3/s$	0.143
Peak Flowrate ( $q_p$ )	l/s	0.060
24 hour rainfall depth ( $Q_{24}$ )	mm	60.1
24 hour runoff volume ( $V_{24}$ )	$m^3$	126.8
		342

#### Downstream Pipe capacity analysis

SAP ID 2000166097

Upstream Invert level	RL (m)	43.77	
Downstream Invert level	RL (m)	43.22	
Pipe diameter	mm	1650	
Colebrook-White roughness co.	k	1	
Pipe length (horizontal)	L	18.00	
Pipe gradient	%	3.06%	
Pipe full flow velocity	m/s	7.520	
Pipe capacity (Qf)	$m^3/s$	16.079	
Pipe capacity	l/s	16079.0	> 60.1 l/s



### Peak Flow Assessment

**Aim:** To assess peak flows from all areas

**Assumptions:**

Runoff Coefficient ( <i>c</i> ): <i>c</i> =0.95 for roof	Design rainfall:	105mm/hr to reflect TP108 10% AEP + CC
<i>c</i> =0.9 for Paving		
<i>c</i> =0.6 for permeable paving		
<i>c</i> =0.3 for permeable surfaces		

Reference: Colebrook-White Formula

10yr ARI + CC 10 minute Existing		Total Site = 0.0809ha		
Area (ha)	C No.	Int (mm/hr)	Q = 2.78CiA	
0.0155	0.95	105.00	4.30	Roof coverage
0.0105	0.90	105.00	2.76	Driveway and paving
0.0549	0.30	105.00	4.81	Pervious surfaces
<b>0.0809</b>		<b>Max.Flow (L/Sec)</b>	<b>11.86</b>	All surfaces

10yr ARI + CC 10 minute Proposed Lot 1		Q = 2.78CiA		
Area (ha)	C No.	Int (mm/hr)	Q = 2.78CiA	
0.0098	0.95	105.00	2.70	Roof coverage
0.0041	0.90	105.00	1.07	Paved Area
0.0135	0.30	105.00	1.18	Pervious surfaces
<b>0.0273</b>		<b>Max.Flow (L/Sec)</b>	<b>4.95</b>	All surfaces

10yr ARI + CC 10 minute Proposed Lot 2		Q = 2.78CiA		
Area (ha)	C No.	Int (mm/hr)	Q = 2.78CiA	
0.0099	0.95	105.00	2.75	Roof coverage
0.0051	0.90	105.00	1.34	Paved Area
0.0162	0.30	105.00	1.42	Pervious surfaces
<b>0.0312</b>		<b>Max.Flow (L/Sec)</b>	<b>5.50</b>	All surfaces

10yr ARI + CC 10 minute Proposed Lot 3		Q = 2.78CiA		
Area (ha)	C No.	Int (mm/hr)	Q = 2.78CiA	
0.0082	0.95	127.00	2.75	Roof coverage
0.0000	0.90	127.00	0.00	Paved Area
0.0144	0.30	127.00	1.53	Pervious surfaces
<b>0.0226</b>		<b>Max.Flow (L/Sec)</b>	<b>4.28</b>	All surfaces

<b>Flow Increase</b>	<b>2.87</b>	L/s
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#### HIRDS V4 Intensity-Duration-Frequency Results

Sitename: 52 KAURILANDS ROAD TITIRANGI

Coordinate system: WGS84

Longitude: 174.6507

Latitude: -36.9249

DDF Mode	Parameter	c	d	e	f	g	h	i
Values:		0.002601	0.434531	-0.0236	0	0.234166	-0.01004	3.168212
Example:	Duration (t ARI (yrs)	x	y		Rainfall Rate (mm/hr)			
24	100	3.178054	4.600149	7.655698				

Rainfall intensities (mm/hr) :: RCP6.0 for the period 2031-2050

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	65.6	46.4	37.6	25.7	17.1	8.51	5.31	3.25	1.94	1.42	1.13	0.951
2	0.5	71.4	50.6	40.9	28	18.7	9.3	5.81	3.55	2.13	1.56	1.24	1.04
5	0.2	91	64.6	52.4	35.9	24	12	7.51	4.6	2.76	2.02	1.62	1.35
10	0.1	105	74.9	60.7	41.7	27.9	14	8.76	5.37	3.22	2.37	1.89	1.59
20	0.05	120	85.3	69.2	47.5	31.8	16	10	6.16	3.71	2.72	2.18	1.83
30	0.033	128	91.5	74.2	51.1	34.2	17.2	10.8	6.64	4	2.94	2.35	1.97
40	0.025	134	95.8	77.8	53.5	35.9	18.1	11.4	6.99	4.2	3.09	2.48	2.08
50	0.02	139	99.3	80.7	55.5	37.2	18.8	11.8	7.25	4.37	3.21	2.57	2.16
60	0.017	143	102	83	57.1	38.3	19.3	12.2	7.48	4.5	3.32	2.65	2.23
80	0.012	149	107	86.6	59.7	40.1	20.2	12.7	7.83	4.72	3.47	2.78	2.33
100	0.01	154	110	89.4	61.6	41.4	20.9	13.2	8.1	4.89	3.6	2.88	2.42
250	0.004	173	124	101	69.6	46.8	23.7	15	9.22	5.57	4.1	3.29	2.76

Rainfall depths (mm) :: RCP6.0 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	12.1	17.1	20.7	28.4	37.5	55.3	68.3	83	98.2	107	114	119
2	0.5	13.2	18.7	22.7	31	41.2	60.7	75.1	90.9	108	118	125	131
5	0.2	16.9	24	29.1	39.9	53.1	78.6	97.5	118	140	154	163	171
10	0.1	19.6	27.8	33.8	46.4	61.9	91.8	114	138	165	181	192	200
20	0.05	22.3	31.7	38.6	53.1	70.8	105	131	159	190	208	221	231
30	0.033	23.9	34	41.5	57	76.1	114	141	171	205	224	239	249
40	0.025	25	35.7	43.5	59.8	79.9	119	149	180	215	237	251	263
50	0.02	25.9	37	45.1	62	82.9	124	154	187	224	246	261	273
60	0.017	26.7	38	46.4	63.8	85.3	128	159	193	231	254	270	282
80	0.012	27.8	39.7	48.4	66.7	89.3	134	166	202	242	266	282	296
100	0.01	28.7	41	50	68.9	92.3	138	172	209	250	275	293	306
250	0.004	32.3	46.2	56.4	77.9	104	157	196	238	285	314	335	350

## Appendix 2 – Wastewater calculation

### Design Flow Estimation

#### Existing Flow

Residential - Mixed Housing Suburban Zone

Existing 3 Bedroom

Total Residents 3 residents

Design Flow (See ACoP Table 5.1.1 Ref below) 180 litres/day/person

Average Dry Weather Flow 0.006 L/s

Peaking Factor PF 6.7

#### Peak Wet Weather Flow (PWWF) 0.04 L/s

PF 6.7 as per ACoP Land Development & Subdivision Chapter 5, Table 5.1.1.

#### Design Flow Estimation

Residential - Mixed Housing Suburban Zone

3 Lot 3 Bedroom Refer Architects Drawings

Total Residents 9 residents

Design Flow (See ACoP Table 5.1.1 Ref below) 180 litres/day/person

Average Dry Weather Flow 0.019 L/s

Peaking Factor PF 6.7

#### Peak Wet Weather Flow (PWWF) 0.13 L/s

PF 6.7 as per ACoP Land Development & Subdivision Chapter 5, Table 5.1.1.

**Table 5.1.1 – Design residential design wastewater flow allowance and peaking factors**

Residential property type	Design wastewater flow allowance	Design wastewater peaking factors	
	Litres per person per day (L/p/d)	Peaking factor: Self-Cleansing Design Flow (Normal PDWF)	Peaking factor: Peak Design Flow (PWWF or Exceptional PDWF)
Up to three storey residential development	180	3.0	6.7
High-rise residential (or mixed-use) buildings four storeys and above	180	3.0	5.0

### Downstream pipe capacity check

#### Design Flow Estimation

##### Residential

320 Lots assuming 3 residents each x 2 (for development)

Total Residents 1920 residents

Design Flow (See ACoP Table 5.1.1 Ref below) 180 litres/day/person

Average Dry Weather Flow 4.00 L/s

Peaking Factor PF 6.7

**Sub Peak Design Flow - residential 26.80 L/s**

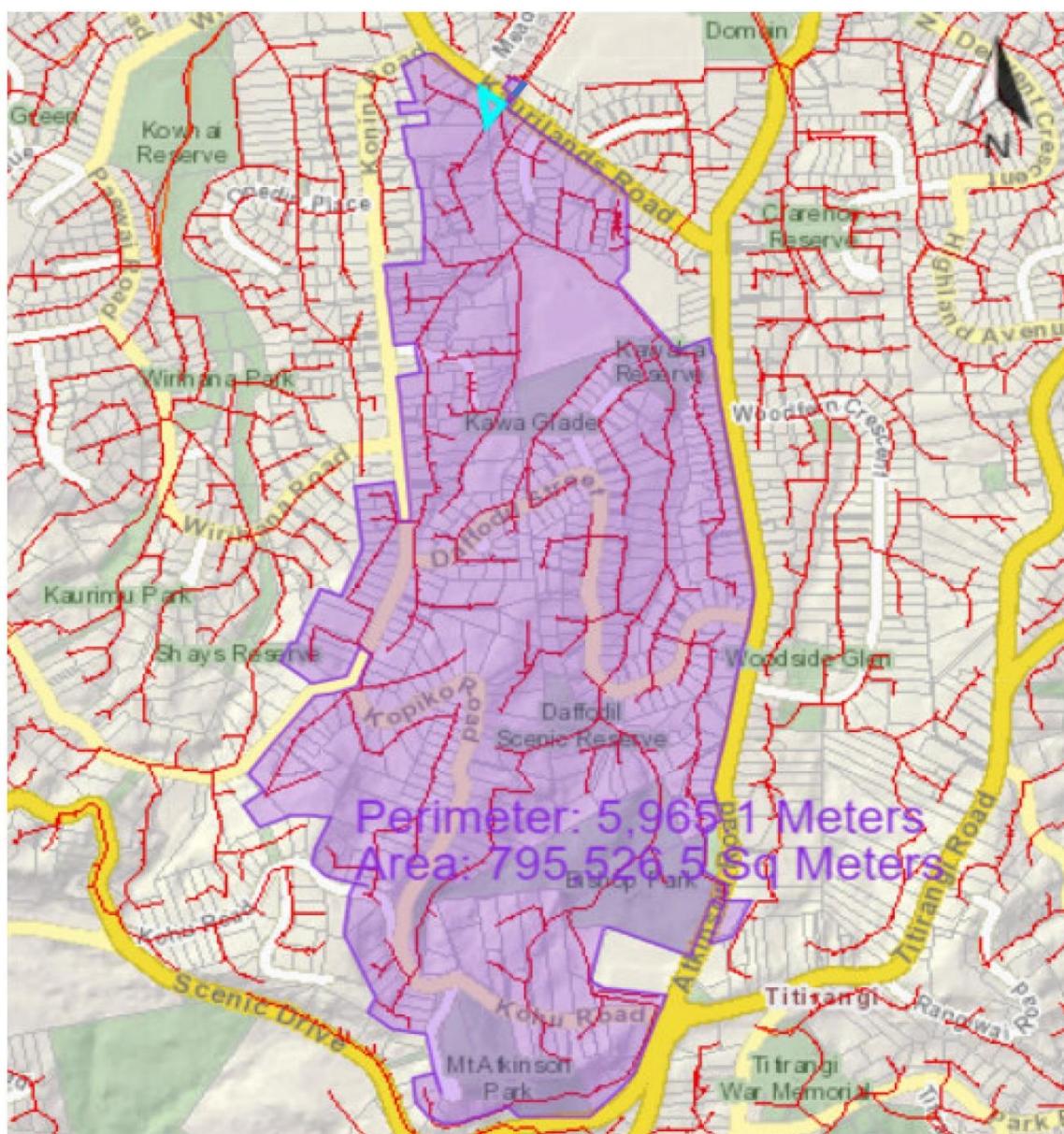
Critical Pipe Capacity (downstream pipe) GIS ID 856835		
Acceleration due to Gravity, g	$m/s^2$	9.81
Pipe Diameter, D	mm	250
Colebrook-White Roughness Coefficient, k	mm	1.5
h1	$mRL$	44.32
h2	$mRL$	41.97
h1-h2	m	2.35
Length of Pipe, l	m	24.0
Hydraulic Gradient, S		0.098
$\sqrt{2gDS}$		21.915
Kinematic Viscosity, v	$m/s^2$	0.000
Velocity, V	$m/s$	3.860
Area of Pipe, A	$m/s^2$	0.049
Pipe Capacity, Qf	$m^3/s$	0.189
<b>Pipe Capacity, Qf</b>	$l/s$	<b>189.492</b>

PE

from Geomaps GIS ID 439014

from Geomaps GIS ID 429884

>26.80 l/s



## Appendix 3 – Water calculations

### Water Supply

The following calculations estimate the anticipated water demand for the development.

The analysis is largely based on the requirements of WSL CoP V2.1

#### Existing Peak Domestic Demand

$$Q_{peak} (l/s) = (q * \# * Peak\ day\ demand * Peak\ Factor) / 86400$$

q (daily cons. l/p/day)	220	L/p/day
D (# of dwellings)	1	#
Pd (people / dwelling)*	3	#
Pres (total # of residents)	3	#
Peak day demand	1320	L/day
Fpeak	2.5	
Qpeak (total peak demand)	0.038	L/s

\*Conservative peaking factor of up to 2.5

#### Proposed Peak Domestic Demand

$$Q_{peak} (l/s) = (q * \# * Peak\ day\ demand * Peak\ Factor) / 86400$$

q (daily cons. l/p/day)	220	L/p/day
D (# of Lots)	3	# * based on total of individual buildings
Pd (people / dwelling)*	3	# *based on development plans, needs watercare approval
Post (total # of residents)	9	#
Peak day demand	3960	L/day
Fpeak	2.5	
Qpeak (total peak demand)	0.115	L/s

\*Conservative peaking factor of up to 2.5

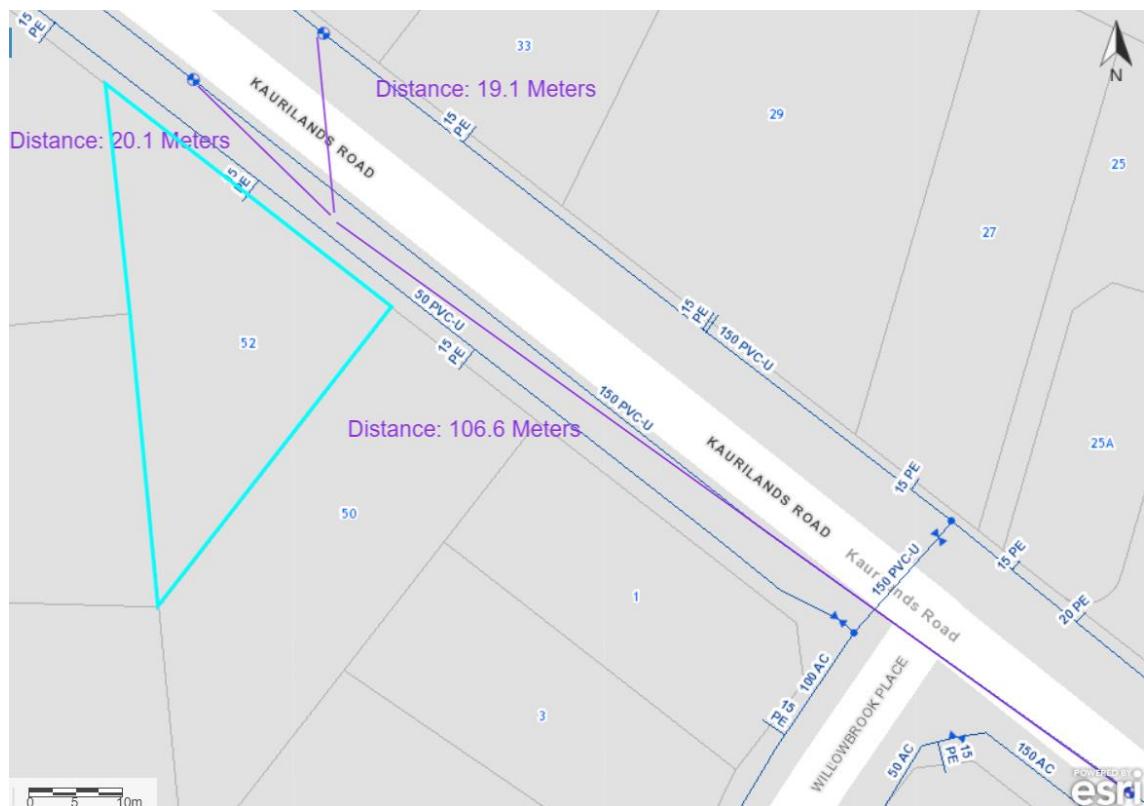
The following table establishes the fire fighting requirements for the site.

(based on SNZ PAS 4509:2008)

#### Fire Water Classification

FW2	Requirements	
	Assuming all structures without	
Req'd flow (L/min) @ distance	Flow / #	Dist. (m)
+ flow (L/min) @ distance	1500	135
Max. # of hydrants for flow	25 L/s	135
	1500	270
	25 L/s	270
	2	135

The existing water supply networks in close proximity to the site must be checked to confirm adequate capacity. The above findings should be confirmed with WSL prior to detailed design.



**SNZ PAS 4509:2008**

**Table 2 – Method for determining firefighting water supply**

Fire water classification	Reticulated water supply			Non-reticulated water supply	
	Required water flow within a distance of 135 m	Additional water flow within a distance of 270 m	Maximum number of fire hydrants to provide flow	Minimum water storage within a distance of 90 m (see Note 8)	Time (firefighting) (min)
FW1	450 L/min (7.5 L/s) (See Note 3)	–	1	15	7
FW2	750 L/min (12.5 L/s)	750 L/min (12.5 L/s)	2	30	45
FW3	1500 L/min (25 L/s)	1500 L/min (25 L/s)	3	60	180
FW4	3000 L/min (50 L/s)	3000 L/min (50 L/s)	4	90	540
FW5	4500 L/min (75 L/s)	4500 L/min (75 L/s)	6	120	1080
FW6	6000 L/min (100 L/s)	6000 L/min (100 L/s)	8	180	2160
FW7	As calculated (see Note 7)				

**NOTE –**

- (1) Table 1 lists the minimum requirements for firefighting water supplies. In developing towns' main reticulation systems, a water supply authority needs to cater for domestic/industrial water usage in addition to the above. This procedure is outlined in Appendix K.
- (2) Special or isolated fire hazards which have higher requirements in an area of lower water supply classification must determine measures to mitigate the hazard or increase the water supply (see 4.4).
- (3) Where houses have a sprinkler system installed to an approved Standard, the distance to a fire hydrant or alternative water supply may be negotiated by agreement with the Fire Region Manager.
- (4) The water requirements for fire protection systems must be considered in addition to the firefighting water supplies, as detailed in table 1 (FW2), the fire protection system demand plus 1500 L/min (25 L/s) at 1 bar residual pressure.
- (5) The minimum flow from a single hydrant must exceed 750 L/min (12.5 L/s), except for those cases where a home sprinkler is installed, in which case the minimum is 450 L/min (7.5 L/s) while the maximum design flow, for safety reasons, is limited to 2100 L/min (35 L/s).
- (6) If the minimum water storage requirement as listed in the above table is not available from the reticulated system (reservoir), water can be sourced from an 'alternative supply' as approved by the Fire Region Manager. This water supply must always be within 90 m of the fire risk.
- (7) FW7 is for either special or isolated hazards or where the fire hazard due to the size of the largest firecell and its fire hazard category make specific fire engineering assessment necessary. Appendix H and J must be used as the basis for calculating this required firefighting water supply.
- (8) See Appendix B.

### 6.3.5.5 Minimum flows

The minimum flow shall be the greater of: (a) 25 L/min for normal residential sites; (b) Fire flows as specified in SNZ PAS 4509 ([this link](#))

### 6.3.5.6 Minimum water demand

The minimum peak domestic demand shall be specified by **Watercare**, or:

- (a) Daily consumption of 250 L/p/day;
- (b) Peaking factor of up to 5;
- (c) Firefighting demands as specified in SNZ PAS 4509;
- (d) The network should be designed to maintain appropriate nominated pressures for both peak demand (average daily demand in L/s x peaking factor) and firefighting demand scenarios. These figures should be applied to mains of 100 mm diameter or greater. Mains less than 100 mm in diameter can be sized using the multiple dwellings provisions of AS/NZS 3500.1 table 3.2.

**Design flows for hospitals, schools and the like shall be agreed with Watercare.**

### 6.3.5.7 Sizing of mains

Tables 6.2 and 6.3 may be used as a guide for sizing mains.

Unless otherwise specified by **Watercare**, the design pressure shall be between 250 kPa and 800 kPa (25 m to 80 m).

A minimum pressure rating of each pipeline component is to be provided to Watercare with the as-built details.

#### C6.3.5.10

*A design pressure of 250 kPa to 800 kPa is set as this provides for approximately 200 kPa for two-storey dwellings at the upper floor and less than excessive pressures for dwellings constructed on lots below the position of the main. Specific additional consideration to these pressures may be needed in areas of significant contour.*

Table 1 – Method for determining required water supply classification

Sprinklered structures	Water supply classification (see table 2)														
Category															
Single family homes with a sprinkler system installed to an approved Standard	FW1														
All other structures (apart from single family homes) with a sprinkler system installed to an approved Standard	FW2														
Non-sprinklered structures	Water supply classification (see table 2)														
Housing; includes single family dwellings, multi-unit dwellings, but excludes multi-storey apartment blocks	FW2														
All other structures (characterised by fire hazard category <sup>(1)</sup> ), examples of which are given below	Water supply classification (see table 2) Floor area of largest firecell of the building (m <sup>2</sup> )														
	0-199 <sup>(10)</sup>	200-399	400-599	600-799	800-999	1000-1199	1200-1399	1400-1599	1600-1799	1800-1999	2000-2199	2200-2399	2400-2599	2600-2799	>2800
FHC 1 <sup>(2)</sup>	FW3	FW3	FW3	FW4	FW4	FW4	FW5	FW6							
FHC 2 <sup>(3)</sup>	FW3	FW3	FW4	FW5	FW5	FW5	FW6	FW6	FW6	FW7	FW7	FW7	FW7	FW7	FW7
FHC 3 <sup>(4)</sup>	FW3	FW4	FW5	FW5	FW6	FW6	FW7	FW7							
FHC 4 <sup>(5)</sup>	FW4	FW6	FW6	FW6	FW6	FW7	FW7								
For special or isolated hazards not covered in above categories <sup>(6)</sup>	FW7														
NOTE –															
(1) Fire hazard category as defined in the compliance documents for the New Zealand Building Code, Acceptable Solution C/AS1.															
(2) FHC 1 is sleeping activities including care facilities, motels, hotels, hostels; crowd activities of <100 people including cinemas, art galleries, community halls, lecture halls, churches; working/business/storage activities processing non-combustible materials such as wineries, cattle yards, horticultural products; multistorey apartment blocks.															
(3) FHC 2 is crowd activities of >100 people, libraries, book storage, night clubs, restaurants; working/business/storage activities with low fire load such as hairdressers, banks, medical consulting rooms, offices.															
(4) FHC 3 is working/business/storage activities with medium fire load such as manufacturing, processing, bulk storage up to 3 metres.															
(5) FHC 4 is working/business/storage activities with high fire load such as chemical manufacturing, feed mills, plastics manufacturing, supermarkets or other stores with bulk display over 3 metres.															
(6) For special or isolated fire hazards in an area with a lower water supply classification, an assessment should be carried out to determine measures to mitigate the hazard or increase the water supply (see 4.4).															
(7) The values in the table were determined by heat release rate modelling for fully developed fires.															
(8) All non-sprinkler protected structures, except houses, have an entry level of FW3.															
(9) Examples of special or isolated hazards may include bulk fuel installations, timber yards, tyre dumps, wood chip stock piles, recycle depots, and marinas.															
(10) For non-sprinkler protected fire hazard category 1 structures less than 50 m <sup>2</sup> in floor area, the FW3 requirement may be reduced by up to 50% with the agreement of the Fire Region Manager. Examples of the sorts of structures intended to be covered by this comment are predominantly garages, sheds, and outbuildings.															

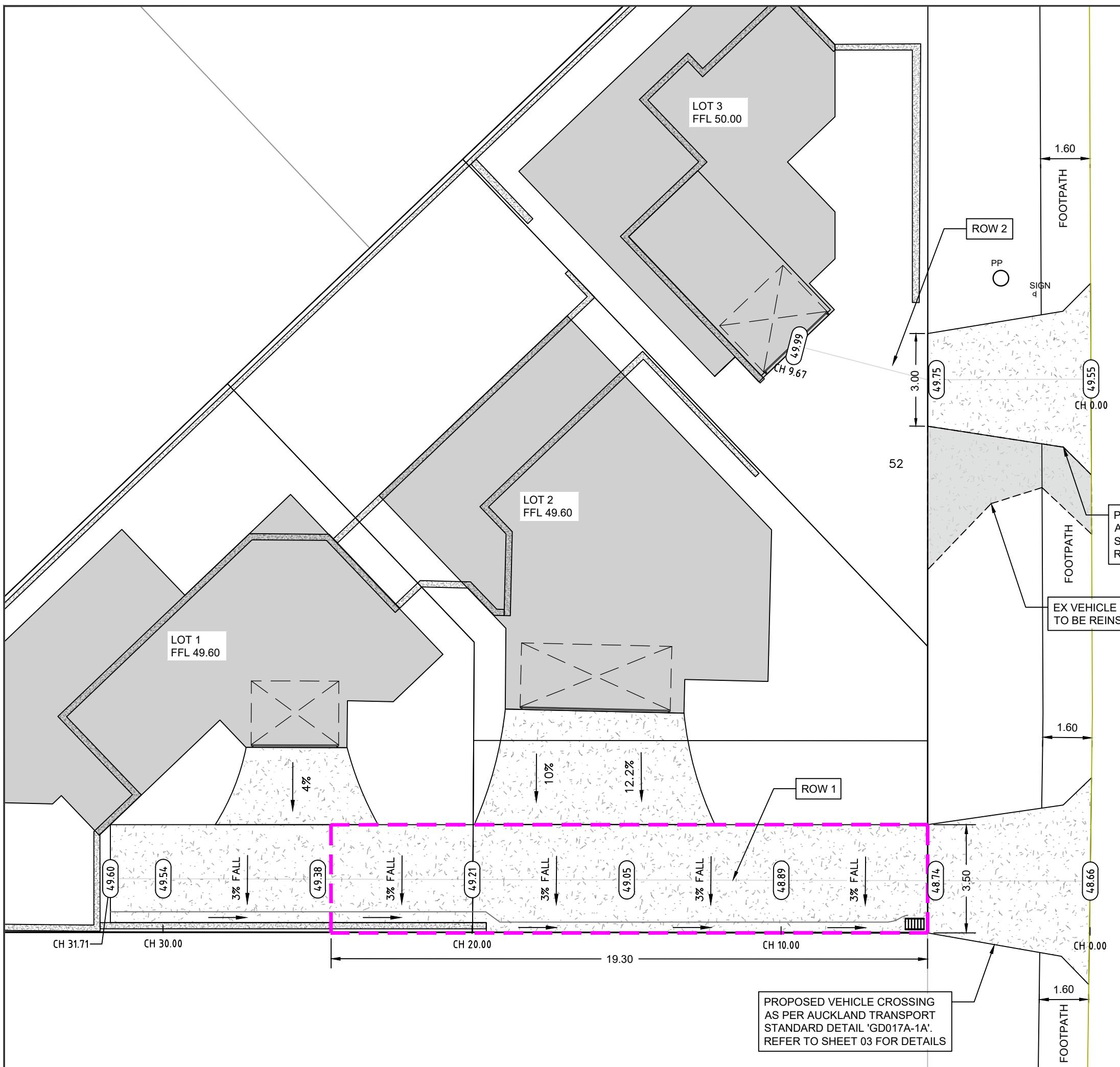
## Appendix 4 – Engineering Plans

- NOTES:**
1. All works to comply with Auckland Council Standards.
  2. All existing services to be located on site by the Contractor prior to commencing the new works.
  3. The Contractor shall reinstate any damages to existing services at their own expense.
  4. The Engineer is to be contacted if any discrepancies are encountered between the standards, calculations and drawings.
  5. All dimensions (not to be obtained by scaling from drawings), levels and underground services etc shall be checked on site by the Contractor prior to commencement of construction works.



**LEGEND:**

	EASEMENT
	RETAINING WALL

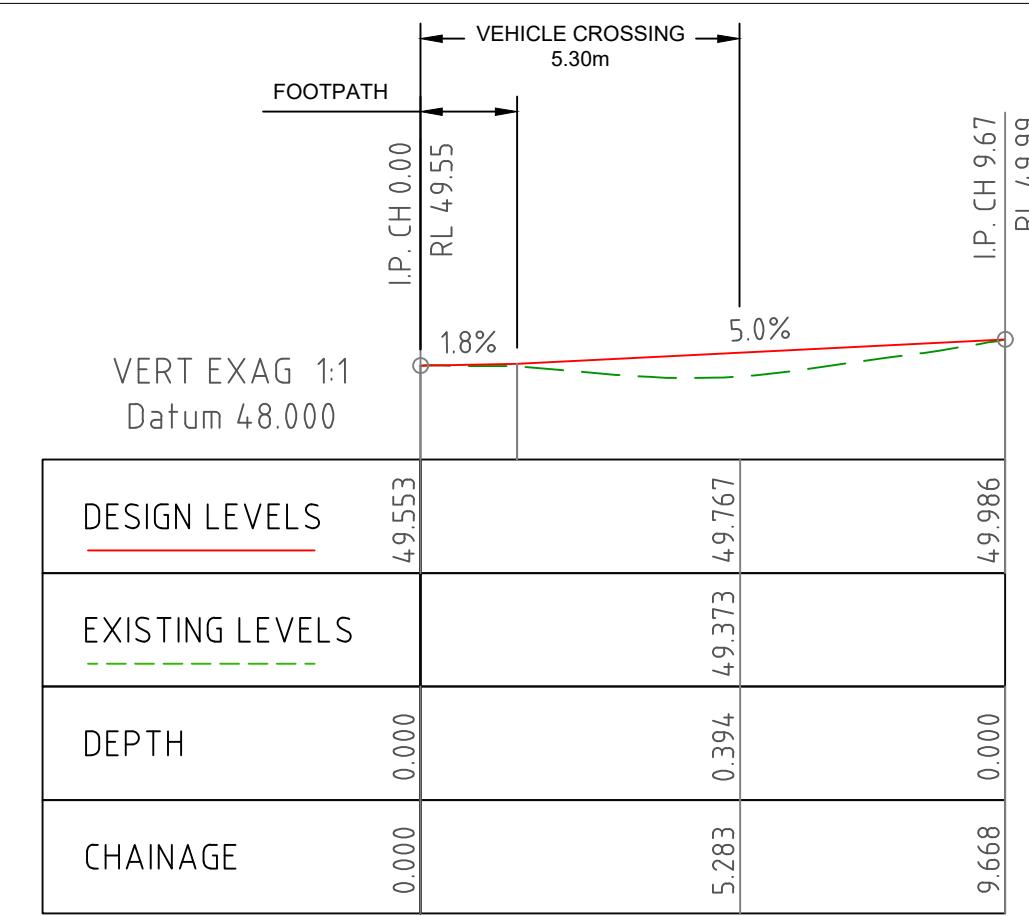
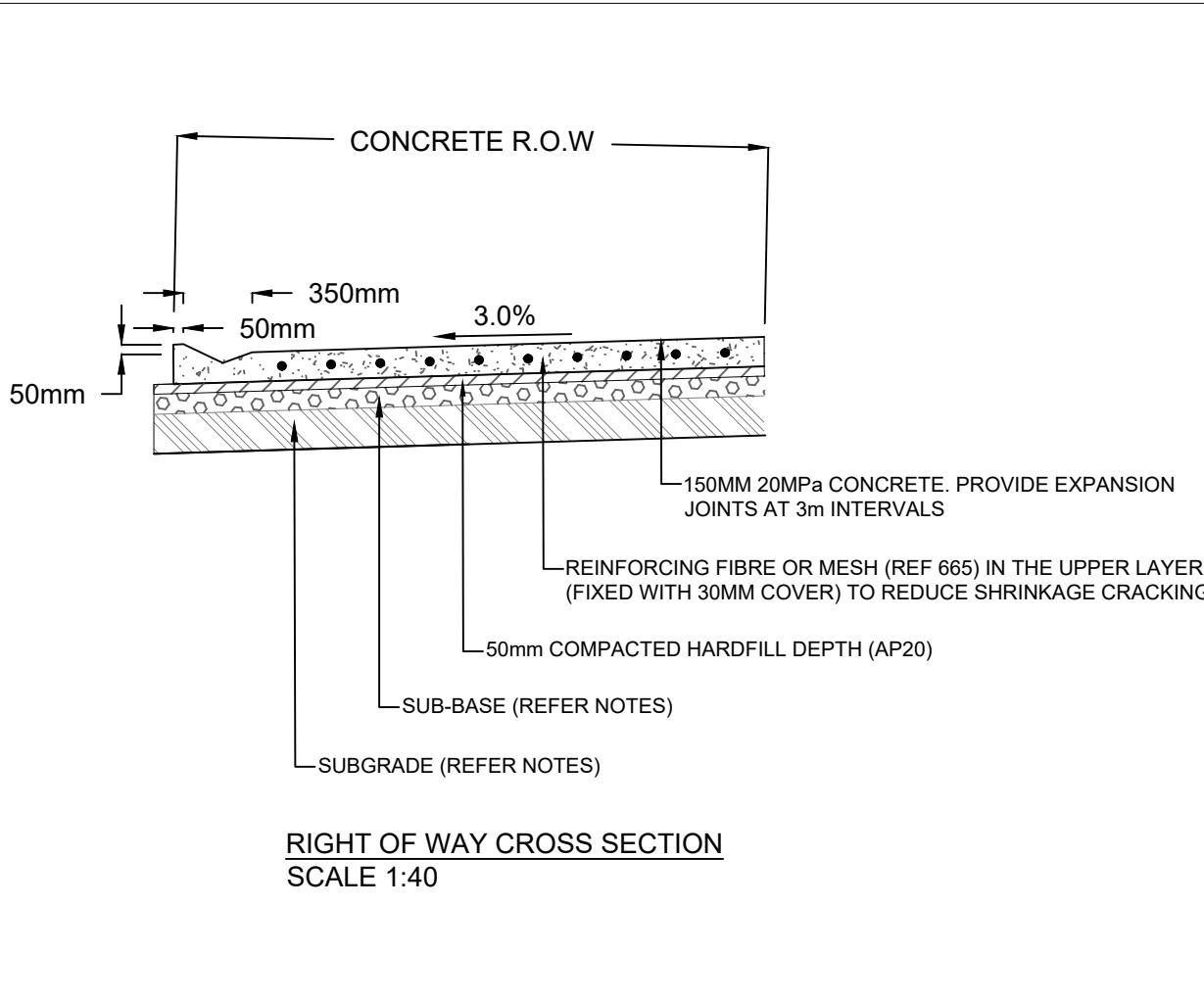
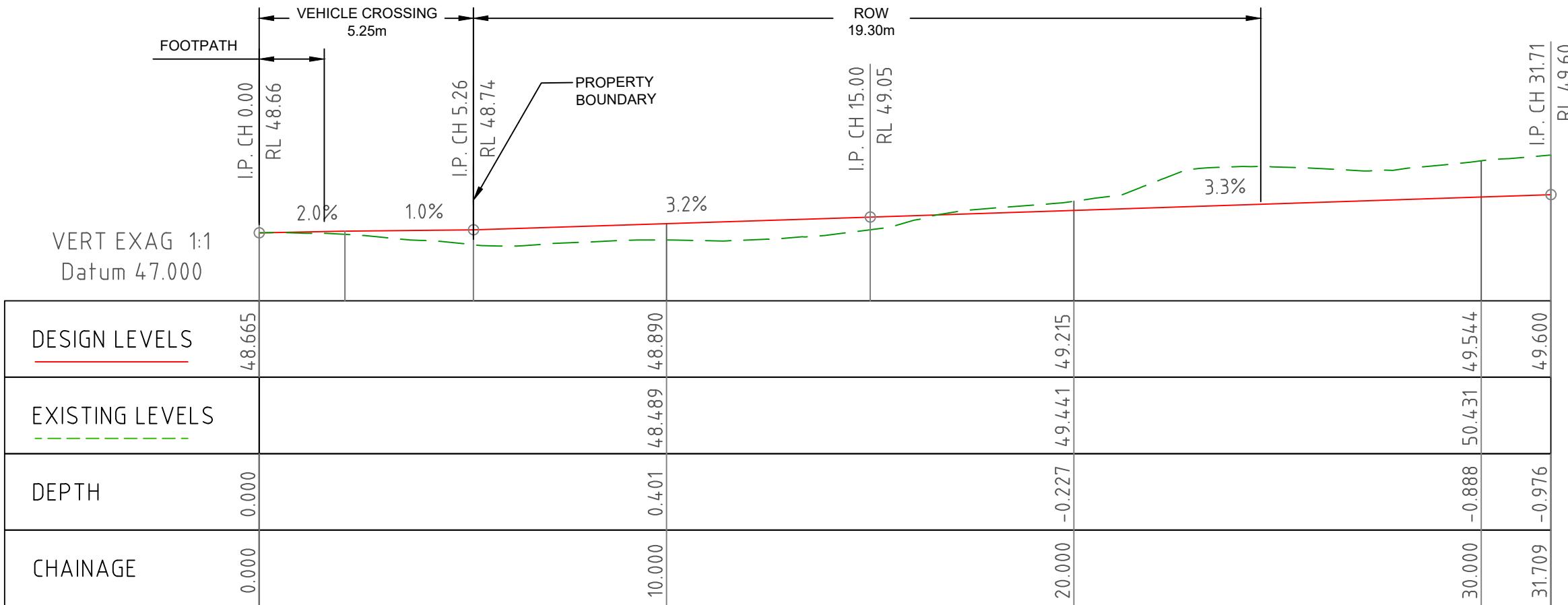


A	FOR ENGINEERING APPROVAL	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: EPA			

**LANDEV**  
LANDEV CONSULTING  
INFO@LANDEV.CO.NZ  
(09) 889 1177  
WWW.LANDEV.CO.NZ

**CLIENT:**  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

**SITE:** 52 KAURILANDS ROAD  
TITIRANGI  
**TITLE:** RIGHT OF WAY LAYOUT PLAN  
**SCALE AT A3:** 1:125    **DATE:** 07/05/21    **DRAWN:** MHS    **CHECKED:** OA  
**PROJECT NO:** 21123    **DRAWING NO:** 01    **REVISION:** A



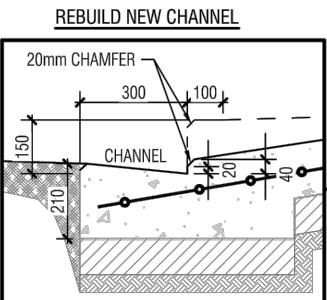
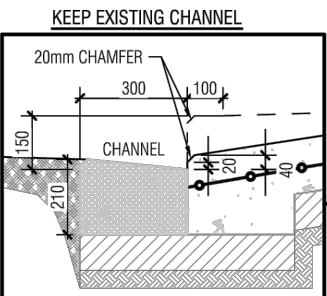
- NOTES:**
- All works to comply with Auckland Council Standards.
  - All existing services to be located on site by the Contractor prior to commencing the new works.
  - The Contractor shall reinstate any damages to existing services at their own expense.
  - The Engineer is to be contacted if any discrepancies are encountered between the standards, calculations and drawings.
  - All dimensions (not to be obtained by scaling from drawings), levels and underground services etc shall be checked on site by the Contractor prior to commencement of construction works.
  - Below the 50mm AP20:  
AP40 or GAP65 sub-base may be required  
min 150mm thick if subgrade CBR < 3  
min 100mm thick if subgrade CBR > 3 to < 7  
not required if subgrade CBR ≥ 7
  - Refer to drawing 01 for Right of Way layout.

A	FOR ENGINEERING APPROVAL	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: EPA			
 <b>LANDDEV</b> LANDEV CONSULTING INFO@LANDEV.CO.NZ (09) 889 1177 WWW.LANDEV.CO.NZ			
CLIENT:  52 KAURILANDS ROAD TITIRANGI AUCKLAND 0604			
SITE:  52 KAURILANDS ROAD TITIRANGI			
TITLE:  RIGHT OF WAY LONG SECTION AND CROSS SECTION			
SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:125	07/05/21	MHS	OA
PROJECT NO:	DRAWING NO:	REVISION:	
21123	02	A	

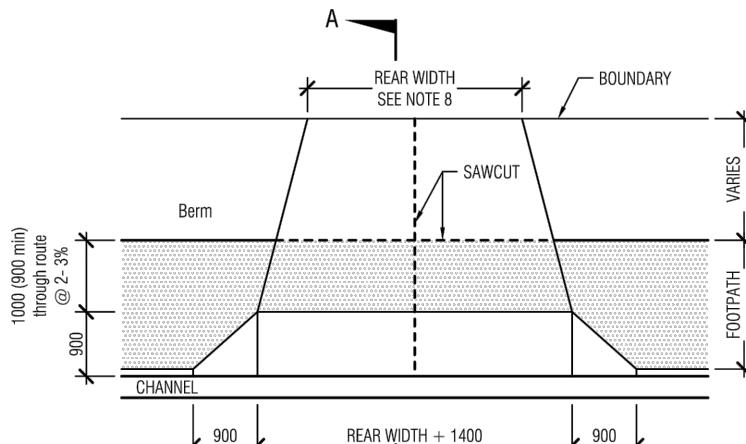
GD017A-1A



3D VIEW  
N.T.S



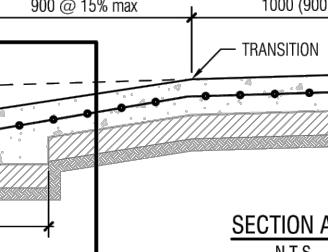
REINSTATE ROAD PAVEMENT  
1000 MIN  
(REFER TO GD014 FOR REINSTATEMENT)



VEHICLE CROSSING  
FOOTPATH NEXT TO KERB  
N.T.S

FOOTPATH CROSSFALL @2-3%  
WIDTH VARIES (1800 Min)

REAR BERM  
VEHICLE CROSSING @2-3%  
WIDTH VARIES



THE STANDARD RESIDENTIAL VEHICLE CROSSING IS UNREINFORCED,  
HOWEVER MESH REF 665 PLACED CENTRALLY IS REQUIRED WHEN  
JOINING TO MORE THAN 4 DWELLINGS

100mm MIN COMPACTED GAP 40  
SUBGRADE TO HAVE MINIMUM CBR OF 3  
(SEE NOTE 2)

Notes:

1. All dimensions are in millimetres unless noted otherwise.
2. If CBR of existing Subgrade is <3, Pavement Design should be provided and approved by Auckland Transport.
3. All concrete to be 20 MPa and constructed in accordance with NZS 3109 with a broom finish and may contain up to 4% oxide.
4. Saw cut expansion joints at 4m centres maximum each way in addition to saw cuts shown on dwg.
5. All work must comply with the NZTA's 'CoPTM' (code of practice for temporary traffic management).
6. Construct in same material and finish as surrounding footpath.
7. Existing channel may be retained if;
  - a) kerb can be removed without disturbing channel
  - b) road crossfall does not exceed 3%
8. Rear Width to be as permitted under Auckland Unitary Plan;  
2750-3000 - Single vehicle crossing  
5500-6000 - Two-Way Shared Access  
3000-3500 - One-Way Shared Access

**GO TO COVER SHEET**



Drawn	Ulysses Gabriel
Checked	Richard Batty
Approved	Chris Beasley
Authorised	Chief Engineer

**TDM TECHNICAL STANDARDS**  
Road layout and geometric design  
Residential Vehicle Crossing (Sheet 2 of 4)

Date:	-
Scales	N.T.S.
Drawing No.	GD017A-1A

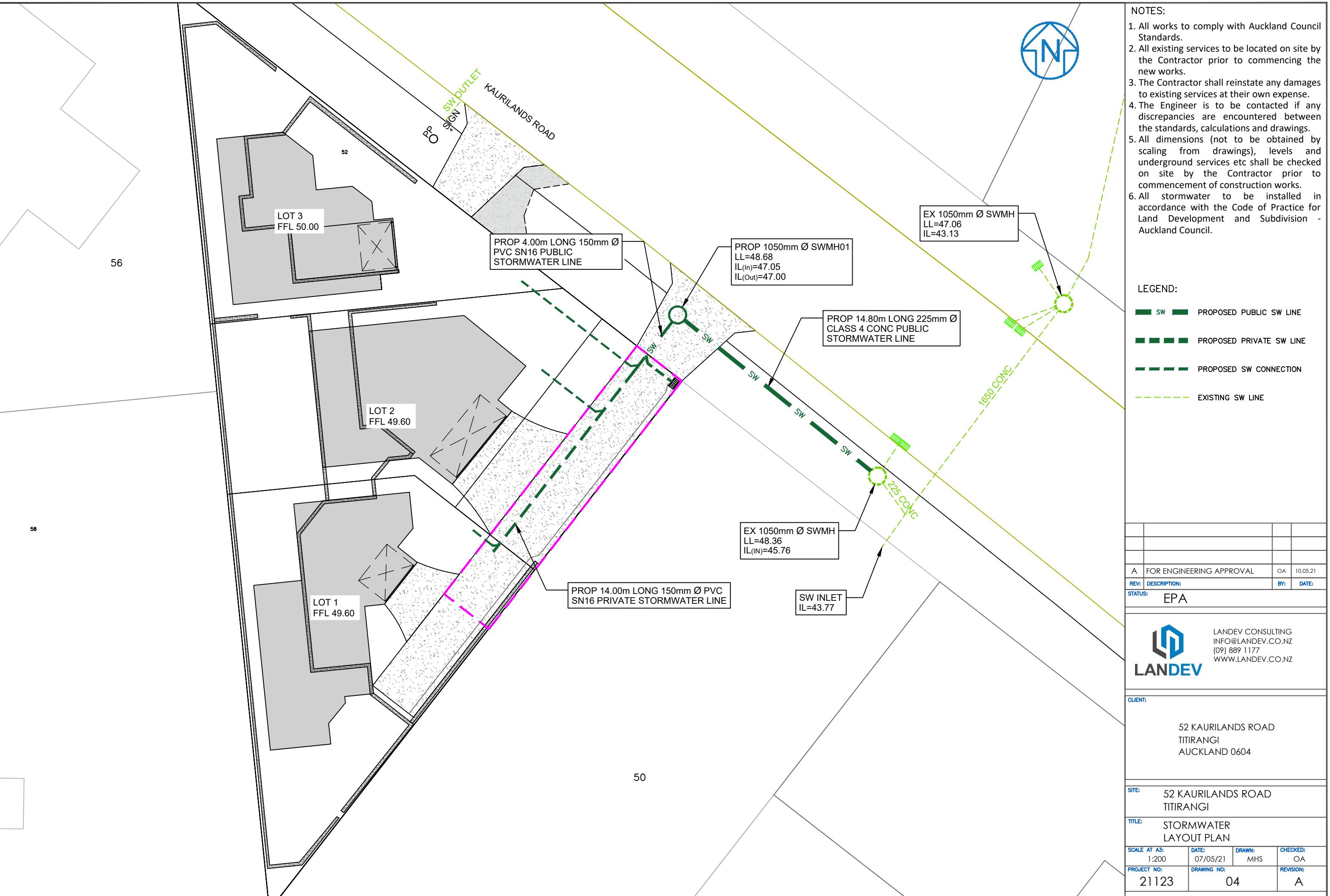
A	FOR ENGINEERING APPROVAL	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: EPA			



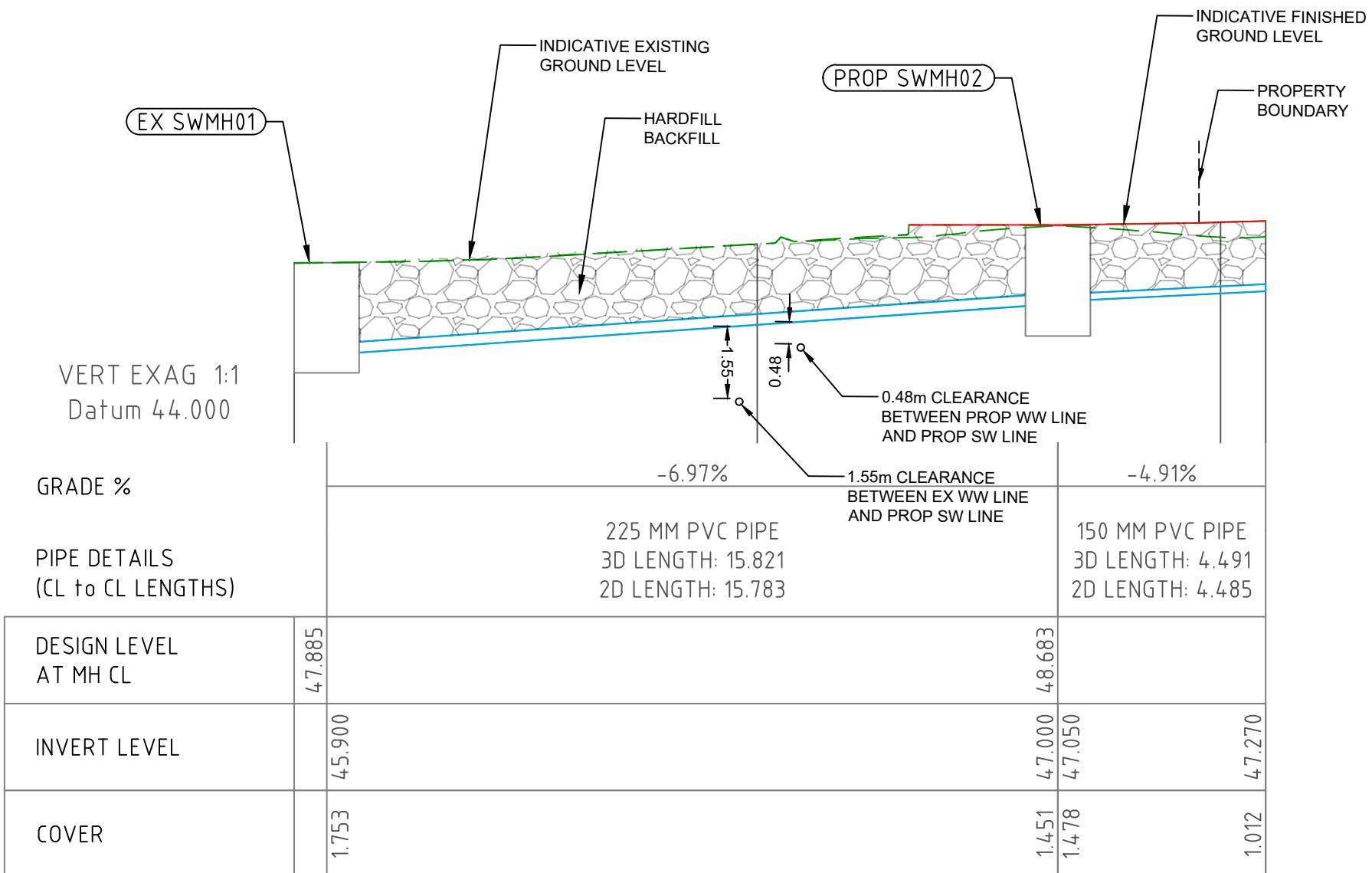
CLIENT:  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

SITE: 52 KAURILANDS ROAD  
TITIRANGI

TITLE: VEHICLE CROSSING DETAILS  
SCALE AT A3: NTS DATE: 07/05/21 DRAWN: MHS CHECKED: OA  
PROJECT NO: 21123 DRAWING NO: 03 REVISION: A



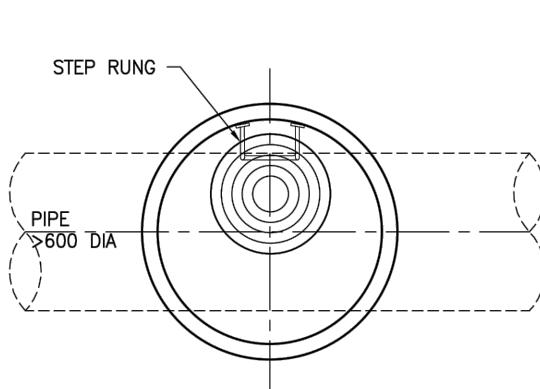
- NOTES:**
1. All works to comply with Auckland Council Standards.
  2. All existing services to be located on site by the Contractor prior to commencing the new works.
  3. The Contractor shall reinstate any damages to existing services at their own expense.
  4. The Engineer is to be contacted if any discrepancies are encountered between the standards, calculations and drawings.
  5. Contractor to verify levels shown and consult engineer if discrepancies are encountered.
  6. All dimensions (not to be obtained by scaling from drawings), levels and underground services etc shall be checked on site by the Contractor prior to commencement of construction works.
  7. All stormwater to be installed in accordance with the Code of Practice for Land Development and Subdivision - Auckland Council.
  8. Refer to drawing 04 for stormwater layout.



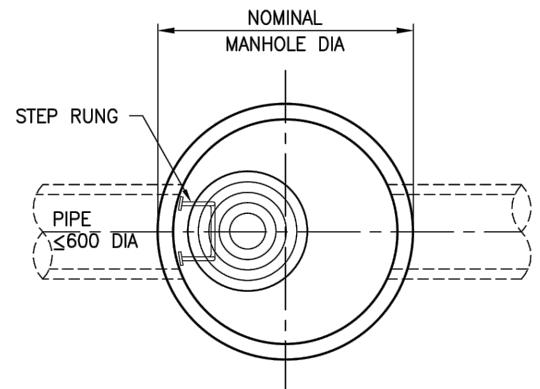
**SW LONG SECTION**

A	FOR ENGINEERING APPROVAL	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: EPA			
 <b>LANDDEV</b> LANDEV CONSULTING INFO@LANDEV.CO.NZ (09) 889 1177 WWW.LANDEV.CO.NZ			
CLIENT: 52 KAURILANDS ROAD TITIRANGI AUCKLAND 0604			
SITE: 52 KAURILANDS ROAD TITIRANGI			
TITLE: STORMWATER LONG SECTION			
SCALE AT A3:	DATE:	DRAWN:	CHECKED:
1:125	07/05/21	MHS	OA
PROJECT NO:	DRAWING NO:	REVISION:	
21123	05	A	

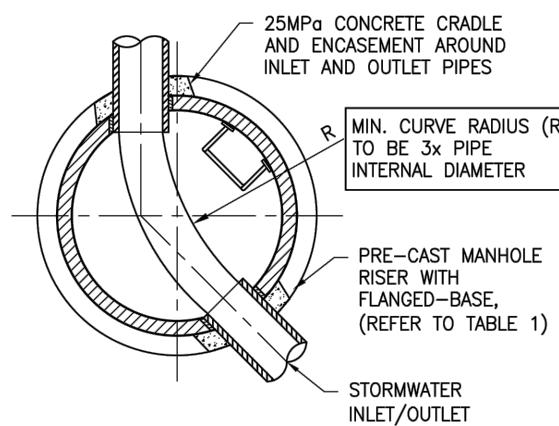
NOTES:



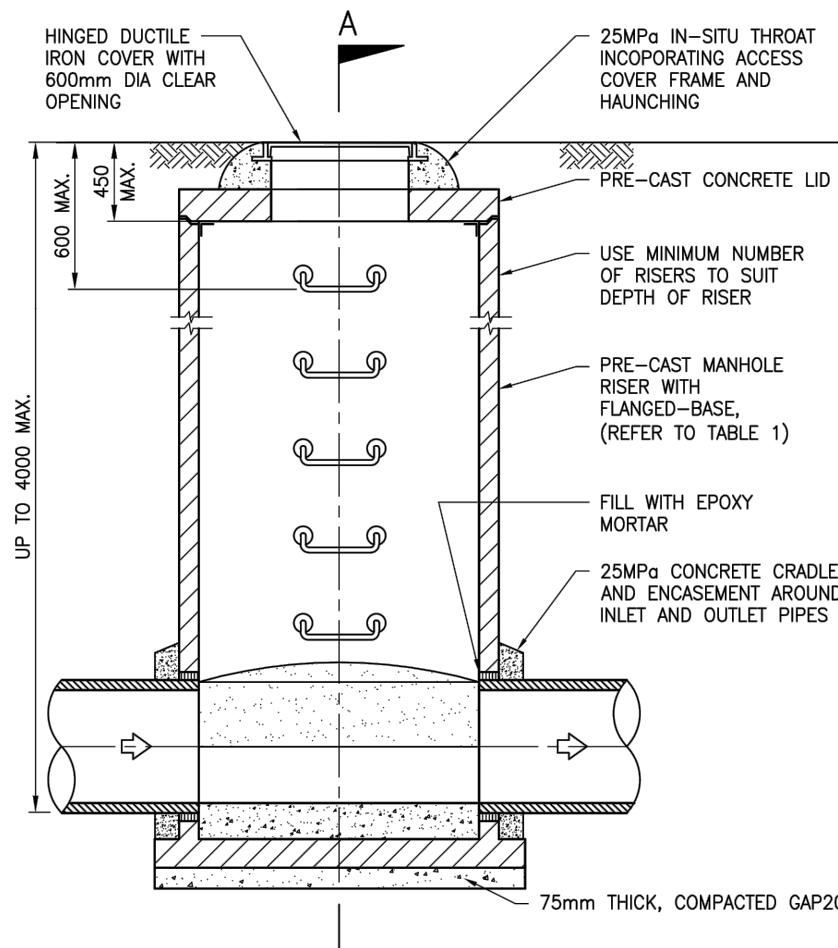
MANHOLE COVER AND  
RUNG ORIENTATION PLAN



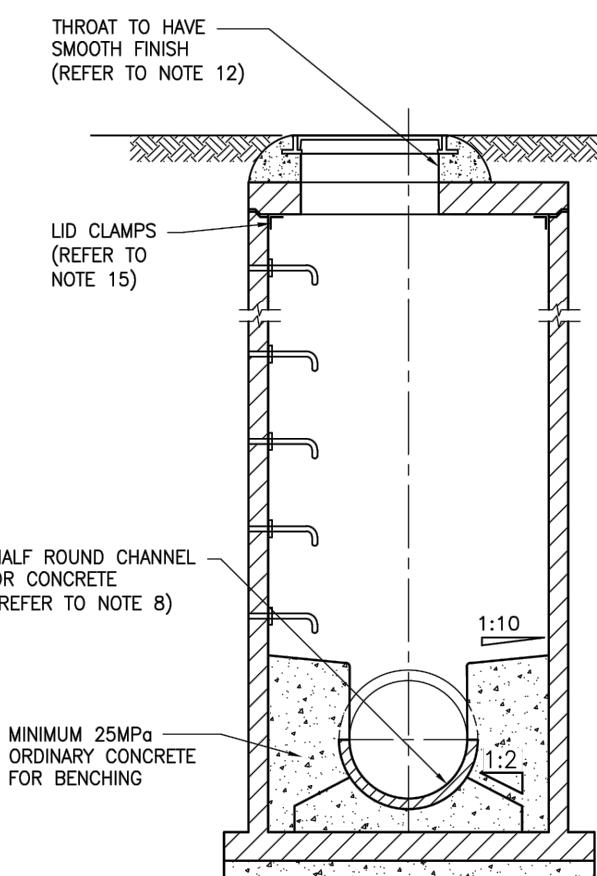
MANHOLE COVER AND  
RUNG ORIENTATION PLAN



MANHOLE BASE &  
BENCHING PLAN



STANDARD MANHOLE UP TO 4.0m DEPTH TO INVERT – ELEVATION



#### NOTES:

- SAFE LANDING IS REQUIRED ON BENCHING AT BASE OF RUNGS.
- ACCESS TO THE MANHOLE SHALL BE CLEAR OF ANY INCOMING PIPES.
- SEE SECTION 4.3.10.9 OF THE SWCoP FOR 'MANHOLE COVER REQUIREMENTS'.
- FOR PIPES <450 DIA, ALL PRE-CAST MANHOLE RISERS SHALL BE 1050mm DIA MAXIMUM. IF DEFLECTION ANGLE IS >90° THEN SPECIFIC DESIGN OF THE RISERS IS REQUIRED.
- FOR PIPE DIAMETERS ≤600mm, ONE FLEXIBLE JOINT IS REQUIRED WITHIN 600mm OF THE RISER WALL. PIPE DIAMETERS GREATER THAN 600mm MAY NOT REQUIRE A FLEXIBLE JOINT.
- MANHOLES SHALL BE DESIGNED TO USE THE MINIMUM NUMBER OF RISERS AND THE MINIMUM RISER HEIGHT SHALL BE 300mm. NO RISERS SHALL BE CUT DOWN TO HEIGHT.
- FOR OUTLET PIPES WITH DIAMETERS GREATER THAN 600mm, REFER TO DRAWING SW09 FOR 'RECESSED RUNGS'.
- WHERE HALF-ROUND CHANNELS ARE NOT AVAILABLE, THE CHANNEL SHALL BE FORMED WITH 25MPa CONCRETE, VIBRATED AND FINISHED SMOOTH. PLASTERING IS NOT PERMITTED.
- ALL MANHOLE OPENINGS SHALL BE CUT WITH CONCRETE SAW. SLEDGE HAMMERS SHALL NOT BE USED.
- FOR CONNECTIONS TO MANHOLES REFER TO SECTION 4.3.10.7 OF THE SWCoP.
- MANHOLES WITH DEPTH TO INVERT LESS THAN 1.5m SHALL HAVE A CENTRALLY LOCATED COVER.
- THE INSIDE OF THE MANHOLE THROAT SHALL BE PAINTED BLUE. RAISED THROATS ARE PERMITTED, BUT ARE SUBJECT TO SPECIFIC DESIGN.
- ALL JOINTS BETWEEN RISERS SHALL BE EPOXIED. BUTYL MASTIC MAY BE USED IF APPROVED BY AUCKLAND COUNCIL.
- WHERE A MANHOLE RISER IS GREATER THAN 2.4m IN HEIGHT ABOVE THE BENCHING, A REDUCER SLAB AND 1050mm RISER MAY BE USED FROM THAT POINT. SPECIFIC DESIGN IS REQUIRED.
- CONCRETE MANHOLE LIDS SHALL BE FIXED DOWN USING CLAMPS. NO EPOXY OR MASTIC SEAL SHALL BE USED ON LIDS.
- COVER/FRAME SHALL BE BOLTED TO LID SLAB WITH SS DYNABOLTS AND SEALED WITH EPOXY MORTAR.
- MANHOLE CONCRETE LIDS AND CAST IRON COVERS SHALL BE DESIGNED IN ACCORDANCE WITH SECTIONS 4.3.10.3 AND 4.3.10.9 OF THE SWCoP.

TABLE 1

MINIMUM MANHOLE RISER DIAMETER

PIPE DIA	DEFLECTION					
	0°	15°	30°	45°	60°	75°
450	1050	1050	1050	1200	1500	1800
525	1050	1050	1200	1200	1500	1800
600	1200	1200	1500	1500	1800	1800
750	1500	1500	1800	1800	SD*	SD*
825	1800	1800	1800	SD*	SD*	SD*
900	1800	1800	SD*	SD*	SD*	SD*
1050	SD*	SD*	SD*	SD*	SD*	SD*

SD\*: SPECIFIC DESIGN.

&gt;75° DEFLECTION SHALL REQUIRE 'SPECIFIC DESIGN' FOR MANHOLE RISERS FOR ANY DIAMETER OF PIPE &gt;375mm

A	FOR ENGINEERING APPROVAL	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: EPA			



CLIENT:  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

SITE: 52 KAURILANDS ROAD  
TITIRANGI

TITLE: STORMWATER  
STANDARD DETAIL

SCALE AT A3: NTS DATE: 07/05/21 DRAWN: MHS CHECKED: OA  
PROJECT NO: SW05 DRAWING NO: 21123 REVISION: 06  
21123 06 A

STORMWATER CODE OF PRACTICE  
STANDARD DETAILS  
REVISION: 2  
REV DATE: 1 NOVEMBER 2015  
CAD FILENAME: AC-STD-SW05.DWG

AUCKLAND COUNCIL

STANDARD STORMWATER MANHOLE  
SUITABLE FOR UP TO 4.0m DEPTH TO INVERT

ENVIRONMENTAL-SW DRAWING SET SHEET  
ORIGINAL SCALE A3  
SCALE: N.T.S.  
DRAWING No. SWCoP 1 OF 1  
DRAWING No. SW05 REV 2



- NOTES:**
- All works to comply with Auckland Council Standards. The contractor is to liaise with Auckland Council officers regarding required Inspections.
  - All existing services to be located on site by the Contractor prior to commencing the new works.
  - The Contractor shall reinstate any damages to existing services at their own expense.
  - The Engineer is to be contacted if any discrepancies are encountered between the standards, calculations and drawings.
  - All dimensions (not to be obtained by scaling from drawings), levels and underground services etc shall be checked on site by the Contractor prior to commencement of construction works.
  - Contractor to verify levels shown and consult engineer if discrepancies are encountered.
  - All Wastewater works to be installed and Engineering quality standard drawings, wherever applicable, shall be in accordance with Watercare Services Limited Code of Practice (2019).
  - All works, design and materials to comply with the latest WSL standards.
  - All Wastewater lateral connections to be 100mm uPVC SN16; Lateral to follow WSL COP WW-17. All lot connections to be 1.7% min grade following WW15.
  - A works over approval is required within 2 metres of a public Water or Wastewater asset (Existing or Proposed).



**LEGEND:**

WM	PROPOSED WATER LINE
DASHED LINE	EXISTING WATER LINE
SS	PROP PUBLIC WW LINE
DASH-DOT LINE	PROP PUBLIC WW CONN
DASH-DOT LINE	EXISTING WW LINE
PINK DASH-DOT LINE	EASEMENT

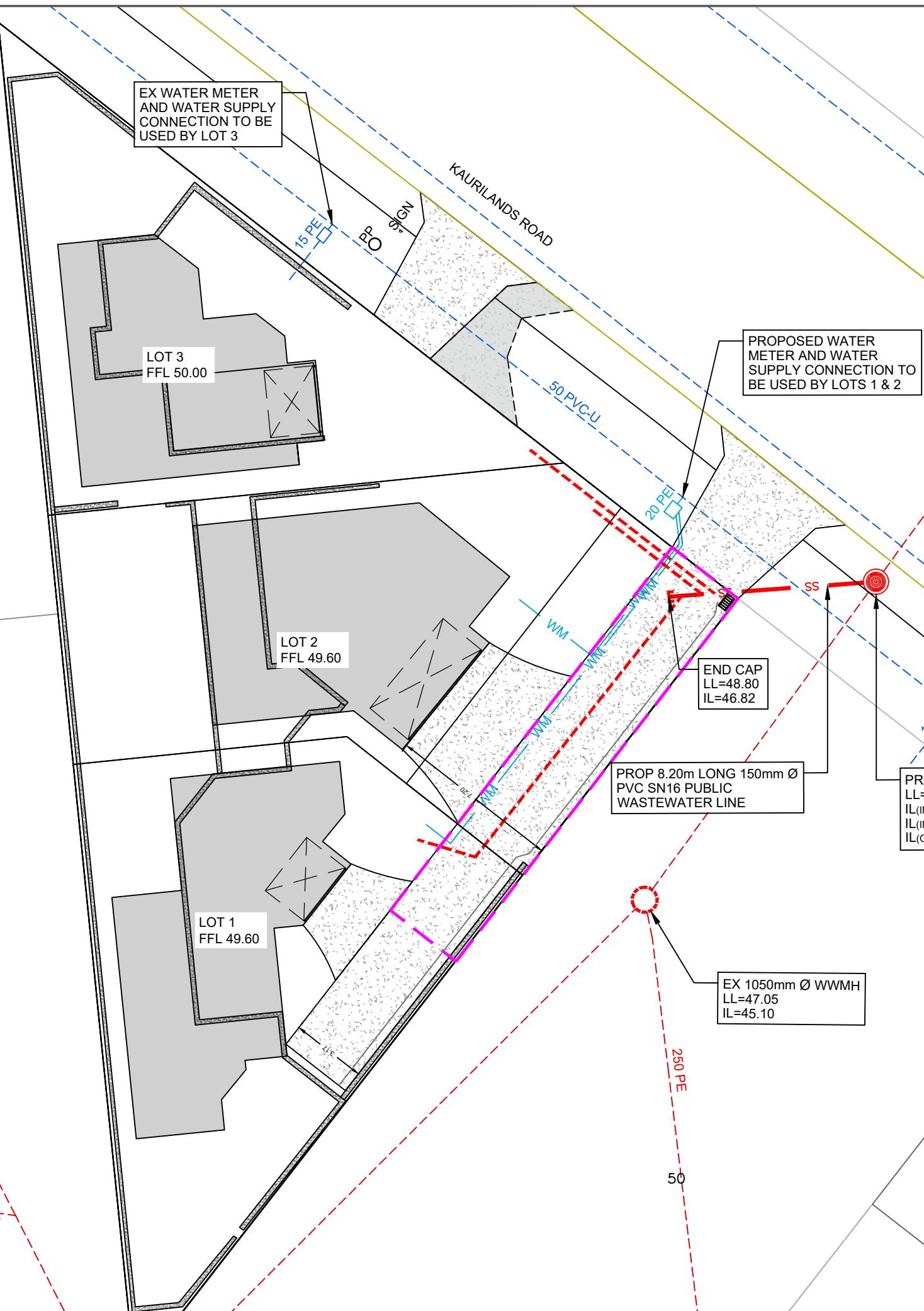
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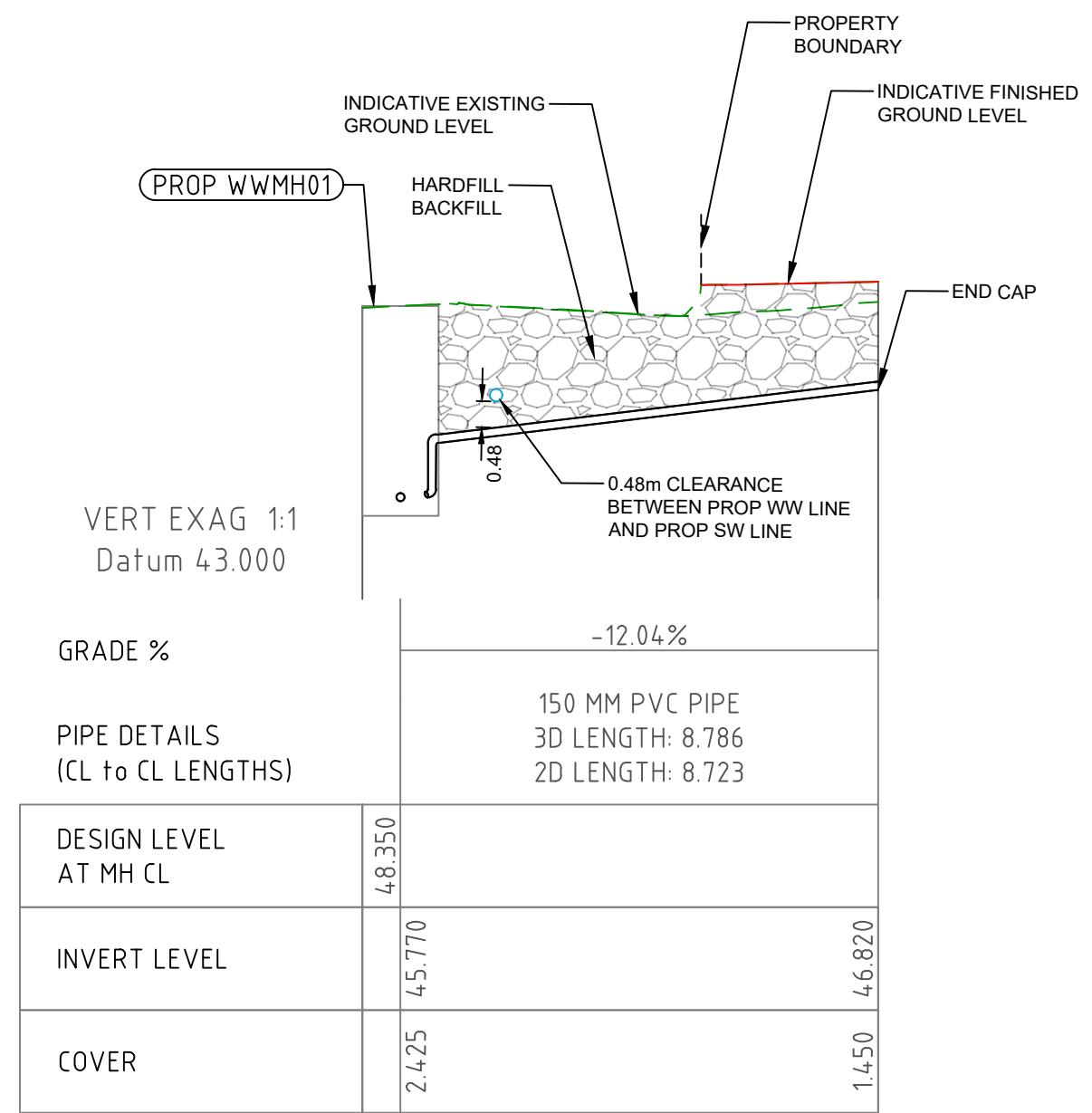
**LANDEV**  
LANDEV CONSULTING  
INFO@LANDEV.CO.NZ  
(09) 889 1177  
WWW.LANDEV.CO.NZ

**CLIENT:**  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

**SITE:** 52 KAURILANDS ROAD  
TITIRANGI  
**TITLE:** WATER AND WASTEWATER  
LAYOUT PLAN  
**SCALE AT A3:** 1:200    **DATE:** 07/05/21    **DRAWN:** MHS    **CHECKED:** OA  
**PROJECT NO:** 21123    **DRAWING NO:** 07    **REVISION:** A

56





WW LONG SECTION

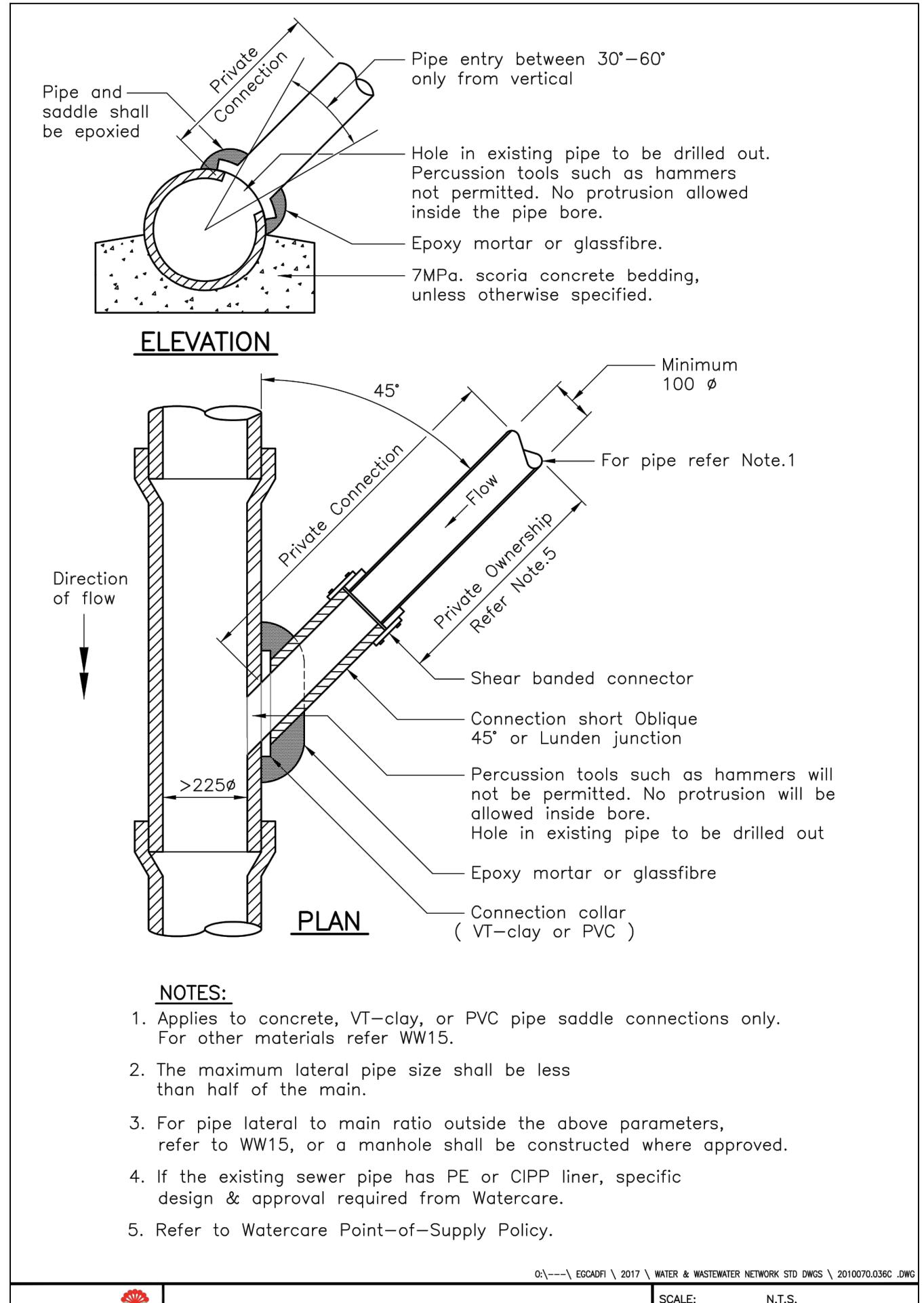
- NOTES:
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  - All existing services to be located on site by the Contractor prior to commencing the new works.
  - The Contractor shall reinstate any damages to existing services at their own expense.
  - The Engineer is to be contacted if any discrepancies are encountered between the standards, calculations and drawings.
  - All dimensions (not to be obtained by scaling from drawings), levels and underground services etc shall be checked on site by the Contractor prior to commencement of construction works.
  - Contractor to verify invert level at existing rodding eye and consult engineer upon invert level confirmation.
  - All Wastewater works to be installed in accordance with Watercare Services Limited Code of Practice.
  - All works, design and materials to comply with the latest WSL standards.
  - All Wastewater lateral connections to be 100mm uPVC SN16; Lateral to follow WSL COP WW-15.

A	FOR ENGINEERING APPROVAL	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: EPA			



CLIENT:  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

SITE: 52 KAURILANDS ROAD  
TITIRANGI  
TITLE: WASTEWATER  
LONG SECTION  
SCALE AT A3: 1:125 DATE: 07/05/21 DRAWN: MHS CHECKED: OA  
PROJECT NO: 21123 DRAWING NO: 08 REVISION: A



## SADDLE CONNECTIONS TO GRAVITY PUBLIC WASTEWATER

SCALE: N.T.S.  
ISSUE DATE: 13-07-2018  
DWG No. 2010070.036C  
REFERENCE No. WW 14

A	FOR ENGINEERING APPROVAL	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: EPA			

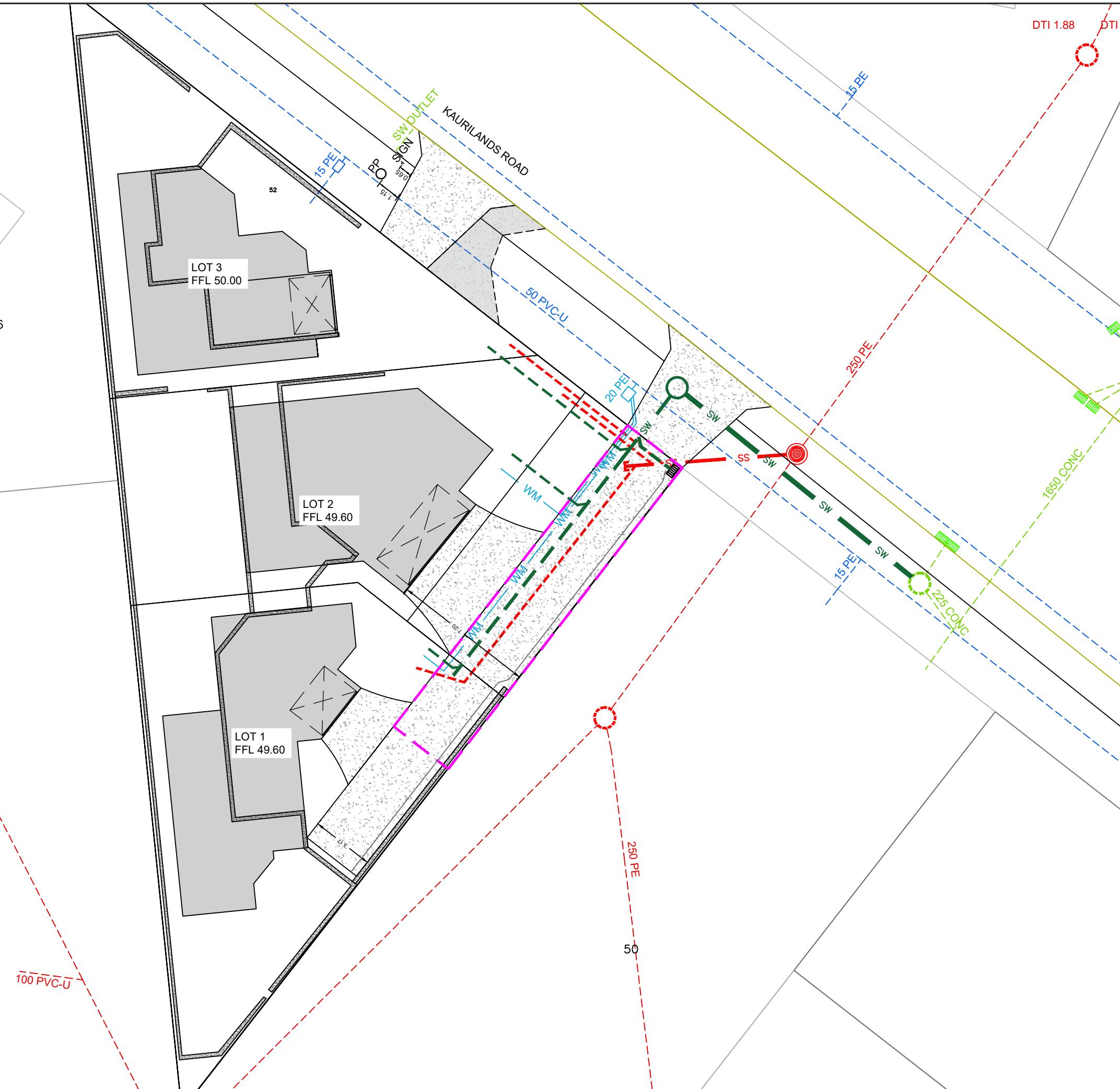
**LANDEV**  
LANDEV CONSULTING  
INFO@LANDEV.CO.NZ  
(09) 889 1177  
WWW.LANDEV.CO.NZ

CLIENT:  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

SITE: 52 KAURILANDS ROAD  
TITIRANGI

TITLE: WASTEWATER  
STANDARD DETAIL  
SCALE AT A3: NTS DATE: 07/05/21 DRAWN: MHS CHECKED: OA  
PROJECT NO: 21123 DRAWING NO: 09 REVISION: A

NOTES:



A	FOR ENGINEERING APPROVAL	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: EPA			



CLIENT:  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

SITE: 52 KAURILANDS ROAD  
TITIRANGI

TITLE: SERVICES LAYOUT PLAN

SCALE AT A3:	DATE:	DRAWN:	CHECKED:
NTS	07/05/21	MHS	OA
PROJECT NO:	DRAWING NO:	REVISION:	
21123	10	A	



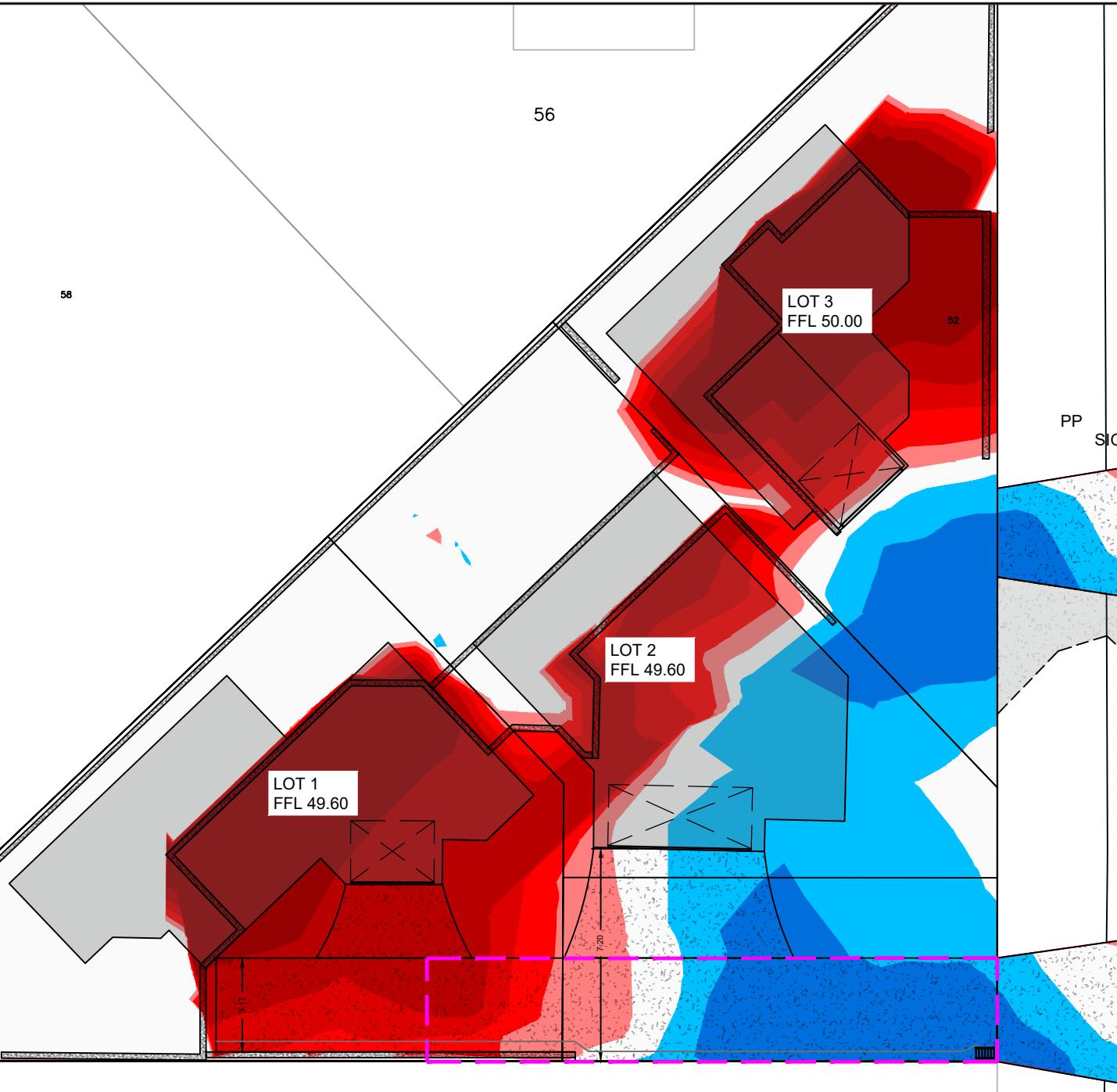
**NOTES:**

1. All works to comply with Auckland Council Standards.
2. All dimensions (not to be obtained by scaling from drawings), levels and underground services etc shall be checked on site by the Contractor prior to commencement of construction works.

KAURILANDS ROAD

#### Surface Analysis: Elevation Ranges

Number	Color	Minimum Elevation (m)	Maximum Elevation (m)
1	Dark Red	-3.249	-1.400
2	Red	-1.400	-0.900
3	Medium Red	-0.900	-0.600
4	Light Red	-0.600	-0.300
5	Lightest Red	-0.300	-0.100
6	White	-0.100	0.100
7	Cyan	0.100	0.300
8	Blue	0.300	0.700



50

Volume	
Cut volume	600.071 Cu. M.
Fill volume	58.059 Cu. M.
Net volume	542.012 Cu.
Area	560 SqM.

A	FOR RESOURCE CONSENT	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: RC			

**LANDDEV**  
LANDDEV CONSULTING  
INFO@LANDDEV.CO.NZ  
(09) 889 1177  
WWW.LANDDEV.CO.NZ

**CLIENT:**  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

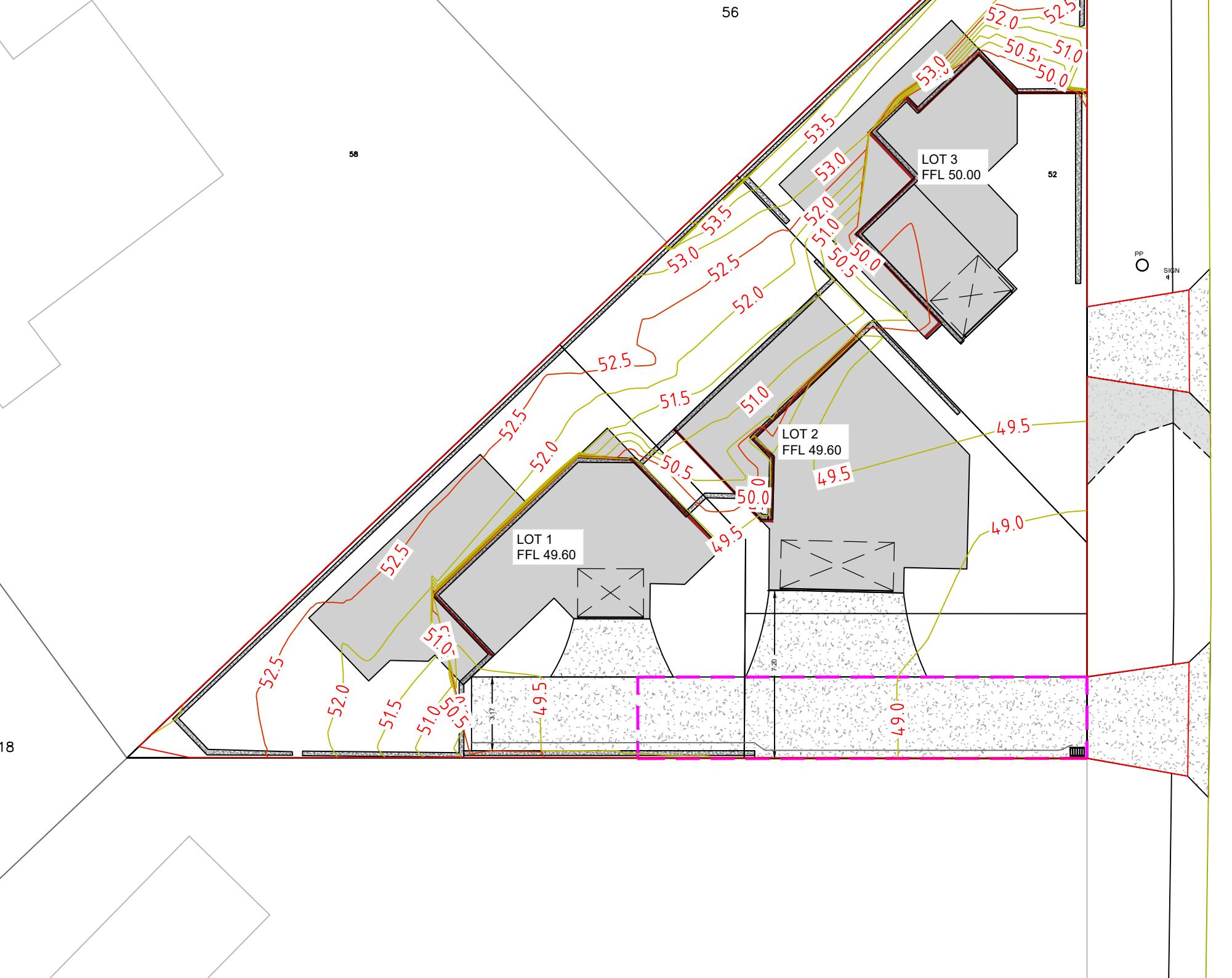
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TITIRANGI

**TITLE:** EARTHWORKS  
CUT AND FILL PLAN

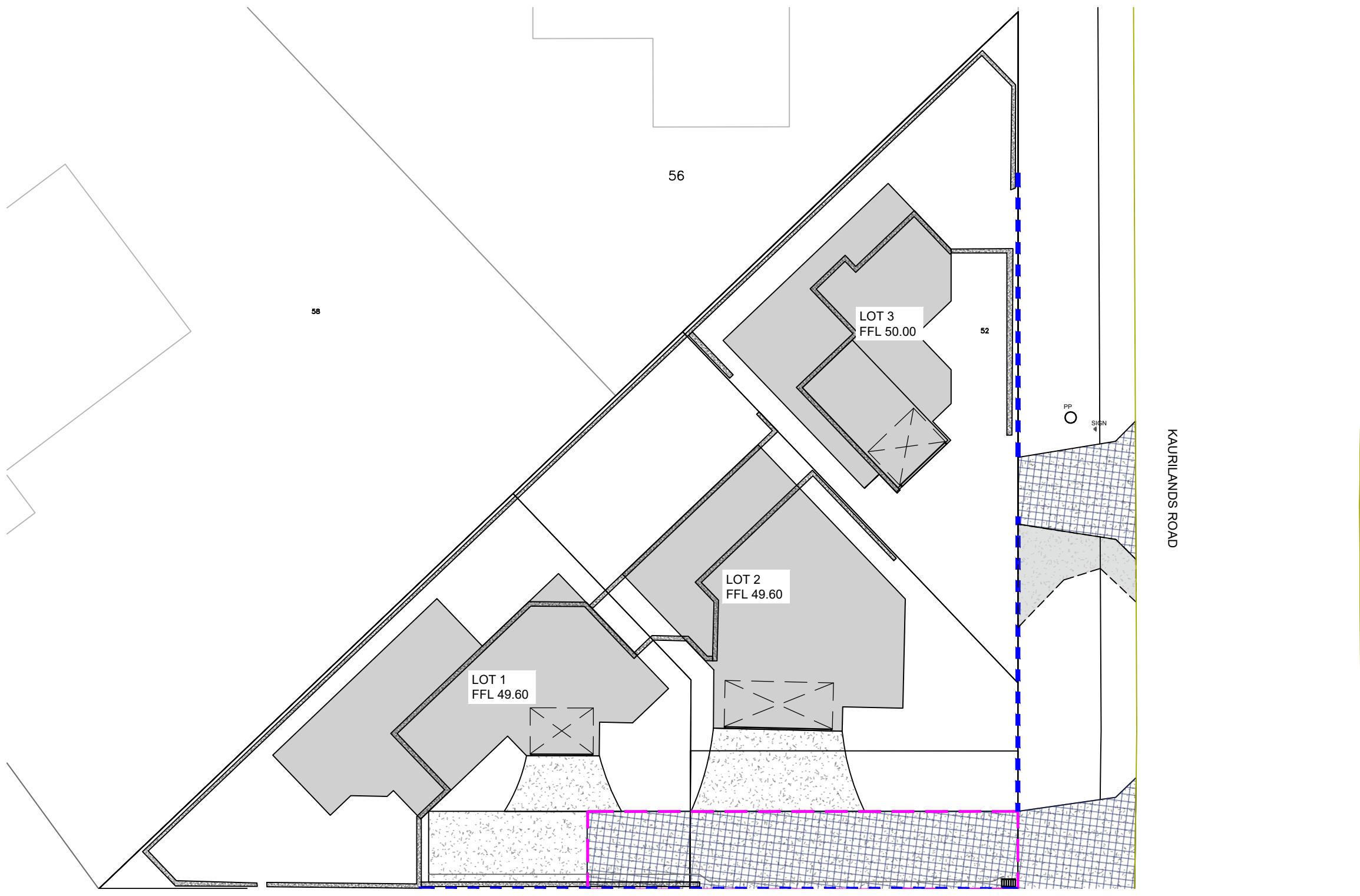
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PROJECT NO:	21123	DRAWING NO:	13	REVISION:	A		



- NOTES:
- All works to comply with Auckland Council Standards. The contractor is to liaise with Auckland Council officers regarding required Inspections.
  - The Engineer is to be contacted if any discrepancies are encountered between the standards, calculations and drawings.
  - All dimensions (not to be obtained by scaling from drawings), levels and underground services etc shall be checked on site by the Contractor prior to commencement of construction works.
  - Contractor to verify levels shown and consult engineer if discrepancies are encountered.



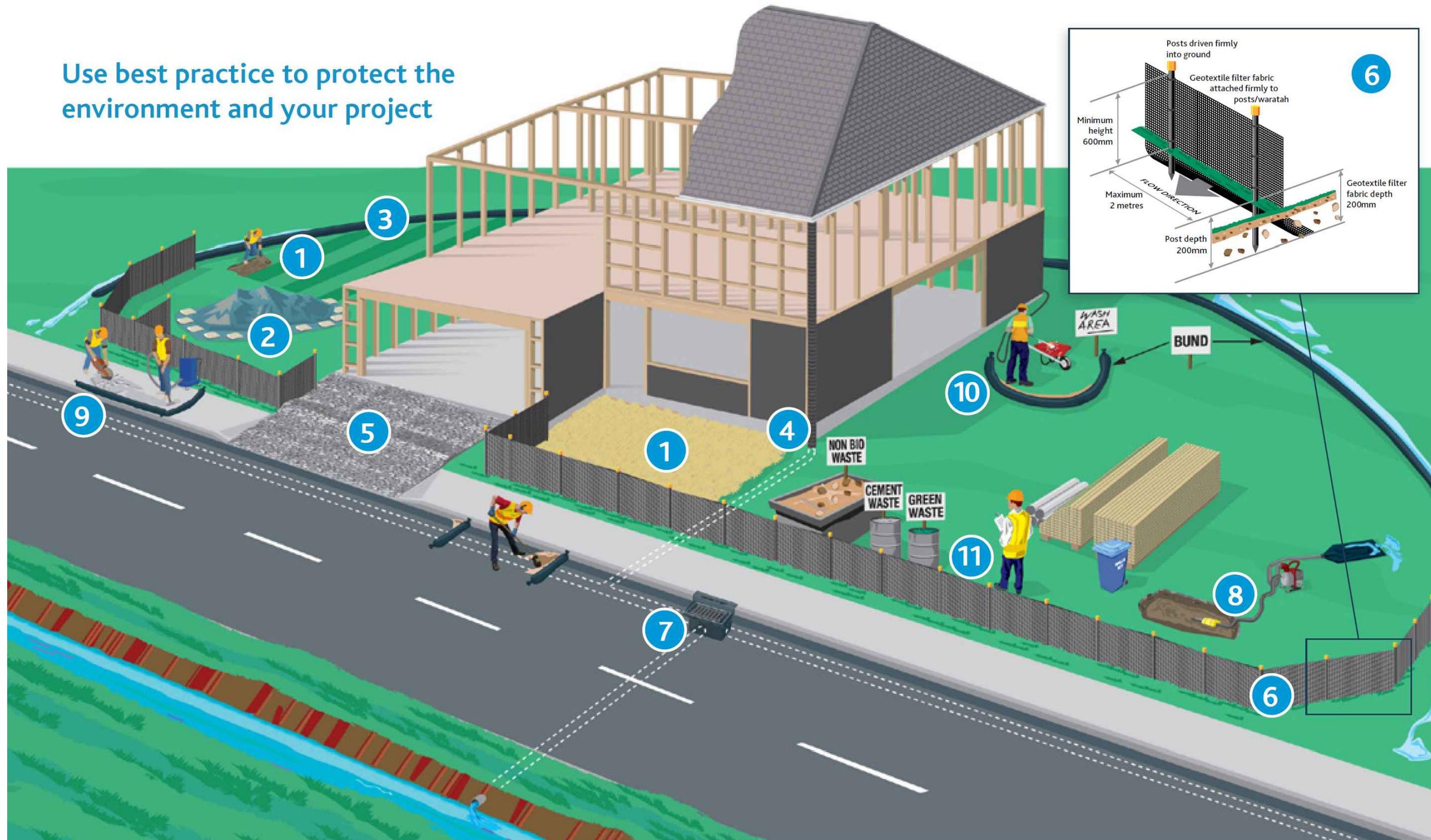
A	FOR RESOURCE CONSENT	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: RC			
<b>LANDEV</b>			LANDEV CONSULTING INFO@LANDEV.CO.NZ (09) 889 1177 WWW.LANDEV.CO.NZ
CLIENT:			
52 KAURILANDS ROAD TITIRANGI AUCKLAND 0604			
SITE: 52 KAURILANDS ROAD TITIRANGI			
TITLE: PROPOSED CONTOURS PLAN			
SCALE AT A3:	1:200	DATE:	07/05/21
PROJECT NO:	21123	DRAWING NO:	14
		REVISION:	A



**NOTES:**

1. All works to comply with Auckland Council Standards.
2. All dimensions (not to be obtained by scaling from drawings), levels and underground services etc shall be checked on site by the Contractor prior to commencement of construction works.

## Use best practice to protect the environment and your project



### Key to site diagram

1. Minimise exposed areas
2. Cover stockpiles
3. Clean water diversion

4. Connect to the stormwater system as soon as the roof is complete
5. Stabilise construction entranceway
6. Silt fences
7. Drain/catchpit protection
8. Dewatering
9. Keep concrete cutting away from drains & water courses
10. Stop concrete, paint and other chemical waste from entering drains or streams. Isolate it on site
11. Maintenance and inspections

A	FOR RESOURCE CONSENT	OA	10.05.21
REV:	DESCRIPTION:	BY:	DATE:
STATUS: RC			

**LANDEV**  
LANDEV CONSULTING  
INFO@LANDEV.CO.NZ  
(09) 889 1177  
WWW.LANDEV.CO.NZ

CLIENT:  
  
52 KAURILANDS ROAD  
TITIRANGI  
AUCKLAND 0604

SITE: 52 KAURILANDS ROAD  
TITIRANGI

TITLE: EROSION AND SEDIMENT  
CONTROL PLAN - SHEET 02

SCALE AT A3:	NTS	DATE: 07/05/21	DRAWN: MHS	CHECKED: OA
PROJECT NO:	21123	DRAWING NO: 16	REVISION: A	