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19/106/C

Panetiki Development
20 Omaha Block Access Rd, Leigh.
Stormwater Control and Disposal Including Detention Tanks

1) Preamble:

Deane Consultancy has been engaged by Hicks Construction to provide design stormwater controls for this development.

Resource Consent application for the development has been lodged. It is intended to submit the application for stormwater design for the entire development at this stage.

2) Existing Stormwater disposal:

The pre-existing two dwellings (one recently demolished, one remains) on the site have historically discharged roof tank overflow to the existing overland flow path without mitigation. Likewise side drainage from the pre-existing 480m of metalled driveways is discharged to the same OFP and thence to the beach within Leigh Harbour, and a small section to the beach to the east, again without any treatment or volume or flow reduction.

The total length of pre-existing unsealed access road is 480m (2400m2) and the total pre-existing roof area discharging is approx 600m2.

3) Proposed stormwater collection and disposal for new development:

a) Roof water:

All roof water from buildings A1, utility building and pavilion will discharge to four water supply tanks located underneath the tennis court. The water supply plant (treatment, filters and pressure pumps) will be located beside these, and this treatment plant will supply potable water to all buildings within the complex. The last of these 5 tanks will be a detention tank (called the "upper detention tank"). This detention tank will then overflow and be discharged to the rocked non scour outlet towards the low point of the overland flowpath.

In addition, roof water from building A2 will feed four 30,000 litre irrigation tanks. These will be available for topping up swimming pools and irrigation of trees and shrubs during drier times of the year. A pump will supply a reticulated irrigation system to upper parts of the complex. These tanks will overflow directly to a 30,000 litre detention tank (Called the "lower detention tank") which will also discharge to the rocked non scour outlet.

The building A3 roof is too low to discharge to the water supply tanks and to the detention tanks, so will discharge directly to the rocked non scour outlet

The total roof area of the new buildings is 4255m2.

b) Access roads:

The proposed internal roads will total 1320m2. Where possible the runoff from road surfaces will be discharged directly to surrounding ground without channelisation. Where the road is on significant grade the road side drains will be collected, and added to other paved area runoff (paragraph c below) and taken to discharge directly to the 9,000 litre silt trap. An existing small discharge to the beach to the east will be stopped. The silt trap will then overflow to the lower detention tank.

c) Other impervious areas:

All buildings will have associated impermeable areas to cater for parking, manouvring vehicles, service entries and pedestrian footpaths. The tennis court is included in this area. These total 2598m2. Existing impermeable areas at the existing main dwelling were 300m2.

Catch pits will collect runoff from the larger areas and carry this runoff directly to the silt trap (pages 1 and 12). However smaller areas and where possible roadways, will be shaped to discharge evenly to grassed areas without channelisation of flows (approx 1,000m2).

d) Total impermeable areas:

The above areas are summarised as follows (all in m2):

Total roof areas	4255
Existing roof areas	600
Nett addition in roof areas.	3655
Total impermeable areas	3918 (1320m2 roads and 2598 parking and other paved areas)
Existing impermeable areas	2700
Nett addition in impermeable areas	1218
Total nett impermeable areas	*4873*
TOTAL Impermeable areas	**8173**

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4) Design of stormwater detention tanks:

These tanks have two functions:

a) Treatment of discharge from paved and roof areas:

Runoff from the roadside drains and from the parking areas will include sediments and tyre detritus. These will be discharged to the silt trap, made up of a 9,000 litre above ground tank. Most solids will settle in the base of this for occasional removal to waste.

However, some sediments of smaller particle size such as clay and silt fines will be carried through into the lower detention tank.

Roof water will contain a small amount of dust and vegetation from roofs which will be treated within the supply tanks which can be occasionally flushed out. This will reach the detention tanks with little if any solids in suspension.

b) Reduction in peak flow discharge rate:

There is an overall increase in impermeable areas at the site. This means there will be a corresponding increase in the speed of flows leaving the site. The tanks will act to detain the flood flow and discharge it through its designed outlets at a flow rate no greater than that from the existing site.

The site is not within SMAF1 or SMAF2 areas identified in the Auckland Unitary plan. Therefore attenuation of stormwater flows is not mandatory. However in line with the owners' requirements, a high standard of mitigation of stormwater discharges is to be provided.

The detention tank design is attached in pages 2-11. In summary, the tanks are designed to fill in the design storm (1 in ten year rainfall event, RCP 8.5 scenario which allows for maximum climate change). The tank outlets are designed orifices to reduce the flow rates to equal those for the predevelopment situation.

The detention tanks will have a 200mm outlets to take overflow should the design inflow be exceeded. This will discharge to a rocked outlet beside the existing overland flowpath and from there through the existing culvert into Leigh Harbour. The existing outlet is stable (refer to photos on pages 13-15 attached). The culvert has a bend in it and it is recommended that a CCTV survey be carried out to check the pipe condition and to plot its location so any building foundations adjacent to it can be designed appropriately.

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5) Reticulation:

The stormwater/water supply system involves four separate sets of pipe work:

1) Potable water supply. This includes down pipes to irrigation and potable supply tanks, and overflow of these to the detention tanks. (See page 11).

2) Stormwater off impermeable surfaces. These go directly to the detention tanks via the silt trap (See page 10).

3) Pressure potable supply pipes. These carry water from the water filtration and treatment plant to all of the buildings on site for potable use.

4) Pressure irrigation supply pipes. These carry irrigation water from the irrigation tanks at building A2 to a small number of irrigation taps around the complex for non potable use (ie mainly irrigation and topping up of swimming pools).

All four pipes, plus the wastewater pipes may be run in the same trench where appropriate.

6) Operation and Maintenance:

An Operation and Maintenance manual will be provided for all stormwater and wastewater infrastructure on the site.

P A Deane, CMEngNZ,CPEng.

13 September, 2021.

UNDER REVIEW:

Attached:

P1	*Tank arrangement*
P2-11	*Volume and flow rate and detention calculations.*
P12-15	*Photos of existing outlet culvert.*
P16	*Detention tank details.*
P17	*Rocked outlet*

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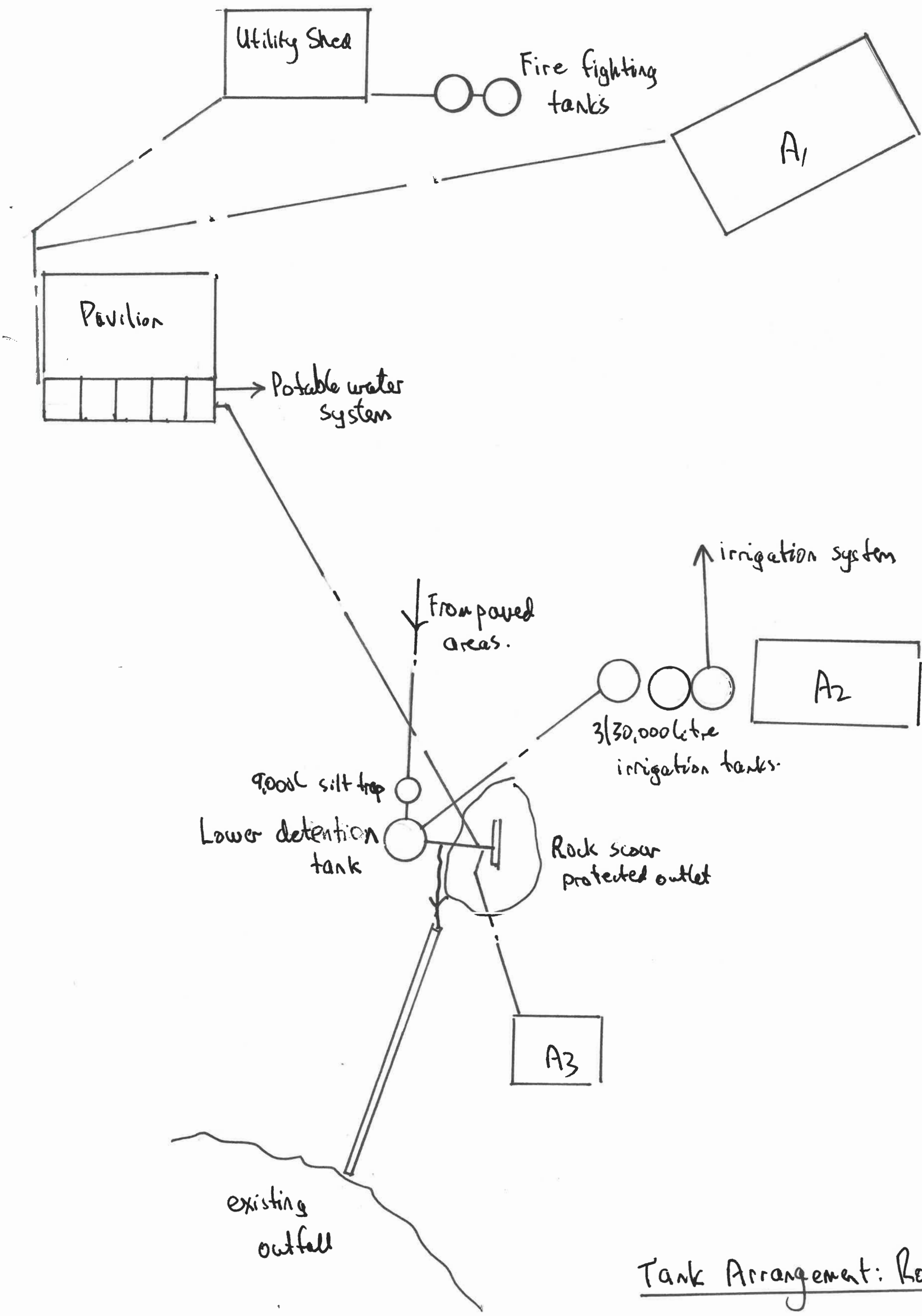

Tank Arrangement: Roof Water

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	Date: 27/11/20	Signed: [signature]

Stormwater Volumes

		A	c		
Predevelopment CA	Roofs	$600m^2$	$\times .9$	=	540
	Paved	$2700m^2$	$\times .85$	=	2295
	Sub Total			=	2835
	Make up to $8245m^2$				
	Unlevel.	$5410m^2$	$\times .35$	=	1893
	TOTAL				4728

Total A $= 8245m^2$

Post development CA	Roofs	4255	$\times .9$	=	3829
	Paved	3990	$\times .85$	=	3391
	TOTAL			=	7220

Total A $= 8245m^2$ ✓

∴ Assuming 1250mm p.a. rainfall, volumes produced from impermeable areas to "stream flow":

Pre dev. $3543m^3$
Post dev $9025m^3$
} increase $= 5482m^3$

Volume usage

Predevelopment: Assume 10 persons on site @ 60% TP58
$= 180 \times .6$ litres $\times 10 \times 365 = 394m^3$

Post development: Assume av. 50% occ'y @ 60% of TP58
$= 5980 \times .5 \times .6 \times 365$ litres $= 655m^3$
Irrigation $= 30 \times 4 \times 2 = 240m^3$
Sw. pool + spa $= 400m^3$

$1295m^3$

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2) Design outflow:

The design out flow is listed as follows:

Table 1: Daily Design Volume

Development:	Design Quantity	Total Design Flow (Litres)
#1 Visitors Accommodation Main Complex 6 x Single Room Luxury Units	12 x 220 litres	2640
Day Staff facilities #2 Visitors Accommodation- Secondary Complex 4 x Single Rooms with ensuites	6 x 50 litres 8 x 220 litres	300 1760
#3 Utility Shed with Managers Accommodation 1 Bedroom Utility Shed Workers Facilities	2 x 180 litres 4 x 50 litres	360 200
#4 Tennis Pavilion 4 x Visitors	4 x 50 litres	200
#5 Small Accommodation Unit 1 x Single Room	2 x 220 litres	440
	TOTAL USAGE FOR DESIGN	**5900 Litres**

Roof tank water supply is proposed. With partial water saving fixtures such as dual flush toilets, no garbage grinders and front-loading commercial washing machines the daily usage per head is 220 litres per person per day for luxury accommodation; 180 litres per person per day for managers accommodation and 50 litres per day for day staff facilities. The total peak daily design quantity is 5900 litres per day shown in table 1 above.

The ratio of lot area to daily design volume is 15.3 which is greater than the minimum of 3.0 for permitted use. The discharge exceeds the maximum of 2000 litres per day therefore it is considered a restricted discretionary activity in terms of Auckland Council TP58.

3) Treatment Quality and System:

The owners have requested that effluent be treated to a tertiary level. The chosen treatment method is an 8.7 Oxyfix FIXEUC90 Submerged Aerated Fixed Film Technology System with an Advanced C 1700 Ultra Violet Water Disinfection Unit. This includes a Greastop C-90 Grease trap, a screen tank fitted prior to the treatment system, and an 80 Micron filter on the irrigation pump. It is expected that this treatment plant will produce an effluent quality of:

- BOD (mg/L) 15
- TSS (mg/L) 15
- TN (mg/L) 40
- E-coli (cfu/100ml) 1000
- 80 Micron Irrigation filter
- UV C1700

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∴ Nett discharge to 'stream flow'

Predevelopment = (3563 − 394) m^3 = 3169 m^3

Post development = (9025 − 1295) m^3 = 7730 m^3

∴ Increase = 4581 m^3

This is additional volume of discharge

Peak discharge flow rates assume tc = 20min.

Predevelopment

1in 2yr Q = ·278 C I A (CA p2)

= ·278 × 4728 × 16·7 × 3 ls^{-1} = 58·0 ls^{-1}

1in 10yr Q = ... 22·7 . . . = 89·5 ls^{-1}

Post development Qlost (driveways to ground from 1,000 m^2)

1in 2yr Qlost = ·278 × 1000 × 16·7 × 3 ls^{-1} = 12·3 ls^{-1}

1in 10yr Qlost = ... 22·7 . . . = 18·9 ls^{-1}

∴ Allowable exit flows from det'n tanks:

1in 2yr Q = (58 − 12·3) ls^{-1} = 45·7 ls^{-1}

1in 10yr Q = (89·5 − 18·9) ls^{-1} = 70·6 ls^{-1}

CA going to Det tanks:

Upper: 3600 m^2 × ·9 ⇒ CA = 3240 m^2 45%

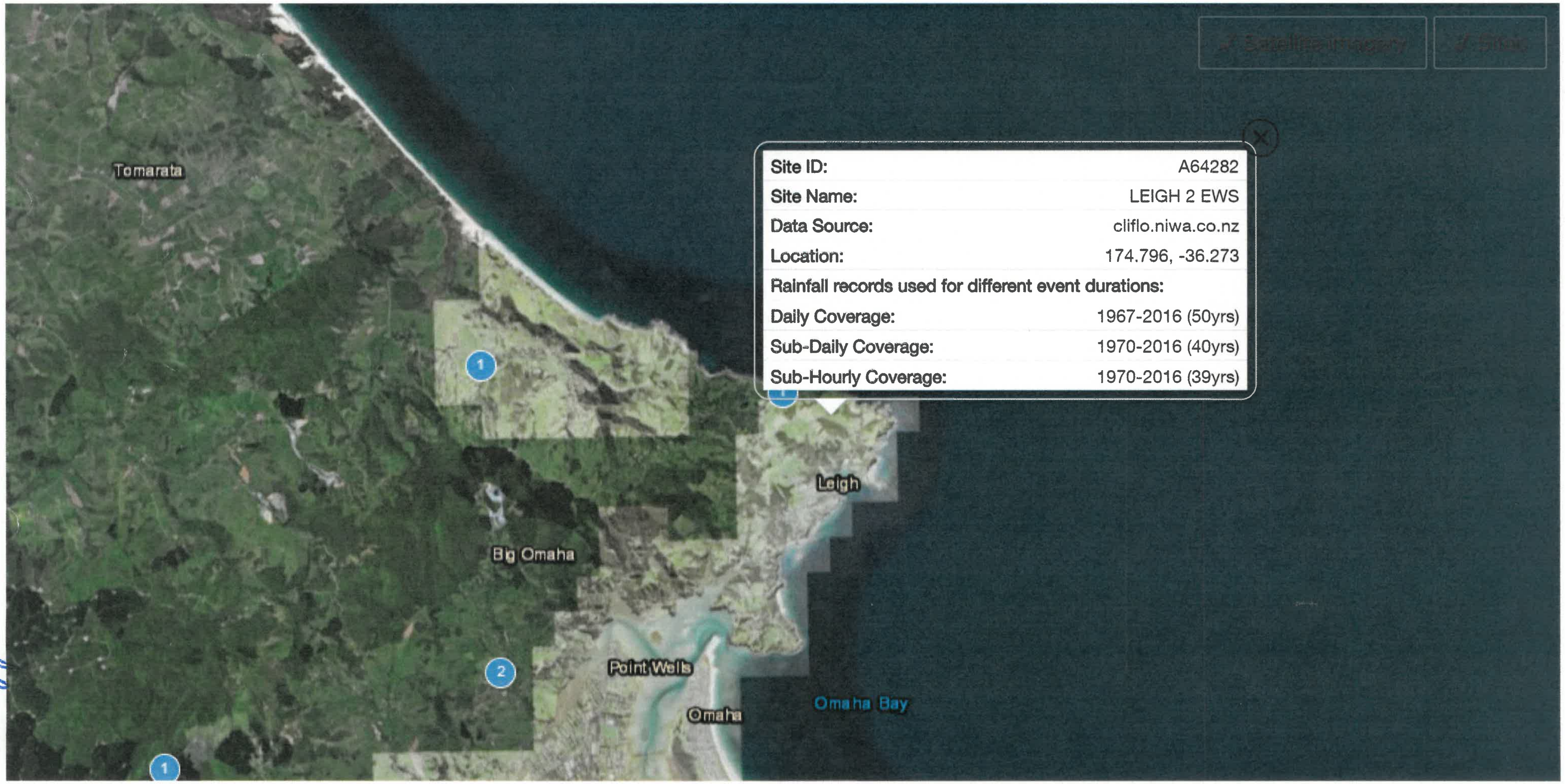
Lower: 7220 − 3240 = 3980 m^2 55%

See P for volume calcs.

High Intensity Rainfall Design System V4 (/)

Location

Address search | Enter your address and press enter to search



P5

p6

Ale

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	8.69	13.4	17.0	24.6	34.2	52.9	66.0	79.4	91.6	97.7	101	104
2	0.500	9.56	14.7	18.7	27.1	37.7	58.3	72.8	87.4	101	108	112	115
5	0.200	12.5	19.3	24.5	35.6	49.6	76.8	96.1	115	133	143	148	152
10	0.100	14.7	22.7	28.8	41.9	58.4	90.6	113	136	158	169	175	180
20	0.050	17.0	26.2	33.2	48.4	67.5	105	131	158	183	196	204	209
30	0.033	18.3	28.3	35.9	52.3	73.0	114	142	171	198	212	221	226
40	0.025	19.3	29.8	37.8	55.1	76.9	120	150	180	209	224	233	239
50	0.020	20.0	31.0	39.3	57.3	80.0	125	156	188	218	233	242	249
60	0.017	20.6	32.0	40.5	59.1	82.5	129	161	194	225	241	250	257
80	0.012	21.6	33.5	42.5	62.0	86.6	135	169	203	236	253	263	270
100	0.010	22.4	34.7	44.0	64.2	89.7	140	175	211	245	262	273	280
250	0.004	25.5	39.5	50.1	73.2	102	160	201	242	281	300	313	321

Rainfall depths (mm) :: RCP8.5 for the period 2081-2100

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
1.58	0.633	10.3	15.9	20.1	29.2	40.3	60.8	74.5	88.5	100	106	109	112
2	0.500	11.4	17.6	22.2	32.3	44.7	67.4	82.8	97.7	111	118	122	124
5	0.200	15.0	23.2	29.4	42.7	59.1	89.6	110	130	148	157	162	166
10	0.100	17.7	27.4	34.7	50.4	69.9	106	131	154	176	187	193	197
20	0.050	20.5	31.6	40.1	58.4	81.0	123	152	179	204	217	224	229

9

ARI	AEP	10m	20m	30m	1h	2h	6h	12h	24h	48h	72h	96h	120h
30	0.033	22.1	34.2	43.4	63.2	87.7	134	164	194	222	235	243	248
40	0.025	23.3	36.0	45.7	66.5	92.4	141	174	205	234	249	257	262
50	0.020	24.2	37.5	47.6	69.3	96.2	147	181	213	244	259	268	273
60	0.017	25.0	38.6	49.0	71.5	99.3	152	187	221	252	268	277	282
80	0.012	26.2	40.6	51.5	75.0	104	159	196	231	265	281	290	297
100	0.010	27.1	42.0	53.3	77.7	108	165	204	240	275	292	302	308
250	0.004	30.8	47.8	60.7	88.6	123	189	233	275	315	334	346	353

p7

UPPER TANK

Tc Min	Intensity mm/hr	Rain fall depth mm	In flow m^3	Out flow during tc	Storage Req'd m^3
20		22.7	73.5	38.1	35.4
30		28.8	93.2	57.1	36.1 critical *
45		35.4	114.6	85.7	28.9
60		41.9	135.7	114.3	21.4
120		58.4	189.1	228.6	—
		Because 100% reuse by facilities on site, 25% volume reduction allowable $\Rightarrow$ $.75 \times 36.1\,m^3 = 27.1\,m^3$			

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LOWER DETENTION TANK

Tc Min	Intensity mm/hr	Rain fall depth mm	In flow m^3	Out flow during tc	Storage Req'd m^3
20		22.7	90.3	46.6	43.7
30		28.8	116.6	69.9	46.7

∴ Volume required

$= .875 \times 46.7\, m^3$

$= 39.1\, m^3$

Partial reuse (irrigation only)

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ORIFICE DESIGN.

Redistribute volumes:

Upper	$27.1\ m^3$		36,200 litre
Lower	$39.1\ m^3$	⇒	30,000 litre
	$66.2\ m^3$		$66.2\ m^3$ ✓

Total allowable out flow = $70.6\ ls^{-1}$

⇒ upper $38.6\ ls^{-1}$
lower $32\ ls^{-1}$

UPPER TANKS 5 tanks 6m x 6m.

∴ Area = $180\ m^2$

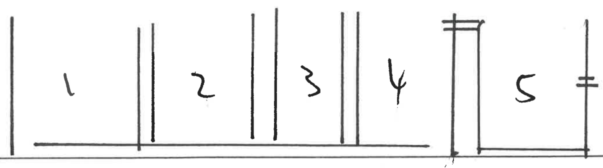
∴ Ht. for $36.2\ m^3$ = 201mm say 200mm.
250mm

$\therefore V = .85 \times \sqrt{2g \times .25} = 1.88\ ms^{-1}$

$\therefore A = \frac{Q}{V} = \frac{.0386}{1.88}\ m^2 \Rightarrow \phi = 160\ mm.$

Try square No.

use part last tank:



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$\therefore$ Area for $36.2m^3 = 1.00m.$

$\therefore v = 3.76 ms^{-1}$

$\therefore A = \frac{.0386}{3.76} m^2 \Rightarrow \phi = 114mm.$ outlet

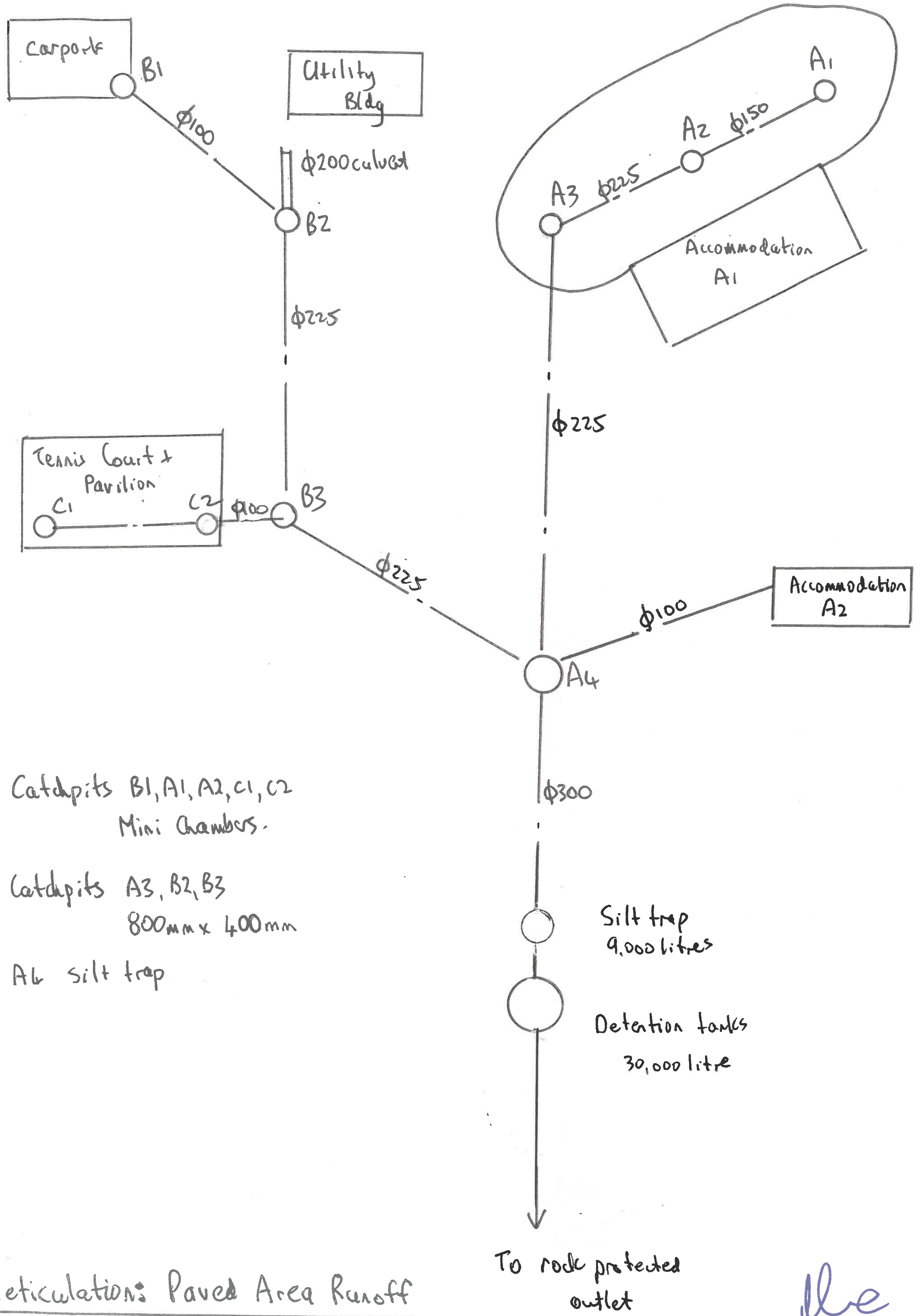
OK

LOWER TANK 30,000 litre tank $\phi = 3.5m.$

$\therefore$ Ht $3.1m.$

$\therefore v = 6.62 ms^{-1} \therefore A = \frac{.032}{6.62} m^2$

$\Rightarrow \phi = 78mm$



Catchpits B1, A1, A2, C1, C2
Mini Chambers.

Catchpits A3, B2, B3
800mm x 400mm

A4 silt trap

Reticulation: Paved Area Runoff

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P13
Inlet of
outlet pipe


P14 Outlet
onto rock

p15 Stable outlet onto beach

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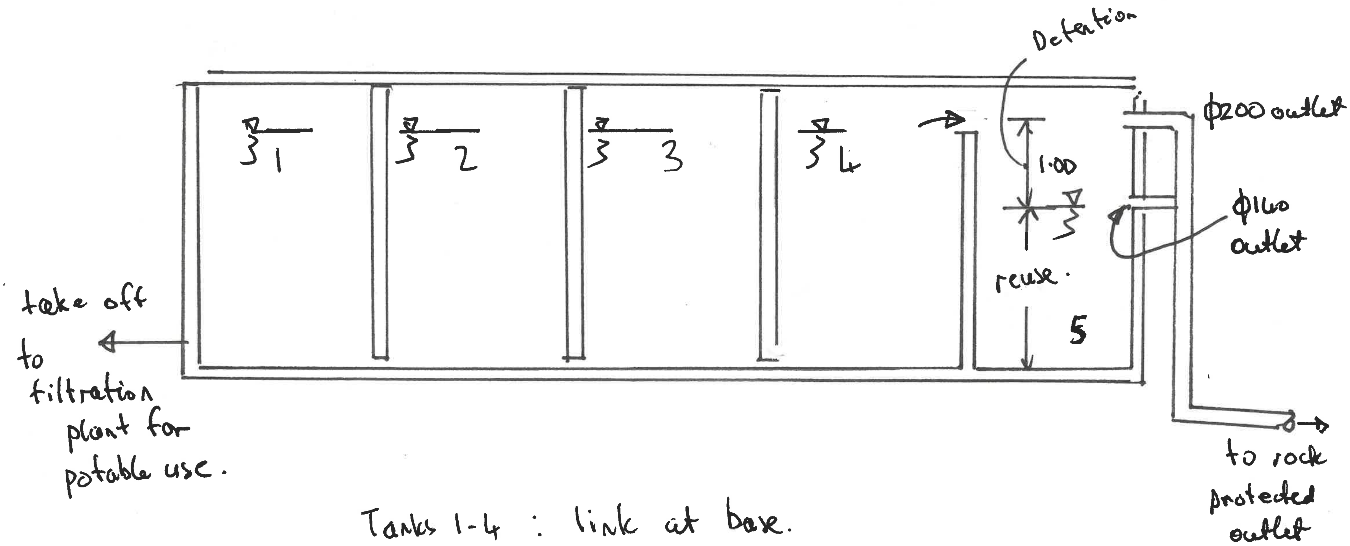
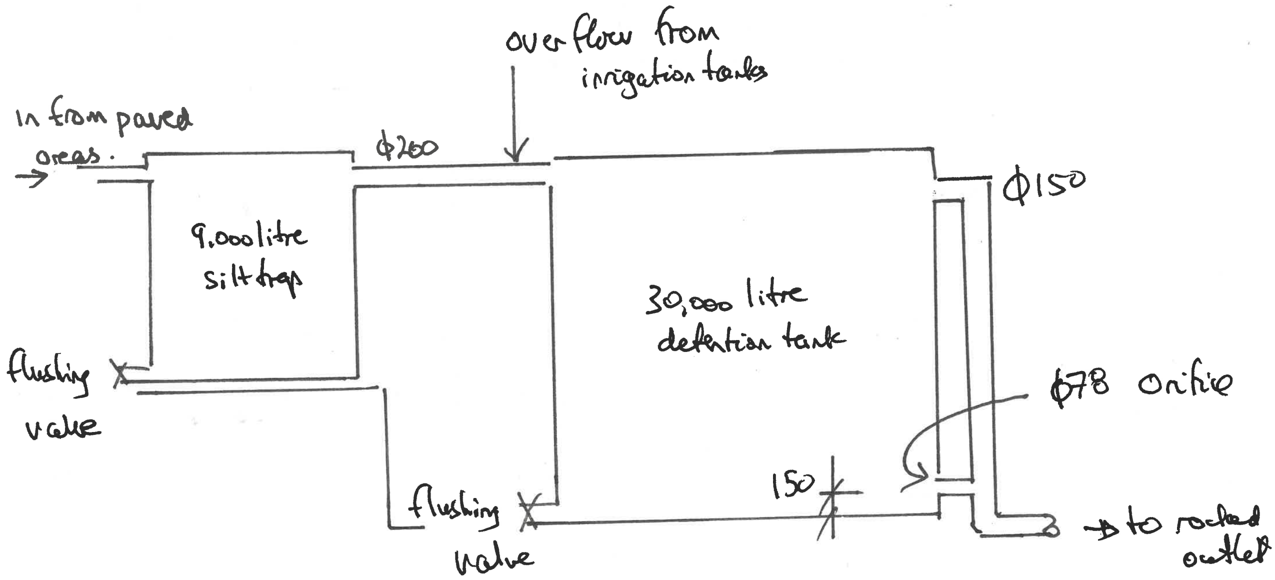


Tanks 1-4 : link at base.

Tank 4 : overflow to tank 5 at top.

UPPER REUSE / DETENTION TANKS



LOWER SILT TRAP / DETENTION TANK

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