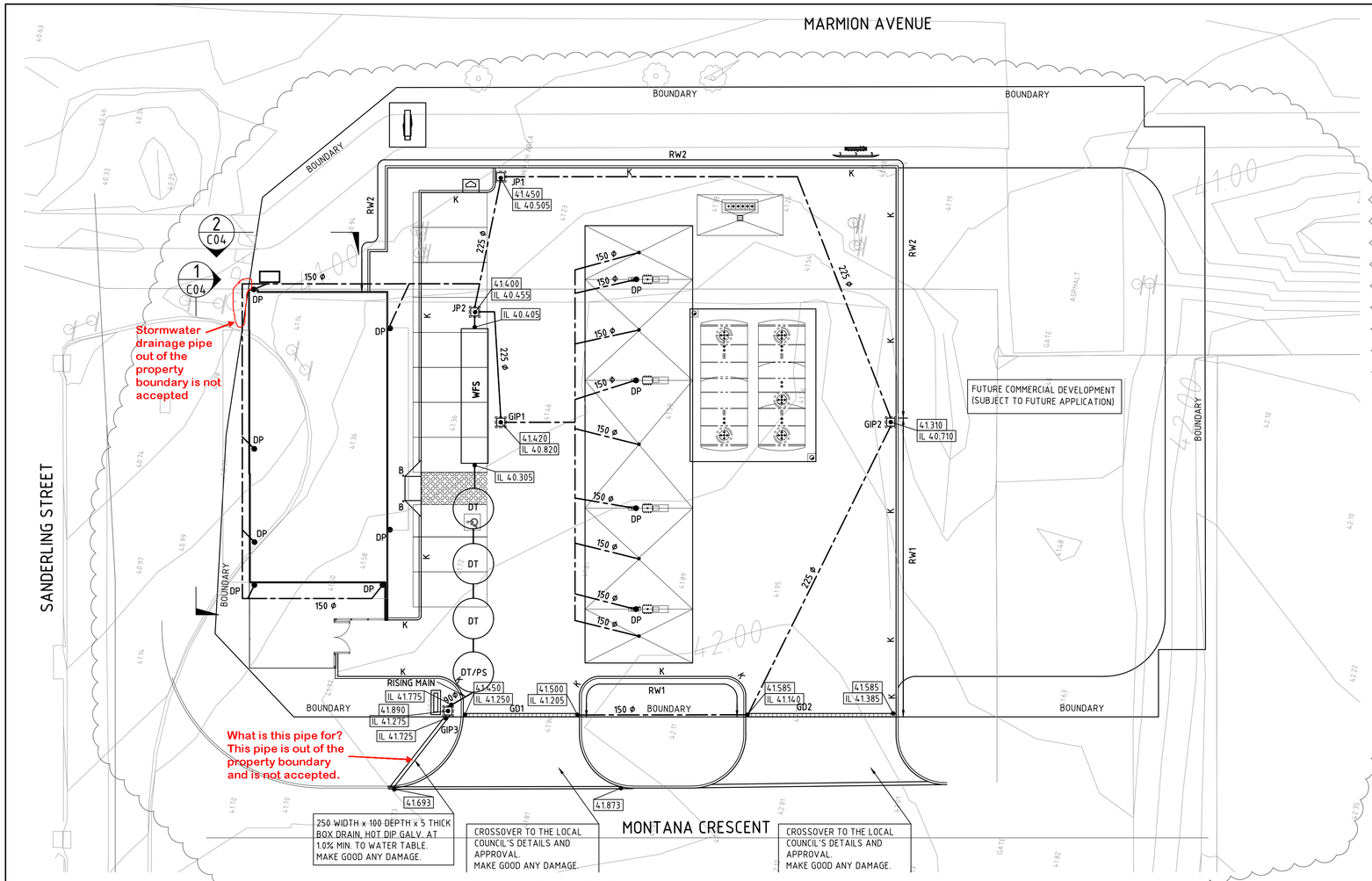
Appendix 5
Conceptual Stormwater Management Plan



STORMWATER PLAN

0 5 10
1:200 (metres)

BULK EXCAVATION AND PAVEMENT NOTES

B1. AFTER BULK EXCAVATION HAS BEEN COMPLETED THE FORMED SURFACE SHALL BE PROOF ROLLED AND TESTED IN ACCORDANCE WITH THE SPECIFICATION. AFTER TOPSOIL STRIP IN FILL ZONES HAS BEEN COMPLETED THE SURFACE SHALL BE PROOF ROLLED AND TESTED IN ACCORDANCE WITH THE SPECIFICATION.

B2. ANY SOFT, WET OR UNSUITABLE SUBGRADE MATERIALS, AS DEFINED IN THE SPECIFICATION, SHALL BE REMOVED AND REPLACED WITH AN APPROVED MATERIAL.

B3. ALL SURPLUS EXCAVATED MATERIALS (EXCLUDING TOPSOIL) SHALL BE REMOVED FROM THE SITE AT THE BUILDER's EXPENSE TO A PLACE OF LEGAL DISPOSAL UNLESS DIRECTED OTHERWISE BY THE PROJECT MANAGER.

B4. EXCAVATED MATERIAL WHICH CONFORMS WITH THE SPECIFICATION REQUIREMENTS FOR CLAY FILL MAY BE USED AS FILL REFER SPECIFICATION.

B5. APPROVED FILL MATERIALS SHALL BE PLACED IN UNIFORM LAYERS, COMPACTED ,TESTED AND PROOF ROLLED IN ACCORDANCE WITH THE SPECIFICATION. THE FINISHED EARTHWORKS LEVEL SHALL BE PROOF ROLLED AND TESTED AS SPECIFIED PRIOR TO PAVEMENT CONSTRUCTION.

B6. DURING CONSTRUCTION THE BUILDER SHALL BE RESPONSIBLE FOR CONSTRUCTING AND MAINTAINING A TEMPORARY SITE DRAINAGE SYSTEM AND TO MAINTAIN THE SITE IN A DRY AND STABLE CONDITION. DETAILS OF THE DRAINAGE SYSTEM SHALL BE TO THE APPROVAL OF THE PROJECT MANAGER.

B7. UNLESS NOTED OTHERWISE ALL BATTERS SHAPED TO FINAL PROFILE SHALL BE CONSTRUCTED AT A SLOPE OF 1 IN 4 (CUT AND FILL), TEMPORARY CONSTRUCTION BATTERS SHALL BE LIMITED TO 1 IN 2. STEEPER SLOPES SHALL NOT BE CONSTRUCTED UNLESS APPROVED BY THE PROJECT MANAGER. STABLISATION AND EROSION PROTECTION SHALL BE PROVIDED AS DIRECTED BY THE PROJECT MANAGER, AT THE BUILDER'S EXPENSE. THE BUILDER SHALL BE RESPONSIBLE FOR THE STABILITY OF HIS TEMPORARY WORKS.

B8. ALL UNDERGROUND SERVICES SHALL BE LAID PRIOR TO FINAL SEALING OF PAVEMENTS.

B9. REFER ARCHITECT'S DRAWING FOR PAVEMENT LINEMARKING AND KERB SETOUT.

NOTE:
BEFORE STARTING ANY PAVEMENT AND BUILDING WORKS, ENSURE THE SUB-GRADE COMPACTION IS AS REQUIRED IN THE STRUCTURAL AND CIVIL SPECIFICATIONS. PROOF ROLLING AND OR COMPACTION TESTS SHALL BE CARRIED OUT.

FOR CONCRETE PAVEMENT NOTES REFER DRG. C02

LEGEND

- EXISTING CONTOUR LEVEL
- IL 111.250 — INVERT LEVEL GD OR STORMWATER PIPE
- K — CONCRETE KERB 100 HEIGHT
- RW1 — RETAINING WALL
- RS — CONCRETE RETAINING STRIP
- 150 ø — STORMWATER PIPE
- CS — 150 DIA CIRCULAR SUMP WITH A GALV. GRATE
- DP — DOWNPIPE - 100 PVC DWV SN6 MIN. AT 1.0% MIN. OR DP SIZE FOR CONNECTION TO DRAIN U.N.O.
- GIP — GRATED INLET PIT
- JP — JUNCTION PIT
- SD-600 — 600 WIDTH SURFACE DRAIN
- SIO — SURFACE INSPECTION OPENING. RISER ON TEE IN DRAIN WITH REMOVABLE SCREW CAP BENEATH SURFACE AND CONCRETE PROTECTIVE COVER AND CAP.
- GD1 — "ACO" S200K POWER DRAIN NEUTRAL CHANNELS WITH CLASS D DUCTILE IRON INTERCEPT GRATES WITH ANTI-SHUNT LUGS AND POWERLOK BOLTLESS LOCKING SYSTEM, OR APPROVED EQUIVALENT..
- GD2, GD3 — "ACO" S200K POWER DRAIN STEPPED CHANNELS WITH CLASS D DUCTILE IRON INTERCEPT GRATES WITH ANTI-SHUNT LUGS AND POWERLOK BOLTLESS LOCKING SYSTEM, OR APPROVED EQUIVALENT..

NOTES

STORMWATER DRAINAGE

1. ALL PIPEWORK TO BE CLASS DWV WITH SOLVENT WELDED JOINTS U.N.O.
2. GIP = REINFORCED CONCRETE PIT WITH CAST IRON FRAME AND GRATE. REFER TO PIT SCHEDULE.
   JP = REINFORCED CONCRETE PIT WITH CAST IRON FRAME AND COVER. REFER TO PIT SCHEDULE.

WFS = WASTE WATER FILTRATION SYSTEM
PURACEPTOR CLASS 1 FULL RETENTION
P.060.L.C1.2C

INLET IL 40.405
OUTLET IL 40.305

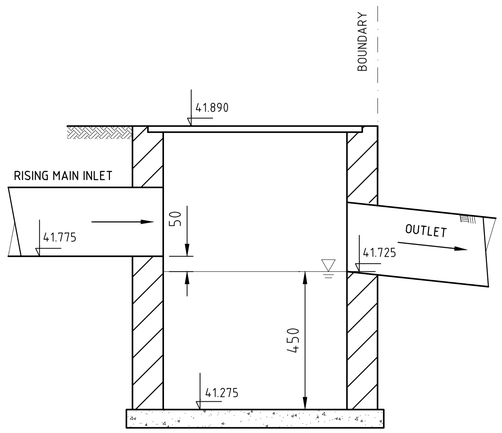
DT/PS = STORMWATER DETENTION TANK/PUMPING STATION

4x23 M^3 DETENTION TANK.
PUMPING DESIGN BASED ON 2 No. PUMPS WITH DISCHARGE = 20 L/S EACH.
USE 2 No. PUMPS IN CASE OF A PUMP FAILURE.

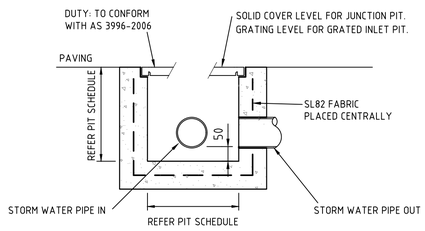
STORMWATER PIT SCHEDULE

PIT No.	SIZE (INERNAL)	TOP R.L.	INVERT R.L.	COVER TYPE
GIP1	600 x 600	41.420	40.820	CLASS D CAST IRON FRAME AND GRATE
GIP2	600 x 600	41.310	40.710	CLASS D CAST IRON FRAME AND GRATE
GIP3	600 x 600	41.890	41.275	CLASS D CAST IRON FRAME AND GRATE
JP1	600 x 600	41.450 X	40.505	CLASS D CAST IRON FRAME AND COVER
JP2	600 x 600	41.400 XXX	40.455	CLASS D CAST IRON FRAME AND COVER

X — APPROXIMATE R.L. - MATCH TO ADJACENT LEVELS.
XX — "ACO" SERIES 600 UNIVERSAL JUNCTION PIT INTEGRAL WITH GD1 OR APPROVED EQUIVALENT.
XXX — ENSURE TOP OF GRATE IS A MIN. 50 ABOVE ADJACENT SURFACE.



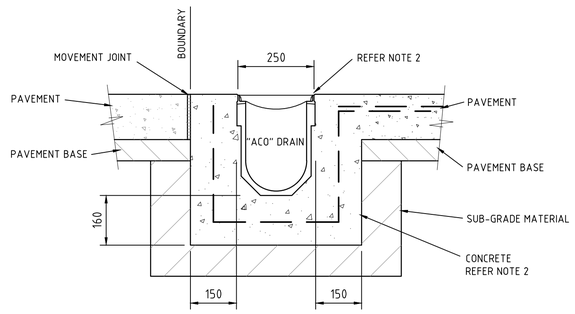
STORMWATER GRATED INLET PIT - GIP3



NOTES (FOR PRECAST UNITS)

1. PENETRATION FOR PIPES SHALL BE APPROX. 50 GREATER THAN THE O/D OF PIPE.
2. PIPES SHALL BE FINISHED FLUSH WITH THE INTERNAL FACE OF THE SUMP.
3. A STIFF MORTAR MIX SHALL BE PACKED INTO THE SPACE FROM BOTH SIDES OF STRUCTURE.
4. THE INTERNAL FACE SHALL BE FINISHED SMOOTH AND A 150 THICK BAND OF CONCRETE SHALL BE POURED OUTSIDE THE SUMP TO SEAL THE PENETRATION.

STORMWATER GRATED INLET PIT - GIP
STORMWATER JUNCTION PIT - JP



"ACO" S200K DRAIN INSTALLATION DETAIL

NOTES:

1. CONCRETE STRENGTH N32. VIBRATE CONCRETE TO ELIMINATE AIR POCKETS.
2. THE FINISHED LEVEL OF THE CONCRETE SURROUND MUST BE APPROXIMATELY 3mm ABOVE THE TOP OF THE CHANNEL EDGE.
3. ALL MATERIALS AND COMPONENTS WITHIN THE SCOPE OF THIS SYSTEM SHALL BE OBTAINED FROM "ACO" AND THE WORK CARRIED OUT AS DETAILED ON THE DRAWING.
4. INSTALL DRAIN IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS.

DO NOT SCALE | FOR INFORMATION

Issue.	Description	Date	Drawn	Chkd
B	CHANGES AS SHOWN.	31.10.18	PK	RGS
A	ISSUED FOR INFORMATION.	12.10.18	PK	RGS

-1 0 1cm at full size 10cm

North

Client: CALTEX

Architect: PROJECT CONSULTANTS WA

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253 FLINDERS STREET
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Project: ALKIMOS - WA
MARMION AVENUE
CNR SENDERLING STREET

Drawing Title: STORM WATER PLAN AND DETAILS

Drawn		Scale A1	Q.A. Check	Date
PK	OCTOBER 2018	1:200 AND AS NOTED		
Designed	Project No.		Dwg. No.	Issue
RGS	SA180040		C01	B

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CIVIL STORMWATER CALCULATIONS

REFERENCE NO	**SA180040**
ISSUE DATE	**October 2018**
AGENT	**Project consultants**
SITE LOCATION	**ALKIMOS WA** **MARMION AVENUE** **CNR SANDERLING STREET**

Note:

1. These calculations are to be read in conjunction with relevant Construction Reports, Structural Drawings and Architectural Drawings

2. All work to comply with the Building Code of Australia and relevant Australian and Australian and New Zealand Standards,

AS 1012 - Ready Mixed Concrete
AS 1254 - PVC Pipes and fittings for Storm/Surface Water Applications
AS 1260 - Unplasticised PVC (UPVC) Pipes and Fittings for Sewerage Applications
AS 1289 - Method of Testing Soils for Engineering Purposes
AS 1342 - Precast Concrete Drainage Pipes
AS 1379 - Specification and Supply of Concrete
AS 1415 - Unplasticised PVC Pipes and Fittings for Soil, Waste and Vent Applications
AS 1428.1 - Design for access and mobility
AS 1478 - Chemical Admixtures for use in Concrete
AS 4049.1 - Paints and Related Materials
AS 1646 - Rubber Joint Rings for Water Supply, Sewerage and Drainage Purposes
AS 1742 - Manual of Uniform Traffic Control Devices
AS 2008 - Residual Bitumen for Pavements
AS 2302 - Code of Practice for Installation of UPVC Pipe Systems
AS 2566 - Plastics Pipe Laying Design
AS 2758 - Concrete Aggregates
AS 3500 - National Plumbing and Drainage
AS 3600 - Concrete Structures
AS 3610 - SAA Formwork for Concrete
AS 3725 - Loads on Buried Concrete Pipes
AS 3792 - Portland and Blended Cements
AS/NZS 2890 1 - Parking Facilities - Off-street car parking
AS/NZS 2890 6 - Off-street parking for people with disabilities

Title:Alkimos WA Marmion Av
Cnr Senderling street
Reference: SA180040
Date: Oct 2018

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Pre developed site

Existing details:

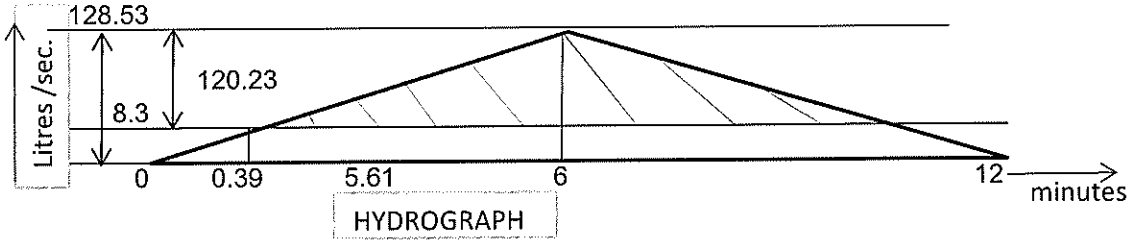
Total area=	3281.6	m^2		
Exisiting roof area =	0	m^2	C' roof=	0.9
Exist. pavement area=	0	m^2	C' pave=	0.75
Existing land area =	3281.6	m^2	C' land=	0.1
ARI (in years) 'y' =	10	Years		
t_c (in minutes) 'm' =	6	minutes		
Intensity of rainfall 'I^y_m' =	91	mm/Hour		
Discharge 'Q' =CIA/3600 =	8.30	Litres/Sec		
Allowable discharge =	8.3	Litres/Sec		

Post developed site

Proposed details:

Roof area=	554.1 m^2	C'roof=	0.9	1.2xC'roof≤1.0=	1.08	1
Pavement area=	1992.1 m^2	C' pave.=	0.75	1.2xC'pave≤1.0=	0.9	0.9
Land area=	735.4 m^2	C' land=	0.1	1.2xC'land≤1.0=	0.12	0.12

ARI (in years) 'y' =	100	Years
t_c (in minutes) 'm' =	6	minutes
Intensity of rainfall 'I^y_m' =	190	mm/Hour
Discharge 'Q' =CIA/3600 =	**128.53**	Litres/Sec



Detention volume = **120.23** X 5.61 X60/1000= **40.49** m^3

Title:Alkimos WA Marmion Av
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Date: Oct 2018

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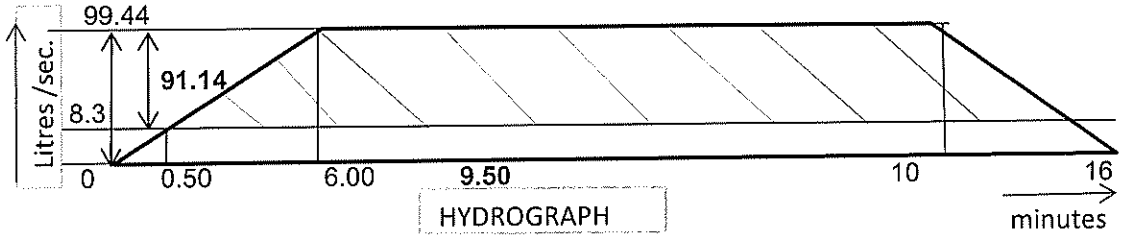
Check for critical storm

Try duration: 10 minutes

Intensity of rainfall 'I^{y}_{m}' = 147 mm/Hour

Discharge 'Q'
=CIA/3600 = **99.44** Litres/Sec



HYDROGRAPH

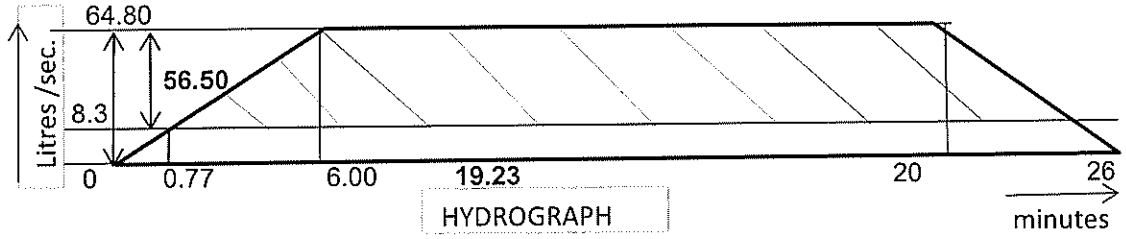
Detention volume = **91.14** X 9.50 X60/1000= **51.94** m^3

Check for critical storm

Try duration: 20 minutes

Intensity of rainfall 'I^{y}_{m}' = 95.8 mm/Hour

Discharge 'Q'
=CIA/3600 = **64.80** Litres/Sec



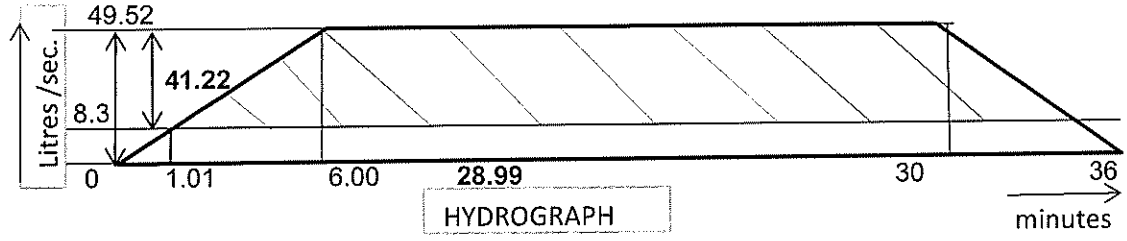
HYDROGRAPH

Detention volume = **56.50** X 19.23 X60/1000= **65.20** m^3

Try duration: 30 minutes

Intensity of rainfall 'I^{y}_{m}' = 73.2 mm/Hour

Discharge 'Q'
=CIA/3600 = **49.52** Litres/Sec



HYDROGRAPH

Detention volume = **41.22** X 28.99 X60/1000= **71.70** m^3

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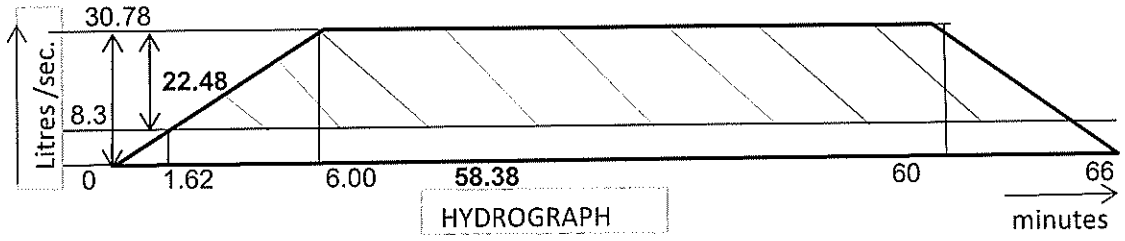
Try duration: 60 minutes

Intensity of rainfall 'I^{y}_{m}' = 45.5 mm/Hour

Discharge 'Q'
=CIA/3600 = **30.78** Litres/Sec

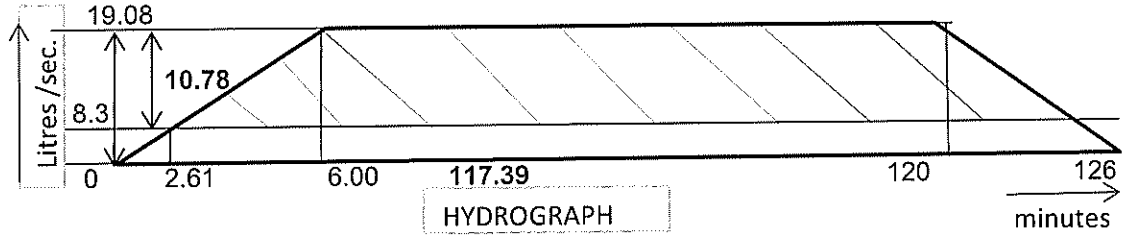


Detention volume = **22.48** X 58.38 X60/1000= **78.74** m^3

Try duration: 120 minutes

Intensity of rainfall 'I^{y}_{m}' = 28.2 mm/Hour

Discharge 'Q' **19.08** Litres/Sec



Detention volume = **10.78** X 117.39 X60/1000= **75.90** m^3

Max. Volume = 78.74 m^3

Provide 4x 23 m^3 detention tanks.

Australian Government
Bureau of Meteorology

LOCATION **31.625 S 115.700 E** * NEAR.. Alkimos beach

LIST OF COEFFICIENTS TO EQUATIONS OF THE FORM

$$ln(I) = A + B \times (ln(T)) + C \times (ln(T))^2 + D \times (ln(T))^3 + E \times (ln(T))^4 + F \times (ln(T))^5 + G \times (ln(T))^6$$

T = TIME IN HOURS AND I = INTENSITY IN MILLIMETRES PER HOUR

RETURN PERIOD	A	B	C	D	E	F	G
1	2.755946	-0.63905E+0	-0.28258E-1	0.74041E-2	0.32091E-3	-0.69471E-4	-0.39797E-4
2	3.009343	-0.64482E+0	-0.25419E-1	0.70790E-2	0.10298E-3	-0.18156E-4	-0.41207E-4
5	3.223878	-0.65973E+0	-0.18072E-1	0.73826E-2	-0.56852E-3	-0.16317E-5	-0.26739E-4
10	3.346570	-0.66813E+0	-0.13677E-1	0.71004E-2	-0.91967E-3	0.65970E-4	-0.28493E-4
20	3.499659	-0.67627E+0	-0.95187E-2	0.73070E-2	-0.13471E-2	0.67745E-4	-0.15715E-4
50	3.685325	-0.68503E+0	-0.49493E-2	0.70261E-2	-0.17028E-2	0.13094E-3	-0.16794E-4
100	3.816930	-0.69127E+0	-0.17923E-2	0.65969E-2	-0.19007E-2	0.20766E-3	-0.24951E-4

RAINFALL INTENSITY IN mm/h FOR VARIOUS DURATIONS AND RETURN PERIODS

	RETURN PERIOD (YEARS)						
DURATION	1	2	5	10	20	50	100
5 mins	58.3	76.9	101.	117.	141.	176.	205.
6 mins	54.3	71.6	93.4	109.	131.	163.	190.
10 mins	43.4	57.0	73.6	85.4	102.	126.	147.
20 mins	30.4	39.6	50.2	57.6	68.0	83.1	95.8
30 mins	24.1	31.2	39.2	44.7	52.5	63.8	73.2
1 hour	15.7	20.3	25.1	28.4	33.1	39.9	45.5
2 hours	10.0	12.8	15.8	17.8	20.7	24.8	28.2
3 hours	7.61	9.77	12.0	13.5	15.7	18.8	21.4
6 hours	4.78	6.13	7.53	8.48	9.84	11.8	13.4
12 hours	3.01	3.86	4.75	5.34	6.20	7.42	8.42
24 hours	1.91	2.44	2.99	3.36	3.89	4.64	5.27
48 hours	1.18	1.51	1.84	2.06	2.38	2.83	3.21
72 hours	.860	1.10	1.34	1.50	1.74	2.07	2.35

(Raw data: 20.92, 3.99, 1.14, 35.36, 6.66, 1.87,skew= 0.660)

HYDROMETEOROLOGICAL ADVISORY SERVICE
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* ENSURE THE COORDINATES ARE THOSE REQUIRED SINCE DATA IS BASED ON THESE AND NOT LOCATION NAME.

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