Report

ERVEN 266 AND RE/21, RIVERSDALE SETTLEMENTS, RIVERSDALE: STORMWATER MANAGEMENT PLAN

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Report No.: MC446-01
Revision: 0
Date: 2025-04-16

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ERVEN 266 AND RE/21 RIVERSDALE SETTLEMENTS, RIVERSDALE: STORMWATER MANAGEMENT PLAN

1. PROPOSED DEVELOPMENT

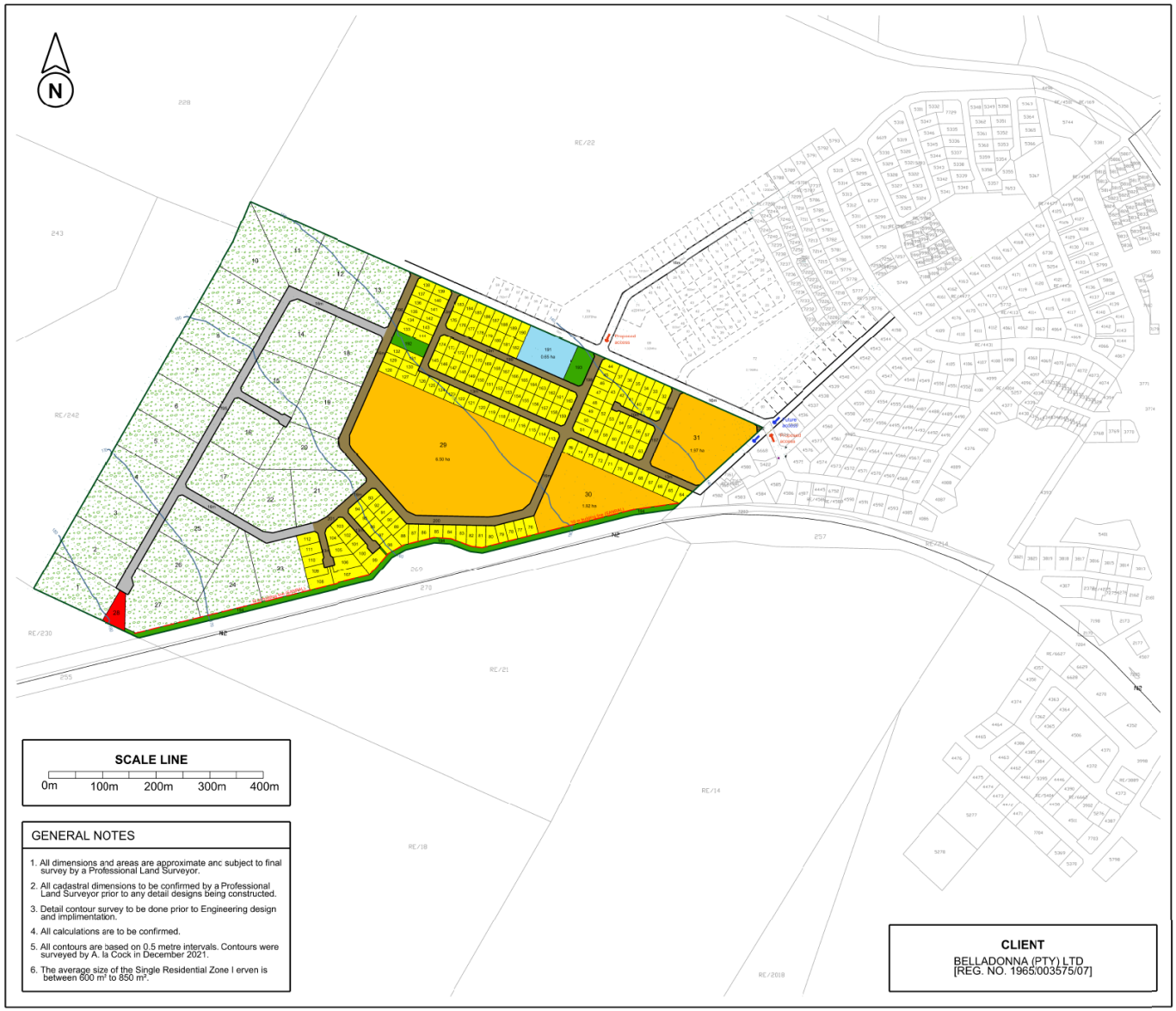
The development site, comprising Erven 266 and RE/21, has an area of 56.4ha and is situated west of Riversdale and north of the N2 as shown in Figure 1.

It is proposed to develop the site as aa residential area with an agricultural zone, single and general residential zones, a business site and a utility site

TABLE 1: PROPOSED SITE DEVELOPMENT DETAILS

ZONING	NO. OF STANDS	ERF NO.	AREA (ha)	% OF AREA
Agricultural Zone 2	27	1-27	27.5	48.8
Single Residential Zone 1	159	32-190	10.4	18.4
General Residential Zone 2	3	29-31	10.4	18.4
Business Zone 3	1	191	0.7	1.2
Transport Zone 2	7	196-202	3.8	6.7
Transport Zone 3	1	195	1.9	3.4
Utility Zone	1	28	0.2	0.4
Open Space Zone 1	3	192-194	1.5	2.7
TOTAL	202		56.4	100

FIGURE 1: LOCATION OF THE DEVELOPMENT SITE: ERVEN 266 AND RE/21, RIVERSDALE



LAYOUT PLAN

PROPOSED DEVELOPMENT ON LOT 266 & A PORTION OF REMAINDER OF LOT 21, RIVERSDALE SETTLEMENT, HESSEQUA MUNICIPALITY, WESTERN CAPE PROVINCE

LEGEND

ZONING	NO. OF STANDS	ERF NO.	AREA (ha)	% OF AREA
Agricultural Zone II	27	1-27	27.5	48.8
Single Residential Zone I	159	32-190	10.4	18.4
General Residential Zone II	3	29-31	10.4	18.4
Business Zone III	1	191	0.7	1.2
Transport Zone II	7	196-202	3.8	6.7
Transport Zone III	1	195	1.9	3.4
Utility Zone	1	28	0.2	0.4
Open Space Zone I	3	192-194	1.5	2.7
TOTAL	202		56.4	100

PROFESSIONAL TEAM

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PROJECT NO.: 217	PLAN NO.: 217/LP12
SCALE: 1 : 5 000	DATE: 13/09/2024

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FIGURE 2: PROPOSED SITE DEVELOPMENT PLAN

2. STORMWATER MANAGEMENT OBJECTIVES

The *Guidelines for the Provision of Services in Residential Townships,* from the Department of Public Works, or the equivalent latest edition thereof, viz, the Redbook - *The Neighbourhood Planning and Design Guide* issued by the National Department of Human Settlement (2019) now applies.

Sustainable Drainage Systems (SuDS) also known as Water Sensitive Urban Design (WSUD) principles as set out in wsudsa.org, have been applied.

The SuDS principles include:

- Flood control and attenuation.
- Water quality improvement.
- Protection of natural watercourses and wetlands.
- Integration with urban planning and green infrastructure.

3. PRE-DEVELOPMENT ANALYSIS

3.1 STORM RUNOFF MODEL

3.1.1 METHODOLOGY

The pre-development and post-development runoffs were calculated using the Storm and Sanitary Analysis (SSA) package using the EPA SWMM hydrology method.

SWMM is a dynamic hydrology-hydraulic-water quality simulation model. It is used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas. The runoff component operates on a collection of sub-catchment areas that receive precipitation and generate runoff and pollutant loads. The routing portion transports this runoff through a system of pipes, channels, storage/treatment devices, pumps, and regulators.

SWMM tracks the quantity and quality of runoff made within each sub catchment. It tracks the flow rate, flow depth, and quality of water in each pipe and channel during a simulation period made up of multiple time steps. SWMM 5.1 used for the development can also model the hydrologic performance of specific types of low impact development (LID) controls. The LID controls that the user can choose include the following: Permeable pavement, Vegetative swales, Infiltration trenches

3.1.2 STORM RAINFALL

The point rainfall figures applicable to the development site have been extracted from the SA Weather Bureau rainfall database. The storm rainfall depths from rainfall station 0010456 W RIVERSDALE at 34˚5' S 21˚15' E were calculated and used for the design (Table 2).

TABLE 2: DESIGN STORM RAINFALL

DURATION (min)	STORM RAINFALL (mm)					
	1:2 y	1:5 y	1:10 y	1:20 y	1:50 y	1:100 y
5	5.5	8.1	10.1	12.3	15.4	17.9
15	10.2	14.9	18.7	22.7	28.4	33.1
60	17.3	25.3	31.6	38.4	48.1	56.1
120	21.3	31.2	39.0	47.3	59.2	69.1
180	23.2	33.9	42.4	51.4	64.4	75.1
360	28.7	42.0	52.5	63.8	79.9	93.2
720	34.4	50.3	62.9	76.3	95.6	111.5
1440	41.0	60.0	75.0	91.0	114.0	133.0

3.2 EXISTING SITE CONDITIONS AND STORMWATER DRAINAGE INFRASTRUCTURE

3.2.1 EXISTING SITE CONDITIONS

The site stretches from the N2 in a north-easterly direction towards erf RE/22 which abuts the existing residential area.

There are no water courses on the site and all runoff would be sheetflow, through the residential area of Riversdale and eventually reaching the Vet River.

The site is fully cultivated under wheat at present.

An Engineering Geological Report by Terra Geotechnical (Report TG21-039/3, Apr 2022) reported mainly on conditions relative to the materials to be excavated or reused for construction. The following extracts were found to be relevant to the stormwater runoff and were implemented in selecting the runoff parameters. The report states that according to the geology map and on-site observations, the site is predominantly underlain by Tertiary aged River Terrace Gravels, with the western edge underlain by sediments of the Kirkwood Formation consisting of Reddish and Greenish Mudstone and Sandstone with subordinate Conglomerate lenses forming part of the Uitenhage Group. The site was deemed not to be dolomitic. The excavation type to a depth of at least 2.50 m below the existing ground level is deemed to be Soft Excavation, with localized Intermediate Excavation Bedrock or pedocrete outcrops were not encountered within the investigated area. Groundwater seepage was encountered throughout the study area in many of the test pits excavated. Typically, the site was covered by an alluvial boulder horizon with abundant root structures in the upper parts. This layer is typically underlain by another alluvial horizon hosting varying amounts of cobbles and boulders. Below the gravel and/or boulder horizon, a cohesive silty/clayey horizon was encountered in most test pits. Underlying these alluvial horizons, the residuum in the form of residual siltstone was exposed within approximately half of the test pits.

3.2.2 EXISTING STORMWATER INFRASTRUCTURE

The site does not have any stormwater infrastructure and runoff drains freely from the site onto erf RE/22.

The existing residential area to the west of RE/4485 (extension of Lobelia Street) has a formal underground system which drains in a westerly direction where it discharges into the watercourse adjacent to Erica Street.

The group housing estate Langezicht abuts erf RE/22. A portion of the runoff from RE/21 (the development site) and RE/22 drains towards the south-western boundary of this estate from where it is diverted around to the watercourse adjacent to Erica Street.

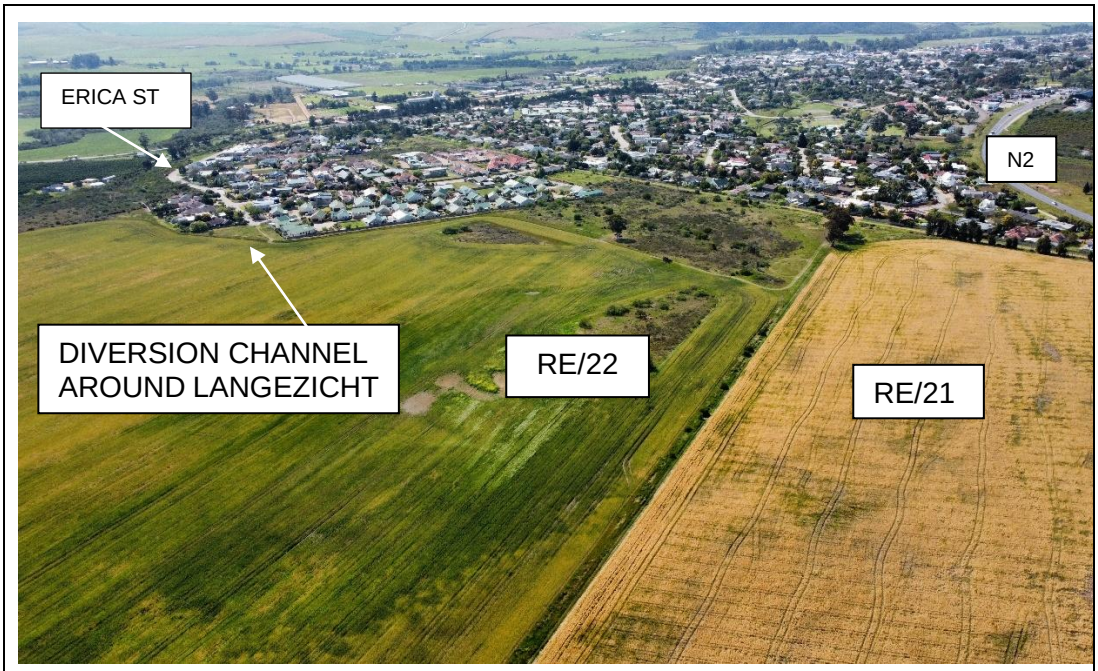

FIGURE 3: EXISTING RUNOFF CONDITIONS RIGHT TO LEFT

3.2.3 ADJACENT CATCHMENT RUNON

There is a small triangular portion of land (erf 230), 3.1ha, at the upper end of the site which drains onto the site.

Apart from that there is no runoff entering the site.

3.3 PRE-DEVELOPMENT RUNOFF PEAKS

The SSA model was used to generate runoff peaks for the pre-development condition using the storm rainfall in Table 2 and the catchment parameters in Table 3.

TABLE 3: SSA MODEL PARAMETERS FOR PRE-DEVELOPMENT CONDITIONS

	LAND USE	Reach Length (m)	Area (m²)	AREA (ha)	Width (m)	% SLOPE	% Imperv	n-Imperv	n-Perv	D-store Imp	D-store Perv	% Zero Imp	SOIL	INFIL CN
SC1	ROW CROPS	1464	306132	30.613	209	3.28%	0	0.020	0.10	2	5	0	C	85
SC2	ROW CROPS	1823	359369	35.937	197	3.44%	0	0.020	0.10	2	5	0	C	85

Note: The full results are included as Annexure A.

The results were checked against the Rational Method and the SSA flows as listed in Table 3 were deemed to be a fair reflection of runoff under existing conditions.

These peak flows representing pre-development conditions were used in the analysis as the base levels which should not be exceeded under the post-development conditions.

TABLE 4: PRE-DEVELOPMENT PEAK FLOWS

	PEAK FLOWS (m^3/s) FOR VARIOUS RECURRENCE INTERVALS (years)					
NODE	**1:2 y**	**1:5 y**	**1:10 y**	**1:20 y**	**1:50 y**	**1:100 y**
OF1	0.10	0.33	0.59	0.95	1.55	2.13
OF2	0.11	0.34	0.60	0.96	1.58	2.17
TOTAL (OF3)	**0.21**	**0.66**	**1.20**	**1.91**	**3.12**	**4.30**

4. POST-DEVELOPMENT STORMWATER MANAGEMENT – QUANTITY AND RATE OF RUNOFF

4.1 REQUIREMENTS

The application of the SuDS principles was defined as follows:

- Provide post-development attenuation to pre-development peaks for storm events ranging from 1:5-year to the 1:50-year storm events.
- Provide controlled discharge of the 1:100-year storm event to not cause downstream damage.

4.2 RUNOFF ANALYSIS

4.2.1 PROPOSED ONSITE STORMWATER CONFIGURATION

The primary means used to attenuate peak flows will be to route the runoff through 4 attenuations ponds located on suitably positioned erven as shown on drawing MC446-C401 and listed in Table 5.

Pond 1 will be located at the lowest part of Erf 29 in the eastern corner, The “Wetland”, that was identified by the Specialist, will be incorporated in an open space within the proposed subdivision of erf 29.

Pond 2 will take up the full extent of Erf 193.

Pond 3 will be located at the lowest part of Erf 31 in the eastern corner.

Pond 4 will be located at the lowest part of Erf 30 in the eastern corner.

TABLE 5: LOCATION OF ATTENUATION PONDS

POND	LOCATED ON ERF	BASE ELEVATION (RLm)
1	29	148.00
2	193	140.00
3	31	135.00
4	30	143.00

The agricultural erven 1-22 are to have a stormwater runoff management system on each erf and the combined runoff is to be routed past the attenuation ponds, directly to Outfall 1 (Link L18).

4.2.2 THE DEVELOPMENT SITE: PROPOSED STORMWATER MANAGEMENT

The attenuated runoff will leave the development site and enter two outfalls (Outfall 1:L18 and Outfall 2:L15) which extend across Erf RE/22, as shown on drawing MC446-C401.

The outfalls combine into a single outfall which will follow a similar route as the existing cutoff channel which passes around the Langezicht development before entering the existing channel which receives runoff from the adjacent residential development (Figures 3 and 4).

FIGURE 4: EXISTING STORMWATER CHANNEL ADJACENT TO ERICA STREET INTO WHICH THE SITE RUNOFF WILL BE DISCHARGED

The primary reason for selecting this outfall route was to cause the least excavation within the established residential areas, while still discharging to the main existing outfall.

4.3 MODEL PARAMETERS

The area (development site plus downstream area) was divided into 25 sub-catchments by using location and existing and proposed land use in selection. The parameters were established by considering the soil type, slope, area, and imperviousness of the proposed land use (Table 6).

The sub-catchment boundaries are shown in Figures B1 and B2 in Annexure B.

The same storm rainfall (Table 2) was used for pre- and post-development conditions.

TABLE 6: SSA PARAMETERS FOR POST-DEVELOPMENT CONDITIONS

Sub-catch-ment	LAND USE	Reach Length (m)	Area (m²)	AREA (ha)	Width (m)	% SLOPE	% Imperv	n-Imperv	n-Perv	D-store Imp	D-store Perv	% Zero Imp	SOIL	INFIL CN
SC1	OPEN SPACE	1349	258897	25.89	192	3.28%	0	0.020	0.10	2	5	0	C	85
SC2	OPEN SPACE	1080	147685	14.77	137	3.44%	0	0.02	0.10	2	5	0	C	85
SC3	SINGLE RESIDENTIAL	146	11777	1.18	81	1.46%	20	0.02	0.15	2	5	0	C	88
SC4	SINGLE RESIDENTIAL	156	17115	1.71	110	1.78%	20	0.02	0.15	2	5	0	C	88
SC5	SINGLE RESIDENTIAL	243	14261	1.43	59	3.45%	20	0.02	0.15	2	5	0	C	88
SC6	GENERAL RESIDENTIAL	380	65166	6.52	171	3.04%	10	0.02	0.10	2	5	0	C	91
SC7	GENERAL RESIDENTIAL	279	23812	2.38	85	3.13%	10	0.02	0.10	2	5	0	C	91
SC8	SINGLE RESIDENTIAL	37	13352	1.34	359	4.38%	20	0.02	0.15	2	5	0	C	88
SC9	SINGLE RESIDENTIAL	37	6357	0.64	174	4.11%	20	0.02	0.15	2	5	0	C	88
SC10	SINGLE RESIDENTIAL	37	3268	0.33	87	3.66%	20	0.02	0.15	2	5	0	C	88
SC11	SINGLE RESIDENTIAL	81	29053	2.91	358	4.15%	20	0.02	0.15	2	5	0	C	88
SC12	SINGLE RESIDENTIAL	81	14107	1.41	174	4.32%	20	0.02	0.15	2	5	0	C	88
SC13	GENERAL RESIDENTIAL	228	20518	2.05	90	3.35%	10	0.02	0.10	2	5	0	C	91
SC14	SINGLE RESIDENTIAL	74	26412	2.64	358	3.23%	20	0.02	0.15	2	5	0	C	88
SC15	SINGLE RESIDENTIAL	75	12990	1.30	174	2.85%	20	0.02	0.15	2	5	0	C	88
SC16	OPEN SPACE	404	89334	8.93	221	1.30%	0	0.02	0.10	2	5	0	C	85
SC17	OPEN SPACE	292	28403	2.84	97	1.45%	0	0.02	0.10	2	5	0	C	85
SC18	OPEN SPACE	121	7154	0.72	59	1.38%	0	0.02	0.10	2	5	0	C	85
SC19	OPEN SPACE	221	13306	1.33	60	1.28%	0	0.02	0.10	2	5	0	C	85
SC20	OPEN SPACE	355	43527	4.35	123	0.63%	0	0.02	0.10	2	5	0	C	85
SC21	SINGLE RESIDENTIAL	235	20488	2.05	87	1.99%	20	0.02	0.15	2	5	0	C	88
SC22	SINGLE RESIDENTIAL	200	27427	2.74	137	2.19%	20	0.02	0.15	2	5	0	C	88
SC23	SINGLE RESIDENTIAL	233	19368	1.94	83	2.89%	20	0.02	0.15	2	5	0	C	88
SC24	OPEN SPACE	131	11841	1.18	91	2.29%	0	0.02	0.10	2	5	0	C	85
SC25	SINGLE RESIDENTIAL	213	17740	1.77	83	1.29%	20	0.02	0.15	2	5	0	C	88

NOTES:

1. Refer to Figures B1 and B2 for sub-catchments location
2. External sub-catchments downstream of the site are included in the table.

4.4 POND OUTLET STRUCTURES

To achieve the attenuation on site a set of orifices and a spillway have been designed at the outlet structure of each of the 4 ponds. A summary is provided in Table 7.

These outlet structures are rectangular chambers with orifice slots set at different elevations, through which flow from the pond enters the chamber. The top is open, with a grid protection cover, and an outlet pipe. Each pond also has a spillway with dimensions as shown.

Details drawings are provided in drawings MC446-C420-C423.

TABLE 7: SUMMARY OF POND OUTLET STRUCTURE DETAILS

	OUTLET TYPE	ORIFICE1	ORIFICE2	SPILLWAY
POND 1	INVERT LEVEL (RLm)	148.00	148.82	149.30
	HEIGHT (m)	0.10	0.30	0.20
Base elev (RLm)	WIDTH (m)	0.10	0.30	4.00
148.00	COEFFICIENT	0.60	0.60	1.84
POND 2	INVERT LEVEL (RLm)	140.00	140.96	141.78
	HEIGHT (m)	0.15	0.27	0.22
Base elev (RLm)	WIDTH (m)	0.15	0.26	5.00
140.00	COEFFICIENT	0.60	0.60	1.84
POND 3	INVERT LEVEL (RLm)	135.00	136.13	136.79
	HEIGHT (m)	0.10	0.25	0.21
Base elev (RLm)	WIDTH (m)	0.10	0.27	5.00
135.00	COEFFICIENT	0.60	0.60	1.84
POND 4	INVERT LEVEL (RLm)	143.00	143.68	144.33
	HEIGHT (m)	0.12	0.18	0.17
Base elev (RLm)	WIDTH (m)	0.15	0.15	3.50
143.00	COEFFICIENT	0.60	0.60	1.84

4.5 EMERGENCY OVERLAND ESCAPE ROUTES

In the event that the pipes along the private roads in the development become blocked, it is proposed that the road prism be designed to convey the peak runoff and direct it towards the 4 ponds.

In the event that the outlet structures and outlet pipes of the ponds become blocked, each pond has a spillway which has been designed to safely discharge the peak inflow.

4.6 ATTENUATION PERFORMANCE

Each of the 4 ponds plays a part in attenuating the runoff peaks so that for the site as a whole the post-development peak flows are attenuated at least to the pre-development values.

The performances of each pond for a range of recurrence intervals are shown in Table 8.

The runoff leaves the site at 2 outfall locations, viz. Outfall 1 (Link L18) and Outfall 2 (Link L15). The 2 outfalls combine in Erf RE/22 at Link 20. Refer to drawing MC446-C401.

The combined runoff from the site is summed up in Table 9 and in Figure 5, where the post-development runoff peaks are shown to have been attenuated to pre-development levels.

The SuDS attenuation of post-development peak runoff to pre-development levels is thus achieved.

TABLE 8: ATTENUATION PERFORMANCE FOR EACH POND

RECURRENCE INTERVAL		1:1 y	1:2 y	1:5 y	1:10 y	1:20 y	1:50 y	1:100 y
POND 1	INFLOW PEAK (m^3/s)	0.1	0.25	0.5	0.74	1.02	1.44	1.81
	PEAK SURFACE AREA (m^2)	3110	3343	3632	3695	3779	3970	4033
	PEAK STORAGE (m^3)	249	1313	2743	3071	3520	4567	4927
	PEAK DEPTH (m)	0.08	0.41	0.82	0.91	1.03	1.3	1.39
	PEAK WATER LEVEL (RLm)	148.08	148.41	148.82	148.91	149.03	149.3	149.39
	OUTFLOW PEAK (m^3/s)	0.01	0.02	0.02	0.09	0.14	0.2	0.41
POND 2	INFLOW PEAK (m^3/s)	0.08	0.28	0.61	0.87	1.15	1.57	1.92
	PEAK SURFACE AREA (m^2)	810	975	1188	1272	1387	1552	1605
	PEAK STORAGE (m^3)	89	419	937	1171	1515	2059	2250
	PEAK DEPTH (m)	0.11	0.48	0.96	1.15	1.41	1.78	1.90
	PEAK WATER LEVEL (RLm)	140.11	140.48	140.96	141.15	141.41	141.78	141.90
	OUTFLOW PEAK (m^3/s)	0.02	0.04	0.06	0.15	0.20	0.25	0.65
POND 3	INFLOW PEAK (m^3/s)	0.09	0.35	0.75	1.07	1.39	1.91	2.34
	PEAK SURFACE AREA (m^2)	1758	2085	2432	2514	2657	2882	2950
	PEAK STORAGE (m^3)	242	1163	2317	2613	3157	4068	4363
	PEAK DEPTH (m)	0.14	0.62	1.13	1.25	1.46	1.79	1.89
	PEAK WATER LEVEL (RLm)	135.14	135.62	136.13	136.25	136.46	136.79	136.89
	OUTFLOW PEAK (m^3/s)	0.01	0.02	0.03	0.09	0.13	0.18	0.49
POND 4	INFLOW PEAK (m^3/s)	0.02	0.08	0.18	0.26	0.35	0.50	0.62
	PEAK SURFACE AREA (m^2)	326	416	557	615	687	792	817
	PEAK STORAGE (m^3)	14	106	296	390	519	734	791
	PEAK DEPTH (m)	0.04	0.29	0.68	0.84	1.04	1.33	1.40
	PEAK WATER LEVEL (RLm)	143.01	143.04	143.29	143.68	143.84	144.04	144.33
	OUTFLOW PEAK (m^3/s)	0.01	0.03	0.04	0.07	0.09	0.11	0.25

NOTES: Pond base elevations (RLm): Pond 1

TABLE 9: ATTENUATION PERFORMANCE FOR WHOLE SITE

	OUTFLOW PEAK (m^3/s)						
RECURRENCE INTERVAL	**1:1 y**	**1:2 y**	**1:5 y**	**1:10 y**	**1:20 y**	**1:50 y**	**1:100 y**
POST-DEVELOPMENT							
OUTFALL 1	0.03	0.21	0.57	1.05	1.63	2.59	3.89
OUTFALL 2	0.01	0.02	0.03	0.09	0.13	0.18	0.49
WHOLE SITE	0.04	0.23	0.60	1.14	1.76	2.77	4.38
PRE-DEVELOPMENT							
WHOLE SITE	0.03	0.21	0.66	1.20	1.91	3.12	4.30

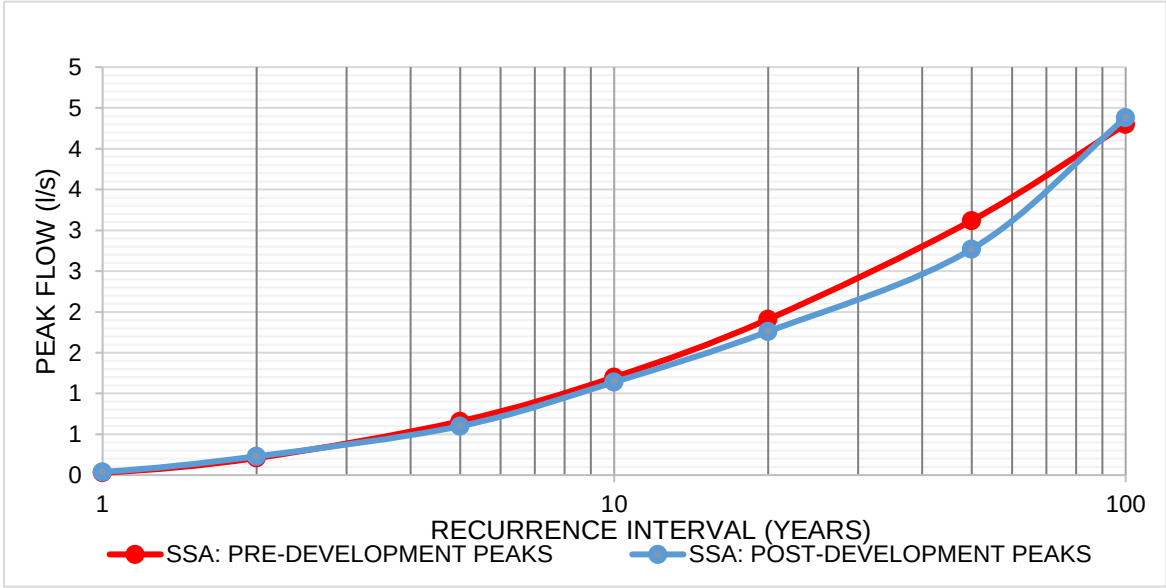

FIGURE 5: ATTENUATION PERFORMANCE FOR THE WHOLE SITE

4.7 REQUIRED CONDUITS AND CHANNELS

Peak flows were generated by the SSA model for all conduits. It was deemed appropriate to size the internal stormwater reticulation for the 1:5 year peak flows.

The balance of flow up to the 1:100 year peaks must be conveyed in the road prism. The summary is shown in Table 10.

The exceptions are the outfalls (links L15, L16, L19 and L31) for which it is proposed to size these for the 1:100 year peak flows.

The pond outlet pipes are listed in Table 11.

The channels on the outfalls are sized for the 1:100 year peak flows (Table 12).

The road prism flow is to enter the ponds through 5m long section of dropped kerb. This will be included in the detail design.

The roads will generally follow the existing natural slopes, however in order to route the runoff from all the agricultural erven directly to the outfall (L15), Street 2 should be vertically aligned so that any surface flow in Street 5 from the agricultural erven, will flow northwards via links L12 and L13.

TABLE 10: REQUIRED CONDUIT AND ROAD PRISM FLOW CAPACITY

LINK	FROM	IL (RLm)	TO	IL (RLm)	5YR (m^3/s)	100YR (m^3/s)	CONDUIT (mm)	SLOPE (%)	PIPE CAPACITY (m^3/s)	MINIMUM ROAD PRISM CAPACITY (m^3/s)
L1	MH1	160.85	MH2	157.35	0.091	0.311	375	2.67%	0.275	0.036
L2	MH2	157.35	MH3	149.60	0.214	0.753	375	2.41%	0.261	0.492
L3	MH3	149.60	POND 1	147.50	0.309	1.105	450	3.04%	0.482	0.623
L4	MH4	146.75	MH15	137.60	0.024	0.413	375	4.42%	0.321	0.092
L5	MH5	143.23	MH6	141.35	0.182	0.524	375	1.23%	0.186	0.338
L6	MH6	141.35	MH7	138.10	0.267	0.765	375	4.09%	0.340	0.425
L7	MH7	138.10	MH8	136.23	0.425	1.253	525	2.30%	0.617	0.636
L8	MH8	136.23	POND 3	135.00	0.563	1.694	600	1.71%	0.750	0.944
L9	MH10	139.35	MH7	138.10	0.160	0.500	375	1.39%	0.198	0.302
L10	MH11	148.35	MH5	143.23	0.190	0.530	375	1.76%	0.223	0.307
L11	MH12	145.35	POND 2	140.00	0.325	1.017	450	2.01%	0.392	0.625
L12	MH13	156.85	MH14	142.50	0.201	1.276	375	4.09%	0.340	0.936
L13	MH14	142.50	MH15	137.60	0.495	3.179	600	1.32%	0.661	2.518
L14	MH16	138.00	MH15	137.60	0.056	0.658	375	14.04%	0.629	0.029
L15	MH9	134.25	MH17	132.85	0.028	0.477	600	0.70%	0.481	0.000
L16	MH17	132.85	MH18	132.77	0.028	0.477	750	0.40%	0.629	0.000
L18	MH15	137.60	MH20	131.79	0.564	3.900	600	1.51%	0.705	3.195
L19	MH19	131.82	MH20	131.79	0.090	0.663	825	0.40%	0.802	0.000
L20	MH20	131.79	MH21	131.53	0.813	4.783	900	0.40%	0.978	3.805
L21	MH21	131.53	MH22	131.31	0.813	4.632	900	0.40%	0.994	3.638
L26	MH30	140.48	POND 3	135.00	0.033	0.235	375	3.61%	0.319	0.000
L31	MH31	132.19	MH19	131.82	0.090	0.663	825	0.40%	0.806	0.000

TABLE 11: POND OUTLET CONDUITS

LINK	LENGTH (m)	FROM	IL (RLm)	TO	IL (RLm)	SLOPE (m/m)	Q50 (m^3/s)	100D
L27	41.180	POND 4	142.25	MH30	140.48	4.30%	0.110	375
L28	16.609	POND 3	134.25	MH9	134.10	0.90%	0.170	375
L29	18.027	POND 2	139.25	MH16	138.00	6.93%	0.240	375
L30	19.448	POND 1	147.50	MH4	146.75	3.86%	0.200	375

TABLE 12: REQUIRED CHANNEL DIMENSIONS

LINK	LENGTH (m)	FROM	IL (RLm)	TO	IL (RLm)	SLOPE (m/m)	Q100 (m^3/s)	BASE (m)	DEPTH (m)	SIDE SLOPE (H:V)
L17	141.93	MH18	132.77	MH31	132.19	0.66%	0.663	1.00	0.461	3
L22	68.11	MH22	131.31	MH23	131.03	0.40%	4.631	1.00	1.116	3
L23	87.15	MH23	131.03	MH24	127.71	3.81%	4.577	1.00	0.721	3
L24	34.77	MH24	127.71	MH25	126.45	3.62%	4.563	1.00	0.729	3
L25	12.44	MH25	126.45	OUTFALL 1	126.18	2.19%	5.197	1.00	0.866	3

5. POST-DEVELOPMENT STORMWATER MANAGEMENT – QUALITY TREATMENT

5.1 OBJECTIVES

In order to quantify the quality treatment, the indicators of suspended solids and total phosphorus may be used. The objectives selected for this development are:

- Suspended solids (SS): 80% reduction
- Total phosphorous (TP): 45% reduction

This treatment is to be applied to the 24h duration 1:0.5-year storm Water Quality Volume (WQv). Table 13 is the summary of the WQv of the contributing sub-catchments to the attenuation ponds.

In addition, litter is to be trapped at the attenuation ponds.

TABLE 13: WATER QUALITY VOLUMES BASED ON COMPUTED RUNOFF

	SUB-CATCHMENT	RUNOFF (mm)	SC AREA (m^2)	WQv (m^3)
POND 1	SC3	0.86	11777	10
	SC4	0.86	17115	15
	SC5	0.86	14261	12
	SC6	0.42	65166	28
	TOTAL	2.99	108319	64
POND 2	SC11	0.86	29053	25
	SC14	0.86	26412	23
	TOTAL	1.73	55465	48
POND 3	SC8	0.87	13352	12
	SC9	0.87	6357	5
	SC10	0.87	3268	3
	SC12	0.86	14107	12
	SC13	0.43	20518	9
	SC15	0.86	12990	11
	TOTAL	4.75	70592	52
POND 4	SC7	0.43	23812	10
	TOTAL	0.43	23812	10

5.2 METHODS

5.2.1 FOREBAYS

Each pond will have a forebay where litter and sediment will be trapped for collection and removal. The forebays will be located at the main inflow point for each pond, will

have a concrete base and will be separated from the rest of the pond by a low gabion wall. An entrance ramp will provide access for maintenance. Details are shown in drawings MC446-C420-423.

In Table 14 the size determination is summarised.

TABLE 14: FOREBAYS – REQUIRED DIMENSIONS

POND 1	VOLUME (m^3)	275.1
	DEPTH (m)	1
	AREA (m^2)	275.1
POND 2	VOLUME (m^3)	140.9
	DEPTH (m)	1
	AREA (m^2)	140.9
POND 3	VOLUME (m^3)	179.3
	DEPTH (m)	1
	AREA (m^2)	179.3
POND 4	VOLUME (m^3)	60.5
	DEPTH (m)	1
	AREA (m^2)	60.5

5.2.2 BIOLOGICAL FILTERBEDS

A 1.2m deep biological filtration bed will be provided at each attenuation pond. The biological filtration bed will have a surface area sized for the incoming WQv, as per the Georgia Stormwater Management Manual Volume 2 Technical Handbook, Section 3.2.3.

The WQv represents the runoff from the 24-hour duration, 1:0,5-year storm.

The remaining areas of the pond bases will be in-situ soil.

Table 15 shows the computation of the filter bed sizes and Table 13 contains the soil grading summary required for the biological filter beds.

For the agricultural erven biological filter beds are to be provided for the dwellings and paved driveways. These will be designed specifically for each erf.

TABLE 15: REQUIRED FILTER BED SIZES

POND 1	Final WQv	64.4
	Filter bed depth, df (min. 1.20m)	1.2
	Darcy constant, k (m/day) minimum	0.3
	Average water height above bed, hf (m)	0.15
	Drain Time, tf (days)	3
	Minimum filter bed area (m^2)	63.6
	Minimum pond base area (m^2)	355.7
POND 2	Final WQv	47.9
	Filter bed depth, df (min. 1.20m)	1.2
	Darcy constant, k (m/day) minimum	0.3
	Average water height above bed, hf (m)	0.15
	Drain Time, tf (days)	3
	Minimum filter bed area (m^2)	47.3
	Minimum pond base area (m^2)	197.6
POND 3	Final WQv	52.1
	Filter bed depth, df (min. 1.20m)	1.2
	Darcy constant, k (m/day) minimum	0.3
	Average water height above bed, hf (m)	0.15
	Drain Time, tf (days)	3
	Minimum filter bed area (m^2)	51.4
	Minimum pond base area (m^2)	242.3
POND 4	Final WQv	10.24
	Filter bed depth, df (min. 1.20m)	1.2
	Darcy constant, k (m/day) minimum	0.3
	Average water height above bed, hf (m)	0.15
	Drain Time, tf (days)	3
	Minimum filter bed area (m^2)	10.1
	Minimum pond base area (m^2)	63.5

TABLE 16: BIOLOGICAL FILTERBED SPECIFICATIONS

Sieve size (mm)	Soil Type	% Passing
6	Fine Gravel	100
2	Coarse sand	90-100
0.6	Medium sand	40-70
0.2	Fine Sand	5-20
0.063	Clay/silt	<5

Notes:
1. Depth as per stormwater management plan.
2. Add 3-5% organic material by weight.
3. Ph 5.5-8.5
4. Underdrain porosity >30%
5. Electrical Conductivity, Salinity <3300 µS/cm
6. Minimum infiltration rate: 600mm/day

References:
- CIRIA Report C753 The SuDS Manual
- Georgia Stormwater Management Manual. Vol 2 Technical Manual

6. MAINTENANCE OF THE STORMWATER SYSTEM

6.1 SCOPE OF MAINTENANCE

The ongoing sustainability of the stormwater system is linked to the effective maintenance of all its components. These include the attenuation ponds, the outlet structures, manholes, pipes, spillways, and channels.

6.2 RESPONSIBILITY FOR MAINTENANCE

Stormwater infrastructure on public roads and erven will be maintained by the local municipality and stormwater infrastructure on privately owned property will be maintained by the registered owners.

The responsible bodies will be required to ensure that the stormwater system is in good repair, in a healthy state and regularly serviced as described in this section of the report. Records should be kept of these maintenance activities.

A maintenance schedules are included as Annexure C. These should be used as checklists and for record purposes.

7. DETAIL DESIGN NOTES

The following points are to be taken note of during the detail design phase:

1. All dimensions and components given in this stormwater management plan are conceptual only and not for construction purposes.
2. The design engineer must design all load bearing and retaining structures.

8. CONCLUSIONS

8.1 PROPOSED DEVELOPMENT

It is proposed to develop Erf 266 and Erf RE/21 for residential land use, including agricultural estates, general residential, group housing, single residential and a single business erf.

The property has an area of 56.4 ha.

8.2 APPLICABLE CONDITIONS

The Riversdale Municipality has guidelines based on The *Guidelines for the Provision of Services in Residential Townships,* from the Department of Public Works. The latest edition thereof is the Redbook - *The Neighbourhood Planning and Design Guide* issued by the National Department of Human Settlement (2019).

In addition, Sustainable Drainage Systems (SuDS) also known as Water Sensitive Urban Design (WSUD) principles as set out in wsudsa.org, have been applied.

8.3 EXISTING CONDITIONS

The site is currently being farmed with wheat and has no defined water courses or stormwater infrastructure.

8.4 PEAK RUNOFF ATTENUATION

The peak post-development runoff peaks have been attenuated to pre-development levels by means of 4 attenuation ponds. These discharge to 2 outfalls which cross erf RE/22 before combining and skirting around the existing development to discharge into an existing channel adjacent to Erica Street.

8.5 RUNOFF WATER QUALITY TREATMENT

The runoff water quality will be treated in the pond forebays and filter beds to a generally accepted standard.

8.6 MAINTENANCE

The importance of maintenance of the stormwater system has been stressed and maintenance schedules have been drawn up and are included in Annexure C.

ANNEXURE A: PRE-DEVELOPMENT RUNOFF: SSA MODEL OUTPUT

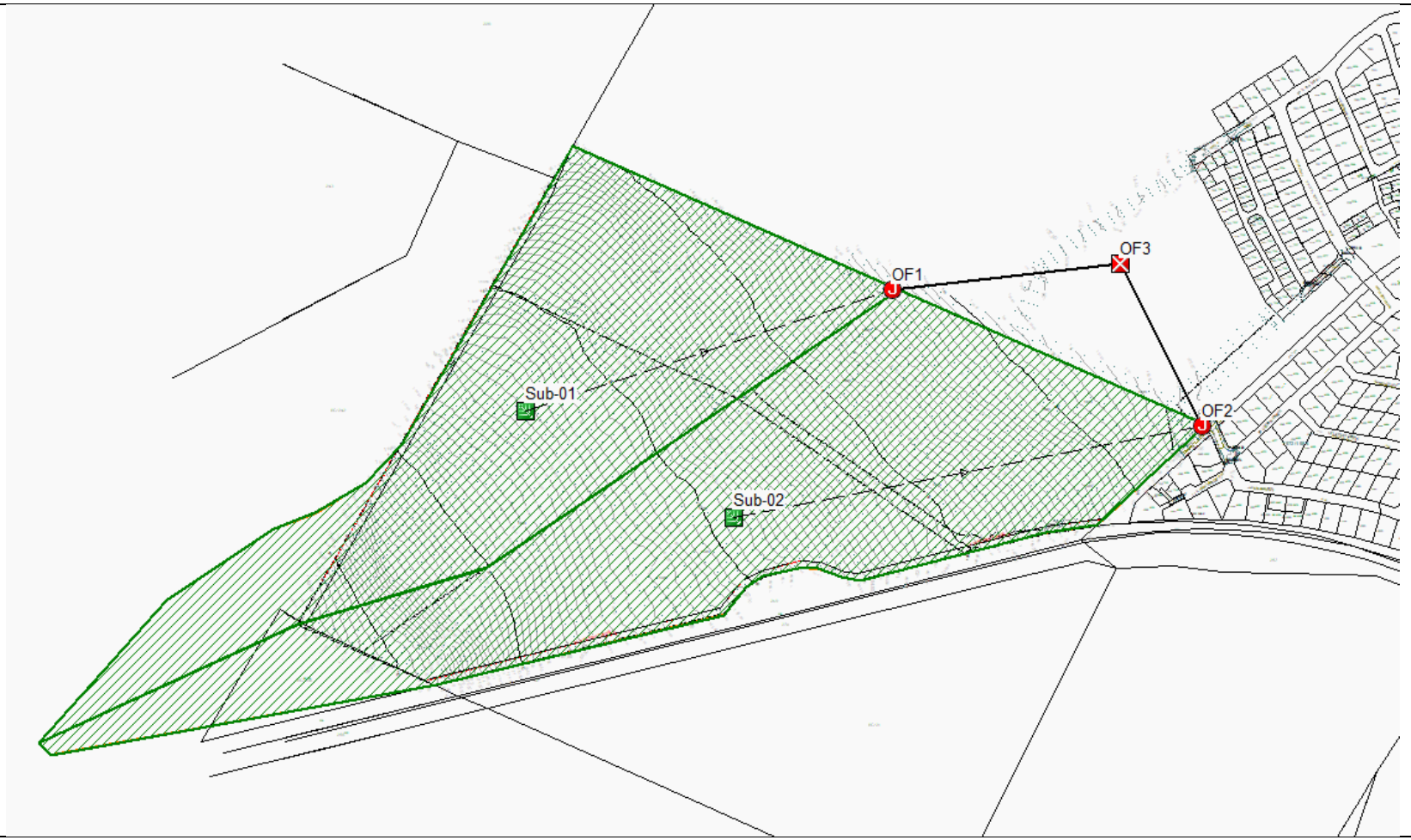

FIGURE 1: PRE-DEVELOPMENT SSA MODEL LAYOUT

NOTE: This SSA model replicates the existing conditions of erf RE/22 as per the information gathered from the survey by PLANSERV (PTY) LTD and site visits.

0.5-YEAR

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Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	6.31	0.00	0.00	5.53	0.00	0.00	0.000	0	10:52:17
Sub-02	6.31	0.00	0.00	5.53	0.00	0.00	0.000	0	12:13:32

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Time Flooded minutes	Retention Time hh:mm:ss
OF1	0.00	0.00	142.50	0	00:00	0	0	0:00:00
OF2	0.00	0.00	135.50	0	00:00	0	0	0:00:00
OF3	0.00	0.00	133.00	0	00:00	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
OF1	JUNCTION	0.000	0.000	0	00:00	0.00		
OF2	JUNCTION	0.000	0.000	0	00:00	0.00		
OF3	OUTFALL	0.000	0.000	0	00:00	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF3	0.00	0.000	0.000
System	0.00	0.000	0.000

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence	Maximum Velocity Attained	Length Factor	Peak Flow during Analysis	Design Flow Capacity	Ratio of Maximum /Design Flow	Ratio of Maximum Flow	Total Time Surcharged	Reported Condition

			days	hh:mm	m/sec		cms	cms	Flow	Depth	minutes	
Link-01	CONDUIT		0	00:00	0.00	1.00	0.000	379.212	0.00	0.00	0	Calculated
Link-02	CONDUIT		0	00:00	0.00	1.00	0.000	194.532	0.00	0.00	0	Calculated

1-YEAR

****
Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	22.59	0.00	0.00	15.03	0.81	0.01	0.036	0	06:31:33
Sub-02	22.59	0.00	0.00	15.03	0.70	0.01	0.031	0	07:20:19

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss

OF1	0.00	0.01	142.51	1	00:00	0	0	0:00:00
OF2	0.01	0.02	135.52	1	00:00	0	0	0:00:00
OF3	0.01	0.02	133.02	0	14:29	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	hh:mm
OF1	JUNCTION	0.010	0.010	1	00:00	0.00		
OF2	JUNCTION	0.010	0.010	1	00:00	0.00		
OF3	OUTFALL	0.000	0.028	0	14:29	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF3	43.08	0.014	0.028
System	43.08	0.014	0.028

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days	hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-01	CONDUIT	0	14:29	5.35	1.00	0.026	379.212	0.00	0.00	0	Calculated
Link-02	CONDUIT	1	00:00	1.43	1.00	0.010	194.532	0.00	0.01	0	Calculated

2-YEAR

****
Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	hh:mm:ss
Sub-01	41.00	0.00	0.00	21.42	10.32	0.10	0.252	0	05:08:26
Sub-02	41.00	0.00	0.00	21.42	9.71	0.11	0.237	0	05:46:51

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
OF1	0.02	0.04	142.54	0	13:50	0	0	0:00:00
OF2	0.02	0.05	135.55	0	14:20	0	0	0:00:00
OF3	0.02	0.05	133.05	0	14:20	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
OF1	JUNCTION	0.103	0.103	0	13:50	0.00		
OF2	JUNCTION	0.107	0.107	0	14:20	0.00		
OF3	OUTFALL	0.000	0.209	0	14:10	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms

OF3	50.02	0.153	0.209
System	50.02	0.153	0.209

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-01	CONDUIT	0 13:50	5.51	1.00	0.103	379.212	0.00	0.01	0	Calculated
Link-02	CONDUIT	0 14:20	3.66	1.00	0.107	194.532	0.00	0.02	0	Calculated

5-YEAR

****
Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	60.00	0.00	0.00	25.67	23.70	0.33	0.395	0	04:24:50
Sub-02	60.00	0.00	0.00	25.67	22.78	0.34	0.380	0	04:57:49

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
OF1	0.02	0.07	142.57	0	12:50	0	0	0:00:00
OF2	0.04	0.09	135.59	0	13:10	0	0	0:00:00
OF3	0.04	0.09	133.09	0	13:10	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
OF1	JUNCTION	0.329	0.329	0	12:50	0.00		
OF2	JUNCTION	0.335	0.335	0	13:10	0.00		
OF3	OUTFALL	0.000	0.663	0	13:00	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF3	51.68	0.344	0.663
System	51.68	0.344	0.663

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition

Link-01	CONDUIT	0	12:50	8.20	1.00	0.329	379.212	0.00	0.02	0	Calculated
Link-02	CONDUIT	0	13:10	5.16	1.00	0.335	194.532	0.00	0.03	0	Calculated

10-YEAR

****
Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	75.00	0.00	0.00	28.07	35.46	0.59	0.473	0	04:02:12
Sub-02	75.00	0.00	0.00	28.07	34.37	0.60	0.458	0	04:32:22

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
OF1	0.03	0.09	142.59	0	12:40	0	0	0:00:00
OF2	0.04	0.12	135.62	0	12:40	0	0	0:00:00
OF3	0.04	0.12	133.12	0	12:40	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
OF1	JUNCTION	0.594	0.594	0	12:40	0.00		
OF2	JUNCTION	0.603	0.603	0	12:40	0.00		
OF3	OUTFALL	0.000	1.197	0	12:40	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF3	54.04	0.495	1.197
System	54.04	0.495	1.197

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition

Link-01	CONDUIT	0	12:40	9.77	1.00	0.594	379.212	0.00	0.03	0	Calculated
Link-02	CONDUIT	0	12:40	6.18	1.00	0.603	194.532	0.00	0.04	0	Calculated

20-YEAR

****
Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	91.00	0.00	0.00	30.04	48.71	0.95	0.535	0	03:44:10
Sub-02	91.00	0.00	0.00	30.04	47.49	0.96	0.522	0	04:12:05

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
OF1	0.03	0.11	142.61	0	12:30	0	0	0:00:00
OF2	0.05	0.15	135.65	0	12:40	0	0	0:00:00
OF3	0.05	0.15	133.15	0	12:40	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
OF1	JUNCTION	0.946	0.946	0	12:30	0.00		
OF2	JUNCTION	0.960	0.960	0	12:40	0.00		
OF3	OUTFALL	0.000	1.906	0	12:30	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF3	56.96	0.648	1.906
System	56.96	0.648	1.906

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition

Link-01	CONDUIT	0	12:30	11.29	1.00	0.946	379.212	0.00	0.04	0	Calculated
Link-02	CONDUIT	0	12:40	7.04	1.00	0.960	194.532	0.00	0.05	0	Calculated

50-YEAR

****
Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	114.00	0.00	0.00	32.18	68.60	1.55	0.602	0	03:24:50
Sub-02	114.00	0.00	0.00	32.18	67.23	1.58	0.590	0	03:50:21

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
OF1	0.04	0.14	142.64	0	12:20	0	0	0:00:00
OF2	0.06	0.19	135.69	0	12:30	0	0	0:00:00

OF3 0.06 0.19 133.19 0 12:30 0 0 0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	hh:mm
OF1	JUNCTION	1.551	1.551	0	12:20	0.00		
OF2	JUNCTION	1.584	1.584	0	12:30	0.00		
OF3	OUTFALL	0.000	3.122	0	12:30	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF3	61.26	0.851	3.122
System	61.26	0.851	3.122

****
Link Flow Summary

****

Link ID	Element Type	Time of Peak Flow Occurrence days	hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
Link-01	CONDUIT	0	12:20	12.96	1.00	1.551	379.212	0.00	0.05	0	Calculated
Link-02	CONDUIT	0	12:30	8.27	1.00	1.584	194.532	0.01	0.06	0	Calculated

100-YEAR

****
Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	133.00	0.00	0.00	33.53	85.53	2.13	0.643	0	03:12:35
Sub-02	133.00	0.00	0.00	33.53	84.05	2.17	0.632	0	03:36:34

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
OF1	0.04	0.16	142.66	0	12:20	0	0	0:00:00
OF2	0.07	0.22	135.72	0	12:20	0	0	0:00:00
OF3	0.07	0.22	133.22	0	12:20	0	0	0:00:00

****
Node Flow Summary

****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
OF1	JUNCTION	2.130	2.130	0	12:20	0.00		
OF2	JUNCTION	2.173	2.173	0	12:20	0.00		
OF3	OUTFALL	0.000	4.303	0	12:20	0.00		

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF3	64.42	1.010	4.303
System	64.42	1.010	4.303

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow	Maximum Velocity	Length Factor	Peak Flow during	Design Flow	Ratio of Maximum	Ratio of Maximum	Total Time	Reported Condition

		Occurrence days	hh:mm	Attained m/sec		Analysis cms	Capacity cms	/Design Flow	Flow Depth	Surcharged minutes	
Link-01	CONDUIT	0	12:20	14.33	1.00	2.130	379.212	0.01	0.05	0	Calculated
Link-02	CONDUIT	0	12:20	9.11	1.00	2.173	194.532	0.01	0.07	0	Calculated

ANNEXURE B: POST-DEVELOPMENT RUNOFF: SSA MODEL OUTPUT

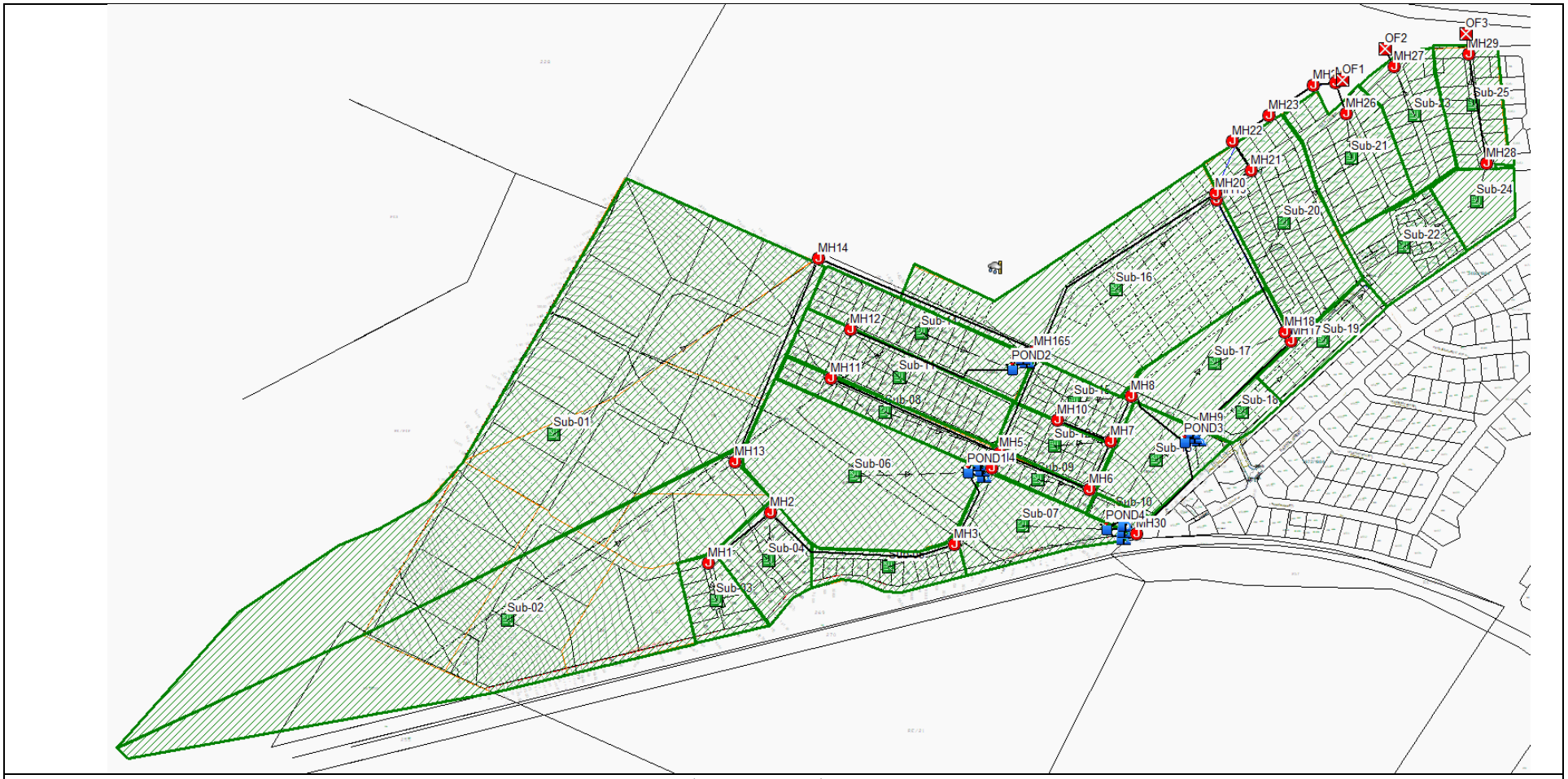

FIGURE B1: PRE-DEVELOPMENT SSA MODEL LAYOUT (JUNCTIONS)

NOTE: This SSA model replicates the proposed stormwater management plan for erf RE/22 as per the information gathered from the survey by PLANSERV (PTY) LTD and site visits.

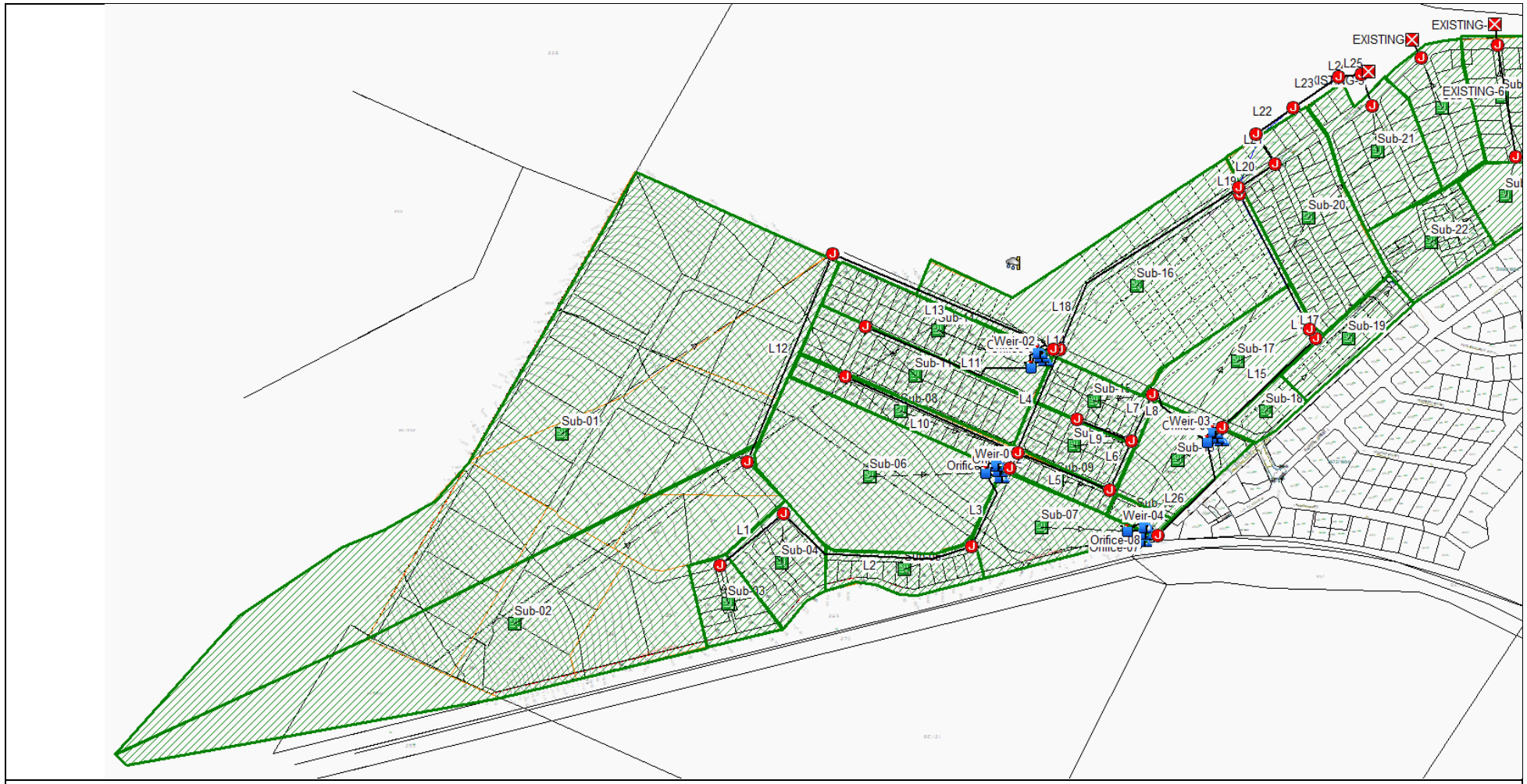

FIGURE B2: PRE-DEVELOPMENT SSA MODEL LAYOUT (LINKS)

NOTE: This SSA model replicates the proposed stormwater management plan for erf RE/22 as per the information gathered from the survey by PLANSERV (PTY) LTD and site visits.

0.5-YEAR

****
Subbasin Runoff Summary
****

Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	6.31	0.00	0.00	5.53	0.00	0.00	0.000	0	10:20:42
Sub-02	6.31	0.00	0.00	5.53	0.00	0.00	0.000	0	08:54:58
Sub-03	6.31	0.00	0.00	4.27	0.86	0.00	0.136	0	03:52:01
Sub-04	6.31	0.00	0.00	4.27	0.86	0.01	0.136	0	03:47:43
Sub-05	6.31	0.00	0.00	4.27	0.86	0.01	0.136	0	04:03:08
Sub-06	6.31	0.00	0.00	4.54	0.42	0.01	0.067	0	11:50:44
Sub-07	6.31	0.00	0.00	4.54	0.43	0.00	0.068	0	03:50:09
Sub-08	6.31	0.00	0.00	4.27	0.87	0.01	0.137	0	01:13:37
Sub-09	6.31	0.00	0.00	4.27	0.87	0.00	0.137	0	01:14:16
Sub-10	6.31	0.00	0.00	4.27	0.87	0.00	0.137	0	01:18:12
Sub-11	6.31	0.00	0.00	4.27	0.86	0.01	0.137	0	01:59:30
Sub-12	6.31	0.00	0.00	4.27	0.86	0.01	0.137	0	01:58:01
Sub-13	6.31	0.00	0.00	4.54	0.43	0.00	0.068	0	03:19:18
Sub-14	6.31	0.00	0.00	4.27	0.86	0.01	0.137	0	02:01:40
Sub-15	6.31	0.00	0.00	4.27	0.86	0.01	0.137	0	02:07:14
Sub-16	6.31	0.00	0.00	5.53	0.00	0.00	0.000	0	06:37:40
Sub-17	6.31	0.00	0.00	5.53	0.00	0.00	0.000	0	05:17:08
Sub-18	6.31	0.00	0.00	5.53	0.00	0.00	0.000	0	03:09:36
Sub-19	6.31	0.00	0.00	5.53	0.00	0.00	0.000	0	04:38:44
Sub-20	6.31	0.06	0.00	5.58	0.00	0.00	0.000	0	07:36:38
Sub-21	6.31	0.00	0.00	4.27	0.85	0.01	0.135	0	04:42:21
Sub-22	6.31	0.00	0.00	4.27	0.85	0.01	0.135	0	04:08:54
Sub-23	6.31	0.00	0.00	4.27	0.85	0.01	0.135	0	04:11:04
Sub-24	6.31	1.98	0.00	6.99	0.00	0.00	0.000	0	02:49:58
Sub-25	6.31	0.00	0.00	4.27	0.85	0.01	0.135	0	05:03:23

****
Node Depth Summary
****

Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
MH1	0.00	0.02	160.87	0	12:10	0	0	0:00:00
MH10	0.00	0.00	139.35	0	00:00	0	0	0:00:00
MH11	0.00	0.00	148.35	0	00:00	0	0	0:00:00
MH12	0.00	0.04	145.39	0	12:10	0	0	0:00:00
MH13	0.00	0.00	156.85	0	00:00	0	0	0:00:00
MH14	0.00	0.00	142.50	0	00:00	0	0	0:00:00
MH15	0.02	0.08	137.68	0	12:29	0	0	0:00:00
MH16	0.02	0.08	137.68	0	12:29	0	0	0:00:00
MH17	0.01	0.02	132.87	0	13:40	0	0	0:00:00
MH18	0.01	0.02	132.79	0	13:41	0	0	0:00:00
MH19	0.01	0.02	131.85	0	13:51	0	0	0:00:00
MH2	0.00	0.04	157.39	0	12:10	0	0	0:00:00
MH20	0.01	0.04	131.83	0	12:55	0	0	0:00:00
MH21	0.01	0.04	131.57	0	12:57	0	0	0:00:00
MH22	0.01	0.04	131.35	0	12:58	0	0	0:00:00
MH23	0.01	0.04	131.08	0	13:00	0	0	0:00:00
MH24	0.01	0.03	127.74	0	13:01	0	0	0:00:00
MH25	0.01	0.03	126.48	0	12:54	0	0	0:00:00
MH26	0.00	0.03	129.64	0	12:10	0	0	0:00:00
MH27	0.00	0.04	126.49	0	12:10	0	0	0:00:00
MH28	0.00	0.00	123.65	0	00:00	0	0	0:00:00
MH29	0.00	0.03	121.43	0	12:10	0	0	0:00:00
MH3	0.00	0.04	149.64	0	12:12	0	0	0:00:00

MH30	0.00	0.01	140.49	0	12:24	0	0	0:00:00
MH4	0.00	0.01	146.76	0	14:48	0	0	0:00:00
MH5	0.00	0.03	143.26	0	12:10	0	0	0:00:00
MH6	0.00	0.03	141.38	0	12:11	0	0	0:00:00
MH7	0.00	0.04	138.14	0	12:10	0	0	0:00:00
MH8	0.01	0.05	136.28	0	12:10	0	0	0:00:00
MH9	0.01	0.02	134.27	0	13:34	0	0	0:00:00
OF1	0.01	0.03	126.21	0	12:54	0	0	0:00:00
OF2	0.00	0.04	126.19	0	12:10	0	0	0:00:00
OF3	0.00	0.03	121.19	0	12:10	0	0	0:00:00
POND1	0.01	0.01	147.51	0	14:48	0	0	0:00:00
POND2	0.00	0.03	140.03	0	12:29	0	0	0:00:00
POND3	0.01	0.02	135.02	0	13:34	0	0	0:00:00
POND4	0.00	0.01	143.01	0	12:24	0	0	0:00:00

****
Node Flow Summary
****

Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
MH1	JUNCTION	0.004	0.004	0	12:10	0.00		
MH10	JUNCTION	0.000	0.000	0	00:00	0.00		
MH11	JUNCTION	0.000	0.000	0	00:00	0.00		
MH12	JUNCTION	0.012	0.012	0	12:10	0.00		
MH13	JUNCTION	0.000	0.000	0	00:00	0.00		
MH14	JUNCTION	0.000	0.000	0	00:00	0.00		
MH15	JUNCTION	0.000	0.005	0	12:35	0.00		
MH16	JUNCTION	0.000	0.004	0	12:29	0.00		
MH17	JUNCTION	0.000	0.002	0	13:40	0.00		
MH18	JUNCTION	0.000	0.002	0	13:41	0.00		

MH19	JUNCTION	0.000	0.002	0	13:51	0.00
MH2	JUNCTION	0.006	0.010	0	12:10	0.00
MH20	JUNCTION	0.000	0.006	0	12:55	0.00
MH21	JUNCTION	0.000	0.006	0	12:57	0.00
MH22	JUNCTION	0.000	0.006	0	12:58	0.00
MH23	JUNCTION	0.000	0.006	0	13:00	0.00
MH24	JUNCTION	0.000	0.006	0	13:01	0.00
MH25	JUNCTION	0.000	0.007	0	12:54	0.00
MH26	JUNCTION	0.007	0.007	0	12:10	0.00
MH27	JUNCTION	0.007	0.007	0	12:10	0.00
MH28	JUNCTION	0.000	0.000	0	00:00	0.00
MH29	JUNCTION	0.006	0.006	0	12:10	0.00
MH3	JUNCTION	0.005	0.014	0	12:12	0.00
MH30	JUNCTION	0.000	0.001	0	12:24	0.00
MH4	JUNCTION	0.000	0.001	0	14:48	0.00
MH5	JUNCTION	0.006	0.006	0	12:10	0.00
MH6	JUNCTION	0.003	0.008	0	12:10	0.00
MH7	JUNCTION	0.006	0.014	0	12:10	0.00
MH8	JUNCTION	0.005	0.019	0	12:10	0.00
MH9	JUNCTION	0.000	0.002	0	13:34	0.00
OF1	OUTFALL	0.000	0.007	0	12:54	0.00
OF2	OUTFALL	0.000	0.007	0	12:10	0.00
OF3	OUTFALL	0.000	0.006	0	12:10	0.00
POND1	STORAGE	0.008	0.021	0	12:12	0.00
POND2	STORAGE	0.011	0.022	0	12:10	0.00
POND3	STORAGE	0.004	0.023	0	12:10	0.00
POND4	STORAGE	0.005	0.005	0	12:10	0.00

****
Storage Node Summary
****

Storage Node ID	Maximum Ponded	Maximum Ponded	Time of Max Ponded	Average Ponded	Average Ponded	Maximum Storage Node	Maximum Exfiltration	Total Exfiltrated

	Volume 1000 m³	Volume (%)	Volume days hh:mm	Volume 1000 m³	Volume (%)	Outflow cms	Rate cmm	Volume 1000 m³
POND1	0.039	1	0 14:48	0.017	0	0.00	0.00	0.000
POND2	0.019	1	0 12:29	0.003	0	0.00	0.00	0.000
POND3	0.030	1	0 13:34	0.010	0	0.00	0.00	0.000
POND4	0.004	0	0 12:23	0.001	0	0.00	0.00	0.000

****
Outfall Loading Summary
****

Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF1	50.92	0.003	0.007
OF2	50.99	0.000	0.007
OF3	50.99	0.000	0.006
System	50.97	0.004	0.020

****
Link Flow Summary
****

Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
EXISTING-3	CONDUIT	0 12:10	1.07	1.00	0.007	14.949	0.00	0.02	0	Calculated

EXISTING-4	CONDUIT	0	12:10	0.64	1.00	0.007	7.095	0.00	0.02	0	Calculated
EXISTING-5	CONDUIT	0	12:10	0.61	1.00	0.006	7.177	0.00	0.02	0	Calculated
EXISTING-6	CONDUIT	0	00:00	0.00	1.00	0.000	8.061	0.00	0.00	0	Calculated
L1	CONDUIT	0	12:11	0.78	1.00	0.004	11.562	0.00	0.02	0	Calculated
L10	CONDUIT	0	00:00	0.00	1.00	0.000	9.368	0.00	0.00	0	Calculated
L11	CONDUIT	0	12:11	1.13	1.00	0.012	10.018	0.00	0.03	0	Calculated
L12	CONDUIT	0	00:00	0.00	1.00	0.000	12.395	0.00	0.00	0	Calculated
L13	CONDUIT	0	00:00	0.00	1.00	0.000	8.137	0.00	0.00	0	Calculated
L14	CONDUIT	0	12:29	0.11	1.00	0.004	0.731	0.01	0.06	0	Calculated
L15	CONDUIT	0	13:40	0.36	1.00	0.002	5.922	0.00	0.01	0	Calculated
L16	CONDUIT	0	13:41	0.30	1.00	0.002	4.486	0.00	0.02	0	Calculated
L17	CONDUIT	0	13:51	0.22	1.00	0.002	28.507	0.00	0.01	0	Calculated
L18	CONDUIT	0	12:43	0.66	1.00	0.005	8.687	0.00	0.02	0	Calculated
L19	CONDUIT	0	13:52	0.32	1.00	0.002	4.838	0.00	0.02	0	Calculated
L2	CONDUIT	0	12:13	1.05	1.00	0.010	10.976	0.00	0.02	0	Calculated
L20	CONDUIT	0	12:57	0.44	1.00	0.006	4.470	0.00	0.03	0	Calculated
L21	CONDUIT	0	12:58	0.44	1.00	0.006	4.478	0.00	0.03	0	Calculated
L22	CONDUIT	0	13:00	0.44	1.00	0.006	4.468	0.00	0.03	0	Calculated
L23	CONDUIT	0	13:01	0.97	1.00	0.006	13.801	0.00	0.02	0	Calculated
L24	CONDUIT	0	13:01	0.95	1.00	0.006	13.459	0.00	0.02	0	Calculated
L25	CONDUIT	0	12:54	0.84	1.00	0.007	10.454	0.00	0.02	0	Calculated
L26	CONDUIT	0	12:27	0.51	1.00	0.001	13.438	0.00	0.01	0	Calculated
L3	CONDUIT	0	12:13	1.15	1.00	0.014	12.325	0.00	0.03	0	Calculated
L4	CONDUIT	0	14:52	0.50	1.00	0.001	14.864	0.00	0.01	0	Calculated
L5	CONDUIT	0	12:11	0.74	1.00	0.006	7.834	0.00	0.02	0	Calculated
L6	CONDUIT	0	12:11	1.11	1.00	0.008	14.299	0.00	0.02	0	Calculated
L7	CONDUIT	0	12:10	1.05	1.00	0.014	10.727	0.00	0.03	0	Calculated
L8	CONDUIT	0	12:11	1.05	1.00	0.019	9.243	0.00	0.03	0	Calculated
L9	CONDUIT	0	00:00	0.00	1.00	0.000	8.335	0.00	0.00	0	Calculated
Orifice-01	ORIFICE	0	14:48			0.001					
Orifice-02	ORIFICE	0	00:00			0.000					
Orifice-03	ORIFICE	0	12:29			0.004					
Orifice-04	ORIFICE	0	00:00			0.000					
Orifice-05	ORIFICE	0	13:34			0.002					
Orifice-06	ORIFICE	0	00:00			0.000					
Orifice-07	ORIFICE	0	12:24			0.001					

Orifice-08	ORIFICE	0	00:00	0.000	
Weir-01	WEIR	0	00:00	0.000	0.00
Weir-02	WEIR	0	00:00	0.000	0.00
Weir-03	WEIR	0	00:00	0.000	0.00
Weir-04	WEIR	0	00:00	0.000	0.00

1-YEAR

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Subbasin Runoff Summary
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Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	22.59	0.00	0.00	15.03	0.85	0.01	0.038	0	06:12:35
Sub-02	22.59	0.00	0.00	15.03	1.00	0.01	0.044	0	05:21:08
Sub-03	22.59	0.00	0.00	10.94	6.59	0.02	0.292	0	02:19:16
Sub-04	22.59	0.00	0.00	10.94	6.61	0.03	0.292	0	02:16:41
Sub-05	22.59	0.00	0.00	10.94	6.55	0.02	0.290	0	02:25:57
Sub-06	22.59	0.00	0.00	10.71	4.52	0.04	0.200	0	07:06:38
Sub-07	22.59	0.00	0.00	10.71	6.40	0.02	0.283	0	02:18:09
Sub-08	22.59	0.00	0.00	10.94	7.07	0.02	0.313	0	00:44:11
Sub-09	22.59	0.00	0.00	10.94	7.07	0.01	0.313	0	00:44:35
Sub-10	22.59	0.00	0.00	10.94	7.06	0.01	0.313	0	00:46:56
Sub-11	22.59	0.00	0.00	10.94	6.95	0.04	0.308	0	01:11:44
Sub-12	22.59	0.00	0.00	10.94	6.95	0.02	0.308	0	01:10:51
Sub-13	22.59	0.00	0.00	10.71	6.52	0.02	0.289	0	01:59:38
Sub-14	22.59	0.00	0.00	10.94	6.94	0.04	0.307	0	01:13:02
Sub-15	22.59	0.00	0.00	10.94	6.92	0.02	0.307	0	01:16:22
Sub-16	22.59	0.00	0.00	15.03	1.31	0.00	0.058	0	03:58:42
Sub-17	22.59	0.00	0.00	15.03	1.54	0.00	0.068	0	03:10:22
Sub-18	22.59	0.00	0.00	15.03	1.97	0.00	0.087	0	01:53:49
Sub-19	22.59	1.05	0.00	15.48	2.08	0.00	0.088	0	02:47:19
Sub-20	22.59	0.53	0.00	15.25	1.37	0.00	0.059	0	04:34:06
Sub-21	22.59	2.89	0.00	11.74	8.02	0.03	0.315	0	02:49:29
Sub-22	22.59	1.00	0.00	11.23	7.10	0.04	0.301	0	02:29:24
Sub-23	22.59	0.00	0.00	10.94	6.53	0.03	0.289	0	02:30:43
Sub-24	22.59	16.39	0.00	20.85	11.86	0.01	0.304	0	01:42:01
Sub-25	22.59	0.00	0.00	10.94	6.35	0.03	0.281	0	03:02:07

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Node Depth Summary
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Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
MH1	0.01	0.04	160.89	0	12:10	0	0	0:00:00
MH10	0.00	0.00	139.35	0	00:00	0	0	0:00:00
MH11	0.00	0.00	148.35	0	00:00	0	0	0:00:00
MH12	0.01	0.07	145.42	0	12:10	0	0	0:00:00
MH13	0.01	0.02	156.87	0	23:40	0	0	0:00:00
MH14	0.02	0.05	142.55	1	00:00	0	0	0:00:00
MH15	0.06	0.17	137.77	0	12:23	0	0	0:00:00
MH16	0.06	0.17	137.77	0	12:40	0	0	0:00:00
MH17	0.03	0.05	132.90	0	17:22	0	0	0:00:00
MH18	0.03	0.05	132.82	0	17:23	0	0	0:00:00
MH19	0.03	0.05	131.88	0	18:21	0	0	0:00:00
MH2	0.01	0.07	157.42	0	12:10	0	0	0:00:00
MH20	0.05	0.10	131.89	0	21:09	0	0	0:00:00
MH21	0.05	0.10	131.63	0	21:10	0	0	0:00:00
MH22	0.05	0.10	131.41	0	21:11	0	0	0:00:00
MH23	0.05	0.10	131.13	0	21:12	0	0	0:00:00
MH24	0.03	0.06	127.77	0	21:12	0	0	0:00:00
MH25	0.04	0.07	126.53	0	12:10	0	0	0:00:00
MH26	0.01	0.05	129.66	0	12:10	0	0	0:00:00
MH27	0.01	0.07	126.52	0	12:10	0	0	0:00:00
MH28	0.01	0.03	123.68	0	13:00	0	0	0:00:00
MH29	0.02	0.07	121.47	0	12:10	0	0	0:00:00
MH3	0.02	0.08	149.68	0	12:10	0	0	0:00:00

MH30	0.01	0.03	140.51	0	12:14	0	0	0:00:00
MH4	0.01	0.03	146.78	0	21:26	0	0	0:00:00
MH5	0.01	0.06	143.29	0	12:10	0	0	0:00:00
MH6	0.01	0.06	141.41	0	12:10	0	0	0:00:00
MH7	0.01	0.08	138.18	0	12:10	0	0	0:00:00
MH8	0.02	0.09	136.32	0	12:10	0	0	0:00:00
MH9	0.03	0.05	134.30	0	17:19	0	0	0:00:00
OF1	0.04	0.07	126.25	0	12:10	0	0	0:00:00
OF2	0.01	0.07	126.22	0	12:10	0	0	0:00:00
OF3	0.02	0.06	121.22	0	12:10	0	0	0:00:00
POND1	0.04	0.08	147.58	0	21:26	0	0	0:00:00
POND2	0.02	0.11	140.11	0	12:22	0	0	0:00:00
POND3	0.06	0.14	135.14	0	17:19	0	0	0:00:00
POND4	0.01	0.04	143.04	0	12:14	0	0	0:00:00

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Node Flow Summary
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Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
MH1	JUNCTION	0.018	0.018	0	12:10	0.00		
MH10	JUNCTION	0.000	0.000	0	00:00	0.00		
MH11	JUNCTION	0.000	0.000	0	00:00	0.00		
MH12	JUNCTION	0.044	0.044	0	12:10	0.00		
MH13	JUNCTION	0.005	0.005	0	23:40	0.00		
MH14	JUNCTION	0.009	0.014	1	00:00	0.00		
MH15	JUNCTION	0.000	0.025	0	12:26	0.00		
MH16	JUNCTION	0.000	0.019	0	12:22	0.00		
MH17	JUNCTION	0.000	0.010	0	17:22	0.00		
MH18	JUNCTION	0.001	0.011	0	18:15	0.00		

MH19	JUNCTION	0.000	0.011	0	18:21	0.00
MH2	JUNCTION	0.026	0.043	0	12:10	0.00
MH20	JUNCTION	0.004	0.040	0	21:09	0.00
MH21	JUNCTION	0.000	0.040	0	21:10	0.00
MH22	JUNCTION	0.000	0.040	0	21:11	0.00
MH23	JUNCTION	0.000	0.040	0	21:12	0.00
MH24	JUNCTION	0.000	0.040	0	21:12	0.00
MH25	JUNCTION	0.000	0.048	0	12:10	0.00
MH26	JUNCTION	0.030	0.030	0	12:10	0.00
MH27	JUNCTION	0.029	0.029	0	12:10	0.00
MH28	JUNCTION	0.005	0.005	0	13:00	0.00
MH29	JUNCTION	0.026	0.026	0	12:10	0.00
MH3	JUNCTION	0.021	0.061	0	12:10	0.00
MH30	JUNCTION	0.000	0.009	0	12:14	0.00
MH4	JUNCTION	0.000	0.008	0	21:26	0.00
MH5	JUNCTION	0.020	0.020	0	12:10	0.00
MH6	JUNCTION	0.010	0.030	0	12:10	0.00
MH7	JUNCTION	0.022	0.052	0	12:10	0.00
MH8	JUNCTION	0.020	0.071	0	12:10	0.00
MH9	JUNCTION	0.000	0.010	0	17:19	0.00
OF1	OUTFALL	0.000	0.048	0	12:10	0.00
OF2	OUTFALL	0.000	0.028	0	12:10	0.00
OF3	OUTFALL	0.000	0.025	0	12:10	0.00
POND1	STORAGE	0.043	0.102	0	12:10	0.00
POND2	STORAGE	0.040	0.084	0	12:10	0.00
POND3	STORAGE	0.016	0.093	0	12:10	0.00
POND4	STORAGE	0.018	0.018	0	12:10	0.00

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Storage Node Summary
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Storage Node ID	Maximum Ponded	Maximum Ponded	Time of Max Ponded	Average Ponded	Average Ponded	Maximum Storage Node	Maximum Exfiltration	Total Exfiltrated

	Volume 1000 m³	Volume (%)	Volume days hh:mm	Volume 1000 m³	Volume (%)	Outflow cms	Rate cmm	Volume 1000 m³
POND1	0.256	5	0 21:26	0.121	2	0.01	0.00	0.000
POND2	0.083	3	0 12:22	0.017	1	0.02	0.00	0.000
POND3	0.246	5	0 17:18	0.111	2	0.01	0.00	0.000
POND4	0.014	2	0 12:14	0.004	0	0.01	0.00	0.000

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Outfall Loading Summary
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Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF1	72.51	0.028	0.048
OF2	72.61	0.002	0.028
OF3	72.54	0.004	0.025
System	72.56	0.034	0.101

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Link Flow Summary
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Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
EXISTING-3	CONDUIT	0 12:10	1.67	1.00	0.030	14.949	0.00	0.03	0	Calculated

EXISTING-4	CONDUIT	0	12:10	0.98	1.00	0.028	7.095	0.00	0.05	0	Calculated
EXISTING-5	CONDUIT	0	12:10	0.95	1.00	0.025	7.177	0.00	0.04	0	Calculated
EXISTING-6	CONDUIT	0	13:06	0.65	1.00	0.005	8.061	0.00	0.02	0	Calculated
L1	CONDUIT	0	12:10	1.22	1.00	0.018	11.562	0.00	0.03	0	Calculated
L10	CONDUIT	0	00:00	0.00	1.00	0.000	9.368	0.00	0.00	0	Calculated
L11	CONDUIT	0	12:11	1.59	1.00	0.045	10.018	0.00	0.05	0	Calculated
L12	CONDUIT	1	00:00	0.87	1.00	0.005	12.395	0.00	0.02	0	Calculated
L13	CONDUIT	1	00:00	0.87	1.00	0.014	8.137	0.00	0.03	0	Calculated
L14	CONDUIT	0	12:23	0.18	1.00	0.019	0.731	0.03	0.11	0	Calculated
L15	CONDUIT	0	17:22	0.63	1.00	0.010	5.922	0.00	0.03	0	Calculated
L16	CONDUIT	0	17:23	0.52	1.00	0.010	4.486	0.00	0.04	0	Calculated
L17	CONDUIT	0	18:21	0.48	1.00	0.011	28.507	0.00	0.02	0	Calculated
L18	CONDUIT	0	12:31	1.10	1.00	0.025	8.687	0.00	0.04	0	Calculated
L19	CONDUIT	0	18:21	0.57	1.00	0.011	4.838	0.00	0.04	0	Calculated
L2	CONDUIT	0	12:11	1.61	1.00	0.042	10.976	0.00	0.04	0	Calculated
L20	CONDUIT	0	21:10	0.78	1.00	0.040	4.470	0.01	0.07	0	Calculated
L21	CONDUIT	0	21:11	0.78	1.00	0.040	4.478	0.01	0.07	0	Calculated
L22	CONDUIT	0	21:12	0.78	1.00	0.040	4.468	0.01	0.07	0	Calculated
L23	CONDUIT	0	21:12	1.72	1.00	0.040	13.801	0.00	0.04	0	Calculated
L24	CONDUIT	0	21:12	1.69	1.00	0.040	13.459	0.00	0.04	0	Calculated
L25	CONDUIT	0	12:10	1.48	1.00	0.048	10.454	0.00	0.05	0	Calculated
L26	CONDUIT	0	12:16	1.08	1.00	0.009	13.438	0.00	0.02	0	Calculated
L3	CONDUIT	0	12:11	1.79	1.00	0.061	12.325	0.00	0.05	0	Calculated
L4	CONDUIT	0	21:28	1.09	1.00	0.008	14.864	0.00	0.02	0	Calculated
L5	CONDUIT	0	12:10	1.05	1.00	0.021	7.834	0.00	0.04	0	Calculated
L6	CONDUIT	0	12:10	1.63	1.00	0.030	14.299	0.00	0.03	0	Calculated
L7	CONDUIT	0	12:10	1.55	1.00	0.051	10.727	0.00	0.05	0	Calculated
L8	CONDUIT	0	12:10	1.56	1.00	0.071	9.243	0.01	0.06	0	Calculated
L9	CONDUIT	0	00:00	0.00	1.00	0.000	8.335	0.00	0.00	0	Calculated
Orifice-01	ORIFICE	0	21:26			0.008					
Orifice-02	ORIFICE	0	00:00			0.000					
Orifice-03	ORIFICE	0	12:22			0.019					
Orifice-04	ORIFICE	0	00:00			0.000					
Orifice-05	ORIFICE	0	17:19			0.010					
Orifice-06	ORIFICE	0	00:00			0.000					
Orifice-07	ORIFICE	0	12:14			0.009					

Orifice-08	ORIFICE	0	00:00	0.000	
Weir-01	WEIR	0	00:00	0.000	0.00
Weir-02	WEIR	0	00:00	0.000	0.00
Weir-03	WEIR	0	00:00	0.000	0.00
Weir-04	WEIR	0	00:00	0.000	0.00

2-YEAR

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Subbasin Runoff Summary
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Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	41.00	0.00	0.00	21.42	10.57	0.09	0.258	0	04:53:29
Sub-02	41.00	0.00	0.00	21.42	11.23	0.06	0.274	0	04:12:57
Sub-03	41.00	0.00	0.00	15.03	20.57	0.04	0.502	0	01:49:42
Sub-04	41.00	0.00	0.00	15.03	20.60	0.07	0.502	0	01:47:40
Sub-05	41.00	0.00	0.00	15.03	20.51	0.05	0.500	0	01:54:58
Sub-06	41.00	0.00	0.00	14.02	17.47	0.10	0.426	0	05:36:04
Sub-07	41.00	0.00	0.00	14.02	21.11	0.08	0.515	0	01:48:49
Sub-08	41.00	0.00	0.00	15.03	21.37	0.09	0.521	0	00:34:48
Sub-09	41.00	0.00	0.00	15.03	21.37	0.05	0.521	0	00:35:07
Sub-10	41.00	0.00	0.00	15.03	21.35	0.02	0.521	0	00:36:58
Sub-11	41.00	0.00	0.00	15.03	21.16	0.16	0.516	0	00:56:30
Sub-12	41.00	0.00	0.00	15.03	21.15	0.08	0.516	0	00:55:48
Sub-13	41.00	0.00	0.00	14.02	21.30	0.07	0.520	0	01:34:14
Sub-14	41.00	0.00	0.00	15.03	21.13	0.14	0.515	0	00:57:32
Sub-15	41.00	0.00	0.00	15.03	21.10	0.07	0.515	0	01:00:10
Sub-16	41.00	0.00	0.00	21.42	12.27	0.05	0.299	0	03:08:02
Sub-17	41.00	0.00	0.00	21.42	12.83	0.02	0.313	0	02:29:57
Sub-18	41.00	0.00	0.00	21.42	13.64	0.01	0.333	0	01:29:39
Sub-19	41.00	7.31	0.00	23.25	18.17	0.01	0.376	0	02:11:48
Sub-20	41.00	1.60	0.00	21.84	12.89	0.02	0.303	0	03:35:55
Sub-21	41.00	27.33	0.00	18.39	42.76	0.07	0.626	0	02:13:30
Sub-22	41.00	8.79	0.00	16.34	27.54	0.10	0.553	0	01:57:41
Sub-23	41.00	0.00	0.00	15.03	20.47	0.07	0.499	0	01:58:43
Sub-24	41.00	63.67	0.00	31.38	65.93	0.06	0.630	0	01:20:22
Sub-25	41.00	0.00	0.00	15.03	20.18	0.06	0.492	0	02:23:27

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Node Depth Summary
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Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
MH1	0.01	0.07	160.92	0	12:10	0	0	0:00:00
MH10	0.00	0.00	139.35	0	00:00	0	0	0:00:00
MH11	0.00	0.00	148.35	0	00:00	0	0	0:00:00
MH12	0.02	0.13	145.48	0	12:10	0	0	0:00:00
MH13	0.03	0.08	156.93	0	13:30	0	0	0:00:00
MH14	0.06	0.15	142.65	0	13:40	0	0	0:00:00
MH15	0.11	0.24	137.84	0	13:28	0	0	0:00:00
MH16	0.11	0.24	137.84	0	13:27	0	0	0:00:00
MH17	0.04	0.07	132.92	0	17:35	0	0	0:00:00
MH18	0.04	0.08	132.85	0	13:10	0	0	0:00:00
MH19	0.05	0.09	131.92	0	13:11	0	0	0:00:00
MH2	0.02	0.10	157.45	0	12:10	0	0	0:00:00
MH20	0.12	0.26	132.05	0	13:30	0	0	0:00:00
MH21	0.12	0.26	131.79	0	13:30	0	0	0:00:00
MH22	0.12	0.26	131.57	0	13:31	0	0	0:00:00
MH23	0.12	0.26	131.29	0	13:31	0	0	0:00:00
MH24	0.07	0.16	127.87	0	13:32	0	0	0:00:00
MH25	0.08	0.18	126.63	0	13:29	0	0	0:00:00
MH26	0.02	0.08	129.69	0	12:10	0	0	0:00:00
MH27	0.02	0.11	126.56	0	12:10	0	0	0:00:00
MH28	0.02	0.09	123.74	0	12:20	0	0	0:00:00
MH29	0.04	0.12	121.52	0	12:10	0	0	0:00:00
MH3	0.03	0.12	149.72	0	12:11	0	0	0:00:00

MH30	0.02	0.05	140.53	0	13:20	0	0	0:00:00
MH4	0.02	0.04	146.79	0	23:25	0	0	0:00:00
MH5	0.02	0.12	143.35	0	12:10	0	0	0:00:00
MH6	0.02	0.11	141.46	0	12:11	0	0	0:00:00
MH7	0.02	0.15	138.25	0	12:10	0	0	0:00:00
MH8	0.03	0.17	136.40	0	12:11	0	0	0:00:00
MH9	0.04	0.06	134.31	0	17:32	0	0	0:00:00
OF1	0.08	0.18	126.36	0	13:29	0	0	0:00:00
OF2	0.02	0.10	126.25	0	12:10	0	0	0:00:00
OF3	0.04	0.12	121.28	0	12:10	0	0	0:00:00
POND1	0.17	0.41	147.91	0	23:25	0	0	0:00:00
POND2	0.11	0.48	140.48	0	13:27	0	0	0:00:00
POND3	0.28	0.62	135.62	0	17:32	0	0	0:00:00
POND4	0.05	0.29	143.29	0	13:20	0	0	0:00:00

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Node Flow Summary
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Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
MH1	JUNCTION	0.044	0.044	0	12:10	0.00		
MH10	JUNCTION	0.000	0.000	0	00:00	0.00		
MH11	JUNCTION	0.000	0.000	0	00:00	0.00		
MH12	JUNCTION	0.155	0.155	0	12:10	0.00		
MH13	JUNCTION	0.062	0.062	0	13:30	0.00		
MH14	JUNCTION	0.092	0.154	0	13:40	0.00		
MH15	JUNCTION	0.000	0.208	0	13:42	0.00		
MH16	JUNCTION	0.000	0.042	0	13:27	0.00		
MH17	JUNCTION	0.000	0.021	0	17:35	0.00		
MH18	JUNCTION	0.021	0.037	0	13:10	0.00		

MH19	JUNCTION	0.000	0.037	0	13:11	0.00
MH2	JUNCTION	0.065	0.107	0	12:10	0.00
MH20	JUNCTION	0.051	0.293	0	13:30	0.00
MH21	JUNCTION	0.000	0.293	0	13:30	0.00
MH22	JUNCTION	0.000	0.293	0	13:31	0.00
MH23	JUNCTION	0.000	0.293	0	13:31	0.00
MH24	JUNCTION	0.000	0.293	0	13:32	0.00
MH25	JUNCTION	0.000	0.324	0	13:29	0.00
MH26	JUNCTION	0.072	0.072	0	12:10	0.00
MH27	JUNCTION	0.071	0.071	0	12:10	0.00
MH28	JUNCTION	0.061	0.061	0	12:20	0.00
MH29	JUNCTION	0.060	0.100	0	12:10	0.00
MH3	JUNCTION	0.053	0.152	0	12:11	0.00
MH30	JUNCTION	0.000	0.026	0	13:20	0.00
MH4	JUNCTION	0.000	0.017	0	23:25	0.00
MH5	JUNCTION	0.095	0.095	0	12:10	0.00
MH6	JUNCTION	0.045	0.135	0	12:10	0.00
MH7	JUNCTION	0.076	0.206	0	12:10	0.00
MH8	JUNCTION	0.067	0.266	0	12:11	0.00
MH9	JUNCTION	0.000	0.021	0	17:32	0.00
OF1	OUTFALL	0.000	0.324	0	13:29	0.00
OF2	OUTFALL	0.000	0.070	0	12:10	0.00
OF3	OUTFALL	0.000	0.100	0	12:10	0.00
POND1	STORAGE	0.103	0.251	0	12:10	0.00
POND2	STORAGE	0.140	0.283	0	12:10	0.00
POND3	STORAGE	0.074	0.350	0	12:11	0.00
POND4	STORAGE	0.076	0.076	0	12:10	0.00

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Storage Node Summary
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Storage Node ID	Maximum Ponded	Maximum Ponded	Time of Max Ponded	Average Ponded	Average Ponded	Maximum Storage Node	Maximum Exfiltration	Total Exfiltrated

	Volume 1000 m³	Volume (%)	Volume days hh:mm	Volume 1000 m³	Volume (%)	Outflow cms	Rate cmm	Volume 1000 m³
POND1	1.317	25	0 23:24	0.556	10	0.02	0.00	0.000
POND2	0.421	17	0 13:27	0.095	4	0.04	0.00	0.000
POND3	1.162	25	0 17:31	0.523	11	0.02	0.00	0.000
POND4	0.107	12	0 13:20	0.017	2	0.03	0.00	0.000

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Outfall Loading Summary
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Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF1	82.75	0.131	0.324
OF2	82.85	0.006	0.070
OF3	82.82	0.016	0.100
System	82.81	0.152	0.398

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Link Flow Summary
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Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
EXISTING-3	CONDUIT	0 12:10	2.16	1.00	0.071	14.949	0.00	0.05	0	Calculated

EXISTING-4	CONDUIT	0	12:10	1.29	1.00	0.070	7.095	0.01	0.07	0	Calculated
EXISTING-5	CONDUIT	0	12:10	1.44	1.00	0.100	7.177	0.01	0.08	0	Calculated
EXISTING-6	CONDUIT	0	12:21	1.35	1.00	0.061	8.061	0.01	0.06	0	Calculated
L1	CONDUIT	0	12:10	1.58	1.00	0.044	11.562	0.00	0.04	0	Calculated
L10	CONDUIT	0	00:00	0.00	1.00	0.000	9.368	0.00	0.00	0	Calculated
L11	CONDUIT	0	12:11	2.12	1.00	0.151	10.018	0.02	0.09	0	Calculated
L12	CONDUIT	0	13:31	1.80	1.00	0.062	12.395	0.00	0.05	0	Calculated
L13	CONDUIT	0	13:42	1.78	1.00	0.154	8.137	0.02	0.10	0	Calculated
L14	CONDUIT	0	13:28	0.22	1.00	0.042	0.731	0.06	0.16	0	Calculated
L15	CONDUIT	0	17:35	0.78	1.00	0.021	5.922	0.00	0.04	0	Calculated
L16	CONDUIT	0	17:35	0.64	1.00	0.021	4.486	0.00	0.05	0	Calculated
L17	CONDUIT	0	13:11	0.69	1.00	0.037	28.507	0.00	0.03	0	Calculated
L18	CONDUIT	0	13:44	1.98	1.00	0.208	8.687	0.02	0.11	0	Calculated
L19	CONDUIT	0	13:11	0.81	1.00	0.037	4.838	0.01	0.06	0	Calculated
L2	CONDUIT	0	12:11	2.04	1.00	0.105	10.976	0.01	0.07	0	Calculated
L20	CONDUIT	0	13:30	1.42	1.00	0.293	4.470	0.07	0.17	0	Calculated
L21	CONDUIT	0	13:31	1.42	1.00	0.293	4.478	0.07	0.17	0	Calculated
L22	CONDUIT	0	13:31	1.42	1.00	0.293	4.468	0.07	0.17	0	Calculated
L23	CONDUIT	0	13:32	3.09	1.00	0.293	13.801	0.02	0.10	0	Calculated
L24	CONDUIT	0	13:32	3.02	1.00	0.293	13.459	0.02	0.10	0	Calculated
L25	CONDUIT	0	13:29	2.69	1.00	0.324	10.454	0.03	0.12	0	Calculated
L26	CONDUIT	0	13:22	1.48	1.00	0.026	13.438	0.00	0.03	0	Calculated
L3	CONDUIT	0	12:11	2.39	1.00	0.152	12.325	0.01	0.08	0	Calculated
L4	CONDUIT	0	23:26	1.39	1.00	0.017	14.864	0.00	0.03	0	Calculated
L5	CONDUIT	0	12:11	1.53	1.00	0.092	7.834	0.01	0.08	0	Calculated
L6	CONDUIT	0	12:11	2.55	1.00	0.134	14.299	0.01	0.07	0	Calculated
L7	CONDUIT	0	12:11	2.36	1.00	0.205	10.727	0.02	0.10	0	Calculated
L8	CONDUIT	0	12:11	2.32	1.00	0.265	9.243	0.03	0.12	0	Calculated
L9	CONDUIT	0	00:00	0.00	1.00	0.000	8.335	0.00	0.00	0	Calculated
Orifice-01	ORIFICE	0	23:25			0.017					
Orifice-02	ORIFICE	0	00:00			0.000					
Orifice-03	ORIFICE	0	13:27			0.042					
Orifice-04	ORIFICE	0	00:00			0.000					
Orifice-05	ORIFICE	0	17:32			0.021					
Orifice-06	ORIFICE	0	00:00			0.000					
Orifice-07	ORIFICE	0	13:20			0.026					

Orifice-08	ORIFICE	0	00:00	0.000	
Weir-01	WEIR	0	00:00	0.000	0.00
Weir-02	WEIR	0	00:00	0.000	0.00
Weir-03	WEIR	0	00:00	0.000	0.00
Weir-04	WEIR	0	00:00	0.000	0.00

5-YEAR

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Subbasin Runoff Summary
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Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	60.00	0.00	0.00	25.67	24.05	0.30	0.401	0	04:12:00
Sub-02	60.00	0.00	0.00	25.67	24.97	0.20	0.416	0	03:37:12
Sub-03	60.00	0.00	0.00	17.57	36.74	0.09	0.612	0	01:34:12
Sub-04	60.00	0.00	0.00	17.57	36.77	0.13	0.613	0	01:32:27
Sub-05	60.00	0.00	0.00	17.57	36.67	0.11	0.611	0	01:38:43
Sub-06	60.00	0.00	0.00	15.94	33.26	0.20	0.554	0	04:48:34
Sub-07	60.00	0.00	0.00	15.94	37.89	0.18	0.631	0	01:33:26
Sub-08	60.00	0.00	0.00	17.57	37.76	0.19	0.629	0	00:29:53
Sub-09	60.00	0.00	0.00	17.57	37.75	0.09	0.629	0	00:30:09
Sub-10	60.00	0.00	0.00	17.57	37.73	0.05	0.629	0	00:31:45
Sub-11	60.00	0.00	0.00	17.57	37.47	0.33	0.625	0	00:48:31
Sub-12	60.00	0.00	0.00	17.57	37.48	0.16	0.625	0	00:47:55
Sub-13	60.00	0.00	0.00	15.94	38.12	0.17	0.635	0	01:20:55
Sub-14	60.00	0.00	0.00	17.57	37.46	0.30	0.624	0	00:49:24
Sub-15	60.00	0.00	0.00	17.57	37.42	0.14	0.624	0	00:51:39
Sub-16	60.00	0.00	0.00	25.67	26.35	0.17	0.439	0	02:41:27
Sub-17	60.00	0.00	0.00	25.67	27.07	0.07	0.451	0	02:08:45
Sub-18	60.00	0.00	0.00	25.67	28.11	0.03	0.469	0	01:16:58
Sub-19	60.00	15.08	0.00	28.07	39.50	0.05	0.526	0	01:53:10
Sub-20	60.00	2.83	0.00	26.16	27.96	0.08	0.445	0	03:05:24
Sub-21	60.00	59.33	0.00	21.48	89.79	0.15	0.752	0	01:54:38
Sub-22	60.00	19.13	0.00	19.27	53.46	0.21	0.676	0	01:41:03
Sub-23	60.00	0.00	0.00	17.57	36.61	0.14	0.610	0	01:41:56
Sub-24	60.00	123.65	0.00	36.03	139.50	0.17	0.760	0	01:09:00

Sub-25	60.00	0.00	0.00	17.57	36.25	0.12	0.604	0	02:03:10

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Node Depth Summary
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Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
MH1	0.02	0.09	160.94	0	12:10	0	0	0:00:00
MH10	0.00	0.00	139.35	0	00:00	0	0	0:00:00
MH11	0.00	0.00	148.35	0	00:00	0	0	0:00:00
MH12	0.03	0.19	145.54	0	12:10	0	0	0:00:00
MH13	0.04	0.13	156.98	0	12:40	0	0	0:00:00
MH14	0.08	0.25	142.75	0	12:42	0	0	0:00:00
MH15	0.15	0.29	137.89	0	13:34	0	0	0:00:00
MH16	0.15	0.29	137.89	0	13:33	0	0	0:00:00
MH17	0.05	0.09	132.93	0	19:18	0	0	0:00:00
MH18	0.06	0.12	132.89	0	12:22	0	0	0:00:00
MH19	0.06	0.14	131.97	0	12:30	0	0	0:00:00
MH2	0.03	0.15	157.50	0	12:10	0	0	0:00:00
MH20	0.16	0.44	132.23	0	12:45	0	0	0:00:00
MH21	0.16	0.43	131.96	0	12:43	0	0	0:00:00
MH22	0.16	0.44	131.74	0	12:46	0	0	0:00:00
MH23	0.16	0.43	131.47	0	12:43	0	0	0:00:00
MH24	0.10	0.25	127.96	0	12:44	0	0	0:00:00
MH25	0.11	0.30	126.75	0	12:40	0	0	0:00:00
MH26	0.03	0.11	129.72	0	12:10	0	0	0:00:00
MH27	0.03	0.15	126.60	0	12:10	0	0	0:00:00
MH28	0.04	0.16	123.81	0	12:15	0	0	0:00:00
MH29	0.05	0.19	121.59	0	12:10	0	0	0:00:00

MH3	0.03	0.17	149.77	0	12:11	0	0	0:00:00
MH30	0.02	0.06	140.54	0	13:27	0	0	0:00:00
MH4	0.03	0.05	146.80	1	00:00	0	0	0:00:00
MH5	0.02	0.17	143.40	0	12:10	0	0	0:00:00
MH6	0.02	0.16	141.51	0	12:11	0	0	0:00:00
MH7	0.03	0.20	138.30	0	12:10	0	0	0:00:00
MH8	0.04	0.25	136.48	0	12:10	0	0	0:00:00
MH9	0.05	0.07	134.32	0	19:15	0	0	0:00:00
OF1	0.11	0.30	126.48	0	12:41	0	0	0:00:00
OF2	0.03	0.15	126.30	0	12:10	0	0	0:00:00
OF3	0.05	0.19	121.35	0	12:11	0	0	0:00:00
POND1	0.35	0.82	148.32	1	00:00	0	0	0:00:00
POND2	0.29	0.96	140.96	0	13:33	0	0	0:00:00
POND3	0.52	1.13	136.13	0	19:15	0	0	0:00:00
POND4	0.13	0.68	143.68	0	13:27	0	0	0:00:00

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Node Flow Summary
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Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
MH1	JUNCTION	0.092	0.092	0	12:10	0.00		
MH10	JUNCTION	0.000	0.000	0	00:00	0.00		
MH11	JUNCTION	0.000	0.000	0	00:00	0.00		
MH12	JUNCTION	0.334	0.334	0	12:10	0.00		
MH13	JUNCTION	0.202	0.202	0	12:40	0.00		
MH14	JUNCTION	0.295	0.495	0	12:42	0.00		
MH15	JUNCTION	0.000	0.568	0	12:51	0.00		
MH16	JUNCTION	0.000	0.059	0	13:33	0.00		
MH17	JUNCTION	0.000	0.028	0	19:18	0.00		

MH18	JUNCTION	0.072	0.090	0	12:22	0.00
MH19	JUNCTION	0.000	0.090	0	12:30	0.00
MH2	JUNCTION	0.135	0.223	0	12:10	0.00
MH20	JUNCTION	0.173	0.817	0	12:42	0.00
MH21	JUNCTION	0.000	0.817	0	12:43	0.00
MH22	JUNCTION	0.000	0.817	0	12:43	0.00
MH23	JUNCTION	0.000	0.817	0	12:43	0.00
MH24	JUNCTION	0.000	0.817	0	12:44	0.00
MH25	JUNCTION	0.000	0.919	0	12:40	0.00
MH26	JUNCTION	0.152	0.152	0	12:10	0.00
MH27	JUNCTION	0.144	0.144	0	12:10	0.00
MH28	JUNCTION	0.170	0.170	0	12:15	0.00
MH29	JUNCTION	0.118	0.251	0	12:10	0.00
MH3	JUNCTION	0.108	0.310	0	12:11	0.00
MH30	JUNCTION	0.000	0.039	0	13:27	0.00
MH4	JUNCTION	0.000	0.024	1	00:00	0.00
MH5	JUNCTION	0.187	0.187	0	12:10	0.00
MH6	JUNCTION	0.089	0.267	0	12:10	0.00
MH7	JUNCTION	0.163	0.425	0	12:10	0.00
MH8	JUNCTION	0.145	0.563	0	12:10	0.00
MH9	JUNCTION	0.000	0.028	0	19:15	0.00
OF1	OUTFALL	0.000	0.919	0	12:41	0.00
OF2	OUTFALL	0.000	0.142	0	12:10	0.00
OF3	OUTFALL	0.000	0.250	0	12:11	0.00
POND1	STORAGE	0.196	0.493	0	12:10	0.00
POND2	STORAGE	0.301	0.614	0	12:10	0.00
POND3	STORAGE	0.170	0.752	0	12:10	0.00
POND4	STORAGE	0.175	0.175	0	12:10	0.00

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Storage Node Summary
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Storage Node ID	Maximum	Maximum	Time of Max	Average	Average	Maximum	Maximum	Total

	Ponded Volume 1000 m³	Ponded Volume (%)	Ponded Volume days hh:mm	Ponded Volume 1000 m³	Ponded Volume (%)	Storage Node Outflow cms	Exfiltration Rate cmm	Exfiltrated Volume 1000 m³
POND1	2.727	51	1 00:00	1.150	21	0.02	0.00	0.000
POND2	0.932	39	0 13:33	0.260	11	0.06	0.00	0.000
POND3	2.312	49	0 19:15	1.046	22	0.03	0.00	0.000
POND4	0.293	34	0 13:26	0.051	6	0.04	0.00	0.000

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Outfall Loading Summary
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Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF1	87.54	0.250	0.919
OF2	87.64	0.009	0.142
OF3	87.64	0.030	0.250
System	87.61	0.290	1.174

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Link Flow Summary
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Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition

EXISTING-3	CONDUIT	0	12:10	2.72	1.00	0.150	14.949	0.01	0.07	0	Calculated
EXISTING-4	CONDUIT	0	12:10	1.58	1.00	0.142	7.095	0.02	0.10	0	Calculated
EXISTING-5	CONDUIT	0	12:11	1.91	1.00	0.250	7.177	0.03	0.13	0	Calculated
EXISTING-6	CONDUIT	0	12:17	1.81	1.00	0.169	8.061	0.02	0.10	0	Calculated
L1	CONDUIT	0	12:10	1.97	1.00	0.091	11.562	0.01	0.06	0	Calculated
L10	CONDUIT	0	00:00	0.00	1.00	0.000	9.368	0.00	0.00	0	Calculated
L11	CONDUIT	0	12:11	2.67	1.00	0.325	10.018	0.03	0.12	0	Calculated
L12	CONDUIT	0	12:41	2.60	1.00	0.201	12.395	0.02	0.09	0	Calculated
L13	CONDUIT	0	12:45	2.54	1.00	0.495	8.137	0.06	0.17	0	Calculated
L14	CONDUIT	0	13:34	0.25	1.00	0.059	0.731	0.08	0.19	0	Calculated
L15	CONDUIT	0	19:18	0.85	1.00	0.028	5.922	0.00	0.05	0	Calculated
L16	CONDUIT	0	19:18	0.71	1.00	0.028	4.486	0.01	0.06	0	Calculated
L17	CONDUIT	0	12:30	0.91	1.00	0.090	28.507	0.00	0.04	0	Calculated
L18	CONDUIT	0	12:52	2.76	1.00	0.568	8.687	0.07	0.17	0	Calculated
L19	CONDUIT	0	12:31	1.05	1.00	0.090	4.838	0.02	0.09	0	Calculated
L2	CONDUIT	0	12:12	2.51	1.00	0.214	10.976	0.02	0.10	0	Calculated
L20	CONDUIT	0	12:43	1.92	1.00	0.817	4.470	0.18	0.29	0	Calculated
L21	CONDUIT	0	12:43	1.92	1.00	0.817	4.478	0.18	0.29	0	Calculated
L22	CONDUIT	0	12:43	1.92	1.00	0.817	4.468	0.18	0.29	0	Calculated
L23	CONDUIT	0	12:44	4.28	1.00	0.817	13.801	0.06	0.17	0	Calculated
L24	CONDUIT	0	12:44	4.20	1.00	0.817	13.459	0.06	0.17	0	Calculated
L25	CONDUIT	0	12:41	3.65	1.00	0.919	10.454	0.09	0.20	0	Calculated
L26	CONDUIT	0	13:28	1.68	1.00	0.039	13.438	0.00	0.04	0	Calculated
L3	CONDUIT	0	12:11	2.85	1.00	0.309	12.325	0.03	0.11	0	Calculated
L4	CONDUIT	1	00:00	1.55	1.00	0.024	14.864	0.00	0.03	0	Calculated
L5	CONDUIT	0	12:11	1.86	1.00	0.182	7.834	0.02	0.11	0	Calculated
L6	CONDUIT	0	12:10	3.12	1.00	0.267	14.299	0.02	0.10	0	Calculated
L7	CONDUIT	0	12:10	2.95	1.00	0.425	10.727	0.04	0.14	0	Calculated
L8	CONDUIT	0	12:10	2.89	1.00	0.563	9.243	0.06	0.17	0	Calculated
L9	CONDUIT	0	00:00	0.00	1.00	0.000	8.335	0.00	0.00	0	Calculated
Orifice-01	ORIFICE	1	00:00			0.024					
Orifice-02	ORIFICE	0	00:00			0.000					
Orifice-03	ORIFICE	0	13:33			0.059					
Orifice-04	ORIFICE	0	00:00			0.000					
Orifice-05	ORIFICE	0	19:15			0.028					
Orifice-06	ORIFICE	0	00:00			0.000					

Orifice-07	ORIFICE	0	13:27	0.039	
Orifice-08	ORIFICE	0	00:00	0.000	
Weir-01	WEIR	0	00:00	0.000	0.00
Weir-02	WEIR	0	00:00	0.000	0.00
Weir-03	WEIR	0	00:00	0.000	0.00
Weir-04	WEIR	0	00:00	0.000	0.00

10-YEAR

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Subbasin Runoff Summary
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Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	75.00	0.00	0.00	28.07	35.87	0.53	0.478	0	03:50:28
Sub-02	75.00	0.00	0.00	28.07	36.93	0.36	0.492	0	03:18:39
Sub-03	75.00	0.00	0.00	18.96	50.17	0.13	0.669	0	01:26:09
Sub-04	75.00	0.00	0.00	18.96	50.20	0.20	0.669	0	01:24:33
Sub-05	75.00	0.00	0.00	18.96	50.08	0.16	0.668	0	01:30:17
Sub-06	75.00	0.00	0.00	16.94	46.47	0.29	0.620	0	04:23:55
Sub-07	75.00	0.00	0.00	16.94	51.68	0.26	0.689	0	01:25:27
Sub-08	75.00	0.00	0.00	18.96	51.35	0.26	0.685	0	00:27:20
Sub-09	75.00	0.00	0.00	18.96	51.34	0.12	0.685	0	00:27:34
Sub-10	75.00	0.00	0.00	18.96	51.31	0.06	0.684	0	00:29:02
Sub-11	75.00	0.00	0.00	18.96	51.01	0.47	0.680	0	00:44:22
Sub-12	75.00	0.00	0.00	18.96	51.02	0.23	0.680	0	00:43:49
Sub-13	75.00	0.00	0.00	16.94	51.95	0.25	0.693	0	01:14:00
Sub-14	75.00	0.00	0.00	18.96	50.99	0.43	0.680	0	00:45:11
Sub-15	75.00	0.00	0.00	18.96	50.95	0.21	0.679	0	00:47:14
Sub-16	75.00	0.00	0.00	28.07	38.49	0.31	0.513	0	02:27:39
Sub-17	75.00	0.00	0.00	28.07	39.32	0.13	0.524	0	01:57:45
Sub-18	75.00	0.00	0.00	28.07	40.52	0.06	0.540	0	01:10:24
Sub-19	75.00	21.74	0.00	30.63	58.18	0.09	0.601	0	01:43:30
Sub-20	75.00	3.85	0.00	28.58	41.00	0.14	0.520	0	02:49:33
Sub-21	75.00	87.04	0.00	22.83	130.61	0.24	0.806	0	01:44:50
Sub-22	75.00	28.18	0.00	20.75	75.72	0.32	0.734	0	01:32:25
Sub-23	75.00	0.00	0.00	18.96	50.02	0.21	0.667	0	01:33:13
Sub-24	75.00	175.17	0.00	38.01	203.56	0.28	0.814	0	01:03:06
Sub-25	75.00	0.00	0.00	18.96	49.60	0.17	0.661	0	01:52:39

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Node Depth Summary
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Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
MH1	0.02	0.11	160.96	0	12:10	0	0	0:00:00
MH10	0.00	0.00	139.35	0	00:00	0	0	0:00:00
MH11	0.00	0.00	148.35	0	00:00	0	0	0:00:00
MH12	0.03	0.22	145.57	0	12:10	0	0	0:00:00
MH13	0.05	0.18	157.03	0	12:30	0	0	0:00:00
MH14	0.10	0.34	142.84	0	12:31	0	0	0:00:00
MH15	0.17	0.45	138.05	0	12:52	0	0	0:00:00
MH16	0.17	0.45	138.05	0	12:52	0	0	0:00:00
MH17	0.07	0.15	133.00	0	14:46	0	0	0:00:00
MH18	0.07	0.16	132.92	0	12:20	0	0	0:00:00
MH19	0.08	0.18	132.00	0	12:21	0	0	0:00:00
MH2	0.03	0.18	157.53	0	12:10	0	0	0:00:00
MH20	0.20	0.59	132.39	0	12:33	0	0	0:00:00
MH21	0.20	0.59	132.12	0	12:33	0	0	0:00:00
MH22	0.20	0.60	131.90	0	12:33	0	0	0:00:00
MH23	0.20	0.60	131.63	0	12:34	0	0	0:00:00
MH24	0.12	0.34	128.05	0	12:34	0	0	0:00:00
MH25	0.14	0.40	126.86	0	12:34	0	0	0:00:00
MH26	0.04	0.13	129.74	0	12:10	0	0	0:00:00
MH27	0.03	0.18	126.63	0	12:10	0	0	0:00:00
MH28	0.04	0.19	123.84	0	12:15	0	0	0:00:00
MH29	0.06	0.24	121.64	0	12:11	0	0	0:00:00
MH3	0.04	0.20	149.80	0	12:10	0	0	0:00:00

MH30	0.03	0.08	140.56	0	13:01	0	0	0:00:00
MH4	0.04	0.08	146.83	0	16:20	0	0	0:00:00
MH5	0.03	0.18	143.41	0	12:10	0	0	0:00:00
MH6	0.03	0.18	141.53	0	12:10	0	0	0:00:00
MH7	0.04	0.24	138.34	0	12:10	0	0	0:00:00
MH8	0.04	0.30	136.53	0	12:10	0	0	0:00:00
MH9	0.06	0.13	134.38	0	14:44	0	0	0:00:00
OF1	0.14	0.40	126.59	0	12:34	0	0	0:00:00
OF2	0.03	0.18	126.33	0	12:10	0	0	0:00:00
OF3	0.06	0.24	121.40	0	12:11	0	0	0:00:00
POND1	0.42	0.91	148.41	0	16:20	0	0	0:00:00
POND2	0.35	1.15	141.15	0	12:52	0	0	0:00:00
POND3	0.59	1.25	136.25	0	14:44	0	0	0:00:00
POND4	0.17	0.84	143.84	0	13:01	0	0	0:00:00

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Node Flow Summary
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Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
MH1	JUNCTION	0.134	0.134	0	12:10	0.00		
MH10	JUNCTION	0.000	0.000	0	00:00	0.00		
MH11	JUNCTION	0.000	0.000	0	00:00	0.00		
MH12	JUNCTION	0.473	0.473	0	12:10	0.00		
MH13	JUNCTION	0.365	0.365	0	12:30	0.00		
MH14	JUNCTION	0.533	0.896	0	12:31	0.00		
MH15	JUNCTION	0.000	1.054	0	12:41	0.00		
MH16	JUNCTION	0.000	0.146	0	12:52	0.00		
MH17	JUNCTION	0.000	0.091	0	14:46	0.00		
MH18	JUNCTION	0.129	0.150	0	12:20	0.00		

MH19	JUNCTION	0.000	0.150	0	12:21	0.00
MH2	JUNCTION	0.198	0.328	0	12:10	0.00
MH20	JUNCTION	0.315	1.483	0	12:33	0.00
MH21	JUNCTION	0.000	1.483	0	12:33	0.00
MH22	JUNCTION	0.000	1.483	0	12:33	0.00
MH23	JUNCTION	0.000	1.483	0	12:34	0.00
MH24	JUNCTION	0.000	1.483	0	12:34	0.00
MH25	JUNCTION	0.000	1.664	0	12:34	0.00
MH26	JUNCTION	0.237	0.237	0	12:10	0.00
MH27	JUNCTION	0.211	0.211	0	12:10	0.00
MH28	JUNCTION	0.284	0.284	0	12:15	0.00
MH29	JUNCTION	0.172	0.408	0	12:11	0.00
MH3	JUNCTION	0.158	0.463	0	12:10	0.00
MH30	JUNCTION	0.000	0.073	0	13:01	0.00
MH4	JUNCTION	0.000	0.087	0	16:20	0.00
MH5	JUNCTION	0.256	0.256	0	12:10	0.00
MH6	JUNCTION	0.122	0.369	0	12:10	0.00
MH7	JUNCTION	0.231	0.606	0	12:10	0.00
MH8	JUNCTION	0.205	0.797	0	12:10	0.00
MH9	JUNCTION	0.000	0.091	0	14:44	0.00
OF1	OUTFALL	0.000	1.664	0	12:34	0.00
OF2	OUTFALL	0.000	0.209	0	12:10	0.00
OF3	OUTFALL	0.000	0.408	0	12:11	0.00
POND1	STORAGE	0.287	0.737	0	12:10	0.00
POND2	STORAGE	0.426	0.869	0	12:10	0.00
POND3	STORAGE	0.250	1.072	0	12:10	0.00
POND4	STORAGE	0.261	0.261	0	12:10	0.00

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Storage Node Summary
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Storage Node ID	Maximum Ponded	Maximum Ponded	Time of Max Ponded	Average Ponded	Average Ponded	Maximum Storage Node	Maximum Exfiltration	Total Exfiltrated

	Volume 1000 m³	Volume (%)	Volume days hh:mm	Volume 1000 m³	Volume (%)	Outflow cms	Rate cmm	Volume 1000 m³
POND1	3.078	57	0 16:20	1.406	26	0.09	0.00	0.000
POND2	1.173	49	0 12:51	0.323	13	0.15	0.00	0.000
POND3	2.602	55	0 14:44	1.206	26	0.09	0.00	0.000
POND4	0.390	45	0 13:01	0.069	8	0.07	0.00	0.000

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Outfall Loading Summary
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Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF1	89.83	0.375	1.664
OF2	89.93	0.012	0.209
OF3	89.90	0.042	0.408
System	89.89	0.430	2.085

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Link Flow Summary
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Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
EXISTING-3	CONDUIT	0 12:10	3.12	1.00	0.235	14.949	0.02	0.09	0	Calculated

EXISTING-4	CONDUIT	0	12:10	1.80	1.00	0.209	7.095	0.03	0.12	0	Calculated
EXISTING-5	CONDUIT	0	12:11	2.20	1.00	0.408	7.177	0.06	0.16	0	Calculated
EXISTING-6	CONDUIT	0	12:16	2.15	1.00	0.282	8.061	0.04	0.13	0	Calculated
L1	CONDUIT	0	12:10	2.21	1.00	0.133	11.562	0.01	0.08	0	Calculated
L10	CONDUIT	0	00:00	0.00	1.00	0.000	9.368	0.00	0.00	0	Calculated
L11	CONDUIT	0	12:10	2.95	1.00	0.461	10.018	0.05	0.15	0	Calculated
L12	CONDUIT	0	12:31	3.13	1.00	0.364	12.395	0.03	0.12	0	Calculated
L13	CONDUIT	0	12:33	3.03	1.00	0.895	8.137	0.11	0.22	0	Calculated
L14	CONDUIT	0	12:52	0.32	1.00	0.146	0.731	0.20	0.30	0	Calculated
L15	CONDUIT	0	14:46	1.22	1.00	0.091	5.922	0.02	0.09	0	Calculated
L16	CONDUIT	0	14:46	1.00	1.00	0.091	4.486	0.02	0.10	0	Calculated
L17	CONDUIT	0	12:21	1.06	1.00	0.150	28.507	0.01	0.05	0	Calculated
L18	CONDUIT	0	12:42	3.32	1.00	1.054	8.687	0.12	0.24	0	Calculated
L19	CONDUIT	0	12:21	1.24	1.00	0.150	4.838	0.03	0.12	0	Calculated
L2	CONDUIT	0	12:11	2.81	1.00	0.317	10.976	0.03	0.12	0	Calculated
L20	CONDUIT	0	12:33	2.27	1.00	1.483	4.470	0.33	0.40	0	Calculated
L21	CONDUIT	0	12:33	2.27	1.00	1.483	4.478	0.33	0.40	0	Calculated
L22	CONDUIT	0	12:34	2.27	1.00	1.483	4.468	0.33	0.40	0	Calculated
L23	CONDUIT	0	12:34	5.10	1.00	1.483	13.801	0.11	0.22	0	Calculated
L24	CONDUIT	0	12:34	5.01	1.00	1.483	13.459	0.11	0.22	0	Calculated
L25	CONDUIT	0	12:34	4.33	1.00	1.664	10.454	0.16	0.27	0	Calculated
L26	CONDUIT	0	13:02	2.01	1.00	0.073	13.438	0.01	0.05	0	Calculated
L3	CONDUIT	0	12:11	3.34	1.00	0.463	12.325	0.04	0.13	0	Calculated
L4	CONDUIT	0	16:22	2.28	1.00	0.087	14.864	0.01	0.05	0	Calculated
L5	CONDUIT	0	12:10	2.08	1.00	0.253	7.834	0.03	0.12	0	Calculated
L6	CONDUIT	0	12:10	3.49	1.00	0.375	14.299	0.03	0.11	0	Calculated
L7	CONDUIT	0	12:10	3.30	1.00	0.600	10.727	0.06	0.16	0	Calculated
L8	CONDUIT	0	12:10	3.22	1.00	0.798	9.243	0.09	0.20	0	Calculated
L9	CONDUIT	0	00:00	0.00	1.00	0.000	8.335	0.00	0.00	0	Calculated
Orifice-01	ORIFICE	0	16:20			0.025					
Orifice-02	ORIFICE	0	16:20			0.061					
Orifice-03	ORIFICE	0	12:52			0.064					
Orifice-04	ORIFICE	0	12:52			0.082					
Orifice-05	ORIFICE	0	14:44			0.030					
Orifice-06	ORIFICE	0	14:44			0.061					
Orifice-07	ORIFICE	0	13:01			0.044					

Orifice-08	ORIFICE	0	13:01	0.029	
Weir-01	WEIR	0	00:00	0.000	0.00
Weir-02	WEIR	0	00:00	0.000	0.00
Weir-03	WEIR	0	00:00	0.000	0.00
Weir-04	WEIR	0	00:00	0.000	0.00

20-YEAR

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Subbasin Runoff Summary
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Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	91.00	0.00	0.00	30.04	49.17	0.85	0.540	0	03:33:19
Sub-02	91.00	0.00	0.00	30.04	50.36	0.58	0.553	0	03:03:51
Sub-03	91.00	0.00	0.00	20.07	64.88	0.18	0.713	0	01:19:44
Sub-04	91.00	0.00	0.00	20.07	64.91	0.27	0.713	0	01:18:15
Sub-05	91.00	0.00	0.00	20.07	64.78	0.21	0.712	0	01:23:33
Sub-06	91.00	0.00	0.00	17.72	60.96	0.40	0.670	0	04:04:15
Sub-07	91.00	0.00	0.00	17.72	66.70	0.35	0.733	0	01:19:06
Sub-08	91.00	0.00	0.00	20.07	66.22	0.33	0.728	0	00:25:18
Sub-09	91.00	0.00	0.00	20.07	66.21	0.16	0.728	0	00:25:31
Sub-10	91.00	0.00	0.00	20.07	66.18	0.08	0.727	0	00:26:52
Sub-11	91.00	0.00	0.00	20.07	65.83	0.62	0.723	0	00:41:04
Sub-12	91.00	0.00	0.00	20.07	65.84	0.30	0.724	0	00:40:33
Sub-13	91.00	0.00	0.00	17.72	67.00	0.34	0.736	0	01:08:29
Sub-14	91.00	0.00	0.00	20.07	65.81	0.56	0.723	0	00:41:49
Sub-15	91.00	0.00	0.00	20.07	65.76	0.27	0.723	0	00:43:43
Sub-16	91.00	0.00	0.00	30.04	52.08	0.49	0.572	0	02:16:40
Sub-17	91.00	0.00	0.00	30.04	53.01	0.21	0.582	0	01:48:59
Sub-18	91.00	0.00	0.00	30.04	54.36	0.09	0.597	0	01:05:09
Sub-19	91.00	29.17	0.00	32.65	79.20	0.14	0.659	0	01:35:47
Sub-20	91.00	4.96	0.00	30.55	55.61	0.23	0.580	0	02:36:56
Sub-21	91.00	118.09	0.00	23.77	176.20	0.35	0.843	0	01:37:02
Sub-22	91.00	38.37	0.00	21.86	100.50	0.45	0.777	0	01:25:32
Sub-23	91.00	0.00	0.00	20.07	64.71	0.29	0.711	0	01:26:17
Sub-24	91.00	232.52	0.00	39.37	275.11	0.43	0.850	0	00:58:24
Sub-25	91.00	0.00	0.00	20.07	64.24	0.23	0.706	0	01:44:16

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Node Depth Summary
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Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
MH1	0.02	0.13	160.98	0	12:10	0	0	0:00:00
MH10	0.00	0.00	139.35	0	00:00	0	0	0:00:00
MH11	0.00	0.00	148.35	0	00:00	0	0	0:00:00
MH12	0.04	0.25	145.60	0	12:10	0	0	0:00:00
MH13	0.06	0.22	157.07	0	12:20	0	0	0:00:00
MH14	0.12	0.43	142.93	0	12:30	0	0	0:00:00
MH15	0.19	0.53	138.13	0	12:47	0	0	0:00:00
MH16	0.19	0.53	138.13	0	12:47	0	0	0:00:00
MH17	0.08	0.18	133.02	0	14:32	0	0	0:00:00
MH18	0.09	0.19	132.96	0	12:10	0	0	0:00:00
MH19	0.09	0.22	132.04	0	12:15	0	0	0:00:00
MH2	0.04	0.21	157.56	0	12:10	0	0	0:00:00
MH20	0.24	0.76	132.55	0	12:26	0	0	0:00:00
MH21	0.24	0.76	132.29	0	12:26	0	0	0:00:00
MH22	0.24	0.76	132.07	0	12:26	0	0	0:00:00
MH23	0.24	0.76	131.80	0	12:26	0	0	0:00:00
MH24	0.14	0.42	128.13	0	12:27	0	0	0:00:00
MH25	0.16	0.51	126.96	0	12:27	0	0	0:00:00
MH26	0.04	0.16	129.77	0	12:10	0	0	0:00:00
MH27	0.04	0.21	126.66	0	12:10	0	0	0:00:00
MH28	0.05	0.23	123.88	0	12:15	0	0	0:00:00
MH29	0.07	0.29	121.69	0	12:11	0	0	0:00:00
MH3	0.04	0.23	149.83	0	12:10	0	0	0:00:00

MH30	0.03	0.09	140.57	0	12:59	0	0	0:00:00
MH4	0.05	0.10	146.85	0	15:22	0	0	0:00:00
MH5	0.03	0.21	143.44	0	12:10	0	0	0:00:00
MH6	0.03	0.21	141.56	0	12:10	0	0	0:00:00
MH7	0.04	0.27	138.37	0	12:10	0	0	0:00:00
MH8	0.05	0.34	136.57	0	12:10	0	0	0:00:00
MH9	0.07	0.16	134.41	0	14:30	0	0	0:00:00
OF1	0.16	0.51	126.69	0	12:27	0	0	0:00:00
OF2	0.04	0.20	126.35	0	12:10	0	0	0:00:00
OF3	0.07	0.29	121.45	0	12:11	0	0	0:00:00
POND1	0.47	1.03	148.53	0	15:22	0	0	0:00:00
POND2	0.41	1.41	141.41	0	12:47	0	0	0:00:00
POND3	0.65	1.46	136.46	0	14:30	0	0	0:00:00
POND4	0.21	1.04	144.04	0	12:59	0	0	0:00:00

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Node Flow Summary
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Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
MH1	JUNCTION	0.182	0.182	0	12:10	0.00		
MH10	JUNCTION	0.000	0.000	0	00:00	0.00		
MH11	JUNCTION	0.000	0.000	0	00:00	0.00		
MH12	JUNCTION	0.622	0.622	0	12:10	0.00		
MH13	JUNCTION	0.579	0.579	0	12:20	0.00		
MH14	JUNCTION	0.849	1.422	0	12:30	0.00		
MH15	JUNCTION	0.000	1.630	0	12:31	0.00		
MH16	JUNCTION	0.000	0.196	0	12:47	0.00		
MH17	JUNCTION	0.000	0.135	0	14:32	0.00		
MH18	JUNCTION	0.206	0.226	0	12:10	0.00		

MH19	JUNCTION	0.000	0.223	0	12:15	0.00
MH2	JUNCTION	0.267	0.444	0	12:10	0.00
MH20	JUNCTION	0.492	2.295	0	12:26	0.00
MH21	JUNCTION	0.000	2.295	0	12:26	0.00
MH22	JUNCTION	0.000	2.296	0	12:26	0.00
MH23	JUNCTION	0.000	2.296	0	12:26	0.00
MH24	JUNCTION	0.000	2.296	0	12:27	0.00
MH25	JUNCTION	0.000	2.580	0	12:27	0.00
MH26	JUNCTION	0.346	0.346	0	12:10	0.00
MH27	JUNCTION	0.286	0.286	0	12:10	0.00
MH28	JUNCTION	0.426	0.426	0	12:15	0.00
MH29	JUNCTION	0.234	0.601	0	12:11	0.00
MH3	JUNCTION	0.214	0.637	0	12:10	0.00
MH30	JUNCTION	0.000	0.092	0	12:59	0.00
MH4	JUNCTION	0.000	0.138	0	15:22	0.00
MH5	JUNCTION	0.330	0.330	0	12:10	0.00
MH6	JUNCTION	0.157	0.476	0	12:10	0.00
MH7	JUNCTION	0.304	0.773	0	12:10	0.00
MH8	JUNCTION	0.271	1.032	0	12:10	0.00
MH9	JUNCTION	0.000	0.135	0	14:30	0.00
OF1	OUTFALL	0.000	2.580	0	12:27	0.00
OF2	OUTFALL	0.000	0.282	0	12:10	0.00
OF3	OUTFALL	0.000	0.600	0	12:11	0.00
POND1	STORAGE	0.396	1.021	0	12:10	0.00
POND2	STORAGE	0.561	1.149	0	12:10	0.00
POND3	STORAGE	0.337	1.394	0	12:10	0.00
POND4	STORAGE	0.355	0.355	0	12:10	0.00

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Storage Node Summary
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Storage Node ID	Maximum Ponded	Maximum Ponded	Time of Max Ponded	Average Ponded	Average Ponded	Maximum Storage Node	Maximum Exfiltration	Total Exfiltrated

	Volume 1000 m³	Volume (%)	Volume days hh:mm	Volume 1000 m³	Volume (%)	Outflow cms	Rate cmm	Volume 1000 m³
POND1	3.537	66	0 15:21	1.570	29	0.14	0.00	0.000
POND2	1.510	63	0 12:47	0.389	16	0.20	0.00	0.000
POND3	3.145	67	0 14:30	1.354	29	0.13	0.00	0.000
POND4	0.520	60	0 12:59	0.090	10	0.09	0.00	0.000

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Outfall Loading Summary
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Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF1	91.46	0.514	2.580
OF2	91.57	0.016	0.282
OF3	91.53	0.055	0.600
System	91.52	0.585	3.258

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Link Flow Summary
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Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
EXISTING-3	CONDUIT	0 12:10	3.41	1.00	0.344	14.949	0.02	0.11	0	Calculated

EXISTING-4	CONDUIT	0	12:10	1.97	1.00	0.282	7.095	0.04	0.14	0	Calculated
EXISTING-5	CONDUIT	0	12:11	2.47	1.00	0.600	7.177	0.08	0.20	0	Calculated
EXISTING-6	CONDUIT	0	12:16	2.42	1.00	0.424	8.061	0.05	0.16	0	Calculated
L1	CONDUIT	0	12:10	2.43	1.00	0.181	11.562	0.02	0.09	0	Calculated
L10	CONDUIT	0	00:00	0.00	1.00	0.000	9.368	0.00	0.00	0	Calculated
L11	CONDUIT	0	12:10	3.20	1.00	0.611	10.018	0.06	0.17	0	Calculated
L12	CONDUIT	0	12:22	3.59	1.00	0.578	12.395	0.05	0.15	0	Calculated
L13	CONDUIT	0	12:30	3.46	1.00	1.422	8.137	0.17	0.28	0	Calculated
L14	CONDUIT	0	12:47	0.35	1.00	0.196	0.731	0.27	0.35	0	Calculated
L15	CONDUIT	0	14:32	1.34	1.00	0.135	5.922	0.02	0.11	0	Calculated
L16	CONDUIT	0	14:32	1.14	1.00	0.135	4.486	0.03	0.12	0	Calculated
L17	CONDUIT	0	12:15	1.20	1.00	0.223	28.507	0.01	0.06	0	Calculated
L18	CONDUIT	0	12:32	3.77	1.00	1.630	8.687	0.19	0.29	0	Calculated
L19	CONDUIT	0	12:15	1.40	1.00	0.223	4.838	0.05	0.15	0	Calculated
L2	CONDUIT	0	12:11	3.08	1.00	0.437	10.976	0.04	0.14	0	Calculated
L20	CONDUIT	0	12:26	2.55	1.00	2.295	4.470	0.51	0.51	0	Calculated
L21	CONDUIT	0	12:26	2.55	1.00	2.296	4.478	0.51	0.51	0	Calculated
L22	CONDUIT	0	12:26	2.54	1.00	2.296	4.468	0.51	0.51	0	Calculated
L23	CONDUIT	0	12:27	5.78	1.00	2.296	13.801	0.17	0.28	0	Calculated
L24	CONDUIT	0	12:27	5.68	1.00	2.296	13.459	0.17	0.28	0	Calculated
L25	CONDUIT	0	12:27	4.90	1.00	2.580	10.454	0.25	0.34	0	Calculated
L26	CONDUIT	0	13:00	2.18	1.00	0.092	13.438	0.01	0.06	0	Calculated
L3	CONDUIT	0	12:11	3.68	1.00	0.637	12.325	0.05	0.15	0	Calculated
L4	CONDUIT	0	15:22	2.63	1.00	0.138	14.864	0.01	0.07	0	Calculated
L5	CONDUIT	0	12:10	2.23	1.00	0.327	7.834	0.04	0.14	0	Calculated
L6	CONDUIT	0	12:10	3.76	1.00	0.476	14.299	0.03	0.12	0	Calculated
L7	CONDUIT	0	12:10	3.54	1.00	0.772	10.727	0.07	0.18	0	Calculated
L8	CONDUIT	0	12:10	3.45	1.00	1.031	9.243	0.11	0.23	0	Calculated
L9	CONDUIT	0	00:00	0.00	1.00	0.000	8.335	0.00	0.00	0	Calculated
Orifice-01	ORIFICE	0	15:22			0.027					
Orifice-02	ORIFICE	0	15:22			0.111					
Orifice-03	ORIFICE	0	12:47			0.071					
Orifice-04	ORIFICE	0	12:47			0.125					
Orifice-05	ORIFICE	0	14:30			0.032					
Orifice-06	ORIFICE	0	14:30			0.103					
Orifice-07	ORIFICE	0	12:59			0.049					

Orifice-08	ORIFICE	0	12:59	0.043	
Weir-01	WEIR	0	00:00	0.000	0.00
Weir-02	WEIR	0	00:00	0.000	0.00
Weir-03	WEIR	0	00:00	0.000	0.00
Weir-04	WEIR	0	00:00	0.000	0.00

50-YEAR

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Subbasin Runoff Summary
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Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	114.00	0.00	0.00	32.18	69.11	1.39	0.606	0	03:14:55
Sub-02	114.00	0.00	0.00	32.18	70.44	0.94	0.618	0	02:48:00
Sub-03	114.00	0.00	0.00	21.26	86.47	0.25	0.759	0	01:12:51
Sub-04	114.00	0.00	0.00	21.26	86.51	0.37	0.759	0	01:11:30
Sub-05	114.00	0.00	0.00	21.26	86.36	0.30	0.758	0	01:16:21
Sub-06	114.00	0.00	0.00	18.53	82.24	0.57	0.721	0	03:43:12
Sub-07	114.00	0.00	0.00	18.53	88.65	0.50	0.778	0	01:12:16
Sub-08	114.00	0.00	0.00	21.26	88.04	0.44	0.772	0	00:23:07
Sub-09	114.00	0.00	0.00	21.26	88.03	0.21	0.772	0	00:23:19
Sub-10	114.00	0.00	0.00	21.26	88.01	0.11	0.772	0	00:24:33
Sub-11	114.00	0.00	0.00	21.26	87.57	0.84	0.768	0	00:37:31
Sub-12	114.00	0.00	0.00	21.26	87.59	0.41	0.768	0	00:37:03
Sub-13	114.00	0.00	0.00	18.53	88.99	0.47	0.781	0	01:02:35
Sub-14	114.00	0.00	0.00	21.26	87.55	0.76	0.768	0	00:38:12
Sub-15	114.00	0.00	0.00	21.26	87.50	0.37	0.768	0	00:39:57
Sub-16	114.00	0.00	0.00	32.18	72.38	0.80	0.635	0	02:04:53
Sub-17	114.00	0.00	0.00	32.18	73.43	0.33	0.644	0	01:39:35
Sub-18	114.00	0.00	0.00	32.18	75.00	0.13	0.658	0	00:59:32
Sub-19	114.00	40.24	0.00	34.73	110.69	0.22	0.718	0	01:27:32
Sub-20	114.00	6.60	0.00	32.68	77.45	0.36	0.642	0	02:23:24
Sub-21	114.00	164.47	0.00	24.64	244.06	0.53	0.876	0	01:28:40
Sub-22	114.00	53.64	0.00	22.96	137.28	0.65	0.819	0	01:18:09
Sub-23	114.00	0.00	0.00	21.26	86.28	0.40	0.757	0	01:18:50
Sub-24	114.00	317.65	0.00	40.61	381.46	0.65	0.884	0	00:53:22
Sub-25	114.00	0.00	0.00	21.26	85.74	0.33	0.752	0	01:35:16

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Node Depth Summary
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Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
MH1	0.03	0.16	161.01	0	12:10	0	0	0:00:00
MH10	0.00	0.00	139.35	0	00:00	0	0	0:00:00
MH11	0.00	0.00	148.35	0	00:00	0	0	0:00:00
MH12	0.04	0.29	145.64	0	12:10	0	0	0:00:00
MH13	0.07	0.28	157.13	0	12:20	0	0	0:00:00
MH14	0.14	0.55	143.05	0	12:20	0	0	0:00:00
MH15	0.22	0.61	138.21	0	12:45	0	0	0:00:00
MH16	0.22	0.61	138.21	0	12:45	0	0	0:00:00
MH17	0.10	0.21	133.05	0	14:28	0	0	0:00:00
MH18	0.10	0.25	133.01	0	12:24	0	0	0:00:00
MH19	0.11	0.29	132.11	0	12:24	0	0	0:00:00
MH2	0.04	0.24	157.59	0	12:10	0	0	0:00:00
MH20	0.29	1.04	132.84	0	12:22	0	0	0:00:00
MH21	0.29	1.04	132.57	0	12:22	0	0	0:00:00
MH22	0.29	1.05	132.35	0	12:23	0	0	0:00:00
MH23	0.29	1.04	132.08	0	12:23	0	0	0:00:00
MH24	0.16	0.54	128.25	0	12:23	0	0	0:00:00
MH25	0.19	0.66	127.11	0	12:23	0	0	0:00:00
MH26	0.05	0.19	129.80	0	12:10	0	0	0:00:00
MH27	0.04	0.24	126.69	0	12:10	0	0	0:00:00
MH28	0.06	0.29	123.94	0	12:15	0	0	0:00:00
MH29	0.08	0.36	121.76	0	12:10	0	0	0:00:00
MH3	0.05	0.27	149.87	0	12:10	0	0	0:00:00

MH30	0.04	0.10	140.58	0	12:59	0	0	0:00:00
MH4	0.06	0.12	146.87	0	14:59	0	0	0:00:00
MH5	0.03	0.24	143.47	0	12:10	0	0	0:00:00
MH6	0.03	0.24	141.59	0	12:10	0	0	0:00:00
MH7	0.05	0.32	138.42	0	12:10	0	0	0:00:00
MH8	0.06	0.39	136.62	0	12:10	0	0	0:00:00
MH9	0.09	0.18	134.43	0	14:26	0	0	0:00:00
OF1	0.19	0.66	126.84	0	12:23	0	0	0:00:00
OF2	0.04	0.24	126.39	0	12:10	0	0	0:00:00
OF3	0.08	0.36	121.52	0	12:10	0	0	0:00:00
POND1	0.56	1.30	148.80	0	14:59	0	0	0:00:00
POND2	0.50	1.78	141.78	0	12:45	0	0	0:00:00
POND3	0.77	1.79	136.79	0	14:26	0	0	0:00:00
POND4	0.28	1.33	144.33	0	12:59	0	0	0:00:00

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Node Flow Summary
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Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
MH1	JUNCTION	0.253	0.253	0	12:10	0.00		
MH10	JUNCTION	0.000	0.000	0	00:00	0.00		
MH11	JUNCTION	0.000	0.000	0	00:00	0.00		
MH12	JUNCTION	0.843	0.843	0	12:10	0.00		
MH13	JUNCTION	0.945	0.945	0	12:20	0.00		
MH14	JUNCTION	1.394	2.336	0	12:20	0.00		
MH15	JUNCTION	0.000	2.588	0	12:22	0.00		
MH16	JUNCTION	0.000	0.252	0	12:45	0.00		
MH17	JUNCTION	0.000	0.181	0	14:28	0.00		
MH18	JUNCTION	0.329	0.389	0	12:24	0.00		

MH19	JUNCTION	0.000	0.387	0	12:24	0.00
MH2	JUNCTION	0.372	0.617	0	12:10	0.00
MH20	JUNCTION	0.801	3.716	0	12:22	0.00
MH21	JUNCTION	0.000	3.715	0	12:22	0.00
MH22	JUNCTION	0.000	3.715	0	12:23	0.00
MH23	JUNCTION	0.000	3.715	0	12:23	0.00
MH24	JUNCTION	0.000	3.715	0	12:23	0.00
MH25	JUNCTION	0.000	4.174	0	12:23	0.00
MH26	JUNCTION	0.529	0.529	0	12:10	0.00
MH27	JUNCTION	0.398	0.398	0	12:10	0.00
MH28	JUNCTION	0.653	0.653	0	12:15	0.00
MH29	JUNCTION	0.327	0.903	0	12:10	0.00
MH3	JUNCTION	0.299	0.890	0	12:10	0.00
MH30	JUNCTION	0.000	0.113	0	12:59	0.00
MH4	JUNCTION	0.000	0.195	0	14:59	0.00
MH5	JUNCTION	0.438	0.438	0	12:10	0.00
MH6	JUNCTION	0.208	0.630	0	12:10	0.00
MH7	JUNCTION	0.411	1.039	0	12:10	0.00
MH8	JUNCTION	0.369	1.392	0	12:10	0.00
MH9	JUNCTION	0.000	0.181	0	14:26	0.00
OF1	OUTFALL	0.000	4.174	0	12:23	0.00
OF2	OUTFALL	0.000	0.392	0	12:10	0.00
OF3	OUTFALL	0.000	0.901	0	12:10	0.00
POND1	STORAGE	0.569	1.441	0	12:10	0.00
POND2	STORAGE	0.761	1.569	0	12:10	0.00
POND3	STORAGE	0.468	1.909	0	12:10	0.00
POND4	STORAGE	0.495	0.495	0	12:10	0.00

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Storage Node Summary
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Storage Node ID	Maximum Ponded	Maximum Ponded	Time of Max Ponded	Average Ponded	Average Ponded	Maximum Storage Node	Maximum Exfiltration	Total Exfiltrated

	Volume 1000 m³	Volume (%)	Volume days hh:mm	Volume 1000 m³	Volume (%)	Outflow cms	Rate cmm	Volume 1000 m³
POND1	4.550	85	0 14:59	1.906	35	0.20	0.00	0.000
POND2	2.066	86	0 12:45	0.499	21	0.25	0.00	0.000
POND3	4.058	87	0 14:26	1.655	35	0.18	0.00	0.000
POND4	0.735	84	0 12:59	0.128	15	0.11	0.00	0.000

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Outfall Loading Summary
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Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF1	93.09	0.718	4.174
OF2	93.20	0.021	0.392
OF3	93.16	0.075	0.901
System	93.15	0.813	5.184

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Link Flow Summary
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Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
EXISTING-3	CONDUIT	0 12:10	3.99	1.00	0.526	14.949	0.04	0.13	0	Calculated

EXISTING-4	CONDUIT	0	12:10	2.17	1.00	0.392	7.095	0.06	0.16	0	Calculated
EXISTING-5	CONDUIT	0	12:10	2.78	1.00	0.901	7.177	0.13	0.24	0	Calculated
EXISTING-6	CONDUIT	0	12:15	2.75	1.00	0.650	8.061	0.08	0.19	0	Calculated
L1	CONDUIT	0	12:10	2.64	1.00	0.251	11.562	0.02	0.10	0	Calculated
L10	CONDUIT	0	00:00	0.00	1.00	0.000	9.368	0.00	0.00	0	Calculated
L11	CONDUIT	0	12:10	3.50	1.00	0.827	10.018	0.08	0.19	0	Calculated
L12	CONDUIT	0	12:20	4.15	1.00	0.944	12.395	0.08	0.19	0	Calculated
L13	CONDUIT	0	12:21	3.98	1.00	2.334	8.137	0.29	0.37	0	Calculated
L14	CONDUIT	0	12:45	0.38	1.00	0.252	0.731	0.35	0.41	0	Calculated
L15	CONDUIT	0	14:28	1.52	1.00	0.181	5.922	0.03	0.12	0	Calculated
L16	CONDUIT	0	14:28	1.24	1.00	0.181	4.486	0.04	0.14	0	Calculated
L17	CONDUIT	0	12:24	1.43	1.00	0.387	28.507	0.01	0.08	0	Calculated
L18	CONDUIT	0	12:23	4.29	1.00	2.586	8.687	0.30	0.37	0	Calculated
L19	CONDUIT	0	12:25	1.64	1.00	0.387	4.838	0.08	0.19	0	Calculated
L2	CONDUIT	0	12:11	3.40	1.00	0.609	10.976	0.06	0.16	0	Calculated
L20	CONDUIT	0	12:22	2.83	1.00	3.715	4.470	0.83	0.70	0	Calculated
L21	CONDUIT	0	12:23	2.83	1.00	3.715	4.478	0.83	0.70	0	Calculated
L22	CONDUIT	0	12:23	2.83	1.00	3.715	4.468	0.83	0.70	0	Calculated
L23	CONDUIT	0	12:23	6.62	1.00	3.715	13.801	0.27	0.35	0	Calculated
L24	CONDUIT	0	12:23	6.51	1.00	3.715	13.459	0.28	0.36	0	Calculated
L25	CONDUIT	0	12:23	5.58	1.00	4.174	10.454	0.40	0.44	0	Calculated
L26	CONDUIT	0	13:00	2.31	1.00	0.113	13.438	0.01	0.07	0	Calculated
L3	CONDUIT	0	12:11	4.07	1.00	0.891	12.325	0.07	0.18	0	Calculated
L4	CONDUIT	0	15:00	2.94	1.00	0.195	14.864	0.01	0.08	0	Calculated
L5	CONDUIT	0	12:10	2.42	1.00	0.434	7.834	0.06	0.16	0	Calculated
L6	CONDUIT	0	12:10	4.08	1.00	0.631	14.299	0.04	0.14	0	Calculated
L7	CONDUIT	0	12:10	3.84	1.00	1.028	10.727	0.10	0.21	0	Calculated
L8	CONDUIT	0	12:10	3.77	1.00	1.388	9.243	0.15	0.26	0	Calculated
L9	CONDUIT	0	00:00	0.00	1.00	0.000	8.335	0.00	0.00	0	Calculated
Orifice-01	ORIFICE	0	14:59			0.030					
Orifice-02	ORIFICE	0	14:59			0.165					
Orifice-03	ORIFICE	0	12:45			0.080					
Orifice-04	ORIFICE	0	12:45			0.169					
Orifice-05	ORIFICE	0	14:26			0.036					
Orifice-06	ORIFICE	0	14:26			0.145					
Orifice-07	ORIFICE	0	12:59			0.055					

Orifice-08	ORIFICE	0	12:59	0.058	
Weir-01	WEIR	0	00:00	0.000	0.00
Weir-02	WEIR	0	12:45	0.003	0.00
Weir-03	WEIR	0	00:00	0.000	0.00
Weir-04	WEIR	0	12:59	0.000	0.00

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Subbasin Runoff Summary
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Subbasin ID	Total Rainfall mm	Total Runon mm	Total Evap. mm	Total Infil. mm	Total Runoff mm	Peak Runoff cms	Runoff Coefficient	Time of Concentration days	Time of Concentration hh:mm:ss
Sub-01	133.00	0.00	0.00	33.53	86.08	1.91	0.647	0	03:03:15
Sub-02	133.00	0.00	0.00	33.53	87.51	1.28	0.658	0	02:37:57
Sub-03	133.00	0.00	0.00	21.99	104.57	0.31	0.786	0	01:08:30
Sub-04	133.00	0.00	0.00	21.99	104.62	0.46	0.787	0	01:07:14
Sub-05	133.00	0.00	0.00	21.99	104.45	0.37	0.785	0	01:11:47
Sub-06	133.00	0.00	0.00	19.02	100.07	0.72	0.752	0	03:29:50
Sub-07	133.00	0.00	0.00	19.02	106.97	0.62	0.804	0	01:07:57
Sub-08	133.00	0.00	0.00	21.99	106.31	0.53	0.799	0	00:21:44
Sub-09	133.00	0.00	0.00	21.99	106.30	0.25	0.799	0	00:21:55
Sub-10	133.00	0.00	0.00	21.99	106.26	0.13	0.799	0	00:23:05
Sub-11	133.00	0.00	0.00	21.99	105.79	1.03	0.795	0	00:35:17
Sub-12	133.00	0.00	0.00	21.99	105.81	0.50	0.796	0	00:34:50
Sub-13	133.00	0.00	0.00	19.02	107.35	0.58	0.807	0	00:58:50
Sub-14	133.00	0.00	0.00	21.99	105.77	0.93	0.795	0	00:35:55
Sub-15	133.00	0.00	0.00	21.99	105.71	0.45	0.795	0	00:37:34
Sub-16	133.00	0.00	0.00	33.53	89.61	1.09	0.674	0	01:57:24
Sub-17	133.00	0.00	0.00	33.53	90.76	0.44	0.682	0	01:33:38
Sub-18	133.00	0.00	0.00	33.53	92.49	0.17	0.695	0	00:55:58
Sub-19	133.00	49.63	0.00	35.99	137.46	0.29	0.753	0	01:22:17
Sub-20	133.00	7.97	0.00	34.01	95.97	0.49	0.681	0	02:14:49
Sub-21	133.00	203.84	0.00	25.13	301.47	0.70	0.895	0	01:23:22
Sub-22	133.00	66.61	0.00	23.61	168.33	0.83	0.843	0	01:13:29
Sub-23	133.00	0.00	0.00	21.99	104.36	0.50	0.785	0	01:14:07
Sub-24	133.00	389.51	0.00	41.28	471.25	0.85	0.902	0	00:50:11
Sub-25	133.00	0.00	0.00	21.99	103.78	0.41	0.780	0	01:29:34

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Node Depth Summary
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Node ID	Average Depth Attained m	Maximum Depth Attained m	Maximum HGL Attained m	Time of Max Occurrence days	Time of Max Occurrence hh:mm	Total Flooded Volume ha-mm	Total Flooded Time minutes	Retention Time hh:mm:ss
MH1	0.03	0.17	161.02	0	12:08	0	0	0:00:00
MH10	0.00	0.00	139.35	0	00:00	0	0	0:00:00
MH11	0.00	0.00	148.35	0	00:00	0	0	0:00:00
MH12	0.05	0.32	145.67	0	12:10	0	0	0:00:00
MH13	0.08	0.33	157.18	0	12:20	0	0	0:00:00
MH14	0.16	0.65	143.15	0	12:20	0	0	0:00:00
MH15	0.24	1.10	138.70	0	12:24	0	0	0:00:00
MH16	0.24	1.10	138.70	0	12:24	0	0	0:00:00
MH17	0.11	0.34	133.18	0	12:53	0	0	0:00:00
MH18	0.12	0.34	133.10	0	12:50	0	0	0:00:00
MH19	0.12	0.38	132.21	0	12:53	0	0	0:00:00
MH2	0.05	0.27	157.62	0	12:10	0	0	0:00:00
MH20	0.34	1.65	133.44	0	12:11	110.14	40	0:00:00
MH21	0.38	6.00	137.53	0	12:11	8.83	15	0:00:00
MH22	0.34	1.65	132.96	0	12:12	6.73	40	0:00:00
MH23	0.33	1.29	132.32	0	12:51	0	0	0:00:00
MH24	0.18	0.61	128.32	0	12:51	0	0	0:00:00
MH25	0.22	0.75	127.20	0	12:13	0	0	0:00:00
MH26	0.06	0.22	129.83	0	12:10	0	0	0:00:00
MH27	0.05	0.27	126.72	0	12:10	0	0	0:00:00
MH28	0.07	0.33	123.98	0	12:15	0	0	0:00:00
MH29	0.08	0.41	121.81	0	12:10	0	0	0:00:00
MH3	0.05	0.30	149.90	0	12:10	0	0	0:00:00

MH30	0.04	0.14	140.62	0	12:33	0	0	0:00:00
MH4	0.07	0.17	146.92	0	13:59	0	0	0:00:00
MH5	0.04	0.27	143.50	0	12:10	0	0	0:00:00
MH6	0.04	0.26	141.61	0	12:10	0	0	0:00:00
MH7	0.05	0.35	138.45	0	12:10	0	0	0:00:00
MH8	0.06	0.44	136.67	0	12:10	0	0	0:00:00
MH9	0.10	0.29	134.54	0	12:52	0	0	0:00:00
OF1	0.22	0.75	126.93	0	12:13	0	0	0:00:00
OF2	0.05	0.27	126.42	0	12:10	0	0	0:00:00
OF3	0.08	0.41	121.57	0	12:10	0	0	0:00:00
POND1	0.60	1.39	148.89	0	13:37	0	0	0:00:00
POND2	0.55	1.90	141.90	0	12:24	0	0	0:00:00
POND3	0.82	1.89	136.89	0	12:52	0	0	0:00:00
POND4	0.31	1.40	144.40	0	12:33	0	0	0:00:00

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Node Flow Summary
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Node ID	Element Type	Maximum Lateral Inflow cms	Peak Inflow cms	Time of Peak Inflow Occurrence days	Time of Peak Inflow Occurrence hh:mm	Maximum Flooding Overflow cms	Time of Peak Flooding Occurrence days	Time of Peak Flooding Occurrence hh:mm
MH1	JUNCTION	0.314	0.314	0	12:10	0.00		
MH10	JUNCTION	0.000	0.000	0	00:00	0.00		
MH11	JUNCTION	0.000	0.000	0	00:00	0.00		
MH12	JUNCTION	1.029	1.029	0	12:10	0.00		
MH13	JUNCTION	1.276	1.276	0	12:20	0.00		
MH14	JUNCTION	1.907	3.182	0	12:20	0.00		
MH15	JUNCTION	0.000	3.893	0	12:24	0.00		
MH16	JUNCTION	0.000	0.649	0	12:24	0.00		
MH17	JUNCTION	0.000	0.493	0	12:53	0.00		
MH18	JUNCTION	0.438	0.689	0	12:50	0.00		

MH19	JUNCTION	0.000	0.688	0	12:53	0.00			
MH2	JUNCTION	0.461	0.768	0	12:10	0.00			
MH20	JUNCTION	1.086	5.345	0	12:24	0.87	0	12:24	
MH21	JUNCTION	0.000	4.795	0	12:41	0.27	0	12:41	
MH22	JUNCTION	0.000	4.634	0	12:15	0.15	0	12:14	
MH23	JUNCTION	0.000	4.647	0	12:51	0.00			
MH24	JUNCTION	0.000	4.621	0	12:51	0.00			
MH25	JUNCTION	0.000	5.210	0	12:13	0.00			
MH26	JUNCTION	0.697	0.697	0	12:10	0.00			
MH27	JUNCTION	0.495	0.495	0	12:10	0.00			
MH28	JUNCTION	0.853	0.853	0	12:15	0.00			
MH29	JUNCTION	0.408	1.165	0	12:10	0.00			
MH3	JUNCTION	0.371	1.110	0	12:10	0.00			
MH30	JUNCTION	0.000	0.250	0	12:33	0.00			
MH4	JUNCTION	0.000	0.413	0	13:37	0.00			
MH5	JUNCTION	0.528	0.528	0	12:10	0.00			
MH6	JUNCTION	0.251	0.765	0	12:10	0.00			
MH7	JUNCTION	0.502	1.259	0	12:10	0.00			
MH8	JUNCTION	0.451	1.699	0	12:10	0.00			
MH9	JUNCTION	0.000	0.493	0	12:52	0.00			
OF1	OUTFALL	0.000	5.209	0	12:13	0.00			
OF2	OUTFALL	0.000	0.494	0	12:10	0.00			
OF3	OUTFALL	0.000	1.165	0	12:10	0.00			
POND1	STORAGE	0.723	1.810	0	12:10	0.00			
POND2	STORAGE	0.930	1.920	0	12:10	0.00			
POND3	STORAGE	0.579	2.340	0	12:10	0.00			
POND4	STORAGE	0.616	0.616	0	12:10	0.00			

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Storage Node Summary
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Storage Node ID	Maximum Ponded	Maximum Ponded	Time of Max Ponded	Average Ponded	Average Ponded	Maximum Storage Node	Maximum Exfiltration	Total Exfiltrated

	Volume 1000 m³	Volume (%)	Volume days hh:mm	Volume 1000 m³	Volume (%)	Outflow cms	Rate cmm	Volume 1000 m³
POND1	4.917	92	0 13:36	2.061	38	0.41	0.00	0.000
POND2	2.243	93	0 12:24	0.550	23	0.65	0.00	0.000
POND3	4.357	93	0 12:52	1.771	38	0.49	0.00	0.000
POND4	0.792	91	0 12:33	0.145	17	0.25	0.00	0.000

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Outfall Loading Summary
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Outfall Node ID	Flow Frequency (%)	Average Flow cms	Peak Inflow cms
OF1	94.00	0.876	5.209
OF2	94.10	0.025	0.494
OF3	94.06	0.091	1.165
System	94.05	0.992	6.743

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Link Flow Summary
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Link ID	Element Type	Time of Peak Flow Occurrence days hh:mm	Maximum Velocity Attained m/sec	Length Factor	Peak Flow during Analysis cms	Design Flow Capacity cms	Ratio of Maximum /Design Flow	Ratio of Maximum Flow Depth	Total Time Surcharged minutes	Reported Condition
EXISTING-3	CONDUIT	0 12:10	4.32	1.00	0.688	14.949	0.05	0.15	0	Calculated

EXISTING-4	CONDUIT	0	12:10	2.31	1.00	0.494	7.095	0.07	0.18	0	Calculated
EXISTING-5	CONDUIT	0	12:10	2.99	1.00	1.165	7.177	0.16	0.27	0	Calculated
EXISTING-6	CONDUIT	0	12:15	2.97	1.00	0.850	8.061	0.11	0.22	0	Calculated
L1	CONDUIT	0	12:10	2.85	1.00	0.311	11.562	0.03	0.11	0	Calculated
L10	CONDUIT	0	00:00	0.00	1.00	0.000	9.368	0.00	0.00	0	Calculated
L11	CONDUIT	0	12:10	3.71	1.00	1.017	10.018	0.10	0.21	0	Calculated
L12	CONDUIT	0	12:20	4.53	1.00	1.276	12.395	0.10	0.22	0	Calculated
L13	CONDUIT	0	12:21	4.32	1.00	3.179	8.137	0.39	0.43	0	Calculated
L14	CONDUIT	0	12:24	0.47	1.00	0.649	0.731	0.89	0.73	0	Calculated
L15	CONDUIT	0	12:53	2.03	1.00	0.493	5.922	0.08	0.20	0	Calculated
L16	CONDUIT	0	12:54	1.67	1.00	0.493	4.486	0.11	0.22	0	Calculated
L17	CONDUIT	0	12:53	1.64	1.00	0.688	28.507	0.02	0.11	0	Calculated
L18	CONDUIT	0	12:25	4.78	1.00	3.890	8.687	0.45	0.47	0	Calculated
L19	CONDUIT	0	12:53	1.94	1.00	0.688	4.838	0.14	0.25	0	Calculated
L2	CONDUIT	0	12:11	3.59	1.00	0.753	10.976	0.07	0.18	0	Calculated
L20	CONDUIT	0	12:41	2.93	1.00	4.795	4.470	1.07	1.00	26	SURCHARGED
L21	CONDUIT	0	12:15	2.94	1.00	4.634	4.478	1.03	0.93	0	> CAPACITY
L22	CONDUIT	0	12:51	2.94	1.00	4.647	4.468	1.04	0.92	0	> CAPACITY
L23	CONDUIT	0	12:51	7.04	1.00	4.621	13.801	0.33	0.40	0	Calculated
L24	CONDUIT	0	12:51	6.89	1.00	4.602	13.459	0.34	0.40	0	Calculated
L25	CONDUIT	0	12:13	5.91	1.00	5.209	10.454	0.50	0.50	0	Calculated
L26	CONDUIT	0	12:34	2.93	1.00	0.250	13.438	0.02	0.10	0	Calculated
L3	CONDUIT	0	12:11	4.33	1.00	1.105	12.325	0.09	0.20	0	Calculated
L4	CONDUIT	0	13:37	3.68	1.00	0.413	14.864	0.03	0.11	0	Calculated
L5	CONDUIT	0	12:10	2.56	1.00	0.524	7.834	0.07	0.18	0	Calculated
L6	CONDUIT	0	12:10	4.31	1.00	0.765	14.299	0.05	0.16	0	Calculated
L7	CONDUIT	0	12:10	4.07	1.00	1.253	10.727	0.12	0.23	0	Calculated
L8	CONDUIT	0	12:10	3.98	1.00	1.694	9.243	0.18	0.29	0	Calculated
L9	CONDUIT	0	00:00	0.00	1.00	0.000	8.335	0.00	0.00	0	Calculated
Orifice-01	ORIFICE	0	13:37			0.031					
Orifice-02	ORIFICE	0	13:37			0.180					
Orifice-03	ORIFICE	0	12:24			0.082					
Orifice-04	ORIFICE	0	12:24			0.181					
Orifice-05	ORIFICE	0	12:52			0.037					
Orifice-06	ORIFICE	0	12:52			0.156					
Orifice-07	ORIFICE	0	12:33			0.057					

Orifice-08	ORIFICE	0	12:33	0.061	
Weir-01	WEIR	0	13:37	0.202	0.00
Weir-02	WEIR	0	12:24	0.386	0.00
Weir-03	WEIR	0	12:52	0.301	0.00
Weir-04	WEIR	0	12:33	0.132	0.00

ANNEXURE C: MAINTENANCE SCHEDULES

TABLE C.1: STORMWATER MAINTENANCE SCHEDULE: ATTENUATION PONDS

COMPONENT	No.	INSPECTIONS (I)		NO	ROUTINE MAINTENANCE (R)		NO.	CORRECTIVE AND IRREGULAR MAINTENANCE		NO.	ANNUAL SPREAD OF MAINTENANCE ACTIVITIES (I=INSPECTION; R=ROUTINE; OTHER AS SPECIFIED)											
		ACTIVITY	FREQUENCY (months)		ACTIVITY	FREQUENCY (months)		ACTIVITY	FREQUENCY (months)		J	F	M	A	M	J	J	A	S	O	N	D
INLET PIPES	3.1	CHECK THAT THE PIPE IS NOT BLOCKED	4	3.1	REMOVE ANY OBSTRUC-TIONS	4	3.1	REPAIR DAMAGE	AS REQUIRED		I, R			I, R			I, R			I, R		
SEDIMENT CHAMBERS WITH WEEPHOLES	3.2	NOTE SEDIMENT LEVEL; FUNCTIONING OF WEEPHOLES	4	3.2	REMOVE SEDIMENT, ENSURE WEEPHOLES ARE NOT CLOGGED	4	3.2	REPAIR ANY CRACKS OR DAMAGE; REPLACE WEEPHOLE SOCKS	AS REQUIRED		I, R			I, R			I, R			I, R		
MAIN TANK	3.3	NOTE ANY CRACKS OR DAMAGE; TANK TO DRAIN EMPTY	4	3.3	ENSURE TANK DRAINS EMPTY	AFTER RAINFALL	3.3	REPAIR ANY CRACKS OR DAMAGE	AS REQUIRED		I, R			I, R			I, R			I, R		
OUTLET CHAMBER	3.4	NOTE ANY CRACKS OR DAMAGE	4	3.4	REMOVE SEDIMENT	4	3.4	REPAIR DAMAGE	AS REQUIRED		I, R			I, R			I, R			I, R		
ORIFICES, WEIR AND SPILLWAY	3.5	ENSURE ALL OPENINGS ARE CLEAR	4	3.5	REMOVE ANY OBSTRUCTIONS	4	3.5	REPAIR DAMAGE	AS REQUIRED		I, R			I, R			I, R			I, R		

Reference:

The South African Guidelines for Sustainable Drainage Systems. N Armitage, M Vice, L Fisher-jeffes, K Winter, A Spiegel, J Dustan. Water Research Commission report TT558/13, May 2013.

The SuDs Manual, B Woods Ballard, S Wilson, H Udale-Clarke, S-Illman, T Scott, R Ashley, R Kellaher. Department for Environment Food & Rural Affairs, ISBN 978-0-86017-760-9, 2015

TABLE C.2: STORMWATER MAINTENANCE SCHEDULE: MANHOLES, PIPES, OUTLET STRUCTURE AND CHANNELS

COMPONENT	NO.	INSPECTIONS (I)		NO.	ROUTINE MAINTENANCE (R)		NO.	CORRECTIVE AND IRREGULAR MAINTENANCE		ANNUAL SPREAD OF MAINTENANCE ACTIVITIES (I=INSPECTION; R=ROUTINE; OTHER AS SPECIFIED)											
		ACTIVITY	FREQUENCY (months)		ACTIVITY	FREQUENCY (months)		ACTIVITY	FREQUENCY (months)	J	F	M	A	M	J	J	A	S	O	N	D
A) ROADS AND PARKING																					
Stormwater overland routes	1.1	Inspect overland routes for obstructions, sediment or damage	1	1.1	Remove obstructions, sediment from overland flow routes	3	1.1	Repair sagging/low points, damage in overland flow routes	On occurrence	I,R	I	I	I,R	I	I	I,R	I	I	I,R	I	I
Underground Pipes	3.2	Inspect pipes for obstructions, sediment and sagging	3	3.2	Remove obstructions, sediment	3	3.2	Repair damages to pipes	On occurrence	I,R			I,R			I,R			I,R		
Manholes and Catch Pits	3.3	Inspect manholes and catch pits for obstructions, sediment and damages	3	3.3	Remove obstructions, sediment	3	3.3	Repair damages to manholes/catch pits	On occurrence	I,R			I,R			I,R			I,R		