

**LEGACY MOUNTAIN ESTATES
RESIDENTIAL DEVELOPMENT
HUNTSVILLE, WEBER COUNTY, UTAH 84317
STORM WATER STUDY
Project No. 20N224
June 11, 2021**

General Site Information:

The proposed Legacy Mountain Residential Development site is located in the Ogden Valley off Old Snowbasin Road South of Highway 39 in Huntsville, Weber County, Utah. Construction will consist of a new road, underground utilities, some retaining walls and detention ponds to accommodate (48) residential lots and (3) common areas when completed.

Storm water from the site will sheet flow across open ground or will be collected in catch basins and will continue via storm drain to one of eight detention areas designated on the attached figure. Storm water will be detained in these detention areas. The site is allowed a unit-release of 0.1 cfs per acre for the 10-yr storm into existing drainage streams throughout the site. Detention calculations have been provided for the site and are included in this report

The study area is broken up into 8 drainage areas (labeled A-1 and A-8). A runoff coefficient of 0.15 is used for natural ground and landscaped areas. A runoff coefficient of 0.90 is used for asphalt, concrete, buildings, and other hard surfaced areas. Some of the lots are larger than others. The lot sizes were broken up into (2) separate "zones" to classify more or less hard surface at a lot. Zone 1 represents lots that are sized 8 acres or larger. Zone 2 represents lots that are smaller than 8 acres in size. Using these zones, average runoff coefficients are shown tabulated below for each area. An average runoff coefficient for the entire project site is 0.204.

Area Characteristics		
Area	Runoff Coefficient	Time of Concentration
A-1	0.177	33 minutes
A-2	0.220	27 minutes
A-3	0.187	19 minutes
A-4	0.219	23 minutes
A-5	0.221	26 minutes
A-6	0.221	20 minutes
A-7	0.205	15 minutes
A-8	0.229	28 minutes

Times of concentration are calculated using the FAA method assuming flow resistance coefficients of $K=0.35$ for landscape and $K=0.91$ for hardscape for each of the areas. The times of concentration for each area are shown in the table above. These times are based on the hydraulically longest drainage path inside each respective drainage area over grass or other vegetation, asphalt, concrete, and/or through a pipeline as applicable. Times calculated to be less than 5 minutes are rounded to 5 minutes (as applicable) when using this method. Rainfall Intensities were taken from NOAA Atlas 14 for pipe sizing and detention requirements. The values obtained were interpolated as necessary. A copy of these data is attached.

Data showing area information, runoff coefficient, time of concentration, peak flows, and detention storage requirements for the site are also provided and can be found in the attached calculations.

Pipe Sizes:

Storm water pipes in the project are proposed to be polyvinylchloride pipes (PVC), concrete pipe (CP), and/or reinforced concrete pipe (RCP). All pipes in the project are sloped to provide the design capacity while maintaining a minimum scour speed of at least 2 feet per second when the pipes are flowing at least half full. The pipes and inlet boxes have enough capacity to convey the 10-year storm without surcharging.

Orifice Plates & Required Detention:

An orifice plate will be used to control the rate that storm water flows from each area of the project. The locations of each orifice plate can be found on the attached figure. Each orifice plate opening size is located in the Detention Pond Characteristics table below. Each orifice plate was sized for each detention facility to utilize its capacity during a 10-yr storm with a release rate of 0.1 cfs/acre. The orifice plate will allow small flows to pass through without detention. As the rate of storm water into the pipes and detention facility increases, the orifice plate will restrict the flow. The maximum flow through the plate will occur when the detention basin reaches the maximum design depth. A detail of the orifice plate can be found in the construction documents for this project. Orifice flows at area A-1, A-2, A-5, and A-8 were upsized to allow for historic passthrough flows.

The required detention for the 10-year storm with a release rate of 0.1 cfs/acre for each area can also be found in the table below, along with the available pond volume and excess storage capacity. In the event the detention facility experiences a storm larger than the design storm water will then spill out over a 1 foot overflow to the existing drainage path and will continue southeasterly in a historical fashion.

Detention Pond Characteristics				
Area	Orifice Plate Diameter (inches)	Required Detention (cubic feet)	Available Detention (cubic feet)	Excess Storage (cubic feet)
A-1	19.18	27,034	28,917	1,883
A-2	20.27	20,274	20,781	507
A-3	6.13	8,238	7,170	-1,068
A-4	5.27	9,365	10,243	878
A-5	21.75	22,678	22,788	110
A-6 W	4.39	1,213	1,213	0
A-6 E	5.84	4,692	6,869	2,177
A-7	2.67	2,170	2,261	91
A-8	5.79	10,532	12,365	1,833

Great Basin Engineering, Inc.

Prepared by Heather Avner



Reviewed by Mark E. Babbitt, P.E.

A-1**Combined Detention Facility**

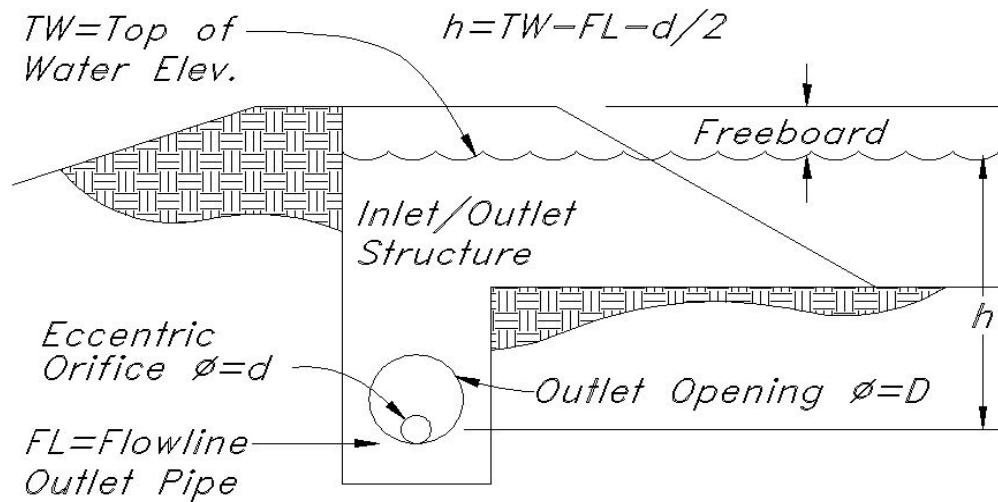
C = **0.18**
 Area = **74.82** acres
 Remaining Unit Discharge = **0.100** cfs/acre
 Release through Restriction = **7.482** cfs

Detention Pond Sized For The **10** Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.97	15755	2245	13510	
10	3.02	23969	4489	19480	
15	2.50	29763	6734	23029	
20	2.13	33799	8979	24820	
25	1.87	37167	11224	25944	
30	1.68	40002	13468	26534	
35	1.54	42747	15713	27034	<- Req. Det.
40	1.40	44441	17958	26483	
45	1.28	45888	20202	25685	
50	1.19	47085	22447	24638	
55	1.10	48232	24692	23540	
60	1.04	49526	26937	22589	
90	0.77	54833	40405	14428	
120	0.62	59431	53873	5558	
180	0.45	64289	80810	-16521	
360	0.29	82290	161620	-79330	
720	0.19	106291	323240	-216949	
1440	0.12	132578	646480	-513902	

Required Storage Volume = **27,034** ft³

ORIFICE PLATE CALCULATIONS



$$Q = 0.62 \cdot A_o \cdot \sqrt{64.4 \cdot h}$$

$$A_o = \frac{\pi \cdot d^2}{4}$$

Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let $\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$

Goal-seek Δ to zero by changing "trial d"

TW =	5071.50	
FL =	5059.38	
Q =	33.578	cfs
trial d =	1.5981	ft
Δ =	0.000	ft
d =	19.18	inches

A-2**Combined Detention Facility**

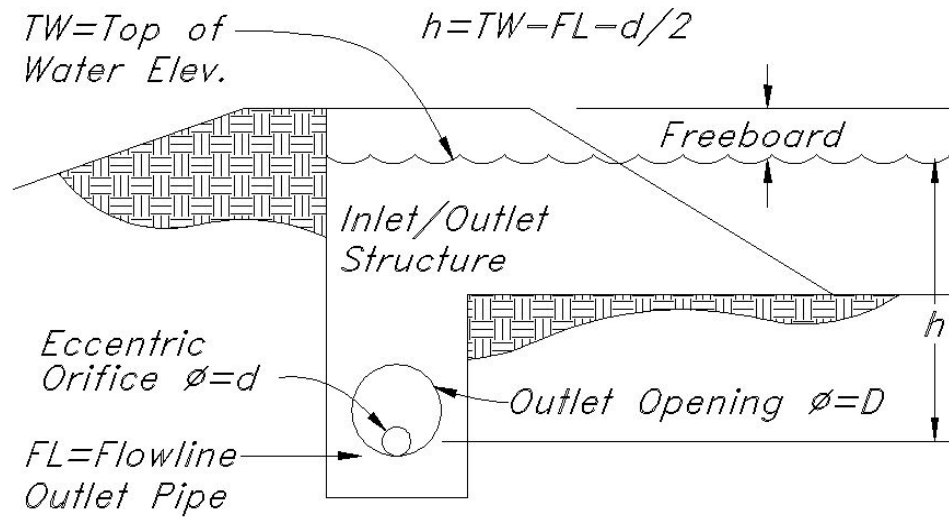
C = **0.22**
 Area = **40.35** acres
 Remaining Unit Discharge = **0.100** cfs/acre
 Release through Restriction = **4.035** cfs

Detention Pond Sized For The **10** Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.97	10595	1211	9385	
10	3.02	16120	2421	13699	
15	2.50	20017	3632	16385	
20	2.13	22731	4842	17888	
25	1.87	24996	6053	18943	
30	1.68	26902	7264	19639	
35	1.54	28748	8474	20274	<- Req. Det.
40	1.40	29888	9685	20203	
45	1.28	30861	10895	19965	
50	1.19	31666	12106	19560	
55	1.10	32437	13317	19120	
60	1.04	33308	14527	18780	
90	0.77	36877	21791	15086	
120	0.62	39969	29054	10915	
180	0.45	43236	43582	-346	
360	0.29	55342	87163	-31822	
720	0.19	71483	174327	-102844	
1440	0.12	89162	348654	-259492	

Required Storage Volume = **20274** ft³

ORIFICE PLATE CALCULATIONS



Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let $\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$

Goal-seek Δ to zero by changing "trial d"

TW =	5211.75	
FL =	5205.75	
Q =	25.318	cfs
trial d =	1.6890	ft
Δ =	0.000	ft
d =	20.27	inches

A-3**Combined Detention Facility (DISCHARGES TO A-1 POND; A-1 RESTRICTION UPSIZED TO ACCOMMODATE)**

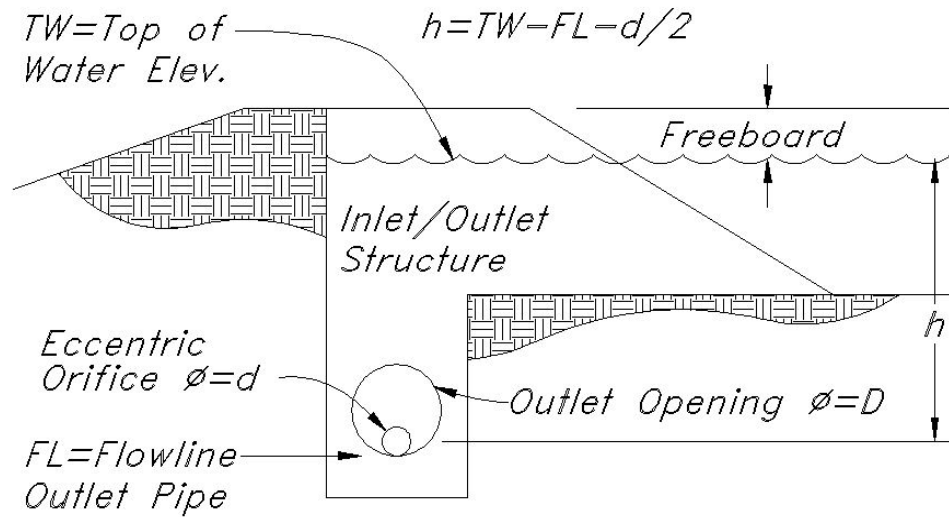
$C = 0.19$
 Remaining Unit Discharge = 0.100 cfs/acre
 $\text{Area} = 20.87$ acres
 Release through Restriction = 2.087 cfs

Detention Pond Sized For The 10 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.97	4652	626	4025	
10	3.02	7077	1252	5825	
15	2.50	8788	1878	6909	
20	2.13	9979	2504	7475	
25	1.87	10974	3130	7843	
30	1.68	11810	3756	8054	
35	1.54	12621	4382	8238	<- Req. Det.
40	1.40	13121	5008	8113	
45	1.28	13548	5635	7914	
50	1.19	13902	6261	7641	
55	1.10	14240	6887	7354	
60	1.04	14622	7513	7110	
90	0.77	16189	11269	4920	
120	0.62	17547	15025	2521	
180	0.45	18981	22538	-3557	
360	0.29	24296	45076	-20781	
720	0.19	31382	90153	-58771	
1440	0.12	39143	180306	-141162	

Required Storage Volume = 8238 ft³

ORIFICE PLATE CALCULATIONS



Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let $\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$

Goal-seek Δ to zero by changing "trial d"

TW =	5115.73	
FL =	5109.00	
Q =	2.596	cfs
trial d =	0.5109	ft
Δ =	0.000	ft
d =	6.13	inches

A-4**Combined Detention Facility**

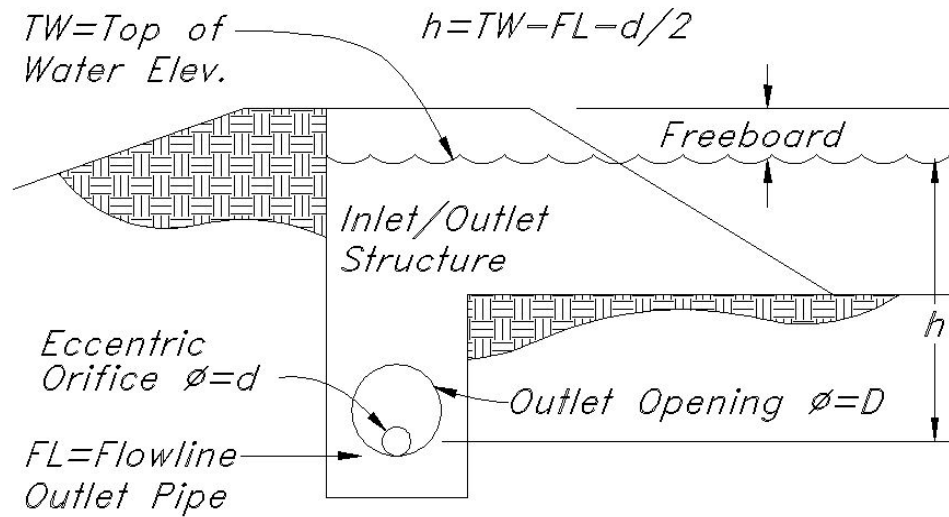
C = **0.22**
 Area = **18.87** acres
 Remaining Unit Discharge = **0.100** cfs/acre
 Release through Restriction = **1.887** cfs

Detention Pond Sized For The **10** Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.97	4912	566	4346	
10	3.02	7473	1132	6341	
15	2.50	9279	1698	7581	
20	2.13	10537	2264	8273	
25	1.87	11588	2830	8758	
30	1.68	12471	3396	9075	
35	1.54	13327	3962	9365	<- Req. Det.
40	1.40	13855	4528	9327	
45	1.28	14306	5094	9212	
50	1.19	14680	5660	9020	
55	1.10	15037	6226	8811	
60	1.04	15441	6792	8649	
90	0.77	17095	10188	6907	
120	0.62	18529	13584	4945	
180	0.45	20043	20376	-333	
360	0.29	25655	40752	-15097	
720	0.19	33138	81505	-48367	
1440	0.12	41333	163009	-121676	

Required Storage Volume = **9365** ft³

ORIFICE PLATE CALCULATIONS



Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let $\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$

Goal-seek Δ to zero by changing "trial d"

TW =	5123.00	
FL =	5116.50	
Q =	1.887	cfs
trial d =	0.4389	ft
Δ =	0.000	ft
d =	5.27	inches

A-5**Combined Detention Facility**

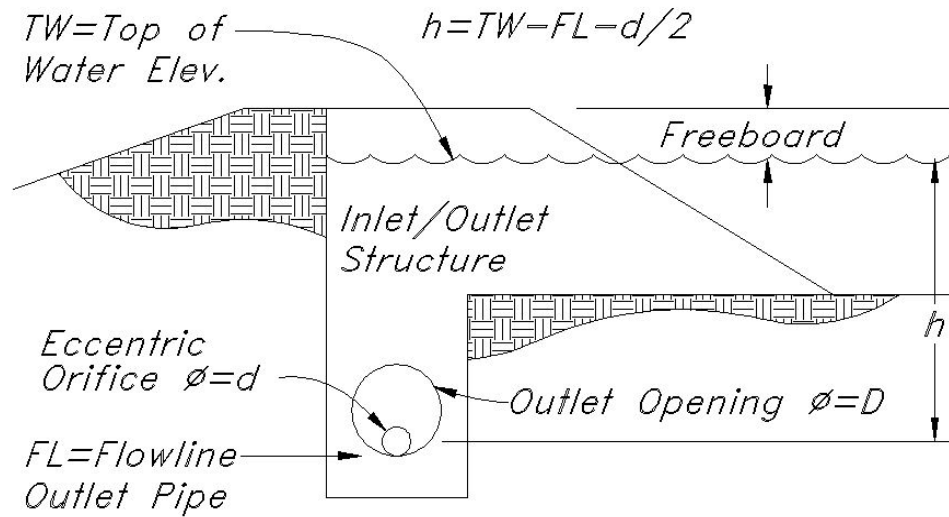
C = **0.22**
 Area = **44.99** acres
 Remaining Unit Discharge = **0.100** cfs/acre
 Release through Restriction = **4.499** cfs

Detention Pond Sized For The **10** Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.97	11841	1350	10491	
10	3.02	18014	2700	15315	
15	2.50	22369	4050	18319	
20	2.13	25402	5399	20002	
25	1.87	27933	6749	21184	
30	1.68	30064	8099	21965	
35	1.54	32127	9449	22678	<- Req. Det.
40	1.40	33400	10799	22601	
45	1.28	34487	12149	22339	
50	1.19	35387	13498	21889	
55	1.10	36249	14848	21401	
60	1.04	37222	16198	21024	
90	0.77	41210	24297	16913	
120	0.62	44666	32396	12270	
180	0.45	48317	48594	-278	
360	0.29	61845	97189	-35343	
720	0.19	79884	194377	-114494	
1440	0.12	99640	388755	-289115	

Required Storage Volume = **22678** ft³

ORIFICE PLATE CALCULATIONS



$$Q = 0.62 \cdot A_o \cdot \sqrt{64.4 \cdot h}$$

$$A_o = \frac{\pi \cdot d^2}{4}$$

Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let $\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$

Goal-seek Δ to zero by changing "trial d"

TW =	5084.50	
FL =	5078.20	
Q =	29.817	cfs
trial d =	1.8124	ft
Δ =	0.000	ft
d =	21.75	inches

A-6**WEST****Combined Detention Facility**

C = 0.22

Remaining Unit Discharge = 0.153 cfs/acre

Area = 3.09 acres

Release through Restriction = 0.474 cfs

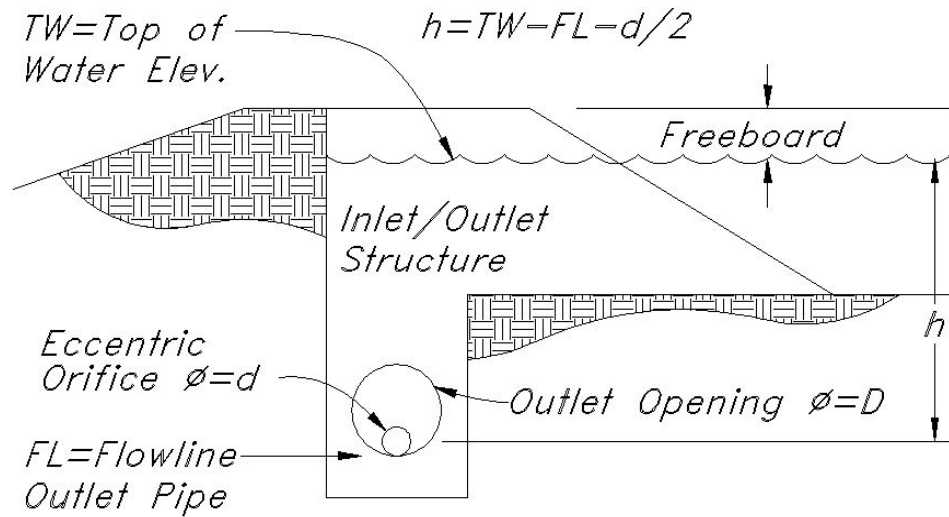
Detention Pond Sized For The 10 Year Storm

Time min	Rainfall Intensity in./hr.	Accumulated Volume (CF)	Allowable Release (CF)	Needed Detention (CF)
5	3.97	814	142	671
10	3.02	1238	284	954
15	2.50	1537	426	1111
20	2.13	1745	568	1177
25	1.87	1919	711	1209
30	1.68	2066	853	1213
35	1.54	2207	995	1213
40	1.40	2295	1137	1158
45	1.28	2370	1279	1091
50	1.19	2431	1421	1010
55	1.10	2491	1563	927
60	1.04	2557	1705	852
90	0.77	2831	2558	274
120	0.62	3069	3411	-342
180	0.45	3320	5116	-1796
360	0.29	4249	10232	-5982
720	0.19	5489	20463	-14975
1440	0.12	6846	40927	-34080

<- Req. Det.

Required Storage Volume = 1213 ft³

ORIFICE PLATE CALCULATIONS



Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let $\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$

Goal-seek Δ to zero by changing "trial d"

TW =	5055.45	
FL =	5054.45	
Q =	0.474	cfs
trial d =	0.3662	ft
Δ =	0.000	ft
d =	4.39	inches

A-7**Combined Detention Facility**

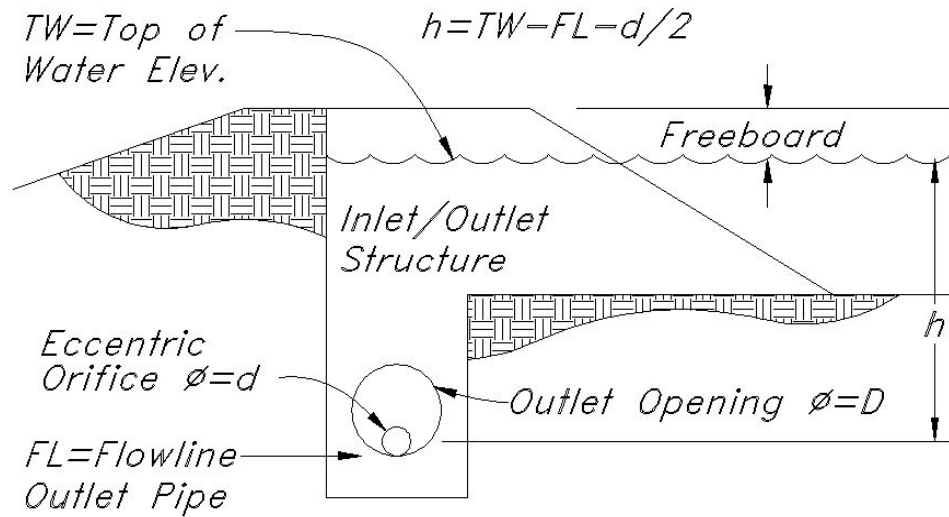
C = Remaining Unit Discharge = cfs/acre
 Area = acres Release through Restriction = cfs

Detention Pond Sized For The Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.97	1172	144	1028	
10	3.02	1783	288	1494	
15	2.50	2214	433	1781	
20	2.13	2514	577	1937	
25	1.87	2764	721	2043	
30	1.68	2975	865	2110	
35	1.54	3179	1010	2170	<- Req. Det.
40	1.40	3305	1154	2151	
45	1.28	3413	1298	2115	
50	1.19	3502	1442	2060	
55	1.10	3587	1587	2001	
60	1.04	3684	1731	1953	
90	0.77	4078	2596	1482	
120	0.62	4420	3462	958	
180	0.45	4782	5193	-411	
360	0.29	6121	10386	-4265	
720	0.19	7906	20772	-12866	
1440	0.12	9861	41544	-31683	

Required Storage Volume = ft³

ORIFICE PLATE CALCULATIONS



Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let $\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$

Goal-seek Δ to zero by changing "trial d"

TW =	5209.50	
FL =	5203.30	
Q =	0.481	cfs
trial d =	0.2228	ft
Δ =	0.000	ft
d =	2.67	inches

A-8**Combined Detention Facility**

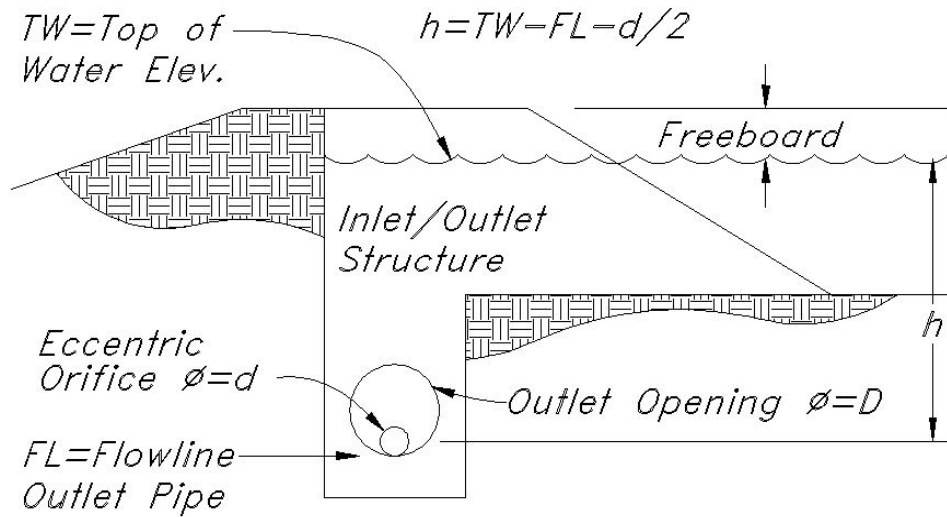
C = **0.23**
 Area = **19.82** acres
 Remaining Unit Discharge = **0.100** cfs/acre
 Release through Restriction = **1.982** cfs

Detention Pond Sized For The **10** Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.97	5416	595	4821	
10	3.02	8240	1189	7050	
15	2.50	10232	1784	8448	
20	2.13	11619	2379	9240	
25	1.87	12777	2973	9803	
30	1.68	13751	3568	10183	
35	1.54	14695	4163	10532	<- Req. Det.
40	1.40	15277	4757	10520	
45	1.28	15775	5352	10423	
50	1.19	16186	5947	10239	
55	1.10	16580	6541	10039	
60	1.04	17025	7136	9889	
90	0.77	18849	10704	8146	
120	0.62	20430	14272	6158	
180	0.45	22100	21408	692	
360	0.29	28288	42816	-14528	
720	0.19	36539	85632	-49093	
1440	0.12	45575	171264	-125689	

Required Storage Volume = **10532** ft³

ORIFICE PLATE CALCULATIONS



Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let $\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$

Goal-seek Δ to zero by changing "trial d"

TW =	5266.00	
FL =	5261.00	
Q =	1.982	cfs
trial d =	0.4822	ft
Δ =	0.000	ft
d =	5.79	inches

Drainage Area Summary						
Area	Required Detention (CF)	Required Restriction (INCH)	Available Detention (CY)	Available Detention (CF)	Water Depth (FT)	Max Wall Height (FT)
A-1	27,034	19.18	1,071.00	28,917	12.12	13.12
A-2	20,274	20.27		20,781		
A-3	8,238	6.13	265.55	7,170	6.73	7.73
A-4	9,365	5.27	379.35	10,243	6.50	7.50
A-5	22,678	21.75	844.00	22,788	6.30	7.30
A-6	1,213	4.39	44.93	1,213	1.00	WEST
A-7	2,170	2.67	83.75	2,261	6.20	7.20
A-8	10,532	5.79	457.95	12,365	5.00	
A-6	4,692	5.84	254.40	6,869	2.54	EAST

A-6 EAST
Combined Detention Facility

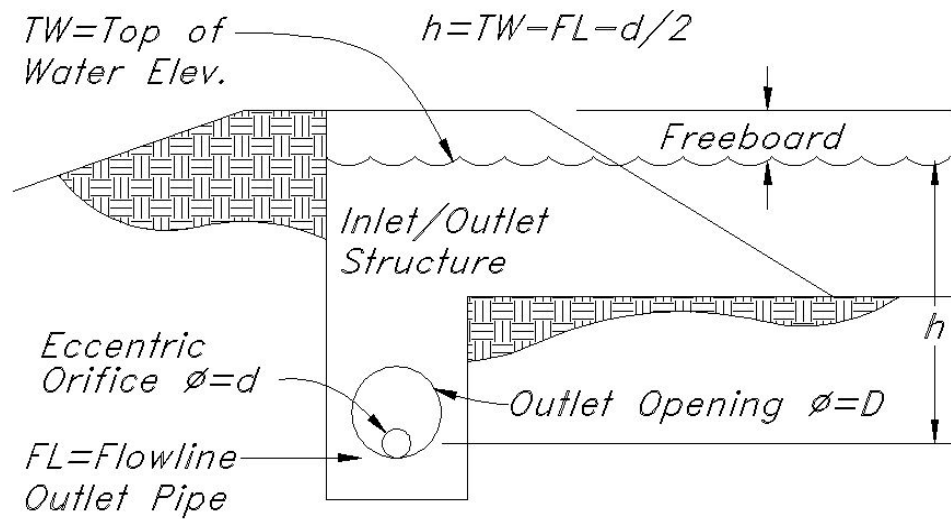
C = 0.22 Remaining Unit Discharge = 0.100 cfs/acre
 Area = 9.27 acres Release through Restriction = 0.927 cfs

Detention Pond Sized For The 10 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	3.97	2443	278	2165	
10	3.02	3718	556	3162	
15	2.50	4618	834	3783	
20	2.13	5245	1113	4133	
25	1.87	5770	1391	4379	
30	1.68	6211	1669	4542	
35	1.54	6639	1947	4692	<- Req. Det.
40	1.40	6904	2225	4678	
45	1.28	7130	2503	4627	
50	1.19	7318	2782	4536	
55	1.10	7498	3060	4438	
60	1.04	7701	3338	4363	
90	0.77	8537	5007	3530	
120	0.62	9264	6676	2588	
180	0.45	10045	10014	31	
360	0.29	12918	20027	-7109	
720	0.19	16807	40055	-23247	
1440	0.12	21220	80109	-58889	

Required Storage Volume = 4692 ft³

ORIFICE PLATE CALCULATIONS



Solving for d, we have.....

$$d = \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Let

$$\Delta = d - \sqrt{\frac{4 \cdot Q}{0.62 \cdot \pi \cdot \sqrt{64.4 \cdot (TW - FL - d/2)}}}$$

Goal-seek Δ to zero by changing "trial d"

TW =	5052.00	
FL =	5049.46	
Q =	1.401	cfs
trial d=	0.4864	ft
Δ =	0.000	ft
d =	5.84	inches



NOAA Atlas 14, Volume 1, Version 5
Location name: Huntsville, Utah, USA*
Latitude: 41.2463°, Longitude: -111.808°
Elevation: 5394.57 ft**

* source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

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PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.86 (1.63-2.16)	2.36 (2.09-2.72)	3.20 (2.80-3.68)	3.97 (3.44-4.57)	5.18 (4.39-6.04)	6.31 (5.20-7.42)	7.63 (6.10-9.08)	9.20 (7.09-11.2)	11.8 (8.54-14.7)	14.2 (9.80-18.3)
10-min	1.42 (1.24-1.64)	1.80 (1.58-2.08)	2.44 (2.13-2.81)	3.02 (2.62-3.49)	3.95 (3.35-4.59)	4.80 (3.95-5.63)	5.81 (4.64-6.91)	7.01 (5.39-8.51)	8.97 (6.50-11.2)	10.8 (7.46-13.9)
15-min	1.18 (1.03-1.36)	1.48 (1.31-1.72)	2.02 (1.76-2.32)	2.50 (2.16-2.88)	3.26 (2.76-3.79)	3.97 (3.27-4.66)	4.80 (3.84-5.71)	5.79 (4.46-7.03)	7.41 (5.38-9.28)	8.93 (6.17-11.5)
30-min	0.790 (0.692-0.912)	1.00 (0.882-1.16)	1.36 (1.19-1.56)	1.68 (1.46-1.94)	2.20 (1.86-2.55)	2.67 (2.20-3.14)	3.23 (2.58-3.84)	3.90 (3.00-4.73)	4.99 (3.62-6.25)	6.01 (4.15-7.73)
60-min	0.489 (0.428-0.565)	0.619 (0.546-0.716)	0.840 (0.734-0.967)	1.04 (0.902-1.20)	1.36 (1.15-1.58)	1.65 (1.36-1.94)	2.00 (1.60-2.38)	2.41 (1.86-2.93)	3.09 (2.24-3.87)	3.72 (2.57-4.79)
2-hr	0.319 (0.284-0.362)	0.399 (0.355-0.454)	0.514 (0.456-0.585)	0.624 (0.546-0.712)	0.802 (0.688-0.922)	0.965 (0.808-1.12)	1.16 (0.940-1.36)	1.39 (1.09-1.67)	1.76 (1.30-2.18)	2.11 (1.48-2.67)
3-hr	0.245 (0.221-0.275)	0.303 (0.273-0.340)	0.378 (0.338-0.424)	0.450 (0.399-0.505)	0.563 (0.490-0.637)	0.670 (0.571-0.766)	0.798 (0.663-0.926)	0.948 (0.763-1.12)	1.19 (0.915-1.46)	1.42 (1.05-1.80)
6-hr	0.169 (0.155-0.185)	0.207 (0.189-0.227)	0.249 (0.227-0.274)	0.288 (0.260-0.318)	0.346 (0.309-0.385)	0.394 (0.347-0.442)	0.450 (0.390-0.511)	0.513 (0.435-0.591)	0.639 (0.523-0.751)	0.752 (0.599-0.905)
12-hr	0.109 (0.100-0.120)	0.134 (0.123-0.147)	0.161 (0.147-0.178)	0.186 (0.168-0.205)	0.222 (0.198-0.248)	0.252 (0.222-0.284)	0.285 (0.247-0.324)	0.320 (0.271-0.369)	0.374 (0.308-0.441)	0.418 (0.336-0.503)
24-hr	0.070 (0.064-0.076)	0.086 (0.079-0.093)	0.102 (0.094-0.111)	0.116 (0.107-0.126)	0.135 (0.124-0.147)	0.150 (0.137-0.163)	0.165 (0.150-0.180)	0.180 (0.163-0.197)	0.201 (0.180-0.223)	0.217 (0.193-0.255)
2-day	0.042 (0.039-0.045)	0.051 (0.047-0.056)	0.061 (0.056-0.067)	0.069 (0.064-0.075)	0.080 (0.074-0.088)	0.089 (0.081-0.097)	0.098 (0.089-0.107)	0.107 (0.097-0.117)	0.118 (0.106-0.130)	0.127 (0.114-0.140)
3-day	0.031 (0.029-0.034)	0.038 (0.035-0.041)	0.045 (0.042-0.049)	0.052 (0.048-0.056)	0.060 (0.055-0.065)	0.067 (0.061-0.073)	0.074 (0.067-0.080)	0.081 (0.073-0.088)	0.090 (0.081-0.098)	0.097 (0.086-0.107)
4-day	0.026 (0.024-0.028)	0.031 (0.029-0.034)	0.038 (0.035-0.041)	0.043 (0.040-0.046)	0.050 (0.046-0.054)	0.056 (0.051-0.060)	0.062 (0.056-0.067)	0.068 (0.061-0.073)	0.076 (0.068-0.083)	0.082 (0.073-0.090)
7-day	0.018 (0.017-0.020)	0.022 (0.020-0.024)	0.026 (0.024-0.029)	0.030 (0.028-0.033)	0.035 (0.032-0.038)	0.039 (0.035-0.043)	0.043 (0.039-0.047)	0.047 (0.042-0.051)	0.052 (0.047-0.058)	0.056 (0.050-0.063)
10-day	0.014 (0.013-0.016)	0.018 (0.016-0.019)	0.021 (0.019-0.023)	0.024 (0.022-0.026)	0.027 (0.025-0.030)	0.030 (0.028-0.033)	0.033 (0.030-0.036)	0.035 (0.032-0.039)	0.039 (0.035-0.043)	0.041 (0.037-0.046)
20-day	0.010 (0.009-0.010)	0.012 (0.011-0.013)	0.014 (0.013-0.015)	0.016 (0.014-0.017)	0.018 (0.016-0.019)	0.019 (0.018-0.021)	0.021 (0.019-0.023)	0.022 (0.020-0.024)	0.024 (0.022-0.026)	0.025 (0.023-0.028)
30-day	0.008 (0.007-0.009)	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.014)	0.014 (0.013-0.016)	0.016 (0.014-0.017)	0.017 (0.015-0.018)	0.018 (0.016-0.019)	0.019 (0.018-0.021)	0.020 (0.018-0.022)
45-day	0.007 (0.006-0.007)	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.010-0.011)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.018)	0.017 (0.016-0.019)
60-day	0.006 (0.005-0.006)	0.007 (0.007-0.008)	0.008 (0.008-0.009)	0.009 (0.009-0.010)	0.011 (0.010-0.011)	0.012 (0.011-0.012)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.015 (0.014-0.016)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical