

**GVH DISTRIBUTION
2458 N RULON WHITE BLVD
OGDEN, UTAH 84404
STORM WATER STUDY
Project No. 20N111
12-23-2020**

General Site Information:

The proposed GVH Distribution Building expansion site is located at 2458 Rulon White Blvd in Ogden Utah. Construction will consist of a new commercial building, parking lots, curb and gutter, underground utilities, and landscaped areas when completed.

This site will have two underground retention facilities, one to serve the stormwater from the Taylor Business Park, the other to replace a public retention pond that is being demolished during the early phases of this project.

Storm water from the site will be collected in inlet boxes and catch basins and will continue via storm drain to the North and South sides of the site. Storm water will be retained in underground retention facilities located below grade at these locations. This site will not be discharging stormwater into a public system. The attached figure shows the project site and location of the storm water system. Retention calculations have been provided for the site. (See attached figure and calculations).

The study area is broken up into 2 drainage areas (labeled A-1 and A-2). 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. An average runoff coefficient of 0.83 was calculated for A-1 and 0.86 for A-2. This yields a coefficient of 0.85 for the overall study area.

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 are about 6 minutes for both areas A-1 and A-2. 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 retention 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.

Required Retention:

The required retention for the 25-year storm with a release rate of 0.00 cfs/acre is 16,346 cubic feet for the entire study area. The available volume in the two retention facilities is 16,500 cubic feet. There is an excess capacity of 154 cubic feet.

The two retention ponds have been sized to service their corresponding drainage areas. Retention pond one will service drainage area A-1 and has a capacity of 7000cubic feet. Retention pond two will receive water from drainage area A-2 and will have a capacity of 9500. Each facility has the capacity to retain the 25-year storm for their corresponding drainage area without surcharging.

Great Basin Engineering, Inc.

Prepared by James Ries EIT

Reviewed by Paul Anderson, P.E.

Storm Water Calculations
 GVH Distribution
 2458 N Rulon White Blvd
 20N111 - SWS - S2

12/21/2020

2 Detained Areas

Hardscape C = 0.90
 Landscape C = 0.15

Drainage Areas	Total Area (ft ²)	Total Area (acres)	Hardscape Area (ft ²)	Hardscape Area (ft ²)	Landscape Area (ft ²)	Landscape Area (acres)	C
Σ Det. Areas	94536	2.170	87775	2.015	6761	0.155	0.846
Σ All Areas	94536	2.170	87775	2.015	6761	0.155	0.846
A-1	40959	0.940	37092	0.852	3867	0.089	0.829
A-2	53577	1.230	50683	1.164	2894	0.066	0.859

Time of Concentration--use FAA Method

For FAA Method, use K's of..

K = 0.35 for landscape
 K = 0.91 for hardscape

Assume Pipe Flow is at 2 ft/s Scour Speed

**Note: S is in percent, 5 min is smallest allowed Tc

Area	Length on Landscape (ft)	Slope of Landscape (%)	Time on Landscape (min.)	Length on Hardscape (ft)	Slope of Hardscape (%)	Time on Hardscape (min.)	Length in Pipe (ft)	Time in Pipe (min.)	TC for entire Area (min.)
A-1	0.00	0.50	0.00	120.00	0.50	4.72	116.00	0.97	5.69
A-2	0.00	0.50	0.00	120.00	0.50	4.72	157.00	1.31	6.03

Rainfall Intensities
Data From NOAA

10-Year and 25-Year Intensities

The equations used for the 10-Year and 25-Year Intensities were found using the attached Rainfall data as well as Interpolated data where applicable.

Storm Intensities

AREA	Tc (minutes)	I (10-yr.) (in./hr.)	I (25-yr.) (in./hr.)
A-1	5.7	3.29	4.35
A-2	6.0	3.23	4.28

Peak Flow Information
 Use Rational Method
 10-Year and 25-Year Intensities

Q=CIA

AREA	C	I10 (in./hr.)	I25 (in./hr.)	A (acres)	Peak Flows		
					Q (10-yr.) (cfs)	Q (25-yr.) (cfs)	
A-1	0.829	3.287	4.352	0.94	2.56	3.39	
A-2	0.859	3.231	4.278	1.23	3.42	4.52	
Σ detained =					5.98	7.92	

Size pipes for		Node Inlet Requirements	
		10	year storm
Area	Node #	% of Total	Q (cfs)
A-1	1	30.0%	0.77
A-1	2	30.0%	0.77
A-1	3	40.0%	1.03
A-2	4	22.0%	0.75
A-2	5	22.0%	0.75
A-2	6	0.0%	0.00
A-2	7	56.0%	1.91

Options for Pipe Sizes Between the Specified Nodes

Up Stream Node	Dn Stream Node	Q (cfs)	Pipe Size (in)	Design Min Slope (%)	Area (ft ²)	Rh (ft)	Manning's n	Scour Min. Slope (%)	First Trial Pipe Size
1	Basin 1	0.77	6	1.344%	0.196	0.125	0.011	1.000%	8
		0.77	8	0.290%	0.349	0.167	0.011	0.400%	
		0.77	10	0.088%	0.545	0.208	0.011	0.280%	
2	Basin 1	0.77	6	1.344%	0.196	0.125	0.011	1.000%	8
		0.77	8	0.290%	0.349	0.167	0.011	0.400%	
		0.77	10	0.088%	0.545	0.208	0.011	0.280%	
3	Basin 1	1.03	6	2.390%	0.196	0.125	0.011	1.000%	10
		1.03	8	0.515%	0.349	0.167	0.011	0.400%	
		1.03	10	0.157%	0.545	0.208	0.011	0.280%	
4	6	0.75	6	1.284%	0.196	0.125	0.011	1.000%	8
		0.75	8	0.277%	0.349	0.167	0.011	0.400%	
		0.75	10	0.084%	0.545	0.208	0.011	0.280%	
5	6	0.75	6	1.284%	0.196	0.125	0.011	1.000%	8
		0.75	8	0.277%	0.349	0.167	0.011	0.400%	
		0.75	10	0.084%	0.545	0.208	0.011	0.280%	
6	Basin 2	1.50	6	5.137%	0.196	0.125	0.011	1.000%	10
		1.50	8	1.107%	0.349	0.167	0.011	0.400%	
		1.50	10	0.337%	0.545	0.208	0.011	0.280%	
7	Basin 2	1.91	8	1.794%	0.349	0.167	0.011	0.400%	12
		1.91	10	0.546%	0.545	0.208	0.011	0.280%	
		1.91	12	0.288%	0.785	0.250	0.013	0.200%	

GVH Distribution

Underground Retention Facility #1

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

Detention Pond Sized For The Year Storm

Time min	Rainfall Intensity in./hr.	Accumulated Volume (CF)	Allowable Release (CF)	Needed Detention (CF)
5	4.50	1053	0	1053
10	3.42	1600	0	1600
15	2.83	1986	0	1986
20	2.41	2254	0	2254
25	2.12	2478	0	2478
30	1.90	2667	0	2667
35	1.74	2852	0	2852
40	1.59	2966	0	2966
45	1.46	3065	0	3065
50	1.35	3147	0	3147
55	1.25	3225	0	3225
60	1.18	3312	0	3312
90	0.85	3586	0	3586
120	0.67	3761	0	3761
180	0.47	3932	0	3932
360	0.29	4800	0	4800
720	0.18	5995	0	5995
1440	0.10	6939	0	6939

Required Storage Volume = ft³

GVH Distribution

Underground Retention Facility #2

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

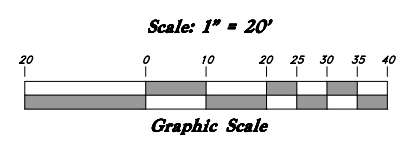
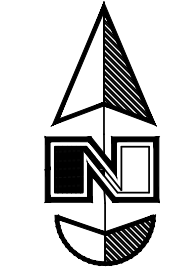
Detention Pond Sized For The Year Storm

Time min	Rainfall Intensity in./hr.	Accumulated Volume (CF)	Allowable Release (CF)	Needed Detention (CF)
5	4.50	1427	0	1427
10	3.42	2169	0	2169
15	2.83	2693	0	2693
20	2.41	3056	0	3056
25	2.12	3360	0	3360
30	1.90	3615	0	3615
35	1.74	3866	0	3866
40	1.59	4022	0	4022
45	1.46	4155	0	4155
50	1.35	4266	0	4266
55	1.25	4372	0	4372
60	1.18	4491	0	4491
90	0.85	4862	0	4862
120	0.67	5100	0	5100
180	0.47	5332	0	5332
360	0.29	6508	0	6508
720	0.18	8129	0	8129
1440	0.10	9408	0	9408

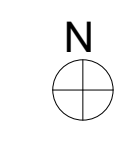
Required Storage Volume = ft³

Combined Volume = 16346 ft³

Checks with single
pond for entire site = YES



COMPASS:



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PROJECT TITLE
GVH DISTRIBUTION
2458 N RULON WHITE BLVD
OGDEN, UTAH 84404
OWNER:

DOCUMENT DATE:
April 01, 2022

PROJECT PHASE
CONSTRUCTION

REVISIONS		
#	Description	Date

DRAWING DESCRIPTION
Storm Water Study

SWS

SHEET NUMBER

