

7.0 CLOSING

Whitestone appreciates the opportunity to be of service to 522 Valley Estates, LLC. Please contact us with any questions or comments regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.



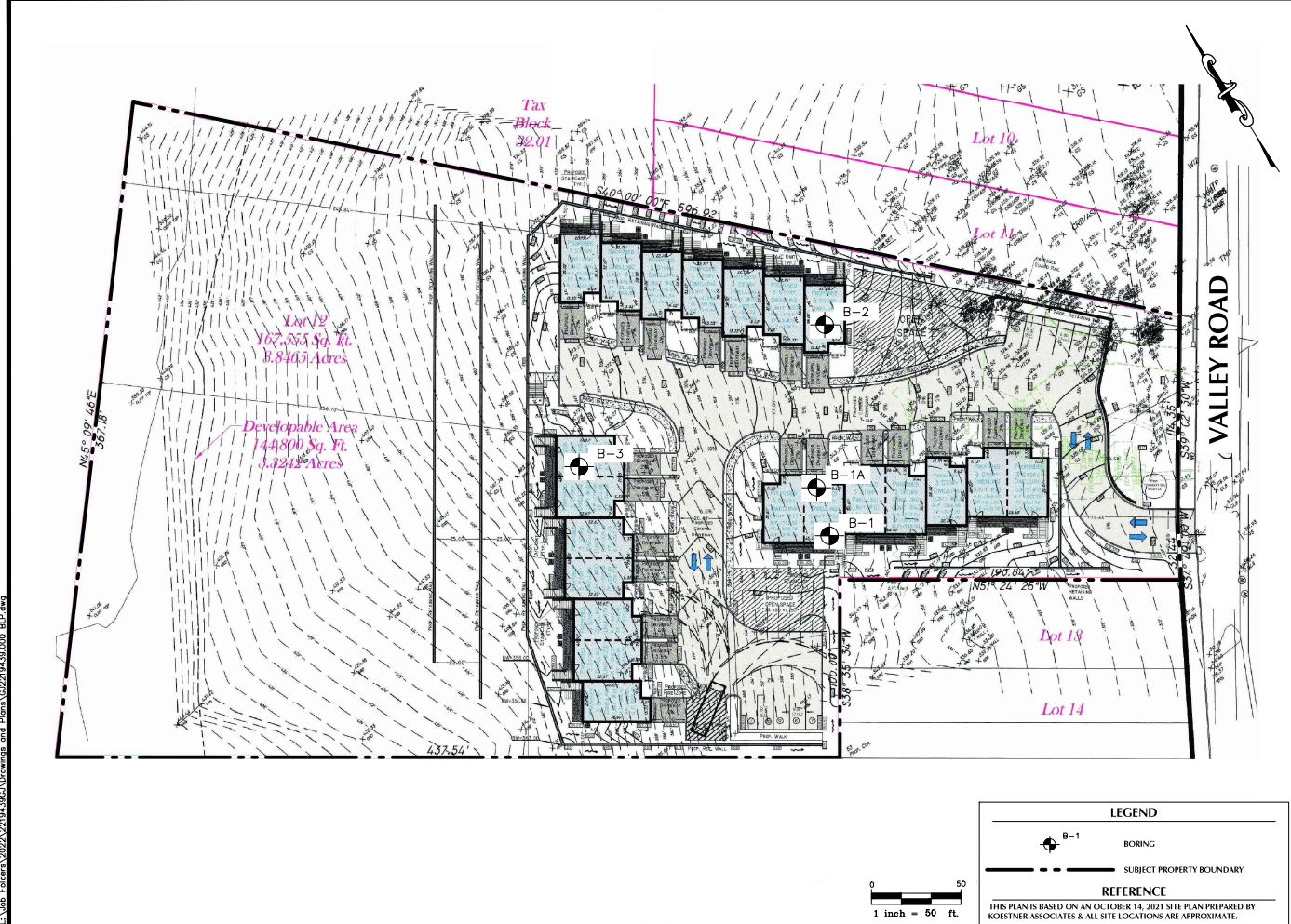
Kyle J. Kopacz, P.E.
Associate



Laurence W. Keller, P.E.
Vice-President

KK/TJ/ri L:\Job Folders\2022\2219439GJ\Reports and Submittals\19439 LimGL.docx
Enclosure
Copy: Tristan D. Jovanov, Whitestone Associates, Inc.

FIGURE 1
Boring Location Plan



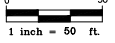
VALLEY ROAD

LEGEND

B-1 BORING
 SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON AN OCTOBER 14, 2021 SITE PLAN PREPARED BY KOESTNER ASSOCIATES & ALL SITE LOCATIONS ARE APPROXIMATE.



WHITESTONE
 An Employee-Owned Company

30 INDEPENDENCE BOULEVARD, SUITE 250, WARREN, NJ 07059
 908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE:	
BORING LOCATION PLAN	
CLIENT:	
522 VALLEY ESTATES, LLC	
PROJECT:	
PROPOSED RESIDENTIAL REDEVELOPMENT 522 VALLEY ESTATES, LLC GUTTEN, PASSAIC COUNTY, NJ	

PROJECT #:	
GJ2219439.000	
DESIGNED BY:	DATE:
GR	8/17/22
SCALE:	SHEET:
1" = 50'	1

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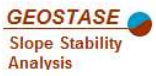
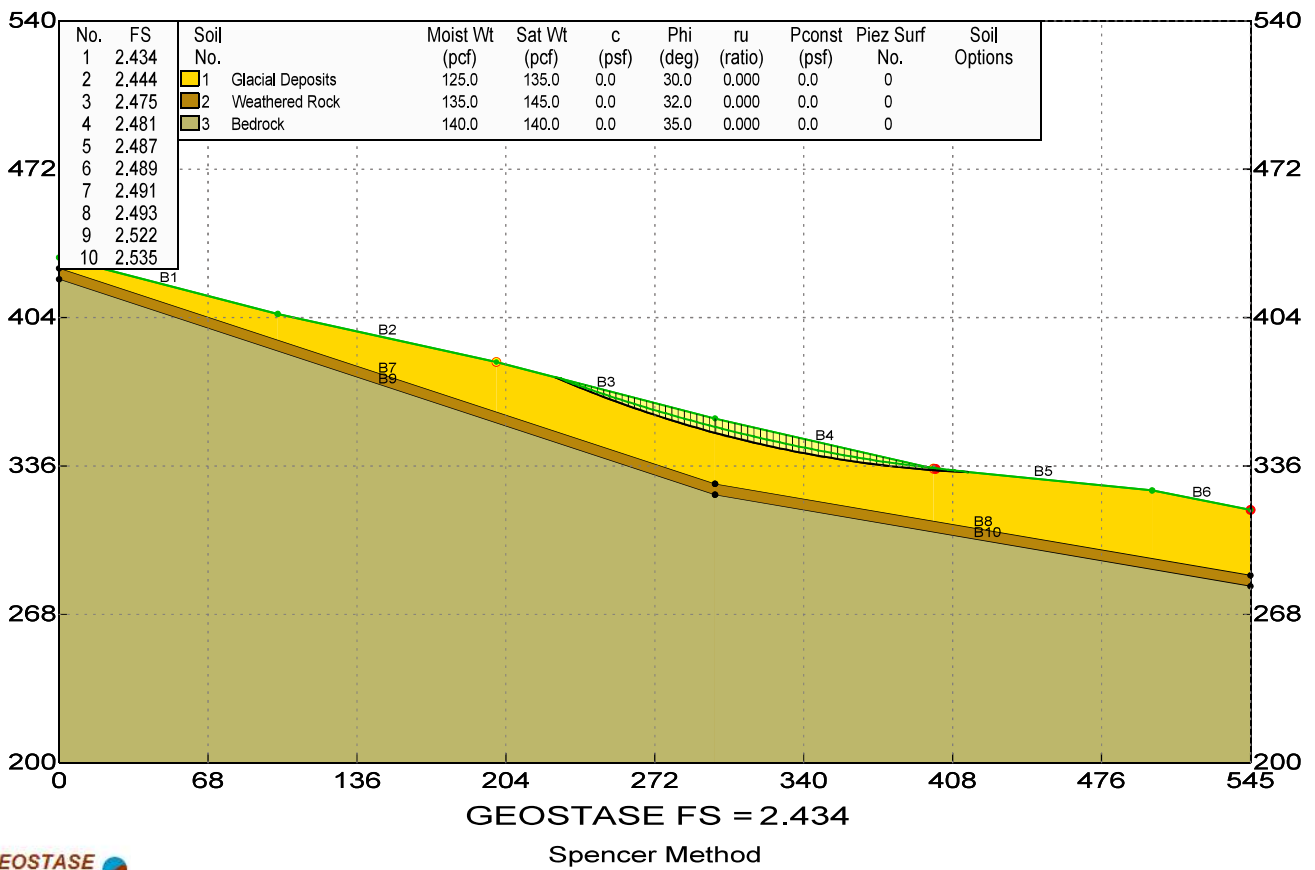


FIGURE 2
Slope Stability Analyses

Proposed Residential Development GJ2219439.000

Whitestone Associates, Inc.

\\Existing Conditions.gsd



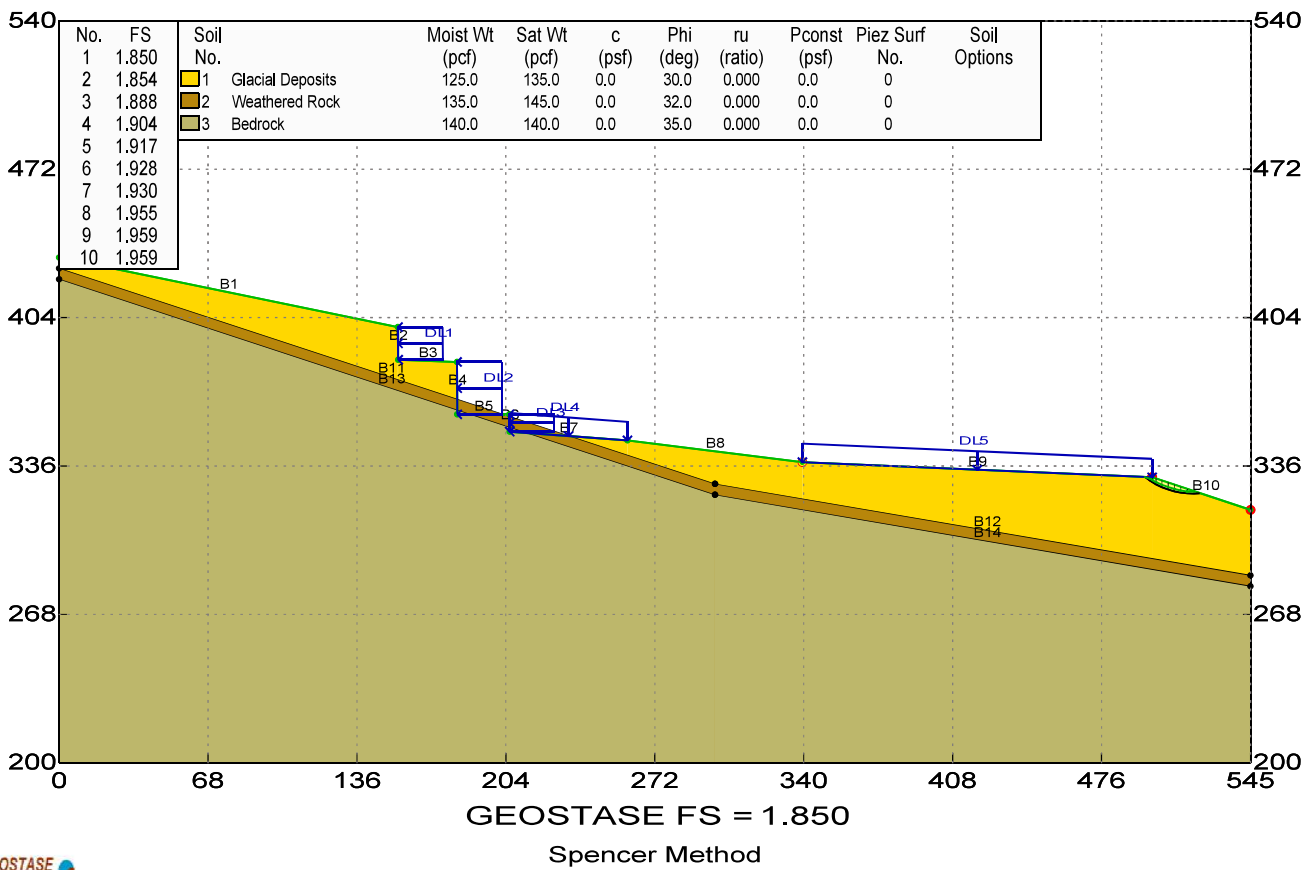
GEOSTASE® by GREGORY GEOTECHNICAL SOFTWARE

PLATE C.1

Proposed Residential Development GJ2219439.000

Whitestone Associates, Inc.

\\Proposed Conditions.gsd



GEOSTASE® by GREGORY GEOTECHNICAL SOFTWARE

PLATE C.1

APPENDIX A
Records of Subsurface Exploration

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Residential Development		WAI Project No.: GJ2219439.000	
Location: 522 Valley Road, Clifton, Passaic County, New Jersey		Client: 522 Valley Estates, LLC	
Surface Elevation: ± 330.0 feet	Date Started: 8/15/2022	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: 35.0 feet bgs	Date Completed: 8/16/2022	During: NE 330.0 ▼	At Completion: 30.0 300.0 ☒
Proposed Location: Building Pad	Logged By: RL	At Completion: NE 330.0 ▼	24 Hours: --- --- ▼
Drill / Test Method: SPT	Contractor: ETD	24 Hours: --- --- ▼	24 Hours: --- --- ▼
Mud Rotary	Equipment: CME 75		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	TOPSOIL	2" Topsoil	
0 - 2	S-1	X	6 - 6 - 7 - 9	6	13	2.0	GLACIAL DEPOSITS	Brown Silty Sand with Gravel, Moist, Medium Dense (SM)	
2 - 4	S-2	X	14 - 15 - 11 - 9	4	26	4.0		As Above (SM)	
5 - 7	S-3	X	9 - 12 - 16 - 16	24	28	7.0		Reddish-Brown Sandy Silt with Gravel, Moist, Very Stiff (ML)	
7 - 8.3	S-4	X	28 - 31 - 50/4"	24	81/10"	8.3		As Above (ML)	2.5 tsf
10 - 12	S-5	X	32 - 38 - 42 - 0	24	80	12.0		Reddish-Brown Silty Sand with Gravel, Moist, Very Dense (SM)	
						15.0		As Above (SM)	
15 - 17	S-6	X	22 - 36 - 48 - 53	24	84	17.0		Reddish-Brown Sandy Silt, Moist, Very Stiff (ML)	3.5 tsf
						20.0			
20 - 22	S-7	X	43 - 26 - 36 - 30	20	62	22.0		Reddish-Brown Silty Sand, Moist, Very Dense (SM)	
						25.0			



RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 2 of 2

Project: Proposed Residential Development			WAI Project No.: GJ2219439.000		
Location: 522 Valley Road, Clifton, Passaic County, New Jersey			Client: 522 Valley Estates, LLC		
Surface Elevation: ± 330.0 feet		Date Started: 8/15/2022		Water Depth Elevation (feet bgs) (feet)	
Termination Depth: 35.0 feet bgs		Date Completed: 8/16/2022		Cave-In Depth Elevation (feet bgs) (feet)	
Proposed Location: Building Pad		Logged By: RL		During: NE 330.0 ▼	
Drill / Test Method: HSA / SPT		Contractor: ETD		At Completion: NE 330.0 ▼	
Mud Rotary		Equipment: CME 75		24 Hours: --- --- ▼	
			At Completion: --- --- ☒		
			24 Hours: --- --- ☒		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						25.0	GLACIAL DEPOSITS	As Above (SM)	
25 - 26.2	S-8	X	44 - 50 - 50/2	21	100/8				
						30.0	WEATHERED ROCK	Reddish-Brown Weathered Rock with Silt, Wet, Very Dense (WR)	
30 - 30.25	S-9	X	50/3	3	50/3				
						35.0		No Recovery Presumed As Above	
35 - 35	S-10	X	50/0	NR	30/0			Boring Log B-1 Terminated at a Depth of 35.0 Feet Below Ground Surface	
						40.0			
						45.0			
						50.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Residential Development		WAI Project No.: GJ2219439.000	
Location: 522 Valley Road, Clifton, Passaic County, New Jersey		Client: 522 Valley Estates, LLC	
Surface Elevation: ± 330.0 feet	Date Started: 8/16/2022	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: 33.1 feet bgs	Date Completed: 8/16/2022	During: NE 330.0 ▼	At Completion: 30.0 300.0 ☒
Proposed Location: Building Pad	Logged By: RL	At Completion: NE 330.0 ▼	24 Hours: --- --- ▼
Drill / Test Method: HSA / SPT Mud Rotary	Contractor: ETD	24 Hours: --- --- ▼	24 Hours: --- --- ▼
	Equipment: CME 75		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						25.0			
						30.0			
								Offset 20 Feet from B-1	
33 - 33.1	S-1	<input checked="" type="checkbox"/>	50/1	1	50/1		WR	Reddish-Brown Weathered Rock (WR)	
						35.0		Boring Log B-1A Terminated at a Depth of 00.0 Feet Below Ground Surface	




RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Residential Development		WAI Project No.: GJ2219439.000	
Location: 522 Valley Road, Clifton, Passaic County, New Jersey		Client: 522 Valley Estates, LLC	
Surface Elevation: ± 342.0 feet	Date Started: 8/15/2022	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: 10.0 feet bgs	Date Completed: 8/16/2022	During: NE --- ▼	At Completion: 10.0 332.0 ☒
Proposed Location: Building Pad	Logged By: RL	At Completion: NE --- ▼	24 Hours: --- --- ▼
Drill / Test Method: SPT	Contractor: ETD	24 Hours: --- --- ▼	24 Hours: --- --- ▼
Mud Rotary	Equipment: CME 75		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	TOPSOIL	2" Topsoil	
0 - 2	S-1	X	2 - 7 - 24 - 24	2	32	2.0	GLACIAL DEPOSITS	Brown Silty Sand, Dry, Dense (SM)	
2 - 4	S-2	X	6 - 14 - 18 - 21	2	32	4.0		Reddish-Brown Poorly Graded Gravel with Silt and Sand, Dry, Dense (SP-SM)	
4 - 6	S-3	X	12 - 26 - 32 - 48	4	58	5.0		Reddish-Brown Sandy Silt, Dry, Very Stiff (ML)	
6 - 8	S-4	X	32 - 48 - 61 - 69	8	109	7.0		Reddish-Brown Silty Gravel, Dry, Very Dense (SM)	
8 - 10	S-5	X	33 - 42 - 31 - 29	10	73	8.3		As Above, Moist (SM)	
						10.0		Boring Log B-2 Terminated at a Depth of 10.0 Feet Below Ground Surface	
						12.0			
						15.0			
						17.0			
						20.0			
						22.0			
						25.0			

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Residential Development		WAI Project No.: GJ2219439.000	
Location: 522 Valley Road, Clifton, Passaic County, New Jersey		Client: 522 Valley Estates, LLC	
Surface Elevation: ± 382.0 feet	Date Started: 8/15/2022	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: 4.75 feet bgs	Date Completed: 8/16/2022	During: NE --- ▼	At Completion: NE --- ▼
Proposed Location: Building Pad	Logged By: RL	24 Hours: --- --- ▼	At Completion: 4.0 378.0 <input checked="" type="checkbox"/>
Drill / Test Method: SPT	Contractor: ETD		24 Hours: --- --- <input checked="" type="checkbox"/>
Tripod	Equipment: CME 75		

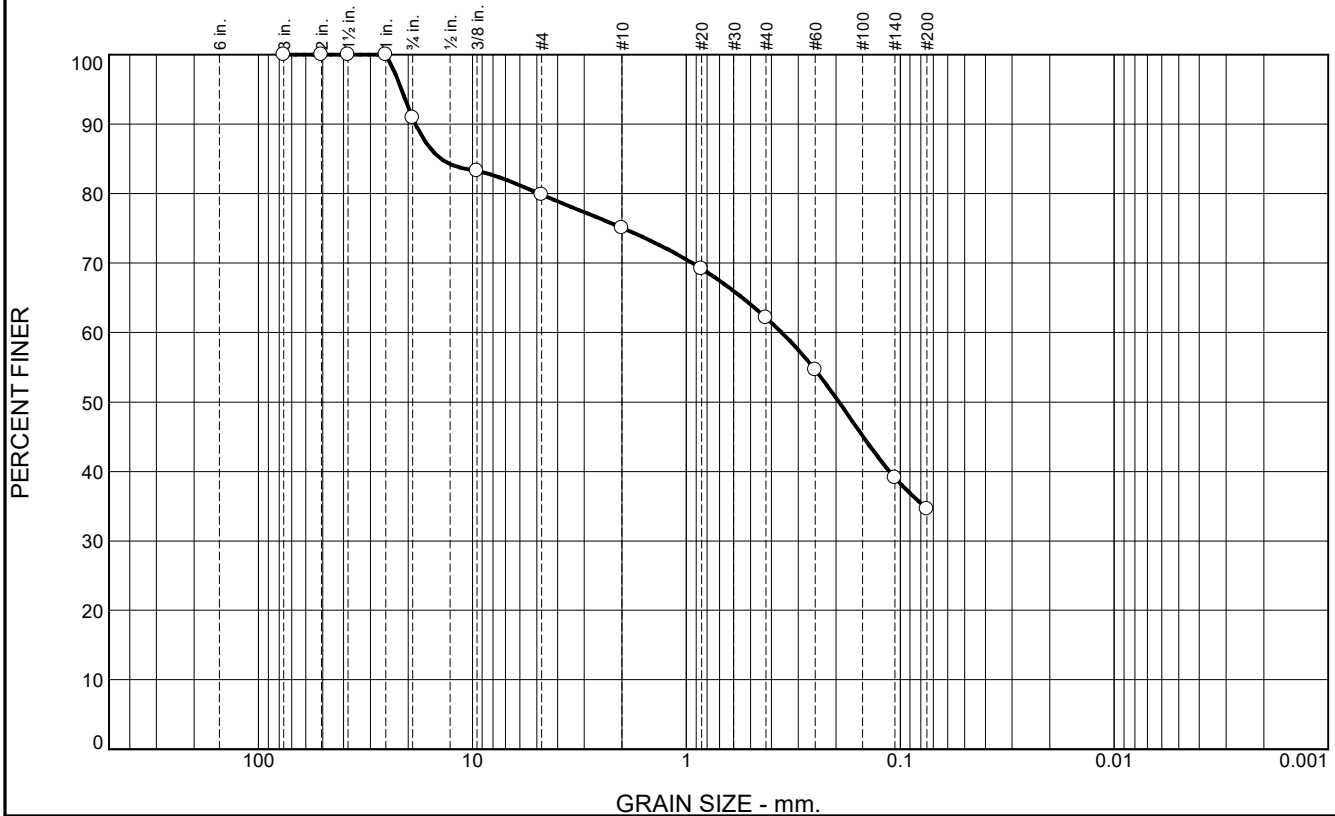
SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	TOPSOIL	3" Topsoil	
0 - 2	S-1		5 - 7 - 29 - 35	3	32	2.0	GLACIAL DEPOSITS	Brown Silty Sand with Gravel, Dry, Dense (SM)	
2 - 3.75	S-2		30 - 41 - 62 - 100 / 3	6	103	3.75		Reddish-Brown Poorly Graded Gravel with Silt and Sand, Dry (SP-SM)	
3.75 - 4.75	S-3		52 - 100	1	100/6	4.75		As Above (SP-SM)	
Boring Log B-3 Terminated at a Depth of 4.75 Feet Below Ground Surface Due to Spoon Refusal									
						12.0			
						15.0			
						17.0			
						20.0			
						22.0			
						25.0			



APPENDIX B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.1	11.1	4.7	13.0	27.5	34.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	90.9		
.375	83.3		
#4	79.8		
#10	75.1		
#20	69.2		
#40	62.1		
#60	54.6		
#140	39.1		
#200	34.6		

Material Description

Silty Sand with Gravel

Atterberg Limits

PL= 18 LL= 21 PI= 3

Coefficients

D₉₀= 18.4623 D₈₅= 14.0052 D₆₀= 0.3587
D₅₀= 0.1938 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

W_n = 14.0 %

* (no specification provided)

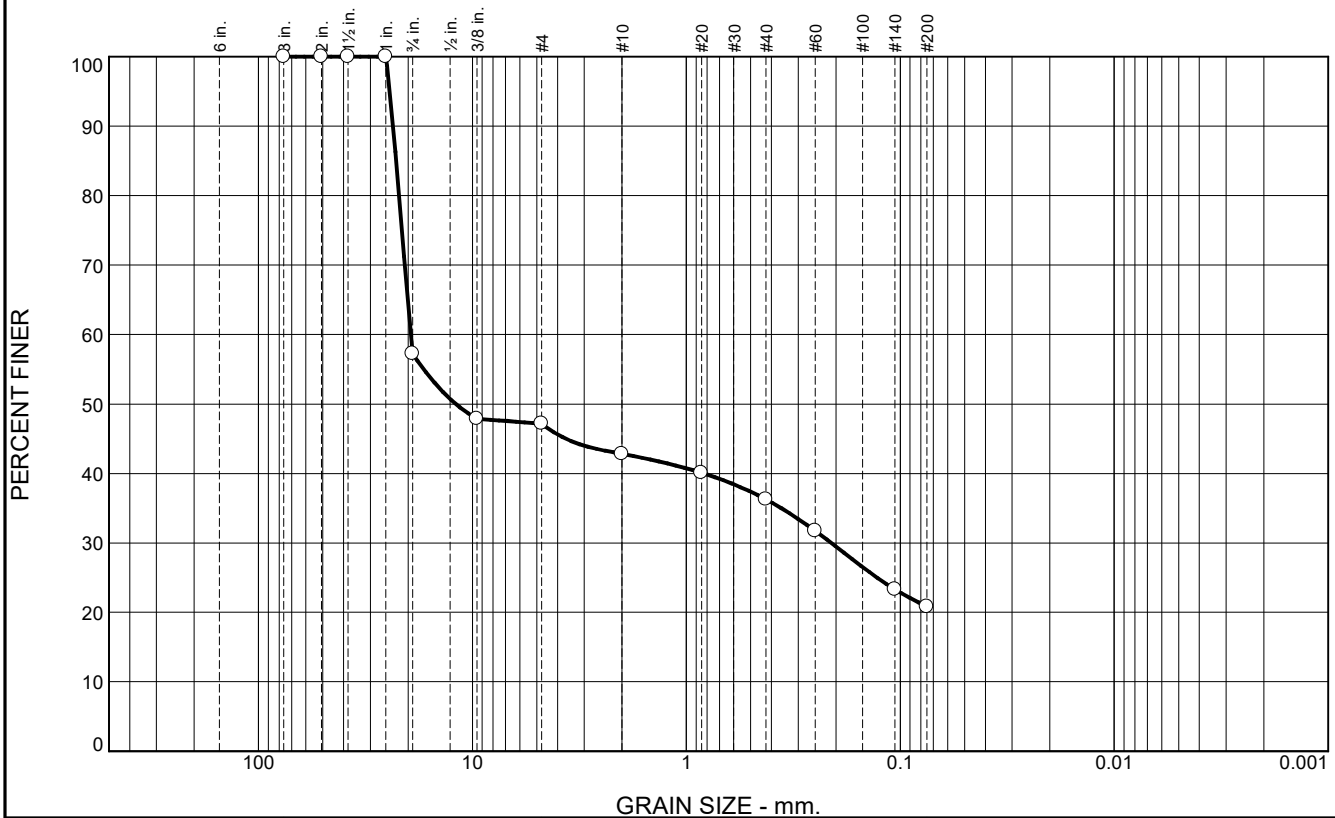
Source of Sample: B-1 Depth: 5.0' - 7.0'
Sample Number: S-3

Date: 08/22/2022

**WHITESTONE
ASSOCIATES, INC.
Warren, New Jersey**

Client: 522 Valley Estates, LLC
Project: Proposed Residential Redevelopment
522 Valley Road, Clifton, Passaic County, New Jersey
Project No: GJ2219439.000 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	42.8	10.0	4.4	6.5	15.5	20.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	57.2		
.375	47.9		
#4	47.2		
#10	42.8		
#20	40.1		
#40	36.3		
#60	31.7		
#140	23.3		
#200	20.8		

Material Description

Silty Gravel with Sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 23.4385 D₈₅= 22.6889 D₆₀= 19.4336
D₅₀= 11.9606 D₃₀= 0.2103 D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

W_n = 4.4 %

* (no specification provided)

Source of Sample: B-3 Depth: 2.0' - 4.75'
Sample Number: S-2/S-3

Date: 08/22/2022

**WHITESTONE
ASSOCIATES, INC.
Warren, New Jersey**

Client: 522 Valley Estates, LLC
Project: Proposed Residential Redevelopment
522 Valley Road, Clifton, Passaic County, New Jersey
Project No: GJ2219439.000 **Figure**

APPENDIX C
Supplemental Information
(USCS, Terms & Symbols)

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	
	MORE THAN 50% OF COARSE FRACTION <u>RETAINED</u> ON NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
	SAND AND SANDY SOILS	MORE THAN 50% OF COARSE FRACTION <u>PASSING</u> NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS <u>LARGER</u> THAN NO. 200 SIEVE SIZE			SM	SILTY SANDS, SAND-SILT MIXTURES	
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>LESS</u> THAN 50	SC	CLAYEY SANDS, SAND-CLAY MIXTURES	
			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY	
	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS	
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS		
		PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS		
HIGHLY ORGANIC SOILS					

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*

Sand and/or Gravel

RELATIVE DENSITY

LOOSE..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*

Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

* VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.

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Other Office Locations:

CHALFONT, PA
215.712.2700

SOUTHBOROUGH, MA
508.485.0755

ROCKY HILL, CT
860.726.7889

WALL, NJ
732.592.2101

PHILADELPHIA, PA
215.848.2323

BEDFORD, NH
603.514.2230

TAMPA, FL
813.851.0690

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

- N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
 Qu: Unconfined compressive strength, TSF.
 Qp: Penetrometer value, unconfined compressive strength, TSF.
 Mc: Moisture content, %.
 LL: Liquid limit, %.
 PI: Plasticity index, %.
 δd: Natural dry density, PCF.
 ▽: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered).
 SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
 ST: Shelby Tube - 3" O.D., except where noted.
 AU: Auger Sample.
 OB: Diamond Bit.
 CB: Carbide Bit
 WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<u>Term (Non-Cohesive Soils)</u>	<u>Standard Penetration Resistance</u>
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

<u>Term (Cohesive Soils)</u>	<u>Qu (TSF)</u>
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

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BEDFORD, NH
603.514.2230

TAMPA, FL
813.851.0690

August 22, 2022

via email

522 VALLEY ESTATES, LLC
164 Getty Avenue
Clifton, New Jersey 07011

Attention: Ms. Gina Gufarotti
Associate

**Regarding: REPORT OF LIMITED GEOTECHNICAL INVESTIGATION
& SLOPE STABILITY ANALYSIS
PROPOSED RESIDENTIAL DEVELOPMENT
522 VALLEY ROAD
BLOCK 32.01, LOT 12
CLIFTON, PASSAIC COUNTY, NEW JERSEY
WHITESTONE PROJECT NO.: GJ2219439.000**

Dear Ms. Gufarotti:

Whitestone Associates, Inc. (Whitestone) has completed a limited geotechnical investigation at the above-referenced site. The purpose of the investigation was to evaluate the existing subsurface conditions and conduct a slope stability analysis in support of the proposed development referenced above. Whitestone's scope of services included conducting test borings across the subject site, evaluating the conditions encountered, and developing geotechnical recommendations for the proposed residential redevelopment and related earthwork.

1.0 PROJECT DESCRIPTION

1.1 Site Location & Existing Conditions

The approximately 3.3-acre subject property located at 522 Valley Road (Block 32.01, Lot 12) in Clifton, Passaic County, New Jersey currently houses a single-family residential dwelling with associated pavements, landscaped areas, and utilities. Based on the October 14, 2021 *Civil Plan Set* prepared by Koestner Associates (Koestner), the subject site is characterized by steep easterly dipping slopes with grade changes on the order of approximately 240 feet. A natural cliff was observed within the northwestern portion of the site with an exposed height of approximately 120 feet.

1.2 Site Geology

The subject property is situated within a section of the Piedmont Physiographic Province known as the Newark Basin. Specifically, the subject site is underlain by the Lower Jurassic-age and Upper Triassic-age Conglomeratic Sandstone member of the Passaic Formation, which is part of the Brunswick Group, and the Lower Jurassic-age Orange Mountain Basalt.

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813.851.0690

The Conglomeratic Sandstone member generally consists of brownish-red pebble conglomerate with medium-grained to coarse-grained feldspathic sandstone and micaceous siltstone that is cross laminated, burrowed, and locally contains pebble layers. The Orange Mountain Basalt generally consists of dark greenish gray to greenish black basalt composed of mostly calcic plagioclase and clinopyroxene.

The overburden materials at the site include Rahway Till associated with the Wisconsin Glacier that presumably reached its most southerly advance approximately 20,000 years ago and ended approximately 10,000 years ago. The glacial deposits are expected to overlay the weathered rock. Glacial till in the area typically contains a heterogeneous mixture of sand, silt, clay and gravel mixed with variable amounts of boulders and cobbles. Overburden materials also include man-made fill associated with past and present development of the subject site.

1.3 Proposed Construction

Based on the aforementioned *Civil Plan Set* and correspondence with 522 Valley Estates, LLC, the proposed redevelopment includes demolition of the existing site structure and construction of 21 townhomes with retaining walls, pavements, landscaped areas, and utilities. The proposed redevelopment is anticipated to have cuts and fills upward of 40 feet. Maximum column and wall loads are anticipated to be less than 75 kips and 3.0 kips per linear foot, respectively.

2.0 FIELD & LABORATORY WORK

2.1 Field Exploration

Field exploration at the project site was conducted by means of three soil test borings (identified as B-1 and B-3) and one offset boring (identified as B-1A) conducted with a truck-mounted drill rig and tripod-mounted drilling equipment using hollow stem augers and split-spoon sampling techniques. The subsurface tests were conducted within accessible portions of the subject site to depths ranging from 4.8 feet below ground surface (fbgs) to 35 fbgs. Test locations subsequently were backfilled to the surface with excavated soils from the investigation or grout, as necessary. The locations of the tests are shown on the accompanying *Boring Location Plan* included as Figure 1.

The subsurface tests were conducted in the presence of a Whitestone geologist who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D 1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling the subsurface tests. Seasonal variations, temperature effects, man-made effects, and recent rainfall conditions may influence the levels of the groundwater, and the observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.2 Laboratory Program

Representative samples of the various strata encountered were subjected to a laboratory program that included Atterberg limits determination (ASTM D-4318), moisture content determinations (ASTM D-2216) and washed gradation analyses (ASTM D-422) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil strata tested were classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table. The engineering classifications are useful when considered in conjunction with the additional site data to estimate properties of the soil types encountered and to predict the soil's behavior under construction and service loads. Laboratory test results are provided in Appendix B.

PHYSICAL/TEXTURAL ANALYSES SUMMARY							
Boring	Sample	Depth (fbgs)	% Passing No. 200 Sieve	Moisture Content (%)	Liquid Limit (%)	Plastic Index (%)	USCS Classification
B-1	S-3	5.0 - 7.0	34.6	14.0	21	3.0	SM
B-3	S-2/S-3	2.0 - 4.75	20.8	4.4	NP	NP	GM

Notes: NP = Non-Plastic

3.0 EXISTING CONDITIONS

3.1 Subsurface Conditions

The subsurface soil conditions encountered within the subsurface tests consisted of the following generalized strata in order of increasing depth. *Records of Subsurface Exploration* are provided in Appendix A.

Surface Cover: The subsurface tests were conducted within existing landscaped areas and encountered approximately two inches to three inches of topsoil at the surface.

Glacial Deposits: Underlying the surface cover, the subsurface tests encountered natural glacial deposits generally consisting of silty sand (USCS: SM), sandy silt (USCS: ML), and gravel with variable amounts of silt and sand (USCS: GM & GP-GM). The glacial deposits extended to a maximum depth of approximately 33 fbgs. SPT N-values within this stratum ranged from 13 blows per foot (bpf) to refusal (defined as greater than 50 blows per six-inch advancement of the split-spoon sampler), indicating a medium dense to very dense relative density and averaging greater than 50 bpf.

Weathered Rock/Bedrock: Top of weathered rock materials were encountered in the deeper soil borings (identified as B-1 and B-1A) at depths ranging between approximately 30 fbgs and 33 fbgs. SPT N-Values recorded within the weathered rock materials generally were within refusal range. Equipment refusal on apparent bedrock was encountered at approximate depths ranging between 33.1 fbgs and 35 fbgs.

Groundwater: Static groundwater was not encountered within the soil borings to a maximum explored depth of approximately 35 fbgs. However, perched/trapped water was encountered within the deeper borings conducted above weathered rock at depths ranging between approximately 30 fbgs and 33 fbgs. Perched/trapped water and groundwater levels should be expected to fluctuate seasonally and following periods of precipitation.

3.2 Existing Geology & Exposed Bedrock

As outlined in the *Civil Plan Set*, the northwestern portion of the subject site has approximately 9,000 square feet of exposed bedrock consisting of conglomerate sandstone. The results of Whitestone's visual observations indicated that the existing rock is generally in a massive condition with few indications of erosion or potential rockfall, however, maintenance of the existing exposed rock should be executed as detailed below.

Rockfall is the movement of rock along a steep slope where natural rock slope excavations exist. The rockfall process can be accelerated due to freeze-thaw and ongoing weathering of the exposed rock. As such, a rockfall catchment zone should be installed beneath the proposed rock walls at the subject site. For this site, a rockfall catchment area is defined as the area between the edge of pavement/walkway and the base of a cut slope, used to restrict rockfalls. The use of catchment areas to contain and restrict rockfall from the roadways and/or walkways is one of the best and most effective rockfall protective measures.

Should site constraints make the rockfall catchment zone unfeasible, alternate methods such as shotcrete, wire mesh, catch fences, or tied-back walls may be evaluated as a replacement. Whitestone should be contacted for further evaluation if it is determined that the rockfall catchment zone option is not possible.

4.0 GLOBAL STABILITY EVALUATION

4.1 General

The proposed redevelopment will include the construction of 21 townhomes with retaining walls, pavements, landscaped areas, and utilities. The proposed redevelopment is anticipated to have cuts and fills upward of 40 feet to the existing gabion wall. As such, a slope stability analysis was conducted to assess the conditions of the existing slope and evaluation global stability for areas of concern based on current and potential proposed conditions.

4.2 Method of Analysis

Whitestone evaluated the global stability for the existing slope and proposed conditions using classical limit equilibrium methods that assume full development of shear strength along the rupture surface at failure. The limit equilibrium method requires information about the soil strength characteristics to compute a factor of safety along a potential sliding mass. Information regarding stress strain behavior is not used and no information regarding slope movements are produced. Movements are usually analyzed by the finite element analysis, which is outside the scope of this study. The factor of safety is the ratio between the soil shear strength and the shear stress required to stabilize the slope. The computer program Geostase was used to conduct the slope stability analysis. The method of analysis selected for this evaluation included a random search of potential failure surfaces using the Modified Bishop Method.

4.3 Existing Soil Parameters

EXISTING SOIL PARAMETERS			
Soil Type	Total Unit Weight (pcf)	Saturated Unit Weight (pcf)	Internal Friction Angle (degrees)
Glacial Deposits	125	135	30
Weathered Rock	135	145	32
Bedrock	140	140	35

4.4 *Summary of Findings*

Based on the project information, Whitestone conducted a slope stability analysis across the subject site to determine the most critical failure paths along the existing slope. Based on Whitestone's analyses, the most critical profile for the proposed development exhibited a minimum factor of safety of 1.850 (factor of safety of 1.5 typically required for stability). Furthermore, the existing factor of safety for the subject site is 2.434. As such, contingent upon adequate design of the proposed retaining structures for the proposed redevelopment, the proposed improvements are not anticipated to negatively impact global stability for the proposed development. Detailed slope stability analyses are provided herein as Figures 2A and 2B.

5.0 *CONCLUSIONS & RECOMMENDATIONS*

The results of the investigation indicate that the proposed structures may be supported on conventional shallow foundations designed to bear within the underlying natural materials and/or controlled structural backfill. The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions encountered within the limited exploration. If there are any significant changes to the project characteristics or if significantly different subsurface conditions are encountered during construction, Whitestone should be consulted such that the recommendations of this report can be reviewed.

5.1 *Site Preparation & Earthwork*

Surface Cover Stripping and Demolition: Prior to stripping operations, all utilities should be identified and secured. Any remaining vegetation, trees, topsoil, organic matter, portions of the existing building and pavements to be demolished and stripped should be removed from within the limits of areas requiring structural fill. Existing structural elements, such as foundation walls, or any concrete foundations, walls or slabs encountered during excavations, should be removed entirely from below proposed foundations and their zones of influence (as determined by lines extending at least one foot laterally beyond footing edges for each vertical foot of depth) and excavated to at least two feet below proposed construction subgrade levels elsewhere. Foundations and slabs may remain in place below these depths below proposed pavements and landscaped areas, where interference with future construction is avoided, however, any existing slab to remain should be thoroughly broken such that maximum particle size is 12 inches to allow vertical drainage of water. The demolition contractor should be required to conduct all earthwork in accordance with the recommendations in this report including backfilling any excavation, utility, etc. with structural fill. All fill or backfill placed in structural areas during any demolition operations should be placed as structural fill in accordance with the recommendations provided in this report.

Excavation Difficulties: Cobbles/boulders and apparent obstructions encountered at the site will present excavation difficulties for foundations, utilities, and similar excavations at variable depths below the surface. Excavation difficulties will be affected by the size of the excavation depth and equipment used. Heavy excavating equipment with ripping tools will probably be effective in removing cobbles/boulders and most obstructions during site grading. The speed and ease of excavation will depend on the type of grading equipment, the skill of the equipment operators, and the size of the excavation. Planned excavation depths beyond refusal depths and in confined excavations, such as for foundation embedment or utility trenches, may require ripping tools, extreme service buckets, or pneumatic hammers.

Surface Preparation/Proofrolling: Prior to placing any fill or subbase materials to raise or restore grades to the desired subgrade elevations, the existing exposed soils should be compacted to a firm surface with several passes in two perpendicular directions of a minimum 10-ton vibratory roller. The

roller should be operated in the static mode or a kneading “sheepsfoot” roller should be used if silt and/or clay soils are encountered at subgrade elevations. The surface then should be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets which may require removal and replacement or further investigation. Proofrolling should be conducted after a suitable period of dry weather to avoid degrading an otherwise stable subgrade. Any fill or backfill should be placed and compacted in accordance with Section 5.2.

Weather Performance Criteria: Because the site soils are, at least, moderately moisture sensitive and will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during warm, dry weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 5.2 of this report may be required prior to resuming work on disturbed subgrade soils. The site contractors should employ necessary means and methods to protect the subgrade including, but not limited to the following:

- ▶ leaving the existing pavement in place as long as practical to protect the subgrade from freeze-thaw cycles and exposure to inclement weather;
- ▶ sealing exposed subgrade soils on a daily basis with a smooth drum roller operated in static mode;
- ▶ regrading the site as needed to maintain positive drainage away from construction areas;
- ▶ removing wet surficial soils and ruts immediately; and
- ▶ limiting exposure to construction traffic especially following inclement weather and subgrade thawing.

Subgrade Protection and Inspection: Every effort should be made to minimize disturbance of the on-site soils by construction traffic and surface runoff. The on-site soils may deteriorate when subjected to repeated construction traffic and may require removal and replacement. These materials also may require wetting and recompaction during dry periods or discing, drying and aeration during wet periods. The contractor should be responsible for protection of subgrades and minimization of exposure of the site soils to precipitation by covering stockpiles and subgrades with plastic and preventing ponding of water by sealing subgrades before precipitation events and grading the site to allow proper drainage of surface water. All rutting from construction equipment should be removed prior to any forecasted or actual precipitation. The services of the geotechnical engineer should be retained to inspect soils conditions immediately prior to concrete placement to verify the suitability of prepared foundation subgrades for support of design loads.

5.2 *Structural Fill & Backfill*

Imported Fill Material: Any imported material placed as structural fill or backfill to restore design grades should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 10 percent of material finer than a #200 sieve. Silts, clays, and silty or clayey sands and gravels with higher percentage of fines and with a liquid limit less than 40 and a plasticity index less than 20 may be considered subject to the owner’s approval, provided that the required moisture content and compaction controls are met. The material should be free of clay lumps, organics, and deleterious material. Any imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

Soil Reusability: Whitestone anticipates that the majority of the underlying natural site soils will be suitable for selective reuse as structural backfill materials provided that any deleterious materials, oversized, and/or objectionable debris encountered are segregated and moisture contents are controlled within two percent of the optimum moisture content. Reuse of the fine-grained natural soils will be contingent on careful inspection by the owner's geotechnical engineer during construction. Soils that become exceedingly wet will require extensive drying prior to reuse. The reuse of the granular soils with a high percentage of plastic fines typically is possible only during ideal weather conditions. Reuse of these soils may require mixing with a more granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas.

Alternatively, imported materials may be required to expedite earthwork operations, especially if the construction schedule or the site area restricts moisture control operations, such as spreading and air drying the soil.

Compaction and Placement Requirements: All fill and backfill should be placed in maximum nine-inch loose lifts and compacted to 95 percent of the maximum dry density within two percent of the optimum moisture content as determined by ASTM D 1557 (Modified Proctor). Whitestone recommends using a small hand-held vibratory compactor to compact the on-site soils within any footing excavations.

5.3 Groundwater Control

Static groundwater was not encountered within the borings to a maximum explored depth of approximately 35 fbs. However, perched groundwater may be encountered following periods of wet weather within fine-grained portions of the natural site soils, especially following precipitation events. Therefore, temporary groundwater control measures should be implemented as described below. Whitestone anticipates that dewatering typically would include numerous sump pumps along the excavation perimeter.

Because the subsurface soils will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations to rainfall. Overexcavation of saturated soils and replacement with controlled structural fill and/or one foot to two feet of open graded gravel (such as ¾-inch clean crushed stone) may be required prior to resuming work on disturbed subgrade soils.

5.4 Shallow Foundation Design Criteria

Whitestone recommends that the proposed structures be supported on conventional shallow foundations designed to bear within the underlying natural soils and/or properly placed structural fill provided these materials are properly evaluated, placed, and compacted in accordance with this report. Foundations bearing within these materials may be designed using a maximum allowable net bearing pressure of 4,000 pounds per square foot. Alternatively, the proposed foundations may be designed to bear entirely in the underlying weathered rock/bedrock and be designed using a maximum allowable net bearing pressure of 6,000 pounds per square foot.

All footing bottoms should be improved by in-trench compaction in the presence of the geotechnical engineer. Regardless of loading conditions, proposed foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings (if planned).

Below-grade footings should be designed so that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the

footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete. Side friction should be neglected when proportioning the footings so that lateral resistance should be provided by friction resistance at the base of the footings. A coefficient of friction against sliding of 0.35 is recommended for use in the design of the foundations bearing within the existing site soils or imported structural fill soils.

Partial Weathered Rock/Bedrock Support: Foundations should not be supported partially on weathered rock, weathered rock-sized cobbles/boulders, or bedrock and partially on soil because of the risk of brittle fracture due to a hinging effect. If the proposed bearing elevations result with partial bearing on such materials, Whitestone recommends removing a minimum of six inches of the weathered rock/bedrock and restoring the bearing elevation with structural fill. As such, rock should be overexcavated for a transition length of 20 feet and backfilled with structural backfill per recommendations outlined in this report for any foundation that results in partial rock and partial soil conditions.

Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing soils along the footing bottoms be verified by a geotechnical engineer immediately prior to placing concrete for the footings. In the event that areas of unsuitable materials are encountered, additional overexcavation and replacement of the materials may be necessary to provide a suitable footing subgrade. Any overexcavation to be restored with structural fill will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation may be eliminated if grades are restored with lean concrete. The bottom of overexcavations should be compacted with walk-behind compactors, vibrating plates, or plate tampers (“jumping jacks”), as appropriate, to compact locally disturbed materials.

Settlement: Whitestone estimates post construction settlements of proposed foundations to be less than one inch if the recommendations outlined in this report are properly implemented. Differential settlement of foundations should be less than one-half inch.

Seismic Site Class: Based on a review of the subsurface conditions relevant to the *2018 International Building Code - New Jersey Edition*, the subject site may be assigned a Site Class C. As such, liquefaction considerations are not expected to have a substantial impact on design.

Frost Coverage: Footings subject to frost action should be placed at least 36 inches below adjacent exterior grades or the depth required by local building codes to provide protection from frost penetration. Because competent rock is not susceptible to frost heaving conditions, foundations bearing directly on top of competent rock, as verified during construction by the geotechnical engineer are not required to extend to typical frost protection depths.

5.5 *Lateral Earth Pressures*

General: Due to the significant grade changes across the property, the proposed redevelopment is anticipated to have retaining walls with cuts and fills upward of 40 feet. While the design of the retaining structures is beyond Whitestone’s current scope of work, Whitestone would be pleased to assist with the calculation of lateral earth pressures based on the soil parameters presented herein during the structural design phase when final grading and wall geometries are available.

Lateral Earth Pressures: Temporary retaining structures and permanent below-grade walls may be required to resist lateral earth pressures. Proposed below-grade walls must be capable of withstanding active and at-rest earth pressures. Retaining/below-grade walls free to rotate generally can be designed to resist active earth pressures. Retaining/below-grade walls corners and restrained walls need to be

designed to resist at-rest earth pressures. Such structures should be properly designed by the Owner's engineer. The following soil parameters apply to the encountered subsurface strata and may be used for design of the proposed temporary and permanent retaining structures.

LATERAL EARTH PRESSURE PARAMETERS			
Parameter	On-Site Granular Soils	On-Site Fine-Grained Soils	Imported Granular Backfill
Moist Density (γ_{moist})	140 pcf	135 pcf	130 pcf
Internal Friction Angle (ϕ)	30°	28°	30°
Active Earth Pressure Coefficient (K_a)	0.33	0.39	0.33
Passive Earth Pressure Coefficient (K_p)	3.00	2.56	3.00
At-Rest Earth Pressure Coefficient (K_o)	0.50	0.56	0.50

Lateral earth pressure will depend on the backfill slope angle and the wall batter angle. A sloped backfill will add surcharge load and affect the angle of the resultant force. The effect of other surcharges will also need to be included in earth pressure calculations, including the loads imposed by adjacent structures and traffic. The effects of proposed sloped backfill surface grades, and proposed slopes beyond the toe of the retaining structure, if applicable, must be considered when calculating resultant forces to be resisted by the retaining structure. A coefficient of friction of 0.35 against sliding can be used for concrete on the existing site soils. Retaining wall footings should be designed so that the combined effect of vertical and horizontal resultants and overturning moment does not exceed the maximum soil bearing capacity provided in Section 5.4.

Backfill Criteria: Whitestone recommends that granular soils be used to backfill behind the proposed retaining walls. The granular backfill materials should consist of clean, relatively well graded sand or gravel with a maximum particle size of three inches and five percent to 15 percent of material finer than a #200 sieve. The material should be free of clay lumps, organics, and deleterious material. Portions of the on-site soils may be suitable for retaining wall backfill, pending approval from the wall designer. Imported granular soils also may be required. A maximum density of 140 pcf should not be exceeded to avoid creating excessive lateral pressure on the walls during compaction operations.

Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

6.0 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to verify that the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. Any overexcavation of existing fill (although not anticipated) within the proposed building footprint area should be witnessed and documented by the owner's geotechnical engineer. The placement of structural backfill within the building structures and behind retaining walls as well as the placement and overexcavation of unsuitable soils also should be documented by the owner's geotechnical engineer.

7.0 CLOSING

Whitestone appreciates the opportunity to be of service to 522 Valley Estates, LLC. Please contact us with any questions or comments regarding this report.

Sincerely,

WHITESTONE ASSOCIATES, INC.



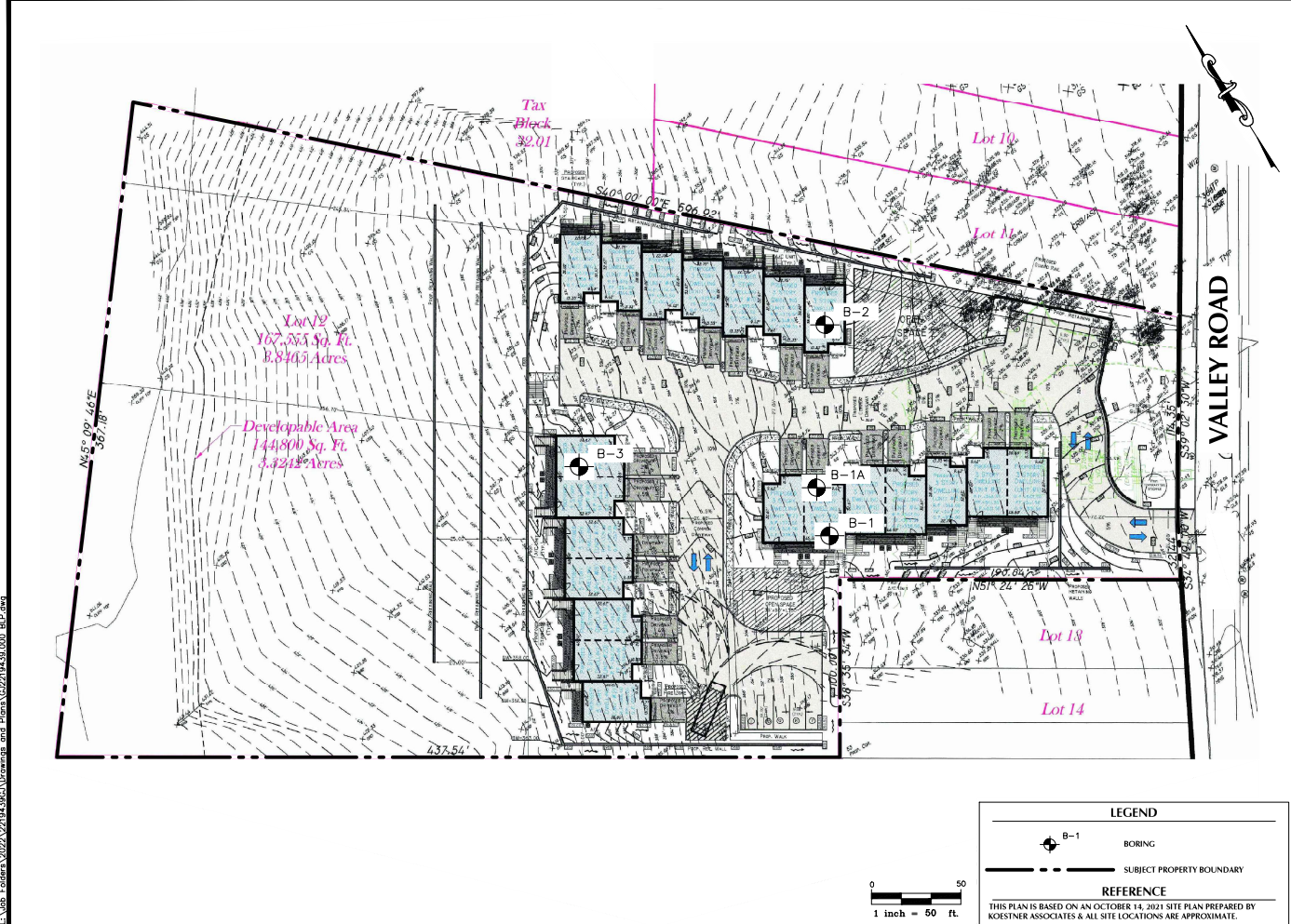
Kyle J. Kopacz, P.E.
Associate



Laurence W. Keller, P.E.
Vice-President

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Enclosure
Copy: Tristan D. Jovanov, Whitestone Associates, Inc.

FIGURE 1
Boring Location Plan



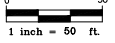
VALLEY ROAD

LEGEND

B-1 BORING
 SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON AN OCTOBER 14, 2021 SITE PLAN PREPARED BY KOESTNER ASSOCIATES & ALL SITE LOCATIONS ARE APPROXIMATE.



WHITESTONE
 An Employee-Owned Company

30 INDEPENDENCE BOULEVARD, SUITE 250, WARREN, NJ 07059
 908.668.7777 WHITESTONEASSOC.COM

DRAWING TITLE:	
BORING LOCATION PLAN	
CLIENT:	
522 VALLEY ESTATES, LLC	
PROJECT:	
PROPOSED RESIDENTIAL REDEVELOPMENT 522 VALLEY ESTATES, LLC CLIFTON, PASSAIC COUNTY, NJ	

PROJECT #:	
GJ2219439.000	
DESIGNED BY:	PLT. NO.:
GR	KK
DATE:	ISSUE:
8/17/22	1
SCALE:	
1" = 50'	

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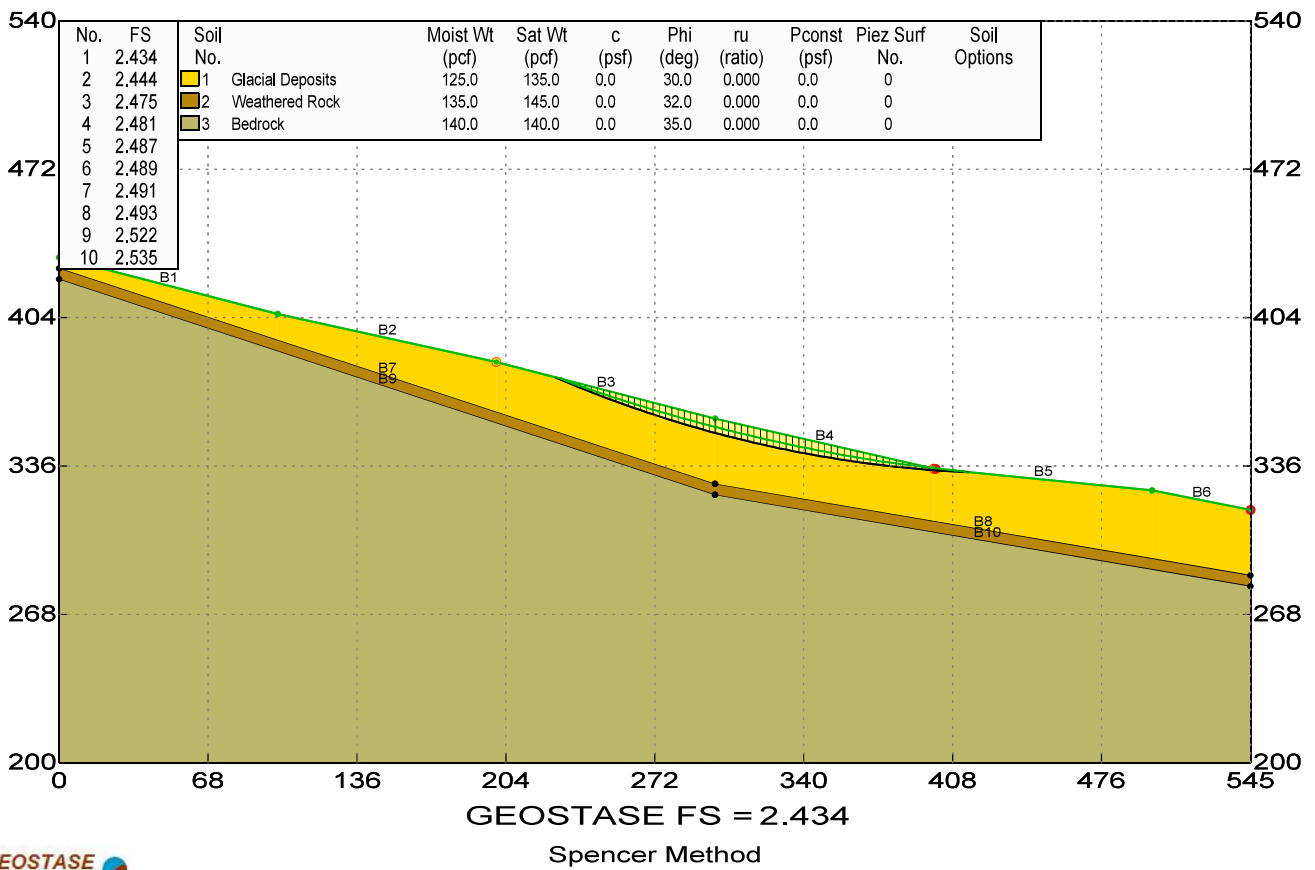


FIGURE 2
Slope Stability Analyses

Proposed Residential Development GJ2219439.000

Whitestone Associates, Inc.

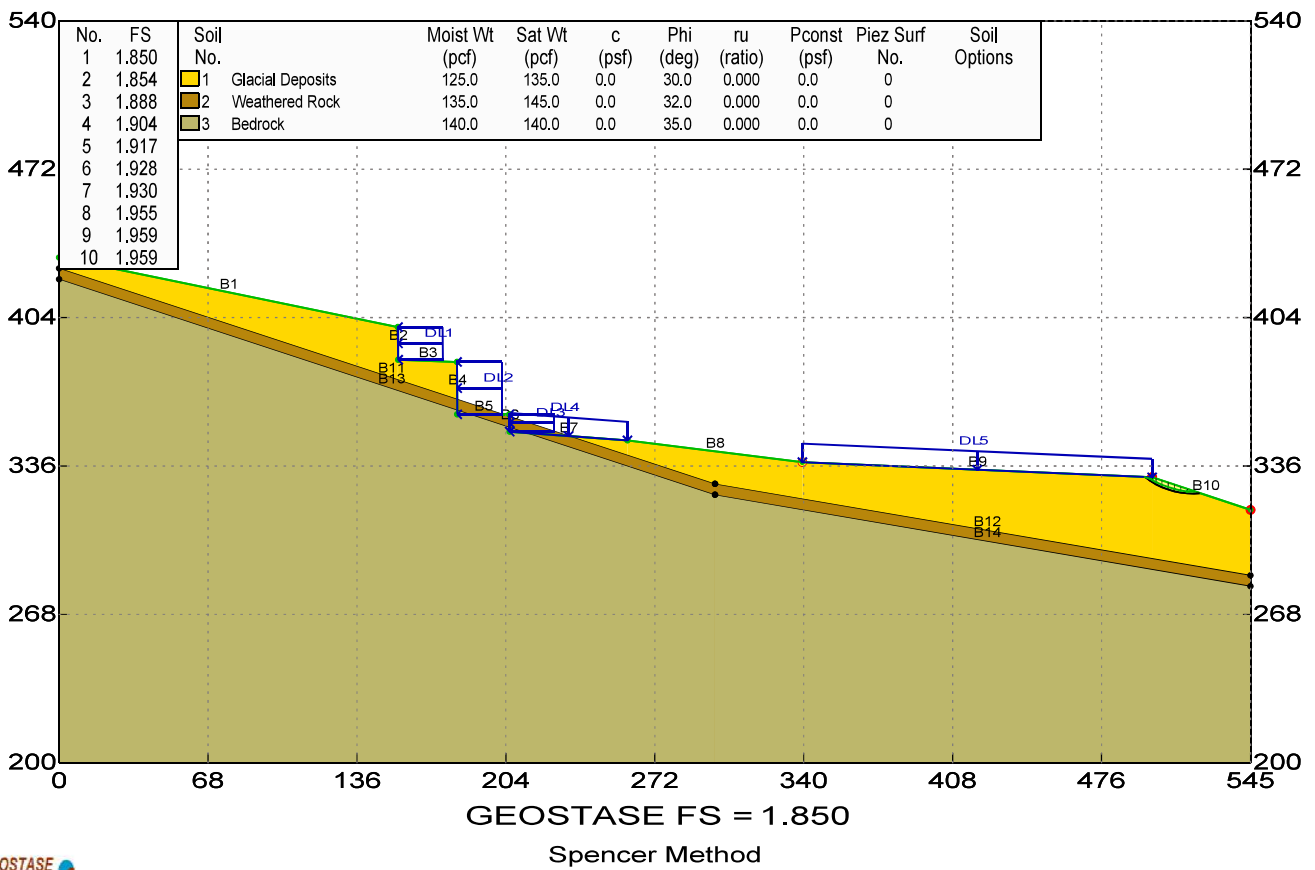
\\Existing Conditions.gsd



Proposed Residential Development GJ2219439.000

Whitestone Associates, Inc.

\\Proposed Conditions.gsd



GEOSTASE® by GREGORY GEOTECHNICAL SOFTWARE

PLATE C.1

APPENDIX A
Records of Subsurface Exploration

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Residential Development		WAI Project No.: GJ2219439.000	
Location: 522 Valley Road, Clifton, Passaic County, New Jersey		Client: 522 Valley Estates, LLC	
Surface Elevation: ± 330.0 feet	Date Started: 8/15/2022	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: 35.0 feet bgs	Date Completed: 8/16/2022	During: NE 330.0 ▼	At Completion: 30.0 300.0 ☒
Proposed Location: Building Pad	Logged By: RL	At Completion: NE 330.0 ▼	24 Hours: --- --- ▼
Drill / Test Method: SPT	Contractor: ETD	24 Hours: --- --- ▼	24 Hours: --- --- ▼
Mud Rotary	Equipment: CME 75		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	TOPSOIL	2" Topsoil	
0 - 2	S-1	X	6 - 6 - 7 - 9	6	13	2.0	GLACIAL DEPOSITS	Brown Silty Sand with Gravel, Moist, Medium Dense (SM)	
2 - 4	S-2	X	14 - 15 - 11 - 9	4	26	4.0		As Above (SM)	
5 - 7	S-3	X	9 - 12 - 16 - 16	24	28	7.0		Reddish-Brown Sandy Silt with Gravel, Moist, Very Stiff (ML)	
7 - 8.3	S-4	X	28 - 31 - 50/4"	24	81/10"	8.3		As Above (ML)	2.5 tsf
10 - 12	S-5	X	32 - 38 - 42 - 0	24	80	12.0		Reddish-Brown Silty Sand with Gravel, Moist, Very Dense (SM)	
15 - 17	S-6	X	22 - 36 - 48 - 53	24	84	17.0		As Above (SM)	3.5 tsf
20 - 22	S-7	X	43 - 26 - 36 - 30	20	62	22.0		Reddish-Brown Sandy Silt, Moist, Very Stiff (ML)	
						25.0		Reddish-Brown Silty Sand, Moist, Very Dense (SM)	



RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 2 of 2

Project: Proposed Residential Development			WAI Project No.: GJ2219439.000		
Location: 522 Valley Road, Clifton, Passaic County, New Jersey			Client: 522 Valley Estates, LLC		
Surface Elevation: ± 330.0 feet		Date Started: 8/15/2022		Water Depth Elevation (feet bgs) (feet)	
Termination Depth: 35.0 feet bgs		Date Completed: 8/16/2022		Cave-In Depth Elevation (feet bgs) (feet)	
Proposed Location: Building Pad		Logged By: RL		During: NE 330.0 ▼	
Drill / Test Method: HSA / SPT		Contractor: ETD		At Completion: NE 330.0 ▼	
Mud Rotary		Equipment: CME 75		24 Hours: --- --- ▼	
			At Completion: --- --- ☒		
			24 Hours: --- --- ☒		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
25 - 26.2	S-8	X	44 - 50 - 50/2	21	100/8	25.0	GLACIAL DEPOSITS	As Above (SM)	
30 - 30.25	S-9	X	50/3	3	50/3	30.0	WEATHERED ROCK	Reddish-Brown Weathered Rock with Silt, Wet, Very Dense (WR)	
35 - 35	S-10	X	50/0	NR	30/0	35.0		No Recovery Presumed As Above	
Boring Log B-1 Terminated at a Depth of 35.0 Feet Below Ground Surface									

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Residential Development		WAI Project No.: GJ2219439.000	
Location: 522 Valley Road, Clifton, Passaic County, New Jersey		Client: 522 Valley Estates, LLC	
Surface Elevation: ± 330.0 feet	Date Started: 8/16/2022	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: 33.1 feet bgs	Date Completed: 8/16/2022	During: NE 330.0 ▼	At Completion: 30.0 300.0 ☒
Proposed Location: Building Pad	Logged By: RL	At Completion: NE 330.0 ▼	24 Hours: --- --- ▼
Drill / Test Method: HSA / SPT Mud Rotary	Contractor: ETD	24 Hours: --- --- ▼	24 Hours: --- --- ▼
	Equipment: CME 75		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						25.0			
						30.0			
									Offset 20 Feet from B-1
33 - 33.1	S-1	<input checked="" type="checkbox"/>	50/1	1	50/1		WR	---	Reddish-Brown Weathered Rock (WR)
						35.0			Boring Log B-1A Terminated at a Depth of 00.0 Feet Below Ground Surface

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched



RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 2

Project: Proposed Residential Development		WAI Project No.: GJ2219439.000	
Location: 522 Valley Road, Clifton, Passaic County, New Jersey		Client: 522 Valley Estates, LLC	
Surface Elevation: ± 342.0 feet	Date Started: 8/15/2022	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: 10.0 feet bgs	Date Completed: 8/16/2022	During: NE --- ▼	At Completion: 10.0 332.0 ☒
Proposed Location: Building Pad	Logged By: RL	At Completion: NE --- ▼	24 Hours: --- --- ▼
Drill / Test Method: SPT	Contractor: ETD	24 Hours: --- --- ▼	24 Hours: --- --- ▼
Mud Rotary	Equipment: CME 75		

SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	TOPSOIL	2" Topsoil	
0 - 2	S-1	X	2 - 7 - 24 - 24	2	32	2.0	GLACIAL DEPOSITS	Brown Silty Sand, Dry, Dense (SM)	
2 - 4	S-2	X	6 - 14 - 18 - 21	2	32	4.0		Reddish-Brown Poorly Graded Gravel with Silt and Sand, Dry, Dense (SP-SM)	
4 - 6	S-3	X	12 - 26 - 32 - 48	4	58	5.0		Reddish-Brown Sandy Silt, Dry, Very Stiff (ML)	
6 - 8	S-4	X	32 - 48 - 61 - 69	8	109	7.0		Reddish-Brown Silty Gravel, Dry, Very Dense (SM)	
8 - 10	S-5	X	33 - 42 - 31 - 29	10	73	8.3		As Above, Moist (SM)	
						10.0		Boring Log B-2 Terminated at a Depth of 10.0 Feet Below Ground Surface	
						12.0			
						15.0			
						17.0			
						20.0			
						22.0			
						25.0			

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

RECORD OF SUBSURFACE EXPLORATION

Project: Proposed Residential Development		WAI Project No.: GJ2219439.000	
Location: 522 Valley Road, Clifton, Passaic County, New Jersey		Client: 522 Valley Estates, LLC	
Surface Elevation: ± 382.0 feet	Date Started: 8/15/2022	Water Depth Elevation (feet bgs) (feet)	Cave-In Depth Elevation (feet bgs) (feet)
Termination Depth: 4.75 feet bgs	Date Completed: 8/16/2022	During: NE --- ▼	At Completion: NE --- ▼
Proposed Location: Building Pad	Logged By: RL	24 Hours: --- --- ▼	At Completion: 4.0 378.0 <input checked="" type="checkbox"/>
Drill / Test Method: SPT	Contractor: ETD		24 Hours: --- --- <input checked="" type="checkbox"/>
Tripod	Equipment: CME 75		

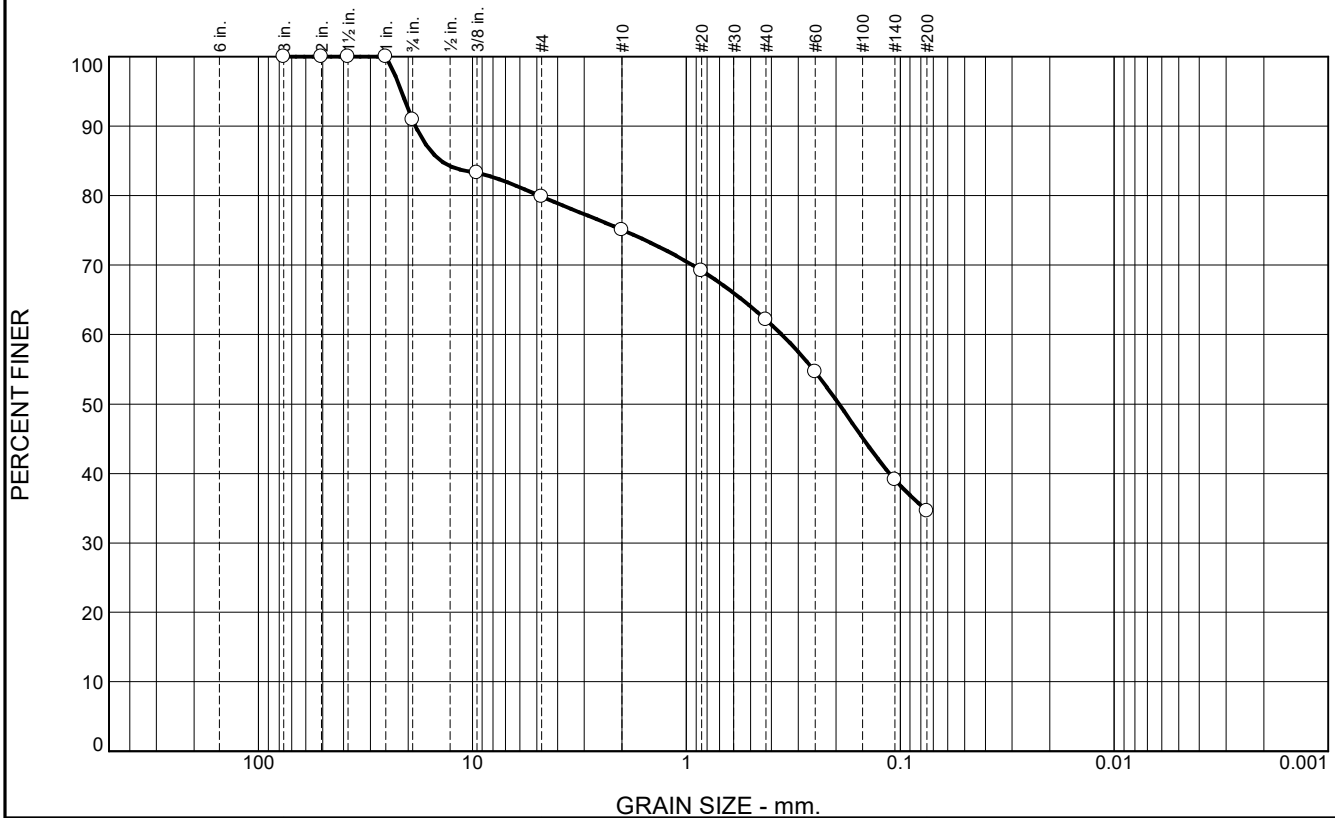
SAMPLE INFORMATION						DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N				
						0.0	TOPSOIL	3" Topsoil	
0 - 2	S-1		5 - 7 - 29 - 35	3	32	2.0	GLACIAL DEPOSITS	Brown Silty Sand with Gravel, Dry, Dense (SM)	
2 - 3.75	S-2		30 - 41 - 62 - 100 / 3	6	103	3.75		Reddish-Brown Poorly Graded Gravel with Silt and Sand, Dry (SP-SM)	
3.75 - 4.75	S-3		52 - 100	1	100/6	4.75		As Above (SP-SM)	
						12.0			
						15.0			
						17.0			
						20.0			
						22.0			
						25.0			
Boring Log B-3 Terminated at a Depth of 4.75 Feet Below Ground Surface Due to Spoon Refusal									



APPENDIX B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.1	11.1	4.7	13.0	27.5	34.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	90.9		
.375	83.3		
#4	79.8		
#10	75.1		
#20	69.2		
#40	62.1		
#60	54.6		
#140	39.1		
#200	34.6		

Material Description

Silty Sand with Gravel

Atterberg Limits

PL= 18 LL= 21 PI= 3

Coefficients

D₉₀= 18.4623 D₈₅= 14.0052 D₆₀= 0.3587
D₅₀= 0.1938 D₃₀= D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

W_n = 14.0 %

* (no specification provided)

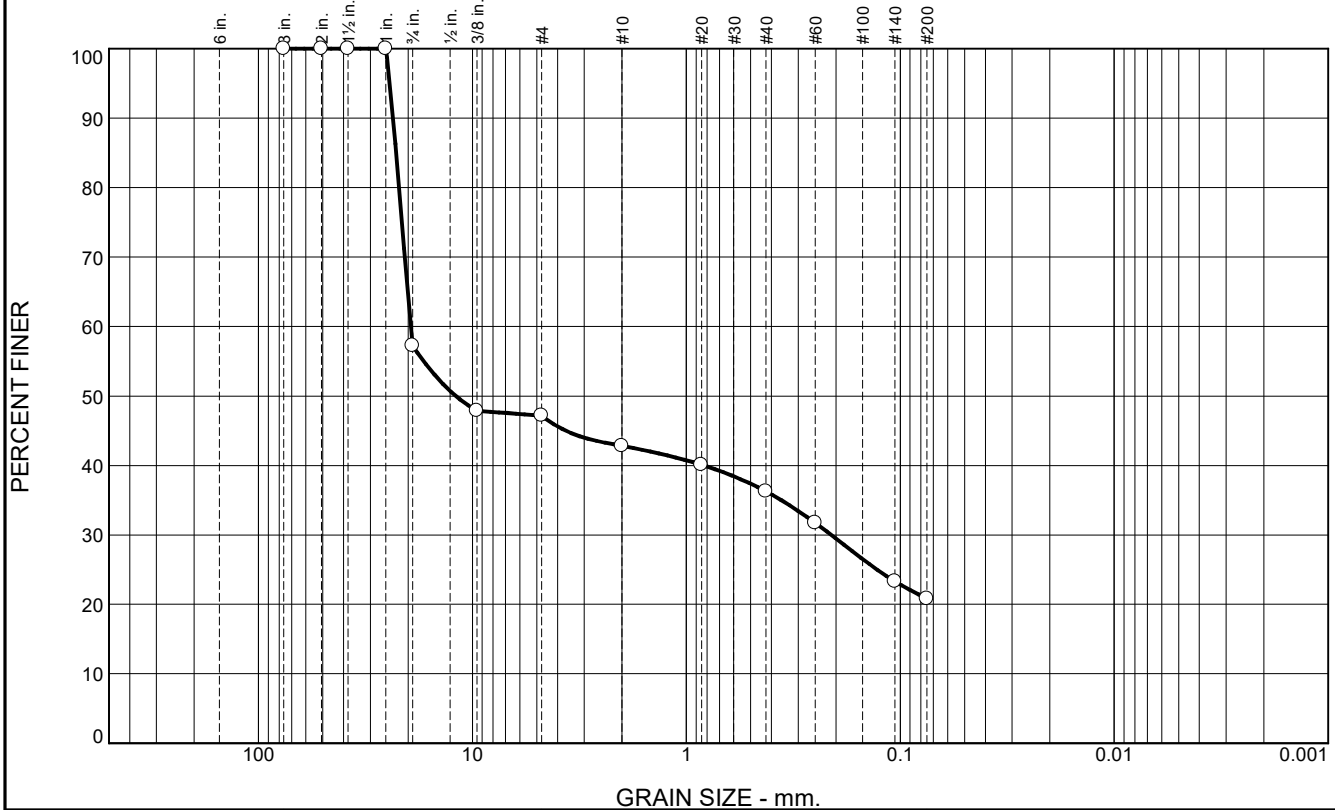
Source of Sample: B-1 Depth: 5.0' - 7.0'
Sample Number: S-3

Date: 08/22/2022

**WHITESTONE
ASSOCIATES, INC.
Warren, New Jersey**

Client: 522 Valley Estates, LLC
Project: Proposed Residential Redevelopment
522 Valley Road, Clifton, Passaic County, New Jersey
Project No: GJ2219439.000 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	42.8	10.0	4.4	6.5	15.5	20.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	57.2		
.375	47.9		
#4	47.2		
#10	42.8		
#20	40.1		
#40	36.3		
#60	31.7		
#140	23.3		
#200	20.8		

Material Description

Silty Gravel with Sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D₉₀= 23.4385 D₈₅= 22.6889 D₆₀= 19.4336
D₅₀= 11.9606 D₃₀= 0.2103 D₁₅=
D₁₀= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

W_n = 4.4 %

* (no specification provided)

Source of Sample: B-3 Depth: 2.0' - 4.75'
Sample Number: S-2/S-3

Date: 08/22/2022

**WHITESTONE
ASSOCIATES, INC.
Warren, New Jersey**

Client: 522 Valley Estates, LLC
Project: Proposed Residential Redevelopment
522 Valley Road, Clifton, Passaic County, New Jersey
Project No: GJ2219439.000 **Figure**

APPENDIX C
Supplemental Information
(USCS, Terms & Symbols)

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION <u>RETAINED</u> ON NO. 4 SIEVE	CLEAN SAND (LITTLE OR NO FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS <u>LARGER</u> THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION <u>PASSING</u> NO. 4 SIEVE	SM	SILTY SANDS, SAND-SILT MIXTURES	
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS <u>LESS</u> THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
	SILTS AND CLAYS	LIQUID LIMITS <u>GREATER</u> THAN 50	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*

Sand and/or Gravel

RELATIVE DENSITY

LOOSE..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*

Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

* VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM NJ.docx

Other Office Locations:

CHALFONT, PA
215.712.2700

SOUTHBOROUGH, MA
508.485.0755

ROCKY HILL, CT
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WALL, NJ
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PHILADELPHIA, PA
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BEDFORD, NH
603.514.2230

TAMPA, FL
813.851.0690

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

- N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
 Qu: Unconfined compressive strength, TSF.
 Qp: Penetrometer value, unconfined compressive strength, TSF.
 Mc: Moisture content, %.
 LL: Liquid limit, %.
 PI: Plasticity index, %.
 δd: Natural dry density, PCF.
 ▽: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

- NE: Not Encountered (Groundwater was not encountered).
 SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
 ST: Shelby Tube - 3" O.D., except where noted.
 AU: Auger Sample.
 OB: Diamond Bit.
 CB: Carbide Bit
 WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<u>Term (Non-Cohesive Soils)</u>	<u>Standard Penetration Resistance</u>
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

<u>Term (Cohesive Soils)</u>	<u>Qu (TSF)</u>
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

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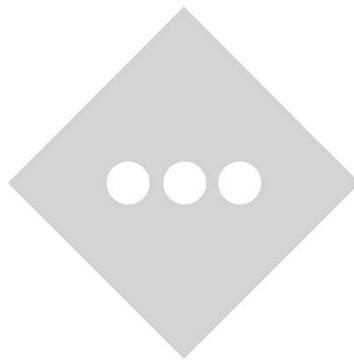
APPENDIX C

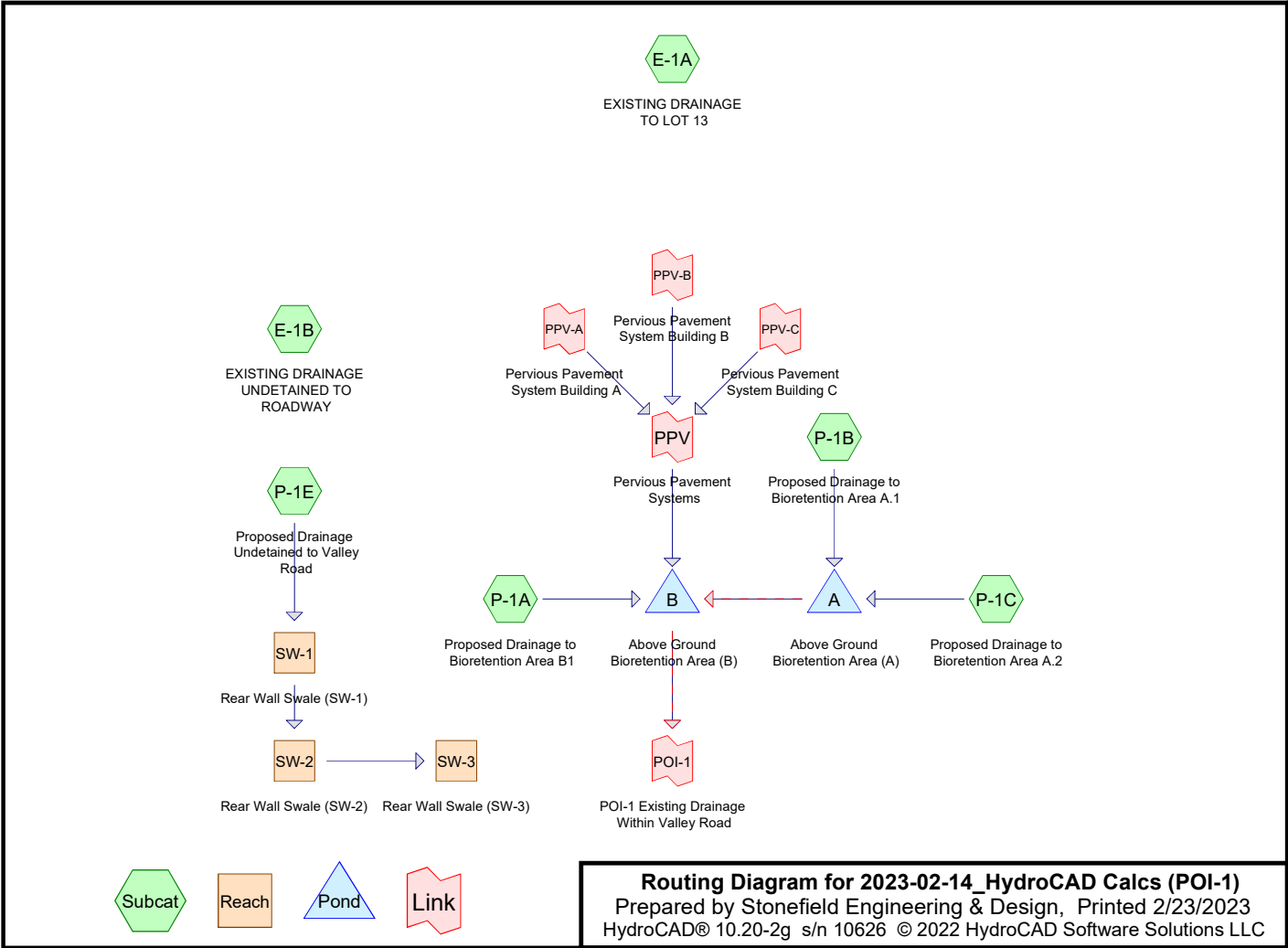
HYDROLOGIC & HYDRAULIC CALCULATIONS

INVENTORY

C-1: HYDROCAD NODE SCHEMATIC DIAGRAM

C-2: HYDROCAD HYDROLOGIC CALCULATIONS





2023-02-14_HydroCAD Calcs (POI-1)

Prepared by Stonefield Engineering & Design

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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 3

Time span=0.00-72.00 hrs, dt=0.02 hrs, 3601 points
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1A: EXISTING DRAINAGE TO LOT 13	Runoff Area=91,865 sf 0.00% Impervious Runoff Depth=0.05" Flow Length=424' Tc=12.9 min CN=72/0 Runoff=0.16 cfs 391 cf
Subcatchment E-1B: EXISTING DRAINAGE UNDETAINED TO ROADWAY	Runoff Area=108,912 sf 0.00% Impervious Runoff Depth=0.03" Flow Length=281' Tc=12.6 min CN=70/0 Runoff=0.11 cfs 299 cf
Subcatchment P-1A: Proposed Drainage to Bioretention Area B1	Runoff Area=17,717 sf 20.82% Impervious Runoff Depth=0.35" Flow Length=99' Tc=6.0 min CN=80/98 Runoff=0.39 cfs 520 cf
Subcatchment P-1B: Proposed Drainage to Bioretention Area A.1	Runoff Area=5,136 sf 13.92% Impervious Runoff Depth=0.21" Flow Length=173' Tc=13.4 min CN=74/98 Runoff=0.04 cfs 89 cf
Subcatchment P-1C: Proposed Drainage to Bioretention Area A.2	Runoff Area=39,200 sf 47.79% Impervious Runoff Depth=0.53" Flow Length=305' Tc=8.7 min CN=74/98 Runoff=1.19 cfs 1,741 cf
Subcatchment P-1E: Proposed Drainage Undetained to Valley Road	Runoff Area=124,291 sf 0.00% Impervious Runoff Depth=0.03" Flow Length=518' Tc=20.9 min CN=70/0 Runoff=0.12 cfs 342 cf
Reach SW-1: Rear Wall Swale (SW-1)	Avg. Flow Depth=0.01' Max Vel=0.81 fps Inflow=0.12 cfs 342 cf n=0.030 L=67.2' S=0.1414 '/' Capacity=102.47 cfs Outflow=0.12 cfs 342 cf
Reach SW-2: Rear Wall Swale (SW-2)	Avg. Flow Depth=0.01' Max Vel=0.64 fps Inflow=0.12 cfs 342 cf n=0.030 L=60.0' S=0.0667 '/' Capacity=70.37 cfs Outflow=0.12 cfs 342 cf
Reach SW-3: Rear Wall Swale (SW-3)	Avg. Flow Depth=0.01' Max Vel=0.50 fps Inflow=0.12 cfs 342 cf n=0.030 L=129.4' S=0.0309 '/' Capacity=47.92 cfs Outflow=0.12 cfs 342 cf
Pond A: Above Ground Bioretention Area (A)	Peak Elev=328.99' Storage=1,704 cf Inflow=1.23 cfs 1,830 cf Discarded=0.02 cfs 1,830 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.02 cfs 1,830 cf
Pond B: Above Ground Bioretention Area (B)	Peak Elev=315.28' Storage=428 cf Inflow=0.39 cfs 523 cf Discarded=0.02 cfs 523 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.02 cfs 523 cf

2023-02-14_HydroCAD Calcs (POI-1)

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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 4

Link POI-1: POI-1 Existing Drainage Within Valley Road

Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link PPV: Pervious Pavement Systems

Inflow=0.00 cfs 2 cf
Primary=0.00 cfs 2 cf

Link PPV-A: WQ Primary Outflow Imported from 2023-02-13_HydroCAD Calcs Pervious Pavement PV-A1~Link PPV-A.hce Inflow=0.00 cfs 0 cf
Area= 9,208 sf 98.96% Imperv. Primary=0.00 cfs 0 cf

Link PPV-B: WQ Primary Outflow Imported from 2023-02-13_HydroCAD Calcs Pervious Pavement PV-B1~Link PPV-B.hce Inflow=0.00 cfs 0 cf
Area= 8,713 sf 98.88% Imperv. Primary=0.00 cfs 0 cf

Link PPV-C: WQ Primary Outflow Imported from 2023-02-13_HydroCAD Calcs Pervious Pavement PV-C1~Link PPV-C.hce Inflow=0.00 cfs 2 cf
Area= 7,359 sf 100.00% Imperv. Primary=0.00 cfs 2 cf

Total Runoff Area = 387,121 sf Runoff Volume = 3,383 cf Average Runoff Depth = 0.10"
94.02% Pervious = 363,984 sf 5.98% Impervious = 23,137 sf

2023-02-14_HydroCAD Calcs (POI-1)

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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 5

Summary for Subcatchment E-1A: EXISTING DRAINAGE TO LOT 13

Runoff = 0.16 cfs @ 1.35 hrs, Volume= 391 cf, Depth= 0.05"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
66,518	70	Woods, Good, HSG C
20,121	74	>75% Grass cover, Good, HSG C
5,226	98	Water Surface, 0% imp, HSG C
91,865	72	Weighted Average
91,865	72	100.00% Pervious Area

2023-02-14_HydroCAD Calcs (POI-1)

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NJ DEP 2-hr WQ Rainfall=1.25"

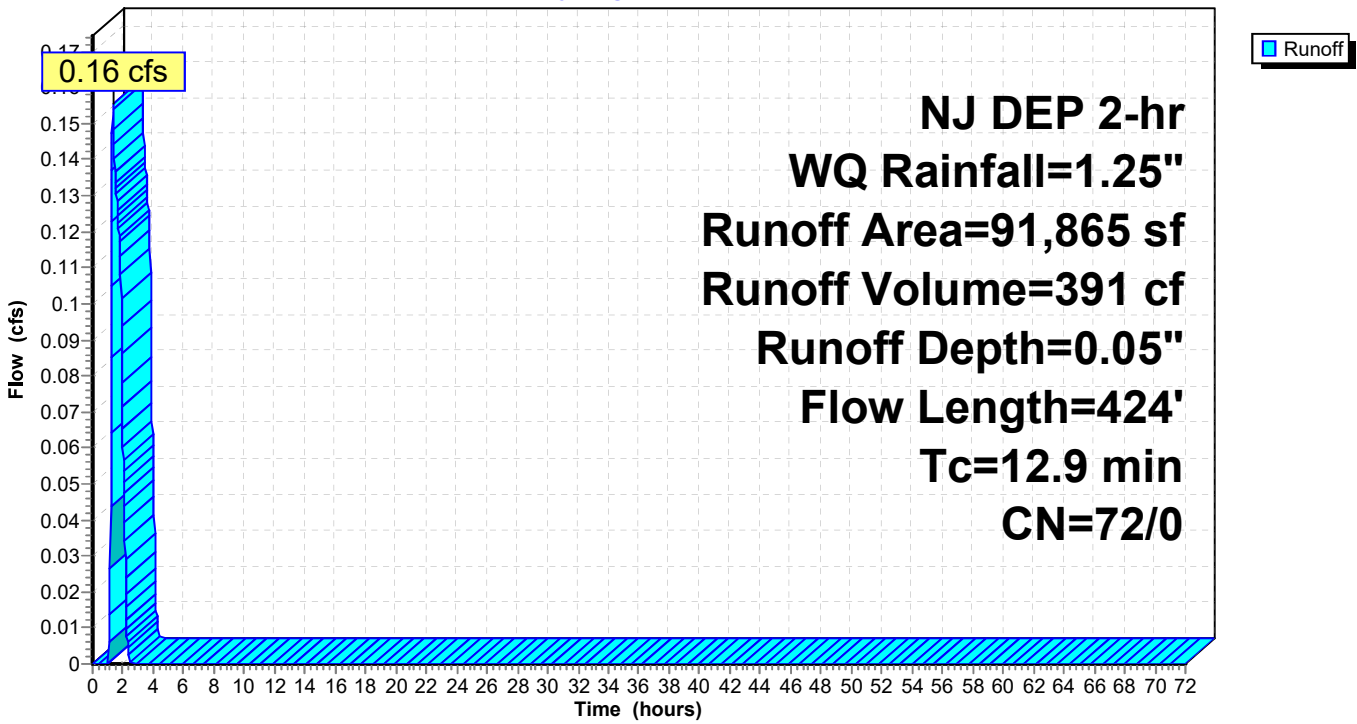
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Page 6

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	73	0.0260	0.18		Sheet Flow, B1-B2 Grass: Short n= 0.150 P2= 3.47"
0.6	52	0.0370	1.35		Shallow Concentrated Flow, B2-B3 Short Grass Pasture Kv= 7.0 fps
1.5	98	0.0255	1.12		Shallow Concentrated Flow, B3-B4 Short Grass Pasture Kv= 7.0 fps
0.6	37	0.0243	1.09		Shallow Concentrated Flow, B4-B5 Short Grass Pasture Kv= 7.0 fps
0.2	16	0.0243	1.09		Shallow Concentrated Flow, B5-B6 Short Grass Pasture Kv= 7.0 fps
0.6	23	0.0087	0.65		Shallow Concentrated Flow, B6-B7 Short Grass Pasture Kv= 7.0 fps
0.2	15	0.0400	1.40		Shallow Concentrated Flow, B7-B8 Short Grass Pasture Kv= 7.0 fps
1.1	45	0.0100	0.70		Shallow Concentrated Flow, B8-B9 Short Grass Pasture Kv= 7.0 fps
1.2	47	0.0083	0.64		Shallow Concentrated Flow, B-9-B10 Short Grass Pasture Kv= 7.0 fps
0.3	18	0.0166	0.90		Shallow Concentrated Flow, B10-B11 Short Grass Pasture Kv= 7.0 fps
12.9	424	Total			

Subcatchment E-1A: EXISTING DRAINAGE TO LOT 13

Hydrograph



2023-02-14_HydroCAD Calcs (POI-1)

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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 8

Summary for Subcatchment E-1B: EXISTING DRAINAGE UNDETAINED TO ROADWAY

Runoff = 0.11 cfs @ 1.60 hrs, Volume= 299 cf, Depth= 0.03"
 Routed to nonexistent node 1L

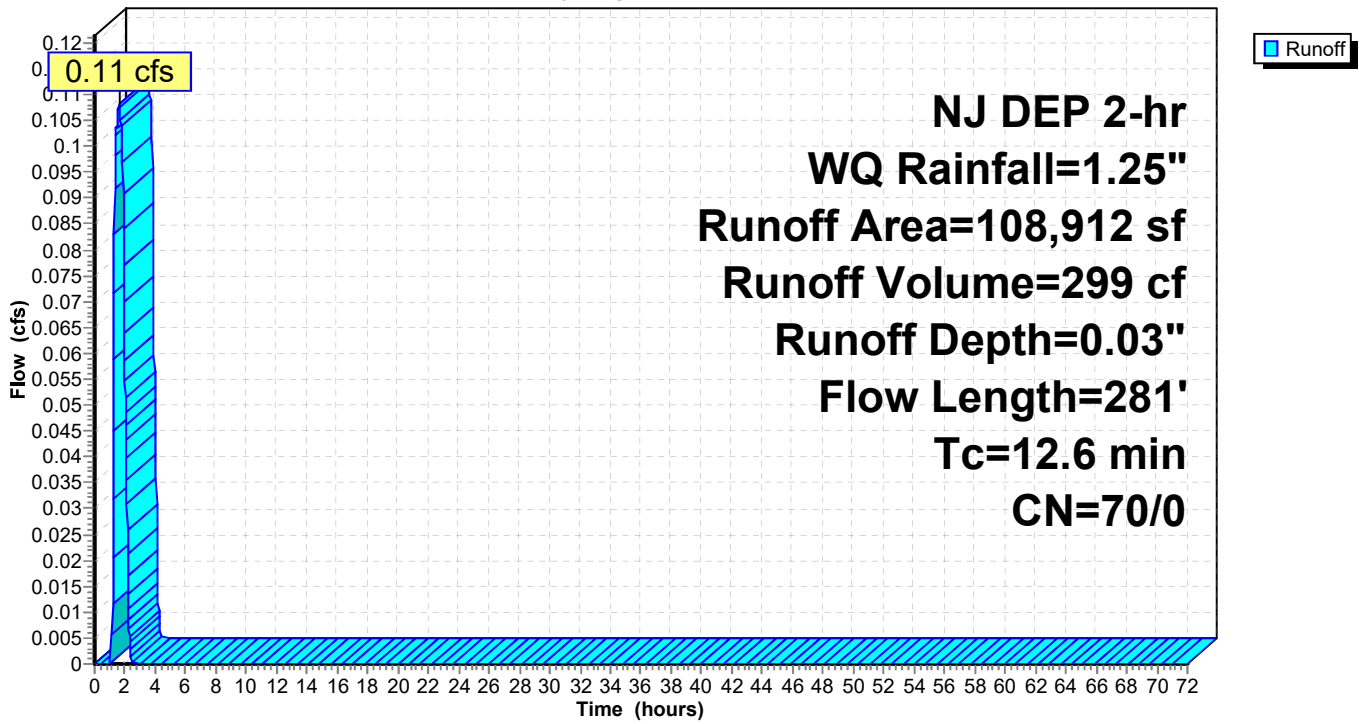
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
108,912	70	Woods, Good, HSG C
108,912	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.0210	0.18		Sheet Flow, A1-A2 Grass: Short n= 0.150 P2= 3.47"
1.5	68	0.0111	0.74		Shallow Concentrated Flow, A2-A3 Short Grass Pasture Kv= 7.0 fps
1.6	95	0.0200	0.99		Shallow Concentrated Flow, A3-A4 Short Grass Pasture Kv= 7.0 fps
0.3	18	0.0200	0.99		Shallow Concentrated Flow, A4-A5 Short Grass Pasture Kv= 7.0 fps
12.6	281	Total			

Subcatchment E-1B: EXISTING DRAINAGE UNDETAINED TO ROADWAY

Hydrograph



2023-02-14_HydroCAD Calcs (POI-1)

Prepared by Stonefield Engineering & Design
 HydroCAD® 10.20-2g s/n 10626 © 2022 HydroCAD Software Solutions LLC

NJ DEP 2-hr WQ Rainfall=1.25"

Printed 2/23/2023

Page 10

Summary for Subcatchment P-1A: Proposed Drainage to Bioretention Area B1

Runoff = 0.39 cfs @ 1.12 hrs, Volume= 520 cf, Depth= 0.35"
 Routed to Pond B : Above Ground Bioretention Area (B)

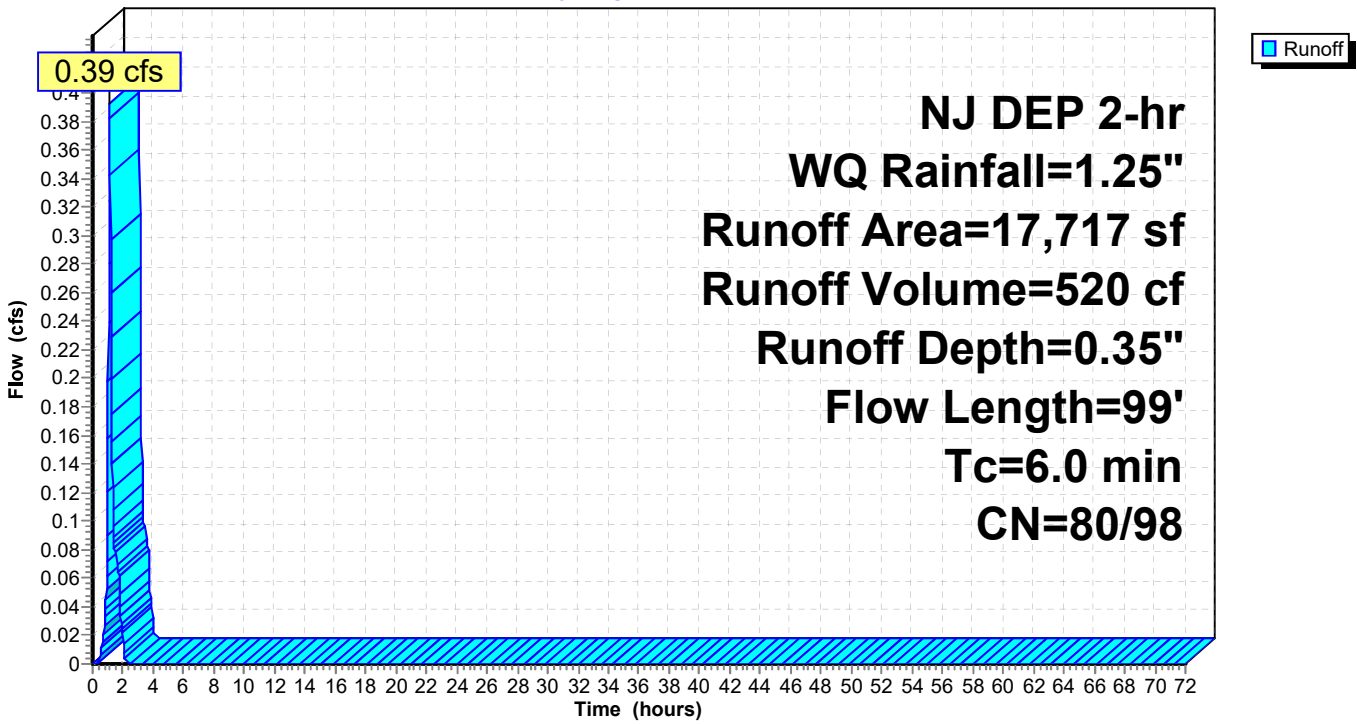
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
14,029	80	>75% Grass cover, Good, HSG D
* 3,688	98	Impervious Area
17,717	84	Weighted Average
14,029	80	79.18% Pervious Area
3,688	98	20.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	19	0.0157	0.12		Sheet Flow, A1-A2 Grass: Short n= 0.150 P2= 3.47"
0.5	25	0.0120	0.77		Shallow Concentrated Flow, A2-A3 Short Grass Pasture Kv= 7.0 fps
0.8	37	0.0108	0.73		Shallow Concentrated Flow, A3-A4 Short Grass Pasture Kv= 7.0 fps
0.2	18	0.0333	1.28		Shallow Concentrated Flow, A4-A5 Short Grass Pasture Kv= 7.0 fps
1.8					Direct Entry, To Meet Minimum
6.0	99	Total			

Subcatchment P-1A: Proposed Drainage to Bioretention Area B1

Hydrograph



2023-02-14_HydroCAD Calcs (POI-1)

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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 12

Summary for Subcatchment P-1B: Proposed Drainage to Bioretention Area A.1

Runoff = 0.04 cfs @ 1.22 hrs, Volume= 89 cf, Depth= 0.21"
 Routed to Pond A : Above Ground Bioretention Area (A)

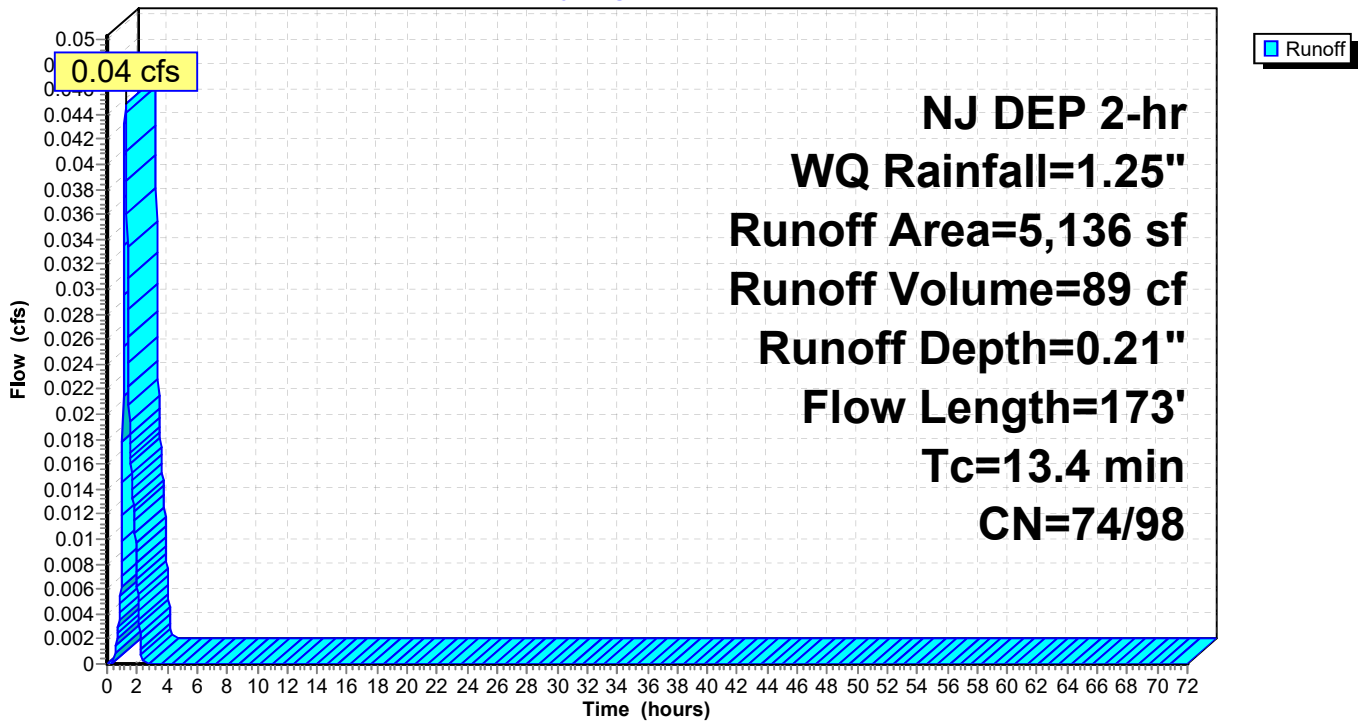
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
* 715	98	Impervious Area
4,421	74	>75% Grass cover, Good, HSG C
5,136	77	Weighted Average
4,421	74	86.08% Pervious Area
715	98	13.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	44	0.0045	0.08		Sheet Flow, B1-B2 Grass: Short n= 0.150 P2= 3.47"
0.8	22	0.0044	0.46		Shallow Concentrated Flow, B2-B3 Short Grass Pasture Kv= 7.0 fps
0.8	22	0.0044	0.46		Shallow Concentrated Flow, B3-B4 Short Grass Pasture Kv= 7.0 fps
1.2	30	0.0033	0.40		Shallow Concentrated Flow, B4-B5 Short Grass Pasture Kv= 7.0 fps
1.2	30	0.0033	0.40		Shallow Concentrated Flow, B5-B6 Short Grass Pasture Kv= 7.0 fps
0.5	25	0.0120	0.77		Shallow Concentrated Flow, B6-B7 Short Grass Pasture Kv= 7.0 fps
13.4	173	Total			

Subcatchment P-1B: Proposed Drainage to Bioretention Area A.1

Hydrograph



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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 14

Summary for Subcatchment P-1C: Proposed Drainage to Bioretention Area A.2

Runoff = 1.19 cfs @ 1.14 hrs, Volume= 1,741 cf, Depth= 0.53"
 Routed to Pond A : Above Ground Bioretention Area (A)

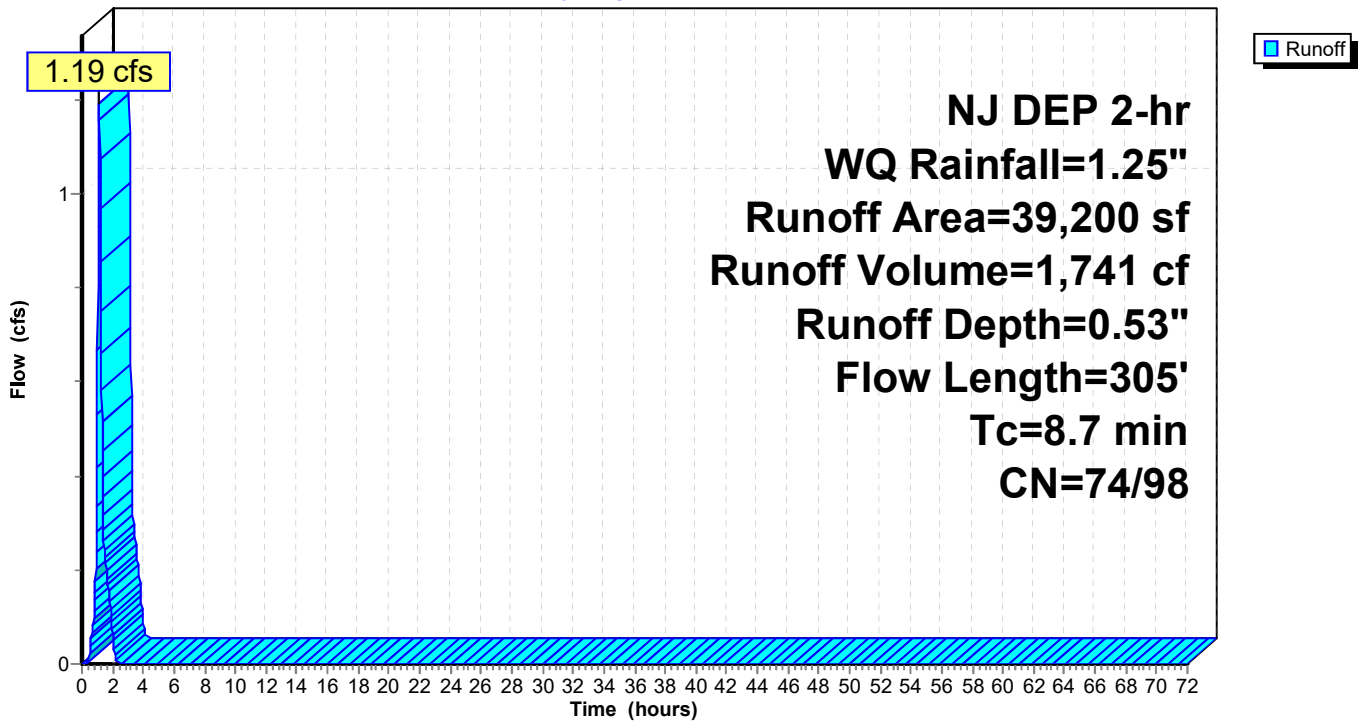
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
18,734	98	Paved parking, HSG C
20,466	74	>75% Grass cover, Good, HSG C
39,200	85	Weighted Average
20,466	74	52.21% Pervious Area
18,734	98	47.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	61	0.0254	0.18		Sheet Flow, C1-C2 Grass: Short n= 0.150 P2= 3.47"
0.3	24	0.0033	1.17		Shallow Concentrated Flow, C2-C3 Paved Kv= 20.3 fps
0.9	77	0.0052	1.46		Shallow Concentrated Flow, C3-C4 Paved Kv= 20.3 fps
1.0	90	0.0055	1.51		Shallow Concentrated Flow, C4-C5 Paved Kv= 20.3 fps
0.7	53	0.0038	1.25		Shallow Concentrated Flow, C5-C6 Paved Kv= 20.3 fps
8.7	305	Total			

Subcatchment P-1C: Proposed Drainage to Bioretention Area A.2

Hydrograph



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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 16

Summary for Subcatchment P-1E: Proposed Drainage Undetained to Valley Road

Runoff = 0.12 cfs @ 1.79 hrs, Volume= 342 cf, Depth= 0.03"
 Routed to Reach SW-1 : Rear Wall Swale (SW-1)

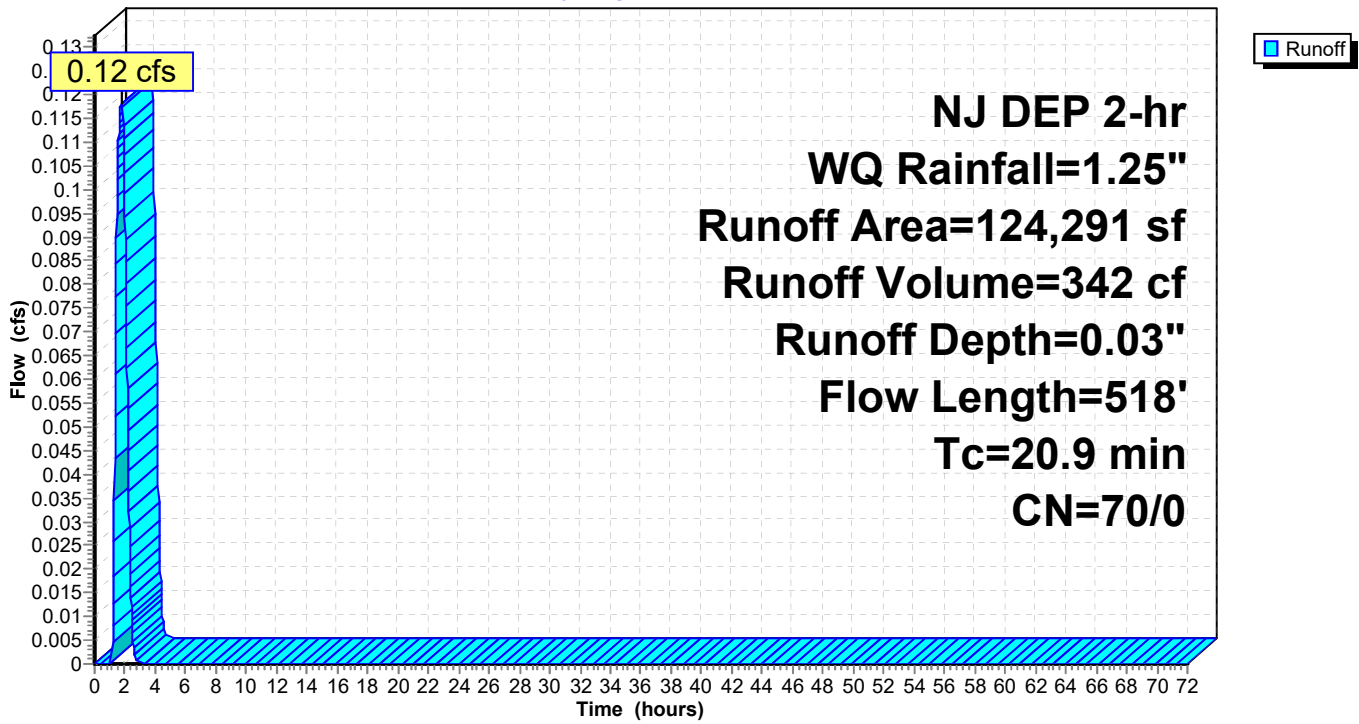
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 NJ DEP 2-hr WQ Rainfall=1.25"

Area (sf)	CN	Description
124,291	70	Woods, Good, HSG C
124,291	70	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0201	0.18		Sheet Flow, E1-E2 Grass: Short n= 0.150 P2= 3.47"
1.5	68	0.0111	0.74		Shallow Concentrated Flow, E2-E3 Short Grass Pasture Kv= 7.0 fps
1.6	95	0.0200	0.99		Shallow Concentrated Flow, E3-E4 Short Grass Pasture Kv= 7.0 fps
0.7	37	0.0162	0.89		Shallow Concentrated Flow, E3-E4 Short Grass Pasture Kv= 7.0 fps
1.6	60	0.0083	0.64		Shallow Concentrated Flow, E5-E6 Short Grass Pasture Kv= 7.0 fps
3.5	96	0.0042	0.45		Shallow Concentrated Flow, E6-E7 Short Grass Pasture Kv= 7.0 fps
1.8	39	0.0026	0.36		Shallow Concentrated Flow, E7-E8 Short Grass Pasture Kv= 7.0 fps
0.8	23	0.0043	0.46		Shallow Concentrated Flow, E8-E9 Short Grass Pasture Kv= 7.0 fps
20.9	518	Total			

Subcatchment P-1E: Proposed Drainage Undetained to Valley Road

Hydrograph



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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 18

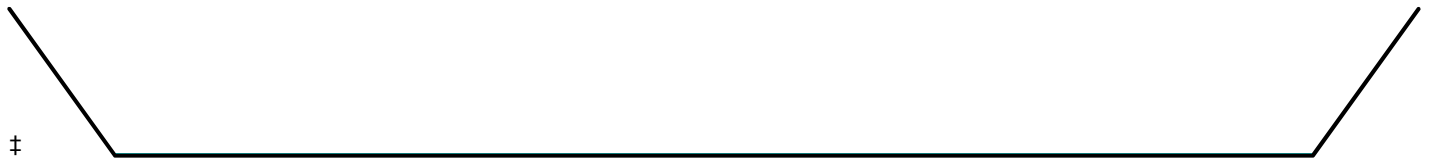
Summary for Reach SW-1: Rear Wall Swale (SW-1)

Inflow Area = 124,291 sf, 0.00% Impervious, Inflow Depth = 0.03" for WQ event
Inflow = 0.12 cfs @ 1.79 hrs, Volume= 342 cf
Outflow = 0.12 cfs @ 1.81 hrs, Volume= 342 cf, Atten= 0%, Lag= 0.9 min
Routed to Reach SW-2 : Rear Wall Swale (SW-2)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.81 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 1.8 min

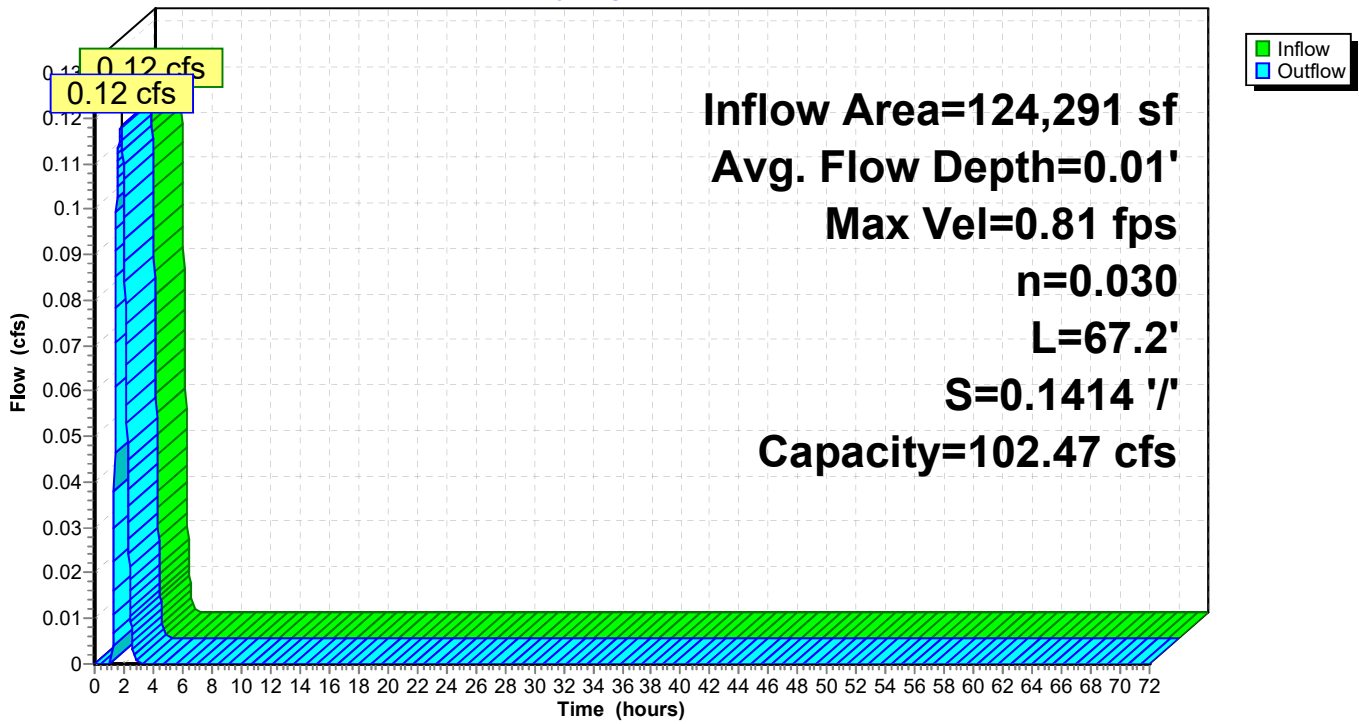
Peak Storage= 10 cf @ 1.81 hrs
Average Depth at Peak Storage= 0.01', Surface Width= 17.05'
Bank-Full Depth= 0.50' Flow Area= 9.3 sf, Capacity= 102.47 cfs

17.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 3.0 ' / ' Top Width= 20.00'
Length= 67.2' Slope= 0.1414 ' / '
Inlet Invert= 389.50', Outlet Invert= 380.00'



Reach SW-1: Rear Wall Swale (SW-1)

Hydrograph



2023-02-14_HydroCAD Calcs (POI-1)

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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 20

Summary for Reach SW-2: Rear Wall Swale (SW-2)

Inflow Area = 124,291 sf, 0.00% Impervious, Inflow Depth = 0.03" for WQ event
Inflow = 0.12 cfs @ 1.81 hrs, Volume= 342 cf
Outflow = 0.12 cfs @ 1.82 hrs, Volume= 342 cf, Atten= 0%, Lag= 0.8 min
Routed to Reach SW-3 : Rear Wall Swale (SW-3)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.64 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 2.1 min

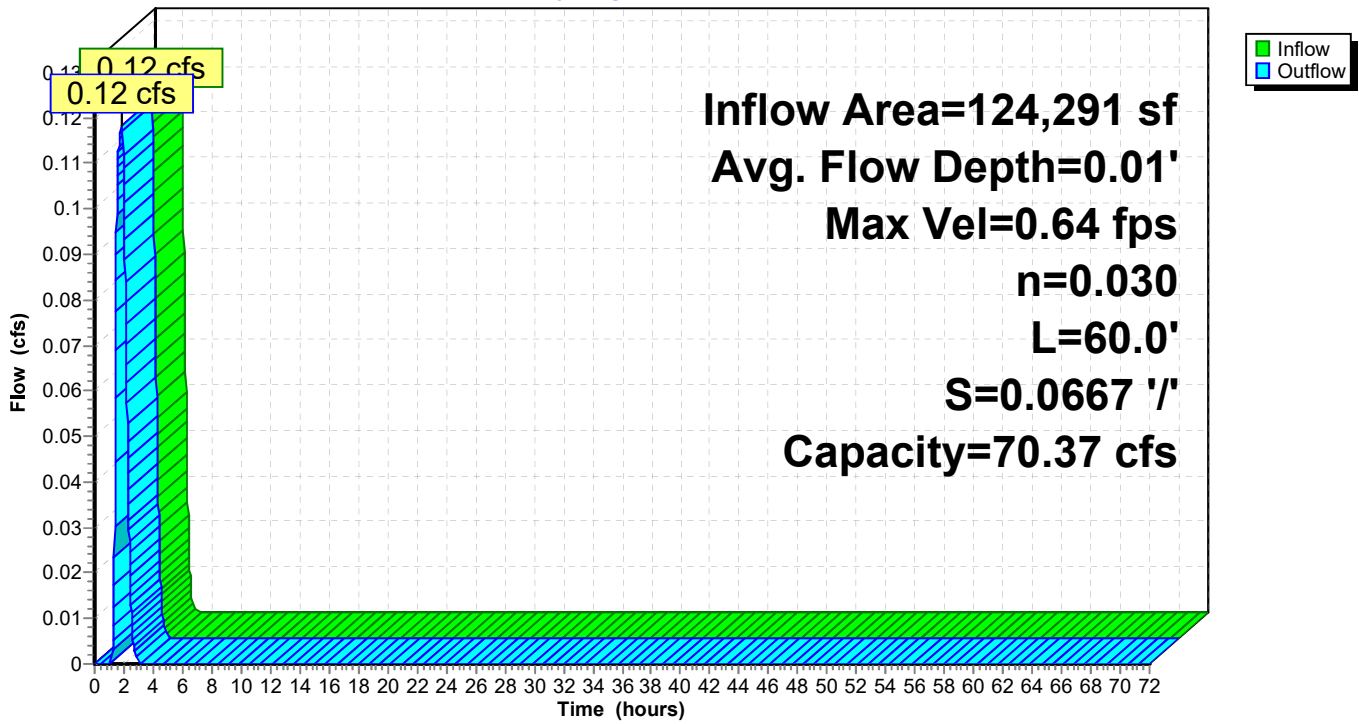
Peak Storage= 11 cf @ 1.82 hrs
Average Depth at Peak Storage= 0.01', Surface Width= 17.07'
Bank-Full Depth= 0.50' Flow Area= 9.3 sf, Capacity= 70.37 cfs

17.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 3.0 ' / ' Top Width= 20.00'
Length= 60.0' Slope= 0.0667 ' / '
Inlet Invert= 380.00', Outlet Invert= 376.00'



Reach SW-2: Rear Wall Swale (SW-2)

Hydrograph



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Page 22

Summary for Reach SW-3: Rear Wall Swale (SW-3)

Inflow Area = 124,291 sf, 0.00% Impervious, Inflow Depth = 0.03" for WQ event
Inflow = 0.12 cfs @ 1.82 hrs, Volume= 342 cf
Outflow = 0.12 cfs @ 1.86 hrs, Volume= 342 cf, Atten= 0%, Lag= 2.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.50 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 6.5 min

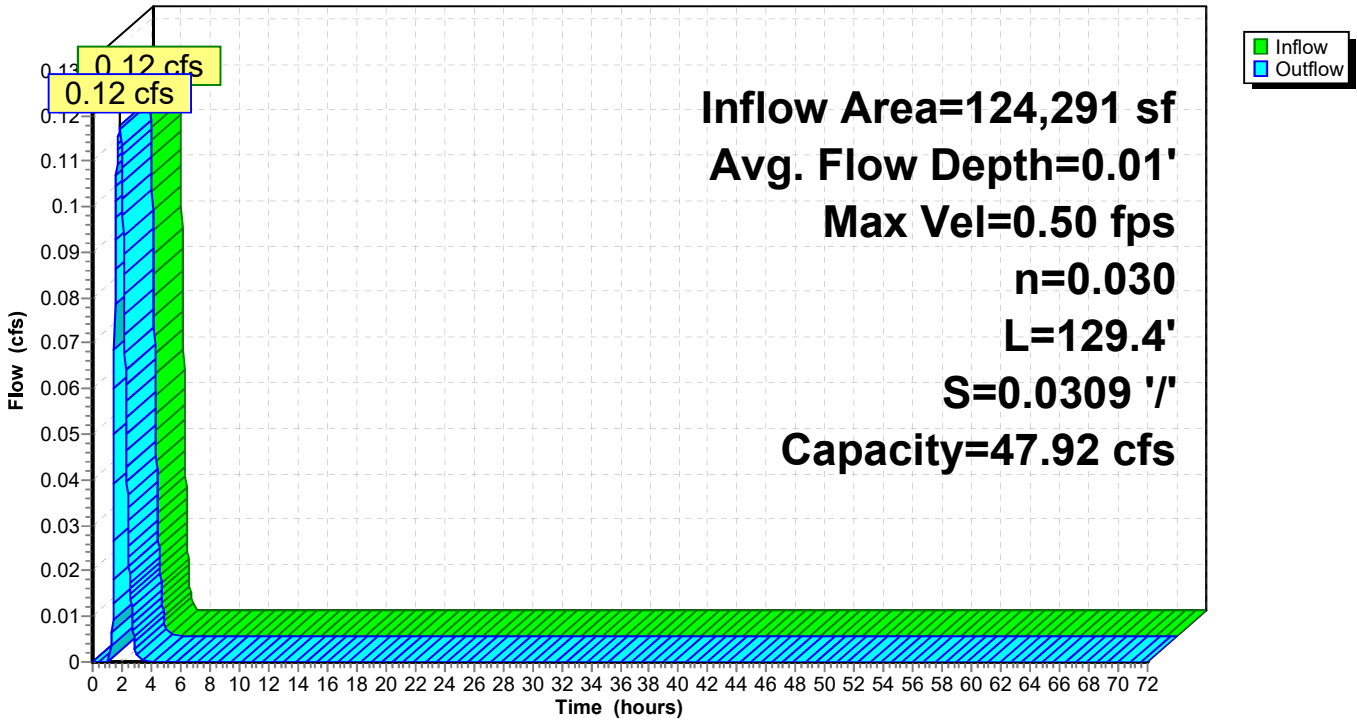
Peak Storage= 30 cf @ 1.86 hrs
Average Depth at Peak Storage= 0.01' , Surface Width= 17.08'
Bank-Full Depth= 0.50' Flow Area= 9.3 sf, Capacity= 47.92 cfs

17.00' x 0.50' deep channel, n= 0.030 Short grass
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 129.4' Slope= 0.0309 '/'
Inlet Invert= 376.00', Outlet Invert= 372.00'



Reach SW-3: Rear Wall Swale (SW-3)

Hydrograph



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Page 24

Summary for Pond A: Above Ground Bioretention Area (A)

Inflow Area = 44,336 sf, 43.87% Impervious, Inflow Depth = 0.50" for WQ event
 Inflow = 1.23 cfs @ 1.14 hrs, Volume= 1,830 cf
 Outflow = 0.02 cfs @ 2.15 hrs, Volume= 1,830 cf, Atten= 98%, Lag= 60.4 min
 Discarded = 0.02 cfs @ 2.15 hrs, Volume= 1,830 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond B : Above Ground Bioretention Area (B)
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Pond B : Above Ground Bioretention Area (B)

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 Peak Elev= 328.99' @ 2.15 hrs Surf.Area= 1,907 sf Storage= 1,704 cf

Plug-Flow detention time= 675.2 min calculated for 1,829 cf (100% of inflow)
 Center-of-Mass det. time= 675.4 min (749.9 - 74.5)

Volume	Invert	Avail.Storage	Storage Description
#1	328.00'	7,803 cf	Above Ground Bioretention Area (A) (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
328.00	1,530	162.0	0	0	1,530
329.00	1,910	176.9	1,716	1,716	1,966
330.00	2,325	192.7	2,114	3,831	2,466
331.00	2,764	208.1	2,541	6,372	2,997
331.50	2,962	213.8	1,431	7,803	3,215

Device	Routing	Invert	Outlet Devices
#1	Primary	326.50'	12.0" Round Culvert L= 64.0' Ke= 0.500 Inlet / Outlet Invert= 326.50' / 325.86' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Device 1	329.00'	20.0" W x 6.0" H Vert. Low Flow C= 0.600 Limited to weir flow at low heads
#3	Device 1	330.23'	32.0" x 32.0" Horiz. Overflow Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	331.00'	10.0' long x 7.0' breadth Emergency Spillway Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.40 2.52 2.70 2.68 2.68 2.67 2.66 2.65 2.65 2.65 2.66 2.65 2.66 2.68 2.70 2.73

2023-02-14_HydroCAD Calcs (POI-1)

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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 25

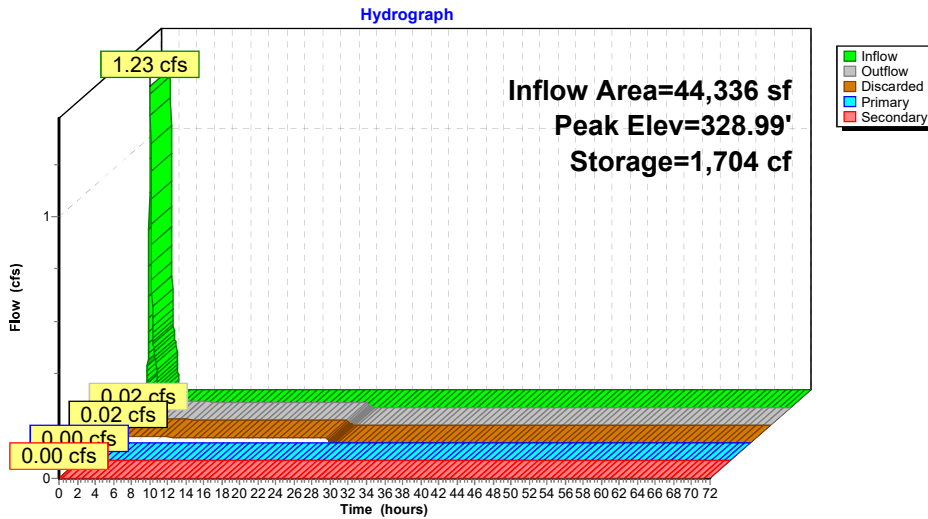
#5 Discarded 328.00' 2.78
0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 310.00'
Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 2.15 hrs HW=328.99' (Free Discharge)
↳ **5=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=328.00' TW=315.00' (Dynamic Tailwater)
↳ **1=Culvert** (Passes 0.00 cfs of 3.75 cfs potential flow)
↳ **2=Low Flow** (Controls 0.00 cfs)
↳ **3=Overflow Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=328.00' TW=315.00' (Dynamic Tailwater)
↳ **4=Emergency Spillway** (Controls 0.00 cfs)

Pond A: Above Ground Bioretention Area (A)



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NJ DEP 2-hr WQ Rainfall=1.25"

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Page 26

Summary for Pond B: Above Ground Bioretention Area (B)

Inflow Area = 87,333 sf, 55.22% Impervious, Inflow Depth = 0.07" for WQ event
 Inflow = 0.39 cfs @ 1.12 hrs, Volume= 523 cf
 Outflow = 0.02 cfs @ 2.05 hrs, Volume= 523 cf, Atten= 95%, Lag= 55.3 min
 Discarded = 0.02 cfs @ 2.05 hrs, Volume= 523 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link POI-1 : POI-1 Existing Drainage Within Valley Road
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link POI-1 : POI-1 Existing Drainage Within Valley Road

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs
 Peak Elev= 315.28' @ 2.05 hrs Surf.Area= 1,610 sf Storage= 428 cf

Plug-Flow detention time= 198.2 min calculated for 523 cf (100% of inflow)
 Center-of-Mass det. time= 198.1 min (273.4 - 75.3)

Volume	Invert	Avail.Storage	Storage Description
#1	315.00'	11,202 cf	Above Ground Bioretention Area (A) (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
315.00	1,499	165.1	0	0	1,499
316.00	1,923	188.6	1,707	1,707	2,184
317.00	2,373	210.7	2,144	3,851	2,914
318.00	2,836	232.0	2,601	6,452	3,696
319.00	3,284	250.9	3,057	9,509	4,461
319.50	3,491	258.4	1,693	11,202	4,791

Device	Routing	Invert	Outlet Devices
#1	Primary	314.04'	12.0" Round Culvert L= 30.0' Ke= 0.500 Inlet / Outlet Invert= 314.04' / 313.74' S= 0.0100 ' / Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	315.30'	10.0" W x 3.0" H Vert. Low Flow C= 0.600 Limited to weir flow at low heads
#3	Device 1	316.35'	11.0" W x 5.0" H Vert. Control Orifice C= 0.600 Limited to weir flow at low heads
#4	Device 1	318.40'	32.0" x 32.0" Horiz. Overflow Grate C= 0.600 Limited to weir flow at low heads
#5	Secondary	319.00'	10.0' long x 8.0' breadth Emergency Spillway Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00

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Page 27

5.50
Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70
2.74
#6 Discarded 315.00' **0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 310.00'
Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 2.05 hrs HW=315.28' (Free Discharge)

└─6=Exfiltration (Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=315.00' TW=0.00' (Dynamic Tailwater)

└─1=Culvert (Passes 0.00 cfs of 2.38 cfs potential flow)

└─2=Low Flow (Controls 0.00 cfs)

└─3=Control Orifice (Controls 0.00 cfs)

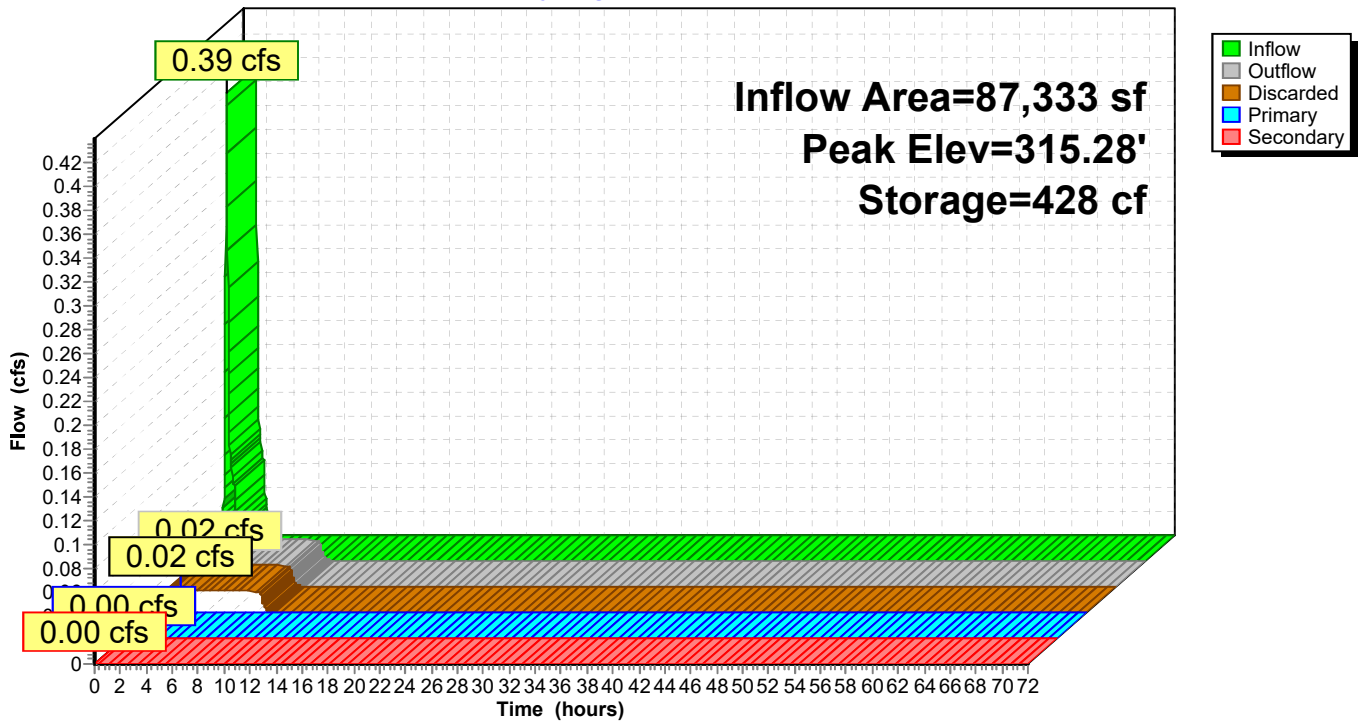
└─4=Overflow Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=315.00' TW=0.00' (Dynamic Tailwater)

└─5=Emergency Spillway (Controls 0.00 cfs)

Pond B: Above Ground Bioretention Area (B)

Hydrograph



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NJ DEP 2-hr WQ Rainfall=1.25"

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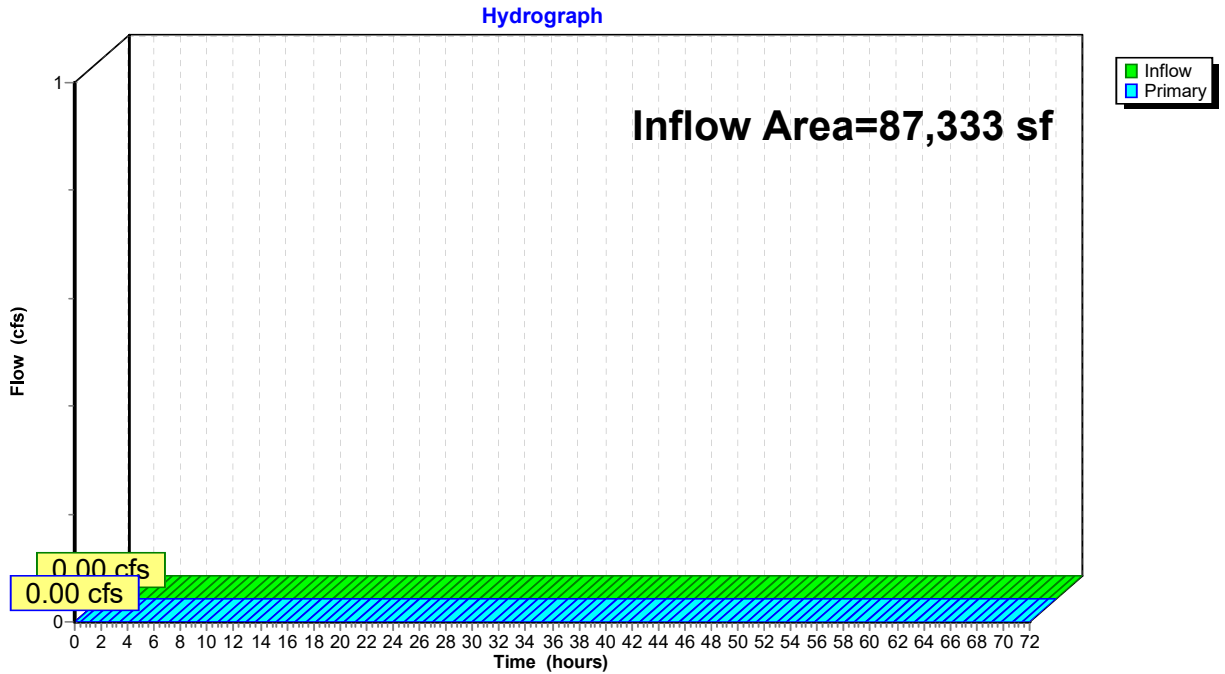
Page 29

Summary for Link POI-1: POI-1 Existing Drainage Within Valley Road

Inflow Area = 87,333 sf, 55.22% Impervious, Inflow Depth = 0.00" for WQ event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Link POI-1: POI-1 Existing Drainage Within Valley Road



Summary for Link PPV: Pervious Pavement Systems

Inflow Area = 25,280 sf, 99.23% Impervious, Inflow Depth = 0.00" for WQ event
Inflow = 0.00 cfs @ 1.83 hrs, Volume= 2 cf
Primary = 0.00 cfs @ 1.83 hrs, Volume= 2 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond B : Above Ground Bioretention Area (B)

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.02 hrs

Link PPV: Pervious Pavement Systems

Hydrograph

