



# Stormwater Management Report

for

UNA VOCE, LLC  
Amended Site Plan

414 White Horse Pike  
Block 81.05, Lot 1  
Borough of Haddon Heights, Camden County, NJ

Prepared by  
**IRVING DESIGN GROUP**



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Richard Oberman, NJPE #34237

January 31, 2024

**Idg Project #: HILL-22-003**

*irving design group, llc*

10 White Horse Pike ♦ Haddon Heights, NJ 08035 ♦ Phone 856-310-9200

## **STORMWATER SUMMARY**

### **1.0 INTRODUCTION**

UNA Voce (Applicant), has constructed an apartment building located at the intersection of White Horse Pike (NJSH Rt. 30) and Haddon Street in the Borough of Haddon Heights, Camden County, New Jersey. The project entailed the renovation of the existing structure and new construction of a 2,186 sf apartment complex, 12 stall proposed parking lot, lighting and landscaping which have all been previously approved.

This report has been prepared to accompany the latest amended minor site plan application for the project.

### **2.0 PROJECT DESCRIPTION**

#### **2.1 Pre-Existing and Existing (As-Built) Conditions**

The project is in Haddon Heights, New Jersey, at the intersection of the White Horse Pike (NJSH Rt. 30) and Haddon Street. The property can be found on the United States Geological Survey (USGS) 7.5- minute topographic quadrangle for Camden and Runnemede, New Jersey.

The subject property is located on a parcel identified on the Haddon Heights tax map as Block 81.05, Lot 1.

The pre-existing site generally consisted of three (3) space paved parking area and an existing 2 ½ story home. The surface coverage was of 0.10 acres of existing impervious surfaces and 0.36 acres of existing pervious surfaces. The "site" was defined as the tax map property boundaries. For pre-existing condition runoff calculations, the "site" was previously analyzed as one Existing Drainage Area (EDA-1).

The pre-existing stormwater from the site collectively drained toward an existing inlet and storm conveyance system located approximately 170' south of the site on Haddon Street where it intersects East Atlantic Avenue.

#### **2.2 Previously Approved-As-Built Conditions**

The previously approved, now constructed, project consists of the existing 2 ½ story home, 15-space parking area (total), a now completed 2,186 sf apartment building, lighting and landscaping. The previously approved, now constructed, surface coverage consists of 0.26 acres of impervious surfaces and 0.20 acres of pervious surfaces. The as built conditions have not increased impervious surface coverage by more than 0.25 acres. The previously approved, now constructed, runoff calculations for the site were analyzed as one Proposed Drainage Area (PDA-1) which was previously submitted by RWD CONSULTANTS a division of PENNONI and approved.

### **3.0 SOIL SURVEY AND PERMEABILITY INFORMATION**

A review of soil information provided in the USDA Web Soil Survey Map Database Report for Camden County indicated the soils on the subject property consist of Freehold-Downer-Urban Land complex (FrpB) (Figure 1 within appendix 4: RWD/PENNONI 2017 Log).

### **3.1 FROM RWD CONSULTANTS/PENNONI SOIL PERMEABILITY STORMWATER BASIN SOIL BORING LOG NOVEMBER 24, 2017**

(Attached as appendix 4)

#### **PENNONI SITE VISIT INFORMATION**

On November 16, 2017; Pennoni conducted one Test Pit (TP-1) onsite and tested soil permeability utilizing the Double Ring infiltrometer method (ASTM D 3385) field test. This test was completed by Josh Holderer of Pennoni. Soil Boring Log information was completed by Larissa Elder of Pennoni. The site did not show signs of previous soil disturbance in the area of testing, The weather was partly cloudy at the time of soil testing. Soil Permeability testing was conducted at approximately 6ft (72 inches).

#### **3.2 CONCLUSION/ FINDINGS**

USDS Soil Maps showed the area of the subject property to contain Freehold-Downer-Urban Land complex (FrpB) soil type. This soil type is considered to be Well Drained. Soil Boring Logs from the site visit on November 16, 2017 by Pennoni show the soil to contain layers of mostly silty loam with some clay layers present. The Soil Boring Log is provided as Figure 2 within appendix 4: RWD/PENNONI 2017 Log.

During the excavation, no water table or seasonal high water table was encountered. Most of the soil layers observed were dry or slightly damp.

Soil permeability testing resulted in an Infiltration Rate of 0.56cm/hr or 0.22in/hr. The Double Ring Field Data Sheet is provided in Figure 3 within appendix 4: RWD/PENNONI 2017 Log.

#### **3.3 UNDERWOOD SOILS INVESTIGATION DECEMBER 2023**

Due to the failure of the open bioretention basin a new soils investigation was performed by Underwood Engineering Company on December 26, 2023. (Attached as appendix 3)

The Underwood findings confirmed the RWD/PENNONI findings with similar marginally better infiltration rates at depths approximately 12.4 feet lower than the RWD/PENNONI investigation in 2017 and 18 feet below the as-built bottom of the basin.

The soils at the bottom of the Underwood excavation (20.4 feet deep from pre-existing surface grade) yielded a low infiltration rate of 0.6in/hr compared to 0.2 in/hr (RWD/PENNONI 2017 investigation: 8 feet deep from pre-existing surface grade).

#### **3.3a INVESTIGATION**

Geotechnical Boring – (TB-1) One continuous geotechnical boring was completed at the stormwater basin location on December 26th, 2023. The test boring was carried out to a depth of approximately eighteen feet below ground surface (BGS). All standard penetration testing (SPT) and split-barrel sampling of soils was performed in accordance with ASTM D-1586.

The soils encountered at the boring location TB-1 consisted generally of very soft loams underlain by medium dense sandy loams and stiff to very stiff loams. Groundwater was not encountered in TB-1. There were no seasonal high water indicators observed in the borehole.

Samples of the soils recovered during drilling operations were sealed in glass jars and transported to the Underwood Soil Laboratory for Hydrometer and Sieve analysis per ASTM D-422, and will be stored for a period of no less than 30 days.

### **3.3b FINDINGS**

The soils tested were identified by visual classification in the field and confirmed by laboratory analysis. The soils tested consisted of sandy loams and loams. The permeability class ratings ranged from K2, or 0.6 to 2 inches per hour, to K3, or 2 to 6 inches per hour. A table containing the test location, depth, soil classification and laboratory permeability class ratings are provided in the table below: Results of permeability testing is contained in the table below:

<b>Test #</b>	<b>Test Depth (ft.)</b>	<b>Soil Description &amp; Texture</b>	<b>Permeability Class Rating</b>
TB-1A	4-6	SANDY LOAM	K3 (2 – 6 in/hr)
TB-1B	6-8	LOAM	K2 (0.6 – 2.0 in/hr)
TB-1C	8-10	LOAM	K2 (0.6 – 2.0 in/hr)

\*Depths taken below existing ground surface elevations at test pit locations.

Note: It is anticipated that the field infiltration rates will be much slower than the laboratory rates due to the in place stiff consistency of the soils and the fine plus very fine sand contents (60-75%) of the soils.

## **4.0 DESIGN CRITERIA/METHODOLOGY**

Irving Design Group utilized the previously approved volume calculation prepared by RWD Consultants a division of Pennoni, last revised in May of 2018. Attached as appendix 2. The established requirement is 1,511 cubic feet of storage.

The RWD/Pennoni design of stormwater management was performed in accordance with the New Jersey administrative code ("NJAC") chapter 7:8 stormwater requirements utilizing the New Jersey Department of Environmental Protection ("NJDEP") Best Management Practices ("BMP") Design Manual.

In New Jersey, projects resulting in over one (1) acre of land disturbance or 0.25 acres of new impervious surfaces are required to comply with the NJDEP's stormwater management rules at N.J.A.C. 7:8. The project is not considered a "major development" as the project will not disturb more than one (1) acre of land and the project will not increase impervious area by 0.25 acres.

### **4.1 Groundwater Recharge**

Pursuant to N.J.A.C. 7:8-5.4(a)2, the groundwater recharge standards apply if either the 0.25 acre or one (1) acre threshold is exceeded. The previously approved now constructed project has not increased impervious surface coverage by more than 0.25 acres and has not disturbed more than one (1) acre of land. Therefore, the groundwater recharge standards do not apply.

## **4.2 Stormwater Quantity**

Pursuant to N.J.A.C. 7:8-5.4(a)3, the runoff quantity standards apply if either the 0.25 acre or one (1) acre thresholds exceeded. The previously approved now constructed has not increased impervious surface coverage by more than 0.25 acres and will not disturb more than one (1) acre of land. Therefore, the water quantity standards do not apply. However, both an underground infiltration system and an open bioretention basing were designed and previously approved. As a result of poor subsurface soil conditions and at the request of Bach Associates this amended site plan application proposes an underground infiltration system to remedy the current open bioretention basin which has failed.

## **4.3 Water Quality**

The previously approved project did not increase impervious surface coverage by more than 0.25 acres. Therefore, water quality treatment is not required pursuant to N.J.A.C. 7:8-5.5.

## **5.0 TECHNIQUES OF ANALYSIS: RWD CONSULTANTS/PENNONI**

In accordance with the stormwater runoff calculation methodology at N.J.A.C. 7:8-5.61 the previously approved quantity (volume and rate) of stormwater runoff for pre- and post-developed conditions were calculated based on the USDA NRCS methodology as described in Technical Release 55 - Urban Hydrology for Small Watersheds (TR-55), dated June 1986.

Due to the area being mostly impervious, time of concentration (TC) was determined to be a minimum of 6 minutes.

Curve numbers (CN) for the drainage areas were based on the hydrologic soil group and land use. The developed area is made up of Freehold-Downer-Urban Land complex (FrpB), Type B soils, therefore CN's of 61 for lawn and landscaped areas, and 98 for impervious areas were utilized.

The impervious areas were calculated as separate subareas to generate hydrographs without weighted CNs as outlined in the N.J. Best Management Practices Manual Chapter 5.

Using the drainage areas, the TCs and CNs as input data, the hydrologic/hydraulic software program Pondpack V8i by Bentley, was utilized to generate the runoff volumes and rates. The established requirement is 1,511 cubic feet of storage.

## 6.0 KEY HYDROLOGIC PRINCIPALS

A 24-hour, Type III storm distribution was utilized with the following rainfall amounts, within Camden County for each storm analyzed. The DelMarVa unit hydrograph was utilized in the calculations. NRCS 24 hr. design storm rainfall depths for New Jersey, as revised September 2004, are used in the calculation.

APPROVED RAINFALL DEPTH INFORMATION	
STORM FREQ. (YR)	RAINFALL DEPTH (INCHES)
2	3.31
10	5.06
100	8.52

## 7.0 PRE-DEVELOPED VS. POST-DEVELOPED RUNOFF COMPARISON

The previously approved project generated a minimal increase in the total runoff leaving the site for the 2, 10, 25 and 100-year storm events. Hydrographs generated for the pre- and post-developed drainage areas and were provided in 2017.

The amended project will incorporate the use of a subsurface basin to store and exceed the volume difference between the pre-and post-developed 25-year storm event. Table 2 below summarizes the volume difference between the pre- and post-developed 25 year storm event. (See appendix 1 for idg Pond Summary report and chamber design).

TABLE 1 – PRE-DEVELOPED VS. POST DEVELOPED TOTAL SITE DISCHARGE					
STORM FREQ. (YR)	PRE-DEVELOPMENT TOTAL SITE DISCHARGE (CFS)	PRE-DEVELOPMENT TOTAL SITE RUNOFF VOLUME (CF)	POST-DEVELOPMENT TOTAL SITE DISCHARGE (CFS)	POST-DEVELOPMENT TOTAL SITE RUNOFF VOLUME (CFS)	RUNOFF INCREASE FROM PRE-DEVELOPMENT (CFS)
2	0.34	1,742	0.57	2,786	+0.23
10	0.77	3,572	1.05	4,944	+0.28
25	1.09	4,966	1.40	6,477	+0.31
100	1.81	8,015	2.14	9,772	+0.33

TABLE 2 PRE-DEVELOPED VS. POST DEVELOPED 25 YEAR STORM RUNOFF VOLUME DIFFERENCE			
STORM EVENT	PRE- DEVELOPMENT TOTAL SITE RUNOFF VOLUME (CF)	POST- DEVELOPMENT TOTAL SITE RUNOFF VOLUME (CF)	VOLUME INCREASE FROM PRE- DEVELOPMENT (CF)
25	4,966	6,477	1,511

## 8.0 STORM SEWER DESIGN

The overflow runoff from the site will drain to an area drain and through a trenchdrain in the newly constructed sidewalk, through the now existing curb ultimately down to an existing stormwater inlet located approximately 170 feet south of the site on Haddon Street where it intersects East Atlantic Avenue.

## 9.0 SOIL EROSION AND SEDIMENT CONTROL

The project complied with the minimum design and performance standards for erosion control established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.

## 10.0 CONCLUSION

As described above, the previously approved project generated a minimal increase in the total runoff leaving the site for the 2 and 10-year storm events and provided a reduction in the 100-year storm runoff rate. **The project is not considered a "major development" as the project will not disturb more than one (1) acre of land and the project will not increase impervious area by 0.25 acres. Therefore, the project is not required to address groundwater recharge, water quantity and water quality requirements of N.J.A.C. 7:8-5.4 and 7:8-5.5. The project has incorporated a subsurface basin utilizing CULTEC chambers and 40% void clean stone to store and exceed the volume difference between the pre-and post-developed 25-year storm event by a factor of 0.85. (See appendix 1 for idg Pond Summary report and chamber design).**



APPENDIX 1  
IDG POND SUMMARY AND CHAMBER DESIGN

*irving design group, llc*

10 White Horse Pike ♦ Haddon Heights, NJ 08035 ♦ Phone 856-310-9200



**414 WHP**

Prepared by Brian Myers

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*Rainfall file not specified*

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**Summary for Pond 3P: (new Pond)**

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,843 cf	<b>14.75'W x 72.63'L x 5.21'H Field A</b> 5,580 cf Overall - 972 cf Embedded = 4,608 cf x 40.0% Voids
#2A	3.00'	972 cf	<b>Cultec R-180 x 44 Inside #1</b> Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap Row Length Adjustment= +1.00' x 3.44 sf x 4 rows
		2,815 cf	Total Available Storage

Storage Group A created with Chamber Wizard

**414 WHP**

Prepared by Brian Myers

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Rainfall file not specified

Printed 1/13/2024

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**Pond 3P: (new Pond) - Chamber Wizard Field A**

**Chamber Model = Cultec R-180 (Cultec Recharger® 180HD)**

Effective Size= 33.6"W x 20.0"H => 3.44 sf x 6.33'L = 21.8 cf

Overall Size= 36.0"W x 20.5"H x 7.33'L with 1.00' Overlap

Row Length Adjustment= +1.00' x 3.44 sf x 4 rows

36.0" Wide + 3.0" Spacing = 39.0" C-C Row Spacing

11 Chambers/Row x 6.33' Long +1.00' Row Adjustment = 70.63' Row Length +12.0" End Stone x 2 = 72.63' Base Length

4 Rows x 36.0" Wide + 3.0" Spacing x 3 + 12.0" Side Stone x 2 = 14.75' Base Width

36.0" Stone Base + 20.5" Chamber Height + 6.0" Stone Cover = 5.21' Field Height

44 Chambers x 21.8 cf +1.00' Row Adjustment x 3.44 sf x 4 Rows = 971.7 cf Chamber Storage

5,579.6 cf Field - 971.7 cf Chambers = 4,607.9 cf Stone x 40.0% Voids = 1,843.2 cf Stone Storage

Chamber Storage + Stone Storage = 2,814.9 cf = 0.065 af

Overall Storage Efficiency = 50.4%

Overall System Size = 72.63' x 14.75' x 5.21'

44 Chambers

206.7 cy Field

170.7 cy Stone





APPENDIX 2  
RWD CONSULTANTS/PENNONI STORMWATER  
MANAGEMENT REPORT

*irving design group, llc*

10 White Horse Pike ♦ Haddon Heights, NJ 08035 ♦ Phone 856-310-9200

**TECHNICAL REPORT**  
**STORMWATER MANAGEMENT REPORT**  
**HADDON HEIGHTS APARMENT COMPLEX**  
**414 WHITE HORSE PIKE**  
**BLOCK 37, LOT 8**  
**HADDON HEIGHTS**  
**CAMDEN COUNTY, NEW JERSEY**



**Prepared For:**

UNA VOCE  
417 White Horse Pike  
Suite E  
Haddon Heights, New Jersey 08035

**Prepared By:**

RWD Consultants  
A Division of Pennoni  
2 Aquarium Drive, Suite 320  
Camden, New Jersey 08103  
T: 856-668-8600

A handwritten signature in blue ink, appearing to read "J. Raday".

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Joseph Raday, PE  
New Jersey License No. 24GE043768

Proj. No. UNAV1701

REV. 8-30-18  
March 2, 2017  
May 10, 2017

## **STORMWATER SUMMARY**

### **1.0 INTRODUCTION**

**UNA Voce (Applicant)**, is proposing to construct an apartment building located at the intersection of White Horse Pike (NJSH Rt. 30) and Haddon Street in the Borough of Haddon Heights, Camden County, New Jersey. The project entails the construction of a 2,698 sf apartment complex, 12 proposed parking spaces, lighting and landscaping.

This report has been prepared to accompany the preliminary/final minor site plan application for the project.

### **2.0 PROJECT DESCRIPTION**

#### **2.1 Existing Conditions**

The project is in Haddon Heights, New Jersey, at the intersection of the White Horse Pike (NJSH Rt. 30) and Haddon Street. The property can be found on the United States Geological Survey (USGS) 7.5- minute topographic quadrangle for Camden and Runnemede, New Jersey. A copy of the USGS map is provided as Figure 1.

The subject property is located on a parcel identified as Block 81.05, Lot 1. A copy of the Tax map is provided as Figure 2.

The existing site generally consists of three (3) space paved parking area and an existing 2 ½ story home. The surface coverage consists of 0.10 acres of existing impervious surfaces and 0.36 acres of existing pervious surfaces. The "site" is defined as the tax map property boundaries. For existing condition runoff calculations, the "site" was analyzed as one Existing Drainage Area (EDA-1).

The stormwater from the site collectively drains towards an existing inlet and storm conveyance system located approximately 170' south on Haddon Street.

#### **2.2 Proposed Conditions**

The proposed project consists of an existing 2 ½ story home, 15-space parking area (total), a proposed 2,698 sf apartment building, lighting and landscaping. The proposed surface coverage consists of 0.26 acres of impervious surfaces and 0.20 acres of pervious surfaces. The proposed conditions will **not** increase impervious surface coverage by more than 0.25 acres. For proposed condition runoff calculations, the site was analyzed as one Proposed Drainage Area (PDA-1).

### 3.0 SOIL SURVEY INFORMATION

A review of soil information provided in the USDA Web Soil Survey Map Database Report for Camden County indicates that the soils on the subject property consist of Freehold-Downer-Urban Land complex (FrpB) (Figure 3).

### 4.0 DESIGN CRITERIA

The design of stormwater was performed in accordance with the New Jersey administrative code ("NJAC") chapter 7:8 stormwater requirements utilizing the New Jersey Department of Environmental Protection ("NJDEP") Best Management Practices ("BMP") Design Manual.

In New Jersey, projects resulting in over one (1) acre of land disturbance or 0.25 acres of new impervious surfaces are required to comply with the NJDEP's stormwater management rules at N.J.A.C. 7:8. The project is **not** considered a "major development" as the project will not disturb more than one (1) acre of land and the project will not increase impervious area by 0.25 acres.

#### 4.1 Groundwater Recharge

Pursuant to N.J.A.C. 7:8-5.4(a)2, the groundwater recharge standards apply if either the 0.25 acre or one (1) acre threshold is exceeded. The proposed project **will not** increase impervious surface coverage by more than 0.25 acres and will not disturb more than one (1) acre of land. Therefore, the groundwater recharge standards do not apply.

#### 4.2 Stormwater Quantity

Pursuant to N.J.A.C. 7:8-5.4(a)3, the runoff quantity standards apply if either the 0.25 acre or one (1) acre threshold is exceeded. The proposed project **will not** increase impervious surface coverage by more than 0.25 acres and will not disturb more than one (1) acre of land. Therefore, the water quantity standards do not apply. However, a rain garden has been incorporated into the project design to capture roof runoff leaving the site (See table 1 Pre-Developed vs. Post-Developed Total Site Discharge Comparison). The rain garden will reduce the rate of runoff for the 100-year storm event.

#### 4.3 Water Quality

The proposed project **will not** increase impervious surface coverage by more than 0.25 acres. Therefore, water quality treatment is not required pursuant to N.J.A.C. 7:8-5.5.

### 5.0 TECHNIQUES OF ANALYSIS

In accordance with the stormwater runoff calculation methodology at N.J.A.C. 7:8-5.6, the quantity (volume and rate) of stormwater runoff for pre- and post-developed conditions is calculated based on the USDA NRCS methodology as described in Technical Release 55 - Urban Hydrology for Small Watersheds (TR-55), dated June 1986.

Due to the area being mostly impervious, time of concentration (TC) was determined to be a minimum of 6 minutes.

Curve numbers (CN) for the drainage areas are based on the hydrologic soil group and land use. The developed area is made up of Freehold-Downer-Urban Land complex (FrpB), Type B soils, therefore CN's of 61 for lawn and landscaped areas, and 98 for impervious areas were utilized.

The impervious areas were calculated as separate subareas to generate hydrographs without weighted CNs as outlined in the N.J. Best Management Practices Manual Chapter 5.

Using the drainage areas, the TCs and CNs as input data, the hydrologic/hydraulic software program Pondpack V8i by Bentley, was utilized to generate the runoff volumes and rates.

## 6.0 KEY HYDROLOGIC PRINCIPALS

A 24-hour, Type III storm distribution was utilized with the following rainfall amounts, within Camden County for each storm analyzed. The DelMarVa unit hydrograph was utilized in the calculations. NRCS 24 hr. design storm rainfall depths for New Jersey, as revised September 2004, are used in the calculation.

2 year	3.31 inches
10 year	5.06 inches
100 year	8.51 inches

## 7.0 PRE-DEVELOPED VS. POST-DEVELOPED RUNOFF COMPARISON

The proposed project will generate a minimal increase in the total runoff leaving the site for the 2, 10, 25 and 100-year storm events. Hydrographs generated for the pre- and post-developed drainage areas and are provided in Appendices A and B respectively. The results are detailed in Table 1 below. The pre- and post-developed drainage area boundaries are depicted on sheets CS9001 and CS9002 in Appendix D.

TABLE 1 – PRE-DEVELOPED VS. POST-DEVELOPED TOTAL SITE DISCHARGE COMPARISON

Storm Event	Pre-Developed Total Site Discharge (cfs)	Pre-Developed Total Site Runoff Volume (cf)	Post-Developed Total Site Discharge (cfs)	Post-Developed Total Site Runoff Volume (cf)	Runoff Increase From Pre-Developed (cfs)
2	0.34	1,742	0.44 <del>0.57</del>	2,178 <del>2,786</del>	+0.10 <del>+0.23</del>
10	0.77	3,572	0.83 <del>1.05</del>	3,964 <del>4,944</del>	+0.06 <del>+0.28</del>
25	1.09	4,966	1.53 <del>1.40</del>	7,100 <del>6,477</del>	+0.56 <del>+0.31</del>
100	1.81	8,015	1.73 <del>2.14</del>	9,017 <del>9,772</del>	-0.08 <del>+0.33</del>

The project will incorporate the use of a subsurface basin to store the volume difference between the pre-and post-developed 25-year storm event. Table 2 below summarizes the volume difference between the pre- and post-developed 25 year storm event.

**TABLE 2 – PRE-DEVELOPED VS. POST-DEVELOPED 25-YEAR STORM RUNOFF VOLUME DIFFERENCE**

Storm Event	Pre-Developed Total Site Runoff Volume (cf)	Post-Developed Total Site Runoff Volume (cf)	Volume Increase From Pre-Developed (cf)
25	4,966	<del>7,100</del> 6,477	<del>2,134</del> 1,511

The subsurface basin consists of <sup>12</sup>fourteen (14) rows of 18" HDPE pipe, this will provide a storage volume of <sup>1,605</sup>2,170 CF (excluding stone voids). See Appendix B for subsurface basin sizing worksheet.

**8.0 STORM SEWER DESIGN**

The runoff from the site drains to an existing stormwater inlet located approximately 170' south on within Haddon Street.

**9.0 SOIL EROSION AND SEDIMENT CONTROL**

The project will comply with the minimum design and performance standards for erosion control established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules. Anticipated erosion control measures to be included in the Soil Erosion and Sediment Control Plan will likely include: minimizing the area of disturbance, placement of silt fencing around the limit of disturbance and a stabilized construction entrance (see Dwg. CS8001). The project will be submitted to the Camden County Conservation District for certification of a Soil Erosion and Sediment Control Plan prior to commencement of construction.

**10.0 CONCLUSION**

As described above, the proposed project will generate a minimal increase in the total runoff leaving the site for the 2 and 10-year storm events and provide a reduction in the 100-year storm runoff rate. The project is not considered a "major development" as the project will not disturb more than one (1) acre of land and the project will not increase impervious area by 0.25 acres. Therefore, the project is not required to address groundwater recharge, water quantity and water quality requirements of N.J.A.C. 7:8-5.4 and 7:8-5.5. The project has incorporated a subsurface basin to store the volume difference between the pre-and post-developed 25-year storm event.



PRE

Subsection: Master Network Summary

**Catchments Summary**

Label	Scenario	Return Event (years)	Hydrograph Volume (ft <sup>3</sup> )	Time to Peak (hours)	Peak Flow (ft <sup>3</sup> /s)
EDA-1 perv	2 year	2	638.000	12.150	0.10
EDA-1 perv	10 year	10	1,832.000	12.150	0.41
EDA-1 perv	25year	25	2,791.000	12.150	0.65
EDA-1 perv	100 year	100	5,005.000	12.150	1.20
EDA-1 Imp	2 year	2	1,116.000	12.100	0.24
EDA-1 Imp	10 year	10	1,749.000	12.100	0.37
EDA-1 Imp	25year	25	2,161.000	12.100	0.46
EDA-1 Imp	100 year	100	2,998.000	12.100	0.63

**Node Summary**

Label	Scenario	Return Event (years)	Hydrograph Volume (ft <sup>3</sup> )	Time to Peak (hours)	Peak Flow (ft <sup>3</sup> /s)
POI-1	2 year	2	1,753.000	12.150	0.34
POI-1	10 year	10	3,580.000	12.150	0.77
POI-1	25year	25	4,952.000	12.150	1.09
POI-1	100 year	100	8,003.000	12.100	1.81

POST

Subsection: Master Network Summary

**Catchments Summary**

Label	Scenario	Return Event (years)	Hydrograph Volume (ft <sup>3</sup> )	Time to Peak (hours)	Peak Flow (ft <sup>3</sup> /s)
PDA-1 perv	2 year	2	443.000	12.150	0.07
PDA-1 perv	10 year	10	1,272.000	12.150	0.28
PDA-1 perv	25 year	25	1,938.000	12.150	0.45
PDA-1 perv	100 year	100	3,476.000	12.150	0.83
PDA-1 Imp	2 year	2	1,227.000	12.100	0.27
PDA-1 Imp	10 year	10	1,923.000	12.100	0.41
PDA-1 Imp	25 year	25	2,377.000	12.100	0.50
PDA-1 Imp	100 year	100	3,298.000	12.100	0.69
proposed roof	2 year	2	1,116.000	12.100	0.24
proposed roof	10 year	10	1,749.000	12.100	0.37
proposed roof	25 year	25	2,161.000	12.100	0.46
proposed roof	100 year	100	2,998.000	12.100	0.63

**Node Summary**

Label	Scenario	Return Event (years)	Hydrograph Volume (ft <sup>3</sup> )	Time to Peak (hours)	Peak Flow (ft <sup>3</sup> /s)
POI-1	2 year	2	2,786.000	12.100	0.57
POI-1	10 year	10	4,944.000	12.100	1.05
POI-1	25 year	25	6,477.000	12.100	1.40
POI-1	100 year	100	9,772.000	12.100	2.14

OLD DESIGN

# STORMWATER RETENTION / DETENTION PIPE SYSTEM SIZING WORKSHEET

THE MOST ADVANCED NAME IN DRAINAGE SYSTEMS  
Version 7.9

Project Name: Haddon Heights Apartment Complex  
 Location (City, State): Haddon Heights, New Jersey  
 Prepared For:  
 Date Prepared:  
 Engineer:  
 Contractor:  
 Regional Engineer:  
 Area Sales Representative:  
 Surface Application:

Enter or Select values in the Yellow fields ONLY

UNIT:  Imperial (ft. in)  Metric (mm, m)

SYSTEM: Plain End ST

Design Storage Volume: 2134 CF

Average Cover Height<sup>4</sup>: 1.50 FT

HEADER	LATERALS			BACKFILL		
	Lateral Diameter (in)	Lateral Length (ft)	Number of Laterals	# of Sticks / Lateral	Approx. Length of End Stick	Stone Porosity? %
Header Diameter	18					0
Number of Headers	2	82	14	5	4-ft	
Perforate Headers?	Yes	0	0	0	0-ft	
Include Header(s) in Storage Volume?	Yes	0	0	0	0-ft	
						Additional Stone Layer Allowing Storage (ASV)? in. 6

STORAGE VOLUME			APPROXIMATE SYSTEM SIZE			EXCAVATION			
Product Volume (CF)	Stone (CF)	ASV (CF)	Width (FT)	Length (FT)	Pipe Diameter (IN)	Disturbed Surface Area (SYD)	Excavation <sup>2</sup> (CYD)	Estimated Backfill <sup>3</sup> (CYD)	ASV (CYD)
Group 1	2,170	0	40	87	18	415	498	418	69
Group 2	0	0	0	0	18	0	0	0	0
Group 3	0	0	0	0	18	0	0	0	0
<b>TOTALS</b>	<b>2,170</b>	<b>0</b>				<b>415</b>	<b>498</b>	<b>418</b>	<b>69</b>

101.7% of the required storage

- NOTES
- Full Stick: Assumed a standard lay length of 19'-8".
  - Excavation: Based on manufacturer's recommended trench width and bedding depth. Estimated volumes assume a flat system based on the user-entered Average Cover Height.
  - Backfill: Does not account for pipe corrugations - calculated for conservative quantities. Not for use with take-offs or ordering purposes.
  - Cover Height: For traffic installations, 1-ft of minimum cover is required for diameters 12-36", 2-ft for 42-60". Maximum cover shall not exceed 8-ft without consulting Applications Engineering.
  - Bill of Materials: Does not differentiate between ST and WT fittings or between A and H profile connections. Determined on a project-specific basis.
  - Quantities: Assumes all Groups are same diameter. Run separate calculations to determine quantities and costs for different Group diameters.

This Excel spreadsheet is provided for rough estimating purposes only. This tool is intended to assist the design engineer in sizing stormwater management systems using ADS pipe and manifold components. As with any calculation aid, this tool should be used for estimating only; the engineer must verify the assumptions and methods to ensure they satisfy the project and local design criteria.

NEW

# STORMWATER RETENTION / DETENTION PIPE SYSTEM SIZING WORKSHEET

THE MOST ADVANCED NAME IN DRAINAGE SYSTEMS  
Version 7.9

Enter or Select values in the Yellow fields ONLY

Imperial (ft., in)    Metric (mm, m)  
**UNIT**  
 Unit of Measure: Imperial (ft., in)   Metric (mm, m)  
**SYSTEM**  
 Joint Type: Plain End ST  
 Design Storage Volume: 1511 CF  
 Average Cover Height: 1.50 FT

Project Name: Haddon Heights Apartment Complex  
 Location (City, State): Haddon Heights, NJ  
 Prepared For:  
 Date Prepared: 8/30/2018  
 Engineer: JR/BM  
 Contractor:  
 Regional Engineer:  
 Area Sales Representative:  
 Surface Application:

HEADER		LATERALS			BACKFILL	
Header Diameter	18	Lateral Diameter (in)	Lateral Length (ft)	Number of Laterals	# of Sticks / Lateral	Approx. Length of End Stick
Number of Headers	2	Group 1	70	12	4	11.7-ft
Perforate Headers?	No	Group 2			0	0-ft
Include Header(s) in Storage Volume?	Yes	Group 3		0	0	0-ft

Perforate Laterals?  No  Yes

A non-perforated system has been selected

STORAGE VOLUME			APPROXIMATE SYSTEM SIZE			EXCAVATION			
Product Volume (CF)	Stone (CF)	ASV (CF)	Total System (CF)	Width (FT)	Length (FT)	Disturbed Surface Area (SYD)	Excavation (CYD)	Estimated Backfill (CYD)	ASV (CYD)
Group 1	1,605	0	1,605	34	75	309	371	311	0
Group 2	0	0	0	0	0	0	0	0	0
Group 3	0	0	0	0	0	0	0	0	0
<b>TOTALS</b>	<b>1,605</b>	<b>0</b>	<b>1,605.00</b>			<b>309</b>	<b>371</b>	<b>311</b>	<b>0</b>

106.2% of the required storage

- NOTES**
- 1 - Full Stick: Assumed a standard lay length of 19'-8".
  - 2 - Excavation: Based on manufacturer's recommended trench width and bedding depth. Estimated volumes assume a flat system based on the user-entered Average Cover Height.
  - 3 - Backfill: Does not account for pipe corrugations - calculated for conservative quantities. Not for use with take-offs or ordering purposes.
  - 4 - Cover Height: For traffic installations, 1-ft of minimum cover is required for diameters 12-36", 2-ft for 42-60". Maximum cover shall not exceed 8-ft without consulting Applications Engineering.
  - 5 - Bill of Materials: Does not differentiate between ST and WT fittings or between A and H profile connections. Determined on a project-specific basis.
  - 6 - Quantities: Assumes all Groups are same diameter. Run separate calculations to determine quantities and costs for different Group diameters.

This Excel spreadsheet is provided for rough estimating purposes only. This tool is intended to assist the design engineer in sizing stormwater management systems using ADS pipe and manifold components. As with any calculation aid, this tool should be used for estimating only; the engineer must verify the assumptions and methods to ensure they satisfy the project and local design criteria.



APPENDIX 3  
UNDERWOOD SOILS INVESTIGATION

*irving design group, llc*

10 White Horse Pike ♦ Haddon Heights, NJ 08035 ♦ Phone 856-310-9200

**UNDERWOOD ENGINEERING COMPANY**  
1 KEYSTONE AVENUE, SUITE 300  
CHERRY HILL, NJ 08003

856-933-1818  
Fax 856-933-3123

Christopher T. Koss, P. E.

---

CLIENT: Una Voce  
315 4<sup>th</sup> Avenue  
Haddon Heights, NJ 08035

PROJECT: 8 Unit Apartments  
414 White Horse Pike  
Haddon Heights, NJ

REQUIREMENT: Professional Engineering Services

LOCATION: Locations Provided by Client

DATE: 1/7/2024

UE REF. NO.: 5198-20251-2 WO#24-0150

ATTENTION: Paul DeMartini email: [demartini80@yahoo.com](mailto:demartini80@yahoo.com)

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**PURPOSE**

The purpose of this report is to present the findings of the continuous geotechnical soil boring and laboratory testing conducted at the 8 Unit Apartments project. The supplemental boring location was provided by the client.

**INVESTIGATION**

Geotechnical Boring – (TB-1) One continuous geotechnical boring was completed at the stormwater basin location on December 26<sup>th</sup>, 2023. The test boring was carried out to a depth of approximately eighteen feet below ground surface (BGS). All standard penetration testing (SPT) and split-barrel sampling of soils was performed in accordance with ASTM D-1586.

The soils encountered at the boring location TB-1 consisted generally of very soft loams underlain by medium dense sandy loams and stiff to very stiff loams.

Groundwater was not encountered in TB-1. There were no seasonal high water indicators observed in the borehole.

Samples of the soils recovered during drilling operations were sealed in glass jars and transported to the Underwood Soil Laboratory for Hydrometer and Sieve analysis per ASTM D-422, and will be stored for a period of no less than 30 days.

**FINDINGS**

The soils tested were identified by visual classification in the field and confirmed by laboratory analysis. The soils tested consisted of sandy loams and loams. The permeability class ratings ranged from K2, or 0.6 to 2 inches per hour, to K3, or 2 to 6 inches per hour. A table containing the test location, depth, soil classification and laboratory permeability class ratings are provided in the table below:

Results of permeability testing is contained in the table below:

Test #	Test Depth (ft.)	Soil Description & Texture	Permeability Class Rating
TB-1A	4-6	SANDY LOAM	K3 (2 – 6 in/hr)
TB-1B	6-8	LOAM	K2 (0.6 – 2.0 in/hr)
TB-1C	8-10	LOAM	K2 (0.6 – 2.0 in/hr)

\*Depths taken below existing ground surface elevations at test pit locations.

Note: It is anticipated that the field infiltration rates will be much slower than the laboratory rates due to the in place stiff consistency of the soils and the fine plus very fine sand contents (60-75%) of the soils.

**QUALIFICATIONS**

Findings are based on the above investigation. No other conclusions are to be drawn other than those specifically stated. This report does not reflect any variations, which may be encountered during construction. Underwood Engineering Company will not be responsible for variations in subsurface soils encountered in areas other than those tested.

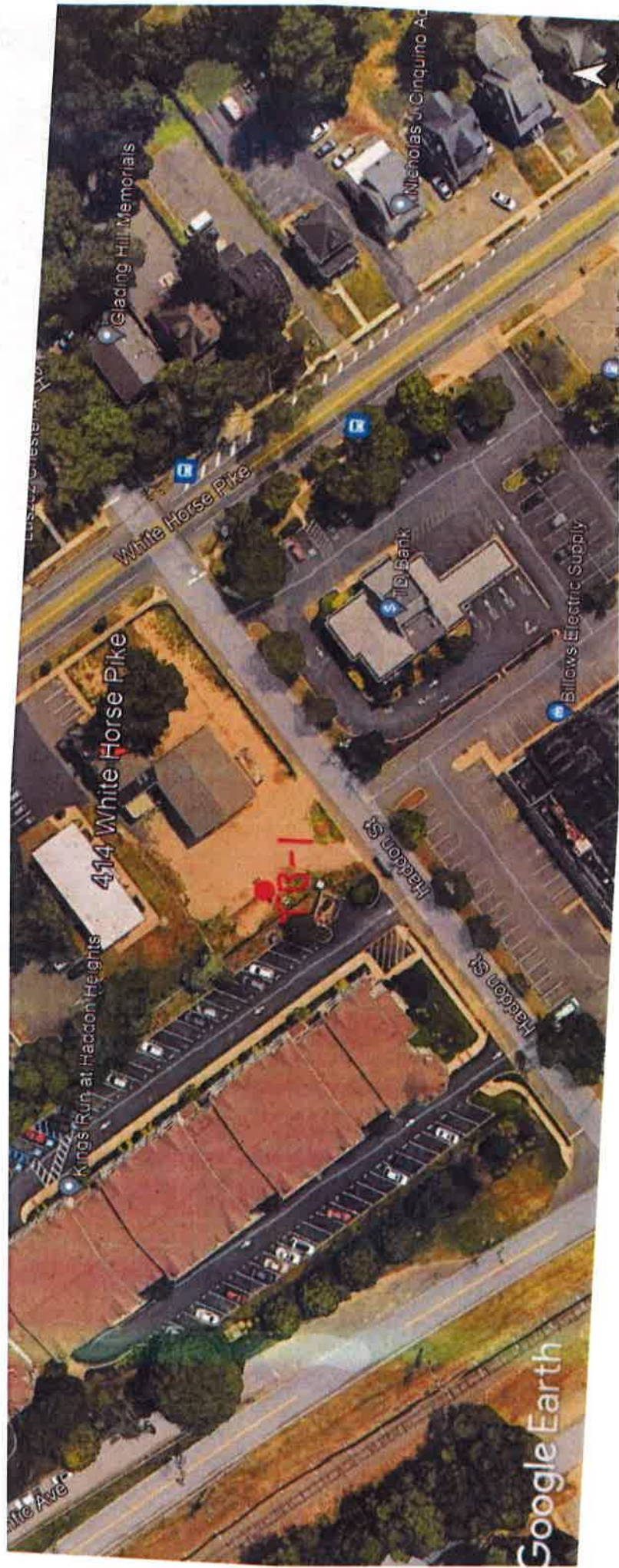
Respectfully submitted,

UNDERWOOD ENGINEERING COMPANY

*Christopher T. Koss*

Christopher T. Koss, P.E.





Google Earth



CLIENT: Una Voce  
 PROJECT: 8 Unit Apartments  
 414 White Horse Pike  
 Haddon Heights, NJ

DATE: 12/26/2023

BORING No.: TB-1

**UNDERWOOD ENGINEERING COMPANY**

1 Keystone Avenue, Suite 300, Cherry Hill, NJ 08003

Ph.# 856.933.1818 Fx.# 856.933.3121

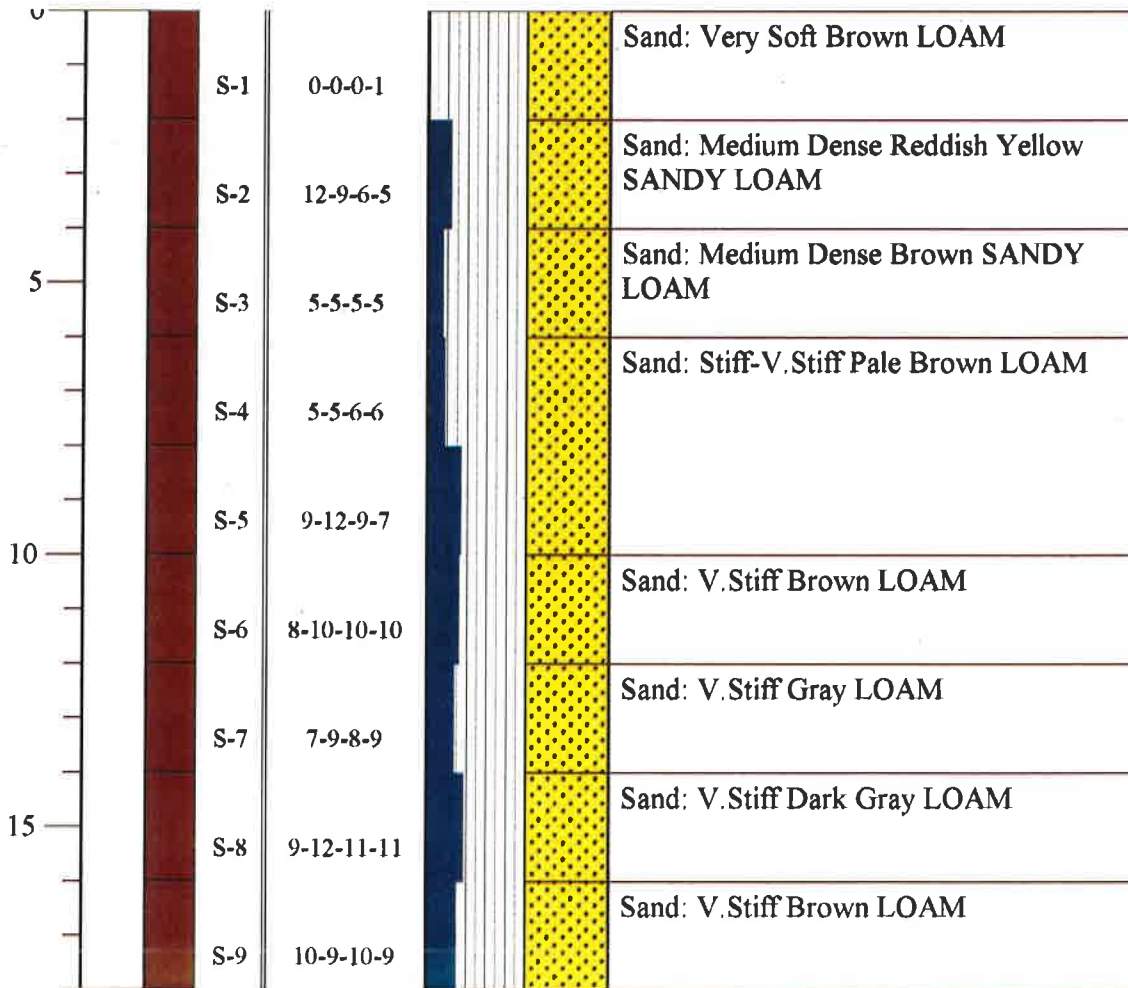
Christopher T. Koss, P.E.

GROUND SURFACE ELEVATION: NA

GROUNDWATER DATA	
DEPTH	Hours After Completion
NA	Groundwater Not Encountered

METHOD OF ADVANCING BORING	DEPTH (FT.)
CONTINUOUS SPLIT SPOON SAMPLE	0 to 18 ft
AUGERS	10 to 16 ft
2" O.D. SPLIT SPOON	16 to 18 ft

Depth (ft)	Groundwater	Sampling Interval	Sample #	Blows	N-Values	Lithology	Soil Description*	Notes:
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\*FIELD CLASSIFICATION ONLY. SOIL CLASSIFICATION FOR PARTICULAR USES SHOULD BE ASCERTAINED BY LABORATORY TESTS.

# Underwood Engineering Company

143 Harding Avenue • Bellmawr, New Jersey 08031

William R. Underwood, P.E., President

(856) 933-1818 • Fax (215) 259-2372

Client: Una Voce

Project: 8 Unit Apartments

Requirement: Hydrometer & Sieve Analysis

Date Performed: 1/3/2024

Location: TB-1 at 4ft to 6ft

Test Number: 1

Project No:

## ASTM D-422 HYDROMETER AND SIEVE ANALYSIS

### A. COARSE FRAGMENT CONTENT

Total dry sample wt. = 250.0

Wt. retained #10 sieve (2mm) = 6.4

% Coarse fragments = 2.6

### B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 97.4

Temperature = 70 °C

a = 1.0 based on specific gravity of soil particles = 2.65 from Table 1 of ASTM D-422

w, weight used for hydrometer analysis/percent passing #10 x 100 = 102.6

L, value of effective depth, Table 2 of ASTM D-422 = see table below

k, based on specific gravity of soil particle and temperature = 0.01217

Time, t (minutes)	Hydrometer reading, r	Percent in suspension, $P=100ra/w$	L (cm)	Soil particle diam.(mm), $D = k \sqrt{L/t}$
2	38	37.0	11.4	0.02906
5	35	34.1	11.4	0.01838
15	30	29.2	11.4	0.01061
30	27	26.3	11.9	0.00766
60	20	19.5	13.0	0.00566
250	19	18.5	13.2	0.00280
1440	15	14.6	13.8	0.00119

### C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 35.2

Wt retained #300 sieve (0.045mm) = 58.2

% Fine plus very fine sand = 60.5

### D. SOIL MORPHOLOGY

Structure : Blocky

Consistence : Friable

### E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 58.2

%Silt = 25.3

%Clay = 16.5

Soil Texture: SANDY LOAM

Soil Permeability Class Rating: K3

# Underwood Engineering Company

143 Harding Avenue • Bellmawr, New Jersey 08031

William R. Underwood, P.E., President

(856) 933-1818 • Fax (215) 259-2372

Client: Una Voce

Project: 8 Unit Apartments

Requirement: Hydrometer & Sieve Analysis

Date Performed: 1/3/2024

Location: TB-1 at 6ft to 8ft

Test Number: 1

Project No:

## ASTM D-422 HYDROMETER AND SIEVE ANALYSIS

### A. COARSE FRAGMENT CONTENT

Total dry sample wt. = 250.0

Wt. retained #10 sieve (2mm) = 8.1

% Coarse fragments = 3.2

### B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 96.8

Temperature = 70 °C

a = 1.0 based on specific gravity of soil particles = 2.65 from Table 1 of ASTM D-422

w, weight used for hydrometer analysis/percent passing #10 x 100 = 103.3

L, value of effective depth, Table 2 of ASTM D-422 = see table below

k, based on specific gravity of soil particle and temperature = 0.01217

Time, t (minutes)	Hydrometer reading, r	Percent in suspension, $P=100ra/w$	L (cm)	Soil particle diam.(mm), $D = k \sqrt{L/t}$
2	48	46.5	11.4	0.02906
5	43	41.6	11.4	0.01838
15	32	31.0	11.4	0.01061
30	28	27.1	11.7	0.00760
60	20	19.4	13.0	0.00566
250	18	17.4	13.3	0.00281
1440	17	16.5	13.5	0.00118

### C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 8

Wt retained #300 sieve (0.045mm) = 48.1

% Fine plus very fine sand = 16.6

### D. SOIL MORPHOLOGY

Structure : Subangular Blocky

Consistence : Friable

### E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 48.1

%Silt = 33.5

%Clay = 18.4

Soil Texture: LOAM

Soil Permeability Class Rating: K2

# Underwood Engineering Company

- 143 Harding Avenue • Bellmawr, New Jersey 08031

William R. Underwood, P.E., President

(856) 933-1818 • Fax (215) 259-2372

Client: Una Voce

Project: 8 Unit Apartments

Requirement: Hydrometer & Sieve Analysis

Date Performed: 1/3/2024

Location: TB-1 at 8ft to 10ft

Test Number: 1

Project No:

## ASTM D-422 HYDROMETER AND SIEVE ANALYSIS

### A. COARSE FRAGMENT CONTENT

Total dry sample wt. = 250.0

Wt. retained #10 sieve (2mm) = 7.1

% Coarse fragments = 2.8

### B. HYDROMETER ANALYSIS

Weight used for hydrometer analysis = 100.0g

Percent Passing #10 sieve = 97.2

Temperature = 70 °C

a = 1.0 based on specific gravity of soil particles = 2.65 from Table 1 of ASTM D-422

w, weight used for hydrometer analysis/percent passing #10 x 100 = 102.9

L, value of effective depth, Table 2 of ASTM D-422 = see table below

k, based on specific gravity of soil particle and temperature = 0.01217

Time, t (minutes)	Hydrometer reading, r	Percent in suspension, $P=100ra/w$	L (cm)	Soil particle diam.(mm), $D = k \sqrt{L/t}$
2	42	40.8	11.4	0.02906
5	38	36.9	11.4	0.01838
15	34	33.0	11.4	0.01061
30	30	29.2	11.4	0.00750
60	25	24.3	12.2	0.00549
250	22	21.4	12.7	0.00274
1440	18	17.5	13.3	0.00117

### C. SIEVE ANALYSIS (of hydrometer sample)

Wt. passing #60 sieve (0.25mm) = 36.5

Wt retained #300 sieve (0.045mm) = 48.9

% Fine plus very fine sand = 74.6

### D. SOIL MORPHOLOGY

Structure : Subangular Blocky

Consistence : Friable

### E. Soil Permeability CLASS RATING and TEXTURAL ANALYSIS

%Sand = 48.9

%Silt = 29.2

%Clay = 21.9

Soil Texture: LOAM

Soil Permeability Class Rating: K2



APPENDIX 4  
PENNONI SOILS INVESTIGATION

*irving design group, llc*

10 White Horse Pike ♦ Haddon Heights, NJ 08035 ♦ Phone 856-310-9200

**SOIL PERMEABILITY**  
**STORMWATER BASIN SOIL BORING LOG**  
**HADDON HEIGHTS APARMENT COMPLEX**  
**414 WHITE HORSE PIKE**  
**BLOCK 37, LOT 8**  
**HADDON HEIGHTS**  
**CAMDEN COUNTY, NEW JERSEY**



**Prepared For:**

UNA VOCE  
417 White Horse Pike  
Suite E  
Haddon Heights, New Jersey 08035

**Prepared By:**

RWD Consultants  
A Division of Pennoni  
2 Aquarium Drive, Suite 320  
Camden, New Jersey 08103  
T: 856-668-8600

A handwritten signature in blue ink, appearing to read 'Joseph Raday', with a long horizontal stroke extending to the right.

---

Joseph Raday, PE  
New Jersey License No. 24GE043768

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**1.0 INTRODUCTION..... 1**

**2.0 PROJECT DESCRIPTION..... 1**

    2.1 EXISTING CONDITIONS..... 1

    2.2 Proposed Conditions..... 1

    2.3 Soil Survey Information ..... 1

**3.0 Site Visit Information..... 2**

**4.0 Conclusion / Findings ..... 2**

**EXHIBITS**

**FIGURE 1 – SOIL MAP**

**FIGURE 2 - SOIL BORING LOG**

**FIGURE 3 – DOUBLE RING FIELD DATA SHEET**

## SOIL PERMEABILITY TEST SUMMARY

### 1.0 INTRODUCTION

**UNA Voce (Applicant)**, is proposing to construct an apartment building located at the intersection of White Horse Pike (NJSH Rt. 30) and Haddon Street in the Borough of Haddon Heights, Camden County, New Jersey. The project entails the construction of a 2,698 sf apartment complex, 12 proposed parking spaces, lighting and landscaping.

This report has been prepared to accompany the preliminary/final minor site plan application for the project.

### 2.0 PROJECT DESCRIPTION

#### 2.1 Existing Conditions

The project is in Haddon Heights, New Jersey, at the intersection of the White Horse Pike (NJSH Rt. 30) and Haddon Street. The subject property is located on a parcel identified as Block 81.05, Lot 1.

The existing site generally consists of three (3) space paved parking area and an existing 2 ½ story home. The surface coverage consists of 0.10 acres of existing impervious surfaces and 0.36 acres of existing pervious surfaces. The "site" is defined as the tax map property boundaries. For existing condition runoff calculations, the "site" was analyzed as one Existing Drainage Area (EDA-1).

The stormwater from the site collectively drains towards an existing inlet and storm conveyance system located approximately 170' south on Haddon Street.

#### 2.2 Proposed Conditions

The proposed project consists of an existing 2 ½ story home, 15-space parking area (total), a proposed 2,698 sf apartment building, lighting and landscaping. The proposed surface coverage consists of 0.26 acres of impervious surfaces and 0.20 acres of pervious surfaces. The proposed conditions will **not** increase impervious surface coverage by more than 0.25 acres. For proposed condition runoff calculations, the site was analyzed as one Proposed Drainage Area (PDA-1).

#### 2.3 Soil Survey Information

A review of soil information provided in the USDA Web Soil Survey Map Database Report for Camden County indicates that the soils on the subject property consist of Freehold-Downer-Urban Land complex (FrpB) (Figure 1).



### 3.0 SITE VISIT INFORMATION

On November 16, 2017; Pennoni conducted one Test Pit (TP-1) onsite and tested soil permeability utilizing the Double Ring infiltrometer method (ASTM D 3385) field test. This test was completed by Josh Holderer of Pennoni. Soil Boring Log information was completed by Larissa Elder of Pennoni. The site did not show signs of previous soil disturbance in the area of testing. The weather was partly cloudy at the time of soil testing. Soil Permeability testing was conducted at approximately 6ft (72 inches).

### 4.0 CONCLUSION / FINDINGS

USDS Soil Maps showed the area of the subject property to contain Freehold-Downer-Urban Land complex (FrpB) soil type. This soil type is considered to be Well Drained. Soil Boring Logs from the site visit on November 16, 2017 by Pennoni show the soil to contain layers of mostly silty loam with some clay layers present. The Soil Boring Log is provided as Figure 2.

During the excavation, no water table or seasonal high water table was encountered. Most of the soil layers observed were dry or slightly damp.

Soil permeability testing resulted in an Infiltration Rate of 0.56cm/hr or 0.22in/hr. The Double Ring Field Data Sheet is provided in Figure 3.

**Figure 1:**

**Soil Map**

Soil Map—Camden County, New Jersey



## MAP LEGEND

- Area of Interest (AOI)
- Area of Interest (AOI)
- Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points
- Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features
- Water Features**
- Streams and Canals
- Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads
- Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

**Warning:** Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL:  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Camden County, New Jersey  
 Survey Area Data: Version 10, Sep 28, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 15, 2014—Jun 24, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Camden County, New Jersey (NJ007)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FrpB	Freehold-Downer-Urban land complex, 0 to 5 percent slopes	0.5	100.0%
<b>Totals for Area of Interest</b>		<b>0.5</b>	<b>100.0%</b>

**Figure 2:**

**Soil Boring Log**

# SOIL BORING LOG

Project Site:	Haddon Heights Apartment Complex				Date:	11-16-2017
Applicant/Owner:	UNA VOCE				County:	Camden County
Investigator(s):	Larissa Elder and Josh Holderer				State:	New Jersey
Do normal conditions exist on the site?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Community ID:	
Is the site significantly disturbed?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Transect ID:	TP-1
Is the area a potential Problem Area?	Yes	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Plot ID:	B1
<b>Remarks:</b>						
Basin Soil Boring #1						
Soil Sample taken at 72" (6ft)						
The soil boring was conducting in an area that currently was a maintained lawn area. The site did not appear to have been disturbed. No evidence of lower layer disturbance was found or anticipated.						

## SOILS

Soil Series and Phase:	Freehold-Downer-Urban land (0 to 5 percent slopes) - FrpB					
Soil Drainage Class:	Well drained					
Taxonomy (Subgroup):						
Field Observations Confirm Mapped Type?	Yes	<input checked="" type="checkbox"/>	No	<input type="checkbox"/>		
<hr/>						
Soil Series and Phase:						
Soil Drainage Class:						
Taxonomy (Subgroup):						
Field Observations Confirm Mapped Type?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>		
<b>Soil Profile Description</b>						
Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Textures, Concretions, Structures, etc.	
0-12		Topsoil 10YR 4/2			Dark grayish brown / Dry	
12-36		10YR 7/6			Yellow/ Silty Loam / Dry	
36-48		10YR 7/2	10YR 6/4		Light Grey with slight light yellowish brown mottles/ Clay / Dry	
48-84		7.5YR 7/8			Redish Yellow/ Sandy Loam with some Medium Size Pebbles present / Dry	
84-108		10YR 5/3			Brown / Silty Clay / Slightly Damp	
108-144		GLE Y 2 3/5B			Very Dark Bluish Gray / Clay / Slightly Damp	
<b>Field Observations</b>						
Seasonal High Water Table (inches):			NEVER REACHED			
Depth to Free-Standing Water in Pit (inches):			NEVER REACHED			
Depth to Saturated Soil (inches):			NEVER REACHED			

**Figure 3:**

**Double Ring Field Data Sheet**



Project Identification: UNAV1701

Test Location: TP-1

Liquid Used: Mun. Water pH: ~ 7.0

Tested By: JWH

Depth to Water Table: Not Encountered

Liquid level maintained using:  Flow Valve;  Float Valve;  Mariotte Tube  
 Penetration of Rings: Inner 5.1 (cm); Outer 10.2 (cm)

Constraints	Area (sq. cm)	Depth of Liquid (cm)	Liquid No.	Containers (cm <sup>3</sup> /cm)
Inner Ring	729.3	7.6	-	182.32
Annular Space	2,188	7.6	-	182.32

Trial Number	Start/ End	Date	Time (hh:mm)	Elapsed Time Δ/(total) (mins)	Flow Readings				Liquid Temp °F	Incremental Infiltration Rate		Ground Temp = <u>61</u> °F Depth of <u>6.0</u> ft
					Inner Ring Reading (cm)	Flow (cm <sup>3</sup> )	Annular Space Reading (cm)	Flow (cm <sup>3</sup> )		Inner (cm/hr)	Annular (cm/hr)	
1	S	11/27/2017	10:43	15	30	117	30.0	117	57	0.64	0.21	Partly cloudy
	E	11/27/2017	10:58	(15)	29.36		29.4		57			
2	S	11/27/2017	10:58	15	29.36	117	29.4	117	57	0.64	0.21	
	E	11/27/2017	11:13	(30)	28.72		28.7		57			
3	S	11/27/2017	11:13	15	28.72	117	28.7	117	57	0.64	0.21	
	E	11/27/2017	11:28	(45)	28.08		28.1		57			
4	S	11/27/2017	11:28	15	28.08	117	28.1	117	57	0.64	0.21	
	E	11/27/2017	11:43	(60)	27.44		27.4		57			
5	S	11/27/2017	11:43	30	27.44	233	27.4	226	57	0.64	0.21	
	E	11/27/2017	12:13	(90)	26.16		26.2		57			
6	S	11/27/2017	12:13	30	26.16	233	26.2	226	57	0.64	0.21	
	E	11/27/2017	12:43	(120)	24.88		25.0		57			
7	S	11/27/2017	12:43	60	24.88	407	24.9	365	57	0.56	0.17	
	E	11/27/2017	13:43	(180)	22.65		22.9		57			
8	S	11/27/2017	13:43	60	22.65	407	22.9	361	57	0.56	0.17	
	E	11/27/2017	14:43	(240)	20.42		20.9		57			

Infiltration Rate  
0.56 cm/hr or 0.22 in./hr