

# Appendix 3: Soils Information

*Geotechnical Study and Other Infiltration Testing Data*

June 29, 2021

MC Blackacre Management LLC  
18032 Lemon Drive, Suite 367  
Yorba Linda, CA 92886



**SOUTHERN  
CALIFORNIA  
GEOTECHNICAL**  
*A California Corporation*

Attention: Mr. Michael Masterson

Project No.: **21G180-2**

Subject: **Results of Infiltration Testing**

Proposed Industrial Building  
Perris Airport Center  
SEC Ellis Avenue at Goetz Road  
Perris, California

References: 1) Geotechnical Investigation, Proposed RV Storage, Perris Valley Airport, SEC Goetz Road and Ellis Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG) for BHT Properties Group, SCG Project No. 19G132-1, dated April 23, 2019.

2) Geotechnical Investigation, Proposed Industrial Building, Perris Airport Center, SEC Ellis Avenue at Goetz Road, Perris, California, prepared by SCG for MC Blackacre Management, LLC, SCG project No. 21G180-1, dated June 28, 2021.

Mr. Masterson:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

### **Scope of Services**

The scope of services performed for this project was in general accordance with our Proposal No. 21P258R, dated May 24, 2021. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, prepared for the Riverside County Department of Environmental Health (RCDEH), dated December 2013 and the ASTM test method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer.

### **Site and Project Description**

The subject site is located at the southeast corner of Goetz Road and Ellis Avenue in Perris, California. The site is bounded to the north by Ellis Avenue, to the west by Goetz Road, to the south by an auction facility, a portion of the Perris Valley Airport (PVA) and a vacant lot, to the northeast by Case Road, and to the east by a vacant lot. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of several irregular-shaped parcels which total 81.64± acres in size. These parcels are located in the northern area of the PVA. The site is currently vacant and generally undeveloped, with the exception of isolated areas in the north-central region of the site. These areas are developed with what appears to be asphaltic concrete pavements. These pavements are located adjacent to the northern terminus of the existing PVA runway. The ground surface cover in the unpaved areas of the site generally consists of exposed soil with moderate to extensive weed growth. Several large trees are present along the northern property line of the subject site, and two large trees are present along the western property line.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth and visual observations made at the time of the subsurface investigation, the site is relatively level with localized undulations of 1 to 2± feet.

### **Proposed Development**

A conceptual site plan, prepared by Ware Malcomb, has been provided to our office by the client. Based on this plan, the subject site will be developed with a 704,480± ft<sup>2</sup> industrial building, located in the western region of the site. Dock-high doors will be constructed along the east wall of the proposed building. The proposed building is expected to be surrounded by asphaltic concrete pavements in the parking and drive areas, Portland cement concrete pavements in the loading dock area, and concrete flatwork and landscaped planters throughout the site.

The proposed development will include on-site infiltration to dispose of storm water. The infiltration system will consist of two infiltration basins located in the southeastern and eastern areas of the site. The bottom of the basins are expected to be 4 to 5± feet below existing site grades.

### **Previous Study**

Southern California Geotechnical, Inc. (SCG) performed a geotechnical investigation for a previously proposed RV storage lot, with the only structure consisting of a 10,000± ft<sup>2</sup> office building located in the northwestern region of the site (Reference No. 1).

As part of this investigation six (6) borings (identified as Boring Nos. B-1 through B-6) were advanced to depths of 5 to 20± feet below the existing site grades. The approximate locations of the previous borings are indicated on the Boring Location Plan, included as Plate 2 in Appendix A of this report. Native alluvium was encountered at the ground surface at all of the boring locations. The near-surface alluvial soils generally consist of loose to medium dense silty sands and clayey sands, and stiff to very stiff sandy clays, extending to depths of 2½ to 6½± feet below the existing site grades. The underlying native alluvium generally possesses higher strengths and densities and consists of clayey sands, silty sands, and sandy clays. Free water was not encountered during the drilling of any of the borings. Based on the lack of water within the borings, the groundwater was considered to have existed at a depth in excess of 20± feet at the time of the previous subsurface exploration.

## **Concurrent Study**

Southern California Geotechnical, Inc. (SCG) concurrently performed a geotechnical investigation at the subject site (Reference No. 2). As part of this investigation, SCG drilled five (5) borings to depths of 5 to 50± feet below the existing site grades. Native older alluvium was encountered at the ground surface at all of the boring locations, extending to depths of 5 to 32± feet below the existing site grades. The alluvium generally consists of dense to very dense clayey sands and silty sands, and stiff to hard sandy clays. Val Verde Tonalite bedrock was encountered beneath the older alluvial soils at one of the boring locations at a depth of 32± feet and extending to a depth of at least 50± feet below the existing site grades. The bedrock consists of medium dense to very dense gray brown to gray fine to coarse-grained tonalite.

Free water was encountered during drilling at depths of 23½± to 30± feet. The static groundwater table is considered to have been present at a depth of 23½± feet below the existing site grades at the time of the subsurface exploration.

## **Subsurface Exploration**

### Scope of Exploration

The subsurface exploration for the infiltration testing consisted of seven (7) backhoe-excavated trenches, extending to depths of 4 to 5± feet below existing site grades. The trenches were logged during excavation by a member of our staff. The approximate locations of the infiltration trenches (identified as I-1 through I-7) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

### Geotechnical Conditions

Native alluvial soils were encountered at the ground surface at all seven (7) infiltration test locations, extending to at least the maximum explored depth of 5± feet below existing site grades. The upper ½ to 1± foot of alluvium appeared to be disturbed and loosened by farm equipment. The disturbed alluvium consists of loose fine sandy silts. Beneath the disturbed alluvial strata and extending to the maximum explored depth of 5± feet, native older alluvium was encountered at all of the trench locations. The alluvium consists of dense to very dense silty fine sands, silty fine to medium sands, and silty fine to coarse sands. Trace quantities of clay and some calcareous nodules were encountered within the alluvial strata. The Trench Logs, which illustrate the conditions encountered at the infiltration test locations, are included with this report.

Groundwater was not encountered during excavation of any of the infiltration trenches. As previously stated in the concurrent studies section of this report, the groundwater at the site is considered to be at a depth of 23½± feet at the time of our investigation.

As part of our research, we reviewed available groundwater data in order to determine the historic high groundwater level for the site. The primary reference used to determine the groundwater depths in this area is the California State Water Resources Control Board, GeoTracker, website, <https://geotracker.waterboards.ca.gov/>. Several monitoring wells on record are located approximately one mile north of the subject site. Water level readings within these monitoring wells indicate a high groundwater level of 37± feet below the ground surface in June 2007.

## **Infiltration Testing – Double Ring Infiltrometer**

The infiltration testing was performed in general accordance with the ASTM test method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double-Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter and 20 inches in height. At each test location, a trench was excavated to the proposed depth of the infiltration system and the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a sixteen-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

### **Infiltration Testing Procedure**

Infiltration testing was performed at both of the infiltration trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at the trench locations, the volumetric measurements were made at 5, 15, and 25-minute increments, depending on the draining characteristics of the soils at each trench location. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets

### **Infiltration Results**

The infiltration rates from the tests are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

<u>Infiltration Test No.</u>	<u>Test Depth (feet)</u>	<u>Soil Description</u>	<u>Infiltration Rate (inches/hour)</u>
I-1	4	Brown Silty fine to medium Sand, trace Clay	1.7
I-2	5	Brown Silty fine to coarse Sand	1.4
I-3	4	Brown Silty fine to coarse Sand	2.3
I-4	4	Brown Silty fine to medium Sand	1.9
I-5	5	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	1.3
I-6	4	Brown Silty fine to coarse Sand	1.0
I-7	4	Brown Silty fine to coarse Sand, trace Clay	1.5

### **Laboratory Testing**

#### Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Trench Logs.

#### Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-7 of this report.

### **Design Recommendations**

Seven (7) infiltration tests were performed at the subject site. As noted above, the infiltration rates at these locations vary from 1.0 to 2.3 inches per hour. **Based on the results of the infiltration testing, we recommend the following infiltration rates to be utilized:**

<b>Infiltration System</b>	<b>Infiltration Rate (inches per hour)</b>
A	1.4
B	1.0

The design of the storm water infiltration system should be performed by the project civil engineer, in accordance with the City of Perris and/or County of Riverside guidelines. It is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials

from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above is based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rate.** It should be noted that the recommended infiltration rates are based on infiltration testing at seven (7) discrete locations and that the overall infiltration rates of the proposed infiltration systems could vary considerably.

### **Infiltration Rate Considerations**

The infiltration rates presented herein was determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

### **Construction Considerations**

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

## **Basin Maintenance**

The proposed project may include infiltration basins. Water flowing into these basins will carry some level of sediment. Wind-blown sediments and erosion of the basin side walls will also contribute to sediment deposition at the bottom of the basin. This layer has the potential to significantly reduce the infiltration rate of the basin subgrade soils. Therefore, a formal basin maintenance program should be established to ensure that these silt and clay deposits are removed from the basin on a regular basis. Appropriate vegetation on the basin sidewalls and bottom may reduce erosion and sediment deposition.

Basin maintenance should also include measures to prevent animal burrows, and to repair any burrows or damage caused by such. Animal burrows in the basin sidewalls can significantly increase the risk of erosion and piping failures.

## **Location of Infiltration Systems**

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

## **General Comments**

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and

hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.


This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

**Closure**

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.



Ryan Bremer  
Staff Geologist

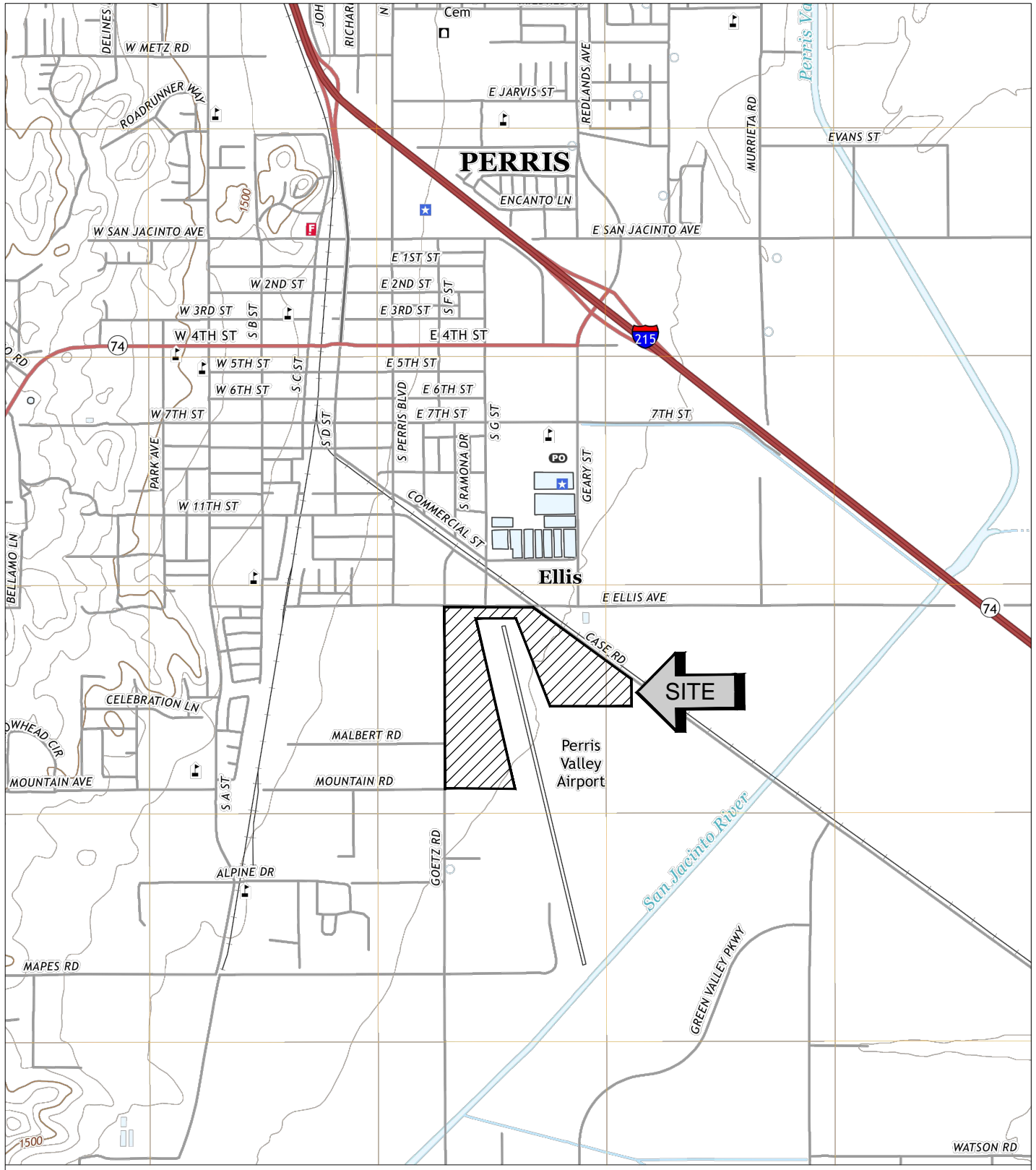


Gregory K. Mitchell, GE 2364  
Principal Engineer



Distribution: (1) Addressee

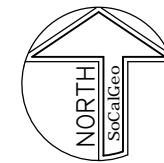
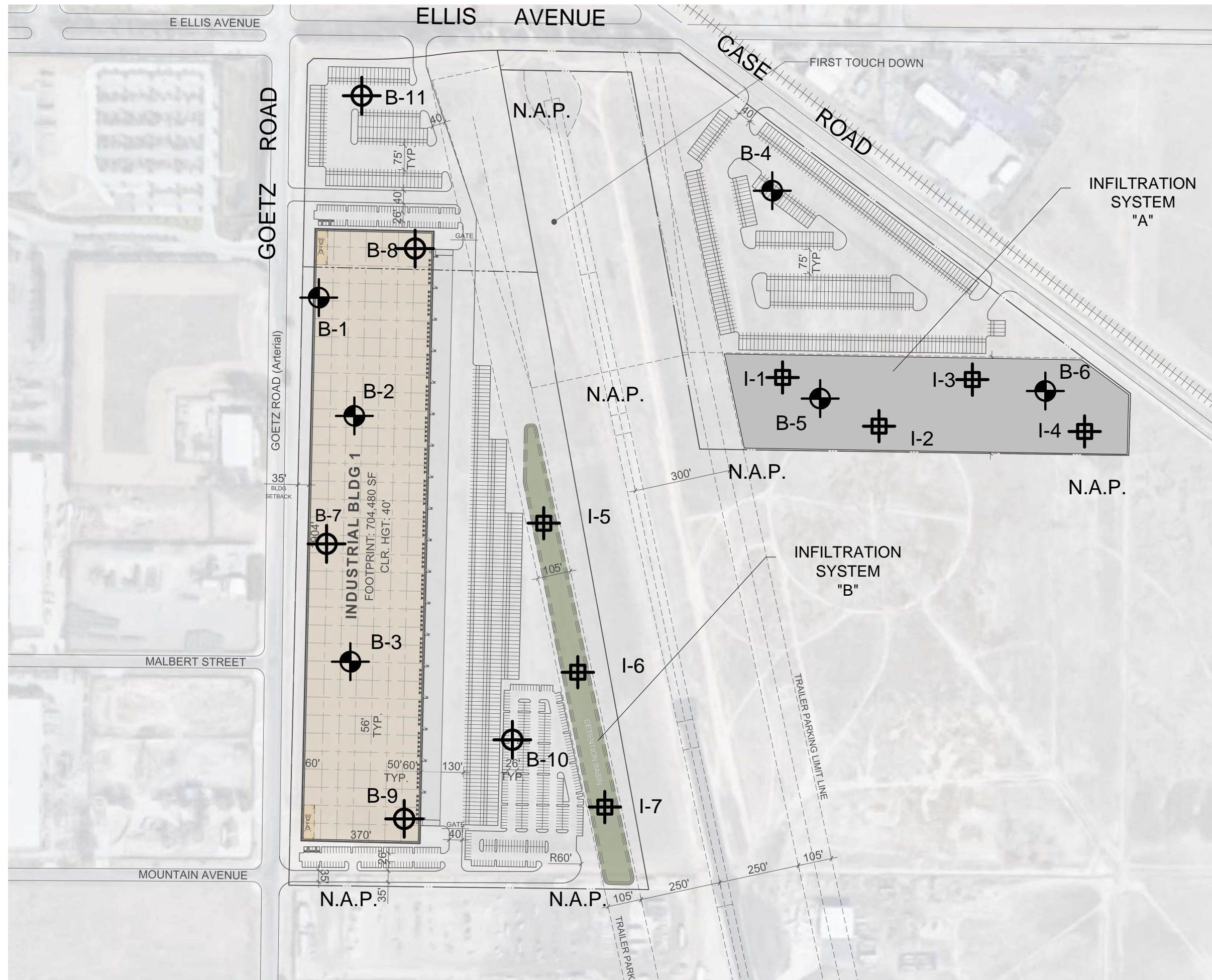
Enclosures: Plate 1 - Site Location Map  
Plate 2 - Infiltration Test Location Plan  
Trench Logs & Trench Log Legend (9 pages)  
Infiltration Test Results Spreadsheets (7 pages)  
Grain Size Distribution Results (7 pages)






SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2018.




<b>SITE LOCATION MAP</b>	
PROPOSED INDUSTRIAL BUILDING	
PERRIS, CALIFORNIA	
SCALE: 1" = 2000'	
DRAWN: JAZ	
CHKD: GKM	
SCG PROJECT 21G180-2	
PLATE 1	<b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>






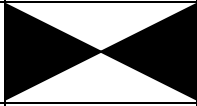

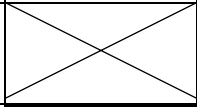


**GEOTECHNICAL LEGEND**

-  APPROXIMATE INFILTRATION TEST LOCATION
-  APPROXIMATE BORING LOCATION (SCG PROJECT NO. 21G180-1)
-  PREVIOUS BORING LOCATION (SCG PROJECT NO. 19G132-1)

NOTE: CONCEPTUAL SITE PLAN PREPARED BY WARE MALCOMB. AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH (2018).

<b>INFILTRATION TEST LOCATION PLAN</b>	
PROPOSED INDUSTRIAL BUILDING	
PERRIS, CALIFORNIA	
SCALE: 1" = 300'	 <b>SOUTHERN CALIFORNIA GEOTECHNICAL</b>
DRAWN: JLL	
CHKD: GKM	
SCG PROJECT 21G180-2	
PLATE 2	

# TRENCH LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
<b>AUGER</b>		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
<b>CORE</b>		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
<b>GRAB</b>		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
<b>CS</b>		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
<b>NSR</b>		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
<b>SPT</b>		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
<b>SH</b>		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
<b>VANE</b>		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

## COLUMN DESCRIPTIONS

### **DEPTH:**

Distance in feet below the ground surface.

### **SAMPLE:**

Sample Type as depicted above.

### **BLOW COUNT:**

Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

### **POCKET PEN.:**

Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

### **GRAPHIC LOG:**

Graphic Soil Symbol as depicted on the following page.

### **DRY DENSITY:**

Dry density of an undisturbed or relatively undisturbed sample in lbs/ft<sup>3</sup>.

### **MOISTURE CONTENT:**

Moisture content of a soil sample, expressed as a percentage of the dry weight.

### **LIQUID LIMIT:**

The moisture content above which a soil behaves as a liquid.

### **PLASTIC LIMIT:**

The moisture content above which a soil behaves as a plastic.

### **PASSING #200 SIEVE:**

The percentage of the sample finer than the #200 standard sieve.

### **UNCONFINED SHEAR:**

The shear strength of a cohesive soil sample, as measured in the unconfined state.

# SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



JOB NO.: 21G180-2	DRILLING DATE: 6/15/21	WATER DEPTH: ---
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: ---
LOCATION: Perris, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SURFACE ELEVATION: --- MSL  <u>DISTURBED ALLUVIUM</u> : Light Brown fine Sandy Silt, trace fine root fibers, loose-damp <u>ALLUVIUM</u> : Brown Silty fine to medium Sand, trace Clay, dense-moist		12			32		
					Trench Terminated at 4'							

TBL\_21G180-2.GPJ\_SOCALGEO.GDT 6/29/21



JOB NO.: 21G180-2	DRILLING DATE: 6/15/21	WATER DEPTH: ---
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: ---
LOCATION: Perris, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
SURFACE ELEVATION: --- MSL												
					DISTURBED ALLUVIUM: Light Brown fine Sandy Silt, trace fine root fibers, loose-damp ALLUVIUM: Brown Silty fine Sand, trace Clay, dense-dry to damp Light Brown Silty fine Sand, some Calcareous nodules, medium dense-damp Brown Silty fine to medium Sand, trace coarse Sand, some Calcareous nodules, dense-very moist		17		28			
5	✋				Trench Terminated at 5'							

TBL 21G180-2.GPJ\_SOCALGEO.GDT 6/29/21




JOB NO.: 21G180-2	DRILLING DATE: 6/15/21	WATER DEPTH: ---
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: ---
LOCATION: Perris, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SURFACE ELEVATION: --- MSL							
					DISTURBED ALLUVIUM: Light Brown fine Sandy Silt, trace fine root fibers, loose-dry ALLUVIUM: Brown Silty fine Sand, trace Clay, dense-moist Light Brown Silty fine to coarse Sand, some Calcareous nodules dense-very moist		27			16		
					Trench Terminated at 4'							

TBL 21G180-2.GPJ\_SOCALGEO.GDT 6/29/21



JOB NO.: 21G180-2      DRILLING DATE: 6/15/21      WATER DEPTH: ---  
 PROJECT: Proposed Industrial Building      EXCAVATION METHOD: Backhoe      CAVE DEPTH: ---  
 LOCATION: Perris, California      LOGGED BY: Caleb Brackett      READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SURFACE ELEVATION: --- MSL							
					DISTURBED ALLUVIUM: Light Brown fine Sandy Silt, trace fine root fibers, loose-dry ALLUVIUM: Brown Silty fine Sand, trace Clay, very dense-damp Light Brown Silty fine to medium Sand, some Calcareous nodules, dense to very dense-very moist		30		42			
					Trench Terminated at 4'							

TBL\_21G180-2.GPJ\_SOCALGEO.GDT 6/29/21



JOB NO.: 21G180-2	DRILLING DATE: 6/14/21	WATER DEPTH: ---
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: ---
LOCATION: Perris, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
SURFACE ELEVATION: --- MSL												
					DISTURBED ALLUVIUM: Light Brown fine Sandy Silt, trace fine root fibers, loose-dry ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand, trace Clay, very dense-damp		8		38			
5					Trench Terminated at 5'							

TBL\_21G180-2.GPJ\_SOCALGEO.GDT 6/29/21



JOB NO.: 21G180-2	DRILLING DATE: 6/14/21	WATER DEPTH: ---
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: ---
LOCATION: Perris, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SURFACE ELEVATION: --- MSL  <u>DISTURBED ALLUVIUM</u> : Brown fine Sandy Silt, trace fine root fibers, loose-dry <u>ALLUVIUM</u> : Brown Silty fine to coarse Sand, very dense-damp		7		36			
					Trench Terminated at 4'							

TBL\_21G180-2.GPJ\_SOCALGEO.GDT 6/29/21



JOB NO.: 21G180-2	DRILLING DATE: 6/14/21	WATER DEPTH: ---
PROJECT: Proposed Industrial Building	EXCAVATION METHOD: Backhoe	CAVE DEPTH: ---
LOCATION: Perris, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS					DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG		DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SURFACE ELEVATION: --- MSL  <u>DISTURBED ALLUVIUM</u> : Brown fine Sandy Silt, trace fine root fibers, loose-dry <u>ALLUVIUM</u> : Brown Silty fine to coarse Sand, trace Clay, little porosity, very dense-damp		4			28		
					Trench Terminated at 4'							

TBL\_21G180-2.GPJ\_SOCALGEO.GDT 6/29/21

## INFILTRATION CALCULATIONS

Project Name	Proposed Industrial Building
Project Location	Perris, California
Project Number	21G180-2
Engineer	Caleb Brackett

Infiltration Test No I-1

Constants			
	Diameter (ft)	Area (ft <sup>2</sup> )	Area (cm <sup>2</sup> )
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

\*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval Elapsed (min)	Flow Readings				Infiltration Rates			
				Inner Ring (ml)	Ring Flow (cm <sup>3</sup> )	Annular Ring (ml)	Space Flow (cm <sup>3</sup> )	Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	8:00 AM	15	0	1500	0	9300	8.22	16.99	3.24	6.69
	Final	8:15 AM	<b>15</b>	1500		9300					
2	Initial	8:17 AM	15	0	1600	0	9100	8.77	16.63	3.45	6.55
	Final	8:32 AM	<b>30</b>	1600		9100					
3	Initial	8:34 AM	15	0	1300	0	9150	7.13	16.72	2.81	6.58
	Final	8:49 AM	<b>45</b>	1300		9150					
4	Initial	8:51 AM	15	0	1000	0	9100	5.48	16.63	2.16	6.55
	Final	9:06 AM	<b>60</b>	1000		9100					
5	Initial	9:08 AM	15	0	900	0	9000	4.93	16.45	1.94	6.48
	Final	9:23 AM	<b>75</b>	900		9000					
6	Initial	9:25 AM	15	0	800	0	9000	4.39	16.45	1.73	6.48
	Final	9:40 AM	<b>90</b>	800		9000					

### INFILTRATION CALCULATIONS

Project Name	Proposed Industrial Building
Project Location	Perris, California
Project Number	21G180-2
Engineer	Caleb Brackett

Infiltration Test No I-2

Constants			
	Diameter (ft)	Area (ft <sup>2</sup> )	Area (cm <sup>2</sup> )
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

\*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval Elapsed (min)	Flow Readings				Infiltration Rates			
				Inner Ring (ml)	Ring Flow (cm <sup>3</sup> )	Annular Ring (ml)	Space Flow (cm <sup>3</sup> )	Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	10:00 AM	25	0	2500	0	7500	8.22	8.22	3.24	3.24
	Final	10:25 AM	<b>25</b>	2500		7500					
2	Initial	10:27 AM	25	0	1600	0	4300	5.26	4.71	2.07	1.86
	Final	10:52 AM	<b>50</b>	1600		4300					
3	Initial	10:54 AM	25	0	1300	0	4000	4.28	4.39	1.68	1.73
	Final	11:19 AM	<b>75</b>	1300		4000					
4	Initial	11:21 AM	25	0	1050	0	2800	3.45	3.07	1.36	1.21
	Final	11:46 AM	<b>100</b>	1050		2800					
5	Initial	11:48 AM	25	0	1050	0	3000	3.45	3.29	1.36	1.30
	Final	12:13 PM	<b>125</b>	1050		3000					
6	Initial	12:15 PM	25	0	1050	0	2900	3.45	3.18	1.36	1.25
	Final	12:40 PM	<b>150</b>	1050		2900					

## INFILTRATION CALCULATIONS

Project Name	Proposed Industrial Building
Project Location	Perris, California
Project Number	21G180-2
Engineer	Caleb Brackett

Infiltration Test No I-3

Constants			
	Diameter (ft)	Area (ft <sup>2</sup> )	Area (cm <sup>2</sup> )
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

\*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval Elapsed (min)	Flow Readings				Infiltration Rates			
				Inner Ring (ml)	Ring Flow (cm <sup>3</sup> )	Annular Ring (ml)	Space Flow (cm <sup>3</sup> )	Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	1:00 PM	5	0		0		16.45	19.19	6.48	7.55
	Final	1:05 PM	<b>5</b>	1000	1000	3500	3500				
2	Initial	1:07 PM	5	0	800	0	3200	13.16	17.54	5.18	6.91
	Final	1:12 PM	<b>10</b>	800	800	3200	3200				
3	Initial	1:15 PM	5	0	650	0	2900	10.69	15.90	4.21	6.26
	Final	1:20 PM	<b>15</b>	650	650	2900	2900				
4	Initial	1:22 PM	5	0	500	0	2700	8.22	14.80	3.24	5.83
	Final	1:27 PM	<b>20</b>	500	500	2700	2700				
5	Initial	1:30 PM	5	0	400	0	2600	6.58	14.25	2.59	5.61
	Final	1:35 PM	<b>25</b>	400	400	2600	2600				
6	Initial	1:37 PM	5	0	350	0	2500	5.76	13.71	2.27	5.40
	Final	1:42 PM	<b>30</b>	350	350	2500	2500				

## INFILTRATION CALCULATIONS

Project Name	Proposed Industrial Building
Project Location	Perris, California
Project Number	21G180-2
Engineer	Caleb Brackett

Infiltration Test No I-4

Constants			
	Diameter (ft)	Area (ft <sup>2</sup> )	Area (cm <sup>2</sup> )
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

\*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval Elapsed (min)	Flow Readings				Infiltration Rates			
				Inner Ring (ml)	Ring Flow (cm <sup>3</sup> )	Annular Ring (ml)	Space Flow (cm <sup>3</sup> )	Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	8:00 AM	5	0	900	0	3300	14.80	18.09	5.83	7.12
	Final	8:05 AM	<b>5</b>	900		3300					
2	Initial	8:07 AM	5	0	600	0	3100	9.87	16.99	3.89	6.69
	Final	8:12 AM	<b>10</b>	600		3100					
3	Initial	8:15 AM	5	0	400	0	2800	6.58	15.35	2.59	6.04
	Final	8:20 AM	<b>15</b>	400		2800					
4	Initial	8:22 AM	5	0	400	0	2400	6.58	13.16	2.59	5.18
	Final	8:27 AM	<b>20</b>	400		2400					
5	Initial	8:30 AM	5	0	350	0	2200	5.76	12.06	2.27	4.75
	Final	8:35 AM	<b>25</b>	350		2200					
6	Initial	8:37 AM	5	0	350	0	2200	5.76	12.06	2.27	4.75
	Final	8:42 AM	<b>30</b>	350		2200					

## INFILTRATION CALCULATIONS

Project Name	Proposed Industrial Building
Project Location	Perris, California
Project Number	21G180-2
Engineer	Caleb Brackett

Infiltration Test No I-5

Constants			
	Diameter (ft)	Area (ft <sup>2</sup> )	Area (cm <sup>2</sup> )
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

\*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval Elapsed (min)	Flow Readings				Infiltration Rates			
				Inner Ring (ml)	Ring Flow (cm <sup>3</sup> )	Annular Ring (ml)	Space Flow (cm <sup>3</sup> )	Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	9:10 AM	25	0	0	0	8500	6.74	9.32	2.65	3.67
	Final	9:35 AM	<b>25</b>	2050	2050	8500					
2	Initial	9:37 AM	25	0	0	0	6400	4.44	7.02	1.75	2.76
	Final	10:02 AM	<b>50</b>	1350	1350	6400					
3	Initial	10:05 AM	25	0	0	0	4200	3.29	4.61	1.30	1.81
	Final	10:30 AM	<b>75</b>	1000	1000	4200					
4	Initial	10:32 AM	25	0	0	0	3500	3.29	3.84	1.30	1.51
	Final	10:57 AM	<b>100</b>	1000	1000	3500					
5	Initial	11:15 AM	25	0	0	0	3600	3.29	3.95	1.30	1.55
	Final	11:40 AM	<b>125</b>	1000	1000	3600					
6	Initial	11:42 AM	25	0	0	0	3500	3.29	3.84	1.30	1.51
	Final	12:07 PM	<b>150</b>	1000	1000	3500					

## INFILTRATION CALCULATIONS

Project Name	Proposed Industrial Building
Project Location	Perris, California
Project Number	21G180-2
Engineer	Caleb Brackett

Infiltration Test No I-6

Constants			
	Diameter (ft)	Area (ft <sup>2</sup> )	Area (cm <sup>2</sup> )
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

\*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval Elapsed (min)	Flow Readings				Infiltration Rates			
				Inner Ring (ml)	Ring Flow (cm <sup>3</sup> )	Annular Ring (ml)	Space Flow (cm <sup>3</sup> )	Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	12:10 PM	30	0	1000	0	3200	2.74	2.92	1.08	1.15
	Final	12:40 PM	<b>30</b>	1000		3200					
2	Initial	12:42 PM	30	0	1000	0	3200	2.74	2.92	1.08	1.15
	Final	1:12 PM	<b>60</b>	1000		3200					
3	Initial	1:15 PM	30	0	950	0	3100	2.60	2.83	1.03	1.12
	Final	1:45 PM	<b>90</b>	950		3100					
4	Initial	1:46 PM	30	0	950	0	3100	2.60	2.83	1.03	1.12
	Final	2:16 PM	<b>120</b>	950		3100					
5	Initial	2:17 PM	30	0	900	0	3000	2.47	2.74	0.97	1.08
	Final	2:47 PM	<b>150</b>	900		3000					
6	Initial	2:48 PM	30	0	900	0	3000	2.47	2.74	0.97	1.08
	Final	3:18 PM	<b>180</b>	900		3000					

## INFILTRATION CALCULATIONS

Project Name	Proposed Industrial Building
Project Location	Perris, California
Project Number	21G180-2
Engineer	Caleb Brackett

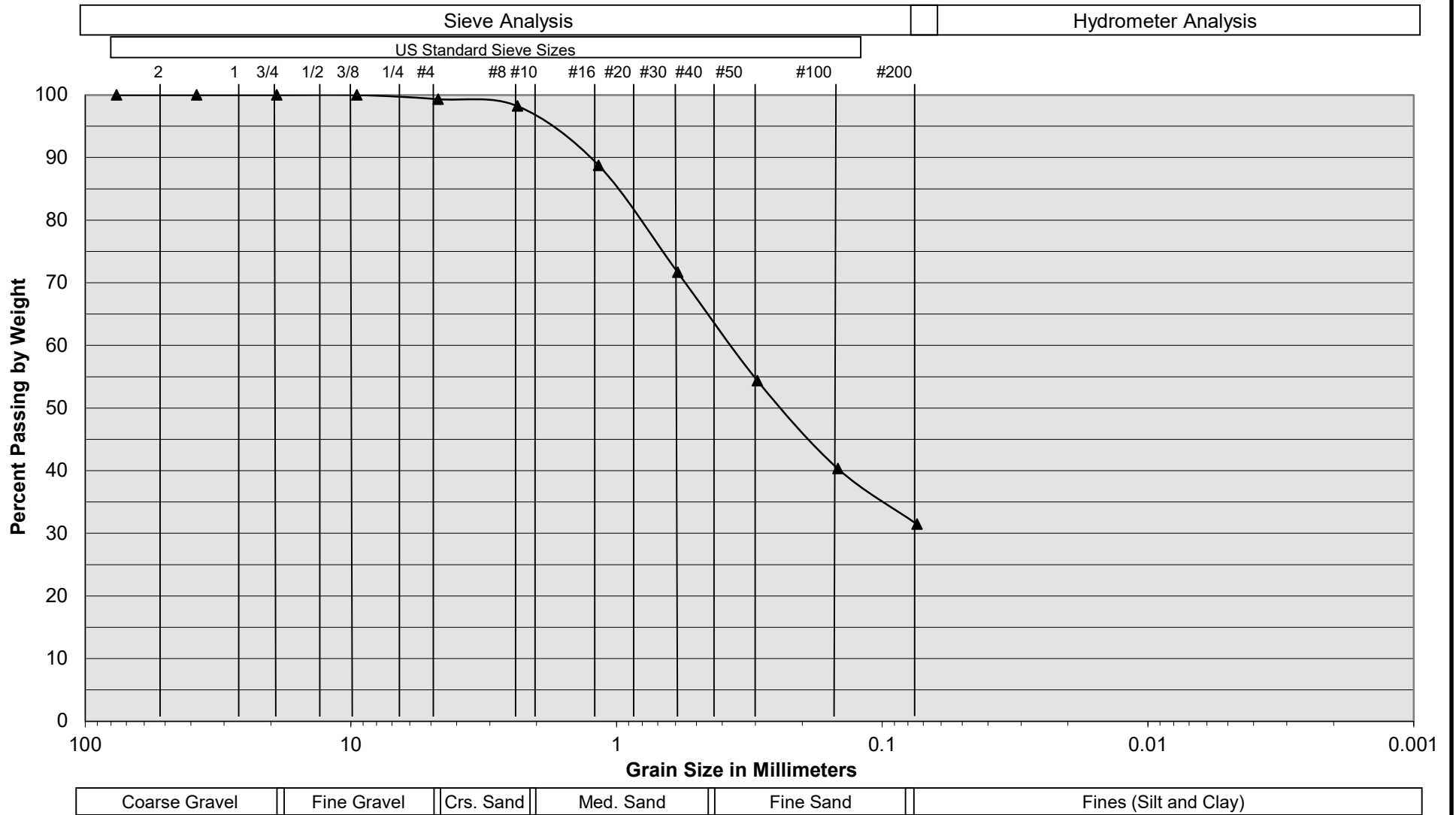
Infiltration Test No I-6

Constants			
	Diameter (ft)	Area (ft <sup>2</sup> )	Area (cm <sup>2</sup> )
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

\*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval Elapsed (min)	Flow Readings				Infiltration Rates				
				Inner Ring (ml)	Ring Flow (cm <sup>3</sup> )	Annular Ring (ml)	Space Flow (cm <sup>3</sup> )	Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)	
1	Initial	8:00 AM	25	0		0						
	Final	8:25 AM	<b>25</b>	2050	2050	8000	8000	6.74	8.77	2.65	3.45	
2	Initial	8:30 AM	25	0		0						
	Final	8:55 AM	<b>50</b>	1250	1250	5500	5500	4.11	6.03	1.62	2.37	
3	Initial	9:00 AM	25	0		0						
	Final	9:25 AM	<b>75</b>	1200	1200	4700	4700	3.95	5.15	1.55	2.03	
4	Initial	9:30 AM	25	0		0						
	Final	9:55 AM	<b>100</b>	1200	1200	4600	4600	3.95	5.04	1.55	1.99	
5	Initial	10:00 AM	25	0		0						
	Final	10:25 AM	<b>125</b>	1150	1150	4500	4500	3.78	4.93	1.49	1.94	
6	Initial	10:30 AM	25	0		0						
	Final	10:55 AM	<b>150</b>	1150	1150	4500	4500	3.78	4.93	1.49	1.94	

# Grain Size Distribution



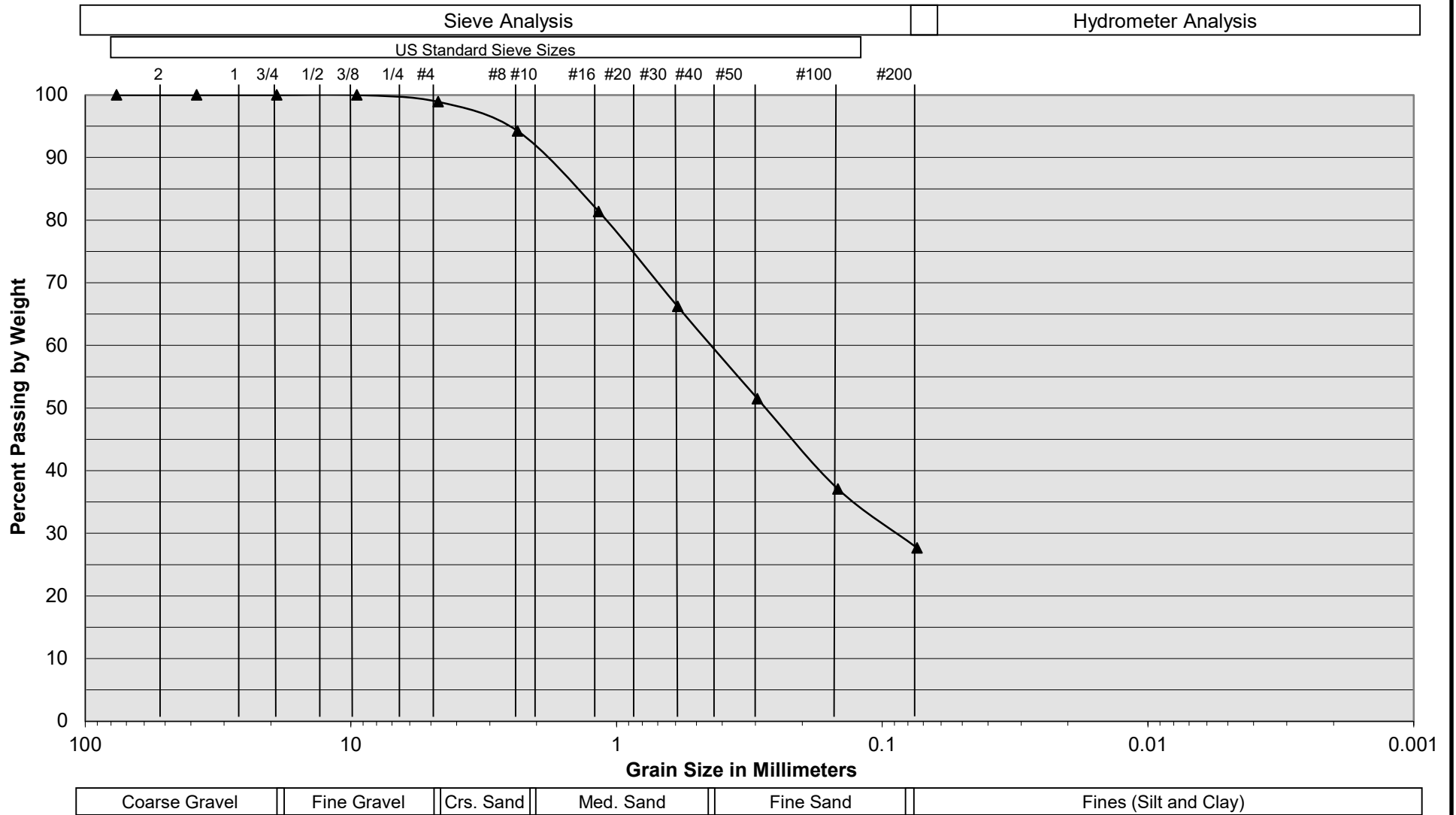
Sample Description	I-1 @ 4'
Soil Classification	Brown Silty fine to medium Sand, trace Clay

Proposed Industrial Building  
 Perris, CA  
 Project No. 21G180-2  
**PLATE C- 1**



**SOUTHERN CALIFORNIA GEOTECHNICAL**  
A California Corporation

# Grain Size Distribution



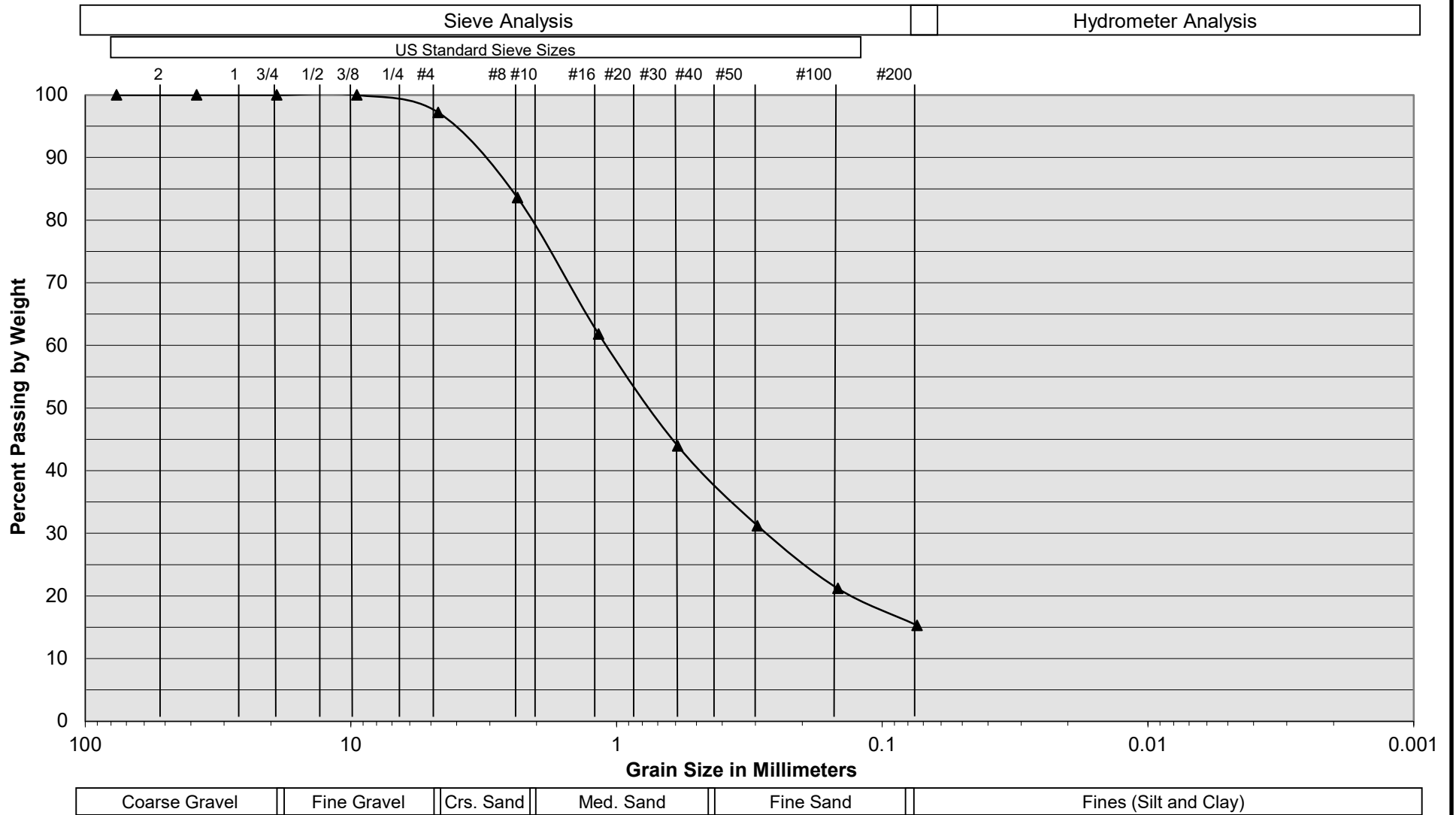
Sample Description	I-2 @ 5'
Soil Classification	Brown Silty fine to medium Sand, trace coarse Sand

Proposed Industrial Building  
 Perris, CA  
 Project No. 21G180-2  
**PLATE C- 2**



**SOUTHERN CALIFORNIA GEOTECHNICAL**  
A California Corporation

# Grain Size Distribution



Sample Description	I-3 @ 4'
Soil Classification	Light Brown Silty fine to coarse Sand

Proposed Industrial Building  
 Perris, CA  
 Project No. 21G180-2  
**PLATE C- 3**

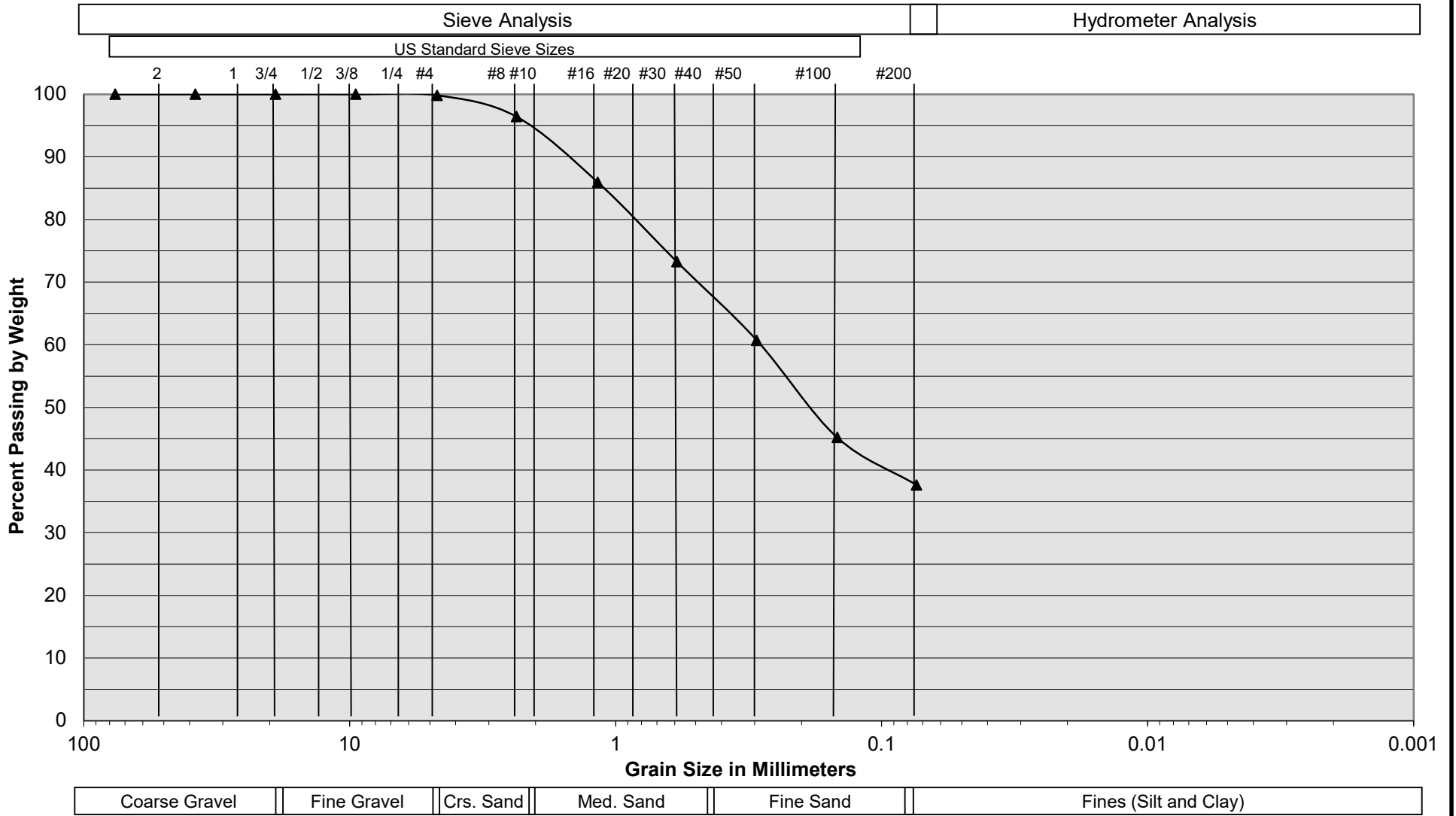




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# Grain Size Distribution



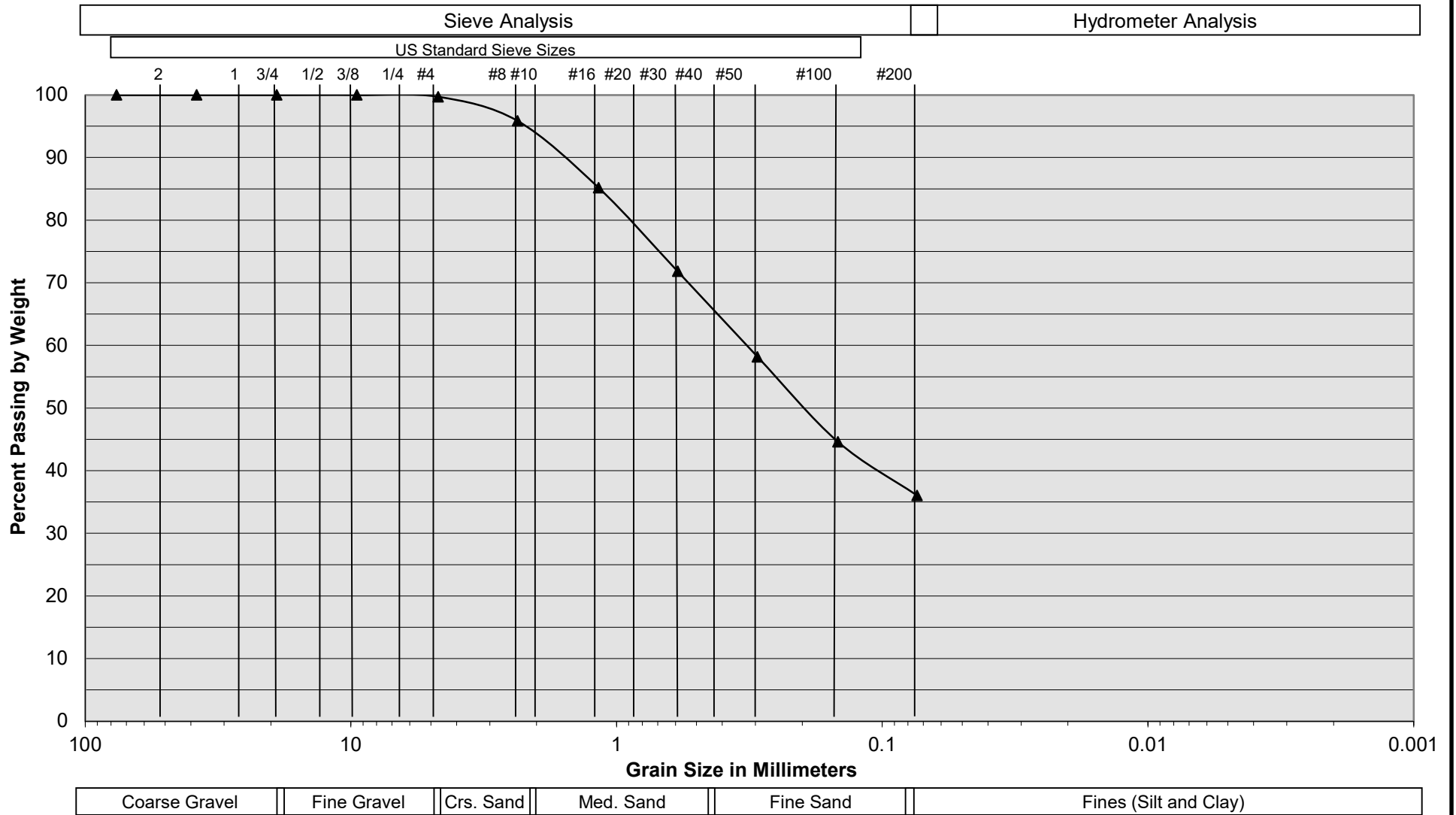
Sample Description	I-5 @ 5'
Soil Classification	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay

Proposed Industrial Building  
 Perris, CA  
 Project No. 21G180-2  
**PLATE C- 5**



**SOUTHERN CALIFORNIA GEOTECHNICAL**  
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# Grain Size Distribution



Sample Description	I-6 @ 4'
Soil Classification	Brown Silty fine to medium Sand, trace coarse Sand

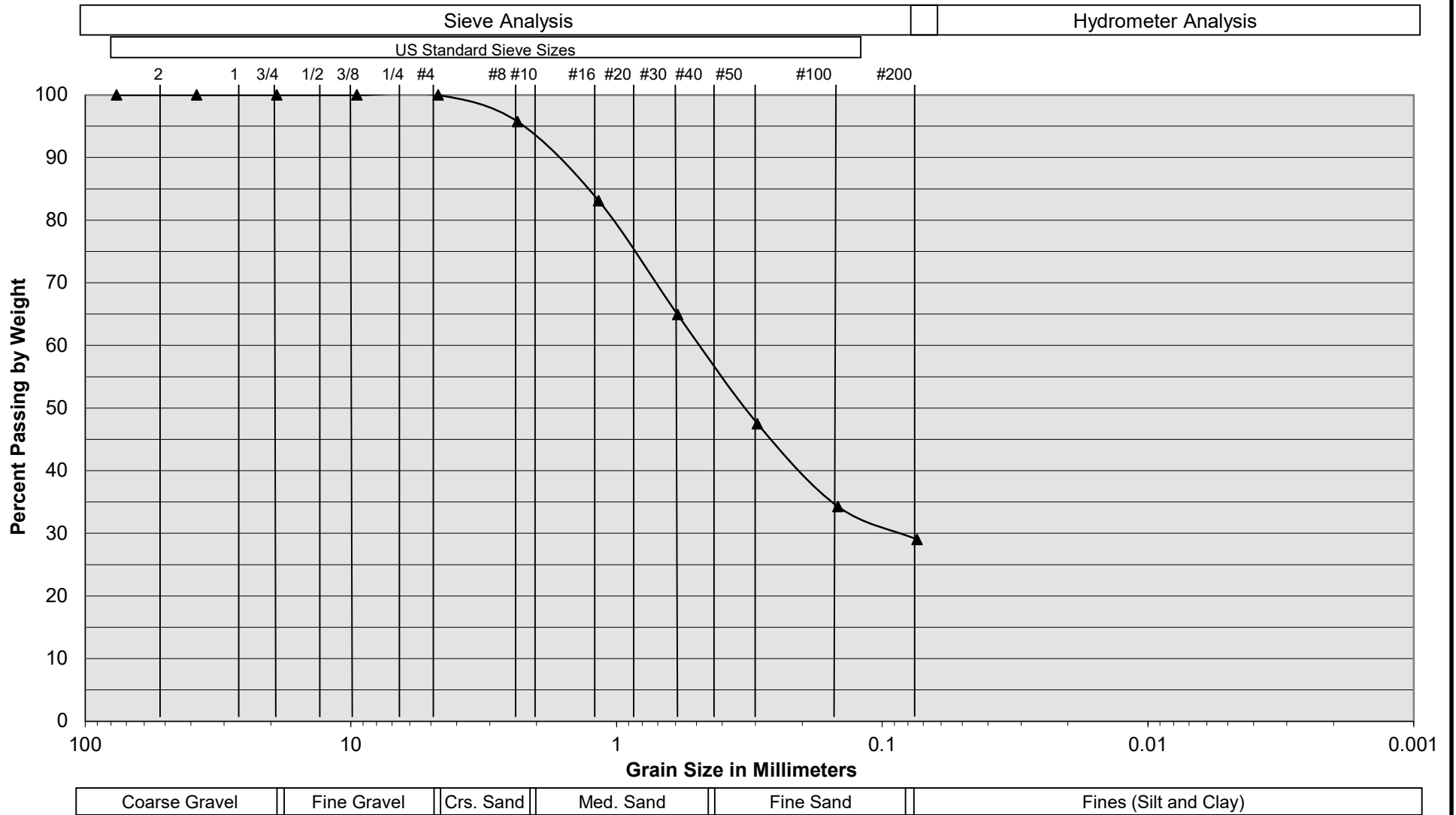
Proposed Industrial Building  
 Perris, CA  
 Project No. 21G180-2  
**PLATE C- 6**





**SOUTHERN CALIFORNIA GEOTECHNICAL**  
A California Corporation

# Grain Size Distribution



Sample Description	I-7 @ 4'
Soil Classification	Brown Silty fine to coarse Sand, trace Clay

Proposed Industrial Building  
 Perris, CA  
 Project No. 21G180-2  
**PLATE C-7**



**SOUTHERN CALIFORNIA GEOTECHNICAL**  
A California Corporation

# Appendix 4: Historical Site Conditions

*Phase I Environmental Site Assessment or Other Information on Past Site Use*

*\*To be provided during final engineering*

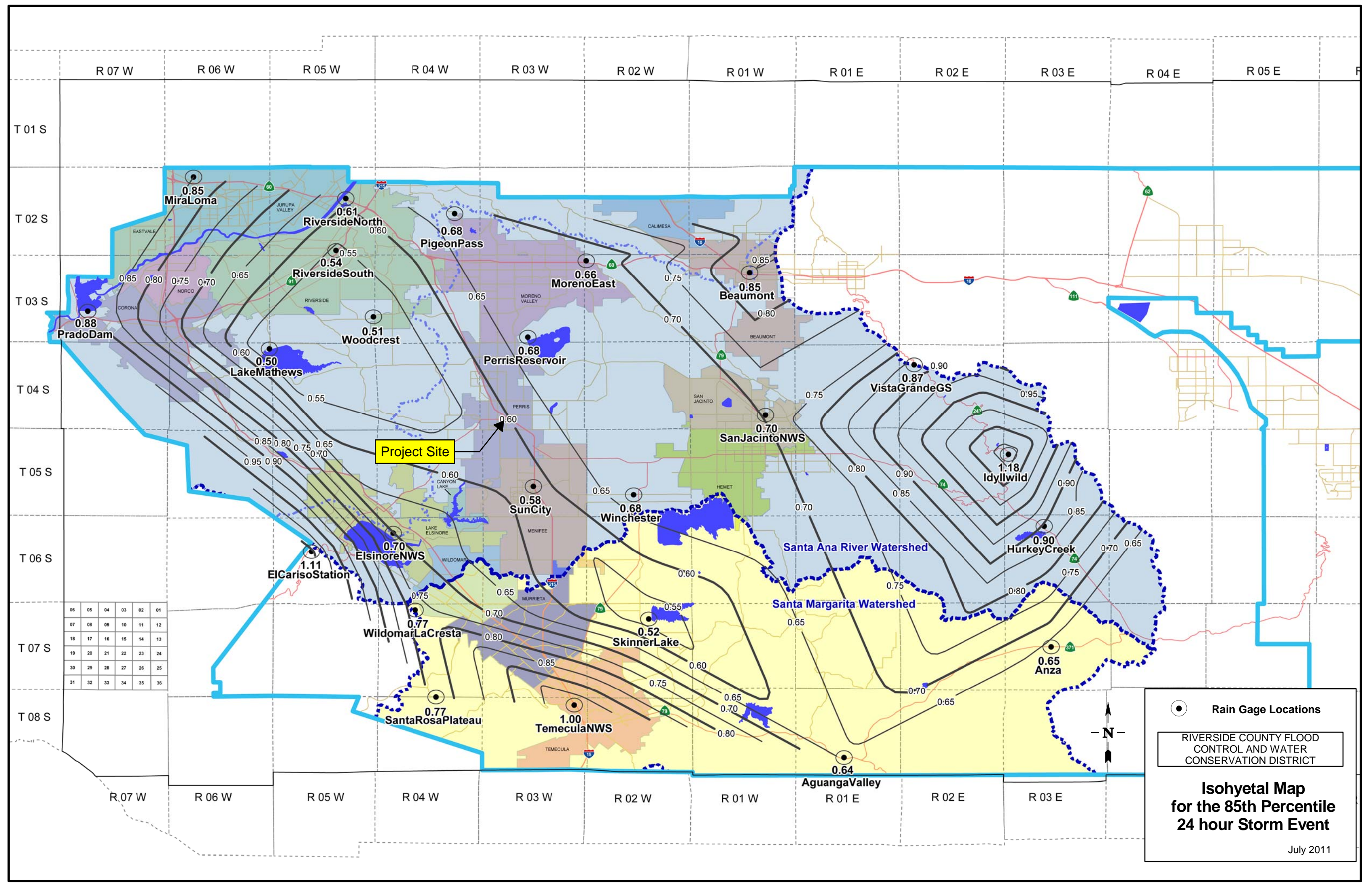
# Appendix 5: LID Infeasibility

*LID Technical Infeasibility Analysis*

**N/A**

# Appendix 6: BMP Design Details

*BMP Sizing, Design Details and other Supporting Documentation*



R 07 W R 06 W R 05 W R 04 W R 03 W R 02 W R 01 W R 01 E R 02 E R 03 E R 04 E R 05 E

T 01 S  
T 02 S  
T 03 S  
T 04 S  
T 05 S  
T 06 S  
T 07 S  
T 08 S

06	05	04	03	02	01
07	08	09	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

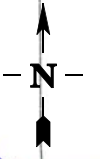
● Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

**Isohyetal Map for the 85th Percentile 24 hour Storm Event**

July 2011

**Project Site**



**Santa Ana Watershed - BMP Design Volume,  $V_{BMP}$**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **Albert A. Webb Associates**

Date **6/26/2023**

Designed by **ABE**

Case No **P22-00005**

Company Project Number/Name

**Perris Airport Logistics Center - Site 1; West Building off Goetz**

**BMP Identification**

BMP NAME / ID **BMP-W1**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

85th Percentile, 24-hour Rainfall Depth,  
from the Isohyetal Map in Handbook Appendix E

$D_{85} =$  **0.60** inches

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, $I_f$	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, $V_{BMP}$ (cubic feet)	Proposed Volume on Plans (cubic feet)
L-W1	40960	Ornamental Landscaping	0.1	0.11	4524.4			
R-W1	391030	Roofs	1	0.89	348798.8			
H-W1	802460	Concrete or Asphalt	1	0.89	715794.3			
BMP-W1	110840	Ornamental Landscaping	0.1	0.11	12243.2			
	<b>1345290</b>				<b>1081360.7</b>	<b>0.60</b>	<b>53617.5</b>	<b>60032</b>

Notes:

Bioretention Facility - Design Procedure		BMP ID BMP-W1	Legend:	Required Entries
				Calculated Cells
Company Name:	Albert A. Webb Associates		Date:	6/26/2023
Designed by:	ABE		County/City Case No.:	P22-00005
<b>Design Volume</b>				
Enter the area tributary to this feature			$A_T =$	31.1 acres
Enter $V_{BMP}$ determined from Section 2.1 of this Handbook			$V_{BMP} =$	53,618 ft <sup>3</sup>
<b>Type of Bioretention Facility Design</b>				
<input checked="" type="radio"/> Side slopes required (parallel to parking spaces or adjacent to walkways) <input type="radio"/> No side slopes required (perpendicular to parking space or Planter Boxes)				
<b>Bioretention Facility Surface Area</b>				
Depth of Soil Filter Media Layer			$d_S =$	1.5 ft
Top Width of Bioretention Facility, excluding curb			$w_T =$	50.0 ft
Total Effective Depth, $d_E$ $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$			$d_E =$	1.34 ft
Minimum Surface Area, $A_m$ $A_M (ft^2) = \frac{V_{BMP} (ft^3)}{d_E (ft)}$			$A_M =$	40,134 ft <sup>2</sup>
Proposed Surface Area			$A =$	44,800 ft <sup>2</sup>
<b>Bioretention Facility Properties</b>				
Side Slopes in Bioretention Facility			$z =$	4 :1
Diameter of Underdrain				6 inches
Longitudinal Slope of Site (3% maximum)				0 %
6" Check Dam Spacing				0 feet
Describe Vegetation:			Natural Grasses	
Notes:	Proposed Basin Footprint is approximately 100' wide x 450' long x 6' deep			

**Santa Ana Watershed - BMP Design Volume,  $V_{BMP}$**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **Albert A. Webb Associates**

Date **6/26/2023**

Designed by **ABE**

Case No **P22-00005**

Company Project Number/Name

**Perris Airport Logistics Center - Site 1; West Building off Goetz**

**BMP Identification**

BMP NAME / ID **BMP-W2**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

85th Percentile, 24-hour Rainfall Depth,  
from the Isohyetal Map in Handbook Appendix E

$D_{85} =$  **0.60** inches

**Drainage Management Area Tabulation**

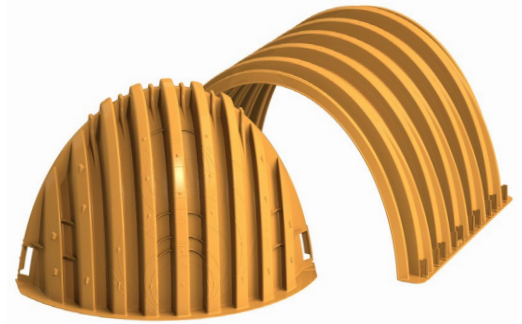
*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, $I_f$	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, $V_{BMP}$ (cubic feet)	Proposed Volume on Plans (cubic feet)
L-W2	135850	Ornamental Landscaping	0.1	0.11	15005.7			
R-W2	462250	Roofs	1	0.89	412327			
H-W2	202150	Concrete or Asphalt	1	0.89	180317.8			
<b>800250</b>		<b>Total</b>			<b>607650.5</b>	<b>0.60</b>	<b>30129.3</b>	<b>30216</b>

Notes:

# StormTech MC-7200 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



## Nominal Chamber Specifications (not to scale)

**Size (L x W x H)**  
83" x 100" x 60"  
2108 mm x 2540 mm x 1524 mm

**Chamber Storage**  
175.9 ft<sup>3</sup> (4.98 m<sup>3</sup>)

**Min. Installed Storage\***  
267.3 ft<sup>3</sup> (7.57 m<sup>3</sup>)

**Weight**  
202 lbs (91.6 kg)

**Shipping**  
7 chambers/pallet  
5 end caps/pallet  
6 pallets/truck

\*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below chambers, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.

## Nominal End Cap Specifications (not to scale)

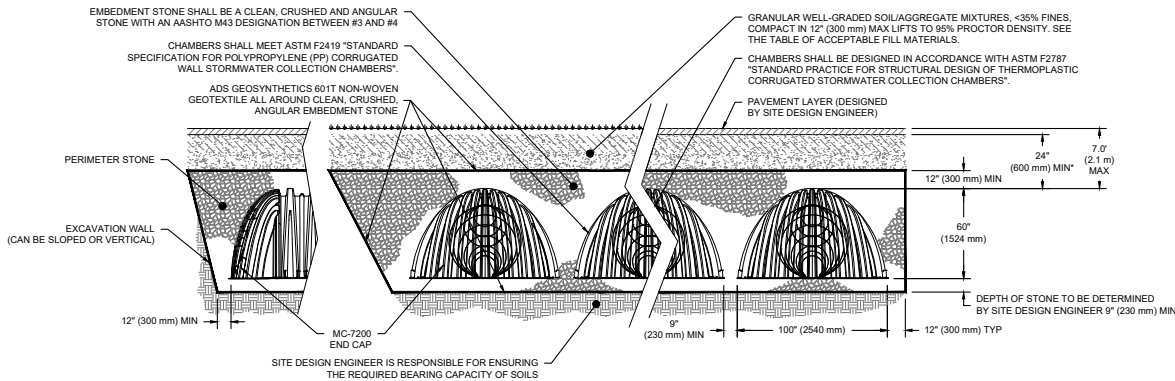
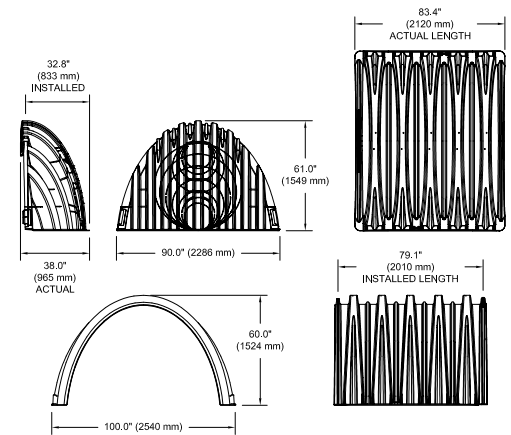
**Size (L x W x H)**  
38" x 90" x 61"  
965 mm x 2286 mm x 1549 mm

**End Cap Storage**  
39.5 ft<sup>3</sup> (1.12 m<sup>3</sup>)

**Min. Installed Storage\***  
115.3 ft<sup>3</sup> (3.26 m<sup>3</sup>)

**Weight**  
Nominal 90.0 lbs (40.8 kg)

\*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 12" (300 mm) of stone perimeter, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.



\*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

# StormTech MC-7200 Specifications

## Storage Volume Per Chamber

	Bare Chamber Storage ft <sup>3</sup> (m <sup>3</sup> )	Chamber and Stone Foundation Depth in. (mm)			
		9 in (230 mm)	12 in (300 mm)	15 in (375 mm)	18 in (450 mm)
Chamber	175.9 (4.98)	267.3 (7.57)	273.3 (7.74)	279.3 (7.91)	285.3 (8.08)
End Cap	39.5 (1.12)	115.3 (3.26)	118.6 (3.36)	121.9 (3.45)	125.2 (3.54)

**Note:** Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 12" (300 mm) stone perimeter in front of end cap.

## Amount of Stone Per Chamber

English Tons (yds <sup>3</sup> )	Stone Foundation Depth			
	9 in	12 in	15 in	18 in
Chamber	12.1 (8.5)	12.9 (9.0)	13.6 (9.6)	14.3 (10.1)
End Cap	9.8 (7.0)	10.2 (7.3)	10.6 (7.6)	11.1 (7.9)
Metric Kilograms (m <sup>3</sup> )	230 mm	300 mm	375 mm	450 mm
Chamber	10977 (6.5)	11703 (6.9)	12338 (7.3)	12973 (7.7)
End Cap	8890 (5.3)	9253 (5.5)	9616 (5.8)	10069 (6.0)

**Note:** Assumes 12" (300 mm) of stone above and 9" (230 mm) row spacing and 12" (300 mm) of perimeter stone in front of end caps. 1 yd<sup>3</sup> = 1.42 english tons.

## Volume Excavation Per Chamber yd<sup>3</sup> (m<sup>3</sup>)

	Stone Foundation Depth			
	9 in (230 mm)	12 in (300 mm)	15 in (375mm)	18 in (450 mm)
Chamber	17.2 (13.2)	17.7 (13.5)	18.3 (14.0)	18.8 (14.4)
End Cap	9.7 (7.4)	10.0 (7.6)	10.3 (7.9)	10.6 (8.1)

**Note:** Assumes 9" (230 mm) of separation between chamber rows, 12" (300 mm) of perimeter in front of the end caps, and 24" (600 mm) of cover. The volume of excavation will vary as depth of cover increases.

Working on a project?

Visit us at [www.stormtech.com](http://www.stormtech.com) and utilize the Design Tool



## User Inputs

<b>Chamber Model:</b>	MC-7200
<b>Outlet Control Structure:</b>	Yes
<b>Project Name:</b>	
<b>Engineer:</b>	N/A
<b>Project Location:</b>	
<b>Measurement Type:</b>	Imperial
<b>Required Storage Volume:</b>	30216 cubic ft.
<b>Stone Porosity:</b>	40%
<b>Stone Foundation Depth:</b>	9 in.
<b>Stone Above Chambers:</b>	12 in.
<b>Average Cover Over Chambers:</b>	24 in.
<b>Design Constraint Dimensions:</b>	(70 ft. x 150 ft.)

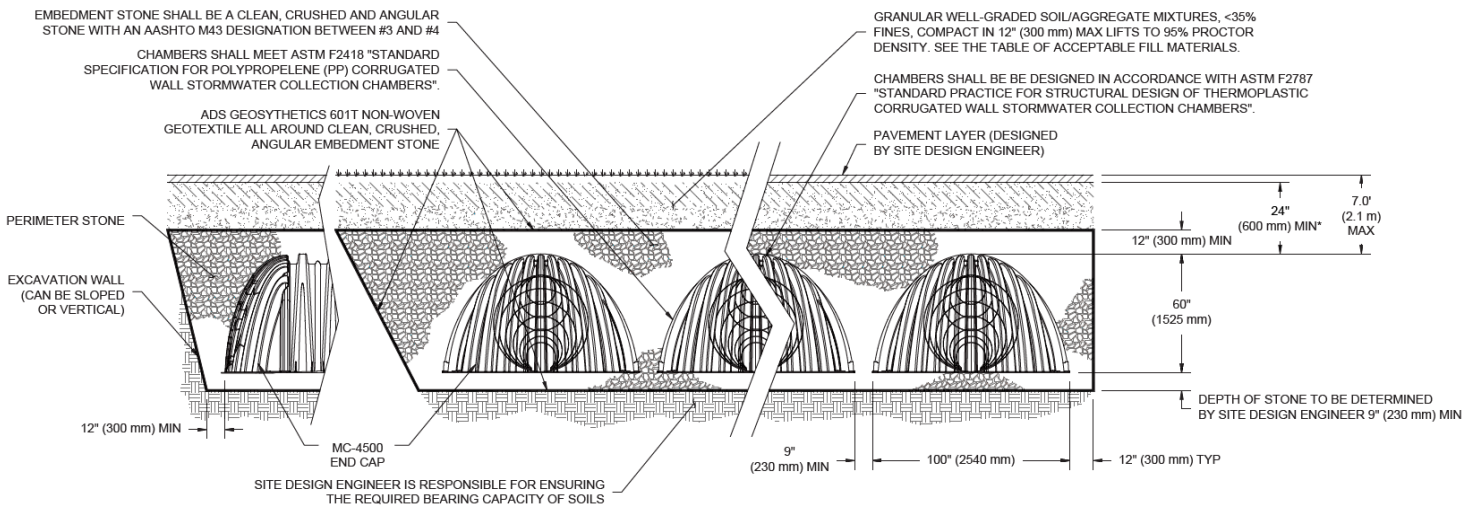
## Results

### System Volume and Bed Size

<b>Installed Storage Volume:</b>	31217.71 cubic ft.
<b>Storage Volume Per Chamber:</b>	175.90 cubic ft.
<b>Number Of Chambers Required:</b>	106
<b>Number Of End Caps Required:</b>	12
<b>Chamber Rows:</b>	6
<b>Maximum Length:</b>	130.60 ft.
<b>Maximum Width:</b>	56.35 ft.
<b>Approx. Bed Size Required:</b>	7313.36 square ft.

### System Components

<b>Amount Of Stone Required:</b>	1121 cubic yards
<b>Volume Of Excavation (Not Including Fill):</b>	1829 cubic yards
<b>Total Non-woven Geotextile Required:</b>	2287 square yards
<b>Woven Geotextile Required (excluding Isolator Row):</b>	107 square yards
<b>Woven Geotextile Required (Isolator Row):</b>	290 square yards
<b>Total Woven Geotextile Required:</b>	396 square yards
<b>Impervious Liner Required:</b>	0 square yards



\*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).



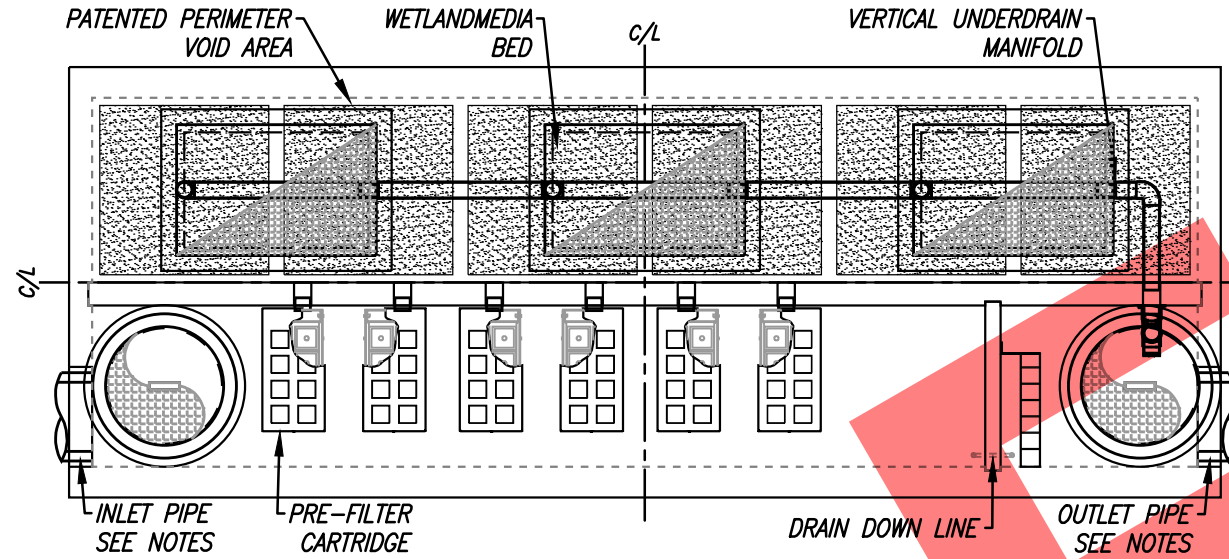


## Volume Based Sizing

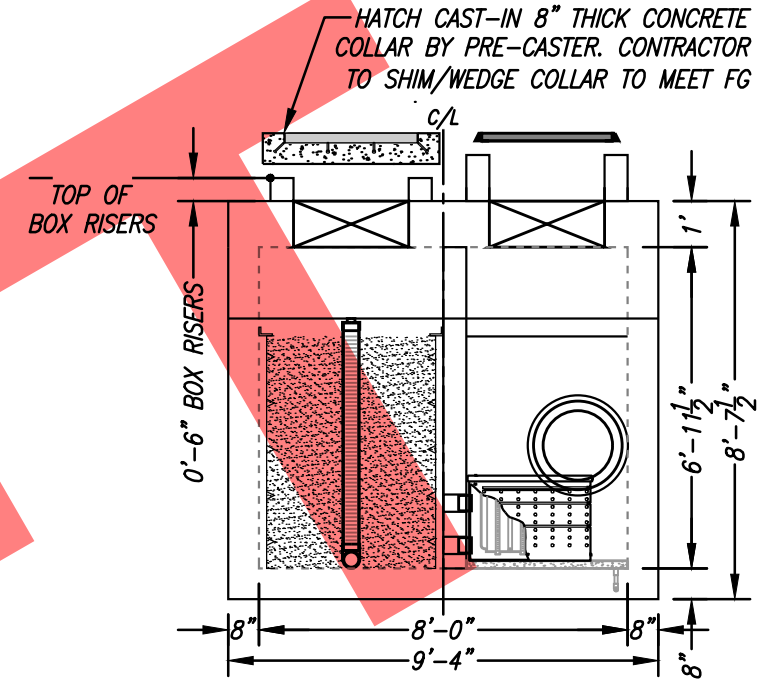
Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-6-8	3191	6382
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145
MWS-L-8-20	12560	25120
MWS-L-8-24	15108	30216

SITE SPECIFIC DATA			
PROJECT NUMBER	10253		
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)	FLOW BASED (CFS)		
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	LOAD LEVEL 5 PER ASTM C1802		
FRAME & COVER	ø30"	3 EA 30" X 48"	ø30"
WETLANDMEDIA VOLUME (CY)	15.06		
ORIFICE SIZE (DIA. INCHES)	5 EA ø2.37"		
NOTES: PRELIMINARY NOT FOR CONSTRUCTION. 6" DIAMETER INTERIOR PIPE REQUIRED.			



**PLAN VIEW**



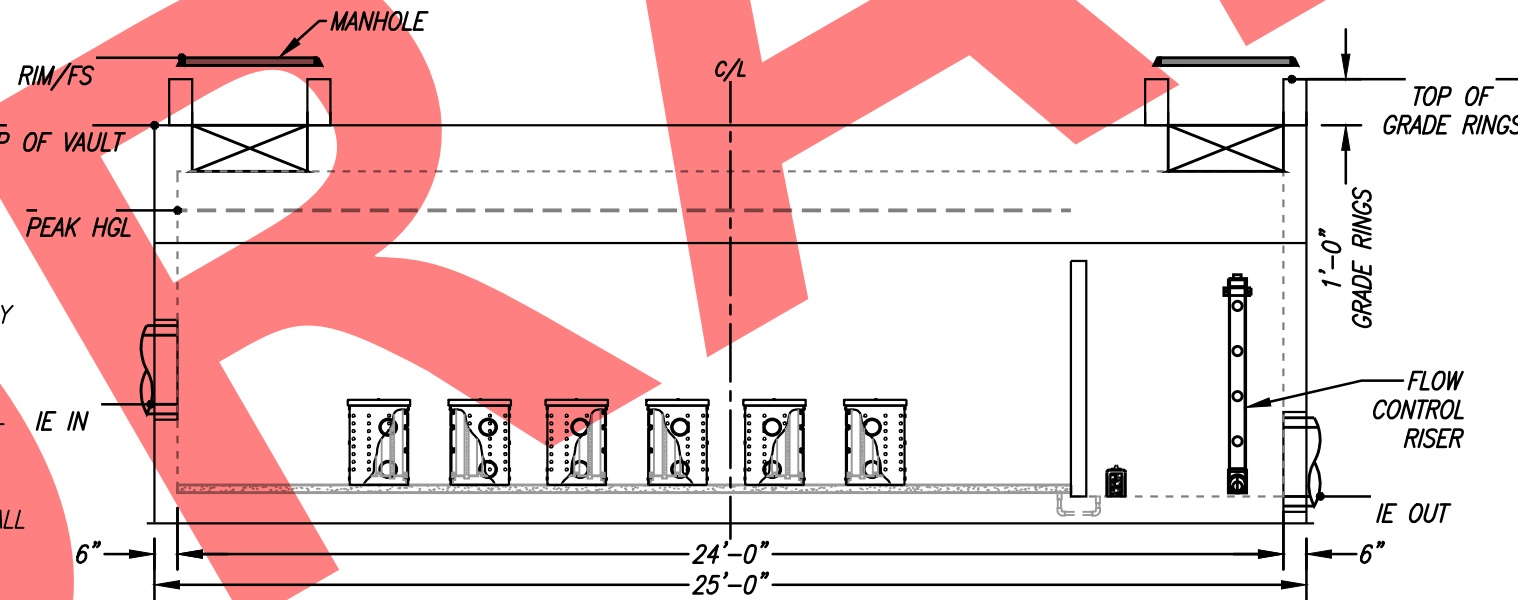
**LEFT END VIEW**

**INSTALLATION NOTES**

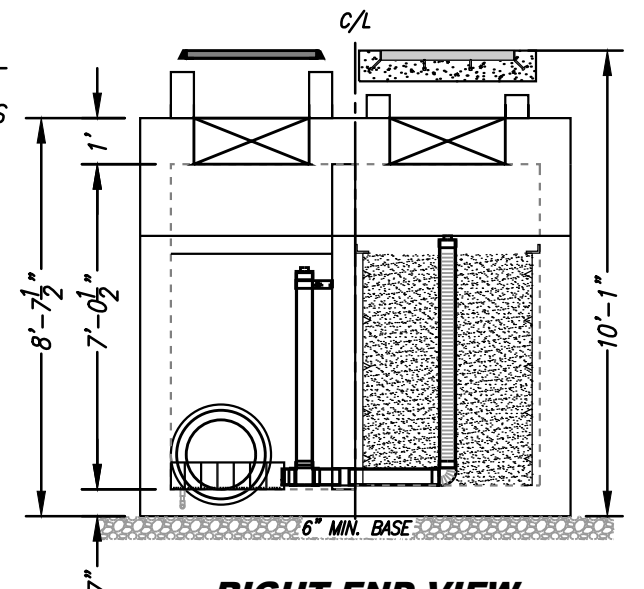
- CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND TOP OF VAULT INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURERS CONTRACT.
- UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
- ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
- CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
- CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
- DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.
- CONTRACTOR RESPONSIBLE FOR CONTACTING MODULAR WETLANDS FOR ACTIVATION OF UNIT. MANUFACTURERS WARRANTY IS VOID WITH OUT PROPER ACTIVATION BY A MODULAR WETLANDS REPRESENTATIVE.

**GENERAL NOTES**

- MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.



**ELEVATION VIEW**



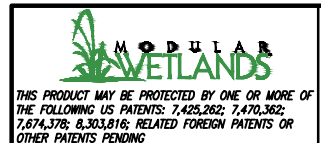
**RIGHT END VIEW**

**INTERNAL BYPASS DISCLOSURE:**

THE DESIGN AND CAPACITY OF THE PEAK CONVEYANCE METHOD TO BE REVIEWED AND APPROVED BY THE ENGINEER OF RECORD. HGL(S) AT PEAK FLOW SHALL BE ASSESSED TO ENSURE NO UPSTREAM FLOODING. PEAK HGL AND BYPASS CAPACITY SHOWN ON DRAWING ARE USED FOR GUIDANCE ONLY.

TREATMENT FLOW (CFS)	
OPERATING HEAD (FT)	
PRETREATMENT LOADING RATE (GPM/SF)	
WETLAND MEDIA LOADING RATE (GPM/SF)	

**MWS-L-8-24-7'-0"-V-UG-HC**  
**STORMWATER BIOFILTRATION SYSTEM**  
**STANDARD DETAIL**



PROPRIETARY AND CONFIDENTIAL:  
 THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF MODULAR WETLANDS SYSTEMS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF MODULAR WETLANDS SYSTEMS IS PROHIBITED.





# Modular Wetlands<sup>®</sup> System Linear

A Stormwater Biofiltration Solution



# OVERVIEW

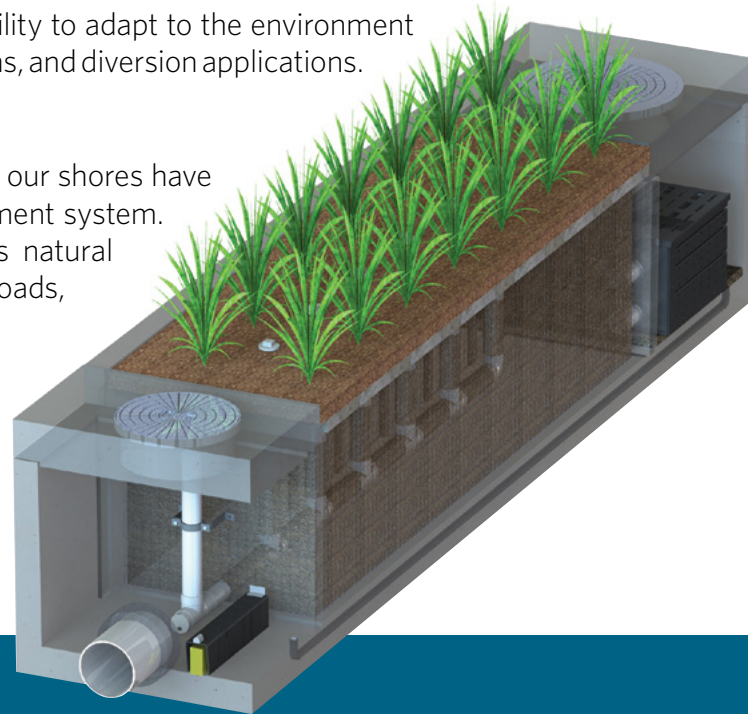
The Bio Clean Modular Wetlands® System Linear (MWS Linear) represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint, higher treatment capacity, and a wide range of versatility. While most biofilters use little or no pretreatment, the Modular Wetlands System Linear incorporates an advanced pretreatment chamber that includes separation and pre-filter cartridges. In this chamber, sediment and hydrocarbons are removed from runoff before entering the biofiltration chamber, reducing maintenance costs and improving performance.

Horizontal flow also gives the system the unique ability to adapt to the environment through a variety of configurations, bypass orientations, and diversion applications.

## The Urban Impact

For hundreds of years, natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as cities grow and develop, our environment's natural filtration systems are blanketed with impervious roads, rooftops, and parking lots.

Bio Clean understands this loss and has spent years re-establishing nature's presence in urban areas, and rejuvenating waterways with the MWS Linear.



# PERFORMANCE

The Modular Wetlands® System Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons, and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. In fact, the MWS Linear harnesses some of the same biological processes found in natural wetlands in order to collect, transform, and remove even the most harmful pollutants.

<b>66%</b> REMOVAL OF DISSOLVED ZINC	<b>69%</b> REMOVAL OF TOTAL ZINC	<b>38%</b> REMOVAL OF DISSOLVED COPPER	<b>64%</b> REMOVAL OF TOTAL PHOSPHORUS	
<b>45%</b> REMOVAL OF NITROGEN	<b>50%</b> REMOVAL OF TOTAL COPPER	<b>95%</b> REMOVAL OF MOTOR OIL	<b>67%</b> REMOVAL OF ORTHO PHOSPHORUS	<b>85%</b> REMOVAL OF TSS

# APPROVALS

The Modular Wetlands® System Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation and perhaps the world. Here is a list of some of the most high-profile approvals, certifications, and verifications from around the country.



## Washington State Department of Ecology TAPe Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft<sup>2</sup> loading rate. The highest performing BMP on the market for all main pollutant categories.



## California Water Resources Control Board, Full Capture Certification

The Modular Wetlands® System is the first biofiltration system to receive certification as a full capture trash treatment control device.



## Virginia Department of Environmental Quality, Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) regulation technical criteria.



## Maryland Department of the Environment, Approved ESD

Granted Environmental Site Design (ESD) status for new construction, redevelopment, and retrofitting when designed in accordance with the design manual.



## MASTEP Evaluation

The University of Massachusetts at Amherst - Water Resources Research Center issued a technical evaluation report noting removal rates up to 84% TSS, 70% total phosphorus, 68.5% total zinc, and more.



## Rhode Island Department of Environmental Management, Approved BMP

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% pathogens, 30% total phosphorus, and 30% total nitrogen.



## Texas Commission on Environmental Quality



## Atlanta Regional Commission

# ADVANTAGES

- HORIZONTAL FLOW BIOFILTRATION
- GREATER FILTER SURFACE AREA
- PRETREATMENT CHAMBER
- PATENTED PERIMETER VOID AREA
- FLOW CONTROL
- NO DEPRESSED PLANTER AREA
- AUTO DRAINDOWN MEANS NO MOSQUITO VECTOR

# OPERATION

The Modular Wetlands® System Linear is the most efficient and versatile biofiltration system on the market, and it is the only system with horizontal flow which:

- Improves performance
- Reduces footprint
- Minimizes maintenance

Figure 1 & Figure 2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

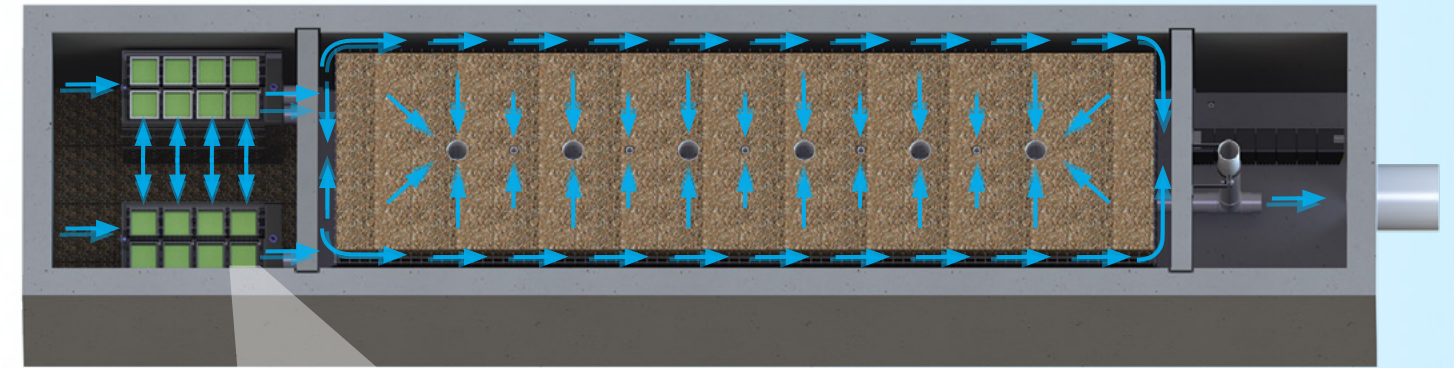


Figure 2,  
Top View

2x to 3x more surface area than traditional downward flow bioretention systems.

## 1 PRETREATMENT

### SEPARATION

- Trash, sediment, and debris are separated before entering the pre-filter boxes
- Designed for easy maintenance access

### PRE-FILTER BOXES

- Over 25 sq. ft. of surface area per box
- Utilizes BioMediaGREEN™ filter material
- Removes over 80% of TSS and 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber

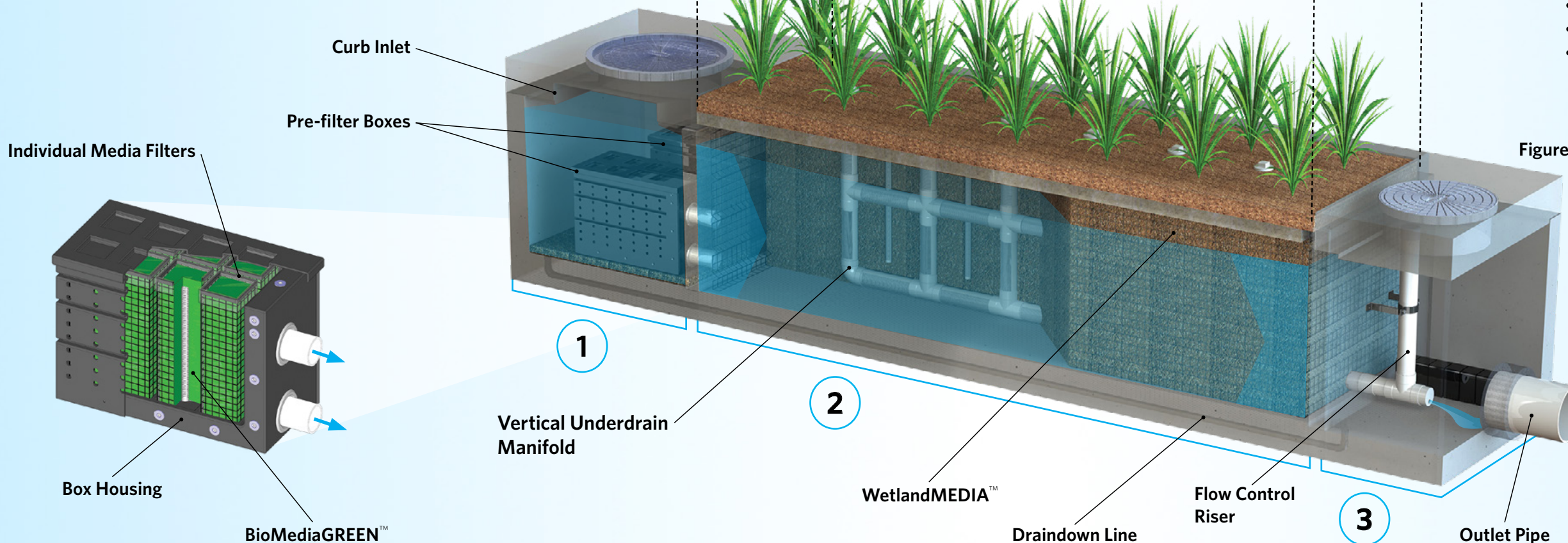


Figure 1

## 2 BIOFILTRATION

### HORIZONTAL FLOW

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

### PATENTED PERIMETER VOID AREA

- Vertically extends void area between the walls and the WetlandMEDIA™ on all four sides
- Maximizes surface area of the media for higher treatment capacity

### WETLANDMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and lightweight

## 3 DISCHARGE

### FLOW CONTROL

- Orifice plate controls flow of water through WetlandMEDIA™ to a level lower than the media's capacity
- Extends the life of the media and improves performance

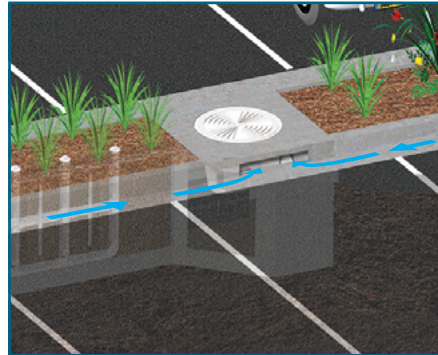
### DRAINDOWN FILTER

- The draindown is an optional feature that completely drains the pretreatment chamber
- Water that drains from the pretreatment chamber between storm events will be treated



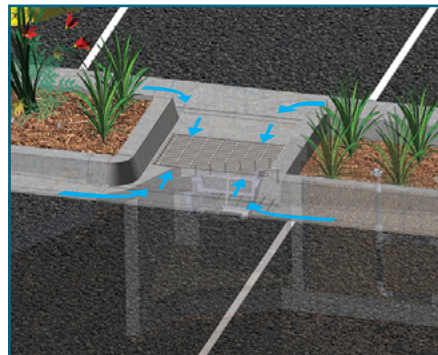
## CONFIGURATIONS

The Modular Wetlands® System Linear is the preferred biofiltration system of civil engineers across the country due to its versatile design. This highly versatile system has available “pipe-in” options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.



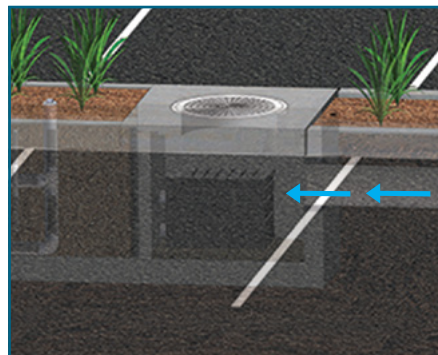
### CURB TYPE

The Curb Type configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions. Length of curb opening varies based on model and size.



### GRATE TYPE

The Grate Type configuration offers the same features and benefits as the Curb Type but with a grated/drop inlet above the systems pretreatment chamber. It has the added benefit of allowing pedestrian access over the inlet. ADA-compliant grates are available to assure easy and safe access. The Grate Type can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



### VAULT TYPE

The system’s patented horizontal flow biofilter is able to accept inflow pipes directly into the pretreatment chamber, meaning the Modular Wetlands® can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the “pipe-in” design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.



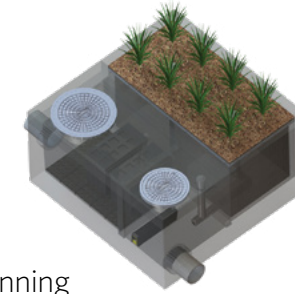
### DOWNSPOUT TYPE

The Downspout Type is a variation of the Vault Type and is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

## ORIENTATIONS

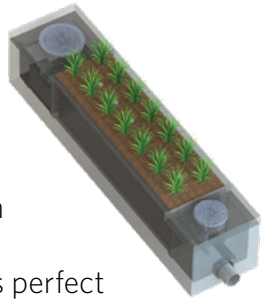
### SIDE-BY-SIDE

The Side-By-Side orientation places the pretreatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.



### END-TO-END

The End-To-End orientation places the pretreatment and discharge chambers on opposite ends of the biofiltration chamber, therefore minimizing the width of the system to 5 ft. (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is that bypass must be external.



## BYPASS

### INTERNAL BYPASS WEIR (SIDE-BY-SIDE ONLY)

The Side-By-Side orientation places the pretreatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system’s treatment capacity, thus allowing bypass from the pretreatment chamber directly to the discharge chamber.

### EXTERNAL DIVERSION WEIR STRUCTURE

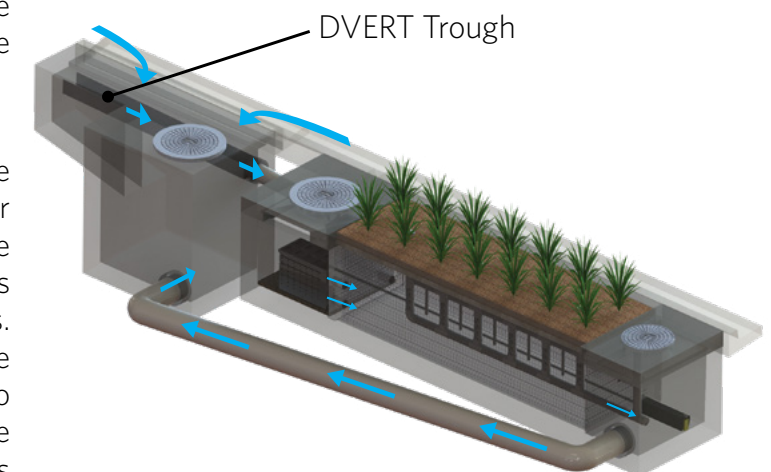
This traditional offline diversion method can be used with the Modular Wetlands® System Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

### FLOW-BY-DESIGN

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

### DVERT LOW FLOW DIVERSION

This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the Modular Wetlands® System Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels



them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allow the system to be installed anywhere space is available.

# SPECIFICATIONS

## FLOW-BASED DESIGNS

The Modular Wetlands® System Linear can be used in stand-alone applications to meet treatment flow requirements, and since it is the only biofiltration system that can accept inflow pipes several feet below the surface, it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

MODEL #	DIMENSIONS	WETLAND MEDIA SURFACE AREA (sq. ft.)	TREATMENT FLOW RATE (cfs)
MWS-L-4-4	4' x 4'	23	0.052
MWS-L-4-6	4' x 6'	32	0.073
MWS-L-4-8	4' x 8'	50	0.115
MWS-L-4-13	4' x 13'	63	0.144
MWS-L-4-15	4' x 15'	76	0.175
MWS-L-4-17	4' x 17'	90	0.206
MWS-L-4-19	4' x 19'	103	0.237
MWS-L-4-21	4' x 21'	117	0.268
MWS-L-6-8	7' x 9'	64	0.147
MWS-L-8-8	8' x 8'	100	0.230
MWS-L-8-12	8' x 12'	151	0.346
MWS-L-8-16	8' x 16'	201	0.462
MWS-L-8-20	9' x 21'	252	0.577
MWS-L-8-24	9' x 25'	302	0.693
MWS-L-10-20	10' x 20'	302	0.693

# VOLUME-BASED DESIGNS

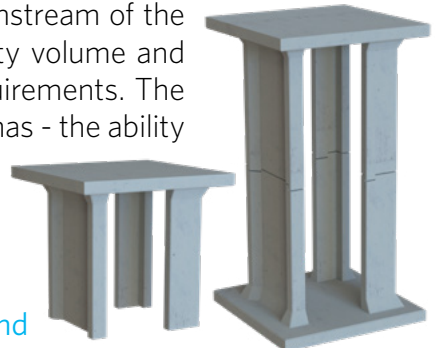
## HORIZONTAL FLOW BIOFILTRATION ADVANTAGE



### MODULAR WETLANDS® SYSTEM LINEAR WITH URBANPOND™ PRESTORAGE

In the example above, the Modular Wetlands® System Linear is installed downstream of the UrbanPond storage system. The MWS Linear is designed for the water quality volume and will treat and discharge the required volume within local draindown time requirements. The MWS Linear's unique horizontal flow design, gives it benefits no other biofilter has - the ability to be placed downstream of detention ponds, extended dry detention basins, underground storage systems and permeable paver reservoirs. The system's horizontal flow configuration and built-in orifice control allows it to be installed with just 6" of fall between inlet and outlet pipe for a simple connection to projects with shallow downstream tie-in points.

UrbanPond  
Single and Double Modules



### DESIGN SUPPORT

Bio Clean engineers are trained to provide you with superior support for all volume sizing configurations throughout the country. Our vast knowledge of state and local regulations allow us to quickly and efficiently size a system to maximize feasibility. Volume control and hydromodification regulations are expanding the need to decrease the cost and size of your biofiltration system. Bio Clean will help you realize these cost savings with the MWS Linear, the only biofilter than can be used downstream of storage BMPs.

## ADVANTAGES

- LOWER COST THAN FLOW-BASED DESIGN
- BUILT-IN ORIFICE CONTROL STRUCTURE
- MEETS LID REQUIREMENTS
- WORKS WITH DEEP INSTALLATIONS

# APPLICATIONS

The Modular Wetlands® System Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.



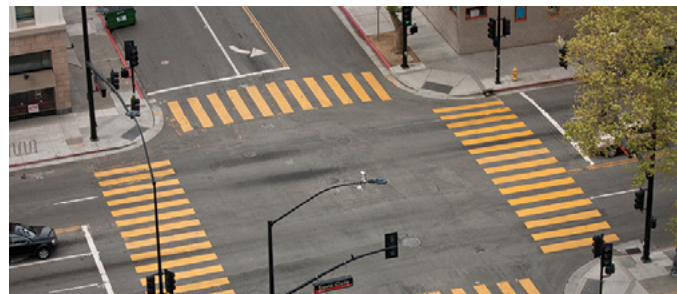
## INDUSTRIAL

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA-mandated effluent limits for dissolved metals and other pollutants.



## RESIDENTIAL

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.



## STREETS

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and it offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.



## PARKING LOTS

Parking lots are designed to maximize space and the Modular Wetlands® 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.



## COMMERCIAL

Compared to bioretention systems, the MWS Linear can treat far more area in less space, meeting treatment and volume control requirements.



## MIXED USE

The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

### More applications include:

- Agriculture
- Reuse
- Low Impact Development
- Waste Water

# PLANT SELECTION

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the Modular Wetlands® System Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade, the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more contact time so that pollutants are more successfully decomposed, volatilized, and incorporated into the biomass of the Modular Wetlands® micro/macro flora and fauna.



A wide range of plants are suitable for use in the Modular Wetlands®, but selections vary by location and climate. View suitable plants by visiting [biocleanenvironmental.com/plants](http://biocleanenvironmental.com/plants).

# INSTALLATION



The Modular Wetlands® System Linear is simple, easy to install, and has a space-efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles precast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians is available to supervise installations and provide technical support.

# MAINTENANCE



Reduce your maintenance costs, man hours, and materials with the Modular Wetlands® System Linear. Unlike other biofiltration systems that provide no pretreatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pretreatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pretreatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pretreatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter boxes is required for long-term operation, and there is absolutely no need to replace expensive biofiltration media.



**Bio  Clean**  
A Forterra Company

5796 Armada Drive Suite 250  
Carlsbad, CA 92008  
855.566.3938  
stormwater@forterrabp.com  
biocleanenvironmental.com

**Santa Ana Watershed - BMP Design Volume,  $V_{BMP}$**

(Rev. 10-2011)

Legend:

Required Entries

Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name **Albert A. Webb Associates**

Date **6/26/2023**

Designed by **ABE**

Case No **P22-00005**

Company Project Number/Name

**Perris Airport Logistics Center - Site 1; West Building off Goetz**

**BMP Identification**

BMP NAME / ID **BMP-O**

*Must match Name/ID used on BMP Design Calculation Sheet*

**Design Rainfall Depth**

85th Percentile, 24-hour Rainfall Depth,  
from the Isohyetal Map in Handbook Appendix E

$D_{85} =$  **0.60** inches

**Drainage Management Area Tabulation**

*Insert additional rows if needed to accommodate all DMAs draining to the BMP*

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, $I_f$	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Storm Depth (in)	Design Capture Volume, $V_{BMP}$ (cubic feet)	Proposed Volume on Plans (cubic feet)
L-O	13160	Ornamental Landscaping	0.1	0.11	1453.6			
H-O	98530	Concrete or Asphalt	1	0.89	87888.8			
BMP-O	125	Ornamental Landscaping	0.1	0.11	13.8			
<b>111815</b>		<b>Total</b>			<b>89356.2</b>	<b>0.60</b>	<b>4430.6</b>	<b>812.5</b>

**Proposed Volume must be greater than the Design Capture Volume**

Notes:

## DMA-O – Ellis Ave

### Mini Gravel “Basin” Filter Sizing

There are a total of 5 mini gravel “basins” included in the design.

One size is included:

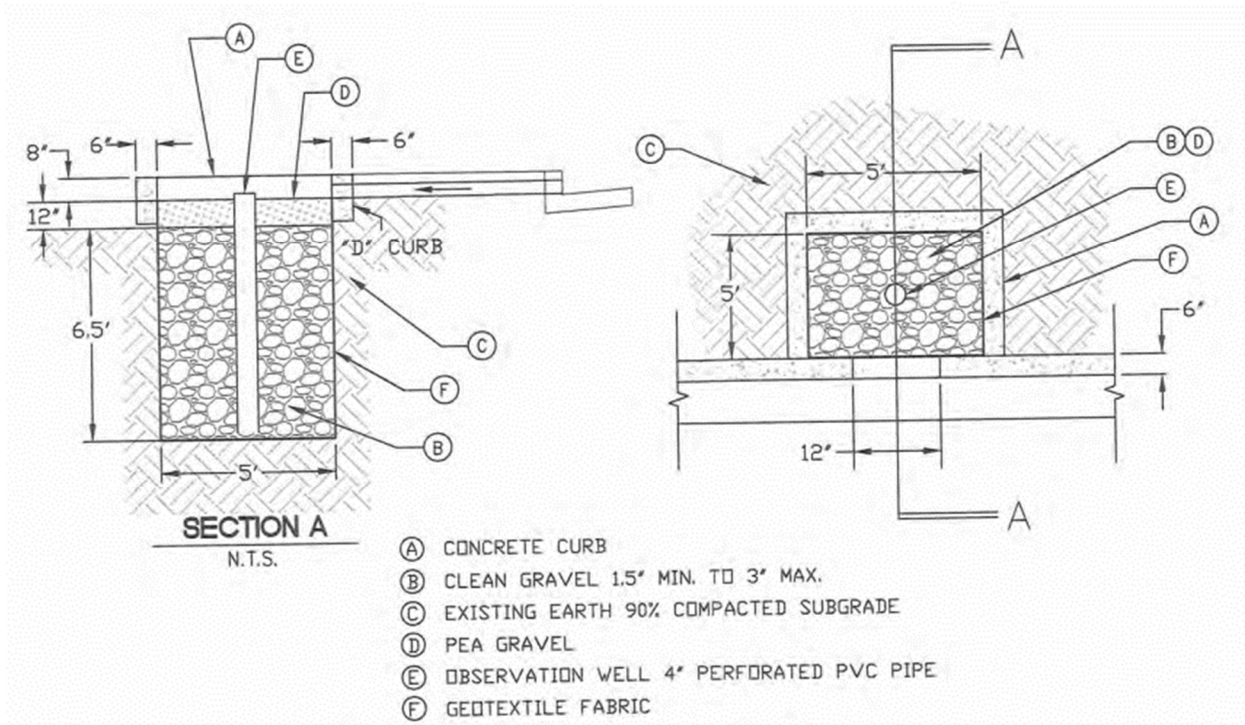
5 ft x 5 ft x 6.5 ft     Volume = 162.5 CF

The average treatment area is 21,700 SF

Design capture volume is 885.3 CF

Design flow is 0.1 cfs

The constructed design manages the water quality treatment to the MEP for these locations.



# Appendix 7: Hydromodification

*Supporting Detail Relating to Hydrologic Conditions of Concern*



# Riverside County SWCT<sup>2</sup> Stormwater & Water Conservation Tracking

Find City

perris

Locate

Clear Results

33.7675,-117.2119 Zoom: 15.5

Toggle Legend

Clear Layers

Metadata

Map Tutorial

## Base Data

### Stormwater Data

Hydromodification Susceptibility Mapping

— Not Susceptible

- - Santa Ana River

— Potentially Susceptible

2010 - 303d/TMDL

Hydromodification Exemption Areas

■ Potentially Not Exempt

■ Potentially Exempt

District Facilities

— District Facilities

— Proposed Facilities

■ Basin

■ Detention Basin

■ Retention Basin

■ Debris Basin

■ Dam

■ Levee

■ Spreading Ground

■ Other

Permit Areas

Hydrologic Unit Codes(HUC)

Topographic Drainage Boundary

Drainage Area Boundaries

City Storm Drains

WQMP 85% Design Isohyetal Map

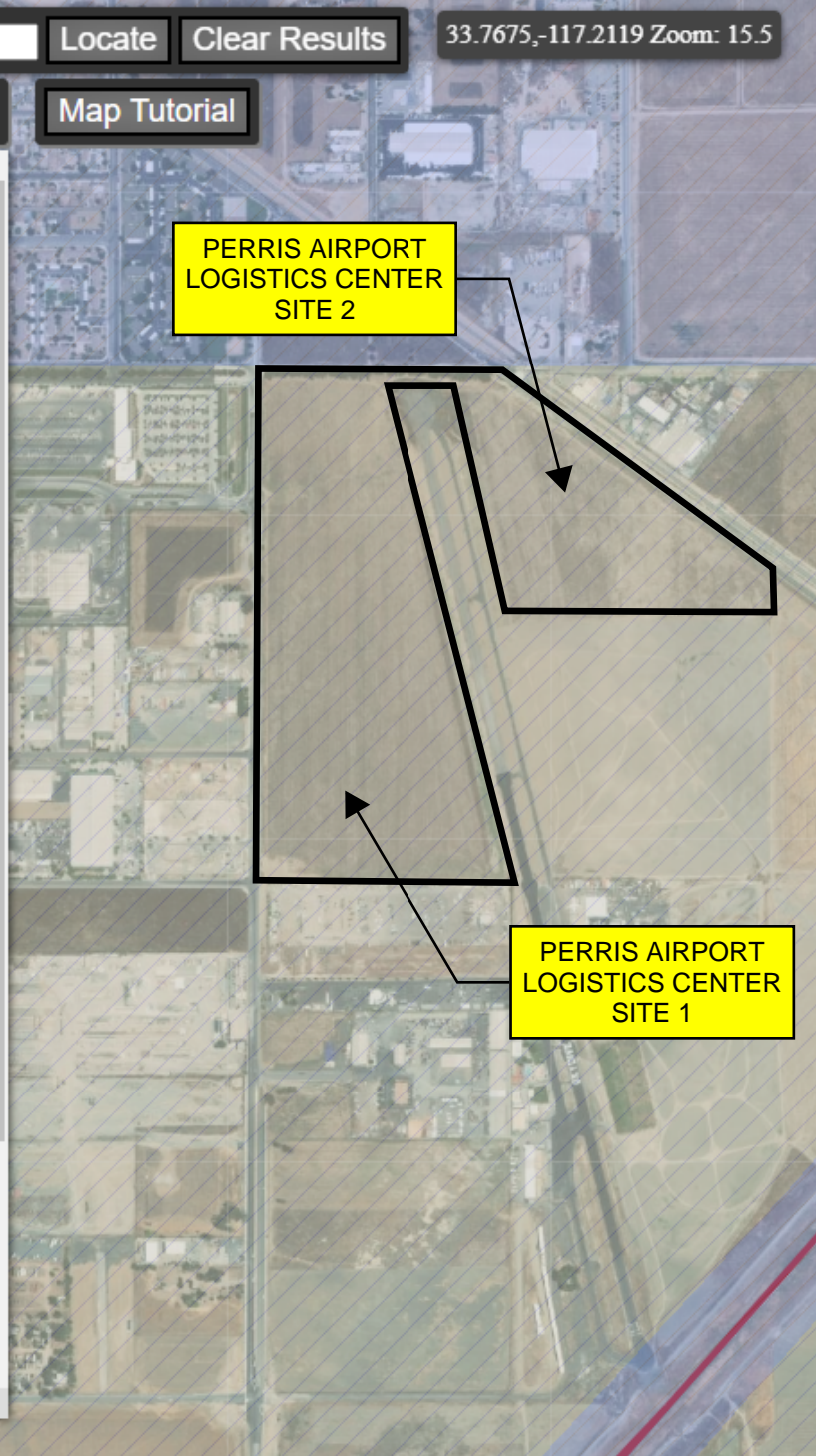
CRP (Control Release Point)

FEMA Floodplain

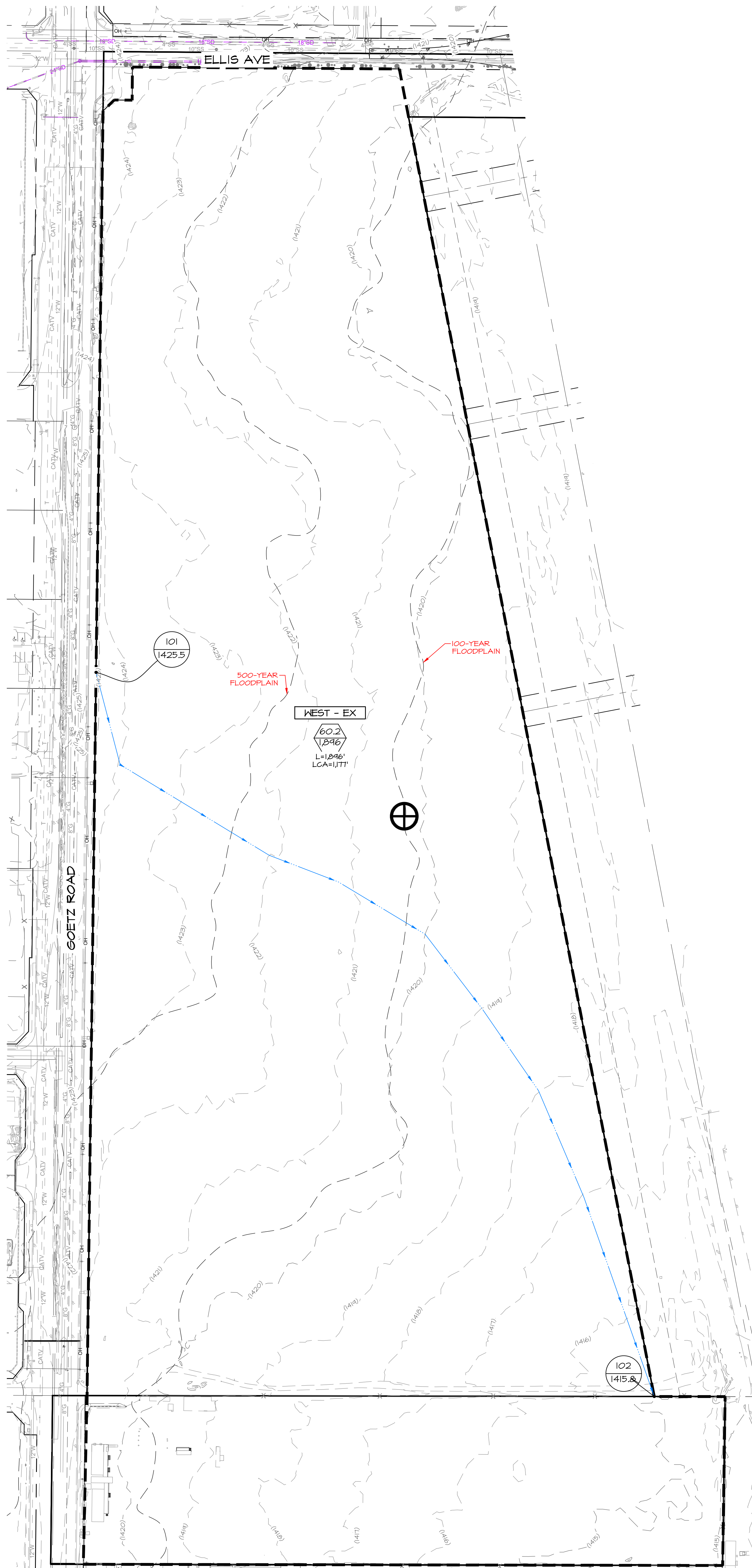
Flood Plain - Other Special Studies

PERRIS AIRPORT LOGISTICS CENTER SITE 2

PERRIS AIRPORT LOGISTICS CENTER SITE 1



*Unit Hydrograph Maps  
Existing and Proposed Conditions*

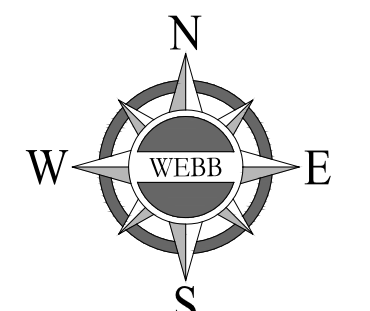


**LEGEND**

	DRAINAGE MANAGEMENT BOUNDARY
	FLOW DIRECTION
	LONGEST FLOW PATH CENTROIDAL LENGTH
	NODE DESIGNATION NODE ELEVATION
	*INVERT ELEVATION
	WATERSHED AREA (ACRES) LONGEST WATER PATH (FT)
	CENTROID

**BASIS OF BEARINGS**  
 THE BASIS OF BEARINGS IS THE CALIFORNIA STATE PLAN COORDINATE SYSTEM, CGS83, ZONE 6, BASED LOCALLY ON CONTROL STATIONS "MLFP" AND "FPBF" NAD 83(NRS2007)

**BENCHMARK DATA**  
 NGS DESIGNATION: 435  
 PID: DX5442  
 DESCRIBED BY METRO WATER DIST. 50, CALIFORNIA 1492 PERRIS, 1300 FEET (396.2 M) WEST OF AT&P RAILROAD ALONG RIDER ST, ON TOP OF NORTH CURB FACE OF RIDER ST, 28 FEET (8.5 M) NORTH OF RIDER ST, 6 FEET (1.8 M) SOUTH OF A GTE TELEPHONE BOX (DAMAGED), A STANDARD 3-1/4 INCH ALUMINUM DIST SET FLUSH IN TOP OF CURB.  
 ELEVATION = 1515.12' (NAVD88)  
 FROM CITY OF SUN CITY BM Z 10489 (RCFC & WCD)  
 FS, 2-1/4 INCH BRASS DISK FLUSH STAMPED "CAL DOT 9/10/16/15 REPL. GR. STONE FD. 1450" ON ETHANAC AC BRIDGE DECK OVER I-215 FREEWAY  
 ELEVATION = 1450.319' (NAVD88)  
 (CONVERSION FACTO TO NGVD 29 15 -2.63' PER RCFC & WCD)

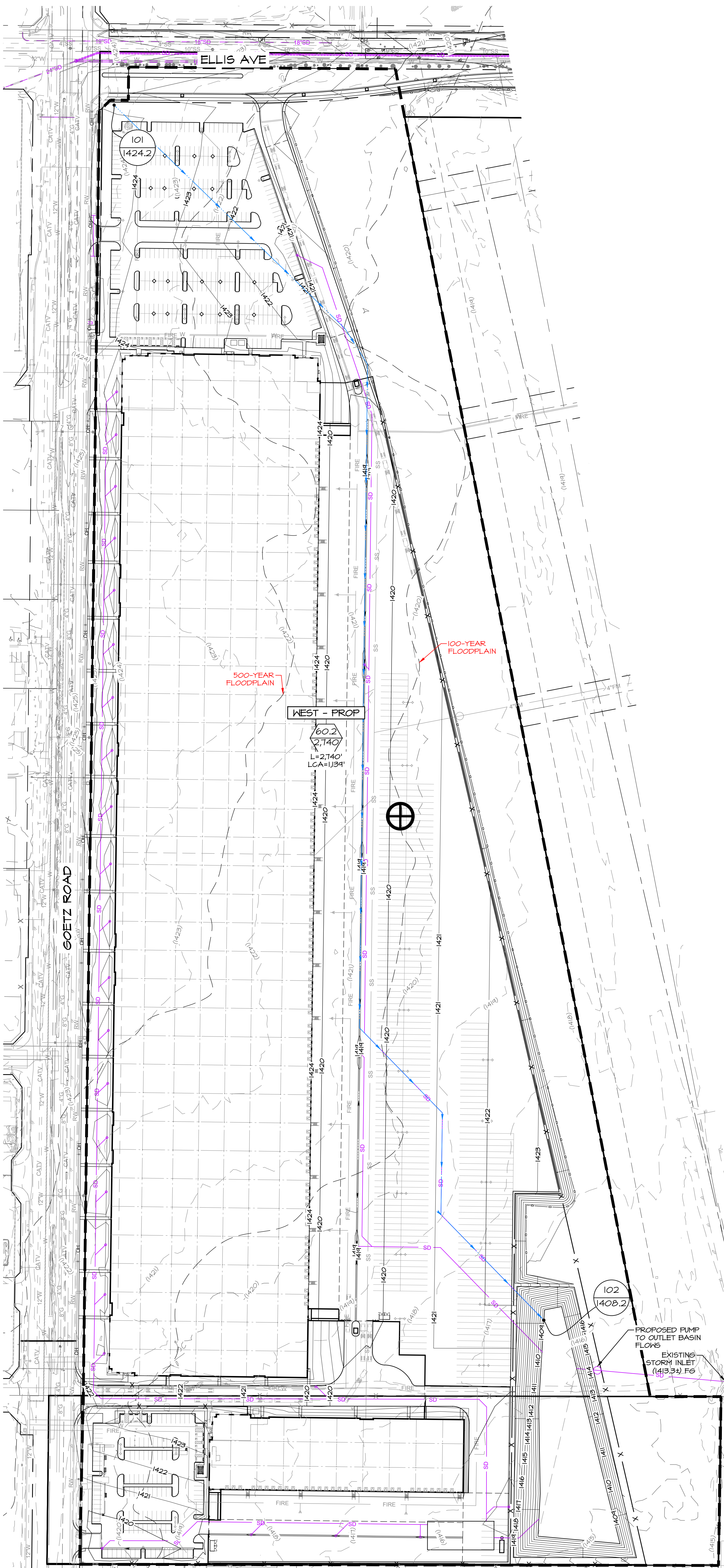


**CITY OF PERRIS**

**PRELIMINARY REPORT (P22-00005)  
 UNIT HYDROGRAPH HYDROLOGY  
 EXISTING UNIT HYDROGRAPH, WEST  
 PERRIS AIRPORT LOGISTICS CENTER**

SCALE: 1" = 100'	<b>ALBERT A. WEBB ASSOCIATES</b>	ENGINEERING CONSULTANTS 3785 McCRAY STREET RIVERSIDE CA 92506 PH. (951) 686-1070 FAX (951) 788-1256	W.O. 21-0235 SHEET 1 OF 1 SHEETS DWG. NO.
DATE: 2023-06-22	DESIGNED: ABE	CHECKED: SKK	PLN CK REF: F.B.

PRELIMINARY  
 H:\2021\21-0235\DRAINAGE\PRO\DWG FOLDER\21-0235-PHYD-UHLDWG 6/20/2023 1:47:48 PM



**LEGEND**

- DRAINAGE MANAGEMENT BOUNDARY
- FLOW DIRECTION
- LONGEST FLOW PATH  
CENTROIDAL LENGTH
- NODE DESIGNATION  
NODE ELEVATION
- \*14XX  
\*INVERT ELEVATION
- WATERSHED AREA (ACRES)  
LONGEST WATER PATH (FT)
- CENTROID

**BASIS OF BEARINGS**

THE BASIS OF BEARINGS IS THE CALIFORNIA STATE PLAN COORDINATE SYSTEM, CGS83, ZONE 6, BASED LOCALLY ON CONTROL STATIONS "MLFP" AND "PPBF" NAD 83(NRS2007)

**BENCHMARK DATA**

NGS DESIGNATION: 435  
PID: DX5442

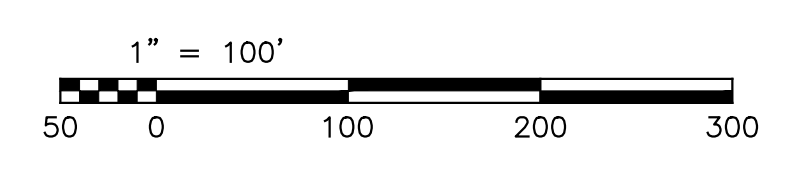
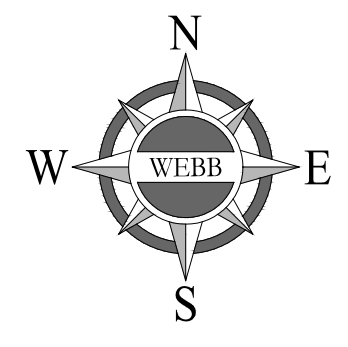
DESCRIBED BY METRO WATER DIST. 50, CALIFORNIA 1492 PERRIS, 1300 FEET (396.2 M) WEST OF AT&P RAILROAD ALONG RIDER ST, ON TOP OF NORTH CURB FACE OF RIDER ST, 28 FEET (8.5 M) NORTH OF RIDER ST, 6 FEET (1.8 M) SOUTH OF A 6TE TELEPHONE BOX (DAMAGED), A STANDARD 3-1/4 INCH ALUMINUM DIST SET FLUSH IN TOP OF CURB.

ELEVATION = 1515.12' (NAVD88)

FROM CITY OF SUN CITY BM Z 10489 (RCFC & WCD)  
FS, 2-1/4 INCH BRASS DISK FLUSH STAMPED "CAL DOT 9/10/16/15 REPL. GR. STONE FD. 1450" ON ETHANAC AC BRIDGE DECK OVER I-215 FREEWAY

ELEVATION = 1450.319' (NAVD88)

(CONVERSION FACTO TO NGVD 29 15 -2.63' PER RCFC & WCD)



**CITY OF PERRIS**

**PRELIMINARY REPORT (P22-00005)  
UNIT HYDROGRAPH HYDROLOGY  
PROPOSED UNIT HYDROGRAPH, WEST  
PERRIS AIRPORT LOGISTICS CENTER**

SCALE: 1" = 100'	<b>ALBERT A. WEBB ASSOCIATES</b>	ENGINEERING CONSULTANTS 3785 McCRAY STREET RIVERSIDE CA 92506 PH. (951) 686-1070 FAX (951) 788-1256	W.O. 21-0235 SHEET 1 OF 1 SHEETS DWG. NO.
DATE: 2023-06-22	DESIGNED: ABE	CHECKED: SKK	PLN CK REF: F.B.

PRELIMINARY  
H:\2021\21-0235\DRAINAGE\PROJ\DWG\_FOLDREV\21-0235-PPFD-UHLDWG 6/27/2023 1:47:48 PM

*Existing Unit Hydrograph  
2-year, 24-hour Storm Event*

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 11/17/22 File: ONSITEEXWEST242.out

+++++

Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

-----  
English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

-----  
21-0235 - MC BLACKACRE PERRIS AIRPORT SITE  
ONSITE UNIT HYDROGRAPH ANALYSIS  
EXISTING CONDITION, 2 YEAR  
FN: ONSITEEXWEST, ABE, 2022-11-17

-----  
Drainage Area = 60.20(Ac.) = 0.094 Sq. Mi.  
Drainage Area for Depth-Area Area Adjustment = 60.20(Ac.) = 0.094 Sq. Mi.  
Length along longest watercourse = 1896.00(Ft.)  
Length along longest watercourse measured to centroid = 1177.00(Ft.)  
Length along longest watercourse = 0.359 Mi.  
Length along longest watercourse measured to centroid = 0.223 Mi.  
Difference in elevation = 9.70(Ft.)  
Slope along watercourse = 27.0127 Ft./Mi.  
Average Manning's 'N' = 0.030  
Lag time = 0.147 Hr.  
Lag time = 8.85 Min.  
25% of lag time = 2.21 Min.  
40% of lag time = 3.54 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
60.20	1.80	108.36

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
60.20	5.00	301.00

STORM EVENT (YEAR) = 2.00  
Area Averaged 2-Year Rainfall = 1.800(In)  
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 1.800(In)  
Areal adjustment factor = 99.99 %  
Adjusted average point rain = 1.800(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
60.200	91.00	0.000
Total Area Entered = 60.20(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)

91.0 91.0 0.117 0.000 0.117 1.000 0.117  
 Sum (F) = 0.117  
 Area averaged mean soil loss (F) (In/Hr) = 0.117  
 Minimum soil loss rate ((In/Hr)) = 0.059  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.900

Unit Hydrograph  
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	56.521	7.445
2	0.167	113.043	31.410
3	0.250	169.564	27.637
4	0.333	226.085	11.012
5	0.417	282.607	6.310
6	0.500	339.128	4.306
7	0.583	395.649	3.128
8	0.667	452.170	2.215
9	0.750	508.692	1.745
10	0.833	565.213	1.397
11	0.917	621.734	1.061
12	1.000	678.256	0.806
13	1.083	734.777	0.593
14	1.167	791.298	0.565
15	1.250	847.820	0.370
		Sum = 100.000	Sum= 60.670

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)	
1	0.08	0.07	( 0.207)	0.013	0.001
2	0.17	0.07	( 0.207)	0.013	0.001
3	0.25	0.07	( 0.206)	0.013	0.001
4	0.33	0.10	( 0.205)	0.019	0.002
5	0.42	0.10	( 0.204)	0.019	0.002
6	0.50	0.10	( 0.203)	0.019	0.002
7	0.58	0.10	( 0.203)	0.019	0.002
8	0.67	0.10	( 0.202)	0.019	0.002
9	0.75	0.10	( 0.201)	0.019	0.002
10	0.83	0.13	( 0.200)	0.026	0.003
11	0.92	0.13	( 0.199)	0.026	0.003
12	1.00	0.13	( 0.199)	0.026	0.003
13	1.08	0.10	( 0.198)	0.019	0.002
14	1.17	0.10	( 0.197)	0.019	0.002
15	1.25	0.10	( 0.196)	0.019	0.002
16	1.33	0.10	( 0.196)	0.019	0.002
17	1.42	0.10	( 0.195)	0.019	0.002
18	1.50	0.10	( 0.194)	0.019	0.002
19	1.58	0.10	( 0.193)	0.019	0.002
20	1.67	0.10	( 0.192)	0.019	0.002
21	1.75	0.10	( 0.192)	0.019	0.002
22	1.83	0.13	( 0.191)	0.026	0.003
23	1.92	0.13	( 0.190)	0.026	0.003
24	2.00	0.13	( 0.189)	0.026	0.003
25	2.08	0.13	( 0.189)	0.026	0.003
26	2.17	0.13	( 0.188)	0.026	0.003
27	2.25	0.13	( 0.187)	0.026	0.003
28	2.33	0.13	( 0.186)	0.026	0.003
29	2.42	0.13	( 0.186)	0.026	0.003
30	2.50	0.13	( 0.185)	0.026	0.003
31	2.58	0.17	( 0.184)	0.032	0.004
32	2.67	0.17	( 0.183)	0.032	0.004
33	2.75	0.17	( 0.183)	0.032	0.004
34	2.83	0.17	( 0.182)	0.032	0.004
35	2.92	0.17	( 0.181)	0.032	0.004

36	3.00	0.17	0.036	( 0.180)	0.032	0.004
37	3.08	0.17	0.036	( 0.180)	0.032	0.004
38	3.17	0.17	0.036	( 0.179)	0.032	0.004
39	3.25	0.17	0.036	( 0.178)	0.032	0.004
40	3.33	0.17	0.036	( 0.177)	0.032	0.004
41	3.42	0.17	0.036	( 0.177)	0.032	0.004
42	3.50	0.17	0.036	( 0.176)	0.032	0.004
43	3.58	0.17	0.036	( 0.175)	0.032	0.004
44	3.67	0.17	0.036	( 0.174)	0.032	0.004
45	3.75	0.17	0.036	( 0.174)	0.032	0.004
46	3.83	0.20	0.043	( 0.173)	0.039	0.004
47	3.92	0.20	0.043	( 0.172)	0.039	0.004
48	4.00	0.20	0.043	( 0.171)	0.039	0.004
49	4.08	0.20	0.043	( 0.171)	0.039	0.004
50	4.17	0.20	0.043	( 0.170)	0.039	0.004
51	4.25	0.20	0.043	( 0.169)	0.039	0.004
52	4.33	0.23	0.050	( 0.169)	0.045	0.005
53	4.42	0.23	0.050	( 0.168)	0.045	0.005
54	4.50	0.23	0.050	( 0.167)	0.045	0.005
55	4.58	0.23	0.050	( 0.166)	0.045	0.005
56	4.67	0.23	0.050	( 0.166)	0.045	0.005
57	4.75	0.23	0.050	( 0.165)	0.045	0.005
58	4.83	0.27	0.058	( 0.164)	0.052	0.006
59	4.92	0.27	0.058	( 0.164)	0.052	0.006
60	5.00	0.27	0.058	( 0.163)	0.052	0.006
61	5.08	0.20	0.043	( 0.162)	0.039	0.004
62	5.17	0.20	0.043	( 0.161)	0.039	0.004
63	5.25	0.20	0.043	( 0.161)	0.039	0.004
64	5.33	0.23	0.050	( 0.160)	0.045	0.005
65	5.42	0.23	0.050	( 0.159)	0.045	0.005
66	5.50	0.23	0.050	( 0.159)	0.045	0.005
67	5.58	0.27	0.058	( 0.158)	0.052	0.006
68	5.67	0.27	0.058	( 0.157)	0.052	0.006
69	5.75	0.27	0.058	( 0.157)	0.052	0.006
70	5.83	0.27	0.058	( 0.156)	0.052	0.006
71	5.92	0.27	0.058	( 0.155)	0.052	0.006
72	6.00	0.27	0.058	( 0.154)	0.052	0.006
73	6.08	0.30	0.065	( 0.154)	0.058	0.006
74	6.17	0.30	0.065	( 0.153)	0.058	0.006
75	6.25	0.30	0.065	( 0.152)	0.058	0.006
76	6.33	0.30	0.065	( 0.152)	0.058	0.006
77	6.42	0.30	0.065	( 0.151)	0.058	0.006
78	6.50	0.30	0.065	( 0.150)	0.058	0.006
79	6.58	0.33	0.072	( 0.150)	0.065	0.007
80	6.67	0.33	0.072	( 0.149)	0.065	0.007
81	6.75	0.33	0.072	( 0.148)	0.065	0.007
82	6.83	0.33	0.072	( 0.148)	0.065	0.007
83	6.92	0.33	0.072	( 0.147)	0.065	0.007
84	7.00	0.33	0.072	( 0.146)	0.065	0.007
85	7.08	0.33	0.072	( 0.146)	0.065	0.007
86	7.17	0.33	0.072	( 0.145)	0.065	0.007
87	7.25	0.33	0.072	( 0.144)	0.065	0.007
88	7.33	0.37	0.079	( 0.144)	0.071	0.008
89	7.42	0.37	0.079	( 0.143)	0.071	0.008
90	7.50	0.37	0.079	( 0.142)	0.071	0.008
91	7.58	0.40	0.086	( 0.142)	0.078	0.009
92	7.67	0.40	0.086	( 0.141)	0.078	0.009
93	7.75	0.40	0.086	( 0.140)	0.078	0.009
94	7.83	0.43	0.094	( 0.140)	0.084	0.009
95	7.92	0.43	0.094	( 0.139)	0.084	0.009
96	8.00	0.43	0.094	( 0.138)	0.084	0.009
97	8.08	0.50	0.108	( 0.138)	0.097	0.011
98	8.17	0.50	0.108	( 0.137)	0.097	0.011
99	8.25	0.50	0.108	( 0.137)	0.097	0.011
100	8.33	0.50	0.108	( 0.136)	0.097	0.011
101	8.42	0.50	0.108	( 0.135)	0.097	0.011
102	8.50	0.50	0.108	( 0.135)	0.097	0.011
103	8.58	0.53	0.115	( 0.134)	0.104	0.012
104	8.67	0.53	0.115	( 0.133)	0.104	0.012
105	8.75	0.53	0.115	( 0.133)	0.104	0.012
106	8.83	0.57	0.122	( 0.132)	0.110	0.012
107	8.92	0.57	0.122	( 0.131)	0.110	0.012
108	9.00	0.57	0.122	( 0.131)	0.110	0.012
109	9.08	0.63	0.137	( 0.130)	0.123	0.014
110	9.17	0.63	0.137	( 0.130)	0.123	0.014

111	9.25	0.63	0.137	( 0.129)	0.123	0.014
112	9.33	0.67	0.144	( 0.128)	( 0.130)	0.016
113	9.42	0.67	0.144	( 0.128)	( 0.130)	0.016
114	9.50	0.67	0.144	( 0.127)	( 0.130)	0.017
115	9.58	0.70	0.151	( 0.127)	( 0.136)	0.025
116	9.67	0.70	0.151	( 0.126)	( 0.136)	0.025
117	9.75	0.70	0.151	( 0.125)	( 0.136)	0.026
118	9.83	0.73	0.158	( 0.125)	( 0.143)	0.034
119	9.92	0.73	0.158	( 0.124)	( 0.143)	0.034
120	10.00	0.73	0.158	( 0.124)	( 0.143)	0.035
121	10.08	0.50	0.108	( 0.123)	0.097	0.011
122	10.17	0.50	0.108	( 0.122)	0.097	0.011
123	10.25	0.50	0.108	( 0.122)	0.097	0.011
124	10.33	0.50	0.108	( 0.121)	0.097	0.011
125	10.42	0.50	0.108	( 0.121)	0.097	0.011
126	10.50	0.50	0.108	( 0.120)	0.097	0.011
127	10.58	0.67	0.144	( 0.119)	( 0.130)	0.025
128	10.67	0.67	0.144	( 0.119)	( 0.130)	0.025
129	10.75	0.67	0.144	( 0.118)	( 0.130)	0.026
130	10.83	0.67	0.144	( 0.118)	( 0.130)	0.026
131	10.92	0.67	0.144	( 0.117)	( 0.130)	0.027
132	11.00	0.67	0.144	( 0.117)	( 0.130)	0.027
133	11.08	0.63	0.137	( 0.116)	( 0.123)	0.021
134	11.17	0.63	0.137	( 0.115)	( 0.123)	0.021
135	11.25	0.63	0.137	( 0.115)	( 0.123)	0.022
136	11.33	0.63	0.137	( 0.114)	( 0.123)	0.023
137	11.42	0.63	0.137	( 0.114)	( 0.123)	0.023
138	11.50	0.63	0.137	( 0.113)	( 0.123)	0.024
139	11.58	0.57	0.122	( 0.113)	0.110	0.012
140	11.67	0.57	0.122	( 0.112)	0.110	0.012
141	11.75	0.57	0.122	( 0.111)	0.110	0.012
142	11.83	0.60	0.130	( 0.111)	( 0.117)	0.019
143	11.92	0.60	0.130	( 0.110)	( 0.117)	0.019
144	12.00	0.60	0.130	( 0.110)	( 0.117)	0.020
145	12.08	0.83	0.180	( 0.109)	( 0.162)	0.071
146	12.17	0.83	0.180	( 0.109)	( 0.162)	0.071
147	12.25	0.83	0.180	( 0.108)	( 0.162)	0.072
148	12.33	0.87	0.187	( 0.108)	( 0.168)	0.080
149	12.42	0.87	0.187	( 0.107)	( 0.168)	0.080
150	12.50	0.87	0.187	( 0.107)	( 0.168)	0.081
151	12.58	0.93	0.202	( 0.106)	( 0.181)	0.096
152	12.67	0.93	0.202	( 0.105)	( 0.181)	0.096
153	12.75	0.93	0.202	( 0.105)	( 0.181)	0.097
154	12.83	0.97	0.209	( 0.104)	( 0.188)	0.104
155	12.92	0.97	0.209	( 0.104)	( 0.188)	0.105
156	13.00	0.97	0.209	( 0.103)	( 0.188)	0.105
157	13.08	1.13	0.245	( 0.103)	( 0.220)	0.142
158	13.17	1.13	0.245	( 0.102)	( 0.220)	0.142
159	13.25	1.13	0.245	( 0.102)	( 0.220)	0.143
160	13.33	1.13	0.245	( 0.101)	( 0.220)	0.144
161	13.42	1.13	0.245	( 0.101)	( 0.220)	0.144
162	13.50	1.13	0.245	( 0.100)	( 0.220)	0.145
163	13.58	0.77	0.166	( 0.100)	( 0.149)	0.066
164	13.67	0.77	0.166	( 0.099)	( 0.149)	0.066
165	13.75	0.77	0.166	( 0.099)	( 0.149)	0.067
166	13.83	0.77	0.166	( 0.098)	( 0.149)	0.067
167	13.92	0.77	0.166	( 0.098)	( 0.149)	0.068
168	14.00	0.77	0.166	( 0.097)	( 0.149)	0.068
169	14.08	0.90	0.194	( 0.097)	( 0.175)	0.098
170	14.17	0.90	0.194	( 0.096)	( 0.175)	0.098
171	14.25	0.90	0.194	( 0.096)	( 0.175)	0.099
172	14.33	0.87	0.187	( 0.095)	( 0.168)	0.092
173	14.42	0.87	0.187	( 0.095)	( 0.168)	0.092
174	14.50	0.87	0.187	( 0.094)	( 0.168)	0.093
175	14.58	0.87	0.187	( 0.094)	( 0.168)	0.093
176	14.67	0.87	0.187	( 0.093)	( 0.168)	0.094
177	14.75	0.87	0.187	( 0.093)	( 0.168)	0.094
178	14.83	0.83	0.180	( 0.092)	( 0.162)	0.088
179	14.92	0.83	0.180	( 0.092)	( 0.162)	0.088
180	15.00	0.83	0.180	( 0.091)	( 0.162)	0.089
181	15.08	0.80	0.173	( 0.091)	( 0.156)	0.082
182	15.17	0.80	0.173	( 0.090)	( 0.156)	0.082
183	15.25	0.80	0.173	( 0.090)	( 0.156)	0.083
184	15.33	0.77	0.166	( 0.090)	( 0.149)	0.076
185	15.42	0.77	0.166	( 0.089)	( 0.149)	0.077

186	15.50	0.77	0.166	0.089	( 0.149)	0.077
187	15.58	0.63	0.137	0.088	( 0.123)	0.049
188	15.67	0.63	0.137	0.088	( 0.123)	0.049
189	15.75	0.63	0.137	0.087	( 0.123)	0.050
190	15.83	0.63	0.137	0.087	( 0.123)	0.050
191	15.92	0.63	0.137	0.086	( 0.123)	0.050
192	16.00	0.63	0.137	0.086	( 0.123)	0.051
193	16.08	0.13	0.029	( 0.085)	0.026	0.003
194	16.17	0.13	0.029	( 0.085)	0.026	0.003
195	16.25	0.13	0.029	( 0.085)	0.026	0.003
196	16.33	0.13	0.029	( 0.084)	0.026	0.003
197	16.42	0.13	0.029	( 0.084)	0.026	0.003
198	16.50	0.13	0.029	( 0.083)	0.026	0.003
199	16.58	0.10	0.022	( 0.083)	0.019	0.002
200	16.67	0.10	0.022	( 0.082)	0.019	0.002
201	16.75	0.10	0.022	( 0.082)	0.019	0.002
202	16.83	0.10	0.022	( 0.082)	0.019	0.002
203	16.92	0.10	0.022	( 0.081)	0.019	0.002
204	17.00	0.10	0.022	( 0.081)	0.019	0.002
205	17.08	0.17	0.036	( 0.080)	0.032	0.004
206	17.17	0.17	0.036	( 0.080)	0.032	0.004
207	17.25	0.17	0.036	( 0.080)	0.032	0.004
208	17.33	0.17	0.036	( 0.079)	0.032	0.004
209	17.42	0.17	0.036	( 0.079)	0.032	0.004
210	17.50	0.17	0.036	( 0.078)	0.032	0.004
211	17.58	0.17	0.036	( 0.078)	0.032	0.004
212	17.67	0.17	0.036	( 0.078)	0.032	0.004
213	17.75	0.17	0.036	( 0.077)	0.032	0.004
214	17.83	0.13	0.029	( 0.077)	0.026	0.003
215	17.92	0.13	0.029	( 0.076)	0.026	0.003
216	18.00	0.13	0.029	( 0.076)	0.026	0.003
217	18.08	0.13	0.029	( 0.076)	0.026	0.003
218	18.17	0.13	0.029	( 0.075)	0.026	0.003
219	18.25	0.13	0.029	( 0.075)	0.026	0.003
220	18.33	0.13	0.029	( 0.075)	0.026	0.003
221	18.42	0.13	0.029	( 0.074)	0.026	0.003
222	18.50	0.13	0.029	( 0.074)	0.026	0.003
223	18.58	0.10	0.022	( 0.074)	0.019	0.002
224	18.67	0.10	0.022	( 0.073)	0.019	0.002
225	18.75	0.10	0.022	( 0.073)	0.019	0.002
226	18.83	0.07	0.014	( 0.072)	0.013	0.001
227	18.92	0.07	0.014	( 0.072)	0.013	0.001
228	19.00	0.07	0.014	( 0.072)	0.013	0.001
229	19.08	0.10	0.022	( 0.071)	0.019	0.002
230	19.17	0.10	0.022	( 0.071)	0.019	0.002
231	19.25	0.10	0.022	( 0.071)	0.019	0.002
232	19.33	0.13	0.029	( 0.070)	0.026	0.003
233	19.42	0.13	0.029	( 0.070)	0.026	0.003
234	19.50	0.13	0.029	( 0.070)	0.026	0.003
235	19.58	0.10	0.022	( 0.069)	0.019	0.002
236	19.67	0.10	0.022	( 0.069)	0.019	0.002
237	19.75	0.10	0.022	( 0.069)	0.019	0.002
238	19.83	0.07	0.014	( 0.069)	0.013	0.001
239	19.92	0.07	0.014	( 0.068)	0.013	0.001
240	20.00	0.07	0.014	( 0.068)	0.013	0.001
241	20.08	0.10	0.022	( 0.068)	0.019	0.002
242	20.17	0.10	0.022	( 0.067)	0.019	0.002
243	20.25	0.10	0.022	( 0.067)	0.019	0.002
244	20.33	0.10	0.022	( 0.067)	0.019	0.002
245	20.42	0.10	0.022	( 0.066)	0.019	0.002
246	20.50	0.10	0.022	( 0.066)	0.019	0.002
247	20.58	0.10	0.022	( 0.066)	0.019	0.002
248	20.67	0.10	0.022	( 0.066)	0.019	0.002
249	20.75	0.10	0.022	( 0.065)	0.019	0.002
250	20.83	0.07	0.014	( 0.065)	0.013	0.001
251	20.92	0.07	0.014	( 0.065)	0.013	0.001
252	21.00	0.07	0.014	( 0.065)	0.013	0.001
253	21.08	0.10	0.022	( 0.064)	0.019	0.002
254	21.17	0.10	0.022	( 0.064)	0.019	0.002
255	21.25	0.10	0.022	( 0.064)	0.019	0.002
256	21.33	0.07	0.014	( 0.064)	0.013	0.001
257	21.42	0.07	0.014	( 0.063)	0.013	0.001
258	21.50	0.07	0.014	( 0.063)	0.013	0.001
259	21.58	0.10	0.022	( 0.063)	0.019	0.002
260	21.67	0.10	0.022	( 0.063)	0.019	0.002

261	21.75	0.10	0.022	( 0.062)	0.019	0.002
262	21.83	0.07	0.014	( 0.062)	0.013	0.001
263	21.92	0.07	0.014	( 0.062)	0.013	0.001
264	22.00	0.07	0.014	( 0.062)	0.013	0.001
265	22.08	0.10	0.022	( 0.062)	0.019	0.002
266	22.17	0.10	0.022	( 0.061)	0.019	0.002
267	22.25	0.10	0.022	( 0.061)	0.019	0.002
268	22.33	0.07	0.014	( 0.061)	0.013	0.001
269	22.42	0.07	0.014	( 0.061)	0.013	0.001
270	22.50	0.07	0.014	( 0.061)	0.013	0.001
271	22.58	0.07	0.014	( 0.060)	0.013	0.001
272	22.67	0.07	0.014	( 0.060)	0.013	0.001
273	22.75	0.07	0.014	( 0.060)	0.013	0.001
274	22.83	0.07	0.014	( 0.060)	0.013	0.001
275	22.92	0.07	0.014	( 0.060)	0.013	0.001
276	23.00	0.07	0.014	( 0.060)	0.013	0.001
277	23.08	0.07	0.014	( 0.060)	0.013	0.001
278	23.17	0.07	0.014	( 0.059)	0.013	0.001
279	23.25	0.07	0.014	( 0.059)	0.013	0.001
280	23.33	0.07	0.014	( 0.059)	0.013	0.001
281	23.42	0.07	0.014	( 0.059)	0.013	0.001
282	23.50	0.07	0.014	( 0.059)	0.013	0.001
283	23.58	0.07	0.014	( 0.059)	0.013	0.001
284	23.67	0.07	0.014	( 0.059)	0.013	0.001
285	23.75	0.07	0.014	( 0.059)	0.013	0.001
286	23.83	0.07	0.014	( 0.059)	0.013	0.001
287	23.92	0.07	0.014	( 0.059)	0.013	0.001
288	24.00	0.07	0.014	( 0.059)	0.013	0.001

(Loss Rate Not Used)

Sum = 100.0 Sum = 5.7

Flood volume = Effective rainfall 0.48(In)  
times area 60.2(Ac.)/[ (In)/(Ft.) ] = 2.4(Ac.Ft)  
Total soil loss = 1.32(In)  
Total soil loss = 6.639(Ac.Ft)  
Total rainfall = 1.80(In)  
Flood volume = 104094.8 Cubic Feet  
Total soil loss = 289205.8 Cubic Feet

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Peak flow rate of this hydrograph = 8.397(CFS)  
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24 - H O U R S T O R M  
R u n o f f H y d r o g r a p h  
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Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.01	Q				
0+10	0.0003	0.03	Q				
0+15	0.0007	0.06	Q				
0+20	0.0012	0.07	Q				
0+25	0.0018	0.09	Q				
0+30	0.0025	0.11	Q				
0+35	0.0033	0.11	Q				
0+40	0.0041	0.12	Q				
0+45	0.0050	0.12	Q				
0+50	0.0058	0.13	Q				
0+55	0.0068	0.14	Q				
1+ 0	0.0079	0.16	Q				
1+ 5	0.0090	0.16	Q				
1+10	0.0100	0.15	Q				
1+15	0.0110	0.14	Q				
1+20	0.0119	0.14	Q				
1+25	0.0129	0.14	Q				
1+30	0.0138	0.13	Q				
1+35	0.0147	0.13	Q				
1+40	0.0156	0.13	Q				
1+45	0.0165	0.13	Q				
1+50	0.0175	0.14	Q				
1+55	0.0185	0.15	Q				
2+ 0	0.0196	0.16	Q				
2+ 5	0.0207	0.17	Q				
2+10	0.0219	0.17	Q				

2+15	0.0231	0.17	Q
2+20	0.0242	0.17	Q
2+25	0.0254	0.17	Q
2+30	0.0266	0.17	Q
2+35	0.0278	0.18	Q
2+40	0.0291	0.19	Q
2+45	0.0305	0.20	Q
2+50	0.0320	0.21	Q
2+55	0.0334	0.21	Q
3+ 0	0.0349	0.21	Q
3+ 5	0.0364	0.21	Q
3+10	0.0379	0.22	Q
3+15	0.0394	0.22	Q
3+20	0.0409	0.22	Q
3+25	0.0423	0.22	Q
3+30	0.0438	0.22	Q
3+35	0.0454	0.22	Q
3+40	0.0469	0.22	Q
3+45	0.0484	0.22	Q
3+50	0.0499	0.22	Q
3+55	0.0515	0.24	Q
4+ 0	0.0532	0.25	Q
4+ 5	0.0550	0.25	VQ
4+10	0.0567	0.26	VQ
4+15	0.0585	0.26	VQ
4+20	0.0603	0.26	Q
4+25	0.0622	0.28	Q
4+30	0.0642	0.29	Q
4+35	0.0662	0.29	Q
4+40	0.0683	0.30	Q
4+45	0.0703	0.30	Q
4+50	0.0724	0.30	Q
4+55	0.0746	0.32	Q
5+ 0	0.0769	0.33	Q
5+ 5	0.0792	0.33	Q
5+10	0.0813	0.31	Q
5+15	0.0833	0.29	Q
5+20	0.0852	0.28	Q
5+25	0.0872	0.29	Q
5+30	0.0893	0.30	Q
5+35	0.0914	0.31	Q
5+40	0.0936	0.32	Q
5+45	0.0959	0.33	Q
5+50	0.0982	0.34	Q
5+55	0.1006	0.34	Q
6+ 0	0.1029	0.34	Q
6+ 5	0.1053	0.35	Q
6+10	0.1078	0.36	Q
6+15	0.1104	0.38	Q
6+20	0.1131	0.38	Q
6+25	0.1157	0.39	Q
6+30	0.1184	0.39	Q
6+35	0.1211	0.39	QV
6+40	0.1239	0.41	QV
6+45	0.1268	0.42	QV
6+50	0.1297	0.43	QV
6+55	0.1327	0.43	QV
7+ 0	0.1356	0.43	QV
7+ 5	0.1386	0.43	QV
7+10	0.1416	0.43	QV
7+15	0.1446	0.43	QV
7+20	0.1476	0.44	QV
7+25	0.1507	0.45	QV
7+30	0.1539	0.47	QV
7+35	0.1572	0.47	QV
7+40	0.1606	0.49	QV
7+45	0.1641	0.50	Q
7+50	0.1676	0.51	Q
7+55	0.1713	0.53	Q
8+ 0	0.1750	0.55	Q
8+ 5	0.1789	0.56	Q
8+10	0.1829	0.59	QV
8+15	0.1872	0.62	QV
8+20	0.1915	0.63	QV
8+25	0.1959	0.64	QV

8+30	0.2004	0.64	QV
8+35	0.2048	0.65	QV
8+40	0.2094	0.67	QV
8+45	0.2141	0.68	QV
8+50	0.2188	0.69	QV
8+55	0.2237	0.71	QV
9+ 0	0.2287	0.72	QV
9+ 5	0.2337	0.73	QV
9+10	0.2390	0.77	QV
9+15	0.2445	0.79	QV
9+20	0.2501	0.81	QV
9+25	0.2560	0.86	QV
9+30	0.2623	0.91	QV
9+35	0.2691	0.98	QV
9+40	0.2771	1.16	Q
9+45	0.2862	1.32	VQ
9+50	0.2961	1.44	VQ
9+55	0.3073	1.64	VQ
10+ 0	0.3199	1.82	V Q
10+ 5	0.3323	1.80	V Q
10+10	0.3420	1.41	Q
10+15	0.3491	1.04	QV
10+20	0.3554	0.91	Q V
10+25	0.3612	0.84	Q Q V
10+30	0.3666	0.79	Q Q V
10+35	0.3723	0.82	Q Q V
10+40	0.3796	1.06	Q V
10+45	0.3884	1.29	QV
10+50	0.3980	1.39	QV
10+55	0.4080	1.45	QV
11+ 0	0.4184	1.51	QV
11+ 5	0.4289	1.53	QV
11+10	0.4388	1.43	Q Q V
11+15	0.4481	1.35	Q Q V
11+20	0.4574	1.35	Q Q V
11+25	0.4668	1.36	Q Q V
11+30	0.4763	1.39	Q Q V
11+35	0.4857	1.36	Q Q V
11+40	0.4936	1.15	Q V
11+45	0.5003	0.97	Q V
11+50	0.5067	0.92	Q Q V
11+55	0.5136	1.01	Q Q V
12+ 0	0.5212	1.10	Q Q V
12+ 5	0.5306	1.37	Q V
12+10	0.5469	2.37	Q V
12+15	0.5693	3.25	V Q
12+20	0.5944	3.65	V Q
12+25	0.6220	4.01	V Q Q
12+30	0.6516	4.30	V Q Q Q
12+35	0.6828	4.54	V Q Q Q
12+40	0.7169	4.94	V Q Q Q
12+45	0.7533	5.29	V Q Q Q
12+50	0.7912	5.50	V Q Q Q
12+55	0.8309	5.77	V Q Q Q
13+ 0	0.8722	6.00	V Q Q Q
13+ 5	0.9156	6.29	V Q Q Q
13+10	0.9643	7.08	V Q Q Q
13+15	1.0178	7.76	V Q Q Q
13+20	1.0733	8.06	V Q Q Q
13+25	1.1302	8.26	V Q Q Q
13+30	1.1880	8.40	V Q Q Q
13+35	1.2442	8.15	V Q Q Q
13+40	1.2905	6.73	V Q
13+45	1.3282	5.48	V Q
13+50	1.3627	5.01	V Q
13+55	1.3956	4.77	V Q
14+ 0	1.4273	4.61	V Q
14+ 5	1.4592	4.63	V Q
14+10	1.4944	5.12	V Q
14+15	1.5327	5.55	V Q
14+20	1.5718	5.68	V Q
14+25	1.6105	5.63	V Q
14+30	1.6489	5.57	V Q
14+35	1.6874	5.58	V Q
14+40	1.7259	5.60	V Q

14+45	1.7646	5.62				
14+50	1.8034	5.63				
14+55	1.8414	5.53				
15+ 0	1.8789	5.44				
15+ 5	1.9161	5.39				
15+10	1.9523	5.26				
15+15	1.9878	5.16				
15+20	2.0228	5.09				
15+25	2.0569	4.94				
15+30	2.0900	4.82				
15+35	2.1220	4.65				
15+40	2.1502	4.08				
15+45	2.1749	3.60				
15+50	2.1984	3.41				
15+55	2.2212	3.31				
16+ 0	2.2436	3.25				
16+ 5	2.2643	3.00				
16+10	2.2784	2.05				
16+15	2.2868	1.22				
16+20	2.2928	0.88				
16+25	2.2975	0.68				
16+30	2.3012	0.54				
16+35	2.3042	0.44				
16+40	2.3066	0.35				
16+45	2.3086	0.28				
16+50	2.3102	0.24				
16+55	2.3117	0.21				
17+ 0	2.3129	0.18				
17+ 5	2.3141	0.17				
17+10	2.3153	0.18				
17+15	2.3166	0.19				
17+20	2.3180	0.20				
17+25	2.3194	0.21				
17+30	2.3208	0.21				
17+35	2.3223	0.21				
17+40	2.3238	0.21				
17+45	2.3252	0.21				
17+50	2.3267	0.21				
17+55	2.3281	0.20				
18+ 0	2.3294	0.19				
18+ 5	2.3306	0.18				
18+10	2.3319	0.18				
18+15	2.3331	0.18				
18+20	2.3344	0.18				
18+25	2.3356	0.18				
18+30	2.3368	0.18				
18+35	2.3380	0.17				
18+40	2.3391	0.16				
18+45	2.3401	0.15				
18+50	2.3410	0.14				
18+55	2.3419	0.12				
19+ 0	2.3426	0.11				
19+ 5	2.3433	0.10				
19+10	2.3441	0.11				
19+15	2.3450	0.12				
19+20	2.3459	0.13				
19+25	2.3469	0.14				
19+30	2.3480	0.16				
19+35	2.3491	0.16				
19+40	2.3501	0.15				
19+45	2.3510	0.14				
19+50	2.3520	0.13				
19+55	2.3528	0.12				
20+ 0	2.3535	0.10				
20+ 5	2.3542	0.10				
20+10	2.3550	0.11				
20+15	2.3558	0.12				
20+20	2.3567	0.13				
20+25	2.3576	0.13				
20+30	2.3584	0.13				
20+35	2.3593	0.13				
20+40	2.3602	0.13				
20+45	2.3611	0.13				
20+50	2.3620	0.13				
20+55	2.3628	0.11				

21+ 0	2.3635	0.10	Q			V
21+ 5	2.3642	0.10	Q			V
21+10	2.3649	0.11	Q			V
21+15	2.3658	0.12	Q			V
21+20	2.3666	0.12	Q			V
21+25	2.3674	0.11	Q			V
21+30	2.3680	0.10	Q			V
21+35	2.3687	0.10	Q			V
21+40	2.3695	0.11	Q			V
21+45	2.3703	0.12	Q			V
21+50	2.3711	0.12	Q			V
21+55	2.3719	0.11	Q			V
22+ 0	2.3726	0.10	Q			V
22+ 5	2.3732	0.10	Q			V
22+10	2.3740	0.11	Q			V
22+15	2.3748	0.12	Q			V
22+20	2.3756	0.12	Q			V
22+25	2.3764	0.11	Q			V
22+30	2.3771	0.10	Q			V
22+35	2.3777	0.09	Q			V
22+40	2.3784	0.09	Q			V
22+45	2.3790	0.09	Q			V
22+50	2.3796	0.09	Q			V
22+55	2.3802	0.09	Q			V
23+ 0	2.3808	0.09	Q			V
23+ 5	2.3814	0.09	Q			V
23+10	2.3821	0.09	Q			V
23+15	2.3827	0.09	Q			V
23+20	2.3833	0.09	Q			V
23+25	2.3839	0.09	Q			V
23+30	2.3845	0.09	Q			V
23+35	2.3851	0.09	Q			V
23+40	2.3857	0.09	Q			V
23+45	2.3863	0.09	Q			V
23+50	2.3869	0.09	Q			V
23+55	2.3875	0.09	Q			V
24+ 0	2.3881	0.09	Q			V
24+ 5	2.3886	0.08	Q			V
24+10	2.3890	0.05	Q			V
24+15	2.3892	0.03	Q			V
24+20	2.3893	0.02	Q			V
24+25	2.3894	0.01	Q			V
24+30	2.3895	0.01	Q			V
24+35	2.3896	0.01	Q			V
24+40	2.3896	0.01	Q			V
24+45	2.3896	0.00	Q			V
24+50	2.3897	0.00	Q			V
24+55	2.3897	0.00	Q			V
25+ 0	2.3897	0.00	Q			V
25+ 5	2.3897	0.00	Q			V
25+10	2.3897	0.00	Q			V

*Proposed Unit Hydrograph  
2-year, 24-hour Storm Event*

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1  
Study date 11/17/22 File: ONSITEPROPWEST242.out

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Riverside County Synthetic Unit Hydrology Method  
RCFC & WCD Manual date - April 1978

Program License Serial Number 4010

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English (in-lb) Input Units Used  
English Rainfall Data (Inches) Input Values Used

English Units used in output format

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21-0235 - PERRIS AIRPORT LOGISTICS CENTER  
ONSITE UNIT HYDROGRAPH ANALYSIS  
PROPOSED CONDITION, 2-YEAR  
FN: ONSITEPROPWEST, ABE, 2022-11-17

-----  
Drainage Area = 60.20(Ac.) = 0.094 Sq. Mi.  
Drainage Area for Depth-Area Area Adjustment = 60.20(Ac.) = 0.094 Sq. Mi.  
Length along longest watercourse = 2740.00(Ft.)  
Length along longest watercourse measured to centroid = 1139.00(Ft.)  
Length along longest watercourse = 0.519 Mi.  
Length along longest watercourse measured to centroid = 0.216 Mi.  
Difference in elevation = 16.00(Ft.)  
Slope along watercourse = 30.8321 Ft./Mi.  
Average Manning's 'N' = 0.015  
Lag time = 0.082 Hr.  
Lag time = 4.90 Min.  
25% of lag time = 1.22 Min.  
40% of lag time = 1.96 Min.  
Unit time = 5.00 Min.  
Duration of storm = 24 Hour(s)  
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
60.20	1.80	108.36

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	weighting[1*2]
60.20	5.00	301.00

STORM EVENT (YEAR) = 2.00  
Area Averaged 2-Year Rainfall = 1.800(In)  
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 1.800(In)  
Areal adjustment factor = 99.99 %  
Adjusted average point rain = 1.800(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
60.200	69.00	0.900
Total Area Entered = 60.20(Ac.)		

RI	RI	Infil. Rate	Impervious	Adj. Infil. Rate	Area%	F
AMC2	AMC-2	(In/Hr)	(Dec.%)	(In/Hr)	(Dec.)	(In/Hr)

69.0 69.0 0.373 0.900 0.071 1.000 0.071  
 Sum (F) = 0.071  
 Area averaged mean soil loss (F) (In/Hr) = 0.071  
 Minimum soil loss rate ((In/Hr)) = 0.035  
 (for 24 hour storm duration)  
 Soil low loss rate (decimal) = 0.200

Unit Hydrograph  
 VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	102.048	19.829
2	0.167	204.096	48.543
3	0.250	306.144	15.333
4	0.333	408.192	6.955
5	0.417	510.240	3.895
6	0.500	612.288	2.514
7	0.583	714.336	1.536
8	0.667	816.384	1.395
Sum = 100.000			Sum= 60.670

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max   Low	Effective (In/Hr)
1	0.08	0.014	( 0.126)   0.003	0.012
2	0.17	0.014	( 0.125)   0.003	0.012
3	0.25	0.014	( 0.125)   0.003	0.012
4	0.33	0.022	( 0.124)   0.004	0.017
5	0.42	0.022	( 0.124)   0.004	0.017
6	0.50	0.022	( 0.123)   0.004	0.017
7	0.58	0.022	( 0.123)   0.004	0.017
8	0.67	0.022	( 0.122)   0.004	0.017
9	0.75	0.022	( 0.122)   0.004	0.017
10	0.83	0.029	( 0.121)   0.006	0.023
11	0.92	0.029	( 0.121)   0.006	0.023
12	1.00	0.029	( 0.120)   0.006	0.023
13	1.08	0.022	( 0.120)   0.004	0.017
14	1.17	0.022	( 0.119)   0.004	0.017
15	1.25	0.022	( 0.119)   0.004	0.017
16	1.33	0.022	( 0.118)   0.004	0.017
17	1.42	0.022	( 0.118)   0.004	0.017
18	1.50	0.022	( 0.117)   0.004	0.017
19	1.58	0.022	( 0.117)   0.004	0.017
20	1.67	0.022	( 0.117)   0.004	0.017
21	1.75	0.022	( 0.116)   0.004	0.017
22	1.83	0.029	( 0.116)   0.006	0.023
23	1.92	0.029	( 0.115)   0.006	0.023
24	2.00	0.029	( 0.115)   0.006	0.023
25	2.08	0.029	( 0.114)   0.006	0.023
26	2.17	0.029	( 0.114)   0.006	0.023
27	2.25	0.029	( 0.113)   0.006	0.023
28	2.33	0.029	( 0.113)   0.006	0.023
29	2.42	0.029	( 0.112)   0.006	0.023
30	2.50	0.029	( 0.112)   0.006	0.023
31	2.58	0.036	( 0.111)   0.007	0.029
32	2.67	0.036	( 0.111)   0.007	0.029
33	2.75	0.036	( 0.110)   0.007	0.029
34	2.83	0.036	( 0.110)   0.007	0.029
35	2.92	0.036	( 0.110)   0.007	0.029
36	3.00	0.036	( 0.109)   0.007	0.029
37	3.08	0.036	( 0.109)   0.007	0.029
38	3.17	0.036	( 0.108)   0.007	0.029
39	3.25	0.036	( 0.108)   0.007	0.029
40	3.33	0.036	( 0.107)   0.007	0.029
41	3.42	0.036	( 0.107)   0.007	0.029
42	3.50	0.036	( 0.106)   0.007	0.029

43	3.58	0.17	0.036	( 0.106)	0.007	0.029
44	3.67	0.17	0.036	( 0.106)	0.007	0.029
45	3.75	0.17	0.036	( 0.105)	0.007	0.029
46	3.83	0.20	0.043	( 0.105)	0.009	0.035
47	3.92	0.20	0.043	( 0.104)	0.009	0.035
48	4.00	0.20	0.043	( 0.104)	0.009	0.035
49	4.08	0.20	0.043	( 0.103)	0.009	0.035
50	4.17	0.20	0.043	( 0.103)	0.009	0.035
51	4.25	0.20	0.043	( 0.102)	0.009	0.035
52	4.33	0.23	0.050	( 0.102)	0.010	0.040
53	4.42	0.23	0.050	( 0.102)	0.010	0.040
54	4.50	0.23	0.050	( 0.101)	0.010	0.040
55	4.58	0.23	0.050	( 0.101)	0.010	0.040
56	4.67	0.23	0.050	( 0.100)	0.010	0.040
57	4.75	0.23	0.050	( 0.100)	0.010	0.040
58	4.83	0.27	0.058	( 0.099)	0.012	0.046
59	4.92	0.27	0.058	( 0.099)	0.012	0.046
60	5.00	0.27	0.058	( 0.099)	0.012	0.046
61	5.08	0.20	0.043	( 0.098)	0.009	0.035
62	5.17	0.20	0.043	( 0.098)	0.009	0.035
63	5.25	0.20	0.043	( 0.097)	0.009	0.035
64	5.33	0.23	0.050	( 0.097)	0.010	0.040
65	5.42	0.23	0.050	( 0.096)	0.010	0.040
66	5.50	0.23	0.050	( 0.096)	0.010	0.040
67	5.58	0.27	0.058	( 0.096)	0.012	0.046
68	5.67	0.27	0.058	( 0.095)	0.012	0.046
69	5.75	0.27	0.058	( 0.095)	0.012	0.046
70	5.83	0.27	0.058	( 0.094)	0.012	0.046
71	5.92	0.27	0.058	( 0.094)	0.012	0.046
72	6.00	0.27	0.058	( 0.093)	0.012	0.046
73	6.08	0.30	0.065	( 0.093)	0.013	0.052
74	6.17	0.30	0.065	( 0.093)	0.013	0.052
75	6.25	0.30	0.065	( 0.092)	0.013	0.052
76	6.33	0.30	0.065	( 0.092)	0.013	0.052
77	6.42	0.30	0.065	( 0.091)	0.013	0.052
78	6.50	0.30	0.065	( 0.091)	0.013	0.052
79	6.58	0.33	0.072	( 0.091)	0.014	0.058
80	6.67	0.33	0.072	( 0.090)	0.014	0.058
81	6.75	0.33	0.072	( 0.090)	0.014	0.058
82	6.83	0.33	0.072	( 0.089)	0.014	0.058
83	6.92	0.33	0.072	( 0.089)	0.014	0.058
84	7.00	0.33	0.072	( 0.089)	0.014	0.058
85	7.08	0.33	0.072	( 0.088)	0.014	0.058
86	7.17	0.33	0.072	( 0.088)	0.014	0.058
87	7.25	0.33	0.072	( 0.087)	0.014	0.058
88	7.33	0.37	0.079	( 0.087)	0.016	0.063
89	7.42	0.37	0.079	( 0.087)	0.016	0.063
90	7.50	0.37	0.079	( 0.086)	0.016	0.063
91	7.58	0.40	0.086	( 0.086)	0.017	0.069
92	7.67	0.40	0.086	( 0.085)	0.017	0.069
93	7.75	0.40	0.086	( 0.085)	0.017	0.069
94	7.83	0.43	0.094	( 0.085)	0.019	0.075
95	7.92	0.43	0.094	( 0.084)	0.019	0.075
96	8.00	0.43	0.094	( 0.084)	0.019	0.075
97	8.08	0.50	0.108	( 0.083)	0.022	0.086
98	8.17	0.50	0.108	( 0.083)	0.022	0.086
99	8.25	0.50	0.108	( 0.083)	0.022	0.086
100	8.33	0.50	0.108	( 0.082)	0.022	0.086
101	8.42	0.50	0.108	( 0.082)	0.022	0.086
102	8.50	0.50	0.108	( 0.082)	0.022	0.086
103	8.58	0.53	0.115	( 0.081)	0.023	0.092
104	8.67	0.53	0.115	( 0.081)	0.023	0.092
105	8.75	0.53	0.115	( 0.080)	0.023	0.092
106	8.83	0.57	0.122	( 0.080)	0.024	0.098
107	8.92	0.57	0.122	( 0.080)	0.024	0.098
108	9.00	0.57	0.122	( 0.079)	0.024	0.098
109	9.08	0.63	0.137	( 0.079)	0.027	0.109
110	9.17	0.63	0.137	( 0.078)	0.027	0.109
111	9.25	0.63	0.137	( 0.078)	0.027	0.109
112	9.33	0.67	0.144	( 0.078)	0.029	0.115
113	9.42	0.67	0.144	( 0.077)	0.029	0.115
114	9.50	0.67	0.144	( 0.077)	0.029	0.115
115	9.58	0.70	0.151	( 0.077)	0.030	0.121
116	9.67	0.70	0.151	( 0.076)	0.030	0.121
117	9.75	0.70	0.151	( 0.076)	0.030	0.121

118	9.83	0.73	0.158	( 0.076)	0.032	0.127
119	9.92	0.73	0.158	( 0.075)	0.032	0.127
120	10.00	0.73	0.158	( 0.075)	0.032	0.127
121	10.08	0.50	0.108	( 0.074)	0.022	0.086
122	10.17	0.50	0.108	( 0.074)	0.022	0.086
123	10.25	0.50	0.108	( 0.074)	0.022	0.086
124	10.33	0.50	0.108	( 0.073)	0.022	0.086
125	10.42	0.50	0.108	( 0.073)	0.022	0.086
126	10.50	0.50	0.108	( 0.073)	0.022	0.086
127	10.58	0.67	0.144	( 0.072)	0.029	0.115
128	10.67	0.67	0.144	( 0.072)	0.029	0.115
129	10.75	0.67	0.144	( 0.072)	0.029	0.115
130	10.83	0.67	0.144	( 0.071)	0.029	0.115
131	10.92	0.67	0.144	( 0.071)	0.029	0.115
132	11.00	0.67	0.144	( 0.071)	0.029	0.115
133	11.08	0.63	0.137	( 0.070)	0.027	0.109
134	11.17	0.63	0.137	( 0.070)	0.027	0.109
135	11.25	0.63	0.137	( 0.069)	0.027	0.109
136	11.33	0.63	0.137	( 0.069)	0.027	0.109
137	11.42	0.63	0.137	( 0.069)	0.027	0.109
138	11.50	0.63	0.137	( 0.068)	0.027	0.109
139	11.58	0.57	0.122	( 0.068)	0.024	0.098
140	11.67	0.57	0.122	( 0.068)	0.024	0.098
141	11.75	0.57	0.122	( 0.067)	0.024	0.098
142	11.83	0.60	0.130	( 0.067)	0.026	0.104
143	11.92	0.60	0.130	( 0.067)	0.026	0.104
144	12.00	0.60	0.130	( 0.066)	0.026	0.104
145	12.08	0.83	0.180	( 0.066)	0.036	0.144
146	12.17	0.83	0.180	( 0.066)	0.036	0.144
147	12.25	0.83	0.180	( 0.065)	0.036	0.144
148	12.33	0.87	0.187	( 0.065)	0.037	0.150
149	12.42	0.87	0.187	( 0.065)	0.037	0.150
150	12.50	0.87	0.187	( 0.064)	0.037	0.150
151	12.58	0.93	0.202	( 0.064)	0.040	0.161
152	12.67	0.93	0.202	( 0.064)	0.040	0.161
153	12.75	0.93	0.202	( 0.064)	0.040	0.161
154	12.83	0.97	0.209	( 0.063)	0.042	0.167
155	12.92	0.97	0.209	( 0.063)	0.042	0.167
156	13.00	0.97	0.209	( 0.063)	0.042	0.167
157	13.08	1.13	0.245	( 0.062)	0.049	0.196
158	13.17	1.13	0.245	( 0.062)	0.049	0.196
159	13.25	1.13	0.245	( 0.062)	0.049	0.196
160	13.33	1.13	0.245	( 0.061)	0.049	0.196
161	13.42	1.13	0.245	( 0.061)	0.049	0.196
162	13.50	1.13	0.245	( 0.061)	0.049	0.196
163	13.58	0.77	0.166	( 0.060)	0.033	0.132
164	13.67	0.77	0.166	( 0.060)	0.033	0.132
165	13.75	0.77	0.166	( 0.060)	0.033	0.132
166	13.83	0.77	0.166	( 0.059)	0.033	0.132
167	13.92	0.77	0.166	( 0.059)	0.033	0.132
168	14.00	0.77	0.166	( 0.059)	0.033	0.132
169	14.08	0.90	0.194	( 0.059)	0.039	0.156
170	14.17	0.90	0.194	( 0.058)	0.039	0.156
171	14.25	0.90	0.194	( 0.058)	0.039	0.156
172	14.33	0.87	0.187	( 0.058)	0.037	0.150
173	14.42	0.87	0.187	( 0.057)	0.037	0.150
174	14.50	0.87	0.187	( 0.057)	0.037	0.150
175	14.58	0.87	0.187	( 0.057)	0.037	0.150
176	14.67	0.87	0.187	( 0.056)	0.037	0.150
177	14.75	0.87	0.187	( 0.056)	0.037	0.150
178	14.83	0.83	0.180	( 0.056)	0.036	0.144
179	14.92	0.83	0.180	( 0.056)	0.036	0.144
180	15.00	0.83	0.180	( 0.055)	0.036	0.144
181	15.08	0.80	0.173	( 0.055)	0.035	0.138
182	15.17	0.80	0.173	( 0.055)	0.035	0.138
183	15.25	0.80	0.173	( 0.054)	0.035	0.138
184	15.33	0.77	0.166	( 0.054)	0.033	0.132
185	15.42	0.77	0.166	( 0.054)	0.033	0.132
186	15.50	0.77	0.166	( 0.054)	0.033	0.132
187	15.58	0.63	0.137	( 0.053)	0.027	0.109
188	15.67	0.63	0.137	( 0.053)	0.027	0.109
189	15.75	0.63	0.137	( 0.053)	0.027	0.109
190	15.83	0.63	0.137	( 0.053)	0.027	0.109
191	15.92	0.63	0.137	( 0.052)	0.027	0.109
192	16.00	0.63	0.137	( 0.052)	0.027	0.109

193	16.08	0.13	0.029	( 0.052)	0.006	0.023
194	16.17	0.13	0.029	( 0.051)	0.006	0.023
195	16.25	0.13	0.029	( 0.051)	0.006	0.023
196	16.33	0.13	0.029	( 0.051)	0.006	0.023
197	16.42	0.13	0.029	( 0.051)	0.006	0.023
198	16.50	0.13	0.029	( 0.050)	0.006	0.023
199	16.58	0.10	0.022	( 0.050)	0.004	0.017
200	16.67	0.10	0.022	( 0.050)	0.004	0.017
201	16.75	0.10	0.022	( 0.050)	0.004	0.017
202	16.83	0.10	0.022	( 0.049)	0.004	0.017
203	16.92	0.10	0.022	( 0.049)	0.004	0.017
204	17.00	0.10	0.022	( 0.049)	0.004	0.017
205	17.08	0.17	0.036	( 0.049)	0.007	0.029
206	17.17	0.17	0.036	( 0.048)	0.007	0.029
207	17.25	0.17	0.036	( 0.048)	0.007	0.029
208	17.33	0.17	0.036	( 0.048)	0.007	0.029
209	17.42	0.17	0.036	( 0.048)	0.007	0.029
210	17.50	0.17	0.036	( 0.047)	0.007	0.029
211	17.58	0.17	0.036	( 0.047)	0.007	0.029
212	17.67	0.17	0.036	( 0.047)	0.007	0.029
213	17.75	0.17	0.036	( 0.047)	0.007	0.029
214	17.83	0.13	0.029	( 0.047)	0.006	0.023
215	17.92	0.13	0.029	( 0.046)	0.006	0.023
216	18.00	0.13	0.029	( 0.046)	0.006	0.023
217	18.08	0.13	0.029	( 0.046)	0.006	0.023
218	18.17	0.13	0.029	( 0.046)	0.006	0.023
219	18.25	0.13	0.029	( 0.045)	0.006	0.023
220	18.33	0.13	0.029	( 0.045)	0.006	0.023
221	18.42	0.13	0.029	( 0.045)	0.006	0.023
222	18.50	0.13	0.029	( 0.045)	0.006	0.023
223	18.58	0.10	0.022	( 0.045)	0.004	0.017
224	18.67	0.10	0.022	( 0.044)	0.004	0.017
225	18.75	0.10	0.022	( 0.044)	0.004	0.017
226	18.83	0.07	0.014	( 0.044)	0.003	0.012
227	18.92	0.07	0.014	( 0.044)	0.003	0.012
228	19.00	0.07	0.014	( 0.043)	0.003	0.012
229	19.08	0.10	0.022	( 0.043)	0.004	0.017
230	19.17	0.10	0.022	( 0.043)	0.004	0.017
231	19.25	0.10	0.022	( 0.043)	0.004	0.017
232	19.33	0.13	0.029	( 0.043)	0.006	0.023
233	19.42	0.13	0.029	( 0.042)	0.006	0.023
234	19.50	0.13	0.029	( 0.042)	0.006	0.023
235	19.58	0.10	0.022	( 0.042)	0.004	0.017
236	19.67	0.10	0.022	( 0.042)	0.004	0.017
237	19.75	0.10	0.022	( 0.042)	0.004	0.017
238	19.83	0.07	0.014	( 0.041)	0.003	0.012
239	19.92	0.07	0.014	( 0.041)	0.003	0.012
240	20.00	0.07	0.014	( 0.041)	0.003	0.012
241	20.08	0.10	0.022	( 0.041)	0.004	0.017
242	20.17	0.10	0.022	( 0.041)	0.004	0.017
243	20.25	0.10	0.022	( 0.041)	0.004	0.017
244	20.33	0.10	0.022	( 0.040)	0.004	0.017
245	20.42	0.10	0.022	( 0.040)	0.004	0.017
246	20.50	0.10	0.022	( 0.040)	0.004	0.017
247	20.58	0.10	0.022	( 0.040)	0.004	0.017
248	20.67	0.10	0.022	( 0.040)	0.004	0.017
249	20.75	0.10	0.022	( 0.040)	0.004	0.017
250	20.83	0.07	0.014	( 0.039)	0.003	0.012
251	20.92	0.07	0.014	( 0.039)	0.003	0.012
252	21.00	0.07	0.014	( 0.039)	0.003	0.012
253	21.08	0.10	0.022	( 0.039)	0.004	0.017
254	21.17	0.10	0.022	( 0.039)	0.004	0.017
255	21.25	0.10	0.022	( 0.039)	0.004	0.017
256	21.33	0.07	0.014	( 0.038)	0.003	0.012
257	21.42	0.07	0.014	( 0.038)	0.003	0.012
258	21.50	0.07	0.014	( 0.038)	0.003	0.012
259	21.58	0.10	0.022	( 0.038)	0.004	0.017
260	21.67	0.10	0.022	( 0.038)	0.004	0.017
261	21.75	0.10	0.022	( 0.038)	0.004	0.017
262	21.83	0.07	0.014	( 0.038)	0.003	0.012
263	21.92	0.07	0.014	( 0.038)	0.003	0.012
264	22.00	0.07	0.014	( 0.037)	0.003	0.012
265	22.08	0.10	0.022	( 0.037)	0.004	0.017
266	22.17	0.10	0.022	( 0.037)	0.004	0.017
267	22.25	0.10	0.022	( 0.037)	0.004	0.017

268	22.33	0.07	0.014	( 0.037)	0.003	0.012
269	22.42	0.07	0.014	( 0.037)	0.003	0.012
270	22.50	0.07	0.014	( 0.037)	0.003	0.012
271	22.58	0.07	0.014	( 0.037)	0.003	0.012
272	22.67	0.07	0.014	( 0.036)	0.003	0.012
273	22.75	0.07	0.014	( 0.036)	0.003	0.012
274	22.83	0.07	0.014	( 0.036)	0.003	0.012
275	22.92	0.07	0.014	( 0.036)	0.003	0.012
276	23.00	0.07	0.014	( 0.036)	0.003	0.012
277	23.08	0.07	0.014	( 0.036)	0.003	0.012
278	23.17	0.07	0.014	( 0.036)	0.003	0.012
279	23.25	0.07	0.014	( 0.036)	0.003	0.012
280	23.33	0.07	0.014	( 0.036)	0.003	0.012
281	23.42	0.07	0.014	( 0.036)	0.003	0.012
282	23.50	0.07	0.014	( 0.036)	0.003	0.012
283	23.58	0.07	0.014	( 0.036)	0.003	0.012
284	23.67	0.07	0.014	( 0.036)	0.003	0.012
285	23.75	0.07	0.014	( 0.036)	0.003	0.012
286	23.83	0.07	0.014	( 0.035)	0.003	0.012
287	23.92	0.07	0.014	( 0.035)	0.003	0.012
288	24.00	0.07	0.014	( 0.035)	0.003	0.012

(Loss Rate Not Used)

Sum = 100.0 Sum = 17.3

Flood volume = Effective rainfall 1.44(In)  
times area 60.2(Ac.)/[In]/(Ft.) = 7.2(Ac.Ft)  
Total soil loss = 0.36(In)  
Total soil loss = 1.806(Ac.Ft)  
Total rainfall = 1.80(In)  
Flood volume = 314640.4 Cubic Feet  
Total soil loss = 78660.1 Cubic Feet

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Peak flow rate of this hydrograph = 11.835(CFS)  
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24 - H O U R S T O R M  
R u n o f f H y d r o g r a p h  
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Hydrograph in 5 Minute intervals ((CFS))  
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Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0010	0.14	Q				
0+10	0.0042	0.48	Q				
0+15	0.0083	0.59	VQ				
0+20	0.0131	0.70	VQ				
0+25	0.0193	0.90	VQ				
0+30	0.0260	0.97	VQ				
0+35	0.0329	1.01	V Q				
0+40	0.0400	1.03	V Q				
0+45	0.0472	1.04	V Q				
0+50	0.0549	1.11	V Q				
0+55	0.0637	1.29	V Q				
1+ 0	0.0730	1.34	V Q				
1+ 5	0.0819	1.30	V Q				
1+10	0.0897	1.14	V Q				
1+15	0.0973	1.10	V Q				
1+20	0.1047	1.08	V Q				
1+25	0.1121	1.07	V Q				
1+30	0.1194	1.06	V Q				
1+35	0.1266	1.05	V Q				
1+40	0.1338	1.05	V Q				
1+45	0.1411	1.05	V Q				
1+50	0.1488	1.12	V Q				
1+55	0.1576	1.29	V Q				
2+ 0	0.1669	1.34	V Q				
2+ 5	0.1763	1.37	V Q				
2+10	0.1858	1.38	VQ				
2+15	0.1953	1.39	VQ				
2+20	0.2049	1.39	VQ				
2+25	0.2146	1.40	VQ				
2+30	0.2242	1.40	VQ				
2+35	0.2343	1.47	VQ				
2+40	0.2456	1.64	V Q				
2+45	0.2572	1.69	V Q				

2+50	0.2690	1.72	V Q
2+55	0.2809	1.73	V Q
3+ 0	0.2929	1.74	V Q
3+ 5	0.3049	1.74	V Q
3+10	0.3170	1.75	V Q
3+15	0.3290	1.75	V Q
3+20	0.3410	1.75	V Q
3+25	0.3531	1.75	V Q
3+30	0.3651	1.75	VQ
3+35	0.3771	1.75	VQ
3+40	0.3892	1.75	VQ
3+45	0.4012	1.75	VQ
3+50	0.4137	1.82	VQ
3+55	0.4274	1.99	VQ
4+ 0	0.4415	2.04	V Q
4+ 5	0.4557	2.06	V Q
4+10	0.4700	2.08	V Q
4+15	0.4844	2.09	V Q
4+20	0.4993	2.16	V Q
4+25	0.5154	2.34	V Q
4+30	0.5318	2.39	V Q
4+35	0.5485	2.41	VQ
4+40	0.5652	2.43	VQ
4+45	0.5820	2.44	VQ
4+50	0.5993	2.51	V Q
4+55	0.6178	2.69	V Q
5+ 0	0.6366	2.74	V Q
5+ 5	0.6547	2.63	V Q
5+10	0.6706	2.30	VQ
5+15	0.6857	2.20	VQ
5+20	0.7011	2.23	VQ
5+25	0.7174	2.37	VQ
5+30	0.7340	2.41	Q
5+35	0.7512	2.49	Q
5+40	0.7696	2.67	VQ
5+45	0.7884	2.73	VQ
5+50	0.8074	2.76	VQ
5+55	0.8265	2.78	VQ
6+ 0	0.8457	2.79	VQ
6+ 5	0.8654	2.86	VQ
6+10	0.8863	3.04	V Q
6+15	0.9076	3.09	VQ
6+20	0.9290	3.11	VQ
6+25	0.9506	3.13	VQ
6+30	0.9722	3.14	VQ
6+35	0.9943	3.21	VQ
6+40	1.0176	3.39	VQ
6+45	1.0413	3.44	VQ
6+50	1.0651	3.46	VQ
6+55	1.0891	3.48	Q
7+ 0	1.1131	3.49	Q
7+ 5	1.1371	3.49	Q
7+10	1.1612	3.50	Q
7+15	1.1853	3.50	Q
7+20	1.2098	3.57	VQ
7+25	1.2355	3.74	VQ
7+30	1.2616	3.79	VQ
7+35	1.2884	3.88	Q
7+40	1.3164	4.07	VQ
7+45	1.3448	4.13	VQ
7+50	1.3739	4.23	VQ
7+55	1.4043	4.42	VQ
8+ 0	1.4352	4.48	VQ
8+ 5	1.4672	4.65	VQ
8+10	1.5016	5.00	V Q
8+15	1.5369	5.12	V Q
8+20	1.5725	5.17	V Q
8+25	1.6084	5.21	V Q
8+30	1.6443	5.22	VQ
8+35	1.6809	5.30	VQ
8+40	1.7186	5.48	VQ
8+45	1.7568	5.54	V Q
8+50	1.7955	5.63	V Q
8+55	1.8356	5.81	VQ
9+ 0	1.8760	5.88	VQ

9+ 5	1.9177	6.04	V Q
9+10	1.9618	6.40	V Q
9+15	2.0067	6.52	V Q Q
9+20	2.0524	6.64	V Q Q
9+25	2.0995	6.84	V Q Q
9+30	2.1471	6.91	V Q Q
9+35	2.1955	7.02	V Q Q
9+40	2.2452	7.21	V Q Q
9+45	2.2953	7.27	V Q Q
9+50	2.3460	7.37	V Q Q
9+55	2.3981	7.56	V Q Q
10+ 0	2.4506	7.62	V Q Q
10+ 5	2.5000	7.17	V Q Q
10+10	2.5413	6.00	Q V
10+15	2.5801	5.63	Q V
10+20	2.6178	5.47	Q V
10+25	2.6548	5.38	Q V
10+30	2.6914	5.32	Q V
10+35	2.7301	5.62	Q V
10+40	2.7745	6.44	Q V
10+45	2.8207	6.71	Q V
10+50	2.8677	6.83	Q V
10+55	2.9152	6.90	Q V
11+ 0	2.9630	6.94	Q V
11+ 5	3.0105	6.90	Q V
11+10	3.0570	6.75	Q V
11+15	3.1032	6.70	Q V
11+20	3.1491	6.68	Q V
11+25	3.1950	6.66	Q V
11+30	3.2408	6.65	Q V
11+35	3.2857	6.51	Q V
11+40	3.3281	6.16	Q V
11+45	3.3698	6.06	Q V
11+50	3.4117	6.08	Q V
11+55	3.4545	6.22	Q V
12+ 0	3.4976	6.26	Q V
12+ 5	3.5441	6.76	Q V
12+10	3.5989	7.95	Q V
12+15	3.6562	8.33	Q V
12+20	3.7153	8.58	Q V
12+25	3.7762	8.85	Q V
12+30	3.8379	8.96	Q V
12+35	3.9010	9.16	Q V
12+40	3.9668	9.55	Q V
12+45	4.0334	9.66	Q V
12+50	4.1008	9.79	Q V
12+55	4.1696	9.99	Q V
13+ 0	4.2389	10.06	Q V
13+ 5	4.3108	10.44	Q V
13+10	4.3887	11.31	Q V
13+15	4.4685	11.59	Q V
13+20	4.5492	11.72	Q V
13+25	4.6304	11.79	Q V
13+30	4.7120	11.84	Q V
13+35	4.7884	11.10	Q V
13+40	4.8521	9.26	Q V
13+45	4.9118	8.67	Q V
13+50	4.9697	8.40	Q V
13+55	5.0265	8.25	Q V
14+ 0	5.0827	8.15	Q V
14+ 5	5.1403	8.37	Q V
14+10	5.2023	9.00	Q V
14+15	5.2657	9.21	Q V
14+20	5.3294	9.24	Q V
14+25	5.3922	9.12	Q V
14+30	5.4549	9.11	Q V
14+35	5.5176	9.10	Q V
14+40	5.5803	9.11	Q V
14+45	5.6430	9.10	Q V
14+50	5.7052	9.03	Q V
14+55	5.7661	8.85	Q V
15+ 0	5.8267	8.80	Q V
15+ 5	5.8866	8.70	Q V
15+10	5.9453	8.52	Q V
15+15	6.0036	8.46	Q V

15+20	6.0611	8.36				V
15+25	6.1174	8.17				V
15+30	6.1732	8.11				V
15+35	6.2270	7.80				V
15+40	6.2759	7.10				V
15+45	6.3233	6.88				V
15+50	6.3700	6.78				V
15+55	6.4162	6.72				V
16+ 0	6.4623	6.68				V
16+ 5	6.5010	5.62				V
16+10	6.5220	3.06				V
16+15	6.5375	2.25				V
16+20	6.5505	1.89				V
16+25	6.5621	1.68				V
16+30	6.5728	1.55				V
16+35	6.5825	1.40				V
16+40	6.5905	1.16				V
16+45	6.5981	1.11				V
16+50	6.6055	1.08				V
16+55	6.6129	1.07				V
17+ 0	6.6202	1.06				V
17+ 5	6.6284	1.19				V
17+10	6.6389	1.53				V
17+15	6.6502	1.63				V
17+20	6.6618	1.68				V
17+25	6.6735	1.71				V
17+30	6.6854	1.73				V
17+35	6.6974	1.74				V
17+40	6.7094	1.75				V
17+45	6.7215	1.75				V
17+50	6.7330	1.68				V
17+55	6.7434	1.51				V
18+ 0	6.7535	1.46				V
18+ 5	6.7633	1.43				V
18+10	6.7731	1.42				V
18+15	6.7828	1.41				V
18+20	6.7924	1.40				V
18+25	6.8021	1.40				V
18+30	6.8117	1.40				V
18+35	6.8209	1.33				V
18+40	6.8288	1.16				V
18+45	6.8365	1.11				V
18+50	6.8434	1.01				V
18+55	6.8491	0.83				V
19+ 0	6.8544	0.77				V
19+ 5	6.8600	0.81				V
19+10	6.8666	0.96				V
19+15	6.8735	1.00				V
19+20	6.8810	1.09				V
19+25	6.8897	1.27				V
19+30	6.8989	1.33				V
19+35	6.9078	1.29				V
19+40	6.9156	1.14				V
19+45	6.9232	1.10				V
19+50	6.9301	1.01				V
19+55	6.9358	0.83				V
20+ 0	6.9411	0.77				V
20+ 5	6.9466	0.81				V
20+10	6.9532	0.96				V
20+15	6.9601	1.00				V
20+20	6.9672	1.02				V
20+25	6.9743	1.03				V
20+30	6.9814	1.04				V
20+35	6.9886	1.04				V
20+40	6.9958	1.05				V
20+45	7.0030	1.05				V
20+50	7.0098	0.98				V
20+55	7.0154	0.81				V
21+ 0	7.0206	0.76				V
21+ 5	7.0261	0.80				V
21+10	7.0327	0.96				V
21+15	7.0396	1.00				V
21+20	7.0461	0.95				V
21+25	7.0516	0.79				V
21+30	7.0567	0.75				V

21+35	7.0622	0.80	Q			V
21+40	7.0688	0.96	Q			V
21+45	7.0757	1.00	Q			V
21+50	7.0823	0.95	Q			V
21+55	7.0877	0.79	Q			V
22+ 0	7.0928	0.75	Q			V
22+ 5	7.0983	0.80	Q			V
22+10	7.1049	0.96	Q			V
22+15	7.1118	1.00	Q			V
22+20	7.1184	0.95	Q			V
22+25	7.1238	0.79	Q			V
22+30	7.1290	0.75	Q			V
22+35	7.1340	0.73	Q			V
22+40	7.1389	0.72	Q			V
22+45	7.1438	0.71	Q			V
22+50	7.1486	0.70	Q			V
22+55	7.1535	0.70	Q			V
23+ 0	7.1583	0.70	Q			V
23+ 5	7.1631	0.70	Q			V
23+10	7.1679	0.70	Q			V
23+15	7.1727	0.70	Q			V
23+20	7.1775	0.70	Q			V
23+25	7.1824	0.70	Q			V
23+30	7.1872	0.70	Q			V
23+35	7.1920	0.70	Q			V
23+40	7.1968	0.70	Q			V
23+45	7.2016	0.70	Q			V
23+50	7.2064	0.70	Q			V
23+55	7.2112	0.70	Q			V
24+ 0	7.2161	0.70	Q			V
24+ 5	7.2199	0.56	Q			V
24+10	7.2214	0.22	Q			V
24+15	7.2222	0.11	Q			V
24+20	7.2227	0.07	Q			V
24+25	7.2229	0.04	Q			V
24+30	7.2231	0.02	Q			V
24+35	7.2232	0.01	Q			V

*Basin Routing*  
*2-year, 24-hour Storm Event*

### BASIN ROUTING RESULTS

	Existing Peak (cfs)	Post Peak (cfs)	Mitigated Peak (cfs)	Ponding Depth (ft)	Water Surface Elev. (ft)	Drawdown Time* (hrs)
<b>2-YEAR 1-HOUR</b>	0.00	0.00			1408.7	
<b>2-YEAR 3-HOUR</b>	0.00	0.00			1408.7	
<b>2-YEAR 6-HOUR</b>	0.00	0.00			1408.7	
<b>2-YEAR 24-HOUR</b>	8.40	11.84	7.88	1.0	1409.7	3.9

\* Drawdown time considered from the end of storm to 0.1' of basin depth. (48hr minimum per airport)



FLOOD HYDROGRAPH ROUTING PROGRAM  
 Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2005  
 Study date: 03/29/23

21-0235 PERRIS AIRPORT LOGISTICS CENTER - WEST  
 BASIN ROUTING CALCULATIONS  
 2-YEAR, 24-HOUR STORM EVENT  
 FN: BMPW.OUT ABE 2023-03-29

Program License Serial Number 4010

\*\*\*\*\* HYDROGRAPH INFORMATION \*\*\*\*\*

From study/file name: ONSITEPROPWEST242.rte  
 \*\*\*\*\*HYDROGRAPH DATA\*\*\*\*\*  
 Number of intervals = 295  
 Time interval = 5.0 (Min.)  
 Maximum/Peak flow rate = 11.835 (CFS)  
 Total volume = 7.223 (Ac.Ft)  
 Status of hydrographs being held in storage  
 Stream 1 Stream 2 Stream 3 Stream 4 Stream 5  
 Peak (CFS) 0.000 0.000 0.000 0.000 0.000  
 Vol (Ac.Ft) 0.000 0.000 0.000 0.000 0.000  
 \*\*\*\*\*

+++++  
 Process from Point/Station 101.000 to Point/Station 102.000  
 \*\*\*\* RETARDING BASIN ROUTING \*\*\*\*

User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 295  
 Hydrograph time unit = 5.000 (Min.)  
 Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)  
 Initial basin storage = 0.00 (Ac.Ft)  
 Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
0.300	0.329	6.131	0.308	0.350
1.000	1.133	6.508	1.111	1.155
1.300	1.494	16.024	1.439	1.549
2.300	2.767	59.513	2.562	2.972
3.300	4.151	125.417	3.719	4.583
4.300	5.649	207.630	4.934	6.364
5.300	7.265	303.369	6.220	8.310

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	3.0	5.92	8.88	11.84	Depth (Ft.)
0.083	0.14	0.01	0.000	O					0.00
0.167	0.48	0.04	0.002	OI					0.00
0.250	0.59	0.10	0.006	OI					0.01

0.333	0.70	0.17	0.009	OI					0.01
0.417	0.90	0.24	0.013	O I					0.01
0.500	0.97	0.33	0.018	O I					0.02
0.583	1.01	0.41	0.022	OI					0.02
0.667	1.03	0.48	0.026	OI					0.02
0.750	1.04	0.55	0.029	OI					0.03
0.833	1.11	0.61	0.033	O I					0.03
0.917	1.29	0.68	0.037	O I					0.03
1.000	1.34	0.76	0.041	OI					0.04
1.083	1.30	0.83	0.044	OI					0.04
1.167	1.14	0.87	0.047	OI					0.04
1.250	1.10	0.90	0.048	O					0.04
1.333	1.08	0.93	0.050	O					0.05
1.417	1.07	0.94	0.051	O					0.05
1.500	1.06	0.96	0.051	O					0.05
1.583	1.05	0.97	0.052	O					0.05
1.667	1.05	0.98	0.053	O					0.05
1.750	1.05	0.99	0.053	O					0.05
1.833	1.12	1.00	0.054	OI					0.05
1.917	1.29	1.02	0.055	OI					0.05
2.000	1.34	1.06	0.057	OI					0.05
2.083	1.37	1.09	0.059	OI					0.05
2.167	1.38	1.13	0.061	O					0.06
2.250	1.39	1.16	0.062	O					0.06
2.333	1.39	1.19	0.064	O					0.06
2.417	1.40	1.21	0.065	O					0.06
2.500	1.40	1.23	0.066	O					0.06
2.583	1.47	1.26	0.068	O					0.06
2.667	1.64	1.29	0.069	OI					0.06
2.750	1.69	1.34	0.072	OI					0.07
2.833	1.72	1.38	0.074	OI					0.07
2.917	1.73	1.42	0.076	OI					0.07
3.000	1.74	1.46	0.078	OI					0.07
3.083	1.74	1.49	0.080	O					0.07
3.167	1.75	1.52	0.082	O					0.07
3.250	1.75	1.55	0.083	O					0.08
3.333	1.75	1.58	0.085	O					0.08
3.417	1.75	1.60	0.086	O					0.08
3.500	1.75	1.61	0.087	O					0.08
3.583	1.75	1.63	0.088	O					0.08
3.667	1.75	1.64	0.088	O					0.08
3.750	1.75	1.66	0.089	O					0.08
3.833	1.82	1.67	0.090	O					0.08
3.917	1.99	1.70	0.091	OI					0.08
4.000	2.04	1.74	0.093	OI					0.09
4.083	2.06	1.78	0.095	OI					0.09
4.167	2.08	1.81	0.097	OI					0.09
4.250	2.09	1.84	0.099	OI					0.09
4.333	2.16	1.88	0.101	O					0.09
4.417	2.34	1.92	0.103	OI					0.09
4.500	2.39	1.98	0.106	OI					0.10
4.583	2.41	2.03	0.109	OI					0.10
4.667	2.43	2.07	0.111	OI					0.10
4.750	2.44	2.12	0.114	OI					0.10
4.833	2.51	2.16	0.116	OI					0.11
4.917	2.69	2.21	0.119	O I					0.11
5.000	2.74	2.27	0.122	OI					0.11
5.083	2.63	2.32	0.125	OI					0.11
5.167	2.30	2.34	0.126	O					0.11
5.250	2.20	2.33	0.125	IO					0.11
5.333	2.23	2.32	0.124	O					0.11
5.417	2.37	2.31	0.124	O					0.11
5.500	2.41	2.32	0.125	O					0.11
5.583	2.49	2.34	0.126	O					0.11
5.667	2.67	2.37	0.127	OI					0.12
5.750	2.73	2.41	0.129	OI					0.12
5.833	2.76	2.45	0.131	OI					0.12
5.917	2.78	2.49	0.133	OI					0.12
6.000	2.79	2.52	0.135	OI					0.12
6.083	2.86	2.56	0.137	OI					0.13
6.167	3.04	2.61	0.140	OI					0.13
6.250	3.09	2.66	0.143	OI					0.13
6.333	3.11	2.71	0.146	OI					0.13
6.417	3.13	2.76	0.148	OI					0.14
6.500	3.14	2.81	0.151	OI					0.14

6.583	3.21	2.85	0.153	OI			0.14
6.667	3.39	2.91	0.156	O I			0.14
6.750	3.44	2.97	0.159	OI			0.15
6.833	3.46	3.03	0.162	OI			0.15
6.917	3.48	3.08	0.165	OI			0.15
7.000	3.49	3.13	0.168	OI			0.15
7.083	3.49	3.17	0.170	OI			0.16
7.167	3.50	3.21	0.172	OI			0.16
7.250	3.50	3.24	0.174	OI			0.16
7.333	3.57	3.28	0.176	OI			0.16
7.417	3.74	3.32	0.178	O I			0.16
7.500	3.79	3.38	0.181	OI			0.17
7.583	3.88	3.43	0.184	OI			0.17
7.667	4.07	3.50	0.188	OI			0.17
7.750	4.13	3.57	0.192	O I			0.17
7.833	4.23	3.64	0.195	O I			0.18
7.917	4.42	3.72	0.200	O I			0.18
8.000	4.48	3.81	0.205	O I			0.19
8.083	4.65	3.90	0.209	O I			0.19
8.167	5.00	4.01	0.215	O I			0.20
8.250	5.12	4.14	0.222	O I			0.20
8.333	5.17	4.26	0.229	O I			0.21
8.417	5.21	4.37	0.235	O I			0.21
8.500	5.22	4.47	0.240	O I			0.22
8.583	5.30	4.57	0.245	O I			0.22
8.667	5.48	4.67	0.251	O I			0.23
8.750	5.54	4.77	0.256	O I			0.23
8.833	5.63	4.87	0.261	O I			0.24
8.917	5.81	4.97	0.267	O I			0.24
9.000	5.88	5.08	0.272	O I			0.25
9.083	6.04	5.18	0.278	O I			0.25
9.167	6.40	5.31	0.285	O  I			0.26
9.250	6.52	5.45	0.292	O  I			0.27
9.333	6.64	5.58	0.300	O  I			0.27
9.417	6.84	5.72	0.307	O   I			0.28
9.500	6.91	5.86	0.315	O   I			0.29
9.583	7.02	6.00	0.322	O I			0.29
9.667	7.21	6.13	0.329	O I			0.30
9.750	7.27	6.13	0.337	O I			0.31
9.833	7.37	6.14	0.345	O I			0.31
9.917	7.56	6.14	0.354	O I			0.32
10.000	7.62	6.15	0.364	O I			0.33
10.083	7.17	6.15	0.373	O I			0.34
10.167	6.00	6.15	0.376	O			0.34
10.250	5.63	6.15	0.373	IO			0.34
10.333	5.47	6.15	0.369	I O			0.33
10.417	5.38	6.15	0.364	I O			0.33
10.500	5.32	6.14	0.359	I O			0.33
10.583	5.62	6.14	0.354	IO			0.32
10.667	6.44	6.14	0.353	OI			0.32
10.750	6.71	6.14	0.356	O I			0.32
10.833	6.83	6.15	0.360	O I			0.33
10.917	6.90	6.15	0.365	O I			0.33
11.000	6.94	6.15	0.371	O I			0.34
11.083	6.90	6.15	0.376	O I			0.34
11.167	6.75	6.16	0.381	O I			0.34
11.250	6.70	6.16	0.384	O I			0.35
11.333	6.68	6.16	0.388	O I			0.35
11.417	6.66	6.16	0.392	O I			0.35
11.500	6.65	6.16	0.395	OI			0.36
11.583	6.51	6.16	0.398	OI			0.36
11.667	6.16	6.16	0.399	O			0.36
11.750	6.06	6.16	0.399	O			0.36
11.833	6.08	6.16	0.398	O			0.36
11.917	6.22	6.16	0.398	O			0.36
12.000	6.26	6.16	0.398	O			0.36
12.083	6.76	6.16	0.401	O I			0.36
12.167	7.95	6.17	0.409	O I			0.37
12.250	8.33	6.17	0.423	O I			0.38
12.333	8.58	6.18	0.438	O I			0.40
12.417	8.85	6.19	0.456	O I			0.41
12.500	8.96	6.20	0.474	O I			0.43
12.583	9.16	6.21	0.494	O I			0.44
12.667	9.55	6.22	0.516	O  I			0.46
12.750	9.66	6.23	0.539	O   I			0.48

12.833	9.79	6.24	0.563			0		I		0.50
12.917	9.99	6.25	0.588			0		I		0.53
13.000	10.06	6.26	0.614			0		I		0.55
13.083	10.44	6.28	0.641			0		I		0.57
13.167	11.31	6.29	0.673			0		I		0.60
13.250	11.59	6.31	0.708			0		I		0.63
13.333	11.72	6.33	0.745			0		I		0.66
13.417	11.79	6.34	0.783			0		I		0.69
13.500	11.84	6.36	0.820			0		I		0.73
13.583	11.10	6.38	0.855			0		I		0.76
13.667	9.26	6.39	0.881			0		I		0.78
13.750	8.67	6.40	0.899			0		I		0.80
13.833	8.40	6.41	0.914			0		I		0.81
13.917	8.25	6.41	0.927			0		I		0.82
14.000	8.15	6.42	0.939			0		I		0.83
14.083	8.37	6.42	0.952			0		I		0.84
14.167	9.00	6.43	0.968			0		I		0.86
14.250	9.21	6.44	0.986			0		I		0.87
14.333	9.24	6.45	1.005			0		I		0.89
14.417	9.12	6.46	1.024			0		I		0.90
14.500	9.11	6.47	1.042			0		I		0.92
14.583	9.10	6.47	1.060			0		I		0.94
14.667	9.11	6.48	1.078			0		I		0.95
14.750	9.10	6.49	1.096			0		I		0.97
14.833	9.03	6.50	1.114			0		I		0.98
14.917	8.85	6.51	1.131			0		I		1.00
15.000	8.80	6.84	1.146			0		I		1.01
15.083	8.70	7.16	1.158			0		I		1.02
15.167	8.52	7.40	1.167			0		I		1.03
15.250	8.46	7.58	1.174			0		I		1.03
15.333	8.36	7.72	1.179			0		I		1.04
15.417	8.17	7.81	1.182			0		I		1.04
15.500	8.11	7.87	1.184			0		I		1.04
15.583	7.80	7.88	1.185			0		I		1.04
15.667	7.10	7.81	1.182			0		I		1.04
15.750	6.88	7.67	1.177			0		I		1.04
15.833	6.78	7.53	1.172			0		I		1.03
15.917	6.72	7.40	1.167			0		I		1.03
16.000	6.68	7.29	1.162			0		I		1.02
16.083	5.62	7.10	1.155			0		I		1.02
16.167	3.06	6.64	1.138			0		I		1.00
16.250	2.25	6.50	1.111		I	0		I		0.98
16.333	1.89	6.48	1.081		I	0		I		0.95
16.417	1.68	6.47	1.048		I	0		I		0.93
16.500	1.55	6.45	1.015		I	0		I		0.90
16.583	1.40	6.44	0.981		I	0		I		0.87
16.667	1.16	6.42	0.945		I	0		I		0.84
16.750	1.11	6.40	0.909		I	0		I		0.80
16.833	1.08	6.39	0.872		I	0		I		0.77
16.917	1.07	6.37	0.836		I	0		I		0.74
17.000	1.06	6.35	0.799		I	0		I		0.71
17.083	1.19	6.33	0.763		I	0		I		0.68
17.167	1.53	6.32	0.729		I	0		I		0.65
17.250	1.63	6.30	0.697		I	0		I		0.62
17.333	1.68	6.29	0.665		I	0		I		0.59
17.417	1.71	6.27	0.633		I	0		I		0.56
17.500	1.73	6.26	0.602		I	0		I		0.54
17.583	1.74	6.24	0.571		I	0		I		0.51
17.667	1.75	6.23	0.540		I	0		I		0.48
17.750	1.75	6.22	0.509		I	0		I		0.46
17.833	1.68	6.20	0.478		I	0		I		0.43
17.917	1.51	6.19	0.446		I	0		I		0.40
18.000	1.46	6.17	0.414		I	0		I		0.37
18.083	1.43	6.16	0.381		I	0		I		0.35
18.167	1.42	6.14	0.349		I	0		I		0.32
18.250	1.41	5.91	0.317		I	0		I		0.29
18.333	1.40	5.37	0.288		I	0		I		0.26
18.417	1.40	4.89	0.262		I	0		I		0.24
18.500	1.40	4.47	0.240		I	0		I		0.22
18.583	1.33	4.09	0.220		I	0		I		0.20
18.667	1.16	3.75	0.201		I	0		I		0.18
18.750	1.11	3.43	0.184		I	0		I		0.17
18.833	1.01	3.15	0.169		I	0		I		0.15
18.917	0.83	2.88	0.154		I	0		I		0.14
19.000	0.77	2.63	0.141		I	0		I		0.13

19.083	0.81	2.41	0.129	I O				0.12
19.167	0.96	2.22	0.119	I O				0.11
19.250	1.00	2.07	0.111	I O				0.10
19.333	1.09	1.95	0.105	I O				0.10
19.417	1.27	1.86	0.100	I O				0.09
19.500	1.33	1.79	0.096	IO				0.09
19.583	1.29	1.73	0.093	IO				0.08
19.667	1.14	1.67	0.090	IO				0.08
19.750	1.10	1.60	0.086	I O				0.08
19.833	1.01	1.54	0.082	I O				0.08
19.917	0.83	1.46	0.078	IO				0.07
20.000	0.77	1.38	0.074	IO				0.07
20.083	0.81	1.31	0.070	IO				0.06
20.167	0.96	1.26	0.068	IO				0.06
20.250	1.00	1.22	0.066	IO				0.06
20.333	1.02	1.20	0.064	IO				0.06
20.417	1.03	1.18	0.063	IO				0.06
20.500	1.04	1.16	0.062	IO				0.06
20.583	1.04	1.15	0.062	IO				0.06
20.667	1.05	1.13	0.061	IO				0.06
20.750	1.05	1.12	0.060	IO				0.05
20.833	0.98	1.11	0.060	IO				0.05
20.917	0.81	1.08	0.058	O				0.05
21.000	0.76	1.05	0.056	O				0.05
21.083	0.80	1.02	0.055	O				0.05
21.167	0.96	1.00	0.054	O				0.05
21.250	1.00	1.00	0.053	O				0.05
21.333	0.95	0.99	0.053	O				0.05
21.417	0.79	0.98	0.053	O				0.05
21.500	0.75	0.95	0.051	O				0.05
21.583	0.80	0.93	0.050	O				0.05
21.667	0.96	0.93	0.050	O				0.05
21.750	1.00	0.93	0.050	O				0.05
21.833	0.95	0.94	0.050	O				0.05
21.917	0.79	0.93	0.050	O				0.05
22.000	0.75	0.91	0.049	O				0.04
22.083	0.80	0.89	0.048	O				0.04
22.167	0.96	0.89	0.048	O				0.04
22.250	1.00	0.90	0.048	O				0.04
22.333	0.95	0.91	0.049	O				0.04
22.417	0.79	0.91	0.049	O				0.04
22.500	0.75	0.89	0.048	O				0.04
22.583	0.73	0.87	0.047	IO				0.04
22.667	0.72	0.85	0.046	IO				0.04
22.750	0.71	0.84	0.045	IO				0.04
22.833	0.70	0.82	0.044	IO				0.04
22.917	0.70	0.81	0.043	IO				0.04
23.000	0.70	0.79	0.043	IO				0.04
23.083	0.70	0.78	0.042	IO				0.04
23.167	0.70	0.77	0.041	IO				0.04
23.250	0.70	0.76	0.041	IO				0.04
23.333	0.70	0.76	0.041	IO				0.04
23.417	0.70	0.75	0.040	IO				0.04
23.500	0.70	0.74	0.040	IO				0.04
23.583	0.70	0.74	0.040	O				0.04
23.667	0.70	0.73	0.039	O				0.04
23.750	0.70	0.73	0.039	O				0.04
23.833	0.70	0.73	0.039	O				0.04
23.917	0.70	0.72	0.039	O				0.04
24.000	0.70	0.72	0.039	O				0.04
24.083	0.56	0.71	0.038	O				0.03
24.167	0.22	0.67	0.036	IO				0.03
24.250	0.11	0.61	0.033	IO				0.03
24.333	0.07	0.55	0.029	IO				0.03
24.417	0.04	0.49	0.026	IO				0.02
24.500	0.02	0.43	0.023	IO				0.02
24.583	0.01	0.38	0.020	IO				0.02
24.667	0.00	0.34	0.018	O				0.02
24.750	0.00	0.30	0.016	O				0.01
24.833	0.00	0.26	0.014	O				0.01
24.917	0.00	0.23	0.012	O				0.01
25.000	0.00	0.20	0.011	O				0.01
25.083	0.00	0.18	0.009	O				0.01
25.167	0.00	0.16	0.008	O				0.01
25.250	0.00	0.14	0.007	O				0.01

25.333	0.00	0.12	0.006	0					0.01
25.417	0.00	0.11	0.006	0					0.01
25.500	0.00	0.09	0.005	0					0.00
25.583	0.00	0.08	0.004	0					0.00
25.667	0.00	0.07	0.004	0					0.00
25.750	0.00	0.06	0.003	0					0.00
25.833	0.00	0.06	0.003	0					0.00
25.917	0.00	0.05	0.003	0					0.00
26.000	0.00	0.04	0.002	0					0.00
26.083	0.00	0.04	0.002	0					0.00
26.167	0.00	0.03	0.002	0					0.00
26.250	0.00	0.03	0.002	0					0.00
26.333	0.00	0.03	0.001	0					0.00
26.417	0.00	0.02	0.001	0					0.00
26.500	0.00	0.02	0.001	0					0.00

\*\*\*\*\*HYDROGRAPH DATA\*\*\*\*\*

Number of intervals = 318  
Time interval = 5.0 (Min.)  
Maximum/Peak flow rate = 7.880 (CFS)  
Total volume = 7.222 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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# Appendix 8: Source Control

*Pollutant Sources/Source Control Checklist*

*\*To be provided during final engineering*

# Appendix 9: O&M

*Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms*

*\*To be provided during final engineering*

# Appendix 10: Educational Materials

*BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information*

*\*To be provided during final engineering*