LANGAN

Memorandum

300 Kimball Drive Parsippany, NJ 07054 T: 973.560.4900 F: 973.560.4901

To: Michael DeCarlo, Township of Verona Engineering Manager

From: Timothy Derrick, P.E.
Michael Fowler, P.E.

Info: Chris Gengaro, President – Montclair Golf Club
David Kupstas, General Manager – Montclair Golf Club
Michael Campbell, Director of Golf Course Operations – Montclair Golf Club

Date: 11 December 2019

Re: Stormwater Calculations Summary
Tennis Courts Renovation
Montclair Golf Club
Verona, New Jersey
Langan Project No.: 001039209

This technical memorandum was prepared to demonstrate that the requirements of the Stormwater Management Rule (NJAC 7:8) and Chapter 123 (Stormwater Management) of the Township of Verona Code for the renovation of the tennis courts at Montclair Golf Club (the Club) have been met. The memorandum, calculations, plans, and figures demonstrate that flows from the project area decrease due to a decrease of impervious coverage (0.23 acres) by eliminating a tennis court and tennis court practice area and therefore meet the requirements of the regulations listed above.

The proposed work includes:

- Removal of the 7 existing tennis courts and tennis practice area;
- Construction of 6 new tennis courts;
- Re-grading of the upper portion of the existing golf practice range;
- Re-sodding and installing underdrains in the lower portion of the golf practice range; and
- The reconstruction of areas affected by the improvements listed above.

The Club previously obtained a permit from the Hudson Essex Passaic Soil Conservation District for this work. The project is considered a "major development" because the work will disturb greater than 1 acre of land. Major developments are required to meet the requirements for stormwater quality, stormwater quantity, and groundwater recharge as described in the Stormwater Management Rule. How the project meets the stormwater quality, groundwater recharge, and stormwater quantity is described below and demonstrated in the attached calculations.

Stormwater Quality

Per 7:8-5.5 (a) of the Stormwater Management Rule and Section 123-9.G.(1) of the Township of Verona Code, "Stormwater management measures shall only be required for water quality control if an additional one-quarter acre of impervious surface is being proposed on a

development site." Stormwater quality measures are not required for this project because the impervious surface will decrease by 0.23 acres within the project area as shown in the attached calculations and plans.

Groundwater Recharge

In order to meet groundwater recharge requirements per 7:8-5.4(a)2.i. of the Stormwater Management Rule and Section 123-9.F.(1)(b)[1] of the Township of Verona Code, the design engineer must either demonstrate that either:

- The site maintains 100% of the average annual preconstruction groundwater recharge volume for the site; or
- Demonstrate that the increase or stormwater runoff volume for the two-year storm is infiltrated.

However, as shown on the attached soils map, the existing soil is "D type" soils. D type soils do not provide any existing infiltration and therefore there is no groundwater recharge to be compensated for and the project will maintain the average annual preconstruction groundwater recharge volume. The New Jersey Groundwater Recharge Spreadsheet has been provided to demonstrate the lack of recharge.

Stormwater Quantity

7:8-5.4(a)3 of the Stormwater Management Rule and Section 123-9.F.(1)(c) of the Township of Verona Code allows a project to meet the requirement of the rule/code in one of 3 ways. The project meets the requirements through method 1:

1. Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the 2-, 10-, and 100-year storm events do not exceed, at any point in time, the preconstruction runoff hydrographs for the same storm events;

The project does not increase the amount of stormwater leaving the site for the 2-, 10-, and 100-year storm events as described in item 1 above. Below is a summary of our hydraulic analysis for the project.

The project has two drainage areas: one area (Watershed A) that drains to a catch basin located in Prospect Avenue and the remaining area (Watershed B) that drains to the golf course. Table 1 demonstrates that the flow from Watershed A decreases for the 2-, 10-, and 100-year storm events. The flow from the project area (Watershed B) will also decrease because the area decreases and the CN value decreases as shown on the enclosed CN calculation sheet and on the watershed area plans.

Table 1 - Comparison of Existing and Proposed Peak Discharges			
	Watershed A		
	2-year Flow (cfs)	10-year Flow (cfs)	100-year Flow (cfs)
Existing	5.501	8.933	15.53
Proposed	5.246	8.741	15.47
Difference	-0.255	-0.192	-0.06

Timothy B. Derrick, P.E.
N.J. Professional Engineer License No. 4678200

Michael J. Fowler, P.E.
N.J. Professional Engineer License No. 3239800

WATERSHED AREA PLANS

LANGAN

HYDROLOGIC ANALYSIS

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Project **Montclair Golf Club - Tennis Court Reconstruction** **EAJ** Date _____

Location **Township of West Orange, Essex County, NJ** **LM** Date _____

Circle one: (Present) Developed **Existing WS A (Tennis Courts)**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
D	**IMPERVIOUS**	**98**			**1.21**	**118.58**
D	**Grass (Good)**	**80**			**0.59**	**47.20**
D	**Woods (Poor)**	**77**			**0.06**	**4.62**
1 Use only one CN source per line				Totals =	**1.86**	**170.40**

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{170.40}{1.86} = 91.61$$

Use CN = **92**

Project **Montclair Golf Club - Tennis Court Reconstruction** **TD** Date **12/10/2019**

Location **Township of West Orange, Essex County, NJ** **-** Date

Circle one: (Present) Developed **Existing WS B (Practice Range)**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
D	**IMPERVIOUS**	**98**			**0.07**	**6.86**
D	**Grass (Good)**	**80**			**0.59**	**47.20**
D	**Woods (Poor)**	**77**			**0.09**	**6.93**
1 Use only one CN source per line				Totals =	**0.75**	**60.99**

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{60.99}{0.75} = 81.32$$

Use CN = **81**

Project **Montclair Golf Club - Tennis Court Reconstruction** **EAJ** Date _____

Location **Township of West Orange, Essex County, NJ** **LM** Date _____

Circle one: Present (Developed) **Proposed WS A (Tennis Courts)**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
D	**IMPERVIOUS**	**98**			**1.03**	**100.94**
D	**Grass (Good)**	**80**			**0.79**	**63.20**
D	**Woods (Poor)**	**77**			**0.06**	**4.62**
1 Use only one CN source per line				Totals =	**1.88**	**168.76**

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{168.76}{1.88} = 89.77 \qquad \text{Use CN} = \boxed{\mathbf{90}}$$

Project **Montclair Golf Club - Tennis Court Reconstruction** **EAJ** Date _____

Location **Township of West Orange, Essex County, NJ** **LM** Date _____

Circle one: Present (Developed) **Proposed WS B (Practice Range)**

1. Runoff Curve Number (CN)

Soil Name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1] Table 2-2	CN [1] Fig. 2-3	CN [1] Fig. 2-4	Area [x] acres [ ] mi^2 [ ] %	Product of CN x area
D	**IMPERVIOUS**	**98**			**0.02**	**1.96**
D	**Grass (Good)**	**80**			**0.61**	**48.80**
D	**Woods (Poor)**	**77**			**0.09**	**6.93**
1 Use only one CN source per line				Totals =	**0.72**	**57.69**

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{57.69}{0.72} = 80.13$$

Use CN = **80**

Hydraflow Table of Contents

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

2 - Year

10 - Year

100 - Year

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	5.501	1	727	17,826	------	------	------	EX WSHD A
2	SCS Runoff	5.246	1	727	16,702	------	------	------	PR WSHD A

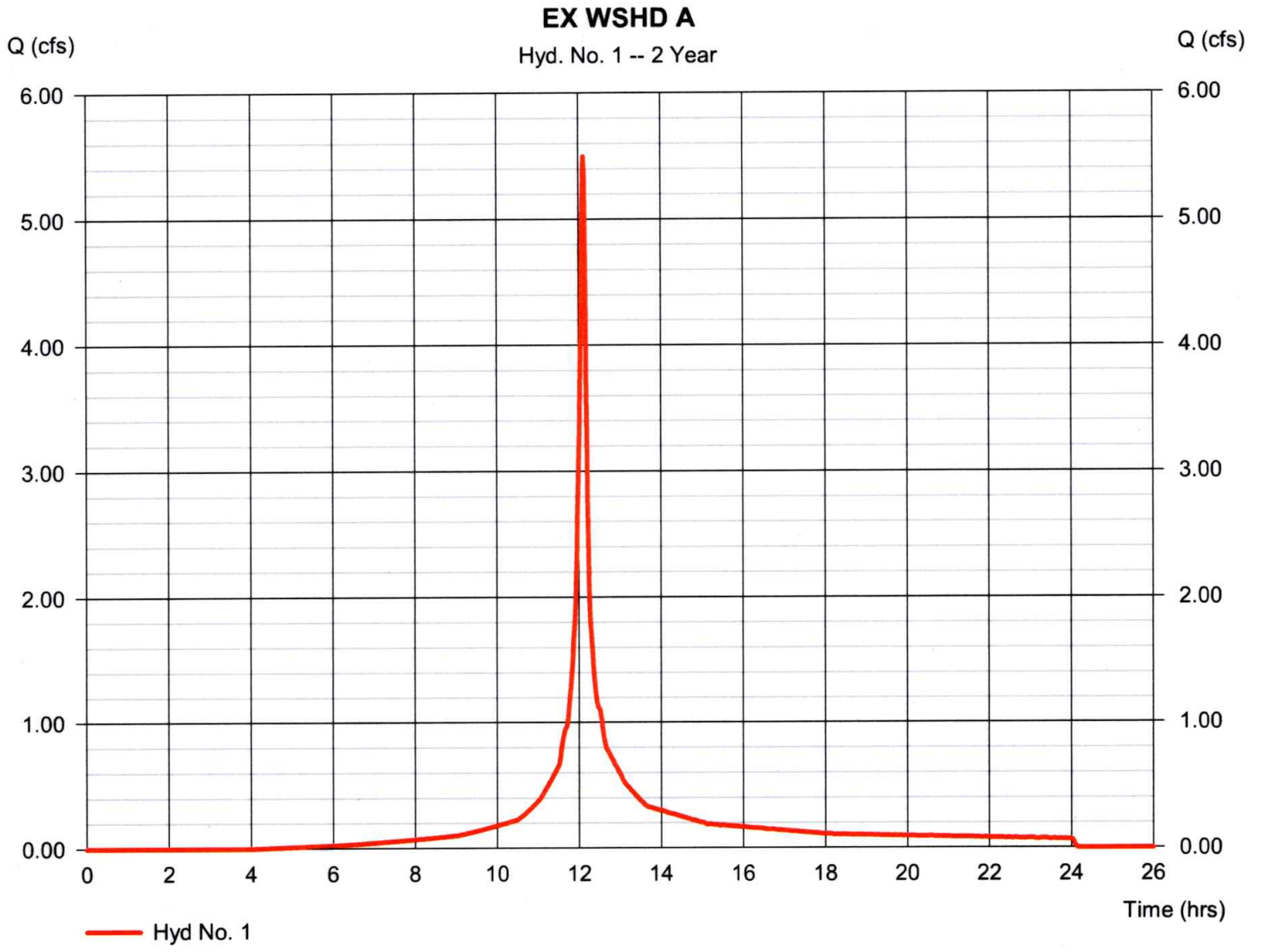
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 12 / 10 / 2019

Hyd. No. 1

EX WSHD A

Hydrograph type	= SCS Runoff	Peak discharge	= 5.501 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 17,826 cuft
Drainage area	= 1.860 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= \\langan.com\data\PAR\data2\[illegible]Project Data_Discipline\Site Civil\S		

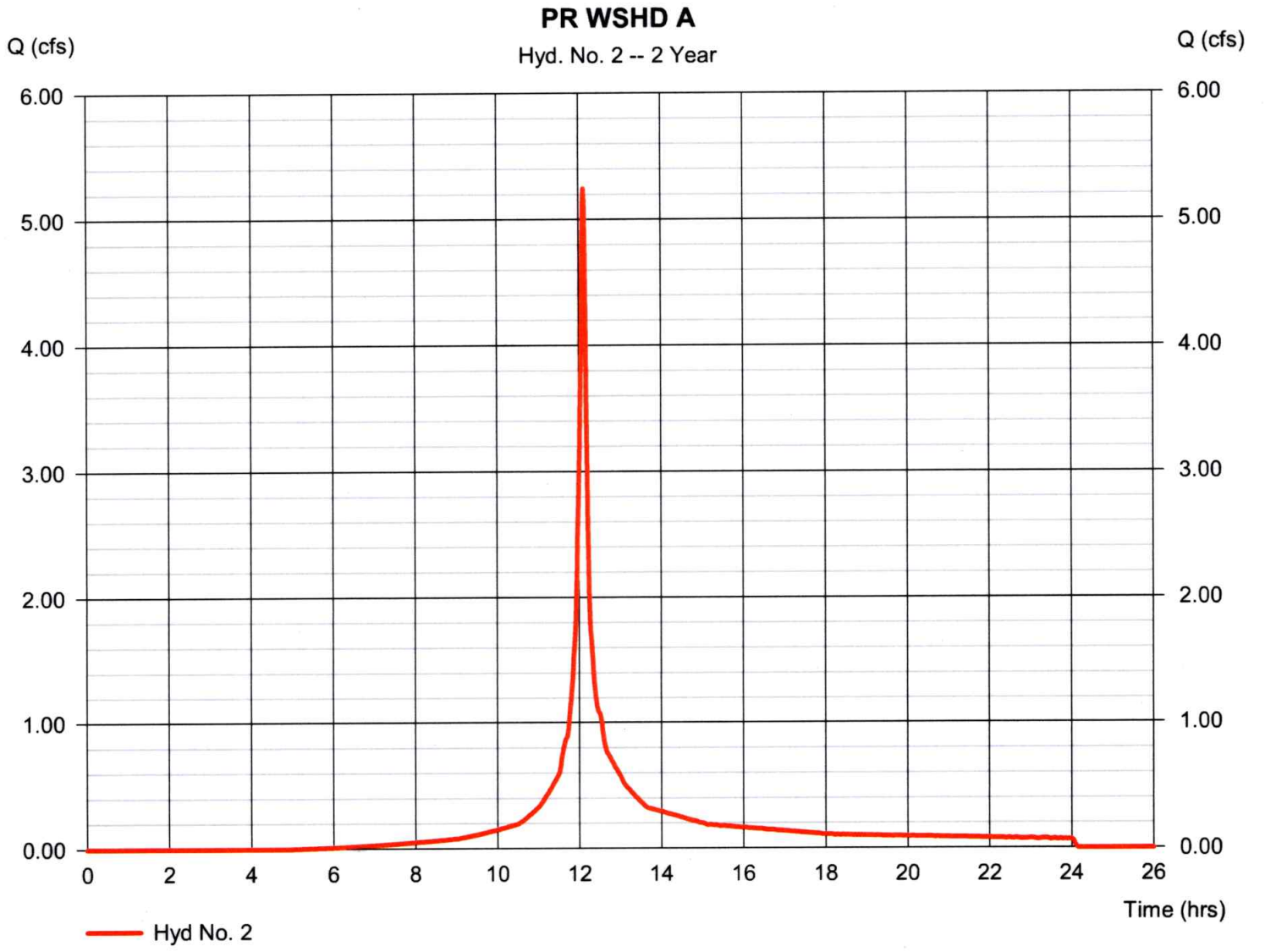


Hydrograph Report

Hyd. No. 2

PR WSHD A

Hydrograph type	= SCS Runoff	Peak discharge	= 5.246 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 16,702 cuft
Drainage area	= 1.880 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.42 in	Distribution	= Custom
Storm duration	= \\langan.com\data\PAR\data2\[illegible]Project Data_Discipline\Site Civil\S		



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	8.933	1	727	29,902	------	------	------	EX WSHD A
2	SCS Runoff	8.741	1	727	28,707	------	------	------	PR WSHD A

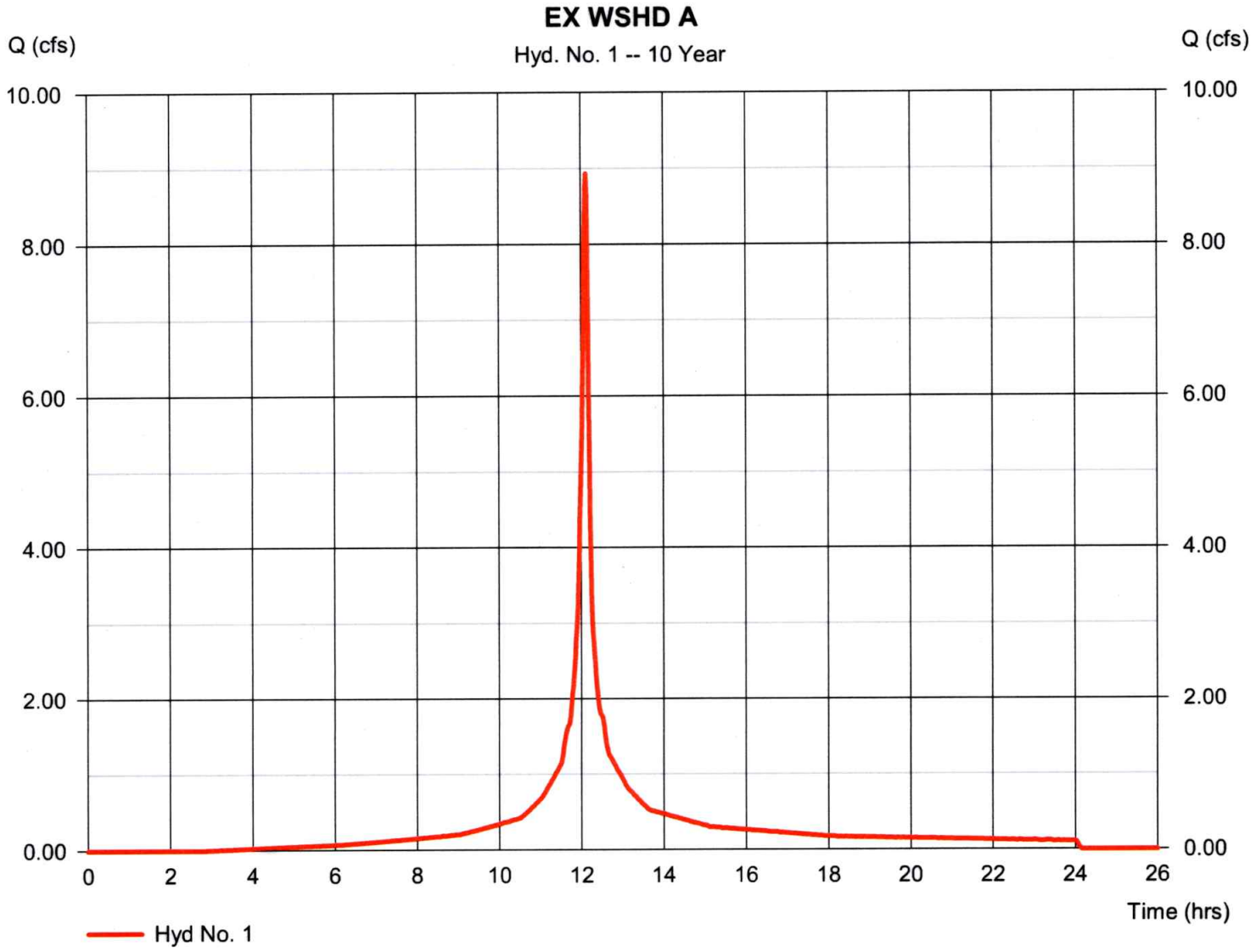
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Tuesday, 12 / 10 / 2019

Hyd. No. 1

EX WSHD A

Hydrograph type	= SCS Runoff	Peak discharge	= 8.933 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 29,902 cuft
Drainage area	= 1.860 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.21 in	Distribution	= Custom
Storm duration	= \\langan.com\data\PAR\data2\[illegible]Project Data_Discipline\Site Civil\S		



Hydrograph Report

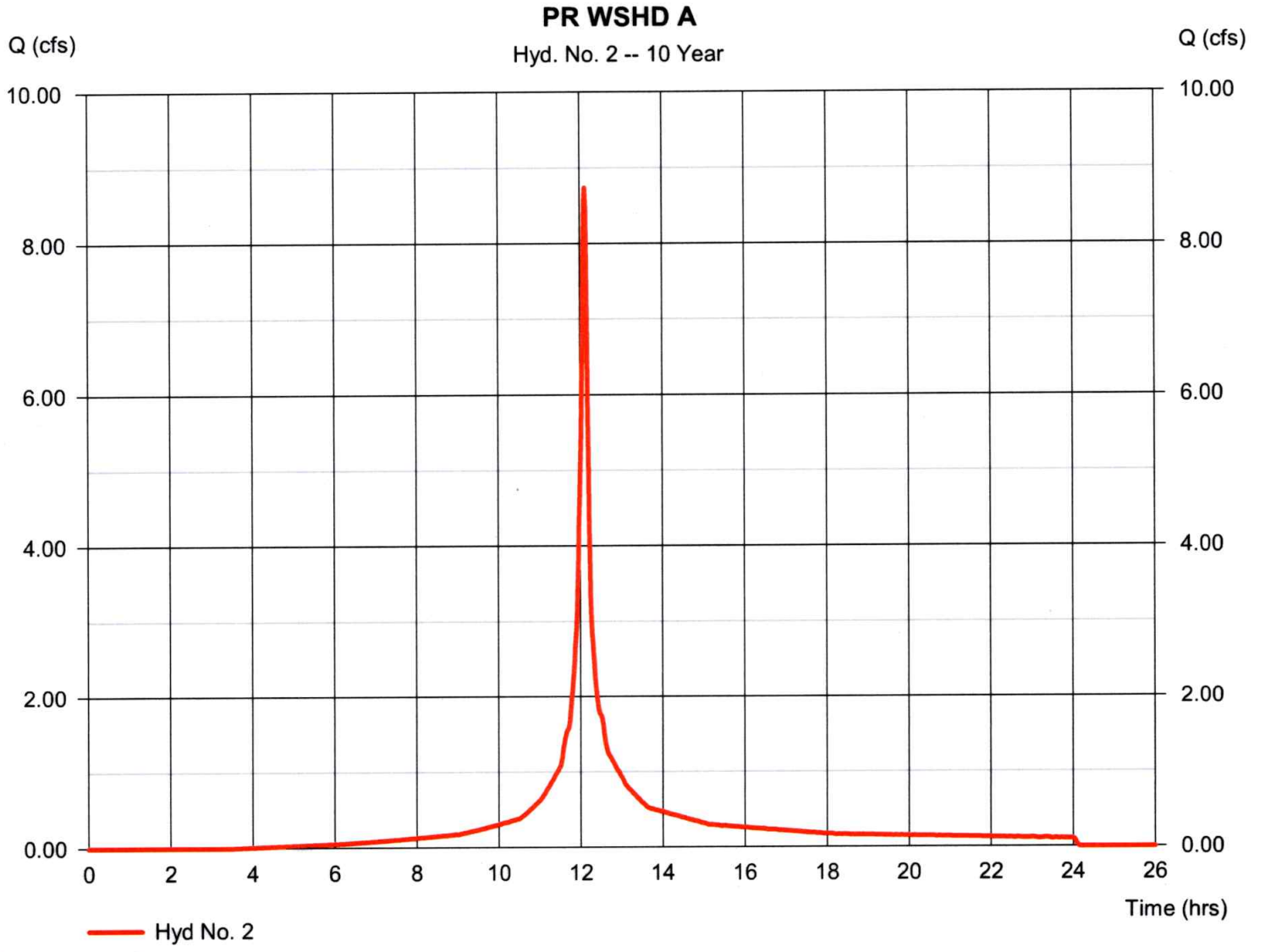
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Tuesday, 12 / 10 / 2019

Hyd. No. 2

PR WSHD A

Hydrograph type	= SCS Runoff	Peak discharge	= 8.741 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 28,707 cuft
Drainage area	= 1.880 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.21 in	Distribution	= Custom
Storm duration	= \\langan.com\data\PAR\data2\[illegible]Project Data_Discipline\Site Civil\S		



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	15.53	1	727	53,940	------	------	------	EX WSHD A
2	SCS Runoff	15.47	1	727	52,820	------	------	------	PR WSHD A

Hydrograph Report

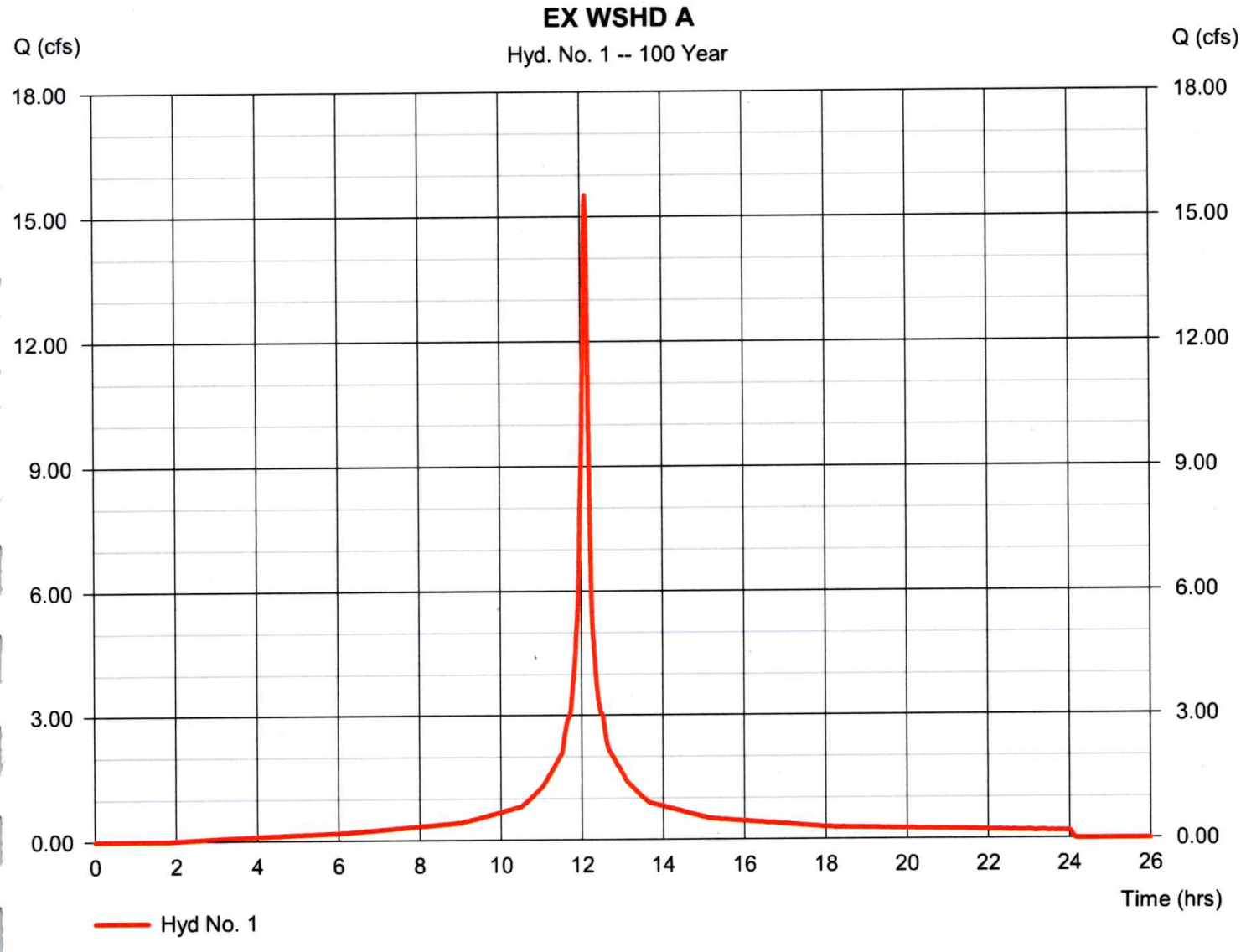
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Tuesday, 12 / 10 / 2019

Hyd. No. 1

EX WSHD A

Hydrograph type	= SCS Runoff	Peak discharge	= 15.53 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 53,940 cuft
Drainage area	= 1.860 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.71 in	Distribution	= Custom
Storm duration	= \\langan.com\data\PAR\data2\[illegible]Project Data_Discipline\Site Civil\S		



Hydrograph Report

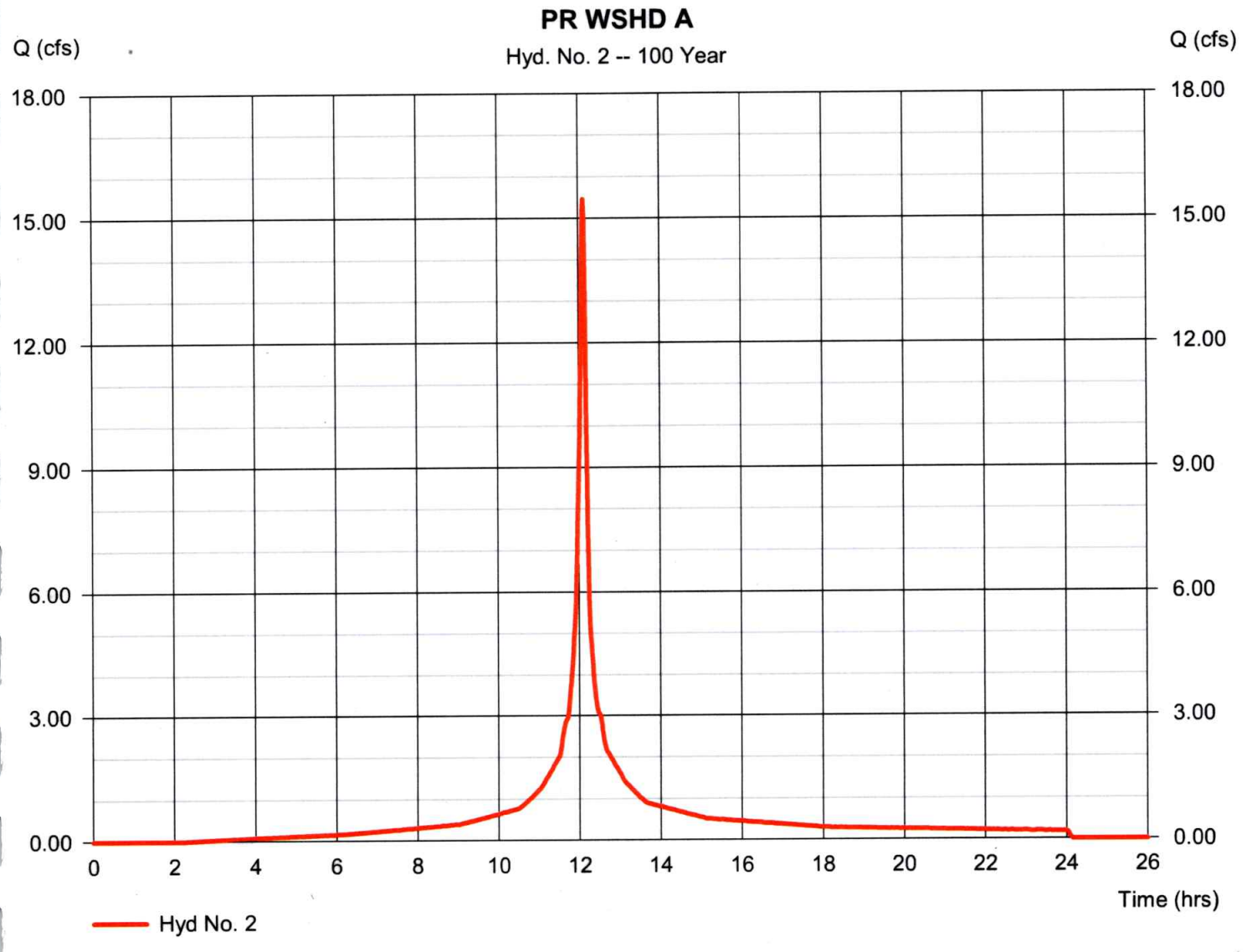
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Tuesday, 12 / 10 / 2019

Hyd. No. 2

PR WSHD A

Hydrograph type	= SCS Runoff	Peak discharge	= 15.47 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 52,820 cuft
Drainage area	= 1.880 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 8.71 in	Distribution	= Custom
Storm duration	= \\langan.com\data\PAR\data2\[illegible]Project Data_Discipline\Site Civil\S		



NRCS SOILS MAP

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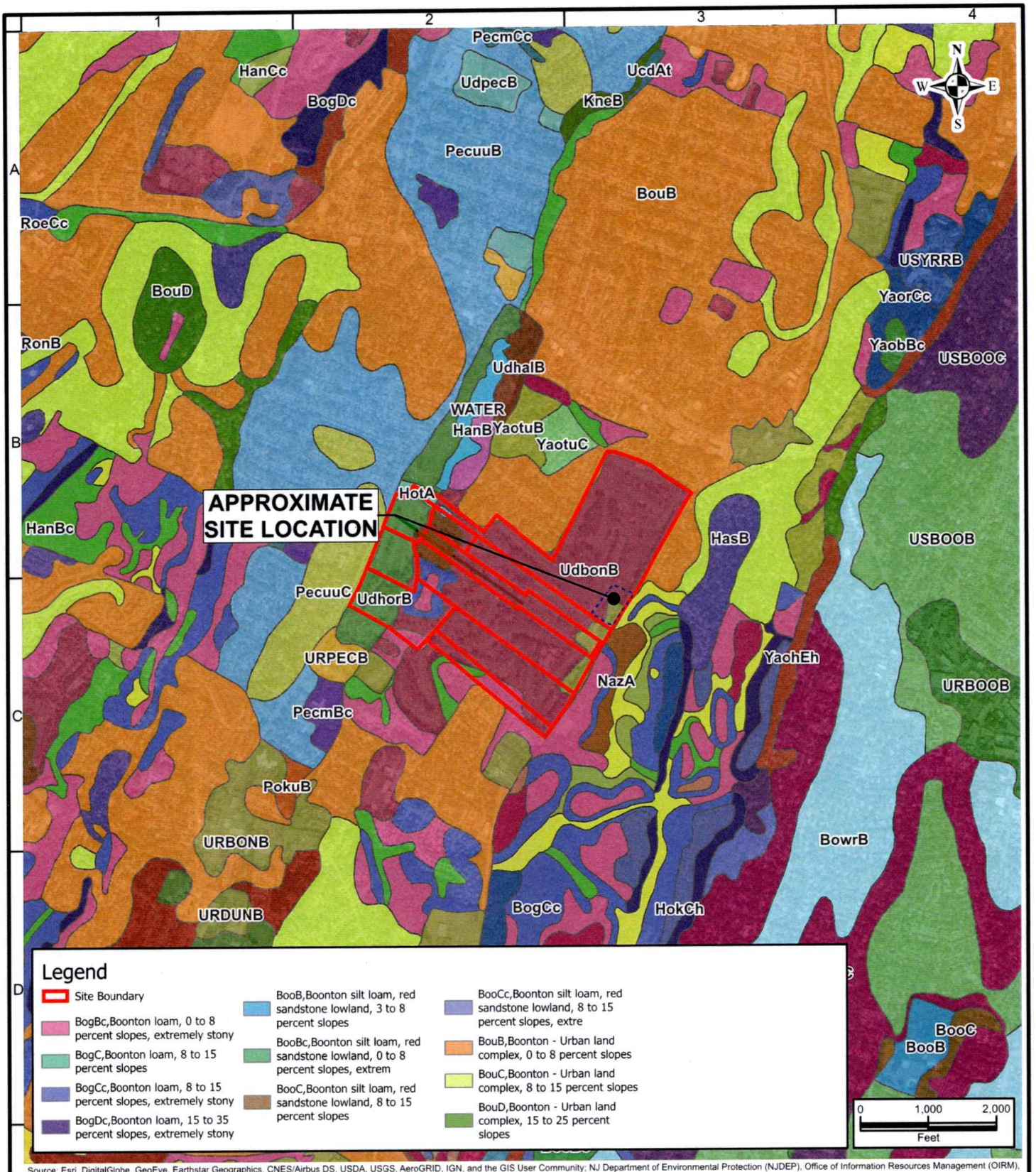

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community; NJ Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS)

LANGAN

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Langan Engineering & Environmental Services, Inc.
Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
Langan International
Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project	Montclair Golf Club Tennis Courts Renovation WEST ORANGE ESSEX COUNTY NEW JERSEY
Drawing Title	NJ SOILS MAP
Project No.	001039209
Date	9/16/2019
Scale	1:2,000
Drawn By	Site Analyzer
Submission Date	09/16/2019
Figure	1
	Sheet 1 of 1

Disclaimer: This information is produced by an automated system and may not be complete. The absence of a feature is not a confirmation that the feature is not present at the subject location. Information produced is in the public domain and unless noted has not been field verified or provided for any specific use. Users are also cautioned to confirm the information shown is suitable for their intended use.
Spatial Reference: NAD 1983 StatePlane New Jersey FIPS 2900 Feet

NEW JERSEY GROUNDWATER RECHARGE SPREADSHEET

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New Jersey Groundwater Recharge Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
ESSEX CO., VERONA BORO	48.9	1.67

Project Name:	Montclair Golf Club
Description:	Short Game Practice Area
Analysis Date:	09/17/19

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.28	Impervious areas	Urban Land*	0.0	-
2	0.16	Woods	Urban Land*	0.0	-
3	1.17	Open space	Urban Land*	0.0	-
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	2.6			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				0.0	-

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.05	Impervious areas	Urban Land*	0.0	-
2	0.16	Woods	Urban Land*	0.0	-
3	1.4	Open space	Urban Land*	0.0	-
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	2.6			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				0.0	-

Procedure to fill the Pre-Development and Post-Development Conditions Tables

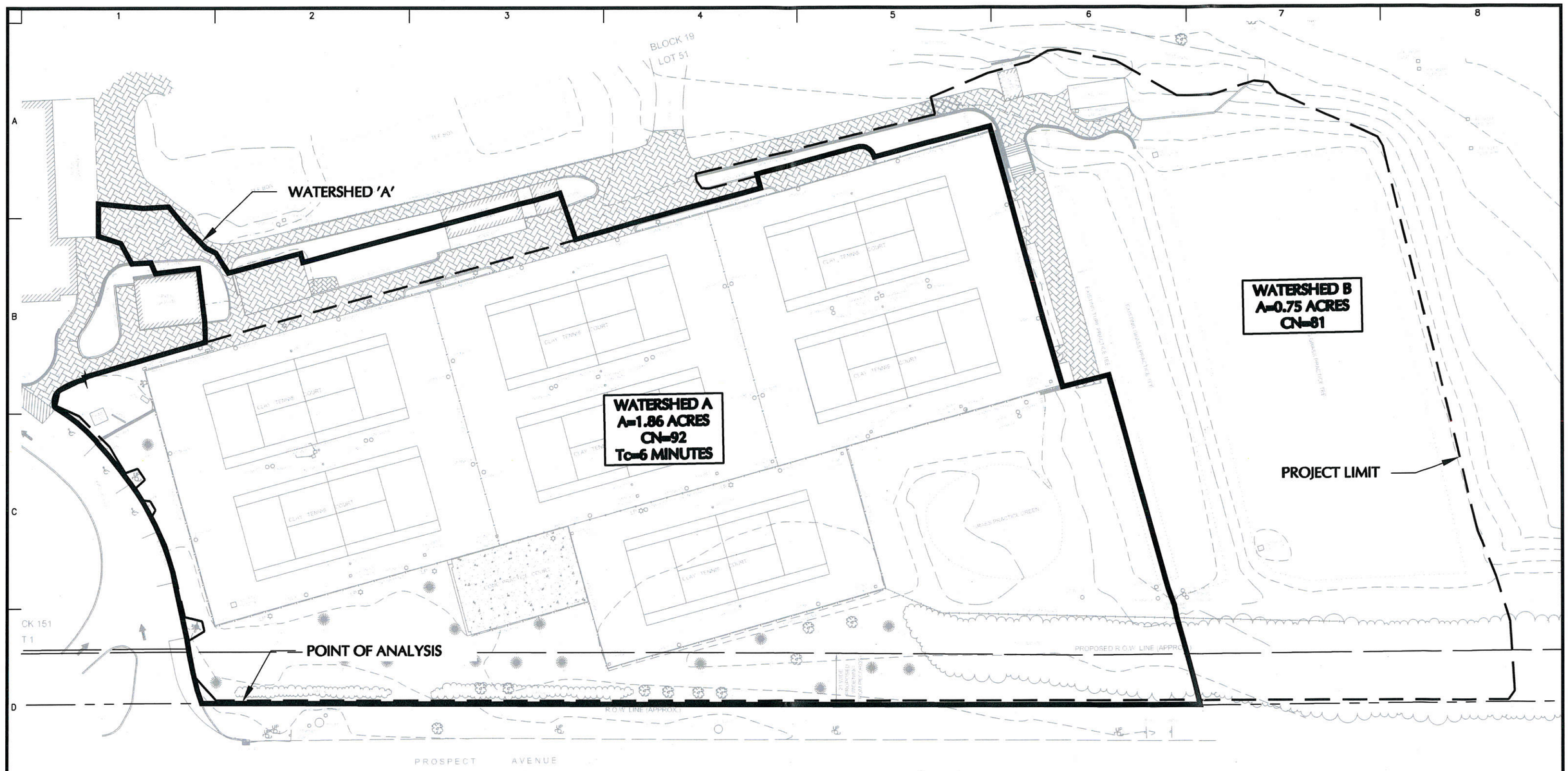
For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	45,738
Post-Development Annual Recharge Deficit=	*0*	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	0.00	(in)	DRWC=	0.00	(in)
ERWC =	0.00	(in)	EDRWC=	0.00	(in)



GENERAL NOTES

1. EXISTING BOUNDARY AND TOPOGRAPHY IS BASED ON A PLAN TITLED "PARTIAL TOPOGRAPHIC SURVEY" PREPARED BY STEWART ENGINEERING AND LAND SURVEYING LLC., LAST REVISED 7/12/18.
2. ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988.
3. PROPOSED CONDITIONS ARE PER THE PLAN SET PREPARED BY THE MOSS GILDAY GROUP TITLED TENNIS COURT RENOVATION PROJECT AT MONTCLAIR GOLF CLUB, LAST REVISED 10/09/19.

40 0 10 25 40
SCALE: 1 INCH = 40 FEET

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NJ Certificate of Authorization No.24GA27996400

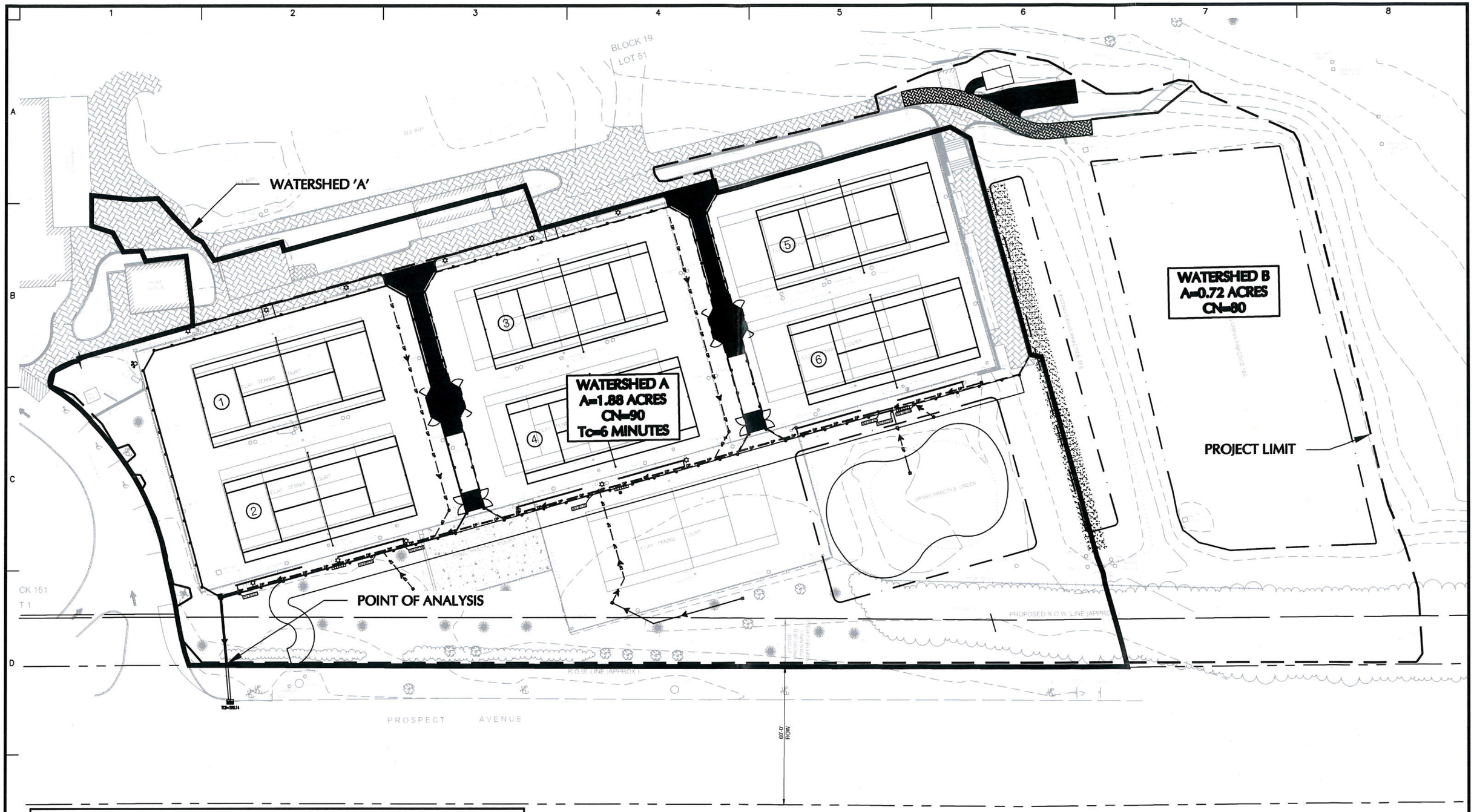
Project
MONTCLAIR GOLF CLUB TENNIS COURTS RENOVATION
TOWNSHIP OF VERONA
ESSEX COUNTY NEW JERSEY

Drawing Title
EXISTING WATERSHED AREA MAP

Project No. 001039209
Date 12/11/2019
Drawn By TD
Checked By GED

Drawing No. **CG101**
Sheet 1 of 1

Filename: \\langan.com\data\PAR\data2\001039209\Project Data\CAD\09\SheetFiles\Tennis Courts\Drainage Area Plans\001039209-CG101-0101.dwg Date: 12/11/2019 Time: 10:37 User: tderrick Style Table: Langan.stb Layout: ANSIB-BL



GENERAL NOTES

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40 0 10 25 40

SCALE: 1 INCH = 40 FEET

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T: 973.560.4900 F: 973.560.4901 www.langan.com
NJ Certificate of Authorization No.24GA27996400

Project
MONTCLAIR GOLF CLUB
TENNIS COURTS
RENOVATION
TOWNSHIP OF VERONA
ESSEX COUNTY NEW JERSEY

Drawing Title
PROPOSED
WATERSHED
AREA MAP

Project No.	001039209
Date	12/11/2019
Drawn By	TD
Checked By	GED

Drawing No.
CG102
Sheet 2 of 2

Filename: \\langan.com\data\PAR\data2\001039209\Project Data\CAD\09\SheetFiles\Tennis Courts\Drainage Area Plans\001039209-CG102-0101.dwg Date: 12/11/2019 Time: 10:36 User: tderrick Style Table: Langan.stb Layout: ANSIB-BL