PROJECT NARRATIVE

Prepared For

METRO TREATMENT CENETER OF NEW HAMPSHIRE, LP
96 HALL STREET
MAP 793Z LOT 23
CONCORD, NEW HAMPSHIRE

April 20, 2020

Prepared for:

Metro Treatment Center of New Hampshire
100 Hall Street
Concord, NH 03301

Prepared By:

NORTHPOINT ENGINEERING, LLC
Civil Engineering ◢ Land Planning ◢ Construction Services
119 Storrs Street, Suite 201
Concord, NH 03301
Tel 603-226-1166
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Project No. 21102

TABLE OF CONTENTS

I. PROJECT NARRATIVE

Property Description

The subject parcel of land is located at 96 Hall Street in Concord, New Hampshire and is currently an undeveloped residential lot. The parcel was previously a residential property with a single family home located on the parcel. The home has been removed and the foundation has been filled in. The driveway entrance for the home remains on Hall Street however the current condition of the property are undeveloped.

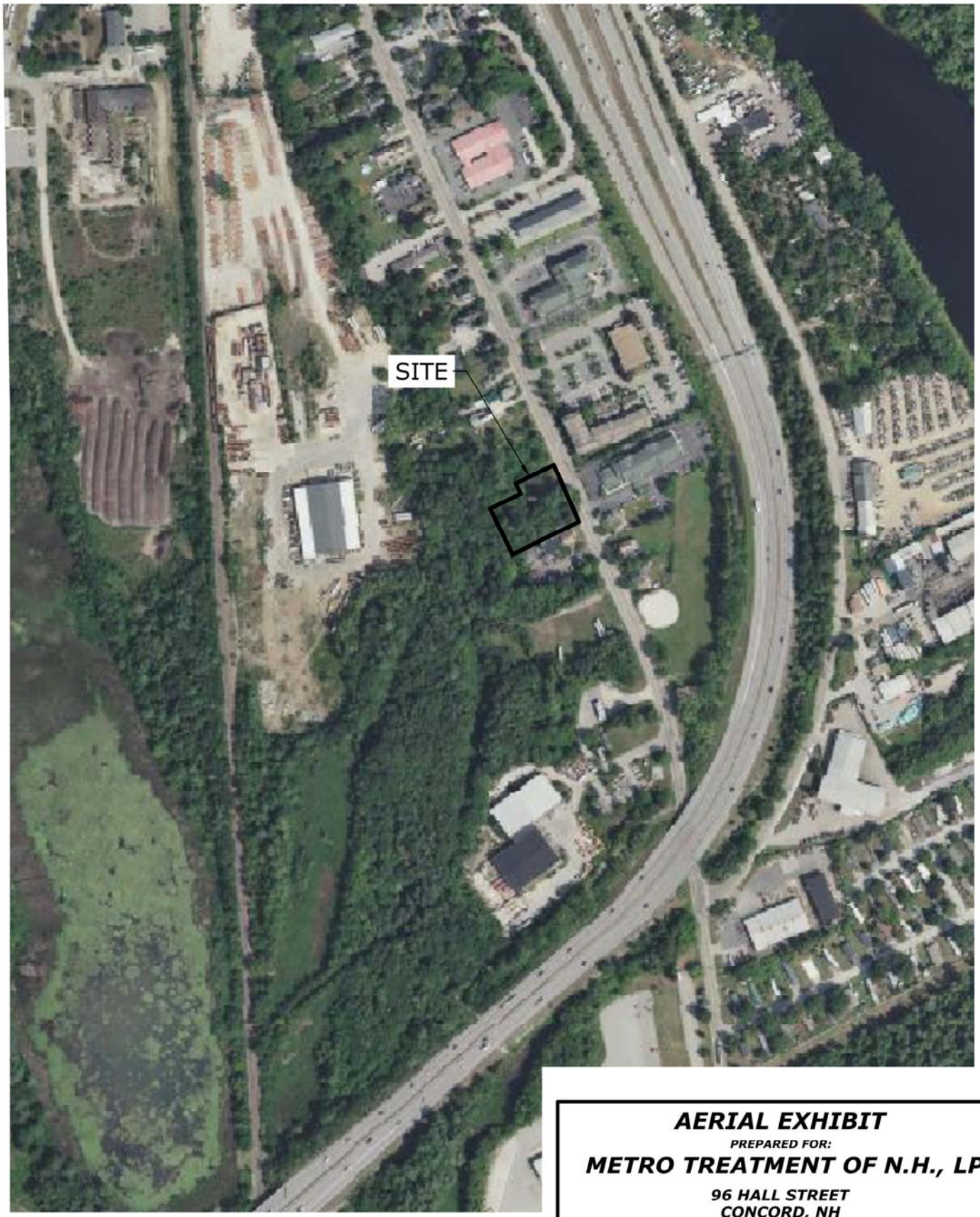
The parcel is bordered to the south by the Metro Treatment Center of New Hampshire, to the west by a scrap metal recycling facility, to north by a residential property, and to the east (across Hall Street) by the Best Western Hotel.

Project Description

The proposed improvements include construction of a new commercial parking lot that will serve the existing Metro Treatment Center of New Hampshire located on the adjacent parcel to the south at 100 Hall Street. The existing curb cut on the subject parcel will be removed and a new driveway connection will be added that connects the new parking lot to the existing parking lot at 100 Hall Street. Related site improvements include landscape, site lighting and stormwater management. The parking expansion will provide relief to the existing parking demands for the Metro Treatment Clinic of New Hampshire. This work will require a conditional use permit to disturb the wetland buffer, located on site, for construction of the stormwater management system.

II. Aerial Photograph Exhibits

FILE: G:_projects\21102\dwg\21102_Exhibits.dwg BY: ian DATE: 18 Apr 2022 - 10:28am



AERIAL EXHIBIT

PREPARED FOR:

METRO TREATMENT OF N.H., LP

96 HALL STREET
CONCORD, NH

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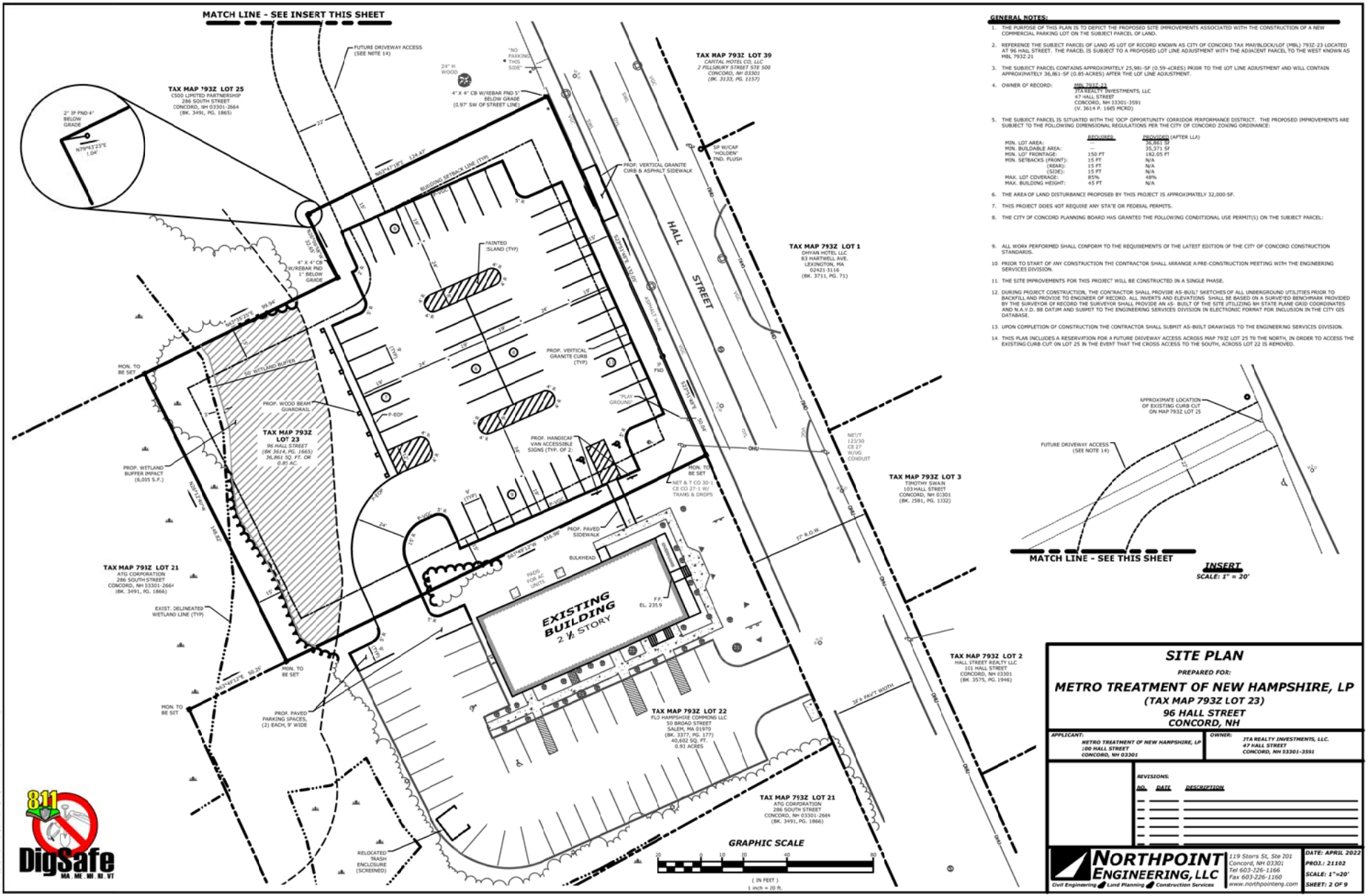
SCALE: 1"=400'	DATE: APRIL. 2022
PROJ.: 21102	SHEET: ----

III. Site Photograph Exhibits

Picture 1: View of site looking north

Picture 2: View Hall Street looking East from the southern property line.

IV. Selected Site Improvement Plan Sheets (8 ½ x 11)



GENERAL NOTES:

1. THE PURPOSE OF THIS PLAN IS TO DEPICT THE PROPOSED SITE IMPROVEMENTS ASSOCIATED WITH THE CONSTRUCTION OF A NEW COMMERCIAL PARKING LOT ON THE SUBJECT PARCEL OF LAND.
2. REFERENCE THE SUBJECT PARCEL OF LAND AS LOT OF RICORD KNOWN AS CITY OF CONCORD TAX MAP/BLOCK/LOT (MBL) 793Z-23 LOCATED AT 96 HALL STREET. THE PARCEL IS SUBJECT TO A PROPOSED LOT LINE ADJUSTMENT WITH THE ADJACENT PARCEL TO THE WEST KNOWN AS MBL 793Z-21
3. THE SUBJECT PARCEL CONTAINS APPROXIMATELY 25,981-SF (0.59-ACRES) PRIOR TO THE LOT LINE ADJUSTMENT AND WILL CONTAIN APPROXIMATELY 36,861-SF (0.85-ACRES) AFTER THE LOT LINE ADJUSTMENT.
4. OWNER OF RECORD: MBL 793Z-23
   JTA REALTY INVESTMENTS, LLC
   47 HALL STREET
   CONCORD, NH 03301-3591
   (V. 3614 P. 1665 MCRD)
5. THE SUBJECT PARCEL IS SITUATED WITH THE 'OCP' OPPORTUNITY CORRIDOR PERFORMANCE DISTRICT. THE PROPOSED IMPROVEMENTS ARE SUBJECT TO THE FOLLOWING DIMENSIONAL REGULATIONS PER THE CITY OF CONCORD ZONING ORDINANCE:

	REQUIRED	PROVIDED (AFTER LLA)
MIN. LOT AREA:	36,861 SF	36,861 SF
MIN. BUILDABLE AREA:	--	35,371 SF
MIN. LOT FRONTAGE:	150 FT	182.05 FT
MIN. SETBACKS (FRONT):	15 FT	N/A
(REAR):	15 FT	N/A
(SIDE):	15 FT	N/A
MAX. LOT COVERAGE:	85%	48%
MAX. BUILDING HEIGHT:	45 FT	N/A

6. THE AREA OF LAND DISTURBANCE PROPOSED BY THIS PROJECT IS APPROXIMATELY 32,000-SF.
7. THIS PROJECT DOES NOT REQUIRE ANY STATE OR FEDERAL PERMITS.
8. THE CITY OF CONCORD PLANNING BOARD HAS GRANTED THE FOLLOWING CONDITIONAL USE PERMIT(S) ON THE SUBJECT PARCEL:
9. ALL WORK PERFORMED SHALL CONFORM TO THE REQUIREMENTS OF THE LATEST EDITION OF THE CITY OF CONCORD CONSTRUCTION STANDARDS.
10. PRIOR TO START OF ANY CONSTRUCTION THE CONTRACTOR SHALL ARRANGE A PRE-CONSTRUCTION MEETING WITH THE ENGINEERING SERVICES DIVISION.
11. THE SITE IMPROVEMENTS FOR THIS PROJECT WILL BE CONSTRUCTED IN A SINGLE PHASE.
12. DURING PROJECT CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE AS-BUILT SKETCHES OF ALL UNDERGROUND UTILITIES PRIOR TO BACKFILL AND PROVIDE TO ENGINEER OF RECORD. ALL INVERTS AND ELEVATIONS SHALL BE BASED ON A SURVEYED BENCHMARK PROVIDED BY THE SURVEYOR OF RECORD THE SURVEYOR SHALL PROVIDE AN AS- BUILT OF THE SITE UTILIZING NH STATE PLANE GRID COORDINATES AND N.A.V.D. 88 DATUM AND SUBMIT TO THE ENGINEERING SERVICES DIVISION IN ELECTRONIC FORMAT FOR INCLUSION IN THE CITY GIS DATABASE.
13. UPON COMPLETION OF CONSTRUCTION THE CONTRACTOR SHALL SUBMIT AS-BUILT DRAWINGS TO THE ENGINEERING SERVICES DIVISION.
14. THIS PLAN INCLUDES A RESERVATION FOR A FUTURE DRIVEWAY ACCESS ACROSS MAP 793Z LOT 25 TO THE NORTH, IN ORDER TO ACCESS THE EXISTING CURB CUT ON LOT 25 IN THE EVENT THAT THE CROSS ACCESS TO THE SOUTH, ACROSS LOT 22 IS REMOVED.

SITE PLAN

PREPARED FOR:

METRO TREATMENT OF NEW HAMPSHIRE, LP

(TAX MAP 793Z LOT 23)

96 HALL STREET
CONCORD, NH

APPLICANT:	OWNER:
METRO TREATMENT OF NEW HAMPSHIRE, LP 100 HALL STREET CONCORD, NH 03301	JTA REALTY INVESTMENTS, LLC. 47 HALL STREET CONCORD, NH 03301-3591

REVISIONS:

NO.	DATE	DESCRIPTION

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DATE: APRIL 2022
PROJ.: 21102
SCALE: 1"=20'
SHEET: 2 OF 9

811 DigSafe MA ME NH RI VT

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May 9, 2022

City of Concord Planning Board
c/o City of Concord Planning Dept
41 Green Street
Concord, NH 03301

Subject: Waiver Requests Letter Supplement
Metro Treatment Center of New Hampshire
96 Hall Street (Map 793Z Lot 23)
Concord, New Hampshire
NPE Proj. No. 21102

Dear Board Members,

On behalf of the Applicant and property owners the referenced Site Plan application, I am formally requesting that the Planning Board grant the following waivers from the City of Concord Site Plan Regulations:

- Section 6.03(2)(c): Site plan application stages
- Section 11.05: Determination of completeness

The waivers requested are to allow the included application to be scheduled for a public hearing on the same date that it is to be scheduled for determination of completeness. That expected date being May 18th, 2022.

Granting this waiver request will not be detrimental to public safety, health, welfare or injurious to other properties. Due to scheduling constraints with construction contractors a project of this size is only reasonably able to be built early in the construction season. This waiver allows for the project to be completed within the calendar year, providing the needed additional parking for the staff and patients of Metro Treatment Center of New Hampshire as soon as possible. This project can be completed on an expedited timeline because of the flat geography and minimal conflicts with surrounding properties and existing utilities. The granting of this waiver will not vary the provisions of the Zoning Ordinance, Master Plan Reports or Official Map any in any manner.

Sincerely,

Ian McGregor, PE
Project Engineer
Northpoint Engineering, LLC

EXHIBIT "A"

Conditional Use Permit associated with Site Plan Application for
Metro Treatment Center of New Hampshire
96 Hall Street (Map 793Z Lot 23)
Concord, New Hampshire

I. Proposal Outline:

The subject parcel of land is located at 96 Hall Street in Concord, New Hampshire and is currently an undeveloped residential lot. The parcel was previously a residential property with a signal family home located on the parcel. The home has been removed and the foundation has been filled in. The driveway entrance for the home remains on Hall Street however the current conditions of the property are undeveloped.

The parcel is bordered to the south by Metro Treatment Center of New Hampshire, to the west by a scrap metal recycling facility, to north by a residential property, and to the east (across Hall Street) by the Best Western Hotel.

The proposed improvements include construction of a new commercial parking lot that will serve the existing Metro Treatment Center of New Hampshire located on the adjacent parcel to the south at 100 Hall Street. The existing curb cut on the subject parcel will be removed and a new driveway connection will be added that connects the new parking lot to the existing parking lot at 100 Hall Street. Related site improvements include landscape, site lighting and stormwater management. The parking expansion will provide relief to the existing parking demands for the Metro Treatment Clinic of New Hampshire. This work will require a conditional use permit to disturb the wetland buffer, located on site, for construction of the stormwater management system.

Because the drainage improvements will involve disturbance of 6,536 sqft of land within the associated 50-foot wetland buffer, the project will require the following Conditional Use Permit:

Section 28-4-3(d) Conditional Use Permit Required for Certain Disturbances of Wetland Buffers

This Conditional Use Permit application is being submitted concurrently with a Site Plan application for the proposed development. Refer to the Site Plan application which contains a more thorough Project Narrative, including photographs of the subject area of the site.

II. Standards of Review for Condition Use Permit – Z.O. Article 28-9-4(b)(4)

In submitting the attached application for a Conditional Use Permit, the applicant recognizes the need to successfully demonstrate, to the satisfaction of the City of Concord Planning Board, that each of following standards have been or will be fulfilled upon completion of the subject work. Specifically:

a. *The use is specifically authorized in this ordinance as a conditional use;*

   Impacts to wetland buffers are authorized by conditional use permit under Article 28-4-3(d) of the Zoning Ordinance.

b. If completed as proposed by the applicant, the development in its proposed location will comply with all requirements of this Article, and with the specific conditions or standards established in this ordinance for the particular use;

The proposed development will be in compliance with all aspects of this Article. There are no other specific conditions or standards established in the ordinance for the particular use. The proposed stormwater basins will comply with all aspects of the Zoning Ordinance and the Subdivision Regulations.

c. The use will not materially endanger the public health or safety;

There is no reason to believe that the health or safety of the general public will be adversely affected by the proposed disturbance to the wetland buffer.

d. The use will be compatible with the neighborhood and with adjoining or abutting uses in the area in which it is to be located;

The proposed use, as it relates to the CUP, will have no impact on the neighborhood or adjoining uses in the area.

e. The use will not have an adverse effect on highway or pedestrian safety;

The proposed use, as it relates to the CUP, will have no impact on highway or pedestrian safety in the area.

f. The use will not have an adverse effect on the natural, environmental, and historic resources of the City;

The proposed use, as it relates to the CUP, involves the construction of stormwater management basins within the wetland buffer. No other uses are proposed within the buffer. There should not be any adverse impact to the natural or environmental resources of the city. The proposed use should not have any impacts at all on the historic resources of the city.

g. *The use will be adequately serviced by necessary public utilities and by community facilities and services of a sufficient capacity to ensure the proper operation of the proposed use, and will not necessitate excessive public expenditures to provide facilities and services with sufficient additional capacity.*

The proposed conditional use will not require any public utilities, facilities or services.

III. Standards of Review for Condition Use Permit – Z.O. Article 28-4-3(d)

In addition to the requirements of Article 28-9-4(b)(4) discussed above, the applicant recognizes the need to successfully demonstrate, to the satisfaction of the City of Concord Planning Board, that each

of following additional standards have been or will be fulfilled upon completion of the subject work. Specifically:

1. *The disturbance of the buffer is necessary to the establishment of an allowable principal or accessory use on the buildable land area of the lot;*

   The proposed disturbance to the wetland buffer is needed to construct stormwater management infrastructure.

2. *The proposed disturbance to the buffer cannot practicably be located otherwise on the lot to eliminate or reduce the impact to the buffer and represents the minimum extent of disturbance necessary to achieve the reasonable use of those portions of the lot consisting of buildable land;*

   There is no other practicable location for the stormwater management system.

3. *The proposed disturbance to the buffer minimizes the environmental impact to the abutting wetland, and to downstream property and hydrologically connected water and wetland resources;*

   A full hydrologic and hydraulic analysis has been prepared and is included within the Stormwater Management Report that was submitted as part of the associated Site Plan application. The onsite stormwater management system has been designed to mitigate the effects of the proposed improvements in accordance with the Regulations such that there will not be any adverse effects to downstream properties or wetlands.

4. *Where applicable, wetland permits have been received or are obtained from the NHDES and USACOE;*

   No NHDES nor USACOE permits are required for completion of this project.

5. *Where applicable, permits for proof of compliance with all other state and/or federal regulations have been received or are obtained.*

   There are no other state or federal regulations that apply to the proposed use, as it relates to the CUP.

STORMWATER MANAGEMENT REPORT

Prepared For

METRO TREATMENT OF NEW HAMPSHIRE, LP
TAX MAP 793Z LOT 23
96 HALL STREET
CONCORD, NEW HAMPSHIRE

April 20, 2022

Prepared for:

Metro Treatment Center of New Hampshire
100 Hall Street
Concord, NH, 03301-3591

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Methodology

In accordance with the provisions and requirements of the City of Concord Site Plan Regulations the 2, 10, 25 and 100-year, (24-hour) return frequency storms were used in all aspects of analysis and design for stormwater management improvements at the subject site, as further documented in this report.

The methodology of the U.S.D.A–S.C.S publication Urban Hydrology for Small Watersheds – Technical Release No. 55 (TR-55) and Computer Program – Project Formulation Hydrology (TR-20) was selected for use in the design of segments of the drainage system in order to estimate peak stormwater discharge volumes. In implementing the methodology of TR-55 and TR-20 a HYDROCAD (Version 10.00) stormwater modeling, hydrograph generating, and routing computer program was utilized.

Estimates for Time of Concentration, used in the analysis were made using the methodology contained within U.S.D.A–S.C.S publication Urban Hydrology for Small Watersheds – Technical Release No. 55 (TR-55). In implementing the TR-55 Method, a minimum Time of Concentration of 2 minutes was utilized for urbanized areas.

All design and analysis calculations performed using the referenced methodologies are attached to this report. These calculations document the subcatchment area, breakdown of surface type, time of concentration, rainfall intensity, peak discharge volume, peak velocity, and other descriptive design data for each watershed and pipe segment evaluated. In addition, the attached “Drainage Areas Plans” graphically define and illustrate the real extent of each watershed or subcatchment area investigated.

Existing Drainage Conditions

The existing subject parcel is approximately 37,000 square feet and is comprised mostly of trees and shrubs on a relatively flat parcel. This parcel drains to both Hall Street to the east and a wetland complex to the west. There are no exiting drainage pathways or constructed stormwater management devices currently located on the site.

Post-Development Drainage Conditions

Overview:

The proposed parking lot expansion will create 17,396 square feet of new impervious surface. The stormwater runoff from the new impervious surface will be attenuated by a detention basin, treated by a stormwater treatment swale, then flow into an infiltration basin.

Stormwater Treatment & Groundwater Recharge:

A treatment swale downstream of the detention basin will provide the stormwater treatment for the collected stormwater runoff from the new parking lot. This treatment swale then flows into an infiltration basin to. The infiltration basin allows treated stormwater to seep into the groundwater to ensure the new development does not increase the total volume of stormwater leaving the site during the predicted 10-year storm event.

Peak Runoff Control:

The site has been designed to provide peak runoff control requirements in accordance with the City of Concord Site Plan Regulations. The new onsite stormwater management basin has been designed to control the peak discharge rates of runoff leaving the detention basin to ensure that post construction flow rates are equal to pre-construction flow rates. The site has been designed such that the 2-year, 10-year, 25-year and 100-year 24-hour post-developed peak flow rates do not exceed the flow rates of the existing conditions. See Table 1 in the Summary of Results below for actual values and Table 2 for Runoff volume control Summary.

Summary of Results

Table 1. Peak Runoff Control Summary

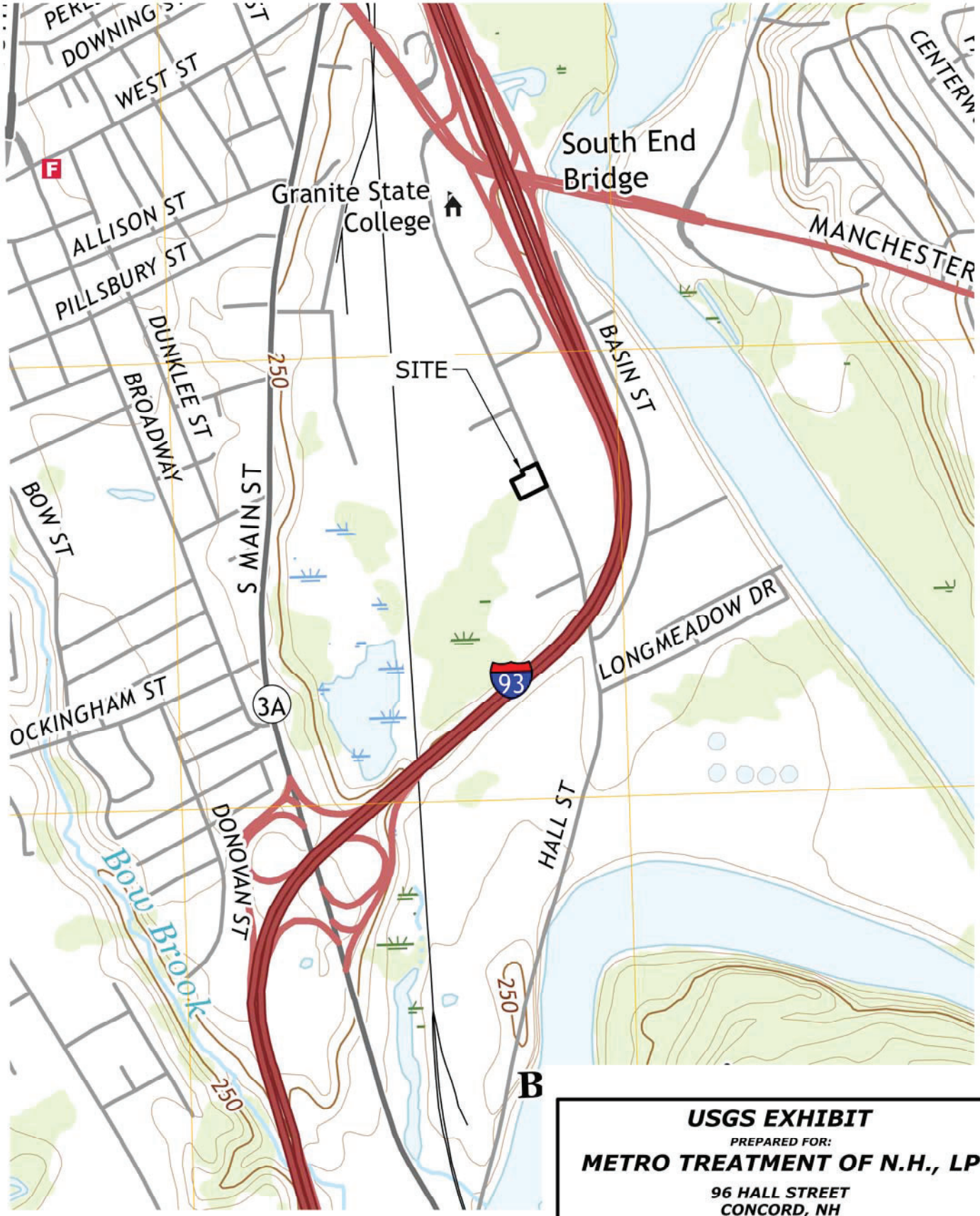
	Peak Rates of Runoff at Study Points							
	(2-Year, 24-Hour)		(10-Year, 24-Hour)		(25-Year, 24-Hour)		(100-Year, 24-Hour)	
Node	Pre	Post	Pre	Post	Pre	Post	Pre	Post
20R (POC1)	0.07-cfs	0.01-cfs	0.40-cfs	0.09-cfs	1.05-cfs	0.41-cfs	1.49-cfs	1.09-cfs
10R (POC2)	0.04-cfs	0.01-cfs	0.17-cfs	0.06-cfs	0.43-cfs	0.11-cfs	0.58-cfs	0.22-cfs

Table 2. Runoff Volume Control Summary

		Runoff Volume at Study Points	
		(10-Year, 24-Hour)	
Study Point	Node	Pre	Post
POC 1	25R	2,000-CF	526-CF
POC 2	10R	787-CF	284-CF

II. USGS MAP EXHIBIT

FILE: G:_projects\21102\dwg\21102_Exhibits.dwg BY: ian DATE: 08 Apr 2022 - 8:21am



USGS EXHIBIT

PREPARED FOR:

METRO TREATMENT OF N.H., LP

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CONCORD, NH

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SCALE: 1"=1000'	DATE: FEB. 2022
PROJ.: 21102	SHEET: 1 OF 1

III. Web Soil Survey Map

Map Scale: 1:1,110 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Merrimack and Belknap Counties, New Hampshire
Survey Area Data: Version 27, Aug 31, 2021

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

Date(s) aerial images were photographed: Aug 7, 2020—Aug 13, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
296A	Freetown mucky peat, 0 to 2 percent slopes	B/D	1.5	46.4%
498A	Urban land-Pootatuck complex, 0 to 3 percent slopes		1.8	53.6%
Totals for Area of Interest			**3.3**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

IV. Aerial Photograph Exhibits

FILE: G:_projects\21102\dwg\21102_Exhibits.dwg BY: ian DATE: 18 Apr 2022 - 10:27am

AERIAL EXHIBIT

PREPARED FOR:

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V. Rip-Rap Calculations

RIP RAP OUTLET PROTECTION APRON CALCULATIONS

Metro Treatment Center of New Hampshire , Concord, NH	4/20/2022
Northpoint Project # 21102	

The purpose of this spreadsheet is to calculate the dimensions of
rip rap required to help prevent soil loss for the 10 year storm event.

Required input to the spreadsheet is

Q	peak flow in CFS
Do	diameter in feet of outlet or width of channel
Tw	tail water at end of apron (minimum of 0.5')

Depending on the tail water conditions either column 1 or column 2 is used for calculations

Column One where Tw<1/2Do	Column One where Tw>1/2Do
Length of Apron	
La = (1.8Q/Do^3/2)+7Do	La = 3*Q/Do^3/2+7Do
Width of Apron at outfall	
W1=3*Do	W1=3*Do
W2 = 3Do + La	W2=3Do+0.4*La
If defined channel use channel width for W1 and W2	
Rock Rip Rap	
d50 = (0.02*Q^4/3)/(Tw*Do)	Same

											RIRAP GRADATION ENVELOPE									
											d100		d85		d50		d15			
Input to Chart					Calculated Output					USE	FROM	TO	FROM	TO	FROM	TO	FROM	TO	depth	USE depth
Description (Optional)		Q (cfs)	Do (ft)	Tw (ft)	La	W1	W2	d50, ft	d50 in	d50 in.	in	in	in	in	in	in	in	in	in	in.
OS#1	15" Outlet from SWMB #1	0.34	1.25	0.50	9	4	13	0.0	0.09	6	9	12	8	11	6	9	2	3	15	15

VI. Drainage Analysis

- Extreme Precipitation Tables

- HydroCAD Output Data – Pre-Developed

    - Drainage Diagram
    - Area Listing and Soil Listing
    - Node List: 2-year, 10-year, 25-year, 100-year
    - Full Summary: 10-year

- HydroCAD Output Data – Post-Developed

    - Drainage Diagram
    - Area Listing and Soil Listing
    - Node List: 2-year, 10-year, 25-year, 100-year
    - Full Summary: 10-year

- BMP Worksheet – Treatment Swale

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	71.525 degrees West
Latitude	43.187 degrees North
Elevation	0 feet
Date/Time	Tue, 08 Feb 2022 15:49:35 -0500

Extreme Precipitation Estimates

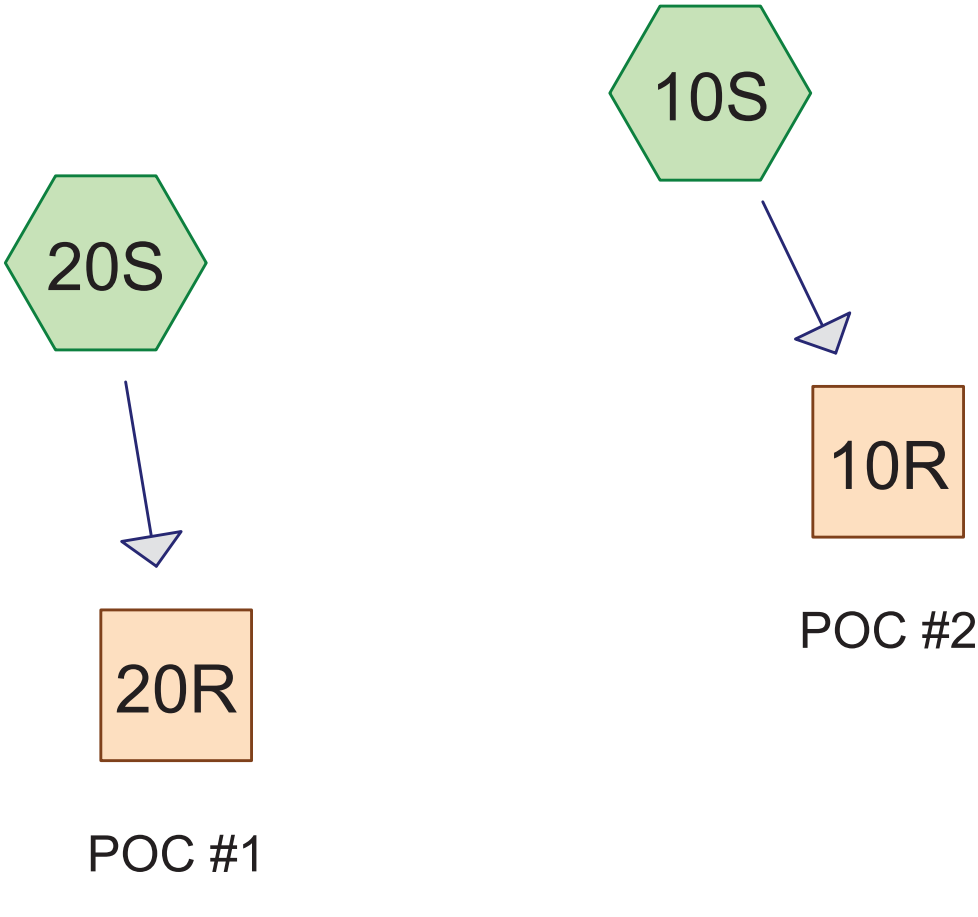
	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.39	0.49	0.64	0.80	1.00	**1yr**	0.69	0.98	1.16	1.47	1.86	2.37	2.57	**1yr**	2.09	2.47	2.89	3.59	4.12	**1yr**
2yr	0.31	0.48	0.60	0.79	1.00	1.25	**2yr**	0.86	1.15	1.45	1.81	2.26	2.82	3.15	**2yr**	2.50	3.03	3.51	4.19	4.79	**2yr**
5yr	0.37	0.58	0.73	0.97	1.25	1.58	**5yr**	1.08	1.44	1.83	2.29	2.84	3.51	4.00	**5yr**	3.11	3.84	4.44	5.21	5.91	**5yr**
10yr	0.42	0.66	0.84	1.14	1.48	1.89	**10yr**	1.28	1.71	2.19	2.73	3.38	4.15	4.79	**10yr**	3.68	4.60	5.30	6.15	6.92	**10yr**
25yr	0.50	0.79	1.01	1.39	1.85	2.38	**25yr**	1.60	2.14	2.77	3.45	4.25	5.19	6.08	**25yr**	4.59	5.85	6.72	7.66	8.55	**25yr**
50yr	0.57	0.91	1.17	1.64	2.20	2.84	**50yr**	1.89	2.54	3.31	4.12	5.06	6.14	7.30	**50yr**	5.44	7.02	8.04	9.04	10.03	**50yr**
100yr	0.65	1.04	1.35	1.91	2.60	3.39	**100yr**	2.25	3.02	3.96	4.93	6.03	7.28	8.75	**100yr**	6.44	8.42	9.61	10.68	11.77	**100yr**
200yr	0.74	1.21	1.57	2.24	3.09	4.05	**200yr**	2.67	3.59	4.73	5.88	7.17	8.62	10.51	**200yr**	7.63	10.10	11.51	12.62	13.82	**200yr**
500yr	0.89	1.47	1.91	2.77	3.88	5.11	**500yr**	3.35	4.51	5.98	7.42	9.02	10.80	13.38	**500yr**	9.56	12.87	14.60	15.75	17.09	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.20	0.32	0.39	0.52	0.64	0.87	**1yr**	0.55	0.85	1.05	1.36	1.59	2.04	2.42	**1yr**	1.80	2.33	2.66	3.29	3.84	**1yr**
2yr	0.30	0.47	0.57	0.78	0.96	1.15	**2yr**	0.83	1.12	1.31	1.72	2.19	2.74	3.05	**2yr**	2.43	2.93	3.41	4.07	4.66	**2yr**
5yr	0.34	0.53	0.66	0.90	1.15	1.37	**5yr**	0.99	1.34	1.54	2.00	2.56	3.28	3.70	**5yr**	2.90	3.56	4.12	4.87	5.55	**5yr**
10yr	0.38	0.58	0.72	1.01	1.30	1.55	**10yr**	1.13	1.51	1.75	2.25	2.87	3.75	4.29	**10yr**	3.32	4.13	4.74	5.56	6.34	**10yr**
25yr	0.44	0.66	0.82	1.18	1.55	1.81	**25yr**	1.34	1.77	2.06	2.61	3.33	4.47	5.20	**25yr**	3.96	5.00	5.68	6.64	7.56	**25yr**
50yr	0.48	0.73	0.91	1.31	1.76	2.03	**50yr**	1.52	1.99	2.35	2.94	3.74	5.11	6.02	**50yr**	4.52	5.79	6.49	7.59	8.57	**50yr**
100yr	0.54	0.81	1.02	1.47	2.01	2.30	**100yr**	1.74	2.25	2.67	3.30	4.21	5.85	6.96	**100yr**	5.17	6.70	7.45	8.68	9.77	**100yr**
200yr	0.59	0.89	1.13	1.64	2.29	2.57	**200yr**	1.97	2.52	3.03	3.72	4.74	6.68	8.05	**200yr**	5.92	7.74	8.51	9.95	11.14	**200yr**
500yr	0.69	1.02	1.32	1.91	2.72	3.01	**500yr**	2.35	2.94	3.61	4.36	5.55	7.97	9.74	**500yr**	7.05	9.37	10.09	11.93	13.29	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.45	0.55	0.73	0.90	1.08	**1yr**	0.78	1.06	1.19	1.59	1.99	2.50	2.75	**1yr**	2.21	2.65	3.15	3.83	4.35	**1yr**
2yr	0.33	0.50	0.62	0.84	1.04	1.24	**2yr**	0.90	1.22	1.39	1.83	2.32	2.91	3.26	**2yr**	2.57	3.13	3.64	4.33	4.94	**2yr**
5yr	0.41	0.63	0.78	1.07	1.36	1.57	**5yr**	1.17	1.54	1.78	2.28	2.90	3.75	4.31	**5yr**	3.32	4.14	4.77	5.55	6.28	**5yr**
10yr	0.49	0.75	0.93	1.30	1.68	1.91	**10yr**	1.45	1.87	2.15	2.70	3.44	4.58	5.33	**10yr**	4.05	5.13	5.90	6.71	7.58	**10yr**
25yr	0.62	0.95	1.18	1.69	2.22	2.48	**25yr**	1.91	2.42	2.76	3.39	4.30	5.93	7.08	**25yr**	5.25	6.81	7.80	8.63	9.69	**25yr**
50yr	0.74	1.13	1.41	2.03	2.73	3.02	**50yr**	2.36	2.95	3.31	4.03	5.10	7.24	8.77	**50yr**	6.41	8.44	9.65	10.46	11.78	**50yr**
100yr	0.90	1.36	1.71	2.47	3.38	3.68	**100yr**	2.92	3.60	4.00	4.79	6.05	8.84	10.90	**100yr**	7.83	10.48	11.96	12.66	14.22	**100yr**
200yr	1.08	1.63	2.07	2.99	4.18	4.49	**200yr**	3.60	4.39	4.82	5.69	7.19	10.79	13.53	**200yr**	9.55	13.01	14.84	15.35	17.15	**200yr**
500yr	1.40	2.08	2.68	3.89	5.53	5.86	**500yr**	4.77	5.73	6.19	7.16	9.03	14.07	18.03	**500yr**	12.45	17.34	19.78	19.80	22.01	**500yr**



Subcat Reach Pond Link

Routing Diagram for 21102_PRE-DEVELOPED
Prepared by Northpoint Engineer, LLC., Printed 4/8/2022

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
18,819	61	Pasture/grassland/range, Good, HSG B (10S, 20S)
1,028	80	Pasture/grassland/range, Good, HSG D (20S)
1,810	98	Paved parking, HSG B (10S, 20S)
14,743	55	Woods, Good, HSG B (10S, 20S)
462	77	Woods, Good, HSG D (20S)
36,862	**61**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
35,372	HSG B	10S, 20S
0	HSG C	
1,490	HSG D	20S
0	Other	
36,862		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Runoff Area=9,553 sf 7.00% Impervious Runoff Depth>0.36"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=63 Runoff=0.04 cfs 283 cf

Subcatchment 20S: Runoff Area=27,309 sf 4.18% Impervious Runoff Depth>0.30"
Flow Length=140' Tc=4.3 min CN=61 Runoff=0.07 cfs 673 cf

Reach 10R: POC #2 Inflow=0.04 cfs 283 cf
Outflow=0.04 cfs 283 cf

Reach 20R: POC #1 Inflow=0.07 cfs 673 cf
Outflow=0.07 cfs 673 cf

Total Runoff Area = 36,862 sf Runoff Volume = 956 cf Average Runoff Depth = 0.31"
95.09% Pervious = 35,052 sf 4.91% Impervious = 1,810 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Runoff Area=9,553 sf 7.00% Impervious Runoff Depth>0.99"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=63 Runoff=0.17 cfs 787 cf

Subcatchment 20S: Runoff Area=27,309 sf 4.18% Impervious Runoff Depth>0.88"
Flow Length=140' Tc=4.3 min CN=61 Runoff=0.40 cfs 2,000 cf

Reach 10R: POC #2 Inflow=0.17 cfs 787 cf
Outflow=0.17 cfs 787 cf

Reach 20R: POC #1 Inflow=0.40 cfs 2,000 cf
Outflow=0.40 cfs 2,000 cf

Total Runoff Area = 36,862 sf Runoff Volume = 2,787 cf Average Runoff Depth = 0.91"
95.09% Pervious = 35,052 sf 4.91% Impervious = 1,810 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Runoff Area=9,553 sf 7.00% Impervious Runoff Depth=1.60"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=63 Runoff=0.43 cfs 1,277 cf

Subcatchment 20S: Runoff Area=27,309 sf 4.18% Impervious Runoff Depth=1.46"
Flow Length=140' Tc=4.3 min CN=61 Runoff=1.05 cfs 3,323 cf

Reach 10R: POC #2 Inflow=0.43 cfs 1,277 cf
Outflow=0.43 cfs 1,277 cf

Reach 20R: POC #1 Inflow=1.05 cfs 3,323 cf
Outflow=1.05 cfs 3,323 cf

Total Runoff Area = 36,862 sf Runoff Volume = 4,600 cf Average Runoff Depth = 1.50"
95.09% Pervious = 35,052 sf 4.91% Impervious = 1,810 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Runoff Area=9,553 sf 7.00% Impervious Runoff Depth>2.24"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=63 Runoff=0.43 cfs 1,782 cf

Subcatchment 20S: Runoff Area=27,309 sf 4.18% Impervious Runoff Depth>2.06"
Flow Length=140' Tc=4.3 min CN=61 Runoff=1.09 cfs 4,698 cf

Reach 10R: POC #2 Inflow=0.43 cfs 1,782 cf
Outflow=0.43 cfs 1,782 cf

Reach 20R: POC #1 Inflow=1.09 cfs 4,698 cf
Outflow=1.09 cfs 4,698 cf

Total Runoff Area = 36,862 sf Runoff Volume = 6,480 cf Average Runoff Depth = 2.11"
95.09% Pervious = 35,052 sf 4.91% Impervious = 1,810 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 10S: Runoff Area=9,553 sf 7.00% Impervious Runoff Depth>2.97"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=63 Runoff=0.58 cfs 2,368 cf

Subcatchment 20S: Runoff Area=27,309 sf 4.18% Impervious Runoff Depth>2.77"
Flow Length=140' Tc=4.3 min CN=61 Runoff=1.49 cfs 6,310 cf

Reach 10R: POC #2 Inflow=0.58 cfs 2,368 cf
Outflow=0.58 cfs 2,368 cf

Reach 20R: POC #1 Inflow=1.49 cfs 6,310 cf
Outflow=1.49 cfs 6,310 cf

Total Runoff Area = 36,862 sf Runoff Volume = 8,678 cf Average Runoff Depth = 2.82"
95.09% Pervious = 35,052 sf 4.91% Impervious = 1,810 sf

Summary for Subcatchment 10S:

Runoff = 0.17 cfs @ 18.06 hrs, Volume= 787 cf, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 36.00 hrs 10 year Rainfall=4.13"

Area (sf)	CN	Description
1,150	55	Woods, Good, HSG B
669	98	Paved parking, HSG B
7,734	61	Pasture/grassland/range, Good, HSG B
9,553	63	Weighted Average
8,884		93.00% Pervious Area
669		7.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	81	0.2470	0.46		**Sheet Flow,** Range n= 0.130 P2= 2.75"

Summary for Subcatchment 20S:

Runoff = 0.40 cfs @ 18.09 hrs, Volume= 2,000 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 36.00 hrs 10 year Rainfall=4.13"

Area (sf)	CN	Description
462	77	Woods, Good, HSG D
1,028	80	Pasture/grassland/range, Good, HSG D
13,593	55	Woods, Good, HSG B
1,141	98	Paved parking, HSG B
11,085	61	Pasture/grassland/range, Good, HSG B
27,309	61	Weighted Average
26,168		95.82% Pervious Area
1,141		4.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	100	0.0300	0.45		**Sheet Flow,** Fallow n= 0.050 P2= 2.75"
0.6	40	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	140	Total			

Summary for Reach 10R: POC #2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9,553 sf, 7.00% Impervious, Inflow Depth > 0.99" for 10 year event
Inflow = 0.17 cfs @ 18.06 hrs, Volume= 787 cf
Outflow = 0.17 cfs @ 18.06 hrs, Volume= 787 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach 20R: POC #1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 27,309 sf, 4.18% Impervious, Inflow Depth > 0.88" for 10 year event
Inflow = 0.40 cfs @ 18.09 hrs, Volume= 2,000 cf
Outflow = 0.40 cfs @ 18.09 hrs, Volume= 2,000 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 10S:

Runoff = 0.43 cfs @ 12.05 hrs, Volume= 1,277 cf, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.15"

Area (sf)	CN	Description
1,150	55	Woods, Good, HSG B
669	98	Paved parking, HSG B
7,734	61	Pasture/grassland/range, Good, HSG B
9,553	63	Weighted Average
8,884		93.00% Pervious Area
669		7.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	81	0.2470	0.46		**Sheet Flow,** Range n= 0.130 P2= 2.75"

Summary for Subcatchment 20S:

Runoff = 1.05 cfs @ 12.07 hrs, Volume= 3,323 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.15"

Area (sf)	CN	Description
462	77	Woods, Good, HSG D
1,028	80	Pasture/grassland/range, Good, HSG D
13,593	55	Woods, Good, HSG B
1,141	98	Paved parking, HSG B
11,085	61	Pasture/grassland/range, Good, HSG B
27,309	61	Weighted Average
26,168		95.82% Pervious Area
1,141		4.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	100	0.0300	0.45		**Sheet Flow,** Fallow n= 0.050 P2= 2.75"
0.6	40	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	140	Total			

Summary for Reach 10R: POC #2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9,553 sf, 7.00% Impervious, Inflow Depth = 1.60" for 25 year event
Inflow = 0.43 cfs @ 12.05 hrs, Volume= 1,277 cf
Outflow = 0.43 cfs @ 12.05 hrs, Volume= 1,277 cf, Atten= 0%, Lag= 0.0 min

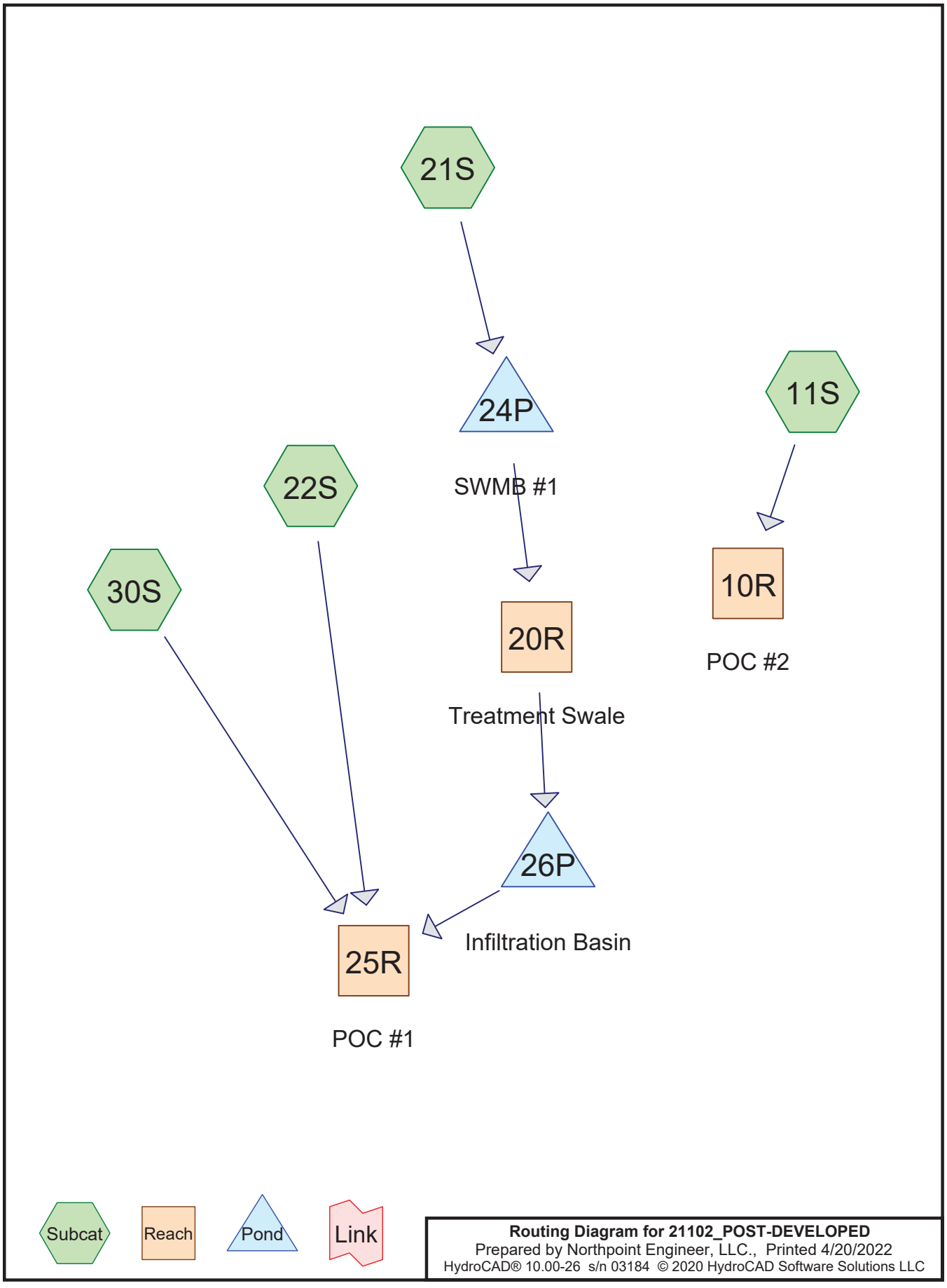
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach 20R: POC #1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 27,309 sf, 4.18% Impervious, Inflow Depth = 1.46" for 25 year event
Inflow = 1.05 cfs @ 12.07 hrs, Volume= 3,323 cf
Outflow = 1.05 cfs @ 12.07 hrs, Volume= 3,323 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



Routing Diagram for 21102_POST-DEVELOPED
Prepared by Northpoint Engineer, LLC., Printed 4/20/2022
HydroCAD® 10.00-26 s/n 03184 © 2020 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
11,012	61	>75% Grass cover, Good, HSG B (11S, 21S, 22S)
1,065	48	Brush, Good, HSG B (30S)
1,028	73	Brush, Good, HSG D (30S)
19,262	98	Paved parking, HSG B (21S)
4,033	55	Woods, Good, HSG B (30S)
462	77	Woods, Good, HSG D (30S)
36,862	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
35,372	HSG B	11S, 21S, 22S, 30S
0	HSG C	
1,490	HSG D	30S
0	Other	
36,862		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 11S: Runoff Area=3,879 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=61 Runoff=0.01 cfs 96 cf

Subcatchment 21S: Runoff Area=25,482 sf 75.59% Impervious Runoff Depth>1.73"
Tc=2.0 min CN=89 Runoff=0.93 cfs 3,671 cf

Subcatchment 22S: Runoff Area=913 sf 0.00% Impervious Runoff Depth>0.30"
Tc=2.0 min CN=61 Runoff=0.00 cfs 23 cf

Subcatchment 30S: Runoff Area=6,588 sf 0.00% Impervious Runoff Depth>0.22"
Tc=2.0 min CN=58 Runoff=0.01 cfs 118 cf

Reach 10R: POC #2 Inflow=0.01 cfs 96 cf
Outflow=0.01 cfs 96 cf

Reach 20R: Treatment Swale Avg. Flow Depth=0.14' Max Vel=0.17 fps Inflow=0.05 cfs 3,078 cf
n=0.150 L=100.0' S=0.0050 '/' Capacity=2.49 cfs Outflow=0.05 cfs 3,057 cf

Reach 25R: POC #1 Inflow=0.01 cfs 141 cf
Outflow=0.01 cfs 141 cf

Pond 24P: SWMB #1 Peak Elev=229.91' Storage=1,954 cf Inflow=0.93 cfs 3,671 cf
Outflow=0.05 cfs 3,078 cf

Pond 26P: Infiltration Basin Peak Elev=227.50' Storage=0 cf Inflow=0.05 cfs 3,057 cf
Discarded=0.05 cfs 3,056 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 3,056 cf

Total Runoff Area = 36,862 sf Runoff Volume = 3,907 cf Average Runoff Depth = 1.27"
47.75% Pervious = 17,600 sf 52.25% Impervious = 19,262 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 11S: Runoff Area=3,879 sf 0.00% Impervious Runoff Depth>0.88"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=61 Runoff=0.06 cfs 284 cf

Subcatchment 21S: Runoff Area=25,482 sf 75.59% Impervious Runoff Depth>2.94"
Tc=2.0 min CN=89 Runoff=1.57 cfs 6,253 cf

Subcatchment 22S: Runoff Area=913 sf 0.00% Impervious Runoff Depth>0.88"
Tc=2.0 min CN=61 Runoff=0.01 cfs 67 cf

Subcatchment 30S: Runoff Area=6,588 sf 0.00% Impervious Runoff Depth>0.72"
Tc=2.0 min CN=58 Runoff=0.08 cfs 398 cf

Reach 10R: POC #2 Inflow=0.06 cfs 284 cf
Outflow=0.06 cfs 284 cf

Reach 20R: Treatment Swale Avg. Flow Depth=0.37' Max Vel=0.29 fps Inflow=0.34 cfs 5,334 cf
n=0.150 L=100.0' S=0.0050 '/' Capacity=2.49 cfs Outflow=0.34 cfs 5,309 cf

Reach 25R: POC #1 Inflow=0.09 cfs 526 cf
Outflow=0.09 cfs 526 cf

Pond 24P: SWMB #1 Peak Elev=230.24' Storage=2,791 cf Inflow=1.57 cfs 6,253 cf
Outflow=0.34 cfs 5,334 cf

Pond 26P: Infiltration Basin Peak Elev=228.51' Storage=1,115 cf Inflow=0.34 cfs 5,309 cf
Discarded=0.10 cfs 5,247 cf Primary=0.02 cfs 61 cf Outflow=0.12 cfs 5,309 cf

Total Runoff Area = 36,862 sf Runoff Volume = 7,002 cf Average Runoff Depth = 2.28"
47.75% Pervious = 17,600 sf 52.25% Impervious = 19,262 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 11S: Runoff Area=3,879 sf 0.00% Impervious Runoff Depth>1.46"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=61 Runoff=0.11 cfs 472 cf

Subcatchment 21S: Runoff Area=25,482 sf 75.59% Impervious Runoff Depth>3.91"
Tc=2.0 min CN=89 Runoff=2.05 cfs 8,313 cf

Subcatchment 22S: Runoff Area=913 sf 0.00% Impervious Runoff Depth>1.46"
Tc=2.0 min CN=61 Runoff=0.03 cfs 111 cf

Subcatchment 30S: Runoff Area=6,588 sf 0.00% Impervious Runoff Depth>1.25"
Tc=2.0 min CN=58 Runoff=0.15 cfs 687 cf

Reach 10R: POC #2 Inflow=0.11 cfs 472 cf
Outflow=0.11 cfs 472 cf

Reach 20R: Treatment Swale Avg. Flow Depth=0.50' Max Vel=0.34 fps Inflow=0.59 cfs 7,206 cf
n=0.150 L=100.0' S=0.0050 '/' Capacity=2.49 cfs Outflow=0.59 cfs 7,179 cf

Reach 25R: POC #1 Inflow=0.41 cfs 2,207 cf
Outflow=0.41 cfs 2,207 cf

Pond 24P: SWMB #1 Peak Elev=230.45' Storage=3,375 cf Inflow=2.05 cfs 8,313 cf
Outflow=0.59 cfs 7,206 cf

Pond 26P: Infiltration Basin Peak Elev=228.59' Storage=1,218 cf Inflow=0.59 cfs 7,179 cf
Discarded=0.10 cfs 5,764 cf Primary=0.38 cfs 1,409 cf Outflow=0.48 cfs 7,173 cf

Total Runoff Area = 36,862 sf Runoff Volume = 9,583 cf Average Runoff Depth = 3.12"
47.75% Pervious = 17,600 sf 52.25% Impervious = 19,262 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 11S: Runoff Area=3,879 sf 0.00% Impervious Runoff Depth>2.77"
Flow Length=81' Slope=0.2470 '/' Tc=2.9 min CN=61 Runoff=0.22 cfs 896 cf

Subcatchment 21S: Runoff Area=25,482 sf 75.59% Impervious Runoff Depth>5.80"
Tc=2.0 min CN=89 Runoff=2.98 cfs 12,326 cf

Subcatchment 22S: Runoff Area=913 sf 0.00% Impervious Runoff Depth>2.77"
Tc=2.0 min CN=61 Runoff=0.05 cfs 211 cf

Subcatchment 30S: Runoff Area=6,588 sf 0.00% Impervious Runoff Depth>2.48"
Tc=2.0 min CN=58 Runoff=0.33 cfs 1,360 cf

Reach 10R: POC #2 Inflow=0.22 cfs 896 cf
Outflow=0.22 cfs 896 cf

Reach 20R: Treatment Swale Avg. Flow Depth=0.74' Max Vel=0.42 fps Inflow=1.50 cfs 10,914 cf
n=0.150 L=100.0' S=0.0050 '/' Capacity=2.49 cfs Outflow=1.33 cfs 10,884 cf

Reach 25R: POC #1 Inflow=1.09 cfs 5,933 cf
Outflow=1.09 cfs 5,933 cf

Pond 24P: SWMB #1 Peak Elev=230.80' Storage=4,404 cf Inflow=2.98 cfs 12,326 cf
Outflow=1.50 cfs 10,914 cf

Pond 26P: Infiltration Basin Peak Elev=228.66' Storage=1,324 cf Inflow=1.33 cfs 10,884 cf
Discarded=0.10 cfs 6,391 cf Primary=0.95 cfs 4,363 cf Outflow=1.05 cfs 10,754 cf

Total Runoff Area = 36,862 sf Runoff Volume = 14,793 cf Average Runoff Depth = 4.82"
47.75% Pervious = 17,600 sf 52.25% Impervious = 19,262 sf

Summary for Subcatchment 11S:

Runoff = 0.06 cfs @ 18.06 hrs, Volume= 284 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 36.00 hrs 10 year Rainfall=4.13"

Area (sf)	CN	Description
3,879	61	>75% Grass cover, Good, HSG B
3,879		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	81	0.2470	0.46		**Sheet Flow,** Range n= 0.130 P2= 2.75"

Summary for Subcatchment 21S:

Runoff = 1.57 cfs @ 18.03 hrs, Volume= 6,253 cf, Depth> 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 36.00 hrs 10 year Rainfall=4.13"

Area (sf)	CN	Description
6,220	61	>75% Grass cover, Good, HSG B
19,262	98	Paved parking, HSG B
25,482	89	Weighted Average
6,220		24.41% Pervious Area
19,262		75.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0					**Direct Entry,**

Summary for Subcatchment 22S:

Runoff = 0.01 cfs @ 18.04 hrs, Volume= 67 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 36.00 hrs 10 year Rainfall=4.13"

Area (sf)	CN	Description
913	61	>75% Grass cover, Good, HSG B
913		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0					**Direct Entry,**

Summary for Subcatchment 30S:

Runoff = 0.08 cfs @ 18.05 hrs, Volume= 398 cf, Depth> 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 36.00 hrs 10 year Rainfall=4.13"

Area (sf)	CN	Description
462	77	Woods, Good, HSG D
1,028	73	Brush, Good, HSG D
4,033	55	Woods, Good, HSG B
1,065	48	Brush, Good, HSG B
6,588	58	Weighted Average
6,588		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0					**Direct Entry,**

Summary for Reach 10R: POC #2

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3,879 sf, 0.00% Impervious, Inflow Depth > 0.88" for 10 year event
Inflow = 0.06 cfs @ 18.06 hrs, Volume= 284 cf
Outflow = 0.06 cfs @ 18.06 hrs, Volume= 284 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Reach 20R: Treatment Swale

Inflow Area = 25,482 sf, 75.59% Impervious, Inflow Depth > 2.51" for 10 year event
Inflow = 0.34 cfs @ 18.58 hrs, Volume= 5,334 cf
Outflow = 0.34 cfs @ 18.65 hrs, Volume= 5,309 cf, Atten= 1%, Lag= 4.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.29 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 11.6 min

Peak Storage= 117 cf @ 18.65 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 2.49 cfs

2.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 8.00'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 228.50', Outlet Invert= 228.00'

‡

Summary for Reach 25R: POC #1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 32,983 sf, 58.40% Impervious, Inflow Depth > 0.19" for 10 year event
Inflow = 0.09 cfs @ 18.05 hrs, Volume= 526 cf
Outflow = 0.09 cfs @ 18.05 hrs, Volume= 526 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Pond 24P: SWMB #1

Inflow Area = 25,482 sf, 75.59% Impervious, Inflow Depth > 2.94" for 10 year event
Inflow = 1.57 cfs @ 18.03 hrs, Volume= 6,253 cf
Outflow = 0.34 cfs @ 18.58 hrs, Volume= 5,334 cf, Atten= 78%, Lag= 33.0 min
Primary = 0.34 cfs @ 18.58 hrs, Volume= 5,334 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 230.24' @ 18.58 hrs Surf.Area= 2,654 sf Storage= 2,791 cf

Plug-Flow detention time= 307.8 min calculated for 5,334 cf (85% of inflow)
Center-of-Mass det. time= 213.2 min (1,408.4 - 1,195.2)

Volume	Invert	Avail.Storage	Storage Description
#1	229.00'	5,013 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
229.00	1,867	0	0
230.00	2,492	2,180	2,180
231.00	3,174	2,833	5,013

Device	Routing	Invert	Outlet Devices
#1	Primary	229.00'	**15.0" Round Culvert** L= 7.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 229.00' / 228.80' S= 0.0286 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Device 1	229.00'	**1.5" Vert. Orifice/Grate** C= 0.600
#3	Device 1	229.90'	**6.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	230.75'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.34 cfs @ 18.58 hrs HW=230.24' TW=228.87' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.34 cfs of 4.41 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 5.22 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.28 cfs @ 1.98 fps)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 26P: Infiltration Basin

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=65)
[62] Hint: Exceeded Reach 20R OUTLET depth by 0.32' @ 21.66 hrs

Inflow Area = 25,482 sf, 75.59% Impervious, Inflow Depth > 2.50" for 10 year event
Inflow = 0.34 cfs @ 18.65 hrs, Volume= 5,309 cf
Outflow = 0.12 cfs @ 20.54 hrs, Volume= 5,309 cf, Atten= 64%, Lag= 112.9 min
Discarded = 0.10 cfs @ 20.54 hrs, Volume= 5,247 cf
Primary = 0.02 cfs @ 20.54 hrs, Volume= 61 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 228.51' @ 20.54 hrs Surf.Area= 1,412 sf Storage= 1,115 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 108.0 min (1,521.8 - 1,413.9)

Volume	Invert	Avail.Storage	Storage Description
#1	227.50'	1,877 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
227.50	800	0	0
228.00	1,090	473	473
228.50	1,403	623	1,096
229.00	1,720	781	1,877

Device	Routing	Invert	Outlet Devices
#1	Discarded	227.50'	**3.000 in/hr Exfiltration over Surface area**
#2	Primary	228.50'	**6.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32

Discarded OutFlow Max=0.10 cfs @ 20.54 hrs HW=228.51' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.02 cfs @ 20.54 hrs HW=228.51' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.29 fps)

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

TREATMENT SWALE DESIGN CRITERIA (Env-Wq 1508.08)

Treatment Swales with Flow Attenuated (Downstream of Detention)

(Env-Wq 1508.08)

Node Name: **20R**

Enter the node name in the drainage analysis (e.g., reach TS 5), if applicable.

Yes	Yes/No	Have you reviewed the restrictions on unlined swales outlined in Env-Wq 1508.08(a)?	
No	Yes/No	Is the system lined? (Required if not treated or if above SHWT.)	
100.00	feet	L = Swale length [1]	**≥ 100'**
7.00	feet	w = Bottom of the swale width[2]	**0 - 8 feet** [2]
227.30	feet	E_{SHWT} = Elevation of SHWT. If none found, use the lowest elev. of test pit	
227.40	feet	E_{BTM} = Elevation of the bottom of the practice	**≥ E_{SHWT}**
3.0	:1	SS_{RIGHT} = Right side slope	**≥3:1**
3.0	:1	SS_{LEFT} = Left side slope	**≥3:1**
0.005	ft/ft	S = Slope of swale in decimal form[3]	**0.005 - .05**
2.5	inches	d = Flow depth in swale at 2-year flow, using Mannings n = 0.15 (Attach summary node report which shows modeled Mannings n.)[4]	**≤ 4"**
12	min	HRT = Hydraulic residence time during the WQF. In some programs, this is shown on node outlet hydrograph as "minimum travel time". (Attach)[5]	**≥ 10 min**
228.10	ft	Peak elevation of the 10-year storm event[6]	
228.90	ft	Elevation of the top of the swale	
YES	Yes/No	10 peak elevation ≤ the top of swale	**← yes**

1. Any portion of the swale that is in a roadside ditch shall not count towards the swale length.
2. Widths up to 16' allowed if a dividing berm or structure is used such that neither width is more than 8'.
3. If > 0.02 (2%) then check dams are required. No additional detention time is credited for check dams.
4. If not using software which displays this data input, provide a screenshot of input screen.
5. If not using software which displays this output, calculate in Designer's Notes, below:

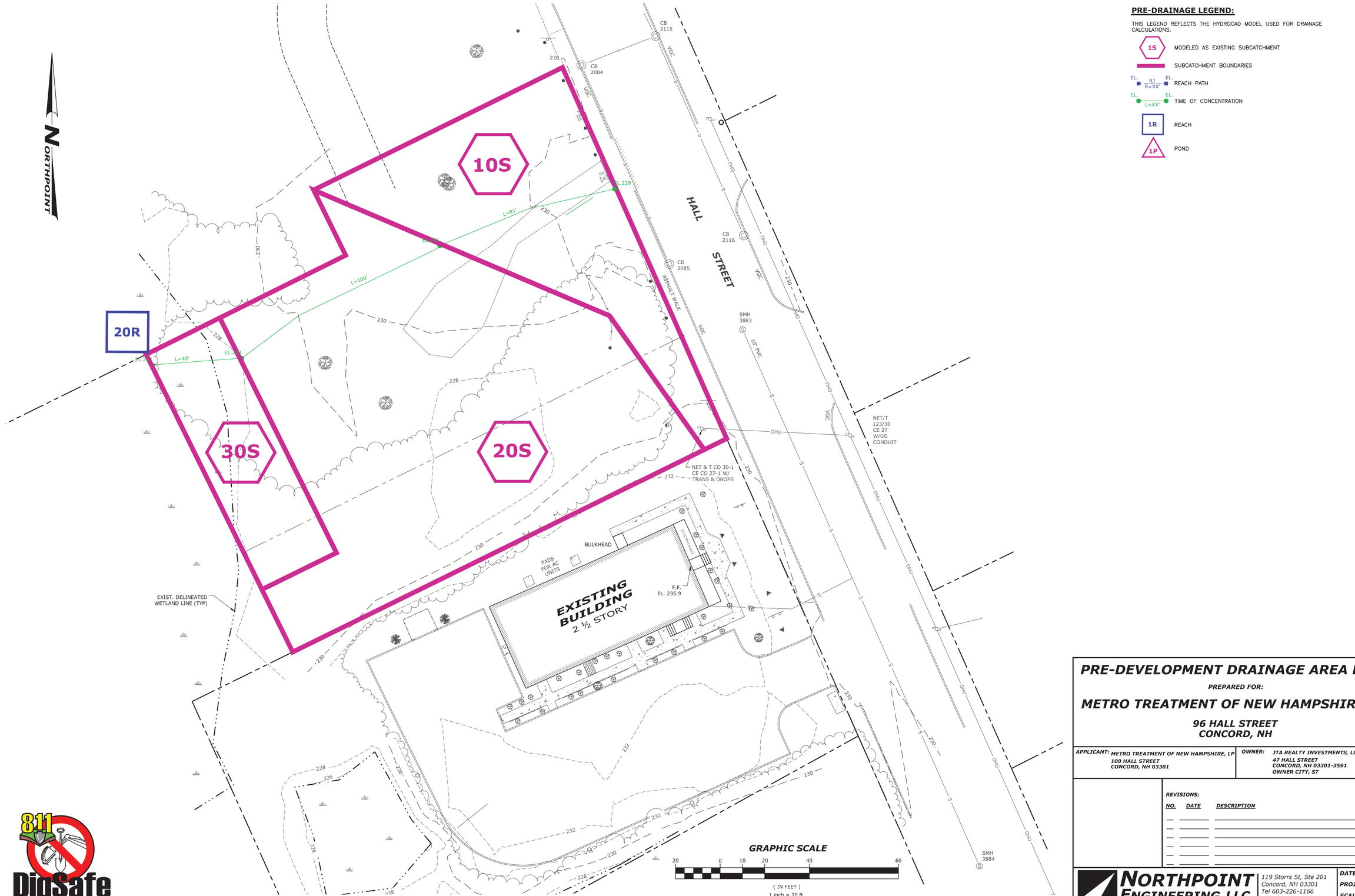
HRT (min) = Length of swale (ft) / (velocity at 2 yr peak depth (ft/sec) * 60)

6. If the swale does not discharge the 50-year storm without overtopping the banks, hydrologic routing of secondary discharge to a different node may be necessary.

Designer's Notes:

VII. Drainage Area Plans

- Pre-Developed Drainage Area Plan
- Post-Developed Drainage Area Plan



PRE-DRAINAGE LEGEND:

THIS LEGEND REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- 1S — MODELED AS EXISTING SUBCATCHMENT
- SUBCATCHMENT BOUNDARIES
- EL. R1 R=XX' EL. — REACH PATH
- EL. L=XX' EL. — TIME OF CONCENTRATION
- 1R — REACH
- 1P — POND

PRE-DEVELOPMENT DRAINAGE AREA PLAN

PREPARED FOR:

METRO TREATMENT OF NEW HAMPSHIRE, LP

96 HALL STREET
CONCORD, NH

APPLICANT:	OWNER:
METRO TREATMENT OF NEW HAMPSHIRE, LP 100 HALL STREET CONCORD, NH 03301	JTA REALTY INVESTMENTS, LLC. 47 HALL STREET CONCORD, NH 03301-3591 OWNER CITY, ST

REVISIONS:

NO.	DATE	DESCRIPTION

NORTHPOINT ENGINEERING, LLC
Civil Engineering ◢ Land Planning ◢ Construction Services
119 Storrs St, Ste 201
Concord, NH 03301
Tel 603-226-1166
Fax 603-226-1160
www.northpointeng.com

DATE: APRIL 2022
PROJ.: 21102
SCALE: 1"=20'
SHEET: 1 OF 1

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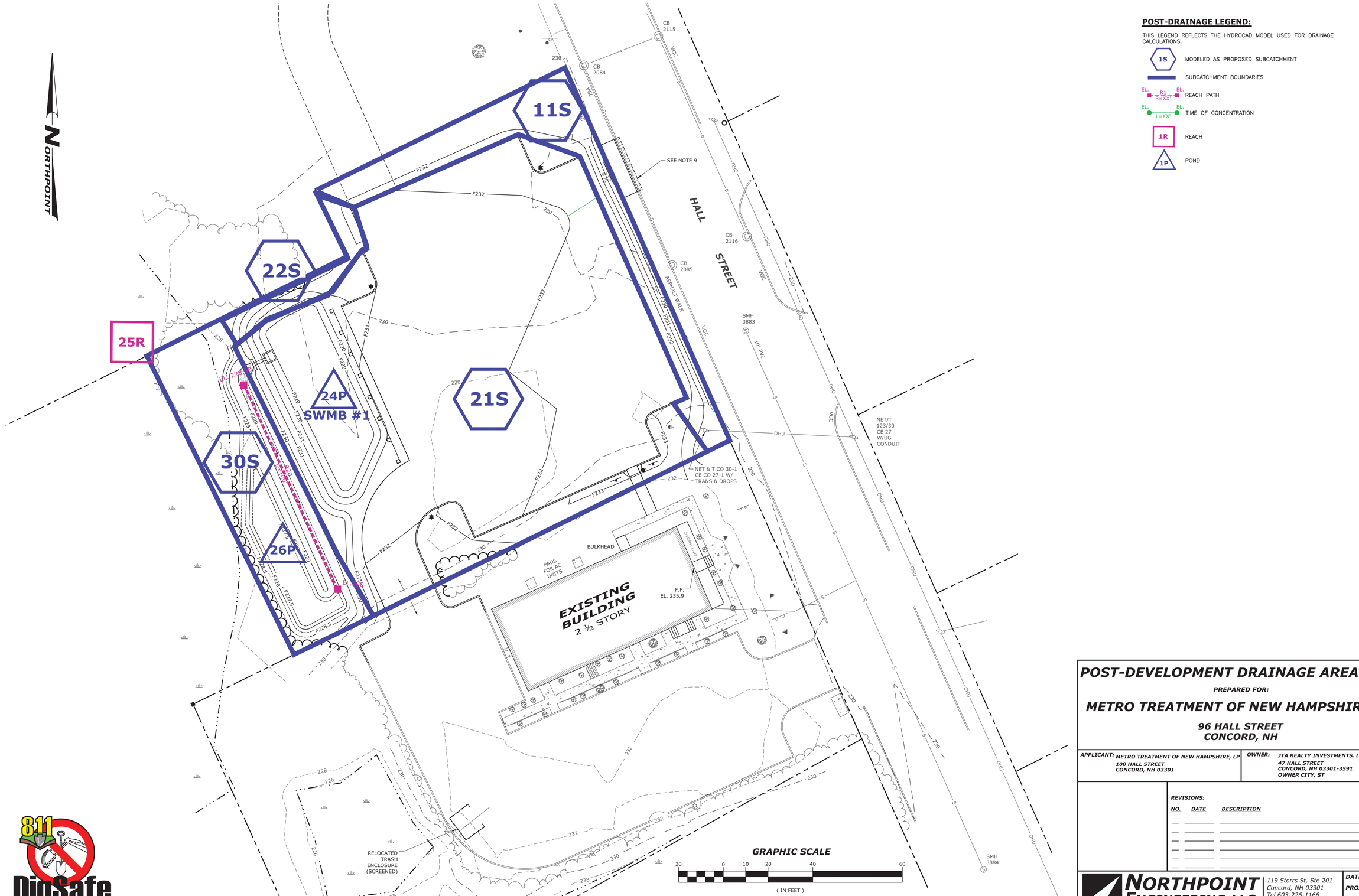

POST-DRAINAGE LEGEND:

THIS LEGEND REFLECTS THE HYDROCAD MODEL USED FOR DRAINAGE CALCULATIONS.

- 1S — MODELED AS PROPOSED SUBCATCHMENT
- SUBCATCHMENT BOUNDARIES
- EL. — R1 R=XX' — EL. — REACH PATH
- EL. — L=XX' — EL. — TIME OF CONCENTRATION
- 1R — REACH
- 1P — POND

POST-DEVELOPMENT DRAINAGE AREA PLAN

PREPARED FOR:

METRO TREATMENT OF NEW HAMPSHIRE, LP

96 HALL STREET
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APPLICANT: METRO TREATMENT OF NEW HAMPSHIRE, LP 100 HALL STREET CONCORD, NH 03301	OWNER: JTA REALTY INVESTMENTS, LLC. 47 HALL STREET CONCORD, NH 03301-3591 OWNER CITY, ST

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DATE: APRIL 2022
PROJ.: 21102
SCALE: 1"=20'
SHEET: 1 OF 1

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