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To: Montefiore Health System Nyack Campus

From: Bryan Waisnor, PE
Shannon Folino, PE

Date: ~~29 January 2025~~ **Revised 13 June 2025**

Re: Stormwater Management Summary
Nyack Hospital Drainage Improvements
160 North Midland Avenue
Nyack, New York
Langan Project No.: 100754201



This memorandum summarizes the stormwater conveyance design associated with the Nyack Hospital Drainage Improvements project within the Montefiore Health System Nyack Campus in Nyack, New York. As shown on the Nyack Hospital Drainage & Utility Improvements Site Plan Drawing Set prepared by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., dated 1/29/2025, last revised 6/13/2025, the improvements include the reconstruction of a portion of the existing parking lot to better convey stormwater runoff and associated drainage pipe improvements. Improvements also include the construction of a concrete wall with stone veneer and hydraulic flood barriers at the two driveway entrances along Highland Avenue. Lastly, a generator and associated equipment are proposed for emergency power at the Hospital.

The balance of the drainage improvements are to direct water away from door locations to on-site drainage structures and for adjustments to grading; the roof leaders which currently discharge at the ground surface will also be piped to connect to the existing storm system.

These on-site drainage improvements, including the new concrete wall and conversion of asphalt to new vegetated areas, result in a net decrease of impervious area by roughly 74 square feet. Because of the reduction in impervious area, the amount of runoff from the site after the project will not exceed its predevelopment characteristics, with a zero net incremental discharge of runoff from the project, in accordance with the intent of Village Code Section 360-4.4.E.(15).

The proposed hydraulic flood barriers are intended to keep excess stormwater runoff from the adjacent right-of-way from overflowing onto the hospital campus during extreme rainfall events. They are recessed in the pavement so as to be flush with the pavement except when water flowing over them activates their operation. The flood barriers have a 4-inch drain that allows stormwater to be conveyed to the existing on-site conveyance system. The proposed improvements will not result in any runoff generated on the site to be diverted to another

MEMO

Stormwater Management Summary
160 North Midland Avenue, Nyack, NY 10960
Nyack Hospital Drainage Improvements
Nyack, New York
Langan Project No.: 100754201

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property, or in this case adjacent right-of-way, in accordance with the intent of Village Code Section 360-4.4.E.(3).

The portion of the on-site storm sewer system with proposed modifications was analyzed using the rational method for estimating runoff for the 25-year-design storms. The site was divided into sub-areas, each contributing runoff to an individual catch basin inlet or roof drain. Values for area, time of concentration, and runoff coefficient (c) were calculated for each contributing sub-area.

Values of time of concentration were chosen based on land cover and slope of the flow path from the hydraulically most distant point in the sub-area to the appropriate inlet. The average runoff coefficient, which is the ratio of peak runoff rate to the average rainfall rate for the period known as the time of concentration, was chosen using the values on the following page.

<u>Land Cover</u>	<u>Runoff Coefficient, c</u>
Grass/Landscaping	0.30
Paved/Impervious	0.99

Rainfall intensities were taken from the rainfall intensity data for New York (Figure 1 – Rainfall Intensity-Duration-Frequency Data). Storm drainage pipes were then sized based on calculated flows using Manning’s Equation and were verified by solving for the hydraulic grade line. Supporting calculations for the stormwater conveyance system are located in Appendix A of this memo.

The proposed stormwater conveyance systems have been designed to safely and effectively convey the 25-year storm such that the hydraulic grade line (HGL) elevation does not exceed the grate elevations at any structure. Detailed design calculations for the on-site stormwater collection system are included in Appendix A of this memo.

Please let us know if you have any questions.

Enclosures: Figure 1 – Rainfall Intensity-Duration-Frequency Data
Appendix A – Stormwater Conveyance Calculations
CG201 – Catchment Area Map



NOAA Atlas 14, Volume 10, Version 3
Location name: Nyack, New York, USA*
Latitude: 41.096°, Longitude: -73.926°
Elevation: 201.72 ft**
* source: ESRI Maps
** source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orian Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)**PF tabular**

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.38 (3.46-5.51)	5.15 (4.04-6.48)	6.40 (5.02-8.08)	7.43 (5.80-9.43)	8.86 (6.66-11.7)	9.95 (7.31-13.4)	11.1 (7.85-15.3)	12.2 (8.27-17.5)	13.8 (9.00-20.5)	15.1 (9.56-22.8)
10-min	3.10 (2.45-3.90)	3.65 (2.87-4.58)	4.54 (3.56-5.72)	5.27 (4.11-6.69)	6.28 (4.72-8.27)	7.04 (5.18-9.47)	7.83 (5.56-10.9)	8.66 (5.86-12.4)	9.80 (6.37-14.5)	10.7 (6.77-16.1)
15-min	2.44 (1.92-3.06)	2.86 (2.25-3.60)	3.55 (2.78-4.48)	4.13 (3.22-5.24)	4.92 (3.70-6.49)	5.52 (4.06-7.43)	6.14 (4.36-8.53)	6.80 (4.60-9.71)	7.69 (5.00-11.4)	8.39 (5.31-12.7)
30-min	1.69 (1.33-2.12)	1.98 (1.56-2.49)	2.45 (1.92-3.10)	2.85 (2.22-3.61)	3.39 (2.55-4.46)	3.80 (2.79-5.10)	4.22 (2.99-5.85)	4.66 (3.15-6.66)	5.25 (3.41-7.76)	5.71 (3.62-8.62)
60-min	1.08 (0.851-1.36)	1.26 (0.995-1.59)	1.57 (1.23-1.97)	1.81 (1.41-2.30)	2.16 (1.62-2.84)	2.42 (1.78-3.25)	2.69 (1.90-3.72)	2.96 (2.01-4.23)	3.33 (2.17-4.92)	3.62 (2.29-5.45)
2-hr	0.719 (0.570-0.898)	0.832 (0.660-1.04)	1.02 (0.804-1.28)	1.17 (0.921-1.48)	1.39 (1.05-1.81)	1.55 (1.14-2.07)	1.71 (1.22-2.36)	1.89 (1.28-2.68)	2.12 (1.39-3.12)	2.31 (1.47-3.46)
3-hr	0.555 (0.442-0.690)	0.644 (0.512-0.801)	0.789 (0.626-0.985)	0.909 (0.716-1.14)	1.07 (0.816-1.40)	1.20 (0.890-1.60)	1.33 (0.953-1.83)	1.47 (1.00-2.08)	1.66 (1.08-2.43)	1.81 (1.15-2.70)
6-hr	0.346 (0.278-0.427)	0.407 (0.326-0.503)	0.507 (0.405-0.629)	0.590 (0.469-0.736)	0.705 (0.540-0.916)	0.791 (0.592-1.05)	0.881 (0.638-1.21)	0.982 (0.671-1.38)	1.13 (0.737-1.64)	1.24 (0.793-1.84)
12-hr	0.205 (0.166-0.251)	0.248 (0.200-0.304)	0.317 (0.255-0.391)	0.375 (0.300-0.465)	0.455 (0.351-0.590)	0.515 (0.388-0.681)	0.578 (0.422-0.794)	0.651 (0.447-0.910)	0.759 (0.498-1.10)	0.848 (0.542-1.25)
24-hr	0.119 (0.097-0.145)	0.146 (0.119-0.178)	0.191 (0.155-0.234)	0.228 (0.184-0.281)	0.280 (0.217-0.360)	0.318 (0.241-0.419)	0.359 (0.264-0.491)	0.407 (0.280-0.564)	0.478 (0.315-0.686)	0.538 (0.345-0.786)
2-day	0.068 (0.056-0.082)	0.083 (0.068-0.101)	0.109 (0.089-0.133)	0.130 (0.106-0.159)	0.160 (0.125-0.205)	0.182 (0.139-0.238)	0.205 (0.152-0.279)	0.233 (0.161-0.321)	0.274 (0.181-0.391)	0.309 (0.199-0.449)
3-day	0.049 (0.041-0.060)	0.061 (0.050-0.073)	0.079 (0.065-0.095)	0.094 (0.076-0.114)	0.115 (0.090-0.146)	0.130 (0.100-0.169)	0.147 (0.109-0.199)	0.166 (0.115-0.228)	0.196 (0.130-0.278)	0.221 (0.143-0.320)
4-day	0.040 (0.033-0.048)	0.049 (0.040-0.058)	0.063 (0.052-0.076)	0.075 (0.061-0.090)	0.091 (0.071-0.115)	0.103 (0.079-0.134)	0.116 (0.086-0.157)	0.131 (0.091-0.180)	0.154 (0.103-0.219)	0.174 (0.113-0.252)
7-day	0.027 (0.022-0.032)	0.032 (0.027-0.039)	0.041 (0.034-0.049)	0.048 (0.040-0.059)	0.059 (0.046-0.074)	0.066 (0.051-0.085)	0.074 (0.055-0.099)	0.084 (0.058-0.114)	0.098 (0.065-0.138)	0.110 (0.071-0.157)
10-day	0.022 (0.018-0.026)	0.026 (0.021-0.031)	0.032 (0.027-0.039)	0.038 (0.031-0.045)	0.045 (0.036-0.057)	0.051 (0.039-0.065)	0.057 (0.042-0.075)	0.063 (0.044-0.086)	0.074 (0.049-0.103)	0.082 (0.053-0.117)
20-day	0.015 (0.013-0.018)	0.018 (0.015-0.021)	0.021 (0.018-0.025)	0.024 (0.020-0.029)	0.028 (0.023-0.035)	0.032 (0.025-0.040)	0.035 (0.026-0.046)	0.039 (0.027-0.052)	0.044 (0.029-0.061)	0.047 (0.031-0.067)
30-day	0.013 (0.011-0.015)	0.014 (0.012-0.017)	0.017 (0.014-0.020)	0.019 (0.016-0.023)	0.022 (0.018-0.027)	0.025 (0.019-0.031)	0.027 (0.020-0.035)	0.029 (0.021-0.039)	0.033 (0.022-0.045)	0.035 (0.023-0.049)
45-day	0.011 (0.009-0.012)	0.012 (0.010-0.014)	0.014 (0.012-0.016)	0.015 (0.013-0.018)	0.017 (0.014-0.021)	0.019 (0.015-0.024)	0.021 (0.016-0.027)	0.022 (0.016-0.030)	0.025 (0.017-0.034)	0.026 (0.017-0.037)
60-day	0.009 (0.008-0.011)	0.010 (0.009-0.012)	0.012 (0.010-0.014)	0.013 (0.011-0.015)	0.015 (0.012-0.018)	0.016 (0.013-0.020)	0.017 (0.013-0.022)	0.019 (0.013-0.025)	0.020 (0.014-0.028)	0.021 (0.014-0.030)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
 Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
 Please refer to NOAA Atlas 14 document for more information.

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Map References: NOAA Atlas 14, Volume 10, Version 3.

LANGAN

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

Collectively known as Langan

NJ CERTIFICATE OF AUTHORIZATION No. 24GA27996400

Project

NYACK HOSPITAL

BLOCK No. 1, LOT No. 74

VILLAGE OF NYACK

ROCKLAND COUNTY

NEW YORK

Drawing Title

RAINFALL
 INTENSITY- DURATION-
 FREQUENCY DATA

Project No.

100754201

Date

01/29/2025

Scale

Drawn By

KT

Checked By

SF

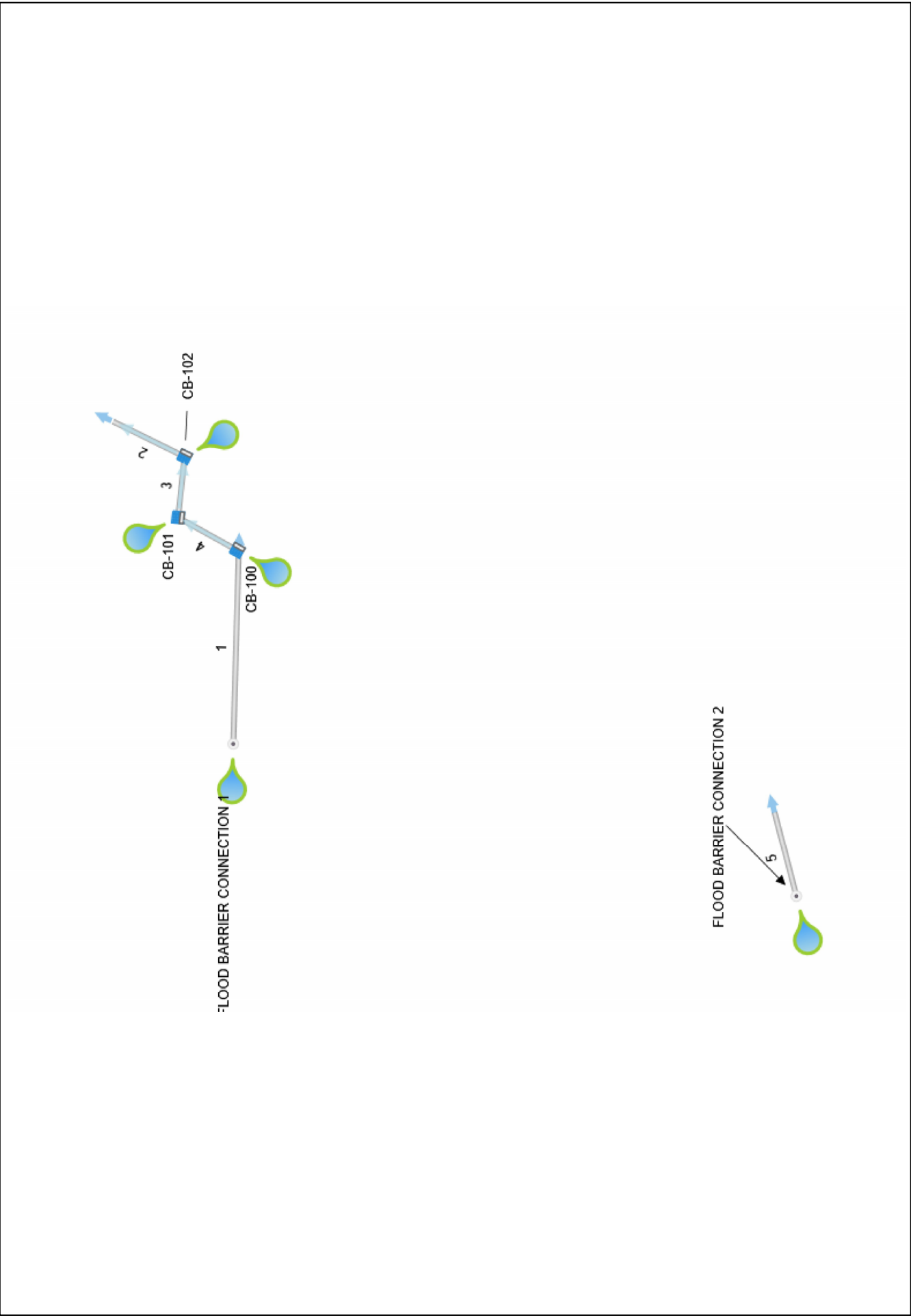
Figure

1

APPENDIX A

Stormwater Conveyance Calculations

Plan View



Storm Sewer Tabulation

Stormwater Studio 2025 v 3.0.0.38

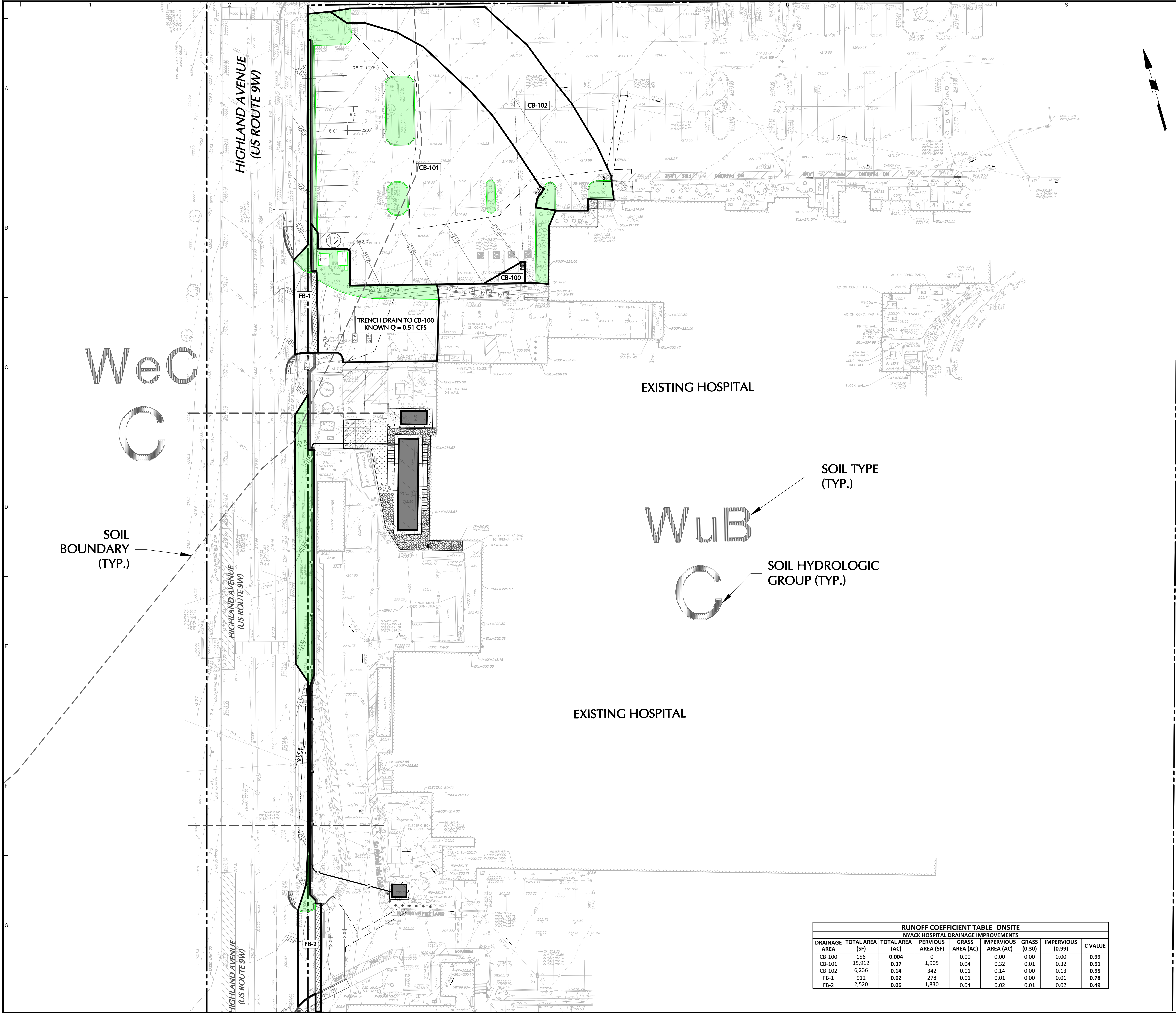
Project Name: 100754212 - Proposed Drainage

06-13-2025

Line ID	Length (ft)	Drmg Area		Rational (C)	C x A		Tc		Intensity (in/hr)	Total Q (cfs)	Capacity (cfs)	Velocity (ft/s)	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
FB-1 TO CB-100	120.98	0.020	0.020	0.78	0.02	0.02	6.0	6.00	8.03	0.13	0.15	1.67	4	0.50	209.42	208.82	209.66	209.15	215.20	214.01	1
CB-102 TO EX. CB-200	49.55	0.140	0.514	0.95	0.13	0.47	6.0	6.26	7.86	4.23	7.00	5.24	15	1.00	207.20	206.70	208.02	207.44	213.28	208.15	2
CB-101 TO CB-102	38.82	0.370	0.374	0.91	0.34	0.34	6.0	6.14	7.94	3.21	7.00	2.74	15	1.00	207.58	207.20	208.66	208.60	213.64	213.28	3
EX. CB-100 TO CB-101	42.64	0.004	0.004	0.99	0.00	0.00	6.0	6.00	8.03	0.54	6.58	1.64	12	2.91	208.82	207.58	209.13	208.87	209.17	213.64	4
FB-2 TO EX. CB	54.20	0.060	0.060	0.49	0.03	0.03	6.0	6.00	8.03	0.24	0.15	2.71	4	0.50	201.49	201.22	202.26	201.55	209.92	209.92	5

Notes: IDF File = NYACK IDF-25.IDF, Return Period = 25-yrs.

Project File: NYACK HOSPITAL - STORM PIPES.sws



LEGEND

201

200

200

200

EXISTING MINOR CONTOUR

EXISTING MAJOR CONTOUR

PROPOSED MINOR CONTOUR

PROPOSED MAJOR CONTOUR

SOIL BOUNDARY LINE

CATCHMENT AREA BOUNDARIES

PERVIOUS AREA WITHIN CATCHMENT AREA

RUNOFF COEFFICIENT TABLE - ONSITE								
NYACK HOSPITAL DRAINAGE IMPROVEMENTS								
DRAINAGE AREA	TOTAL AREA (\$F)	TOTAL AREA (AC)	PERVIOUS AREA (\$F)	GRASS AREA (AC)	IMPERVIOUS AREA (AC)	GRASS (0.30)	IMPERVIOUS (0.99)	C VALUE
CB-100	156	0.004	0	0.00	0.00	0.00	0.00	0.99
CB-101	15,912	0.37	1,905	0.04	0.32	0.01	0.32	0.91
CB-102	6,236	0.14	342	0.01	0.14	0.00	0.13	0.95
FB-1	912	0.02	278	0.01	0.01	0.00	0.01	0.78
FB-2	2,520	0.06	1,830	0.04	0.02	0.01	0.02	0.49

6/13/2025	REVISED FOR VILLAGE AND NYSDOT COMMENTS	1.
Date	Description	No.

Revisions

LANGAN

Langan Engineering, Environmental, Surveying,
Landscape Architecture and Geology, D.P.C.

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Project

NYACK HOSPITAL
DRAINAGE & UTILITY
IMPROVEMENTS

SECTION No. 66.21 BLOCK No. 1, LOT No. 74.74.1 & 74.2
NYACK NEW YORK

Rockland County

Drawing Title

CATCHMENT AREA
MAP

Project No.
100754212

Date
1/29/2025

Drawn By
KT

Checked By
SF

CG201