Stormwater Management Report, Stormwater Pollution Prevention Plan (SWPPP), and Post Construction Maintenance Plan

for

526 Central Ave

City of Albany

Albany County, New York

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STORMWATER MANAGEMENT REPORT

For
526 CENTRAL AVE
CITY OF ALBANY, ALBANY COUNTY, NEW YORK

The overall Stormwater Management package consists of three reports:

- The first report is the Stormwater Management Report. The Engineering report demonstrates through calculations that the proposed management technique will operate correctly and that the practice is designed in accordance with applicable standards.
- The second report is the Stormwater Pollution Prevention Plan (SWPPP). The SWPPP details activities that are to occur during construction of the site. The SWPPP identifies the individuals that are responsible to prevent water quality violations and offsite degradation. The narrative report, along with the plans, show locations for temporary measures, such as silt fence, that should be used to protect the site until the site is stabilized. Sample weekly, monthly and quarterly reports have been included for documenting compliance with the SPDES permit.
- The third report is the Post-Construction Maintenance Plan. The Maintenance Plan identifies to the Owner which activities can be anticipated to ensure that the stormwater management practice operated correctly. Routine maintenance activities have been identified and typical annual operating expenses have been presented.

A. Stormwater Management Report

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B. Stormwater Pollution Prevention Plan (SWPPP)

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C. Post Construction Maintenance Plan

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1.0 EXECUTIVE SUMMARY

Regan Development Corporation is proposing to construct a 5-story building located on 526 Central Ave in the City of Albany. The project involves redeveloping of and existing vacant parcel for office, retail and apartment use. The building is situated on tax parcel 65.37-3-55.1, 53, 47 and 54 which comprise a total of 3.37 acres. The proposed 5-story building will be comprised of 71 apartment units, +/- 16,193 sf of office space and 4,446 sf of general retail. The currently vacant site and the development of projects will be subject to NYSDEC SPDES Phase II requirements for water quality and quantity as it will disturb greater than 1 acre for this project.

The proposed site improvements have been designed in accordance with the Stormwater Management Design Manual (SWDM) published by the New York State Department of Environmental Conservation (NYSDEC) and the City of Albany stormwater regulations. Enhanced stormwater regulations implemented in 2003 call for more stringent design standards when dealing with stormwater runoff on sites disturbing more than 1 acre of land. The "new" regulations are commonly referred to as "Phase II" guidelines. The proposed improvements for the project site meet or exceed water quantity, runoff reduction and water quality requirements as specified in the 2015 NYSDEC SWDM guidelines.

The objective of controlling water quantity is to ensure that the peak rate of runoff leaving the site does not increase as result of site development. The proposed management strategy consists of using two types of underground storage array systems. One underground storage array system will be used for infiltration of stormwater. The other underground storage array system will be designed to temporary hold stormwater runoff and meter the stormwater at a control rate to the existing combined sewer overflow (CSO) on Central Ave. The underground storage array systems in combination will treat water quality and quantity for the project and is designed to hold stormwater runoff generated by new impervious areas for storms up to the 100-year event.

Water quality for the redevelopment site will be achieved by the two methods. An underground infiltration array will recharge the stormwater runoff and pretreatment will be achieved by a hydrodynamic unit for the project. This will be done for approximately 60% of the redeveloped site. The remaining 40% of the site stormwater will be treated by a hydrodynamic unit. There will be a small section of new impervious area that cannot be treated for water quality as this is mainly because of grade, but the amount of offsite impervious area that will now be captured and infiltrated will be offset the new area not capture and treated.

Routine maintenance is a key component in the successful operation of the stormwater management practice. Provisions ensuring the upkeep are required and are submitted in the accompanying maintenance plan. The Maintenance Plan, Stormwater Pollution Prevention Plan (SWPPP) and draft Notice-of-Intent (NOI) Application have been completed for this site. The NOI is required to be submitted to NYSDEC in order to obtain a SPDES Phase II permit. Application to NYSDEC for coverage under the Phase II permit occurs prior to construction activities and after municipal site plan approvals are obtained.

The following Stormwater Management Report quantitatively assesses the pre-development and post-development runoff conditions of the site. The report documents that the proposed improvements will meet the minimum requirements of water quality parameters as set forth in the NYSDEC guidelines.

1.1 Methodology for Designing Storm Water Management

1. Determine contributory watershed area(s) and subsequent sub-watersheds for proposed site according to site conditions. Design a pipe layout to convey stormwater to selected locations.

2. Evaluate pre and post development stormwater runoff conditions for various storm intensities, durations and frequencies of occurrences using USDA Technical Release 55 (TR-55) methodology.

3. Evaluate and obtain RRv as necessitated.

4. Evaluate peak runoff and storage requirements for the NYSDEC specified 1, 2, 10, 25 and 100-year storm frequencies.

2.0 SITE CONDITIONS

2.1 Topography

The existing topography is fairly flat for a majority of the site with slopes of approximately 2-3%. The topography generally flows from west to east, and is collated via catch basins along Central Ave. See Exhibit D.3 for the existing topography.

2.2 Soils

The USDA Soil Survey was used to determine the existing soils within the project boundaries. Hydrologic soil groups were determined to analyze runoff volumes and flow rates. Soils found within the project and adjacent properties are as follows:

Ur	Urban Land	HSG C
Us	urban Land-Udipsamments	HSG A

See Exhibit A.4 for further soil information. The information in Exhibit A.4 is depicted in Exhibit D.2, entitled "Soil Map" for soil delineation within the project site.

2.3 Test Pits

Contained with the plans there are multiply test pits that have been performed by Dente Engineering. The proposed infiltration array system is situated in test pits "I1". Per Dente Engineering test pit results the test pit went between 8 feet deep at had a starting elevation of between elevations +/- 245.0.

Based upon the test pits, the highest season high water elevation was determined to be 237.0. Per NYSDEC SWDM there is required 3-foot separation distance between the bottom of the infiltration array and seasonal high-water table. Thus, the proposed bottom of infiltration basin is at elevation 340 or it provides 3.0 feet of separation minimally.

The infiltration rate within this area was determined to be 7.5 inches/hour. Within the hydraulic model the infiltration rate was set at 5.0 inches per hour or a 1.5 safety factor was used within the model.

3.0 PRE AND POST DEVELOPMENT GRAPHICAL PEAK DISCHARGE

This section describes the stormwater analysis internal to the site, including the runoff generated within the limits of the site. Analysis of upstream/downstream watershed to the receiving waters for this project site is not included in the computations for this report. The peak discharge rates represented in this report demonstrate only the expected peak flows from the delineated watersheds and do not take into account the overall watersheds. The non-delineated Pre and Post Development upstream/downstream watersheds are considered base flow and where the proposed site improvement will not have an effect on stormwater runoff. Therefore, the Pre and Post Development non-delineated upstream/downstream watershed will have the exact same stormwater runoff characteristics.

3.1 Pre-Development Area Descriptions and Discharge Points

The Pre-Development stormwater system was analyzed by reviewing the contributing watershed to the discharge point which was identified based on the existing topography. To analyze and compare the post development conditions, with the pre-development conditions, the watershed was divided into two sub-areas (Refer to "Pre-Development" in Exhibit E.3).

Pre-Development Area #1 is approximately 3.72 acres, contains grass, wooded areas and impervious area associated with Central Ave, homes along Manning's Blvd, Stewarts' site, Credit Union site and pavement/gravel on the site. Stormwater sheet flow in an easterly direction to catch basin on Central Ave (Discharge Point #1). Areas of grass and impervious within the site (only) in this watershed has been assigned as "woods" per City of Albany requirements to determine the weighted CN value (See Figure -3 entitled "Wooded Area Map" in Exhibit E.4) The CN value has been computed to be 76

The watershed designated as Pre-Development Area #2 is approximately 1.05 acres in size and drains to the south to the existing closed drainage system within Abrooken School Parking lot located (Discharge Point #2). The CN has been calculated to be 83.

3.2 Post Development Area Descriptions and Discharge Points

The following section describes the post development drainage patterns. To analyze and compare the post development conditions, with the post development conditions, the watershed was divided into four sub-areas. The post development watershed has been delineated based on the discharge point, and analyzed. (Refer to "Post-Development" in Exhibit E.5).

The watershed designated as Post-Development Area #1 is approximately 1.03 acres in size and drains to the CSO system on Central Ave (Discharge Point #1). The watershed contains mostly impervious area from mostly offsite areas (Central Ave, Stewarts' site, and Credit Union site) and will small amount of pavement on the site. The CN has been calculated to be 94.

Post-Development #1A is approximately 2.35 acres and collects stormwater runoff via the closed drainage system on the property and transported to the underground stormwater infiltration array system. The onsite closed drainage system collects stormwater runoff from woods, grass area and impervious area on the site and from the rear of homes along Manning's Blvd. The stormwater runoff is sent to an underground infiltration array system and during larger storm events, excess stormwater runoff is sent to the underground stormwater detention array system within Post Development Area #1B watershed. The CN has been calculated to be 87.

Post-Development #1B is approximately 1.21 acres and collects stormwater runoff via the closed drainage system on the property and transported to the underground stormwater detention array system. The onsite closed drainage system collects stormwater runoff from impervious area on the site and from adjoining Abrooken School. The array system discharges stormwater runoff to the CSO system on Central Ave. (Discharge Point #1). The CN has been calculated to be 95.

Post Development Area #2 watershed is approximately 0.1 acres in size and drains to the south to the existing closed drainage system within Abrooken School Parking lot located (Discharge Point #2). The CN has been calculated to be 84.

3.3 Time of Concentration (TOC)

Times of Concentration (TOC) paths were determined for pre and post development subareas by using the methodology described in National Resource Conservation Service's TR-55 manual. Sheet flow never exceeded 150 feet over natural terrain and 100 feet for newly disturbed areas. A Manning's n=0.40 was used for Pre and Post development areas that sheet flowed across wooded areas, and n=0.24 over grassed areas. Calculations for the TOC paths can be found in Exhibit A.2 and A.3.

3.4 Weighted Curve Number (CN)

Within each watershed area, cover type and hydrologic condition are compared to the Hydrologic Soil Group classification to derive a runoff curve number. Subsequently, a weighted average, or composite runoff curve number (CN) is determined. Runoff curve number supporting calculations for pre-development and post-development scenarios are presented in Exhibit A.2 and A.3.

3.5 Peak Discharges for Pre and Post Development Areas

Using TR-55 Graphical Method, the peak discharges for both pre and post development areas/watersheds are shown in the following tables. Note: the peak discharges for both pre and post development were based on TOC, runoff (Q), Weighted Curve Number (CN) and other factors. The calculations for these values are found in Exhibit A.2 and A.3.

Table-1 Pre-Development Peak Discharge

Watershed	1-Year Peak Flow (cfs)	2-Year Peak Flow (cfs)	10-Year Peak Flow (cfs)	25-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)	CN	Area (Acres)	TOC (Hrs.)
Pre #1	2.73	4.35	10.46	11.71	20.38	76	3.72	0.196
Pre #2	1.33	1.87	3.73	4.17	6.88	83	1.05	0.190

Table-2 Post Development Peak Discharge (Unattenuated)

Watershed	1-Year Peak Flow (cfs)	2-Year Peak Flow (cfs)	10-Year Peak Flow (cfs)	25-Year Peak Flow (cfs)	100-Year Peak Flow (cfs)	CN	Area (Acres)	TOC (Hrs.)
Post #1	2.16	2.75	4.67	5.16	7.71	94	1.00	0.189
Post #1A	5.03	6.05	12.14	13.55	21.05	87	2.35	0.100
Post #1B	3.54	4.45	7.43	8.17	12.13	95	1.21	0.100
Post #2	0.28	0.38	0.75	0.85	1.37	84	0.17	0.100

Post Area #1A, #1B and #2 time of concentration was set a minimum of 0.1 hours to determine the worst-case runoff for this watershed

3.6 Pre-Development vs Post Development Peak Discharges at Discharge Points

Stormwater management systems are proposed at each watershed where new impervious is proposed. A further discussion of how stormwater runoff quantity is managed is discussed in Sections 4.0 and 5.0 of this report. As Post Development Area #2 peak flows are all less then Pre Development Area #2 flows no proposed storm water mitigation measure are proposed for this watershed.

3.7 Graphical Peak Discharges Usage

The graphical peak discharge method was used for the following:

1. Preliminary sizing of Holding Facility;
2. Sizing the Proposed Conveyance System;
3. Sizing of Holding Facility
4. Analysis of Holding Facility.

4.0 PROPOSED WATER QUANTITY CONTROLS

4.1 Proposed Stormwater Management Strategy

The proposed strategy consists of utilizing a closed drainage system that directs the runoff towards either a underground stormwater infiltration array or detention array . The underground stormwater infiltration array systems will attenuate stormwater runoff generated by the project and address water quality for the project. The stormwater from the underground stormwater array systems will be metered out to the closed drainage system on Central Ave.

The stormwater analysis was performed using *Hydraflow Hydrographs* software developed by *Intellisolve®*. The software uses the Soil Conservation Service (SCS), now known as (NRCS) National Resources Conservation Service, hydrologic methods to compute the 24-hour precipitation event. The runoff curve numbers and time of concentrations were computed using the NRCS TR-55 tabular methodology as describe in Section 3.0 of this report. The 24-hour rainfall amounts for Albany County are documented in Exhibit A.1.

4.2 Runoff Reduction Volume (RRv)

Implementation of green infrastructure practices aids in the reduction of runoff by proactively reducing runoff volume, peak flow, and flow duration. It promotes infiltration and evapotranspiration to improve groundwater recharge, and also relieves pollutants for the "end of pipe" stormwater treatment practice. The green infrastructure techniques listed below are pre-approved methods that the NYSDEC has deemed acceptable to be used towards the planning of development projects, and runoff reduction. Some standard SMPs may also be used instead of the factors below.

Table-3 Runoff Reduction Techniques

Group	Practice	Implementation/Justification
Preservation of Natural Resources	Preservation of Undisturbed Areas	Most of the site is previously disturbed.
	Preservation of Buffers	None presently exist on the site.
	Reduction of Clearing and Grading	As the parcel size is small and the site development criteria of is per City of Albany Planning Board the site grading as be reduced so to construct the site.
	Locating Development in Less Sensitive Areas	None presently exist on the site.
	Open Space Design	The site is not conducive to open space design
	Soil Restoration	Soil restoration is provided for this project. See Construction Drawings for notes dictating this to be done.
Reduction of Impervious Cover	Roadway Reduction	None presently exist on the site.
	Sidewalk Reduction	Per the requirements of City
	Driveway Reduction	None presently exist on the site.
	Cul-de-sac Reduction	None presently exist on the site.
	Building Footprint Reduction	The 5 story building is at the maximum height per code to reduce building footprint.
	Parking Reduction	Parking area and turn aisle are design to City standards
Runoff Reduction Techniques	Conservation of natural areas	None presently exist on the site.

Runoff Reduction Techniques	Sheetflow to riparian buffers or filter strips	None presently exist on the site.
	Vegetated open swale	Project site is not physically large enough to satisfy the design requirements set forth in the SWDM.
	Tree planting/tree box	Landscaping along road that front property and within the site is proposed.
	Disconnection of rooftop runoff	Project site does not allow enough space for dedicated filter strip area
	Stream daylighting for redevelopment projects	None present on the site
	Rain garden	Surface area of building is too large for a Rain Gardens
	Green roof	The architect has reviewed the option of installing a green roof, and has determined it was not feasible for this site.
	Stormwater Planter	Practice is not being proposed as practice would make proposed sidewalks non ADA compliant or may interfere with sidewalk maintenance.
	Rain tank/Cistern	Practice is not being proposed as the proposed site does not have a lot of grass to water with cistern volume.
	Porous Pavement	Porous pavement is not being proposed as concern for long term maintenance and abutting school use.

The RRv is the minimum volume of runoff that is to be removed from the runoff volume that is sent to the "end of pipe" treatment practice by utilizing infiltration, evaporation, recycling, recharging, etc. The intent of implementing the green infrastructure techniques is to redistribute the WQv prior to runoff being collected by the proposed stormwater drainage system.

Per section 9.3.2.B.II of NYSDEC SWDM the redevelopment of this project does not require RRv as the existing impervious area (104,999 sf) is greater than the proposed impervious area for the project (99,643 sf) and also a minimum of 25% of WQV must be treated for redevelopment projects. As the proposed project proposes to infiltration stormwater for about 60% of RRV will be achieved for this project even though it is not required.

$$RR_v\text{(acre-feet)} = [(P)(Rv^*)(Aic)(S)] /12$$

Where:
(Aic)=Total area of new impervious cover
Rv* = 0.05+0.009(I) where I is 100% impervious
S=Hydrologic Soil Group (HSG) Specific Reduction Factor (S)

HSG A = 0.55
HSG B = 0.40
HSG C = 0.30
HSG D = 0.20

It has been determined that the minimum RRv for the project is 5,508 cf for combined Post Development Areas #1A and #1B.
Project achieves= 5,747 cf of RRv reduction within Post Development #1A watershed so on a project whole RRV is satisfied for the site even though not required for this project.

4.3 Water Quality

The Water Quality Volume is designed to improve water quality of the discharged stormwater runoff; to capture and treat 90% of the average annual stormwater runoff volume. The proposed stormwater management strategy for this project is sized to accommodate the Water Quality Volume. Each treatment watershed will, at minimum, detain and thus treat the WQv. See Exhibit B.1 for calculations.

$$WQ_v(\text{acre-feet}) = [(P)(Rv)(A)] / 12$$

Where:
Rv = 0.05+0.009(I)
I = Impervious Cover (Percent)
Minimum Rv = 0.2 if WQv > RRv
P(inch) = 90% Rainfall Event Number
A = site area in acres

The WQv was determined to be 5,747 cf for Post Development Area #1A and 4,540 cf for Post Development Area #1B. The Water Quality volume was based upon the proposed buildings, parking lot areas and offsite impervious areas.

4.4 Channel Protection Volume (CPv)

The channel protection storage volume requirements are designed to protect downstream channels from erosion. This goal is accomplished by providing 24-hour extended detention of the one-year, 24-hour rainfall storm event. This volume is held over a 24 hour period; controlled by a discharge rate (volume/24 hours).

4.5 Overbank Flood Protection Volume

The overbank flood protection volume requirements are incorporated to prevent an increase in the frequency of flooding and magnitude of out-of-bank flooding downstream of the management practice. Overbank control requires storage to attenuate the post-development 10-year, storm, and reduce the 24-hour peak discharge rate to the pre-development rates.

4.6 Extreme Flood Protection Volume

The intent of the extreme flood protection volume is to a) prevent the increased risk of flood damage from large storm events, b) maintain the boundaries of the pre-development 100-year floodplain, and c) protect the physical integrity of the stormwater management practices. Extreme flood protection control requires storage to attenuate the post-development 100-year, 24-hour peak discharge rate to the pre-development rates. The 100-year attenuated storm event is further discussed in Section "5.0 Proposed Water Quality and Quantity Controls".

4.7 Safe passage of the 100-Year Design Storm

Downstream properties must be protected from the adverse affects of new development and thus the 100 year storm event must not exhibit increases in runoff rates. The runoff generated from the 100 year design storm must not exceed the pre-development runoff rates. All proposed outlet structures and walls of the treatment practices must be able to withstand the 100-year design storm and properly discharge The 100-year storm event is further discussed in Section "5.0 Proposed Water Quality and Quantity Controls".

5.0 PROPOSED WATER QUALITY AND QUANTITY CONTROLS

5.1 Proposed Stormwater Management Strategy

The proposed strategy consists of utilizing a closed drainage system that directs the runoff towards two underground stormwater array systems. The first underground stormwater array system will allow stormwater runoff to infiltrate. The second underground stormwater array system will just be used for detention of stormwater runoff. The underground infiltration stormwater array system will be comprised of 10 sticks of 18" pipe with void stone to allow stormwater runoff generated by the project to infiltrate and also address water quality. The other underground detention stormwater array system will be comprised of 6 sticks of 60" pipe. Stormwater from this array system will be sent to a hydrodynamic unit to address water quality. Both underground array systems will be metered out to the existing CSO system on Central Ave.

The stormwater analysis was performed using Hydraflow Hydrographs software developed by Intellisolve®. The software uses the Soil Conservation Service (SCS), now known as (NRCS) National Resources Conservation Service, hydrologic methods to compute the 24-hour precipitation event. The runoff curve numbers and time of concentrations were computed using the NRCS TR-55, tabular methodology as describe in Section 3.0 of this report. The 24-hour rainfall amounts for Albany are documented in Exhibit A.1.

The hydrograph model is set up to simulate Pre-Development Areas versus Post-Development Area watersheds. Exhibit C.1 shows a schematic of the model elements. It is the goal of the hydraulic model to demonstrate the water surface elevation within the underground stormwater infiltration array system, elevation within the underground stormwater detention array system and peak discharges through low flow and high flow by-pass piping. The combination of flow being sent to from the underground stormwater array systems and overland flow from other watersheds were evaluated at discharge points to ensure that there was no net increase in peak discharge rates between pre-development and post-development conditions for the 1, 2, 10, 25 and 100-year storm events.

5.2 Water Quantity Using TR-55 Tabular Method For Post Development Areas #1A

Under the proposed condition stormwater runoff from Post Development Areas #1, #1A and #1B will exceed Pre-Development Areas #1 peak runoff rates to discharge point #1 if a detention facility was not constructed. To manage the increase in stormwater runoff volume associated with the proposed site improvements, in Post Development Area #1A delineated watershed, an underground stormwater infiltration array system will be installed. The underground stormwater infiltration array system will attenuate stormwater and allow for minimally the entire WQV storm event to full recharge into the native soils. The underground stormwater infiltration array system will be comprised of 18-inch pipe. The 18" infiltration array system will be comprised of 10 sticks at 150 lf made up of perforated pipe and header assembly. Void stone will be placed around the pipe to increase the storage capacity of the array and surface area. The underground infiltration array system uses a void ratio of 30% for the stone around the pipe within the hydraulic model.

Hydraflow Hydrographs software was used to develop a hydraulic model of the proposed underground stormwater infiltration array system in Post Development Area #1A delineated watershed. *Hydraflow Hydrographs* software was used to calculate the effectiveness of the proposed outlet pipe would meter flows to the other underground detention stormwater array system with Post Development Area #1B watershed. The model demonstrates that the underground stormwater infiltration array system will store up to the 100-year storm from the stormwater runoff volume associated with Post Development Area #1A delineated watershed. The hydraulic modeling was simulated for the 1, 2, 10, 25 and 100-year storm events. See Exhibit C.1 for model information and design.

To obtain the results in Table 4, inflow (hydrograph #4 labeled "Post #1A" in *Hydraflow Hydrographs* software model) vs. outflow (hydrograph 7 labeled "Route Infil. Array" in *Hydraflow Hydrographs* software model) hydrographs and routing tables were calculated for the proposed underground storage pipe system and the results are as follows:

Table-4 Post Flow from Underground Infiltration Array System

	1-Year Flow (cfs)	2-Year Flow (cfs)	10-Year Flow (cfs)	25-Year Flow (cfs)	100-Year Flow (cfs)
Post Development Area #1A	4.872	6.52	11.93	13.39	20.41
Max. Water Surface Elevation (WSEL)	240.87	241.29	242.38	242.53	242.98
Outflow	0.00	0.00	7.696	9.569	17.53

To obtain the peak outflow from the proposed underground pipe storage array system labeled "Infiltration Array" in the software model, an 18" orifice labeled as "Clv A" at elevation 241.50 and a 24" orifice labeled as "Clv B" at elevation 241.50 was used to stimulate storm events in the *Hydraflow Hydrographs* software model. Also, the infiltration rate within the array was set at 5.0 inches per hour area (1.5 safety factor).

The 100-year WSEL has been determined to be 242.98 or there is 0.27 feet of freeboard (CB# 12 lowest top of frame with watershed) within the array. It should be note that additional storage volume in closed drainage system and catch basin structures potential storage capacity not included to available storage volumes.

5.3 Water Quantity Using TR-55 Tabular Method For Post Development Areas #1B

Under the proposed condition stormwater runoff from Post Development Areas #1, #1A and #1B will exceed Pre-Development Areas #1 peak runoff rates to discharge point #1 if a detention facility was not constructed. To manage the increase in stormwater runoff volume associated with the proposed site improvements, in Post Development Area #1B delineated watershed, an underground stormwater detention array system will be installed. The underground stormwater detention array system will be comprised of 60-inch pipe. The 60" detention array system will be comprised of 6 sticks at 150 lf made up of solid pipe and header assembly.

Hydraflow Hydrographs software was used to develop a hydraulic model of the proposed underground stormwater detention array system in Post Development Area #1B delineated watershed. *Hydraflow Hydrographs* software was used to calculate the effectiveness of the proposed outlet pipe would meter flow to Central Ave CSO system. The model demonstrates that the underground stormwater detention system will store up to the 100-year storm from the stormwater runoff volume associated with Post Development Area #1B delineated watershed and excess stormwater runoff form the infiltration array. The hydraulic modeling was simulated for the 1, 2, 10, 25 and 100-year storm events. See Exhibit C.1 for model information and design.

To obtain the results in Table 5, inflow (hydrograph #8 labeled "Combined flow to Detention Array" in *Hydraflow Hydrographs* software model) vs. outflow (hydrograph 9 labeled "Route Detention Array" in *Hydraflow Hydrographs* software model) hydrographs and routing tables were calculated for the proposed underground storage pipe system and the results are as follows:

Table-5 Post Flow from Underground Detention Array System

	1-Year Flow (cfs)	2-Year Flow (cfs)	10-Year Flow (cfs)	25-Year Flow (cfs)	100-Year Flow (cfs)
Post Development Area #1B	3.585	4.450	7.185	7.863	11.40
Flow from Infiltration Array (hydrograph 7)	0.00	0.00	7.696	9.569	17.53
Combined Flow to Detention Array (Post #1B + Overflow from infiltration Array)	3.585	4.450	13.05	16.33	28.42
Max. Water Surface Elevation (WSEL)	237.06	237.26	238.54	238.84	241.19
Outflow	0.629	0.656	1.758	2.556	5.435

To obtain the peak outflow from the proposed underground pipe storage array system labeled "Detention Array" in the software model, a 4" orifice labeled as "Clv A" at elevation 234.65 and a 10" orifice labeled as "Clv B" at elevation 238.00 was used to stimulate storm events in the *Hydraflow Hydrographs* software model.

The 100-year WSEL has been determined to be 241.19 or there is 0.21 feet of freeboard within the underground detention array system. It should be note that additional storage volume in closed drainage system and catch basin structures potential storage capacity not included to available storage volumes

5.4 Combined Flow to Discharge Point #1

Under the proposed condition stormwater runoff from Post Development Areas #1, #1A and #1B will exceed Pre-Development Areas #1 peak runoff rates to discharge point #1 if a detention facility was not constructed. To manage the increase in stormwater runoff volume associated with the proposed site improvements, in Post Development Area #1A and #1B watersheds an underground stormwater infiltration and detention array system will be installed. Overland flow from Post Development Area #1 will also flow to the existing discharge point #1 and is mostly comprised of off-site impervious areas (Central Ave, Stewarts' site, and Credit Union site). The combined stormwater flow from the underground arrays and overland flow from Post Development Area #1 was combined on a time line to determine the proposed peak discharge rate at discharge point #1

The Combined Post Development peak stormwater rates were compared to Pre-Development Area #1 (see Table #6 below) to determine the net impacts to the existing CSO system on Central Ave (Discharge Point #1). As noted in Section 3.1 of this report and in conformance with City of Albany stormwater regulations most of Pre-Development Area #1 was consider woods even though is it currently paved or has grave surfaces. Thus, the peak discharges rates from Pre-Development note in Table #6 are actually higher then indicted.

Table-6 Post Combined Flow to DP#1 vs. Pre Development

	1-Year Flow (cfs)	2-Year Flow (cfs)	10-Year Flow (cfs)	25-Year Flow (cfs)	100-Year Flow (cfs)
Pre Area #1	3.196	4.946	11.41	13.17	22.78
Combined Post Flow	3.186	3.866	6.114	7.435	12.97
Net Change	-0.001	-1.08	-5.296	-5.735	-9.81

As see from Table 6 Discharge Point #1 (existing CSO system on Central Ave) will receive a reduced peak stormwater runoff rate then it currently experiences now. To obtain the Combined Post Flow it is the combined sum of Hydrographs 9 "Route Detention Array" + Hydrographs 3 "Post Area #1"

5.5 Discharge Point #2

As stated in Section 3.6 of this report and within the model Post Development Area #2 peak flows are less then Pre-Development peak flows to Discharge point #2 (Abrooken School Parking) by more than 60% thus no stormwater mitigation or detention facility is required for this area.

5.6 Water Quality Treatment, Pretreatment and Runoff Reduction Volume (Area #1A)

Post Development Area #1A watershed has been designed in accordance with NYSDEC Phase II Management Guidelines with respect to Water Quality requirements. The proposed plan is to grade a portion of the parking lot, direct the rear roof downspouts and collect stormwater runoff from offsite impervious areas from rear lots abutting the property along Manning's Blvd to the on-site closed drainage system. The onsite closed drainage system will direct stormwater runoff to the underground infiltration stormwater array system. The underground infiltration stormwater array system allows up to 2-year stormwater runoff from this watershed to infiltrate into the ground before excess runoff is sent to the other underground detention array system within Post Development Area #1B watershed (See Table 4).

The untreated stormwater will first flow to a prefabricated concrete hydrodynamic underground water quality unit manufactured by Contech commonly called a "Vortechs" to act as pretreatment.

Catch basin #9 will send metered stormwater hydrodynamic unit. Using the New York State Stormwater Design Manual the WQv was established to be 5,747 cf for Post Development Area #1A this calculation can be found in Exhibit B.1. The 5,747 cf equals to a WQv peak flow 2.47 cfs (see Exhibit B.2). The proposed hydrodynamic unit will be model CDS3030 by Contech can treat a WQv rate up to 3.0 cfs (See Exhibits B.5) and is sized per NJDEP treatment standards. This will satisfy the 100% pretreated requirement before it enters the infiltration array area. To ensure the WQv flow enters the hydrodynamic unit from Catch Basin #9 before the high flow pipe that is directly connected to the array (CB #10 18-inch pipe is 12- inches higher then 12-inch pipe to CB#9) an orifice equation analysis was reviewed. The calculation with Exhibit B.3 shows that the 12" pipe from CB#9 will deliver minimally 2.72 cfs (2.47 cfs WQv peak rate) to the hydrodynamic unit before the 18" high flow by-pass pipe is activated. The maximum flow to the hydrodynamic unit via the 12" pipe from CB#9 will be 6.94 cfs. The hydrodynamic model 3030 can pass through 20 cfs, thus is sized according for pretreatment and ensure that not too much flow does not go through the hydrodynamic unit.

As up to the 2 -year runoff is recharged (per Table 4), RRv and WQv for Post Development Area #1A are satisfied as infiltration per NYSDEC SWDM provides 100% RRv and WQv treatment.

5.7 Water Quality Treatment, Pretreatment and Runoff Reduction Volume (Area #1B)

Post Development Area #1B watershed has been designed in accordance with NYSDEC Phase II Management Guidelines with respect to Water Quality requirements. The proposed plan is to grade a portion of the parking lot, direct the front roof downspouts and collect stormwater runoff from offsite impervious areas near the school to the on-site closed drainage system. The onsite closed drainage system will direct stormwater runoff to the underground detention stormwater array system. The underground detention stormwater array system then meters the stormwater out to the existing CSO system on Central Ave. The untreated stormwater from the underground detention stormwater array system will be allowed to be treated by a prefabricated concrete hydrodynamic underground water quality unit manufactured by Contech commonly called a "Vortechs" before the stormwater runoff is allowed to enter the CSO system on Central Ave.

Storm Manhole #4 will send metered stormwater hydrodynamic unit. Using the New York State Stormwater Design Manual the WQv was established to be 4,540 cf for Post Development Area #1B this calculation can be found in Exhibit B.1. The 4,540 cf equals to a WQv peak flow 1.95 cfs (Exhibit B.2). The proposed hydrodynamic unit will be model CDS3020 by Contech which can treat a WQv rate up to 2.0 cfs (See Exhibits B.5) and is sized per NJDEP treatment standards. This will satisfy the 100% WQv treated requirement before it enters the CSO system on Central Ave. To ensure the WQv flow enters the hydrodynamic unit from Storm Manhole #4 before the high flow pipe by-pass pipe (CB #1 10-inch pipe at elevation 238.00 to STMH#3) the piping configuration was modeled in *Hydraflow Hydrographs* software

Per the hydraulic model during the 1-year storm event the 4" pipe to WQv#1 (model CDS3020) is 0.629 cfs and the water elevation is 237.06. Thus, this ensures that all stormwater will go through the hydrodynamic unit before it is allowed to flow to the existing CSO system. The maximum flow to the hydrodynamic unit via the 4" pipe from STMH#4 will be 1.07 cfs. The hydrodynamic model 3020 can pass through 20 cfs, thus is sized according for WQv treatment and ensure that not too much flow does not go through the hydrodynamic unit.

Therefore, WQv per section 9.3.2.B.III of the NYSDEC SWDM is meet by the hydrodynamic unit. No RRv will be treated in this watershed.

5.8 Global Water Quality Treatment and Runoff Reduction Volume

Per section 9.2.II of NYSDEC SWDM the redevelopment of this project does not require RRv as the existing impervious area (104,999 sf site only) is greater than the proposed impervious area for the project (99,643 sf site only). It should be noted that NYSDEC SWDM includes gravel as impervious area. To try and achieve RRv for the project, infiltration was implemented within Post Development Area #1A watershed. While the infiltration achieves 100% RRv reduction in Post Development Area #1A, in Post Development #1B there is no RRv treatment. As these two watersheds are connected, RRv globally can be review per NYSDEC SWDM. The minimum RRv is

5,508 cf and the project achieves 5,747 cf (see Exhibit B.4). While 100% RRv is not achieved the Project, the project exceeds the minimal RRv requirement per NYSDEC for this project.

Water Quality is achieved by infiltration for Post Development Area #1A watershed and by a hydrodynamic unit with Post Development Area # 1B watershed hydrodynamic unit. Within Post Development #1 there is a small portion of Watershed #1 (5,750 sf) of new impervious area is not being treat per NYSDEC SWDM as a result of existing grades. The 5,750 sf area is the main drive lane into the project site. Offsite area such as rear revised parking lot of Fire Credit Union Building (2,100 sf) and the rear of homes along Manning Blvd (+/- 4,000 sf) will now send stormwater runoff to the underground infiltration array (currently flowing to CSO on Central Ave) thus ensuring globally that WQv is exceed for this project. Also, as there is a reduction on impervious of +/- 5,300 sf within the site also acts as a credit for the project.

6.0 PROPOSED CONVEYANCE SYSTEM

The proposed closed drainage was designed and checked to pass the 25-year storm event. Calculations for anticipated flow through each pipe run can be found in Exhibit D.1. The anticipated flows through each proposed pipe run were based upon percentage of watershed flowing to each proposed catch basin.

7.0 SOURCES AND BIBLIOGRAPHY

SCS TR-55 Urban Hydrology for Small Watersheds, United States Department of Agriculture

Soil Survey. United States Department of Agriculture, Soil Conservation Service.

8.0 EXHIBITS

Exhibit A – Graphical Peak Discharge Calculations

.1	24-Hour Rainfall Intensity Table
.2	Pre-Development (CN. TOC, Peak Discharge)
.3	Post Development (CN. TOC, Peak Discharge)
.4	NRCS Soil Information
.5	Dente Soil Information

RAINFALL LIST BY COUNTY

The frequency values listed below are average values for the County. Please check these against the maps on Figure 2-1 thru 2-3 for your county. In certain areas of the county jobs may require higher or lower rainfall values.

	RAINFALL FOR EACH FREQUENCY							Average Annual
	1YR	2YR	5YR	10YR	25YR	50YR	100YR	Rainfall
ALBANY	2.4	2.9	3.7	4.5	4.9	5.5	7.0	35.7
ALLEGANY	2.2	2.6	3.2	3.8	4.3	4.8	5.3	37.6
BRONX	2.7	3.5	4.5	5.0	6.0	7.0	7.5	44.1
BROOME	2.4	2.8	3.5	4.2	4.8	5.3	6.2	37.8
CATTARAUGUS	2.2	2.5	3.2	3.7	4.2	4.7	5.2	44.1
CAYUGA	2.2	2.5	3.2	3.8	4.4	4.8	5.3	31.3
CHAUTAUQUA	2.1	2.5	3.1	3.6	4.1	4.6	4.9	52.1
CHEMUNG	2.3	2.7	3.4	3.9	4.6	5.0	5.6	34.3
CHENANGO	2.3	2.8	3.4	4.0	4.8	5.0	6.0	41.5
CLINTON	2.0	2.5	3.1	3.5	4.0	4.5	4.9	31.8
COLUMBIA	2.5	3.0	4.0	4.7	5.5	6.0	7.8	39.9
CORTLAND	2.3	2.7	3.4	3.9	4.6	4.9	5.6	43.2
DELAWARE	2.5	2.9	4.0	4.5	5.0	5.5	7.9	45.0
DUTCHESS	2.8	3.5	4.5	5.0	6.0	7.0	8.0	40.2
ERIE	2.1	2.5	3.1	3.6	4.0	4.5	4.9	44.1
ESSEX	2.1	2.5	3.2	3.6	4.2	4.6	5.1	38.2
FRANKLIN	2.0	2.5	3.0	3.5	4.0	4.5	4.8	47.3
FULTON	2.3	2.6	3.4	3.9	4.6	4.9	5.5	40.8
GENESEE	2.1	2.5	3.1	3.6	4.1	4.6	4.9	36.8
GREENE	3.0	3.0	4.5	5.0	6.0	7.0	8.0	42.4
HAMILTON	2.2	2.5	3.2	3.7	4.3	4.7	5.4	44.0
HERKIMER	2.2	2.5	3.2	3.7	4.4	4.7	5.5	46.4
JEFFERSON	2.1	2.5	3.0	3.5	4.0	4.5	4.7	38.7
KINGS	2.7	3.5	4.5	5.0	6.0	7.0	7.5	44.1
LEWIS	2.3	2.5	3.1	3.6	4.2	4.5	4.8	43.3
LIVINGSTON	2.2	2.5	3.2	3.7	4.2	4.7	5.0	33.7
MADISON	2.3	2.6	3.3	3.8	4.6	4.9	5.5	40.3
MANHATTAN	2.7	3.5	4.5	5.0	6.0	6.5	7.5	44.1
MONROE	2.2	2.5	3.1	3.6	4.1	4.6	4.9	30.9
MONTGOMERY	2.4	2.7	3.4	3.9	4.7	5.0	5.7	36.2
NASSAU	2.7	3.5	4.5	5.0	6.0	7.0	7.5	44.1
NIAGARA	2.1	2.5	3.0	3.5	4.0	4.5	4.8	39.9
ONEIDA	2.3	2.5	3.2	3.8	4.5	4.8	5.4	49.4
ONONDAGA	2.2	2.6	3.2	3.8	4.5	4.8	5.2	40.5
ONTARIO	2.2	2.5	3.2	3.7	4.3	4.7	5.0	33.4
ORANGE	2.9	3.5	4.5	5.5	6.5	7.0	8.0	48.0
ORLEANS	2.1	2.5	3.0	3.5	4.0	4.5	4.8	39.4

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PROJECT # 972.21 | SHEET # 1 OF: 2 | PAGE # OF:

MADE BY: JWE DATE: 2/23/2018

PROJECT: 526 Central Ave | CHKD BY: DATE:

SUBJECT: TOC and Peak Discharges | REVISED BY: DATE:

Pre Development #1 & #2 | CHKD BY: DATE:

DRAINAGE AREA NAME		**PRE DEVELOPMENT AREA #1**		
TIME OF CONCENTRATION 2-YR 24 Hr RAINFALL= 2.9 IN	SURFACE COVER CROSS SECTION	MANNING "N" WETTED PER.	FLOW LENGTH AVG VELOCITY	SLOPE Tt (Hrs)
SHEET FLOW	GRASS/PAVEMENT	N= 0.12	150 FT.	2.50% 0.182 Hrs
SHALLOW FLOW	PAVED		207 FT. 3.9 F.P.S	2.00% 0.015 Hrs

DRAINAGE AREA NAME		**PRE DEVELOPMENT AREA #2**		
TIME OF CONCENTRATION 2-YR 24 Hr RAINFALL= 2.9 IN	SURFACE COVER CROSS SECTION	MANNING "N" WETTED PER.	FLOW LENGTH AVG VELOCITY	SLOPE Tt (Hrs)
SHEET FLOW	GRASS/PAVEMENT	N= 0.12	150 FT.	2.60% 0.179 Hrs
SHALLOW FLOW	PAVED		160 FT. 3.8 F.P.S	1.80% 0.012 Hrs

Peak Discharge for Pre-Development Area #1

Total Area in Acres= 3.72 Ac
Weighted CN= 76 Ia= 0.632
Time of Concentration= 0.196 Hrs
Pond Factor= 1

Peak Discharge for Pre Development Area #2

Total Area in Acres= 1.05 Ac
Weighted CN= 83 Ia= 0.410
Time of Concentration= 0.190 Hrs
Pond Factor= 1

RAINFALL TYPE II

Pre-Development Area #1

STORM	Precipitation (P) inches	Runoff (Q)	Ia/P	Qu	Qp PEAK DISCHARGE
1 Year	2.40	0.63 In.	0.26	746 csm/in	2.73 CFS
2 Year	2.90	0.95 In.	0.22	788 csm/in	4.35 CFS
10 Year	4.50	2.13 In.	0.14	821 csm/in	10.16 CFS
25 Year	4.90	2.45 In.	0.13	822 csm/in	11.71 CFS
100 Year	7.00	4.26 In.	0.09	823 csm/in	20.38 CFS

Pre Development Area #2

STORM	Precipitation (P) inches	Runoff (Q)	Ia/P	Qu	Qp PEAK DISCHARGE
1 Year	2.40	0.98 In.	0.17	826 csm/in	1.33 CFS
2 Year	2.90	1.37 In.	0.14	831 csm/in	1.87 CFS
10 Year	4.50	2.73 In.	0.09	832 csm/in	3.73 CFS
25 Year	4.90	3.05 In.	0.08	833 csm/in	4.17 CFS
100 Year	7.00	5.03 In.	0.06	834 csm/in	6.88 CFS

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PROJECT # 972.21 | SHEET # 1 OF: 2 | PAGE # OF:

MADE BY: JWE | DATE: 2/23/2018

PROJECT: 526 Central Ave | CHKD BY: | DATE:

SUBJECT: Pre-Development Condition | REVISED BY: | DATE:

AREA #1 and #2 | CHKD BY: | DATE:

Applicable Standards:

Urban Hydrology for Small Watersheds, Technical Release 55. USDA, June 1986.

PRE-DEVELOPMENT

AREA	Land Use Area (feet^2)	Land Use / Cover Description[1]	Hydrologic Soil Group[1]	Actual CN[1]	AREA Area (feet^2)	Factored CN %	Factored CN CN	Weighted CN
#1	36,786	*Paved parking lots,roofs etc.*	C	98	**162,233**	23%	22.2	**76**
	6,914	*Urban Open Space, Good (> 75% grass)*	C	74	**sq. feet**	4%	3.2	
	108,533	*Woods (Good)*	C	70		67%	46.8	
	5,000	*Woods (Good)*	A	30	**=**	3%	0.9	
	5,000	*Residential, 1/8 acre lots or less*	A	77		3%	2.4	
				0	**3.724**	0%	0.0	
				0	**acres**	0%	0.0	
				0		0%	0.0	
				0	**=**	0%	0.0	
				0		0%	0.0	
				0	**0.006**	0%	0.0	
				0	**sq. mi**	0%	0.0	
	162,233					100%		

AREA	Land Use Area (feet^2)	Land Use / Cover Description[1]	Hydrologic Soil Group[1]	Actual CN[1]	AREA Area (feet^2)	Factored CN %	Factored CN CN	Weighted CN
#2	24,450	*Paved parking lots,roofs etc.*	C	98	**45,906**	53%	52.2	**83**
	21,456	*Brush, brush-weed-grass mix (Good)*	C	65	**sq. feet**	47%	30.4	
				0		0%	0.0	
				0	**=**	0%	0.0	
				0		0%	0.0	
				0	**1.054**	0%	0.0	
				0	**acres**	0%	0.0	
				0		0%	0.0	
				0	**=**	0%	0.0	
				0		0%	0.0	
				0	**0.002**	0%	0.0	
				0	**sq. mi**	0%	0.0	
	45,906					100%		

Comments: [1] Source: TR-55, Tables 2-2a,b,c.

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PROJECT # 972.21 | SHEET # 1 OF: 4 | PAGE # OF:

MADE BY: JWE DATE: 2/23/2018

PROJECT: 526 Central Ave | CHKD BY: DATE:

SUBJECT: TOC and Peak Discharges | REVISED BY: DATE:

Post Development Area #1 and #1A | CHKD BY: DATE:

DRAINAGE AREA NAME		POST DEVELOPMENT AREA #1			
TIME OF CONCENTRATION 2-YR 24 Hr RAINFALL= 2.9 IN		SURFACE COVER CROSS SECTION	MANNING "N" WETTED PER.	FLOW LENGTH AVG VELOCITY	SLOPE Tt (Hrs)
SHEET FLOW		GRASS/PAVEMENT	N= 0.11	150 FT.	2.50% 0.169 Hrs
SHALLOW FLOW		PAVED		274 FT. 3.9 F.P.S	2.00% 0.020 Hrs

DRAINAGE AREA NAME		POST DEVELOPMENT AREA #1A			
TIME OF CONCENTRATION 2-YR 24 Hr RAINFALL= 2.9 IN		SURFACE COVER CROSS SECTION	MANNING "N" WETTED PER.	FLOW LENGTH AVG VELOCITY	SLOPE Tt (Hrs)
SHEET FLOW	Assumed TOC Path of 0.1 hours (Worst Case)				
SHALLOW FLOW					
CHANNEL FLOW Hydraulic Radius=					

Peak Discharge for Post-Development Area #1		Peak Discharge for Post-Development Area #1A	
Total Area in Acres=	1.03 Ac	Total Area in Acres=	2.35 Ac
Weighted CN=	94 Ia= 0.128	Weighted CN=	87 Ia= 0.299
Time of Concentration=	0.189 Hrs	Time of Concentration=	0.100 Hrs
Pond Factor=	1	Pond Factor=	1

RAINFALL TYPE II

Post-Development Area #1

STORM	Precipitation (P) inches	Runoff (Q)	Ia/P	Qu	Qp PEAK DISCHARGE
1 Year	2.40	1.77 In.	0.05	758 csm/in	2.16 CFS
2 Year	2.90	2.25 In.	0.04	759 csm/in	2.75 CFS
10 Year	4.50	3.82 In.	0.03	760 csm/in	4.67 CFS
25 Year	4.90	4.21 In.	0.03	761 csm/in	5.16 CFS
100 Year	7.00	6.29 In.	0.02	762 csm/in	7.71 CFS

Post Development Area #1A

STORM	Precipitation (P) inches	Runoff (Q)	Ia/P	Qu	Qp PEAK DISCHARGE
1 Year	2.40	1.37 In.	0.12	1000 csm/in	5.03 CFS
2 Year	2.90	1.81 In.	0.10	1001 csm/in	6.65 CFS
10 Year	4.50	3.30 In.	0.07	1002 csm/in	12.14 CFS
25 Year	4.90	3.68 In.	0.06	1003 csm/in	13.55 CFS
100 Year	7.00	5.71 In.	0.04	1004 csm/in	21.05 CFS

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PROJECT # 972.21 | SHEET # 2 OF: 4 | PAGE # OF:

MADE BY: JWE | DATE: 2/23/2018

PROJECT: 526 Central Ave | CHKD BY: | DATE:

SUBJECT: Post-Development Condition | REVISED BY: | DATE:

AREA #1 and #1A | CHKD BY: | DATE:

Applicable Standards:

Urban Hydrology for Small Watersheds, Technical Release 55, USDA, June 1986.

POST-DEVELOPMENT

AREA	Land Use Area (feet²)	Land Use / Cover Description[1]	Hydrologic Soil Group[1]	Actual CN[1]	AREA Area (feet²)	Factored CN %	Factored CN CN	Weighted CN
#1	38,062	*Paved parking lots,roofs etc.*	C	98	**44,976**	85%	82.9	94
	6,914	*Urban Open Space, Good (> 75% grass)*	C	74	**sq. feet**	15%	11.4	
				0		0%	0.0	
				0	=	0%	0.0	
				0		0%	0.0	
				0	**1.033**	0%	0.0	
				0	**acres**	0%	0.0	
				0		0%	0.0	
				0	=	0%	0.0	
				0		0%	0.0	
				0	**0.002**	0%	0.0	
				0	**sq. mi**	0%	0.0	
	44,976					100%		

AREA	Land Use Area (feet²)	Land Use / Cover Description[1]	Hydrologic Soil Group[1]	Actual CN[1]	AREA Area (feet²)	Factored CN %	Factored CN CN	Weighted CN
#1A	58,112	*Paved parking lots,roofs etc.*	C	98	**102,612**	57%	55.5	87
	38,500	*Urban Open Space, Good (> 75% grass)*	C	74	**sq. feet**	38%	27.8	
	1,000	*Urban Open Space, Good (> 75% grass)*	A	39		1%	0.4	
	5,000	*Residential, 1/8 acre lots or less*	A	77	=	5%	3.8	
				0		0%	0.0	
				0	**2.356**	0%	0.0	
				0	**acres**	0%	0.0	
				0		0%	0.0	
				0	=	0%	0.0	
				0		0%	0.0	
				0	**0.004**	0%	0.0	
				0	**sq. mi**	0%	0.0	
	102,612					100%		

Comments: [1] Source: TR-55, Tables 2-2a,b,c.

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PROJECT # 972.21 | SHEET # 3 OF: 4 | PAGE # OF:

MADE BY: JWE | DATE: 2/23/2018

PROJECT: 526 Central Ave | CHKD BY: | DATE:

SUBJECT: TOC and Peak Discharges | REVISED BY: | DATE:

Post Development Area #1B & #2 | CHKD BY: | DATE:

DRAINAGE AREA NAME	**POST DEVELOPMENT AREA #1B**			
TIME OF CONCENTRATION 2-YR 24 Hr RAINFALL= 2.9 IN	SURFACE COVER CROSS SECTION	MANNING "N" WETTED PER.	FLOW LENGTH AVG VELOCITY	SLOPE Tt (Hrs)
SHEET FLOW	Assumed TOC Path of 0.1 hours (Worst Case)			
SHALLOW FLOW				
CHANNEL FLOW Hydraulic Radius= ####				

DRAINAGE AREA NAME	**POST DEVELOPMENT AREA #2**			
TIME OF CONCENTRATION 2-YR 24 Hr RAINFALL= 2.9 IN	SURFACE COVER CROSS SECTION	MANNING "N" WETTED PER.	FLOW LENGTH AVG VELOCITY	SLOPE Tt (Hrs)
SHEET FLOW	Assumed TOC Path of 0.1 hours (Worst Case)			
SHALLOW FLOW				
CHANNEL FLOW Hydraulic Radius=				

Peak Discharge for Post-Development Area #1B

Total Area in Acres= 1.21 Ac
Weighted CN= 95 Ia= 0.105
Time of Concentration= 0.100 Hrs
Pond Factor= 1

Peak Discharge for Post-Development Area #2

Total Area in Acres= 0.17 Ac
Weighted CN= 84 Ia= 0.381
Time of Concentration= 0.100 Hrs
Pond Factor= 1

RAINFALL TYPE II

Post-Development Area #1B

STORM	Precipitation (P) inches	Runoff (Q)	Ia/P	Qu	Qp PEAK DISCHARGE
1 Year	2.40	1.87 In.	0.04	1000 csm/in	3.54 CFS
2 Year	2.90	2.35 In.	0.04	1001 csm/in	4.45 CFS
10 Year	4.50	3.92 In.	0.02	1002 csm/in	7.43 CFS
25 Year	4.90	4.31 In.	0.02	1003 csm/in	8.17 CFS
100 Year	7.00	6.39 In.	0.02	1004 csm/in	12.13 CFS

Post-Development Area #2

STORM	Precipitation (P) inches	Runoff (Q)	Ia/P	Qu	Qp PEAK DISCHARGE
1 Year	2.40	1.04 In.	0.16	1000 csm/in	0.28 CFS
2 Year	2.90	1.43 In.	0.13	1001 csm/in	0.38 CFS
10 Year	4.50	2.82 In.	0.08	1002 csm/in	0.75 CFS
25 Year	4.90	3.18 In.	0.08	1003 csm/in	0.85 CFS
100 Year	7.00	5.14 In.	0.05	1004 csm/in	1.37 CFS

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MADE BY: JWE | DATE: 2/23/2018

PROJECT: 526 Central Ave | CHKD BY: | DATE:

SUBJECT: Post-Development Condition | REVISED BY: | DATE:

AREA #1B and #2 | CHKD BY: | DATE:

Applicable Standards:

Urban Hydrology for Small Watersheds, Technical Release 55. USDA, June 1986.

POST-DEVELOPMENT

AREA	Land Use Area (feet²)	Land Use / Cover Description[1]	Hydrologic Soil Group[1]	Actual CN[1]	AREA Area (feet²)	Factored CN %	Factored CN CN	Weighted CN
#1B	46,788	*Paved parking lots,roofs etc.*	C	98	**52,788**	89%	86.9	95
	6,000	*Urban Open Space, Good (> 75% grass)*	C	74	**sq. feet**	11%	8.4	
				0		0%	0.0	
				0	=	0%	0.0	
				0		0%	0.0	
				0	**1.212**	0%	0.0	
				0	**acres**	0%	0.0	
				0		0%	0.0	
				0	=	0%	0.0	
				0		0%	0.0	
				0	**0.002**	0%	0.0	
				0	**sq. mi**	0%	0.0	
	52,788					100%		

AREA	Land Use Area (feet²)	Land Use / Cover Description[1]	Hydrologic Soil Group[1]	Actual CN[1]	AREA Area (feet²)	Factored CN %	Factored CN CN	Weighted CN
#2	3,085	*Paved parking lots,roofs etc.*	C	98	**7,762**	40%	39.0	84
	4,677	*Urban Open Space, Good (> 75% grass)*	C	74	**sq. feet**	60%	44.6	
				0		0%	0.0	
				0	=	0%	0.0	
				0		0%	0.0	
				0	**0.178**	0%	0.0	
				0	**acres**	0%	0.0	
				0		0%	0.0	
				0	=	0%	0.0	
				0		0%	0.0	
				0	**0.000**	0%	0.0	
				0	**sq. mi**	0%	0.0	
	7,762					100%		

Comments: [1] Source: TR-55, Tables 2-2a,b,c.

Soil Map—Albany County, New York
(526 Central Ave)

Map Scale: 1:1,990 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Albany County, New York
Survey Area Data: Version 15, Oct 8, 2017

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

Date(s) aerial images were photographed: Jun 10, 2015—Mar 29, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ur	Urban land	6.8	69.2%
Us	Urban land-Udipsamments complex, 0 to 8 percent slopes	3.0	30.8%
Totals for Area of Interest		**9.8**	**100.0%**

Water Features

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

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 four hydrologic soil groups are:

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.

Surface runoff refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

Water table refers to a saturated zone in the soil. The water features table indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. The kind of water table, apparent or perched, is given if a seasonal high water table exists in the soil. A water table is perched if free water is restricted from moving downward in the soil by a restrictive feature, in most cases a hardpan; there is a dry layer of soil underneath a wet layer. A water table is apparent if free water is present in all horizons from its upper boundary to below 2 meters or to the depth of observation. The water table kind listed is for the first major component in the map unit.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and *very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

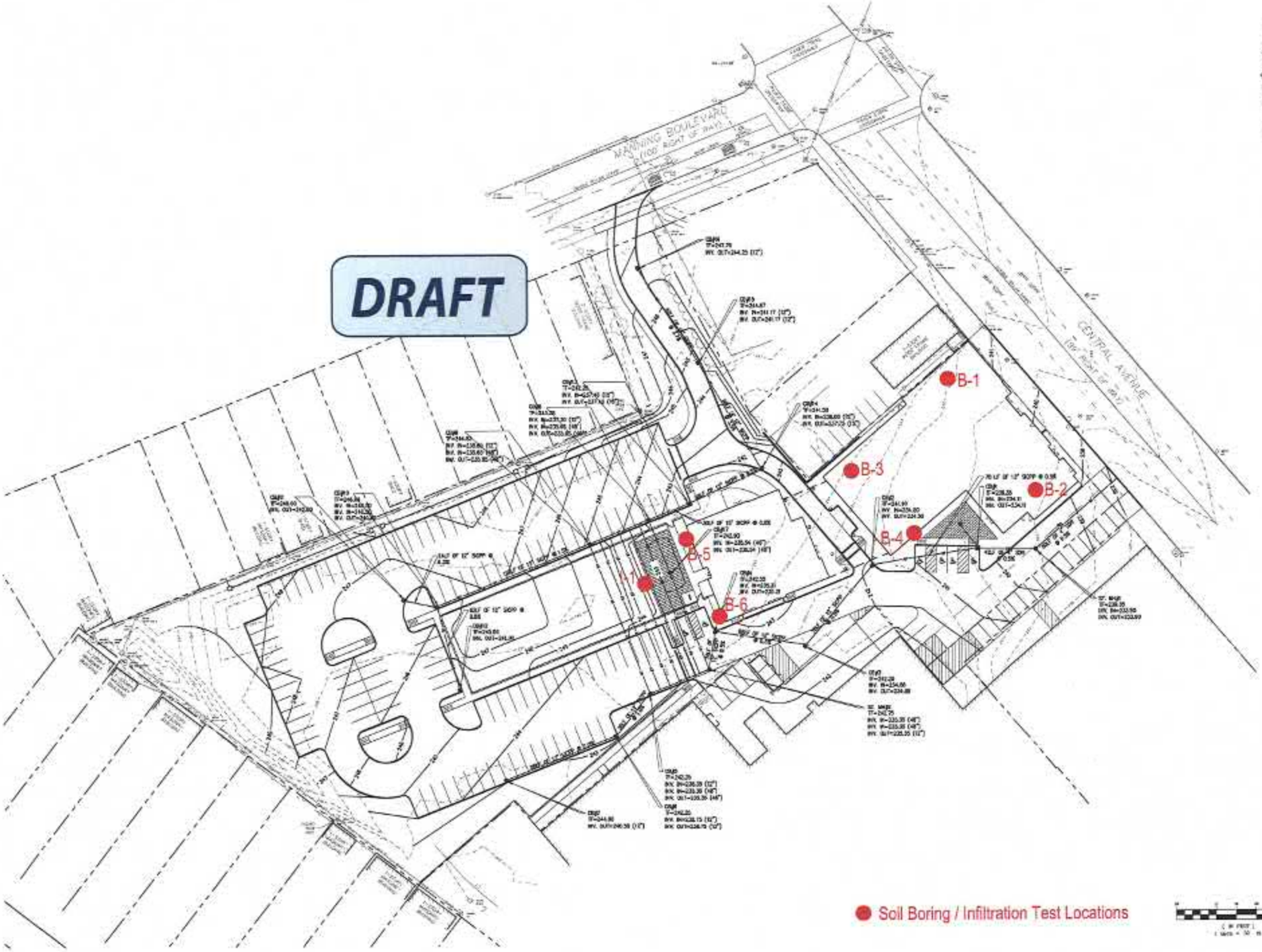
Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Report—Water Features

Map unit symbol and soil name	Hydrologic group	Surface runoff	Most likely months	Water table			Ponding			Flooding	
				Upper limit	Lower limit	Kind	Surface depth	Duration	Frequency	Duration	Frequency
				Ft	*Ft*		*Ft*				
Ur—Urban land											
Urban land				—	—	—	—	—	—	—	
Us—Urban land-Udipsamments complex, 0 to 8 percent slopes											
Urban land				—	—	—	—	—	—	—	
Udipsamments	A		Jan-Dec	—	—	—	—	—	None	—	None

Data Source Information

Soil Survey Area: Albany County, New York
Survey Area Data: Version 15, Oct 8, 2017



THE SWINBURNE BUILDING

GRADING & DRAINAGE PLAN

C-5

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-1

PROJECT: 526 Central Avenue	**DATE**	START: 2/22/18	FINISH: 2/22/18

LOCATION: Albany, New York

CLIENT: Regan Development Co

JOB NUMBER: JB185008

DRILL TYPE: CME 45C

METHODS: 3 1/4" Hollow Stem Augers, ASTM 36 Drilling Methods with Auto Hammer

RFACE ELEVATION: +/- 242.0'

CLASSIFICATION: O.Burns

DRAFT

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	
	1	6	8				**FILL:** Brown/Gray F-C SAND & CONCRETE,
				6	10	14	Some Asphalt, trace silt & brick **(MOIST, FIRM)**
	2	4	5				Dark Brown to Brown Mottled F-M SAND, Little
				6	5	11	to trace silt
	3	4	4				Similar with Seams of Little Silt
5'				3	3	7	
	4	2	2				Grades Little Silt, trace organics (WET)
				2	4	4	
10'	5	1	2				Grades Some Silt (SATURATED)
				1	2	3	
15'	6	WH	WH				Grades Gray Fine SAND, trace silt
				1/12"	-	1	
							(MOIST TO SATURATED, FIRM TO LOOSE)
20'	7	1	3				Gray SILT and CLAY
				2	2	5	**(SATURATED, SOFT)**
							End of boring 22.0' depth.
							Groundwater measured at 11.0' depth within
25'							auger casings after Sample #6.

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-2	
PROJECT: 526 Central Avenue	**DATE** START: 2/23/18	FINISH: 2/23/18
LOCATION: Albany, New York	**METHODS:** 3 1/4" Hollow Stem Augers, ASTM	
CLIENT: Regan Development Corp.	D1586 Drilling Methods with Auto Hammer	
JOB NUMBER: JB185008	**SURFACE ELEVATION**: +/- 240.0'	
DRILL TYPE: CME 45C	**CLASSIFICATION:** O.Burns	

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	
	1	6	6				**FILL:** Brown F-M SAND, Little Mottling and
				3	2	9	Silt (MOIST)
	2	3	6				Grades Brown Mottled F-C SAND, Some Brick
				6	1	12	
5'	3	WH	1				Grades Some Mortar, Grades to Dark Brown
				1	3	2	SILT, Little Brick
	4	4	3				**(MOIST, FIRM AND LOOSE)**
				6	5	9	Brown/Dark Brown F-M SAND, trace silt,
							rootlets noted **(WET, LOOSE)**
10'	5	1	1				Dark Brown PEAT, trace sand **(MOIST, LOOSE)**
				4	4	5	Gray Fine SAND, Some Silt
15'	6	WH	1/12"				Grades Little Silt (SATURATED)
				-	1	1	
							(MOIST TO SATURATED, LOOSE)
20'							
							End of boring 20.0' depth.
							Driller notes 3.0' of running sand within auger
							casings upon completion of borehole.
25'							

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-3		
PROJECT: 526 Central Avenue	**DATE**	START: 2/25/18	FINISH: 2/25/18
LOCATION: Albany, New York	**METHODS:** 3 1/4" Hollow Stem Augers, ASTM		
CLIENT: Regan Development Corp.	D1586 Drilling Methods with Auto Hammer		
JOB NUMBER: JB185008	**SURFACE ELEVATION**: +/- 244.0'		
DRILL TYPE: CME 45C	**CLASSIFICATION:** O.Burns		

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	
	1	3	5				**FILL:** Brown/Gray F-C SAND, SILT, and
				7	10	12	GRAVEL, Little Concrete (MOIST)
	2	7	10				Grades Some Silt, Brick, and Asphalt
				8	14	18	**(MOIST, FIRM)**
	3	10	6				
5'				5	4	11	Dark Brown to Brown F-M SAND, Some to
	4	4	2				Little Silt, Grades Gray, trace organics noted
				2	3	4	(WET)
10'	5	2	4				Grades Some Silt (SATURATED)
				5	4	9	
15'	6	WH	WH				
				WH	WH	WH	
20'	7	3	1				Grades Little Silt
				2	3	3	
25'	8	2	1				Grades trace silt
				1	2	2	
							(MOIST TO SATURATED, FIRM TO LOOSE)

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-3 contin.

PROJECT: 526 Central Avenue	**DATE**	START: 2/25/18	FINISH: 2/25/18

LOCATION: Albany, New York	**METHODS**: 3 1/4" Hollow Stem Augers, ASTM
CLIENT: Regan Development Corp.	D1586 Drilling Methods with Auto Hammer
JOB NUMBER: JB185008	**SURFACE ELEVATION**: +/- 244.0'
DRILL TYPE: CME 45C	**CLASSIFICATION**: O.Burns

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	
30'	9	1	1	2	4	3	Gray SILT and CLAY
35'	10	WH	WH	1	4	1	
40'	11	WH	WH	WH	1	WH	
45'	12	WH	WH	1	1	1	
50'	13	WH	WH	WH	1	1	**(SATURATED, VERY SOFT)**
55'							End of boring 52.0' depth. Groundwater measured at 11.4' depth within auger casings after Sample #6.

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-4		
PROJECT: 526 Central Avenue	**DATE**	START: 2/23/18	FINISH: 2/23/18
LOCATION: Albany, New York	**METHODS:** 3 1/4" Hollow Stem Augers, ASTM		
CLIENT: Regan Development Corp.	D1586 Drilling Methods with Auto Hammer		
JOB NUMBER: JB185008	**SURFACE ELEVATION**: +/- 242.0'		
DRILL TYPE: CME 45C	**CLASSIFICATION:** O.Burns		

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	+/- 4" Asphalt, +/- 4" Base
	1	21	10				**FILL:** Brown F-C SAND, Some Silt and Ash,
				10	11	20	Little Gravel, trace cinders **(MOIST, FIRM)**
	2	10	7				
				4	4	11	Brown F-M SAND, Little Silt
5'	3	4	3				
				3	3	6	
	4	3					Grades to Gray
						3	
							(MOIST TO WET, FIRM TO LOOSE)
10'	5	3	1				Dark Brown PEAT
				1	2	2	
	6	1	2				
				3	2	5	
	7	2	1				**(MOIST, LOOSE)**
15'				2	4	3	Gray Fine SAND, Some Silt (WET)
	8	1	1				Grades (SATURATED)
				2	3	3	
20'	9	1	1/12"				Grades Little Silt
				-	1	1	**(WET TO SATURATED, LOOSE)**
							End of boring 22.0' depth.
25'							

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: B-5

PROJECT: 526 Central Avenue	**DATE**	START: 2/23/18	FINISH: 2/23/18

LOCATION: Albany, New York	**METHODS**: 3 1/4" Hollow Stem Augers, ASTM
CLIENT: Regan Development Corp.	D1586 Drilling Methods with Auto Hammer
JOB NUMBER: JB185008	**SURFACE ELEVATION**: +/- 246.0'
DRILL TYPE: CME 45C	**CLASSIFICATION**: O.Burns

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	
	1	4	5				**FILL**: Brown F-C SAND, Little Asphalt and
				5	4	10	Silt **(MOIST, LOOSE)**
	2	3	3				Brown F-M SAND, Some to Little Silt, Little
				5	4	8	Gray Mottling
	3	4	3				Grades Brown
5'				3	3	6	
	4	3	3				Grades trace silt (WET)
				3	4	6	
10'	5	WH	1/12"				Grades (SATURATED)
				-	1	1	
15'	6	WH	1/12"				
				-	1	1	
20'	7	WH	WH				Grades Gray
				1	1	1	**(WET TO SATURATED, LOOSE)**
							End of boring 22.0' depth.
							Groundwater measured at 8.8' depth within
25'							auger casings after Sample #6.

DENTE GROUP, A TERRACON COMPANY | SUBSURFACE LOG: B-6

PROJECT: 526 Central Avenue | **DATE** START: 2/23/18 FINISH: 2/23/18

LOCATION: Albany, New York | **METHODS**: 3 1/4" Hollow Stem Augers, ASTM D1586 Drilling Methods with Auto Hammer

CLIENT: Regan Development Corp.

JOB NUMBER: JB185008 | **SURFACE ELEVATION**: +/- 245.0'

DRILL TYPE: CME 45C | **CLASSIFICATION**: O.Burns

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	
	1	6	5				**FILL:** Brown/Gray F-C SAND & CONCRETE,
				6	5	11	trace silt **(MOIST, FIRM)**
	2	1	2				Brown Mottled F-M SAND, Little Silt
				2	1	4	
	3	2	3				Grades Brown
5'				3	3	6	
	4	3	3				Grades Some Silt (SATURATED)
				3	2	6	
	5	1/12"	-				Grades Little Silt
				1/12"	-	1	
10'	6	WH	1				
				1	1	2	
15'	7	WH	WH				Grades trace silt
				WH	WH	WH	
20'	8	1	1				**(MOIST TO SATURATED, LOOSE)**
				2	3	3	Gray SILT and CLAY **(SATURATED, V. SOFT)**
							End of boring 22.0' depth.
							Groundwater measured at 8.5' depth within
25'							auger casings upon completion of borehole.

DENTE GROUP, A TERRACON COMPANY	SUBSURFACE LOG: I-1

PROJECT: 526 Central Avenue	**DATE**	START: 2/25/18	FINISH: 2/25/18

LOCATION: Albany, New York	**METHODS:** 3 1/4" Hollow Stem Augers, ASTM
CLIENT: Regan Development Corp.	D1586 Drilling Methods with Auto Hammer
JOB NUMBER: JB185008	**SURFACE ELEVATION**: +/- 245.0'
DRILL TYPE: CME 45C	**CLASSIFICATION:** O.Burns

SAMPLE		BLOWS ON SAMPLER					CLASSIFICATION / OBSERVATIONS
DEPTH	#	6"	12"	18"	24"	N	
	1	5	5				**FILL:** Brown Mottled F-C SAND, Some Gravel,
				4	5	9	Little Silt **(MOIST, LOOSE)**
	2	5	4				Brown F-M SAND, Little Silt, trace mottling
				4	4	8	
	3	2	3				
5'				3	2	6	
	4	3	3				Grades (WET)
				2	2	5	**(MOIST TO WET, LOOSET)**
							End of boring 8.0' depth.
10'							
15'							
20'							
25'							

DENTE

A Terracon COMPANY

INFILTRATION TEST RESULTS

PROJECT: 526 Central Avenue | **PROJECT NO.** JB185008

PROJECT LOCATION: Albany, New Y | **DATE:** 2/26/18

WEATHER: | **TESTER:** AB

DRAFT

Test Location	Test Depth (feet)	Trial No.	Water Drop (inches)	Elapsed Time (hours)	Infiltration Rate (inches/hour)
I-1	5.1	1	7.5	1.00	7.5
		2	7.5	1.00	7.5
		3	7.5	1.00	7.5
		4	7.5	1.00	7.5
		Average infiltration rate for four trials was 7.5 inches per hour. Infiltration rate of final trial was 7.5 inches per hour.			

Notes:

(1) Testing was conducted in general accord with the "Infiltration Testing Requirements" contained in Appendix D of the New York State Storm Water Management Design Manual.

(2) Test pipe was installed in a borehole made adjacent to test boring I-1.

SOIL CLASSIFICATION AT TEST DEPTH

Test Location I-1: Brown F-M SAND, Little Silt

Exhibit B – WQv, RRv and Pretreatment

.1 Water Quality Volume (WQv) (Post Area #1A and #1B)

.2 WQv Peak Flows (Post Area #1A and #1B)

.3 Peak flows to WQV #2

.4 RRv for Project

.5 Hydrodynamic Unit

Engineering and Land Surveying, P.C.

PROJECT # 972.21 | SHEET # | OF: | PAGE # | OF:

MADE BY: JWE | DATE: 2/28/2018

PROJECT: 526 Central Ave | CHKD BY: | DATE:

SUBJECT: UNIFORM STORMWATER SIZING CRITERIA | REVISED BY: | DATE:

WQv, CPv AND PRELIMINARY BASIN SIZING | CHKD BY: | DATE:

Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Basic Watershed Data

County: Albany

90% Rainfall Event: 1.2 *inches (Figure 4.1 - NYS SWDM)*

Rainfall Distribution Type = 2 (1, 1A , 2 or 3)

Impervious Area: 1.33 *acres*

Condition	Watershed Area (Ac)	Watershed Area mi^2	AVE. CN	TOC (hrs)	Pond/Swamp Adjustment Factor Fp	Initial Abstraction Ia (inches)
Pre Area 1	3.72	0.006	76	0.196	1	0.63
Post Area 1	1.03	0.002	94	0.189	1	0.13
Post Area 1A	2.36	0.004	87	0.1	1	0.30

(See supporting documentation)

DIRECT RUNOFF SUMMARY

Storm Event *n*	Precip. $_{24\text{-hr}}P_{n\text{-yr}}$ (inches)	PRE-DEVELOPMENT (Area 1) Runoff $_{24\text{-hr}}Q_{n\text{-yr}}$ (inches)	Peak Discharge $_{Pre}Qp_{n\text{-yr}}$ (cfs)	Runoff Volume $_{Pre}Vr_{n\text{-yr}}$ (cubic feet)	POST-DEVELOPMENT (Area 1) Runoff $_{24\text{-hr}}Q_{n\text{-yr}}$ (inches)	Peak Discharge $_{Post}Qp_{n\text{-yr}}$ (cfs)	Runoff Volume $_{Post}Vr_{n\text{-yr}}$ (cubic feet)	POST-DEVELOPMENT (Area 1A) Runoff $_{24\text{-hr}}Q_{n\text{-yr}}$ (inches)	Peak Discharge $_{Ult}Qp_{n\text{-yr}}$ (cfs)	Runoff Volume $_{Ult}Vr_{n\text{-yr}}$ (cubic feet)
1-yr	2.4	0.6	2.8	8,572	1.8	2.2	6,633	1.2	4.7	10,501
2-yr	2.9	0.9	4.3	12,805	2.3	2.7	8,426	1.7	6.2	14,129
5-yr	3.7	1.5	7.2	20,420	3.0	3.5	11,332	2.4	8.5	20,209
10-yr	4.5	2.1	10.2	28,760	3.8	4.3	14,265	3.1	10.8	26,503
25-yr	4.9	2.5	11.7	33,129	4.2	4.7	15,738	3.5	11.9	29,704
50-yr	5.5	3.0	14.0	39,876	4.8	5.4	17,954	4.0	13.6	34,554
100-yr	7.0	4.3	19.7	57,489	6.3	6.9	23,511	5.5	17.8	46,861

UNIFORM STORMWATER SIZING PARAMETER SUMMARY

Water Quality Volume, WQv = 0.13 **acre-feet** (5,747 ft^3)

Channel Protection Storage Volume, Vs = 0.2 **acre-feet** (6,882 ft^3)

Average Release Rate = 0.08 **cfs**

Overbank Flood Protection Volume, $Qp_{10\text{-yr}}$ = 0.23 **acre-feet** (9,946 ft^3)

Extreme Flood Protection Volume, $Qf_{100\text{-yr}}$ = 0.29 **acre-feet** (12,678 ft^3)

Safe Passage of 100-yr Design Storm = 17.8 **cfs**

PROJECT # 972.21	SHEET # OF:	PAGE # OF:	
	MADE BY: JWE	DATE: 2/28/2018	
PROJECT: 526 Central Ave	CHKD BY:	DATE:	
SUBJECT: UNIFORM STORMWATER SIZING CRITERIA	REVISED BY:	DATE:	
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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Hydrologic Input Parameters and Site Hydrology

Rainfall Distribution Type = 2 (1, 1A , 2 or 3)

24-hour, 1-yr event ($_{24\text{-hr}}P_{1\text{-yr}}$) = 2.4 inches

Condition	Area (Ac)	CN	Tc (hrs)
Pre Area #1	3.72	76	0.196
Post Area #1	1.03	94	0.19
Post Area #1A	2.36	87	0.1

(See supporting documentation)

Hydrologic Calculations

	Event / Runoff					
	$_{24\text{-hr}}Q_{1\text{-yr}}$		$_{24\text{-hr}}Q_{10\text{-yr}}$		$_{24\text{-hr}}Q_{100\text{-yr}}$	
Condition	(inches)	(cfs)	(inches)	(cfs)	(inches)	(cfs)
Pre Area 1	0.63	2.75	2.13	10.17	4.26	19.75
Post Area 1	1.77	2.16	3.82	4.34	6.29	6.90
Post Area 1A	1.23	4.69	3.10	10.80	5.48	17.80

(See supporting documentation)

Water Quality Volume, WQv

Compute Impervious Cover

(Use both on-site and off-site drainage)

Impervious Area: 1.33 acres

Total Watershed Area: 2.36 acres

I = Impervious Area / Total Watershed Area
I = 1.33 acres / 2.36 acres
I = 56.5%

Compute Runoff Coefficient, Rv

Rv = 0.05 + 0.009 * (I), where I = % impervious cover
Rv = 0.05 + 0.009 * (56.5)
Rv = 0.56

Compute WQv, (includes both on-site and off-site drainage)

(Use the 90% capture rule with 1.2" of rainfall, Figure 4.1 NYS-SWDM)

WQv = (1.2in.) * (Rv) * (A)
WQv = (1.2in.) * (0.56) * (2.356ac) * (1ft/12in)
WQv = 0.13 ac-ft (5,747 ft^3)

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Compute Channel Protection Storage Volume, Vs

For stream channel protection, provide 24 hours of extended detention (T) for the one-year event.

First, determine the value of the unit peak discharge (qu) using TR-55 and Rainfall Distribution Type

Calculate the initial abstraction (Ia) for POST DEVELOPMENT AREA #1A CN of 87

Ia = (200 / CN - 2)

Ia = (200 / 87 - 2)

Ia = 0.299

Calculate Ia / $_{24\text{-hr}}P_{1\text{-yr}}$

Ia / $_{24\text{-hr}}P_{1\text{-yr}}$ = 0.3 / 2.4 inches

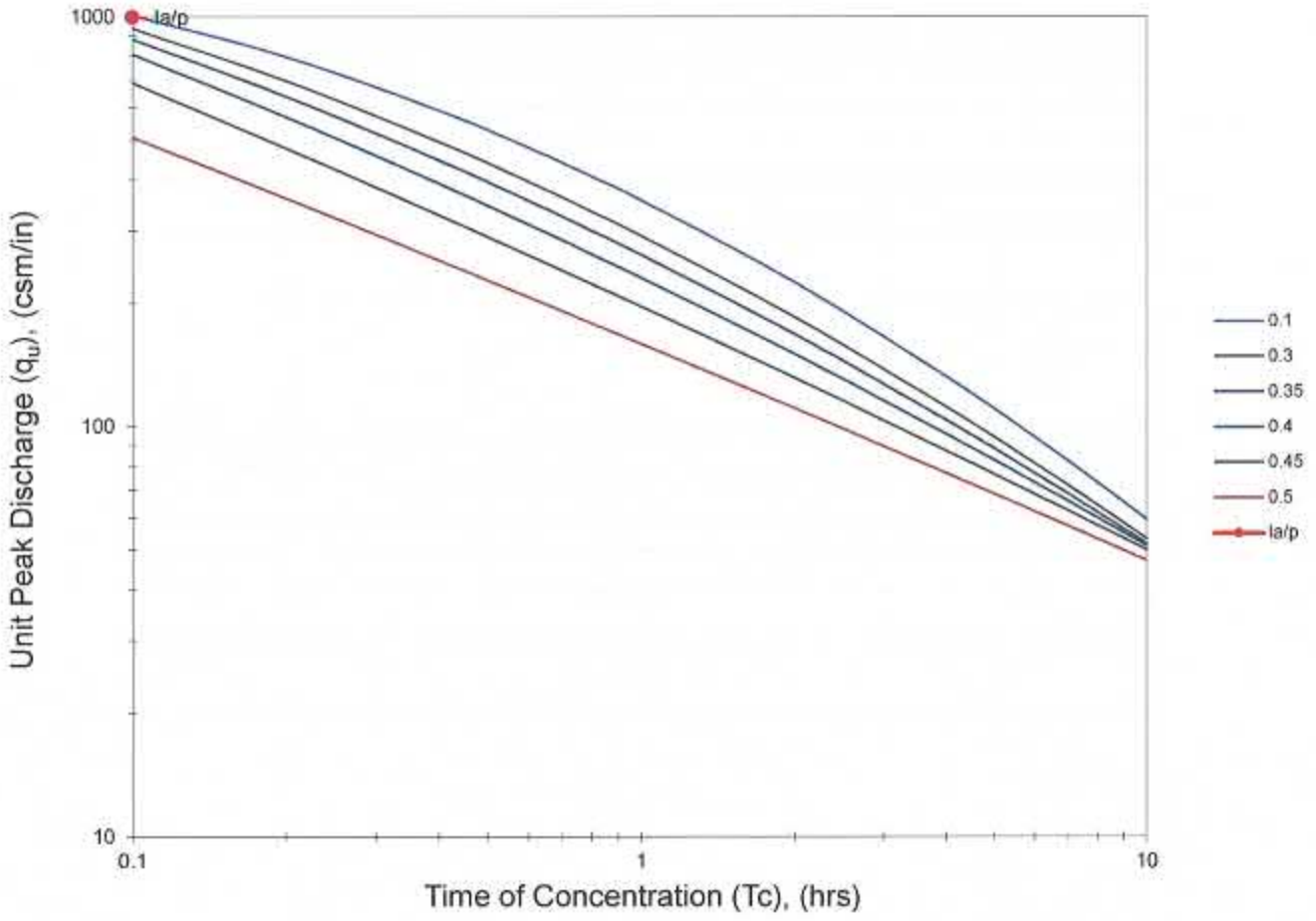
Ia / $_{24\text{-hr}}P_{1\text{-yr}}$ = 0.12 inches

Using Ia/P = 0.125 and Tc = 0.1;

qu = 1000.0 csm/in where csm = (cubic feet per second per square mile per year)

Unit Peak Discharge (qu) for NRCS (SCS) type II rainfall distribution

Source: Exhibit 4-II, TR-55. USDA.



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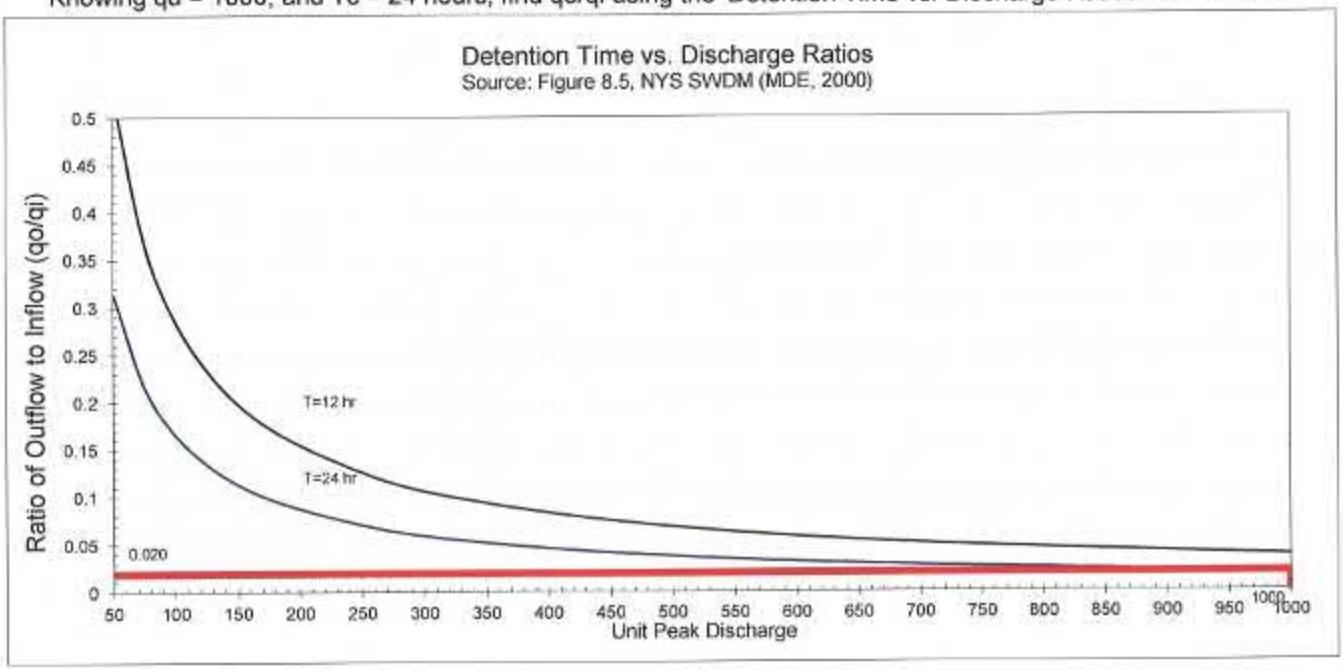
Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Knowing qu = 1000, and Tc = 24 hours, find qo/qi using the 'Detention Time vs. Discharge Ratios' chart below.



Peak outflow discharge/peak inflow discharge (qo/qi)

qo/qi = 0.020

Approximate detention basin routing for 24-hour rainfall

(Applicable through single- and multiple-stage structures)

$$Vs/Vr = 0.683 - 1.43(qo/qi) + 1.64(qo/qi)^2 - 0.804(qo/qi)^3$$

(Where Vs equals channel protection storage (Cpv) and Vr equals the volume of runoff in inches.)

Source: NYS-SMDM, Appendix B.1, equation 2.1.16

Vs/Vr = 0.683 - 1.43(0.02) + 1.64(0.02)^2 - 0.804(0.02)^3

Vs/Vr = 0.66

$_{24\text{-hr}}Q_{1\text{-yr}}$ = 1.23 inches

Vs = Cpv = (Vs/Vr) * (24-hrQ1-yr) * (Drainage Area) / 12

Source: NYS-SMDM, Appendix B.1, equation 2.1.17

Channel protection storage (Cpv) = Vs = 0.16 acre-feet (6882 cubic feet)

Define the Average Release Rate

The above volume, 0.16 acre-feet, is to be released over 24 hours

Average Release Rate = 0.16 ac-ft * 43,560 cf/ac) / (24 hrs * 3,600 sec/hr)

Average Release Rate = 0.080 cfs

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Compute Overbank Flood Protection Volume ($Qp_{10\text{-}yr}$)

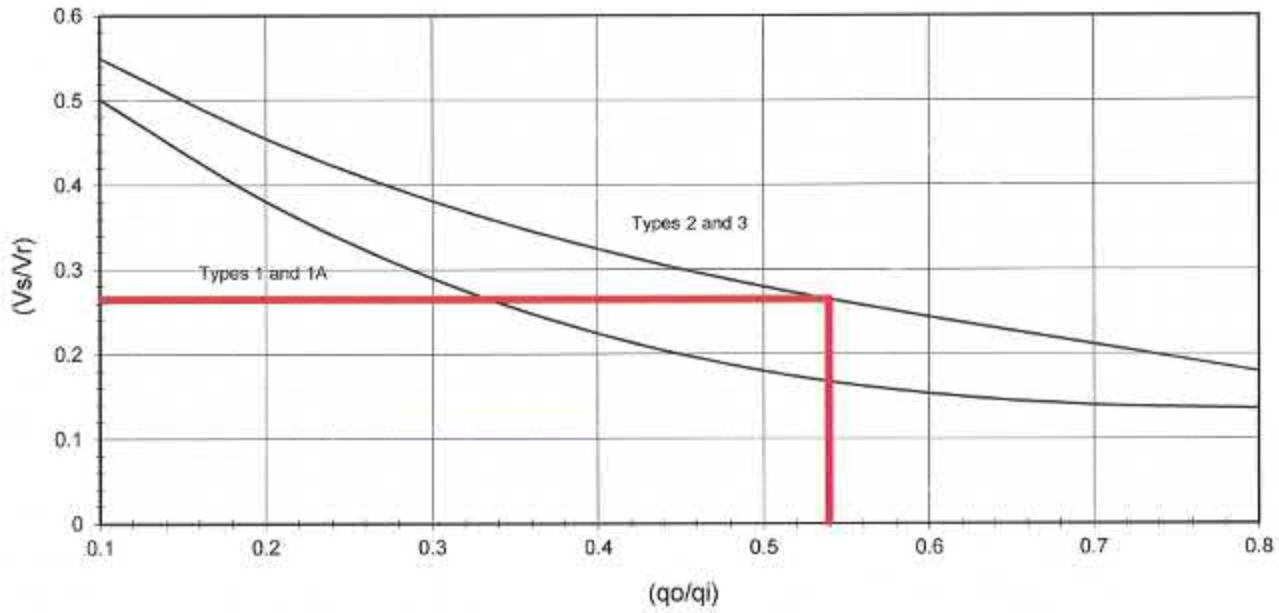
For the overbank flood protection volume, size is determined using the TR-55 "Short cut method," which relates the storage volume to the required reduction in peak flow and storm inflow volume (Figure 8.6).

For a Post-developed inflow rate (qi) = 10.80 cfs and a
Pre-developed, allowable outflow rate (qo) = 5.83 cfs
(qo/qi) = 0.54

* Using NYS-SMDM, Figure 8.6, and a post-developed curve number of qo/q1, the resultant (Vs/Vr) is

Vs/Vr = 0.27

Approximate Detention Basin Routing for Rainfall Types I, IA, II, and III
Source: Figure 8.6. TR-55, 1986



Using a total $_{24\text{-}hr}Q_{10\text{-}yr}$ runoff volume of 0.7 acre-feet (32630 cubic feet), the required storage (Vs) is:

Vs = Qpv = (Vs/Vr) * ($_{24\text{-}hr}Q_{10\text{-}yr}$)
Vs = Qpv = 0.27 * 0.7 acre-feet
Vs = **Qpv = 0.20 acre-feet** (8649 cubic feet)

While the TR-55 short cut method reports to incorporate multiple stage structures, experience has shown that an additional 10-15% storage is required when multiple levels of extended detention are provided inclusive with the 10-year storm. So, for preliminary sizing purposes, add 15% to the required volume for the 10-year storm.
Source: NYS-SMDM, Chapter 8, page 8-9

$Qp_{10\text{-}yr}$ = 0.23 acre-feet (9946 cubic feet)

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Compute Extreme Flood Protection Volume ($Qp_{100\text{-}yr}$)

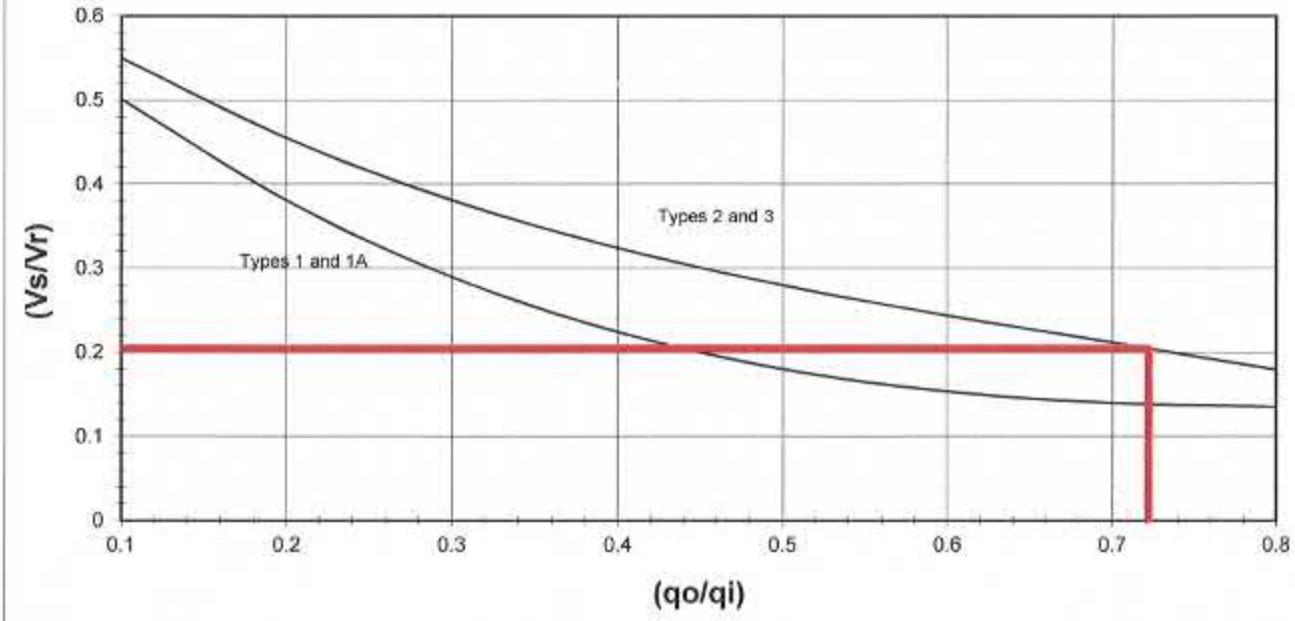
For the extreme flood protection volume, size is determined using the TR-55 "Short cut method," which relates the storage volume to the required reduction in peak flow and storm inflow volume (Figure 8.6).

For a Post-developed inflow rate (qi) = 17.80 cfs and a
Pre-developed, allowable outflow rate (qo) = 12.85 cfs
(qo/qi) = 0.72

* Using NYS-SMDM, Figure 8.6, and a post-developed curve number of , the resultant (Vs/Vr) is

Vs/Vr = 0.20

Approximate Detention Basin Routing for Rainfall Types I, IA, II, and III
Source: Figure 8.6, TR-55, 1986



Using a total $_{24\text{-}hr}Q_{100\text{-}yr}$ runoff volume of 1.2 acre-feet (53779 cubic feet), the required storage (Vs) is:

Vs = Qpv = (Vs/Vr) * ($_{24\text{-}hr}Q_{100\text{-}yr}$)
Vs = Qpv = 0.2 * 1.2 acre-feet
Vs = **Qpv = 0.25 acre-feet** (11025 cubic feet)

While the TR-55 short cut method reports to incorporate multiple stage structures, experience has shown that an additional 10-15% storage is required when multiple levels of extended detention are provided inclusive with the 100-year storm. So, for preliminary sizing purposes, add 15% to the required volume for the 10-year storm.
Source: NYS-SMDM, Chapter 8, page 8-9

$Qp_{100\text{-}yr}$ = 0.29 acre-feet (12678 cubic feet)

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Analyze Safe Passage of 100-Year Design Storm (Qf)

If peak discharge control of the 100-year storm is not required, it is still necessary to provide safe passage for the 100-year event under ultimate buildout conditions;

$_{24\text{-hr}}Q_{100\text{-yr}}$ (Pre-development Rate) = Q_{ult} = **18** **cfs**

Engineering and Land Surveying, P.C.

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Basic Watershed Data

County: Albany

90% Rainfall Event: 1.2 *inches (Figure 4.1 - NYS SWDM)*

Rainfall Distribution Type = 2 (1, 1A , 2 or 3)

Impervious Area: 1.09 *acres*

Condition	Watershed Area (Ac)	Watershed Area mi^2	AVE. CN	TOC (hrs)	Pond/Swamp Adjustment Factor Fp	Initial Abstraction Ia (inches)
Pre Area 1	3.72	0.006	76	0.196	1	0.63
Post Area 1	1.03	0.002	94	0.189	1	0.13
Post Area 1B	1.21	0.002	95	0.1	1	0.11

(See supporting documentation)

DIRECT RUNOFF SUMMARY

Storm Event *n*	Precip. $_{24\text{-hr}}P_{n\text{-yr}}$ (inches)	PRE-DEVELOPMENT (Area 1) Runoff $_{24\text{-hr}}Q_{n\text{-yr}}$ (inches)	Peak Discharge $_{Pre}Qp_{n\text{-yr}}$ (cfs)	Runoff Volume $_{Pre}Vr_{n\text{-yr}}$ (cubic feet)	POST-DEVELOPMENT (Area 1) Runoff $_{24\text{-hr}}Q_{n\text{-yr}}$ (inches)	Peak Discharge $_{Post}Qp_{n\text{-yr}}$ (cfs)	Runoff Volume $_{Post}Vr_{n\text{-yr}}$ (cubic feet)	POST-DEVELOPMENT (Area 1B) Runoff $_{24\text{-hr}}Q_{n\text{-yr}}$ (inches)	Peak Discharge $_{Ult}Qp_{n\text{-yr}}$ (cfs)	Runoff Volume $_{Ult}Vr_{n\text{-yr}}$ (cubic feet)
1-yr	2.4	0.6	2.8	8,572	1.8	2.2	6,633	1.9	3.1	8,212
2-yr	2.9	0.9	4.3	12,805	2.3	2.7	8,426	2.4	3.8	10,347
5-yr	3.7	1.5	7.2	20,420	3.0	3.5	11,332	3.1	5.0	13,795
10-yr	4.5	2.1	10.2	28,760	3.8	4.3	14,265	3.9	6.1	17,267
25-yr	4.9	2.5	11.7	33,129	4.2	4.7	15,738	4.3	6.6	19,008
50-yr	5.5	3.0	14.0	39,876	4.8	5.4	17,954	4.9	7.5	21,625
100-yr	7.0	4.3	19.7	57,489	6.3	6.9	23,511	6.4	9.6	28,182

UNIFORM STORMWATER SIZING PARAMETER SUMMARY

Water Quality Volume, WQv = 0.10 **acre-feet** (4,540 ft^3)

Channel Protection Storage Volume, Vs = 0.1 **acre-feet** (5,382 ft^3)

Average Release Rate = 0.06 **cfs**

Overbank Flood Protection Volume, $Qp_{10\text{-yr}}$ = 0.05 **acre-feet** (2,255 ft^3)

Extreme Flood Protection Volume, $Qf_{100\text{-yr}}$ = -0.14 **acre-feet** ((6,133) ft^3)

Safe Passage of 100-yr Design Storm = 9.6 **cfs**

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Hydrologic Input Parameters and Site Hydrology

Rainfall Distribution Type = 2 (1, 1A , 2 or 3)

24-hour, 1-yr event ($_{24\text{-hr}}P_{1\text{-yr}}$) = 2.4 inches

Condition	Area (Ac)	CN	Tc (hrs)
Pre Area #1	3.72	76	0.196
Post Area #1	1.03	94	0.19
Post Area #1B	1.21	95	0.1

(See supporting documentation)

Hydrologic Calculations

Condition	Event / Runoff					
	$_{24\text{-hr}}Q_{1\text{-yr}}$		$_{24\text{-hr}}Q_{10\text{-yr}}$		$_{24\text{-hr}}Q_{100\text{-yr}}$	
	(inches)	(cfs)	(inches)	(cfs)	(inches)	(cfs)
Pre Area 1	0.63	2.75	2.13	10.17	4.26	19.75
Post Area 1	1.77	2.16	3.82	4.34	6.29	6.90
Post Area 1B	1.87	3.13	3.92	6.08	6.41	9.55

(See supporting documentation)

Water Quality Volume, WQv

Compute Impervious Cover

(Use both on-site and off-site drainage)

Impervious Area: 1.09 acres

Total Watershed Area: 1.21 acres

I = Impervious Area / Total Watershed Area
I = 1.09 acres / 1.21 acres
I = 89.9%

Compute Runoff Coefficient, Rv

Rv = 0.05 + 0.009 * (I), where I = % impervious cover
Rv = 0.05 + 0.009 * (89.9)
Rv = 0.86

Compute WQv, (includes both on-site and off-site drainage)

(Use the 90% capture rule with 1.2" of rainfall, Figure 4.1 NYS-SWDM)

WQv = (1.2in.) * (Rv) * (A)
WQv = (1.2in.) * (0.86) * (1.212ac) * (1ft/12in)
WQv = 0.10 ac-ft (4,540 ft^3)

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Compute Channel Protection Storage Volume, Vs

For stream channel protection, provide 24 hours of extended detention (T) for the one-year event.

First, determine the value of the unit peak discharge (qu) using TR-55 and Rainfall Distribution Type

Calculate the initial abstraction (Ia) for POST DEVELOPMENT AREA #1B CN of 95

Ia = (200 / CN - 2)

Ia = (200 / 95 - 2)

Ia = 0.105

Calculate Ia / $_{24\text{-hr}}P_{1\text{-yr}}$

Ia / $_{24\text{-hr}}P_{1\text{-yr}}$ = 0.11 / 2.4 inches

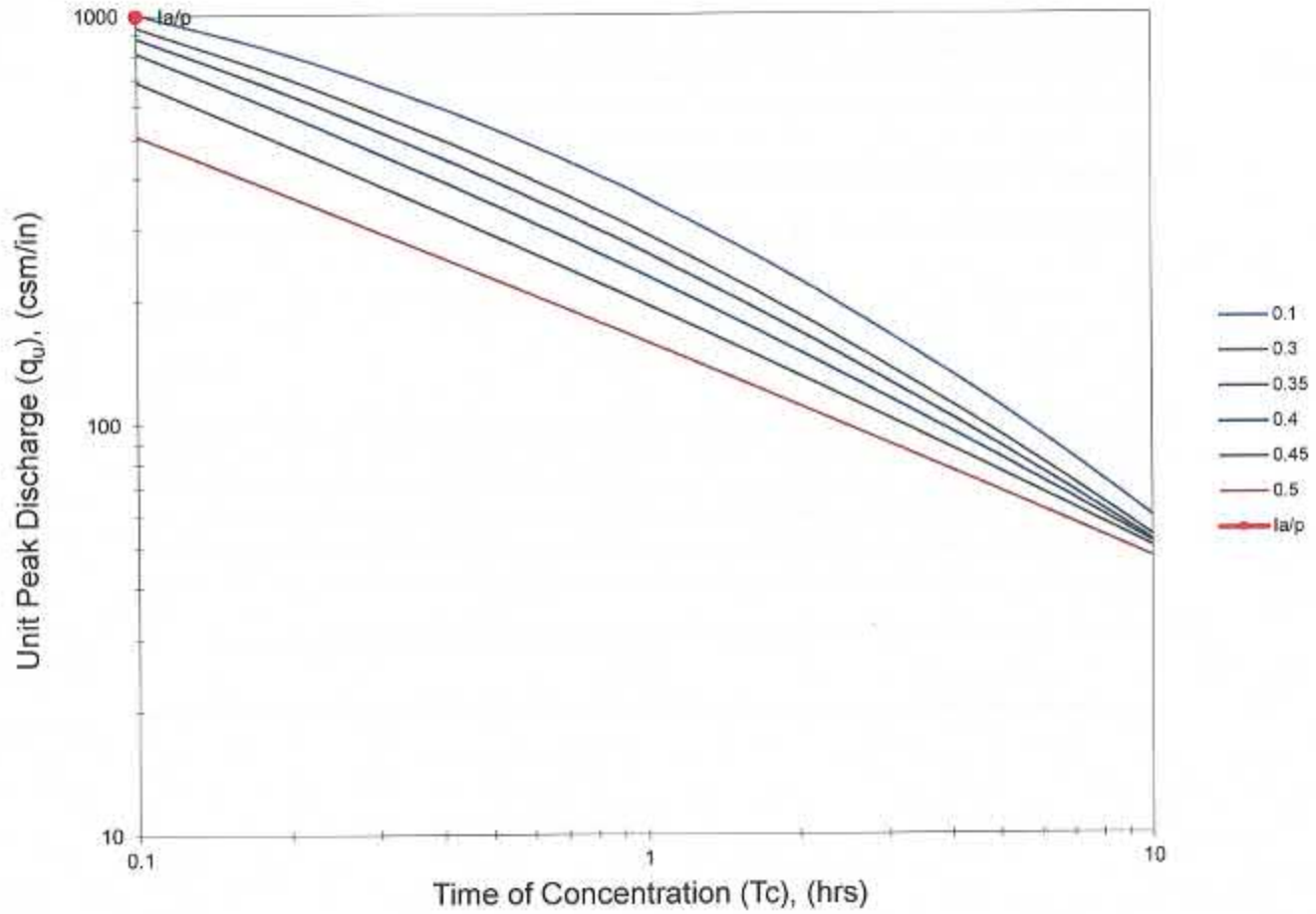
Ia / $_{24\text{-hr}}P_{1\text{-yr}}$ = 0.04 inches

Using Ia/P = 0.044 and Tc = 0.1;

qu = 1000.0 csm/in where csm = (cubic feet per second per square mile per year)

Unit Peak Discharge (qu) for NRCS (SCS) type II rainfall distribution

Source: Exhibit 4-II, TR-55. USDA.



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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

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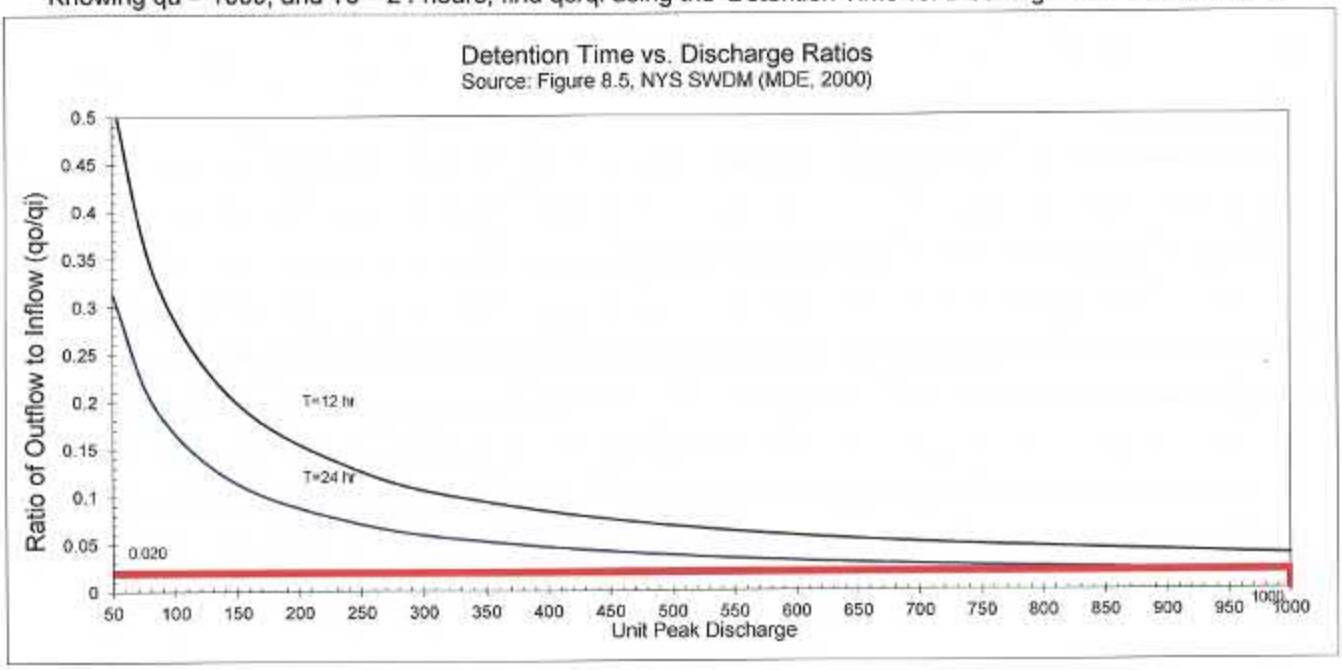
Knowing qu = 1000, and Tc = 24 hours, find qo/qi using the 'Detention Time vs. Discharge Ratios' chart below.



Peak outflow discharge/peak inflow discharge (qo/qi)

qo/qi = 0.020

Approximate detention basin routing for 24-hour rainfall

(Applicable through single- and multiple-stage structures)

$$Vs/Vr = 0.683 - 1.43(qo/qi) + 1.64(qo/qi)^2 - 0.804(qo/qi)^3$$

(Where Vs equals channel protection storage (Cpv) and Vr equals the volume of runoff in inches.)

Source: NYS-SMDM, Appendix B.1, equation 2.1.16

Vs/Vr = 0.683 - 1.43(0.02) + 1.64(0.02)^2 - 0.804(0.02)^3

Vs/Vr = 0.66

$_{24\text{-hr}}Q_{1\text{-yr}}$ = 1.87 inches

Vs = Cpv = (Vs/Vr) * (24-hrQ1-yr) * (Drainage Area) / 12

Source: NYS-SMDM, Appendix B.1, equation 2.1.17

Channel protection storage (Cpv) = Vs = 0.12 acre-feet (5382 cubic feet)

Define the Average Release Rate

The above volume, 0.12 acre-feet, is to be released over 24 hours

Average Release Rate = 0.12 ac-ft * 43,560 cf/ac) / (24 hrs * 3,600 sec/hr)

Average Release Rate = 0.062 cfs

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Compute Overbank Flood Protection Volume ($Qp_{10\text{-}yr}$)

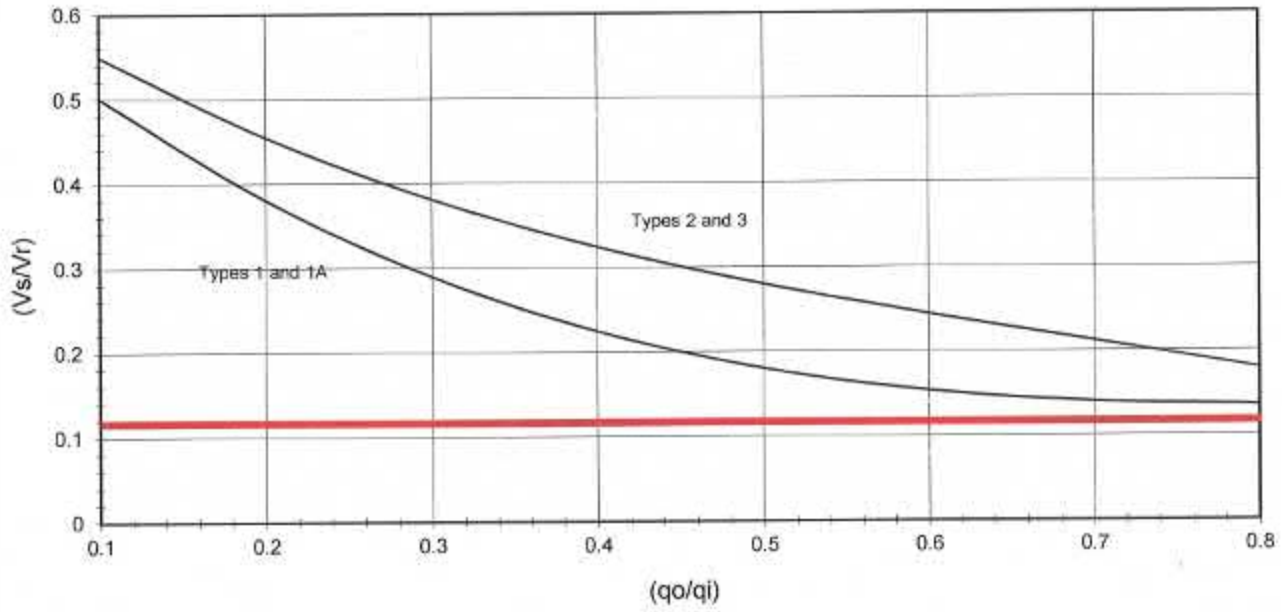
For the overbank flood protection volume, size is determined using the TR-55 "Short cut method," which relates the storage volume to the required reduction in peak flow and storm inflow volume (Figure 8.6).

For a Post-developed inflow rate (qi) = 6.08 cfs and a
Pre-developed, allowable outflow rate (qo) = 5.83 cfs
(qo/qi) = 0.96

* Using NYS-SMDM, Figure 8.6, and a post-developed curve number of qo/q1, the resultant (Vs/Vr) is

Vs/Vr = 0.12

Approximate Detention Basin Routing for Rainfall Types I, IA, II, and III
Source: Figure 8.6, TR-55, 1986



Using a total $_{24\text{-}hr}Q_{10\text{-}yr}$ runoff volume of 0.4 acre-feet (16786 cubic feet), the required storage (Vs) is:

Vs = Qpv = (Vs/Vr) * ($_{24\text{-}hr}Q_{10\text{-}yr}$)
Vs = Qpv = 0.12 * 0.4 acre-feet
Vs = **Qpv = 0.05 acre-feet** (1961 cubic feet)

While the TR-55 short cut method reports to incorporate multiple stage structures, experience has shown that an additional 10-15% storage is required when multiple levels of extended detention are provided inclusive with the 10-year storm. So, for preliminary sizing purposes, add 15% to the required volume for the 10-year storm.
Source: NYS-SMDM, Chapter 8, page 8-9

$Qp_{10\text{-}yr}$ = 0.05 acre-feet (2255 cubic feet)

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Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

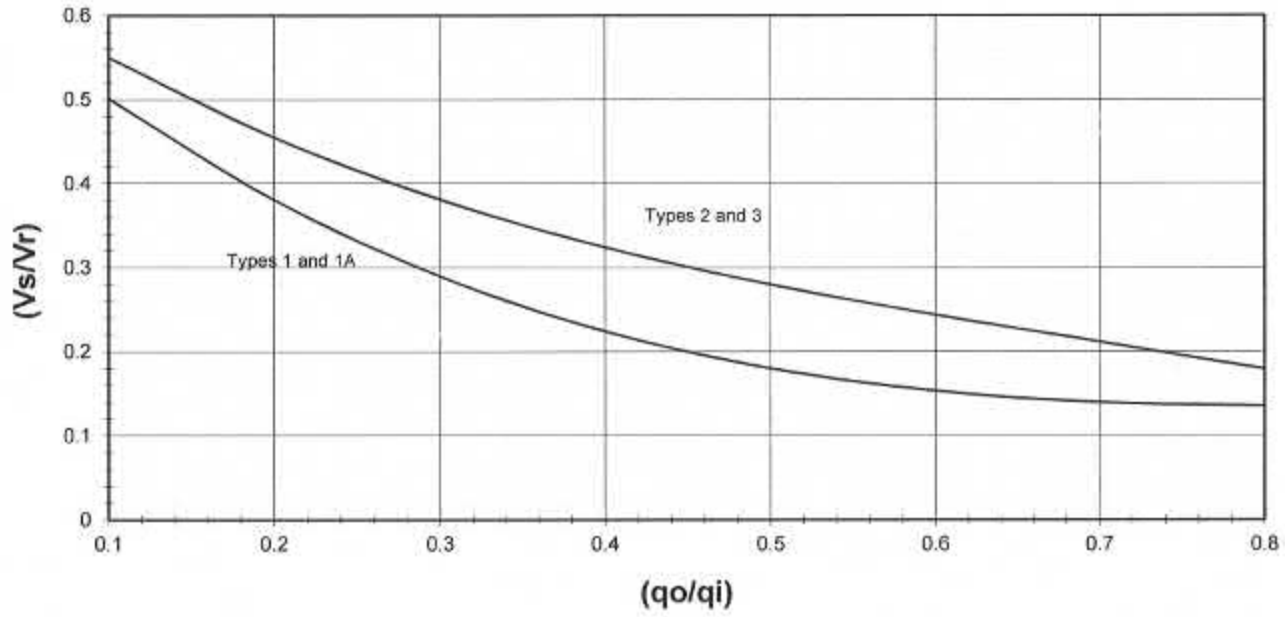
Compute Extreme Flood Protection Volume ($Qp_{100\text{-}yr}$)

For the extreme flood protection volume, size is determined using the TR-55 "Short cut method," which relates the storage volume to the required reduction in peak flow and storm inflow volume (Figure 8.6).

For a Post-developed inflow rate (qi) = 9.55 cfs and a
Pre-developed, allowable outflow rate (qo) = 12.85 cfs
(qo/qi) = 1.34

* Using NYS-SMDM, Figure 8.6, and a post-developed curve number of , the resultant (Vs/Vr) is
Vs/Vr = -0.19

Approximate Detention Basin Routing for Rainfall Types I, IA, II, and III
Source: Figure 8.6. TR-55, 1986



Using a total $_{24\text{-}hr}Q_{100\text{-}yr}$ runoff volume of 0.6 acre-feet (27666 cubic feet), the required storage (Vs) is:

Vs = Qpv = (Vs/Vr) * ($_{24\text{-}hr}Q_{100\text{-}yr}$)
Vs = Qpv = -0.19 * 0.6 acre-feet
Vs = **Qpv = -0.12 acre-feet** (-5333 cubic feet)

While the TR-55 short cut method reports to incorporate multiple stage structures, experience has shown that an additional 10-15% storage is required when multiple levels of extended detention are provided inclusive with the 100-year storm. So, for preliminary sizing purposes, add 15% to the required volume for the 10-year storm.
Source: NYS-SMDM, Chapter 8, page 8-9

$Qp_{100\text{-}yr}$ = -0.14 acre-feet (-6133 cubic feet)

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PROJECT: 526 Central Ave	CHKD BY:		DATE:
SUBJECT: UNIFORM STORMWATER SIZING CRITERIA	REVISED BY:		DATE:
WQv, CPv AND PRELIMINARY BASIN SIZING	CHKD BY:		DATE:

Computation of Preliminary Stormwater Storage Volumes and Peak Discharges

(Designed for compliance with *New York State Management Design Manual* guidelines)

Analyze Safe Passage of 100-Year Design Storm (Qf)

If peak discharge control of the 100-year storm is not required, it is still necessary to provide safe passage for the 100-year event under ultimate buildout conditions;

$_{24\text{-hr}}Q_{100\text{-yr}}$ (Pre-development Rate) = Q_{ult} = **10** **cfs**

Engineering and Land Surveying, P.C.

PROJECT # 972.21 | SHEET # 1 OF: 1 | PAGE # OF:

MADE BY: JWE DATE: 2/28/2018

PROJECT: 526 Central Ave | CHKD BY: DATE:

SUBJECT: Pretreatment | REVISED BY: DATE:

Post Development Area #1A | CHKD BY: DATE:

The Water Quality Peak Flow calculations in accordance with Appendix B of the August 2010 NYSDEC Stormwater Management Design Manual for the purposes of sizing diversion or off-line structures.

Using the water quality volume (WQv), a corresponding Curve Number (CN) is computed utilizing the following equation:

CN = 1000 / [10 + 5P + 10Q - 10(Q^2 + 1.25 QP)^1/2]

Where P = rainfall, in inches (use the 90% rainfall event from Figure 4.1 for the Water Quailty Storm)
Q = runoff, in inches

P = 1.2 inch for Albany County
Q = 5747 WQv in cf = 0.67 inches
102612 Watershed Area in sf

CN = 94

Once a CN is computed, the time of concentration (tc) is computed using guidance provided in TR-55.

The tc for this watershed is 0.10 hrs

Using the computed CN, tc, and drainage area (A) in acres, the peak discharge (Qp) for the water quailty storm event is computed (either Type II or Type III in the state of New York)

Read initial abstraction (Ia), compute Ia / P
Read the unit peak discharge (qu) for appropriate tc
Using the water quality volume (WQv), compute the peak discharge (Qp)

Qp = qu x A x WQv

Where Qp = the peak discharge, in cfs
qu = the unit peak discharge, in cfs/sq mi/inch
A = drainage area, in square miles
WQv = Water Quality Volume, in watershed inches

qu = 1000 csm/in
A = 2.36 acres, or 0.0037 square miles
WQv = 0.13193 acft or 0.7 watershed inches

Qp = 2.47 cfs

Engineering and Land Surveying, P.C.

PROJECT # 972.21 | SHEET # 1 OF: 1 | PAGE # OF:

MADE BY: JWE DATE: 2/28/2018

PROJECT: 526 Central Ave | CHKD BY: DATE:

SUBJECT: WQv Treatment | REVISED BY: DATE:

Post Development Area #1B | CHKD BY: DATE:

The Water Quality Peak Flow calculations in accordance with Appendix B of the August 2010 NYSDEC Stormwater Management Design Manual for the purposes of sizing diversion or off-line structures.

Using the water quality volume (WQv), a corresponding Curve Number (CN) is computed utilizing the following equation:

CN = 1000 / [10 + 5P + 10Q - 10(Q^2 + 1.25 QP)^1/2]

Where P = rainfall, in inches (use the 90% rainfall event from Figure 4.1 for the Water Quailty Storm)
Q = runoff, in inches

P = 1.2 inch for Albany County
Q = 4540 WQv in cf = 1.03 inches
52788 Watershed Area in sf

CN = 98

Once a CN is computed, the time of concentration (tc) is computed using guidance provided in TR-55.

The tc for this watershed is 0.10 hrs

Using the computed CN, tc, and drainage area (A) in acres, the peak discharge (Qp) for the water quailty storm event is computed (either Type II or Type III in the state of New York)

Read initial abstraction (Ia), compute Ia / P
Read the unit peak discharge (qu) for appropriate tc
Using the water quality volume (WQv), compute the peak discharge (Qp)

Qp = qu x A x WQv

Where Qp = the peak discharge, in cfs
qu = the unit peak discharge, in cfs/sq mi/inch
A = drainage area, in square miles
WQv = Water Quality Volume, in watershed inches

qu = 1000 csm/in
A = 1.21 acres, or 0.0019 square miles
WQv = 0.10422 acft or 1.0 watershed inches

Qp = 1.95 cfs

Engineering and Land Surveying, P.C.

PROJECT # 972.21 | SHEET # 1 OF: 1 | PAGE # OF:

MADE BY: JWE DATE: 2/26/2018

PROJECT: 526 Central Ave | CHKD BY: DATE:

SUBJECT: Hydrodyanmic Unit | REVISED BY: DATE:

Post Development Area #1A | CHKD BY: DATE:

DETERMINE MINIMUM FLOW AND MAXIMUM FLOW TO VORTECH UNIT

CB#10 HAS INVERT OUT OF 240.24 FOR 12" PIPE TO VORTECH UNIT AND INVERT OUT OF 241.24 FOR 18" BY-PASS

DETERMINE MINIMUM FLOW TO VORTECH UNIT BEFORE 12" BY-PASS DISCHARGES STORMWATER

USING AND ORIFICE EQUATION

$Q=CxAx(2GH)^{\wedge 0.5}$

A= AREA OR PIPE (FT^2)

C= ORIFICE DISCHARGE COEFFICIENT

G= GRAVITATIONAL ACCELERATION (FT/SEC^2)

H=HEAD FROM CENTER OF PIPE (FT)

A= 0.785 FT^2

C= 0.610

G= 32.20 FT/SEC^2

H= 0.500 FT

HEAD WAS DETERMINED FROM 12" BYPASS INVERT ELEV=240.24 - INV OF PIPE 241.24 + 0.5' (1/2 PIPE DIA.)= **0.5' POTENTIAL HEAD**

Q= 2.72 CF > 2.47 CFS WQv PEAK FLOW THEREFORE ALL OF WQv WILL BE DIVERTED TO VORTECH UNIT BEFORE 18" BY-PASS TAKES ON STORMWATER

DETERMINE MAXIMUM FLOW TO VORTECH BASE ON 100-YEAR STORM EVENT 100-YEAR WSEL

USING AND ORIFICE EQUATION

$Q=CxAx(2GH)^{\wedge 0.5}$

A= AREA OR PIPE (FT^2)

C= ORIFICE DISCHARGE COEFFICIENT

G= GRAVITATIONAL ACCELERATION (FT/SEC^2)

H=HEAD FROM CENTER OF PIPE (FT)

A= 0.785 FT^2

C= 0.610

G= 32.20 FT/SEC^2

H= 3.260 FT

HEAD WAS DETERMINED FROM 100-YEAR WSEL= 243.0 - INV OF PIPE 240.24 + 0.5' (1/2 PIPE DIA.) = **3.26' POTENTIAL HEAD**

Q= 6.94 CF < 20 CFS THE MAXIMUM FLOW THROUGH VORTECH MODEL 3030

Engineering and Land Surveying, P.C.

PROJECT # 972.21 | SHEET # 1 OF: 1 | PAGE # OF:

MADE BY: JWE DATE: 2/26/2018

PROJECT: 526 Central Ave | CHKD BY: DATE:

SUBJECT: WQv/RRv | REVISED BY: DATE:

Post Development Area #1A | CHKD BY: DATE:

GENERAL INFORMATION, WQv, AND MINIMUM RRv VALUES

Post Area 1A

RRv is achieved for project as all new impervious for project is within watershed.

RRv

S value = 100.0% A soils = 0.55

S value = 0.0% C soils = 0.30

S value = 0.0% D soils = 0.20

S value = weighted value of soils 0.55

Rv= 0.95

Ai= 1.33 acres

Minimum required RRv= $\frac{P \times Rv \times S \times Ai}{12}$ = **3,027 cf**

Post Area 1A

Drainage Area #1A= 102,612 sf

Impervious Area= 58,112 sf

Drainage Area #1A WQv= $\frac{P \times Rv \times A}{12}$ = **5747 CF** Min. WQv required

Post Area 1B

Minimum required RRv= $\frac{P \times Rv \times S \times Ai}{12}$ = **2,481 cf**

Rv= 0.95

Ai= 1.09 acres

Post Area 1B

Drainage Area #1B= 52,788 sf

Impervious Area= 47,788 sf

Drainage Area #1B WQv= $\frac{P \times Rv \times A}{12}$ = **4540 CF** Min. WQv required

Standard SMP (Infiltration)

Infiltration practice provides 100% RRv reduction in Watershed #1A

RRv from Infiltration= 100% x 5747.00 cf = **5747.00 cf**

RRv from Infiltration= WQv - recalculated WQv = 10,287.0 - 5747.00 = **4,540 cf** (WQv required for project)

TOTAL RUNOFF REDUCTION VOLUME (RRv) SUMMARY

Original WQv = 10287 cf Post Area #1A and #1B

Minimum RRv = 5,508 cf Post Area #1A and #1B

Total RRv provided = 5,747 cf In Post Area #1A only

Total RRv provided of **5,747** cf is greater than minimum RRv o **5,508** cf



CONTECH®
ENGINEERED SOLUTIONS

CDS®

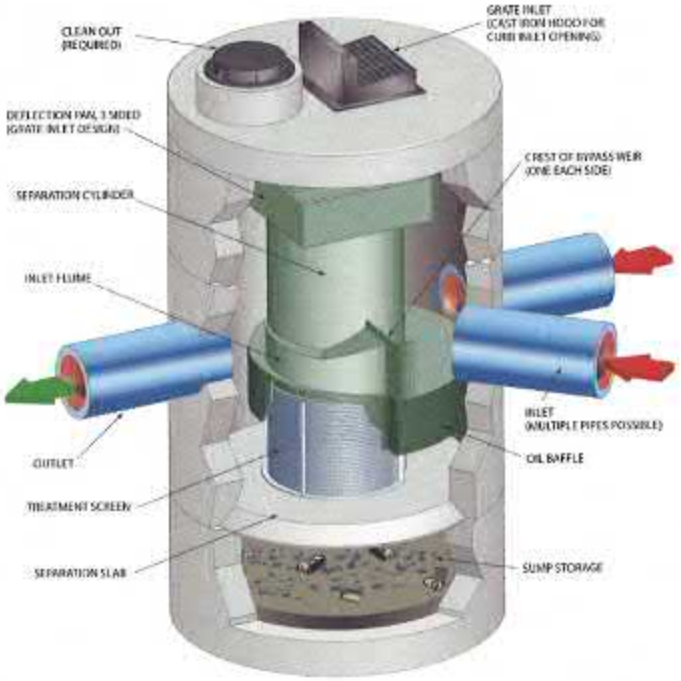
Solutions Guide

Continuous Deflective Separation - CDS®

Superior Stormwater Trash and Sediment Removal

The CDS is a swirl concentrator hybrid technology that uses continuous deflective separation – a combination of swirl concentration and indirect screening to screen, separate and trap debris, sediment, and hydrocarbons from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material debris 2.4 mm or larger, without binding. CDS retains all captured pollutants, even at high flow rates, and provides easy access for maintenance.

CDS is used to meet trash Total Maximum Daily Load (TMDL) requirements, for stormwater quality control, inlet and outlet pollution control, and as pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and a variety of green infrastructure practices.



Learn more about the CDS system at www.ContechES.com/CDS ❖ ❖ ❖

CDS® Approvals

CDS has been verified by some of the most stringent stormwater technology evaluation organizations in North America, including:

- Washington State Department of Ecology
- New Jersey Department of Environmental Protection
- Canadian Environmental Technology Verification (ETV)
- California Statewide Trash Amendments Full Capture System Certified*

** The CDS System has been certified by the California State Water Resources Control Board as a Full Capture System provided that it is sized to treat the peak flow rate from the region specific 1-year, 1-hour design storm, or the peak flow capacity of the corresponding storm drain, whichever is less.*

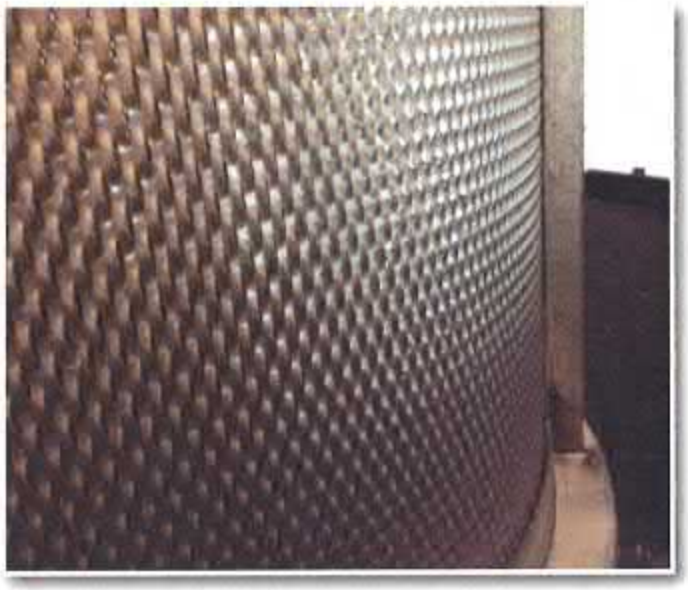
CDS® Features & Benefits

Feature	Benefit
1. Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger	1. Superior pollutant removal
2. Self-cleaning screen	2. Ease of maintenance
3. Isolated storage sump eliminates scour potential	3. Excellent pollutant retention
4. Internal bypass	4. Eliminates the need for additional structures
5. Multiple pipe inlets and 90-180° angles	5. Design flexibility
6. Numerous regulatory approvals	6. Proven performance

The CDS® Screen

Traditional approaches to trash control typically involve "direct screening" that can easily become clogged, as trash is pinned to the screen as water passes through. Clogged screens can lead to flooding as water backs up.

The design of the CDS screen is fundamentally different. Flow is introduced to the screen face which is louvered so that it is smooth in the downstream direction. The effect created is called "Continuous Deflective Separation." The power of the incoming flow is harnessed to continually shear debris off the screen and to direct trash and sediment toward the center of the separation cylinder.



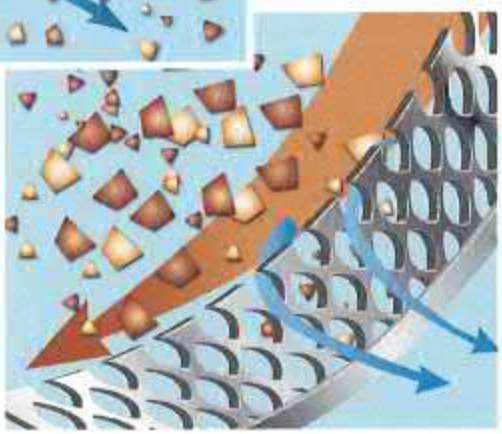
Key Features:

Self-Cleaning Screening Technology

- CDS Screen captures neutrally buoyant materials missed by other separator systems.
- Screen is hydraulically designed to be self-cleaning.
- Runoff entering the separation cylinder must pass through the screen prior to discharge, eliminating potential for scouring previously captured trash at high flow rates.

The CDS Screen – Self-Cleaning Screening Technology ❖ ❖ ❖

Direct Screening – particles that are larger than the aperture size of the screen can cause clogging, resulting in flooding if not maintained frequently.



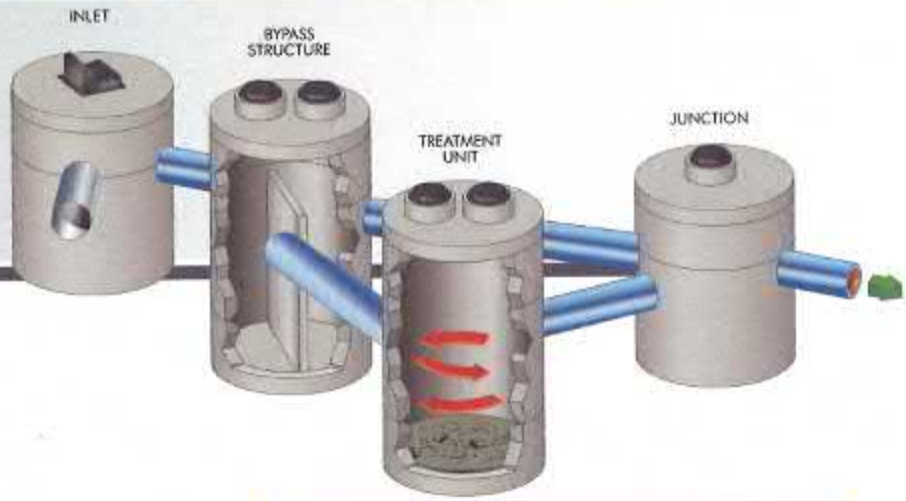
Continuous Deflective Separation Indirect Screening – water velocities within the swirl chamber continually shear debris off the screen to keep it clean.

CDS® Configuration - One System that Can Do It All!

The CDS effectively treats stormwater runoff while reducing the number of structures on your site.

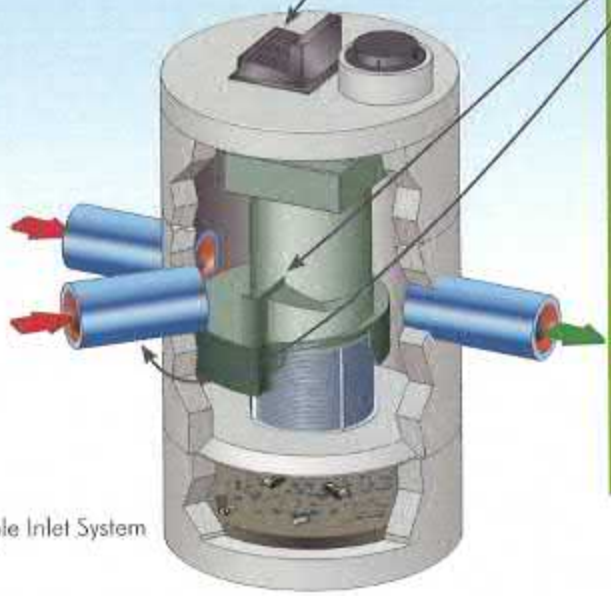
WHY GO THROUGH ALL THIS?

TRADITIONAL STORMWATER TREATMENT SITE DESIGN



ONE SYSTEM CAN DO IT ALL!

- Inline, offline, grate inlet, and drop inlet configurations available
- Internal and external peak bypass options available



CDS® Multiple Inlet System

Save Time, Space, and Money with CDS®

- Grate inlet option available
- Internal bypass weir
- Accepts multiple inlets at a variety of angles
- Advanced hydrodynamic separator
- Captures and retains 100% of floatables and neutrally buoyant debris 2.4 mm or larger
- Indirect screening capability keeps screen from clogging
- Retention of all captured pollutants, even at high flows
- Performance verified by NJCAT, WA Ecology, and ETV Canada

CDS® Applications

CDS is commonly used in the following stormwater applications:

- Stormwater quality control – trash, debris, sediment, and hydrocarbon removal
- Urban retrofit and redevelopment
- Inlet and outlet protection
- Pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and Low Impact Development designs.

CDS provides trash control.

CDS pretreats a bioswale.

CDS pretreats a rainwater harvesting cistern.

CDS standalone system removes trash and sediment.

CDS® Models and Capacities

	CDS MODEL	Treatment Flow Rates[1]			Estimated Maximum Peak Conveyance Flow[3] (cfs)/(L/s)	Minimum Sump Storage Capacity[4] (yd^3)/(m^3)	Minimum Oil Storage Capacity[4] (gal)/(L)
		75 microns (cfs)/(L/s)	125 microns[2] (cfs)/(L/s)	Trash & Debris (cfs)/(L/s)			
PRECAST	CDS2015-4	0.5 (14.2)	0.7 (19.8)	1.0 (28.3)	10 (283)	0.9 (0.7)	61 (232)
	CDS2015-5	0.5 (14.2)	0.7(19.8)	1.0 (28.3)	10 (283)	1.5 (1.1)	83 (313)
	CDS2020-5	0.7 (19.8)	1.1 (31.2)	1.5 (42.5)	14 (396)	1.5 (1.1)	99 (376)
	CDS2025-5	1.1 (31.2)	1.6 (45.3)	2.2 (62.3)	14 (396)	1.5 (1.1)	116 (439)
	CDS3020-6	1.4 (39.6)	2.0 (56.6)	2.8 (79.3)	20 (566)	2.1 (1.6)	184 (696)
	CDS3025-6	1.7 (48.1)	2.5 (70.8)	3.5 (99.2)	20 (566)	2.1 (1.6)	210 (795)
	CDS3030-6	2.0 (56.6)	3.0 (85.0)	4.2 (118.9)	20 (566)	2.1 (1.6)	236 (895)
	CDS3035-6	2.6 (73.6)	3.8 (106.2)	5.3 (150.0)	20 (566)	2.1 (1.6)	263 (994)
	CDS4030-8	3.1 (87.7)	4.5 (127.4)	6.3 (178.3)	30 (850)	5.6 (4.3)	426 (1612)
	CDS4040-8	4.1 (116.1)	6.0 (169.9)	8.4 (237.8)	30 (850)	5.6 (4.3)	520 (1970)
	CDS4045-8	5.1 (144.4)	7.5 (212.4)	10.5 (297.2)	30 (850)	5.6 (4.3)	568 (2149)
	CDS5640-10	6.1 (172.7)	9.0 (254.9)	12.6 (356.7)	50 (1416)	8.7 (6.7)	758 (2869)
	CDS5653-10	9.5 (268.9)	14.0 (396.5)	19.6 (554.8)	50 (1416)	8.7 (6.7)	965 (3652)
	CDS5668-10	12.9 (365.1)	19.0 (538.1)	26.6 (752.9)	50 (1416)	8.7 (6.7)	1172 (4435)
	CDS5678-10	17.0 (481.2)	25.0 (708.0)	35.0 (990.7)	50 (1416)	8.7 (6.7)	1309 (4956)
	CDS9280-12	27.2 (770.2)	40.0 (1132.7)	56.0 (1585.7)	Offline	16.8 (12.8)	N/A
	CDS9290-12	35.4 (1002.4)	52.0 (1472.5)	72 (2038.8)		16.8 (12.8)	
	CDS92100-12	42.8 (1212.0)	63.0 (1783.9)	88 (2491.9)		16.8 (12.8)	
CAST-IN-PLACE	CDS150134-22	100.7 (2851.5)	148.0 (4190.9)	270 (7645.6)		56.3 (43.0)	
	CDS200164-26	183.6 (5199.0)	270.0 (7645.6)	378.0 (10703.8)		78.7 (60.2)	
	CDS240160-32	204 (5776.6)	300.0 (8495.1)	420.0 (8495.1)		119.1 (91.1)	
	Additional Cast-in-Place models available upon request.						

1. Alternative PSD/D_{50} sizing is available upon request.
2. 125 micron flows are based on the CDS Washington State Department of Ecology approval for 80% removal of a particle size distribution (PSD) having a mean particle size (D_{50}) of 125 microns.
3. Estimated maximum peak conveyance flow is calculated using conservative values and may be exceeded on sites with lower inflow velocities and sufficient head over the weir.
4. Sump and oil capacities can be customized to meet site needs

CDS® Maintenance

Systems vary in their maintenance needs, and the selection of a cost-effective and easy-to-access treatment system can mean a huge difference in maintenance expenses for years to come.

A CDS unit is designed to minimize maintenance and make it as easy and inexpensive as possible to keep our systems working properly.

Most CDS units can easily be cleaned in 30 minutes.

Inspection

Inspection is the key to effective maintenance. Pollutant deposition and transport may vary from year to year and site to site. Semi-annual inspections will help ensure that the system is cleaned out at the appropriate time. Inspections should be performed more frequently where site conditions may cause rapid accumulation of pollutants.

Recommendations for CDS Maintenance

The recommended cleanout of solids within the CDS unit's sump should occur at 75% of the sump capacity. Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection and cleanout of the separation chamber and sump, and another allows inspection and cleanout of sediment captured and retained behind the screen. A vacuum truck is recommended for cleanout of the CDS unit and can be easily accomplished in less than 30 minutes for most installations.

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DYO Project
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- Localized rainfall data allows for region specific designs
- PDF report includes detailed performance calculations, specification and standard drawing for the unit that was sized

Design Your Own (DYO) Hydrodynamic Separator online at www.ContechES.com/

Next Steps

Learn more

See our CDS systems in action at **www.ContechES.com/videos**

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- Detention/Infiltration
- Rainwater Harvesting
- Biofiltration/Bioretention

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- High Density Polyethylene (HDPE)
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State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

401-02B
Bureau of Nonpoint Pollution Control
Division of Water Quality
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

BOB MARTIN
Commissioner

June 7, 2011

Derek Berg
Regulatory Manager – Stormwater
Contech Construction Products
200 Enterprise Drive
Scarborough, ME 04074

Re: On-line Conditional Interim Certification for the Continuous Deflective Separation (CDS) by Contech Construction Products Inc.

Expiration Date: July 15, 2011

Dear Mr. Berg:

This letter is in response to your request for the Continuous Deflective Separation (CDS) by Contech Construction Products Inc. to be used as an on-line device. The Department has reviewed your verification report supplied by NJCAT and has received the required signed statement from the verification entity and the manufacturer. The signed letters indicate that the qualifications of the observer were satisfactory, listed the protocol requirements and specified that all of the requirements of the protocol were met or exceeded. Based on a review of the information received the Continuous Deflective Separation (CDS) by Contech Construction Products Inc. can be used as an off-line or on-line device.

Additional information regarding the implementation of the Stormwater Management Rules, N.J.A.C. 7:8, are available at www.njstormwater.org. If you have any questions regarding the above information, please contact Ms. Sandra Blick of my office at (609) 633-7021.

Sincerely,

Ed Frankel, P.P., Section Chief
Bureau of Nonpoint Pollution Control

C: Chron File
Richard Magee, NJCAT
Mark Pedersen, DLUR
Elizabeth Dragon, BNPC

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
Post Office Box 029
Trenton, New Jersey 08625-029
609-633-7021 Fax: 609-984-2147
http://www.state.nj.us/dep/dwq/bnpc_home.htm

JON S. CORZINE
Governor

MARK N. MAURIELLO
Acting Commissioner

May 27, 2009

Derek Berg
200 Enterprise Drive
Scarborough, ME 04074

Re: Extension of Conditional Interim Certification for the High Efficiency Continuous Deflective Separator (CDS) Unit by Contech Stormwater Solutions

Expiration Date: May 15, 2011

Dear Mr. Berg:

The Stormwater Management Rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by New Jersey Corporation for Advanced Technology and have been certified by the New Jersey Department of Environmental Protection (NJDEP).

The certification process has been revised. The revised process places MTDs into five categories. The High Efficiency Continuous Deflective Separator (CDS) Unit by Contech Stormwater Solutions has been qualified for Category II, MTDs with Interim Certifications.

The NJDEP received the maintenance plan required under Category II and acknowledges that the requirements for this category are met; therefore, the expiration of the interim certification letter dated January 12, 2005 has been extended until May 15, 2011.

The Department anticipates proposing further adjustments to this process through the readoption of the Stormwater Management Rules. Additional information regarding the implementation of the Stormwater Management Rules N.J.A.C. 7:8 are available at www.njstormwater.org. If you have any questions regarding the above information, please contact Ms. Sandra Blick of my office at (609) 633-7021.

Sincerely,

Barry Chalofsky, P.P., Chief
Bureau of Nonpoint Pollution Control

JON S. CORZINE
Governor

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Watershed Management
Office of the Director
401 E. State Street, P.O. Box 418
Trenton, NJ 08625-0418
Telephone: (609) 984-0058
Fax: (609) 633-0750

LISA P. JACKSON
Commissioner

October 17, 2008

Derek Berg
Regional Regulatory Manager – Northeast
Contech Stormwater Solutions
200 Enterprise Drive
Scarborough, ME 04074

Re: Interim Certification of High Efficiency Continuous Deflective Separator Unit by CONTECH Stormwater Solutions, Inc.

Dear Mr. Berg:

This is in reference to the conditional interim certification cited above. Due to a typographical error, the expiration date of the original letter was incorrectly listed as February 29, 2009. The correct expiration date is March 1, 2009.

Please note that this letter does not modify any of the conditions listed on the certification document.

Please attach this letter to your copy of the reinstatement of the conditional interim certification. If you have any questions regarding the above information, please contact Sandra Blick of my office at (609) 633-1441.

Sincerely,

Barbara Hirst

p Lawrence J. Baier
Director

c: Rhea Weinberg Brekke, NJCAT
Tom Micai, NJDEP
Mary Beth Brenner, NJDEP

July 10, 2008

Addendum B to CDS Technologies, Inc. Interim Certification High Efficiency Continuous Deflective Separator Units

This document provides the correlation of the new CDS nomenclature to the units which received interim certification on January 12, 2005 and should be attached to the interim certification document for reference.

Original CDS Naming Nomenclature	New CDS Naming Nomenclature
PMIU20_15 (Drop-in Inlet)	CDS2015-4W (Drop-in Inlet)
PMSU20_15_4	CDS2015-4W
PMSU20_15	CDS2015-W
PMSU20_20	CDS2020-W
PMSU20_25	CDS2025-W
PMSU30_20	CDS3020-W
PMSU30_30	CDS3030-W
PMSU30_35	CDS3030-W
PMSU40_30	CDS4030-W
PMSU40_40	CDS4040-W
PMSU40_45	CDS4045-W
PSWC30_20	CDS3020-DW
PSW30_30	CDS3030-DVW
PSWC30_30	CDS3030-DW
PSWC30_35	CDS3035-DW
PSWC40_30	CDS4030-DW
PSWC40_40	CDS4040-DW
PSWC40_45	CDS4045-DW
PSW50_42	CDS5042-DVW
PSWC56_40	CDS5640-DW
PSW50_50	CDS5050-DVW
PSWC56_53	CDS5653-DW
PSWC56_68	CDS5658-DW
PSWC56_78	CDS5678-DW
PSW70_70	CDS7070-DVW
PSW100_60	CDS10060-DVW
PSW100_80	CDS10080-DVW
PSW100_100	CDS100100-DVW
CSW150_134	CDS150134-DCW
CSW200_164	CDS200164-DCW
CSW240_160	CDS240160-DCW

April 6, 2008

Addendum to the High Efficiency Continuous Deflective Separator Unit Conditional Interim Certification

Based on the progress in conducting the field test of the High Efficiency Continuous Deflective Separator Unit, the NJDEP is approving the request for an extension of the Conditional Interim Certification until **February 29, 2009**. During this time CONTECH Stormwater Solutions must continue to submit quarterly updates showing progress of the field test to the NJDEP and NJCAT.

January 12, 2007

ADDENDUM TO CDS TECHNOGIES, INC. INTERIM CERTIFICATION
High Efficiency Continuous Deflective Separator Units

CDS Storm Water Treatment Units For NJDEP Regulated Projects[1]
Capacities & Physical Features

Model* Designation			Treatment Capacity Range		Screen Diameter & Height		Sump Capacity (yd^3)	Depth Below Pipe Invert (ft)	Foot Print Diameter (ft)
			cfs	MGD	(ft)	(ft)			
Precast**	Inline	PMIU20_15 (Drop-in Inlet)	0.7	0.5	2.0	1.5	0.9	5.0	4.8
		PMSU20_15_4	0.7	0.5	2.0	1.5	0.9	5.0	4.8
		PMSU20_15	0.7	0.5	2.0	1.5	1.5	5.0	6.0
		PMSU20_20	1.1	0.7	2.0	2.0	1.5	5.6	6.0
		PMSU20_25	1.6	1	2.0	2.5	1.5	5.9	6.0
		PMSU30_20	2	1.3	3.0	2.0	2	6.0	7.3
		PMSU30_30	3	1.9	3.0	3.0	2.1	6.9	7.3
		PMSU40_30	4.5	3	4.0	3.0	5.6	8.6	9.5
		PMSU40_40	6	3.9	4.0	4.0	5.6	9.6	9.5
	Offline	PSWC30_20	2	1.3	3.0	2.0	3.1	7.0	7.2
		PSW30_30	3	1.9	3.0	3.0	1.5	6.9	5.4
		PSWC30_30	3	1.9	3.0	3.0	2.3	7.2	7.3
		PSWC40_30	4.5	3	4.0	3.0	5.6	8.5	8.3
		PSWC40_40	6	3.9	4.0	4.0	5.6	9.6	8.3
		PSW50_42	9	5.8	5.0	4.2	1.9	9.6	8.0
		PSWC56_40	9	5.8	5.6	4.0	5.6	9.6	9.5
		PSW50_50	11	7.1	5.0	5.0	1.6	10.3	8.0
		PSWC56_53	14	9	5.6	5.3	5.6	10.3	9.5
		PSWC56_68	19	12	5.6	6.8	5.6	12.6	9.5
		PSWC56_78	25	16	5.6	7.8	5.6	13.6	9.5
		PSW70_70	26	17	7.0	7.0	3.6	14.0	10.5
		PSW100_60	30	19	10.0	6.0	5.7 or 11.6	12.0	17.5
		PSW100_80	50	32	10.0	8.0	5.7 or 11.6	14.0	
		PSW100_100	64	41	10.0	10.0	5.7 or 11.6	16.0	
Cast in Place		CSW150_134	148	95.5	15.0	13.4	14.1***	19.6***	25.5
		CSW200_164	270	174	20.0	16.4	14.1***	22.6***	34.5
		CSW240_160	300	194	24.0	16.0	14.1***	21.2***	41

[1]All CDS Units provided for NJDEP Regulated projects are provided with a sediment weir for higher TSS removal

*CDS Model Prefixes
PMIU = Precast Manhole Insert Unit
PMSU = Precast Manhole Stormwater Unit
PSWC = Precast Stormwater Concentric
PSW = Precast Stormwater Concentric
*CDS Model Suffixes
Precast (P), and Cast-in-Place (C), Stormwater (SW)

**CDS Technologies can customize units to meet specific design flows and sump capacities.

**Precast or Cast in place unit can be designed to treat flows in between 64-cfs and 148-cfs. Please contact CDS design engineers.

***Sump Capacities and Depth Below Pipe Invert can vary due to specific site design

The above units are subjected to the conditions as described in the NJDEP Conditional Interim Certification Letter of January 12, 2005.

Richard J. Codey
Acting Governor

State of New Jersey
Department of Environmental Protection
Division of Science, Research and Technology
Bureau of Sustainable Communities & Innovative Technologies
PO Box 409
Trenton, NJ 08625-0409
Tel: 609-292-9692
FAX: 609-292-7340

Bradley M. Campbell
Commissioner

January 12, 2005

James A. Heist, P.E.
Vice President – New Product Development
CDS Technologies Inc
105 Springbrook Place
Cary, NC 27511

RE: Interim Certification of the High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) by CDS Technologies, Inc.

Dear Mr. Heist:

In accordance with the Energy and Environmental Technology Verification (EETV) Act at N.J.S.A. 13:1D-134, the New Jersey Department of Environmental Protection (NJDEP) is pleased to issue a **Conditional Interim Certification** for the High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) developed by CDS Technologies, Inc. This technology uses the mechanism of continuous deflective separation to enhance separation of sediments from stormwater runoff. This conditional interim certification is being issued based on the New Jersey Corporation for Advanced Technology (NJCAT) verification addendum report, dated December 2004.

According to NJCAT's verification report, and as indicated in the attached Conditional Interim Certification Findings, the 500 GPM (1.1 cfs) High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5), with a 2400 micron screen opening an a configured outlet for best sediment control operating with an average influent Total Suspended Solids (TSS) concentration of 184 mg/L and zero initial sediment loading, has been shown to have a total mass TSS removal efficiency of 73.7% (per NJDEP treatment efficiency calculation methodology) for silica sand particles <100 microns (d_{50} particle size of 63 microns) in laboratory studies using simulated stormwater. Based on this demonstrated laboratory performance, NJDEP has a high degree of confidence that the High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) has the capability of achieving in field applications, at a minimum, a TSS removal efficiency of 50%. Therefore, NJDEP certifies that the High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) is capable of achieving a minimum TSS removal efficiency of 50% from stormwater runoff, and shall be permitted accordingly. In addition, the following conditions will apply to the conditional interim certification:

1. The High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) should be the first component, if used as part of a treatment train (i.e. utilized in front of best management practices methods such as detention, retention, and infiltration basins, as defined in the NJ Stormwater Best Management Practices Manual).
2. The High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) shall be designed in accordance with New Jersey's water quality design storm, as required in the Stormwater Management Rules (N.J.A.C. 7:8).
3. A Quality Assurance Project Plan, in accordance with the Technology Acceptance and Reciprocity Partnership (TARP) Tier II Protocol for Stormwater Best Management Practice Demonstration (July, 2003), and including any additional field testing requirements that the NJDEP may request, shall be submitted to NJDEP and NJCAT within six (6) months from the date of this conditional interim certification letter.
4. Field evaluation data that are consistent with the Tier II Protocol and additional NJDEP field test requirements shall be submitted to NJDEP and/or NJCAT by December 31, 2006.

Additionally, similar High Efficiency Continuous Deflective Separators units can be used to address different influent flow rate applications **providing that the hydraulic design of these units is the same as Model PMSU20_20_5**. Also, as specified in the verification report, all stormwater manufactured treatment devices sold in New Jersey must be high efficiency units configured with a sediment weir. Please note that this approval letter shall expire on June 30, 2007, unless extended by NJDEP. For final certification of the High Efficiency Continuous Deflective Separator Units, verified data must be generated from a full-scale field demonstration utilizing the TARP Tier II Protocol and incorporating any additional NJDEP field test requirements. If you have any questions about this conditional interim certification, please contact Ravi Patraju of my staff at (609) 292-0125.

Sincerely,

Martin Rosen
Chief, Bureau of Sustainable Communities
and Innovative Technologies

Enclosure

c: Sam Wolfe, Assistant Commissioner, Environmental Regulation
Ernest Hahn, Assistant Commissioner, Land Use Management
Narinder Ahuja, Director, Water Quality
Mark Mauriello, Director, Land Use Regulation
Larry Baier, Director, Watershed Management
Eileen Murphy, Director, Science, Research, and Technology
Rhea Brekke, Executive Director, New Jersey Corporation for Advanced Technology

Conditional Interim Certification Findings

NJDEP Technology Certification Program:

Bureau of Sustainable Communities & Innovative Technologies
Division of Science, Research & Technology
401 E State Street, P.O. Box 409
Trenton, NJ 08625
(609) 292-9692

Manufactured Treatment Device:

High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5)

Applicant Information:

CDS Technologies, Inc.
105 Springbrook Place
Cary, NC 27511
(919) 858-8887

Technology Description:

The mechanism by which the CDS technology separates and retains gross pollutant is by first diverting flow and associated pollutants in a stormwater or combined sewer drainage system away from the main flow stream of the pipe or channel into a pollutant separation and containment chamber. The separation and containment chamber consists of a containment sump in the lower section and an upper separation section. Gross pollutants are separated within the chamber using a perforated plate allowing the filtered water to pass through to a volute return system and then to the outlet pipe. The water and associated pollutant contained within the separation chamber are kept in continuous motion by the energy generated by the incoming flow. This has the effect of preventing the separation plate from being blocked by the gross solids separated from the inflow. The heavier solids ultimately settle into the containment sump.

Figure 1 is a schematic representation of the solids separation mechanism of the CDS technology. The diversion of the stormwater and associated pollutants into a separation chamber overcomes problems associated with the direct filtration systems of conventional gross pollutant traps. The present design of the CDS system utilizes a simple solids diversion unit to divert flows into the separation chamber. The diversion unit is designed to divert all flows into the separation chamber as long as water levels are below the crest level of the diversion unit. As water levels exceed the crest of the diversion unit, some flows would by-pass the CDS system. The crest level of the diversion unit may be adjusted to suit individual installations.

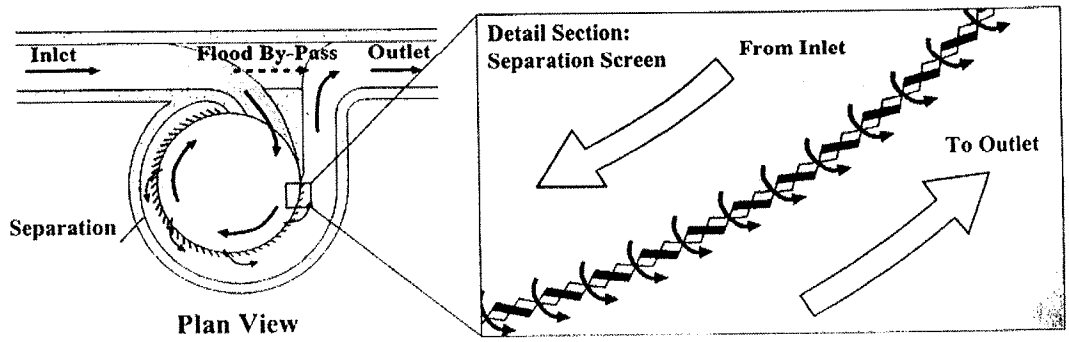


Figure 1 Schematic Representation of the CDS System

The solids separation system consists of a large expanded stainless steel plate, which acts as a filter screen with an outer volute outlet passage. The perforations in the separation screen are typically elongated in shape and are aligned with the longer axis in the vertical direction. The size of the elliptical holes can be specified according to performance requirements and typical width of the short axis ranges from 2.4 mm to 4.7 mm. The separation screen is installed in the unit such that the leading edge of each perforation extends into the flow within the containment chamber, essentially presenting a closed face to the direction of flow of solids and liquid.

CDS, recognizing that New Jersey requires protection of its water resources through the removal of a very fine gradation of particles, has developed a high-efficiency particle removal device. This device is referred to as a High Efficiency Continuous Deflective Separator, which combines the mechanism of continuous deflective separation, along with a sedimentation weir and increased diameter manhole, to enhance separation of sediments from stormwater. All stormwater units offered in New Jersey will be one of these high efficiency units.

New Jersey Corporation for Advanced Technology Verified Claim:

> **A 500 GPM (1.1 cfs) unit (Model PMSU20_20_5) with a 2400 micron screen opening and a configured outlet for best sediment control, operating with an average influent TSS concentration of 184 mg/L and zero initial sediment loading, has been shown to have a total mass TSS removal efficiency of 73.7% (per NJDEP treatment efficiency calculation methodology) for silica sand particles <100 microns (d_{50} particle size of 63 microns) in laboratory studies using simulated stormwater.**

Technology Limitations:

- The CDS Technologies, Inc.'s High Efficiency Continuous Deflective Separator device was tested with zero initial sediment loading.

NJDEP Conditional Interim Certification:

Based on the demonstrated and NJCAT verified laboratory performance, NJDEP has a high degree of confidence that the High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) has the capability of achieving in field applications, at a minimum, a TSS removal efficiency of 50%. Therefore, **NJDEP certifies that the High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) is capable of achieving a minimum TSS removal efficiency of 50% from stormwater runoff**, and shall be permitted accordingly. In addition, the following conditions shall apply to the conditional interim certification:

1. The High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) should be the first component, if used as part of a treatment train (i.e., utilized in front of best management practices methods such as detention, retention, and infiltration basins, as defined in the NJ Stormwater Best Management Practices Manual).
2. The High Efficiency Continuous Deflective Separator Unit (Model PMSU20_20_5) shall be designed in accordance with New Jersey's water quality design storm, as required in the Stormwater Management Rules (N.J.A.C. 7:8).
3. A Quality Assurance Project Plan, in accordance with the Technology Acceptance and Reciprocity Partnership (TARP) Tier II Protocol for Stormwater Best Management Practice Demonstration (July, 2003), and including any additional field testing requirements that the NJDEP shall request, shall be submitted to NJDEP and NJCAT within six (6) months from the date of this Conditional Interim Certification letter.
4. Field evaluation data that are consistent with the Tier II Protocol and additional NJDEP field test requirements shall be submitted to NJDEP and/or NJCAT by December 31, 2006.

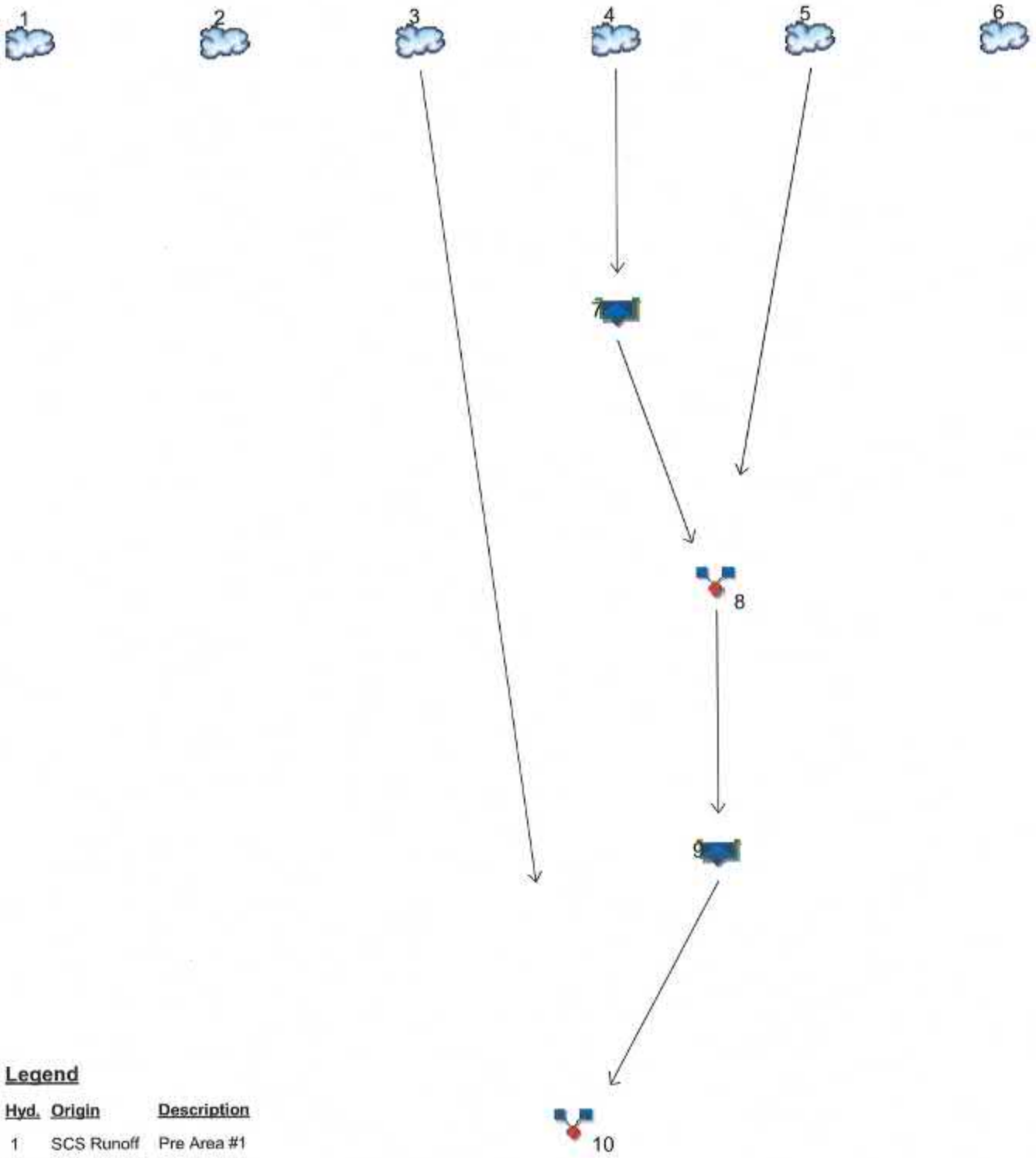
Additionally, similar CDS High Efficiency Continuous Deflective Separator units can be used to address different influent flow rate applications providing that the hydraulic design of these units is the same as Model PMSU20_20_5. Also, as specified in the verification report, all stormwater manufactured treatment devices sold in New Jersey must be high efficiency units configured with a sediment weir.

Exhibit C – Hydrologic Model Simulation Using TR-55 Tabular Method

.1 Routing Tables for the 1, 2, 10, 25 and 100 year storms with Inflow and Outflow Hydrographs

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre Area #1
2	SCS Runoff	Pre Area #2
3	SCS Runoff	Post Area #1
4	SCS Runoff	Post Area #1A
5	SCS Runoff	Post Area #1B
6	SCS Runoff	Post Area #2
7	Reservoir	Route Infil. Array
8	Combine	Combined Flow to Detention Array
9	Reservoir	Route Detention Array
10	Combine	Post Combined Flow to DP#1

Hydraflow Table of Contents

526 Central.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Wednesday, 03 / 7 / 2018

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	3.196	4.946	-------	-------	11.41	13.17	-------	22.78	Pre Area #1
2	SCS Runoff	------	1.477	2.073	-------	-------	4.133	4.663	-------	7.471	Pre Area #2
3	SCS Runoff	------	2.569	3.223	-------	-------	5.295	5.808	-------	8.483	Post Area #1
4	SCS Runoff	------	4.872	6.520	-------	-------	11.93	13.29	-------	20.41	Post Area #1A
5	SCS Runoff	------	3.585	4.450	-------	-------	7.185	7.863	-------	11.40	Post Area #1B
6	SCS Runoff	------	0.314	0.430	-------	-------	0.832	0.934	-------	1.474	Post Area #2
7	Reservoir	4	0.000	0.000	-------	-------	7.696	9.569	-------	17.53	Route Infil. Array
8	Combine	5, 7	3.585	4.450	-------	-------	13.05	16.33	-------	28.42	Combined Flow to Detention Array
9	Reservoir	8	0.629	0.656	-------	-------	1.758	2.556	-------	5.435	Route Detention Array
10	Combine	3, 9	3.186	3.866	-------	-------	6.114	7.435	-------	12.97	Post Combined Flow to DP#1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	3.196	2	722	8,840	------	------	------	Pre Area #1
2	SCS Runoff	1.477	2	722	3,870	------	------	------	Pre Area #2
3	SCS Runoff	2.569	2	720	6,860	------	------	------	Post Area #1
4	SCS Runoff	4.872	2	716	9,845	------	------	------	Post Area #1A
5	SCS Runoff	3.585	2	716	7,699	------	------	------	Post Area #1B
6	SCS Runoff	0.314	2	718	629	------	------	------	Post Area #2
7	Reservoir	0.000	2	674	0	4	240.87	2,821	Route Infil. Array
8	Combine	3.585	2	716	7,699	5, 7	------	------	Combined Flow to Detention Array
9	Reservoir	0.629	2	726	157,313	8	237.06	2,290	Route Detention Array
10	Combine	3.186	2	720	164,171	3, 9	------	------	Post Combined Flow to DP#1

Hydrograph Report

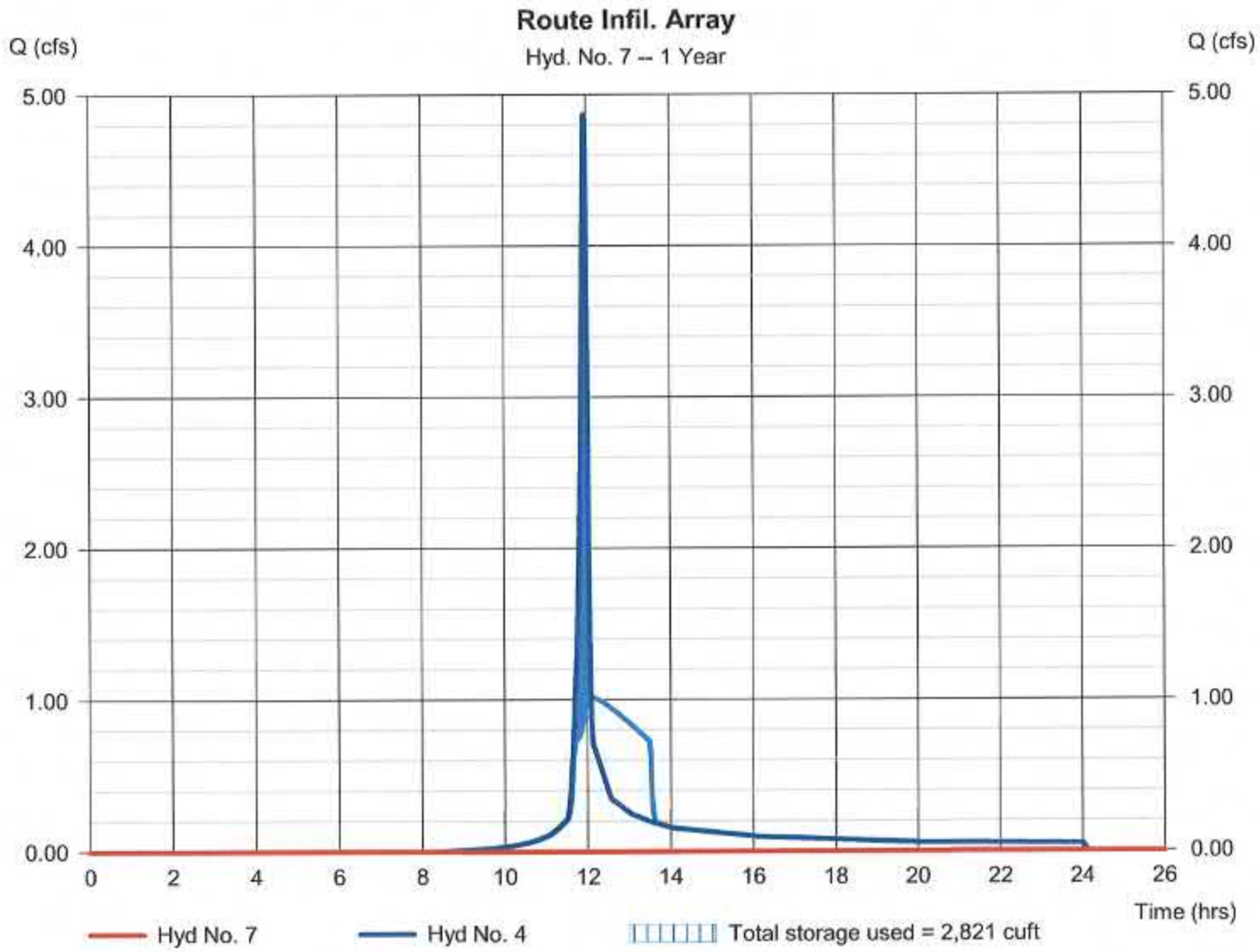
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Wednesday, 03 / 7 / 2018

Hyd. No. 7

Route Infil. Array

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.23 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 4 - Post Area #1A	Max. Elevation	= 240.87 ft
Reservoir name	= Infiltration Array	Max. Storage	= 2,821 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 1 - Infiltration Array

Pond Data

UG Chambers -Invert elev. = 240.00 ft, Rise x Span = 1.50 x 1.50 ft, Barrel Len = 150.00 ft, No. Barrels = 10, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 240.00 ft, Width = 4.00 ft, Height = 3.00 ft, Voids = 30.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	240.00	n/a	0	0
0.30	240.30	n/a	847	847
0.60	240.60	n/a	1,021	1,868
0.90	240.90	n/a	1,064	2,932
1.20	241.20	n/a	1,021	3,952
1.50	241.50	n/a	847	4,799
1.80	241.80	n/a	569	5,368
2.10	242.10	n/a	569	5,937
2.40	242.40	n/a	569	6,506
2.70	242.70	n/a	569	7,075
3.00	243.00	n/a	569	7,644

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	24.00	0.00	0.00
Span (in)	= 18.00	24.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 241.50	241.50	0.00	0.00
Length (ft)	= 30.00	30.00	0.00	0.00
Slope (%)	= 8.30	7.20	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 5.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	240.00	0.00	0.00	---	---	---	---	---	---	0.000	---	0.000
0.03	85	240.03	0.00	0.00	---	---	---	---	---	---	0.724	---	0.724
0.06	169	240.06	0.00	0.00	---	---	---	---	---	---	0.734	---	0.734
0.09	254	240.09	0.00	0.00	---	---	---	---	---	---	0.745	---	0.745
0.12	339	240.12	0.00	0.00	---	---	---	---	---	---	0.756	---	0.756
0.15	424	240.15	0.00	0.00	---	---	---	---	---	---	0.766	---	0.766
0.18	508	240.18	0.00	0.00	---	---	---	---	---	---	0.777	---	0.777
0.21	593	240.21	0.00	0.00	---	---	---	---	---	---	0.788	---	0.788
0.24	678	240.24	0.00	0.00	---	---	---	---	---	---	0.799	---	0.799
0.27	763	240.27	0.00	0.00	---	---	---	---	---	---	0.809	---	0.809
0.30	847	240.30	0.00	0.00	---	---	---	---	---	---	0.820	---	0.820
0.33	949	240.33	0.00	0.00	---	---	---	---	---	---	0.831	---	0.831
0.36	1,052	240.36	0.00	0.00	---	---	---	---	---	---	0.841	---	0.841
0.39	1,154	240.39	0.00	0.00	---	---	---	---	---	---	0.852	---	0.852
0.42	1,256	240.42	0.00	0.00	---	---	---	---	---	---	0.863	---	0.863
0.45	1,358	240.45	0.00	0.00	---	---	---	---	---	---	0.873	---	0.873
0.48	1,460	240.48	0.00	0.00	---	---	---	---	---	---	0.884	---	0.884
0.51	1,562	240.51	0.00	0.00	---	---	---	---	---	---	0.895	---	0.895
0.54	1,664	240.54	0.00	0.00	---	---	---	---	---	---	0.905	---	0.905
0.57	1,766	240.57	0.00	0.00	---	---	---	---	---	---	0.916	---	0.916
0.60	1,868	240.60	0.00	0.00	---	---	---	---	---	---	0.927	---	0.927
0.63	1,974	240.63	0.00	0.00	---	---	---	---	---	---	0.938	---	0.938
0.66	2,081	240.66	0.00	0.00	---	---	---	---	---	---	0.948	---	0.948
0.69	2,187	240.69	0.00	0.00	---	---	---	---	---	---	0.959	---	0.959
0.72	2,294	240.72	0.00	0.00	---	---	---	---	---	---	0.970	---	0.970
0.75	2,400	240.75	0.00	0.00	---	---	---	---	---	---	0.980	---	0.980
0.78	2,506	240.78	0.00	0.00	---	---	---	---	---	---	0.991	---	0.991
0.81	2,613	240.81	0.00	0.00	---	---	---	---	---	---	1.002	---	1.002
0.84	2,719	240.84	0.00	0.00	---	---	---	---	---	---	1.012	---	1.012
0.87	2,825	240.87	0.00	0.00	---	---	---	---	---	---	1.023	---	1.023
0.90	2,932	240.90	0.00	0.00	---	---	---	---	---	---	1.034	---	1.034
0.93	3,034	240.93	0.00	0.00	---	---	---	---	---	---	1.044	---	1.044

Continues on next page...

Infiltration Array

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.96	3,136	240.96	0.00	0.00	---	---	---	---	---	---	1.055	---	1.055
0.99	3,238	240.99	0.00	0.00	---	---	---	---	---	---	1.066	---	1.066
1.02	3,340	241.02	0.00	0.00	---	---	---	---	---	---	1.077	---	1.077
1.05	3,442	241.05	0.00	0.00	---	---	---	---	---	---	1.087	---	1.087
1.08	3,544	241.08	0.00	0.00	---	---	---	---	---	---	1.098	---	1.098
1.11	3,646	241.11	0.00	0.00	---	---	---	---	---	---	1.109	---	1.109
1.14	3,748	241.14	0.00	0.00	---	---	---	---	---	---	1.119	---	1.119
1.17	3,850	241.17	0.00	0.00	---	---	---	---	---	---	1.130	---	1.130
1.20	3,952	241.20	0.00	0.00	---	---	---	---	---	---	1.141	---	1.141
1.23	4,037	241.23	0.00	0.00	---	---	---	---	---	---	1.151	---	1.151
1.26	4,122	241.26	0.00	0.00	---	---	---	---	---	---	1.162	---	1.162
1.29	4,206	241.29	0.00	0.00	---	---	---	---	---	---	1.173	---	1.173
1.32	4,291	241.32	0.00	0.00	---	---	---	---	---	---	1.184	---	1.184
1.35	4,376	241.35	0.00	0.00	---	---	---	---	---	---	1.194	---	1.194
1.38	4,461	241.38	0.00	0.00	---	---	---	---	---	---	1.205	---	1.205
1.41	4,545	241.41	0.00	0.00	---	---	---	---	---	---	1.216	---	1.216
1.44	4,630	241.44	0.00	0.00	---	---	---	---	---	---	1.226	---	1.226
1.47	4,715	241.47	0.00	0.00	---	---	---	---	---	---	1.237	---	1.237
1.50	4,799	241.50	0.00	0.00	---	---	---	---	---	---	1.248	---	1.248
1.53	4,856	241.53	0.01 ic	0.01 ic	---	---	---	---	---	---	1.258	---	1.269
1.56	4,913	241.56	0.02 ic	0.02 ic	---	---	---	---	---	---	1.269	---	1.312
1.59	4,970	241.59	0.04 ic	0.05 ic	---	---	---	---	---	---	1.280	---	1.376
1.62	5,027	241.62	0.08 ic	0.09 ic	---	---	---	---	---	---	1.290	---	1.461
1.65	5,084	241.65	0.12 ic	0.14 ic	---	---	---	---	---	---	1.301	---	1.565
1.68	5,141	241.68	0.17 ic	0.20 ic	---	---	---	---	---	---	1.312	---	1.688
1.71	5,198	241.71	0.24 ic	0.28 ic	---	---	---	---	---	---	1.323	---	1.834
1.74	5,255	241.74	0.30 ic	0.36 ic	---	---	---	---	---	---	1.333	---	1.995
1.77	5,311	241.77	0.38 ic	0.45 ic	---	---	---	---	---	---	1.344	---	2.178
1.80	5,368	241.80	0.47 ic	0.55 ic	---	---	---	---	---	---	1.355	---	2.378
1.83	5,425	241.83	0.56 ic	0.66 ic	---	---	---	---	---	---	1.365	---	2.595
1.86	5,482	241.86	0.67 ic	0.79 ic	---	---	---	---	---	---	1.376	---	2.829
1.89	5,539	241.89	0.78 ic	0.92 ic	---	---	---	---	---	---	1.387	---	3.085
1.92	5,596	241.92	0.89 ic	1.06 ic	---	---	---	---	---	---	1.397	---	3.354
1.95	5,653	241.95	1.02 ic	1.21 ic	---	---	---	---	---	---	1.408	---	3.642
1.98	5,710	241.98	1.15 ic	1.37 ic	---	---	---	---	---	---	1.419	---	3.939
2.01	5,767	242.01	1.29 ic	1.54 ic	---	---	---	---	---	---	1.429	---	4.255
2.04	5,823	242.04	1.44 ic	1.71 ic	---	---	---	---	---	---	1.440	---	4.590
2.07	5,880	242.07	1.59 ic	1.90 ic	---	---	---	---	---	---	1.451	---	4.940
2.10	5,937	242.10	1.74 ic	2.10 ic	---	---	---	---	---	---	1.462	---	5.301
2.13	5,994	242.13	1.90 ic	2.29 ic	---	---	---	---	---	---	1.472	---	5.671
2.16	6,051	242.16	2.07 ic	2.51 ic	---	---	---	---	---	---	1.483	---	6.065
2.19	6,108	242.19	2.25 ic	2.72 ic	---	---	---	---	---	---	1.494	---	6.466
2.22	6,165	242.22	2.43 ic	2.95 ic	---	---	---	---	---	---	1.504	---	6.877
2.25	6,222	242.25	2.61 ic	3.18 ic	---	---	---	---	---	---	1.515	---	7.306
2.28	6,279	242.28	2.79 ic	3.41 ic	---	---	---	---	---	---	1.526	---	7.734
2.31	6,335	242.31	2.98 ic	3.66 ic	---	---	---	---	---	---	1.536	---	8.182
2.34	6,392	242.34	3.18 ic	3.91 ic	---	---	---	---	---	---	1.547	---	8.637
2.37	6,449	242.37	3.38 ic	4.17 ic	---	---	---	---	---	---	1.558	---	9.112
2.40	6,506	242.40	3.58 ic	4.44 ic	---	---	---	---	---	---	1.569	---	9.585
2.43	6,563	242.43	3.78 ic	4.70 ic	---	---	---	---	---	---	1.579	---	10.07
2.46	6,620	242.46	3.99 ic	4.98 ic	---	---	---	---	---	---	1.590	---	10.55
2.49	6,677	242.49	4.20 ic	5.26 ic	---	---	---	---	---	---	1.601	---	11.05
2.52	6,734	242.52	4.40 ic	5.54 ic	---	---	---	---	---	---	1.611	---	11.56
2.55	6,791	242.55	4.61 ic	5.83 ic	---	---	---	---	---	---	1.622	---	12.06
2.58	6,847	242.58	4.82 ic	6.12 ic	---	---	---	---	---	---	1.633	---	12.58
2.61	6,904	242.61	5.03 ic	6.43 ic	---	---	---	---	---	---	1.643	---	13.11
2.64	6,961	242.64	5.24 ic	6.73 ic	---	---	---	---	---	---	1.654	---	13.63
2.67	7,018	242.67	5.45 ic	7.03 ic	---	---	---	---	---	---	1.665	---	14.15
2.70	7,075	242.70	5.65 ic	7.35 ic	---	---	---	---	---	---	1.675	---	14.68
2.73	7,132	242.73	5.86 ic	7.66 ic	---	---	---	---	---	---	1.686	---	15.20
2.76	7,189	242.76	6.06 ic	7.97 ic	---	---	---	---	---	---	1.697	---	15.73
2.79	7,246	242.79	6.25 ic	8.29 ic	---	---	---	---	---	---	1.708	---	16.25
2.82	7,303	242.82	6.44 ic	8.61 ic	---	---	---	---	---	---	1.718	---	16.77
2.85	7,359	242.85	6.63 ic	8.93 ic	---	---	---	---	---	---	1.729	---	17.29
2.88	7,416	242.88	6.80 ic	9.26 ic	---	---	---	---	---	---	1.740	---	17.80
2.91	7,473	242.91	6.97 ic	9.57 ic	---	---	---	---	---	---	1.750	---	18.29
2.94	7,530	242.94	7.12 ic	9.90 ic	---	---	---	---	---	---	1.761	---	18.79
2.97	7,587	242.97	7.26 ic	10.22 ic	---	---	---	---	---	---	1.772	---	19.25
3.00	7,644	243.00	7.37 ic	10.55 ic	---	---	---	---	---	---	1.782	---	19.70

...End

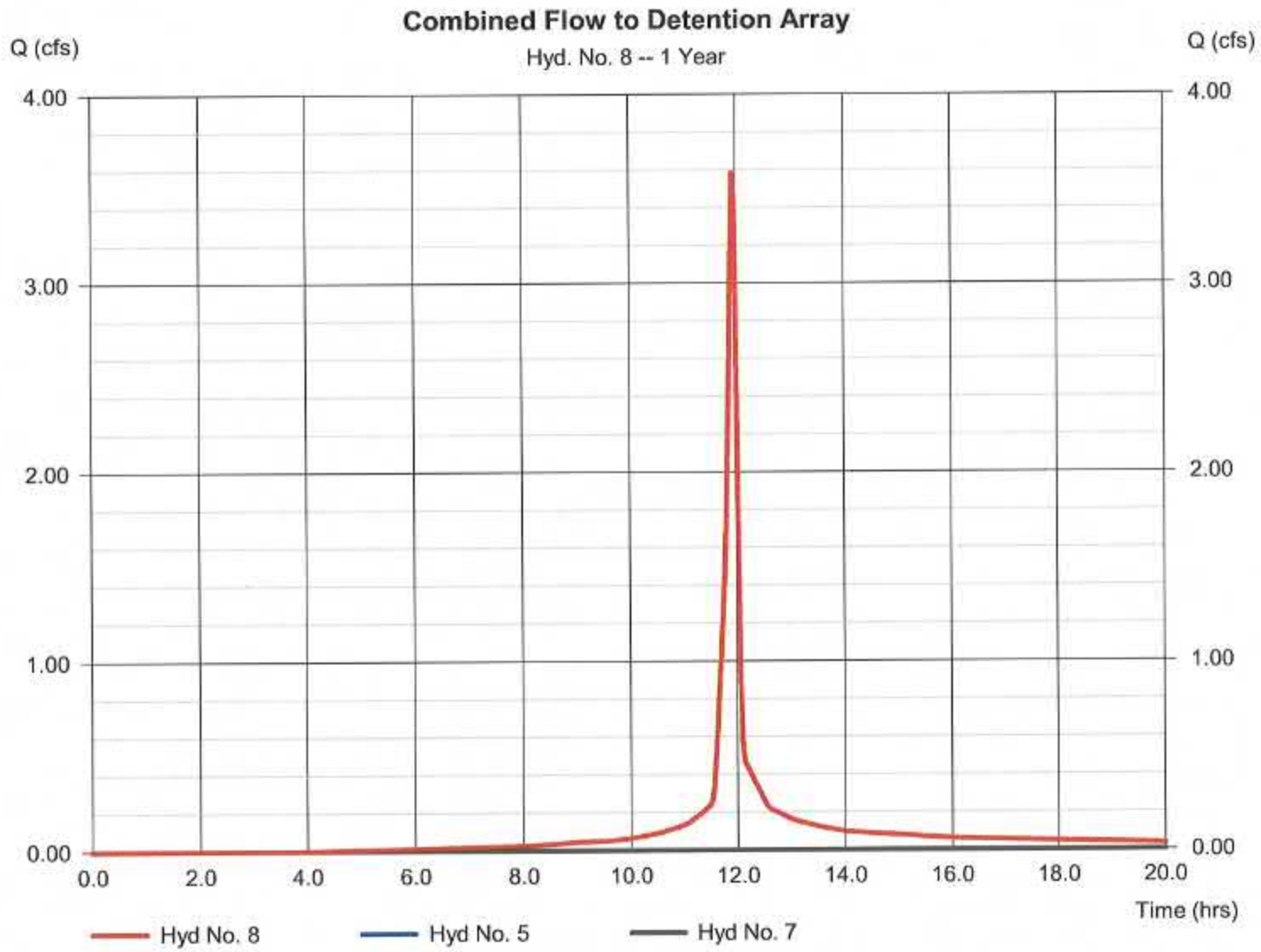
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Wednesday, 03 / 7 / 2018

Hyd. No. 8

Combined Flow to Detention Array

Hydrograph type	= Combine	Peak discharge	= 3.585 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 7,699 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 1.212 ac



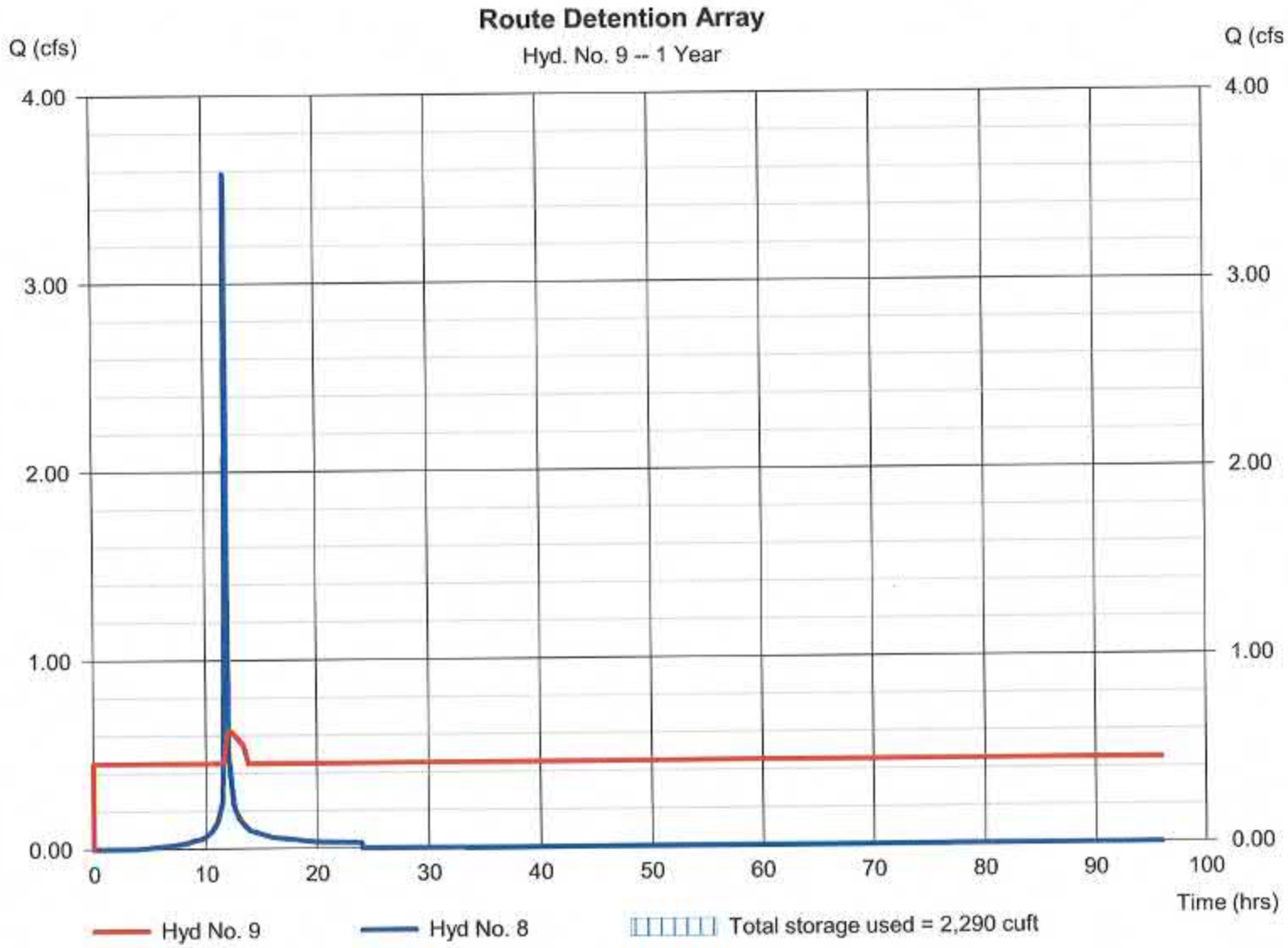
Hydrograph Report

Hyd. No. 9

Route Detention Array

Hydrograph type	= Reservoir	Peak discharge	= 0.629 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 157,313 cuft
Inflow hyd. No.	= 8 - Combined Flow to Detention Array	Max. Elevation	= 237.06 ft
Reservoir name	= Detention Array	Max. Storage	= 2,290 cuft

Storage Indication method used.



Pond No. 2 - Detention Array

Pond Data

UG Chambers -Invert elev. = 236.00 ft, Rise x Span = 5.00 x 5.00 ft, Barrel Len = 150.00 ft, No. Barrels = 6, Slope = 0.25%, Headers = Yes

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	236.00	n/a	0	0
0.54	236.54	n/a	620	620
1.08	237.07	n/a	1,713	2,333
1.61	237.61	n/a	2,219	4,553
2.15	238.15	n/a	2,499	7,052
2.69	238.69	n/a	2,622	9,674
3.22	239.23	n/a	2,627	12,301
3.76	239.76	n/a	2,494	14,795
4.30	240.30	n/a	2,218	17,013
4.84	240.84	n/a	1,714	18,727
5.38	241.38	n/a	617	19,344

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 4.00	10.00	0.00	0.00
Span (in)	= 4.00	10.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 234.65	238.00	0.00	0.00
Length (ft)	= 6.00	17.00	0.00	0.00
Slope (%)	= 0.60	27.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	236.00	0.46 ic	0.00	---	---	---	---	---	---	---	---	0.457
0.05	62	236.05	0.47 ic	0.00	---	---	---	---	---	---	---	---	0.467
0.11	124	236.11	0.48 ic	0.00	---	---	---	---	---	---	---	---	0.477
0.16	186	236.16	0.49 ic	0.00	---	---	---	---	---	---	---	---	0.487
0.22	248	236.21	0.50 ic	0.00	---	---	---	---	---	---	---	---	0.497
0.27	310	236.27	0.51 ic	0.00	---	---	---	---	---	---	---	---	0.506
0.32	372	236.32	0.52 ic	0.00	---	---	---	---	---	---	---	---	0.516
0.38	434	236.38	0.52 ic	0.00	---	---	---	---	---	---	---	---	0.525
0.43	496	236.43	0.53 ic	0.00	---	---	---	---	---	---	---	---	0.534
0.48	558	236.48	0.54 ic	0.00	---	---	---	---	---	---	---	---	0.542
0.54	620	236.54	0.55 ic	0.00	---	---	---	---	---	---	---	---	0.551
0.59	791	236.59	0.56 ic	0.00	---	---	---	---	---	---	---	---	0.560
0.64	963	236.65	0.57 ic	0.00	---	---	---	---	---	---	---	---	0.568
0.70	1,134	236.70	0.58 ic	0.00	---	---	---	---	---	---	---	---	0.576
0.75	1,305	236.75	0.58 ic	0.00	---	---	---	---	---	---	---	---	0.585
0.81	1,477	236.81	0.59 ic	0.00	---	---	---	---	---	---	---	---	0.593
0.86	1,648	236.86	0.60 ic	0.00	---	---	---	---	---	---	---	---	0.601
0.91	1,819	236.91	0.61 ic	0.00	---	---	---	---	---	---	---	---	0.608
0.97	1,991	236.97	0.62 ic	0.00	---	---	---	---	---	---	---	---	0.616
1.02	2,162	237.02	0.62 ic	0.00	---	---	---	---	---	---	---	---	0.624
1.08	2,333	237.07	0.63 ic	0.00	---	---	---	---	---	---	---	---	0.631
1.13	2,555	237.13	0.64 ic	0.00	---	---	---	---	---	---	---	---	0.639
1.18	2,777	237.18	0.65 ic	0.00	---	---	---	---	---	---	---	---	0.646
1.24	2,999	237.24	0.65 ic	0.00	---	---	---	---	---	---	---	---	0.654
1.29	3,221	237.29	0.66 ic	0.00	---	---	---	---	---	---	---	---	0.661
1.34	3,443	237.34	0.67 ic	0.00	---	---	---	---	---	---	---	---	0.668
1.40	3,665	237.40	0.67 ic	0.00	---	---	---	---	---	---	---	---	0.675
1.45	3,887	237.45	0.68 ic	0.00	---	---	---	---	---	---	---	---	0.682
1.50	4,109	237.51	0.69 ic	0.00	---	---	---	---	---	---	---	---	0.689
1.56	4,331	237.56	0.70 ic	0.00	---	---	---	---	---	---	---	---	0.696
1.61	4,553	237.61	0.70 ic	0.00	---	---	---	---	---	---	---	---	0.702
1.67	4,803	237.67	0.71 ic	0.00	---	---	---	---	---	---	---	---	0.709

Continues on next page...

Detention Array

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.72	5,053	237.72	0.72 ic	0.00	---	---	---	---	---	---	---	---	0.716
1.77	5,303	237.77	0.72 ic	0.00	---	---	---	---	---	---	---	---	0.722
1.83	5,552	237.83	0.73 ic	0.00	---	---	---	---	---	---	---	---	0.729
1.88	5,802	237.88	0.74 ic	0.00	---	---	---	---	---	---	---	---	0.735
1.93	6,052	237.93	0.74 ic	0.00	---	---	---	---	---	---	---	---	0.742
1.99	6,302	237.99	0.75 ic	0.00	---	---	---	---	---	---	---	---	0.748
2.04	6,552	238.04	0.75 ic	0.01 ic	---	---	---	---	---	---	---	---	0.762
2.10	6,802	238.10	0.76 ic	0.04 ic	---	---	---	---	---	---	---	---	0.798
2.15	7,052	238.15	0.77 ic	0.09 ic	---	---	---	---	---	---	---	---	0.855
2.20	7,314	238.20	0.77 ic	0.16 ic	---	---	---	---	---	---	---	---	0.932
2.26	7,576	238.26	0.78 ic	0.25 ic	---	---	---	---	---	---	---	---	1.027
2.31	7,839	238.31	0.79 ic	0.35 ic	---	---	---	---	---	---	---	---	1.139
2.37	8,101	238.37	0.79 ic	0.47 ic	---	---	---	---	---	---	---	---	1.264
2.42	8,363	238.42	0.80 ic	0.61 ic	---	---	---	---	---	---	---	---	1.403
2.47	8,625	238.47	0.80 ic	0.75 ic	---	---	---	---	---	---	---	---	1.551
2.53	8,888	238.53	0.81 ic	0.90 ic	---	---	---	---	---	---	---	---	1.706
2.58	9,150	238.58	0.82 ic	1.05 ic	---	---	---	---	---	---	---	---	1.867
2.63	9,412	238.63	0.82 ic	1.21 ic	---	---	---	---	---	---	---	---	2.027
2.69	9,674	238.69	0.83 ic	1.36 ic	---	---	---	---	---	---	---	---	2.186
2.74	9,937	238.74	0.83 ic	1.50 ic	---	---	---	---	---	---	---	---	2.335
2.80	10,200	238.79	0.84 ic	1.63 ic	---	---	---	---	---	---	---	---	2.466
2.85	10,462	238.85	0.84 ic	1.73 ic	---	---	---	---	---	---	---	---	2.570
2.90	10,725	238.90	0.85 ic	1.83 ic	---	---	---	---	---	---	---	---	2.680
2.96	10,988	238.96	0.85 ic	1.93 ic	---	---	---	---	---	---	---	---	2.784
3.01	11,250	239.01	0.86 ic	2.02 ic	---	---	---	---	---	---	---	---	2.883
3.06	11,513	239.06	0.87 ic	2.11 ic	---	---	---	---	---	---	---	---	2.978
3.12	11,776	239.12	0.87 ic	2.20 ic	---	---	---	---	---	---	---	---	3.070
3.17	12,038	239.17	0.88 ic	2.28 ic	---	---	---	---	---	---	---	---	3.158
3.22	12,301	239.23	0.88 ic	2.36 ic	---	---	---	---	---	---	---	---	3.243
3.28	12,550	239.28	0.89 ic	2.44 ic	---	---	---	---	---	---	---	---	3.326
3.33	12,800	239.33	0.89 ic	2.51 ic	---	---	---	---	---	---	---	---	3.406
3.39	13,049	239.39	0.90 ic	2.59 ic	---	---	---	---	---	---	---	---	3.484
3.44	13,298	239.44	0.90 ic	2.66 ic	---	---	---	---	---	---	---	---	3.560
3.49	13,548	239.49	0.91 ic	2.73 ic	---	---	---	---	---	---	---	---	3.634
3.55	13,797	239.55	0.91 ic	2.79 ic	---	---	---	---	---	---	---	---	3.706
3.60	14,047	239.60	0.92 ic	2.86 ic	---	---	---	---	---	---	---	---	3.777
3.65	14,296	239.66	0.92 ic	2.92 ic	---	---	---	---	---	---	---	---	3.846
3.71	14,545	239.71	0.93 ic	2.98 ic	---	---	---	---	---	---	---	---	3.914
3.76	14,795	239.76	0.93 ic	3.05 ic	---	---	---	---	---	---	---	---	3.981
3.82	15,017	239.82	0.94 ic	3.11 ic	---	---	---	---	---	---	---	---	4.046
3.87	15,238	239.87	0.94 ic	3.17 ic	---	---	---	---	---	---	---	---	4.110
3.92	15,460	239.92	0.95 ic	3.22 ic	---	---	---	---	---	---	---	---	4.173
3.98	15,682	239.98	0.95 ic	3.28 ic	---	---	---	---	---	---	---	---	4.235
4.03	15,904	240.03	0.96 ic	3.34 ic	---	---	---	---	---	---	---	---	4.296
4.09	16,126	240.09	0.96 ic	3.39 ic	---	---	---	---	---	---	---	---	4.356
4.14	16,348	240.14	0.97 ic	3.45 ic	---	---	---	---	---	---	---	---	4.415
4.19	16,569	240.19	0.97 ic	3.50 ic	---	---	---	---	---	---	---	---	4.473
4.25	16,791	240.25	0.98 ic	3.55 ic	---	---	---	---	---	---	---	---	4.531
4.30	17,013	240.30	0.98 ic	3.60 ic	---	---	---	---	---	---	---	---	4.587
4.35	17,184	240.35	0.99 ic	3.65 ic	---	---	---	---	---	---	---	---	4.643
4.41	17,356	240.41	0.99 ic	3.70 ic	---	---	---	---	---	---	---	---	4.698
4.46	17,527	240.46	1.00 ic	3.75 ic	---	---	---	---	---	---	---	---	4.753
4.51	17,698	240.51	1.00 ic	3.80 ic	---	---	---	---	---	---	---	---	4.807
4.57	17,870	240.57	1.01 ic	3.85 ic	---	---	---	---	---	---	---	---	4.860
4.62	18,041	240.62	1.01 ic	3.90 ic	---	---	---	---	---	---	---	---	4.912
4.68	18,212	240.68	1.02 ic	3.95 ic	---	---	---	---	---	---	---	---	4.964
4.73	18,384	240.73	1.02 ic	3.99 ic	---	---	---	---	---	---	---	---	5.016
4.78	18,555	240.78	1.03 ic	4.04 ic	---	---	---	---	---	---	---	---	5.066
4.84	18,727	240.84	1.03 ic	4.09 ic	---	---	---	---	---	---	---	---	5.116
4.89	18,788	240.89	1.04 ic	4.13 ic	---	---	---	---	---	---	---	---	5.166
4.95	18,850	240.95	1.04 ic	4.18 ic	---	---	---	---	---	---	---	---	5.215
5.00	18,912	241.00	1.04 ic	4.22 ic	---	---	---	---	---	---	---	---	5.264
5.05	18,974	241.05	1.05 ic	4.26 ic	---	---	---	---	---	---	---	---	5.312
5.11	19,035	241.11	1.05 ic	4.31 ic	---	---	---	---	---	---	---	---	5.360
5.16	19,097	241.16	1.06 ic	4.35 ic	---	---	---	---	---	---	---	---	5.407
5.21	19,159	241.21	1.06 ic	4.39 ic	---	---	---	---	---	---	---	---	5.454
5.27	19,220	241.27	1.07 ic	4.43 ic	---	---	---	---	---	---	---	---	5.501
5.32	19,282	241.32	1.07 ic	4.48 ic	---	---	---	---	---	---	---	---	5.547
5.38	19,344	241.38	1.08 ic	4.52 ic	---	---	---	---	---	---	---	---	5.592

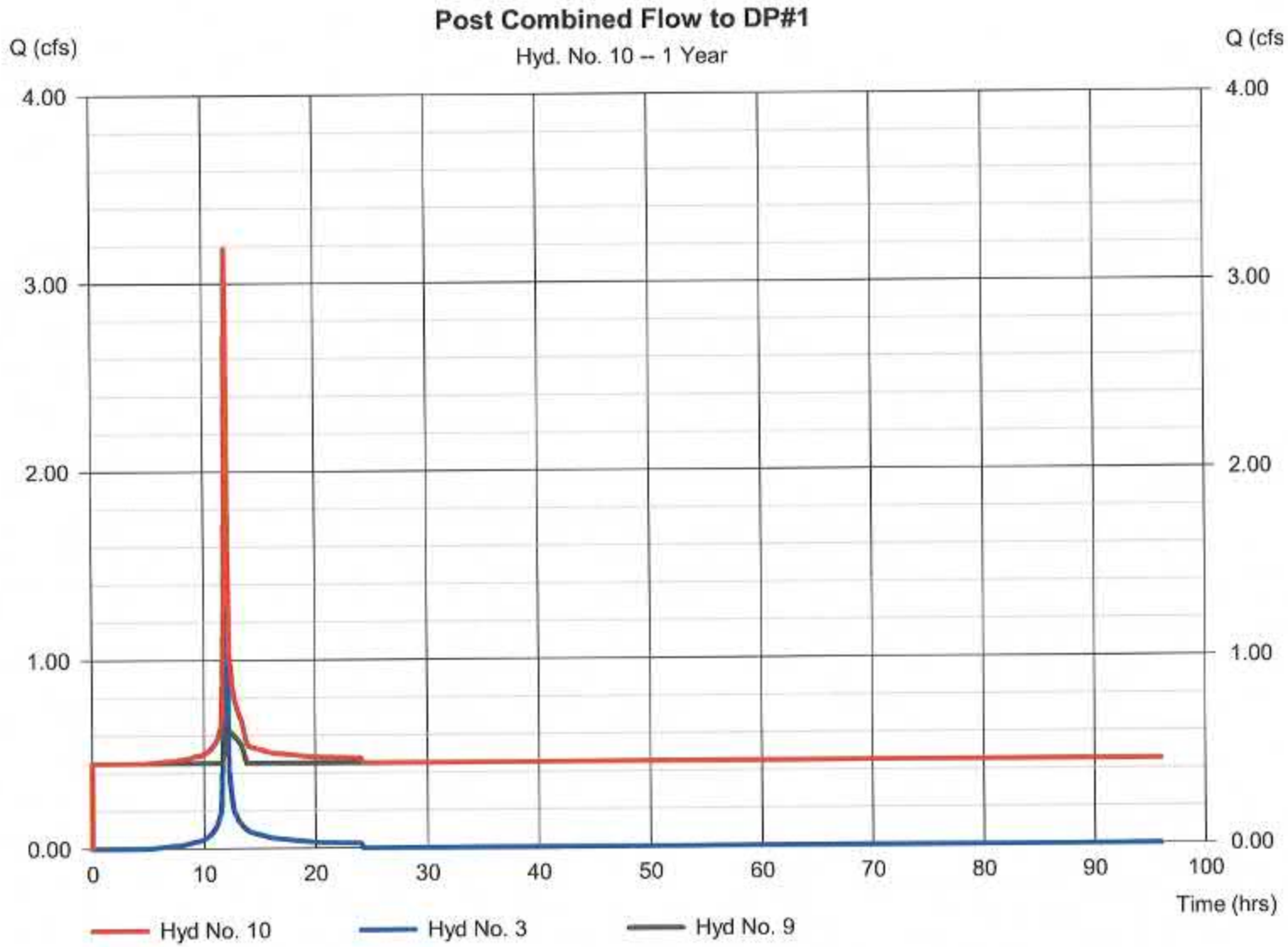
...End

Hydrograph Report

Hyd. No. 10

Post Combined Flow to DP#1

Hydrograph type	= Combine	Peak discharge	= 3.186 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 164,171 cuft
Inflow hyds.	= 3, 9	Contrib. drain. area	= 1.033 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	4.946	2	722	13,206	------	------	------	Pre Area #1
2	SCS Runoff	2.073	2	720	5,392	------	------	------	Pre Area #2
3	SCS Runoff	3.223	2	720	8,714	------	------	------	Post Area #1
4	SCS Runoff	6.520	2	716	13,246	------	------	------	Post Area #1A
5	SCS Runoff	4.450	2	716	9,700	------	------	------	Post Area #1B
6	SCS Runoff	0.430	2	716	869	------	------	------	Post Area #2
7	Reservoir	0.000	2	698	0	4	241.29	4,192	Route Infil. Array
8	Combine	4.450	2	716	9,700	5, 7	------	------	Combined Flow to Detention Array
9	Reservoir	0.656	2	726	157,764	8	237.26	3,082	Route Detention Array
10	Combine	3.866	2	720	166,477	3, 9	------	------	Post Combined Flow to DP#1

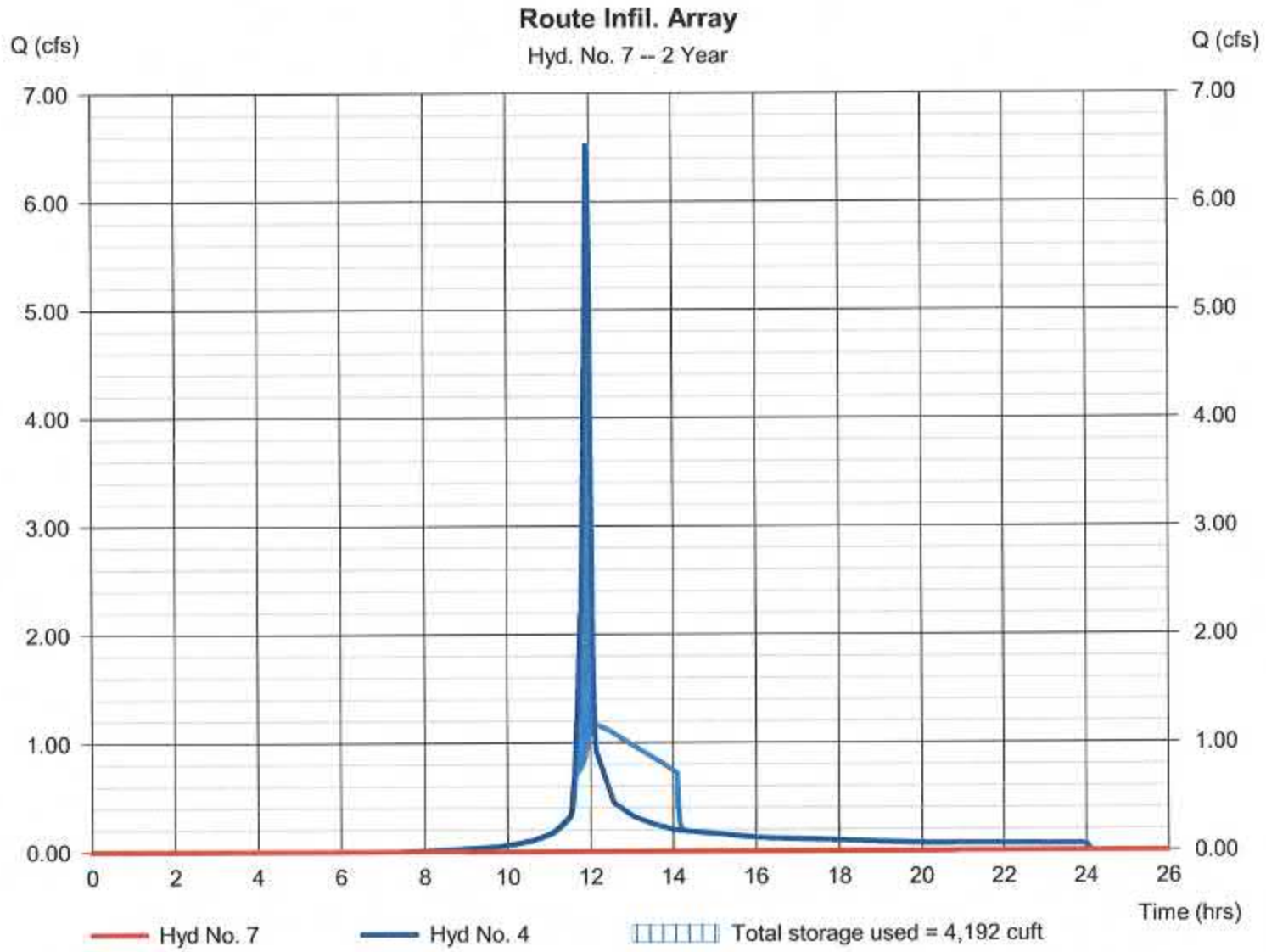
Hydrograph Report

Hyd. No. 7

Route Infil. Array

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.63 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 4 - Post Area #1A	Max. Elevation	= 241.29 ft
Reservoir name	= Infiltration Array	Max. Storage	= 4,192 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

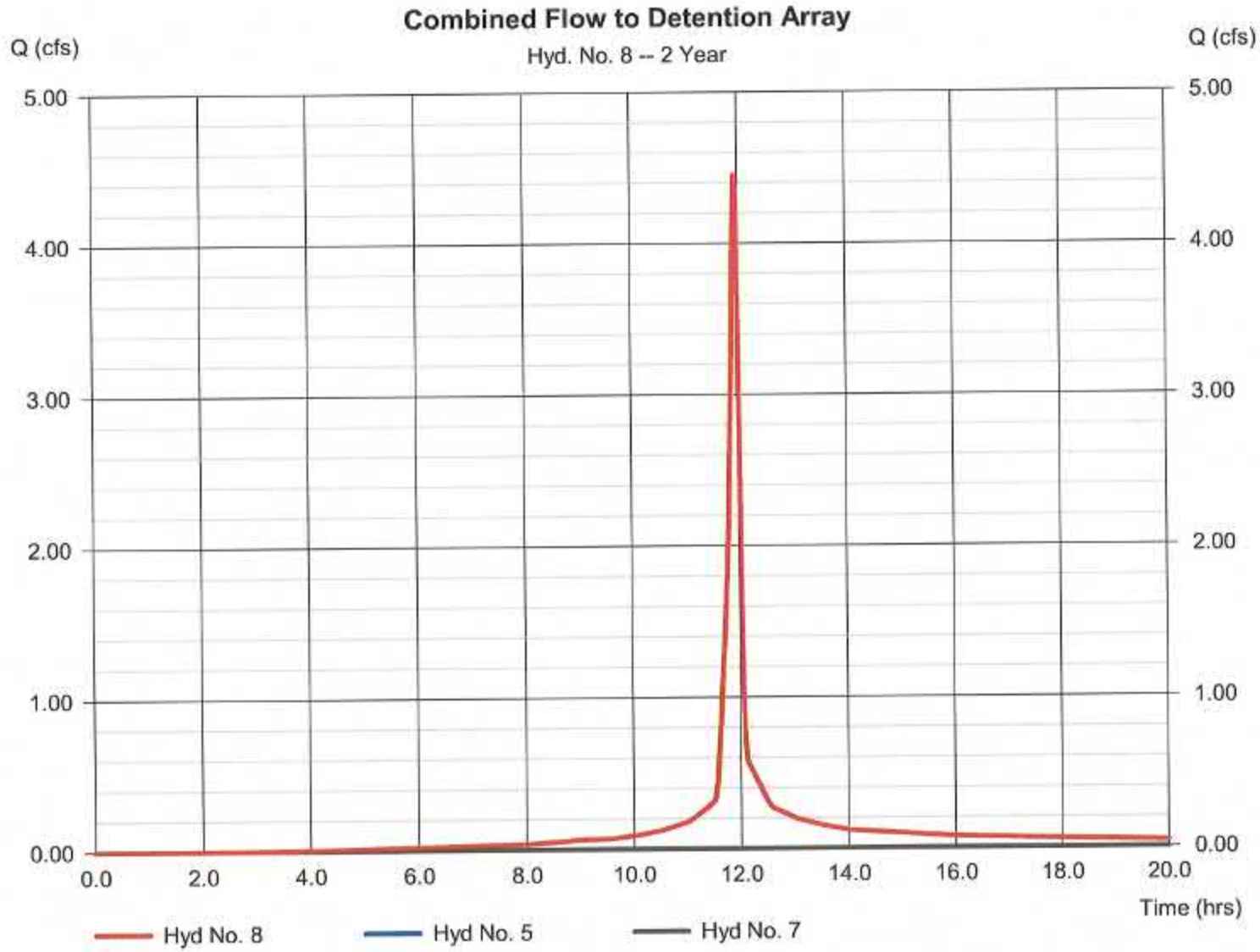


Hydrograph Report

Hyd. No. 8

Combined Flow to Detention Array

Hydrograph type	= Combine	Peak discharge	= 4.450 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 9,700 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 1.212 ac



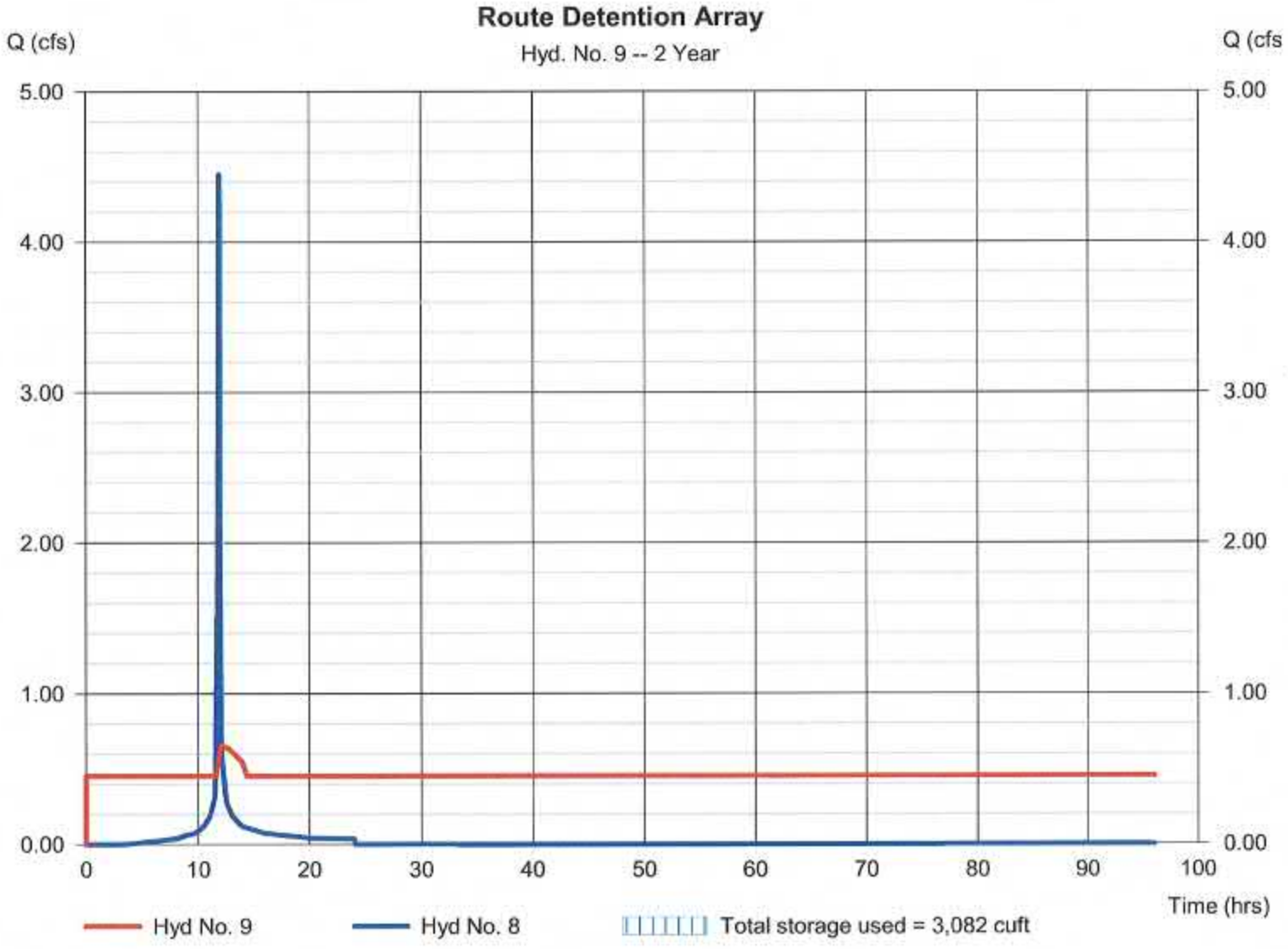
Hydrograph Report

Hyd. No. 9

Route Detention Array

Hydrograph type	= Reservoir	Peak discharge	= 0.656 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 157,764 cuft
Inflow hyd. No.	= 8 - Combined Flow to Detention Array	Max. Elevation	= 237.26 ft
Reservoir name	= Detention Array	Max. Storage	= 3,082 cuft

Storage Indication method used.

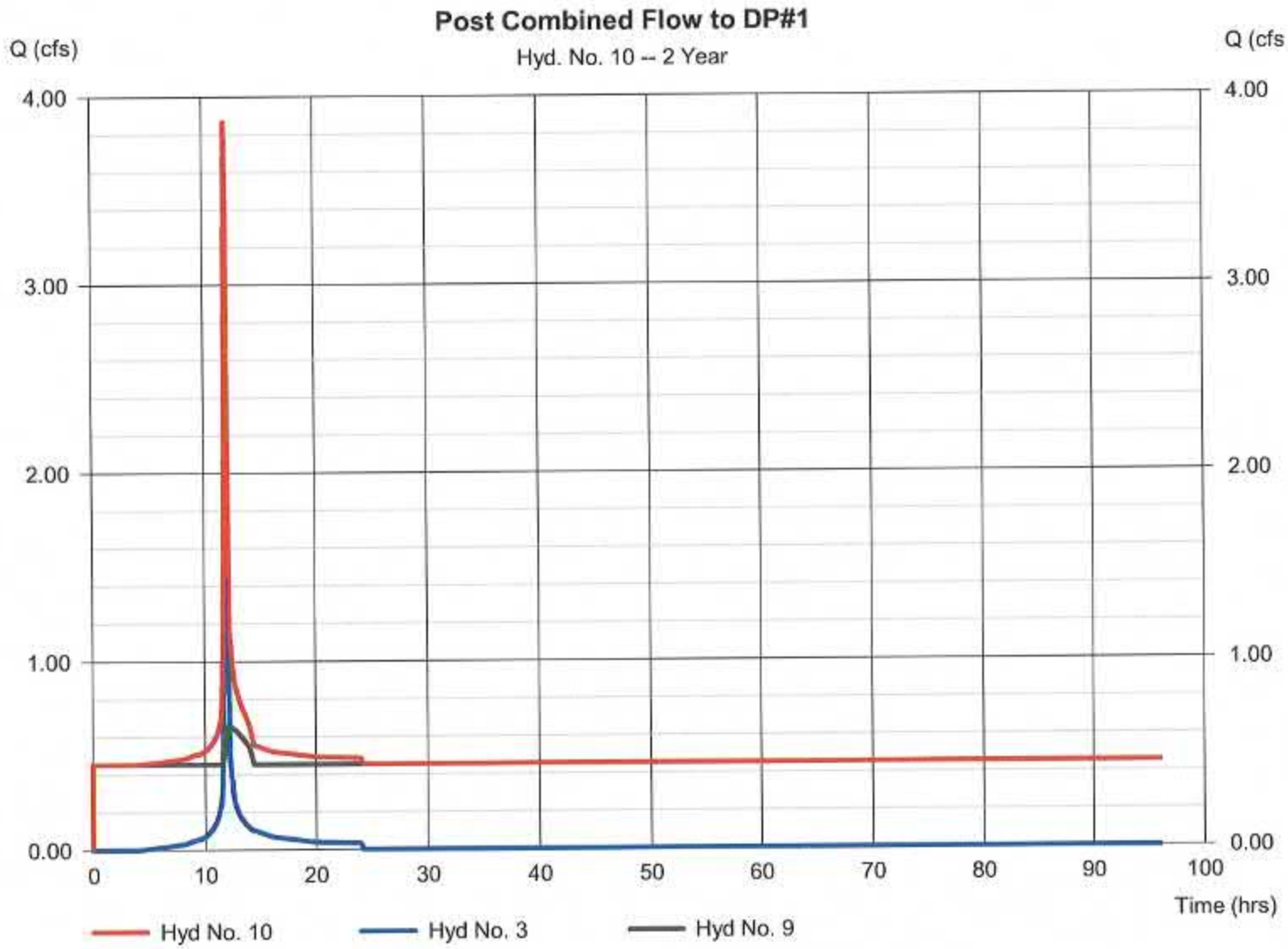


Hydrograph Report

Hyd. No. 10

Post Combined Flow to DP#1

Hydrograph type	= Combine	Peak discharge	= 3.866 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 166,477 cuft
Inflow hyds.	= 3, 9	Contrib. drain. area	= 1.033 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	11.41	2	720	29,659	------	------	------	Pre Area #1
2	SCS Runoff	4.133	2	720	10,754	------	------	------	Pre Area #2
3	SCS Runoff	5.295	2	720	14,754	------	------	------	Post Area #1
4	SCS Runoff	11.93	2	716	24,846	------	------	------	Post Area #1A
5	SCS Runoff	7.185	2	716	16,188	------	------	------	Post Area #1B
6	SCS Runoff	0.832	2	716	1,706	------	------	------	Post Area #2
7	Reservoir	7.696	2	720	4,047	4	242.38	6,467	Route Infil. Array
8	Combine	13.05	2	720	20,234	5, 7	------	------	Combined Flow to Detention Array
9	Reservoir	1.758	2	732	162,612	8	238.54	8,972	Route Detention Array
10	Combine	6.114	2	722	177,364	3, 9	------	------	Post Combined Flow to DP#1

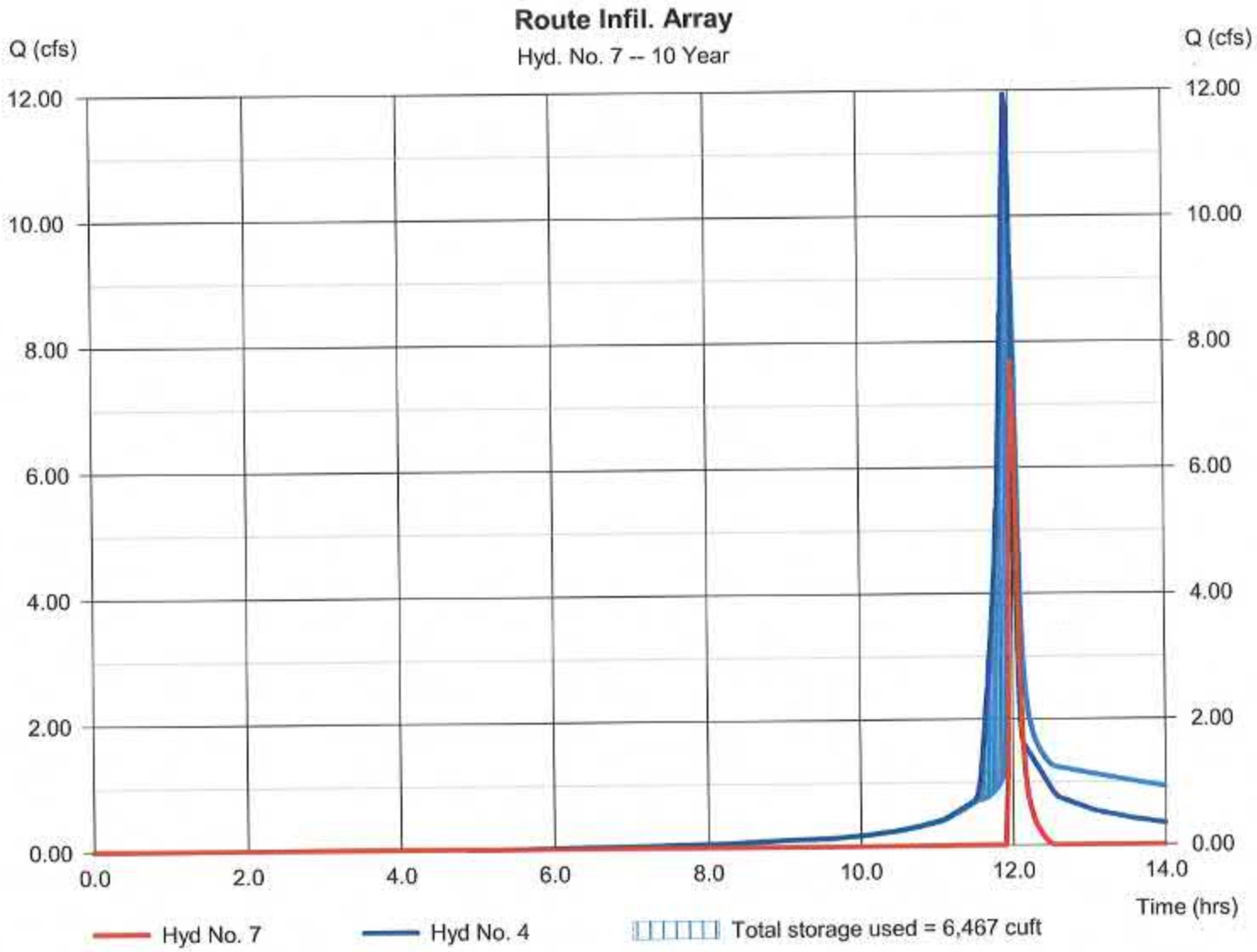
Hydrograph Report

Hyd. No. 7

Route Infil. Array

Hydrograph type	= Reservoir	Peak discharge	= 7.696 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 4,047 cuft
Inflow hyd. No.	= 4 - Post Area #1A	Max. Elevation	= 242.38 ft
Reservoir name	= Infiltration Array	Max. Storage	= 6,467 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

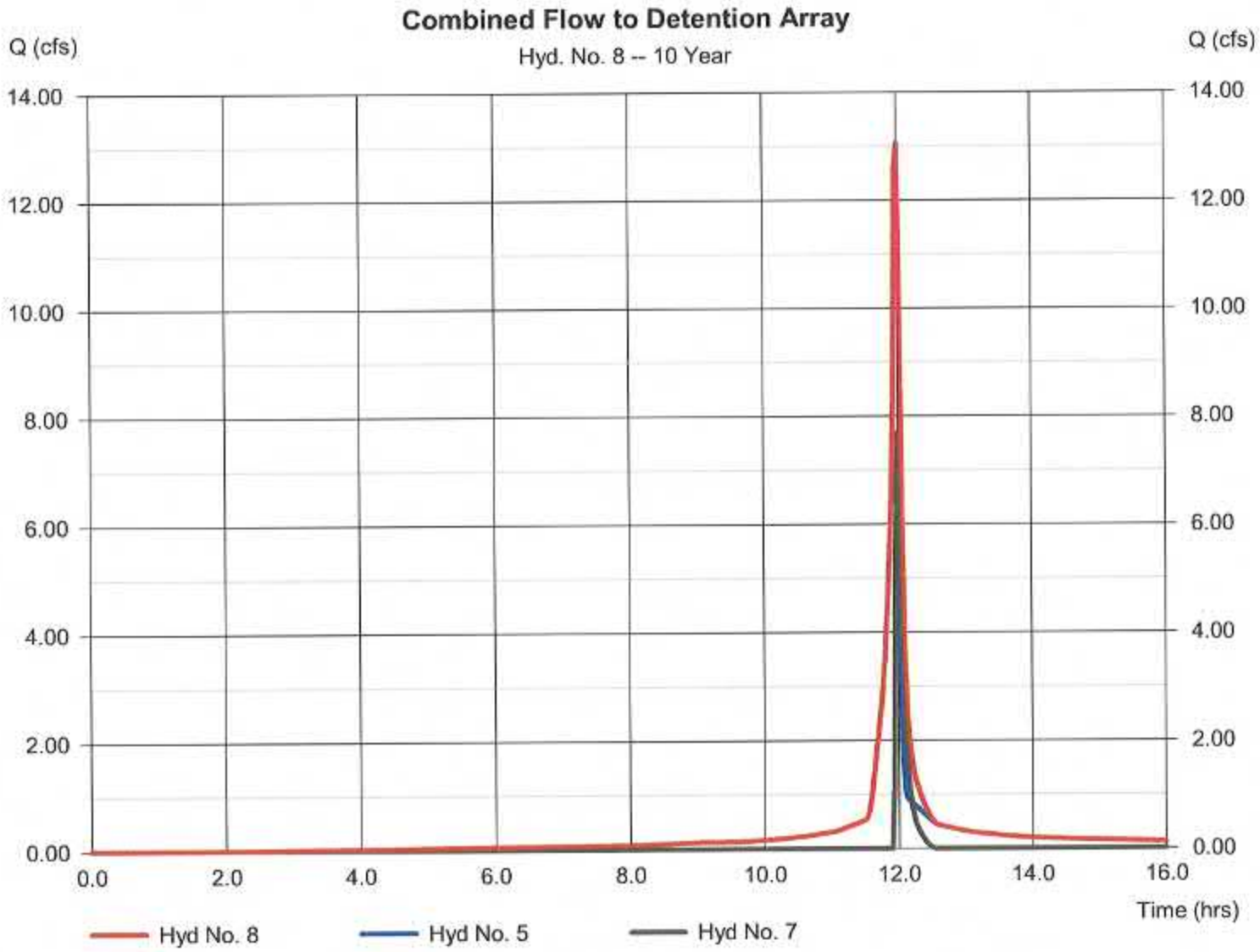


Hydrograph Report

Hyd. No. 8

Combined Flow to Detention Array

Hydrograph type	= Combine	Peak discharge	= 13.05 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 20,234 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 1.212 ac



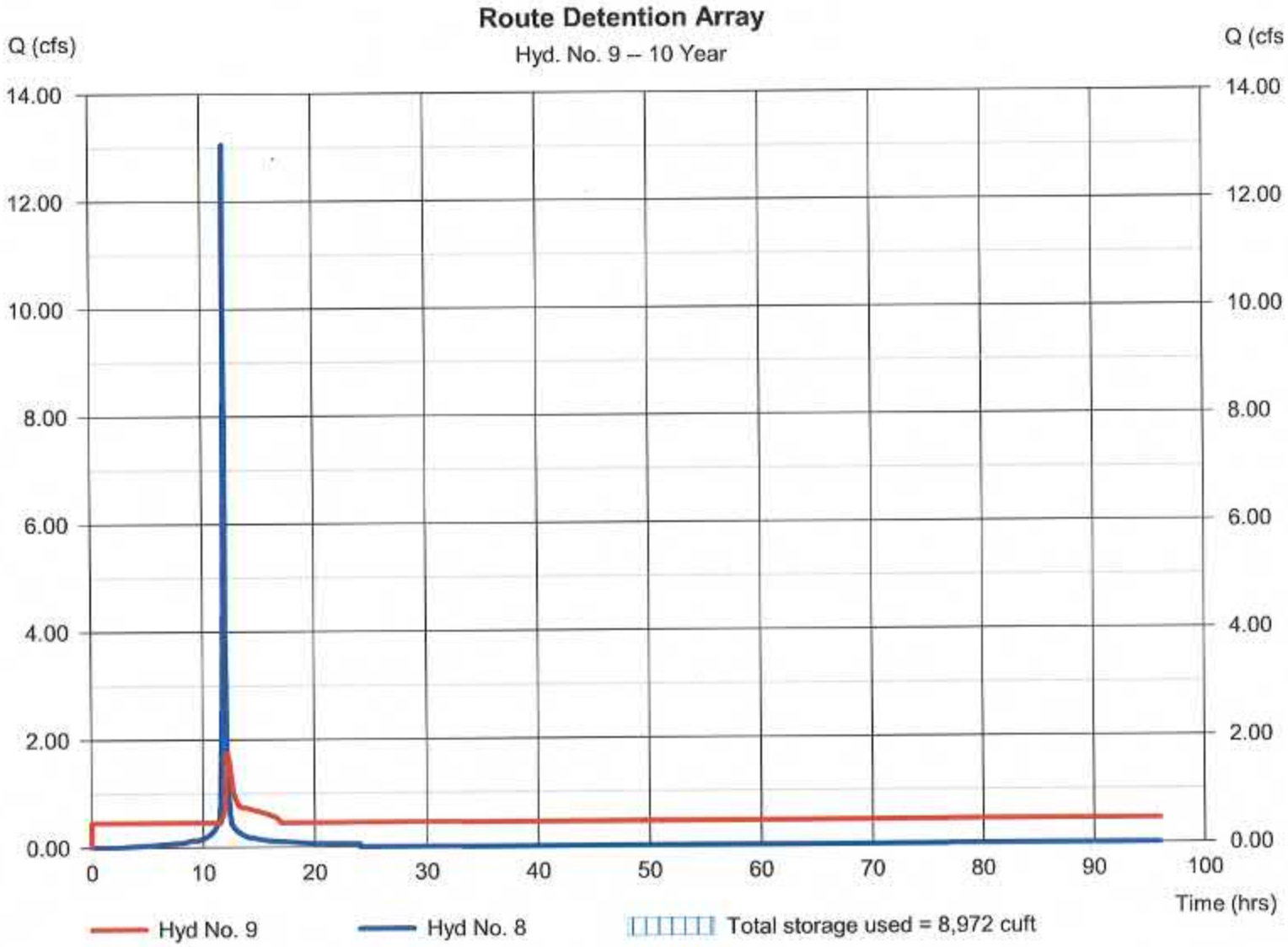
Hydrograph Report

Hyd. No. 9

Route Detention Array

Hydrograph type	= Reservoir	Peak discharge	= 1.758 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 162,612 cuft
Inflow hyd. No.	= 8 - Combined Flow to Detention Array	Max. Elevation	= 238.54 ft
Reservoir name	= Detention Array	Max. Storage	= 8,972 cuft

Storage Indication method used.

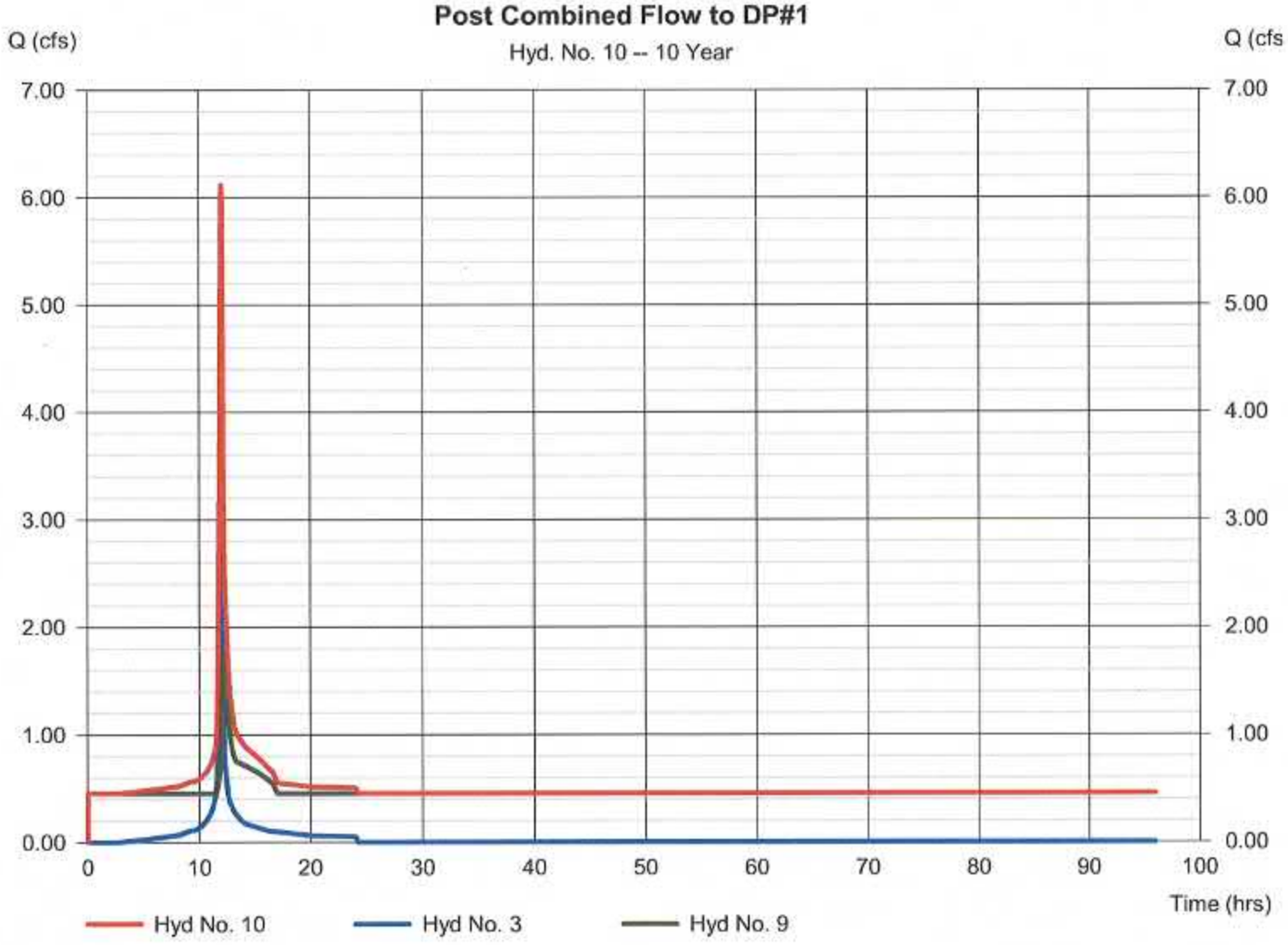


Hydrograph Report

Hyd. No. 10

Post Combined Flow to DP#1

Hydrograph type	= Combine	Peak discharge	= 6.114 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 177,364 cuft
Inflow hyds.	= 3, 9	Contrib. drain. area	= 1.033 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	13.17	2	720	34,164	------	------	------	Pre Area #1
2	SCS Runoff	4.663	2	720	12,167	------	------	------	Pre Area #2
3	SCS Runoff	5.808	2	720	16,277	------	------	------	Post Area #1
4	SCS Runoff	13.29	2	716	27,847	------	------	------	Post Area #1A
5	SCS Runoff	7.863	2	716	17,820	------	------	------	Post Area #1B
6	SCS Runoff	0.934	2	716	1,926	------	------	------	Post Area #2
7	Reservoir	9.569	2	720	5,445	4	242.53	6,690	Route Infil. Array
8	Combine	16.33	2	718	23,265	5, 7	------	------	Combined Flow to Detention Array
9	Reservoir	2.556	2	730	164,816	8	238.84	10,427	Route Detention Array
10	Combine	7.435	2	722	181,091	3, 9	------	------	Post Combined Flow to DP#1

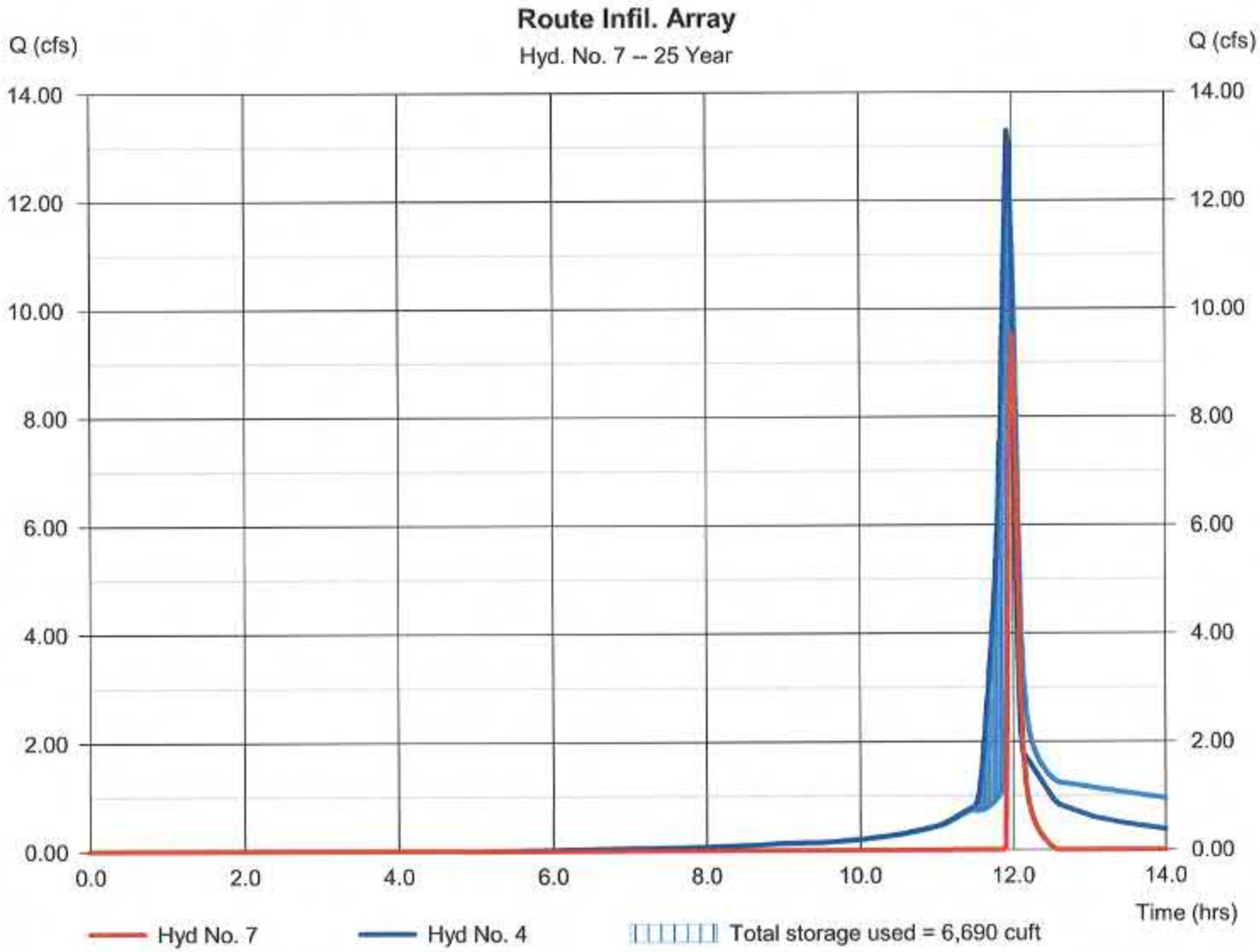
Hydrograph Report

Hyd. No. 7

Route Infil. Array

Hydrograph type	= Reservoir	Peak discharge	= 9.569 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 5,445 cuft
Inflow hyd. No.	= 4 - Post Area #1A	Max. Elevation	= 242.53 ft
Reservoir name	= Infiltration Array	Max. Storage	= 6,690 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

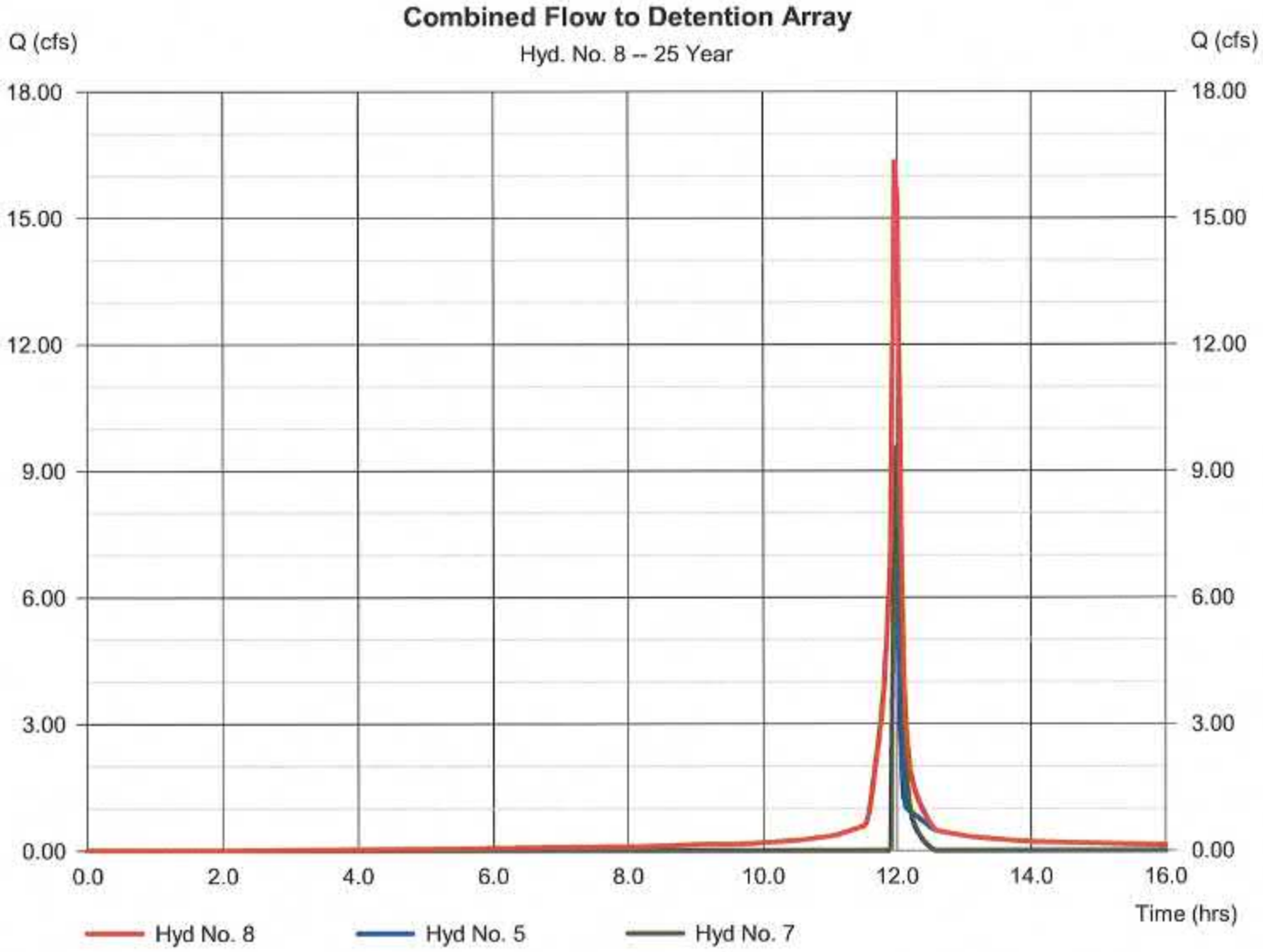


Hydrograph Report

Hyd. No. 8

Combined Flow to Detention Array

Hydrograph type	= Combine	Peak discharge	= 16.33 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 23,265 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 1.212 ac



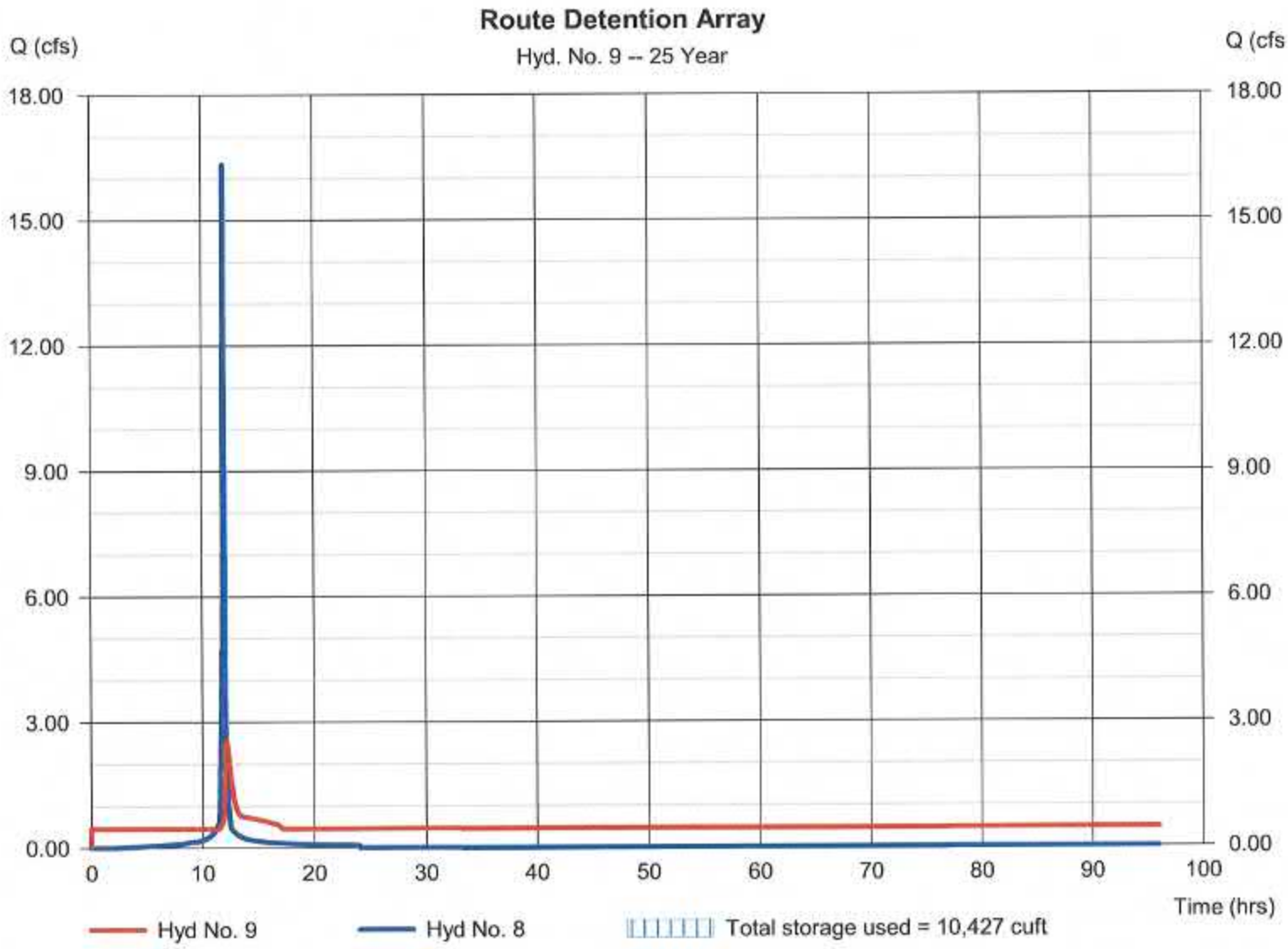
Hydrograph Report

Hyd. No. 9

Route Detention Array

Hydrograph type	= Reservoir	Peak discharge	= 2.556 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 164,816 cuft
Inflow hyd. No.	= 8 - Combined Flow to Detention Array	Max. Elevation	= 238.84 ft
Reservoir name	= Detention Array	Max. Storage	= 10,427 cuft

Storage Indication method used.

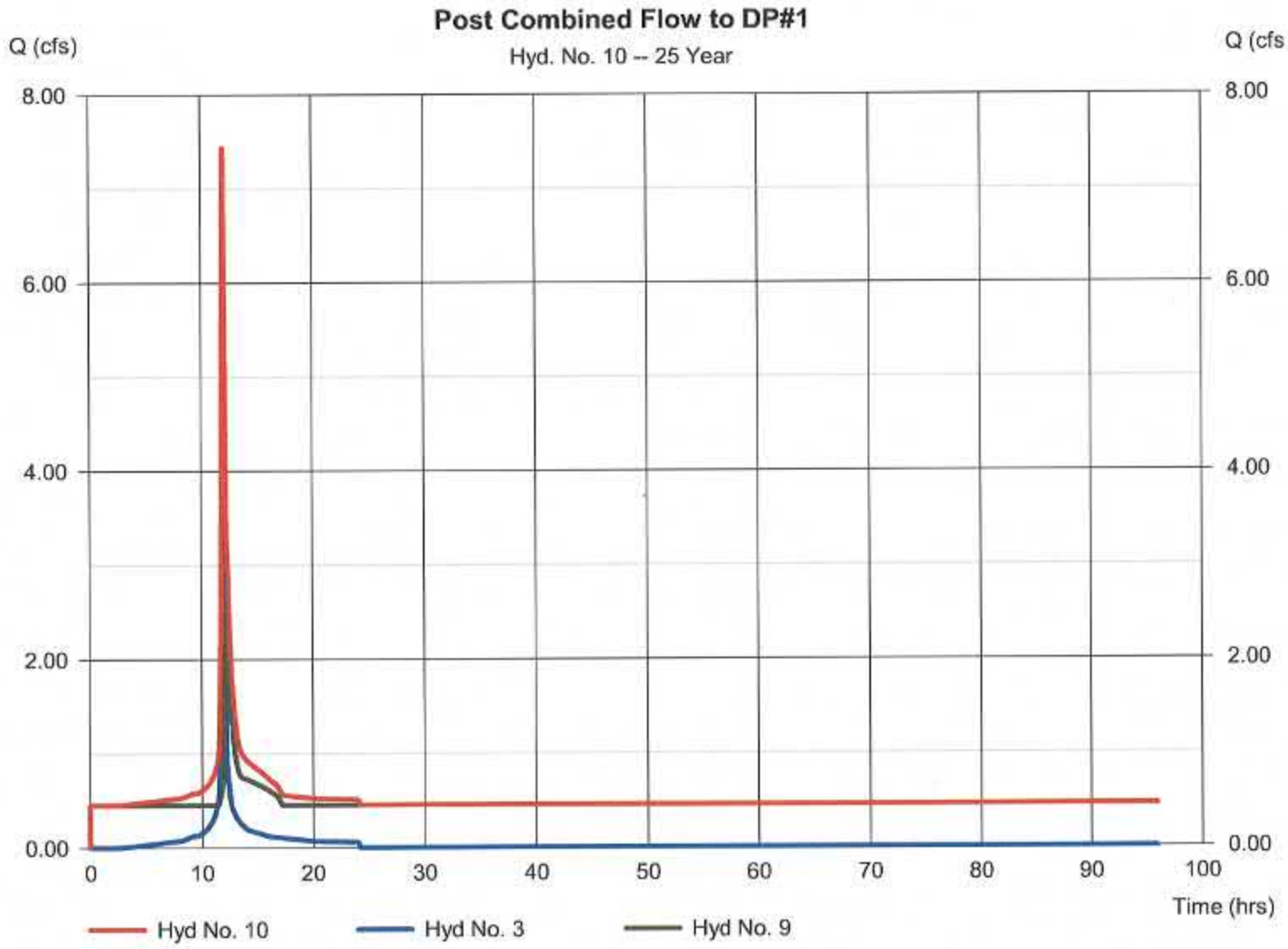


Hydrograph Report

Hyd. No. 10

Post Combined Flow to DP#1

Hydrograph type	= Combine	Peak discharge	= 7.435 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 181,091 cuft
Inflow hyds.	= 3, 9	Contrib. drain. area	= 1.033 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	22.78	2	720	59,286	------	------	------	Pre Area #1
2	SCS Runoff	7.471	2	720	19,838	------	------	------	Pre Area #2
3	SCS Runoff	8.483	2	720	24,317	------	------	------	Post Area #1
4	SCS Runoff	20.41	2	716	43,932	------	------	------	Post Area #1A
5	SCS Runoff	11.40	2	716	26,421	------	------	------	Post Area #1B
6	SCS Runoff	1.474	2	716	3,114	------	------	------	Post Area #2
7	Reservoir	17.53	2	718	13,531	4	242.98	7,593	Route Infil. Array
8	Combine	28.42	2	718	39,952	5, 7	------	------	Combined Flow to Detention Array
9	Reservoir	5.435	2	728	177,725	8	241.19	19,134	Route Detention Array
10	Combine	12.97	2	722	202,038	3, 9	------	------	Post Combined Flow to DP#1

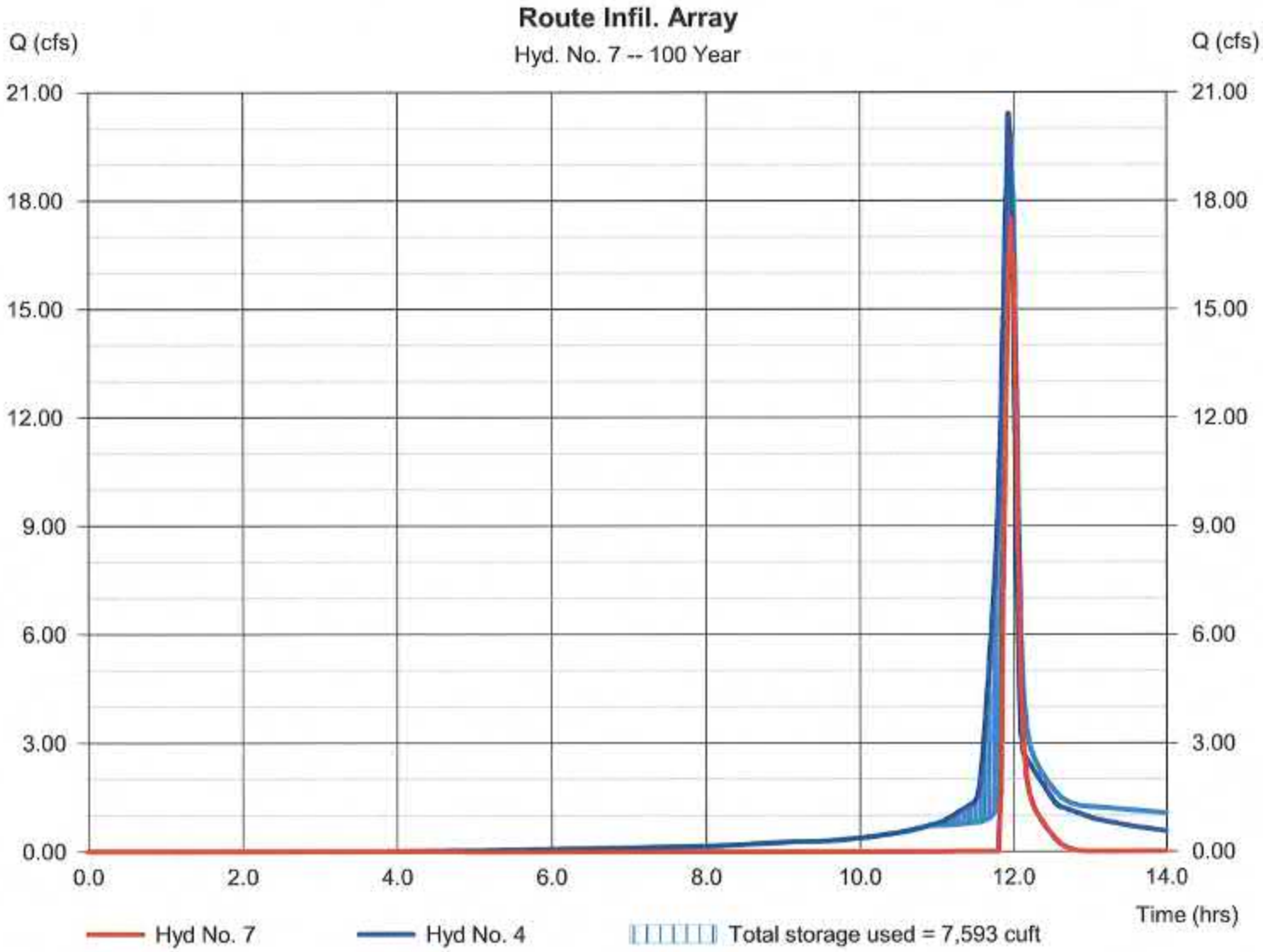
Hydrograph Report

Hyd. No. 7

Route Infil. Array

Hydrograph type	= Reservoir	Peak discharge	= 17.53 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 13,531 cuft
Inflow hyd. No.	= 4 - Post Area #1A	Max. Elevation	= 242.98 ft
Reservoir name	= Infiltration Array	Max. Storage	= 7,593 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

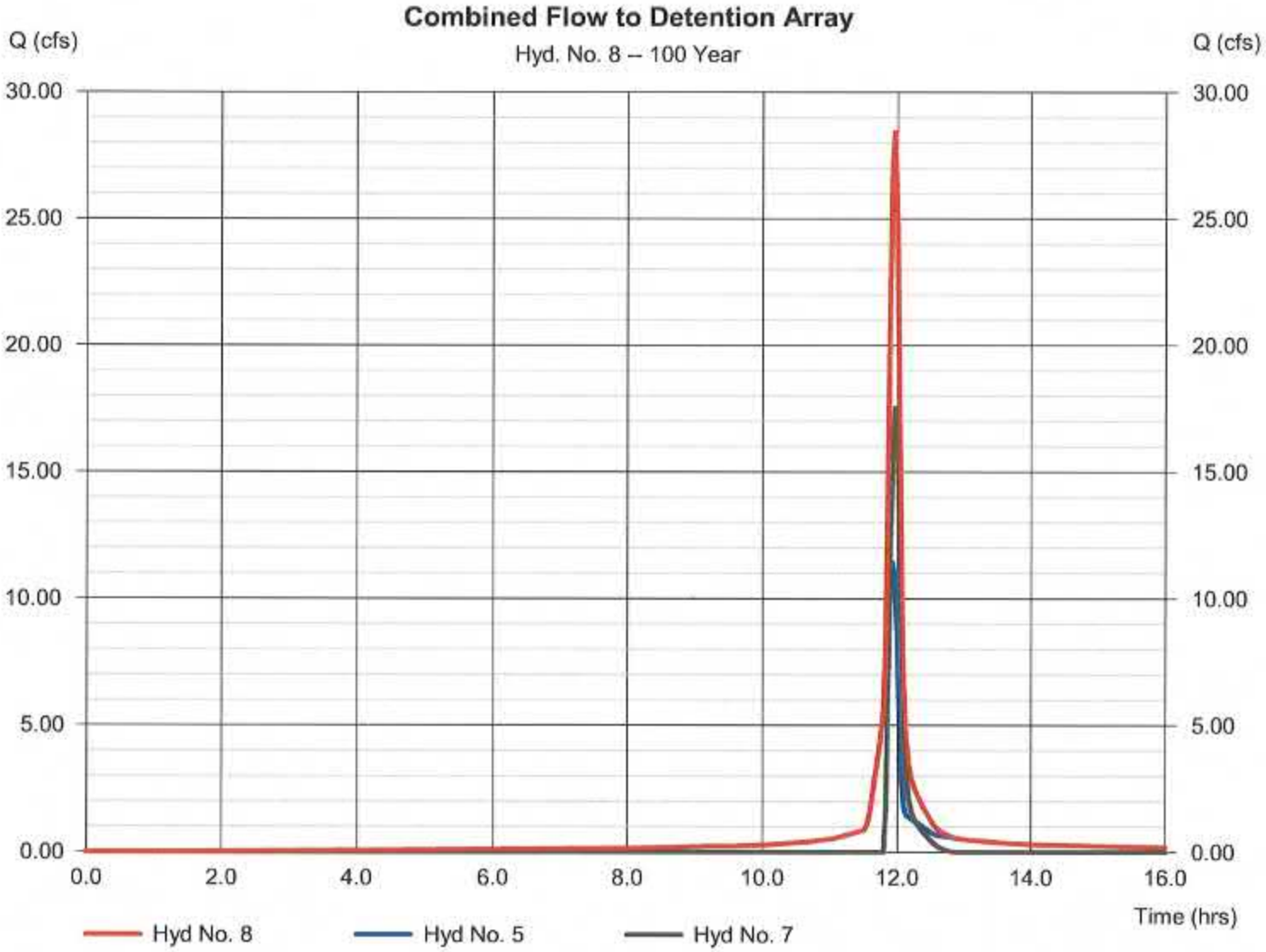


Hydrograph Report

Hyd. No. 8

Combined Flow to Detention Array

Hydrograph type	= Combine	Peak discharge	= 28.42 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 39,952 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 1.212 ac



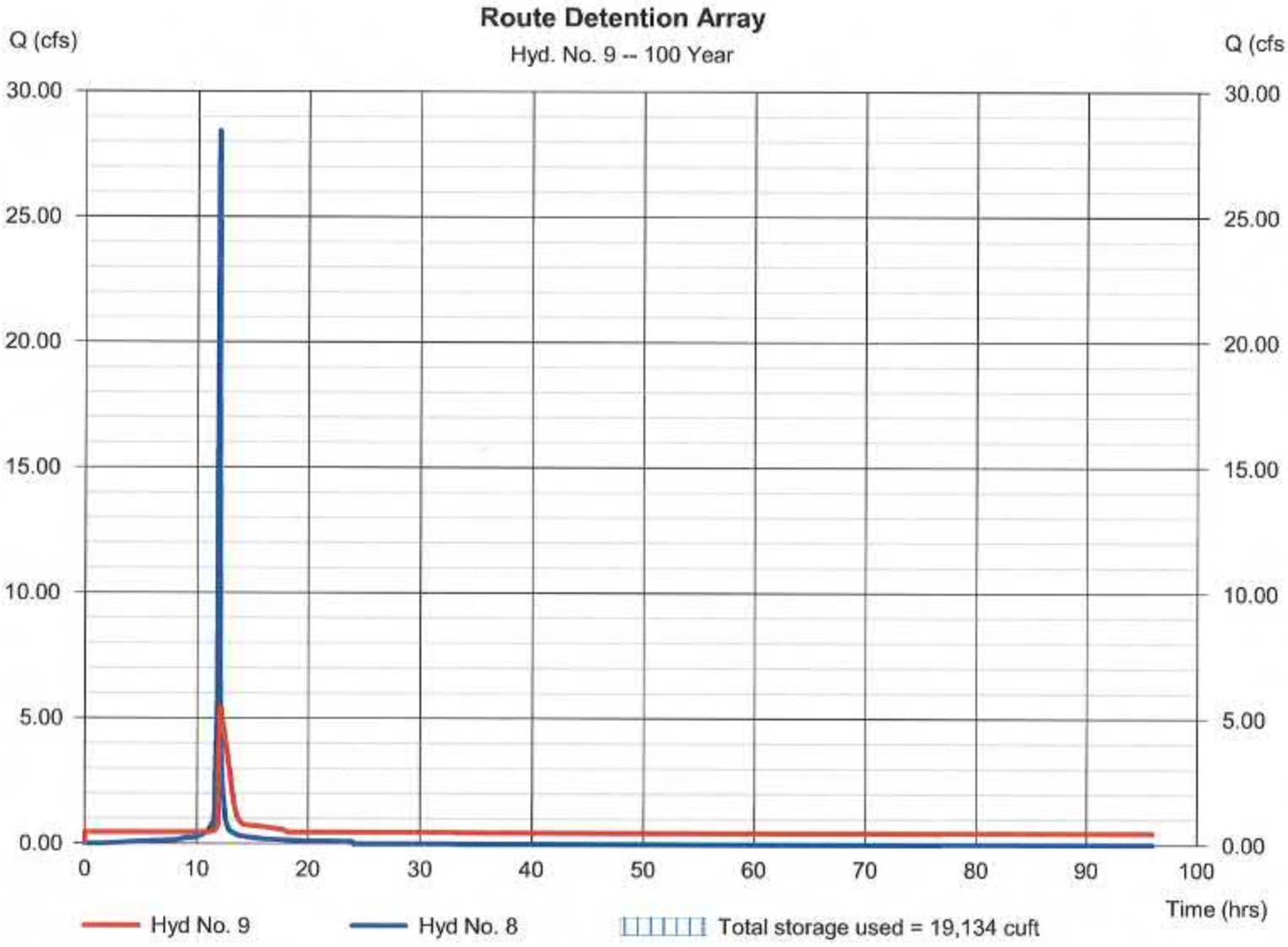
Hydrograph Report

Hyd. No. 9

Route Detention Array

Hydrograph type	= Reservoir	Peak discharge	= 5.435 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 177,725 cuft
Inflow hyd. No.	= 8 - Combined Flow to Detention Array	Max. Elevation	= 241.19 ft
Reservoir name	= Detention Array	Max. Storage	= 19,134 cuft

Storage Indication method used.



Hydrograph Report

Hyd. No. 10

Post Combined Flow to DP#1

Hydrograph type	= Combine	Peak discharge	= 12.97 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 202,038 cuft
Inflow hyds.	= 3, 9	Contrib. drain. area	= 1.033 ac

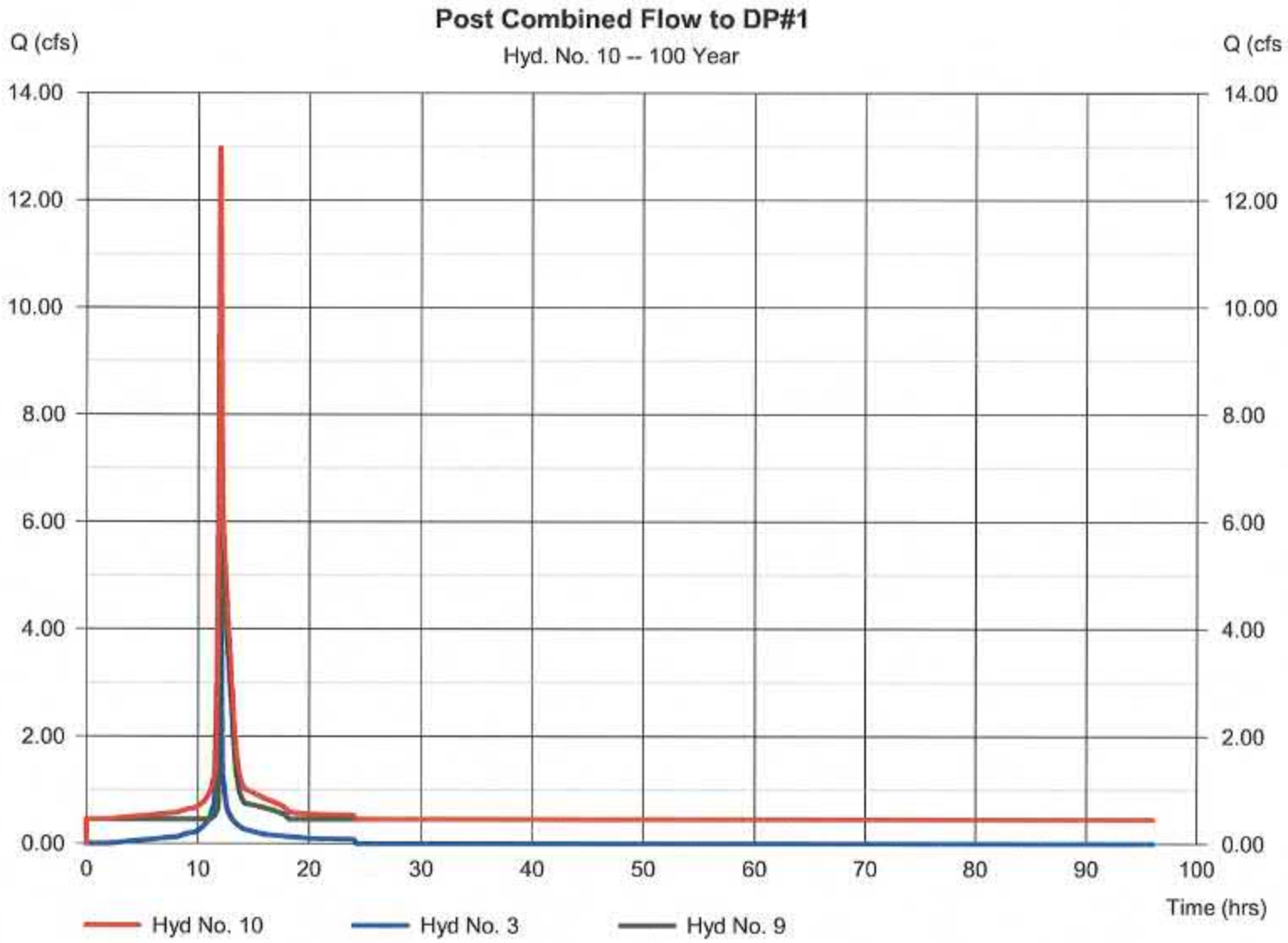


Exhibit D – Pipes

.1 Closed Drainage System Expected Flows and Manning's Calculations

PROJECT # 972.21 | SHEET # 1 OF: 1 | PAGE # OF:

MADE BY: JWE | DATE: 3/2/2018

PROJECT: 526 Central Ave | CHKD BY: | DATE:

SUBJECT: PIPE CAPACITIES USING MANNING'S EQUATION | REVISED BY: | DATE:

CHKD BY: | DATE:

Pipe Run	Drainage Area (sf) To CB	Total Upstream Area (sf) Contribute to CB	Percentage of Watershed	Expected 25-year Peak Flow (cfs) to Pipes	Expected Velocity (fps) At Peak Flow in Pipes	Allowable Flow in Pipe (cfs)	Proposed Pipe Size and Slope	% FULL
POST DEVELOPMENT AREA #1A								
CB#17 to CB#16	5700		5.55%	0.75	2.40	4.96	15" SICPP @ 0.5%	30%
CB#16 to CB#15	25300	5700	30.21%	4.09	4.10	8.44	18" SICPP @ 0.5%	60%
CB#15 to CB#10		31000	30.21%	4.09	4.10	8.44	18" SICPP @ 0.5%	60%
CB#14 to CB#13	3700		3.61%	0.49	4.05	6.24	12" SICPP @ 2.3%	20%
CB#13 TO CB#12	5100	3700	8.58%	1.16	4.00	6.02	12" SICPP @ 1.3%	40%
CB#12 TO CB#11	10900	8800	19.20%	2.60	3.60	4.96	15" SICPP @ 0.5%	60%
CB#11 TO CB#10	12700	23400	35.18%	4.77	4.30	4.96	15" SICPP @ 0.5%	92%
CB#10 TO CB#9	Part of hydrualic model of array							
CB#9 TO WQv#2	Part of hydrualic model of array							
POST DEVELOPMENT AREA #1B								
CB#5 to CB#6	16200		30.69%	2.51	3.66	2.82	12" SICPP @ 0.5%	90%
CB#6 to CB#7	7600	16200	45.09%	3.68	5.39	4.96	15" SICPP @ 0.5%	25%
CB#7 to CB#8	2700	23800	50.20%	4.10	4.10	8.44	18" SICPP @ 0.5%	60%
CB#8 to STMH#7		26500	50.20%	4.10	4.10	8.44	18" SICPP @ 0.5%	60%
CB#4 TO STMH #6	8000		15.15%	1.24	3.05	3.09	12" SICPP @ 0.6%	50%
CB#1 TO STMH #3	Part of hydrualic model of array							
CB#3 TO STMH #4	Part of hydrualic model of array							

SICPP OR HDPE IS "SMOOTH INTERIOR CORRUGATED PLASTIC PIPE"

Allowable flow was based on Manning's equation with n=0.012 for SICPP

Expected flow calculations in Pipe Runs

$$Q = \frac{\text{Drainage area to CB + Total Upstream Area Contributing to CB's}}{\text{Total Area of Watershed (Post Development Area \#1A)}} \times \text{25 year peak discharge}$$

Example (Pipe Runs between CB#16 to CB#15)

$$Q = \frac{\text{25,300 sf +5,700 sf}}{\text{102,612 sf (Post Development Area \#1A)}} \times \text{13.55 cfs} = \textbf{4.09 cfs}$$

Exhibit D – Maps

.1 Project Location Map

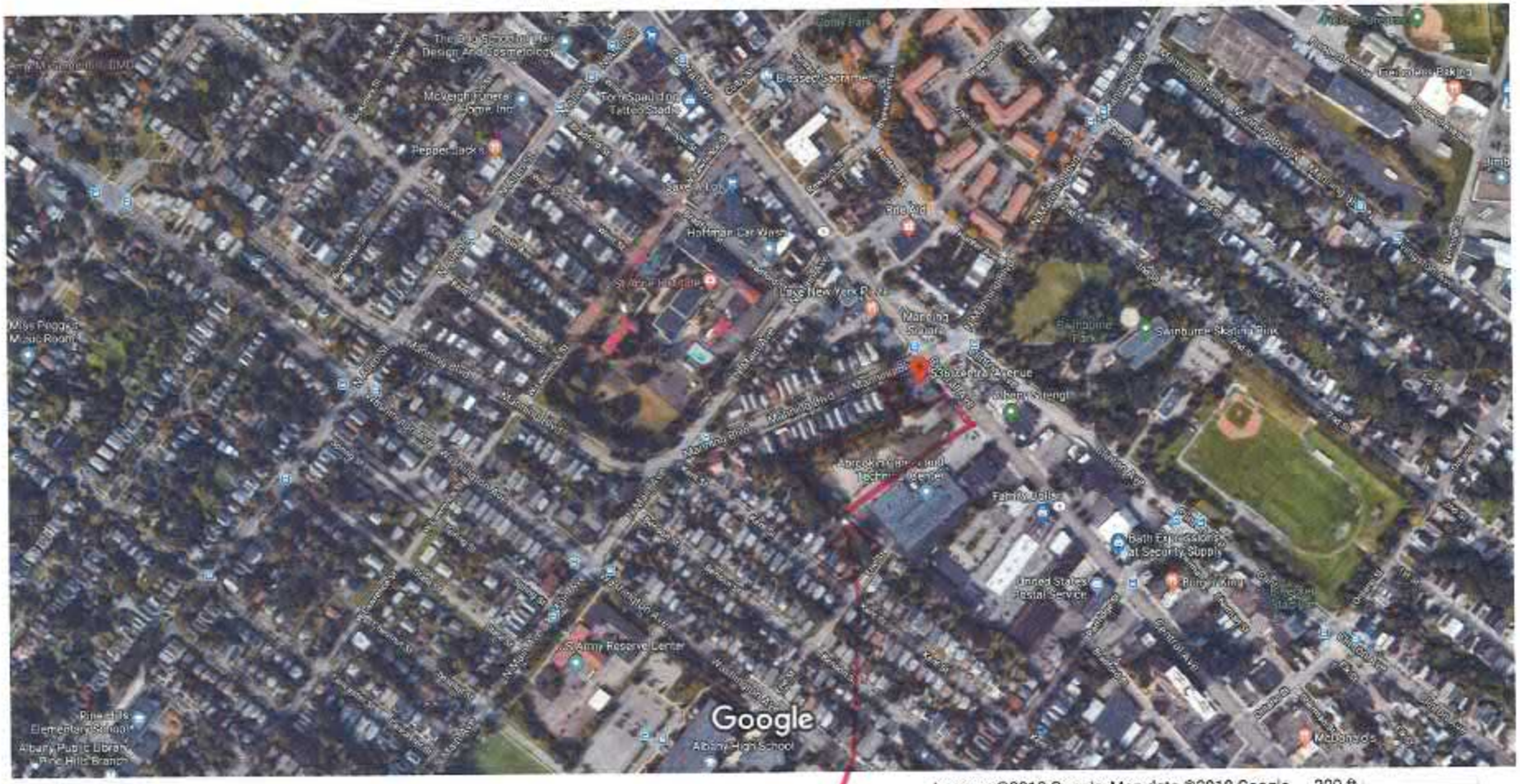
.2 Soil Map (Figure 1)

.3 Pre-Development Watersheds (Figure 2)

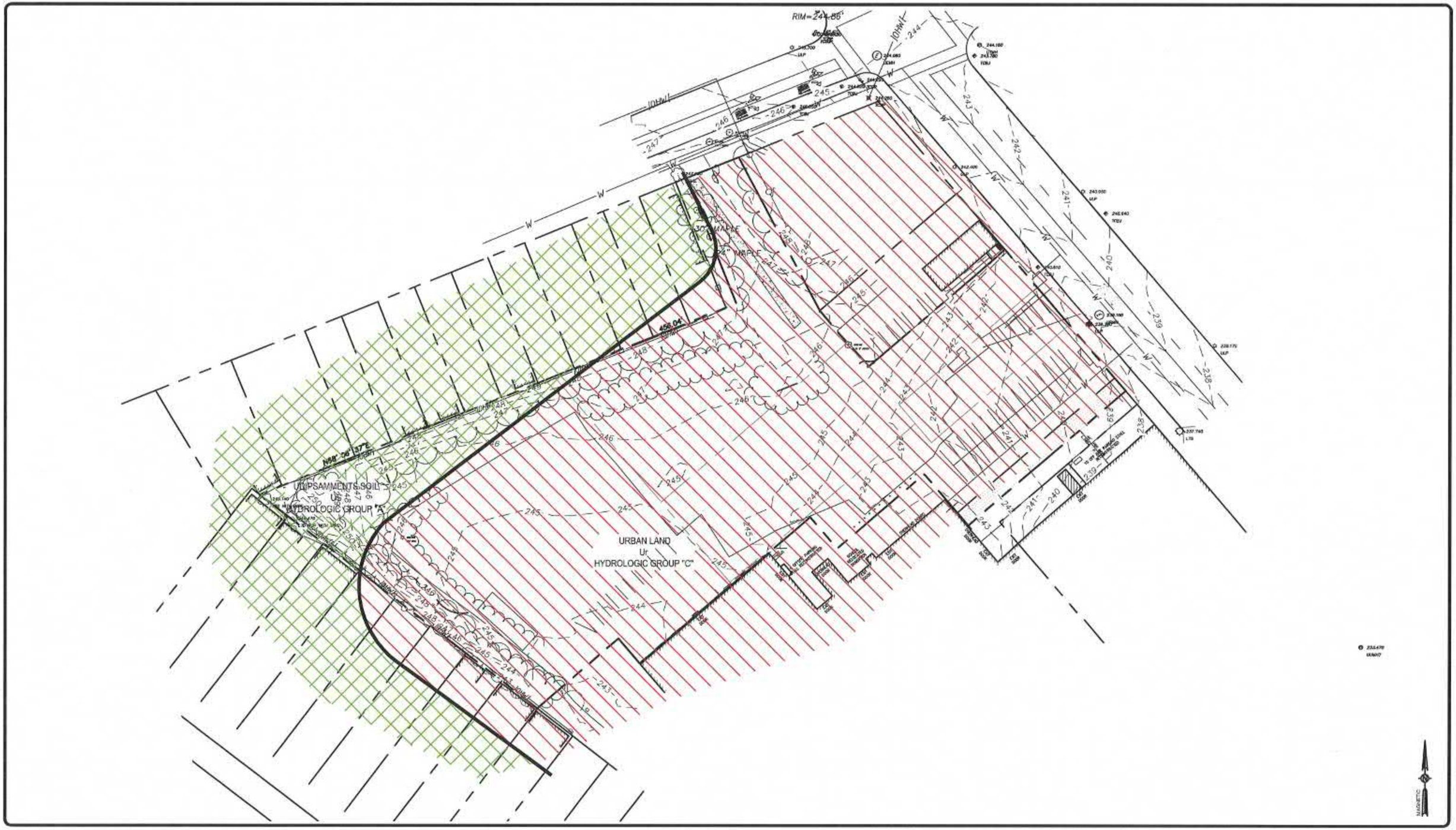
.4 Wooded Area Map (Figure 3)

.5 Post Development Watersheds (Figure 4)

Google Maps 536 Central Ave



site



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SUBMITTAL / REVISIONS

No.	DATE	DESCRIPTION	BY	REVIEWED BY:	DATE

PROJ. MANAGER:	JWE
CHIEF DESIGNER:	JWE
DESIGNED BY:	JWE
DRAWN BY:	AML
CHECKED BY:	JWE

SEAL

DRAFT

Engineering and Land Surveying, P.C.
1533 Crescent Road - Clifton Park, NY 12065

REGAN DEVELOPMENT

SOIL MAP

526 CENTRAL AVE
CITY OF ALBANY NY

SCALE: 1"=80'
CONTRACT No.: 972.21
MJ PROJ. No.: 972.21
DATE: 3/3/2016

FIG 1

File Name: S:\m\972\972.21 Sanborn\Sanmaster.dwg (Layout: soil map)
Date: Wed, Mar 02, 2016 - 2:11 PM (Warren Jewett)

SUBMITTAL / REVISIONS

No.	DATE	DESCRIPTION	BY	REVIEWED BY:	DATE

PROJ. MANAGER:	JWE
CHIEF DESIGNER:	JWE
DESIGNED BY:	JWE
DRAWN BY:	AML
CHECKED BY:	JWE

SEAL

DRAFT

Engineering and Land Surveying, P.C.
1533 Crescent Road - Clifton Park, NY 12065

REGAN DEVELOPMENT

PRE-DEVELOPMENT MAP

526 CENTRAL AVE
CITY OF ALBANY NY

SCALE:	1"=80'
CONTRACT No.:	972.21
MJ PROJ. No.:	972.21
DATE:	3/3/2018

FIG 2

File Name: F:\972\2021 Gentbom\Stormwater.dwg (Layout: PRE)
Date: Wed, Mar 07, 2018 - 2:11 PM (User: jwalton)

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SUBMITTAL / REVISIONS

No.	DATE	DESCRIPTION	BY	REVIEWED BY:	DATE

PROJ. MANAGER:	JWE
CHIEF DESIGNER:	JWE
DESIGNED BY:	JWE
DRAWN BY:	AML
CHECKED BY:	JWE

SEAL

DRAFT

Engineering and Land Surveying, P.C.
1533 Crescent Road - Clifton Park, NY 12065

REGAN DEVELOPMENT

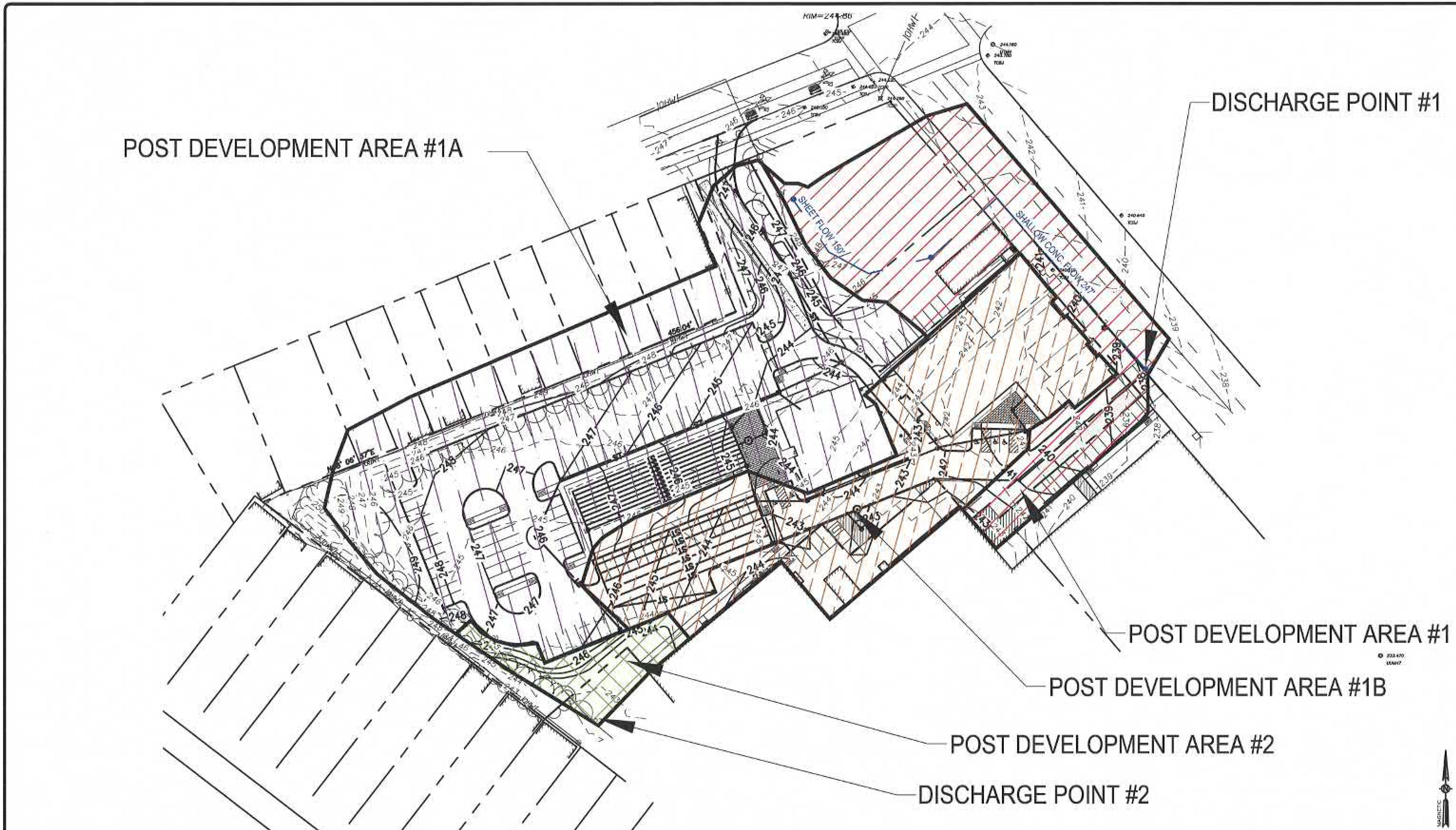
WOODED AREA MAP

526 CENTRAL AVE
CITY OF ALBANY NY

SCALE: 1"=80'
CONTRACT No.: 972.21
MJ PROJ. No.: 972.21
DATE: 3/3/2018

FIG 3

File Name: P:\pf\2972\2.21 Svstcom\d\Stormwater.dwg (Layout: WOOD)
Date: Wed, Mar 07, 2018 - 2:09 PM (Name: jkalish)



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SUBMITTAL / REVISIONS

No.	DATE	DESCRIPTION	BY	REVIEWED BY:	DATE

PROJ. MANAGER:	JWE
CHIEF DESIGNER:	JWE
DESIGNED BY:	JWE
DRAWN BY:	AML
CHECKED BY:	JWE

SEAL

DRAFT

MJ Engineering and Land Surveying, P.C.
1533 Crescent Road - Clifton Park, NY 12065

REGAN DEVELOPMENT

POST DEVELOPMENT MAP

526 CENTRAL AVE
CITY OF ALBANY NY

SCALE: 1"=80'
CONTRACT No.: 972.21
MJ PROJ. No.: 972.21
DATE: 3/3/2018

FIG 4

Stormwater Pollution Prevention Plan (SWPPP)
for

526 Central Ave

City of Albany
Albany County, New York

February 2018

Prepared by:

Engineering and
Land Surveying, P.C.

21 Corporate Drive, Suite 105
Clifton Park, NY 12065
Tel: 518-371-0799
Fax: 518-371-0822

STORMWATER POLLUTION PREVENTION PLAN
for
526 CENTRAL AVE
CITY OF ALBANY, ALBANY COUNTY, NEW YORK

Table of Contents

1.0 OWNER AND CONTRACTOR'S/SUBCONTRACTOR'S CERTIFICATION

Notice of Intent (NOI) Permitee and General Contractor and Subcontractors shall read Section 2.0 through Section 5.0 of Stormwater Pollution Prevention Plan (SWPPP). Each representative of his or her company shall understand their responsibilities, base upon their scope of work, that Erosion Control and Pollution Control are required for this project. The NOI Permittee, General Contractor and all Subcontractors shall sign the "logbook" listed below. If a Subcontractor wishes **NOT** to sign the logbook the General Contractor is to obtain the name, company and phone number of this company and list the information in the logbook.

1.1 NOI PERMITTEE'S CERTIFICATION:

"I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharge from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of referenced permit and the laws of State of New York and could subject me to criminal, civil and/or administrative proceedings."

Print Name: _____ Company Name: _____

Signature: _____ Company Address: _____

_____

Phone #: _____

1.2 GENERAL SITE CONTRACTOR'S CONTRACTOR AND SUBCONTRACTORS CERTIFICATION:

"I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharge from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of referenced permit and the laws of State of New York and could subject me to criminal, civil and/or administrative proceedings."

General Site Contractor

Print Name: _____ Company Name: _____

Signature: _____ Company Address: _____

_____

Phone #: _____

Each Subcontractor to site General Contractor (GC) or contractor responsible for site construction aspects shall list their company responsibility (i.e. Landscaper, Underground Utilities (water or sewer) Installer, Electric Service Installer, Gas Service Installer, Asphalt Pavement Installer, Curb (concrete, granite) Installer, Lighting Installer, etc.)

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

General Site SubContractor (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

For each subcontractor listed, the affidavit statement in Section 1.2 of this document shall apply.

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

General Site SubContractor (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

SubContractor to Site GC (list responsibility)_____

Print Name: _____ Company Name:_____

Signature:_____ Phone #:_____

For each subcontractor listed, the affidavit statement in Section 1.2 of this document shall apply.

1.3 BUILDING CONTRACTOR AND SUBCONTRACTORS CERTIFICATION:

"I hereby certify that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharge from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of referenced permit and the laws of State of New York and could subject me to criminal, civil and/or administrative proceedings."

Building Contractor

Print Name: _____ Company Name: _____

Signature: _____ Company Address: _____

_____

Phone #: _____

Each Subcontractor to site General Contractor (GC) of the building(s) or contractor responsible for building construction aspects shall list their company responsibility (i.e. Electrical, Plugging, Masonry, Structural, Foundations, Fit-Up, etc.)

SubContractor to Building GC (list Responsibility)_____

Print Name: _____ Company Name: _____

Signature: _____ Phone #: _____

SubContractor to Building GC (list Responsibility)_____

Print Name: _____ Company Name: _____

Signature: _____ Phone #: _____

SubContractor to Building GC (list Responsibility)_____

Print Name: _____ Company Name: _____

Signature: _____ Phone #: _____

SubContractor to Building GC (list Responsibility)________________________

Print Name: ____________________ Company Name: ____________________

Signature: ____________________ Phone #: ____________________

SubContractor to Building GC (list Responsibility)________________________

Print Name: ____________________ Company Name: ____________________

Signature: ____________________ Phone #: ____________________

SubContractor to Building GC (list Responsibility)________________________

Print Name: ____________________ Company Name: ____________________

Signature: ____________________ Phone #: ____________________

SubContractor to Building GC (list Responsibility)________________________

Print Name: ____________________ Company Name: ____________________

Signature: ____________________ Phone #: ____________________

SubContractor to Building GC (list Responsibility)________________________

Print Name: ____________________ Company Name: ____________________

Signature: ____________________ Phone #: ____________________

SubContractor to Building GC (list Responsibility)________________________

Print Name: ____________________ Company Name: ____________________

Signature: ____________________ Phone #: ____________________

For each subcontractor listed, the affidavit statement in Section 1.3 of this document shall apply.

2.0 NYSDEC GUIDELINES FOR PREPARING A SWPPP

2.1 STORMWATER POLLUTION PREVENTION (SWPPP) REQUIREMENTS

A. THE NARRATIVE REPORT

Provide applicant information such as name, legal address and phone number on the cover sheet or attach a copy the NOI after submission of the form. ***(A Draft NOI can be found at and of this Exhibit F.1)***

Site Address	526 Central Ave
Descriptive Site Location	The site is approximately 3.5 acres and is currently vacant parcel
	Regan Development Corporation 1055 Saw Mill River Road Ardsley NY 10502
	(914) 693-6613
Property Management (if different than Owner)	SAME AS OWNER

1. Provide address and complete description of the site along with background information about the scope of the project. ***(See Section 1.0 of Stormwater Management Report (SWMR).)***
2. Provide a statement of stormwater management objectives. ***(See Section 1.0 of SWMR.)***
3. Provide a brief description of pre-development conditions:
   a. Identify the natural drainage areas and drainage points.

      (See Section 3.0 of SWMR and Exhibit E.3).

   b. Name the bodies of waters and wetlands and describe the drainage structures on the site of impacted by the site.

      (See Exhibits E.3 and Construction Drawings)

   c. Identify critical and environmentally sensitive areas such as high erodible areas, steep slopes, natural resource conservation areas, and wildlife habitats.

      (See Exhibits E.3 and Construction Drawings)

   d. Identify utility lines, easements, water supply wells, and sewage treatment systems.

      (See Exhibits E.3 and Construction Drawings)

   e. Identify soil type:

      - General description (texture, permeability, drainage capacity)

        (See Section 2.0 of SWMR and Exhibits E.2)

      - Hydrologic Soil Group (HSG) for hydrologic calculations

        (See Section 2.0 of SWMR and Exhibits E.2)

4. Describe the future site:

   Provide a brief description of planned post-development conditions, the stormwater runoff quality and quantity comparing to pre-development conditions, and the measures employed to maintain a safe stormwater discharge:

(See Section 1.0, 3.0, 4.0 and 5.0 of SWMR and Exhibits E.3 and E.4)

a. The proposed development and the scope of the SWPPP. ***(See Section 5.0 of SWMR)***

b. Disturbed area in acres ***(3.2 acres)***

c. Duration of activity, from ***(6/30/18~12/30/19)***

d. Acreage, location and boundaries of proposed impervious area

(See Exhibits E.4, E.5, A.2 and Construction Drawings)

e. Future utility lines, easements, water supply wells, and sewage treatment systems.

(See Exhibits E.4 and Construction Drawings)

f. Define environmentally sensitive areas that will be protected from disturbance

(See Exhibits E.4 and Construction Drawings)

g. Define the divide lines of drainage areas in the future site according to proposed changes.

(See Exhibits E.4 and Construction Drawings)

h. The SWPPP should include the following pollution prevention measures:

- Identify the plan for preventing litter, construction chemicals, and construction debris exposed to stormwater from becoming a pollutant source in storm water discharges (e.g., screening outfalls, picked up daily; and ***(See Section 4.0 of this report)***
- Describe how construction and waste materials will be stored on-site and the controls planned to reduce pollutants from these materials, including storage practices to minimize exposure of the materials to stormwater, and spill prevention and response. ***(See Section 4.0 of this report)***

i. If the site discharges to a TMDL or 303d segment, it is the responsibility of the applicant to identify the requirements and accommodate them in the SWPPP. ***(n/a)***

j. The responsible person(s) for implementation of the SWPPP and inspection. The plan must identify the contractor(s) and subcontractor(s) responsible for each measure and include and signed contractor certification statement.

(See Section 1.0 of this report for contactor and owner certification)

k. An updated plan must include copies of the written summaries of the compliance status that are prepared quarterly. The updated plan and required reports must be signed / certified by the permittee. ***(See Section 6.0 of this report for NYSDEC quarterly form)***

B. MAPS

Attach individual maps.

1. Provide, at minimum, a 1:24,000, scale map that identifies:
   - location of the site
   - topography
   - offsite drainage area
   - bodies of water in the vicinity of the site

   (See Exhibits E.1 through E.4 and Construction Drawings)

2. Provide a 1"=50' to 1"=100' map that shows the **existing** condition of the site including:
   - contour lines
   - drainage area

- structures
- natural resources and vegetative cover
- water bodies, streams perennial and intermittent

(See Exhibits E.1 through E.3 and Construction Drawings)

3. Provide individual map(s) based on the requirement of each component of the SWPPP to show all the above features for the future condition of the site:

- final grading, areas of cuts and fills and change of land cover
- future utility lines, easements, water supply wells, and sewage treatment systems
- locations of off-site material, waste, borrow or equipment storage areas
- points of stormwater discharge, flow patterns and discharges to surface water
- all proposed practices: E&SC, water quality controls
- boundaries of existing predominant vegetation and proposed limits of clearing

(See Exhibits E.4 and construction drawings)

C. PLAN COMPONENTS

The three components of a SWPPP are: Erosion and Sediment Control; Water Quality Control and Quantity Control.

(See Exhibits E.1 through E.4, construction drawings and Section 5.0 of SWMR demonstrate how the three components of the SWPPP are managed)

2.2 EROSION AND SEDIMENT CONTROL DESIGN ELEMENTS BY NYSDEC

A generic E&SC plan may be utilized for minor grading activities associated with small construction activities. Any sites with and approved standard grading plan also require an E&SC plan designed for the site at the same time as the grading plan development. The following describes basic steps in preparing and E&SC plan. A complete set of design specifications and maintenance requirements of all the E&SC practices may be found in the Department's technical standards for erosion and sedimentation control NY Standards for Erosion and Sediment Control.

Follow construction sequence scheduling. The sequence of actions in an E&SC plan is runoff control, stabilization, and then sediment control. The management practices used in each phase of the plan must be identified on the Construction Sequence Schedule and appropriate maps.

Erosion and sediment control provisions should be included for all construction activities where any excavation, stripping, filling, grading or earth movement takes place. Provide dimensional details of proposed practices. The details must include plan and vertical view (cross sectional design) calculations used in sizing and justification for the sizing of selected practices.

(The following Step 1 through 8 should be incorporated into the plan SWPPP package. Step 1 through 8 were incorporated where applicable and are discussed in Sections 3.0 through 6.0 in further detail and depicted in the Construction Drawings package.)

Step 1: Pre-Construction Actions

Resource Protection

- Evaluate, mark and protect important trees and associated rooting zones, wetlands, on-site septic systems absorption fields, etc. ***(See Construction Drawings SWPPP Drawing)***
- Protect existing vegetated areas suitable for filter strips, especially in perimeter areas.

(See Construction Drawings)

Surface Water Protection

- Identify the drainage area in the plan. Divide the site into natural drainage areas.

  (See Exhibits E.3 and E.4)

- Divert the off-site clean runoff from entering disturbed areas. ***(See Construction Drawings)***
- Identify bodies of water located on site or in the vicinity of the site.

  (See Construction Drawings and Exhibits E.3 and E.4)

- Plan appropriate practices to protect on-site or downstream surface water. ***(See Construction Drawings)***

Stabilize Construction Entrance

- Establish a temporary construction entrance to capture mud and debris from construction vehicles before then enter the public highway. ***(See Construction Drawings)***
- Stabilize bare areas (entrances, construction routes, equipment parking areas) immediately as work takes place. Top these areas with gravel or maintain vegetative cover. ***(See Construction Drawings)***
- Sediment tracked onto public streets should be removed or cleaned on a daily basis.

  (See Construction Drawings)

Perimeter Sediment Controls

- Silt fence material and installation comply with the standard drawing and specifications.

  (See Construction Drawings and Section 3.0)

- Install silt fences based on appropriate spacing intervals. Decrease this interval as the slope increases. Silt fence should be placed on or parallel to contours where this is no erosion. The area below the silt fence should be undisturbed ground. ***(See Construction Drawing SWPPP Drawing)***
- Install principal basins after construction site is assessed.

  (See Construction Drawing SWPPP Drawing)

- Install additional sediment traps and barriers as needed during grading.

  (See Construction Drawing SWPPP Drawing)

Step2: Runoff and Drainage Control

Runoff Control

- Install practices after sediment traps are installed and before land grading starts.

  (See Construction Drawings and Section 3.0)

- Control the runoff in each small drainage area before flow reaches runoff from entire site.

  (See Construction Drawings)

- Divert offsite or clean runoff from disturbed areas. ***(See Construction Drawings)***
- Convey surface flows from highly erodible soil and steep slope to more suitable stable area.

  (See Construction Drawings)

- Runoff from existing or proposed cut and fill slopes should be redirected to lower water velocity without causing erosion. ***(See Construction Drawings)***

- Final site drainage should be designed to prevent erosion, concentrated flows to adjacent properties, controlled overflow, and ponding. ***(See Construction Drawings)***

Runoff Conveyance System.

- Stabilize conveyance system. ***(See Construction Drawings)***
- Channels and streambanks need to be seeded at the outlet points. ***(See Construction Drawings)***
- Install check dams to slow down the velocity of concentrated flow. ***(See Construction Drawings)***
- Protect existing natural drainage systems and streams by maintaining vegetative buffers and by implanting other appropriate practices. ***(See Construction Drawings)***

Groundwater Recharge

- Install practices to infiltrate the runoff on the site as much as possible.

  (There is a lack of flat space on the site that will accommodate an infiltration practice.)

- Provide groundwater recharge to maintain the hydrologic regime of the downstream water bodies and simulate predevelopment hydrology.

  (There is a lack of flat space on the site that will accommodate an infiltration practice.)

- Use infiltration practices to prevent concentrate flows.

  (There is a lack of flat space on the site that will accommodate an infiltration practice.)

Outlet Stabilization

- Install practices to prevent erosion and discharge points. ***(See Construction Drawings)***

Step 3: Grading

- Limit the initial clearing and earth disturbance to the minimum necessary to install sediment control measures. Excavation for footings, clearing, or other earth disturbance may only take place after the sediment and erosion controls are installed. ***(See Construction Drawings)***
- Stockpile the topsoil removed from the site. The topsoil should be protected, stabilized and sited in a location away from the storm drains and waterbodies.

  (See Construction Drawings)

- Changed in grade or removal of vegetation should not disturb established buffers and should not be allowed within any regulated distance from wetlands, the high water line of a body of water affected by tidal action, or other such protected zones.

  (Disturbance buffers are proposed along wetland boundaries. See Construction Drawings)

- Avoid disturbance of steep slopes.

  (Slopes have been avoided where possible; areas where slopes are to be disturbed are to be stabilized with a Permanent Erosion Control Mat.)

- An undisturbed buffer should be maintained to control runoff from steep slopes within sensitive areas.

  (No disturbances are proposed within sensitive areas.)

- Proposed grading should not impair existing surface drainage resulting in a potential erosion hazard impacting adjacent land or waterbodies. ***(See Construction Drawings)***

Step 4: Erosion Control (Stabilization)

- Implement erosion control practices to keep the soil in place. ***(See Construction Drawings and Section 3.0)***
- Stabilization should be completed immediately for the surface of all perimeter control and perimeter slopes. ***(See Construction Drawings and Section 3.0 of this report)***
- When activates temporarily cease during construction, soil stockpiles and exposed soil should be stabilized by seed, mulch or other appropriate measures as soon as possible, but in no case more than 14 days after construction activity has ceased. ***(See Construction Drawings and Section 3.0 of this report)***
- Following initial soil disturbance, or re-disturbance, permanent or temporary, stabilization should be completed within 14 days or as soon as possible. ***(See Construction Drawings and Section 3.0 of this report)***
- Apply temporary or permanent stabilization measures immediately on all disturbed areas where work is delayed or completed. ***(See Construction Drawings and Section 3.0 of this report)***
- Consult the local Soil and Water Conservation District for proper timing and application rate of seed, fertilizer and mulch. ***(See Construction Drawings and Section 3.0 of this report)***

Step 5: Sediment Control

- At any location where surface runoff from disturbed or graded areas may flow off the construction area, sediment control measures must be installed to prevent sediment from being transported off site. No grading, filling or other disturbance is allowed within existing drainage swales. ***(See Construction Drawings)***
- Swales or other areas that transport concentrated flow should be appropriately stabilized. ***(See Construction Drawings)***
- Downspout or sump pump discharges must have acceptable outfalls that are protected by splash blocks, sod, or piping as required by site conditions (i.e., no concentrated flow directed over fill slopes) ***(See Construction Drawings)***

Step 6: Maintenance and Inspection

- Identify the type, number and frequency of maintenance actions required for stormwater management and erosion control during construction and for permanent practices that remain on the site once construction is finalized. ***(See Construction Drawings, Section 6.0 of this report and Post Construction Maintenance Plan)***
- Inspection must be indicated on the Construction Sequence Schedule. Inspection must be performed every 7 calendar days and immediately after periods of rainfall greater than 0.5 inch. ***(See Section 6.0 of this report and Exhibit F.3)***
- Inspection must verify that all practices are adequately operational, maintained properly and that sediment is removed from all control structures. ***(See Section 6.0 of this report and Exhibit F)***
- Inspection must look for evidence of the soil erosion on the site, potential of pollutants entering drainage systems, problems at discharge points (such as turbidity in receiving water), and signs of soil and mud transport from the site to the public road at the entrance. ***(See Section 6.0 of this report and Construction Drawings)***
- Routine maintenance must be identified on the schedule and performed on a regular basis and as soon as possible as a problem is identified. ***(See Section 6.0 of this report, Exhibit E and Construction Drawings)***

- Identify the person or entities responsible for conducting the maintenance actions during construction and post-construction. ***(See Section 6.0 of this report, Exhibit F, Post Construction Maintenance Plan and Construction Drawings)***

- Retain a copy of the inspection and quarterly reports on-site with the SWPPP.

  (See Exhibit F for Reports)

Step 7: Finalize Grading & Landscaping

- Identify the final grading and stabilization plan once the construction is completed.

  (See Construction Drawings)

- All open areas, including borrow and spoil areas must be stabilized. ***(See Construction Drawings)***

- Plan a permanent top soil, seed, sod, mulch, riprap or other stabilization practice in the remaining disturbed areas as appropriate. ***(See Construction Drawings)***

- Stabilization must be undertaken no later than 14 days after construction activities has ceased except as noted in the GP-0-08-0001. ***(See Construction Drawings and Section 3.0)***

- Remove the temporary control measures. ***(See Construction Drawings and Section 6.0)***

Step 8: Post Construction Controls

- Identify the permanent structural or non-structural practices that will remain on site. ***(See Construction Drawings and Post Construction Maintenance Plan)***

- Ensure that the permanent structural or non-structural practices utilized during construction are properly designed to suit the post-construction site conditions. ***(See Construction Drawings)***

- In finalizing the plan, evaluate the post-construction runoff condition on site. ***(See Section 5.0 of SWMR)***

- Minimize the risk of concentrated flow and erosion. ***(See Section 5.0 of SWMR)***

- On-site runoff controls help reduce the risk of increased runoff velocity, erosion and point source discharge. In addition to the standard runoff and erosion control practices identified in NY Standards for Erosion and Sediment Control, some of the techniques discussed under on-site runoff control discussion may be applied. ***(See Construction Drawings)***

Steps 1 through 8 are basic instructional guidelines for preparing a SWPPP for pre construction, during construction and post construction activities for a given site. Site characteristics and construction sequencing will impact the amount of work to be preformed. Additional erosion control practices procedures post maintenance practices are included in the following sections.

2.3 SWPPP REQUIREMENTS FOR WATER QUALITY AND WATER QUANTITY CONTROL PLANS

A Water Quality and Water Quantity Control Plan must be designed to meet DEC's required sizing criteria and pollutant removal goals. These criteria are fully presented in the Chapter 4 and Chapter 5 of NYS Stormwater Management Design Manual. The following provides a list of information and calculations required for completing the water quality and quantity components of the SWPPP. The outline of the following place may also be used by those who choose to deviate from DEC's standards.

Water Quality and Quantity Plan Details **(See Section 5.0 of SWMR and Construction Drawings)**

Select stormwater management practices from the list of approved practices in the Chapter 5 of the Design Manual that suit the future condition of the site. Identify a list of selected practices along with a brief description and site information. Location of these practices must also be identified on a map. The SWPPP must provide dimensional details of proposed practices and include summary tables of corresponding calculations for the design of the selected practices. Use Appendix H of the Design Manual for an example checklist for final stormwater management plan preparation.

A. MAPPING REQUIREMENTS:

- Ensure that in addition to the general features identified previously, maps prepared for the site illustrate at a minimum:
  - Existing and proposed topography (minimum of 2-foot contours recommended)
  - Mapping of predominant soils from USDA soil surveys as well as location of any site-specific borehole investigations that may have been performed
  - Location of existing and proposed conveyance systems such as grass channels, swales, and storm drain and flow paths
  - Location of floodplain/floodway limits and relationship of site to upstream and downstream properties and drainages
  - Location and dimensions of proposed channel modifications, such as bridge or culvert crossings
  - Location, size, maintenance access, and limits of disturbance of proposed structural stormwater management practices

(See Exhibits E.3 and E.4 and Construction Drawings for all of the above)

- Prepare representative cross-section and profile drawings and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, etc). Drawings should include:
  - Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)
  - Design water surface elevations
  - Structural details of outlet structures, embankments, spillways, stilling basins, grade control structures, conveyance channels, etc
  - Logs of borehole investigations that may have been performed along with supporting geotechnical report

(See Exhibits E.3 and E.4 and Construction Drawings for all of the above that applies)

B. HYDROLOGIC AND HYDRAULIC ANALYSIS:

Conduct a hydrologic and hydraulic analysis for all structural components of the stormwater system (e.g., storm drains, open channels, swales, management practices, etc.) for applicable design storms. The analysis should include:

- Existing condition analysis for time of concentrations, runoff rates, volumes, velocities, and water surface elevations showing methodologies used and supporting calculations. ***(See Sections 1.0, 3.0 and 5.0 of SWMR and Exhibit A.2)***
- Proposed condition analysis for time of concentrations, runoff rates, volumes, velocities, water surface elevations, and routing showing the methodologies used and supporting calculations. ***(See Sections 1.0, 3.0 and 5.0 of SWMR and Exhibit A.3)***
- Final sizing calculations for structural stormwater management practices including contributing drainage area, storage, and outlet configuration ***(See Sections 1.0, 3.0 and 5.0 of SWMR and Exhibit C.2)***

  Sizing for Water Quality (WQ_V) Control: Size the selected practices base on the 90% rule methodology defined in the Chapter 4 of the Design Manual. Identify the numeric values and provide calculations for:

  $WQ_V=[(P)(R_V)(A)] / 12$

  $R_V = 0.05+0.009I$

  I = Impervious Cover (Percent)

  Minimum $R_V = 0.2$

P = 90% Rainfall Event Number (See figure 4.1)

A = site area in acres

(See Exhibit B for WQv calculations)

Sizing for Water Quantity Controls:

- Channel Protection (CP_V), Default Criterion: CP_V = 24-hour extended detention of post-developed, 1-year, 24-hour event. ***(See Exhibit B and C for WQv calculations)***
- Channel Protection, Options for Sites Larger than 50 Acres: Distributed Runoff Control – geomorphic assessment to determine the bankfull channel characteristics and thresholds for channel stability and bedload movement. ***(See Exhibits B and C for calculations)***
- Sizing for Overbank Flood (Q_p): Control the peak discharge from the 10-year storm to 10-year pre-development rates. ***(See Exhibit C for calculations)***
- Sizing for Extreme Storm (Q_f): Control the peak discharge from the 100-year storm to 100-year pre-development rates. Safely pass the 100-year storm event. ***(See Exhibit C for calculations)***
- Stage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities (e.g., stormwater ponds and wetlands) ***(See Exhibit C)***
- Final analysis of potential downstream impact/effects of project, where necessary ***(n/a for this project)***
- Dam breach analysis, where necessary ***(n/a for this project)***

C. FINALIZE LANDSCAPING

- Final landscaping plans for structural stormwater management practices and any site reforestation or revegetation ***(Topsoil and Seed and buffering landscape along property line)***
- Provide structural calculations and construction specification, where necessary ***(n/a for this project)***

D. MAINTENANCE PLAN

Maintenance plan must include:

- Name, address, and phone number of responsible parties for maintenance
- Description of annual maintenance tasks
- Description of applicable easements
- Description of funding source
- Minimum vegetative cover requirements
- Access and Safety issues
- Testing and disposal of sediments that will likely be necessary
- Evidence of acquisition of all applicable local and non-local permits
- Evidence of acquisition of all necessary legal agreements (e.g., easements, covenants, land trusts)

(Post Construction Maintenance Plan section in report)

2.4 CONSTRUCTION SEQUENCE SCHEDULING

Prepare a schedule for activities during and after construction. Define the sequence of implementing the E&SC and water quality / quantity control practices identified in your SWPPP. This schedule must identify activities during the period prior to soil disturbance through site stabilization. Also identify the inspection and maintenance measures during and after construction. Quantity of practices may be identified by the number of units or any other type of measures identified in the SWPPP. All the planned activities should be marked corresponding maps. A copy of the schedule along with the maps should be available at the construction site.

Type	Activites *(Identify name of planned practices)*	Number *(Quantity)*	Map Symbols	Estimated Start(Date)----End(Date) Pre During Post	Maintenance Actions
1-Pre-Construction Actions	To be determined by Contractor prior to site disturbance				
2- Runoff & Drainage Control					
3- Grading					
4- Erosion Control					
5- Sediment Control					
M6-Maintenance, Inspection & Plan Update					
7- Finalize Grading & Landscaping					
8- Post construction SW Mgmt.					

3.0 CONSTRUCTION EROSION CONTROL PRACTICES

Listed below are the suggested Temporary Erosion Control Devices that may be required for this site above what is indicated on the Erosion Control Plan in the construction drawings. A SWPPP has been provided for the contractor to follow in the Construction Drawing Plan. The SWPPP is a general guideline for the contractor to follow during the course of construction. The site inspector may/can revise the SWPPP as he/she feels necessary to prevent erodable soils form leaving the construction work area. All anticipated Temporary and Permanent Erosion Control measures required for construction of this project have been shown in the "Construction Drawing" documents. Any modifications to the SWPPP during construction shall be subject to engineer review.

The SPDES Permittee will be held responsible for any soil exposure and/or erosion that occurs outside the defined limits of work and haul roads, and will immediately install erosion control measures and stabilize disturbed areas. Furthermore, any fines that could arise as a result of improper implementation of the SWPPP will be the responsibility of the SPDES Permittee.

CONTRACTOR OR OWNER SHALL ENSURE THAT AT LEAST ONE TRAINED NYSDEC CERTIFIED EROSION CONTROL CONTRACTOR IS ON SITE ON A DAILY BASIS WHEN SOIL DISTURBANCE ACTIVITIES ARE BEING PREFORMED.

Siltation Fence (Temporary)

Silt fence shall be installed and maintained to prevent sediment transport until permanent soil stabilization occurs. The anticipated locations for silt fence placement are shown on the plans. Additional Silt fence may be needed as site conditions warrant. The Contractor and Stormwater Management Inspector are encouraged to identify additional placement opportunities as necessary to maintain the highest water quality standards possible. (See Construction Drawings for typical silt fence installation). Silt fence shall be placed parallel to contours and should not be placed in concentrated flows.

Stone Check Dams (Temporary)

Stone Check dams shall be installed and maintained to prevent sediment transport until permanent soil stabilization occurs. The anticipated locations for stone check dam placement are shown on the plans. Additional Stone Check dams may be needed as site conditions warrant. The Contractor and Stormwater Management Inspector are encouraged to identify additional placement opportunities as necessary to maintain the highest water quality standards possible. (See Construction Drawings for typical check dam installation)

Stockpile (Temporary)

Topsoil or any other soil excavated during construction shall stockpile in a suitable area clear from any stormwater drainage course. Silt fence will be used to enclose all stockpile areas. Stockpiles which are inactive for more than 14 days shall be temporary seeded. The temporary stockpile shall be protected with a diversion swale if necessary.

Seed and Mulch (Temporary)

Any disturbed areas that are exposed for than 14 days and not subject to construction traffic will immediately receive temporary seeding. If the season prevents the establishment of the temporary cover the disturbed areas with mulch or straw at rate of 2.0 tons per acre.

Construction Entrance (Temporary)

Construction entrance shall 50 foot long by 24 feet. The construction entrance captures material and debris before construction vehicles leave the project work zone. (See Construction Drawing for construction entrance installation)

Dust Control (Temporary)

Water will be applied at a rate to minimize air born particles from leaving the construction site as instructed by inspector.

4.0 CONSTRUCTION WASTE MANAGEMENT

Waste material generated during site preparation and construction will be disposed of at a suitable landfill.

Clearing and grubbing material will be properly disposed of. Trees, brush and stumps shall not be buried on-site.

Hazardous waste will not be generated or is anticipated as a result of construction. If there are any materials generated, a licensed hazardous carrier will be contracted to dispose of the hazardous material at a suitable site. The SWPPP will need subsequent modification if this occurs.

5.0 SEQUENCE OF CONSTRUCTION

The following sequence of construction is intended to demonstrate the general order of construction activities to ensuring that no off-site degradation will be caused by erosion within the project limits. The sequencing of construction may be modified as field conditions warrant ensuring environmental compliance and good housekeeping.

The general sequence of construction for the project shall be:

1. CONTRACTOR SHALL INSTALL CONSTRUCTION ENTRANCE.
2. CLEAR AREA FOR NEW BUILDING.
3. INSTALL SILT FENCE AND GRUB AREA
4. ROUGH GRADE NEW BUILDING SITE AREA.
5. INSTALL BUILDING UTILITIES, FOUNDATION, CONSTRUCT BUILDING.
6. INSTALL UTILITIES, (STORM, ETC.)
7. INSTALL UNDERGROUND ARRAYS AND HYDRODYANMIC UNITS
8. INSTALL CATCH BASIN INLET PROTECTION
CULVERT RIP RAP PROTECTION AND TEMPORARY STONE CHECK DAM.
9. FINISH GRADE AROUND BUILDING
10. INSTALL SUBBASE, CURBS, SIDEWALKS AND PAVEMENTS.
11. FINNISH GRADE, LANDSCAPED SEED AREA.
12. REMOVE TEMPORARY MEASURE AS ORDER BY WEEKLY STORMWATER INSPECTOR.

Removal of silt fence any other erosion control devices can occur once seed has permanently stabilized area and/or instructed by the qualified erosion control/stormwater pollution prevention representative.

6.0 EROSION CONTROL MAINTENANCE DURING CONSTRUCTION

A certified/qualified inspector shall inspect the site at least once every (7) calendar days. The qualified inspector shall make modifications to the SWPPP as he/she feels the site conditions warrant. The qualified inspector shall complete weekly, monthly and quarterly reports as required by NYSDEC. Weekly, monthly, and quarterly reports can be found in Exhibit F.4. Maintenance of erosion control devices shall follow the recommendations set forth in the "New York Standards and Specifications for Erosion and Sediment Controls" dated August 2005, commonly know as the "Blue Book". The Contractor must maintain a record of the inspections in a site logbook. The logbook shall be maintained onsite and be made available to authorities upon request.

7.0 GENERAL PERMIT (GP 0-15-002) INFORMATIONS

7.1 HISTORICAL PLACES

Stormwater discharge from the site does affect listed or eligible for listing on State or National Register of Historic Places based upon the GIS information obtained from NYS Office of Parks, Recreation and Historic Perseveration (OPRHP) website. See attached map.

7.2 ENDANGER SPECIES

Stormwater discharge from the site does not affect listed, endangered or threaten species based upon the GIS information obtained from NYSDEC Environmental Resource Map.

7.3 NOTICE OF INTENT

Application for a SPDES discharge permit is deemed not necessary for the proposed project as it is part of Albany CSO system.

Exhibits

Exhibit F – Stormwater Pollution Prevention Plan (SWPPP)

.1 Construction Site Log Book

.2 NYSOPRHP and DEC Maps

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

CONSTRUCTION SITE LOG BOOK

TABLE OF CONTENTS

1. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name _____

GP-0-08-001 Permit No._____ **Date of Authorization**_____

Name of Operator _____

General Contractor _____

The Following Information To Be Read By All Person.s Involved in The Construction of Stormwater Related Activities:

Site Assessment and Inspections –

a. The Operator agrees to have a qualified professional[1] conduct an assessment of the site prior to the commencement of construction and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction. Following the commencement of construction, site inspections shall be conducted by the qualified professional at least every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater.

b. The Operator shall maintain a record of all inspection reports in this site log book. The site log book shall be maintained on site and be made available to the permitting authorities upon request. Prior to the commencement of construction[2], the Operator shall certify in the site log book that the SWPPP, prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements. The Operator shall post at the site, in a publicly-accessible location, a summary of the site inspection activities on a monthly basis.

c. Prior to filing of the Notice of Termination or the end of permit term, the Operator shall have the qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed.

[1] "Qualified Professional means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed engineer or someone working under the direction and supervision of a licensed engineer (person must have experience in the principles and practices of erosion and sediment control). Certified Professional in Erosion and Sediment Control (CPESC), or soil scientist.

[2] "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.

[3] "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

2. OPERATOR'S CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal State and local erosion and sediment control requirements. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law. "

Name (please print)

Title: _____

Date: _____

Address: _____

Phone: _____

Email: _____

3. PRE-CONSTRUCTION SITE ASSESSMENT FORM

Inspector (print name) _____ **Date of Inspection** _____

Qualified Professional (print name) _____ **Qualified Professional Signature** _____

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the following forms is accurate and complete.

NOTE: Provide comments below as necessary

a. Notice of Intent, SWPPP, and Contractors. Certification:

Y N NA

[ ][ ][ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ][ ][ ] Is the SWPPP on-site? Where?_____
[ ][ ][ ] Is the Plan current? What is the latest revision date?_____
[ ][ ][ ] Have all contractors involved with implementing the erosion and sediment control portions of the SWPPP signed the contractor's certification?

b. Resource Protection

Y N NA

[ ][ ][ ] Are construction limits clearly flagged or fenced?
[ ][ ][ ] Important trees and associated rooting zones, on-site septic systems absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, etc. have been flagged for protection.
[ ][ ][ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

c. Surface Water Protection

Y N NA

[ ][ ][ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ][ ][ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ][ ][ ] Appropriate practices to protect on-site or downstream surface water are installed.

d. Stabilized Construction Entrance

Y N NA

[ ][ ][ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ][ ][ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ][ ][ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

e. Perimeter Sediment Controls

Y N NA

[ ][ ][ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ][ ][ ] Silt fences are installed at appropriate spacing intervals
[ ][ ][ ] Sediment/detention basin was installed as first land disturbing activity.
[ ][ ][ ] Sediment traps and barriers are installed.

4. CONSTRUCTION DURATION INSPECTIONS

These Inspection Forms will be filled out during the entire construction phase of the project.

_____ _____

Inspector (print name) **Date of Inspection**

_____ _____

Qualified Professional (print name) **Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Check one of the following:

Weekly Inspection or, **Rain Event Inspection** (greater than 0.5 inches in 24 hour period)

☐ **Weekly Inspection or,** ☐ **Rain Event Inspection** (greater than 0.5 inches in 24 hrs)
Date of Rain Event _____ **Amount of Rain** ____ **in.**

On a plan/sketch below that represents the project area, or on an attached site map:
1.Indicate the extent of all disturbed site areas and drainage pathways;
2.Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;
3.Indicate all areas of the site that have undergone temporary or permanent stabilization;
4.Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

SITE PLAN/SKETCH

Time on site _____ AM/PM

Time off site _____ AM/PM

Weather _____

Temp _____ °F

Photos Taken _____

Comments:

Contractor Signature _____ Date _____

General Housekeeping

Y N NA

[ ] [ ] [ ] Is there an increase in turbidity that will cause a substantial visible contrast to natural conditions?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

Temporary Stream Crossing

Y N NA

[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] 20 feet minimum approach length, minimum 6 inch depth of rock, 18 inch maximum fill depth over pipes.
[ ] [ ] [ ] Installed diversion dike/swale through both approaches 50 feet (max) from top of bank.
[ ] [ ] [ ] Fill composed of clean shot rock or KTC Class III channel lining.
[ ] [ ] [ ] Rock clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Excavation Dewatering

Y N NA

[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

Vegetative Filter Strips

Y N NA

[ ] [ ] [ ] Vegetation is dense and there are no signs of erosion.
[ ] [ ] [ ] Width of filter strip is per the approved plan.
[ ] [ ] [ ] Ground slope of filter strip is between 1% and 5%.

Level Spreader

Y N NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

Interceptor Dikes and Swales

Y N NA

[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

Sediment Control

Y N NA

[ ] [ ] [ ] Sediment control practices are located and installed correctly.
[ ] [ ] [ ] BMPs are maintained per specifications
[ ] [ ] [ ] Stockpiles are stabilized and contained.
[ ] [ ] [ ] De-watering operations prevent direct discharges to sensitive features.
[ ] [ ] [ ] Construction Schedule—Are clearing and grading operations divided into stages for

large areas (i.e. greater than 2 acres), as opposed to mass grading? (NOTE: If staged, erosion control measures may also need to be staged.)

Adverse Impacts or Off-Site Degradation

Y N NA

[ ] [ ] [ ] Work is within the limits of the approved plans, including clearing and blasting.
[ ] [ ] [ ] Adverse impacts – ponds, streams, wetlands and sinkholes are free of sediment from site.
[ ] [ ] [ ] Off-site degradation - sediment is kept out of roadways, adjacent property, storm sewers, or air (dust).

Stabilized Construction Entrance

Y N NA

[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

Reinforced Silt Fence

Y N NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Installed steel posts, downstream side of flow, maximum 6 foot intervals with 6 x 6 inch 14 gage wire.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
[ ] [ ] [ ] Sediment accumulation is ___% of design capacity.

Stone Check Dam

Y N NA

[ ] [ ] [ ] Channel is without erosion (i.e., flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (i.e., rocks have not been displaced and no permanent pools behind the structure).
[ ] [ ] [ ] Sediment accumulation is ___% of design capacity.

Block and Gravel Drop Inlet Protection

Y N NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Sediment accumulation ___% of design capacity.

Filter Fabric (Drop) Inlet Protection

Y N NA

[ ] [ ] [ ] Installed 2-inch x 4-inch wood frame and wood posts, with maximum 3-foot spacing.
[ ] [ ] [ ] Filter fabric buried a minimum of 8 inches and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
[ ] [ ] [ ] Sediment accumulation is ___% of design capacity.

Excavated Drop Inlet Protection

Y N NA

[ ] [ ] [ ] Excavated depth is a minimum 1-foot, but no more that 2-feet maximum.
[ ] [ ] [ ] Gravel supported by hardware cloth to allow drainage and restrict sediment movement.

[ ] [ ] [ ] Excavated side slopes should be 2:1.

Temporary Sediment Trap

Y N NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
[ ] [ ] [ ] Sediment accumulation is ___% of design capacity.

Temporary Sediment Basin

Y N NA

[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Sediment accumulation is ___% of design capacity
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.

MODIFICATIONS TO THE SWPPP

Modification & Reason:

5. MONITORING, REPORTING AND THREE MONTH STATUS REPORTS

A. The NYSDEC may, at its sole discretion, require monitoring of discharge(s) from the permitted construction activity after notifying the Operator in writing of the basis for such monitoring, the parameters and frequency at which monitoring shall occur and the associated reporting requirements, if any.

B. The Operator shall also prepare a written summary of its status with respect to compliance with this general permit at a minimum frequency of every three months during which coverage under this permit exists. The summary should address the status of achieving each component of the SWPPP . This summary shall be handled according to Permit requirements.

6. FINAL STABILZATION AND RETENTION OF RECORDS

A. Qualified Professional Certification -The Operator shall have the qualified professional perform a final site inspection prior to filing the Notice of Termination of the end of the permit term.

Y N NA
[ ][ ][ ] Final site drainage will prevent erosion, concentrated flows to adjacent properties, uncontrolled overflow, and ponding.
[ ][ ][ ] Conveyance systems are stabilized.
[ ][ ][ ] Channels and streambanks are seeded at the outlet points.

"I hereby certify that the site has undergone final stabilization. Final Stabilization means that all soil disturbing activities have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures. Further, all temporary erosion and sediment controls (such as silt fence) not specified for permanent erosion control have been removed.

Name of Qualified Professional:_____
Signature:_____

B Retention of Records - The Operator shall retain copies of SWPPPs and any reports submitted in conjunction with this permit, and records of all data used to complete the NOI to be covered by this permit, for a period of at least three years from the date that the site is finally stabilized. This period may be extended by the Department, in its sole discretion, at any time upon written notification.

C. Maintenance of SWPPP and any reports at the construction site - The Operator shall retain a copy of the SWPPP required by this permit at the construction site from the date of initiation of construction activities to the date of final stabilization.

D. Addresses - Except for the submittal of NOIs and NOTs, all written correspondence under this permit directed to NYSDEC, including the submittal of individual permit applications, shall be sent to the address of the appropriate Department Office.

_____

_____

_____

_____

_____

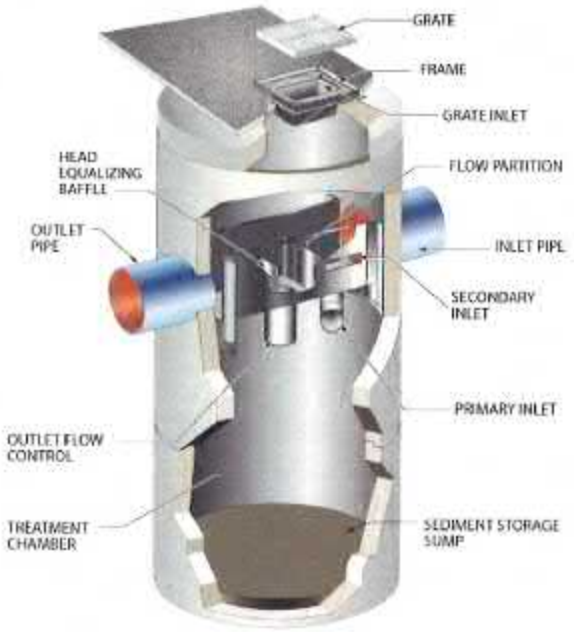
VortSentry® HS

Engineered performance and installation simplicity

The VortSentry HS system employs a helical flow pattern that enhances trapping and containment of pollutants and provides effective removal of settleable solids and floating contaminants from urban runoff.

With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The design of the VortSentry HS minimizes adverse velocities or turbulence in the treatment chamber. This helps to prevent the washout of previously captured pollutants even during peak conditions.

The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofits.



How does it work?

Flows from low intensity storms, which are most frequent, are directed into the treatment chamber through the primary inlet. The tangentially oriented downward pipe induces a swirling motion in the treatment chamber that increases capture and containment abilities. Moderate storm flows are directed into the treatment chamber through the secondary inlet, which allows for capture of floating trash and debris. The secondary inlet also provides for treatment of higher flows without significantly increasing the velocity or turbulence in the treatment chamber. This allows for a more quiescent separation environment. Settleable solids and floating pollutants are captured and contained in the treatment chamber.

Flow exits the treatment chamber through the outlet flow control, which manages the amount of flow that is treated and helps maintain the helical flow patterns developed within the treatment chamber.

Flows exceeding the system's rated treatment flow are diverted away from the treatment chamber by the flow partition. Internal diversion of high flows eliminates the need for external bypass structures. During bypass, the head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber. This helps prevent re-suspension of previously captured pollutants.

VortSentry HS

- Helical flow pattern enhances trapping and containment of pollutants
- High treatment and bypass capacities
- Compact footprint ideal for congested sites
- Lightweight design easy to install
- Available in both inline and grate inlet configurations
- Quick manufacturing turnaround time

Available Models

		CDS Model	Typical Internal MH Diameter or Equivalent ID[1] ft	m	Typical Depth[2] Below Pipe Invert ft	m	Water Quality Flow[3] 125 µm cfs	L/s	Screen Diameter/Height ft	m	Typical Sump Capacity yd³	m³
Precast**	Inline	CDS2015-4	4	1.2	3.5	1.1	0.7	19.8	2.0/1.5	0.6/0.5	0.5	0.4
		CDS2015	5	1.5	5.2	1.6	0.7	19.8	2.0/1.5	0.6/0.5	1.3	1.0
		CDS2020	5	1.5	5.7	1.7	1.1	31.2	2.0/2.0	0.6/0.6	1.3	1.0
		CDS2025	5	1.5	6.0	1.8	1.6	45.3	2.0/2.5	0.6/0.8	1.3	1.0
		CDS3020	6	1.8	6.2	1.9	2.0	56.6	3.0/2.0	0.9/0.6	2.1	1.6
		CDS3030	6	1.8	7.1	2.2	3.0	85.0	3.0/3.0	0.9/0.9	2.1	1.6
		CDS3035	6	1.8	7.6	2.3	3.8	106.2	3.0/3.5	0.9/1.1	2.1	1.6
		CDS4030	8	2.4	8.6	2.6	4.5	127.4	4.0/3.0	1.2/0.9	5.6	4.3
		CDS4040	8	2.4	9.7	3.0	6.0	169.9	4.0/4.0	1.2/1.2	5.6	4.3
		CDS4045	8	2.4	10.3	3.1	7.5	212.4	4.0/4.5	1.2/1.4	5.6	4.3
	Offline	CDS3020-D	6	1.8	6.2	1.9	2.0	56.6	3.0/2.0	0.9/0.6	2.1	1.6
		CDS3030-DV	6	1.8	6.9	2.1	3.0	85.0	3.0/3.0	0.9/0.9	2.1	1.6
		CDS3030-D	6	1.8	7.1	2.2	3.0	85.0	3.0/3.0	0.9/0.9	2.1	1.6
		CDS3035-D	6	1.8	8.7	2.6	3.8	106.2	3.0/3.5	0.9/1.1	2.1	1.6
		CDS4030-D	7	2.1	8.6	2.6	4.5	127.4	4.0/3.0	1.2/0.9	4.3	3.3
		CDS4040-D	7	2.1	9.6	2.9	6.0	169.9	4.0/4.0	1.2/1.2	4.3	3.3
		CDS4045-D	7	2.1	10.1	3.1	7.5	212.4	4.0/4.5	1.2/1.4	4.3	3.3
		CDS5042-DV	9.5	2.9	9.6	2.9	9.0	254.9	5.0/4.2	1.5/1.3	1.9	1.5
		CDS5640-D	8	2.4	9.5	2.9	9.0	254.9	5.6/4.0	1.7/1.2	5.6	4.3
		CDS5050-DV	9.5	2.9	10.3	3.1	11	311.5	5.0/5.0	1.5/1.5	1.9	1.5
		CDS5653-D	8	2.4	10.9	3.3	14	396.5	5.6/5.3	1.7/1.6	5.6	4.3
		CDS5668-D	8	2.4	12.4	3.8	19	538.1	5.6/6.8	1.7/2.1	5.6	4.3
		CDS5678-D	8	2.4	13.4	4.1	25	708.0	5.6/7.8	1.7/2.4	5.6	4.3
		CDS7070-DV	12	3.7	14	4.3	26	736.3	7.0/7.0	2.1/2.1	3.3	2.5
		CDS10060-DV	17.5	5.3	12	3.7	30	849.6	10.0/6.0	3.0/1.8	5.0 or 10.2	3.8 or 7.8
		CDS10080-DV	17.5	5.3	14	4.3	50	1416.0	10.0/8.0	3.0/2.4	5.0 or 10.2	3.8 or 7.8
		CDS100100-DV	17.5	5.3	16	4.9	64	1812.5	10.0/10.0	3.0/3.0	5.0 or 10.2	3.8 or 7.8
Cast In Place	Offline	CDS150134-DC	22	6.7**	22	6.7**	148	4191.4	15.0/13.4	4.6/4.1	20.4	15.6
		CDS200164-DC	26	7.9**	26	7.9**	270	7646.6	20.0/16.4	6.1/5.0	20.4	15.6
		CDS240160-DC	32	9.8**	25	7.6**	300	8496.2	24.0/16.0	7.3/4.9	20.4	15.6

**Sump Capacities and Depth Below Pipe Invert can vary due to specific site design

1. Structure diameter represents the typical inside dimension of the concrete structure. Offline systems will require additional concrete diversion components.
2. Depth Below Pipe and Sump Capacities can vary to accommodate specific site design.
3. Water Quality Flow is based on 80% removal of a Particle Size Distribution (PSD) having a mean particle size: d50=125-µm, which is a typical PSD gradation characterizing particulate matter (TSS/SSC) in urban rainfall runoff.

Water Quality Flow, Particle Size & Performance Notes:

- 80% removal (Re=80%) performance forecasts of the PSD having a d50=125-µm is derived from controlled tests of a unit equipped with 2400-µm screen. Performance forecasts for specific particle size gradations or d50s=50, 75, 125, 150 & 200-µm are also available. Removal forecasts based on unit evaluations conducted in accordance with the Technology Assessment Protocol - Ecology (TAPE) protocols, Washington Department of Ecology (WASDOE).
- Units can be sized to achieve specific Re performance for peak flow rates for specific Water Quality Flows, over the hydrograph of a Water Quality Storm Event or sized to meet a specific removal on an average basis using accepted probabilistic methods. When sizing based on a specific water quality flow rate, the required flow to be treated should be equal to or less than the listed water quality flow for the selected system.

  Contact our support staff for the most cost effective sizing for your area.

Vortechs Model	Swirl Chamber Diameter		Internal Length		Water Quality Flow[1] cfs / L/s			Peak Treatment Flow[2]		Sediment Storage	
	ft	m	ft	m	50 µm	110 µm	200 µm	cfs	L/s	yd³	m³
1000	3	0.9	9	2.7	0.21/5.9	0.59/16.7	0.98/27.8	1.6	45.3	0.7	0.5
2000	4	1.2	10	3.0	0.36/10.2	1.0/28.3	1.7/48.1	2.8	79.3	1.2	0.9
3000	5	1.5	11	3.4	0.59/16.7	1.7/48.1	2.7/76.5	4.5	127.4	1.8	1.4
4000	6	1.8	12	3.7	0.78/22.1	2.2/62.3	3.7/104.8	6.0	169.9	2.4	1.8
5000	7	2.1	13	4.0	1.1/31.1	3.1/87.8	5.2/147.2	8.5	240.7	3.2	2.4
7000	8	2.4	14	4.3	1.4/39.6	4.1/116.1	6.7/189.7	11.0	311.5	4.0	3.1
9000	9	2.7	15	4.6	1.8/51.0	5.2/147.2	8.5/240.7	14.0	396.4	4.8	3.7
11000	10	3.0	16	4.9	2.3/65.1	6.5/184.1	10.7/303.0	17.5	495.5	5.6	4.3
16000	12	3.7	18	5.5	3.3/93.4	9.3/263.3	15.3/433.2	25.0	707.9	7.1	5.4

1. Water Quality Flow Rates are based on 80% removal for the particle size distributions (PSD) listed above with d50 = 50, 110 & 200-µm. Particle size should be chosen based on anticipated sediment load.
2. Peak Treatment Flow is maximum flow treated for each unit listed. This flow represents an infrequent storm event such as a 10 or 25 yr storm.

Standard Vortechs System depth below invert is 3' for all precast models.

Cast-in-place system are available to treat higher flows. Check with your local representatives for specifications.

VortSentry Model	Swirl Chamber Diameter		Typical Depth Below Invert		Water Quality Flow[1] 110 µm		Max. Size Inlet/Outlet		Sediment Storage	
	ft	m	ft	m	cfs	L/s	in	mm	yd³	m³
VS30*	3	0.9	5.8	1.8	0.26	7.4	12	300	0.8	0.6
VS40	4	1.2	7.0	2.1	0.58	16.4	18	460	1.4	1.1
VS50*	5	1.5	8.0	2.4	1.1	31.1	18	460	2.2	1.7
VS60	6	1.8	8.9	2.7	1.8	51.0	24	600	3.1	2.4
VS70*	7	2.1	9.7	3.0	2.7	76.5	30	750	4.3	3.3
VS80	8	2.4	10.1	3.1	3.9	110.4	36	600	5.6	4.3

* Denotes models may not be manufactured in your area. Check with your local representative for availability.

1. Water Quality Flow is based on 80% removal of a particle size distribution with an average particle size of 110-µm. This flow also represents the maximum flow prior to which bypass occurs.

VortSentry HS Model	Swirl Chamber Diameter		Typical Depth Below Invert		Water Quality Flow[1] 240 µm		Max. Size Inlet/Outlet		Sediment Storage	
	ft	m	ft	m	cfs	L/s	in	mm	yd³	m³
HS36*	3	0.9	5.6	1.7	0.55	15.6	18	460	0.5	0.4
HS48	4	1.2	6.8	2.1	1.2	34.0	24	600	0.9	0.7
HS60*	5	1.5	8.0	2.4	2.2	62.3	30	760	1.5	1.1
HS72	6	1.8	9.2	2.8	3.7	104.8	36	900	2.1	1.6
HS84*	7	2.1	10.4	3.2	5.6	158.6	42	1050	2.8	2.1
HS96	8	2.4	11.5	3.5	8.1	229.4	48	1200	3.7	2.8

* Models may not be manufactured in your area. Check with your local representative for availability.

1. Water Quality Flow is based on 80% removal of a particle size distribution with an average particle size of 240-µm. This flow also represents the maximum flow prior to which bypass occurs.

Notes:
- Systems can be sized based on a water quality flow (e.g. 1 inch storm) or on a net annual basis depending on the local regulatory requirement.
- When sizing based on a water quality storm, the required flow to be treated should be equal or less than the listed water quality flow for the selected system. Systems sized based on a water quality storm are generally more conservatively sized.
- Additional particle size distributions are available for sizing purposes upon request.
- Depth below invert is measured to the inside bottom of the system. This depth can be adjusted to meet specific storage or maintenance requirements.
- Contact our support staff for the most cost effective sizing for your area.

Customer Support

Installation

CONTECH Stormwater Solutions' products are some of the easiest to install in the industry. We provide comprehensive installation drawings, details and instructions, as well as full technical support on every project.

Maintenance

Maintenance of CONTECH Stormwater Solutions products is cost effective, straightforward and efficient. We offer a complete range of engineering planning, design and drawing, and construction services that can be tailored to your specific site needs.

Support

- Drawings and specifications are available at contechstormwater.com.
- Site-specific design support is available from our professional engineering staff engineers.

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PROJECT # 972.21

PROJECT: 526 Central Ave

SUBJECT: Estimated Operation and Maintenance Costs

SHEET # 1 OF: 2 PAGE # 1 OF: 2

MADE BY: JWE DATE: 3/2/2018

CHKD BY: DATE:

REVISED BY: DATE:

CHKD BY: DATE:

Estimated Annual Operation and Maintenance Costs associated with the Stormwater Management Practices (SMP)

Estimated Frequency	Maintenance Item	Unit of Measurement	Unit Cost	Estimated Quantity	Cost	Maintenance Interval (years)	Frequency (per year)	Annual Cost
Annual	Inspection & Report by Qualified Professional	Each	$ 1,500	1	$ 1,500	1	1.00	$ 1,500
	Rain event inspection (3 inches in 24 hr storm)	Each	$ 500	1	$ 500	1	1.00	$ 500
	Clean, Remove and dispose of sediment from Hydrodynamic Units	Lump Sum	$ 2,000	1	$ 2,000	10	1.00	$ 2,000
10-Year [2]	Clean, Remove and dispose of sediment from Closed Drainage System and array	Crew Day	$ 1,500	1	$ 1,500	10	0.10	$ 150
		Disposal	$ 1,500	1	$ 1,500	10	0.10	$ 150
	Repair Private Closed Drainage System	Lump Sum	$ 5,000	1	$ 5,000	10	0.10	$ 500

Subtotal: $ 4,800

Contingency (15%): $ 720

Total: $ 5,520

Estimated Total Annual Cost[3], say: $ 5,500

Notes:
(1) Included in landscaping contract
(2) Detailed maintenance guidelines are provided in NYS Stormwater Management Design Manual and Stormwater Pollution Prevention Plan developed for this project.
(3) Estimated annual costs should be adjusted for inflation, recommend 3% annually. Costs are in 2018 dollars.

PROJECT # 972.21		SHEET # 2 OF: 2	PAGE # 2 OF: 2
		MADE BY:	DATE:
PROJECT: 526 Central Ave		CHKD BY:	DATE:
SUBJECT: Estimated Operation and Maintenance Costs		REVISED BY:	DATE:
Stormwater Management Practices		CHKD BY:	DATE:

Suggested Annual funding, accounting for inflation

Estimated Total Annual Cost: $ 5,520

Year	Inflation Rate			
	2.50%	2.75%	3.00%	4.00%
2018	$ 5,520	$ 5,520	$ 5,520	$ 5,520
2019	$ 5,658	$ 5,672	$ 5,686	$ 5,741
2020	$ 5,799	$ 5,828	$ 5,856	$ 5,970
2021	$ 5,944	$ 5,988	$ 6,032	$ 6,209
2022	$ 6,093	$ 6,153	$ 6,213	$ 6,458
2023	$ 6,245	$ 6,322	$ 6,399	$ 6,716
2024	$ 6,402	$ 6,496	$ 6,591	$ 6,985
2025	$ 6,562	$ 6,674	$ 6,789	$ 7,264
2026	$ 6,726	$ 6,858	$ 6,993	$ 7,555
2027	$ 6,894	$ 7,047	$ 7,202	$ 7,857
2028	$ 7,066	$ 7,240	$ 7,418	$ 8,171
2029	$ 7,243	$ 7,439	$ 7,641	$ 8,498
2030	$ 7,424	$ 7,644	$ 7,870	$ 8,838
2031	$ 7,609	$ 7,854	$ 8,106	$ 9,191
2032	$ 7,800	$ 8,070	$ 8,349	$ 9,559
2033	$ 7,995	$ 8,292	$ 8,600	$ 9,941
2034	$ 8,194	$ 8,520	$ 8,858	$ 10,339
2035	$ 8,399	$ 8,754	$ 9,124	$ 10,752
2036	$ 8,609	$ 8,995	$ 9,397	$ 11,183
2037	$ 8,825	$ 9,243	$ 9,679	$ 11,630
2038	$ 9,045	$ 9,497	$ 9,970	$ 12,095
2039	$ 9,271	$ 9,758	$ 10,269	$ 12,579
2040	$ 9,503	$ 10,026	$ 10,577	$ 13,082
2041	$ 9,741	$ 10,302	$ 10,894	$ 13,605
2042	$ 9,984	$ 10,585	$ 11,221	$ 14,149
2043	$ 10,234	$ 10,876	$ 11,558	$ 14,715
2044	$ 10,490	$ 11,175	$ 11,904	$ 15,304
2045	$ 10,752	$ 11,483	$ 12,262	$ 15,916
2046	$ 11,021	$ 11,799	$ 12,629	$ 16,553
2047	$ 11,296	$ 12,123	$ 13,008	$ 17,215
2048	$ 11,579	$ 12,456	$ 13,398	$ 17,904