Stormwater Management Permit

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

July 11, 2022
***Revised: September 26, 2022**
***Revised: October 11, 2022**

Prepared for:

3P Properties, LLC
665 Church Street
Whitinsville, MA 01588

Prepared by:

Dana F. Perkins, Inc.
1057 East Street
Tewksbury, MA 01876

Submitted To:
Town of Andover ~ Planning Board

Stormwater Management Permit ~ Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

Project Description

The subject property is an existing 86,929 square foot lot located at 43 River Road, assessor's map 126, parcel 4. This is existing lot part of the larger property located at 43 River Road. The subject property is shown as Lot "A" on record plan #11374 recorded at the Essex North Registry of Deeds. The existing site is a vacant wooded lot. There are no existing bordering vegetated wetlands located on site.

The soils on site have been mapped by the National Resource Conservation Service (NRCS) as being comprised of Paxton and Woodbridge Fine Sandy Loam (Hydrologic Group C). Deep-hole soil observations were conducted in July of 2022 by Dana F. Perkins, Inc. The soil observations were consistent with the NRCS mapping. These observations were consistent throughout the test areas. Based on the Massachusetts Stormwater Handbook, sandy loam soils are considered to be part of Hydrologic Group B, both for recharge calculations and infiltration rates. As such, Hydrologic Group B was used to model the existing and proposed conditions.

The Applicant is proposing the construction of a 25,800 SF (footprint) self storage facility (3-story, 77,400 SF total), bituminous concrete parking and driveway areas, associated grading, utilities and stormwater management best-management practices (BMPs). To address the issues of Stormwater Management, the Applicant has proposed best management practices (BMPs), including siltation and sedimentation control, a Contech CDS hydrodynamic separator unit, and two infiltration basins to provide groundwater recharge and detention. All of the stormwater runoff from impervious area on site is proposed to be recharged. The following report shall demonstrate how the applicant intends to comply with the Standards of the Stormwater Management policies.

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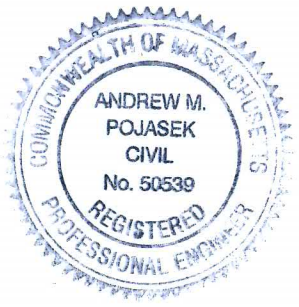
Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-Term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-Term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.



Professional Engineer

Professional Engineer

10/11/22
Date

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Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New Development

LID Measures: Stormwater Standards require LID measures to be considered. Document what sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas ~ *The applicant is proposing no alteration of any Wetland Resource Areas.*

Standard #1: No new untreated discharges:

No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

- No new untreated discharges ~ *All new stormwater outfalls shall only discharge treated stormwater and clean roof runoff. The stormwater shall be recharged through the use of infiltration basins, therefore no erosion shall take place within the wetlands or water of the Commonwealth.*

- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included ~ *Supporting calculations have been included.*

Standard #2: Peak Rate Attenuation

Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm ~ *Hydrological calculations have been provided.*

- Calculations provided to show that post-development peak discharge rates do not exceed predevelopment rates for the 2-year and 10-year 24-hour storms. If evaluations shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm ~ *Hydrological calculations have been provided.*

Standard #3: Recharge to groundwater

Loss of annual recharge to ground water shall be eliminate or minimized through the use of infiltration methods, including environmentally sensitive site design, low impact development techniques, best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

- Soil analysis provided ~ *The soils on site have been mapped by the National Resource Conservation Service (NRCS) as being comprised of Paxton and Woodbridge Fine Sandy Loam and have been field verified to consist of sandy loam soils. Infiltration calculations have been based on the Hydrologic Group "B" group (according to the Massachusetts Stormwater Handbook classifications for sandy loam) requirements and have been attached to this report. Deep-hole observation test pits have also been conducted.*

- Required recharge volume calculation provided ~ *Stormwater runoff from the impervious areas, to the maximum extent practicable, is being proposed to recharge through infiltration basins. The infiltration basins have been designed to infiltrate more than the required recharge volume. Calculations have been included in this report.*

- Sizing the infiltration BMP's is based on the following method: Indicate method used: *Calculations have been included in this report.*

- Runoff from all impervious areas at the site discharging to the infiltration BMP ~ *Runoff from all of the proposed impervious areas on site, to the maximum extent practicable, discharge to an infiltration BMP.*

- Calculations showing that the infiltration BMPs will drain in 72 hours are provided ~ *Calculations have been provided demonstrating that each infiltration BMP will drain in less than 72 hours.*

- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas ~ *Runoff from the paved areas shall first be treated by deep-sump catch basin and CDS hydrodynamic separators before entering the infiltration basins. The infiltration basins will then provide further treatment to the stormwater runoff as it is being infiltrated into the ground. There are no nearby wetland resource areas located on the property.*

Standard #4: Water Quality

Stormwater Management systems must be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:

a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained;
b. Stormwater BMPs are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
c. Pre-treatment is provided in accordance with the Massachusetts Stormwater Handbook.

- A Long-Term Pollution Prevention Plan is attached to the Stormwater Report and is included as an attachment to the Wetlands Notice of Intent ~ *A Long-Term Pollution Prevention Plan is attached to this Stormwater Report .*

- Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge is: Within the Zone II or Interim Wellhead Protection Area ~ *Stormwater BMPs have been proposed to meet the 80% TSS removal requirement. The property is not located in a Zone II. Calculations have been provided.*

- Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided ~ *Calculations documenting TSS removal are included with this report. The property is not located in a Zone II. Pretreatment is provided by deep-sump catch basins and Contech CDS hydrodynamic separator unit. Further treatment is provided by infiltration basins.*

- The BMP is sized (and calculations provided) based on:
  - The equivalent flow rate associated with the water quality volume and documentation is provided showing that the BMP treats the required water quality volume. ~ *The Contech CDS hydrodynamic separator is sized based on flow capacity Calculations have been provided that convert the runoff volume to a 1.0" Equivalent Water Quality Flow rate.*

- The applicant proposed to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. ~ *The applicant is proposing to use Contech CDS hydrodynamic separator units. Documentation has been provided.*

Standard #5: Land Uses with Higher Potential Pollutant Loads

For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt and stormwater runoff, the proponent shall use the specific stormwater BMPs determined by the Department to be suitable for such use as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Water Act, M.G.L. c. 21, ¶ 26-53, and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

- The NPDES Multi-Sector General Permit does *not* cover the land use ~ *It is our opinion that the project does not require the filing of a NPDES Multi-Sector General Permit.*

Standard #6: Critical Areas

Stormwater discharges to a Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or any other critical area require the use of the specific source control and pollution prevention measures and the specific stormwater best management practices determined by the Department to be suitable for managing discharges to such area, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters or Special Resource Waters shall be set back from the receiving water and receive the highest and best practical method of treatment. A "stormwater discharge," as defined in 314 CMR 3.04(2)(a)1. Or (b), to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of the public water supply.

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area ~ *The subject property is not located within a Zone II critical area. Stormwater BMPs have been designed to meet all applicable pretreatment requirements and additional local recharge requirements. Calculations have been provided.*

- Critical areas and BMPs are identified in the Stormwater Report ~ *The subject property is not located within a Zone II critical area. Stormwater BMPs have been designed to meet all applicable pretreatment requirements and additional local recharge requirements. Calculations have been provided.*

Standard #7: Redevelopments and Other Projects Subject to Standards only to the Maximum Extent Practicable.

- *The proposed project is comprised of new development. The entire site had been designed to be in compliance with all Stormwater Management Standards.*

Standard #8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan), must be developed and implemented.

- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report ~ *A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan has been included in the Stormwater Report.*

- The Project is covered by a NPDES Construction General ~ *Construction activities will disturb more than one acre of land and will be covered by an NPDES Construction General Permit. The SWPPP will be submitted prior to construction.*

Standard #9: Operation and Maintenance Plan

A long-term operation and maintenance plan must be developed and implemented to ensure that stormwater management systems function as designed.

- The Post Construction and Maintenance Plan is included in the Stormwater Report ~ *A Long-Term Pollution Prevention Plan has been prepared and included in this report and shall be implemented after construction is complete to ensure the function of the proposed BMPs on site.*

Standard #10: No illicit discharges

All illicit discharges to the stormwater management system are prohibited.

- The Long-Term Pollution Prevention Plan includes measure to prevent illicit discharges ~ *The Long-Term Pollution Prevention Plan incorporates measures to prevent illicit discharges to the stormwater system in the future.*
- No Illicit Discharge Compliance Statement is attached, but will be submitted prior to the discharge of any stormwater to post-construction BMPs ~ *An Illicit Discharge Compliance Statement is attached and must be completed prior to any construction activities taking place on site.*

Stormwater Management Permit ~ Proposed Self Storage Facility
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Andover, Massachusetts

Illicit Discharge Compliance Statement

Illicit discharges shall not be discharged to any Stormwater Management System, prior to, throughout, or after construction. Illicit Discharges include not only wastewater, but also stormwater runoff that has become contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil or grease. An Illicit Discharge **does not** include the following activities: firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

By signing below, I certify to the following:

1. No Illicit Discharges currently exist on site.
2. No Illicit Discharges are proposed on site.
3. I understand the negative impacts that Illicit Discharges could impose upon the Stormwater Management Systems, both existing and/or to be constructed on the property located at **43 River Road ~ Andover, Massachusetts**
4. I have read and understand both the **Construction Period Stormwater Pollution Prevention Plan** and the **Long-Term Stormwater Pollution Prevent Plan** and shall maintain the integrity of their inspection and maintenance procedures.
5. I shall immediately report any Illicit Discharges to the following entities:
    a. Dana F. Perkins, Inc. ~ Engineering Department
    b. Town of Andover ~ Board of Health
    c. Town of Andover ~ Planning & Conservation Department

Sign Name: Denise H. B

Print Name: Denise H. Brookhouse

Date: 9/16/22

Stormwater Management Permit

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

CONSTRUCTION PERIOD
POLLUTION PREVENTION PLAN

Prepared for:

3P Properties, LLC
665 Church Street
Whitinsville, MA 01588

Prepared by:

Dana F. Perkins, Inc.
1057 East Street
Tewksbury, MA 01876

Submitted To:
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Stormwater Management Permit ~ Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

Construction Period Stormwater Pollution Prevention Plan

Index of Materials

Appendices

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts
Construction Period Pollution Prevention Plan

Stormwater Pollution Prevention Plan Certification

I hereby certify, under penalty of law, that this document and all attachments were reviewed by me, and to the best of my knowledge the information submitted is true, accurate, and complete. I am aware that there are significant penalties for knowingly submitting false information including the possibility of fines and imprisonment.

Signed: _____

(must be signed by Company Officer)

Date: _____

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts
Construction Period Pollution Prevention Plan

Contractor Certification

I hereby certify, under penalty of law, that I understand the terms and conditions of the National Pollutant Discharge Elimination System (N.P.D.E.S.) that authorizes the stormwater discharges associated with the construction activities for this particular construction site as identified on this part of the certification.

Signed: _____

Representative of: (name of Construction Company)

_____

Date: _____

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Construction Period Pollution Prevention Plan

Construction / Implementation Checklist

1. Maintain Records of Construction Activities, including:
   - □ Dates when major grading activities occur.
   - □ Dates when construction activities temporarily cease on a portion of the site.
   - □ Dates when construction activities permanently cease on a portion of the site.
   - □ Dates when stabilization measures are initiated on the site.

2. Prepared Inspection Reports summarizing:
   - □ Name of inspector
   - □ Qualifications of inspector
   - □ Measures/areas inspected
   - □ Observed conditions
   - □ Changes necessary to the SWPP

3. Report Releases of Reportable Quantities of Oil or Hazardous Materials (if they occur):
   - □ Notify National Response Center 800-424-8802 immediately
   - □ Notify permitting authoring in writing within 14 days
   - □ Modify the pollution prevention plan to include:
     - the date of release
     - circumstances leading to the release
     - steps taken to prevent reoccurrence of the release

4. Modify Pollution Prevention Plan as necessary to:
   - □ Comply with the minimum permit requirements when notified by EPA that the plan does not comply.
   - □ Address a change in design, construction operation or maintenance which has an effect on the potential for discharge of pollutants.
   - □ Prevent reoccurrence of reportable quantity releases of a hazardous material or oil.

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts
Construction Period Pollution Prevention Plan

Site Description

Project Name: Proposed Self Storage Facility

Project Location: 43 River Road ~ Andover, MA 01810

Latitude & Latitude: 42.6923°, -71.1929°

Applicant Address: 3P Properties, LLC
665 Church Street
Whitinsville, MA 01588

Party Responsible for Implementation of Construction Period S.W.P.P.P. : SITE CONTRACTOR

Approximate Project Area: 86,929 square-feet ±

Total Area of Disturbance: 86,929 square-feet ±

Total Proposed Impervious Area (full site): 55,102 square-feet ±

Proposed Runoff Coefficient: 0.68

Total Area of Wetland Alteration: 0

Total Area of Wetland Restoration: 0

Stormwater Management BMP's Provided:
Deep-Sump Catch Basins, Hydrodynamic separator, Infiltration basins, level spreader

Utilities to be Provided:
Public water, electric, gas, and sewer services

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Construction Period Pollution Prevention Plan

Sequence of Major Construction Activities

1. Install erosion controls as shown on the design plans.
2. Install construction fencing, as necessary.
3. Install crushed stoned apron at the proposed construction entrance.
4. Clear proposed parking areas and building site.
5. Construct proposed self storage building.
6. Preliminary site grading.
7. Install proposed drainage structures and drain lines.
8. Construct infiltration basins.
9. Install proposed utilities to building addition.
10. Finalize building construction.
11. Finalize site grading.
12. Install binder course of bituminous concrete pavement and appropriate curbing.
13. Loam and seed proposed grassed areas
14. Install proposed landscaping (ie. trees, mulched areas, etc.).
15. Install top course of bituminous concrete pavement.
16. Ensure full germination of all seeded areas. Repair any necessary areas.
17. Remove any sediment from all drainage structures.
18. Remove temporary erosion controls after entire site has been properly stabilized.

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Construction Period Pollution Prevention Plan

Implementation and Maintenance of Erosion and Sediment Controls

Temporary Stabilization

Stockpiles of soil materials will be surrounded sediment filtermitt (or straw wattles). Areas of the site that have been stripped of topsoil and are not part of the active construction area for at least 14 days shall be temporarily stabilized with 4,000 pounds per acre of straw mulch.

Permanent Stabilization

Disturbed portions of the site where construction activities permanently cease shall be stabilized with permanent seed, hydroseed, or sod no later than 14 days after the last construction activity.

Stormwater Management

Stormwater Management BMPs shall be inspected weekly during construction. Any accumulated sediment shall be removed and disposed of according to Town of Andover regulations. During construction, sediment filtermitt (or straw wattles) shall be used to the extent practicable to direct stormwater towards pervious areas on-site rather than directly towards Stormwater Management BMPs.

Other Controls

Waste Disposal

Waste Materials: All waste materials including trash and construction debris shall be collected and stored in securely lidded metal dumpsters. Trash and/or construction debris shall not be allowed to remain exposed for any period of time. Metal dumpsters shall be emptied a minimum of once per week or more often as necessary. No construction waste materials shall be buried onsite. All personnel will be instructed regarding the proper procedure for waste disposal. It shall be the responsibility of the general contractor to ensure that these procedures are followed.

Hazardous Waste: All hazardous waste will be disposed of in the manner specified by local and/or State regulation or by the manufacturer. Site personnel will be instructed in these practices and the general contractor shall be responsible for seeing that these procedures are followed.

Sanitary Waste: All sanitary waste will be collected from the portable units as necessary by a licensed sanitary waste management contractor.

Offsite Vehicle Tracking

Dump trucks hauling material to and from the construction site shall be covered by a tarpaulin. A crushed-stone apron shall be constructed at construction site entrance to reduce offsite vehicle tracking.

Proposed Self Storage Facility
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Construction Period Pollution Prevention Plan

Maintenance / Inspection Procedures

The following maintenance and inspection procedures shall be followed so as to ensure proper erosion and sediment control throughout construction.

1. The siltation controls shall be installed prior to conducting any land-disturbing activities.
2. All erosion control measures shall be inspected once per week and following any storm event of 0.5 inches or greater.
3. Should dewatering activities be required, pumped groundwater shall be directed to a dewatering sump prior to discharge to any wetland resource area or stormwater management area.
4. All measures will be maintained in good working order and shall be repaired as necessary throughout construction. If a repair is necessary, it will be initiated within 24 hours of observation.
5. Sediment shall be removed from the erosion controls when it has accumulated to a depth of approximately 6 inches.
6. Any catch basins located immediately downstream from the construction site shall be inspected once per week and following any storm event of 0.5 inches or greater. Any significant sediment accumulation within these catch basins shall be removed within 24 hours of observation.
7. All seeded areas shall be inspected periodically to insure proper germination and adequate coverage and shall be reseeded as necessary. Any washouts shall be promptly repaired, reseeded and mulched.
8. Provide and maintain dumpsters for trash removal. Trash and construction debris shall be picked up daily.
9. The Contractor shall direct surface runoff to unpaved, pervious areas on the site to the maximum extent possible, utilizing temporary straw waddles as required preventing erosion and sedimentation of offsite areas.
10. During construction and installation of the Stormwater Management BMPs, care should be taken to minimize any sediment intrusion into these systems. Any significant sediment accumulation within these systems shall be removed within 24 hours of observation.
11. The Contractor shall make every effort to minimize the amount of impervious pavement area tributary to the drainage system and Stormwater Management BMPs until the site has been stabilized. The Contractor shall continue to direct surface runoff to unpaved areas as noted above.
12. Catch basins shall be inspected inspected once per week and following any storm event of 0.5 inches or greater. Any significant sediment accumulation within these catch basins shall be removed within 24 hours of observation.
13. Contech Separator units shall be inspected and maintained in accordance with guidelines provided by Contech. At a minimum, the Contech units shall be inspected inspected once per week and following any storm event of 0.5 inches or greater. Any significant sediment accumulation within the Contech Unit shall be removed within 24 hours of observation.
14. The vain drain shall be inspected inspected once per week and following any storm event of 0.5 inches or greater. Any significant sediment accumulation within the vain drain shall be removed within 24 hours of observation.
15. The infiltration basins shall be inspected inspected once per week and following any storm event of 0.5 inches or greater. Any debris, sediment, or other material shall be removed as needed and disposed of properly.
16. The level spreader shall be inspected inspected once per week and following any storm event of 0.5 inches or greater. Any debris, sediment, or other material shall be removed as needed and disposed of properly.

17. A maintenance inspection report will be made after each inspection during construction. A copy of the report form to be completed by the inspector is attached. These reports shall be compiled and kept on site during construction. They shall be retained by the contractor for a period of 3 years.

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Construction Period Pollution Prevention Plan

Non-Stormwater Discharges

It is expected that the following non-stormwater discharges may occur from the site during the construction period.

1. Firefighting activities
2. Water from water line flushings
3. Landscape irrigation
4. Potable water sources
5. Foundation drains
6. Air conditioning condensation
7. Footing drains
8. Individual car washing
9. Flows from riparian habitats and wetlands
10. Dechlorinated water from swimming pools
11. Building wash waters from residential buildings without detergents.
12. Pavement wash waters (where no spills or leaks of toxic or hazardous materials have occurred).
13. Uncontaminated groundwater (from dewatering excavation).

All of the above non-stormwater discharges will be directed to the pervious areas on site.

No other illicit discharges shall be permitted to discharge on site at any time. Suspected illicit discharges shall be reported to the Site Contractor immediately.

Inventory for Pollution Prevention Plan

The materials or substances listed below are expected to be present onsite during construction:

- Asphalt
- Gravel and various sized stones
- Poly-vinyl chloride piping (sewage disposal)
- Polyethylene piping (drainage)
- Copper piping (domestic water)
- Petroleum Based Products
- Fertilizer

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Construction Period Pollution Prevention Plan

Spill Prevention

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Good Housekeeping

The following good housekeeping practices shall be followed onsite during construction:

- An effort will be made to store only enough product as required
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers
- Product will be kept in their original containers with the original manufacturer's label
- Substances will not be mixed with one another except as required by the manufacturer
- Whenever possible, all of a product will be used up before disposing of the container
- Materials shall be disposed of as recommended by the manufacturer.
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite

Hazardous Materials

The following practices shall be used to reduce the risks associated with hazardous materials:

- Products will be kept in original containers unless they are not resealable
- Original labels and material safety data will be retained
- If surplus product must be disposed of, manufacturer's or local and State recommended methods for proper disposal must be followed.

Product Specific Practices

The following product specific practices will be followed onsite:

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations.

Fertilizers

Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be working into the soil to limit exposure to stormwater runoff. Fertilizer shall be stored in a covered shed to prevent exposure the rain and stormwater runoff. The contents of any partially used bags of fertilizer shall be stored in sealable plastic bins to avoid spills.

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Spill Prevention (continued)

Paints

All containers of paint shall be tightly sealed and stored when not in use. Excess paint shall not be discharged to the stormwater drainage system but will be properly disposed of according to the manufacturer's instructions and/or State and local regulations.

Concrete Trucks

Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

Spill Control Practices

In addition to the good housekeeping and material management practices previously discussed, the following practices will be followed for spill prevention and cleanup;

- Manufacturer's recommended methods of spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include, but are not limited to: brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up if another spill occurs. A description of the spill, what caused it, and the cleanup measures will also be included.
- The site superintendent responsible for the day-to-day operations will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite.

Stormwater Management Permit

Proposed Self Storage Facility
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Andover, Massachusetts

Appendix A

Inspection Reports

Proposed Self Storage Facility ~ 43 River Road
Construction Period Pollution Prevention Plan

Inspection and Maintenance Report Form

Inspector: _____ Date: _____

Inspector Qualifications: _____

Days since last rainfall: _____ Amount of Last Rainfall: _____

Area	Date Since Last Disturbance	Method of Stabilization	Stabilized? (yes/no)	Condition

Stabilization Required: _____

To be performed by: _____ On or before: _____

Inspections to be completed every 7 days and within 24 hours of a rainfall even of 0.5 inches or more

Proposed Self Storage Facility ~ 43 River Road
Construction Period Pollution Prevention Plan

Inspector:			Date:	
Inspector Qualifications:				
Days since last rainfall:			Amount of Last Rainfall:	
Condition of Sediment Filtermitt:				
(straw wattles)				
Condition of Mulched Areas:				
Condition of Grassed Areas:				
Condition of Slopes Onsite:				
Does sediment get tracked onto adjacent roadways?				
Other observations:				
Catch Basins				
Contech Unit				
Infiltration Basin				
Vain Drain				
Level Spreader				
Maintenance Required:				
Inspections to be completed every 7 days and within 24 hours of				
a rainfall even of 0.5 inches or more				
To be performed by:			On or before:	

Stormwater Management Permit

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

LONG - TERM
POLLUTION PREVENTION PLAN

Prepared for:

3P Properties, LLC
665 Church Street
Whitinsville, MA 01588

Prepared by:

Dana F. Perkins, Inc.
1057 East Street
Tewksbury, MA 01876

Submitted To:
Town of Andover ~ Planning Board

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts
Long-Term Pollution Prevention Plan

Site Description

Project Name: Proposed Self Storage Facility

Project Location: 43 River Road ~ Andover, MA 01810

Latitude & Latitude: 42.6923°, -71.1929°

Applicant Address: 3P Properties, LLC
665 Church Street
Whitinsville, MA 01588

Party Responsible for Implementation of Construction Period S.W.P.P.P. : Property Owner*

***Future owners to be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance per MSH Volume 1, Chapter 1**

Current Property Owner contact information : Dirk Koopman
(508) 889-7045

Operation and Maintenance Budget: $5,000 - $10,000 for the first year
(Budget requirements to be assessed, and adjusted as necessary, at the completion of the first year)

Name of Receiving Water: All impervious areas are to be directed towards the proposed infiltration basins and recharged back into the ground.

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts
Long-Term Pollution Prevention Plan

Maintenance / Inspection Procedures

The following maintenance and inspection procedures shall be followed so as to ensure proper erosion and sediment control after construction is complete and the site has become completely stabilized:

1. Inspect all embankments for erosion. Any washed out areas must be repaired, then loamed, seeded and mulched, as necessary.
2. Paved areas shall be monitored on a perpetual basis. Trash and any foreign debris shall be removed upon inspection.
3. Paved areas shall be swept at least twice per year, especially in late April or early May after the winter sanding season.
4. Any permanent dumpster(s) on site shall be fence in, covered at all times, and shall be emptied regularly.
5. Any observed litter or debris should be removed from the stormwater management areas upon observation.
6. Catch basins shall be inspected at least four times per year. Sediment shall be removed from the catch basins on a minimum annual basis, or when it has accumulated to within 2-feet of the outlet pipe elevation (sump at 50% capacity)
7. Contech Separator units shall be inspected and maintained in accordance with guidelines provided by Contech. At a minimum, the Contech units shall be inspected at least two times per year, and sediments should be removed on an annual basis, or when the depth of deposits are greater than, or equal to, half the sump depth.
8. The vain drain shall be inspected at least two times per year and cleaned out as necessary. Any debris, sediment, or other material shall be removed as needed and disposed of properly.
9. The infiltration basins shall be inspected at least two times per year. Any debris, sediment, or other material shall be removed as needed and disposed of properly.
10. The level spreader shall be inspected at least two times per year. Any debris, sediment, or other material shall be removed as needed and disposed of properly.
11. Inspection reports shall be prepared and compiled for reference.

Long-Term Pollution Prevention Plan Site Inspection Report

General Information			
Project Name	Proposed Self Storage Facility		
Location	43 River Road, Andover, Massachusetts		
Date of Inspection		**Start/End Time**	
Inspector's Name(s) **Contact Number**			

	BMP/activity	Inspection Completed	Maintenance Required?	Corrective Action Needed and Notes
1	Inspect all embankments for erosion.	☐Yes ☐No	☐Yes ☐No	
2	The street shall be swept.	☐Yes ☐No	☐Yes ☐No	
3	Inspect catch basins	☐Yes ☐No	☐Yes ☐No	
4	Inspect CDS Stormceptor Unit	☐Yes ☐No	☐Yes ☐No	
5	Inspect infiltration basins and level spreader.	☐Yes ☐No	☐Yes ☐No	

General Notes

CERTIFICATION STATEMENT

"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. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name:_____

Signature:_____ **Date:**_____

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

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

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

CONTECH
ENGINEERED SOLUTIONS
800.925.5240
www.ContechES.com

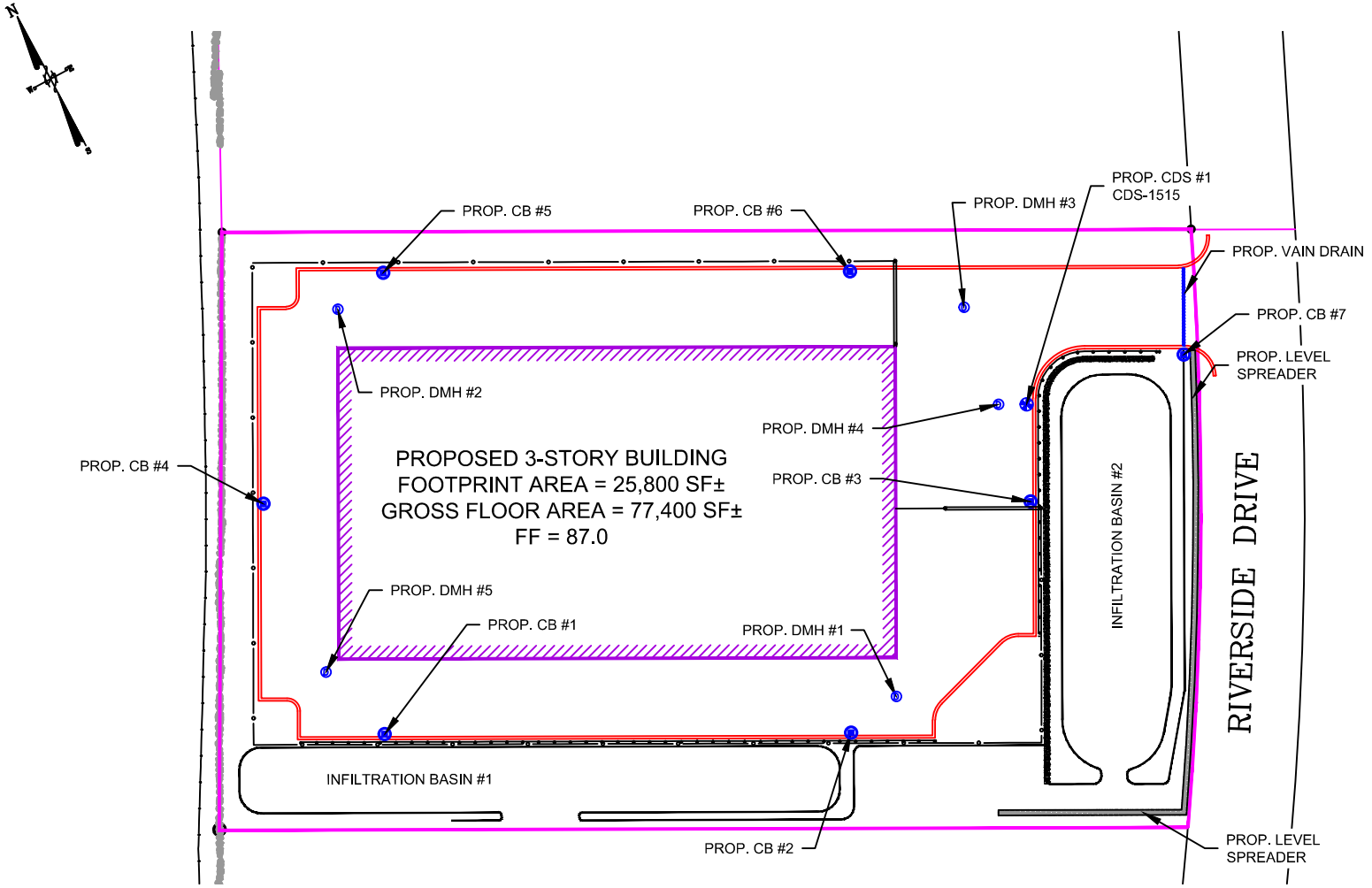
CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.



(IN FEET)
1 inch = 20 ft.

OPERATION & MAINTENANCE
PROPOSED SELF STORAGE FACILITY
43 RIVER ROAD
ANDOVER, MASSACHUSETTS

SCALE: 1" = 20' | DATE: JULY 11, 2022

DANA F. PERKINS, Inc.
Consulting Engineers & Land Surveyors
1037 EAST STREET – TEWKSBURY, MASSACHUSETTS 01876
TEL: 978-858-0990 FAX: 978-640-0237
DANAFPERKINS.COM

PREPARED FOR: 3P PROPERTIES, LLC
665 CHURCH STREET
WHITINSVILLE, MA

JOB NO. 51947 | SHEET 1 OF 1

Stormwater Management Permit

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

Stormwater Management Calculations

Prepared for:

3P Properties, LLC
665 Church Street
Whitinsville, MA 01588

Prepared by:

Dana F. Perkins, Inc.
1057 East Street
Tewksbury, MA 01876

Submitted To:
Town of Andover ~ Planning Board

STORMWATER CALCULATIONS

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

Required Recharge Volume

Total Proposed Impervious Area = 55,102 SF ± ("B" Soils)

Infiltration Standard for "B" Soils = 0.35 inches of runoff

Required Recharge Volume = Impervious Area x Infiltration Standard

Required Volume to Recharge = 55,102 SF x (0.35 IN x 1 FT/12 IN) »» **1,607 CF**

Volume Provided in Infiltration Chambers

Storage volume provided per infiltration basin #1 = 8,254 CF ±

Storage volume provided per infiltration basin #1 = 11,454 CF ±

19,708 CF > 1,607 CF

Water Quality Treatment Volume

The stormwater runoff volume that requires treatment is equal to 1.0" of rainfall over the total new impervious areas. For the purposes of this design, existing impervious areas directed towards the hydrodynamic separator units were included. With the exception of the small area of the proposed driveway closest to River Road, all impervious paved areas are directed towards the hydrodynamic separator units.

Each infiltration basin was designed to store the water quality treatment volume for the amount of impervious area directed towards the system.

Infiltration Basin #1

Impervious area = 25,800 SF

Water quality volume = 1 IN x 1 FT/12 IN x 25,800 SF = 2,150 CF

Water quality volume provided = 8,254 CF > 2,150 CF

Infiltration Basin #2

Impervious area = 29,304 SF

Water quality volume = 1 IN x 1 FT/12 IN x 29,304 SF = 2,442 CF

Water quality volume provided = 11,454 CF > 2,442 CF

The hydrodynamic separator units are sized based on flow capacity of a 1.0" Equivalent Water Quality Flow rate.

WQF = (Qu) x (A) x (WQV)

WQF = Water Quality Flow

Qu = the unit peak discharge in CSM/IN = 795 CSM/IN

A = impervious surface drainage area in square miles

WQV = water quality volume in watershed inches = 1 IN

CDS Unit 1

A = 29,304 SF = 0.00105 MILES²

WQF = 795 CSM/IN x 0.00105 MILES² x 1 IN »» 0.83 CFS

CDS1015 Treatment Capacity = 1.0 CFS > 0.83 CFS

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

PROPOSED SELF STORAGE FACILITY
ANDOVER, MA

Area	**0.67 ac**	Unit Site Designation	**WQU**
Weighted C	**0.9**	Rainfall Station #	**69**
t_c	**6 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.2
0.06	9.4%	29.3%	0.04	0.04	9.0
0.08	7.7%	37.0%	0.05	0.05	7.3
0.10	8.6%	45.6%	0.06	0.06	8.0
0.12	6.3%	51.9%	0.07	0.07	5.8
0.14	4.7%	56.5%	0.08	0.08	4.3
0.16	4.6%	61.2%	0.10	0.10	4.2
0.18	3.5%	64.7%	0.11	0.11	3.2
0.20	4.3%	69.1%	0.12	0.12	3.9
0.25	8.0%	77.1%	0.15	0.15	7.0
0.30	5.6%	82.7%	0.18	0.18	4.7
0.35	4.4%	87.0%	0.21	0.21	3.6
0.40	2.5%	89.5%	0.24	0.24	2.0
0.45	2.5%	92.1%	0.27	0.27	2.0
0.50	1.4%	93.5%	0.30	0.30	1.1
0.75	5.0%	98.5%	0.45	0.45	3.3
1.00	1.0%	99.5%	0.61	0.61	0.6
1.50	0.0%	99.5%	0.91	0.91	0.0
2.00	0.0%	99.5%	1.21	1.00	0.0
3.00	0.5%	100.0%	1.82	1.00	0.1
					88.9
				Removal Efficiency Adjustment[2] =	6.5%
				Predicted % Annual Rainfall Treated =	93.3%
				Predicted Net Annual Load Removal Efficiency =	**82.5%**

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

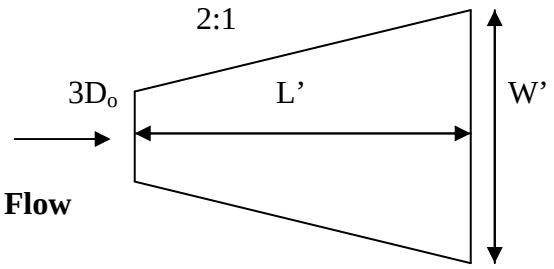
Rip Rap Splash Pad Sizing

Apron Length = $1.7(Q)/(D_0^{3/2}) + 8\ D_0$

Apron Width = $3D_0 + L_a$

D_0=Maximum inside culvert width

L_a=Length of Apron



Stone diameter = $0.02/TW * (Q/D_0)^{4/3}$

TW = tail water, assumed to be 0.3

The stone diameter is calculated to be the median diameter size of rip rap stone (inches).

Outfall	Pipe Diameter (feet)	Q Flow (cfs)	Length (min) (feet)	Width (min) (feet)	Stone Diameter (min) (inches)
FES #1	1	3.57	14.07	17.07	4.36
FES #2	1	0.36	8.61	11.61	0.20
FES #3	1	3.28	13.58	16.58	3.90

*Q Flow is equal to the 25-year flow as calculated through HydroCAD.

** A minimum rip rap stone size of 6" should be utilized

Infiltration BMPs ~ Draw Down Time

Infiltration Rate ("B" Soils) = 1.02 IN/HR = 0.085 FT/HR

Total storage volume provided within the infiltration basin #1 = 8,254 CF

Surface Area for Infiltration Basin #1 = 1,580 SF

Draw Down Rate (CF/HR) = 1580 SF x 0.085 FT/HR »» 134.3 CF/HR

Draw Down Time = 8,254 CF / (134.3 CF/HR) **»» 61.5 hours**

72 hours > 61.5 hours

Total storage volume provided within the infiltration basin #2 = 11,454 CF

Surface Area for Infiltration Basin #2 = 2,286 SF

Draw Down Rate (CF/HR) = 2,286 SF x 0.085 FT/HR »» 194.3 CF/HR

Draw Down Time = 11,454 CF / (194.3 CF/HR) **»» 59.0 hours**

72 hours > 59.0 hours

Phosphorus Reduction Calculations

Proposed Average Annual Distinct Phosphorus (P) Load Export Rates

	P Load Export Rate (lb/ac/yr)*
Impervious (Commercial)	1.78
Pervious (HSG B)	0.12

* Load rates provided by EPA BMP Accounting and Tracking Tool (BATT)

Untreated Proposed Conditions Phosphorus Load by Area

	Proposed Area (ac)	P Load Export Rate (lb/ac/yr) (PLE)	Untreated Project P Load (lb/yr)	Target Reduction(%)*	Target P Load (lb/yr)
Impervious	1.265	1.78	2.25	60	1.35
Pervious	0.731	0.12	0.09	0	0.09
Total	1.996		2.34		1.44

*Town Stormwater Management and Erosion Control Regulations require 60% phosphorus removal from the total post-construction impervious surface area on the site.

Phosphorus Reduction Credits for Selected Enhance Non-Structural BMPs

	Impervious Areas to Catch Basins (ac)	PLE (lb/ac/yr)	Phosphorus Reduction Factor*	Credit
Catch Basin Cleaning	0.673	1.78	2%	0.02

* Phosphorus Reduction Factor provided by EPA BMP Accounting and Tracking Tool (BATT)

Phosphorus Loading to Structural Stormwater BMPs

	Impervious Area (ac)	Pervious Area (ac)	P Load to BMP (lb/yr)
Infiltration Pond #1	0.592	0.167	1.07
Infiltration Pond #2	0.673	0.394	1.25
Total	1.265	0.561	2.32

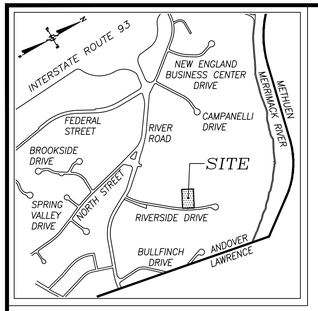
Phosphorus Load Reductions per Structural Stormwater BMP*

	Infiltration Rate (in/hr)	P BMP Efficiency (%)	Removed P Load (lb/yr)
Infiltration Pond #1	1.02	96.2	1.03
Infiltration Pond #2	1.02	96.2	1.20

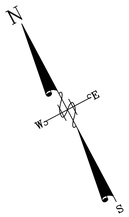
* Phosphorus Load Reductions provided by EPA BMP Accounting and Tracking Tool (BATT)

Phosphorus Load Export Proposed Conditions

Untreated Project P Load (lb/yr)	Non-Structural P Reduction (lb/yr)	Structural P Reduction (lb/yr)	Total P Reduction (lb/yr)	Proposed P Load (lb/yr)	Target P Load (lb/yr)	Target Met
2.34	0.02	2.23	2.25	0.09	1.44	Yes



LOCUS MAP:
NOT TO SCALE



LEGEND:

SYMBOLS AND ABBREVIATIONS SHOWN ON THIS PLAN

CONTOUR	---100---
CHAIN LINK FENCE	——o——
STOCKADE FENCE	——▫——
CATCH BASIN ~ CB	▦ ●
DRAIN MANHOLE ~ DMH	Ⓓ
HYDRANT	
WATER VALVE	WV
FINISH FLOOR ELEVATION	F.F.=100.00
INVERT ELEVATION	INV.=100.00
BITUMINOUS	BIT.
CONCRETE	CONC.
EXISTING	EX.
PROPOSED	PR.
SQUARE FEET	SF
NOW OR FORMERLY	N/F

NOTES:

1. SUBJECT PROPERTY LOCATED ON A PORTION OF THE PROPERTY LOCATED ON ANDOVER ASSESSORS MAP #126, LOT #4. SUBJECT PROPERTY SHOWN AS LOT A ON RECORD PLAN #11374 RECORDED AT THE ESSEX NORTH REGISTRY OF DEEDS.
2. SUBJECT PROPERTY LOCATED IN TOWN OF ANDOVER ZONING DISTRICT "IA" ~ INDUSTRIAL A ZONING DISTRICT.
3. TOPOGRAPHY AND EXISTING CONDITIONS SHOWN HEREON IS THE RESULT OF AN ON-THE-GROUND SURVEY CONDUCTED BY DANA F. PERKINS, INC., IN MAY OF 2022.

DEED REFERENCES:

ESSEX NORTH REGISTRY OF DEEDS
DEED BOOK: 17058 PAGE: 310
PLAN BOOK: PLAN #8302
PLAN BOOK: PLAN #11374

RECORD OWNERS:

3P PROPERTIES, LLC
665 CHURCH STREET
WHITINSVILLE, MA

DEEP-HOLE TEST PIT INFORMATION

TEST No.	DATE TAKEN	GROUND ELEVATION	BOTTOM ELEVATION	TOTAL DEPTH	WATER TABLE**	SOIL CLASSIFICATION	SOIL EVALUATOR
TP1	07/08/22	85.1	79.1	6.0'	79.1	SANDY LOAM	DANA F. PERKINS, INC.
TP2	07/08/22	85.9	79.9	6.0'	79.9	SANDY LOAM	DANA F. PERKINS, INC.
TP3	07/08/22	78.4	72.4	6.0'	72.4	SANDY LOAM	DANA F. PERKINS, INC.
TP4	07/08/22	79.7	74.7	5.0'	74.7	SANDY LOAM	DANA F. PERKINS, INC.

**WATER TABLE ASSUMED TO BE LOCATED AT THE BOTTOM ELEVATION OF THE TEST PIT WHERE NO OBSERVATIONS OF REDOXIMORPHIC FEATURES WERE SEEN.

EXISTING SEWER EASEMENT (SEE PLAN NO. 9362)
N/F
ANDOVER PARK DEVELOPMENT L.P.T.
EXISTING WATER EASEMENT
EXISTING WATER LINE (APPROX. LOCATION)
BOULDERS
EXISTING SEWER LINE
IRON PIPE (FOUND)
S62°09'52"E 373.95'
IRON PIPE (FOUND)
N24°24'07"E 13.00'
N/F
3P PROPERTIES, LLC
43 RIVER ROAD
LOT "A"
MAP: 126 PARCEL: 4
LOT AREA = 86,929 SF±
89x4
79x40
79x54
79x47
N/F
GREATER LAWRENCE REGIONAL VOCATIONAL TECHNICAL HIGH SCHOOL
CHAIN LINK FENCE
STONE WALL
EXISTING 20' WIDE WATER EASEMENT
EXISTING 8" WATER LINE (APPROX. LOCATION)
EXISTING 35' WIDE WATER LINE EASEMENT
ID2
ZONE LINE IA
230.76'
N28°13'49"E
TP1
TP2
TP3
TP4
CONC. DEBRIS PILE
373.60'
N62°09'52"W
N/F
3P PROPERTIES, LLC
RIVERSIDE DRIVE
(40' WIDE - PRIVATE)
EXISTING ELECTRIC LINE (APPROX. LOCATION)
EXISTING GAS LINE (APPROX. LOCATION)
EXISTING 8" WATER LINE (APPROX. LOCATION)
N/F
AETNA REAL ESTATE ASSOC. L.P.
BENCHMARK:
SURVEY NAIL
ELEV.=77.90
N.G.V.D. 1929

DATE	BY	REVISION
9/26/22	AMP	REVISED PER PEER REVIEW COMMENTS

UTILITY STATEMENT:
THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES STATE THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

SOIL TEST PIT PLAN
PROPOSED SELF STORAGE FACILITY
43 RIVER ROAD
ANDOVER, MASSACHUSETTS

SCALE: 1" = 20' | DATE: JULY 11, 2022 | JOB NO. 51947 | SHEET 1 OF 1

DANA F. PERKINS, inc.
Consulting Engineers & Land Surveyors
1057 EAST STREET ~ TEWKSBURY, MASSACHUSETTS 01876
TEL: 978-858-0690 FAX: 978-640-0237
DANAFPERKINS.COM

PREPARED FOR:
3P PROPERTIES, LLC
665 CHURCH STREET
WHITINSVILLE, MA

Commonwealth of Massachusetts
City/Town of Andover

Deep Observation Hole Number: TP-1(Stormwater Management) Surface Elevation: 85.1

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A	10yr 3/2				Sandy Loam	-	-	Structureless	Friable	
4-8	B	2.5Y 6/6				Sandy Loam	-	-	Structureless	Friable	
8-72	C	2.5y 6/3				Sandy Loam	< 15	< 15	Structureless	Friable	

Additional Notes

Commonwealth of Massachusetts
City/Town of Andover

Deep Observation Hole Number: TP-2(Stormwater Management) Surface Elevation: 85.9

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	A	10yr 3/2				Sandy Loam	-	-	Structureless	Friable	
4-12	B	2.5Y 6/6				Sandy Loam	-	-	Structureless	Friable	
12-72	C	2.5y 6/3				Sandy Loam	< 15	< 15	Structureless	Friable	

Additional Notes

Commonwealth of Massachusetts
City/Town of Andover

Deep Observation Hole Number: TP-3(Stormwater Management) Surface Elevation: 78.4

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A	10yr 3/3				Sandy Loam	-	-	Structureless	Friable	
8-72	C	2.5y 6/3				Sandy Loam	< 10	< 10	Structureless	Friable	

Additional Notes

Commonwealth of Massachusetts
City/Town of Andover

Deep Observation Hole Number: TP-4(Stormwater Management) Surface Elevation: 79.7

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8	A	10yr 3/2				Sandy Loam	-	-	Structureless	Friable	
8-60	C	2.5y 7/3				Sandy Loam	< 15	< 15	Structureless	Friable	

Additional Notes

Location: Proposed Self Storage Facility ~ **TSS Treatment Removal**
43 River Road, Andover, MA

TSS Removal Calculation Worksheet

A **BMP**	B **TSS Removal Rate**	C **Starting TSS Load***	D **Amount Removed (BxC)**	E **Remaining Load (C-D)**
Deep-Sump Catch Basin	0.25	1.00*	0.25	0.75
CDS Unit	0.825	0.75	0.62	0.13
Infiltration Basin	0.80	0.13	0.10	0.03
			.	
		TOTAL TSS REMOVAL =	**97%**	

*Equals remaining load from previous BMP (E) which enters the BMP

Project: Proposed Self Storage Facility ~ 43 River Road, Andover, Massachusetts
Prepared By: Dana F. Perkins, Inc.
Date: September 26, 2022

Location: Proposed Self Storage Facility ~ **TSS Treatment Removal**
43 River Road, Andover, MA

TSS Removal Calculation Worksheet

A **BMP**	B **TSS Removal Rate**	C **Starting TSS Load***	D **Amount Removed (BxC)**	E **Remaining Load (C-D)**
Deep-Sump Catch Basin	0.25	1.00*	0.25	0.75
Infiltration Basin #2	0.80	0.75	0.60	0.15
			.	
		TOTAL TSS REMOVAL =	**85%**	

*Equals remaining load from previous BMP (E) which enters the BMP
**Discharge is considered de minimis

Project: Proposed Self Storage Facility ~ 43 River Road, Andover, Massachusetts
Prepared By: Dana F. Perkins, Inc.
Date: September 26, 2022

Stormwater Management Permit

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

Hydrological Analysis

Prepared for:

3P Properties, LLC
43 River Road
Andover, MA 01810

Prepared by:

Dana F. Perkins, Inc.
1057 East Street
Tewksbury, MA 01876

Submitted To:
Town of Andover ~ Planning Board

Stormwater Summary

Pre-development Conditions

The existing conditions stormwater runoff consists of four separate subcatchments. The majority of the existing site is directed towards the southern abutting property. Portions of the existing site are also directed towards the abutting properties to the west and the north. Finally, a small portions of the site is directed towards the Riverside Drive right of way.

Post-development Conditions

The project has been designed to capture and recharge the required recharge volume for post-development stormwater runoff on-site, with overflows directed towards the various existing design points. A HydroCAD report has been included demonstrating that the proposed stormwater system reduces peak rates of runoff below pre-development rates.

Subcatchment #1
Abutting Property to the South (3P Properties, LLC)

Storm	Existing	Proposed	Difference
2-Year (3.12")	0.06 cfs	0.06 cfs	-0.00 cfs
10-Year (4.93")	0.94 cfs	0.47 cfs	-0.47 cfs
25-Year (6.06")	1.72 cfs	0.63 cfs	-1.09 cfs
100-Year (7.80")	3.12 cfs	3.08 cfs	-0.04 cfs

Subcatchment #2
Abutting Property to the West (Greater Lawrence Vocational Technical High School)

Storm	Existing	Proposed	Difference
2-Year (3.12")	0.02 cfs	0.02 cfs	-0.00 cfs
10-Year (4.93")	0.31 cfs	0.04 cfs	-0.41 cfs
25-Year (6.06")	0.58 cfs	0.05 cfs	-0.74 cfs
100-Year (7.80")	1.05 cfs	0.08 cfs	-0.97 cfs

Subcatchment #3
Abutting Property to the North (Andover Park Development, LPT)

Storm	Existing	Proposed	Difference
2-Year (3.12")	0.01 cfs	0.01 cfs	-0.00 cfs
10-Year (4.93")	0.22 cfs	0.03 cfs	-0.19 cfs
25-Year (6.06")	0.40 cfs	0.04 cfs	-0.36 cfs
100-Year (7.80")	0.72 cfs	0.06 cfs	-0.62 cfs

Subcatchment #4- Riverside Drive (ROW)

Storm	Existing	Proposed	Difference
2-Year (3.12")	0.00 cfs	0.00 cfs	-0.00 cfs
10-Year (4.93")	0.05 cfs	0.00 cfs	-0.05 cfs
25-Year (6.06")	0.09 cfs	0.00 cfs	-0.09 cfs
100-Year (7.80")	0.17 cfs	0.00 cfs	-0.17 cfs

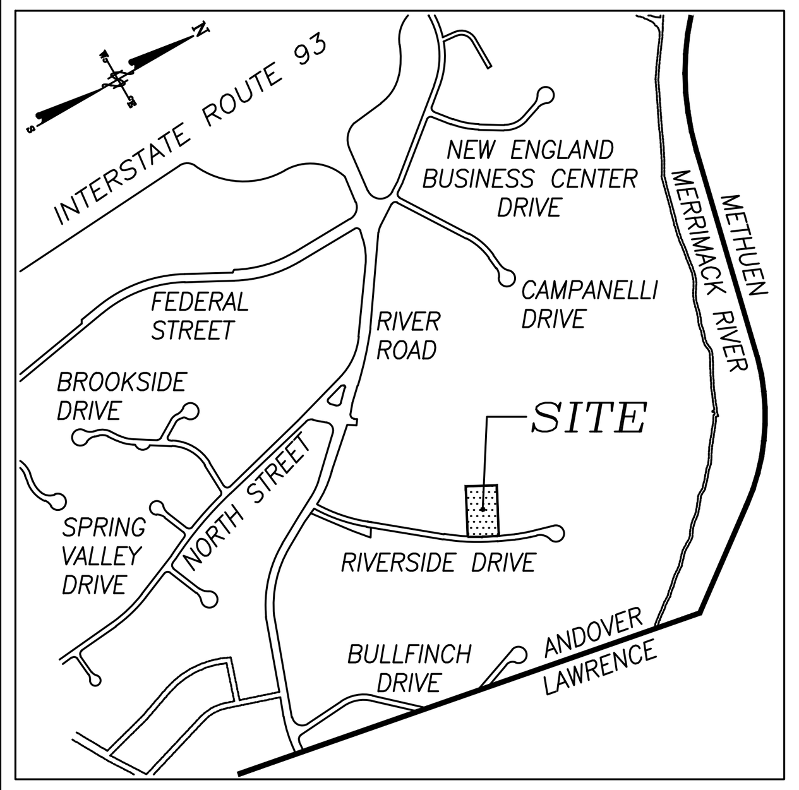
A level spreader has been proposed to capture stormwater heading towards Riverside Drive and outlets towards Subcatchment #1, thus eliminating all stormwater flows towards Riverside Drive.

Infiltration Basin #1

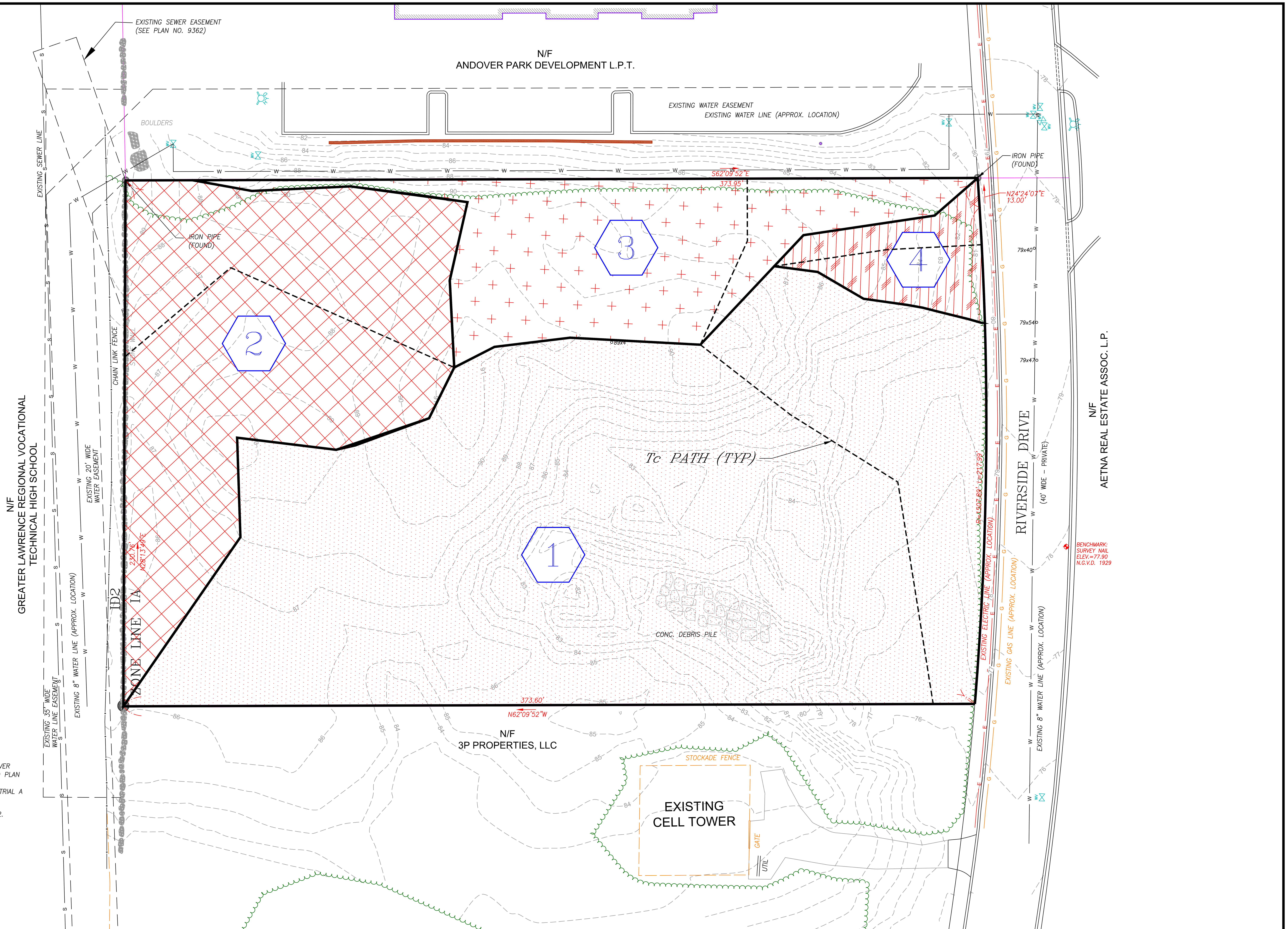
Storm	Peak	Proposed Berm
2-Year (3.12")	84.39	86.50
10-Year (4.93")	85.19	86.50
25-Year (6.06")	85.51	86.50
100-Year (7.80")	85.57	86.50

Infiltration Basin #2

Storm	Peak	Proposed Berm
2-Year (3.12")	78.55	81.25
10-Year (4.93")	79.69	81.25
25-Year (6.06")	80.17	81.25
100-Year (7.80")	80.27	81.25



LOCUS MAP:
NOT TO SCALE



LEGEND:

SYMBOLS AND ABBREVIATIONS SHOWN ON THIS PLAN

CONTOUR	— — —100— — —
CHAIN LINK FENCE	——o——
STOCKADE FENCE	——□——
CATCH BASIN ~ CB	
DRAIN MANHOLE ~ DMH	
HYDRANT	
WATER VALVE	WV
FINISH FLOOR ELEVATION	F.F.=100.00
INVERT ELEVATION	INV.=100.00
BITUMINOUS	BIT.
CONCRETE	CONC.
EXISTING	EX.
PROPOSED	PR.
SQUARE FEET	SF
NOW OR FORMERLY	N/F

NOTES:

1. SUBJECT PROPERTY LOCATED ON A PORTION OF THE PROPERTY LOCATED ON ANDOVER ASSESSORS MAP #126, LOT #4. SUBJECT PROPERTY SHOWN AS LOT A ON RECORD PLAN #11374 RECORDED AT THE ESSEX NORTH REGISTRY OF DEEDS.
2. SUBJECT PROPERTY LOCATED IN TOWN OF ANDOVER ZONING DISTRICT "IA" ~ INDUSTRIAL A ZONING DISTRICT.
3. TOPOGRAPHY AND EXISTING CONDITIONS SHOWN HEREON IS THE RESULT OF AN ON-THE-GROUND SURVEY CONDUCTED BY DANA F. PERKINS, INC., IN MAY OF 2022.

DEED REFERENCES:

ESSEX NORTH REGISTRY OF DEEDS
DEED BOOK: 17058 PAGE: 310
PLAN BOOK: PLAN #8302
PLAN BOOK: PLAN #11374

RECORD OWNERS:

3P PROPERTIES, LLC
665 CHURCH STREET
WHITINSVILLE, MA

DATE	BY	REVISION
9/26/22	AMP	REVISED PER PEER REVIEW COMMENTS

UTILITY STATEMENT:
THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES STATE THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

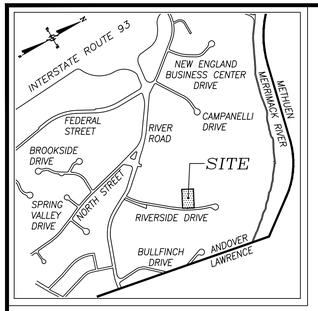
EXISTING DRAINAGE DIVIDE
PROPOSED SELF STORAGE FACILITY
43 RIVER ROAD
ANDOVER, MASSACHUSETTS

SCALE: 1" = 20'
DATE: JULY 11, 2022

DANA F. PERKINS, inc.
Consulting Engineers & Land Surveyors
1057 EAST STREET ~ TEWKSBURY, MASSACHUSETTS 01876
TEL: 978-858-0680 FAX: 978-640-0237
DANAFPERKINS.COM

PREPARED FOR:
3P PROPERTIES, LLC
665 CHURCH STREET
WHITINSVILLE, MA

JOB NO. 51947
SHEET 1 OF 1

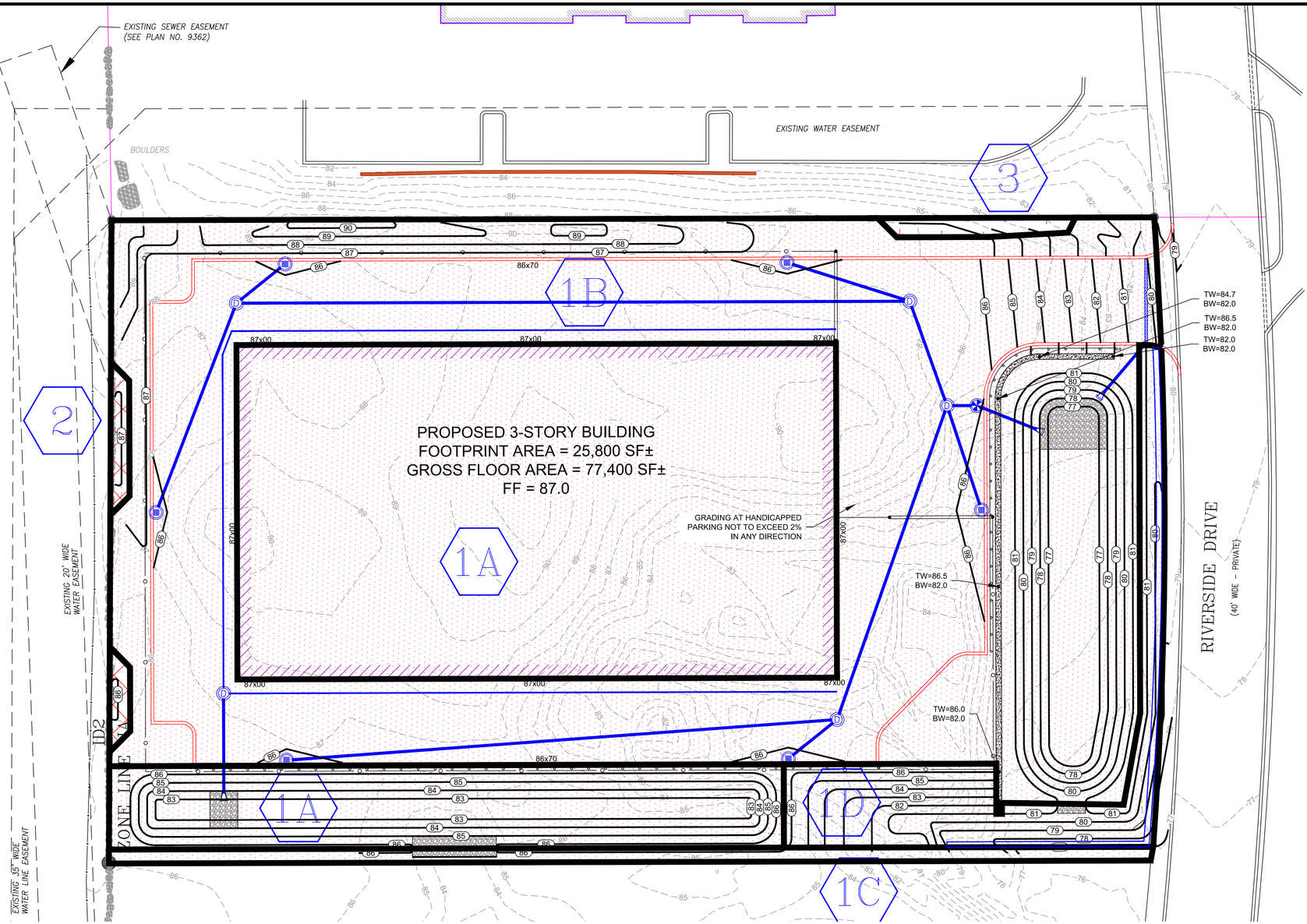


LOCUS MAP:
NOT TO SCALE

LEGEND:

SYMBOLS AND ABBREVIATIONS SHOWN ON THIS PLAN

CONTOUR	100
PROPOSED CONTOUR	100
PROPOSED DRAIN LINE	
PROPOSED CATCH BASIN ~ CB	
PROPOSED DRAIN MANHOLE ~ DMH	D
PROPOSED SPOT ELEVATION	• 100x00
INVERT ELEVATION	INV=100.00
HIGH-DENSITY POLYETHYLENE (PIPE)	HDPE
FINISH FLOOR ELEVATION	F.F.=100.00
BITUMINOUS	BIT.
CONCRETE	CONC.
EXISTING	EX.
PROPOSED	PROP.
SQUARE FEET	SF
TOP OF WALL ELEVATION	TW=100.00
BOTTOM OF WALL ELEVATION	BW=100.00
NOW OR FORMERLY	N/F



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RECORD OWNERS:

3P PROPERTIES, LLC
665 CHURCH STREET
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DATE	BY	REVISION
9/26/22	AMP	REVISED PER PEER REVIEW COMMENTS

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20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

PROPOSED DRAINAGE DIVIDE

PROPOSED SELF STORAGE FACILITY
43 RIVER ROAD
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SCALE: 1" = 20' | DATE: JULY 11, 2022 | JOB NO. 51947 | SHEET 1 OF 1

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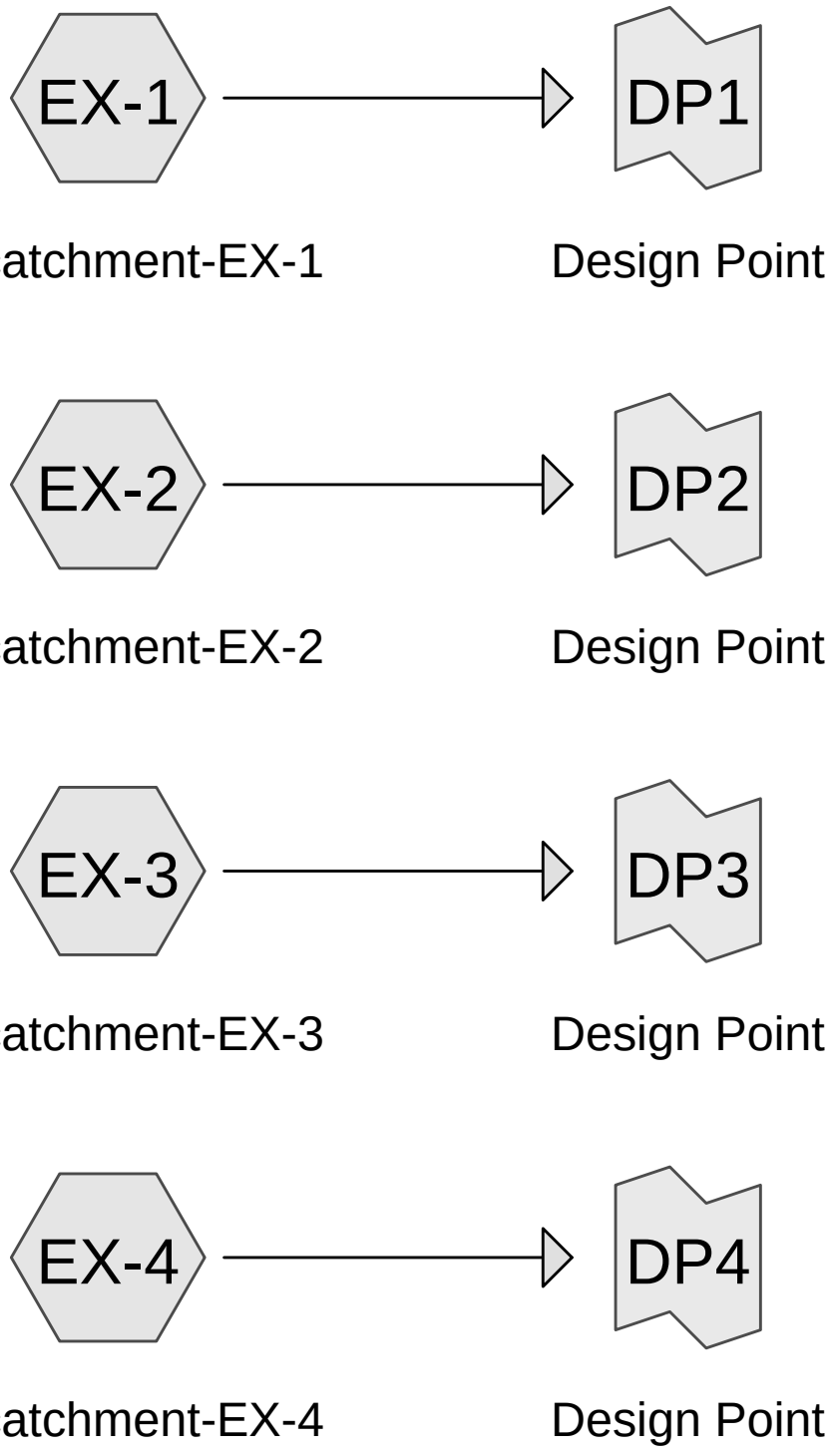


Subcat Reach Pond Link

Routing Diagram for Hydrology
Prepared by Dana F. Perkins, Inc.

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Subcatchment-EX-1 Runoff Area=52,360 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=205' Tc=8.6 min CN=55 Runoff=0.06 cfs 0.023 af

Subcatchment EX-2: Subcatchment-EX-2 Runoff Area=19,809 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=168' Tc=11.4 min CN=55 Runoff=0.02 cfs 0.009 af

Subcatchment EX-3: Subcatchment-EX-3 Runoff Area=11,839 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=77' Tc=8.2 min CN=55 Runoff=0.01 cfs 0.005 af

Subcatchment EX-4: Subcatchment-EX-4 Runoff Area=2,933 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=92' Tc=9.2 min CN=55 Runoff=0.00 cfs 0.001 af

Link DP1: Design Point Inflow=0.06 cfs 0.023 af
Primary=0.06 cfs 0.023 af

Link DP2: Design Point Inflow=0.02 cfs 0.009 af
Primary=0.02 cfs 0.009 af

Link DP3: Design Point Inflow=0.01 cfs 0.005 af
Primary=0.01 cfs 0.005 af

Link DP4: Design Point Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Total Runoff Area = 1.996 ac Runoff Volume = 0.038 af Average Runoff Depth = 0.23"
100.00% Pervious = 1.996 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EX-1: Subcatchment-EX-1

Runoff = 0.06 cfs @ 12.32 hrs, Volume= 0.023 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
52,360	55	Woods, Good, HSG B
52,360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1280	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.6	56	0.0898	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	99	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.6	205	Total			

Summary for Subcatchment EX-2: Subcatchment-EX-2

Runoff = 0.02 cfs @ 12.37 hrs, Volume= 0.009 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
19,809	55	Woods, Good, HSG B
19,809		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
3.6	118	0.0119	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	168	Total			

Summary for Subcatchment EX-3: Subcatchment-EX-3

Runoff = 0.01 cfs @ 12.29 hrs, Volume= 0.005 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
11,839	55	Woods, Good, HSG B
11,839		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.4	27	0.0547	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	77	Total			

Summary for Subcatchment EX-4: Subcatchment-EX-4

Runoff = 0.00 cfs @ 12.34 hrs, Volume= 0.001 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
2,933	55	Woods, Good, HSG B
2,933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.4	42	0.1058	1.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	92	Total			

Summary for Link DP1: Design Point

Inflow Area = 1.202 ac, 0.00% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 0.06 cfs @ 12.32 hrs, Volume= 0.023 af
Primary = 0.06 cfs @ 12.32 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP2: Design Point

Inflow Area = 0.455 ac, 0.00% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 0.02 cfs @ 12.37 hrs, Volume= 0.009 af
Primary = 0.02 cfs @ 12.37 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP3: Design Point

Inflow Area = 0.272 ac, 0.00% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 0.01 cfs @ 12.29 hrs, Volume= 0.005 af
Primary = 0.01 cfs @ 12.29 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP4: Design Point

Inflow Area = 0.067 ac, 0.00% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 0.00 cfs @ 12.34 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 12.34 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Subcatchment-EX-1 Runoff Area=52,360 sf 0.00% Impervious Runoff Depth=0.95"
Flow Length=205' Tc=8.6 min CN=55 Runoff=0.94 cfs 0.095 af

Subcatchment EX-2: Subcatchment-EX-2 Runoff Area=19,809 sf 0.00% Impervious Runoff Depth=0.95"
Flow Length=168' Tc=11.4 min CN=55 Runoff=0.31 cfs 0.036 af

Subcatchment EX-3: Subcatchment-EX-3 Runoff Area=11,839 sf 0.00% Impervious Runoff Depth=0.95"
Flow Length=77' Tc=8.2 min CN=55 Runoff=0.22 cfs 0.021 af

Subcatchment EX-4: Subcatchment-EX-4 Runoff Area=2,933 sf 0.00% Impervious Runoff Depth=0.95"
Flow Length=92' Tc=9.2 min CN=55 Runoff=0.05 cfs 0.005 af

Link DP1: Design Point Inflow=0.94 cfs 0.095 af
Primary=0.94 cfs 0.095 af

Link DP2: Design Point Inflow=0.31 cfs 0.036 af
Primary=0.31 cfs 0.036 af

Link DP3: Design Point Inflow=0.22 cfs 0.021 af
Primary=0.22 cfs 0.021 af

Link DP4: Design Point Inflow=0.05 cfs 0.005 af
Primary=0.05 cfs 0.005 af

Total Runoff Area = 1.996 ac Runoff Volume = 0.157 af Average Runoff Depth = 0.95"
100.00% Pervious = 1.996 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EX-1: Subcatchment-EX-1

Runoff = 0.94 cfs @ 12.17 hrs, Volume= 0.095 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
52,360	55	Woods, Good, HSG B
52,360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1280	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.6	56	0.0898	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	99	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.6	205	Total			

Summary for Subcatchment EX-2: Subcatchment-EX-2

Runoff = 0.31 cfs @ 12.20 hrs, Volume= 0.036 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
19,809	55	Woods, Good, HSG B
19,809		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
3.6	118	0.0119	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	168	Total			

Summary for Subcatchment EX-3: Subcatchment-EX-3

Runoff = 0.22 cfs @ 12.16 hrs, Volume= 0.021 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
11,839	55	Woods, Good, HSG B
11,839		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.4	27	0.0547	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	77	Total			

Summary for Subcatchment EX-4: Subcatchment-EX-4

Runoff = 0.05 cfs @ 12.18 hrs, Volume= 0.005 af, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
2,933	55	Woods, Good, HSG B
2,933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.4	42	0.1058	1.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	92	Total			

Summary for Link DP1: Design Point

Inflow Area = 1.202 ac, 0.00% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 0.94 cfs @ 12.17 hrs, Volume= 0.095 af
Primary = 0.94 cfs @ 12.17 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP2: Design Point

Inflow Area = 0.455 ac, 0.00% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 0.31 cfs @ 12.20 hrs, Volume= 0.036 af
Primary = 0.31 cfs @ 12.20 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP3: Design Point

Inflow Area = 0.272 ac, 0.00% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 0.22 cfs @ 12.16 hrs, Volume= 0.021 af
Primary = 0.22 cfs @ 12.16 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP4: Design Point

Inflow Area = 0.067 ac, 0.00% Impervious, Inflow Depth = 0.95" for 10-Year event
Inflow = 0.05 cfs @ 12.18 hrs, Volume= 0.005 af
Primary = 0.05 cfs @ 12.18 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Subcatchment-EX-1 Runoff Area=52,360 sf 0.00% Impervious Runoff Depth=1.55"
Flow Length=205' Tc=8.6 min CN=55 Runoff=1.72 cfs 0.156 af

Subcatchment EX-2: Subcatchment-EX-2 Runoff Area=19,809 sf 0.00% Impervious Runoff Depth=1.55"
Flow Length=168' Tc=11.4 min CN=55 Runoff=0.58 cfs 0.059 af

Subcatchment EX-3: Subcatchment-EX-3 Runoff Area=11,839 sf 0.00% Impervious Runoff Depth=1.55"
Flow Length=77' Tc=8.2 min CN=55 Runoff=0.40 cfs 0.035 af

Subcatchment EX-4: Subcatchment-EX-4 Runoff Area=2,933 sf 0.00% Impervious Runoff Depth=1.55"
Flow Length=92' Tc=9.2 min CN=55 Runoff=0.09 cfs 0.009 af

Link DP1: Design Point Inflow=1.72 cfs 0.156 af
Primary=1.72 cfs 0.156 af

Link DP2: Design Point Inflow=0.58 cfs 0.059 af
Primary=0.58 cfs 0.059 af

Link DP3: Design Point Inflow=0.40 cfs 0.035 af
Primary=0.40 cfs 0.035 af

Link DP4: Design Point Inflow=0.09 cfs 0.009 af
Primary=0.09 cfs 0.009 af

Total Runoff Area = 1.996 ac Runoff Volume = 0.258 af Average Runoff Depth = 1.55"
100.00% Pervious = 1.996 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EX-1: Subcatchment-EX-1

Runoff = 1.72 cfs @ 12.17 hrs, Volume= 0.156 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
52,360	55	Woods, Good, HSG B
52,360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1280	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.6	56	0.0898	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	99	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.6	205	Total			

Summary for Subcatchment EX-2: Subcatchment-EX-2

Runoff = 0.58 cfs @ 12.20 hrs, Volume= 0.059 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
19,809	55	Woods, Good, HSG B
19,809		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
3.6	118	0.0119	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	168	Total			

Summary for Subcatchment EX-3: Subcatchment-EX-3

Runoff = 0.40 cfs @ 12.16 hrs, Volume= 0.035 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
11,839	55	Woods, Good, HSG B
11,839		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.4	27	0.0547	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	77	Total			

Summary for Subcatchment EX-4: Subcatchment-EX-4

Runoff = 0.09 cfs @ 12.17 hrs, Volume= 0.009 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
2,933	55	Woods, Good, HSG B
2,933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.4	42	0.1058	1.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	92	Total			

Summary for Link DP1: Design Point

Inflow Area = 1.202 ac, 0.00% Impervious, Inflow Depth = 1.55" for 25-Year event
Inflow = 1.72 cfs @ 12.17 hrs, Volume= 0.156 af
Primary = 1.72 cfs @ 12.17 hrs, Volume= 0.156 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP2: Design Point

Inflow Area = 0.455 ac, 0.00% Impervious, Inflow Depth = 1.55" for 25-Year event
Inflow = 0.58 cfs @ 12.20 hrs, Volume= 0.059 af
Primary = 0.58 cfs @ 12.20 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP3: Design Point

Inflow Area = 0.272 ac, 0.00% Impervious, Inflow Depth = 1.55" for 25-Year event
Inflow = 0.40 cfs @ 12.16 hrs, Volume= 0.035 af
Primary = 0.40 cfs @ 12.16 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP4: Design Point

Inflow Area = 0.067 ac, 0.00% Impervious, Inflow Depth = 1.55" for 25-Year event
Inflow = 0.09 cfs @ 12.17 hrs, Volume= 0.009 af
Primary = 0.09 cfs @ 12.17 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-1: Subcatchment-EX-1 Runoff Area=52,360 sf 0.00% Impervious Runoff Depth=2.65"
Flow Length=205' Tc=8.6 min CN=55 Runoff=3.12 cfs 0.265 af

Subcatchment EX-2: Subcatchment-EX-2 Runoff Area=19,809 sf 0.00% Impervious Runoff Depth=2.65"
Flow Length=168' Tc=11.4 min CN=55 Runoff=1.05 cfs 0.100 af

Subcatchment EX-3: Subcatchment-EX-3 Runoff Area=11,839 sf 0.00% Impervious Runoff Depth=2.65"
Flow Length=77' Tc=8.2 min CN=55 Runoff=0.72 cfs 0.060 af

Subcatchment EX-4: Subcatchment-EX-4 Runoff Area=2,933 sf 0.00% Impervious Runoff Depth=2.65"
Flow Length=92' Tc=9.2 min CN=55 Runoff=0.17 cfs 0.015 af

Link DP1: Design Point Inflow=3.12 cfs 0.265 af
Primary=3.12 cfs 0.265 af

Link DP2: Design Point Inflow=1.05 cfs 0.100 af
Primary=1.05 cfs 0.100 af

Link DP3: Design Point Inflow=0.72 cfs 0.060 af
Primary=0.72 cfs 0.060 af

Link DP4: Design Point Inflow=0.17 cfs 0.015 af
Primary=0.17 cfs 0.015 af

Total Runoff Area = 1.996 ac Runoff Volume = 0.440 af Average Runoff Depth = 2.65"
100.00% Pervious = 1.996 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EX-1: Subcatchment-EX-1

Runoff = 3.12 cfs @ 12.16 hrs, Volume= 0.265 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
52,360	55	Woods, Good, HSG B
52,360		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1280	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.6	56	0.0898	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	99	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.6	205	Total			

Summary for Subcatchment EX-2: Subcatchment-EX-2

Runoff = 1.05 cfs @ 12.20 hrs, Volume= 0.100 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
19,809	55	Woods, Good, HSG B
19,809		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
3.6	118	0.0119	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.4	168	Total			

Summary for Subcatchment EX-3: Subcatchment-EX-3

Runoff = 0.72 cfs @ 12.16 hrs, Volume= 0.060 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
11,839	55	Woods, Good, HSG B
11,839		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0640	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.4	27	0.0547	1.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	77	Total			

Summary for Subcatchment EX-4: Subcatchment-EX-4

Runoff = 0.17 cfs @ 12.17 hrs, Volume= 0.015 af, Depth= 2.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
2,933	55	Woods, Good, HSG B
2,933		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0480	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
0.4	42	0.1058	1.63		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	92	Total			

Summary for Link DP1: Design Point

Inflow Area = 1.202 ac, 0.00% Impervious, Inflow Depth = 2.65" for 100-Year event
Inflow = 3.12 cfs @ 12.16 hrs, Volume= 0.265 af
Primary = 3.12 cfs @ 12.16 hrs, Volume= 0.265 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP2: Design Point

Inflow Area = 0.455 ac, 0.00% Impervious, Inflow Depth = 2.65" for 100-Year event
Inflow = 1.05 cfs @ 12.20 hrs, Volume= 0.100 af
Primary = 1.05 cfs @ 12.20 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP3: Design Point

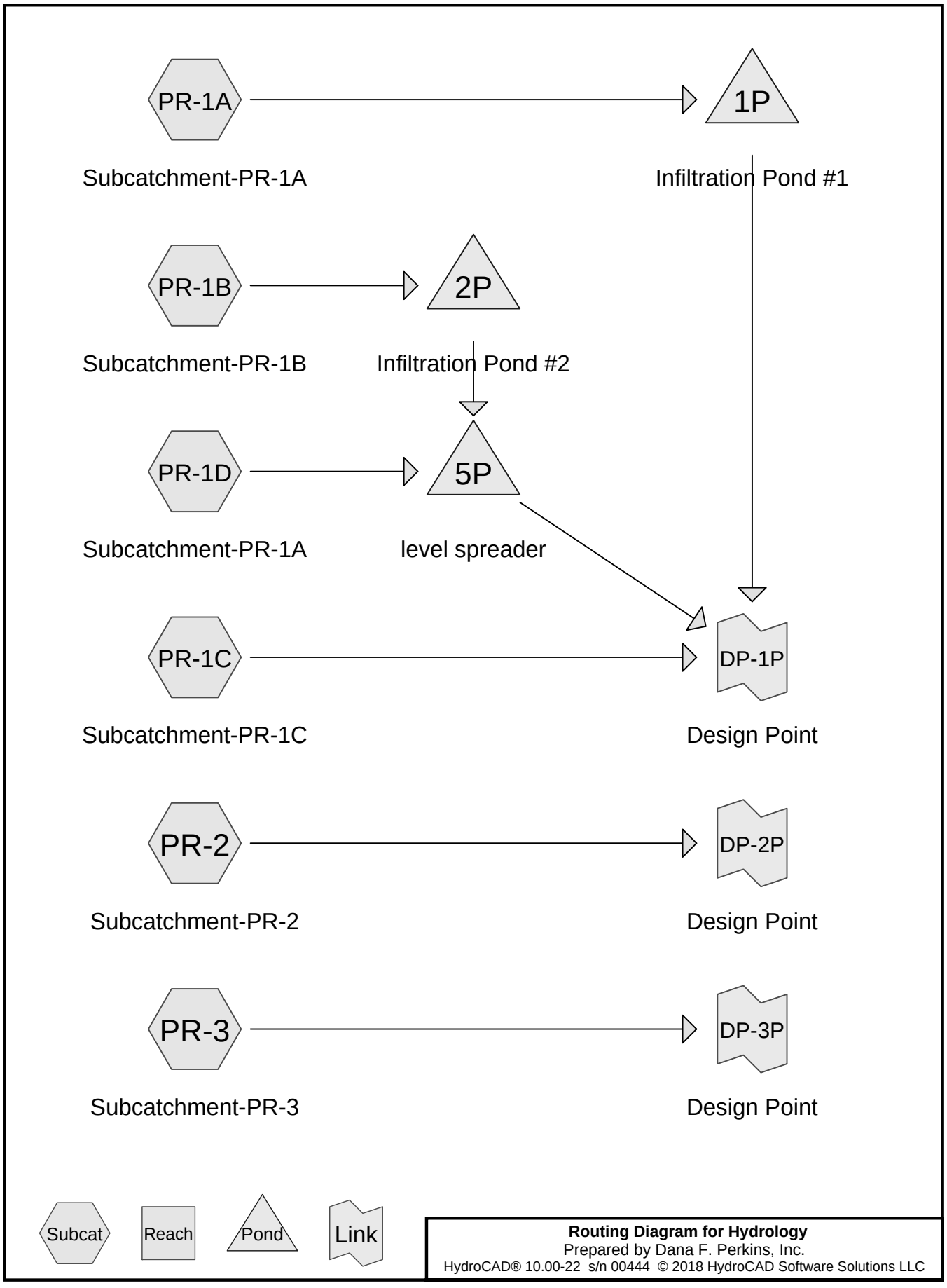
Inflow Area = 0.272 ac, 0.00% Impervious, Inflow Depth = 2.65" for 100-Year event
Inflow = 0.72 cfs @ 12.16 hrs, Volume= 0.060 af
Primary = 0.72 cfs @ 12.16 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP4: Design Point

Inflow Area = 0.067 ac, 0.00% Impervious, Inflow Depth = 2.65" for 100-Year event
Inflow = 0.17 cfs @ 12.17 hrs, Volume= 0.015 af
Primary = 0.17 cfs @ 12.17 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs



Routing Diagram for Hydrology
Prepared by Dana F. Perkins, Inc.

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=33,035 sf 78.10% Impervious Runoff Depth=2.47"
Tc=5.0 min CN=94 Runoff=2.04 cfs 0.156 af

Subcatchment PR-1B: Runoff Area=46,479 sf 63.05% Impervious Runoff Depth=2.18"
Tc=5.0 min CN=91 Runoff=2.62 cfs 0.194 af

Subcatchment PR-1C: Subcatchment-PR-1C Runoff Area=1,861 sf 0.00% Impervious Runoff Depth=1.28"
Tc=5.0 min CN=79 Runoff=0.06 cfs 0.005 af

Subcatchment PR-1D: Subcatchment-PR-1A Runoff Area=4,585 sf 0.00% Impervious Runoff Depth=1.28"
Tc=5.0 min CN=79 Runoff=0.16 cfs 0.011 af

Subcatchment PR-2: Subcatchment-PR-2 Runoff Area=548 sf 0.00% Impervious Runoff Depth=1.28"
Tc=5.0 min CN=79 Runoff=0.02 cfs 0.001 af

Subcatchment PR-3: Subcatchment-PR-3 Runoff Area=432 sf 0.00% Impervious Runoff Depth=1.28"
Tc=5.0 min CN=79 Runoff=0.01 cfs 0.001 af

Pond 1P: Infiltration Pond #1 Peak Elev=84.39' Storage=3,504 cf Inflow=2.04 cfs 0.156 af
Discarded=0.08 cfs 0.156 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.156 af

Pond 2P: Infiltration Pond #2 Peak Elev=78.55' Storage=4,599 cf Inflow=2.62 cfs 0.194 af
Discarded=0.09 cfs 0.194 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.194 af

Pond 5P: level spreader Peak Elev=77.00' Storage=200 cf Inflow=0.16 cfs 0.011 af
Outflow=0.03 cfs 0.007 af

Link DP-1P: Design Point Inflow=0.06 cfs 0.011 af
Primary=0.06 cfs 0.011 af

Link DP-2P: Design Point Inflow=0.02 cfs 0.001 af
Primary=0.02 cfs 0.001 af

Link DP-3P: Design Point Inflow=0.01 cfs 0.001 af
Primary=0.01 cfs 0.001 af

Total Runoff Area = 1.996 ac Runoff Volume = 0.368 af Average Runoff Depth = 2.21"
36.62% Pervious = 0.731 ac 63.38% Impervious = 1.265 ac

Summary for Subcatchment PR-1A: Subcatchment-PR-1A

Runoff = 2.04 cfs @ 12.12 hrs, Volume= 0.156 af, Depth= 2.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
25,800	98	Roofs, HSG A
7,235	79	<50% Grass cover, Poor, HSG B
33,035	94	Weighted Average
7,235		21.90% Pervious Area
25,800		78.10% Impervious Area

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

Summary for Subcatchment PR-1B: Subcatchment-PR-1B

Runoff = 2.62 cfs @ 12.12 hrs, Volume= 0.194 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
29,304	98	Paved parking, HSG A
17,175	79	<50% Grass cover, Poor, HSG B
46,479	91	Weighted Average
17,175		36.95% Pervious Area
29,304		63.05% Impervious Area

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

Summary for Subcatchment PR-1C: Subcatchment-PR-1C

Runoff = 0.06 cfs @ 12.13 hrs, Volume= 0.005 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
1,861	79	<50% Grass cover, Poor, HSG B
1,861		100.00% Pervious Area

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

Summary for Subcatchment PR-1D: Subcatchment-PR-1A

Runoff = 0.16 cfs @ 12.13 hrs, Volume= 0.011 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
4,585	79	<50% Grass cover, Poor, HSG B
4,585		100.00% Pervious Area

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

Summary for Subcatchment PR-2: Subcatchment-PR-2

Runoff = 0.02 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
548	79	<50% Grass cover, Poor, HSG B
548		100.00% Pervious Area

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

Summary for Subcatchment PR-3: Subcatchment-PR-3

Runoff = 0.01 cfs @ 12.13 hrs, Volume= 0.001 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.12"

Area (sf)	CN	Description
432	79	<50% Grass cover, Poor, HSG B
432		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Pond #1

Inflow Area = 0.758 ac, 78.10% Impervious, Inflow Depth = 2.47" for 2-Year event
Inflow = 2.04 cfs @ 12.12 hrs, Volume= 0.156 af
Outflow = 0.08 cfs @ 14.90 hrs, Volume= 0.156 af, Atten= 96%, Lag= 166.6 min
Discarded = 0.08 cfs @ 14.90 hrs, Volume= 0.156 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 84.39' @ 14.90 hrs Surf.Area= 3,482 sf Storage= 3,504 cf

Plug-Flow detention time= 467.5 min calculated for 0.156 af (100% of inflow)
Center-of-Mass det. time= 467.6 min (1,266.4 - 798.8)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	10,975 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	1,580	0	0
84.00	2,940	2,260	2,260
85.00	4,340	3,640	5,900
86.00	5,810	5,075	10,975

Device	Routing	Invert	Outlet Devices
#1	Discarded	83.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	85.50'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.08 cfs @ 14.90 hrs HW=84.39' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=83.00' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: Infiltration Pond #2

Inflow Area = 1.067 ac, 63.05% Impervious, Inflow Depth = 2.18" for 2-Year event
Inflow = 2.62 cfs @ 12.12 hrs, Volume= 0.194 af
Outflow = 0.09 cfs @ 16.26 hrs, Volume= 0.194 af, Atten= 97%, Lag= 248.6 min
Discarded = 0.09 cfs @ 16.26 hrs, Volume= 0.194 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 78.55' @ 16.26 hrs Surf.Area= 3,673 sf Storage= 4,599 cf

Plug-Flow detention time= 575.4 min calculated for 0.194 af (100% of inflow)
Center-of-Mass det. time= 575.4 min (1,394.2 - 818.8)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	16,546 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	2,286	0	0
78.00	3,162	2,724	2,724
79.00	4,094	3,628	6,352
80.00	5,083	4,589	10,941
81.00	6,128	5,606	16,546

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	80.15'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.09 cfs @ 16.26 hrs HW=78.55' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=77.00' (Free Discharge)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 5P: level spreader

Inflow Area = 1.172 ac, 57.39% Impervious, Inflow Depth = 0.11" for 2-Year event
Inflow = 0.16 cfs @ 12.13 hrs, Volume= 0.011 af
Outflow = 0.03 cfs @ 12.44 hrs, Volume= 0.007 af, Atten= 80%, Lag= 18.9 min
Primary = 0.03 cfs @ 12.44 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 77.00' @ 12.44 hrs Surf.Area= 500 sf Storage= 200 cf

Plug-Flow detention time= 254.4 min calculated for 0.007 af (59% of inflow)
Center-of-Mass det. time= 112.6 min (988.0 - 875.4)

Volume	Invert	Avail.Storage	Storage Description
#1	76.00'	400 cf	**2.00'W x 250.00'L x 2.00'H Prismatoid** 1,000 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	77.00'	**43.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.01 cfs @ 12.44 hrs HW=77.00' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.01 cfs @ 0.13 fps)

Summary for Link DP-1P: Design Point

Inflow Area = 1.973 ac, 64.10% Impervious, Inflow Depth = 0.07" for 2-Year event
Inflow = 0.06 cfs @ 12.13 hrs, Volume= 0.011 af
Primary = 0.06 cfs @ 12.13 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP-2P: Design Point

Inflow Area = 0.013 ac, 0.00% Impervious, Inflow Depth = 1.28" for 2-Year event
Inflow = 0.02 cfs @ 12.13 hrs, Volume= 0.001 af
Primary = 0.02 cfs @ 12.13 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP-3P: Design Point

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 1.28" for 2-Year event
Inflow = 0.01 cfs @ 12.13 hrs, Volume= 0.001 af
Primary = 0.01 cfs @ 12.13 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=33,035 sf 78.10% Impervious Runoff Depth=4.24"
Tc=5.0 min CN=94 Runoff=3.38 cfs 0.268 af

Subcatchment PR-1B: Runoff Area=46,479 sf 63.05% Impervious Runoff Depth=3.91"
Tc=5.0 min CN=91 Runoff=4.54 cfs 0.348 af

Subcatchment PR-1C: Subcatchment-PR-1C Runoff Area=1,861 sf 0.00% Impervious Runoff Depth=2.74"
Tc=5.0 min CN=79 Runoff=0.14 cfs 0.010 af

Subcatchment PR-1D: Subcatchment-PR-1A Runoff Area=4,585 sf 0.00% Impervious Runoff Depth=2.74"
Tc=5.0 min CN=79 Runoff=0.33 cfs 0.024 af

Subcatchment PR-2: Subcatchment-PR-2 Runoff Area=548 sf 0.00% Impervious Runoff Depth=2.74"
Tc=5.0 min CN=79 Runoff=0.04 cfs 0.003 af

Subcatchment PR-3: Subcatchment-PR-3 Runoff Area=432 sf 0.00% Impervious Runoff Depth=2.74"
Tc=5.0 min CN=79 Runoff=0.03 cfs 0.002 af

Pond 1P: Infiltration Pond #1 Peak Elev=85.19' Storage=6,747 cf Inflow=3.38 cfs 0.268 af
Discarded=0.11 cfs 0.268 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.268 af

Pond 2P: Infiltration Pond #2 Peak Elev=79.69' Storage=9,416 cf Inflow=4.54 cfs 0.348 af
Discarded=0.11 cfs 0.316 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.316 af

Pond 5P: level spreader Peak Elev=77.02' Storage=203 cf Inflow=0.33 cfs 0.024 af
Outflow=0.33 cfs 0.019 af

Link DP-1P: Design Point Inflow=0.47 cfs 0.029 af
Primary=0.47 cfs 0.029 af

Link DP-2P: Design Point Inflow=0.04 cfs 0.003 af
Primary=0.04 cfs 0.003 af

Link DP-3P: Design Point Inflow=0.03 cfs 0.002 af
Primary=0.03 cfs 0.002 af

Total Runoff Area = 1.996 ac Runoff Volume = 0.655 af Average Runoff Depth = 3.94"
36.62% Pervious = 0.731 ac 63.38% Impervious = 1.265 ac

Summary for Subcatchment PR-1A: Subcatchment-PR-1A

Runoff = 3.38 cfs @ 12.12 hrs, Volume= 0.268 af, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
25,800	98	Roofs, HSG A
7,235	79	<50% Grass cover, Poor, HSG B
33,035	94	Weighted Average
7,235		21.90% Pervious Area
25,800		78.10% Impervious Area

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

Summary for Subcatchment PR-1B: Subcatchment-PR-1B

Runoff = 4.54 cfs @ 12.12 hrs, Volume= 0.348 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
29,304	98	Paved parking, HSG A
17,175	79	<50% Grass cover, Poor, HSG B
46,479	91	Weighted Average
17,175		36.95% Pervious Area
29,304		63.05% Impervious Area

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

Summary for Subcatchment PR-1C: Subcatchment-PR-1C

Runoff = 0.14 cfs @ 12.12 hrs, Volume= 0.010 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
1,861	79	<50% Grass cover, Poor, HSG B
1,861		100.00% Pervious Area

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

Summary for Subcatchment PR-1D: Subcatchment-PR-1A

Runoff = 0.33 cfs @ 12.12 hrs, Volume= 0.024 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
4,585	79	<50% Grass cover, Poor, HSG B
4,585		100.00% Pervious Area

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

Summary for Subcatchment PR-2: Subcatchment-PR-2

Runoff = 0.04 cfs @ 12.12 hrs, Volume= 0.003 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
548	79	<50% Grass cover, Poor, HSG B
548		100.00% Pervious Area

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

Summary for Subcatchment PR-3: Subcatchment-PR-3

Runoff = 0.03 cfs @ 12.12 hrs, Volume= 0.002 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.93"

Area (sf)	CN	Description
432	79	<50% Grass cover, Poor, HSG B
432		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Pond #1

Inflow Area = 0.758 ac, 78.10% Impervious, Inflow Depth = 4.24" for 10-Year event
Inflow = 3.38 cfs @ 12.12 hrs, Volume= 0.268 af
Outflow = 0.11 cfs @ 15.96 hrs, Volume= 0.268 af, Atten= 97%, Lag= 230.4 min
Discarded = 0.11 cfs @ 15.96 hrs, Volume= 0.268 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 85.19' @ 15.96 hrs Surf.Area= 4,618 sf Storage= 6,747 cf

Plug-Flow detention time= 698.6 min calculated for 0.268 af (100% of inflow)
Center-of-Mass det. time= 698.7 min (1,479.7 - 781.0)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	10,975 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	1,580	0	0
84.00	2,940	2,260	2,260
85.00	4,340	3,640	5,900
86.00	5,810	5,075	10,975

Device	Routing	Invert	Outlet Devices
#1	Discarded	83.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	85.50'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.11 cfs @ 15.96 hrs HW=85.19' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=83.00' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 2P: Infiltration Pond #2

Inflow Area = 1.067 ac, 63.05% Impervious, Inflow Depth = 3.91" for 10-Year event
Inflow = 4.54 cfs @ 12.12 hrs, Volume= 0.348 af
Outflow = 0.11 cfs @ 17.69 hrs, Volume= 0.316 af, Atten= 98%, Lag= 333.9 min
Discarded = 0.11 cfs @ 17.69 hrs, Volume= 0.316 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 79.69' @ 17.69 hrs Surf.Area= 4,777 sf Storage= 9,416 cf

Plug-Flow detention time= 831.7 min calculated for 0.316 af (91% of inflow)
Center-of-Mass det. time= 781.3 min (1,579.4 - 798.0)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	16,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	2,286	0	0
78.00	3,162	2,724	2,724
79.00	4,094	3,628	6,352
80.00	5,083	4,589	10,941
81.00	6,128	5,606	16,546

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	80.15'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.11 cfs @ 17.69 hrs HW=79.69' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=77.00' (Free Discharge)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 5P: level spreader

Inflow Area = 1.172 ac, 57.39% Impervious, Inflow Depth = 0.25" for 10-Year event
Inflow = 0.33 cfs @ 12.12 hrs, Volume= 0.024 af
Outflow = 0.33 cfs @ 12.13 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.1 min
Primary = 0.33 cfs @ 12.13 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 77.02' @ 12.13 hrs Surf.Area= 500 sf Storage= 203 cf

Plug-Flow detention time= 133.4 min calculated for 0.019 af (81% of inflow)
Center-of-Mass det. time= 45.7 min (892.6 - 846.9)

Volume	Invert	Avail.Storage	Storage Description
#1	76.00'	400 cf	**2.00'W x 250.00'L x 2.00'H Prismatoid** 1,000 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	77.00'	**43.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.30 cfs @ 12.13 hrs HW=77.02' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.30 cfs @ 0.42 fps)

Summary for Link DP-1P: Design Point

Inflow Area = 1.973 ac, 64.10% Impervious, Inflow Depth = 0.18" for 10-Year event
Inflow = 0.47 cfs @ 12.13 hrs, Volume= 0.029 af
Primary = 0.47 cfs @ 12.13 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP-2P: Design Point

Inflow Area = 0.013 ac, 0.00% Impervious, Inflow Depth = 2.74" for 10-Year event
Inflow = 0.04 cfs @ 12.12 hrs, Volume= 0.003 af
Primary = 0.04 cfs @ 12.12 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP-3P: Design Point

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 2.74" for 10-Year event
Inflow = 0.03 cfs @ 12.12 hrs, Volume= 0.002 af
Primary = 0.03 cfs @ 12.12 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=33,035 sf 78.10% Impervious Runoff Depth=5.36"
Tc=5.0 min CN=94 Runoff=4.21 cfs 0.338 af

Subcatchment PR-1B: Runoff Area=46,479 sf 63.05% Impervious Runoff Depth=5.02"
Tc=5.0 min CN=91 Runoff=5.73 cfs 0.446 af

Subcatchment PR-1C: Subcatchment-PR-1C Runoff Area=1,861 sf 0.00% Impervious Runoff Depth=3.73"
Tc=5.0 min CN=79 Runoff=0.18 cfs 0.013 af

Subcatchment PR-1D: Subcatchment-PR-1A Runoff Area=4,585 sf 0.00% Impervious Runoff Depth=3.73"
Tc=5.0 min CN=79 Runoff=0.45 cfs 0.033 af

Subcatchment PR-2: Subcatchment-PR-2 Runoff Area=548 sf 0.00% Impervious Runoff Depth=3.73"
Tc=5.0 min CN=79 Runoff=0.05 cfs 0.004 af

Subcatchment PR-3: Subcatchment-PR-3 Runoff Area=432 sf 0.00% Impervious Runoff Depth=3.73"
Tc=5.0 min CN=79 Runoff=0.04 cfs 0.003 af

Pond 1P: Infiltration Pond #1 Peak Elev=85.51' Storage=8,307 cf Inflow=4.21 cfs 0.338 af
Discarded=0.12 cfs 0.311 af Primary=0.15 cfs 0.016 af Outflow=0.27 cfs 0.327 af

Pond 2P: Infiltration Pond #2 Peak Elev=80.17' Storage=11,829 cf Inflow=5.73 cfs 0.446 af
Discarded=0.12 cfs 0.357 af Primary=0.13 cfs 0.022 af Outflow=0.26 cfs 0.379 af

Pond 5P: level spreader Peak Elev=77.02' Storage=204 cf Inflow=0.45 cfs 0.055 af
Outflow=0.45 cfs 0.051 af

Link DP-1P: Design Point Inflow=0.63 cfs 0.080 af
Primary=0.63 cfs 0.080 af

Link DP-2P: Design Point Inflow=0.05 cfs 0.004 af
Primary=0.05 cfs 0.004 af

Link DP-3P: Design Point Inflow=0.04 cfs 0.003 af
Primary=0.04 cfs 0.003 af

Total Runoff Area = 1.996 ac Runoff Volume = 0.838 af Average Runoff Depth = 5.04"
36.62% Pervious = 0.731 ac 63.38% Impervious = 1.265 ac

Summary for Subcatchment PR-1A: Subcatchment-PR-1A

Runoff = 4.21 cfs @ 12.12 hrs, Volume= 0.338 af, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
25,800	98	Roofs, HSG A
7,235	79	<50% Grass cover, Poor, HSG B
33,035	94	Weighted Average
7,235		21.90% Pervious Area
25,800		78.10% Impervious Area

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

Summary for Subcatchment PR-1B: Subcatchment-PR-1B

Runoff = 5.73 cfs @ 12.12 hrs, Volume= 0.446 af, Depth= 5.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
29,304	98	Paved parking, HSG A
17,175	79	<50% Grass cover, Poor, HSG B
46,479	91	Weighted Average
17,175		36.95% Pervious Area
29,304		63.05% Impervious Area

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

Summary for Subcatchment PR-1C: Subcatchment-PR-1C

Runoff = 0.18 cfs @ 12.12 hrs, Volume= 0.013 af, Depth= 3.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
1,861	79	<50% Grass cover, Poor, HSG B
1,861		100.00% Pervious Area

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

Summary for Subcatchment PR-1D: Subcatchment-PR-1A

Runoff = 0.45 cfs @ 12.12 hrs, Volume= 0.033 af, Depth= 3.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
4,585	79	<50% Grass cover, Poor, HSG B
4,585		100.00% Pervious Area

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

Summary for Subcatchment PR-2: Subcatchment-PR-2

Runoff = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af, Depth= 3.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
548	79	<50% Grass cover, Poor, HSG B
548		100.00% Pervious Area

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

Summary for Subcatchment PR-3: Subcatchment-PR-3

Runoff = 0.04 cfs @ 12.12 hrs, Volume= 0.003 af, Depth= 3.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=6.06"

Area (sf)	CN	Description
432	79	<50% Grass cover, Poor, HSG B
432		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Pond #1

Inflow Area = 0.758 ac, 78.10% Impervious, Inflow Depth = 5.36" for 25-Year event
Inflow = 4.21 cfs @ 12.12 hrs, Volume= 0.338 af
Outflow = 0.27 cfs @ 13.54 hrs, Volume= 0.327 af, Atten= 94%, Lag= 85.5 min
Discarded = 0.12 cfs @ 13.54 hrs, Volume= 0.311 af
Primary = 0.15 cfs @ 13.54 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 85.51' @ 13.54 hrs Surf.Area= 5,090 sf Storage= 8,307 cf

Plug-Flow detention time= 724.3 min calculated for 0.327 af (97% of inflow)
Center-of-Mass det. time= 702.6 min (1,476.5 - 774.0)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	10,975 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	1,580	0	0
84.00	2,940	2,260	2,260
85.00	4,340	3,640	5,900
86.00	5,810	5,075	10,975

Device	Routing	Invert	Outlet Devices
#1	Discarded	83.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	85.50'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.12 cfs @ 13.54 hrs HW=85.51' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.10 cfs @ 13.54 hrs HW=85.51' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.10 cfs @ 0.33 fps)

Summary for Pond 2P: Infiltration Pond #2

Inflow Area = 1.067 ac, 63.05% Impervious, Inflow Depth = 5.02" for 25-Year event
Inflow = 5.73 cfs @ 12.12 hrs, Volume= 0.446 af
Outflow = 0.26 cfs @ 14.58 hrs, Volume= 0.379 af, Atten= 96%, Lag= 147.5 min
Discarded = 0.12 cfs @ 14.58 hrs, Volume= 0.357 af
Primary = 0.13 cfs @ 14.58 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 80.17' @ 14.58 hrs Surf.Area= 5,263 sf Storage= 11,829 cf

Plug-Flow detention time= 825.8 min calculated for 0.379 af (85% of inflow)
Center-of-Mass det. time= 750.8 min (1,540.5 - 789.6)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	16,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	2,286	0	0
78.00	3,162	2,724	2,724
79.00	4,094	3,628	6,352
80.00	5,083	4,589	10,941
81.00	6,128	5,606	16,546

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	80.15'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.12 cfs @ 14.58 hrs HW=80.17' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=0.11 cfs @ 14.58 hrs HW=80.17' (Free Discharge)
2=Sharp-Crested Rectangular Weir (Weir Controls 0.11 cfs @ 0.49 fps)

Summary for Pond 5P: level spreader

Inflow Area = 1.172 ac, 57.39% Impervious, Inflow Depth = 0.56" for 25-Year event
Inflow = 0.45 cfs @ 12.12 hrs, Volume= 0.055 af
Outflow = 0.45 cfs @ 12.12 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.1 min
Primary = 0.45 cfs @ 12.12 hrs, Volume= 0.051 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 77.02' @ 12.12 hrs Surf.Area= 500 sf Storage= 204 cf

Plug-Flow detention time= 59.8 min calculated for 0.051 af (92% of inflow)
Center-of-Mass det. time= 24.7 min (903.0 - 878.3)

Volume	Invert	Avail.Storage	Storage Description
#1	76.00'	400 cf	**2.00'W x 250.00'L x 2.00'H Prismatoid** 1,000 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	77.00'	**43.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=0.44 cfs @ 12.12 hrs HW=77.02' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.44 cfs @ 0.48 fps)

Summary for Link DP-1P: Design Point

Inflow Area = 1.973 ac, 64.10% Impervious, Inflow Depth = 0.49" for 25-Year event
Inflow = 0.63 cfs @ 12.12 hrs, Volume= 0.080 af
Primary = 0.63 cfs @ 12.12 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP-2P: Design Point

Inflow Area = 0.013 ac, 0.00% Impervious, Inflow Depth = 3.73" for 25-Year event
Inflow = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af
Primary = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP-3P: Design Point

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 3.73" for 25-Year event
Inflow = 0.04 cfs @ 12.12 hrs, Volume= 0.003 af
Primary = 0.04 cfs @ 12.12 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment PR-1A: Runoff Area=33,035 sf 78.10% Impervious Runoff Depth=7.08"
Tc=5.0 min CN=94 Runoff=5.48 cfs 0.448 af

Subcatchment PR-1B: Runoff Area=46,479 sf 63.05% Impervious Runoff Depth=6.73"
Tc=5.0 min CN=91 Runoff=7.54 cfs 0.598 af

Subcatchment PR-1C: Subcatchment-PR-1C Runoff Area=1,861 sf 0.00% Impervious Runoff Depth=5.32"
Tc=5.0 min CN=79 Runoff=0.26 cfs 0.019 af

Subcatchment PR-1D: Subcatchment-PR-1A Runoff Area=4,585 sf 0.00% Impervious Runoff Depth=5.32"
Tc=5.0 min CN=79 Runoff=0.63 cfs 0.047 af

Subcatchment PR-2: Subcatchment-PR-2 Runoff Area=548 sf 0.00% Impervious Runoff Depth=5.32"
Tc=5.0 min CN=79 Runoff=0.08 cfs 0.006 af

Subcatchment PR-3: Subcatchment-PR-3 Runoff Area=432 sf 0.00% Impervious Runoff Depth=5.32"
Tc=5.0 min CN=79 Runoff=0.06 cfs 0.004 af

Pond 1P: Infiltration Pond #1 Peak Elev=85.57' Storage=8,620 cf Inflow=5.48 cfs 0.448 af
Discarded=0.12 cfs 0.326 af Primary=1.93 cfs 0.105 af Outflow=2.06 cfs 0.431 af

Pond 2P: Infiltration Pond #2 Peak Elev=80.27' Storage=12,374 cf Inflow=7.54 cfs 0.598 af
Discarded=0.13 cfs 0.369 af Primary=1.48 cfs 0.159 af Outflow=1.61 cfs 0.527 af

Pond 5P: level spreader Peak Elev=77.05' Storage=210 cf Inflow=1.62 cfs 0.205 af
Outflow=1.62 cfs 0.201 af

Link DP-1P: Design Point Inflow=3.08 cfs 0.324 af
Primary=3.08 cfs 0.324 af

Link DP-2P: Design Point Inflow=0.08 cfs 0.006 af
Primary=0.08 cfs 0.006 af

Link DP-3P: Design Point Inflow=0.06 cfs 0.004 af
Primary=0.06 cfs 0.004 af

Total Runoff Area = 1.996 ac Runoff Volume = 1.121 af Average Runoff Depth = 6.74"
36.62% Pervious = 0.731 ac 63.38% Impervious = 1.265 ac

Summary for Subcatchment PR-1A: Subcatchment-PR-1A

Runoff = 5.48 cfs @ 12.12 hrs, Volume= 0.448 af, Depth= 7.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
25,800	98	Roofs, HSG A
7,235	79	<50% Grass cover, Poor, HSG B
33,035	94	Weighted Average
7,235		21.90% Pervious Area
25,800		78.10% Impervious Area

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

Summary for Subcatchment PR-1B: Subcatchment-PR-1B

Runoff = 7.54 cfs @ 12.12 hrs, Volume= 0.598 af, Depth= 6.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
29,304	98	Paved parking, HSG A
17,175	79	<50% Grass cover, Poor, HSG B
46,479	91	Weighted Average
17,175		36.95% Pervious Area
29,304		63.05% Impervious Area

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

Summary for Subcatchment PR-1C: Subcatchment-PR-1C

Runoff = 0.26 cfs @ 12.12 hrs, Volume= 0.019 af, Depth= 5.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
1,861	79	<50% Grass cover, Poor, HSG B
1,861		100.00% Pervious Area

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

Summary for Subcatchment PR-1D: Subcatchment-PR-1A

Runoff = 0.63 cfs @ 12.12 hrs, Volume= 0.047 af, Depth= 5.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
4,585	79	<50% Grass cover, Poor, HSG B
4,585		100.00% Pervious Area

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

Summary for Subcatchment PR-2: Subcatchment-PR-2

Runoff = 0.08 cfs @ 12.12 hrs, Volume= 0.006 af, Depth= 5.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
548	79	<50% Grass cover, Poor, HSG B
548		100.00% Pervious Area

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

Summary for Subcatchment PR-3: Subcatchment-PR-3

Runoff = 0.06 cfs @ 12.12 hrs, Volume= 0.004 af, Depth= 5.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=7.80"

Area (sf)	CN	Description
432	79	<50% Grass cover, Poor, HSG B
432		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Pond #1

Inflow Area = 0.758 ac, 78.10% Impervious, Inflow Depth = 7.08" for 100-Year event
Inflow = 5.48 cfs @ 12.12 hrs, Volume= 0.448 af
Outflow = 2.06 cfs @ 12.24 hrs, Volume= 0.431 af, Atten= 62%, Lag= 7.3 min
Discarded = 0.12 cfs @ 12.24 hrs, Volume= 0.326 af
Primary = 1.93 cfs @ 12.24 hrs, Volume= 0.105 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 85.57' @ 12.24 hrs Surf.Area= 5,180 sf Storage= 8,620 cf

Plug-Flow detention time= 583.4 min calculated for 0.431 af (96% of inflow)
Center-of-Mass det. time= 560.1 min (1,326.4 - 766.2)

Volume	Invert	Avail.Storage	Storage Description
#1	83.00'	10,975 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
83.00	1,580	0	0
84.00	2,940	2,260	2,260
85.00	4,340	3,640	5,900
86.00	5,810	5,075	10,975

Device	Routing	Invert	Outlet Devices
#1	Discarded	83.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	85.50'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.12 cfs @ 12.24 hrs HW=85.57' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=1.90 cfs @ 12.24 hrs HW=85.57' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.90 cfs @ 0.89 fps)

Summary for Pond 2P: Infiltration Pond #2

Inflow Area = 1.067 ac, 63.05% Impervious, Inflow Depth = 6.73" for 100-Year event
Inflow = 7.54 cfs @ 12.12 hrs, Volume= 0.598 af
Outflow = 1.61 cfs @ 12.37 hrs, Volume= 0.527 af, Atten= 79%, Lag= 15.0 min
Discarded = 0.13 cfs @ 12.37 hrs, Volume= 0.369 af
Primary = 1.48 cfs @ 12.37 hrs, Volume= 0.159 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 80.27' @ 12.37 hrs Surf.Area= 5,370 sf Storage= 12,374 cf

Plug-Flow detention time= 625.1 min calculated for 0.527 af (88% of inflow)
Center-of-Mass det. time= 561.6 min (1,341.8 - 780.2)

Volume	Invert	Avail.Storage	Storage Description
#1	77.00'	16,546 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
77.00	2,286	0	0
78.00	3,162	2,724	2,724
79.00	4,094	3,628	6,352
80.00	5,083	4,589	10,941
81.00	6,128	5,606	16,546

Device	Routing	Invert	Outlet Devices
#1	Discarded	77.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	80.15'	**10.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 0.5' Crest Height

Discarded OutFlow Max=0.13 cfs @ 12.37 hrs HW=80.27' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=1.47 cfs @ 12.37 hrs HW=80.27' (Free Discharge)
2=Sharp-Crested Rectangular Weir (Weir Controls 1.47 cfs @ 1.19 fps)

Summary for Pond 5P: level spreader

Inflow Area = 1.172 ac, 57.39% Impervious, Inflow Depth = 2.10" for 100-Year event
Inflow = 1.62 cfs @ 12.36 hrs, Volume= 0.205 af
Outflow = 1.62 cfs @ 12.36 hrs, Volume= 0.201 af, Atten= 0%, Lag= 0.1 min
Primary = 1.62 cfs @ 12.36 hrs, Volume= 0.201 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 77.05' @ 12.36 hrs Surf.Area= 500 sf Storage= 210 cf

Plug-Flow detention time= 18.5 min calculated for 0.201 af (98% of inflow)
Center-of-Mass det. time= 7.1 min (848.9 - 841.8)

Volume	Invert	Avail.Storage	Storage Description
#1	76.00'	400 cf	**2.00'W x 250.00'L x 2.00'H Prismatoid** 1,000 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	77.00'	**43.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 1.0' Crest Height

Primary OutFlow Max=1.60 cfs @ 12.36 hrs HW=77.05' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 1.60 cfs @ 0.74 fps)

Summary for Link DP-1P: Design Point

Inflow Area = 1.973 ac, 64.10% Impervious, Inflow Depth = 1.97" for 100-Year event
Inflow = 3.08 cfs @ 12.31 hrs, Volume= 0.324 af
Primary = 3.08 cfs @ 12.31 hrs, Volume= 0.324 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP-2P: Design Point

Inflow Area = 0.013 ac, 0.00% Impervious, Inflow Depth = 5.32" for 100-Year event
Inflow = 0.08 cfs @ 12.12 hrs, Volume= 0.006 af
Primary = 0.08 cfs @ 12.12 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link DP-3P: Design Point

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth = 5.32" for 100-Year event
Inflow = 0.06 cfs @ 12.12 hrs, Volume= 0.004 af
Primary = 0.06 cfs @ 12.12 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Stormwater Management Permit

Proposed Self Storage Facility
43 River Road
Andover, Massachusetts

Hydraulic Calculations

Prepared for:

3P Properties, LLC
665 Church Street
Whitinsville, MA 01588

Prepared by:

Dana F. Perkins, Inc.
1057 East Street
Tewksbury, MA 01876

Submitted To:
Town of Andover ~ Planning Board

Dana F. Perkins, Inc.
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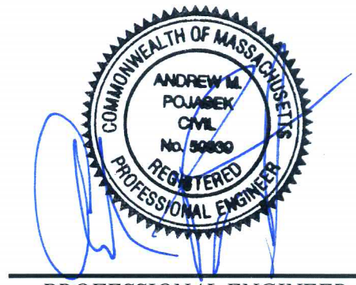

LOCATION: Proposed Self Storage Facility
43 River Road, Andover; MA

COMPUTED BY: AMP
CHECKED BY: EED

DATE: July 11, 2022
SHEET: 1 of 1

25-YEAR STORM
DESIGN EVENT

PROFESSIONAL ENGINEER

LOCATION		AREA x COEFFICIENT							TIME OF FLOW			DESIGN					PROFILE				
		PERVIOUS			IMPERVIOUS							ALL PIPES ARE CIRCULAR HDPE UNLESS NOTED								INVERT ELEV.	
FROM	TO	AREA	C	SUBTOTAL	AREA	C	SUBTOTAL	TOTAL	Total	I	Q	PIPE SIZE	SLOPE	n	CAPACITY FULL	VELOCITY FULL	LENGTH	FALL	RIM ELEV.	UPPER	LOWER
		(acres)			(acres)				(min.)	(in/hr)	(c. f. s.)	(inches)	(ft. per ft.)		(c. f. s.)	(ft. / sec)	(ft.)	(ft.)	(ft.)	(ft.)	(ft.)
CB #1	DMH #1	0.000	0.30	0.000	0.088	0.90	0.079	0.079	5.00	6.2	0.49	12	0.005	0.012	2.73	3.48	196	0.98	85.80	82.30	81.32
CB #2	DMH #1	0.000	0.30	0.000	0.096	0.90	0.086	0.086	5.00	6.2	0.53	12	0.005	0.012	2.73	3.48	20	0.10	85.80	82.30	82.20
CB #4	DMH #2	0.000	0.30	0.000	0.107	0.90	0.097	0.097	5.00	6.2	0.60	12	0.005	0.012	2.73	3.48	78	0.39	85.80	82.30	81.91
CB #5	DMH #2	0.000	0.30	0.000	0.088	0.90	0.079	0.079	5.00	6.2	0.49	12	0.005	0.012	2.73	3.48	20	0.10	85.80	82.30	82.20
CB #6	DMH #3	0.000	0.30	0.000	0.092	0.90	0.082	0.082	5.00	6.2	0.51	12	0.005	0.012	2.73	3.48	90	0.45	265.60	262.60	262.15
DMH #2	DMH #3	-	-	-	-	-	-	0.175	5.00	6.2	1.08	12	0.005	0.012	2.73	3.48	44	0.22	85.80	82.30	82.08
CB #3	DMH #4	0.000	0.30	0.000	0.174	0.90	0.156	0.156	5.00	6.2	0.96	12	0.005	0.012	2.73	3.48	36	0.18	85.60	82.10	81.92
DMH #1	DMH #4	-	-	-	-	-	-	0.165	5.00	6.2	1.02	12	0.005	0.012	2.73	3.48	116	0.58	86.40	81.22	80.64
DMH #3	DMH #4	-	-	-	-	-	-	0.258	5.00	6.2	1.59	12	0.005	0.012	2.73	3.48	36	0.18	86.85	80.52	80.34
DMH #4	STC #1	-	-	-	-	-	-	0.579	5.00	6.2	3.57	12	0.040	0.012	7.73	9.85	8	0.32	86.40	79.32	79.00
STC #1	FES #1	-	-	-	-	-	-	0.579	5.00	6.2	3.57	12	0.040	0.012	7.73	9.85	23	0.92	86.00	79.00	78.08
TRENCH	FES #2	0.000	0.30	0.000	0.065	0.90	0.058	0.058	5.00	6.2	0.36	12	0.005	0.012	2.73	3.48	24	0.12	80.25	79.00	78.88
ROOF	FES #3	0.000	0.30	0.000	0.592	0.90	0.533	0.533	5.00	6.2	3.28	12	0.010	0.012	3.87	4.93	38	0.38	86.80	83.38	83.00