Drainage Calculations and Stormwater Management Plan

In Support of:

Notice of Intent

For:

Office/ Shop Building

809 South Franklin Street (Map 52, Plot 67)
Holbrook, Massachusetts 02343

Applicant:

Johnson Sheet Metal Co., Inc.

809 South Franklin Street
Holbrook, Massachusetts 02343

Submitted to:

Town of Holbrook
Conservation Commission

Dated: June 29, 2022

Prepared By:
Jacobs Driscoll Engineering, Inc.
50 Oliver Street
North Easton, MA 02356

JN: 01-2021-020

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Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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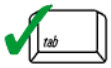
A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

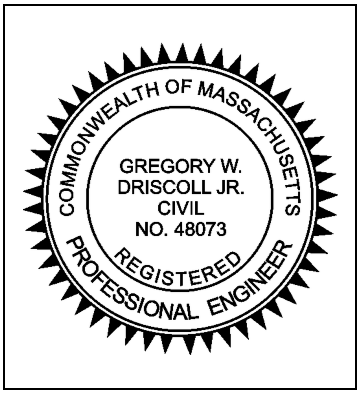
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

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 that 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.

Registered Professional Engineer Block and Signature



6/29/2022
Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☒ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation 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.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☒ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

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

☒ 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
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ 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 applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☒ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☒ 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.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

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

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☒ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Drainage Calculations and Stormwater Management Plan
For
Johnson Sheet Metal Co., Inc.
Proposed Office & Shop Building
809 South Franklin Street, Holbrook, MA 02343

2.0 PROJECT NARRATIVE

Introduction

The applicant, Jake Johnston of Johnson Sheet Metal Co. Inc., proposes to construct a 5,000 square foot Office/Shop Building on a wooded portion of their land located at 809 South Franklin Street in Holbrook, MA. The existing parcel can be identified on Assessor's Map 52, Plot 67 with a total area of approximately 1.163 +/- acres.

Locus

The site is located on the eastern side of South Franklin Street in Holbrook. The property is surrounded by business uses to the North and South and a residential use is located to the East of the property. Refer to Figure 1 – USGS Map for the location of the site. This report contains calculations of stormwater runoff for the pre-development and post-development conditions and includes the design of the proposed drainage system and stormwater best management practices (BMPs).

Resource Areas

The front portion of the locus property contains two existing buildings and is surrounded by existing paved areas. The rear portion of the locus property contains an open gravel storage area and is surrounded by mostly wooded land to the North and East. The Bordering Vegetated Wetland (BVW) A-series is located on the eastern most edge of the locus property. The property is located outside of NHESP Estimated & Priority Habitat for Rare Species. A portion of the site is located within a FEMA flood zone, Zone AE, however the area to be developed is outside of the flood zone. The locus property is also located within a Zone II.

Pre-Development Condition

The existing drainage area tributary to the site consists of approximately 0.17 acres of existing impervious area and 0.51 acres of woodlands. The limits of the drainage study include the property lines to the North, West and the existing culvert located off the locus site to the North. The topography of the property consists of moderate slopes with no major breaks or drop-offs.

The existing conditions HydroCAD model was used to calculate the runoff associated with the limits of the site as stated above and establish the baseline data to compare the future improvements to. Two design points were identified and utilized in the HydroCAD analysis. Identified as DP-1, which is the North and West property lines for 809 South Franklin Street. The existing culvert located off the locus site was identified as the second design point identified as DP-2.

Soils information was obtained from the USDA Natural Resources Conservation Service's (NRCS) Web Soil Survey mapping. Site soils are classified as the following SCS Hydrologic Soil Groups: Urban Lane (No SCS Hydrologic Soil Group Rating), Merrimac Fine Sandy Loam (254B - SCS Hydrologic Soil Group A), Whitman Fine Sandy Loam (73A - SCS Hydrologic Soil Group D). Refer

to Figure 8, Soil Survey Map, for a delineation of the boundaries of the soils with respect to the study area.

Refer to the site plan set for the plan view of the proposed building, parking lot and associated utilities. The watershed area analyzed was approximately 0.689 acres. Also, refer to Appendix A for computer results, soil characteristics, cover descriptions and time of concentrations for all subareas.

Post-Development Condition

In the post-development condition, stormwater watershed areas were analyzed for purposes of designing drainage systems to accommodate the bituminous pavement, building, and grass areas. The watershed area analyzed was approximately 0.689 acres. The objective in designing the proposed drainage facilities for the project was to maintain existing drainage patterns to the extent practicable and to ensure that the post-development rates of runoff are equal or less than pre-development rates. Refer to the Proposed Watershed Delineation Plan, in Appendix B for a delineation of drainage subareas for the post-development design condition. The design points for the post-development design conditions correspond to those analyzed for the pre-development design condition.

Stormwater Management Facilities

The proposed stormwater facilities were designed to attenuate peak flows generated by all storm events to ensure that post-development peak flows generated by all storm events are less than pre-development flows at the design point. The proposed facility was analyzed using the SCS TR-20 computer program (HydroCAD). The proposed design realizes reductions in peak flow rate as well as discharge volume for all storm events.

Conclusion

It is our opinion that with the mitigation provided and the strict compliance to the plans and standard procedures that are required by the Conservation Commission, there will be no adverse impacts to any resource areas. We look forward working with the Planning Board and Conservation Commission during the permitting process to satisfy any concerns that may arise.

3.0 COMPLIANCE WITH STORMWATER MANAGEMENT STANDARDS

Standard 1 – No New Untreated Discharges

The proposed improvements to the property are designed so that new stormwater conveyances do not discharge untreated pavement runoff into, or cause erosion to, wetlands. The Standard is met.

Standard 2 – Peak Rate Attenuation

A hydrologic study was performed to determine the rate of runoff for the 2, 10, 25, and 100-year storm events under the pre-development (present) conditions. This value was established as the future (post-development) maximum allowable rate. Two (2) discharge study points were compared at the North and West property lines of 809 South Franklin Street (DP-1), and the existing culvert located off the locus site to the North (DP-2) where the drainage is conveyed. From these analyses the proposed site improvements and stormwater management system were designed to reduce the future peak runoff rate for the area discharging to the design points. This was accomplished by designing a wet basin which attenuates flow for all of the design storms. Appendix A contains the delineation and discharge points of drainage subareas for the pre-development design condition. Appendix B contains the delineation and discharge points of drainage subareas for the post-development design condition.

In the pre-development stormwater analysis, the watershed area analyzed was approximately 0.689 acres consisting of the project property and offsite areas that drain onto the property. Refer to the site plan set for the plan view of the study area.

In the post-development condition, the stormwater watershed areas were analyzed for purposes of designing a stormwater management system to accommodate the runoff generated by the building roof area, pavement area and new landscape areas as well as to continue to handle the offsite flows that come onto the property. The watershed area analyzed was approximately 0.689 acres. The objective in designing the proposed drainage facilities for the project was to maintain existing drainage patterns to the extent practicable and to ensure that the post-development rates of runoff are equal or less than pre-development rates.

Stormwater management computations for this redevelopment project were performed by Jacobs Driscoll Engineering, Inc. using an SCS based computer program, HydroCAD 10.10, for existing and proposed conditions for the 2, 10, 25, and 100-year storm events from TP-40 rainfall data, Type III, 24 hour storm curves. The stormwater detention facilities were designed to accommodate peak flows generated by a 100-year storm event with outflow less than the existing condition.

Subcatchment Data Summary

Design Point Subcatchment	**Time of Concentration (Tc) (Minutes)**	**Weighted Curve Number (CN)**
DP-1		
EDA-1A	17.4	74
PDA-1A	6	70
DP-2		
EDA-1B	16.5	75
PDA-1B	6	88
PDA-1C	17.0	77

Pre-Development vs. Post-Development Peak Rates of Runoff

Design Point	**2 Year Storm (3.20 Inches)**		**10 Year Storm (4.70 Inches)**		**25 Year Storm (5.50 Inches)**		**100 Year Storm (6.80 Inches)**	
	Exist. (CFS)	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**
DP-1 (809 s. Franklin St. Property Lines)	0.26	0.12	0.56	0.29	0.74	0.39	1.04	0.59
DP-2 (Offsite Culvert)	0.33	0.16	0.68	0.45	0.58	0.36	1.24	0.84

A comparison of the pre-development and post-development peak rates of runoff indicates that the peak rates of runoff for the post-development conditions will be equal to or less than the pre-development condition for all storm events. The Standard is met.

Standard 3 – Groundwater Recharge

Runoff will be infiltrated by the infiltration basins, which will the meet the Stormwater Guidelines for infiltration to include:

- Infiltration structures will be a minimum of two feet above seasonal high groundwater.
- Utilize the "Simple Dynamic method for sizing the storage volume, which takes into account the fact that stormwater is exfiltrating from the infiltration basin at the same time that the basin is filling.
- Hydraulic conductivity are based on soil survey information and values developed from Rawls, Brakensiek and Saxton, 1982, Estimation of Soil Water Properties, *Transactions of the American Society of Agricultural Engineers*, vol. 25, no.5.
- Refer to Appendix C for soil testing results.

Groundwater Recharge Volumes by Basins

Basin	Soil Type	Target Depth Factor (F) (in)	Total Impervious Area (sf)	Required Recharge Volume (cf)[1]	Provided Recharge Volume (cf)[2]
Basin 1P	D	0.1	8,117	67.6	0*

1. Required Recharge Volume = Target Depth Factor (0.1"/12 in/ft) x Impervious Area (8,117 sf) [simple dynamic method]
2. Provided Recharge Volume = Volume as calculated by the HydroCAD model

*Due to the high groundwater encountered on the site during soil testing and the presence of D soils on the site in the area of the proposed development groundwater recharge is not possible. Further, the presence of the existing buildings on the locus property creates a challenge because the existing elevations around the buildings need to remain in order for the existing buildings to remain and function as the applicant intends for them to do regardless of the proposed project. The Standard is not met because of D soils on the site.

Standard 4 – Water Quality

The Long-Term Pollution Prevention Plan has been incorporated into the Post-Development Operation and Maintenance Plan. Refer to Appendices for BMP Operation and Maintenance Plans.

Removal rates for all paved surfaces are:

Pre-treatment:	
Sediment Forebay	25%
Overall system TSS Removal:	
Wet Basin	80%
Total:	80%

As shown above, the required TSS removal rates are met or exceed for each treatment train. See Appendix C for Sizing and TSS Removal Charts.

Sediment Forebay Sizing Requirements

Subcatchment	Contributing Impervious Area (ft^2)	Required Volume[1] (ft^3)	Provided Volume (ft^3)
Basin 1P	8,117	68	1,098

1. Required Forebay Volume = Contributing Impervious Area(8,117 sq.ft.) x (1 in./12 in/ft.) x (0.1 in./acre)

The proposed use is not a Land Use with Higher Potential Pollution Loads (LUHPPL); however the site is located with a Zone II and therefore, the required water quality volume equals 1" of runoff multiplied by the total impervious area of the post-development site for all discharges. The Water Quality Volume (WQV) to be treated is equal to the impervious area draining to the water

quality device multiplied by one inch. The calculation below shows the volume required for the proposed development.

Water Quality Volume Required vs. Volume Provided

Subcatchment	Impervious Contributing Area (ft^2)	Required Water Quality Volume[1] (ft^3)	Provided Water Quality Volume (ft^3)
Basin 1P	8,117	677	3,799

1. Required Water Quality Volume = Impervious Area (8,117 sq.ft) x (1"/1 acre) x (1ft/12")

As shown above the Water Quality Volume provided below the lowest outlet device exceeds the required water quality volume. See the appendices for the Stage-Area-Storage Table for Basin 1P indicating the volume provided below the lowest outlet device in the table above.

The drainage system has been designed to comply with the Standards of the DEP Stormwater Management Regulations. The proposed treatment stream will renovate the stormwater and improve the water quality by promoting the settlement of sediments and pollutants before runoff is released from the site. Refer to the appendices for TSS Removal Calculation Worksheets. The Standard is met.

Standard 5 – Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The proposed project is not a land use with higher potential pollutant loads. Not applicable.

Standard 6 – Critical Areas

This site is within a critical area (Zone II to a subsurface water supply) and water quality treatment of 1" of runoff is required. The Water Quality Volume (WQV) to be treated is equal to the impervious area draining to the water quality device multiplied by one inch. Discharges are setback from the resource area and proper treatment provided. Refer to Standard 4 and Appendix B for further calculations. The Standard is met.

Standard 7 – Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

Not applicable.

Standard 8 – Construction Period Pollution Prevention and Erosion and Sedimentation Control

Straw wattle perimeter erosion control devices will be utilized in place of haybales and siltation fence and will be placed at the down-gradient limit of work prior to the commencement of any construction activity. The integrity of the straw wattle will be maintained by periodic inspection and replacement as necessary. The straw wattle will remain in place for the duration of the project. Refer to the Grading, Drainage, Utility and Erosion Control Plan for the locations of the erosion and sedimentation controls as well as the Construction Detail Plans of the plan set for details.

Also, a Construction Phase Pollution Prevention and Erosion and Sedimentation Plan has been developed for the project and is attached to this report, see the Appendices. The Standard is met.

Standard 9 – Operation and Maintenance Plan

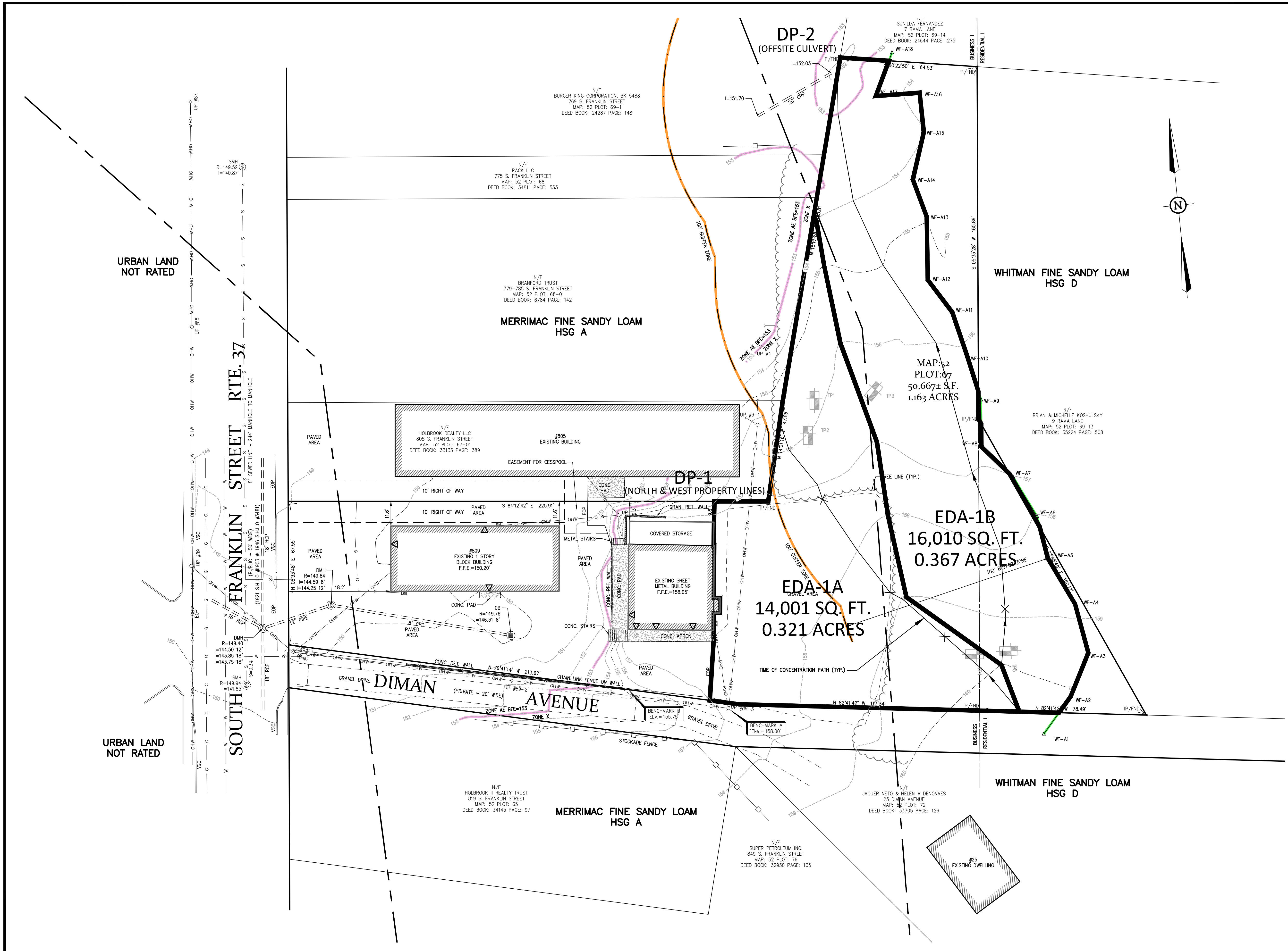
The Post Construction Operation and Maintenance Plan are provided as part of this application and is included in the Appendices. The Standard is met.

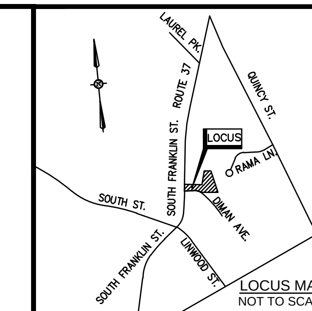
Standard 10 – Prohibition of Illicit Discharges

No illicit discharges have been observed on site. Furthermore, measures to prevent illicit discharges are included in the Long-Term Pollution Prevention Plan. Therefore, provisions have been made to prevent illicit discharges and the Standard is met.

APPENDIX A

Pre-Development Design Condition





PERMITTING SET

REVISIONS		
No.	DATE	DESCRIPTION

DRAWN BY: JVW
CHECKED BY: EPJ / GWD
DESIGNED BY: GWD / JVW

EXISTING DRAINAGE AREA PLAN

809 S. FRANKLIN STREET
IN
HOLBROOK
(NORFOLK COUNTY)
MASSACHUSETTS

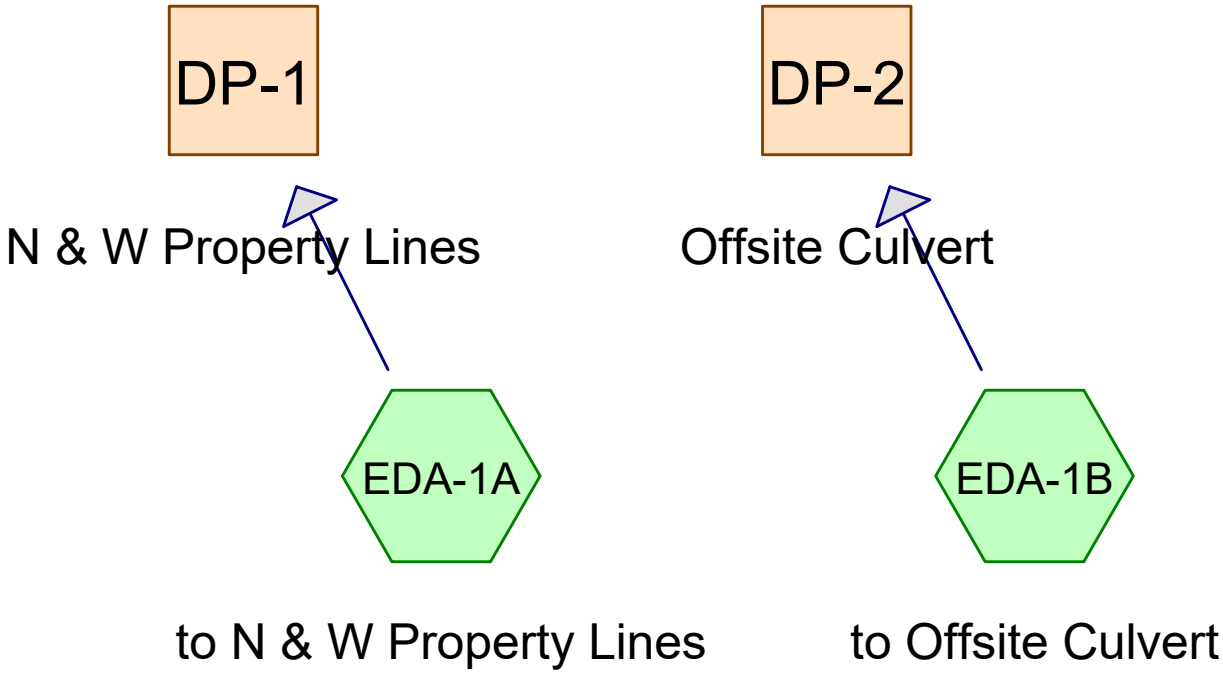
JUNE 29, 2022

PREPARED FOR:
JOHNSON SHEET METAL CO., INC
809 S. FRANKLIN STREET
HOLBROOK
MASSACHUSETTS 02343

0 20' 40'
SCALE: 1" = 20'
(WHEN PLOTTED ON 24"X36" SHEET)

JDE
Jacobs Driscoll Engineering
50 Oliver Street
North Easton, Massachusetts 02356
Phone: 508-928-4400
www.JacobsDriscoll.com

SHEET 1 OF 2
JOB NUMBER: 01-2021-020



Subcat Reach Pond Link

Routing Diagram for 01-2021-020 Existing R0
Prepared by Jacobs Driscoll Engineering, Inc., Printed 6/28/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.70	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.50	2
4	100-Year	Type III 24-hr		Default	24.00	1	6.80	2

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EDA-1A: to N & W Property Lines Runoff Area=14,001 sf 0.00% Impervious Runoff Depth=1.04"
Flow Length=179' Tc=17.4 min CN=74 Runoff=0.26 cfs 0.028 af

Subcatchment EDA-1B: to Offsite Culvert Runoff Area=16,010 sf 0.00% Impervious Runoff Depth=1.09"
Flow Length=317' Tc=16.5 min CN=75 Runoff=0.33 cfs 0.034 af

Reach DP-1: N & W Property Lines Inflow=0.26 cfs 0.028 af
Outflow=0.26 cfs 0.028 af

Reach DP-2: Offsite Culvert Inflow=0.33 cfs 0.034 af
Outflow=0.33 cfs 0.034 af

Total Runoff Area = 0.689 ac Runoff Volume = 0.061 af Average Runoff Depth = 1.07"
100.00% Pervious = 0.689 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EDA-1A: to N & W Property Lines

Runoff = 0.26 cfs @ 12.26 hrs, Volume= 0.028 af, Depth= 1.04"
Routed to Reach DP-1 : N & W Property Lines

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
406	39	>75% Grass cover, Good, HSG A
7,213	96	Gravel surface, HSG A
247	96	Gravel surface, HSG D
3,693	30	Woods, Good, HSG A
2,442	77	Woods, Good, HSG D
14,001	74	Weighted Average
14,001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	50	0.0110	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.7	33	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	54	0.0293	2.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	42	0.0405	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	179	Total			

Summary for Subcatchment EDA-1B: to Offsite Culvert

Runoff = 0.33 cfs @ 12.25 hrs, Volume= 0.034 af, Depth= 1.09"
Routed to Reach DP-2 : Offsite Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
638	30	Woods, Good, HSG A
15,372	77	Woods, Good, HSG D
16,010	75	Weighted Average
16,010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0270	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	267	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.5	317	Total			

Summary for Reach DP-1: N & W Property Lines

Inflow Area = 0.321 ac, 0.00% Impervious, Inflow Depth = 1.04" for 2-Year event
Inflow = 0.26 cfs @ 12.26 hrs, Volume= 0.028 af
Outflow = 0.26 cfs @ 12.26 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Offsite Culvert

Inflow Area = 0.368 ac, 0.00% Impervious, Inflow Depth = 1.09" for 2-Year event
Inflow = 0.33 cfs @ 12.25 hrs, Volume= 0.034 af
Outflow = 0.33 cfs @ 12.25 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EDA-1A: to N & W Property Lines Runoff Area=14,001 sf 0.00% Impervious Runoff Depth=2.13"
Flow Length=179' Tc=17.4 min CN=74 Runoff=0.56 cfs 0.057 af

Subcatchment EDA-1B: to Offsite Culvert Runoff Area=16,010 sf 0.00% Impervious Runoff Depth=2.21"
Flow Length=317' Tc=16.5 min CN=75 Runoff=0.68 cfs 0.068 af

Reach DP-1: N & W Property Lines Inflow=0.56 cfs 0.057 af
Outflow=0.56 cfs 0.057 af

Reach DP-2: Offsite Culvert Inflow=0.68 cfs 0.068 af
Outflow=0.68 cfs 0.068 af

Total Runoff Area = 0.689 ac Runoff Volume = 0.125 af Average Runoff Depth = 2.17"
100.00% Pervious = 0.689 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EDA-1A: to N & W Property Lines

Runoff = 0.56 cfs @ 12.25 hrs, Volume= 0.057 af, Depth= 2.13"
Routed to Reach DP-1 : N & W Property Lines

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
406	39	>75% Grass cover, Good, HSG A
7,213	96	Gravel surface, HSG A
247	96	Gravel surface, HSG D
3,693	30	Woods, Good, HSG A
2,442	77	Woods, Good, HSG D
14,001	74	Weighted Average
14,001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	50	0.0110	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.7	33	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	54	0.0293	2.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	42	0.0405	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	179	Total			

Summary for Subcatchment EDA-1B: to Offsite Culvert

Runoff = 0.68 cfs @ 12.24 hrs, Volume= 0.068 af, Depth= 2.21"
Routed to Reach DP-2 : Offsite Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
638	30	Woods, Good, HSG A
15,372	77	Woods, Good, HSG D
16,010	75	Weighted Average
16,010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0270	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	267	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.5	317	Total			

Summary for Reach DP-1: N & W Property Lines

Inflow Area = 0.321 ac, 0.00% Impervious, Inflow Depth = 2.13" for 10-Year event
Inflow = 0.56 cfs @ 12.25 hrs, Volume= 0.057 af
Outflow = 0.56 cfs @ 12.25 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Offsite Culvert

Inflow Area = 0.368 ac, 0.00% Impervious, Inflow Depth = 2.21" for 10-Year event
Inflow = 0.68 cfs @ 12.24 hrs, Volume= 0.068 af
Outflow = 0.68 cfs @ 12.24 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EDA-1A: to N & W Property Lines Runoff Area=14,001 sf 0.00% Impervious Runoff Depth=2.77"
Flow Length=179' Tc=17.4 min CN=74 Runoff=0.74 cfs 0.074 af

Subcatchment EDA-1B: to Offsite Culvert Runoff Area=16,010 sf 0.00% Impervious Runoff Depth=2.86"
Flow Length=317' Tc=16.5 min CN=75 Runoff=0.89 cfs 0.088 af

Reach DP-1: N & W Property Lines Inflow=0.74 cfs 0.074 af
Outflow=0.74 cfs 0.074 af

Reach DP-2: Offsite Culvert Inflow=0.89 cfs 0.088 af
Outflow=0.89 cfs 0.088 af

Total Runoff Area = 0.689 ac Runoff Volume = 0.162 af Average Runoff Depth = 2.82"
100.00% Pervious = 0.689 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EDA-1A: to N & W Property Lines

Runoff = 0.74 cfs @ 12.25 hrs, Volume= 0.074 af, Depth= 2.77"
Routed to Reach DP-1 : N & W Property Lines

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
406	39	>75% Grass cover, Good, HSG A
7,213	96	Gravel surface, HSG A
247	96	Gravel surface, HSG D
3,693	30	Woods, Good, HSG A
2,442	77	Woods, Good, HSG D
14,001	74	Weighted Average
14,001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	50	0.0110	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.7	33	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	54	0.0293	2.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	42	0.0405	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	179	Total			

Summary for Subcatchment EDA-1B: to Offsite Culvert

Runoff = 0.89 cfs @ 12.23 hrs, Volume= 0.088 af, Depth= 2.86"
Routed to Reach DP-2 : Offsite Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
638	30	Woods, Good, HSG A
15,372	77	Woods, Good, HSG D
16,010	75	Weighted Average
16,010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0270	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	267	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.5	317	Total			

Summary for Reach DP-1: N & W Property Lines

Inflow Area = 0.321 ac, 0.00% Impervious, Inflow Depth = 2.77" for 25-Year event
Inflow = 0.74 cfs @ 12.25 hrs, Volume= 0.074 af
Outflow = 0.74 cfs @ 12.25 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Offsite Culvert

Inflow Area = 0.368 ac, 0.00% Impervious, Inflow Depth = 2.86" for 25-Year event
Inflow = 0.89 cfs @ 12.23 hrs, Volume= 0.088 af
Outflow = 0.89 cfs @ 12.23 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 EDA-1A: to N & W Property Lines Runoff Area=14,001 sf 0.00% Impervious Runoff Depth=3.87"
Flow Length=179' Tc=17.4 min CN=74 Runoff=1.04 cfs 0.104 af

Subcatchment EDA-1B: to Offsite Culvert Runoff Area=16,010 sf 0.00% Impervious Runoff Depth=3.97"
Flow Length=317' Tc=16.5 min CN=75 Runoff=1.24 cfs 0.122 af

Reach DP-1: N & W Property Lines Inflow=1.04 cfs 0.104 af
Outflow=1.04 cfs 0.104 af

Reach DP-2: Offsite Culvert Inflow=1.24 cfs 0.122 af
Outflow=1.24 cfs 0.122 af

Total Runoff Area = 0.689 ac Runoff Volume = 0.225 af Average Runoff Depth = 3.92"
100.00% Pervious = 0.689 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment EDA-1A: to N & W Property Lines

Runoff = 1.04 cfs @ 12.24 hrs, Volume= 0.104 af, Depth= 3.87"
Routed to Reach DP-1 : N & W Property Lines

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

Area (sf)	CN	Description
406	39	>75% Grass cover, Good, HSG A
7,213	96	Gravel surface, HSG A
247	96	Gravel surface, HSG D
3,693	30	Woods, Good, HSG A
2,442	77	Woods, Good, HSG D
14,001	74	Weighted Average
14,001		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.7	50	0.0110	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.7	33	0.0280	0.84		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	54	0.0293	2.76		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.7	42	0.0405	1.01		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.4	179	Total			

Summary for Subcatchment EDA-1B: to Offsite Culvert

Runoff = 1.24 cfs @ 12.23 hrs, Volume= 0.122 af, Depth= 3.97"
Routed to Reach DP-2 : Offsite Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

Area (sf)	CN	Description
638	30	Woods, Good, HSG A
15,372	77	Woods, Good, HSG D
16,010	75	Weighted Average
16,010		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0270	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	267	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.5	317	Total			

Summary for Reach DP-1: N & W Property Lines

Inflow Area = 0.321 ac, 0.00% Impervious, Inflow Depth = 3.87" for 100-Year event
Inflow = 1.04 cfs @ 12.24 hrs, Volume= 0.104 af
Outflow = 1.04 cfs @ 12.24 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

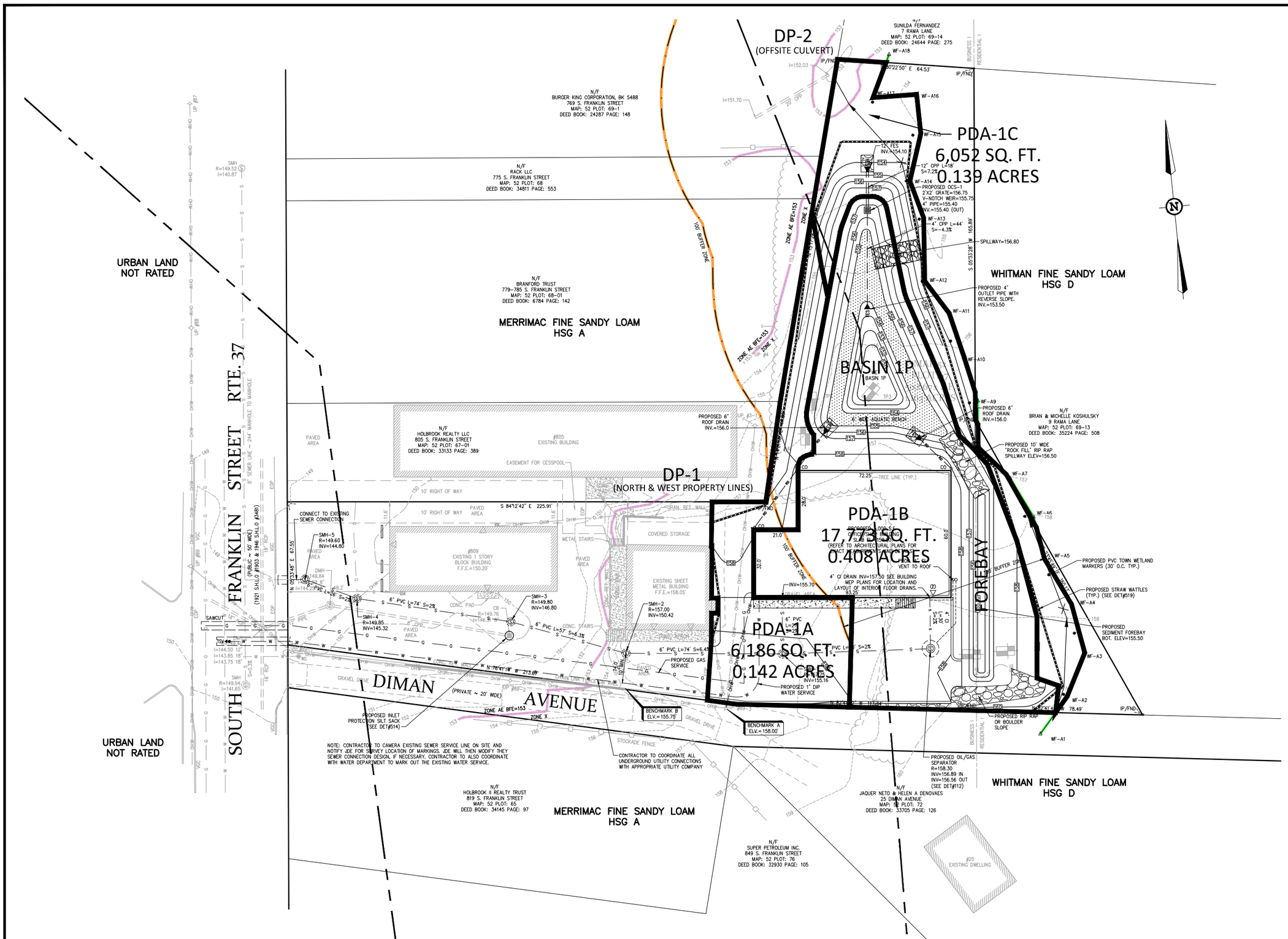
Summary for Reach DP-2: Offsite Culvert

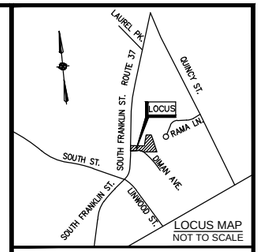
Inflow Area = 0.368 ac, 0.00% Impervious, Inflow Depth = 3.97" for 100-Year event
Inflow = 1.24 cfs @ 12.23 hrs, Volume= 0.122 af
Outflow = 1.24 cfs @ 12.23 hrs, Volume= 0.122 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

APPENDIX B

Post-Development Design Condition





PERMITTING SET

REVISIONS

No.	DATE	DESCRIPTION

DRAWN BY:	JVW
CHECKED BY:	EPJ / GWD
DESIGNED BY:	GWD / JVW

PROPOSED DRAINAGE AREA PLAN

809 S. FRANKLIN STREET
IN
HOLBROOK
(NORFOLK COUNTY)
MASSACHUSETTS

JUNE 29, 2022

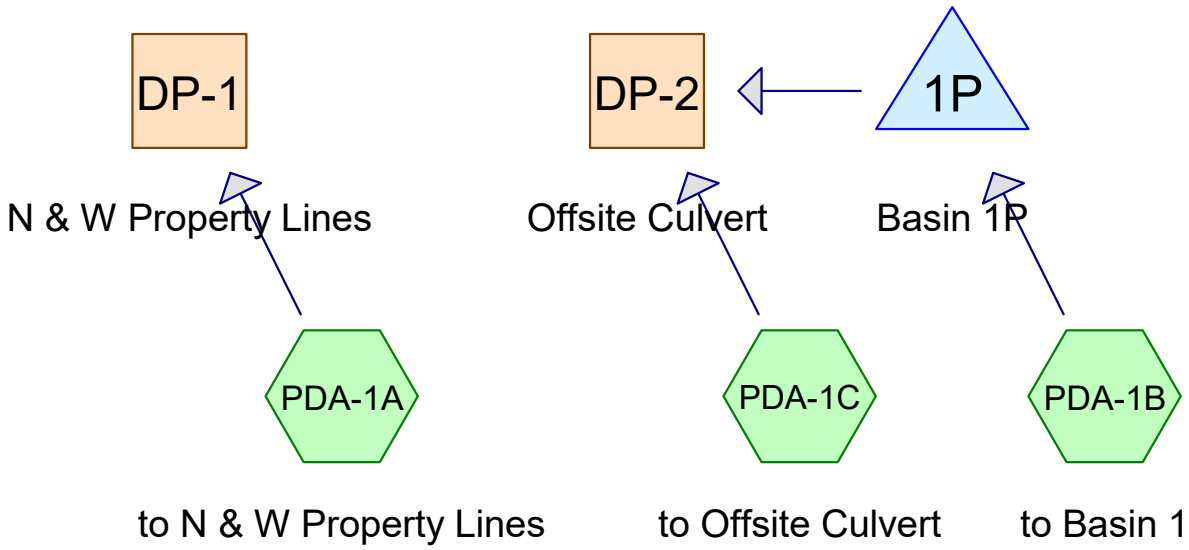
PREPARED FOR:
JOHNSON SHEET METAL CO., INC
809 S. FRANKLIN STREET
HOLBROOK
MASSACHUSETTS 02343

0 20' 40'
SCALE: 1" = 20'
(WHEN PLOTTED ON 24"X36" SHEET)

JDE
Jacobs Driscoll Engineering
50 Oliver Street
North Easton, Massachusetts 02356
Phone: 508-928-4400
www.JacobsDriscoll.com

SHEET 2 OF 2

JOB NUMBER: 01-2021-020



Subcat Reach Pond Link

Routing Diagram for 01-2021-020 Proposed R0
Prepared by Jacobs Driscoll Engineering, Inc., Printed 6/29/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.70	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.50	2
4	100-Year	Type III 24-hr		Default	24.00	1	6.80	2

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PDA-1A: to N & W Property Lines Runoff Area=6,186 sf 53.01% Impervious Runoff Depth=0.83"
Tc=6.0 min CN=70 Runoff=0.12 cfs 0.010 af

Subcatchment PDA-1B: to Basin 1 Runoff Area=17,773 sf 57.10% Impervious Runoff Depth=2.00"
Tc=6.0 min CN=88 Runoff=0.93 cfs 0.068 af

Subcatchment PDA-1C: to Offsite Culvert Runoff Area=6,052 sf 0.00% Impervious Runoff Depth=1.21"
Flow Length=329' Tc=17.0 min CN=77 Runoff=0.14 cfs 0.014 af

Reach DP-1: N & W Property Lines Inflow=0.12 cfs 0.010 af
Outflow=0.12 cfs 0.010 af

Reach DP-2: Offsite Culvert Inflow=0.16 cfs 0.057 af
Outflow=0.16 cfs 0.057 af

Pond 1P: Basin 1P Peak Elev=155.61' Storage=5,533 cf Inflow=0.93 cfs 0.068 af
Outflow=0.08 cfs 0.043 af

Total Runoff Area = 0.689 ac Runoff Volume = 0.092 af Average Runoff Depth = 1.60"
55.26% Pervious = 0.381 ac 44.74% Impervious = 0.308 ac

Summary for Subcatchment PDA-1A: to N & W Property Lines

Runoff = 0.12 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 0.83"
Routed to Reach DP-1 : N & W Property Lines

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,279	98	Paved parking, HSG A
2,907	39	>75% Grass cover, Good, HSG A
6,186	70	Weighted Average
2,907		46.99% Pervious Area
3,279		53.01% Impervious Area

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

Summary for Subcatchment PDA-1B: to Basin 1

Runoff = 0.93 cfs @ 12.09 hrs, Volume= 0.068 af, Depth= 2.00"
Routed to Pond 1P : Basin 1P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
2,866	98	Roofs, HSG A
2,134	98	Roofs, HSG D
795	98	Paved parking, HSG A
1,666	98	Paved parking, HSG D
2,687	98	Water Surface, HSG A
1,316	39	>75% Grass cover, Good, HSG A
5,653	80	>75% Grass cover, Good, HSG D
11	96	Gravel surface, HSG A
645	96	Gravel surface, HSG D
17,773	88	Weighted Average
7,625		42.90% Pervious Area
10,148		57.10% Impervious Area

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

Summary for Subcatchment PDA-1C: to Offsite Culvert

Runoff = 0.14 cfs @ 12.25 hrs, Volume= 0.014 af, Depth= 1.21"
Routed to Reach DP-2 : Offsite Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
133	39	>75% Grass cover, Good, HSG A
1,933	80	>75% Grass cover, Good, HSG D
3,986	77	Woods, Good, HSG D
6,052	77	Weighted Average
6,052		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0270	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
5.2	228	0.0215	0.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	51	0.0392	0.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.0	329	Total			

Summary for Reach DP-1: N & W Property Lines

Inflow Area = 0.142 ac, 53.01% Impervious, Inflow Depth = 0.83" for 2-Year event
Inflow = 0.12 cfs @ 12.10 hrs, Volume= 0.010 af
Outflow = 0.12 cfs @ 12.10 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Offsite Culvert

Inflow Area = 0.547 ac, 42.59% Impervious, Inflow Depth > 1.25" for 2-Year event
Inflow = 0.16 cfs @ 12.30 hrs, Volume= 0.057 af
Outflow = 0.16 cfs @ 12.30 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Basin 1P

Inflow Area = 0.408 ac, 57.10% Impervious, Inflow Depth = 2.00" for 2-Year event
Inflow = 0.93 cfs @ 12.09 hrs, Volume= 0.068 af
Outflow = 0.08 cfs @ 13.33 hrs, Volume= 0.043 af, Atten= 92%, Lag= 74.5 min
Primary = 0.08 cfs @ 13.33 hrs, Volume= 0.043 af
Routed to Reach DP-2 : Offsite Culvert

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 155.00' Surf.Area= 2,496 sf Storage= 3,799 cf
Peak Elev= 155.61' @ 13.33 hrs Surf.Area= 3,414 sf Storage= 5,533 cf (1,734 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 287.6 min (1,102.6 - 815.1)

Volume	Invert	Avail.Storage	Storage Description
#1	155.50'	1,098 cf	**Forebay (Prismatic)** Listed below (Recalc)
#2	151.00'	12,793 cf	**Wet Basin (Prismatic)** Listed below (Recalc)
		13,891 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.50	298	0	0
156.00	663	240	240
157.00	1,052	858	1,098

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
151.00	320	0	0
152.00	527	424	424
153.00	781	654	1,078
154.00	1,083	932	2,010
155.00	2,496	1,790	3,799
156.00	3,373	2,935	6,734
157.00	4,013	3,693	10,427
157.50	5,452	2,366	12,793

Device	Routing	Invert	Outlet Devices
#1	Primary	154.40'	**12.0" Round Culvert** L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 154.40' / 154.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	155.40'	**4.0" Round Culvert** L= 44.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 153.50' / 155.40' S= -0.0432 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#3	Device 1	155.75'	**30.0 deg x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)
#4	Device 1	156.75'	**24.0" x 24.0" Horiz. Top Grate of OCS** C= 0.600 Limited to weir flow at low heads
#5	Primary	156.80'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65

2.66 2.66 2.68 2.70 2.74

#6	Primary	155.50'	**8.00' long x 32.00' breadth x 1.00' high Rock Fill** Rock Diam.= 0.750", S.D.= 0.400", Voids= 40.0%

Primary OutFlow Max=0.08 cfs @ 13.33 hrs HW=155.61' (Free Discharge)

- **1=Culvert** (Passes 0.07 cfs of 2.52 cfs potential flow)
  - **2=Culvert** (Inlet Controls 0.07 cfs @ 1.24 fps)
  - **3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
  - **4=Top Grate of OCS** (Controls 0.00 cfs)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **6=Rock Fill** (Rockfill Controls 0.00 cfs)

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PDA-1A: to N & W Property Lines Runoff Area=6,186 sf 53.01% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=70 Runoff=0.29 cfs 0.021 af

Subcatchment PDA-1B: to Basin 1 Runoff Area=17,773 sf 57.10% Impervious Runoff Depth=3.38"
Tc=6.0 min CN=88 Runoff=1.55 cfs 0.115 af

Subcatchment PDA-1C: to Offsite Culvert Runoff Area=6,052 sf 0.00% Impervious Runoff Depth=2.37"
Flow Length=329' Tc=17.0 min CN=77 Runoff=0.28 cfs 0.027 af

Reach DP-1: N & W Property Lines Inflow=0.29 cfs 0.021 af
Outflow=0.29 cfs 0.021 af

Reach DP-2: Offsite Culvert Inflow=0.45 cfs 0.118 af
Outflow=0.45 cfs 0.118 af

Pond 1P: Basin 1P Peak Elev=155.89' Storage=6,546 cf Inflow=1.55 cfs 0.115 af
Outflow=0.20 cfs 0.090 af

Total Runoff Area = 0.689 ac Runoff Volume = 0.164 af Average Runoff Depth = 2.86"
55.26% Pervious = 0.381 ac 44.74% Impervious = 0.308 ac

Summary for Subcatchment PDA-1A: to N & W Property Lines

Runoff = 0.29 cfs @ 12.10 hrs, Volume= 0.021 af, Depth= 1.82"
Routed to Reach DP-1 : N & W Property Lines

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
3,279	98	Paved parking, HSG A
2,907	39	>75% Grass cover, Good, HSG A
6,186	70	Weighted Average
2,907		46.99% Pervious Area
3,279		53.01% Impervious Area

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

Summary for Subcatchment PDA-1B: to Basin 1

Runoff = 1.55 cfs @ 12.09 hrs, Volume= 0.115 af, Depth= 3.38"
Routed to Pond 1P : Basin 1P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
2,866	98	Roofs, HSG A
2,134	98	Roofs, HSG D
795	98	Paved parking, HSG A
1,666	98	Paved parking, HSG D
2,687	98	Water Surface, HSG A
1,316	39	>75% Grass cover, Good, HSG A
5,653	80	>75% Grass cover, Good, HSG D
11	96	Gravel surface, HSG A
645	96	Gravel surface, HSG D
17,773	88	Weighted Average
7,625		42.90% Pervious Area
10,148		57.10% Impervious Area

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

Summary for Subcatchment PDA-1C: to Offsite Culvert

Runoff = 0.28 cfs @ 12.24 hrs, Volume= 0.027 af, Depth= 2.37"
Routed to Reach DP-2 : Offsite Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
133	39	>75% Grass cover, Good, HSG A
1,933	80	>75% Grass cover, Good, HSG D
3,986	77	Woods, Good, HSG D
6,052	77	Weighted Average
6,052		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0270	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
5.2	228	0.0215	0.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	51	0.0392	0.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.0	329	Total			

Summary for Reach DP-1: N & W Property Lines

Inflow Area = 0.142 ac, 53.01% Impervious, Inflow Depth = 1.82" for 10-Year event
Inflow = 0.29 cfs @ 12.10 hrs, Volume= 0.021 af
Outflow = 0.29 cfs @ 12.10 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Offsite Culvert

Inflow Area = 0.547 ac, 42.59% Impervious, Inflow Depth > 2.59" for 10-Year event
Inflow = 0.45 cfs @ 12.26 hrs, Volume= 0.118 af
Outflow = 0.45 cfs @ 12.26 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Basin 1P

Inflow Area = 0.408 ac, 57.10% Impervious, Inflow Depth = 3.38" for 10-Year event
Inflow = 1.55 cfs @ 12.09 hrs, Volume= 0.115 af
Outflow = 0.20 cfs @ 12.66 hrs, Volume= 0.090 af, Atten= 87%, Lag= 34.5 min
Primary = 0.20 cfs @ 12.66 hrs, Volume= 0.090 af
Routed to Reach DP-2 : Offsite Culvert

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 155.00' Surf.Area= 2,496 sf Storage= 3,799 cf
Peak Elev= 155.89' @ 12.66 hrs Surf.Area= 3,862 sf Storage= 6,546 cf (2,747 cf above start)

Plug-Flow detention time= 1,755.4 min calculated for 0.003 af (3% of inflow)
Center-of-Mass det. time= 210.2 min (1,010.4 - 800.1)

Volume	Invert	Avail.Storage	Storage Description
#1	155.50'	1,098 cf	**Forebay (Prismatic)** Listed below (Recalc)
#2	151.00'	12,793 cf	**Wet Basin (Prismatic)** Listed below (Recalc)
		13,891 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.50	298	0	0
156.00	663	240	240
157.00	1,052	858	1,098

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
151.00	320	0	0
152.00	527	424	424
153.00	781	654	1,078
154.00	1,083	932	2,010
155.00	2,496	1,790	3,799
156.00	3,373	2,935	6,734
157.00	4,013	3,693	10,427
157.50	5,452	2,366	12,793

Device	Routing	Invert	Outlet Devices
#1	Primary	154.40'	**12.0" Round Culvert** L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 154.40' / 154.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	155.40'	**4.0" Round Culvert** L= 44.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 153.50' / 155.40' S= -0.0432 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#3	Device 1	155.75'	**30.0 deg x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)
#4	Device 1	156.75'	**24.0" x 24.0" Horiz. Top Grate of OCS** C= 0.600 Limited to weir flow at low heads
#5	Primary	156.80'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65

			2.66 2.66 2.68 2.70 2.74
#6	Primary	155.50'	**8.00' long x 32.00' breadth x 1.00' high Rock Fill**
			Rock Diam.= 0.750", S.D.= 0.400", Voids= 40.0%

Primary OutFlow Max=0.20 cfs @ 12.66 hrs HW=155.89' (Free Discharge)
- **1=Culvert** (Passes 0.18 cfs of 2.97 cfs potential flow)
  - **2=Culvert** (Outlet Controls 0.17 cfs @ 2.01 fps)
  - **3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.01 cfs @ 0.98 fps)
  - **4=Top Grate of OCS** (Controls 0.00 cfs)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **6=Rock Fill** (Rockfill Controls 0.02 cfs @ 0.01 fps)

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PDA-1A: to N & W Property Lines Runoff Area=6,186 sf 53.01% Impervious Runoff Depth=2.41"
Tc=6.0 min CN=70 Runoff=0.39 cfs 0.029 af

Subcatchment PDA-1B: to Basin 1 Runoff Area=17,773 sf 57.10% Impervious Runoff Depth=4.15"
Tc=6.0 min CN=88 Runoff=1.88 cfs 0.141 af

Subcatchment PDA-1C: to Offsite Culvert Runoff Area=6,052 sf 0.00% Impervious Runoff Depth=3.05"
Flow Length=329' Tc=17.0 min CN=77 Runoff=0.36 cfs 0.035 af

Reach DP-1: N & W Property Lines Inflow=0.39 cfs 0.029 af
Outflow=0.39 cfs 0.029 af

Reach DP-2: Offsite Culvert Inflow=0.58 cfs 0.151 af
Outflow=0.58 cfs 0.151 af

Pond 1P: Basin 1P Peak Elev=156.04' Storage=7,142 cf Inflow=1.88 cfs 0.141 af
Outflow=0.27 cfs 0.116 af

Total Runoff Area = 0.689 ac Runoff Volume = 0.205 af Average Runoff Depth = 3.57"
55.26% Pervious = 0.381 ac 44.74% Impervious = 0.308 ac

Summary for Subcatchment PDA-1A: to N & W Property Lines

Runoff = 0.39 cfs @ 12.10 hrs, Volume= 0.029 af, Depth= 2.41"
Routed to Reach DP-1 : N & W Property Lines

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
3,279	98	Paved parking, HSG A
2,907	39	>75% Grass cover, Good, HSG A
6,186	70	Weighted Average
2,907		46.99% Pervious Area
3,279		53.01% Impervious Area

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

Summary for Subcatchment PDA-1B: to Basin 1

Runoff = 1.88 cfs @ 12.09 hrs, Volume= 0.141 af, Depth= 4.15"
Routed to Pond 1P : Basin 1P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
2,866	98	Roofs, HSG A
2,134	98	Roofs, HSG D
795	98	Paved parking, HSG A
1,666	98	Paved parking, HSG D
2,687	98	Water Surface, HSG A
1,316	39	>75% Grass cover, Good, HSG A
5,653	80	>75% Grass cover, Good, HSG D
11	96	Gravel surface, HSG A
645	96	Gravel surface, HSG D
17,773	88	Weighted Average
7,625		42.90% Pervious Area
10,148		57.10% Impervious Area

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

Summary for Subcatchment PDA-1C: to Offsite Culvert

Runoff = 0.36 cfs @ 12.24 hrs, Volume= 0.035 af, Depth= 3.05"
Routed to Reach DP-2 : Offsite Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
133	39	>75% Grass cover, Good, HSG A
1,933	80	>75% Grass cover, Good, HSG D
3,986	77	Woods, Good, HSG D
6,052	77	Weighted Average
6,052		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0270	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
5.2	228	0.0215	0.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	51	0.0392	0.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.0	329	Total			

Summary for Reach DP-1: N & W Property Lines

Inflow Area = 0.142 ac, 53.01% Impervious, Inflow Depth = 2.41" for 25-Year event
Inflow = 0.39 cfs @ 12.10 hrs, Volume= 0.029 af
Outflow = 0.39 cfs @ 12.10 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Offsite Culvert

Inflow Area = 0.547 ac, 42.59% Impervious, Inflow Depth > 3.32" for 25-Year event
Inflow = 0.58 cfs @ 12.26 hrs, Volume= 0.151 af
Outflow = 0.58 cfs @ 12.26 hrs, Volume= 0.151 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Basin 1P

Inflow Area = 0.408 ac, 57.10% Impervious, Inflow Depth = 4.15" for 25-Year event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 0.141 af
Outflow = 0.27 cfs @ 12.61 hrs, Volume= 0.116 af, Atten= 86%, Lag= 31.2 min
Primary = 0.27 cfs @ 12.61 hrs, Volume= 0.116 af
Routed to Reach DP-2 : Offsite Culvert

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 155.00' Surf.Area= 2,496 sf Storage= 3,799 cf
Peak Elev= 156.04' @ 12.61 hrs Surf.Area= 4,079 sf Storage= 7,142 cf (3,343 cf above start)

Plug-Flow detention time= 759.0 min calculated for 0.029 af (21% of inflow)
Center-of-Mass det. time= 199.5 min (994.0 - 794.5)

Volume	Invert	Avail.Storage	Storage Description
#1	155.50'	1,098 cf	**Forebay (Prismatic)** Listed below (Recalc)
#2	151.00'	12,793 cf	**Wet Basin (Prismatic)** Listed below (Recalc)
		13,891 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.50	298	0	0
156.00	663	240	240
157.00	1,052	858	1,098

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
151.00	320	0	0
152.00	527	424	424
153.00	781	654	1,078
154.00	1,083	932	2,010
155.00	2,496	1,790	3,799
156.00	3,373	2,935	6,734
157.00	4,013	3,693	10,427
157.50	5,452	2,366	12,793

Device	Routing	Invert	Outlet Devices
#1	Primary	154.40'	**12.0" Round Culvert** L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 154.40' / 154.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	155.40'	**4.0" Round Culvert** L= 44.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 153.50' / 155.40' S= -0.0432 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#3	Device 1	155.75'	**30.0 deg x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)
#4	Device 1	156.75'	**24.0" x 24.0" Horiz. Top Grate of OCS** C= 0.600 Limited to weir flow at low heads
#5	Primary	156.80'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65

2.66 2.66 2.68 2.70 2.74

#6	Primary	155.50'	**8.00' long x 32.00' breadth x 1.00' high Rock Fill** Rock Diam.= 0.750", S.D.= 0.400", Voids= 40.0%

Primary OutFlow Max=0.27 cfs @ 12.61 hrs HW=156.04' (Free Discharge)
- **1=Culvert** (Passes 0.23 cfs of 3.19 cfs potential flow)
  - **2=Culvert** (Outlet Controls 0.20 cfs @ 2.29 fps)
  - **3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.03 cfs @ 1.41 fps)
  - **4=Top Grate of OCS** (Controls 0.00 cfs)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **6=Rock Fill** (Rockfill Controls 0.04 cfs @ 0.02 fps)

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 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 PDA-1A: to N & W Property Lines Runoff Area=6,186 sf 53.01% Impervious Runoff Depth=3.45"
Tc=6.0 min CN=70 Runoff=0.56 cfs 0.041 af

Subcatchment PDA-1B: to Basin 1 Runoff Area=17,773 sf 57.10% Impervious Runoff Depth=5.40"
Tc=6.0 min CN=88 Runoff=2.42 cfs 0.184 af

Subcatchment PDA-1C: to Offsite Culvert Runoff Area=6,052 sf 0.00% Impervious Runoff Depth=4.19"
Flow Length=329' Tc=17.0 min CN=77 Runoff=0.49 cfs 0.048 af

Reach DP-1: N & W Property Lines Inflow=0.56 cfs 0.041 af
Outflow=0.56 cfs 0.041 af

Reach DP-2: Offsite Culvert Inflow=0.84 cfs 0.207 af
Outflow=0.84 cfs 0.207 af

Pond 1P: Basin 1P Peak Elev=156.25' Storage=8,030 cf Inflow=2.42 cfs 0.184 af
Outflow=0.43 cfs 0.159 af

Total Runoff Area = 0.689 ac Runoff Volume = 0.273 af Average Runoff Depth = 4.75"
55.26% Pervious = 0.381 ac 44.74% Impervious = 0.308 ac

Summary for Subcatchment PDA-1A: to N & W Property Lines

Runoff = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 3.45"
Routed to Reach DP-1 : N & W Property Lines

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

Area (sf)	CN	Description
3,279	98	Paved parking, HSG A
2,907	39	>75% Grass cover, Good, HSG A
6,186	70	Weighted Average
2,907		46.99% Pervious Area
3,279		53.01% Impervious Area

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

Summary for Subcatchment PDA-1B: to Basin 1

Runoff = 2.42 cfs @ 12.09 hrs, Volume= 0.184 af, Depth= 5.40"
Routed to Pond 1P : Basin 1P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

Area (sf)	CN	Description
2,866	98	Roofs, HSG A
2,134	98	Roofs, HSG D
795	98	Paved parking, HSG A
1,666	98	Paved parking, HSG D
2,687	98	Water Surface, HSG A
1,316	39	>75% Grass cover, Good, HSG A
5,653	80	>75% Grass cover, Good, HSG D
11	96	Gravel surface, HSG A
645	96	Gravel surface, HSG D
17,773	88	Weighted Average
7,625		42.90% Pervious Area
10,148		57.10% Impervious Area

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

Summary for Subcatchment PDA-1C: to Offsite Culvert

Runoff = 0.49 cfs @ 12.23 hrs, Volume= 0.048 af, Depth= 4.19"
Routed to Reach DP-2 : Offsite Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.80"

Area (sf)	CN	Description
133	39	>75% Grass cover, Good, HSG A
1,933	80	>75% Grass cover, Good, HSG D
3,986	77	Woods, Good, HSG D
6,052	77	Weighted Average
6,052		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.9	50	0.0270	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
5.2	228	0.0215	0.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	51	0.0392	0.99		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.0	329	Total			

Summary for Reach DP-1: N & W Property Lines

Inflow Area = 0.142 ac, 53.01% Impervious, Inflow Depth = 3.45" for 100-Year event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af
Outflow = 0.56 cfs @ 12.09 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach DP-2: Offsite Culvert

Inflow Area = 0.547 ac, 42.59% Impervious, Inflow Depth > 4.55" for 100-Year event
Inflow = 0.84 cfs @ 12.27 hrs, Volume= 0.207 af
Outflow = 0.84 cfs @ 12.27 hrs, Volume= 0.207 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Pond 1P: Basin 1P

Inflow Area = 0.408 ac, 57.10% Impervious, Inflow Depth = 5.40" for 100-Year event
Inflow = 2.42 cfs @ 12.09 hrs, Volume= 0.184 af
Outflow = 0.43 cfs @ 12.55 hrs, Volume= 0.159 af, Atten= 82%, Lag= 27.7 min
Primary = 0.43 cfs @ 12.55 hrs, Volume= 0.159 af
Routed to Reach DP-2 : Offsite Culvert

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Starting Elev= 155.00' Surf.Area= 2,496 sf Storage= 3,799 cf
Peak Elev= 156.25' @ 12.55 hrs Surf.Area= 4,297 sf Storage= 8,030 cf (4,231 cf above start)

Plug-Flow detention time= 517.4 min calculated for 0.072 af (39% of inflow)
Center-of-Mass det. time= 185.5 min (972.8 - 787.3)

Volume	Invert	Avail.Storage	Storage Description
#1	155.50'	1,098 cf	**Forebay (Prismatic)** Listed below (Recalc)
#2	151.00'	12,793 cf	**Wet Basin (Prismatic)** Listed below (Recalc)
		13,891 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.50	298	0	0
156.00	663	240	240
157.00	1,052	858	1,098

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
151.00	320	0	0
152.00	527	424	424
153.00	781	654	1,078
154.00	1,083	932	2,010
155.00	2,496	1,790	3,799
156.00	3,373	2,935	6,734
157.00	4,013	3,693	10,427
157.50	5,452	2,366	12,793

Device	Routing	Invert	Outlet Devices
#1	Primary	154.40'	**12.0" Round Culvert** L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 154.40' / 154.10' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	155.40'	**4.0" Round Culvert** L= 44.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 153.50' / 155.40' S= -0.0432 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.09 sf
#3	Device 1	155.75'	**30.0 deg x 1.00' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)
#4	Device 1	156.75'	**24.0" x 24.0" Horiz. Top Grate of OCS** C= 0.600 Limited to weir flow at low heads
#5	Primary	156.80'	**10.0' long x 8.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65

2.66 2.66 2.68 2.70 2.74

#6	Primary	155.50'	**8.00' long x 32.00' breadth x 1.00' high Rock Fill** Rock Diam.= 0.750", S.D.= 0.400", Voids= 40.0%

Primary OutFlow Max=0.43 cfs @ 12.55 hrs HW=156.25' (Free Discharge)
- **1=Culvert** (Passes 0.36 cfs of 3.47 cfs potential flow)
  - **2=Culvert** (Outlet Controls 0.23 cfs @ 2.64 fps)
  - **3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.13 cfs @ 1.85 fps)
  - **4=Top Grate of OCS** (Controls 0.00 cfs)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
- **6=Rock Fill** (Rockfill Controls 0.07 cfs @ 0.02 fps)

APPENDIX C

Basin Storage Table for WQV Calculation

TSS Removal Worksheets

Illicit Discharge Compliance Statement

Stage-Area-Storage for Pond 1P: Basin 1P

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
151.00	0	153.60	1,600	156.20	7,802
151.05	16	153.65	1,649	156.25	8,015
151.10	33	153.70	1,698	156.30	8,231
151.15	50	153.75	1,748	156.35	8,449
151.20	68	153.80	1,799	156.40	8,670
151.25	86	153.85	1,850	156.45	8,894
151.30	105	153.90	1,903	156.50	9,120
151.35	125	153.95	1,956	156.55	9,349
151.40	145	154.00	2,010	156.60	9,581
151.45	165	154.05	2,065	156.65	9,815
151.50	186	154.10	2,125	156.70	10,051
151.55	207	154.15	2,188	156.75	10,290
151.60	229	154.20	2,254	156.80	10,532
151.65	252	154.25	2,324	156.85	10,776
151.70	275	154.30	2,398	156.90	11,023
151.75	298	154.35	2,475	156.95	11,272
151.80	322	154.40	2,556	157.00	11,524
151.85	347	154.45	2,640	157.05	11,728
151.90	372	154.50	2,728	157.10	11,940
151.95	397	154.55	2,819	157.15	12,159
152.00	424	154.60	2,914	157.20	12,384
152.05	450	154.65	3,012	157.25	12,617
152.10	477	154.70	3,114	157.30	12,858
152.15	505	154.75	3,219	157.35	13,105
152.20	534	154.80	3,328	157.40	13,360
152.25	563	154.85	3,440	157.45	13,621
152.30	593	154.90	3,556	157.50	**13,891**
152.35	624	154.95	3,676		
152.40	655	→ 155.00	3,799		
152.45	686	155.05	3,925		
152.50	719	155.10	4,053		
152.55	752	155.15	4,183		
152.60	785	155.20	4,316		
152.65	820	155.25	4,450		
152.70	855	155.30	4,587		
152.75	890	155.35	4,726		
152.80	926	155.40	4,868		
152.85	963	155.45	5,011		
152.90	1,001	155.50	5,157		
152.95	1,039	155.55	5,320		
153.00	1,078	155.60	5,488		
153.05	1,117	155.65	5,660		
153.10	1,157	155.70	5,835		
153.15	1,198	155.75	6,015		
153.20	1,240	155.80	6,199		
153.25	1,282	155.85	6,386		
153.30	1,325	155.90	6,578		
153.35	1,369	155.95	6,774		
153.40	1,414	156.00	6,974		
153.45	1,460	156.05	7,177		
153.50	1,506	156.10	7,382		
153.55	1,553	156.15	7,591		

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Basin 1P - Pretreatment

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Sediment Forebay	**0.25**	**1.00**	**0.25**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**
	0.00	**0.75**	**0.00**	**0.75**

Total TSS Removal = **25%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Johnson Sheet Metal**

Prepared By: **Jacobs Driscoll Engineering, Inc.**

Date: **6/29/2022**

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Basin 1P - Wet Basin

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Wet Basin	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **Johnson Sheet Metal**

Prepared By: **Jacobs Driscoll Engineering, Inc.**

Date: **6/29/2022**

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Stormwater Management Regulations Standard #10:

Illicit Discharge Compliance Statement

An illicit discharge is any discharge to a municipal separate storm sewer system (MS_4) that is not comprised entirely of stormwater, discharges from fire-fighting activities, and certain non-designated non-stormwater discharges.

To the best of my knowledge, no detectable illicit discharge exists on site. The site plans included with this report detail the storm sewers that convey stormwater on the site and demonstrate that these systems do not include the entry of an illicit discharge. An Operations and Maintenance Plan is also included along with the Long Term Pollution Prevention Plan that outlines measures to prevent future illicit discharges. As the Site Owner, I will ultimately be responsible for implementing the Long Term Pollution Prevention Plan.

Name: Jacob Johnston

Company: Johnson Sheet Metal Co., Inc

Title: Manager

Signature: 

Date: 6/28/2022

APPENDIX D

Construction Phase Pollution Prevention and Erosion and Sedimentation Plan

Post-Development BMP Operation and Maintenance Plan – including Long-Term Pollution Prevention Plan

Construction Phase Pollution Prevention and Erosion and Sedimentation Control Plan

In Support of:

Notice of Intent

For:

Office/ Shop Building

809 South Franklin Street (Map 52, Plot 67)
Holbrook, Massachusetts 02343

Applicant:

Johnson Sheet Metal Co., Inc.

809 South Franklin Street
Holbrook, Massachusetts 02343

Submitted to:

Town of Holbrook
Conservation Commission

Dated: June 29, 2022

Prepared By:

Jacobs Driscoll Engineering, Inc.
50 Oliver Street
North Easton, MA 02356

JN: 01-2021-020

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Construction Phase Pollution Prevention & Erosion and Sedimentation Control Plan

Erosion and sedimentation will be controlled at the site by utilizing Structural Practices, Stabilization Practices, and Dust Control. These practices correspond with plans entitled "Site Development Plans" dated June 29, 2022, prepared by Jacobs Driscoll Engineering hereinafter referred to as the Site Plans.

Responsible Party/Property Owner/Developer contact information:

Jake Johnston
Johnson Sheet Metal Co., Inc.
809 South Franklin Street
Holbrook, MA 02343
Phone: (781) 767-3540

Town of Holbrook Contact Information:

Town of Holbrook
Department of Public Works
Keith Nastasia, Superintendent
Holbrook Town Hall
50 North Franklin Street
Holbrook, MA 02343
Phone: (781) 767-1800

Narrative:

Project Description:

The applicant, Jake Johnston of Johnson Sheet Metal Co. Inc., proposes to construct a 5,000 square foot Office/Shop Building on a wooded portion of their land located at 809 South Franklin Street in Holbrook, MA.

Site Description:

The site improvements will include all of the necessary access drives, drainage improvements, parking area, and landscape areas.

Adjacent Property:

The site is located on the eastern side of South Franklin Street in Holbrook. The property is surrounded by business uses to the North and South and a residential use is located to the East of the property. The existing parcel can be identified on Assessor's Map 52, Plot 67 with a total area of approximately 1.163 +/- acres.

Soils:

Soils information was obtained from the USDA Natural Resources Conservation Service's (NRCS) Web Soil Survey mapping. Site soils are classified as the following SCS Hydrologic Soil Groups: Urban Lane (No SCS Hydrologic Soil Group Rating), Merrimac Fine Sandy Loam (254B - SCS Hydrologic Soil Group A), Whitman Fine Sandy Loam (73A - SCS Hydrologic Soil Group D). Refer to Figure 8, Soil Survey Map, for a delineation of the boundaries of the soils with respect to the study area.

Erosion and Sedimentation Control Practices:

Structural Practices:

1) **Straw Wattles and/or Filter Sock Barrier Controls** –Filter sock erosion control barrier will be constructed along downward slopes at the limit of work in locations shown on the plans. This control will be installed prior to major soil disturbance on the site. The barrier control shall be installed as shown on the Erosion Control Detail Plan and the manufacturer's recommendations. Also, a stockpile of 100' of straw wattles shall be kept onsite for any emergency repairs to the filter sock erosion control barrier.

   Straw Wattles and/or Filter Sock Design/Installation Requirements *
   * (included on Inspection/Evaluation Checklist)

   a) Wattles or sock should be placed lengthwise on the contour, with the ends of adjacent Wattles/sock tightly abutting one another and overlapping on the ground surface (not one over another) per manufacturer instructions.

   b) The barrier should be placed on natural ground and staked on either side or through the barrier per manufacturer requirements.

   c) Wattles/sock barriers should be removed when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

   Straw Wattles and/or Filter Sock Barrier Inspection/Maintenance *

   a) Straw Wattles and/or filter sock barriers should be inspected within 24 hours after a runoff-producing rainfall event of 0.5" or greater and a minimum of 1 time per week.

   b) Close attention should be paid to the repair of damaged barriers, undercutting beneath the barrier, and flow around the ends of the barrier.

   c) Necessary repairs to barriers or replacement of bales should be completed promptly.

d) Sediment deposits should be checked after each runoff-producing rainfall. They must be removed when the level of deposition reaches approximately one-half the height of the barrier.

e) Any sediment deposits remaining in place after the hay bale barrier is no longer required should be dressed to conform to the existing grade, prepared and seeded.

2) **Stabilized Construction Entrance** – A stabilized construction entrance will be placed at the location indicated on the Grading, Drainage and Utility Plan. The stabilized construction entrance will be installed immediately prior to any land disturbance. The construction entrance will keep mud and sediment from being tracked off the construction site by vehicles leaving the site. The stabilized construction entrance shall be constructed as shown on the Construction Detail Plan.

Construction Entrance Design/Construction Requirements *

a) Grade foundation for positive drainage away from the work area.

b) Stone for a stabilized construction entrance shall consist of 1 to 3-inch stone placed on a stable foundation.

c) Pad dimensions: The minimum length of the gravel pad should be 30 feet. The pad should extend the full width of 23' as shown on the plan or wide enough so that the largest construction vehicle will fit in the entrance with room to spare; whichever is greater. If a large amount of traffic is expected at the entrance, then the stabilized construction entrance should be wide enough to fit two vehicles across with room to spare.

d) A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.

e) Washing: If the site conditions are such that the majority of mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the vehicle enters the street. The wash area should be a level area with 3-inch washed stone minimum, or a commercial rack.

f) Water employed in the washing process shall be directed to a sediment trap or approved sediment-trapping device prior to discharge to the temporary sedimentation basin along the site entrance drive. Sediment should be prevented from entering any watercourses.

Construction Entrance Inspection/Maintenance *

a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment outside the work area. This may require periodic topdressing with additional stone

b) The construction entrance and sediment disposal area shall be inspected weekly and after heavy rains or heavy use.

c) Mud and sediment tracked or washed onto public road shall be immediately removed by sweeping.

d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be top dressed with new stone. Replacement of the entire pad may be necessary when the pad becomes completely clogged.

e) If washing facilities are used, the sediment traps should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.

f) The pad shall be reshaped as needed for drainage and runoff control.

g) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

3) **Inlet Protection** – Inlet Protection will be utilized around the catch basin grates. The inlet protection will allow the storm drain inlets to be used before final stabilization. This structural practice will allow early use of the drainage system. Siltsack or equivalent will be utilized for the inlet protection. Siltsack is manufactured by ACF Environmental. The telephone number is 1-800-437-6746. Regular flow siltsack will be utilized, and if it does not allow enough storm water flow, hi-flow siltsack will be utilized. Furthermore, the newly installed catch basins shall also have haybales set around the inlet to further protect the inlet from sedimentation.

Silt Sack (or equivalent) Inlet Protection Inspection/Maintenance Requirements *

a) All trapping devices and the structures they protect should be inspected after every rain storm and repairs made as necessary.

b) Sediment should be removed from the trapping devices after the sediment has reached a maximum depth of one-half the depth of the trap.

c) Oil build-up should be removed by using a small portable pump and disposed of in accordance with all applicable local, state, and federal regulations.

d) Sediment should be disposed of in a suitable area outside of the wetland buffers and protected from erosion by either structural or vegetative means. Sediment removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

e) The silt sack must be replaced if it is ripped or torn in any way.

f) Temporary traps should be removed and the area repaired as soon as the contributing drainage area to the inlet has been completely stabilized.

Stabilization Practices:

Stabilization measures shall be implemented as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased. Vegetative stabilization measures shall be employed. All perimeter dikes and slopes, basin or trap embankments shall be stabilized with sod, seed, and anchored straw mulch within seven calendar days of disturbance. All other disturbed areas shall be stabilized with sod, seed, and anchored straw mulch within fourteen calendar days after disturbing activities have ceased. Topsoil shall be stripped from disturbed areas and stockpiled in an approved area and stabilized with temporary vegetative cover if left for more than thirty calendar days. Perimeter sediment controls shall be installed around stockpiled topsoil. During the months of October through March, when seeding and sodding may be impractical, anchored mulch shall be applied as approved by the Conservation Commission.

1) **Temporary Seeding** – Temporary seeding will allow a short-term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be done at stock piles and disturbed portions of the site where construction activity will temporarily cease for at least 21 days. The temporary seedings will stabilize cleared and unvegetated areas that will not be brought into final grade for several weeks or months.

   Temporary Seeding Planting Procedures *

   a) Planting should preferably be done between April 1st and June 30th, and September 1st through September 31st. If planting is done in the months of July and August, irrigation may be required. If planting is done between October 1st and March 31st, anchored mulch should be applied immediately after planting. If seeding is done during the summer months, irrigation of some sort will probably be necessary.

b) Before seeding, install structural practice controls. Utilize Amoco supergro or equivalent.

c) The seedbed should be firm with a fairly fine surface. Perform all cultural operations across or at right angles to the slope. A minimum of 4-inches of tilled topsoil is required. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content.

d) Apply uniformly 2 tons of ground limestone per acre (100 lbs. Per 1,000 sq.ft.) or according to soil test. Apply uniformly 10-10-10 analysis fertilizer at the rate of 400 lbs. per acre (14 lbs. per 1,000 sq.ft.) or as indicated by soil test. Forty percent of the nitrogen should be in organic form. Work in lime and fertilizer to a depth of 4-inches using any suitable equipment.

e) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30th	½ to ¾ inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter Rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

f) Use an effective mulch, such as clean grain straw; tacked and/or tied with netting to protect seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance *

a) Inspect within 4 weeks of planting to see if stands are adequate. Check for damage within 24 hours of a rainfall event of 0.5 inches or greater and a minimum of 1 time per week. Stands should be uniform and dense. Fertilize, reseed, and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially in abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes. The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	Manufacturer	Product	Remarks
Sediment Fence	Amoco	Woven polypropylene 1198 or equivalent	0.425 mm opening
Construction Entrance	Amoco	Woven polypropylene 2002 or equivalent	0.300 mm opening
Outlet Protection	Amoco	Nonwoven polypropylene 4551 or equivalent	0.150 mm opening
Erosion Control (slope stability)	Amoco	Supergro or equivalent	Erosion control revegetation mix, open polypropylene fiber on degradable polypropylene net scrim

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance *

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

3) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas, which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes (slopes greater than 3:1), mulch must be supplemented with netting. The preferred mulching material is straw.

Mulch (Hay or Straw) Materials and Installation

a) Straw has been found to be one of the most effective organic mulch materials. The specifications for straw are described below, but other material may be appropriate. The straw should be air-dried; free of undesirable seeds & coarse materials. The application rate per 1,000 sq.ft. is 90-100 lbs. (2-3 bales) and the

application rate per acre is 2 tons (100-120 bales). The application should cover about 90% of the surface. The use of straw mulch is appropriate where mulch is maintained for more than three months. Straw mulch is subject to wind blowing unless anchored, is the most commonly used mulching material, and has the best microenvironment for germinating seeds.

Mulch Maintenance *

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, remulch, and install new netting.

b) Straw or grass mulches that blow or wash away should be repaired promptly.

c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting degrades and becomes less of a problem.

d) Continue inspections until vegetation is well established.

4) **Land Grading** – Grading on fill slopes, cut slopes, and stockpile areas will be done with full siltation controls in place.

Land Grading Design/Installation Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on critical disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.

b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.

c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.

d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.

e) Fill should consist of material from borrow areas and excess cut will be stockpiled in areas shown on the Site Plans. All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.

Land Grading Stabilization Inspection/Maintenance *

a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.

b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.

c) Areas requiring revegetation should be repaired immediately. Slopes should be limed and fertilized as necessary to keep vegetation healthy. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) **Topsoiling** * – Topsoiling will help establish vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a silt loam texture with 15% to 20% organic content.

Topsoiling Placement

a) Topsoil should not be placed while in a frozen or muddy condition, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.

b) Do not place topsoil on slopes steeper than 3:1 without mulching and netting. Slopes greater than 2:1 will require rip rap surface treatment for stabilization.

c) If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. The best method is to actually work the topsoil into the layer below for a depth of at least 6 inches.

6) **Preserving Natural Vegetation** – The trees to be saved will be clearly flagged or marked with a bright colored ribbon. Snow fencing will be set at the drip/spread line of the trees and shrubs to be protected. Machinery will be kept away from tree roots.

7) **<u>Permanent Seeding</u>** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of plants should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be done early enough in the fall so that a good cover is established before cold weather comes and growth stops until the spring. A good cover is defined as vegetation covering 75 percent or more of the ground surface.

<u>Permanent Seeding Seedbed Preparation</u>

a) In infertile or coarse-textured subsoil, it is best to stockpile topsoil and respread it over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.

b) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.

c) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch when stepped on with a shoe. Areas to receive topsoil shall not be firmed until after topsoiling and lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.

<u>Permanent Seeding Grass Selection/Application</u>

a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydroseeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.

b) Lime and fertilize. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.

c) Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergro or equivalent should be utilized.

<u>Permanent Seeding Inspection/Maintenance *</u>

a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed plants where necessary.

b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in accordance with soil test results.

c) If a stand has less than 40% cover, reevaluate choice of plant materials and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents resowing, mulch or jute netting is an effective temporary cover.

d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed. Organic fertilizer shall be utilized in areas within the 100 foot buffer zone to a wetland resource area.

Dust Control *:

Dust control will be utilized throughout the entire construction process of the site. For example, keeping disturbed surfaces moist during windy periods will be an effective control measure, especially for construction haul roads. The use of dust control will prevent the movement of soil to offsite areas. However, care must be taken to not create runoff from excessive use of water to control dust. The following are methods of Dust Control that may be used on-site:

- Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
- Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
- Sprinkling – The site may be sprinkled until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
- Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.

Non-Stormwater Discharges:

During construction activities at the site, some water from the site will be suitable for discharge to the detention areas and/or temporary sediment basin areas. Non-stormwater discharges will be directed to recharge groundwater and to replenish wetland resource areas.

The construction de-watering and all non-stormwater discharges will be directed into a sediment dirt bag (or equivalent inlet protection) or a sediment basin. Sediment material

removed shall be disposed of in accordance with all applicable local, state, and federal regulations.

The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction De-watering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b)(14)(x).

Soil Stockpiling*:

Topsoil and subsoil from the roadway grading will be stockpiled in locations shown on the plans.

Stockpile Material Construction Procedure

1. Topsoil and subsoil that are stripped will be stockpiled for later distribution on disturbed areas.

2. The stockpiles will be located as shown on the plans. These locations will allow them to not interfere with work on the site.

3. Seed the stockpiles with a temporary erosion control mix if the stockpile is to remain undisturbed for more than 30 days. The stockpiles must be stable and the side slopes should not exceed 2:1.

4. Sediment Fence/Hay Bale Barrier erosion control measures should be placed surrounding each stockpile.

5. As needed, the stockpiled topsoil and subsoil are redistributed throughout the site.

Construction Sequence:

To prevent excessive erosion and silting, the following construction sequence coupled with other widely accepted principals for reducing erosion and sedimentation shall be implemented in the development of the site.

Construction Sequence

The following Construction Sequence shall be followed by the contractor and is also outlined on the Notice of Intent Plan:

1. Install erosion control devices to establish the limit of work as shown on plan.

2. Construct temporary construction exit area as shown on detail #509.

3. Discharges from dewatering of excavations shall not be diverted directly into any wetlands or existing storm drains without pretreatment via settling basins.
4. Clear and grub site within the limit of work.

5. Construct storm water management basin to be uses a sediment trap. Install low flow perforated pipe with filter fabric and stone. So not install low flow orifice cap until site is fully stabilized.

6. Establish rough sub grades for parking lot, drainage basin and building platform.

7. Perform building and site construction per approved site plans.

8. Inspect and maintain erosion control measures after rainfall events and a minimum of once per week.

9. Remove sediment buildup at erosion control devices as needed. Redistribute material over site in conformance with earthwork specifications.

10. As drainage structures are installed, install filter fabric and straw bales around new structures in accordance with detail #507 and maintain them until pavement is in place and vegetation is established. All outfalls shall be immediately stabilized with stone protection as required.

11. All cut and fill slopes shall be temporarily stabilized with top soil, seed and mulch or curlex as required if construction activity ceases on said slopes for a period of seven days or greater. All slopes shall be permanently stabilized as required immediately upon completion of final grading.

12. Complete finish grading and stabilization of site. Place final paving course.

13. Remove sediment from all drainage structures and pipes after completion of construction. Remove and regrade temporary berms, swales, check dams, etc. Stabilize disturbed areas.

14. Clean out all sediment from storm water management basin and outlet structures. Regrade to contours per design. Stabilize all slopes as required.

15. Remove erosion control devices & silt fence upon establishment of permanent ground cover and issuance of a Certificate of Compliance from the Holbrook Conservation Commission. Stabilize all areas where straw wattles (erosion control device) were removed.

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. The applicant shall be responsible to secure the services of a licensed engineer or similar professional (inspector) on an on-going basis throughout all phases of the project. Refer to the

Inspection/Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should review the erosion and sediment controls with respect to the following:

- Whether or not the measure was installed/performed correctly.
- Whether or not there has been damage to the measure since it was installed or performed.
- What should be done to correct any problems with the measure.

The inspector should complete the Stormwater Management Construction Phase BMP Inspection Schedule and Evaluation Checklist, as attached, for documenting the findings and should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. The inspector should notify the appropriate person to make the changes and submit copies of the form to the local Planning Board upon request.

It is essential that the inspector document the inspection of the pollution prevention measures. These records will be used to request maintenance and repair and to prove that the inspection and maintenance were performed. The forms list each of the measures to be inspected on the site, the inspector's name, the date of the inspection, the condition of the measure/area inspected, maintenance or repair performed and any changes which should be made to the Pollution Prevention & Erosion and Sedimentation Control Plan to control or eliminate unforeseen pollution of storm water.

Post-Construction Phase Best Management Practices Operation & Maintenance Plan and Long-Term Pollution Prevention Plan

In Support of:

Notice of Intent

For:

Office/ Shop Building

809 South Franklin Street (Map 52, Plot 67)
Holbrook, Massachusetts 02343

Applicant:

Johnson Sheet Metal Co., Inc.

809 South Franklin Street
Holbrook, Massachusetts 02343

Submitted to:

Town of Holbrook Conservation Commission

Dated: June 29, 2022

Prepared By:
Jacobs Driscoll Engineering, Inc.
50 Oliver Street
North Easton, MA 02356

JN: 01-2021-020

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Post-Construction Best Management Practices (BMPs) Operation and Maintenance Plan

Responsible Party/Property Owner/Developer contact information:

Jake Johnston
Johnson Sheet Metal Co., Inc.
809 South Franklin Street
Holbrook, MA 02343
Phone: (781) 767-3540

Town of Holbrook Contact Information:

Town of Holbrook
Department of Public Works
Keith Nastasia, Superintendent
Holbrook Town Hall
50 North Franklin Street
Holbrook, MA 02343
Phone: (781) 767-1800

Best Management Practices (BMPs) of the Commonwealth of Massachusetts Department of Environmental Protection's (DEP's) Stormwater Management Policy (SMP) have been implemented and utilized for the project. The following information provided is to be used as a guideline for monitoring and maintaining the performance of the drainage facilities and to ensure that the quality of water runoff meets the standards set forth by the SMP. The structural Best Management Practices (BMPs) shall be inspected during rainfall conditions during the first year of operation to verify functionality.

BMPs currently installed on the property include:

- Sediment Forebay
- Wet Basin

Operation:

Once the proposed new drainage, grading and pavement has been constructed and the site has been permanently stabilized and the stormwater facilities are online, the operation of the stormwater management system will function as intended. In the primary train of stormwater treatment, the stormwater runoff from the paved areas is directed off the pavement, through the sediment forebay then to the infiltration basin where it will recharge the groundwater table.

1. **First Year Operation** - Inspection and maintenance, as outlined herein, shall be performed four times within the first year of operation. An inspection report shall be

maintained. See also the general ongoing maintenance operations below as these tasks will apply in the first year of operation as well.

A visual inspection shall be made of all stormwater management system components for the entire storm drainage system. The general condition of these structures should be reviewed and accumulated debris shall be removed. The condition of all outlets shall be noted and a description of the drainage structures shall be included in the report. Deleterious materials shall be removed from these structures in order for the system to function properly.

All outlets, draining channels, and slopes shall be kept stabilized. Any erosion shall be repaired immediately.

Maintenance:

1. **Parking Lot & Driveway Maintenance** – Vacuum sweepers shall sweep paved areas periodically during dry weather to remove excess sediments to reduce the amount of sediments that the drainage system shall have to remove from the runoff. The sweeping should be conducted on a semiannual basis before April 30th and after November 15th.

   Salt used for de-icing on the pavement during winter months shall be limited as much as possible as this will reduce the need for removal and treatment. Sand containing the minimum amount of calcium chloride (or approved equivalent) needed for handling may be applied as part of the routine winter maintenance activities. Estimated annual budget $1,000.

2. **Sediment Forebay** – The sediment forebay shall be checked for debris accumulation on a quarterly basis. Trash, leaves, branches, etc. shall be removed from facility. Silt, sand and sediment, if significant accumulation occurs, shall be removed by hand annually. Material removed from the forebay shall be disposed of in accordance with all applicable local, state, and federal regulations. The sediment forebay shall be kept free of woody vegetation by mowing at least once per year. Reseeding, weed control, and invasive species removal may need to be performed periodically to maintain healthy vegetation and maintain the pollutant removal efficiency of the facilities. Accumulated sediment shall be removed from the infiltration basin before it exceeds 1' in depth, or at least once every 5 years.

   Any slope erosion within the facilities shall be stabilized and repaired as soon as practical. The outlet structure and embankment shall be inspected annually for structural integrity. Inspect riprap outlet structures after heavy rains for erosion at sides and ends of apron and for stone displacement. Rock may need to be added if sediment builds up in the pore spaces of the outlet pad. Make repairs immediately using appropriate stone sizes. Do not place stones above finished grade.

Frost ports shall be inspected for woody vegetation which shall be removed if found. Also inspect for sediment buildup. Should sediment buildup become an issue, the crushed stone and filter fabric in the frost port shall be removed and replaced.

The inspections shall be conducted by a licensed engineer or qualified professional (inspector). Estimated annual budget $1,500.

3. **Spillways, Plunge Pools and Embankments** – Along with the Infiltration Basin and Sediment Forebay inspection, these areas shall also be inspected quarterly for debris accumulation. Trash, leaves, branches, etc. shall be removed from facilities. Silt, sand and sediment, if significant accumulation occurs, shall be removed by hand annually. Should significant accumulation of sediment occur, then either placement of additional stone or removal and replacement of the rip rap may be necessary. The spillways, plunge pools and embankments shall be kept free of woody vegetation by mowing at least once per year or hand removal in rip rap areas. Reseeding, weed control, and invasive species removal may need to be performed periodically to maintain healthy vegetation on embankments. Material removed from the basin or forebay shall be disposed of in accordance with all applicable local, state, and federal regulations.

   Any slope erosion within the facilities shall be stabilized and repaired as soon as practical. The embankments/dykes/berms shall be inspected annually for structural integrity, seepage and loss of fines. If animal burrows are found, then a wildlife removal expert shall be brought in to remove the animal and the burrows shall be repaired. Inspect riprap outlet structures after heavy rains for erosion at sides and ends of apron and for stone displacement. Rock may need to be added if sediment builds up in the pore spaces of the outlet pad. Make repairs immediately using appropriate stone sizes. Do not place stones above finished grade.

   The inspections shall be conducted by a licensed engineer or qualified professional (inspector). Estimated annual budget $1,000.

Maintenance Responsibilities:

All post construction maintenance activities will be documented and kept on file. Annual inspection reports in the form of an Evaluation Checklist and a cover letter (see attached form) **shall be submitted to the local Conservation Commission on an annual basis**. Inspections shall be performed by a licensed engineer or similar professional (inspector).

The following minimum information shall be recorded:

- Date of inspection
- General condition of the entire system
- Corrective maintenance actions taken to ensure adequate function and when performed.

- A copy of these inspection reports shall be furnished to the appropriate agency upon request.
- Maintain a minimum of 3 years of O&M activity records.

Long-Term Pollution Prevention Plan

Good Housekeeping:

To develop and implement an operation and maintenance program with the goal of preventing or reducing pollutant runoff by keeping potential pollutants from coming into contact with stormwater or being transported off site without treatment, the following efforts will be made:

- Property Management awareness and training on how to incorporate pollution prevention techniques into maintenance operations.
- Follow appropriate best management practices (BMPs) by proper maintenance and inspection procedures.

Storage and Disposal of Household Waste and Toxics:

This management measure involves educating the general public on the management considerations for hazardous materials. Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts. Property owners are encouraged to contract with a hazardous waste collection company as required for removal of the waste.

MADEP has prepared several materials for property owners on how to properly use and dispose of household hazardous materials:

http://www.mass.gov/dep/recycle/reduce/househol.htm

For consumer questions on household hazardous waste call the following number:

DEP Household Hazardous Waste Hotline 800-343-3420

The following is a list of management considerations for hazardous materials as outlined by the EPA:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport;
- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself;

- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests.

The following is a list of commonly used hazardous materials used in the household:

Batteries – automotive and rechargeable
nickel cadmium batteries
(no alkaline batteries)
Gasoline
Oil-based paints
Fluorescent light bulbs and lamps
Pool chemicals
Propane tanks
Lawn chemicals,
fertilizers and weed killers
Turpentine
Bug sprays
Antifreeze
Paint thinners, strippers, varnishes and stains
Arts and crafts chemicals
Charcoal lighter fluid
Disinfectant
Drain clog dissolvers
Driveway sealer
Flea dips, sprays and collars
Houseplant insecticides
Metal polishes
Mothballs
Motor oil and filters
Muriatic acid (concrete cleaner)
Nail polishes and nail polish removers
Oven cleaner
Household pest and rat poisons
Rug and upholstery cleaners
Shoe polish
Windshield wiper fluid

Landscape Maintenance:

This management measure seeks to control the storm water impacts of landscaping and lawn care practices through education and outreach on methods that reduce nutrient loadings and the amount of storm water runoff generated from lawns. Nutrient loads generated by fertilizer use on suburban lawns can be significant, and recent research has shown that lawns produce more surface runoff than previously thought. Only slow release organic fertilizers may be used in wetland buffer zone areas and only after testing the soil and consultation with the Conservation Agent. See the attached Lawn Management Plan for sustainable lawn establishment and maintenance practices in sensitive areas.

Using proper landscaping techniques can effectively increase the value of a property while benefiting the environment. These practices can benefit the environment by reducing water use; decreasing energy use (because less water pumping and treatment is required); minimizing runoff of storm and irrigation water that transports soils, fertilizers, and pesticides; and creating additional habitat for plants and wildlife. The following lawn and landscaping management practices will be encouraged:

- Mow lawns at the highest recommended height, 3" plus.
- Minimize lawn size and maintain existing native vegetation.
- Collect rainwater for landscaping/gardening needs (rain barrels and cisterns to capture roof runoff).

- Raise public awareness for promoting the water efficient maintenance practices by informing users of water efficient irrigation techniques and other innovative approaches to water conservation.
- Abide by water restrictions and other conservation measures implemented by the Town of Holbrook.
- Water only when necessary.
- Use automatic irrigation systems with rain sensors to reduce water use.

The developer shall provide each homeowner with a copy of this document as well as the attached Lawn Management Plan. It is anticipated that the Conservation Commission will require a perpetual Special Condition within the Order of Conditions that require each homeowner, and every homeowner thereafter as ownership of the properties transfers from time to time, to receive a copy of the Order of Conditions as well as this document and the attached Lawn Management Plan.

Integrated Pest Management (IPM):

This management measure seeks to limit the adverse impacts of insecticides and herbicides by providing information on alternative pest control techniques other than chemicals or explaining how to determine the correct dosages needed to manage pests. Be advised that the use of pesticides, herbicides and fungicides are not allowed within wetland buffer zones without first consulting with the Conservation Agent.

The presence of pesticides in stormwater runoff has a direct impact on the health of aquatic organisms and can present a threat to humans through contamination of drinking water supplies. The pesticides of greatest concern are insecticides, such as diazinon and chloropyrifos, which even at very low levels can be harmful to aquatic life. The major source of pesticides to urban steams is home application of products designed to kill insects and weeds in the lawn and garden. The following IPM practices will be encouraged:

- Lawn care and landscaping management programs including appropriate pesticide use management as part of program.
- Raise public awareness by referring homeowners to "A Homeowner's Guide to Environmentally Sound Lawncare, Maintaining a Healthy Lawn the IPM Way", Massachusetts Department of Food and Agriculture, Pesticide Bureau or link **http://www.mass.gov/dep/water/resources/nonpoint.htm#megaman**>
- Proper implementation of the Lawn Maintenance Plan will reduce the need for pesticides, herbicides or fungicides in the first place and is therefore the best management practice for lawn and pest management.

Proper Management of Deicing Chemicals and Snow:

The following deicing chemicals and snow storage practices will be encouraged:

- Select effective snow disposal sites adjacent to or on pervious surfaces in upland areas away from water resources and wells. At these locations, the snow meltwater can filter in to the soil, leaving behind sand and debris, which can be removed in the springtime.
- No roadway deicing materials shall be stockpiled on site unless all storage areas are protected from exposure to rain, snow, snowmelt and runoff.
- Avoid dumping snow into any waterbody, including wetlands, cranberry bogs, detention/infiltration basins, forebays, and grassed swales/channels.
- Avoid disposing of snow on top of storm drain catch basins.

Property Location: 809 South Franklin Street, Holbrook, MA 02343 **Date: _____**

Stormwater Management – Long-Term Operation and Maintenance
Best Management Practices – Inspection Schedule and Evaluation Checklist

Long Term Practices

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check (1)	Cleaning/Repair Needed: ☐yes ☐no (List Items)	Date of Cleaning/ Repair	Performed by
Sediment Forebay				Sediment level, trash removal, maintenance of vegetation (mowing, seeding, weeding, etc.)			
Wet Basin				Sediment level, trash removal, maintenance of vegetation, maintenance of rip rap stone (hand removal of vegetation, etc.)			
Spillway				Signs of erosion, signs of seepage, trash removal, maintenance of rip rap stone (hand removal of vegetation, etc.)			
Plunge pools				Signs of erosion, trash removal, maintenance of rip rap stone (hand removal of vegetation, etc.)			

(1) Refer to the Massachusetts Stormwater Management, Volume Two: MA Stormwater Handbook (Feb. 2008) for recommendations regarding frequency for inspection and maintenance of specific BMP's.