

## SHERMAN & FRYDRYK, LLC

*Land Surveying and Engineering*

[www.shs:manfrydryk.com](http://www.shs:manfrydryk.com)



August 19, 2015

Town of South Hadley  
Planning Board  
116 Main Street  
South Hadley, MA 01705

RE: Quality Fleet Services, Inc.  
Site Re-Development  
548 New Ludlow Road, South Hadley  
MassDEP #288-0436

Dear Board Members:

Please find enclosed the following additional information submitted for Site Plan Approval on behalf of our client, Quality Fleet Services, Inc. for the above referenced project:

1. Ten copies of the revised site plan (four sheets each).
2. Ten copies of the revised Stormwater Management Plan Narrative.
3. Ten copies of the revised Project Report and Drainage Calculations including the revised Operation and Maintenance Plan with Maintenance Agreement and revised Calculations for Stormwater Policy standards.

The following information has been submitted to address the comments received from Aimee Bell Project Engineer of Fuss & O'Neill in a letter dated August 5, 2015 for the above referenced project:

### **Project Manual & Drainage Report**

1. Twelve test pits have been conducted on the parcel. Seven evaluations have been completed within the area mapped as Swansea Muck in the NRCS Soil Survey. The soil conditions observed are consistent with the Windsor Loamy Sand characteristic and as such, a soil class A appears to be appropriate for the site. The three test pits in the area of the infiltration basin confirm the Windsor A soils. A percolation test witnessed by the Town of South Hadley Board of Health Director Sharon Hart in the area of the infiltration basin resulted in a 5 minute per inch rate. In addition, the original and revised drainage calculations have been prepared using an infiltration rate of 25 minutes per inch (Rawls rate for Loamy Sand) to provide a conservative analysis of the site.
2. The HydroCAD model utilizes theoretical ponds to summarize the calculated flow leaving the perimeter of the property at the analysis point and these ponds are not actually design or existing features. The theoretical pond is provided with an excessive volume to collect and summarize the entire calculated storm run-off and reports the discharge result at each analysis point as an inflow to the theoretical pond.
3. The existing watershed map and proposed conditions map have been revised to clarify the area converted to brush in the subcatchment area #201.

4. The existing watershed map and proposed conditions map have been revised to clarify the area converted to brush in the subcatchment area #202.
5. The existing watershed map and proposed conditions map have been revised to clarify the area of gravel in each subcatchment area.
6. The 249 contour line has been revised to better depict how the infiltration basin was modeled.
7. The infiltration basin will outlet at the location of the outlet structure. The outlet structure is comprised of a concrete wall with a crest elevation of 248.35 (see Basin Outlet Control detail on Sheet 3). The concrete outlet structure is represented as the weir in the basin model included in the drainage analysis. The earth embankment provides containment of the stormwater within the basin volume and has a crest elevation of 249.75. The maximum elevation for the 100-year storm is 248.76
8. The Operation and Maintenance Plan has been revised to include a maintenance schedule for the sediment basin.
9. The Operation and Maintenance Plan has been revised to include a maintenance schedule for the sediment forebay.
10. The Operation and Maintenance Plan has been revised to include a maintenance schedule for the sediment grass swale
11. The Calculation for Stormwater Policy Standards and Drainage Analysis has been revised to show:
  - a. The infiltration basin provides the required recharge volume for Standard #3.
  - b. The infiltration basin provides the required water quality volume for Standard #4.
12. The Calculation for Stormwater Policy Standard #3 draw down time has been revised.
13. The 44% TSS pretreatment is provided with the sediment basin and sediment forebay. The Mass Stormwater Handbook footnote #27 in Volume 3, Chapter 1 states "If runoff is directed to a BMP like an extended dry detention basin that is required to include a sediment forebay, no additional credit is given to the sediment forebay when determining whether 80% TSS removal is achieved. However, the 25% removal credit given to the sediment forebay can be used to satisfy the 44% TSS pretreatment requirement prior to discharge to the infiltration structure for runoff from LUHPPLs, within an area with a rapid infiltration rate." A sediment basin with a 25% removal credit and sediment forebay with a 25% removal credit is provided in the project resulting in 44% TSS removal prior to the infiltration basin.

#### **Stormwater Management Bylaw**

14. No Action Required.
15. The information for the sediment control plan has been prepared and include in the revised Stormwater Management Plan – Narrative.
16. The limit of disturbance has been provided on the landscape plan sheet 5 of 5.

17. The description of the wetlands has been included in the revised Stormwater Management Plan – Narrative.
18. A detail of the grass swale has been added to detail sheet 3 of 5.
19. A landscaping plan, sheet 5 of 5, has been provided.
20. The material stockpile areas have been note on the revised site plans, Sheet 2 of 5.
21. A stone filter strip to help remove oils is included along the edge of the paved parking area. The paved parking area is of limited size, 2,640 square feet with space for nine employee vehicles, and is not served by a closed drainage system. There is no closed drainage system available on site or within New Ludlow Road for connection of an outlet from an oil and water separator.

#### **Site Plans**

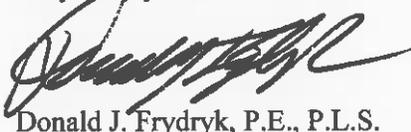
22. The revised site plans lists the bottom of the infiltration basin as 248.00

#### **Stormwater Management Standards**

23. No Action Required.
24. Addressed above.
25. Addressed above.
26. Addressed above.
27. Addressed above. 44% TSS pretreatment provided.
28. No Action Required.
29. Addressed above.
30. Addressed above.

We look forward to meeting with you to discuss this project in detail.

Very truly yours,



Donald J. Frydryk, P.E., P.L.S.

C     DEP – Wetlands  
      South Hadley Conservation Commission  
      Quality Fleet Services, Inc.

## Stormwater Management Plan – Narrative

“Quality Fleet Services, Inc.”  
**SITE RE-DEVELOPMENT**  
548 New Ludlow Road  
South Hadley, MA

Revised August 19, 2015

The project proposed by Quality Fleet Services, Inc. consists of the site improvements at 548 New Ludlow Road (Map 8, Parcel 118, South Hadley approximately 300 feet easterly of Old Lyman Road. The proposed site improvements will include the construction of a 14,580 square foot maintenance building, a small paved parking area for office staff, and a second driveway entrance. The driveway entrances will be constructed with a paved apron to the limit of the right of way. The site will remain gravel outside of the proposed building with 4-foot concrete aprons at the overhead door locations. This project will also include the construction of an open channel drainage system with a sediment basin, sediment forebay, and infiltration basin for stormwater mitigation. During the more severe storms, any overflow from the infiltration system will discharge overland toward the wetlands east of the property.

The following information has been provided in accordance with Article XVI of the Town of South Hadley Bylaw:

- a. **Contact Information:** The Owner is The Moynihan Realty Group, LLC, 625 State Street, Belchertown, MA 01007, 413-695-3232. The Applicant is Quality Fleet Services, Inc., 625 State Street, Belchertown, MA 01007, 413-695-3232. The locus is shown as Parcel 118 on the Town of South Hadley Assessor’s Map 8.
- b. **Locus Map –** An USGS Locus Map, Assessor’s Locus Map, and NHESP Locus Map are included with the Application. The project is not within a Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife.
- c. **Zoning and Land Use -** The lot is zoned Industrial A. The land is used for bulk material storage and sales.
- d. **Proposed Land Use –** The applicant proposes to construct a commercial vehicle maintenance building.
- e. **Easements –** No easements exist on the property. No easements are proposed.
- f. **Utilities –** The property is serviced by overhead utility wires from New Ludlow Road. The proposed building will be connected to all utility services through the overhead utility wires.

- g. Site Topography – Existing and proposed grading is shown on the attached plan.
- h. The proposed limit of disturbance is shown on the provided landscaping plan sheet 5 of 5.
- i. The project will disturb approximately 217,800 square feet.
- j. Existing Site Hydrology – The existing site consists of an open gravel surface used for bulk material storage and transfer with steep slopes up to the perimeter of the parcel along the west sideline, north rear line, and a portion of the east sideline. A wetland area exists to the east of the parcel and within the property line in the northeast portion of the property. According to the Soil Conservation Service Hampden County (central part) soil maps, the soil types on the site consist of Hu – Hinkley-Merrimac-Urban Land, Pg – Pits (Gravel), Sw – Swansea Muck, & WnD – Windsor Loamy Sand (See Appendix B of the drainage report). The Hinkley-Merrimac-Urban Land, Pits (Gravel), & Windsor Loamy Sand soils fall into hydrologic group “A”. The Swansea Muck soils fall into hydrologic group “D”.
- k. Stormwater Conveyances and Wetlands – Wetlands exist to the east of the property. Delineated wetlands and associated buffers can be seen on the attached plan. The wetland is an open swamp.
- l. The project area is not within the mapped area of the 100-year flood plain as shown on FEMA Community Panel # 250170 0010 A.
- m. The project is not within 400 feet of a mapped Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife.
- n. Three test pits have been conducted on the parcel in the area of the proposed infiltration basin. The estimated seasonal high groundwater elevation is estimated at elevation 245.0 in the area of the infiltration basin.
- o. Existing and Proposed ground surface covers are provided on the existing conditions and site plan, and the stormwater drainage manual provides existing and proposed runoff coefficients and watershed boundaries for the drainage areas.
- p. Existing and Proposed drainage maps are provided in the revised drainage manual.
- q. The revised drainage manual and design plans provide a description of the stormwater management system.
- r. See the revised drainage report for the required watershed calculations.
- s. No downstream analysis provided. The proposed project reduces proposed stormwater discharge below the existing runoff rates during all design storms evaluated.

- t. The soil evaluations for 12 test pits conducted across the property are included in the revised drainage report.
- u. A landscape plan sheet 5 of 5 has been provided.
- v. The existing steep (1:1) side slopes will remain. The area of the proposed building and behind will collect to the proposed infiltration basin. The area in front of the building will continue to flow overland to New Ludlow Road. The level portion of the site has an approximate 2% slope.
- w. The project will not be phased.
- x. Erosion Control – Erosion control measures include the use of wattles along the limit of work and temporary sediment basins as shown on the revised site plan. All disturbed areas will be loamed and seeded. All slopes greater than 4 to 1 shall also be mulched or netted to add further protection until vegetation is established. No opportunities to divert uncontaminated waters is available.
- y. Hazardous Waste – The applicant will store all hazardous materials within the building.
- z. Sequence of Activities / Timeline – The applicant is anticipating an six month timeline for completion of all the work on site. Using an assumed start date of September 1st, the following Inspection Schedule has been proposed, (Adjustments to the final schedule will be submitted to the Board once a contractor is hired and the work is scheduled)

1. Inspection of Erosion Controls after site clearing, rough grading and final grading	10/1/15
2. Inspection of Stormwater components	4/1/16
3. Final Inspection*	5/15/16

\*The applicant respectfully requests a waiver to the “full TV inspection” of the stormwater facilities. The facility will remain privately owned, will be maintained by the applicant, and will not be the responsibility of the Town of South Hadley if they fail.

- aa. Performance Guarantee – Stormwater sheet flow is the basis of operation for the majority of the Stormwater originating in the development area. An annual budget cost of approximately \$1,500 is anticipated for the operation and maintenance of the stormwater system. Anticipated maintenance includes:

- a. Infiltration System inspection ( yearly)            -            \$1,500.00

For a 5-year period, it is recommended that a performance guarantee in the amount of \$7,500 (\$1,500 per year for a period of 5 years). Note: the guarantee is not to be released until a final as-built showing the completed work is submitted to the town.

***PROJECT MANUAL &  
DRAINAGE REPORT***

**“Quality Fleet Services, Inc.”  
SITE RE-DEVELOPMENT  
548 New Ludlow Road  
South Hadley, MA**

June 2015  
Revised August 19, 2015

**Prepared for:**

**Owner:  
The Moynihan Realty Group, LLC  
625 State Street  
Belchertown, MA 01007**

**Applicant:  
Quality Fleet Services, Inc.  
625 State Street  
Belchertown, MA 01007**

**Prepared by:**

**Sherman & Frydryk, LLC  
Land Surveying and Engineering  
3 Converse Street, Suite 203  
Palmer, MA 01069**



“Quality Fleet Services, Inc.”  
**SITE RE-DEVELOPMENT**  
548 New Ludlow Road  
South Hadley, MA

**Drainage Report**

**Introduction**

This report has been prepared to summarize the work associated with the proposed site improvements at 548 New Ludlow Road, South Hadley (See locus plan in appendix A of the original report) and to analyze storm water management for the proposed improvements. The project takes place on Parcel 118 as shown on the Town of South Hadley Assessor’s Map 8. This narrative has been prepared in conjunction with plans entitled “Quality Fleet Services, Inc., Site Re-Development, 548 New Ludlow Road, South Hadley, MA”, prepared by Sherman & Frydryk, LLC, Land Surveying and Engineering, dated June 10, 2015, revised August 19, 2015; five sheets.

The site improvements include the construction of a 14,580 square foot maintenance building, a small paved parking area for office staff, and a second driveway entrance. The driveway entrances will be constructed with a paved apron to the limit of the right of way. The site will remain gravel outside of the proposed building with 4-foot concrete aprons at the overhead door locations. This project will also include the construction of an open channel drainage system with a sediment basin, sediment forebay, and infiltration basin for stormwater mitigation. During the more severe storms, any overflow from the infiltration system will discharge overland toward the wetlands east of the property.

The project area is not within a Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife, as shown on the Oct. 2008, Massachusetts Natural Heritage Atlas, 13th Edition (see Appendix A of the drainage report). The project area is not within the mapped area of the 100-year flood plain as shown on FEMA Community Panel # 2501700010A (See Appendix 2 of the Notice of Intent).

**Drainage Report**

**Site Soils:** The existing site consists of an open gravel surface used for bulk material storage and transfer with steep slopes up to the perimeter of the parcel along the west sideline, north rear line, and a portion of the east sideline. A wetland area exists to the east of the parcel and within the property line in the northeast portion of the property. According to the Soil Conservation Service Hampden County (central part) soil maps, the soil types on the site consist of Hu – Hinkley-Merrimac-Urban Land, Pg – Pits

(Gravel), Sw – Swansea Muck, & WnD – Windsor Loamy Sand (See Appendix B of this report). The Hinkley-Merrimac-Urban Land, Pits (Gravel), & Windsor Loamy Sand soils fall into hydrologic group “A”. The Swansea Muck soils fall into hydrologic group “D”.

This soil data was supplemented by twelve test pits on the parcel with five in the area of the proposed infiltration basin and three along the roadway frontage. Seven evaluations have been completed within the area mapped as Swansea Muck in the NRCS Soil Survey. The soil conditions observed are consistent with the Windsor Loamy Sand characteristic. The estimated seasonal high groundwater elevation is estimated at elevation 245.0 in the area of the infiltration basin. A percolation test witnessed by the Town of South Hadley Board of Health Director Sharon Hart in the area of the infiltration basin resulted in a 5 minute per inch rate. A soil texture of sand has been used to determine the design infiltration rate, based on “Table 2.3.3 1982 Rawls Rates” from the Massachusetts Stormwater Handbook, of 2.41 inches per hour. The drainage calculations have been prepared using an infiltration rate of 25 minutes per inch to provide a conservative analysis. Soil evaluation results are contained in Appendix A of this report.

Existing conditions: The site is divided into two drainage areas. The front of the parcel (Subcatchment 101) discharges storm water run-off directly to the shoulder of New Ludlow Road. New Ludlow Road does not have a closed drainage system near the locus property. The remaining portion of the property (Subcatchment 102) discharges overland to the existing wetlands east of the parcel.

These drainage areas were evaluated for peak flows using the “HydroCAD” Stormwater Modeling System using a 2-year 24 hour rainfall of 3.1 inches, a 10-year 24 hour rainfall of 4.5 inches, and a 100-year 24 hour rainfall of 6.5 inches as taken from the “Rainfall Frequency Atlas for the Northeast” compiled by the Soil Conservation Service. A summary of drainage calculations for existing watershed is contained in Appendix B of this report. A theoretical Pond (Pond 301) was used to summarize the peak overflow from the front of the property (Subcatchment 101) to New Ludlow Road. A theoretical Pond (Pond 302) was used to summarize the peak overflow from the rear of the property (Subcatchment 102) to the wetlands. The following is a summary of peak flows from each storm.

Existing Runoff

<u>Year Storm</u>	<u>Pond 301</u> <u>Peak Runoff (cfs)</u>	<u>Pond 302</u> <u>Peak Runoff (cfs)</u>
2	4.51	7.55
10	6.70	14.44
100	9.79	24.93

Proposed conditions: Proposed improvements to the parcel will not significantly alter the drainage patterns on the site. The front of the parcel (Subcatchment 201) discharging

storm water run-off directly to the shoulder of New Ludlow Road will be reduced by the proposed channels on the west and east property sidelines. The rear portion of the property (Subcatchment 202) will collect to a proposed sediment basin and infiltration basin (Pond 402) through open channels along the property sidelines. The infiltration basin (Pond 402) has been sized to mitigate the 100-year storm. During the more infrequent storm events, the infiltration basin (Pond 402) will discharge the detained stormwater to the vegetated buffer zone of the existing wetlands east of the parcel. The infiltration basin discharges across a wide spillway sized to maintain a low discharge flow velocity to prevent scour at the outlet.

The watershed area is evaluated for peak flows using the “HydroCAD” Stormwater Modeling System. The analysis use a Recharge Volume 24 hour rainfall of 1.02 inches, Water Quality Volume 24 hour rainfall of 1.17 inches, 2-year 24 hour rainfall of 3.1 inches, a 10-year 24 hour rainfall of 4.5 inches and a 100-year 24 hour rainfall of 6.5 inches as taken from the “Rainfall Frequency Atlas for the Northeast” compiled by the Soil Conservation Service. A summary of drainage calculations for proposed conditions is contained in Appendix C of this report. A theoretical Pond (Pond 501) was used to summarize the peak overflow from the front of the property (Subcatchment 201) to New Ludlow Road. A theoretical Pond (Pond 502) was used to summarize the peak overflow from the infiltration basin (Pond 402) to the wetlands. The following is a summary of peak flows from each storm.

#### Proposed Runoff

<u>Year Storm</u>	<u>Pond 501 Peak Runoff (cfs)</u>	<u>Pond 502 Peak Runoff (cfs)</u>
2	2.37	5.63
10	4.06	12.51
100	6.49	23.12
Recharge Vol.	0.24	0.0
Water Quality	0.36	0.0

#### SUMMARY

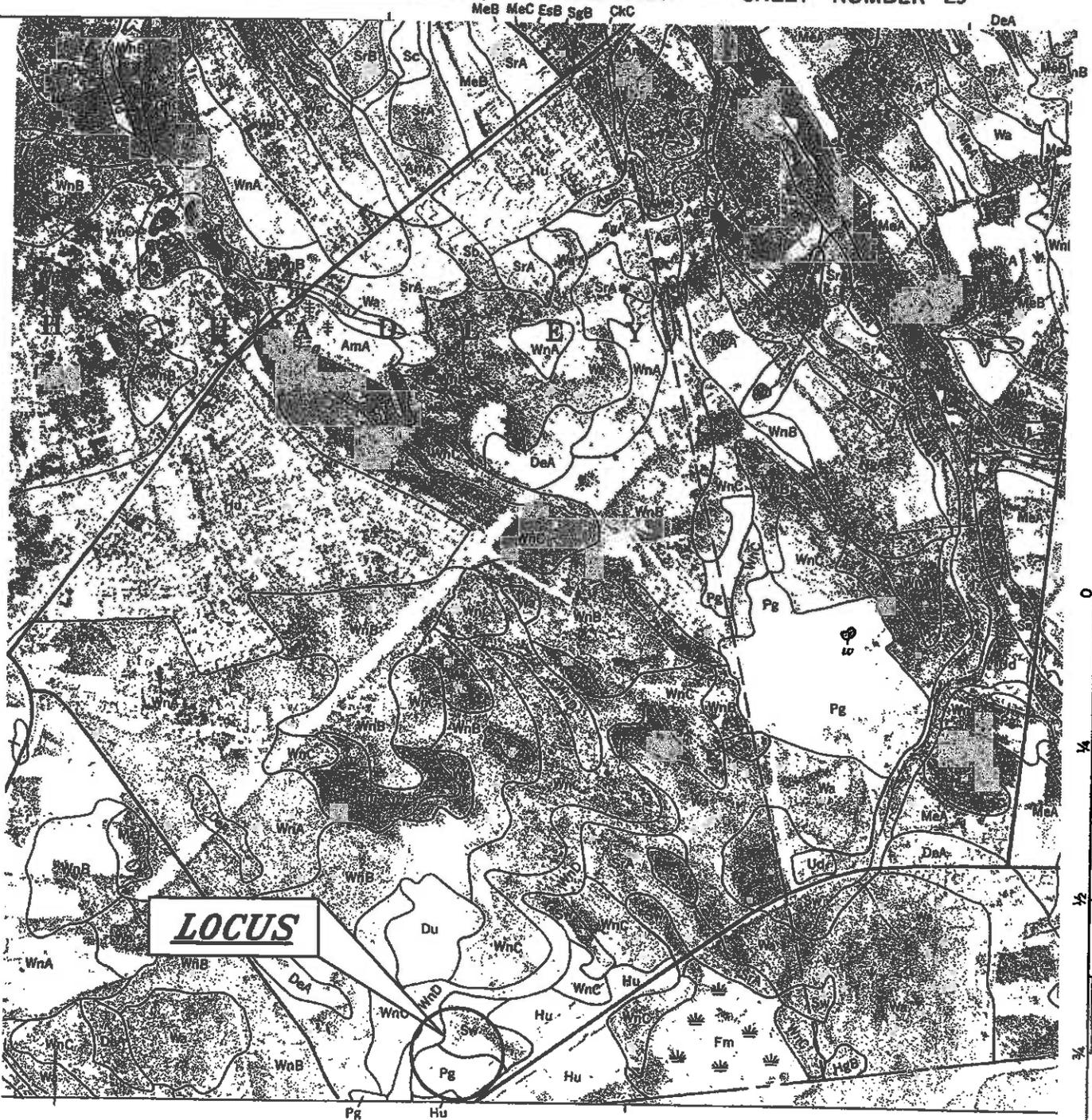
Through the use of additional vegetated areas on the perimeter of the site, the open drainage channels, and infiltration basin system, the proposed improvements will decrease peak flow rates for the design storms analyzed. As such, we believe this project will have no negative affect on the existing watersheds.

A revised Operation and Maintenance Plan is included as Appendix D, the revised Calculations for Stormwater Policy Standards is included in Appendix E. The Stormwater Management Standards Check List has been included as Appendix F, and the Stormwater Pollution Prevention Plan has been included as Appendix G of the original report. The EPA NOI shall be filed prior to construction.

## **APPENDIX A**

### **SOILS INFORMATION**

HAMPSHIRE COUNTY, MASSACHUSETTS, CENTRAL PART — SHEET NUMBER 29



**LOCUS**

**SHERMAN & FRYDRYK, LLC**  
*Land Surveying and Engineering*



3 Converse St.  
 Suite 203  
 Palmer, MA 01069

**SITE LOCUS ON S.C.S. SOIL MAP**  
 PREPARED FOR  
**QUALITY FLEET SERVICES, INC.**  
 548 NEW LUDLOW ROAD  
 SOUTH HADLEY, MA

DATE: 6/9/15	PROJECT NO: 14121B	DRAFTING: GAB
CHECKED: KTT	APPROVED: N/A	HORZ: 1:15,840

Location Address or Lot No. QFS New Ludlow Rd

SOUTH Hadley  
On-site Review

Deep Hole Number \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_ Weather \_\_\_\_\_  
 Location (identify on site plan) \_\_\_\_\_  
 Land Use \_\_\_\_\_ Slope (%) \_\_\_\_\_ Surface Stones \_\_\_\_\_  
 Vegetation \_\_\_\_\_  
 Landform \_\_\_\_\_  
 Position on landscape (sketch on the back) \_\_\_\_\_  
 Distances from:  
 Open Water Body \_\_\_\_\_ feet Drainage way \_\_\_\_\_ feet  
 Possible Wet Area \_\_\_\_\_ feet Property Line \_\_\_\_\_ feet  
 Drinking Water Well \_\_\_\_\_ feet Other \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG\***

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
TP 101 0-4" 4-65"	F11 C1	LS	2.5Y 7/8	30"	0% Gravel Weeping @ 40"
TP 102 0-6" 6-46"	F11 C1	LS	11	24"	0% Gravel Weeping @ 32"
TP 103 0-36" 36-40" 40"-64"	F11 C1	organics & stone LS	2.5Y 5/2	40"	Large Cobbles Weeping @ 48"
TP 201 0-28" 28-54"	F11 C1	LS	2.5Y 7/2	None Obs	0% Gravel No weeping
TP 202 0-58" 58-60" 60-94"	F11 A B/C	Sand LS	5Y 6/8	None Obs	0% Gravel

\* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Outwash Depth to Bedrock: \_\_\_\_\_  
 Depth to Groundwater: Standing Water in the Hole: \_\_\_\_\_ Weeping from Pit Face: \_\_\_\_\_  
 Estimated Seasonal High Ground Water: \_\_\_\_\_



DEP APPROVED FORM - 12/07/95

TP 203  
 0-16" F11  
 16-20" A/B 10YR 8/5  
 20-96" C 5Y 6/8  
 weeping @ 94"

Location Address or Lot No. New Ludlow Rd, S. Hadley

**On-site Review**

Deep Hole Number ..... Date: 8/13/15 Time: 8:15 Weather .....

Location (identify on site plan) .....

Land Use ..... Slope (%) ..... Surface Stones .....

Vegetation .....

Landform .....

Position on landscape (sketch on the back) .....

Distances from:

Open Water Body ..... feet Drainage way ..... feet

Possible Wet Area ..... feet Property Line ..... feet

Drinking Water Well ..... feet Other .....

**DEEP OBSERVATION HOLE LOG\***

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
#104 0-38 38-46 46-76	Fill				weeping = 50" 0% Gravel Homogeneous Sand
	A	SL	10YR 2/1	50" faint	
	C	LS	2.5Y 5/1		
#105 0-5 0-89	Fill				weeping = 43" 0% Gravel
	C	LS	2.5Y 7/3	42" 5YR 6/8	

\* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Outwash Depth to Bedrock: .....

Depth to Groundwater: Standing Water in the Hole: ..... Weeping from Pit Face: .....

Estimated Seasonal High Ground Water: .....



Location Address or Lot No. New Ludlow Rd

COMMONWEALTH OF MASSACHUSETTS

South Hadley , Massachusetts

Percolation Test*		
Date: <u>8/13/15</u>		Time: _____
Observation Hole #	<u>104</u>	<u>105</u>
Depth of Perc	<u>52"</u>	<u>32"</u>
Start Pre-soak	<u>9:13</u>	<u>9:30</u>
End Pre-soak	<u>9:28 1/2" Drop</u>	<u>9:45</u>
Time at 12"	<u>9:28</u>	<u>9:45</u>
Time at 9"	<u>10:40 @ 9 1/2"</u>	<u>9:49</u>
Time at 6"		<u>9:55</u>
Time (9"-6")		<u>16 min</u>
Rate Min./Inch		<u>5 mpi</u>

\* Minimum of 1 percolation test must be performed in both the primary area AND reserve area.

Site Passed  Site Failed

Performed By: Keith Terry

Witnessed By: Sharon Hart

Comments: 1" of water in hole @ start of soaking



Location Address or Lot No. New Ludlow Rd, S. Hadley

**On-site Review**

Deep Hole Number \_\_\_\_\_ Date: 8/13/15 Time: \_\_\_\_\_ Weather \_\_\_\_\_

Location (identify on site plan) \_\_\_\_\_

Land Use \_\_\_\_\_ Slope (%) \_\_\_\_\_ Surface Stones \_\_\_\_\_

Vegetation \_\_\_\_\_

Landform \_\_\_\_\_

Position on landscape (sketch on the back) \_\_\_\_\_

Distances from:

Open Water Body \_\_\_\_\_ feet      Drainage way \_\_\_\_\_ feet  
 Possible Wet Area \_\_\_\_\_ feet      Property Line \_\_\_\_\_ feet  
 Drinking Water Well \_\_\_\_\_ feet      Other \_\_\_\_\_

**DEEP OBSERVATION HOLE LOG\***

TP#

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
<u>204</u> 0-5 5-74 74-95	Fill C <sub>1</sub> C <sub>2</sub>	LS LS	2.5Y7/3 2.5Y6/3	74" Faint	0% Gravel
<u>205</u> 0-8 8-105	Fill C	LS	2.5Y7/3	None Obs	0% Gravel
<u>206</u> 0-14" 14-96"	Fill C	LS	2.5Y7/3	None Obs	0% Gravel
<u>207</u> 0-18" 18"-108"	Fill Bw C	LS LS	5Y6/8 2.5Y7/3	None Obs	0% Gravel

\* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Outwash      Depth to Bedrock: N/A

Depth to Groundwater: Standing Water in the Hole: N/A      Weeping from Pit Face: N/A

Estimated Seasonal High Ground Water: \_\_\_\_\_



Soil survey of  
**Hampshire County, Massachusetts**  
Central part

U.S. Department of Agriculture, Soil Conservation Service  
in cooperation with Massachusetts Agricultural Experiment Station

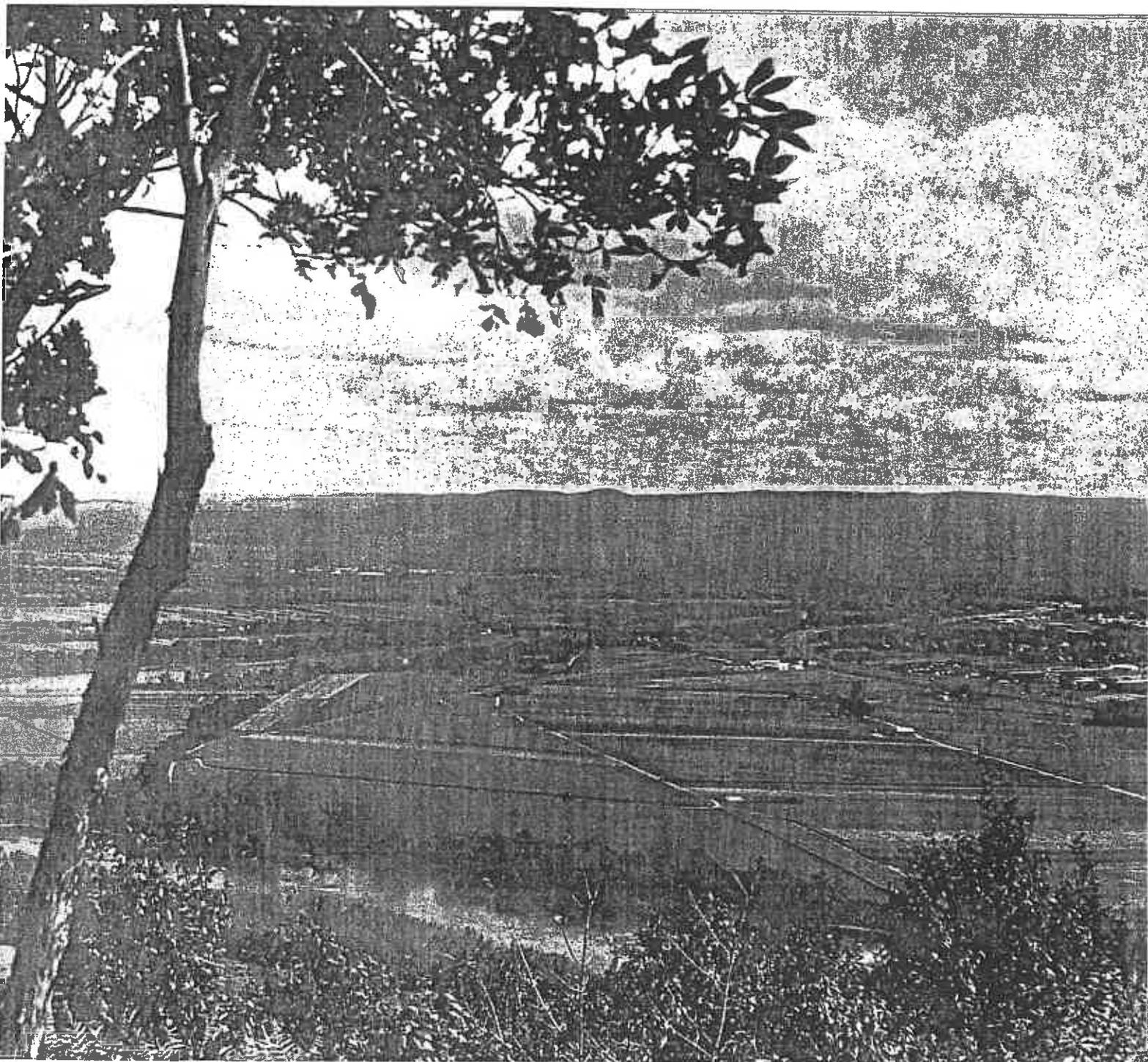


TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion		
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Potential frost action	Uncoated steel	Concrete
AgA, AgB, AgC Agawam	B	None	---	---	ft	---	---	in	---	Low	Low	High.
AmA, AmB Amostown	C	None	---	---	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate	Moderate	Moderate.
Au#: Amostown	C	None	---	---	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate	Moderate	Moderate.
Windsor	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Urban land.												
BaA, BaB Beigrade	B	None	---	---	1.5-3.5	Apparent	Nov-Apr	>60	---	High	Moderate	Moderate.
BoA, BoB, BoC Boxford	C	None	---	---	1.5-3.0	Apparent	Nov-Apr	>60	---	High	High	Moderate.
CkB, CkC, CkB, CmC, CnB, CnC, CnD Charlton	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
CoE#: Charlton	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Gloucester	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
CpC*, CpD#: Charlton	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Hollis	C/D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low	High.
CrC*, CrE#: Charlton	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Rock outcrop.												
Hollis	C/D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low	High.
DeA Deerfield	B	None	---	---	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate	Low	High.
Du#. Dumps												
EsA, EsB Enosburg	D	None	---	---	0-1.0	Apparent	Nov-May	>60	---	Moderate	High	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding				High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Potential frost action	Uncoated steel	Concrete
Fm Freetown	D	None	---	---	0-1.0	Apparent	Jan-Dec	>60	---	High	High	High.
GfB, GfC, GfD, GhC, GxB, GxC, GxD Gloucester	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Ha- Hadley	B	Occasional	Brief	Feb-Apr	4.0-6.0	Apparent	Nov-Apr	>60	---	High	Low	Moderate.
Hd* Hadley	B	Occasional	Brief	Feb-Apr	4.0-6.0	Apparent	Nov-Apr	>60	---	High	Low	Moderate.
Winoski	B	Occasional	Brief	Feb-Apr	1.5-3.0	Apparent	Nov-Apr	>60	---	High	Moderate	Moderate.
Urban land.												
HfB, HfC- Haven	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
HgA, HgB, HgC, HfD, HfC- Hinckley	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Hu* Hinckley	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Merrima c- Urban land.	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
HvC- Holyoke	C/D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low	High.
Lk- Limerick	C	Frequent	Brief	Jan-Jun	0.5-1.5	Apparent	Nov-Jun	>60	---	High	High	Low.
Ma** Maybid	D	None	---	---	+1-0.5	Apparent	Oct-Aug	>60	---	High	High	Moderate.
MeA, MeB, MeC, MeD- Merrimac	A	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
MoB, MoC, MsC, MxB, MxC, MxD- Montauk	C	None	---	---	2.0-2.5	Perched	Feb-May	>60	---	Moderate	Low	High.
NaC*, NaD* Narragansett	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
Holyoke	C/D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low	High.

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion		
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Potential frost action	Uncoated steel	Concrete
NaC#, NaD#: Rock outcrop.								In				
NgA, NgB: Minigret	B	None	---	---	1.5-3.0	Apparent	Nov-Apr	>60	---	Moderate	Low	High.
PaB, PaC, PaD, PbB, PbC, PbD, PcB, PcC, PcD, PcE: Paxton	C	None	---	---	1.5-2.5	Perched	Feb-Mar	>60	---	Moderate	Low	Moderate.
Pd#: Paxton	C	None	---	---	1.5-2.5	Perched	Feb-Mar	>60	---	Moderate	Low	Moderate.
Charlton	B	None	---	---	>6.0	---	---	>60	---	Low	Low	High.
Urban land.												
Pg#. Pits												
PuA, PuB, PuC: Pollux	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
Pv: Footatuck	B	Frequent	Brief	Nov-Apr	1.5-3.0	Apparent	Nov-Apr	>60	---	Moderate	Moderate	Moderate.
Qu#. Quarries												
Ra: Raynham	C	None	---	---	0.5-2.0	Apparent	Nov-May	>60	---	High	High	Moderate.
RdA, RdB, ReA, ReB: Ridgebury	C	None	---	---	0-1.5	Perched	Nov-May	>60	---	High	High	High.
Rm: Rippowam	C	Frequent	Brief	Nov-Apr	0-1.5	Apparent	Nov-May	>60	---	High	High	High.
Ro#. Rock outcrop												
RoC#, RoE#: Rock outcrop.	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
Narragansett	C/D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low	High.
Holyoke												
Sa: Saco	D	Frequent	Brief	Nov-May	0-0.5	Apparent	Sep-Jun	>60	---	High	Low	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

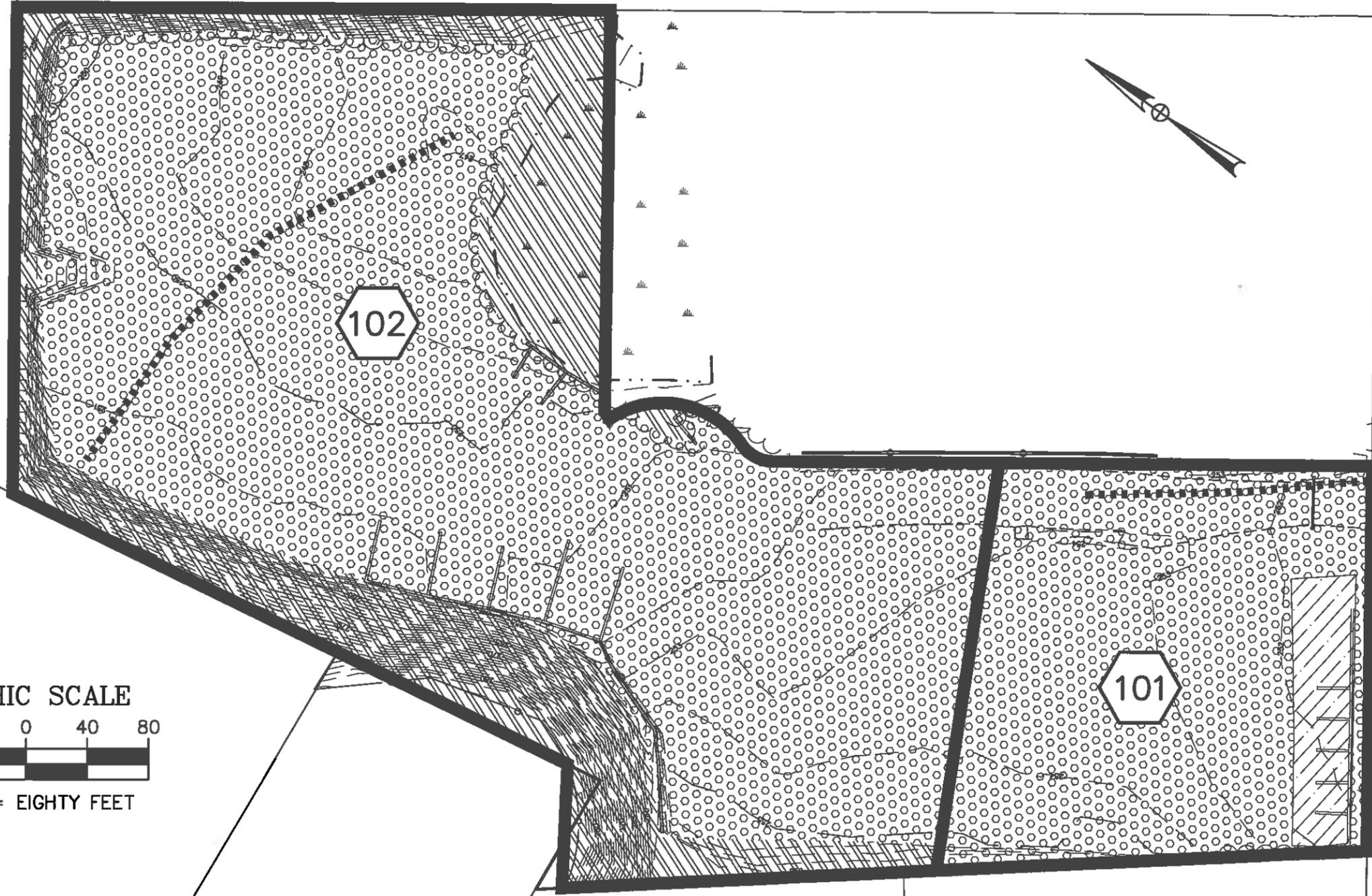
Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion		
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Potential frost action	Uncoated steel	Concrete
Sb** Scarboro	D	None			Ft	Apparent	Jan-Dec	>60		High	High	High
Sc Scitico	C	None				Apparent	Nov-May	>60		High	High	Moderate
SgB, ShB, ShC Scituate	C	None				Perched	Nov-May	>60		Moderate	Low	High
SrA, SrB Sudbury	B	None				Apparent	Dec-Apr	>60		Moderate	Low	High
Su Suncook	A	Common	Brief	Mar-May		Apparent	Jan-Apr	>60		Low	Low	High
Sw Swansea	D	None				Apparent	Jan-Dec	>60		High	High	High
Ud* Udorthents	C	None				Apparent	Nov-Apr	>60		High	Low	High
Wa Waipole	C	None				Perched	Feb-Mar	>60		Moderate	Low	Moderate
WeB, WeC, WfB, WfC, WgB, WgC Methersfield	C	None				Perched	Sep-Jun	>60		High	High	High
WhA** Whitman	D	None										
WnA, WnB, WnC, WnD Windsor	A	None						>60		Low	Low	High
WoA, WoB, WoC Windsor	A	None						>60		Low	Low	High
Wp* Windsor	A	None						>60		Low	Low	High
Scitico	C	None				Apparent	Nov-May	>60		High	High	Moderate
Amostown	C	None				Apparent	Dec-Apr	>60		Moderate	Moderate	Moderate
Ws Winooski	B	Occasional	Brief	Feb-Apr		Apparent	Nov-Apr	>60		High	Moderate	Moderate
WtA, WtB, WtC, WvB, WvC, WxB, WxC, WxD Woodbridge	C	None				Perched	Nov-May	>60		High	Low	Moderate

\* See description of the map unit for composition and behavior characteristics of the map unit.  
 \*\* In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.



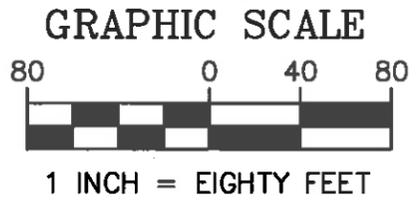
## **APPENDIX B**

### **EXISTING CONDITIONS**



**LEGEND**

-  BRUSH, HSG A, CN=30
-  GRAVEL, HSG A, CN=98
-  PAVED PARKING, HSG A, CN=98
-  TIME OF CONCENTRATION PATH

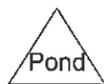
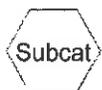
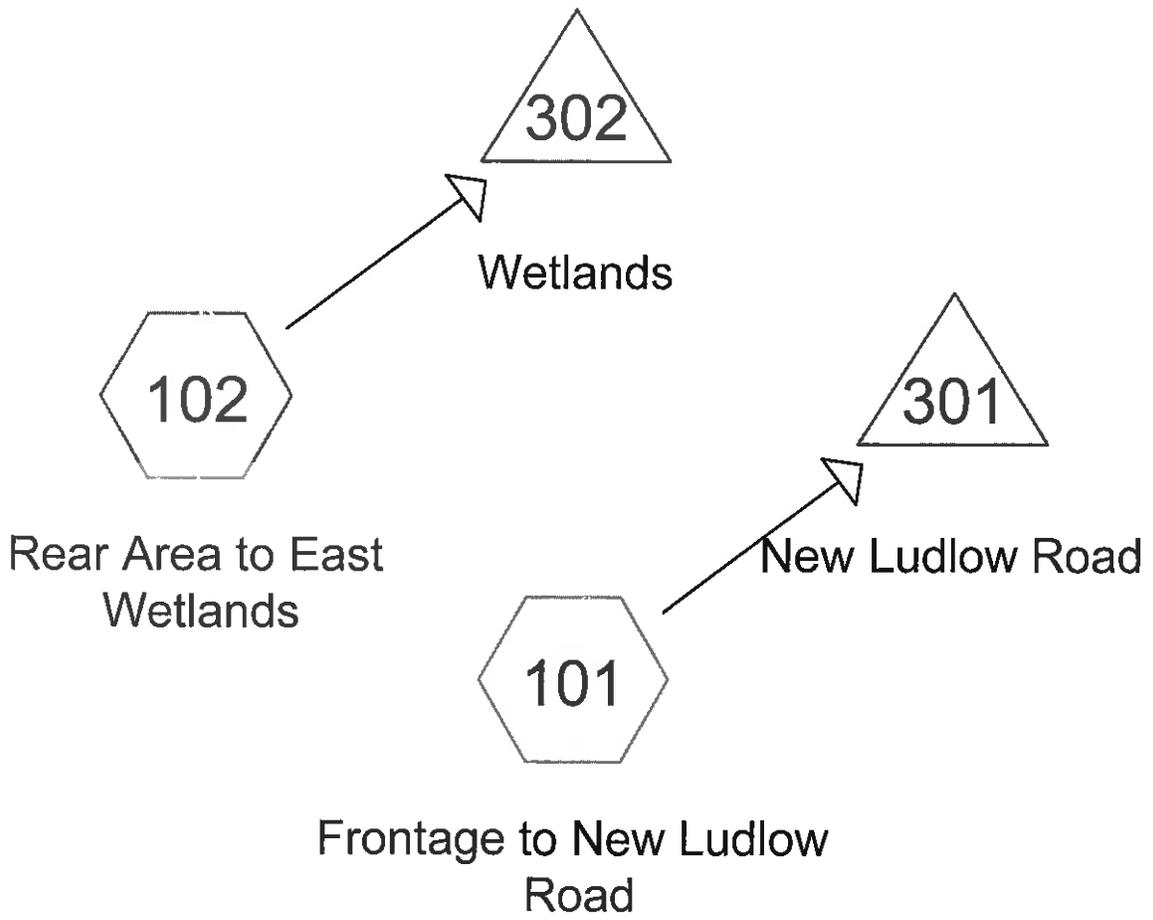


**SHERMAN & FRYDRYK, LLC**  
*Land Surveying and Engineering*  
 3 Converse Street, Suite 203  
 Palmer, MA 01069



**EXISTING WATERSHED**  
**QUALITY FLEET SERVICES, INC.**  
 548 NEW LUDLOW ROAD  
 SOUTH HADLEY, MA

DATE: 8/17/15	SCALE: 1"=80'	PROJECT #: 14121B
FIELD WORK:	DRAWN: KTT	APPROVED: DJF



# 14121B QFS-Existing Watershed

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## Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
58,590	30	Brush, Good, HSG A (102)
227,130	96	Gravel surface, HSG A (101, 102)
6,883	98	Paved parking, HSG A (101)
<b>292,603</b>	<b>83</b>	<b>TOTAL AREA</b>

**14121B QFS-Existing Watershed**

Type III 24-hr 2 Year Rainfall=3.10"

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HydroCAD® 10.00-13 s/n 01267 © 2014 HydroCAD Software Solutions LLCPrinted 6/8/2015  
Page 3**Summary for Subcatchment 101: Frontage to New Ludlow Road**

Runoff = 4.51 cfs @ 12.07 hrs, Volume= 14,946 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 Year Rainfall=3.10"

Area (sf)	CN	Description
0	30	Brush, Good, HSG A
60,216	96	Gravel surface, HSG A
6,883	98	Paved parking, HSG A
67,099	96	Weighted Average
60,216	96	89.74% Pervious Area
6,883	98	10.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0080	0.68		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
1.9	166	0.0080	1.44		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
2.4	186	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 102: Rear Area to East Wetlands**

Runoff = 7.55 cfs @ 12.08 hrs, Volume= 23,717 cf, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 Year Rainfall=3.10"

Area (sf)	CN	Description
58,590	30	Brush, Good, HSG A
166,914	96	Gravel surface, HSG A
0	98	Paved parking, HSG A
225,504	79	Weighted Average
225,504	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.87		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
2.6	305	0.0150	1.97		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
3.0	325	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond 301: New Ludlow Road**

Inflow Area = 67,099 sf, 10.26% Impervious, Inflow Depth = 2.67" for 2 Year event  
 Inflow = 4.51 cfs @ 12.07 hrs, Volume= 14,946 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.07' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 14,946 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

**14121B QFS-Existing Watershed**

Type III 24-hr 2 Year Rainfall=3.10"

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Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Pond 302: Wetlands**

Inflow Area = 225,504 sf, 0.00% Impervious, Inflow Depth = 1.26" for 2 Year event  
 Inflow = 7.55 cfs @ 12.08 hrs, Volume= 23,717 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.11' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 23,717 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**14121B QFS-Existing Watershed**

Type III 24-hr 100 Year Rainfall=6.50"

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**Summary for Subcatchment 101: Frontage to New Ludlow Road**

Runoff = 9.79 cfs @ 12.07 hrs, Volume= 33,827 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 Year Rainfall=6.50"

Area (sf)	CN	Description
0	30	Brush, Good, HSG A
60,216	96	Gravel surface, HSG A
6,883	98	Paved parking, HSG A
67,099	96	Weighted Average
60,216	96	89.74% Pervious Area
6,883	98	10.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0080	0.68		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
1.9	166	0.0080	1.44		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
2.4	186	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 102: Rear Area to East Wetlands**

Runoff = 24.93 cfs @ 12.08 hrs, Volume= 77,597 cf, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 Year Rainfall=6.50"

Area (sf)	CN	Description
58,590	30	Brush, Good, HSG A
166,914	96	Gravel surface, HSG A
0	98	Paved parking, HSG A
225,504	79	Weighted Average
225,504	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.87		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
2.6	305	0.0150	1.97		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
3.0	325	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond 301: New Ludlow Road**Inflow Area = 67,099 sf, 10.26% Impervious, Inflow Depth = 6.05" for 100 Year event  
Inflow = 9.79 cfs @ 12.07 hrs, Volume= 33,827 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 minRouting by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 100.16' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 33,827 cfPlug-Flow detention time= (not calculated: initial storage exceeds outflow)  
Center-of-Mass det. time= (not calculated: no outflow)

**14121B QFS-Existing Watershed**

Type III 24-hr 100 Year Rainfall=6.50"

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Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Pond 302: Wetlands**

Inflow Area = 225,504 sf, 0.00% Impervious, Inflow Depth = 4.13" for 100 Year event  
 Inflow = 24.93 cfs @ 12.08 hrs, Volume= 77,597 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method. Time Span= 0.00-72.00 hrs. dt= 0.05 hrs  
 Peak Elev= 100.36' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 77,597 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**14121B QFS-Existing Watershed**

Type III 24-hr 10 Year Rainfall=4.50"

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Page 5**Summary for Subcatchment 101: Frontage to New Ludlow Road**

Runoff = 6.70 cfs @ 12.07 hrs, Volume= 22,698 cf, Depth= 4.06"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 Year Rainfall=4.50"

Area (sf)	CN	Description
0	30	Brush, Good, HSG A
60,216	96	Gravel surface, HSG A
6,883	98	Paved parking, HSG A
67,099	96	Weighted Average
60,216	96	89.74% Pervious Area
6,883	98	10.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0080	0.68		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
1.9	166	0.0080	1.44		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
2.4	186	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 102: Rear Area to East Wetlands**

Runoff = 14.44 cfs @ 12.08 hrs, Volume= 44,659 cf, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 Year Rainfall=4.50"

Area (sf)	CN	Description
58,590	30	Brush, Good, HSG A
166,914	96	Gravel surface, HSG A
0	98	Paved parking, HSG A
225,504	79	Weighted Average
225,504	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.87		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
2.6	305	0.0150	1.97		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
3.0	325	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond 301: New Ludlow Road**

Inflow Area = 67,099 sf, 10.26% Impervious, Inflow Depth = 4.06" for 10 Year event  
 Inflow = 6.70 cfs @ 12.07 hrs, Volume= 22,698 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.10' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 22,698 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

**14121B QFS-Existing Watershed**

Type III 24-hr 10 Year Rainfall=4.50"

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Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Pond 302: Wetlands**

Inflow Area = 225.504 sf, 0.00% Impervious, Inflow Depth = 2.38" for 10 Year event  
 Inflow = 14.44 cfs @ 12.08 hrs. Volume= 44,659 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

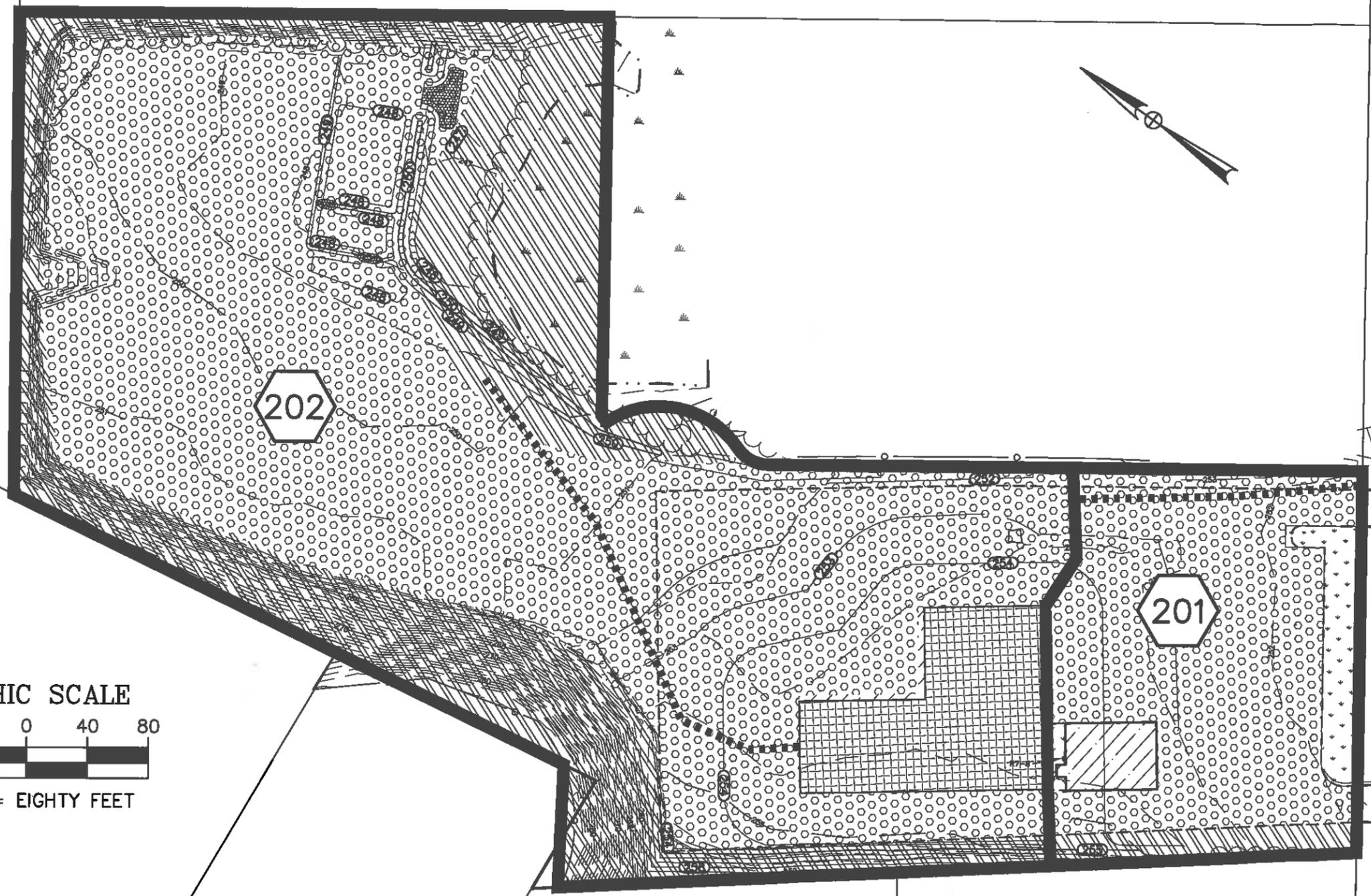
Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.21' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 44.659 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

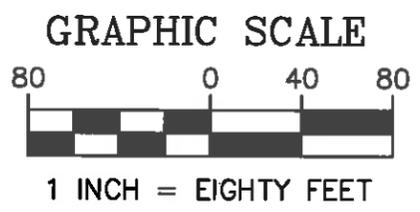
## **APPENDIX C**

### **POST-DEVELOPMENT CONDITIONS**



**LEGEND**

-  BRUSH,  
HSG A,  
CN=30
-  GRAVEL,  
HSG A,  
CN=96
-  PAVED PARKING,  
HSG A,  
CN=98
-  GRASS,  
HSG A,  
CN=39
-  ROOFS,  
HSG A,  
CN=98
-  TIME OF  
CONCENTRATION  
PATH

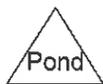
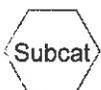
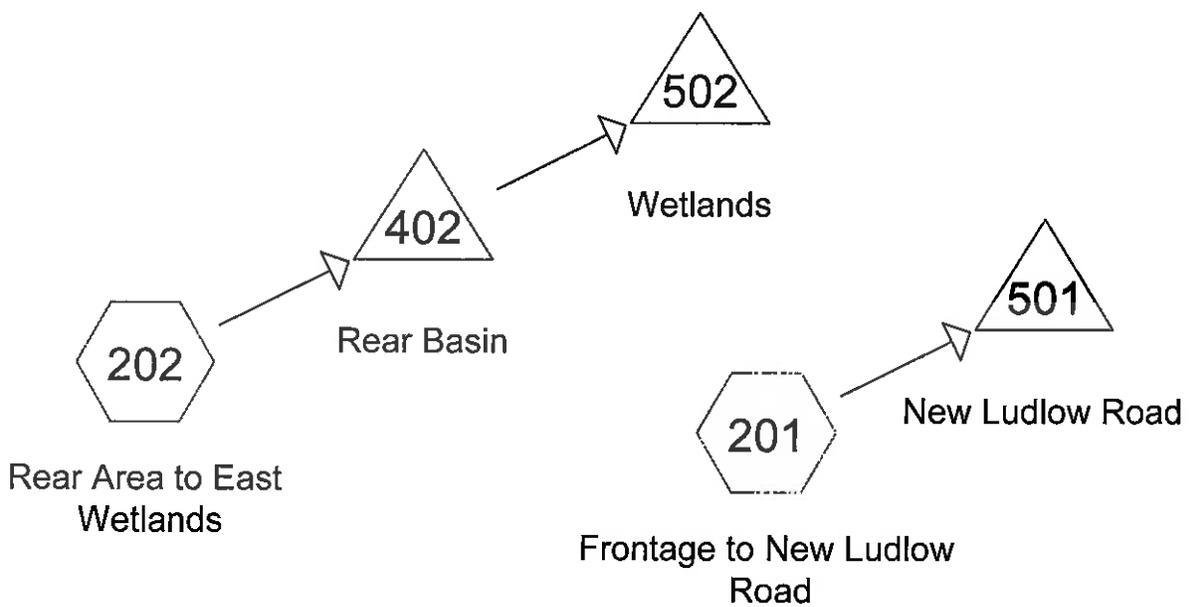


**SHERMAN & FRYDRYK, LLC**  
*Land Surveying and Engineering*  
 3 Converse Street, Suite 203  
 Palmer, MA 01069



**PROPOSED CONDITIONS**  
**QUALITY FLEET SERVICES, INC.**  
 548 NEW LUDLOW ROAD  
 SOUTH HADLEY, MA

DATE: 8/17/15	SCALE: 1"=80'	PROJECT #: 14121B
FIELD WORK:	DRAWN: KTT	APPROVED: DJF



**14121B QFS-Proposed Cond- Rev2**Prepared by Sherman & Frydryk, LLC, Land Surveying and Engineering  
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**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,811	39	>75% Grass cover, Good, HSG A (201)
78,445	30	Brush, Good, HSG A (201, 202)
191,167	96	Gravel surface, HSG A (201, 202)
3,600	98	Paved parking, HSG A (201, 202)
14,580	98	Roofs, HSG A (202)
<b>292,603</b>	<b>77</b>	<b>TOTAL AREA</b>

**Summary for Subcatchment 201: Frontage to New Ludlow Road**

Runoff = 2.37 cfs @ 12.08 hrs, Volume= 7,403 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 Year Rainfall=3.10"

Area (sf)	CN	Description
4,811	39	>75% Grass cover, Good, HSG A
4,034	30	Brush, Good, HSG A
39,041	96	Gravel surface, HSG A
3,050	98	Paved parking, HSG A
0	98	Roofs, HSG A
50,936	86	Weighted Average
47,886	85	94.01% Pervious Area
3,050	98	5.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0080	0.68		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
1.9	166	0.0080	1.44		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
2.4	186	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 202: Rear Area to East Wetlands**

Runoff = 6.65 cfs @ 12.09 hrs, Volume= 21,971 cf, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2 Year Rainfall=3.10"

Area (sf)	CN	Description
74,411	30	Brush, Good, HSG A
152,126	96	Gravel surface, HSG A
550	98	Paved parking, HSG A
14,580	98	Roofs, HSG A
241,667	76	Weighted Average
226,537	74	93.74% Pervious Area
15,130	98	6.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.87		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
2.6	305	0.0150	1.97		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
3.0	325	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond 402: Rear Basin**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 1.09" for 2 Year event  
 Inflow = 6.65 cfs @ 12.09 hrs, Volume= 21,971 cf  
 Outflow = 5.95 cfs @ 12.13 hrs, Volume= 21,971 cf, Atten= 10%, Lag= 2.4 min  
 Discarded = 0.33 cfs @ 12.13 hrs, Volume= 12,189 cf  
 Primary = 5.63 cfs @ 12.13 hrs, Volume= 9,782 cf

**14121B QFS-Proposed Cond- Rev2**

Type III 24-hr 2 Year Rainfall=3.10"

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Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 248.51' @ 12.13 hrs Surf.Area= 6,643 sf Storage= 2,846 cf

Plug-Flow detention time= 41.4 min calculated for 21,956 cf (100% of inflow)  
Center-of-Mass det. time= 41.4 min ( 887.0 - 845.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	1,250 cf	<b>Sediment Basin (Prismatic)</b> Listed below (Recalc)
#2	248.00'	1,170 cf	<b>Sediment Forebay (Prismatic)</b> Listed below (Recalc)
#3	248.00'	4,175 cf	<b>Infiltration Basin (Prismatic)</b> Listed below (Recalc)
		6,595 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	900	0	0
249.00	1,600	1,250	1,250

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	890	0	0
249.00	1,450	1,170	1,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	2,700	0	0
249.00	5,650	4,175	4,175

Device	Routing	Invert	Outlet Devices
#1	Primary	248.35'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 248.35 249.35 Width (feet) 26.00 34.00
#2	Discarded	248.00'	<b>2.140 in/hr Exfiltration (25 mpi) over Surface area</b> Phase-In= 0.05'

**Discarded OutFlow** Max=0.33 cfs @ 12.13 hrs HW=248.51' (Free Discharge)  
↳ **2=Exfiltration (25 mpi)** (Exfiltration Controls 0.33 cfs)

**Primary OutFlow** Max=5.49 cfs @ 12.13 hrs HW=248.51' (Free Discharge)  
↳ **1=Custom Weir/Orifice** (Weir Controls 5.49 cfs @ 1.30 fps)

**Summary for Pond 501: New Ludlow Road**

Inflow Area = 50,936 sf, 5.99% Impervious, Inflow Depth = 1.74" for 2 Year event  
Inflow = 2.37 cfs @ 12.08 hrs, Volume= 7,403 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 100.03' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 7,403 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

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Type III 24-hr 2 Year Rainfall=3.10"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Pond 502: Wetlands**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 0.49" for 2 Year event  
 Inflow = 5.63 cfs @ 12.13 hrs, Volume= 9,782 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.04' @ 16.20 hrs Surf.Area= 217,800 sf Storage= 9,782 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**14121B QFS-Proposed Cond- Rev2**

Type III 24-hr 10 Year Rainfall=4.50"

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**Summary for Subcatchment 201: Frontage to New Ludlow Road**

Runoff = 4.06 cfs @ 12.07 hrs, Volume= 12.693 cf, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 Year Rainfall=4.50"

Area (sf)	CN	Description
4,811	39	>75% Grass cover, Good, HSG A
4,034	30	Brush, Good, HSG A
39,041	96	Gravel surface, HSG A
3,050	98	Paved parking, HSG A
0	98	Roofs, HSG A
50,936	86	Weighted Average
47,886	85	94.01% Pervious Area
3,050	98	5.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0080	0.68		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
1.9	166	0.0080	1.44		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
2.4	186	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 202: Rear Area to East Wetlands**

Runoff = 13.45 cfs @ 12.08 hrs, Volume= 42,610 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10 Year Rainfall=4.50"

Area (sf)	CN	Description
74,411	30	Brush, Good, HSG A
152,126	96	Gravel surface, HSG A
550	98	Paved parking, HSG A
14,580	98	Roofs, HSG A
241,667	76	Weighted Average
226,537	74	93.74% Pervious Area
15,130	98	6.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.87		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
2.6	305	0.0150	1.97		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
3.0	325	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond 402: Rear Basin**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 2.12" for 10 Year event  
 Inflow = 13.45 cfs @ 12.08 hrs, Volume= 42,610 cf  
 Outflow = 12.86 cfs @ 12.11 hrs, Volume= 42,610 cf, Atten= 4%, Lag= 1.8 min  
 Discarded = 0.35 cfs @ 12.11 hrs, Volume= 15,991 cf  
 Primary = 12.51 cfs @ 12.11 hrs, Volume= 26,619 cf

**14121B QFS-Proposed Cond- Rev2**

Type III 24-hr 10 Year Rainfall=4.50"

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Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 248.62' @ 12.11 hrs Surf.Area= 7,110 sf Storage= 3,610 cf

Plug-Flow detention time= 33.3 min calculated for 42,581 cf (100% of inflow)  
Center-of-Mass det. time= 33.4 min ( 863.5 - 830.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	1,250 cf	<b>Sediment Basin (Prismatic)</b> Listed below (Recalc)
#2	248.00'	1,170 cf	<b>Sediment Forebay (Prismatic)</b> Listed below (Recalc)
#3	248.00'	4,175 cf	<b>Infiltration Basin (Prismatic)</b> Listed below (Recalc)
		6,595 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	900	0	0
249.00	1,600	1,250	1,250

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	890	0	0
249.00	1,450	1,170	1,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	2,700	0	0
249.00	5,650	4,175	4,175

Device	Routing	Invert	Outlet Devices
#1	Primary	248.35'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 248.35 249.35 Width (feet) 26.00 34.00
#2	Discarded	248.00'	<b>2.140 in/hr Exfiltration (25 mpi) over Surface area</b> Phase-In= 0.05'

**Discarded OutFlow** Max=0.35 cfs @ 12.11 hrs HW=248.62' (Free Discharge)  
↳ **2=Exfiltration (25 mpi)** (Exfiltration Controls 0.35 cfs)

**Primary OutFlow** Max=12.21 cfs @ 12.11 hrs HW=248.62' (Free Discharge)  
↳ **1=Custom Weir/Orifice** (Weir Controls 12.21 cfs @ 1.68 fps)

**Summary for Pond 501: New Ludlow Road**

Inflow Area = 50,936 sf, 5.99% Impervious, Inflow Depth = 2.99" for 10 Year event  
Inflow = 4.06 cfs @ 12.07 hrs, Volume= 12,693 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 100.06' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 12,693 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

**14121B QFS-Proposed Cond- Rev2**

Type III 24-hr 10 Year Rainfall=4.50"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Pond 502: Wetlands**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 1.32" for 10 Year event  
 Inflow = 12.51 cfs @ 12.11 hrs, Volume= 26,619 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.12' @ 18.85 hrs Surf.Area= 217,800 sf Storage= 26,619 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Subcatchment 201: Frontage to New Ludlow Road**

Runoff = 6.49 cfs @ 12.07 hrs, Volume= 20,650 cf, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 Year Rainfall=6.50"

Area (sf)	CN	Description
4,811	39	>75% Grass cover, Good, HSG A
4,034	30	Brush, Good, HSG A
39,041	96	Gravel surface, HSG A
3,050	98	Paved parking, HSG A
0	98	Roofs, HSG A
50,936	86	Weighted Average
47,886	85	94.01% Pervious Area
3,050	98	5.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0080	0.68		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
1.9	166	0.0080	1.44		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
2.4	186	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 202: Rear Area to East Wetlands**

Runoff = 24.23 cfs @ 12.08 hrs, Volume= 76,038 cf, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100 Year Rainfall=6.50"

Area (sf)	CN	Description
74,411	30	Brush, Good, HSG A
152,126	96	Gravel surface, HSG A
550	98	Paved parking, HSG A
14,580	98	Roofs, HSG A
241,667	76	Weighted Average
226,537	74	93.74% Pervious Area
15,130	98	6.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.87		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
2.6	305	0.0150	1.97		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
3.0	325	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond 402: Rear Basin**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 3.78" for 100 Year event  
 Inflow = 24.23 cfs @ 12.08 hrs, Volume= 76,038 cf  
 Outflow = 23.50 cfs @ 12.10 hrs, Volume= 76,038 cf, Atten= 3%, Lag= 1.6 min  
 Discarded = 0.38 cfs @ 12.10 hrs, Volume= 18,926 cf  
 Primary = 23.12 cfs @ 12.10 hrs, Volume= 57,111 cf

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Type III 24-hr 100 Year Rainfall=6.50"

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Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 248.76' @ 12.10 hrs Surf.Area= 7,673 sf Storage= 4,597 cf

Plug-Flow detention time= 24.4 min calculated for 75,985 cf (100% of inflow)  
Center-of-Mass det. time= 24.4 min ( 840.3 - 815.8 )

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	1,250 cf	<b>Sediment Basin (Prismatic)</b> Listed below (Recalc)
#2	248.00'	1,170 cf	<b>Sediment Forebay (Prismatic)</b> Listed below (Recalc)
#3	248.00'	4,175 cf	<b>Infiltration Basin (Prismatic)</b> Listed below (Recalc)
		6,595 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	900	0	0
249.00	1,600	1,250	1,250

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	890	0	0
249.00	1,450	1,170	1,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	2,700	0	0
249.00	5,650	4,175	4,175

Device	Routing	Invert	Outlet Devices
#1	Primary	248.35'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 248.35 249.35 Width (feet) 26.00 34.00
#2	Discarded	248.00'	<b>2.140 in/hr Exfiltration (25 mpi) over Surface area</b> Phase-In= 0.05'

**Discarded OutFlow** Max=0.38 cfs @ 12.10 hrs HW=248.75' (Free Discharge)  
↳ **2=Exfiltration (25 mpi)** (Exfiltration Controls 0.38 cfs)

**Primary OutFlow** Max=22.87 cfs @ 12.10 hrs HW=248.75' (Free Discharge)  
↳ **1=Custom Weir/Orifice** (Weir Controls 22.87 cfs @ 2.05 fps)

**Summary for Pond 501: New Ludlow Road**

Inflow Area = 50,936 sf, 5.99% Impervious, Inflow Depth = 4.86" for 100 Year event  
Inflow = 6.49 cfs @ 12.07 hrs, Volume= 20,650 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 100.09' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 20,650 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

**14121B QFS-Proposed Cond- Rev2**

Type III 24-hr 100 Year Rainfall=6.50"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Pond 502: Wetlands**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 2.84" for 100 Year event  
 Inflow = 23.12 cfs @ 12.10 hrs, Volume= 57,111 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.26' @ 23.60 hrs Surf.Area= 217,800 sf Storage= 57,111 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Subcatchment 201: Frontage to New Ludlow Road**

Runoff = 0.24 cfs @ 12.10 hrs, Volume= 936 cf, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr Recharge Volume Rainfall=1.02"

Area (sf)	CN	Description
4,811	39	>75% Grass cover, Good, HSG A
4,034	30	Brush, Good, HSG A
39,041	96	Gravel surface, HSG A
3,050	98	Paved parking, HSG A
0	98	Roofs, HSG A
50,936	86	Weighted Average
47,886	85	94.01% Pervious Area
3,050	98	5.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0080	0.68		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
1.9	166	0.0080	1.44		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
2.4	186	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 202: Rear Area to East Wetlands**

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 1,518 cf, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr Recharge Volume Rainfall=1.02"

Area (sf)	CN	Description
74,411	30	Brush, Good, HSG A
152,126	96	Gravel surface, HSG A
550	98	Paved parking, HSG A
14,580	98	Roofs, HSG A
241,667	76	Weighted Average
226,537	74	93.74% Pervious Area
15,130	98	6.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.87		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
2.6	305	0.0150	1.97		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
3.0	325	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond 402: Rear Basin**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 0.08" for Recharge Volume event  
 Inflow = 0.32 cfs @ 12.07 hrs, Volume= 1,518 cf  
 Outflow = 0.18 cfs @ 12.20 hrs, Volume= 1,518 cf, Atten= 44%, Lag= 7.5 min  
 Discarded = 0.18 cfs @ 12.20 hrs, Volume= 1,518 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

**14121B QFS-Proposed Conc- Rev2**

Type III 24-hr Recharge Volume Rainfall=1.02"

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Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 248.04' @ 12.20 hrs Surf.Area= 4,651 sf Storage= 175 cf

Plug-Flow detention time= 16.8 min calculated for 1,518 cf (100% of inflow)  
Center-of-Mass det. time= 16.7 min ( 888.7 - 872.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	1,250 cf	<b>Sediment Basin (Prismatic)</b> Listed below (Recalc)
#2	248.00'	1,170 cf	<b>Sediment Forebay (Prismatic)</b> Listed below (Recalc)
#3	248.00'	4,175 cf	<b>Infiltration Basin (Prismatic)</b> Listed below (Recalc)
		6,595 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	900	0	0
249.00	1,600	1,250	1,250

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	890	0	0
249.00	1,450	1,170	1,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	2,700	0	0
249.00	5,650	4,175	4,175

Device	Routing	Invert	Outlet Devices
#1	Primary	248.35'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 248.35 249.35 Width (feet) 26.00 34.00
#2	Discarded	248.00'	<b>2.140 in/hr Exfiltration (25 mpi) over Surface area</b> Phase-In= 0.05'

**Discarded OutFlow** Max=0.18 cfs @ 12.20 hrs HW=248.04' (Free Discharge)  
↳ **2=Exfiltration (25 mpi)** (Exfiltration Controls 0.18 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=248.00' (Free Discharge)  
↳ **1=Custom Weir/Orifice** ( Controls 0.00 cfs)

**Summary for Pond 501: New Ludlow Road**

Inflow Area = 50,936 sf, 5.99% Impervious, Inflow Depth = 0.22" for Recharge Volume event  
Inflow = 0.24 cfs @ 12.10 hrs, Volume= 936 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 100.00' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 936 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

**14121B QFS-Proposed Cond- Rev2**

Type III 24-hr Recharge Volume Rainfall=1.02"

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Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Pond 502: Wetlands**

Inflow Area = 241.667 sf, 6.26% Impervious, Inflow Depth = 0.00" for Recharge Volume event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.00' @ 0.00 hrs Surf.Area= 217,800 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Subcatchment 201: Frontage to New Ludlow Road**

Runoff = 0.36 cfs @ 12.09 hrs, Volume= 1,275 cf, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr Water Quality Rainfall=1.17"

Area (sf)	CN	Description
4,811	39	>75% Grass cover, Good, HSG A
4,034	30	Brush, Good, HSG A
39,041	96	Gravel surface, HSG A
3,050	98	Paved parking, HSG A
0	98	Roofs, HSG A
50,936	86	Weighted Average
47,886	85	94.01% Pervious Area
3,050	98	5.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	20	0.0080	0.68		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
1.9	166	0.0080	1.44		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
2.4	186	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment 202: Rear Area to East Wetlands**

Runoff = 0.37 cfs @ 12.07 hrs, Volume= 2,241 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Type III 24-hr Water Quality Rainfall=1.17"

Area (sf)	CN	Description
74,411	30	Brush, Good, HSG A
152,126	96	Gravel surface, HSG A
550	98	Paved parking, HSG A
14,580	98	Roofs, HSG A
241,667	76	Weighted Average
226,537	74	93.74% Pervious Area
15,130	98	6.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0150	0.87		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.10"
2.6	305	0.0150	1.97		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
3.0	325	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond 402: Rear Basin**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 0.11" for Water Quality event  
 Inflow = 0.37 cfs @ 12.07 hrs, Volume= 2,241 cf  
 Outflow = 0.20 cfs @ 12.21 hrs, Volume= 2,241 cf, Atten= 45%, Lag= 8.4 min  
 Discarded = 0.20 cfs @ 12.21 hrs, Volume= 2,241 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

**14121B QFS-Proposed Cond- Rev2**

Type III 24-hr Water Quality Rainfall=1.17"

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Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 248.05' @ 12.21 hrs Surf.Area= 4,680 sf Storage= 207 cf

Plug-Flow detention time= 16.7 min calculated for 2,240 cf (100% of inflow)  
Center-of-Mass det. time= 16.7 min ( 897.4 - 880.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	1,250 cf	<b>Sediment Basin (Prismatic)</b> Listed below (Recalc)
#2	248.00'	1,170 cf	<b>Sediment Forebay (Prismatic)</b> Listed below (Recalc)
#3	248.00'	4,175 cf	<b>Infiltration Basin (Prismatic)</b> Listed below (Recalc)
		6,595 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	900	0	0
249.00	1,600	1,250	1,250

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	890	0	0
249.00	1,450	1,170	1,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	2,700	0	0
249.00	5,650	4,175	4,175

Device	Routing	Invert	Outlet Devices
#1	Primary	248.35'	<b>Custom Weir/Orifice, Cv= 2.62 (C= 3.28)</b> Elev. (feet) 248.35 249.35 Width (feet) 26.00 34.00
#2	Discarded	248.00'	<b>2.140 in/hr Exfiltration (25 mpi) over Surface area</b> Phase-In= 0.05'

**Discarded OutFlow** Max=0.21 cfs @ 12.21 hrs HW=248.04' (Free Discharge)  
↳ **2=Exfiltration (25 mpi)** (Exfiltration Controls 0.21 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=248.00' (Free Discharge)  
↳ **1=Custom Weir/Orifice** ( Controls 0.00 cfs)

**Summary for Pond 501: New Ludlow Road**

Inflow Area = 50,936 sf, 5.99% Impervious, Inflow Depth = 0.30" for Water Quality event  
Inflow = 0.36 cfs @ 12.09 hrs, Volume= 1,275 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 100.01' @ 24.35 hrs Surf.Area= 217,800 sf Storage= 1,275 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
Center-of-Mass det. time= (not calculated: no outflow)

Volume	invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

**Summary for Pond 502: Wetlands**

Inflow Area = 241,667 sf, 6.26% Impervious, Inflow Depth = 0.00" for Water Quality event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 100.00' @ 0.00 hrs Surf.Area= 217,800 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1,089,000 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	217,800	0	0
105.00	217,800	1,089,000	1,089,000

## **APPENDIX D**

### **OPERATION AND MAINTENANCE PLAN**

## OPERATION & MAINTENANCE PLAN

“Quality Fleet Services, Inc.”

### SITE DEVELOPMENT

548 New Ludlow Road

South Hadley, MA

June 10, 2015

Revised August 18, 2015

It is anticipated that Quality Fleet Services, Inc. will retain responsibility for the operation and maintenance of the stormwater system upon completion of construction. An annual budget cost of approximately \$1,500 is anticipated for the operation and maintenance of the stormwater system. Until such time, the contractor of the project will be responsible for operation and maintenance.

The contractor selected to complete the site work construction will be responsible for the operation and maintenance of the temporary erosion control measures during construction and the stormwater management system during the construction phase of the project. Erosion control measures shall be installed and maintained as shown on site plans for the project in accordance with details shown on the plan. Erosion control shall be maintained as detailed on the site plans.

The following maintenance and inspection recommendations are taken from DEP’s Stormwater Management Technical Handbook and shall become part of the operation and maintenance plan for the stormwater management system located on the site:

**All stormwater management devices shall be thoroughly cleaned immediately after any spill which may occur on site.**

All stormwater management components shall be inspected on a monthly basis during the first six months of operation after the completion of construction. At least three monthly inspections of the stormwater management system must take place during the first growing season after the completion of construction.

**Infiltration Basin:** Once the infiltration system goes on-line, inspections shall occur after every major storm for the first six months to ensure proper stabilization and function. Standing water in the basin 48 to 72 hours after the storm indicates the infiltration capacity may be compromised due to clogging of the soil. Sediment shall be removed as necessary to maintain infiltration and capacity of the components.

After the initial six-month period, the infiltration basin shall be inspected at least twice per year. Items to check include standing water, differential settlement, erosion, and sediment accumulation. Sediment shall be removed from the infiltration basin as necessary. Removal procedures should not take place until the infiltration basin is thoroughly dry.

At least twice per year, the buffer area, side slopes, and basin bottom shall be mowed. Grass clippings and accumulated organic matter shall be removed to prevent the formation of an impervious organic mat. Trash and debris shall also be removed at this time. Deep tilling can be used to break up a clogged surface area. Any tilled areas on the slopes of the basin shall be revegetated immediately.

The infiltration basin is equipped with a sediment indicator pad. At the time of inspection, the inspector shall locate the pad by probing the bottom of the basin and sediment shall be removed when 1 inch of sediment covers the indicator pad. Sediment shall be removed across the basin to 1 inch below the level of the indicator pad. Removal procedures should not take place until the floor of the basin is thoroughly dry. Light equipment, which will not compact the underlying soil, should be used to remove the top layer. The remaining soil should be deeply tilled, and revegetated as soon as possible.

**Sediment Forebay:** Once the infiltration system goes on-line, inspections shall occur after every major storm for the first six months to ensure proper stabilization and function. Standing water in the basin 48 to 72 hours after the storm indicates the infiltration capacity may be compromised due to clogging of the soil. Sediment shall be removed as necessary to maintain capacity of the forebay.

After the initial six-month period, the sediment forebay shall be inspected at least twice per year. Items to check include standing water, differential settlement, erosion, and sediment accumulation. Sediment shall be removed from the forebay as necessary. Removal procedures should not take place until the forebay is thoroughly dry.

At least twice per year, the side slopes and forebay bottom shall be mowed. Grass clippings and accumulated organic matter shall be removed to prevent the formation of an impervious organic mat. Trash and debris shall also be removed at this time. Deep tilling can be used to break up a clogged surface area. Any tilled areas on the slopes of the forebay shall be revegetated immediately.

The sediment forebay is equipped with a sediment indicator pad. At the time of inspection, the inspector shall locate the pad by probing the bottom of the forebay and sediment shall be removed when 1 inch of sediment covers the indicator pad. Sediment shall be removed across the forebay to 1 inch below the level of the indicator pad. Removal procedures should not take place until the floor of the forebay is thoroughly dry. Light equipment, which will not compact the underlying soil, should be used to remove the top layer. The remaining soil should be deeply tilled, and revegetated as soon as possible.

**Sediment Basin:** Once the infiltration system goes on-line, inspections shall occur after every major storm for the first six months to ensure proper stabilization and function. Standing water in the basin 48 to 72 hours after the storm indicates the infiltration capacity may be compromised due to clogging of the soil. Sediment shall be removed as necessary to maintain capacity of the basin.

After the initial six-month period, the sediment basin shall be inspected at least twice per year. Items to check include standing water, differential settlement, erosion, and sediment accumulation. Sediment shall be removed from the sediment basin as necessary. Removal procedures should not take place until the sediment basin is thoroughly dry.

At least twice per year, the side slopes and basin bottom shall be mowed. Grass clippings and accumulated organic matter shall be removed to prevent the formation of an impervious organic mat. Trash and debris shall also be removed at this time. Deep tilling can be used to break up a clogged surface area. Any tilled areas on the slopes of the basin shall be revegetated immediately.

The sediment basin is equipped with a sediment indicator pad. At the time of inspection, the inspector shall locate the pad by probing the bottom of the basin and sediment shall be removed when 1 inch of sediment covers the indicator pad. Sediment shall be removed across the basin to 1 inch below the level of the indicator pad. Removal procedures should not take place until the floor of the basin is thoroughly dry. Light equipment, which will not compact the underlying soil, should be used to remove the top layer. The remaining soil should be deeply tilled, and revegetated as soon as possible.

Grass Swale: Mow on an as-needed basis during the growing season so that the grass height does not exceed 6 inches. Remove accumulated trash and debris prior to mowing. Inspect swale semi-annually the first year and at least once a year thereafter. Inspect the grass for growth and the side slopes for signs of erosion and formation of rills and gullies. Plant an alternative grass species if the original grass cover is not successfully established. If grass growth is impaired by winter road salt or other deicer use, re-establish the grass in the spring.

Check grass swale on a yearly basis for sediment and clean as needed. Use hand methods when cleaning to minimize disturbance to vegetation and underlying soils.

Mosquito Prevention and Control: Clear debris and vegetation from the roof leader connections and the general site area to limit standing pools of water. Larvicides shall be applied as necessary to the catch basins and infiltration basin if ponding remains over 72 hours. All larvicides shall be applied by a licensed pesticide applicator and in compliance with all pesticide label requirements. The larvicide *Bacillus sphaericus* (*Bs*) or approved equal shall be hand broadcast during or immediately after wet weather, when the detention or infiltration basin has a standing pool of water, unless the product used can withstand extended dry periods.

Public Safety Features: All differential settlement shall be graded smooth and seeded.

**Maintenance Responsibility**

- A. The owner of the property on which work has been done pursuant to this Ordinance for private stormwater management facilities, or any other person or agent in control of such property, shall maintain in good condition and promptly repair and restore all grade surfaces, walls, drains, dams and structures, vegetation, erosion and sediment control measures and other protective devices. Such repairs or restoration and maintenance shall be in accordance with approved plans.
- B. Quality Fleet Services, Inc. will retain responsibility for the operation and maintenance of the stormwater system, the infiltration basin shall be inspected at least twice per year. Items to check include standing water, differential settlement, erosion, and sediment accumulation.
- C. A record of installation and a rolling log of operation and maintenance activities shall be retained for a minimum of three years. The log shall be made available to the Authorized Enforcement Agency upon request.
- D. Failure to properly maintain practices during and post construction is considered a violation of the stormwater permit.
- E. There are no proposed easements associated with the operation of the Stormwater Management System. Quality Fleet Services, Inc. will allow access to the public officials or their agents for inspection of the system at reasonable times.
- F. Quality Fleet Services, Inc. will notify the Town of South Hadley Planning Board if the facility were to change ownership to signify the end of their responsibility for operation and maintenance of the facility.
- G. Quality Fleet Services, Inc. acknowledges that after notice by the Permit Granting Authority to correct a violation requiring maintenance work, satisfactory correction are not made by Quality Fleet Services, Inc., within thirty days, the Department of Public Works may perform all necessary work to place the facility in proper working condition and place a municipal lien on the affected property as security for all of the cost assumed by the Town to perform the work.

**Operator Information**

Name(print): \_\_\_\_\_ Signature: \_\_\_\_\_  
 \_\_\_\_\_  
 Quality Fleet Services, Inc. Date: \_\_\_\_\_  
 Address: 625 State Street, Belchertown, MA  
 Telephone: \_\_\_\_\_

**Owner Information**

Name(print): Nick Moynihan Signature: \_\_\_\_\_  
 \_\_\_\_\_  
 The Moynihan Realty Group, LLC Date: \_\_\_\_\_  
 Address: 625 State Street, Belchertown, MA  
 Telephone: (413) 695 - 3232

**South Hadley Planning Board**

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

"Quality Fleet Services, Inc."  
**SITE DEVELOPMENT**  
 548 New Ludlow Road  
 South Hadley, MA

**OPERATION AND MAINTENANCE LOG FORM**

INSPECTOR: \_\_\_\_\_ DATE: \_\_\_\_\_

INSPECTORS QUALIFICATIONS: \_\_\_\_\_

DAYS SINCE LAST RAINFALL: \_\_\_\_\_ AMOUNT OF LAST RAINFALL \_\_\_\_\_ INCHES

**STRUCTURAL CONTROLS**

BMP	CONDITION	EVIDENCE OF SEDIMENT LEAVING SITE OR CONTROL	NEEDS MAINTENANCE (NOTE BELOW)
SEDIMENT BASIN			
SEDIMENT FOREBAY			
INFILTRATION BASIN			
GRASS SWALE			
ADDITIONAL MEASURES RECOMMENDED			
ADDITIONAL MEASURES RECOMMENDED			
ADDITIONAL MEASURES RECOMMENDED			

**MAINTENANCE REQUIRED:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**TO BE PERFORMED BY:** \_\_\_\_\_ **ON OR BEFORE:** \_\_\_\_\_

## **APPENDIX E**

### **CALCULATIONS FOR STORMWATER POLICY STANDARDS**

# CALCULATIONS FOR STORMWATER POLICY STANDARDS

“Quality Fleet Services, Inc.”  
**SITE DEVELOPMENT**  
548 New Ludlow Road  
South Hadley, MA

June 10, 2015  
Revised: August 19, 2015

## **STANDARD #1: NO NEW UNTREATED DISCHARGES**

No point source discharges have been observed on the site. No point source discharges are proposed.

## **STANDARD #2: PEAK RATE ATTENUATION**

Through the use of the proposed open drainage system and infiltration basin, the proposed development project will not increase peak flows to New Ludlow Road, or to the wetland area east of the property.

## **STANDARD #3: RECHARGE TO GROUNDWATER**

### **Proposed Infiltration System:**

Proposed Impervious area (pavement & buildings) = 18,180 sq. ft.  
Impervious area is 100% HSG A, Type A soil  
Volume to be recharged: 18,180 sq. ft. x 1 in. x (1/12) = 1,515 cu. ft.

An infiltration rate of 25 min./in. (2.41 in./hour) was used for existing soil at the infiltration basin. For the Recharge Volume Storm, the proposed drainage calculations (Appendix C of the Drainage Report) show the infiltration basin infiltrates 1,518 cubic feet or 0.0348 acre-feet.

### **Drawdown within 72-hours, Infiltration Basin:**

Recharge Volume (Rv) = 1,518 cu. ft.  
Rawls Infiltration Rate (Sandy Loam) = 2.41 inch/hour = 0.2008 ft/hr  
Bottom Area = 4,350 sf  
Drawdown time = (Rv)(1/Rawls Rate)(1/Bottom Area)  
= (1,518 cf) (1/0.2008 ft/hr) (1/4,350 sf)  
= 1.7 hours

### Mounding Analysis:

Using a Groundwater Mounding Calculator from the website:

<http://www.aqtesolv.com/forum/rmound.asp>, the following parameters were entered to determine the increase in hydraulic head.

w (Percolation Rate):  $[(1,518 \text{ cf}) / (4,350 \text{ sf})] / 72 \text{ hr.} = 0.00485 \text{ ft./hr.}$

K (Hydraulic Conductivity):  $2.41 \text{ in./hr.} = 0.2008 \text{ ft./hr.}$

S (Specific Yield): 0.15

t (Time): 72 hr.

$h_i$  (Initial Saturated Thickness): 3.00 ft.

a (Length of Recharge Area): 100 ft.

b (Width of Recharge Area): 41 ft.

This gives an increase in hydraulic head = 0.97 feet  
or a mounding elevation of 245.97 feet.

The analysis indicates the groundwater mounding will not completely saturate the soil below the bottom of the infiltration basin. The infiltration basin will not retain water beyond 72 hours.

### **STANDARD #4: 80% TSS REMOVAL**

#### Proposed Infiltration System:

Proposed Impervious area (pavement & buildings) = 18,180 sq. ft.

Impervious area is 100% HSG A, Type A soil

Volume to be recharged:  $18,180 \text{ sq. ft.} \times 1 \text{ in.} \times (1/12) = 1,515 \text{ cu. ft.}$

An infiltration rate of 25 min./in. (2.41 in./hour) was used for existing soil at the infiltration basin. For the Water Quality Storm, the proposed drainage calculations (Appendix C of the Drainage Report) show the infiltration basin infiltrates 2,241 cubic feet or 0.0514 acre-feet.

Overland flow to infiltration basin

Sediment Basin (25%): $(1)(0.25) =$	25.0% of TSS
Infiltration Basin with Forebay (80%): $[(1)-(0.25)(0.80) =$	60.0% of TSS
TOTAL:	85.0% of TSS

**STANDARD #5: HIGHER POTENTIAL POLLUTION LOADS**

The proposed facility will be used for vehicle maintenance & repairs. This type of facility is contained in the 12 types listed in the Higher Potential Pollution Loads standard.

**STANDARD #6: PROTECTION OF CRITICAL AREAS**

This site does not contribute stormwater runoff to a Critical Area.

**STANDARD #7: REDEVELOPMENT**

The proposed project meets the criteria of new development & redevelopment. The stormwater management has been provided to meet the new development requirements.

**STANDARD #8: CONSTRUCTION PERIOD POLLUTION PREVENTION**

A Stormwater Pollution Prevention Plan with construction period controls has been prepared for the project and is included in the Project Manual & Drainage Report.

**STANDARD #9: OPERATION AND MAINTENANCE PLAN**

An Operation and Maintenance Plan has been prepared for the project and is included in the Project Manual & Drainage Report.

**STANDARD #10: ILLICIT DISCHARGE COMPLIANCE STATEMENT**

Illicit Discharge Compliance Statement:

I hereby certify under the penalties of perjury that no illicit discharges exist on the site. I understand that the pollution prevention plan shall be implemented to prevent illicit discharges to the stormwater management system including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

\_\_\_\_\_  
Signature of Property Owner

\_\_\_\_\_  
Date