Date Submitted to EPA: 12/21/2018
EPA Approved: TBD
Date Amended: N/A
Amendment Notes: N/A

Narragansett Bay Watershed SCP
Lawton Valley Reservoir (RI0007035L-06)
Portsmouth, Rhode Island

Key Findings

This SCP Report is for Lawton Valley Reservoir (RI0007035L-06) located within the Narragansett Bay Watershed (Figure 1-A).

Table 1-A: Subwatershed Summary

Impairments	Evaluation Methodology	RIDOT Reduction Target (% / Acres)	Existing Treatment	Potential Treatment	Runoff Reduction	Remaining RIDOT Reduction Target	NonRIDOT Treatment Credit
Total Phosphorus, Total Organic Carbon	IC Method	4.8% (0.2 ac)	0	0.5 ac	0.4 ac-ft	0	15%

Site Description

Subwatershed Description

- The subwatershed is located in Portsmouth, RI.
- The subwatershed is 785 acres and 10.5% impervious (82 acres).
- The general land uses within the subwatershed are deciduous forest, developed recreation, residential, and cropland.

RIDOT Discharging Area

- RIDOT maintained property is 6.1 total acres and 4.1 impervious acres.
- No “Other RIDOT roadways” exist in this subwatershed.
- The subwatershed area increased from approximately 743 acres to 785 acres (5.6 percent) due to changes identified during desktop review and site visits.
- There are no High Priority outfalls (Appendix 6).
- There are no Priority outfalls (Paragraph 20.b.).
- There are no RIDOT MS4 discharge points for which RIDOT must provide a schedule for initiating IDDE inspections (Appendix 8).
- There are no MS4 outfalls for which RIDOT shall identify upgradient interconnections (Appendix 9).
- There are no TMDL Priority outfalls
- There is 1 incoming MS4 interconnection and 1 private incoming interconnection.
- There is 1 outgoing interconnection.

Non-Discharge Areas

- RIDOT did not identify any non-discharge areas.

Sewered/Combined Sewer Areas

- There are no areas in the subwatershed that are sewered.
- There are no areas that discharge to a combined sewer system.

Reduction Target Development

- RIDOT's IC reduction target is 0.2 acres.
- A TMDL is planned for 2019 for the total phosphorus and total organic carbon impairments.

Existing Stormwater Controls

- No STUs currently exist within the subwatershed.

Potential Enhanced Non-Structural Stormwater Controls

- RIDOT has identified that structural control measures are needed to reduce its effective IC to achieve the RIDOT IC reduction target.
- RIDOT will perform enhanced street sweeping within the Consent Decree designated Area of Interest (AOI).

Potential Structural Stormwater Controls

- RIDOT has identified that additional control measures are needed to reduce its effective IC to achieve the RIDOT IC reduction target.
- RIDOT identified 6 opportunities for potential STUs within the subwatershed (Table 2-A) with a total IC reduction credit of 0.5 acres.
- No TIP projects (as of November 2018) are scheduled for the next 5 years within the subwatershed.

Table 2-A: STU Stormwater Controls Summary

STU ID	Stormwater Control Type	Catchment Area (ac)	Impervious Cover (ac)	Treatment Depth (in) (Depth of Runoff Treated)	Runoff Reduction (ac-ft)	Equivalent IC Reduction Credit (ac)	Estimated Cost	Cost per IC Reduction Acre ($/ac)	Retrofit Priority
SCP-LVR-002	Bioretention Swale	0.3	0.2	0.8	0.08	0.11	$31,100	$282,700	1
SCP-LVR-005	Bioretention Swale	0.4	0.3	0.6	0.08	0.13	$31,100	$239,200	1
							Percent RIDOT Reduction Reached		133%
SCP-LVR-001	Bioretention Swale	0.3	0.2	1.0	0.11	0.13	$39,400	$303,100	2
SCP-LVR-003	Bioretention Swale	0.2	0.2	0.8	0.07	0.09	$30,100	$334,400	2
SCP-LVR-004	Bioretention Swale	0.1	0.1	1.0	0.03	0.03	$18,200	$606,700	2
							Percent RIDOT Reduction Reached		272%
SCP-LVR-006	Bioretention Swale	0.2	0.1	1.1	0.04	0.04	$20,100	$502,500	3
							Percent RIDOT Reduction Reached		289%
Total		1.5	1.0		0.4	0.5	$170,000		

Site Description

Subwatershed Description

Lawton Valley Reservoir (RI0007035L-06) is located within the Narragansett Bay Watershed (Figure 1-A). The subwatershed is located in Portsmouth, RI. It is in the south-central region of the Town, in between the Lawton Brook (RI0007035R-04) and Saint Mary's Pond (RI0007035L-05) subwatersheds. The subwatershed headwaters are located in Saint Mary's Pond. Waters discharging from Saint Mary's Pond enter Sisson Pond, which discharges into Lawton Brook at the boundary of the Lawton Valley Reservoir watershed. Lawton Brook flows north a short distance through wooded area into Lawton Valley Reservoir, passing under Union Street (RIDOT-owned), where it receives stormwater runoff from two outfalls. The reservoir also receives water from an unnamed tributary flowing from the northeast, which drains much of the land in the northeast portion of the watershed. A significant amount of land in the subwatershed consists of the Green Valley Country Club golf course, and this land mostly drains into the reservoir via overland flow. Most of the residential (impervious) area in the watershed is in the northern part and farther away from the waterbody. RIDOT also owns and operates Middle Road, which is partially located in the watershed along the eastern boundary. Runoff from Middle Road leaves the RIDOT system via an outgoing interconnection at Greylock Drive. The Rhode Island Department of Environmental Management (RIDEM) water quality classification for Lawton Valley Reservoir is Class AA. Use goals associated with this classification include public drinking water supply, fish and wildlife habitat, and primary and secondary contact recreation. According to RIDEM's Clean Water Act (CWA) Integrated List of Waterbodies – Appendix A 2016 Index of Waterbodies and Category Listing,[1] the impairments affecting this waterbody segment are total phosphorus and total organic carbon (TOC). RIDEM has classified Lawton Valley Reservoir as a Category 5 waterbody that is not supporting of fish and wildlife habitat or public drinking water supply. The waterbody is fully supporting primary and secondary contact recreation, and is not assessed for fish consumption. TMDLs for the phosphorus and TOC impairments are anticipated in 2019.

[1] RIDEM, March 2018, 2016 Integrated Water Quality Monitoring and Assessment List – Appendix A 2016 Index of Waterbodies and Category Listing. Available at: http://dem.ri.gov/programs/benviron/water/quality/surfwq/pdfs/iwr16.pdf

RIDOT maintained property in the subwatershed is 6.1 acres; 4.1 acres of which is impervious. ArcGIS online Figure 1/2 shows the subwatershed with the impaired waterbody segments, the Rhode Island Department of Transportation (RIDOT) maintained roadways, the RIDOT maintained property (catchment area) that is discharging to the waterbody, and the outfalls that are discharging to the waterbody. According to 2011 land use data obtained from the Rhode Island Geographic Information System (RIGIS),[2] the subwatershed consists mostly of deciduous forest, developed recreation, residential, and cropland.

RIDOT Discharging Area Description

ArcGIS online Figure 3 shows RIDOT maintained roadways and catchment areas, outfalls, catch basins, interconnections, and RIDEM-listed impaired water bodies located within the subwatershed, as discussed below.

Subwatershed Boundary Delineation

The RIDEM-provided subwatershed boundary was reviewed through desktop analysis and site visits. As a result of this review, the subwatershed area increased from approximately 743 acres to 785 acres (5.6 percent). A subwatershed boundary modification memo was sent to RIDEM on December 31, 2018 and is under review.

A revised subwatershed was delineated using automated ArcSWAT tools and 1-meter LiDAR elevation data. While the new delineation generally concurred with the HUC14 delineation, it did include minor variations around the subwatershed perimeter resulting from the use of higher-resolution data for the delineation. Beyond the minor variations due to topographic data, three specific modifications were made to the Lawton Valley Reservoir subwatershed boundary.

1. The existing delineation had overlapping area with Lawton Brook (RI0007035R-04) at the Lawton Valley Reservoir Dam impoundment as well as with the Melville Ponds (RI0007029L-01) subwatershed. The proposed subwatershed boundary for Lawton Valley Reservoir was updated to be coincident with these neighboring subwatersheds.
2. The subwatershed boundary between Lawton Valley Reservoir and Melville Ponds (RI0007029L-01) was adjusted to reflect Town of Portsmouth records indicating that Flint Corn Road drains north to Mill Lane and into the Melville Ponds subwatershed. Town roads, east of Flint Corn and south of Mill Lane, drain south into the Lawton Valley Reservoir subwatershed.
3. More runoff occurs from the Green Valley Country Club than in the existing delineation. Runoff from the agricultural lands, to the north of the country club, flows southwest into the golf course and watering ponds.

Other RIDOT Roadways

Preliminary evaluation of this subwatershed determined RIDOT roads are properly identified and no "Other RIDOT roadways" exist in this subwatershed.

[2] Rhode Island Department of Environmental Management, Rhode Island Department of Administration, Statewide Planning Program, Photo Science, Inc. www.rigis.org

RIDOT Roadways

RIDOT maintained roadways in the subwatershed include: Union Street and Middle Road. RIDOT maintains 6.1 acres of property (impervious and pervious) within the subwatershed, all of which are directly or indirectly discharging to Lawton Valley Reservoir with 4.1 acres of impervious cover. The RIDOT direct and indirect discharging areas include the following:

Table 3-A: Direct and Indirect Discharging Areas

RIDOT Roadway	Roadway Type	ROW Description	Adjacent Land Use	Drainage System
Union Street	two lane roadway with drainage swales on both sides in some areas	Right-of-Way (ROW) width ranging from 45- to 75- feet	medium density residential	partially-closed drainage system with direct discharge to Lawton Brook
Middle Road	two lane roadway with drainage swales on one side in some areas	ROW width ranging from 40- to 70- feet	medium-high density residential and agriculture	partially-closed drainage system with discharge to Town of Portsmouth

Outfall Catchment Delineation

RIDOT catchment areas by discharge location within the subwatershed are summarized in Appendix A-A. Catchments in the Lawton Valley Reservoir subwatershed were delineated based on a desktop review of RIDOT drainage data, 1-meter resolution LiDAR data, and Google Earth, and 3-inch resolution aerial imagery. The RIDOT Right-of-Way (ROW) boundary was determined based on parcel boundaries retrieved from the Town of Portsmouth website. Non-RIDOT catchments were delineated only for those RIDOT catchments containing a potential STU. Non-RIDOT catchments in this subwatershed are limited due to the presence of a stone wall along both sides of most of the RIDOT ROW. In general, runoff is conveyed to the outfalls via a series of roadside drainage swales and culverts. Catchments were confirmed by a field visit that took place in October 2018. The field visit confirmed general questions regarding utilities, roadway crowns and superelevation, drainage patterns and infrastructure, etc.

Illicit Discharge Detection and Elimination Priority Outfalls

There are 2 mapped RIDOT outfalls within the Lawton Valley Reservoir subwatershed. There are no High Priority outfalls (as defined in Appendix 6) or Priority outfalls (as defined by paragraph 20.b) located in the subwatershed. There are also no RIDOT MS4 discharge points for which RIDOT must provide a schedule for initiating IDDE inspections (per Appendix 8). There are no MS4 outfalls for which RIDOT shall identify upgradient interconnections (per Appendix 9).

TMDL Priority Outfalls

There are no TMDL priority outfalls located in the subwatershed.

Interconnections

Interconnections are shown on ArcGIS online Figure 3. RIDOT utilized RIDOT drainage data and reviewed local topography and surface drainage patterns to identify possible interconnections.

MS4: RIDOT identified 1 location where a municipal separate storm sewer system (MS4) ties into the RIDOT drainage system (incoming interconnection) and 1 location where RIDOT drainage ties into a municipal drainage system adjacent to their property (outgoing interconnection). The incoming Town of Portsmouth MS4 interconnection enters the RIDOT system at the intersection of Union Street and Almy Knoll Terrace. The outgoing MS4 interconnection is at the intersection of Middle Road (RIDOT) and Greylock Drive (Town), where RIDOT drainage outfalls to the Town of Portsmouth MS4.

Private: The desktop review, drainage system mapping, and field visits identified 1 potential private interconnection. This interconnection enters the system west of Almy Knoll and east of Jepson Lane.

RIDOT reviewed its Physical Alterations Permit Application (PAPA) database. This database lists permits requested by adjacent properties to tie into the RIDOT storm drainage system and includes an analysis of the applicant's contribution to the RIDOT storm drainage system. The current PAPA database did not contain entries for any of the potential interconnections listed above. The interconnections are included in RIDOT's online mapping database. RIDOT will add all private interconnections for which the owner is unknown to its IDDE program to verify that only stormwater flows are being discharged and will have the owners file for a PAPA. Further, RIDOT will review future PAPA permit requests for compliance with its TAC 0071 – PAPA Guidance – Public and Private Tie-Ins to the State's Drainage System and its RIPDES permit and to ensure that only stormwater flows are being introduced to their system.

Non-Discharge Areas

RIDOT did not identify any non-discharge areas in the subwatershed.

Sewered/Combined Sewer Areas

There are no areas in the subwatershed that are sewered.

There are no areas in the subwatershed that discharge to a combined sewer system.

Flow and Water Quality Monitoring Data

As part of this SCP, RIDOT reviewed the following sources for existing flow and water quality monitoring data:

- University of Rhode Island (URI) Watershed Watch
- Groundwater Elevation Data

URI Watershed Watch[3]

The URI Watershed Watch does not have any monitoring sites within the Lawton Valley Reservoir subwatershed. The only monitoring site in the Town of Portsmouth is at Melville Pond – Upper.

[3] University of Rhode Island (URI) Watershed Watch. Available at: https://web.uri.edu/watershedwatch/uri-watershed-watch-monitoring-data/

Groundwater Elevation Data

Groundwater elevation data was obtained from the United States Department of Agricultural National Cooperative Soil Survey and includes soil classification, standard groundwater depths, and infiltration rates.

Reduction Target Development

The impairments affecting Lawton Valley Reservoir (RI0007035L-06) are total phosphorus and total organic carbon. TMDLs are planned for 2019 for these impairments.

Impervious Cover Method

As shown in Table 4-A-2 the subwatershed's percent IC is greater than 10%, thereby indicating that stormwater is a likely contributor to the impairment. To meet RIDOT's apportioned responsibility for achieving the subwatershed IC reduction target, RIDOT's effective IC within the subwatershed will need to be reduced by the percentage calculated in Table 4-A-2. (Note: The TMDL Method was not performed for this water body, and as a result, there is no Table 4-A-1: TMDL Method: Pollutant Reduction Target Summary)

Table 4-A-2: Impervious Cover Method: IC Reduction Target Summary

Subwatershed Total Area:	785 acres
Subwatershed Total IC Area (%):	82 acres (10.5%)
Subwatershed Target IC (10%):	78 acres
Subwatershed IC Reduction Target:	4.8%
RIDOT Contributing Total Area to Waterbody:	6.1 acres
RIDOT Contributing Total IC Area to Waterbody:	4.1 acres
RIDOT IC Reduction Target:	0.2 acres
Pollutants of Concern:	Total Phosphorus, Total Organic Carbon

Non-Stormwater Related Impairments

The Lawton Valley Reservoir (RI0007035L-06) subwatershed is not impaired by non-stormwater related impairments.

Existing Stormwater Controls

No stormwater treatment units (STUs) currently exist to treat stormwater from RIDOT's property directly or indirectly discharging to Lawton Valley Reservoir (RI0007035L-06). Under existing conditions, RIDOT's estimated equivalent IC exceeds the RIDOT IC reduction target.

Potential Enhanced Non-Structural Stormwater Controls

RIDOT has identified that control measures are needed to reduce its effective IC within the contributing subwatershed to achieve the required RIDOT IC reduction target. RIDOT did not identify any potential non-structural stormwater controls beyond what is required in the Consent Decree.

Stormwater Controls Description

As part of compliance with the Consent Decree, RIDOT will be performing enhanced street sweeping (estimated two times per year) within the Consent Decree designated Area of Interest (AOI). These roadways include a total of 0.9 miles containing 4.1 impervious acres within this subwatershed, shown on ArcGIS online Figure 2.

Potential Structural Stormwater Controls

RIDOT has identified that structural control measures are needed to reduce its effective IC within the contributing subwatershed to achieve the required RIDOT IC reduction target. Appropriate locations are potentially available for control measures, as shown in ArcGIS online Figure 4.

Specific stormwater controls have been identified that may be considered for implementation, as described in the following section. See sub-section Evaluation of Infeasible Stormwater Controls for more information regarding locations where retrofit STUs are not currently feasible.

Stormwater Controls Description

RIDOT identified specific locations and several general locations for potential structural STUs within this subwatershed. ArcGIS online Figure 4 shows potential STU locations with catchment areas, including non-RIDOT areas and Appendix C-A lists site-specific constraints.

Below are descriptions of the potential STUs including location, conceptual design, RIDOT ROW treated, hydrologic soil group based on United States Department of Agriculture National Cooperative Soil Survey, major constraints, and any partnership required.

SCP-LVR-001, SCP-LVR-002, SCP-LVR-003, SCP-LVR-004, SCP-LVR-005, SCP-LVR-006

> All six potential STUs proposed for this subwatershed are bioretention swales. Much of the RIDOT roadways (both Union Street and Middle Road) already contain existing drainage swales along the sides of the road with a series of culverts that convey water under driveways and toward the RIDOT outfalls. The proposed STUs consist of retrofitting the drainage swales with bioretention systems. In most locations, abutting private property is separated from the roadway and adjacent drainage by a stone wall. STUs proposed on Union Street (-001, -002, -003, -004) are all on the north side of the road, which is the same side as the outfalls. As a result, these STUs would only treat the adjacent half of the RIDOT roadway (north of the roadway crown). The majority of the STU catchments is within the RIDOT ROW. There is no curbing along these roads, but there is not enough ROW width for sheet flow to occur across a filter strip. Instead, runoff will enter the swales at discrete inlets with pretreatment systems. An overflow system will be designed to bypass flows in excess of the design volume to the existing drainage system (storm drain system where available or downstream swale). Poor soils in the area will prevent infiltration, so an underdrain will be installed and connected to the existing drainage system (storm drain system or downstream swale). In general, potential obstacles to implementation

include coordination with abutters regarding maintained sections of lawn in the ROW, as well as an historic cemetery located next to SCP-LVR-001. Care would need to be taken while grading adjacent to the stone walls.

TIP STUs

The RIDOT Transportation Improvement Plan (TIP) identifies RIDOT projects that are scheduled to be designed and constructed in the near future.

No TIP projects (as of November 2018) are scheduled for the next 5 years within the subwatershed.

Limited ROW STUs

RIDOT did not identify any roadways as areas with limited ROW STUs.

Infeasible Stormwater Controls

Through this evaluation, RIDOT determined that certain areas of the direct and indirect discharging area are not feasible for retrofit stormwater controls. These locations are shown in ArcGIS online Figure 4 with specific constraints listed in Appendix C-A. In general, constraints included utilities, existing vegetation, and ROW width, limiting the construction and/or function of a potential STU. Although some constraints are manageable via creative design and permitting, other constraints or the combination of multiple constraints make locations prohibitive for retrofit STUs. These locations may be feasible for STUs in the future if conditions change and will be evaluated as transportation designs occur.

Stormwater Controls Calculations

Calculations showing effective IC reduction credit for potential stormwater controls are attached as Appendix B-A and summarized in Table 1-A.

Implementation

Existing and potential enhanced non-structural and structural controls are summarized in Table 5-A below.

Table 5-A: Stormwater Controls Summary

STU ID	Stormwater Control Type	Catchment Area (ac)	Impervious Cover (ac)	Treatment Depth (in) (Depth of Runoff Treated)	Runoff Reduction (ac-ft)	Equivalent IC Reduction Credit (ac)	Estimated Cost	Cost per IC Reduction Acre ($/ac)	Retrofit Priority
SCP-LVR-002	Bioretention Swale	0.3	0.2	0.8	0.08	0.11	$31,100	$282,700	1
SCP-LVR-005	Bioretention Swale	0.4	0.3	0.6	0.08	0.13	$31,100	$239,200	1
							Percent RIDOT Reduction Reached		133%
SCP-LVR-001	Bioretention Swale	0.3	0.2	1.0	0.11	0.13	$39,400	$303,100	2
SCP-LVR-003	Bioretention Swale	0.2	0.2	0.8	0.07	0.09	$30,100	$334,400	2
SCP-LVR-004	Bioretention Swale	0.1	0.1	1.0	0.03	0.03	$18,200	$606,700	2
							Percent RIDOT Reduction Reached		272%
SCP-LVR-006	Bioretention Swale	0.2	0.1	1.1	0.04	0.04	$20,100	$502,500	3
							Percent RIDOT Reduction Reached		289%
Total		1.5	1.0		0.4	0.5	$170,000		

RIDOT will implement this SCP through:

1. Non-Constructed Measures
2. RIDOT New Construction and Re-Construction Projects
3. Retrofit Projects

RIDOT constructs STUs as part of either programmed or retrofit projects until the RIDOT IC or pollutant reduction target is met.

Non-Constructed Measures

RIDOT will perform enhanced street sweeping on Union Street and Middle Road per the Consent Decree (as defined by paragraph 41), as these roads indirectly drain to a Newport Water Supply Reservoir (Lawton Valley Reservoir).

RIDOT New Construction and Re-Construction

No new or re-construction projects whose scope and limits have been defined at the time of this SCP have been identified.

Retrofits

Retrofit STUs have been identified as part of this SCP. Table 5-A includes estimated costs and implementation priority for these controls. Cost estimates for STUs were obtained from guidance in EPA's memo "Methodology for developing cost estimates for Opti-Tool", RIDOT Weighted Average Unit Prices for calendar years 2017 and 2018, and experience from prior stormwater projects. Costs from EPA's memo have not been adjusted to the current year. Average unit costs were developed based on a typical STU retrofit scenario and include considerations for mobilization and demobilization, soil erosion and sediment control, contingency, engineering and design fees, and construction administration. Individual STU costs were then adjusted based on STU size, with larger systems being more cost-effective than smaller systems. Cost estimates presented in this SCP should be considered as Order of Magnitude as defined by the American Association of Cost Engineers and are expected to be accurate within a plus 50% or minus 30% range as they were developed without detailed engineering data.

STU retrofit priorities were determined based on per-acre cost of IC reduction, constructability, and necessity for achieving the RIDOT IC reduction target. STUs more difficult and/or expensive to implement were generally given lower priority, unless they are necessary for achieving the reduction target, in which case they were tagged as priority 1 or 2. STUs located in TIP areas were given retrofit priorities based on the project start date, where near-term projects are higher priority and longer-term projects are lower priority.

Table 6-A shows the implementation schedule for the major milestones for design and construction of the retrofit STUs. Although these target implementation dates have been identified at this time based on the STU prioritization, RIDOT may implement certain STUs on an alternate schedule if cost efficiencies are identified. Examples of potential cost saving opportunities include:

- Constructing STUs along a highway corridor that spans multiple SCP subwatersheds at the completion of all associated SCPs
- Modifications in planned roadway project timelines or scopes
- Identification of partnering opportunities.

Table 6-A: Structural Controls Target Implementation Schedule

STU Priority Level	Feasibility & Scope Start	Recommended Target Dates by		
		Design Start	Construction Advertise	Construction Finalized
Priority Level 1	June 2019	January 2021	June 2022	June 2023
Priority Level 2	June 2021	As Needed to Fulfill Target	As Needed to Fulfill Target	As Needed to Fulfill Target
Priority Level 3	June 2023	As Needed to Fulfill Target	As Needed to Fulfill Target	As Needed to Fulfill Target

Note: Target dates are based on an assumed EPA approval within six months of SCP submittal. The dates only apply to STU's that are determined feasible and are needed to fulfill target.

Municipal and Private Partnerships

There are no existing or proposed partnerships, therefore Appendix E-A is not included. RIDOT will continue to evaluate opportunities for municipal and private partnerships that may allow for construction of stormwater controls on non-RIDOT property.

IDDE Activities

RIDOT has completed IDDE dry-weather screenings at its outfalls within this subwatershed.

During system mapping activities, dry-weather discharge was not observed at any of the outfalls in the subwatershed. Between April 1 and November 30, 2019, RIDOT will inspect the outfalls where flow was not observed during dry weather under wet-weather conditions and analyze samples for parameters listed in Paragraph 21c.

Public Outreach

During development of this SCP, RIDOT met with the Town of Portsmouth on May 2, 2018. RIDOT conveyed the Consent Decree requirements and the SCP Plan development schedule and made a request for available stormwater system mapping data. RIDOT was not able to obtain infrastructure or any other data from the Town. RIDOT will continue coordination with the Town of Portsmouth to share data, findings, and plans for improvements.

STU Operations and Maintenance Plan

Existing and newly constructed STUs will be inspected, operated, and maintained to ensure functionality and longevity of the STUs. The inspection, operation, and maintenance procedures for STUs are consistent with those outlined in RIDEM's Stormwater Design and Installation Standards Manual, amended in March 2015,[4] and RIDOT's forthcoming Linear Stormwater Manual (2019), and include inspections and maintenance that is customized to the functioning components of the STU.

[4] Rhode Island Stormwater Design and Installation Standards Manual, Rhode Island Department of Environmental Management and Coastal Resources Management Council, Amended March 2015. Accessed: http://www.dem.ri.gov/pubs/regs/regs/water/swmanual15.pdf.

Next Steps

In the year following submission of this SCP, RIDOT will develop feasibility studies for all Priority 1 STUs listed in Table 2-A. These feasibility studies will further evaluate site characteristics and constraints, including soil infiltration rates, utility conflicts, and catchment areas to each potential STU. In addition, a 30% design, 90% design, PS&E and required Contract Advertising Documents and as-build plans will be developed for each of the Priority 1 STUs.

APPENDIX A-A

Lawton Valley Reservoir (RI0007035L-06)

RIDOT DISCHARGING AREA SUMMARY

Appendix A-A: RIDOT Discharging Area Summary

Structure ID	Discharge Location	Description	Total Area (ac)	Impervious Cover (ac)	Pervious Cover (ac)	Pervious Cover Types
OF-446	Stream/River	Metal pipe w/ headwall	1.7	1.1	0.6	Grass/ Forest
OF-447	Stream/River	Metal pipe w/ headwall	1.9	1.4	0.4	Grass/ Forest
CB-393343	MS4	Outgoing Interconnection	2.5	1.6	1.0	Grass/ Forest

APPENDIX B-A

Lawton Valley Reservoir (RI0007035L-06)

STORMWATER CONTROLS

POLLUTANT CALCULATIONS

APPENDIX B-A
Stormwater Controls
Pollutant Calculations - RIDOT_Catchment

Segment Name: Lawton Valley Reservoir (RI0007035L-06), Group 1A
Date: 12/31/2018

Catchment ID	WBID	Discharge ID	STU ID (if applicable)	Treatment Status*	Impervious Area (sq ft)	IDDE Exemption Status*	TIP Project ID	TIP Year	Notes	Shape_Length (ft)	Total Area (sq ft)	Catchment Pollutant Load, lb/yr			
												P	TSS	N	Zn
NF-LVR-001	RI0007035L-06	OF-446		Not Feasible	38044	Not exempt				3723.105608	59870.44098	1.22	550	7.78	1.08
NF-LVR-003	RI0007035L-06	OF-447		Not Feasible	49768	Not exempt				3117.491637	63853.07645	1.56	710	9.88	1.41
NF-LVR-007	RI0007035L-06	CB-393343		Not Feasible	53956	Not exempt				5708.448552	84214.33603	1.73	780	11.02	1.54
PT-LVR-002	RI0007035L-06	OF-446	SCP-LVR-001	Potential	10096	Not exempt				1099.911382	13809.45382	0.32	145	2.02	0.29
PT-LVR-004	RI0007035L-06	OF-447	SCP-LVR-002	Potential	3620	Not exempt				434.888112	3957.144243	0.11	51	0.7	0.1
PT-LVR-005	RI0007035L-06	OF-447	SCP-LVR-003	Potential	6540	Not exempt				682.22221	8448.333301	0.21	93	1.3	0.19
PT-LVR-006	RI0007035L-06	OF-447	SCP-LVR-004	Potential	2428	Not exempt				477.325761	5057.695117	0.08	36	0.52	0.07
PT-LVR-008	RI0007035L-06	CB-393343	SCP-LVR-005	Potential	11992	Not exempt				1608.624147	19241.3824	0.39	174	2.46	0.34
PT-LVR-009	RI0007035L-06	CB-393343	SCP-LVR-006	Potential	2964	Not exempt				484.830184	6946.199157	0.1	44	0.65	0.09

APPENDIX B-A
Stormwater Controls
Pollutant Calculations - Non-RIDOT_Catchment

Segment Name: Lawton Valley Reservoir (RI0007035L-06), Group 1A
Date: 12/31/2018

Catchment ID	WBID	Discharge ID	STU ID	Treatment Status*	Impervious Area (sq ft)	Ownership*	Ownership Notes	Land Use*	Notes	Shape_Length (ft)	Total Area (sq ft)	Catchment Pollutant Load, lb/yr			
												P	TSS	N	Zn
PT-LVR-004	RI0007035L-06	OF-447	SCP-LVR-002	Potential	5648	Private		Residential		378.916655	7717.975543	0.3	58.2	1.9	0.1
PT-LVR-005	RI0007035L-06	OF-447	SCP-LVR-003	Potential	912	Municipality		Residential		171.028182	1390.349139	0.0	9.5	0.3	0.0

APPENDIX B-A
Stormwater Controls
Pollutant Calculations - Potential_STU

Segment Name: Lawton Valley Reservoir (RI0007035L-06), Group 1A
Date: 12/31/2018

STU ID	WBID	STU Category*	STU Type*	STU Soil Type*	STU WQ Treatment Volume (ft^3)	STU Depth (ft) (Depth of STU. This field is optional to help calculate water quality treatment volume.)	STU Status*	Notes	Shape_Length (ft)	Total Area (sq ft)
SCP-LVR-001	RI0007035L-06	Structural	Bioretention Swale	Silt Loam (0.27 in/hr)	853		Potential	Next to historic cemetery, can make STU discontinuous and avoid placement directly adjacent	453.821753	1342.632161
SCP-LVR-002	RI0007035L-06	Structural	Bioretention Swale	Silt Loam (0.27 in/hr)	609		Potential		339.106878	1041.340021
SCP-LVR-003	RI0007035L-06	Structural	Bioretention Swale	Silt Loam (0.27 in/hr)	522		Potential		398.541795	2076.65047
SCP-LVR-004	RI0007035L-06	Structural	Bioretention Swale	Silt Loam (0.27 in/hr)	209		Potential		362.551339	1848.682934
SCP-LVR-005	RI0007035L-06	Structural	Bioretention Swale	Silt Loam (0.27 in/hr)	609		Potential		421.757008	1553.290096
SCP-LVR-006	RI0007035L-06	Structural	Bioretention Swale	Silt Loam (0.27 in/hr)	261		Potential		338.591385	1140.45787

APPENDIX B-A
Stormwater Controls
Pollutant Calculations - STU Storage Volume

Segment Name: Lawton Valley Reservoir (RI0007035L-06), Group 1A
Date: 12/31/2018

Fields from GIS			Ponding (Surface) Volume				Void (Subsurface) Volume					Total Storage Volume (ft^3)
STU_ID	STU Type	Storage Volume (ft^3)	Length (ft)	Width (ft)	Depth (ft)	Notes	Length (ft)	Width (ft)	Depth (ft)	Void Space	Notes	
SCP-LVR-001	Bioretention Swale	853	210	3.5	0.5		210	3.5	2	0.33		853
SCP-LVR-002	Bioretention Swale	609	150	3.5	0.5		150	3.5	2	0.33		609
SCP-LVR-003	Bioretention Swale	522	150	3	0.5		150	3	2	0.33		522
SCP-LVR-004	Bioretention Swale	209	60	3	0.5		60	3	2	0.33		209
SCP-LVR-005	Bioretention Swale	609	150	3.5	0.5		150	3.5	2	0.33		609
SCP-LVR-006	Bioretention Swale	261	75	3	0.5		75	3	2	0.33		261

APPENDIX B-A

Stormwater Controls

Pollutant Calculations - Reduction Targets

Segment Name: Lawton Valley Reservoir (RI0007035L-06), Group 1A

Date: 12/31/2018

Subwatershed ID:	Total Subwatershed Area (ac)	Total Subwatershed IC Area (ac)	RIDOT Total Area (ac)[1]	RIDOT Total IC Area (ac)
RI0007035L-06	785	82	6.1	4.1

[1] RIDOT contributing total area to waterbody is equal to total RIDOT area minus non-discharge areas (does not include non-discharge areas) and areas discharging to a CSO.

IC Standard

Total Subwatershed IC Area (%)	Subwatershed Target IC (10%) (ac)	Subwatershed IC Reduction Target (%):	RIDOT IC Reduction Target (ac)
10.5%	78	4.8%	0.2

TMDL Method

Pollutant of Concern[2]	Required TMDL Pollutant Reduction Target (%)[3]	Current RIDOT Load (lb/yr)	RIDOT Pollutant Reduction Target (lb/yr)
Aluminum			
Cadmium			
Copper			
Lead			
Zinc			
Phosphorus			
Nitrogen			

[2] Zinc used as a surrogate for all metals per consent decree.

[3] Pollutant load reduction (%) per TMDL.

APPENDIX B-A
Stormwater Controls
Pollutant Calculations - Structural Water Quality Calcs

Segment Name: Lawton Valley Reservoir (RI0007035L-06), Group 1A
Date: 12/31/2018

									Water Quality Results																				
									Phosphorous			TSS			Nitrogen			Zinc			Impervious Cover								Runoff Reduction	
STU ID	STU Type*	Total Catchment Area (sq. ft.)	Impervious Catchment Area (Sq. Ft.)	STU Storage Volume definitions (ft^3)	STU Treatment Depth (in.) (Depth of Runoff Treated)	STU Soil Type*	Pervious Catchment Area (sq. ft.)	Catchment % Impervious	P Load (lb/yr)	P Removal Credit (%)	P Reduction (lb/yr)	TSS Load (lb/yr)	TSS Removal Credit (%)	TSS Reduction (lb/yr)	Nitrogen Load (lb/yr)	Nitrogen Removal Credit (%)	Nitrogen Reduction (lb/yr)	Zinc Load (lb/yr)	Zinc Removal Credit (%)	Zinc Reduction (lb/yr)	Impervious Catchment Area (Acres)	TSS Reduction Factor	Phosphorus Reduction Factor	Runoff Factor	Flow Factor	Pervious Cover Factor	Effective IC Reduction (acres)	Runoff Reduction %	Runoff Reduction (ac-ft)
SCP-LVR-001	Bioretention Swale	13,809	10,096	853	1.01	Silt Loam (0.27 in/hr)	3,713	73%	0.3	53%	0.2	145	99%	144	2.0	32%	0.6	0.3	97%	0.3	0.2	1.0	0.6	0.1	0.5	55%	0.13	13%	0.11
SCP-LVR-002	Bioretention Swale	11,675	9,268	609	0.79	Silt Loam (0.27 in/hr)	2,407	79%	0.4	48%	0.2	109	98%	107	2.6	31%	0.8	0.2	96%	0.2	0.2	1.0	0.5	0.1	0.4	51%	0.11	10%	0.08
SCP-LVR-003	Bioretention Swale	9,839	7,452	522	0.84	Silt Loam (0.27 in/hr)	2,387	76%	0.3	49%	0.1	102	98%	101	1.6	31%	0.5	0.2	96%	0.2	0.2	1.0	0.5	0.1	0.4	52%	0.09	11%	0.07
SCP-LVR-004	Bioretention Swale	5,058	2,428	209	1.03	Silt Loam (0.27 in/hr)	2,630	48%	0.1	52%	0.0	36	99%	36	0.5	32%	0.2	0.1	97%	0.1	0.1	1.0	0.6	0.1	0.5	55%	0.03	13%	0.03
SCP-LVR-005	Bioretention Swale	19,241	11,992	609	0.61	Silt Loam (0.27 in/hr)	7,249	62%	0.4	44%	0.2	174	97%	169	2.5	28%	0.7	0.3	96%	0.3	0.3	1.0	0.5	0.1	0.3	48%	0.13	8%	0.08
SCP-LVR-006	Bioretention Swale	6,946	2,964	261	1.06	Silt Loam (0.27 in/hr)	3,982	43%	0.1	52%	0.1	44	99%	43	0.7	32%	0.2	0.1	97%	0.1	0.1	1.0	0.6	0.2	0.5	55%	0.04	14%	0.04

APPENDIX B-A
Stormwater Controls
Pollutant Calculations - STU_WaterQuality

Segment Name: Lawton Valley Reservoir (RI0007035L-06), Group 1A
Date: 12/31/2018

STU ID	Catchment Area (sqft)	RIDOT Catchment Area (sqft)	Impervious Area of STU catchment (sqft)	RIDOT Impervious Area of STU catchment	Treatment Depth (inches) (Depth of Runoff Treated)	TP Load (lb/year)	RIDOT TP Load (lb/year)	TP Removal (%)	TP Removal (lb/year)	RIDOT TP Removal (lb/year)	TN Load (lb/year)	RIDOT TN Load (lb/year)	TN Removal (%)	TN Removal (lb/year)	RIDOT TN Removal (lb/year)	TSS Load (lb/year)	RIDOT TSS Load (lb/year)	TSS Removal (%)	TSS Removal (lb/year)	RIDOT TSS Removal (lb/year)	Zinc Load (lb/year)	RIDOT ZN Load (lb/year)	Zinc Removal (%)	Zinc Removal (lb/year)	RIDOT ZN Removal (lb/year)	Effective IC Reduction (acres)	RIDOT Effective IC Reduction (acres)	IC Removal (%) (Pervious Cover Factor *100)	Runoff Reduction (ac-ft)	Runoff Factor	Flow Factor	Total Phosphorus Factor	Total Suspended Solids Factor	Cost	Cost Per Acre IC Removed	Retrofit Priority
SCP-LVR-001	13809	13809	10096	10096	1.0	0.3	0.3	53	0.2	0.2	2.0	2.0	32	0.6	0.6	145	145	99	144	144	0.3	0.3	97	0.3	0.3	0.13	0.13	55	0.11	0.1	0.5	0.6	1.0	39400	303100	2
SCP-LVR-002	11675	3957	9268	3620	0.8	0.4	0.1	48	0.2	0.1	2.6	0.7	31	0.8	0.2	109	51	98	107	50	0.2	0.1	96	0.2	0.1	0.11	0.04	51	0.08	0.1	0.4	0.5	1.0	31100	282700	1
SCP-LVR-003	9839	8448	7452	6540	0.8	0.3	0.2	49	0.1	0.1	1.6	1.3	31	0.5	0.4	102	93	98	101	91	0.2	0.2	96	0.2	0.2	0.09	0.08	52	0.07	0.1	0.4	0.5	1.0	30100	334400	2
SCP-LVR-004	5058	5058	2428	2428	1.0	0.1	0.1	52	0.0	0.0	0.5	0.5	32	0.2	0.2	36	36	99	36	36	0.1	0.1	97	0.1	0.1	0.03	0.03	55	0.03	0.1	0.5	0.6	1.0	18200	606700	2
SCP-LVR-005	19241	19241	11992	11992	0.6	0.4	0.4	44	0.2	0.2	2.5	2.5	28	0.7	0.7	174	174	97	169	169	0.3	0.3	96	0.3	0.3	0.13	0.13	48	0.08	0.1	0.3	0.5	1.0	31100	239200	1
SCP-LVR-006	6946	6946	2964	2964	1.1	0.1	0.1	52	0.1	0.1	0.7	0.7	32	0.2	0.2	44	44	99	43	43	0.1	0.1	97	0.1	0.1	0.04	0.04	55	0.04	0.2	0.5	0.6	1.0	20100	502500	3

APPENDIX B-A
Stormwater Controls
Pollutant Calculations - STU_WaterQuality

Segment Name: Lawton Valley Reservoir (RI0007035L-06), Group 1A
Date: 12/31/2018

Subwatershed ID	Total RIDOT area (acres)	RIDOT IC area (acres)	RIDOT Non-Discharge Area (acres)	RIDOT CSO Discharge Area (acres)	RIDOT Phosphorus Load (lbs/yr)	TP Reduction Target (%)	TP Reduction Target (lbs/yr)	Existing STUs TP Reduction (lbs/yr)	Potential STUs TP Reduction (lbs/yr)	Total TP Reduction (lbs/yr)	TP Reduction by NonRIDOT Area (%)	RIDOT Nitrogen Load (lbs/yr)	TN Reduction Target (%)	TN Reduction Target (lbs/yr)	Existing STUs TN Reduction (lbs/yr)	Potential STUs TN Reduction (lbs/yr)	Total TN Reduction (lbs/yr)	TN Reduction by NonRIDOT Area (%)	RIDOT Zinc Load (lbs/yr)	Zinc Reduction Target (%)	Zinc Reduction Target (lbs/yr)	Existing STUs Zinc Reduction (lbs/yr)	Potential STUs Zinc Reduction (lbs/yr)	Total Zinc Reduction (lbs/yr)	Zinc Reduction by NonRIDOT Area (%)	RIDOT TSS Load (lbs/yr)	TSS Reduction Target (%)	TSS Reduction Target (lbs/yr)	Existing STUs TSS Reduction (lbs/yr)	Potential STUs TSS Reduction (lbs/yr)	Total TSS Reduction (lbs/yr)	TSS Reduction by NonRIDOT	Effective IC Reduction Target (%)	Effective IC Reduction Target (acres)	Existing STUs Effective IC	Potential STUs Effective IC	Total Effective IC Reduction Achieved	Total Effective IC Reduction Achieved	IC Reduction by NonRIDOT Area (%)
RI0007035L-06	6.1	4.1	0	0	5.5	0		0.0	0.8	0.8	22.37	34.6	0.00		0.0	3.0	3.0	22.40	5.1	0	0.00	0.0	1.1	1.1	8.99	2525			0.0	599	599	11.07	4.8%	0.2	0.0	0.5	0.524	262	14.59

APPENDIX C-A

Lawton Valley Reservoir (RI0007035L-06)

IDENTIFIED CONSTRAINTS FOR STU IMPLEMENTATION

Appendix C-A: Identified Site Constraints Limiting STU Implementation

	Environmental Constraints																Physical Constraints								Access Constraints		
Catchment ID	FEMA Floodplain (FIRM)	Inundation Surfaces (RIGIS)	Outstanding Resource Waters (RIGIS)	Surface Water Protection Areas (RIGIS)	Freshwater Wetlands (RIGIS)	OWTS Critical Resource Area (RIDEM)	Coastal Features (CRMC)	Endangered Species (RI Natural Heritage Program)	Environmental Justice Area (RIDEM)	Open Space / Conservation Land (RIGIS)	Cultural / Historic Resources (RIGIS)	Underground Storage Tanks (RIDEM)	Leaking Underground Storage Tanks (RIDEM)	CERCLIS/National Priority List (US EPA)	Environmental Land Use Restriction (RIDEM)	Other Resource Area	Non-RIDOT Property / Limited Right-Of-Way	Soils (Poor Infiltration Capacity) (Urban Fill)	Groundwater Resources	Ledge (Bedrock)	Existing Vegetation	Steep Slopes	Elevated Topography	Utilities	Safety	Road Closure	STU Recommended
PT-LVR-002				X							X							X			X						X
PT-LVR-004				X														X									X
PT-LVR-005				X														X									X
PT-LVR-006				X														X									X
PT-LVR-008				X														X									X
PT-LVR-009				X														X									X
NF-LVR-001				X														X						X			
NF-LVR-003				X														X						X			
NF-LVR-007				X														X						X			

APPENDIX D-A

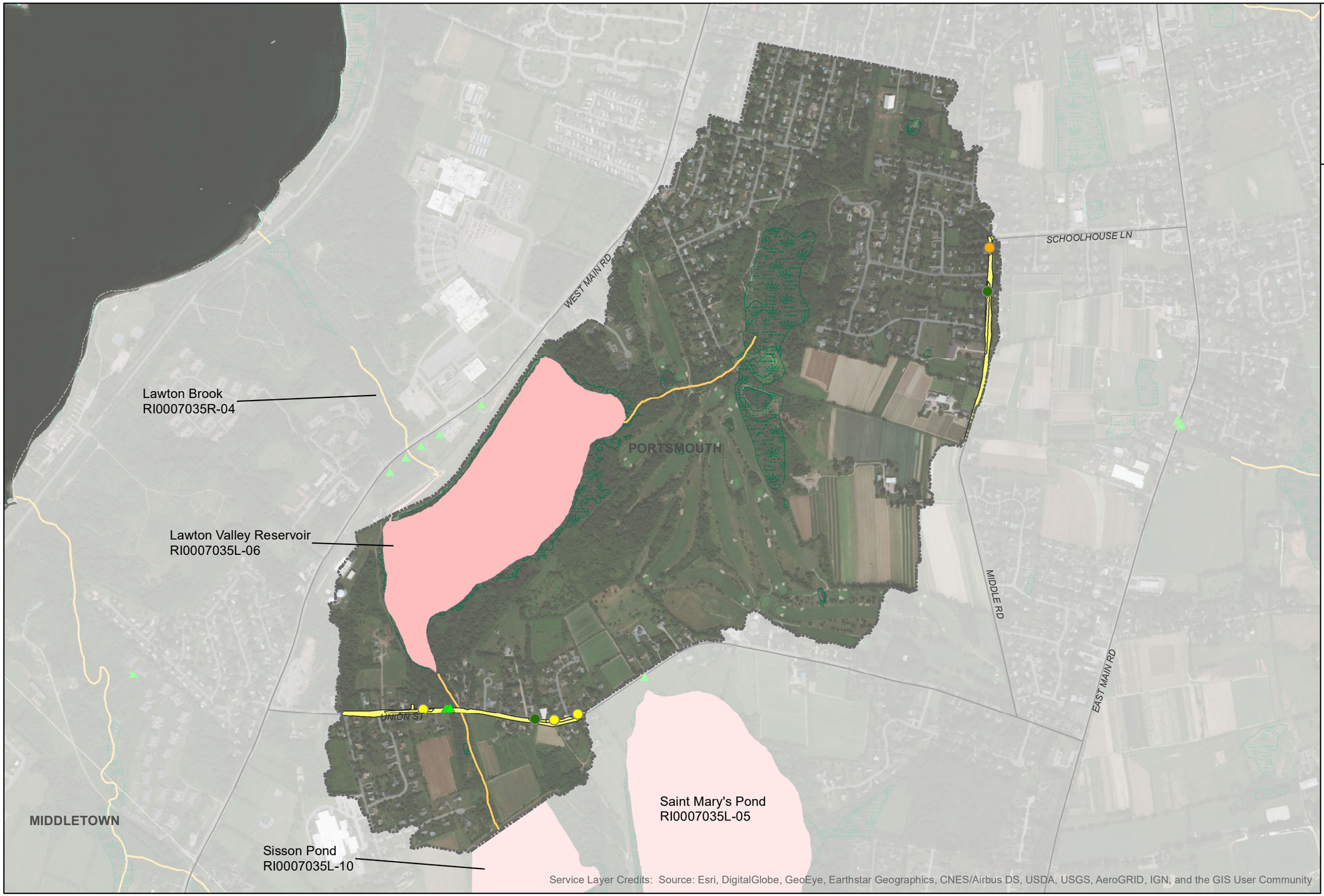
Lawton Valley Reservoir (RI0007035L-06)

TIP PROJECTS

FIGURE 1-A

Lawton Valley Reservoir (RI0007035L-06)

SUBWATERSHED OVERVIEW



SCP Watershed
RIDOT Catchment Area
NonRIDOT Catchment Area
RIDOT Maintained Roads
Town Boundaries
Wetlands
Impaired Streams, TMDL
Impaired Streams, No TMDL
Impaired Lakes & Estuaries, TMDL
Impaired Lakes & Estuaries, No TMDL
RIDOT Outfalls
Priority Outfalls
Existing STU

Potential STU Location

Retrofit Priority 1
Retrofit Priority 2
Retrofit Priority 3

N

0 1,500 Feet

Figure 1-A

Lawton Valley Reservoir
RI0007035L-06
Impaired Subwatershed

December 2018

RI DOT
Driven to get you there