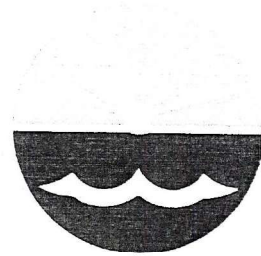


**WASTEWATER FACILITY PLAN UPDATE FOR NBC-
OWNED INTERCEPTORS AND TOWN SEWERS IN
JOHNSTON, RHODE ISLAND
Contract No. 08:304.60P**

Narragansett Bay Commission



Submitted by

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REVIEWED AND APPROVED IN ACCORDANCE WITH THE
REQUIREMENTS OF THE RHODE ISLAND DEPARTMENT
OF ENVIRONMENTAL MANAGEMENT.

Date: September 13, 2011

Supervisor: Angel S. Thet *agz*
Chief, Office of Water Resources

DEM file #10-A

SUBMITTED SEPTEMBER 9, 2011

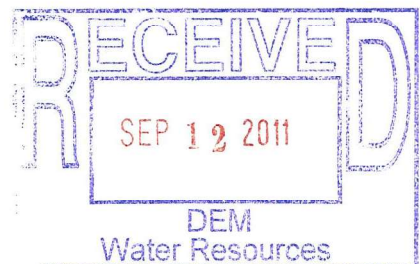


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SECTION 1.0

INTRODUCTION AND BACKGROUND

This *2010 Johnston Facilities Plan Update* (Plan) was prepared by Pare Corporation (PARE) and the BETA Group, Inc. (BETA) on behalf of the Narragansett Bay Commission (NBC) for their wastewater collection system in Johnston. This plan also addresses the tributary flow for the Town of Johnston's collection system.

1.1 STATEMENT OF PROJECT NEED AND PURPOSE

The purpose of the *Facilities Plan Update* is to develop a coordinated and planned expansion of the existing sewer infrastructure in the Town of Johnston, Rhode Island. The existing infrastructure includes the NBC interceptor system and the Town's wastewater collection system. The need for this Plan arises from town-wide development pressures in areas that are unserved or underserved by sanitary sewer. In addition, there is a need for sewer service in developed areas of Town that have failing or undersized Onsite Wastewater Treatment Systems (OWTS). There is also a need to coordinate future sewer expansion with improvements to the existing system in order to address undersized sewer components and inflow and infiltration (I/I).

This *Facilities Plan Update* addresses the NBC-owned interceptors in the Town of Johnston and the Town's sewers immediately tributary to NBC interceptors and facilities. With the exception of a limited section west of I-295 served by City of Cranston sewers and the Town of Smithfield, current sewer service is limited to the area east of I-295. All other residential, commercial, and industrial development west of I-295 and several neighborhoods east of I-295 are served with OWTS. The *Facilities Plan Update* evaluates the capability of the NBC interceptor system to accommodate growth and development in unsewered areas of the Town where gravity flow, or minimal pumped of flow, could be directed to NBC interceptors.

The section of Johnston immediately west of I-295, including areas at Exit 4 (Plainfield Pike/RI-14), Exit 5 (Scituate Avenue), and Exit 6 (Route 6/Hartford Avenue), as well as Greenville Avenue, is increasingly subject to development pressures. Extension of sewers would enable economic development, expansion of the tax base, and job creation at these prime locations that are well served with highway access both via I-295 to the north and south, and via US Route 6 to

the east to Providence. Extension of sewers to developed areas west of I-295 with sufficient capacity to accommodate future residential, commercial, and industrial use would be important to meet the Town's development objectives and projected build-out.

The *Facilities Plan Update* addresses the following three goals:

- Provide sewer service to existing development east of I-295. Several densely developed neighborhoods continue to rely on OWTS.
- Provide sewer service to proposed development east of I-295. Although the east side of Town is relatively densely developed, there is potential for infill development and development on several large unutilized or underutilized parcels.
- Extend sewer service west of I-295, an area that generally depends on OWTS.

1.2 SCOPE OF FACILITIES PLAN

The scope of the *Facilities Plan Update* includes the following areas of work:

- Preparation of a Sewer System Evaluation Study (SSES) – The purpose of the SSES Report was to address the capacity and condition of NBC's interceptors in Johnston. The SSES preparation included flow metering at several locations throughout Town, reviewing video inspection logs and manhole inspection reports, and conducting field reconnaissance to identify potential illicit connections to the sewer, all in an effort to identify potential sources of I/I.
- Updating and Preparing New Available System Mapping – The existing and available mapping information from NBC was updated and verified through field reconnaissance and survey to create a complete sewer interceptor system map for NBC. A new map was also prepared for the Town's collection system.
- Previous Report Review – To ensure consistency with prior studies and with the Town's current plans for build-out, the following reports were reviewed during the preparation of this *Facilities Plan Update*.
 - Johnston Comprehensive Community Plan, 2007

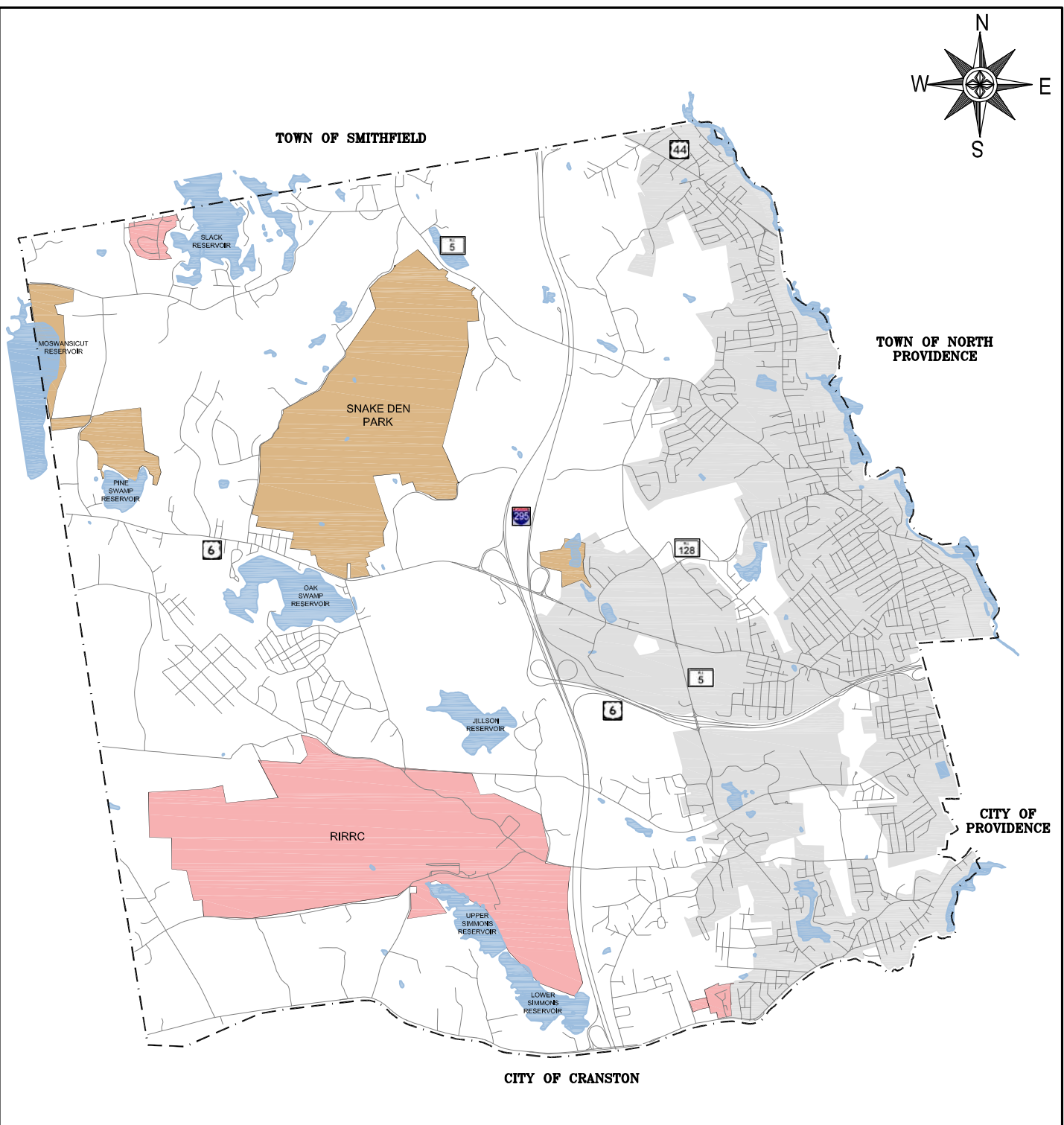
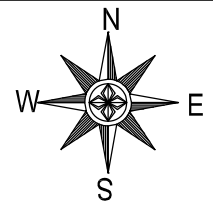
- Sewer System Evaluation Study, 1990
 - Town of Johnston Facilities Plan, 1993
 - Central Avenue Pump Station Evaluation, 2008
 - Interceptor Capacity Analysis, 2007
 - Town of Johnston Water Service Expansion Plan
 - Town of Johnston Zoning Ordinance, Subdivision Regulations, Sewer Ordinance, and Sanitary Sewer Management Program
 - RI Report on Proposed Sewerage System
 - RI Report on Proposed System of Sanitary Sewers
 - ISDS Wastewater Management Plan for the Town of Johnston, 2001
- Existing Conditions Assessment – Based on the information obtained from the SSES Report, as well as previous studies, the entire collection system was reviewed relative to its ability to serve the existing customer base. This included a review of the NBC interceptor and Johnston sewer capacity. This also included a review of the impact that I/I is having on peak sewer flows and recommendations for system improvements.
- Future Conditions Assessment – This plan focuses on a 20-year build-out scenario and the future sewer demands associated with that build-out. Toward that end, this plan addresses development pressures in areas that presently do not have sewer service, and coordination of sewer expansion and existing infrastructure upgrades.

1.3 PLANNING AREA




1.3.1 *Planning Area Description*

The planning area includes the entire Town of Johnston with a focus on the area west of I-295. Currently the NBC owns and operates two interceptors, the Johnston-North Interceptor (JNI) and the Johnston-South Interceptor (JSI) on the east side of I-295. The Town of Johnston maintains the secondary lines from the interceptors to 4,600¹ customers (except for those that are directly connected to the interceptors). The current sewer service area is shown on Figure 1-1. The NBC-owned interceptors, pump stations (both NBC and Town of Johnston), and the Town-owned

¹ Town of Johnston *Comprehensive Community Plan*, as modified through January 2, 2007, page 7-7.



LEGEND

-  EXISTING SEWER SERVICE AREA (NBC)
-  EXISTING SEWER SERVICE AREA (RIRRC, CITY OF CRANSTON OR SMITHFIELD)
-  CONSERVATION AREAS

N.T.S.

FIGURE:

1 - 1

TOWN OF JOHNSTON FACILITIES PLAN
EXISTING SEWER SERVICE AREAS



PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

collection system, is presented in Figure 1-2. A detailed system map of the entire collection system is presented at Appendix A. Preparation of the collection system map has been closely coordinated with the NBC and the Town of Johnston.

The *Facilities Plan Update* incorporates information from the *Facilities Plan Reaffirmation, Johnston RI - Memorial Plat Area and the Cherry Hill Area*.² The Honorable Joseph M. Polisena, Mayor, received correspondence from the Rhode Island Department of Environmental Management (DEM) on October 3, 2008 that DEM “hereby reaffirms and approves the findings related to environmental impacts for the project area identified in this document.” The *Facilities Plan Reaffirmation* documented concurrence with the 1993 *Wastewater Facilities Plan* prepared by Travassos-Geremia & Associates for the Town of Johnston. While the 1993 plan was prepared for the Town of Johnston for its wastewater collection system, this *Facilities Plan Update* has been prepared to address the NBC interceptor system capacity and its ability to handle additional flows from areas west of I-295 and unsewered areas east of I-295.

1.3.2 *Political Jurisdiction*

The Town of Johnston is governed by an elected Mayor and Town Council. The Johnston Sewer Department shares the responsibility for sewer service with the NBC. The Johnston Sanitary District was created in 1972 and disbanded in the mid-1990s, when this function was replaced by the Johnston Department of Public Works, as an element of Town government.

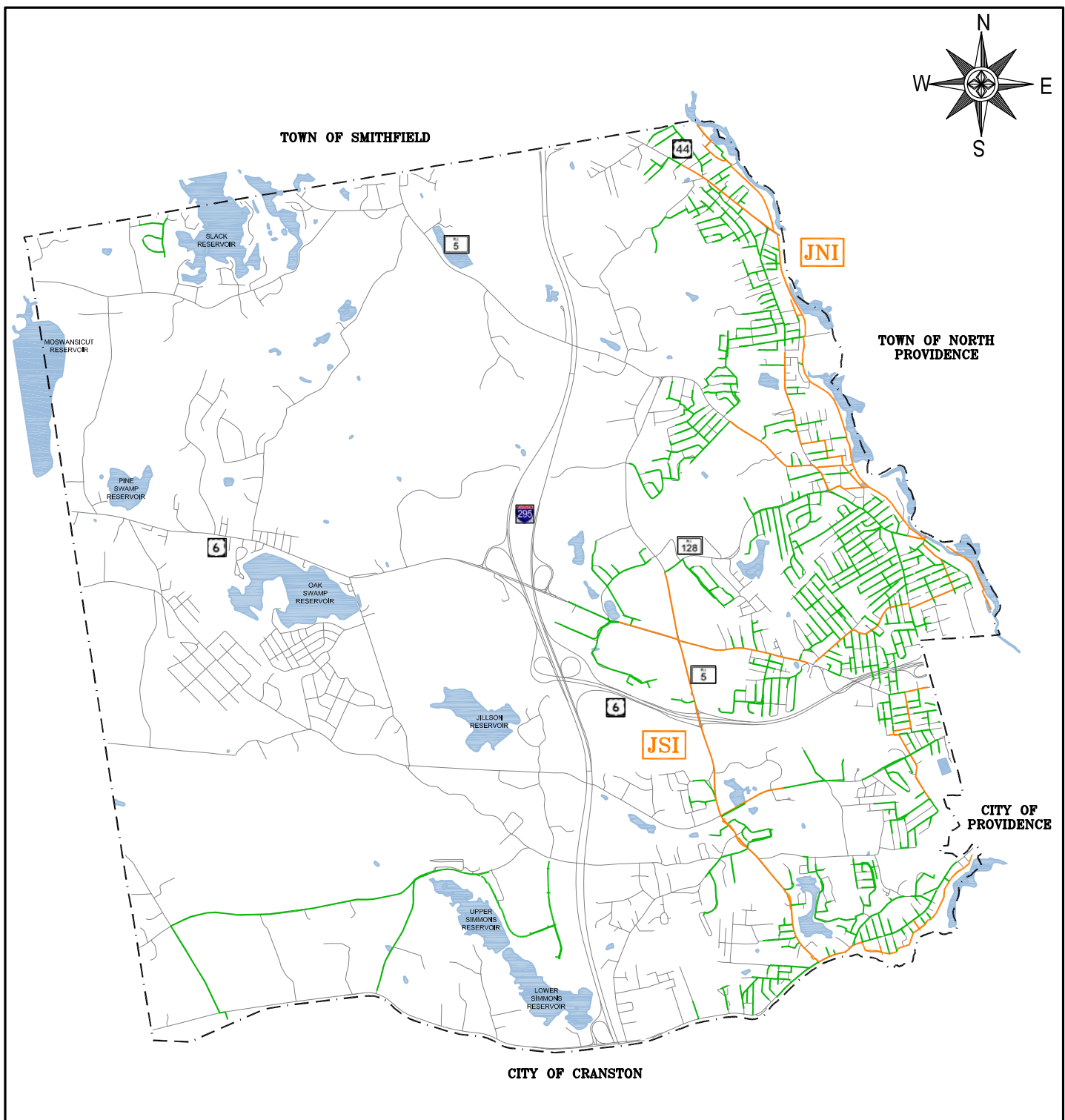
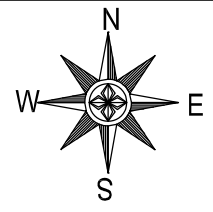
1.3.3 *Institutional Structure*

The NBC is governed by a 19-member Board of Commissioners, appointed by the mayors and administrators of the municipalities in the service area, as well as ten gubernatorial appointments. The Board meets monthly to guide the direction of the NBC.



1.3.4 *Wastewater Utility Management Structure*

The NBC assumed authority of the interceptors with the 1983 signing of the Acquisition Agreement By and Between the Town of Johnston and the Narragansett Bay Water Quality

² Town of Johnston, RI, *Facilities Plan Reaffirmation, Johnston RI - Memorial Plat Area and the Cherry Hill Area*, prepared by James J. Geremia & Associates, Inc. and submitted July 24, 2008.



LEGEND

-  NBC OWNED INTERCEPTOR
-  TOWN OWNED SEWER

N.T.S.

FIGURE:

1-2

TOWN OF JOHNSTON FACILITIES PLAN
EXISTING SEWER COLLECTION SYSTEM



PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

Management District Commission. A copy of the Acquisition Agreement is included as Appendix B.

Wastewater in Johnston is collected via the Town-owned collection system and conveyed to the NBC-owned interceptors as indicated in Figure 1-2. Collected wastewater ultimately discharges to the NBC wastewater treatment facility at Fields Point in Providence. The Fields Point Wastewater Treatment Facility is designed for 200 MGD preliminary and primary treatment, and 65 MGD secondary treatment.³

The Town currently owns and operates the secondary lines in collection system. The operation and maintenance for these lines, including the Town-owned pump stations, is the responsibility of the Town's Department of Public Works. The Town Engineer is also the head of the Town's sewer department.

The Town has an On-site Wastewater Management Program, which provides technical assistance to residents with on-site wastewater treatment systems. The Program is run by the Town's designated coordinator, who is responsible for maintaining records of individual systems, notifying owners of maintenance requirements, and providing technical review and approval of new systems. The Program allows residents to participate in the State's Community Septic System Loan Program.

1.3.5 *Current Rate Structure*

All users pay a "sewer user fee" which is paid by each customer directly to the NBC for treatment of sewage flows from the Town. NBC bills Johnston customers at a flat fee for service as well as a fee based on consumption. Consumption is based on water meter readings provided by the Providence Water Supply Board. If an account has well water and is tied into the sewer, NBC bills the customer based on 98 hundred cubic feet of water per unit times the consumption rate and the flat fee. Currently, well accounts are billed \$409.94 per year.

³ *Facilities Plan Reaffirmation Johnston RI, Memorial Plat Area and Cherry Hill Area*, prepared for the Town of Johnston, RI by James J. Geremia & Associates, Inc., July 24, 2008.

1.3.6. *Comprehensive Community Planning*

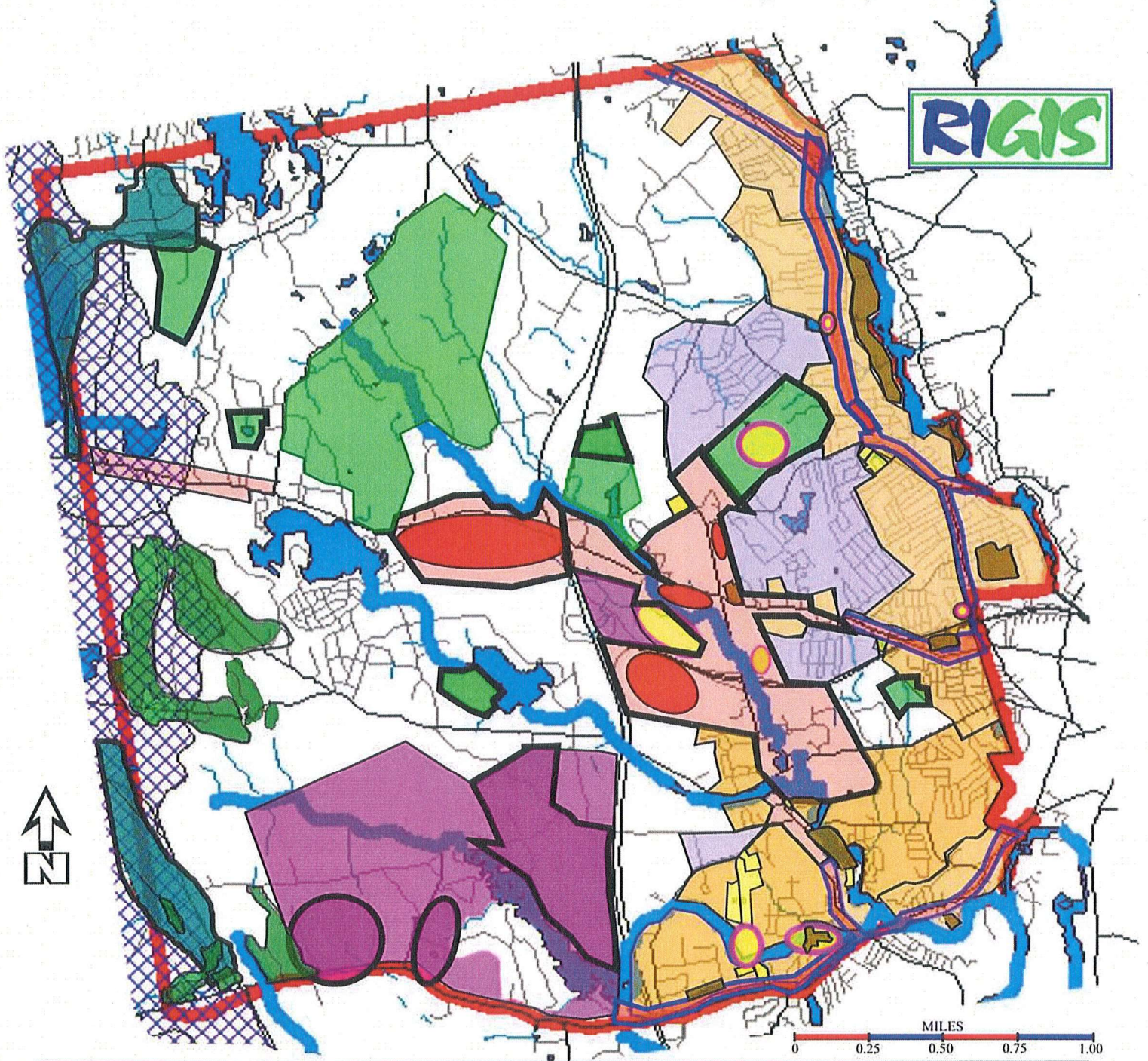
The Town of Johnston Planning Department is responsible for Town-wide planning. The *Town of Johnston, RI Comprehensive Community Plan (CCP)* was originally prepared in the 1990s but never approved by the Rhode Island Department of Administration. The CCP has been updated through January 2, 2007 when the Town Council voted to adopt the plan.⁴ The Town has responded to Rhode Island Division of Administration outstanding issues required for State approval. As the Town has responded to Division of Administration comments, State certification is anticipated upon submission of documentation of local adoption.⁵ Build-out assumptions were acquired for pending developments from the Town's Comprehensive Community Plan and coordination with the Town's Administration, Planning Department, and Engineering Department. The 2007 plan has been reviewed by Rhode Island Statewide Planning; it is anticipated that State certification will be received following Town Council adoption. Although state actions must be consistent with the state-approved plan, municipal decisions are guided by the locally-adopted plan. Future land use is identified in Figure 10-1B *Future Land Use Plan* including targeted properties (see Appendix A). This *Facilities Plan Update* is specifically consistent with the 2007 CCP goals and policies. The following excerpts demonstrate consistency with the 2007 CCP.

Land Use Goal 4, to *improve the compatibility of residential developments with their surroundings and the capacity of the land to support this type of development*, is directly associated with sewer service, although the associated policies direct the Town to change zoning to reflect the availability of sewer:

- Policy LU-4g: Revise zoning map to provide for denser housing in existing urbanized areas and areas of good highway access that possess the availability of both public sewer and water within 1,000 feet to which the housing is required to be connected to.
- Policy LU-4h: Revise zoning map to provide for less dense housing in areas where public services such as public sewer and water are not available or are not proposed to become available.

⁴ *Town of Johnston RI Comprehensive Community Plan*, as modified through January 2, 2007 (original submission December 1991)

⁵ Merrick Cook, Johnston Town Planner, July 28, 2009.



- | | | | |
|--|--|--|--|
| | Very High Density - Less than 10,000 sq ft / dwelling unit - public sewer & water | | Industrial Land Use |
| | High Density 7,000 sq ft - 12,000 sq ft / dwelling unit - public sewer & water | | Brownfield Redevelopment Overlay
- Industrial Land Use eligible for affordable housing incentives |
| | Medium Density 12,000 sq ft - 35,000 sq ft / dwelling unit - public sewer & water | | Business Land Use |
| | Low Density - 35,000 sq ft - 80,000 sq ft or more / dwelling unit - public sewer or water | | Mixed Use - Business-Residential Land Use |
| | Very Low Density - Drinking Water Reservoir Overlay
more than 80,000 sq. ft. / dwelling unit - no public sewer or water | | Preserved Open Space - existing & proposed
- Low Density Residential Underlying Use |
| | Affordable Housing Overlay - public sewer, water, & transportation | | Ponds and Reservoirs |
| | Targeted New Development Industrial | | Streams |
| | Targeted New Development Business | | Local Roads |
| | Targeted Open Space Acquisition | | Major Highways |

Figure 10-1B. Future Land Use Plan, Johnston, RI including targeted properties

- Policy LU-4L recommends that at least five main residential land use categories be established within the Zoning Ordinance to accommodate multiple residential land use densities. This policy indicates that municipal sewer should be available for all residential densities with lots up to but not including 80,000 square feet.

Sewer extension is consistent with Land Use Goal 5 *to develop public services and facilities that adequately support the needs of existing and planned residential neighborhoods and non-residential development (LU-5)*. This goal is implemented through the following policies⁶ that are relevant to sewer extension:

- Policy LU-5a: Provision of public water and sewer utilities for existing and planned residential neighborhoods where such facilities are lacking and *where densities are sufficiently intense enough* (emphasis added) to make use of these facilities.
- Policy LU-5b: Prepare a detailed database from the existing inventory of public water and sewer utilities and corresponding mapping no matter who the service provider and convert the information into a comprehensive GIS mapping of these facilities. (*Note: one of the products of the NBC Facilities Plan update is to provide such mapping*).
- Policy LU-5c: Re-examine the recommendations of the Facilities Management Plan and Wastewater Management Plan, develop priorities and strategies for future development that may occur, and determine whether or not the uses and the densities in these areas are sufficiently intense enough to make efficient use if these facilities are extended to these areas; incorporate these determinations into all land use decisions.
- Policy LU-5d: Prepare and annually update a formal Capital Improvement Program (CIP), which is adopted by the Town Council and implemented as an element of the fiscal budget.

Sewer availability within 1,000 feet is consistent with Land Use Goal 8 *to Promote the preservation, improvement and enhancement of the positive and desirable characteristics of the Town's environment and use patterns while also encouraging and supporting more efficient use of the Town's natural resources, energy resources, fiscal resources, and other resources, and public services and facilities in residential and non-residential structures and development patterns*. This goal is implemented through the following policy⁷ relevant to sewer extension:

⁶ 2007 Johnston Comprehensive Community Plan, page 2-11.

⁷ 2007 Johnston Comprehensive Community Plan, page 2-14.

- Policy LU-8g: Continue to provide in the Zoning Ordinance and Land Development Regulations the special considerations for a PD zone that permits denser mixed-residential/non-residential use development in higher density areas with good highway access that possess the availability of both public sewer and water within 1,000 feet to which the housing is required to be connected.

The Economic Development chapter identifies several areas as “specific areas targeted for economic development”⁸ for industrial development and business/commercial development. Two of these are unsewered:

- Plainfield Pike – West of I-295 (RI-14) is targeted for industrial development. Although development on the Cranston side of the road is served by a Cranston sewer, the Johnston side does not have sewer access.
- Hartford Avenue – West of I-295 (Route 6) currently zoned highway commercial and planned business. Area lacks sewer and water although both are within the reachable vicinity.

Economic Development issues include the need to broaden the Town’s tax base by delineating areas for economic development initiatives and actively promoting the growth and expansion of new and existing business-oriented land uses.

Sewer extension is consistent with Economic Development Goal 2 to *Assess and develop local infrastructure in order to meet the needs of economic development initiatives* (ED-2), and Goal 3 to *Encourage selective economic development growth initiatives and diversification of those economic activities that will promote employment and business growth opportunities and that are compatible with surrounding land uses*. These goals are implemented through the following policies⁹ relevant to sewer extension:

- Policy ED-2a and ED-3a: Assess existing infrastructure, that is, public water, public sewer, road/highway access conditions, and constraints to its use or expansion.

⁸ Ibid, pages 5-15 to 5-16.

⁹ 2007 Johnston Comprehensive Community Plan, page 2-28.

Preservation and improvement of ground and surface water quality with the extension of sewer service areas is consistent with Natural and Cultural Resources Goal 2 *to protect and preserve environmentally sensitive areas, especially the quality and quantity of the Town's potable water supply and other existing and potential drinking water supplies, aquifers, and recharge areas as well as surface water quality for habitat and recreational use* (NCR-2).¹⁰ This goal is implemented through the following policies relevant to sewer extension:

- Policy NCR-2a: Preserve the quality of ground and surface waters.

The Services and Facilities chapter indicates that immediate plans involve “looping” existing portions of the sewer system throughout the Town and expansion to the unsewered areas east of I-295. “For the longer term, sewer expansion planning will look to areas adjacent to built-up sections of the Town, consistent with development needs. Future growth of sewer service will also be influenced by economic development plans, particularly near I-295 on Plainfield Pike (RI-14) and Hartford Avenue (US 6). Any potential industrial or commercial development in the western section of Town will need to be a coordinated undertaking of Town and State agencies. Expansion of the sewer system will also affect residential development patterns and any Land Use recommendations must be consistent with those planned expansions.” The Services and Facilities chapter indicates that the Town has approached the City of Cranston to discuss the future expansion of Johnston sewers in the vicinity of Plainfield Street/Pike.”¹¹ At this time, the City of Cranston is not allowing any customers in Johnston to connect to Cranston’s sewer in Plainfield Street/Pike.

Sewer extension is consistent with Services and Facilities Goal 1 *to Provide an efficient and adequate system of public services* (SF-1) and Goal 2 *to Provide facilities, equipment, and staffing to make the system of public services possible*. These goals are implemented through the following policies¹² relevant to sewer extension:

- Policy SF – 1g: Work to expand water and sewer utilities to serve areas targeted in this Comprehensive Plan for development of non-residential uses.

¹⁰ Ibid, page 2-33.

¹¹ Ibid, page 7-10.

¹² 2007 *Johnston Comprehensive Community Plan*, page 2-28.

- Policy SF – 1j: Pursue interconnections between existing components of the sanitary sewer system (loops) to improve function, capacity and operation.
- Policy SF – 2f: Create connections between existing components of the sanitary sewer system (Loops) to improve function, capacity and operation.

The *Facilities Plan Update* is consistent with the RIGIS-based mapping presented in the 2007 *Johnston Comprehensive Community Plan*. Copies of these resource maps are presented in Appendix A. As presented in the *Comprehensive Community Plan*, Figure 6-6 presents Forest and Wetland Resources and Figure 6-7 presents Rare and Endangered Species. Cultural Resources are presented in Figure 6-10. These figures are provided in Appendix C.

1.3.7 *Land Use 2025: Rhode Island State Land Use Policies and Plan*

Land Use 2025, the state land use guide plan element, identifies areas of the state within an urban services boundary that will support the bulk of the state’s development needs through 2025. With the exception of areas within the Scituate Reservoir watershed and areas preserved for conservation such as Snake Den State Park, the majority of land within the Town of Johnston is identified within the urban services boundary.¹³ The urban services boundary has been designated by the state to accommodate future urban development through maintenance of current land use, reuse of properties, and infill development. Development within this boundary should generally be encouraged by state and local policies and investments. Extension of sewers within the urban services boundary is in concurrence with *Land Use 2025*.

The 2025 land use map identifies only the areas served directly by the NBC interceptors as sewerred. As the map is updated by Rhode Island Division of Planning, it will be revised to indicate sewerred areas.¹⁴ GIS mapping produced as part of this *Facilities Plan Update* will be available for this update.

¹³ Rhode Island Division of Planning, 2006. *Land Use 2025: Rhode Island State Land Use Policies and Plan Executive Summary*. M. Allard Cox (ed.), Rhode Island Sea Grant, Narragansett, RI 16 pp.

¹⁴ Nancy Hess, Principal Planner, RI Statewide Planning Program....

SECTION 2.0 EFFLUENT LIMITATIONS

2.1 RIPDES PERMIT

Johnston wastewater that is conveyed to the NBC treatment facility at Fields Point is subject to the NBC RIPDES permit for that facility. A copy of the most recent RIPDES permit for the Fields Point facility is presented in Appendix D.

2.2 RECEIVING WATERS

The Fields Point WWTF discharges to the Providence River, which is “water quality limited.” The NBC continues to make improvements to the combined sewer system to assure that receiving water quality is improved. In addition NBC has implemented processes to remove Ammonia and total Nitrogen from its discharge which is intended to improve water quality in Narragansett Bay.

2.3 STATE WATER QUALITY STANDARDS

The Town of Johnston is located within two river watershed basins, the Woonasquatucket and the Pawtuxet. Eastern and northern sections of Town are located within the Woonasquatucket River watershed. The majority of Town is located within the Pocasset River watershed sub-basin (Pawtuxet River basin). Limited areas along the Scituate municipal boundary are located in either the Scituate Reservoir watershed sub-basin or the Moswansicut Reservoir sub-basin (Pawtuxet River basin). Very limited areas along the Plainfield Pike are located within the Pawtuxet River basin and sub-basin. Receiving waters for the NBC system are the upper Narragansett Bay / Providence River.

The Providence River is designated as an SB1 surface feature. Per the Rhode Island Department of Environmental Management’s (RI DEM) Surface Water Quality Regulations, SB1 surface water bodies are, “... are designated for primary and secondary contact recreational activities and fish and wildlife habitat. They shall be suitable for aquacultural uses, navigation, and industrial cooling. These waters shall have good aesthetic value. Primary contact recreational activities

may be impacted due to pathogens from approved wastewater discharges. However all Class SB criteria must be met.”

SECTION 3.0

ASSESSMENT OF EXISTING CONDITIONS

The following section describes existing conditions in the Town of Johnston as they relate to future sewerage. Within this section are descriptions of the existing land use and development in town, existing geophysical characteristics in town (i.e., wetlands, water bodies, topography, etc.), existing sewerage and unsewered areas of town, and other environmental conditions. Much of the information presented in this section is based on information contained in the Town's 2007 CCP and the recently completed Sewer System Evaluation Study (SSES) report, which was prepared as part of this *Facilities Plan Update*.

3.1 PLANNING AREA DESCRIPTION

The Town of Johnston is a 23.7-square mile suburban/semi-rural community located north and west of the City of Providence. As indicated in Figure 1-1, the Town is bordered by Providence and North Providence to the east (in part along the Woonasquatucket River), Cranston to the south, Scituate to the west, and Smithfield to the north. I-295 essentially bisects the Town with the easterly section considered urbanized and the western section predominantly regarded as “ex-urban” or even “semi-rural” in atmosphere and environment.¹⁵

3.2 GEOPHYSICAL CONDITIONS

Geophysical conditions in Johnston are documented in both the 2007 CCP¹⁶ and the 1993 *Johnston Wastewater Facilities Plan*. Detail on soils, topography, geology, hydrology, watersheds, wetlands, floodplains, and water quality are found in these documents (see 2007 CCP mapping presented in the Appendix C). Approximately 62 percent of Johnston is developed. Large water bodies include the Oak Swamp Reservoir, Almy Reservoir, Upper and Lower Simmons Reservoirs, Kimball Reservoir, and Moswansicut Pond.

¹⁵ Ibid, page 1-5.

¹⁶ Ibid, pages 6-1 to 6-7.

3.2.1 *Soil Conditions*

The most important glacial deposits for water sources and construction materials are shallow sand and gravel outwash deposits (most less than 50 feet in depth). Two areas with shallow deposits include the area extending from the Slack Reservoir under Hartford Avenue south to the Pocasset River Basin and continued south along Atwood Avenue and the area following the Woonasquatucket River Basin and covering almost the entire eastern edge of town.

Approximately 55 percent of the Town’s soils contain no constraints to development as indicated in Table 3-1. Soils with moderate constraints due to high water table and shallow depth to bedrock predominate in the central portions of the Town and form an irregular band trending from northwest to southeast. Severely constrained soils occupy approximately 15 percent of the Town and are primarily located within the central and north-central portions of Johnston but include a large isolated pocket of severely constrained soils in the southwestern corner of Johnston. Categories of soil constraints to development are presented in the 2007 CCP as Figure 6-2 (see Appendix C).

Table 3-1: Soil Constraint Categories in Johnston RI			
Constraint	Degree	Area (acres)	Percent
No constraints to development	None	7,706.60	55%
Seasonal high water table (9"-14")	Moderate	533.6	4%
Bedrock and slope constraints (>15% slope)	Moderate	3,678.30	26%
Hydric soils (0"-18")	Severe	1,817.70	13%
All others (rock, sand, etc.)	Severe	300.2	2%

Source: 2007 Johnston Comprehensive Community Plan, page 6-7

3.2.2 *Surface and Groundwater Quality*

According to the 2007 CCP, 16 percent of Johnston is wetland as defined by the US Department of Agriculture Fish and Wildlife Service’s National Wetlands Inventory and as identified in RIGIS mapping. Wetlands include 1,953 acres of vegetated wetlands and 510 acres of open water. Nearly all vegetated wetlands are deciduous forested wetlands. Figure 6-6 of the 2007 CCP in Appendix C identifies wetlands.

Surface water bodies and surrounding land use are presented in Table 3-2 and watershed sub-basins are identified in *Johnston Comprehensive Community Plan* Figure 6-4 (see Appendix C).

Table 3-2: Surface Water Resources				
Water Body	Water Quality	Area in Acres	Land Use	Location
Slack Reservoir and Hawkins Pond	B	164 (120 acres in Johnston)	Heavily developed with year-round homes	Northwest Johnston
Almy Reservoir	B	74.5	93 acres purchased by Town	West of I-295/US-6/6A
Oak Swamp Reservoir	B	105	Shallow depth, used mainly for fishing	West of I-295, south of US-6
Upper and Lower Simmons Reservoir		103	Proximity to Central Landfill limits use	West of I-295
Moswansicut Pond and Kimball Reservoir	A	Kimball: 21.4; Mosqansicut: 281 (22.5 acres in Johnston)	Public water supply	West of I-295 on Scituate border
Woonasquatucket River System	C	4,990 acres in watershed (4.2 miles of river in Johnston)	Urban	East of I-295 on Providence, North Providence border
Pocasset River System	B	9,200 acre watershed	Urban to rural	Pocasset River is east of I-295; watershed extends west of I-295

Source: 2007 Johnston Comprehensive Community Plan, pages 6-13 to 6-16

The Town of Johnston has minimal or no dependency on groundwater for drinking water supply and is therefore exempt from addressing groundwater in the comprehensive plan.¹⁷ Groundwater quality in Johnston is classified as GA with the following exceptions: GB along the densely developed eastern portion of Johnston and in the vicinity of the Central Landfill where groundwater is classified as GB and GC.¹⁸ GA groundwater is considered suitable for public or private drinking water use without treatment. GB groundwater may not be suitable for public or private drinking water use without treatment due to known or presumed degradation. The GC classification indicates that because of present or past land use or hydrogeological conditions, the area is more suitable for certain waste disposal practices than for development as a drinking water

¹⁷ Rhode Island Department of Environmental Management, Groundwater Protection Program, Office of Water Resources, *DEM Groundwater Protection Program, Local Comprehensive Plan Review Criteria*, April 2005

¹⁸ State of Rhode Island and Providence Plantations Department of Environmental Management Office of Water Resources, *Rules and Regulations for Groundwater Quality*, May 2006.

supply. Johnston is not identified as having a groundwater reservoir or critical portions of recharge areas.¹⁹

The 2007 CCP identifies nine non-community public well locations. Seven wells west of I-295 include four on Hartford Avenue (childcare center, two hotel/motor inns, and a plaza), two on Plainfield Pike (a nursing home and a corner store), and one in a subdivision on Golden View Drive. Figure 6-9, in the 2007 CCP (Appendix C) indicates non-community public wells.

3.3 DEMOGRAPHICS AND LAND USE

According to the 2000 US Census, population in Johnston was 28,195, a 6.2 percent increase from the 1990 population of 26,542. The average household size for owner occupied units was 2.7 persons per unit while renter-occupied units had an average household size of 1.9 persons per unit. With 11,574 total housing units, the 2000 average was 2.43 persons per household.

The 2007 CCP divides the town into four planning districts, which correspond to the four US Census Tracts. Figure 3-1 shows the location of each Census Tract/Planning District. Table 3-3 presents information from the 2000 US Census for the four Planning Districts.

Table 3-3: Population, Housing Units, and Persons per Household Town of Johnston				
	Census Tract/Planning District			
	1	2	3	4
Population	6,740	9,645	5,144	6,690
Housing Units	2,792	3,860	2,325	2,590
Persons Per Household	2.4	2.5	2.2	2.6

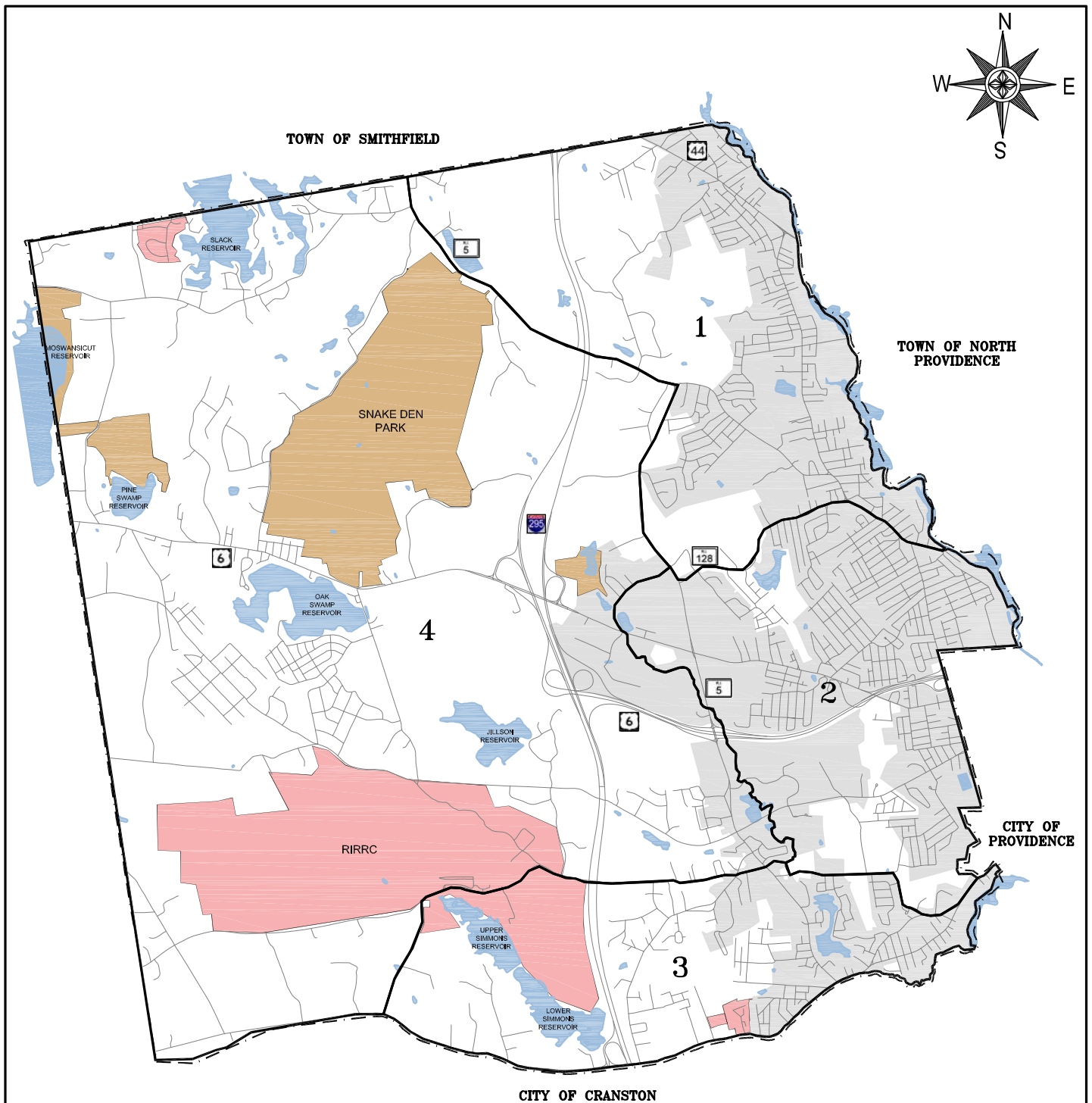
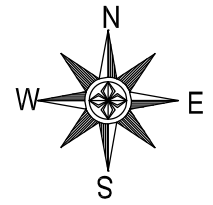
Source: US Census 2000 Summary File 3

US Census estimates since 2000 indicate that the Johnston population is relatively stable, reaching a maximum population in 2004 of 29,296.²⁰ The 2008 estimated population of 28,524²¹




¹⁹ *Ibid*, page 51.

²⁰ RI Statewide Planning Program, *Population Estimates Rhode Island, by City & Town and County, 2000-2005*. (source: US Census Bureau, Population Estimates Division)

²¹ RI Statewide Planning Program, *2008 Population Estimates Rhode Island, by City & Town* (source: US Census Bureau, Population Estimates Division)



LEGEND

-  EXISTING SEWER SERVICE AREA (NBC)
-  EXISTING SEWER SERVICE AREA (RIRRC, CITY OF CRANSTON OR SMITHFIELD)
-  CONSERVATION AREAS

N.T.S.

FIGURE:

3-1

TOWN OF JOHNSTON FACILITIES PLAN
PLANNING DISTRICT BOUNDARIES



PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

represents a 0.9 percent increase since 2000, significantly below the growth rate experienced in the 1990s. Population projections for 2010 to 2030 are presented in Table 3-4.

Table 3-4: Johnston Population Projections, 2010 to 2030	
Year	Population Projection
2010	29,036
2015	29,609
2020	30,247
2025	30,793
2030	31,192

Source: Statewide Planning Program Technical Paper Number 154, Rhode Island Population Projections: State, County and Municipal 2000-2030, August 2004.

The residential pattern of development varies in each of the four planning districts, as indicated in Table 3-5. Single-family subdivisions are more common in Planning District 2, located immediately west of Providence, and in Planning District 4 (including the West End). Single-family developments, especially those in R-40 zoning district (40,000 sf lots), are more likely to be served by septic systems than where residential density is greater (R-7 and R-10 districts).

Table 3-5: Distribution of Residential Units per Structure, by Planning District								
	Planning District							
	1		2		3		4	
	Percent	Number	Percent	Number	Percent	Number	Percent	Number
Single Family	71%	1,978	78%	2,992	46%	1,071	85%	2,213
Two Family	12%	344	9%	362	14%	326	3%	74
3 or 4 units	8%	224	4%	158	4%	96	2%	42
5 to 9 units	2%	60	3%	109	3%	62	0%	10
10 or more units	7%	177	6%	216	33%	770	10%	251
Totals	100%	2,792 (1)	100%	3,860 (2)	100%	2,325	100%	2,590

Source: US Census 2000 Summary File 3

(1) Includes 9 boats, RVs, van, etc.

(2) Includes 23 mobile homes

Table 3-6 indicates the age of residential structures in the four planning districts, based on 2000 US Census data. Between 2000 and 2007, 404 residential building permits were issued for single-family construction.²² Residential subdivisions that were developed with Onsite Wastewater Treatment Systems (OWTS) that are generally more than 25 years of age may have been constructed in accordance with less rigorous design standards and may be nearing the end of their useful life.

²² Rhode Island Department of Economic Development, Updated Economic and Demographic Data for the Town of Johnston, 2000 to 2008. http://www.riedc.com/files/Johnston_0.xls

Table 3-6: Year Residential Structure Built, Percent Distribution by Planning District				
Timeframe	Planning District			
	1	2	3	4
1990-March 2000	14%	10%	9%	24%
1980s	12%	12%	27%	17%
1970s	19%	19%	19%	16%
1960s	16%	21%	10%	14%
1940s or 1950s	20%	26%	17%	21%
prior to 1939	20%	12%	18%	8%

Source: US Census 2000 Summary File 3

Changing patterns of land use between 1964 and 1995 (the most recently available information) are presented in Table 3-7, based on the 2007 CCP.

Table 3-7: Land Use Comparisons – 1964, 1990 and 1995						
Land Use	1964		1990		1995	
	Acres	%	Acres	%	Acres	%
Residential	2,780	18	3,771	24	4,144	27
Urban Transition (infill potential)	31	0.2	98	1	82	1
Agricultural	2,080	13	946	6	903	6
Commercial	62	0.4	515	3	570	4
Industrial	153	1	258	2	995	6
Govt, Institutional	168	1	159	1	159	1
Cemeteries	26	0.2	43	0.3	50	0.3
Transportation-Utilities	689	4	1,132	7	578	4
Recreation-Open Space	80	1	102	1	139	1
Vacant Land	9,507	62	8,522	55	7,956	51
Total Acres	15,576		15,576		15,576	

Source: 2007 Johnston Comprehensive Community Plan, Table 3-2: Land Use Comparisons – 1964, 1990, and 1995

3.4 OTHER ENVIRONMENTAL CONDITIONS

3.4.1 *Noise and Air Quality*

The 2007 CCP indicates that major sources of noise are traffic related or associated with industrial use such as RIRRC operations at the Central Landfill. Air quality testing is routinely conducted at the Central Landfill. The fact that methane gas is generated from the landfill itself is well-known.

3.4.2 *Other Federal/State Projects that Affect the Environment*

Two federal/state projects affect the Town of Johnston and its environment. The RIRRC operates the major solid waste management system in Rhode Island. All facilities are located at the RIRRC complex west of I-295 on Shun Pike and include the landfill and support facilities: tipping facility; landfill leachate treatment facility; pumping station and sewer main, which deliver treated landfill leachate to the Cranston wastewater system; two landfill gas-fired electric power generating stations; construction and demolition (C&D) processing facility that crushes C&D for use as landfill cover material; composting facility, which handles commercial and municipal leaf and yard debris and clean wood; the Material Recycling Facility (MRF); and Eco-Depot for household hazardous waste.

RIRRC continues to expand solid waste management operations at its facility on Shun Pike.²³ Continued acquisition of property for buffering has limited residential land use. Industrial and office use development that is compatible with landfill operations is anticipated in future years.

The second major state project with implications for Johnston is the Scituate Reservoir, owned and operated by the Providence Water Supply Board (PWSB). This reservoir system provides drinking water supplies for over half of the state's residents. A limited section of the Scituate Reservoir Watershed sub-basin extends along the western border of Johnston. The *Scituate Reservoir Watershed Management Plan*, a state guide plan element, concluded that the primary issues affecting the Scituate Reservoir watershed are rapid growth and changing land use

²³ Rhode Island Resource Recovery Corporation, *Rhode Island Comprehensive Solid Waste Management Plan*, State Guide Plan Element 171, adopted for the period April 12, 2007 through April 12, 2012.

patterns.²⁴ The rural watershed communities are on the fringe of Providence metropolitan area urban development. The plan includes recommendations for developing innovative land use ordinances and a rural development guidebook that will preserve the rural environments and prevent ground and surface water pollution within and outside of the Scituate Reservoir watershed.

Land Use 2025, Rhode Island State Land Use Policies and Plan, has identified areas in the state that are suitable for future urban development. Only limited areas of Johnston (correlating to the NBC interceptors and not reflecting the Town collection system) are identified as having sewer service in 2025 although the entire town is located within the Urban Services Boundary.²⁵ This boundary has been defined to identify areas of the state that are optimum areas for accommodating the bulk of the state's development needs through 2025. These are areas where growth, whether new development or reuse, infill, and redevelopment, should generally be encouraged by state and local policies and investments. Extension of sewers both east and west of I-295 is consistent with the state guide plan element.

3.4.3 *Affected Plant/Animal Communities*

The 2007 CCP reports that wildlife communities within Johnston are typical of those found in other central Rhode Island communities. Large tracts of woodland still remaining in the West End (west of I-295), particularly those adjacent to farms and reservoirs, are important to maintaining diverse populations of wildlife. Rhode Island Department of Environmental Management (RI DEM) Division of Fish and Wildlife recommends preservation of Snake Den State Park and adjacent areas, and the Dame Farm area. Snake Den is also important for habitat of several rare species. The 2007 CCP, Figure 6-7 in Appendix C identifies locations of habitats of rare and endangered species.

²⁴ *Scituate Reservoir Watershed Management Plan*, adopted by the Rhode Island State Planning Council as State Guide Plan Element 125, December 1990.

²⁵ Rhode Island Division of Planning, *Land Use 2025: Rhode Island State Land Use Policies and Plan*, 2006. RI Statewide Planning Program staff has indicated that the sewer data layer was based upon 1989 information and will be updated in the future as staff is available.

3.4.4 OWTS Problem Areas

In 2001, there were 45 failed OWTS systems, 212 repairs to systems, and 23 alterations to systems in the Town.²⁶ The data indicates that the area of Cherry Hill Road, Neutatconkanut Hill, and an area surrounding Oak Swamp and Slack Reservoir are the areas of the greatest concern due to the number and extent of the repairs and failed systems. As indicated in the *Town of Johnston Capital Improvements Plan*, the Cherry Hill Sewer Project (S08-1) includes sewers to 181 homes.

RI DEM Office of Compliance & Inspection, OWTS Compliance Program, maintains a database of properties where Notices of Intent and the more formal Notice of Violation have been issued for failed OWTS.²⁷ Based on January 2009 data for active cases, 63 Notices of Intent (NOI) and eight more formal Notice of Violation (NOV) have been issued since 1992 (29 of the NOIs were used since January 2001 and all NOVs have been issued since June 2003). Due to lack of staffing, little follow-up has been conducted by RI DEM regarding the current status (i.e., if private septic systems have been replaced, repaired, or municipal sewer has been extended to the property). Of the 21 NOIs issued since January 2001, one is located in the Cherry Hill Sewer Project, two are in the Memorial Plat Sewer Project, one is in the Salina Sewer Project, 12 are located elsewhere east of I-295, and five are west of I-295. RI DEM reports that of the 21 NOIs, no response has been received from the property owner on 14, designer evaluation has been submitted on four, permit applications for repair have been received for two, and correspondence has been recorded in the file for the last.

Of the eight NOVs, one property is included in the area to be sewered in the Salina/Belvedere Area Sewer Project (S08-2), one located along Plainfield Pike east of I-295 has been approved by RI DEM for a system repair, and six are located in the West End (four are in the vicinity of either Oak Swamp Reservoir or Slack Reservoir). Design of repairs is underway at two of the four NOVs located west of I-295 (one has an approved repair plan and another has a repair permit application pending). Legal proceedings are pending on four of the eight NOVs.

²⁶ 2007 *Johnston Comprehensive Community Plan*, page 7-9.

²⁷ Craig B. Mac Laughlin, Senior Environmental Scientist, Office of Compliance & Inspection OWTS Compliance Program, February 3, 2009

3.4.5 CERCLIS Sites

Twenty (20) Johnston sites were included on the US Environmental Protection Agency's Comprehensive Environmental Response, Cleanup, and Liability Act List (CERCLIS) in 2006, with 11 listed as Active and nine as Archived. Ten (10) active sites in the vicinity of the Central Landfill are associated with individual hazardous waste disposal activities. Two additional CERCLIS sites, the Hartford Avenue gravel pits and the Hi-Lo Cipriano site, are in close proximity to public water supply wells registered with RI DEM.²⁸ The 2007 CCP Figure 6-9 in Appendix C indicates CERCLIS locations.

3.5 EXISTING SYSTEM OVERVIEW

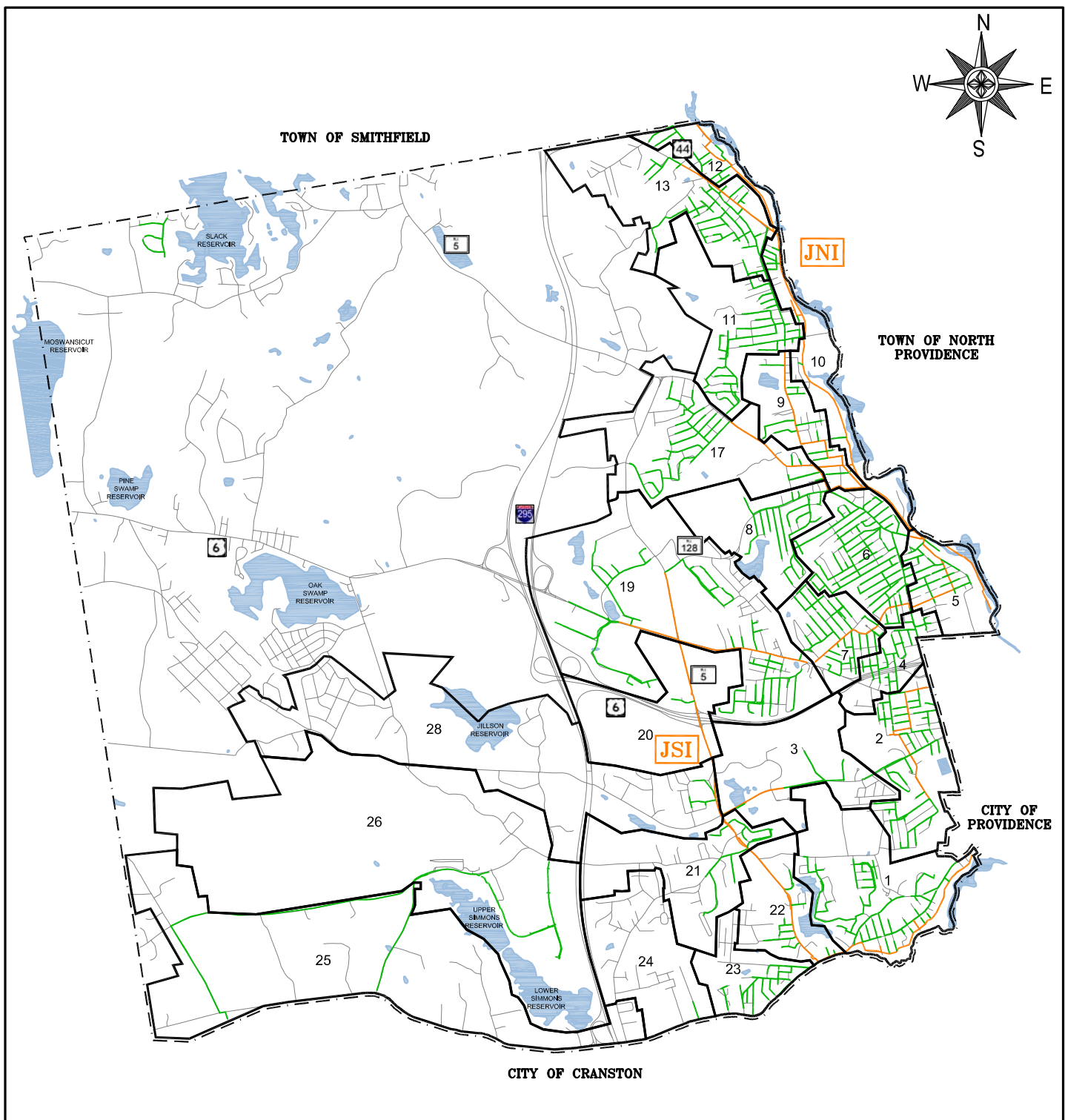
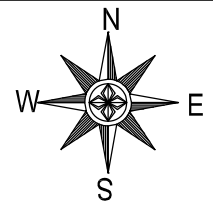
3.5.1 Collection System

Sewer Service in Johnston is provided primarily on the east side of I-295 and includes 23 sewersheds. A sewershed is a sub-area within the Town, defined based on topography with a common discharge location. Sewersheds are analogous to watersheds in drainage or hydrologic studies. Existing sewershed boundaries are shown on Figure 3-2. The wastewater collection system within the Town of Johnston is operated and maintained by four separate authorities: the NBC, Town of Johnston, the City of Cranston, and the Town of Smithfield.




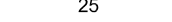
Within the existing sewered area, the NBC maintains and operates the Central Avenue pump station and two major networks of interceptors. The Johnston-North Interceptor (JNI) serves the northeast section of Johnston and the Johnston-South Interceptor (JSI) serves the southern section, all east of I-295. Pipe sizes range from 8 to 30-inches in diameter and are constructed of asbestos cement, vitrified clay, and PVC. Each of the interceptors consists of multiple branches:

- JNI consists of approximately 7.9 miles of sewer pipe ranging from 8 to 24-inches in diameter. The JNI has six branches: Putnam Pike at Hebdeen Street to Manton Avenue, Riverside Avenue to Putnam Pike, George Waterman Road at Garner Avenue to Irons Avenue, Greenville Avenue at Salina to Newman Avenue, Greenville Avenue at Lee Street to Traver Avenue, and Borden Avenue at Hartford Avenue to Killingly Street.

²⁸ 2007 *Johnston Comprehensive Community Plan*, page 6-23.



LEGEND

-  NBC OWNED INTERCEPTOR
-  TOWN OWNED SEWER
-  SEWERSHED BOUNDARY
-  SEWERSHED I.D.

N.T.S.

FIGURE:

3-2

**TOWN OF JOHNSTON FACILITIES PLAN
EXISTING SEWERSHED BOUNDARIES**



PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

- JSI includes approximately 8.8 miles of sewer pipe (including 6.9 miles in Johnston) with Johnston pipes ranging from 8 to 30-inches in diameter. The JSI has four branches: Atwood Avenue at Cherry Hill Road to Plainfield Pike, Hartford Avenue at Borden Avenue to Atwood Avenue, Hartford Avenue at Memorial Avenue to Atwood Avenue, and Ashby Street at Pasadena Drive to Hartford Avenue. The Central Avenue Pump Station is part of the JSI and is the only NBC-owned pump station within the town, originally installed in 1985.

The Johnston Sewer Department shares the responsibility for sewer service with the NBC. The Town owns and maintains the secondary lines that are connected to the NBC system. The sewer system, which became operational in 1960, now includes a total of 58 miles of Town-owned and maintained sewer lines. The Town-owned wastewater collection infrastructure is depicted on the Existing Conditions Plan, which is included as Appendix A. According to the 2007 CCP, the Town of Johnston provides sewer service to 4,600 customers in the community.²⁹

In 2001, the Town created a Wastewater Management District and Board that monitors the unsewered areas and makes recommendations to the Town Council pertaining to actions needed to be undertaken. As an example, in 2004, the Town installed public sewers in the Rotary Drive neighborhood. The area is adjacent to the Pocasset River and many of the OWTS in this neighborhood had failed.

3.5.2 *Pump Stations*

There are currently 19 wastewater pump stations located within the Town of Johnston. Of these pump stations, 11 are owned by the Town, 1 is owned by NBC, 5 are private, and 4 are owned by the RIRRC. One of the private pump stations on Roger Williams Drive discharges to the Town of Smithfield's collection system. The RIRRC's pump stations discharge to the City of Cranston's collection system. A list of privately- and Town-owned pump stations is presented in Table 3-8.

²⁹ 2007 *Johnston Comprehensive Community Plan*, page 7-7

Table 3-8: NBC, Town of Johnston, and Private Pump Stations		
Sewer Pump Station Location	Owner	Pumps and Other Comments
1. Foxtail Drive	Private	Installed in 2001 to control odor problem associated with Foxtail Drive sewer force main.
2. Jennifer Drive	Town	Two 188 gpm submersible pumps.
3. Green Valley Estates (Sweet Hill Road)	Town	Two 100 gpm submersible pumps (believed to be hydromatic)
4. Ostend Street	Town	Two 60 gpm submersible pumps.
5. Industrial Lane	Town	Two 150 gpm submersible pumps.
6. Federal Way	Private	No information available. Serves a condominium complex.
7. Susan Circle	Town	Two 100 gpm submersible pumps.
8. South Bennett Drive (LaFazia Drive)	Town	Two 35 gpm submersible pumps.
9. River Drive	Town	Two 35 gpm submersible pumps.
10. Park Street (Centre Drive)	Private	No information available. Serves a condominium complex.
11. Morgan Mill Road	Town	Two 150 gpm submersible pumps.
12. Rotary Drive	Town	The pump station was locked at the time of the inspection, so no visual observation of the actual pumps or wet well was possible.
13. Sprague Circle	Town	Consists of two above ground pumps with a wet well underground (size and type of pumps are not known).
14. Kern Acre Estates (Candace Court)	Town	Consists of two above ground pumps with a wet well underground (size and type of pumps are not known).
15. Central Avenue	NBC	Recently Upgraded with two 316 gpm pumps. Previously discharged to the east end of Central Ave near Orchard Street, now discharges to Atwood Ave.
16. Austins Way	RIRRC	Discharges to Cranston
17. Lakeside Commerce Center	RIRRC	Discharges to Cranston
18. RIRRC Pump Station	RIRRC	Discharges to Cranston
19. Roger Williams Drive Pump Station	Private	Discharges to Smithfield

3.5.3 Wastewater Treatment Facilities

Flow from all municipal sewers in Johnston is conveyed to the NBC treatment facility at Fields Point. This facility has a 65.0 MGD design flow and presently treats an average 45.5 MGD flow. According to a DEM July 2008 listing of Municipal Treatment Plants,³⁰ this plant serves a total population of 208,743 including 15,925 of 28,195 in Johnston. Operation of the Fields Point WWTF is not the subject of this *Facilities Plan Update*. Cranston sewers convey flow to the Cranston Water Pollution Control Facility (WPCF) at 140 Pettaconsett Avenue. The receiving waters for this facility are the Pawtuxet River. This plant has a 19.0 MGD design flow with an average daily flow of 13.2 MGD. The plant serves approximately 77,000 of the 79,269 population of Cranston (US Census 2000).³¹ This plant also serves a small number of customers in Johnston that are located along Plainfield Pike and the RIRRC facilities. Operation of the Cranston WPCF is not the subject of this *Facilities Plan Update*.

3.5.4 City of Cranston

The Johnston-Cranston municipal boundary is located along Plainfield Street/Pike. The City of Cranston provides sewer service to Cranston properties along the south side of the road via public sewers that are located within the right-of-way. The Town of Johnston did not participate in or contribute toward this sewer construction. Some Johnston properties have negotiated and contracted with the City of Cranston for sewer connections to their properties. A listing of properties in Johnston that are served by the City of Cranston is presented in Table 3-9. The area served by the City of Cranston is generally limited to the area around the Central Landfill, and a few properties along Plainfield Pike. The properties are identified on the Existing System Map, included as Appendix A.

³⁰ <http://www.dem.ri.gov/programs/benviron/water/permits/wtf/potwops.htm>

³¹ *Ibid.*

TABLE 3-9: Johnston Properties Connected to Cranston Sewer	
Address	Description
1999 Plainfield Pike	6 Businesses
25 Nardolillo Street	52 Apartment Units
65 Shun Pike	RIRRC
1609 Plainfield Pike	54 Apartment Units
24 Shun Pike	Florida Power & Light (FPL)
Shun Pike	Johnston Industrial Park

Source: City of Cranston January 8, 2009 transmittal from Shahriar Alam, Public Works, to Lorie Caruso, Town Engineer, Town of Johnston, RE: Sewer connections to Cranston

3.5.5 Planned Capital Improvements

The Town of Johnston 5-Year Capital Budget Program (FY08/09 through FY12/13) outlines the following sewer-related projects:³²

- Cherry Hill Sewer Project (S08-1) involves constructing sewers to service approximately 181 homes. This area is located north of Hartford Avenue and east of Atwood Avenue. This project is listed in the *Capital Budget Program* for a User Assessment Bond Issue in 2008-09 and 2009-10 for a total of \$4.1 million.
- Salina/Belvedere Area Sewer Project (S08-2) includes both sewer and drainage construction. Areas within the project boundary with no public sewers have failing septic systems. Other areas within the project boundary have failing sewer mains, particularly along Salina Avenue, that are expected to receive violations from regulatory agencies. There are approximately 67 homes needing sanitary sewers. It is presumed that the failing sewer mains are the result of excessive I/I, which is the result of an inadequate drainage system in the area. The existing sewer mains may be adequate for the sanitary wastewater flow in this area if the storm water drainage system were addressed. The limited present drainage system may also be impacted by failing septic systems. This project is listed in the *Capital Budget Program* for design in 2009-10 and 2010-11 with

³² Joseph M. Polisena, Mayor. *Town of Johnston 5 Year Capital Budget Program FY 08/09 through FY12/13*, December 5, 2007 (Planning Board approved a positive recommendation 12/19/07).

- construction in 2011-12. The budget for design and construction for this project is \$3.5 million.
- Memorial Plat Sewer Project (S08-3), which is currently being constructed, involves constructing sewers to service approximately 115 homes on Mills Drive, Picotte Drive, Arnold Drive, Mongone Drive, Richardson Drive, Harrington Drive, Corrine Drive, Pinewood Avenue, and a few homes on Central Avenue. Several failed septic systems are located in this area and RI DEM is looking for immediate action.

The 2007 CCP indicates that the Town has approached the City of Cranston to discuss the future expansion of Cranston sewers in the vicinity of Plainfield Street/Pike as several property owners in this vicinity have expressed an interest in connecting to public sewers. Town of Johnston officials have stated that the City of Cranston will not accept any additional customers from Johnston.

The City of Cranston provides sewer service to the RIRRC's Central Landfill complex, power plants and associated industrial development on Shun Pike via two sewer lines privately-owned either by RIRRC or Florida Power and Light (FPL). The majority of industrially zoned land in Johnston is located in this area. Although these privately owned force mains pass additional residential and industrial development along Green Hill Road, Shun Pike, and Peck Hill Road, sewer service cannot be accommodated either because of ownership or technical issues associated with the force main.

The RIRRC-owned force main extends from the Central Landfill complex on Shun Pike via Green Hill Road to the City of Cranston gravity line on Plainfield Pike. To protect groundwater from landfill leachate contamination, the RIRRC has equipped all new landfill expansion since 1993 with base liners and leachate collection systems. In 1999, a permanent leachate treatment facility was brought on-line and by 2005, it was processing approximately 200,000 gallons of landfill leachate daily. A number of improvements to the facility were installed in FY 2005, increasing its capacity to 400,000 gallons per day.³³ This pretreated effluent is discharged to the RIRRC force main for conveyance to the City of Cranston WWTF. The new Ridgewood Power

³³ Rhode Island Resource Recovery Corporation, *Rhode Island Comprehensive Solid Waste Management Plan*, page 6.49.

Plant that will be relocated to the south side of Shun Pike to accommodate landfill expansion may be redirected to NBC's wastewater collection system in Johnston.

The FPL power generation plant is served by a privately-owned dual line connection via Shun Pike and Peck Hill Road and through the City of Cranston to the city's wastewater treatment facility off of Pontiac Avenue. A 16-inch line conveys treated wastewater effluent from the City of Cranston WWTF to the FPL plant for use as cooling water. A 12-inch line conveys excess effluent and sewerage from the FPL plant to the City of Cranston WWTF. The FPL line also serves the Lakeside Commerce Center, the industrial park located near the Central Landfill. In the future, the wastewater flow from the Lakeside Commerce Center redirected from the FPL line and the Cranston collection system to NBC's wastewater collection system in Johnston.

3.6 EXISTING SYSTEM EVALUATION

3.6.1 Previous System Evaluations

Over the last several years, the Town of Johnston and NBC have each commissioned several sewer system evaluations. Those evaluations have been reviewed to identify deficiencies in the existing system. In addition, a Sewer System Evaluation Study (PARE/BETA, 2009) (SSES) was completed as part of this project. The SSES report is for the existing NBC interceptor system, and was completed to assess the impact that inflow and infiltration (I/I) is having on NBC's interceptor system. A list of the previous evaluations is provided below.

1. October 1990 *Sewer System Evaluation Survey, Status Summary, Town of Johnston, RI* prepared by Waterman Engineering Co. and Whitman & Howard, Inc. NBC has implemented recommendations for eliminating inflow/infiltration in accordance with this report.
2. A *Sewer System Evaluation Study (SSES)* was completed in 1992 that documented recommendations for future plans for local sewer service upgrade and expansion.
3. In October, 1993, Waterman Engineering Co. and Whitman & Howard, Inc. finalized the *Facilities Planning Report and Environmental Assessment for Interceptor Sewers Town of Johnston* for the NBC. This study outlined existing and future deficiencies in handling sewage flows, and identified needs for replacement or relief interceptors.

4. The October 1993 *Facilities Plan for Wastewater Management in the Town of Johnston*, prepared by Travassos-Geremia & Associates, Inc, addressed implementation of SSES recommendations. Subsequent to the adoption of the *Facilities Plan*, the Town has focused planning actions on sewer service upgrade and expansion to the unsewered areas located in more densely populated sections east of I-295.
5. The NBC *Interceptor Capacity Analysis (ICA)*, completed by BETA Group, Inc. in February, 2007 entailed installation and maintenance of seventy flow monitoring meters throughout the NBC system, including eight in Johnston. The *ICA* recommended that inflow reduction measures be completed in one Johnston meter basin (SJI-5T) to alleviate wet weather capacity issues within JSI. At the time the report was prepared, future growth west of I-295 was not considered. Three areas of pipe sections were found to be capacity deficient during dry weather and numerous sections were identified with capacity issues during wet weather. The report recommended pipe replacement for capacity deficiencies in the JNI and inflow reduction in conjunction with pipe replacement in the JSI.
6. The *Facilities Plan Reaffirmation, Johnston, Rhode Island, Memorial Plat Area and Cherry Hill Area*, prepared by James J. Geremia & Associates, Inc., was completed in July 2008 with reaffirmation received from RI DEM on October 3, 2008. This plan identified areas with soils with severe limitations for on-site wastewater disposal. Residents within both areas have requested that sewers be installed as a result of Individual Sewage Disposal Systems (ISDS, now identified as OWTS) failures.
7. According to the NBC Operating Budget FY 2009, of the 75,000 residential class and 7,900 non-residential class accounts system wide, 6 percent are in Johnston. The NBC reported several completed projects in the FY2009 annual report including a Johnston South interceptor inspection and cleaning project (Project No. 30436M). New projects include interceptor repairs in Johnston (Project No. 30451C).³⁴ NBC Sewer Repair Project No. 1 includes replacement of approximately 90 feet of asbestos cement sewer with PVC pipe and replacing brick manholes with precast concrete (Project No. 30229C).

³⁴ Narragansett Bay Commission, *Operating Budget Fiscal Year 2009*, Vincent J. Mesoellella, Chairman, Raymond J. Marshall, Executive Director

3.6.2 Existing System Evaluation

Based on PARE's review of the previous reports, as identified above, as well as the SSES report, which was completed as part of this project, the following evaluation of the existing system is provided.

The Town of Johnston's flows are metered by the Silver Lake and Manton Avenue meters. NBC provided meter records for the period November 3, 2008 to August 26, 2009. The average daily flow recorded during that period at the Manton Avenue meter was 2.8 MGD with a peak daily flow of 5.5 MGD. The average daily flow at the Silver Lake meter was 2.5 MGD with a peak daily flow of 5.3 MGD. The flow metered at Silver Lake and Manton Avenue also includes flow from some small areas of Providence, so the meter readings from these two meters is an over estimation of the flow from Johnston.

The NBC's *Interceptor Capacity Analysis (ICA)* project, completed by BETA Group, Inc. in February 2007, included installation of seventy meters throughout the NBC system, with installation of three meters in the Johnston-North Interceptor (JNI) and five meters in the Johnston-South Interceptor (JSI). The meter information collected during the ICA was supplemented with meter data collected as part of this project. Nineteen meters were installed in the JNI and JSI from October 1, 2008 to December 1, 2008. A static model of the wastewater interceptor system in Johnston was created and populated with flow data collected from the meters. In addition, slope, invert, pipe length, material, diameter were obtained from existing plan information and a field survey conducted by Sugrue and Associates. The model was utilized to evaluate two primary conditions, dry weather and wet weather.

Dry Weather Conditions

Based on meter information collected under dry weather conditions, the collection system appears to be generally adequate for the existing customer base. However, there are a number of pipes that appear to be capacity deficient during both dry weather and wet weather conditions. Four pipes sections in JNI have been identified as capacity deficient (i.e., exceed 80 percent of their capacity) during dry weather conditions, and identified in Table 3-10.

TABLE 3-10: JNI - Capacity Deficient Dry Weather	
Pipe Segment	Capacity
I130021:I130020	91%
I130019:I130018	229%
J140019:J140018	100%
J140025:J140023	121%

Approximately 11 pipe sections in the JSI are capacity deficient under existing dry weather flows, as indicated in Table 3-11.

TABLE 3-11: JSI - Capacity Deficient Dry Weather	
Pipe Segment	Capacity
H130017:H130016	96%
H130012:H130011	107%
H130011:H130010	111%
H130010:H130009	102%
J100050:J100051	80%
J120013:J120012	86%
J120012:I120002	84%
I120002:I120001	81%
I120003:I120005	122%
I120005:I120004	137%
I120004:I120018	145%

Wet Weather Conditions

During wet weather flows, there are significantly more pipes in the JNI and JSI that are capacity deficient. In the JNI, there are 17 pipe sections that exceed 100 percent of their estimated capacity as a result of wet weather conditions, as indicated in Table 3-12.

TABLE 3-12: JN1 - Capacity Deficient Wet Weather	
Pipe Segment	Capacity
H160005:I160002	103%
I160003:I160001	102%
I160008:I160009	118%
I130012:I130021	126%
I130021:I130020	152%
I130020:I130019	131%
I130019:I130018	382%
I130014:I130028	106%
I130028:I130027	114%
I130025:I130024	103%
I130023:I130022	106%
J130001:J130004	109%
J130005:J130007	179%
J140019:J140018	479%
J140025:J140023	581%
J140002:J140003	127%
J140017:J140016	101%
J140016:J140012	112%

In the JSI, there are 50 pipe sections that exceed 100 percent of their estimated capacity during wet weather conditions, as indicated in Table 3-13.

TABLE 3-13: JSI - Capacity Deficient Wet Weather			
Pipe Segment	Capacity	Pipe Segment	Capacity
G140001:699	108%	J120018:J120017	121%
G140002:G140003	104%	J120017:J120006	144%
G140003:G130009	107%	J120006:J120007	137%
H120003:H120002	134%	J120007:J120008	153%
H120001:H120015	107%	J120008:J120009	225%
H120014:H120013	144%	J120009:J120005	106%
H100013:H100015	107%	J120005:J120001	136%
H100011:H100010	149%	J120001:J120004	136%
H100007:H100006	120%	J120004:J120003	136%
H100004:H100003	130%	J120003:J120002	152%
I90016:I90015	122%	H130019:H130018	116%
I90007:I90034	142%	H130018:H130017	118%
J90004:J90005	104%	H130017:H130016	208%
J90005:J90006	105%	H130016:H130021	100%
J100049:J100050	114%	H130015:H130014	127%
J100050:J100051	157%	H130014:H130013	136%
J110002:J110001	162%	H130013:H130012	136%
J110001:J120013	136%	H130012:H130011	253%
J120013:J120012	296%	H130011:H130010	263%
J120012:I120002	287%	H130010:H130009	242%
I120002:I120001	216%	H130009:H130008	112%
I120001:I120003	206%	H130008:H130007	102%
I120003:I120005	326%	H130022:H130006	101%
I120005:I120004	367%	H130003:H130023	111%
I120004:J120018	388%	H130023:714	172%

Those pipe sections that are capacity deficient during both dry weather and wet weather are shown on the map provided in Appendix E.

Pipe sections in JNI and JSI that are capacity deficient during dry weather likely need to be upgraded. The nature and extent of the upgrade will be based on the future build-out of the Town and the amount of additional flow anticipated in that line. Pipe sections that are capacity deficient during wet weather (but not dry weather) could be addressed in one of two ways – the pipes could be upgraded to accommodate wet weather conditions or the source of I/I could be addressed, which could reduce the flow in the system.

Inflow and Infiltration

The 2009 SSES report attempted to identify the source of the I/I that is impacting these pipe sections. The entire SSES report, including the conclusions and recommendations for further evaluation, is included as Appendix I. Supplemental metering conducted as part of the SSES from October 1 to December 1, 2008, included both dry weather and wet weather flows for 11 sub basins on the JNI and 8 on the JSI.³⁵

Based on the SSES report, it appears as though meter basins JNI-I and JNI-J are contributing high amounts of inflow, which are adversely impacting sewers on Borden Avenue, Dyerville Avenue, and Hedley Avenue. During a limited field investigation of the contributing sub-basins, PARE observed evidence of potential sources of I/I. Three town-owned manholes on Niverville Street, between Antwerp Street and Normandy Street, were filled with sand, which may be the result of a broken line or an illicit drainage connection. PARE also observed a town-owned manhole on Harrison Street, between Waterman Avenue and Highland Avenue, which exhibited significant groundwater infiltration. PARE did not conduct a field investigation of the condition of every manhole in the area, but it is likely that there are other manholes that are in similar condition that are contributing I/I to the system.

In addition, meter basin JNI-D and JNI-G are contributing high amounts of infiltration and inflow, respectively, which is adversely impacting sewers on Greenville Avenue. While I/I

³⁵ Narragansett Bay Commission, Draft *Town of Johnston, Rhode Island Sewer System Evaluation Survey*, February 2009, prepared by BETA Group, Inc.

reductions may reduce the flow in these pipes, future sanitary loading may increase the flow in these pipes, which may require that they be upgraded.

One section of pipe on George Waterman Road upstream of Irons Avenue appears to exceed 100 percent of its estimated capacity during wet weather conditions. While the meter basin that contributes to this pipe section (meter basin JNI-C) was not identified as contributing excessive inflow or infiltration, it appears as though I/I is adversely impacting this sewer line. Meter basin JNI-C had a high level of inflow (2,732-gpd/in-mile); however, it was below the threshold capacity cited in the report of 4,000-gpd/in-mile. Meter basin JNI-C was not identified for future investigation; however, further investigation of the contributing I/I may be warranted in order to reduce the flow in this pipe.

There are pipe sections along Hartford Avenue and Atwood Avenue that exceed 100 percent of their capacity during wet weather conditions. These pipe sections are associated with meter basins JSI-X, JSI-Y, and JSI-Z. Meter basins JSI-X and JSI-Y appear to be contributing excessive inflow. Further investigation in these meter basins is warranted in order to identify the source of the inflow and attempt to reduce its contribution to this line. Regardless of the impact that I/I is having on this pipe section, upgrades may be required in the future in order to accommodate additional future flows resulting from town-wide build-out.

During a limited field investigation of the contributing sub-basins in the JSI service area, PARE observed evidence of potential sources of I/I. A storm water catch basin, located in sub-basin JSI-V on Starr Street at the intersection of DeLuca Street, appears to be connected to the sanitary sewer. Also, a town-owned manhole, located in JSI-U on Joy Street just south of Mill Street, was filled with sand, which may be the result of a broken line or an illicit drainage connection. This catch basin and manhole could be contributing excess I/I to this area of the system.

To identify the source and location of excessive I/I system wide, the SSES report recommends the following:

1. Conduct closed-circuit television (CCTV) inspections in JSI-U to further evaluate excessive infiltration contributions from the basin. CCTV inspections should be isolated

- to local sewers within the basin since NBC-owned interceptors have been inspected and appear to be in good condition.
2. Focused inflow investigations be conducted in Johnston-South Interceptor basins JSI-X, JSI-Y, JSI-R, JSI-S and JSI-V first and then in Johnston-North Interceptor meter basins JNI-A, JNI-I, JNI-J, and JNI-G. Preliminary inflow investigations should consist of field investigations to determine if catch basins and downspouts are tied into storm drains or sanitary sewer. Potential inflow sources identified on Table 3-1 (of the SSES report) should also be included in this preliminary investigation. Based on the findings of the preliminary investigation, a decision will be made as to whether or not further investigation using smoke testing should be conducted.
 3. Damaged or leaking manholes identified in Chapter 3 [of the SSES] be repaired.

In addition to the recommendations from the SSES report, it is also recommended that basins JNI-C and JSI-Z be investigated for potential sources of I/I.

SECTION 4.0

ASSESSMENT OF FUTURE CONDITIONS

A twenty-year planning horizon has been used to project wasteloads and flows from development identified in the 2007 *Johnston Comprehensive Community Plan*. For planning purposes, projected demand for the year 2030 has been used. For discussions in this report, the planning horizon has been divided into three planning periods, 0-5 years, 5-10 years, and 10 to 20 years.

4.1 LAND USE FORECASTS, BUILD-OUT, AND POPULATION PROJECTIONS

A build-out analysis has been conducted specifically for the *Facilities Plan Update*, to determine potential sewer demand both east and west of I-295. This analysis identified vacant parcels from a visual analysis of orthophotography. Based on data presented in Table 4-1, there are 2,398 acres currently vacant,³⁶ a decrease from the 7,956 vacant land acres in 1995, as identified in the 2007 *Comprehensive Community Plan*, as presented in Table 3-7 of this document. The Rhode Island Geographic Information System (RIGIS) datalayers for *Historic Sites, Districts and Candidates; Wetlands; Protected Open Space; DEM Open Space; Rare/Endangered Species; Bedrock and Slope Constraint (>15%)* shapefiles were superimposed over the mapped vacant/undeveloped areas to identify buildable acreage. Current zoning district lot sizes were then applied for residentially zoned parcels. This figure was then reduced by 15 percent to allow for infrastructure construction (primarily roads and stormwater management). Build-out data is tallied by zoning district in Table 4-1.

As indicated, a total of 579 single-family residential units could be built east of I-295 while 628 single-family residential units could be constructed west of I-295. The build-out was prepared for single-family construction and does not reflect the opportunity for more intensive multi-family construction. East of I-295 approximately three acres of land zoned B-2 (General Business) and six acres of land zoned Planned Business are developable while west of I-295 approximately 108 acres are developable in the B-3 (Interchange Business) Zone.

³⁶ Google Earth, ©USFWS, © Tele Atlas (2008 image, downloaded January 2009)

Table 4-1: Commercial and Residential Build-out, East and West of I-295					
	Acres			Build-out	
	Vacant Area	Constraints (1)	Developable Area (2)	Units	Acres/Description
East of I-295					
Commercial					
B-2	130.33	126.3	3.4		3 - General Business
PBUS	30.28	22.71	6.43		6 - Planned District
Residential					
R-7	77.3	62.7	12.4	77	Single-family Residential
R-10	27.12	8.12	16	35	Single-family Residential
R-15	32.7	9	19.41	56	
R-20	241.54	137.8	88.14	192	Single-family Residential
R-40	668.3	445.2	200	218	Single-family Residential
Total	1,208	811.83	345.78	579	Single-family Residential
West of I-295					
Commercial					
B-3	389.3	262.3	108		108 - Interchange Business
Residential					
R-20	100.38	57.28	36.63	80	Single-family Residential
R-40	1908	1328	492	548	Single-family Residential
Total	2,398	1647.58	636.63	628	Single-family Residential
Total Town-wide Build-out (residential)				1207	Single-family units

(1) Constraints based on RIGIS datalayers for *Historic Sites, Districts and Candidates; Wetlands; Protected Open Space; DEM Open Space; Rare/Endangered Species; Bedrock and Slope Constraint (>15%)*

(2) Reflects 15% reduction for road and other infrastructure construction.

Between 2000 and 2006, permits were issued for 349 single-family units in Johnston (averaging 50 per year).³⁷ The pace of construction has continuously decreased from a peak of 81 permits in 2000 to 18 permits in 2006. Assuming an average of 50 new single-family units constructed annually, full build-out could occur in approximately 24 years, beyond the 20-year planning horizon for the *Facilities Plan Update*. It is recognized, however, that the pace of single-family

³⁷ RI Economic Development Corporation Residential Construction Statistics, <http://www.riedc.com/files/Johnston.xls>

construction may continue to decrease as only the more challenging and less suitable sites for residential development remain.

Table 4-2 presents information on the total number of residential units projected in Johnston at full build-out in 2034. Note that this does not reflect additional multifamily construction. As indicated in Tables 4-3 and 4-4, many of the proposed projects in Johnston include multifamily condominium or assisted living projects (these projects are not reflected in Table 4-2). Assuming the town-wide number of persons per household in the 2000 US Census of 2.44 per unit, total population at build-out could be 31,942. This figure is above the 31,192 population projection prepared by RI Statewide Planning for 2030, as presented in Table 3-4.³⁸

Table 4-2: Total Residential Units at Build-out, 2034					
	2000 (1)	2000-2006 (2)	Additional SF Units at Build-out		Total
			East	West	
Single Family Units	8,254	349	579	628	9,810
2-9 Units	1,867	0	0	0	1,867
10+ Units	1,414	0	0	0	1,414
<i>Total Units</i>	<i>11,535</i>	<i>349</i>	<i>579</i>	<i>628</i>	<i>13,091</i>

(1) US Census 2000 Summary File 3

(2) RIEDC

The build-out completed for the *Facilities Plan Update* indicates that more parcels may be available for development than the Town had previously projected. According to the *Johnston Affordable Housing Plan* (2005) and the *2007 Comprehensive Community Plan*, 693 buildable acres are available with nearly every piece of available residential land located west of I-295 in the R-40 zoning district, yielding a residential build-out of 755 new lots.³⁹ The Town of Johnston Planning Department was unable to provide any documentation on the build-out methodology beyond what was presented in the 2007 comprehensive plan. This data does not correlate strongly with the build-out prepared for this *Facilities Plan Update*. The build-out for the

³⁸ RI Statewide Planning Program Technical Paper Number 154, *Rhode Island Population Projections: State, County, and Municipal 2000-2030*, August 2004.

³⁹ *2007 Johnston Comprehensive Community Plan*, page 3-19 to 3-21.

Facilities Plan Update yields more important data for sewer demand projections as it considers both vacant developable land east and west of I-295. The higher build-out would assure that sewer demand would not be under projected.

4.2 ECONOMIC FORECASTS

As indicated in *State Guide Plan Element 212 - Industrial Land Use Plan* revised August 2001, Johnston is located within Substate Employment Growth Area 3 with Providence, East Providence, Warwick, Cranston, and North Providence. Johnston has 19 industrial sites totaling 723 acres. None of the sites meets the criteria for high potential sites.⁴⁰ Reference is made to the RIRRC and plans to develop an industrial park (plans have advanced consistent with the State Guide Plan for the Lakeside Commerce Center and associated development). As discussed above, this development is or will be served by one of two privately-owned sewer lines that connect to the City of Cranston sewer system.

Economic forecasts for the Town of Johnston are consistent with goals for the *2007 Johnston Comprehensive Community Plan*. The Town of Johnston and the RIRRC have outlined economic development initiatives for increased industrial development in the vicinity of the Central Landfill and increased commercial development on Hartford Avenue (Route 6) west of I-295 in the area zoned highway commercial and planned business. This area lacks sewer and water although both are within the reachable vicinity. The Johnston mayor has also identified economic strategies for areas both east and west of I-295 that require both municipal sewer and water service to facilitate development.

According to the 2000 US Census, the median household income in Johnston was \$43,514, a 33 percent increase since 1990. In 2000 the statewide median household income was \$42,090.⁴¹

4.3 FORECASTED FLOWS AND WASTELOADS

Forecasted wastewater flows were estimated based on the current zoning town-wide and the projected build-out of the Town. Future flows were projected for the 0-5, 5-10, and 10-20 year time horizons. Table 4-5 shows the residential and non-residential flow projections.

⁴⁰ State Guide Plan Element 212 - Industrial Land Use Plan Revised August 2001.

⁴¹ Rhode Island Statewide Planning Program, Rhode Island Census 2000 (source: 2000 US Census)

For the purposes of this report, the only significant build-out assumed to occur in the 0-5 timeframe are projects that are known to the Town and are in some stage of planning at this time. It is assumed that any development that is not in some stage of planning currently would be built outside the 0-5 year timeframe. Tables 4-3 and 4-4 list the future developments in Johnston that are currently in some stage of planning or construction. Please note that the time horizon for these developments, as well as other future build-out of the Town is approximate. Any one of these developments might occur sooner or later than what is indicated in this report.

Table 4-3: Ongoing Projects with Town Approval (Not yet constructed/Under Construction)		
Development, Address	Sewer	OWTS
US Immigration Center, 1543 Atwood Avenue	Immigration Center 20,000 sf office development	Assisted Living
Briarcliffe Gardens, 49 Old Pocasset Road, Woodlake Drive		
FM Global, Central Avenue	350,000 sf corporate office building	
Centre at Cherry Hill, 350 Cherry Hill Road, Atwood Avenue	55 condo units, office, coffee shop, bank	
Hampton Place - Grieco, Hartford Avenue	34 units	
Lakeside Commerce Center, Scituate Ave., Shun Pike, Austin's Way	RIRCC/Cranston Sewer	
Pines Condominium, 682 Greenville Avenue at I-295		144 residential units (112 3-beds, 32 2-beds)

Source: Planning & Economic Development Department of Public Works, Town of Johnston January 8, 2009 memo to Lorraine Caruso, Town Engineer from Merrick A. Cook, Jr., Administrative Officer Re: Current & proposed projects that may require water service

Table 4-4: Projects Proposed - In the Planning Review Process (Not yet approved)		
Development	Address	Description
Alvina Estates II – Russo	10 Alvina Drive	5 single-family units (West End)
Atwood Avenue - Cassisi	Atwood Avenue (vicinity of)	8 single-family units
Boulder Estates	Boulder Drive	8 single-family units
B. Maceroni & Sons Funeral Home	1779 Atwood Avenue	Funeral home/1 parlor
Belfield Drive – Barnkan	63 Belfield Drive	1 single-family unit (West End)
Bellawoods Vue – Aceto	Mascio Drive and Violet Street	5 single-family units
CVS Pharmacy	1993 Plainfield Pike	Retail
D'Ambra Manufacturing Facility	Shun Pike, Scituate Avenue, Austin's Way	Industrial RIRRC / Cranston Sewer
Falcon Nest – Abatecola	1046 Atwood Avenue & 29 Granite Street	17 single-family units
Irons Avenue Condominiums	Irons Avenue	22 commercial units
Killian Estates	Killian Rd./Greenville Ave./I-295 intersection)	50 senior apartments
Killingly Place	504 Killingly Street	Business Development Project
Mangiarelli's	1302 Atwood Ave.	1 single-family unit
Contractors Business Park	Plainfield Pike	Commercial condos
Pocasset Mills	75 Pocasset Street	91 Multifamily Units (112 bedrooms)
Poppy Hills II – Collardo	4 Tulip Hill Road & 30 Poppy Hill Drive	9 single-family units (West End)
Rockcrest Highlands	Rockcrest Lane, Venice Avenue, & Granite Street	10 single-family units
Rosemont/Elmhurst Avenues	Rosemont and Elmhurst Avenues	1 single-family unit
Rustic View-Annaldo	Atwood Avenue	Multi-family 28 units
Shun Pike/ Vinagro	114/116 Shun Pike	Industrial/Residential: sorting station and single-family units
Stonehill Marketplace		Retail Development
Stuart's Plaza/Johnston Commons		Hotel/Restaurant/Retail
Windsor Woods I	17-19 Surrey Drive, 8 Stagecoach Drive, 7 Carriage Way	8 single-family units (West End)
Windsor Woods II	Carriage and Bridle Ways, Parasol Court	13 single-family units (West End)

Source: Planning & Economic Development Department of Public Works, Town of Johnston January 8, 2009 memo to Lorraine Caruso, Town Engineer from Merrick A. Cook, Jr., Administrative Officer Re: Current & proposed projects that may require water service

To project future wastewater flows, a complete build-out of the Town was evaluated during three time horizons, 0-5 years, 5-10 years, and 10-20 years. The build-out assumed current zoning requirements, environmental constraints, physical constraints, etc. The phased build-out of the Town is depicted on a series of system maps, which are attached as Appendix F. Future flow projections are provided as Appendix G. A detailed description of the projected sewer flow for each time horizon is provided below.

4.3.1 Residential

0-5 Year Timeframe

The anticipated residential development in the 0-5 year timeframe, which may be served by sewer, is approximately 458 new housing units. As sewer is expanded to serve these new residential units, as well as future industrial/commercial development, approximately 207 existing homes could be connected to new sewers. It should be noted that the Cherry Hill was included in the Johnston Capital Improvement Plan as a potential sewer project that could occur in the 0-5 year timeframe. This project could add as many as 181 units to the 0-5 year timeframe. However, residents in the neighborhood recently voted against the project, which will likely move it outside the 0-5 year timeframe. However, to be conservative, it is assumed that this neighborhood will be sewered at some point, and therefore, the projected wastewater flow from the Cherry Hill neighborhood is included in the 10-20 year estimate. The added residential wastewater flow expected in the 0-5 year timeframe is approximately 200,000 gpd.

5-10 Year Timeframe

The anticipated residential development in the 5-10 year timeframe, which may be served by sewer, is approximately 704 new housing units. In addition, approximately 1,022 existing homes could be sewered as the collection system is expanded in Johnston. Also, the Salina neighborhood, which includes approximately 67 units, is included as part of the Johnston Capital Improvement Plan, and could be sewered in the 5-10 year timeframe. The added residential wastewater flow expected in the 5-10 year timeframe is approximately 540,000 gpd.

10-20 Year Timeframe

The anticipated residential development in the 10-20 year timeframe, which may be served by sewer, is approximately 145 new housing units. In addition, approximately 1,396 existing homes could be sewered as the collection system is expanded in Johnston. The added residential wastewater flow expected in the 10-20 year timeframe is approximately 516,000 gpd.

4.3.2 *Industrial/Commercial*

0-5 Year Timeframe

The anticipated industrial/commercial development in the 0-5 year timeframe is expected to contribute approximately 1,022,000 gpd of wastewater flow. This includes new development as well as existing development that is not yet sewered but could be connected as sewers are expanded in Johnston. This includes 820,000 gpd of flow from the RIRRC's Central Landfill and Lakeside Commerce Center. Of this 820,000 gpd, 650,000 gpd is the average daily landfill leachate flow and 170,000 gpd is the Lakeside Commerce Center flow. Of the 170,000 gpd from the Lakeside Commerce Center, 90,000 gpd is non-contact cooling water.

5-10 Year Timeframe

The anticipated industrial/commercial development in the 5-10 year timeframe is expected to contribute approximately 421,000 gpd wastewater flow. This includes new development as well as existing development that is not yet sewered, but could be connected as sewers are expanded in Johnston.

10-20 Year Timeframe

The anticipated industrial/commercial development in the 10-20 year timeframe is expected to contribute approximately 341,000 gpd wastewater flow. This includes new development as well as some existing development that is not yet sewered.

4.3.3 *Inflow and Infiltration*

As described in Section 6, there is approximately 25 miles of new sewer proposed as part of this facility plan. Based on an I/I estimate of 250 gpd-in/mile for new sewer, the increase in I/I that could result from the proposed sewer is approximately 132,000 gpd.

However, as new pipe is added and I/I increases, certain existing areas with excess I/I could be addressed, which would reduce I/I in the existing system. The SSES report identified a number of areas within the Town with high I/I. However, the exact source of the I/I was not determined – the SSES report recommended additional investigation to identify the exact source of the I/I. For the purposes of estimating cost effective I/I removal, it was assumed that the three worst sub-basins in the JNI and the JSI could be addressed cost effectively over the next 20 years. It is assumed that I/I (on an average daily basis) could be reduced by 90 percent in these sub-basins. The total reduction in I/I could be as high as 549,000 gpd, which would result in an average daily reduction in I/I off approximately 59 percent. A breakdown of I/I reduction per time horizon is provided in Table 4-5. The volume of I/I in each sub-basin is provided in the SSES. Please note that these estimates of I/I reduction are based on assumption regarding I/I removal, which would have to be verified through additional field investigation. The actual volume of I/I reduction and the sub-basins that could be cost effectively addressed could change based on the results of further investigation.

A summary of the project wastewater flows for each timeframe is summarized in the table below. A detailed breakdown of each timeframe is provided in Appendix G.

TABLE 4-5 Projected Wastewater Flows					
	Residential	Industrial/Commercial	Inflow and Infiltration Reduction ¹	Inflow and Infiltration Addition ²	Total
0-5 Years	200,000 gpd	1,022,000 gpd	(305,000 gpd)	21,000 gpd	938,000 gpd
5-10 Years	540,000 gpd	421,000 gpd	(158,000 gpd)	36,000 gpd	839,000 gpd
10-20 Years	516,000 gpd	341,000 gpd	(86,000 gpd)	75,000 gpd	846,000 gpd
Total	1,256,000 gpd	1,784,000 gpd	(549,000 gpd)	132,000 gpd	2,623,000 gpd
Total Future Flow = 5,300,000 gpd (Current) + 2,623,000 gpd (Increase) =					7,923,000 gpd

1 = This is the volume of I/I that could be cost effectively removed from the existing system.

2 = This is volume of I/I that may be added to the system as a result of new pipe infrastructure, based on a rate of 250 gpd-in/mile.

4.3.4 Septage

There are approximately 3,080 unsewered single-family homes in Johnston, 58 multi-family homes, and 212 unsewered businesses. These homes and businesses rely on on-site wastewater treatment systems. Assuming an average septic tank capacity of 1,500 gallons for single-family

homes and 2,500 gallons for multi-family homes and businesses, and assuming a three-year pump-out period, the average annual septage volume generated in Johnston is anticipated to be 1.8 MG per year.

During the next 20 years, approximately 2,873 single-family homes that are currently served by on-site wastewater treatment, as well as most of the 58 multi-families and most of the 212 business, may be sewerred, which will significantly reduce the total volume of septage generated in Johnston. However, there may be new homes constructed in the western half of Johnston that will not get sewer within the timeframe of this project. Those homes will increase the septage volume generated in Johnston. Despite these new homes, it is anticipated that over the next 20 years, if this plan is implemented, septage volume will decrease by 75 to 95 percent of its current volume.

Currently, septage is transported out of town, to Cranston, Lincoln, Warwick, and Smithfield. There are currently no septage receiving facilities in Johnston.

4.4 ADEQUACY OF EXISTING NBC INTERCEPTORS AND PUMP STATION FOR FUTURE FLOWS

4.4.1 Interceptor System

In general, the NBC interceptor system in Johnston is adequate for existing wastewater flows. There are some areas that exceed their capacity during wet weather flows, as discussed in Section 3, which should be addressed during the build-out of the system, as discussed in subsequent sections of this report.

The anticipated future wastewater flow in the system is estimated to increase by approximately 3.19 MGD, which is approximately 60 percent greater than existing flows. There appears to be adequate capacity in most of the NBC interceptor system to accommodate this increase in wastewater flow, with the exception of those areas that are currently critically operating. However, the impact that future wastewater flows will have on the existing system will depend in large part on where future flows are directed to the existing system. The routing of future wastewater flows is discussed in detail in Section 5 as part of the expansion of the existing wastewater collection system.

4.4.2 Central Avenue Pump Station

As discussed in previous sections of this Facility Plan, the Central Avenue Pump Station has been upgraded. Upgrades included new pumps and motors, new controls, new electrical systems, and a new force main to the Atwood Avenue branch of the JSI. The design of the new upgrades accounted for future wastewater flows in the pump station's contributing sewershed area. The Central Avenue Pump Station can accept additional wastewater flows from its contributing service area.

SECTION 5.0

DEVELOPMENT AND EVALUATION OF ALTERNATIVES

A twenty-year planning horizon has been used to project the potential future build-out of each delineated sewershed. The sewer layout in each sewershed was evaluated based on the following factors: environmental impacts, land use, ease of construction, total cost, design and permitting costs, and other socioeconomic parameters affected by the overall system. This section of the report describes the evaluation of alternatives for future sewerage, including alternatives for areas of town that are unlikely to be sewerage within the timeframe of this plan (i.e., 20 years). This section also describes ways in which the existing infrastructure could be optimized, in order to accommodate future flows.

5.1 OPTIMIZATION OF EXISTING FACILITIES

Overall, the NBC-owned wastewater collection system within the Town of Johnston consists of gravity sewer pipe and one pump station, the Central Avenue Pump Station. There are two major branches of sewer interceptors that are referred to throughout the report, Johnston-North Interceptor (JNI) and Johnston-South Interceptor (JSI). The Central Avenue Pump Station is part of the JSI and is the only NBC-owned pump station within town, originally installed in 1985. All of the NBC-owned Interceptor pipes were installed in 1955, which consisted of asbestos cement pipes. In 1996, upgrades and repairs to some of this pipe were made and replaced the asbestos cement pipe with PVC.

There are four primary means by which existing facilities could be optimized;

- Reduce existing wastewater flows through conservation;
- Reduce system-wide I/I;
- Upgrade the Central Avenue Pump Station, and
- Eliminate redundant pump stations.

5.1.1 Wastewater Flow Reduction

Water conservation is an important component of reducing overall wastewater flows in the system. However, it is important to target certain types of water use to effectively control wastewater flow. Indoor water uses, such as showers, toilets, dishwashers, etc. contribute directly to overall wastewater production. Outdoor water uses, such as lawn watering, car washing, pool filling, etc have a significant impact on water use, but generally don't contribute to wastewater flows in the collection system. Therefore, to optimize flows in the existing collection system, it will be important to target conservation measures for indoor water use.

Water conservation measures can be implemented for both residential and non-residential customers. The methods for the water conservation are similar, but the scale and specific technologies available for residential and non-residential customers varies to some degree. Residential costumers utilize water for primarily domestic purposes, while non-residential customers utilize water for things like process water, cooling water, facility maintenance, etc.

Water Saving Fixtures

Water saving fixtures are an accepted means of reducing overall water use. These fixtures typically include low-flow showerheads/faucets and low-flow toilets. Low flow showerheads and faucets reduce water use by decreasing the opening size in the fixture. Low flow toilets reduce water use by utilizing less water per flush. Increasing in popularity are water-saving appliances, such as low water dishwashers and washing machines.

The overall effectiveness of water saving fixtures has met with mixed results. There are no industry-wide standards on water saving fixtures, so the actual impact certain fixtures have on water use is questionable. In addition, there is a popular perception that water saving fixtures are expensive and reduce the quality of water service. In addition, some water saving fixtures, such as faucets and showerheads, may require additional maintenance. Therefore, to increase the use of water saving fixtures, these fixtures must be comparable in price to regular fixtures and must provide a comparable level of service to regular fixtures. In addition, they must be easy to maintain or replace.

Some water districts provide water conservation kits to their customers. These kits typically include inexpensive water saving fixtures, such as showerheads and faucet aerators, as well as educational packets on water conservation. A comprehensive program to distribute water conservation kits to customers could effectively reduce wastewater generation, but mandating water saving fixtures could prove to be difficult. A mandate to utilize water saving fixtures would require coordination with the local plumbing codes, and coordination with local planning boards in order to develop guidelines for new development. In addition, consideration would need to be given to customers that have private water, as well as residents that utilize on-site wastewater treatment. Any mandate would need to be equitable in its implementation in order for it to be widely accepted by town residents.

Conservation Rates

Conservation rates are an accepted practice in the water utility industry to curb water use. Conservation rates can effectively reduce industrial/commercial water use, as well as some components of residential water use. However, they can be relatively ineffective at reducing residential wastewater generation. Typically, water conservation rates target the upper tier water user. These users are either industrial or commercial in nature, or residential users that have high non-domestic water use, such as lawn irrigation. As a result, conservation rates curb industrial/commercial water use, as well as residential lawn watering, but do not effectively reduce residential domestic water use, which contributes to overall wastewater generation. Therefore, conservation rates could be a successful tool in reducing industrial/commercial wastewater generation, but most likely will not have a significant impact on residential wastewater generation.

Water Re-use

Water re-use is an effective and economical means of reducing wastewater generation. Water re-use is primarily a mechanism for industrial and commercial users to reduce their overall water use and subsequent wastewater generation, but is increasing becoming a component of new residential development. Gray water, which is the non-sanitary component of the wastewater, can be used for a number of other things. Without treatment it can be utilized for non-contact cooling water or landscape irrigation. With some minor treatment it can be

utilized as wash-down water for non-sensitive surfaces such as floors, parking lots, building exteriors, etc. It can also be utilized for certain industrial or agricultural processes.

Water re-use is more difficult in residential applications due to the expense or complexity of separating gray water from sanitary wastewater. However, some new developments are including separate gray water systems in homes and utilizing the gray water for landscape irrigation. This serves the dual purpose of reducing peak water use and reducing the overall wastewater generation.

Education

One of the most important components of conservation efforts is public education. Water conservation is most successful when the public understands the impacts and of their water use. A public education program would be a critical component of any water conservation program, whether it be water saving fixtures, water re-use, or conservation rates.

5.1.2 Reducing Inflow and Infiltration

A Sewer System Evaluation Study (SSES) Report was completed as part of this project. The SSES report is for the existing NBC interceptor system, and was completed in order to assess the impact that inflow and infiltration (I/I) is having on NBC's interceptor system. The NBC's *Interceptor Capacity Analysis (ICA)* project, completed by BETA Group, Inc. in February 2007, included installation of seventy meters throughout the NBC system, with installation of three meters in the JNI and five meters in the Johnston-South Interceptor JSI. Meters were installed in strategic locations within the system for the purpose of collecting data over a period of time to establish where and when spikes of flow were occurring. Recorded data from the sewer meter stations were then compared to recorded rainfall date (i.e., wet weather). If the time of the spike coincided with a rainfall event, then it assumed to be caused by stormwater inflow. If the spike did not coincide with a rainfall event, then it assumed to be caused by high ground water infiltration. The analyses then flagged specific areas within the system that raised concern. Areas of concern have been discussed in Section 3 and have been illustrated on the map provided.

A Class I survey of the NBC-owned sewer system was performed in order to locate all NBC-owned manholes within Johnston. The survey included locating all surface structures and pipe

inverts with indication of whether or not there is illicit discharge of stormwater conveyance into the sanitary sewers present (i.e., grated catch basin or undisclosed piping). Several manholes were identified as potential locations of I/I. Those manholes are shown on the map provided as Appendix E. A combination of inflow and infiltration throughout an entire network of sewer pipes may cause deficiencies downstream. All illicit discharge should be eliminated from the system to avoid stormwater flows entering the sanitary sewers.

5.1.3 *Upgrades to the Central Avenue Pump Station*

The Central Avenue Pump Station was installed by NBC in 1985. Although the Atwood Avenue Interceptor branch is located less than 1,000 feet to the west of the pump station, sanitary flows were originally discharged to the Ashby Street branch (approximately 1 mile east of the station) due to capacity issues within the Atwood Avenue branch. The pumps within this station were sized to overcome the head losses within the long force and the elevation change between the station and Ashby Street. In addition, the pumps appear to have been sized for a flow rate much higher than peak flow rate observed in the station currently. As a result, the existing pump motors in the station are 30 HP.

NBC is currently upgrading the Central Avenue Pump Station. The size of the pumps in the station were re-evaluated based on current and projected wastewater flow flows. In addition, the force main was rerouted to Atwood Avenue. Upgrades to the Atwood Avenue sewer main within the past 10 years have significantly increased capacity in the Atwood Avenue main. As a result, the pumps within this pump station have been reduced in size to approximately 7.5 HP.

5.1.4 *Eliminate Redundant Pump Stations*

While not owned by NBC, there are several pump stations within the Town of Johnston that could be eliminated by combining service areas or installing relatively short sections of sewer main extensions. By combining pump stations, overall energy usage would be reduced, as well as long-term operation and maintenance costs.

The Morgan Mill pump station, which has two 150-gpm pumps and the River Drive pump station, which has two 35-gpm pump, are both located in close proximity to the Lafazia Drive pump station, which currently has two 35 gpm pumps. The River Drive pump station and the

Lafazia Drive pump station are both located in sewershed 1. The Morgan Mill pump station is located in the adjacent sewershed 22. While Morgan Mill and River Drive could be eliminated, the Lafazia Drive pump station would need to be modified to handle the increase in system flow. The specific pipe layout and new sewer installation that would be required to combine these stations is discussed in the following sections for sewershed 1 and sewershed 22.

The Federal Way pump station is a private pump station that serves a condominium development. It would be possible to eliminate this pump station with a 1,200 ft pipe extension through an abutting parcel to Atwood Avenue sewer line. However, this would require an easement through the abutting parcel. The specific pipe layout that would be required to eliminate this station is provided the following section for sewershed 19.

5.2 REGIONAL SOLUTIONS

The Town of Johnston is currently engaged in a regional wastewater management strategy. Sewered portions of Johnston are served by the NBC regional system, and the City of Cranston's local collection system, and to a much lesser degree, the Town of Smithfield's local collection system. The JNI and the JSI convey flow to the Woonasquatucket Interceptor, which ultimately conveys flow to the Field's Point Wastewater Treatment Facility in Providence. Areas in Town around the RIRRC Central Landfill and a few customers along Plainfield Street discharge to the City of Cranston's wastewater collection system. One neighborhood near the Slack Reservoir along the Smithfield town-line discharges to the Smithfield collection system. There is not an intermunicipal agreement between the Town of Johnston and the Town of Smithfield. Johnston sewer users pay the Smithfield Sewer Authority directly.

Future flows from unsewered areas of Johnston could feasibly be directed to one of these three systems. Most of the Town could be connected to the NBC system through sewer main extensions. Customers along Plainfield Street could be connected either to the NBC system through a main extension or to the Cranston system, which already has a sewer line in Plainfield Pike. Connection to Cranston's system may be more technically feasible for some customers, but there may be jurisdictional issues associated with connecting to the Cranston sewer. Given that the Town did not participate in the construction of the sewer main in Plainfield Pike, the City of

Cranston would have to review their policy for connection and come to an agreement with the Town of Johnston on the terms of use for that sewer main.

In addition, there are some relatively small portions of Johnston located near the Smithfield town-line that may be better suited by connecting to the collection system in Smithfield, which ultimately discharges to the Town of Smithfield's wastewater treatment plant. Portions of the Town in the vicinity of the Moswansicut Reservoir and along Winsor Avenue are geographically isolated from the NBC system. In addition, topography in this area generally slopes toward Smithfield, which may make connecting to Smithfield the most viable alternative for future sewers in this area.

5.3 UNSEWERED AREAS

Approximately 2/3 of the Town (by area) is unsewered, including most of the area west of I-295. There are a total of 3,080 residential, 58 multi-family, and 212 businesses that do not have sewer service. A total of 43 delineated sewersheds within the Town of Johnston have been evaluated with regard to future wastewater management strategies. Of these 43 sewersheds, 26 sewersheds are either completely unsewered or have substantial unsewered areas. The remaining 17 sewersheds are either substantially sewered or are located in an area of Town that is anticipated to no significant wastewater flow. Some of these sewersheds could be served by an expanded wastewater collection system; however, it is unlikely that the system would expand to those areas within the timeframe of this project (i.e., 20 years). For these 17 sewersheds, a no action alternative is likely the most feasible alternative. For the remaining 26 sewersheds, PARE evaluated other alternatives, including continued use of existing on-site systems, upgrades to on-site septic systems including innovative technologies, and new or upgraded sewer collection systems that discharge to the public collection system.

5.3.1 No Action Alternative

It is important to note that a **No Action** alternative was evaluated. The No Action alternative would be a continuation of the status quo in Johnston without extension of sewers to either unsewered areas east of I-295 or to unsewered areas west of I-295. Table 5-1 indicates the estimated single-family dwelling units served by on-site wastewater treatment systems both east and west of I-295, by zoning district. As indicated, approximately 1,100 presumed single-family

dwelling units east of I-295 and 1,980 units west of I-295 are not served by sewers. Although many of the larger half-acre and one-acre lots may be suitable for on-site systems, it may be challenging to accommodate a functional system on many of the smaller lots (some as small as 5,000 square feet) located in the Simmonsville area of Johnston.

Table 5-1: Unsewered Properties, Town of Johnston			
	Residential (1F)	Multifamily Apt/Condo Buildings	Businesses
Planning District 1			
East of I-295	210	0	40
West of I-295	65	0	1
Planning District 2			
East of I-295			
North of Route 6	85	45	2
South of Route 6	75	13	3
Planning District 3			
East of I-295	450	0	31
West of I-295	65	0	35
Planning District 4			
East of I-295	280	0	20
West of I-295	1,850	0	80
East of I-295	1,100	58	96
West of I-295	1,980	0	116
Total	3,080	58	212

Source: PARE review of orthophoto with sewer service map.

The No Action Alternative would not address violations, on-site wastewater treatment system failures, or future conditions where systems on single lots constructed in the 1950s to 1960s may face the need for replacement. Many of the unsewered neighborhoods east of I-295 were constructed on lots smaller than current zoning would permit by right. As indicated in Table 5-2, many of the randomly selected properties in unsewered neighborhoods are well below the R20 20,000 square foot minimum lot size or the R15 15,000 square foot minimum lot size. It is

presumed that many of the on-site wastewater treatment systems constructed for these 40- to 50-year old homes may be substandard cesspools, may be in need of repair, or have been replaced (given a standard life expectancy of 25 years).

Table 5-2: Representative Lot Sizes in Unsewered Areas East of I-295			
Address	Zoning *	Lot Size	Year Constructed
14 Woodward Rd.	R15	5,662 sf	1978
1 Naples Street	R20	6,534 sf	1935
89 Naples Street	R20	9,583 sf	1951
3 Woodward Rd.	R15	10,018 sf	1930
6 Rose Hill Road	R20	10,455 sf	1962
21 Capitol Street	R20	12,196 sf	1950
6 Woodward Rd.	R15	16,117 sf	1967
69 Starr Street	R20	12,632 sf	1942
3 Jasper Avenue	R15	6,098 sf	1989

* Minimum lot size per Johnston zoning ordinance: R15 - 15,000 square feet; R20 - 20,000 square feet

Source: Appraisal Vision Assessor's Database last updated 12/16/08

It would be difficult to continue to serve many of the areas with on-site wastewater treatment systems given their small lot sizes and the density of development in these areas of Town. In addition, the areas around Oak Swamp Reservoir and Slack Reservoir have significant environmental constraints that would make continued use of on-site wastewater treatment systems generally impractical. For these reason, it appears as though expanding the existing wastewater collection system into these area of Johnston would be the preferred alternative.

5.3.2 On-site Wastewater Treatment Systems

Town of Johnston enacted a Wastewater Management Board in 2003 to administer the Town's on-site wastewater program. The RI DEM reports that the Town's Program has established minimum design and construction standards that are more stringent than the RI DEM's minimum design and construction guidelines.

While extending the existing sewer infrastructure appears to be the most viable long-term wastewater management strategy in Johnston, there are areas of town that will continue to rely on on-site wastewater treatment due to their relative geographic isolation, or because sewer cannot realistically be extended to those areas within the 20-year timeframe of this plan.

Currently, most residents in Town west of I-295, and some small neighborhoods east of I-295, rely on on-site wastewater treatment. As indicated in section 3, there are currently 71 active cases on-file with the RI DEM Office of Water Quality relating to substandard septic systems, either Notices of Intent or Notices of Violation. Some are in the Cherry Hill neighborhood, some are in the Salina Drive neighborhood, and some are in the vicinity of Oak Swamp Reservoir and Slack Reservoir. The Salina Drive neighborhood and the Cherry Hill neighborhood are included in the Town's most recent capital improvements plan as areas with future sewers. However, residents in the Cherry Hill neighborhood recently rejected a proposal to extend sewer to their area. It is unknown at this time when sewers will be extended to Cherry Hill.

These four areas (Cherry Hill, Salina Drive, Oak Swamp Reservoir, and Slack Reservoir), as well as other smaller areas in Town, are in need of comprehensive wastewater management strategies because of their high number of failing septic systems. As a result, these areas of Town, particularly the areas around Oak Swamp Reservoir and Slack Reservoir, have a significant influence on the evaluation of wastewater management alternatives for this plan.

Traditional on-site wastewater treatment systems (formally referred to as individual sewerage disposal systems or ISDS) consist of a septic tank, distribution box, and leachfield. Traditional systems, also known as conventional systems, are adequate for many sites, but can be prohibited if a particular site does not have ample space, suitable type soils, adequate separation distances from groundwater or bedrock, or adequate distance from nearby surface water bodies. Other constraints that can limit the usefulness of a traditional system include proximity to a drinking water source, the number and density of systems in the area, and the sensitivity to downgradient environmental receptors. For the areas of town around Oak Swamp Reservoir and Slack Reservoir, traditional on-site wastewater treatment systems are generally infeasible. Both areas have poor soil conditions and small lots, and are in close proximity to sensitive surface water bodies. For that reason, the continued use of traditional on-site wastewater treatment systems is considered impractical for these areas.

When a traditional system is inappropriate, a nontraditional system that utilizes innovative technology may be required. Innovative technology systems utilize advanced treatment procedures to improve the effluent quality from the system and thereby require smaller leaching fields. Such systems greatly reduce overall bacteria, suspended solids, and nitrogen. The cost of these systems is typically approximately double the cost of a conventional system. The additional costs include energy costs to power the technology and costs to hire a professional for operation and maintenance. These systems are also effective for communities, as the system design can be optimized for operational and maintenance costs from a multiple small systems to one large community system.

Due to the smaller lots east of I-295 and the extent of existing sewer infrastructure, it is proposed that sewer be extended to these properties. West of I-295, sewers are proposed on Plainfield Pike, Route 6, and Greenville Avenue for commercial development and residents in the Oak Swamp Reservoir neighborhood. Some of the remaining areas west of I-295 will rely on on-site wastewater treatment for the long-term future. Innovative technologies should be considered in some of these areas of Town.

5.4 SEWER EXTENSIONS

In general, it appears as though expanding the existing sewer collection system is the most cost-effective, technically feasible, and environmentally beneficial alternative in most of the 43 sewersheds that were evaluated. Expanding the sewer collection system is the most technically feasible option in certain areas of town, particularly around Oak Swamp Reservoir, where dense residential development, small lot sizes, and severe environmental constraints makes continued on-site wastewater treatment an impractical long-term wastewater strategy. For that reason, it makes practical sense to extend the existing sewer infrastructure along Central Avenue into that area of town. As a result, other areas in town that are along the proposed sewer alignment would have access to sewer.

Expanding sewer service in town is also consistent with Rhode Island's state guide plan - *Land Use 2025: Rhode Island State Land Use Policies and Plan*. The state guide plan identifies most of the Town of Johnston as within the State's urban services boundary. The urban services boundary is an area within the State that has been designated for urban development, which would benefit from the public sewers.

In addition, expanding sewer service is consistent with the economic development agenda of the town's Comprehensive Community Plan, particularly along Plainfield Pike and Hartford Avenue.

For these reasons, the evaluation of alternatives in most sewersheds included expanding and/or upgrading the existing sewer infrastructure.

5.4.1 *Wastewater Conveyance Alternatives*

Gravity Sewers

In general, the preferred wastewater conveyance alternative is via gravity sewers. The capital costs for installing gravity sewers are comparable to the capital costs of installing pressurized or vacuum sewers; however, the long-term operation and maintenance of gravity sewers is easier, less expensive, and more reliable.

The downside of gravity sewers is that they are limited by topography. Gravity sewers can be very expensive if they need to be deep or installed in ledge or groundwater. In some cases, it is impractical to install gravity sewers. For those reasons, alternate conveyance methods are considered, such as neighborhood pump stations, individual grinder pumps, and vacuum sewers.

Pump Stations

In some neighborhoods, the topography does not lend itself to a complete gravity system. In those areas, a single pump station may be required to lift the flow from the neighborhood to the main collection system. Given the uneven topography in Johnston pump stations may be required to convey flow from unsewered areas to the existing collection system. Therefore, centralized or neighborhood pump stations are considered a viable wastewater conveyance alternative and have been considered in the preferred alternative, as discussed in Section 6.

Individual Grinder Pumps

The ability of individual homes to connect to the existing or proposed gravity collection system depends on their position and elevation relative to the gravity sewer. In some cases,

one or more homes in a neighborhood may not be able to connect to an existing or proposed sewer because they are too low relative to the system. In other cases, entire neighborhoods may be too low to connect to an existing sewer. Each case must be evaluated individually to determine if it is more cost effective to install grinder pumps or a centralized pump station.

While grinder pumps can be valuable tools for connecting a homeowner to a public sewer, they are relatively expensive to install and maintain, and the costs are usually borne entirely by the homeowner. Because grinder pumps macerate solids into a slurry, the motors need to be larger than those of comparable solids handling pumps. The increased motor size adds to the pump installation cost, as well as the long-term operational cost due to the increase in electric usage. Another big disadvantage of grinder pumps is that homeowners do not always have a clear understanding of their ownership and maintenance responsibilities. Homeowners frequently assume that the town owns the grinder pump and is therefore responsible for maintenance and replacement. This can lead to confusion and ultimately a drain on town resources when a grinder pump needs to be replaced. For these reasons, it may be more practical to install a centralized pump station if the number of homes that require pressurized sewers is significant.

Despite these disadvantages, individual grinder pumps are considered a viable wastewater conveyance alternative and have been considered in the preferred alternatives, as discussed in Section 6.

Septic Tank Effluent Pump (STEP) System

A STEP system is hybrid system, a combination of on-site wastewater treatment and pressurized sewers. A STEP system typically utilizes a septic tank in a manner similar to an on-site wastewater treatment system (i.e., as a solids settling tank). However, the tank is equipped with a submersible style pump that pumps to a pressurized collection system in the street. The benefit of a STEP system is that it discharges settled wastewater to the collection system, which is easier to transport in a gravity system (less susceptible to clogs) and easier to treat at the treatment plant. The disadvantage of a STEP system is that, like a septic system, the septic tank needs to be pumped out every 3 to 5 years. In addition, the capital costs of installing a septic tank and pump can be expensive, and the operating costs are similar to those of a grinder pump system, which can also be expensive. STEP systems make

the most sense when an existing home with a septic system needs to connect to an existing or proposed pressurized collection system. An existing septic tank can be relatively easily modified to a STEP system without having to make too many modifications to the building plumbing. STEP systems are not very popular in Rhode Island mainly due to the need to pump out the tank.

Vacuum Sewers

Vacuum sewers are not considered to be a preferred or viable alternative due to their limited capacity and their severity of system failure when a failure occurs (i.e., raw wastewater can accumulate in connected buildings). While the energy costs associated with vacuum sewers can be less than individual grinder pumps or pump stations, the energy cost savings are offset by the expense of maintaining the lines and troubleshooting problem areas. In addition, the vacuum valve and sump located in individual homes is typically beyond the ability of a homeowner to replace or maintain, and therefore maintenance must be performed by a qualified contractor, at the expense of the homeowner.

SECTION 6.0 PLAN SELECTION

Based on the available alternatives described in previous sections of the Facilities Plan, the preferred alternative for the future of Johnston is to expand the existing sewer infrastructure into most of the unsewered areas of Johnston while maintaining continued use of on-site wastewater treatment systems in limited sections of town.

To accurately assess the environmental impacts, technical feasibility, and cost implications of the preferred alternative, the town was subdivided into 43 sewersheds. Each sewershed in the system was reviewed for the technical feasibility of expanding the existing sewer infrastructure to that sewershed. In cases where there is no likelihood of expanding the sewer to a particular sewershed in the 20-year timeframe of this plan, alternative wastewater management strategies were considered. The costs presented herein are approximate and are for budgetary scales only. The appropriateness of each sewershed layout, the various quantities assumed, and the costs, are approximate and must be further evaluated during the conceptual design phase of each alternative. Costs presented herein also include work on private property in order to establish connections to the proposed sewers, permission for which must be sought.

When reviewing the subsequent sections of this plan, consideration should be given to the nature of this evaluation, which is for planning purposes only. Specifically, the following considerations should be made:

- 1.) Recommendations for upgrades to the NBC-owned interceptor system are based upon a build-out of the Town of Johnston that anticipates development of the Town as stated in Section 4 of this Facility Plan. The assumed build-out is estimated based upon the best available information. The recommended upgrades may not be required or may be smaller in scope if development does not occur as estimated. Conversely, if build-out is greater than estimated, it may be necessary to upgrade beyond the recommendations stated in the facility plan.
- 2.) Recommendations for upgrades to the NBC-owned interceptor system are also based upon estimates of capacity during existing peak dry weather flows. The peaking factor used in this analysis was higher than that used in the 2007 Interceptor Capacity Report. The spreadsheets

in Appendix G of this Facility Plan display estimated capacities and highlight pipe segments with limited capacity. It is recommended that NBC conduct flow monitoring for a sufficient period of time to confirm whether a pipe has limited capacity. If flow monitoring results show that there is more capacity available than stated in the spreadsheets, recommended upgrades may not be required or may be smaller in scope.

- 3.) In some instances, certain NBC-owned pipes may marginally exceed their estimated capacity currently or in the future. The impact that these marginal pipe sections have on the overall system performance may not be significant and may cause only occasional or minor surcharging in system manholes. If this surcharging does not adversely impact system customers, it may not warrant pipe upgrades. To further evaluate these sections, it is recommended that a computerized sewer model be created for the NBC interceptor system in Johnston to evaluate the impact that these marginal system pipes will have on system performance. In addition, the model could be used to verify some of the other recommendations about future system improvements made herein.
- 4.) The flow rates utilized for the evaluation of wet weather flows are based on the theoretical five-year one-hour storm event of 1.55 inches/hour. Actual conditions in the Johnston collection system of the NBC interceptor system during a rain event may vary from what is described in this report.

6.1 SEWERSHED EVALUATION

6.1.1 Sewershed No.1

Sewershed 1 is located in the southeast portion of Johnston at the town line adjacent to the cities of Cranston and Providence. Sewershed 1 is located generally between Plainfield Street and Morgan Avenue and extends west to Atwood Avenue. The entire sewershed encompasses approximately 421 acres of land.

The topography of sewershed 1 is moderately sloped north to south and east to west. The highest and lowest ground surface elevations in the sewershed are 280 feet and 90 feet, respectively. The Pocasset River borders the southern perimeter of the sewershed and two streams run north to south from Central Avenue down to River Drive. Approximately 7 percent of the overall sewershed are RIGIS delineated wetlands.

Constraints to future development within the sewershed include the presence of streams, RI DEM regulated wetlands, and bedrock/slope considerations. Existing developed areas within the sewershed are primarily residential with some existing commercial/industrial south of Plainfield Street at the Pocasset River. Remaining undeveloped areas are zoned Residential and General Business. Pending development projects identified by the Town include F.M. Global (350,000 SF corporate office development) and Pocasset Mills (91 Multi-family residential units) have been incorporated into the 0 – 5 Year Planning Horizon. The build-out of vacant parcels within this sewershed revealed the potential for an additional 56 residential units south of Morgan Avenue (R-20 Zone), within the 5 – 10 Year Planning Horizon.

Approximately 263-acres of the overall 421-acre sewershed is currently serviced with sanitary sewers. The existing sewer includes Town-owned 8-inch sewers that range in material make of PVC, asbestos cement, and vitrified clay. The majority of the sewers, except those adjacent to Plainfield Street, drain toward one of the three operative pump stations: Sprague Circle, Lafazia Drive, and River Drive. The ultimate discharge point for sewershed 1 sanitary sewer flow is the NBC-owned 30-inch Plainfield Street primary interceptor that runs parallel to the Pocasset River.

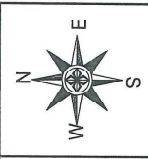
A portion of the main branch of NBC's JSI runs through sewershed 1. A 30-inch interceptor runs along Plainfield Street, beneath the Pocasset River toward the Providence city line. The evaluation of the existing system identified a number of pipe sections along Plainfield Street that are at or above capacity during dry and wet weather conditions. In addition, future flow from the anticipated build-out of sewershed 1, along with the upstream tributary sewersheds, would exacerbate the capacity issues along Plainfield Street. As a result, much of the interceptor along Plainfield Street will need to be upgraded over the next 20 years. Those upgrades are depicted in Figure 6-1. The upgrades include approximately 6,000 feet of 42-inch pipe between manhole J100056 and I190011. Costs associated with these improvements are shown in Table 6-1.

It should be noted that a small portion (i.e., 900 feet) of the Plainfield Street interceptor is located in sewershed 22. This portion of the Plainfield Street interceptor should also be upgraded. Because it is assumed that this upgrade would be completed concurrently to the upgrade in sewershed 1, the cost of the entire upgrade (i.e., both sewersheds) is included in cost breakdown in Table 6-1.

TABLE 6-1 SEWERSHED 1 - OPINION OF PROBABLE CONSTRUCTION COSTS NBC INTERCEPTOR UPGRADES				
	Quantity	Unit Price	Unit	Total
1.Sewer Main Installation				
a. Gravity Line Installation (42-inches)	6,030	\$ 215.74/LF		\$ 1,421,533.42
b. Force Main Installation	0	\$ -/LF		\$ -
2.Manholes	26	\$ 7,000.00/EACH		\$ 182,000.00
3.Rock Removal 0% (None)	0	\$ 100.00/CY		\$ -
4.Pavement Restoration (State)	515	\$ 100.00/TON		\$ 51,510.42
5.Traffic Protection	13	\$ 960.00/DAY		\$ 12,480.00
6.Temporary Bypass Pumping	25	\$ 6,500.00/WEEK		\$ 162,500.00
7.New Service Connection	15	\$ 4,000.00/EACH		\$ 60,000.00
8.Pump Station Upgrade	0	\$ 200,000.00/EACH		\$ -
9.Legal Fees for Easement Development	0	\$ 10,000.00/PARCEL		\$ -
			Sub-Total	\$ 1,890,023.83
10.Mobilization/Demobilization (10%)				\$ 189,000.00
11.Utility Coordination (5%)				\$ 95,000.00
12.Engineering/Design/Permitting/Construction Admin (10 %)				\$ 189,000.00
13.Contingency (20%)				\$ 473,000.00
			SEWERSHED TOTAL	\$ 2,800,000.00

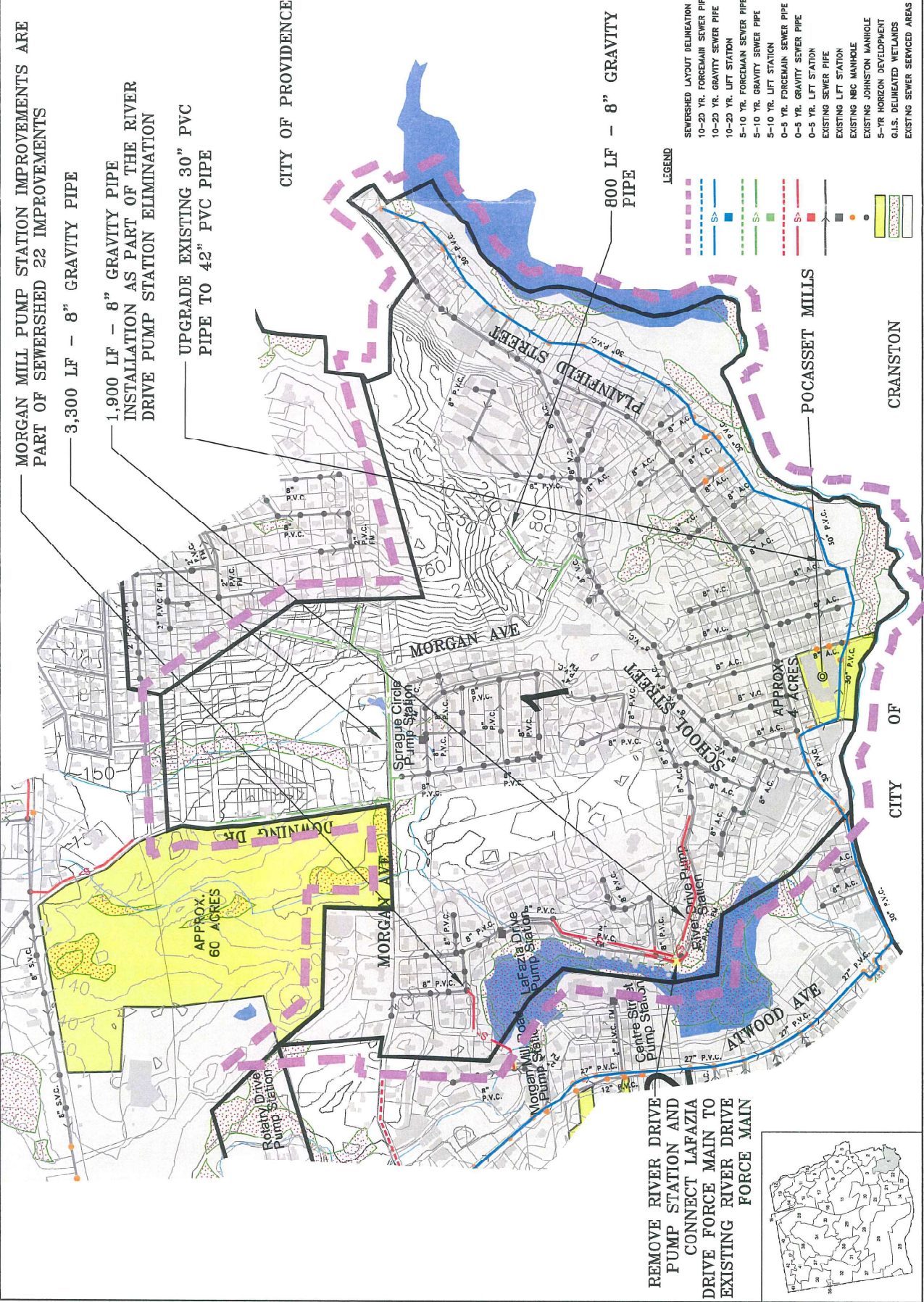
The proposed additions to the existing sewer in this sewershed includes a 3,100 LF extension of 8-inch sewer into the existing residential development of Downing Drive and Appian Way as illustrated in Figure 6-1. In addition, the existing River Drive Pump Station could potentially be eliminated with an extension of the existing gravity sewer within River Drive. The River Drive service area could discharge to the LaFazia Drive pump station with upgrades to the LaFazia Drive pump station and a connection of the two force mains within River Drive. Extensions to the existing sewer for pending development projects and build-out of vacant parcels are projected to occur within the 0 – 5 Year Planning Horizon and 5 – 10 year Planning Horizon, respectively. In addition, future sewers to existing structures includes the extension of sewers to approximately 36 existing residences within the 5 – 10 Year Planning Horizon. Costs associated with these improvements are shown in Table 6-2.

TABLE 6-2 SEWERSHED 1 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
5-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	1,900	\$ 53.35 /LF	\$	139,368.52
b. Force Main Installation (2-inches)	300	\$ 42.03 /LF	\$	12,669.56
2.Manholes	10	\$ 2,500.00 /EACH	\$	25,000.00
3.Rock Removal 5%	163	\$ 100.00 /CY	\$	16,300.00
4.Pavement Restoration (Town)	1,026	\$ 100.00 /TON	\$	102,605.56
5.Traffic Protection	44	\$ 960.00 /DAY	\$	42,240.00
6.New Service Connection	37	\$ 4,000.00 /EACH	\$	148,000.00
7.Pump Station Upgrade	1	\$ 190,000.00 /EACH	\$	190,000.00
8.Pump Station Telemetry	1	\$ 10,000.00 /LS	\$	10,000.00
9.Legal Fees for Easement Development	1	\$ 10,000.00 /PARCEL	\$	10,000.00
			Sub-Total \$	696,183.63
10.Mobilization/Demobilization (10%)			\$	70,000.00
11.Utility Coordination (5%)			\$	35,000.00
12.Engineering/Design/Permitting/Construction Admin (10 %)			\$	70,000.00
13.Contingency (20%)			\$	174,000.00
			5-year TOTAL \$	1,000,000.00
10-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	4,100	\$ 53.35 /LF	\$	300,742.59
2.Manholes	21	\$ 2,500.00 /EACH	\$	52,920.00
3.Rock Removal 5%	304	\$ 100.00 /CY	\$	30,400.00
4.Pavement Restoration (town)	1,912	\$ 100.00 /TON	\$	191,219.44
5.Traffic Protection	82	\$ 960.00 /DAY	\$	78,720.00
6.New Service Connection	92	\$ 4,000.00 /EACH	\$	368,000.00
7.Pump Station Construction	0	\$ - /EACH	\$	-
8.Legal Fees for Easement Development	0	\$ 10,000.00 /PARCEL	\$	-
			Sub-Total \$	1,022,002.04
9.Mobilization/Demobilization (10%)			\$	102,000.00
10.Utility Coordination (5%)			\$	51,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)			\$	102,000.00
12.Contingency (20%)			\$	255,000.00
			10-year TOTAL \$	1,500,000.00
			SEWERSHED TOTAL	2,500,000.00



TOWN OF JOHNSTON FACILITIES PLAN
SEWERED NO.1
MORGAN AVENUE & PLAINFIELD STREET

SCALE: 1" = 600'
FIGURE:
6-1



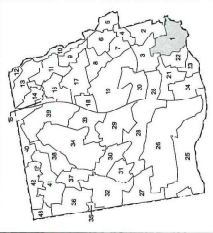
MORGAN MILL PUMP STATION IMPROVEMENTS ARE PART OF SEWERED 22 IMPROVEMENTS
3,300 LF - 8" GRAVITY PIPE
1,900 LF - 8" GRAVITY PIPE INSTALLATION AS PART OF THE RIVER DRIVE PUMP STATION ELIMINATION
UPGRADE EXISTING 30" PVC PIPE TO 42" PVC PIPE

CITY OF PROVIDENCE

800 LF - 8" GRAVITY PIPE

- LEGEND
- SEWERED LAYOUT DELINEATION
 - 10-20 YR. FOREMAIN SEWER PIPE
 - 10-20 YR. GRAVITY SEWER PIPE
 - 10-20 YR. LIFT STATION
 - 5-10 YR. FOREMAIN SEWER PIPE
 - 5-10 YR. GRAVITY SEWER PIPE
 - 5-10 YR. LIFT STATION
 - 0-5 YR. FOREMAIN SEWER PIPE
 - 0-5 YR. GRAVITY SEWER PIPE
 - 0-5 YR. LIFT STATION
 - EXISTING SEWER PIPE
 - EXISTING LIFT STATION
 - EXISTING NEC MANHOLE
 - EXISTING JOHNSTON MANHOLE
 - 5-YR HORIZON DEVELOPMENT
 - G.L.S. DELINEATED WETLANDS
 - EXISTING SEWER SERVED AREAS

REMOVE RIVER DRIVE PUMP STATION AND CONNECT LAFAZIA DRIVE FORCE MAIN TO EXISTING RIVER DRIVE FORCE MAIN



6.1.2 Sewershed No.2

Sewershed 2 is located in the southeast corner of Johnston at the town line adjacent to the City of Providence. Central Avenue runs through the center of sewershed 2 with Hartford Avenue at the northern limit and Ipswich Street at the southern limit. The entire sewershed encompasses approximately 291 acres of land, of which approximately 7 percent (21.7 acres) is *RIGIS* delineated wetlands.

Constraints to future development within the sewershed include the presence of streams, RI DEM regulated wetlands, and bedrock/slope considerations. In addition to the natural constraints, National Grid power transmission lines pass through the sewershed directly through the vacant parcels. Existing developed areas within the sewershed are primarily residential. Remaining undeveloped areas are zoned Residential (R-20 Zone). The build-out of vacant parcels within this sewershed identified the potential for an additional 35 residential units (R-15 Zone) north of Central Avenue, projected within the 5 – 10 Year Planning Horizon. Service to the projected development is anticipated to be a small 8-inch sewer extension from the existing sewer from nearby Tafts Avenue. Refer to Figure 6-2.

Approximately 200-acres (69 percent) of the overall 291-acre sewershed is currently serviced with sanitary sewers. The existing sewer includes Town-owned 8-inch sewers that range in material make of PVC, asbestos cement, and vitrified clay. Town-owned sewers also include an existing 6-inch force main formerly used by the Central Avenue pump station and now used by Memorial Plat within sewershed 3 and a small pump station serving a low lying residential development along Susan Circle off Central Avenue. An 8-inch secondary branch of the NBC-owned JSI is located along Ashby Street, Alden Street, Whittesley Road, and Harding Avenue near the western edge of this sewershed where it discharges to an 8-inch line on Hartford Avenue.

The evaluation of the existing system identified a number of pipe sections along this secondary branch that exceed their capacity during wet weather conditions. The SSES identified this section of pipe as having excessive inflow during wet weather conditions, from J120002 to J110002. This inflow appears to cause these pipe sections to exceed their capacity during wet weather conditions. Therefore, rather than upgrade this line, it appears as though further investigation into inflow is warranted to reduce wet weather flow in these pipes.



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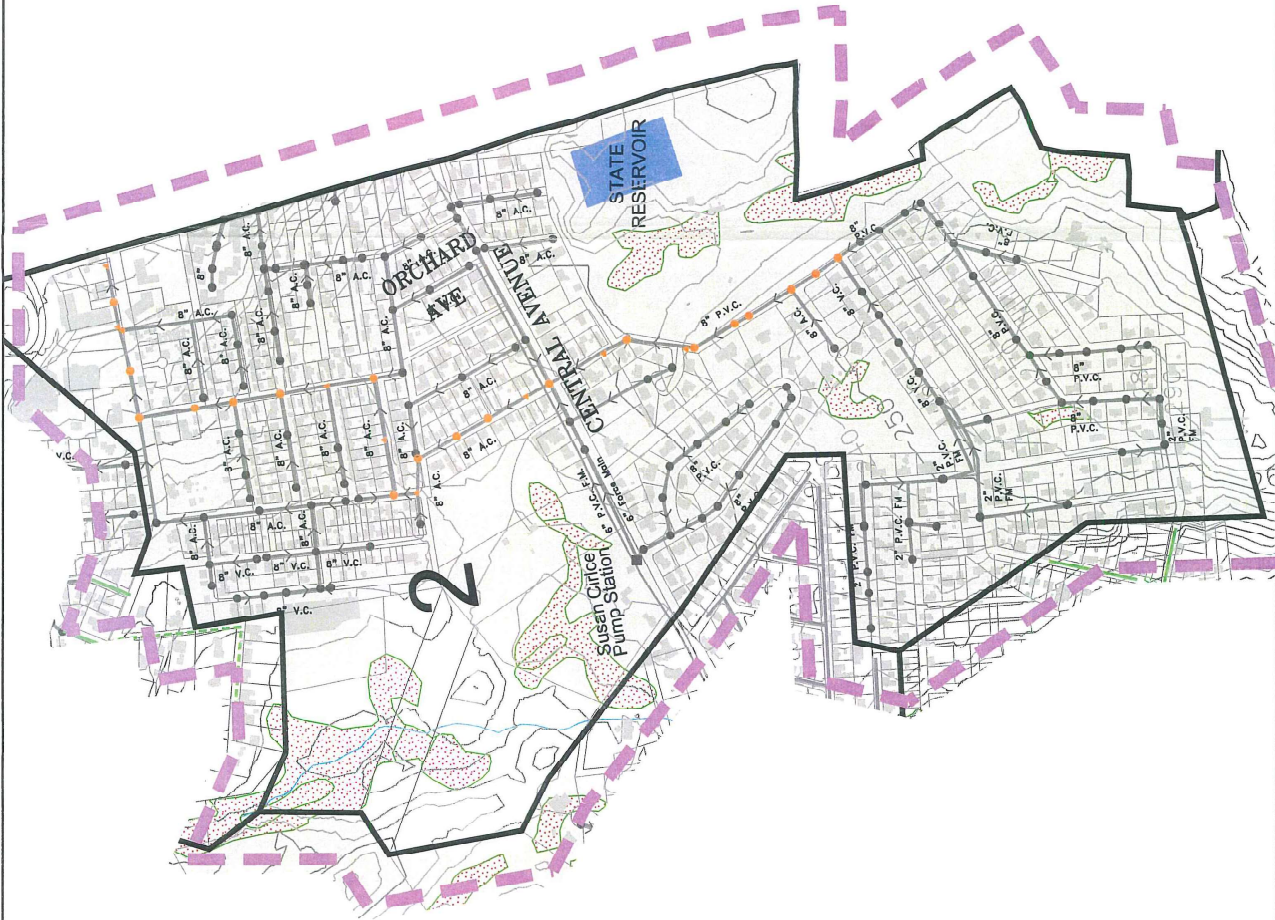
TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 MORGAN AVENUE & PLAINFIELD STREET

SCALE: 1" = 600'

FIGURE:

6-2

- LEGEND**
- SEWERSHED LAYOUT DELINEATION
 - 10-20 YR. FORCEMAIN SEWER PIPE
 - 10-20 YR. GRAVITY SEWER PIPE
 - 10-20 YR. LIFT STATION
 - 5-10 YR. FORCEMAIN SEWER PIPE
 - 5-10 YR. GRAVITY SEWER PIPE
 - 5-10 YR. LIFT STATION
 - 0-5 YR. FORCEMAIN SEWER PIPE
 - 0-5 YR. GRAVITY SEWER PIPE
 - 0-5 YR. LIFT STATION
 - EXISTING SEWER PIPE
 - EXISTING LIFT STATION
 - EXISTING INB MANHOLE
 - EXISTING JOHNSTON MANHOLE
 - 5-YR. HORIZON DEVELOPMENT
 - G.I.S. DELINEATED WETLANDS
 - EXISTING SEWER SERVICED AREAS



6.1.3 Sewershed No.3

Sewershed 3 is located in the southeast portion of Johnston along Central Avenue. Sewershed 3 is located on the east side of Atwood Avenue and extends up to and includes Memorial Plat. The entire sewershed encompasses approximately 318 acres of land. Approximately 214 acres of the overall 318-acre sewershed is currently serviced with sanitary sewers.

The topography of sewershed 3 is moderately sloped north to south and east to west. The highest and lowest ground surface elevations in the sewershed are 215 feet and 100 feet, respectively. RI Route 6 borders the northern edge of the sewershed and Atwood Avenue borders portions of the western perimeter. Approximately 13 percent of the overall sewershed is RIGIS delineated wetlands. Refer to Figure 6-3.

Constraints to future development within the sewershed include the presence of streams, RI DEM regulated wetlands, and bedrock/slope considerations. The wetlands and stream constraints limit the amount of possible build-out of the vacant land. Existing developed areas within the sewershed are mixed, with residential on the eastern side of the sewershed and commercial along the frontage of Atwood Avenue. Future sewer projects identified by the Town include the Memorial Plat development project (115 single-family residences – Capital Budget Program) within the 0 – 5 Year Planning Horizon. The build-out of vacant parcels within sewershed 3 could yield an additional 30 residential units based on current zoning (R-20 Zone), within the 5 – 10 Year Planning Horizon.

The existing sewer includes Town-owned 8-inch PVC sewers. With the exception of the Atwood Avenue interceptor, all of the existing sewers within this sewershed drain to the Central Avenue pump station. Until recently, the Central Avenue pump station discharged east to a manhole in Central Avenue at Orchard Street, ultimately discharging to an NBC-owned secondary interceptor branch at along Ashby Street. NBC recently upgraded the Central Avenue pump station and rerouted the existing force main from the Central Avenue Pump Station to a recently installed 27-inch interceptor on Atwood Avenue.

Improvements to the sanitary infrastructure in this sewershed include the installation of new sewer service to residents of Memorial Plat. These improvements include 1,100 linear feet of 8-inch gravity pipe, 5,200 linear feet of 1½-inch force main and approximately 115 grinder pump

installations. Future sewers to Memorial Plat and build-out of vacant parcels are projected to occur within the 0 – 5 Year Planning Horizon, while future sewers to existing structures (3 residences) is projected to occur within the 5 – 10 Year Planning Horizon. Costs associated with these improvements are shown in Table 6-3.

TABLE 6-3 SEWERSHED 3 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
5-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	1,100	\$ 53.35	/LF	\$ 80,687.04
b. Force Main Installation (1 1/2-inches)	0	\$ 41.20	/LF	\$ -
2.Manholes	6	\$ 2,500.00	/EACH	\$ 15,000.00
3.Rock Removal 5%	61	\$ 100.00	/CY	\$ 6,100.00
4.Pavement Restoration	513	\$ 100.00	/TON	\$ 51,302.78
5.Traffic Protection	22	\$ 960.00	/DAY	\$ 21,120.00
6.New Service Connection	115	\$ 4,000.00	/EACH	\$ 460,000.00
7.Pump Station Construction	0	-	/EACH	\$ -
8.Legal Fees for Easement Development	0	\$ 10,000.00	/PARCEL	\$ -
			Sub-Total	\$ 634,209.81
9.Mobilization/Demobilization (10%)				\$ 63,000.00
10.Utility Coordination (5%)				\$ 32,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)				\$ 63,000.00
12.Contingency (20%)				\$ 158,000.00
			5-year TOTAL	\$ 1,000,000.00
10-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation	0	-	/LF	\$ -
b. Force Main Installation	0	-	/LF	\$ -
2.Manholes	0	-	/EACH	\$ -
3.Rock Removal 5%	0	\$ 100.00	/CY	\$ -
4.Pavement Restoration	0	\$ 100.00	/TON	\$ -
5.Traffic Protection	6	\$ 960.00	/DAY	\$ 5,760.00
6.New Service Connection	3	\$ 4,000.00	/EACH	\$ 12,000.00
7.Pump Station Construction	0	-	/EACH	\$ -
8.Legal Fees for Easement Development	0	\$ 10,000.00	/PARCEL	\$ -
			Sub-Total	\$ 17,760.00
9.Mobilization/Demobilization (10%)				\$ 2,000.00
10Utility Coordination (5%)				\$ 1,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)				\$ 2,000.00
12.Contingency (20%)				\$ 5,000.00
			10-year TOTAL	\$ 28,000.00
			SEWERSHED TOTAL	\$ 1,100,000.00



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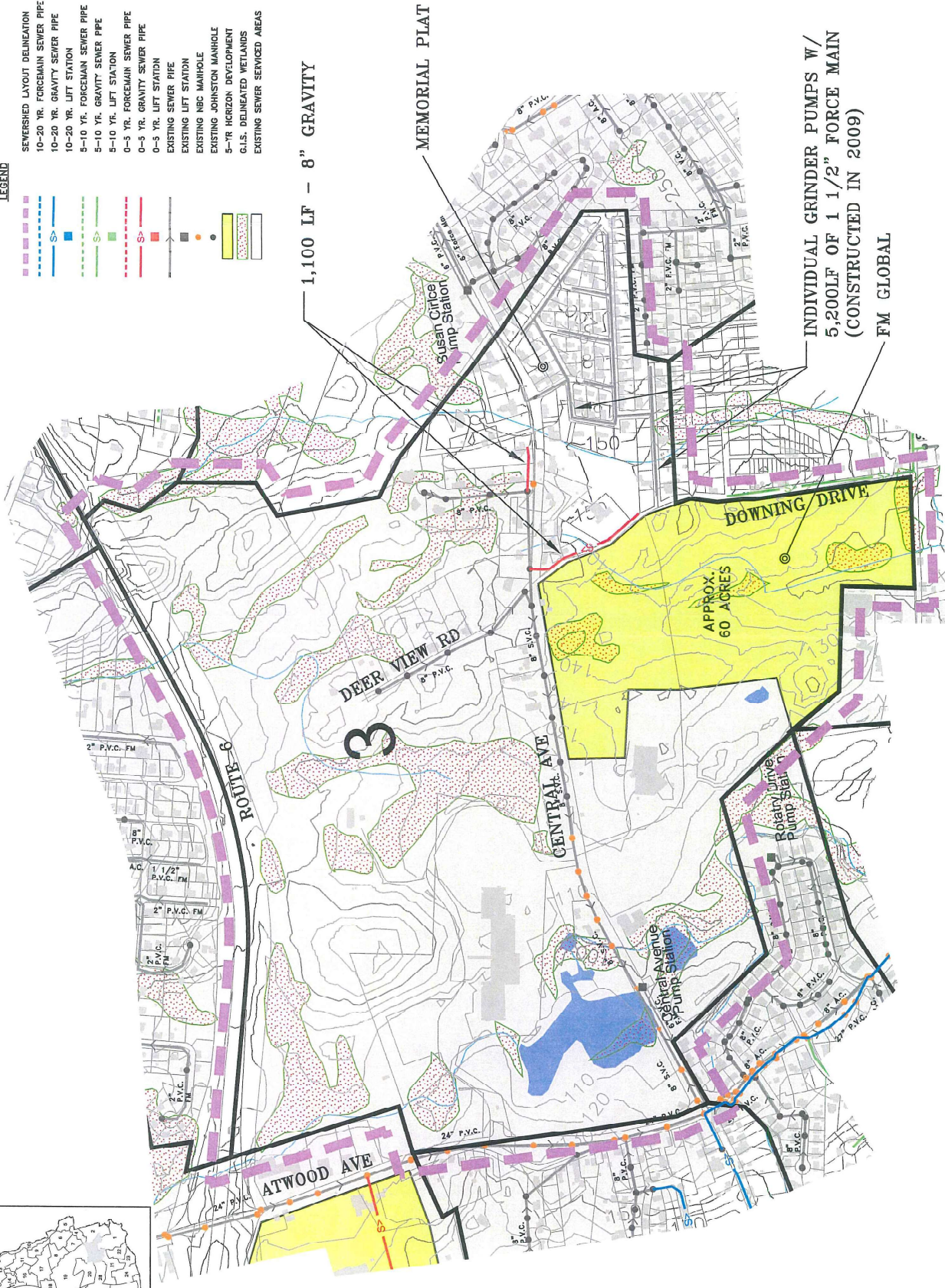
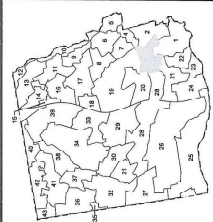


TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 SEWERSHED NO. 3
 CENTRAL AVE & DEER VIEW RD

SCALE: 1" = 600'
 FIGURE:

6-3

- LEGEND**
- SEWERSHED LAYOUT DELINEATION
 - 10-20 YR. FORCEMAIN SEWER PIPE
 - 10-20 YR. GRAVITY SEWER PIPE
 - 10-20 YR. LIFT STATION
 - 5-10 YR. FORCEMAIN SEWER PIPE
 - 5-10 YR. GRAVITY SEWER PIPE
 - 5-10 YR. LIFT STATION
 - 0-5 YR. FORCEMAIN SEWER PIPE
 - 0-5 YR. GRAVITY SEWER PIPE
 - 0-5 YR. LIFT STATION
 - EXISTING SEWER PIPE
 - EXISTING LIFT STATION
 - EXISTING NBC MANHOLE
 - EXISTING JOHNSTON MANHOLE
 - 5+ YR. HORIZON DEVELOPMENT
 - C.I.S. DELINEATED WETLANDS
 - EXISTING SEWER SERVICED AREAS



INDIVIDUAL GRINDER PUMPS W/
 5,200LF OF 1 1/2" FORCE MAIN
 (CONSTRUCTED IN 2009)
 FM GLOBAL

1,100 LF - 8" GRAVITY

APPROX.
 60 ACRES

6.1.4 Sewershed No.4

Sewershed 4 is located on the eastern town limits of Johnston on either side of RI Route 6. The majority of sewershed 4 is north of RI Route 6, but also includes a portion south of RI Route 6 where Hartford Avenue passes over the highway. The entire sewershed encompasses approximately 115 acres of land.

The topography of Sewershed 4 is moderately sloped south to north and west to east. The highest and lowest ground surface elevations in the sewershed are 200 feet and 80 feet, respectively. There are approximately 2-acres of RIGIS delineated wetlands within the sewershed and no vacant land available for development.

Approximately 85-acres of the overall 115-acre sewershed is currently serviced with sanitary sewers. The existing sewer includes Town-owned 8-inch pipes that range in material make of PVC, asbestos cement, and vitrified clay. All of the sewers within this sewershed drain to the existing NBC-owned 27-inch Dyerville Avenue interceptor. The sewershed is composed of primarily commercial and residential uses.

Improvements in this sewershed include an 8-inch pipe extension into Hartford Avenue to provide conveyance of sanitary flows to the 26 residential dwelling units fronting on Hartford Avenue, Woodward Road, and Valley View Drive. This improvement would include an 850-ft extension of 8-inch gravity sewer and a 1,200 linear feet of 1-½ inch force main to service those utilizing grinder pumps on Woodward Road and Valley View Drive as illustrated in Figure 6-4. The extension across Hartford Avenue to the existing dwellings (26 residential units) are planned to occur within the 5 – 10 Year Planning Horizon of the Town's Facility Plan. Costs associated with these improvements are shown in Table 6-4.

TABLE 6-4				
SEWERSHED 4 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
5-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	400	\$ 53.35/LF		\$ 29,340.74
2.Manholes	2	\$ 2,500.00/EACH		\$ 5,000.00
3.Rock Removal 5%	30	\$ 100.00/CY		\$ 3,000.00
4.Pavement Restoration				
a. Town owned Road	187	\$ 100.00/TON		\$ 18,655.56
5.Traffic Protection	8	\$ 960.00/DAY		\$ 7,680.00
6.New Service Connection	1	\$ 4,000.00/EACH		\$ 4,000.00
7.Pump Station Construction	0	\$ - /LS		\$ -
8.Legal Fees for Easement Development	0	\$ 10,000.00/PARCEL		\$ -
			Sub-Total	\$ 67,676.30
9.Mobilization/Demobilization (10%)				\$ 7,000.00
10.Utility Coordination (5%)				\$ 3,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)				\$ 7,000.00
12.Contingency (20%)				\$ 17,000.00
			5-year TOTAL	\$ 102,000.00
10-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	850	\$ 53.35/LF		\$ 62,349.07
b. Grinder Force Main Installation (2-inches)	1,200	\$ 42.03/LF		\$ 50,678.22
2.Manholes	5	\$ 2,500.00/EACH		\$ 12,501.00
3.Rock Removal 5%	152	\$ 100.00/CY		\$ 15,200.00
4.Pavement Restoration				
a. Town owned Road	770	\$ 100.00/TON		\$ 76,954.17
b. State owned Road	319	\$ 100.00/TON		\$ 31,944.44
5.Traffic Protection	41	\$ 960.00/DAY		\$ 39,360.00
6.New Service Connection by Gravity	10	\$ 4,000.00/EACH		\$ 40,000.00
7.New Service Connection with Grinder Pump	16	\$ 9,000.00/EACH		\$ 144,000.00
8.Legal Fees for Easement Development	\$	10,000.00/PARCEL		\$ -
			Sub-Total	\$ 472,986.91
9.Mobilization/Demobilization (10%)				\$ 47,000.00
10.Utility Coordination (5%)				\$ 24,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)				\$ 47,000.00
12.Contingency (20%)				\$ 118,000.00
			10-year TOTAL	\$ 710,000.00
			SEWERSHED TOTAL	\$ 820,000.00



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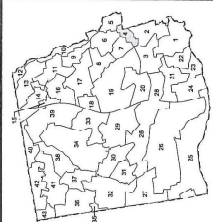
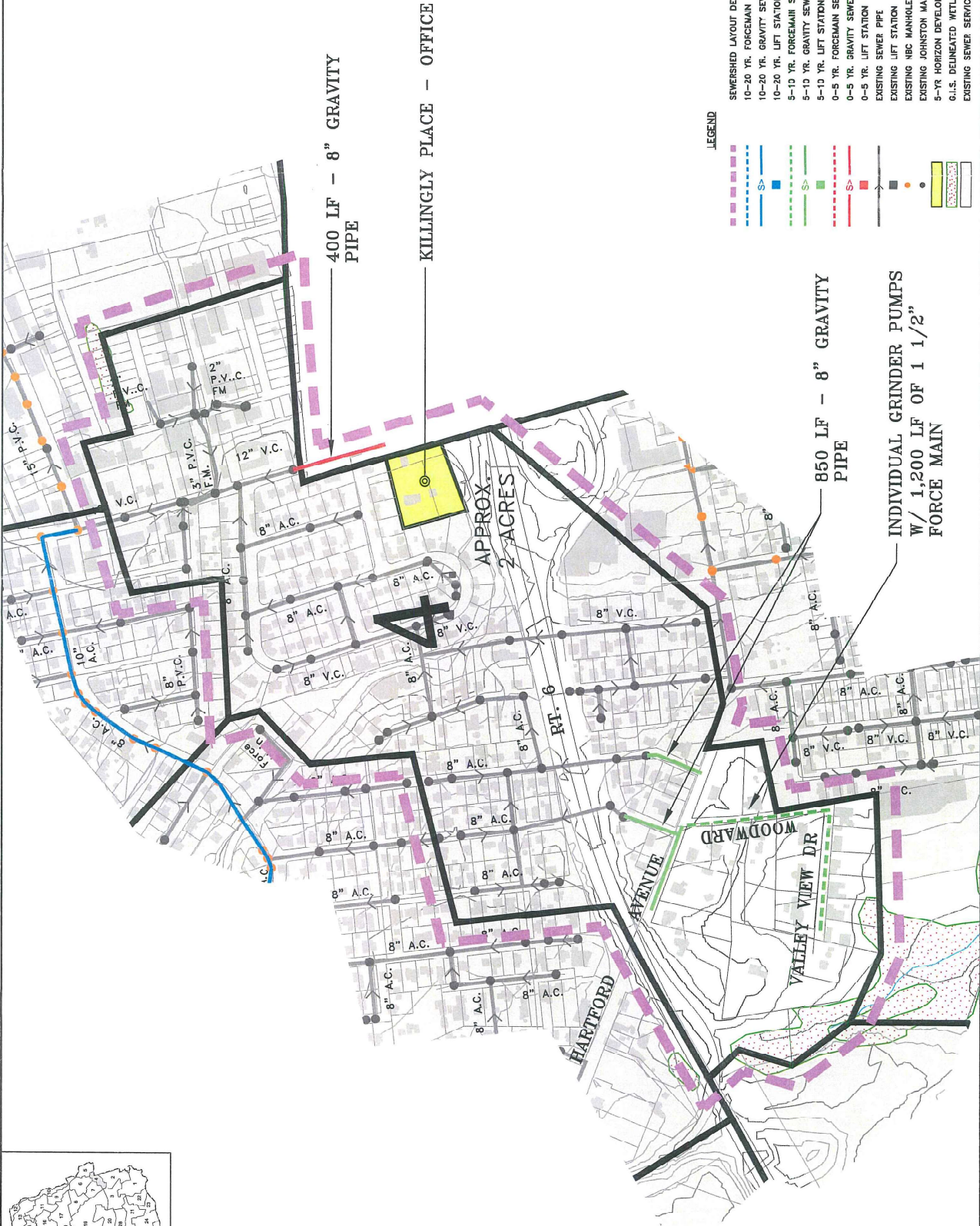


TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 SEMERSHED NO. 4
 HARTFORD AVENUE & WOODWARD ROAD

SCALE: 1" = 40'
 FIGURE:

6-4

- LEGEND**
- SEWERED LAYOUT DELINEATION
 - 10-20 YR. FORCEMAIN SEWER PIPE
 - 10-20 YR. GRAVITY SEWER PIPE
 - 10-20 YR. LIFT STATION
 - 5-10 YR. FORCEMAIN SEWER PIPE
 - 5-10 YR. GRAVITY SEWER PIPE
 - 5-10 YR. LIFT STATION
 - 0-5 YR. FORCEMAIN SEWER PIPE
 - 0-5 YR. GRAVITY SEWER PIPE
 - 0-5 YR. LIFT STATION
 - EXISTING SEWER PIPE
 - EXISTING LIFT STATION
 - EXISTING NBC MANHOLE
 - EXISTING JOHNSTON MANHOLE
 - 5-YR. HORIZON DEVELOPMENT
 - 6-I.S. DELINEATED WETLANDS
 - EXISTING SEWER SERVICED AREAS



6.1.5 *Sewershed No.6 and No.7*

Sewershed 6 and 7 are located in the central-eastern section of Johnston near the Town line adjacent to the City of Providence. These two sewersheds includes scattered commercial and residential neighborhoods located along and east of Killingly Street, and heading north to Greenville Avenue. The two sewersheds encompass approximately 406 acres, of which approximately 10 acres are RIGIS delineated wetlands.

Constraints to future development within these two sewersheds include the presence of streams and RI DEM regulated wetland considerations. Existing developed areas within the sewershed are mixed with Killingly Street primarily a commercial corridor (B-2 General Business Zone) and existing residential neighborhoods to the west. Remaining undeveloped areas are zoned Residential (R-20 Zone). Pending development projects identified by the Town include Rosemont/Elmhurst (1 residential unit) projected within the 0 – 5 Year Planning Horizon. The build-out of vacant parcels within this sewershed revealed the potential for an additional 34 residential units within the western section of the sewershed, projected within the 5 – 10 Year Planning Horizon.

Approximately 95 percent of the overall 406-acre sewershed is currently served by sanitary sewers. The existing sewer includes 8-inch and 10-inch sewers that range in material make of PVC, asbestos cement, and vitrified clay. Included within this sewershed is an NBC-owned secondary branch of the JN1, which begins east of Lee Street on Greenville Avenue and connects to the primary branch at the intersection of Traver Avenue. Within sewershed 6 and 7 is the Borden Avenue secondary branch of the Johnston-North interceptor that begins at the Hartford Avenue and Borden Avenue intersection, travels along Borden Avenue and discharges further downstream at Dyerville Avenue. The evaluation of the existing system identified a number of pipe sections along Borden Avenue in sewershed 6 and sewershed 7 that are at or above capacity during dry and wet weather conditions. These pipes should be upgraded to accommodate the existing flow in this line. The upgrades required include approximately 2,200 feet of 12-inch sewer between J130002 and I130012. These upgrades are depicted on Figure 6-5, and a cost breakdown for these upgrades is provided in Table 6-5, below.

TABLE 6-5 SEWERSHED 6 + 7 - OPINION OF PROBABLE CONSTRUCTION COSTS - NBC INTERCEPTOR UPGRADES				
	Quantity	Unit Price	Unit	Total
1.Sewer Main Installation				
a. Gravity Line Installation (12-inches)	2,200	\$ 64.87	/LF	\$ 186,710.74
b. Force Main Installation	0	-	/LF	\$ -
2.Manholes	17	\$ 2,500.00	/EACH	\$ 42,500.00
3.Rock Removal 0% (None)	0	\$ 100.00	/CY	\$ -
4.Pavement Restoration (Town)	1,026	\$ 100.00	/TON	\$ 102,605.56
5.Traffic Protection	44	\$ 960.00	/DAY	\$ 42,240.00
6.Temporary Bypass Pumping	9	\$ 6,500.00	/WEEK	\$ 58,500.00
7.New Service Connection	35	\$ 4,000.00	/EACH	\$ 140,000.00
8.Pump Station Upgrade	0	\$ 200,000.00	/EACH	\$ -
9.Legal Fees for Easement Development	0	\$ 10,000.00	/PARCEL	\$ -
			Sub-Total	\$ 572,556.30
10.Mobilization/Demobilization (10%)			\$	57,000.00
11.Utility Coordination (5%)			\$	29,000.00
12.Engineering/Design/Permitting/Construction Admin (10 %)			\$	57,000.00
13.Contingency (20%)			\$	143,000.00
			SEWERSHED TOTAL	\$ 900,000.00

There are no new sewers proposed within this sewershed, other than new service connections. Costs associated with service connections of this sewershed during the 0 – 5 and the 5 – 10 Year Horizon of the Planning Period have been included in Table 6-6, below.

TABLE 6-6 SEWERSHED 6 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
5-year Horizon				
1.Sewer Main Installation	0	\$ - /LF	\$	-
2.Manholes	0	\$ 2,500.00/EACH	\$	-
3.Rock Removal 5%	0	\$ 100.00/CY	\$	-
4.Pavement Restoration				
a. Town owned Road	0	\$ 100.00/TON	\$	-
5.Traffic Protection	2	\$ 960.00/DAY	\$	1,920.00
6.New Service Connection	1	\$ 4,000.00/EACH	\$	4,000.00
7.Pump Station Construction	0	\$ - /LS	\$	-
8.Legal Fees for Easement Development		\$ 10,000.00/PARCEL	\$	-
			Sub-Total \$	5,920.00
9.Mobilization/Demobilization (10%)			\$	600.00
10.Utility Coordination (5%)			\$	300.00
11.Engineering/Design/Permitting/Construction Admin (10 %)			\$	600.00
12.Contingency (20%)			\$	1,000.00
			5-year TOTAL \$	8,000.00
10-year Horizon				
1.Sewer Main Installation	0	\$ - /LF	\$	-
2.Manholes	0	\$ 2,500.00/EACH	\$	-
3.Rock Removal 5%	0	\$ 100.00/CY	\$	-
4.Pavement Restoration				
a. Town owned Road	0	\$ 100.00/TON	\$	-
5.Traffic Protection	68	\$ 960.00/DAY	\$	65,280.00
6.New Service Connection	34	\$ 4,000.00/EACH	\$	136,000.00
7.Pump Station Construction	0	\$ - /LS	\$	-
8.Legal Fees for Easement Development		\$ 10,000.00/PARCEL	\$	-
			Sub-Total \$	201,280.00
9.Mobilization/Demobilization (10%)			\$	20,000.00
10.Utility Coordination (5%)			\$	10,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)			\$	20,000.00
12.Contingency (20%)			\$	50,000.00
			10-year TOTAL \$	300,000.00
			SEWERSHED TOTAL \$	308,000.00



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TOWN OF JOHNSTON FACILITIES PLAN
 SEWER IMPROVEMENTS
 HARTFORD AVENUE & WOODWARD ROAD

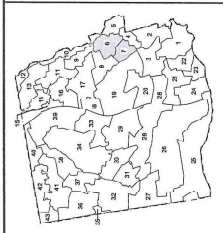
SCALE: 1" = 800'

FIGURE:

6-5

UPGRADE EXISTING
 8-INCH AC TO NEW
 12-INCH PVC ON
 BORDEN AVENUE

- LEGEND**
- SEWERSHED LAYOUT DELINEATION
 - 10-20 YR. FORCEMAIN SEWER PIPE
 - 10-20 YR. GRAVITY SEWER PIPE
 - 10-20 YR. LIFT STATION
 - 5-10 YR. FORCEMAIN SEWER PIPE
 - 5-10 YR. GRAVITY SEWER PIPE
 - 5-10 YR. LIFT STATION
 - 0-5 YR. FORCEMAIN SEWER PIPE
 - 0-5 YR. GRAVITY SEWER PIPE
 - 0-5 YR. LIFT STATION
 - EXISTING SEWER PIPE
 - EXISTING LIFT STATION
 - EXISTING REC MANHOLE
 - EXISTING JOHNSTON MANHOLE
 - 5-YE HORIZON DEVELOPMENT
 - 6.I.S. DELINEATED WETLANDS
 - EXISTING SEWER SERVICED AREAS



6.1.6 Sewershed No.8

Sewershed 8 is located in the eastern-central section of Johnston, approximately one-half mile north of RI Route 6, one-quarter mile east of RI Route 5, and just west of Greenville Avenue. Currently, approximately 105 acres of the overall 246-acre sewershed is currently served by sanitary sewers.

The topography of Sewershed 8 is moderately sloped south to north and west to east. The highest and lowest ground surface elevations in the sewershed are 205 feet and 112 feet, respectively. Approximately 34 percent of the area is RIGIS delineated wetlands within the sewershed with approximately half of the entire sewershed available for development.

Constraints to future development within the sewershed include the presence of streams, RI DEM regulated wetlands, and bedrock/slope considerations. The existing sewer includes Town-owned 8-inch pipes that range in material make of PVC and vitrified clay, with one stretch of pressurized pipe from the use of individual grinder pumps. All of the sewers within this sewershed drain to the existing NBC-owned 12-inch Greenville Avenue secondary branch of the JN1.

Existing development within the sewershed is predominantly residential. Remaining undeveloped areas (mostly on the western half of the sewershed) are zoned Residential and Planned Business. Pending development projects identified by the Town include roughly 10 percent (17 residential units) of the residential development of Cherry Hill Road west of Greenville Avenue (the remaining 90 percent of the Cherry Hill development is within sewershed 19), projected to occur within the 0 – 5 Year Planning Horizon. The build-out of vacant parcels within this sewershed identified the potential for an additional 21 residential units (R-15 Zone), 38 residential units (R-20 Zone), and 11 acres (Planned Business Zone) within the 5 – 10 Year Planning Horizon. Improvements to the current sewer infrastructure would include a small 8-inch pipe extension from the existing 8-inch PVC pipe in Cherry Hill Road to provide conveyance of sanitary flows to the residents further upstream.

The proposed improvement includes a 1,200 linear feet increase of 8-inch gravity sewer as illustrated in Figure 6-6. Improvements to the existing sewer for the Cherry Hill development project is projected within the 0 – 5 Year Planning Horizon, while the build-out of vacant parcels

are projected to occur within the 5 – 10 Year Planning Horizon. Costs associated with these improvements are shown in Table 6-7 below.

TABLE 6-7 SEWERSHED 8 - OPINION OF PROBABLE CONSTRUCTION COSTS - TOWN-OWNED SEWER				
	Quantity	Unit Price	Unit	Total
5-year Horizon				
1.Sewer Main Installation				
a. Gravity Line Installation (8-inches)	1,200	\$ 53.35/LF		\$ 88,022.22
2.Manholes	6	\$ 2,500.00/EACH		\$ 15,000.00
3.Rock Removal 5%	89	\$ 100.00/CY		\$ 8,900.00
4.Pavement Restoration	560	\$ 100.00/TON		\$ 55,966.67
5.Traffic Protection	24	\$ 960.00/DAY		\$ 23,040.00
6.New Service Connection	17	\$ 4,000.00/EACH		\$ 68,000.00
7.Pump Station Construction	0	\$ - /LS		\$ -
8.Legal Fees for Easement Development	0	\$ 10,000.00/PARCEL		\$ -
			Sub-Total \$	258,928.89
9.Mobilization/Demobilization (10%)			\$	26,000.00
10.Utility Coordination (5%)			\$	13,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)			\$	26,000.00
12.Contingency (20%)			\$	65,000.00
			5-year TOTAL \$	390,000.00
10-year Horizon				
1.Sewer Main Installation	0	\$ - /LF		\$ -
2.Manholes	0	\$ 2,500.00/EACH		\$ -
3.Rock Removal 5%	0	\$ 100.00/CY		\$ -
4.Pavement Restoration	0	\$ 100.00/TON		\$ -
5.Traffic Protection	118	\$ 960.00/DAY		\$ 113,280.00
6.New Service Connection	59	\$ 4,000.00/EACH		\$ 236,000.00
7.Pump Station Construction	0	\$ - /LS		\$ -
8.Legal Fees for Easement Development	0	\$ 10,000.00/PARCEL		\$ -
			Sub-Total \$	349,280.00
9.Mobilization/Demobilization (10%)			\$	35,000.00
10.Utility Coordination (5%)			\$	17,000.00
11.Engineering/Design/Permitting/Construction Admin (10 %)			\$	35,000.00
12.Contingency (20%)			\$	87,000.00
			10-year TOTAL \$	520,000.00
			SEWERSHED TOTAL \$	910,000.00



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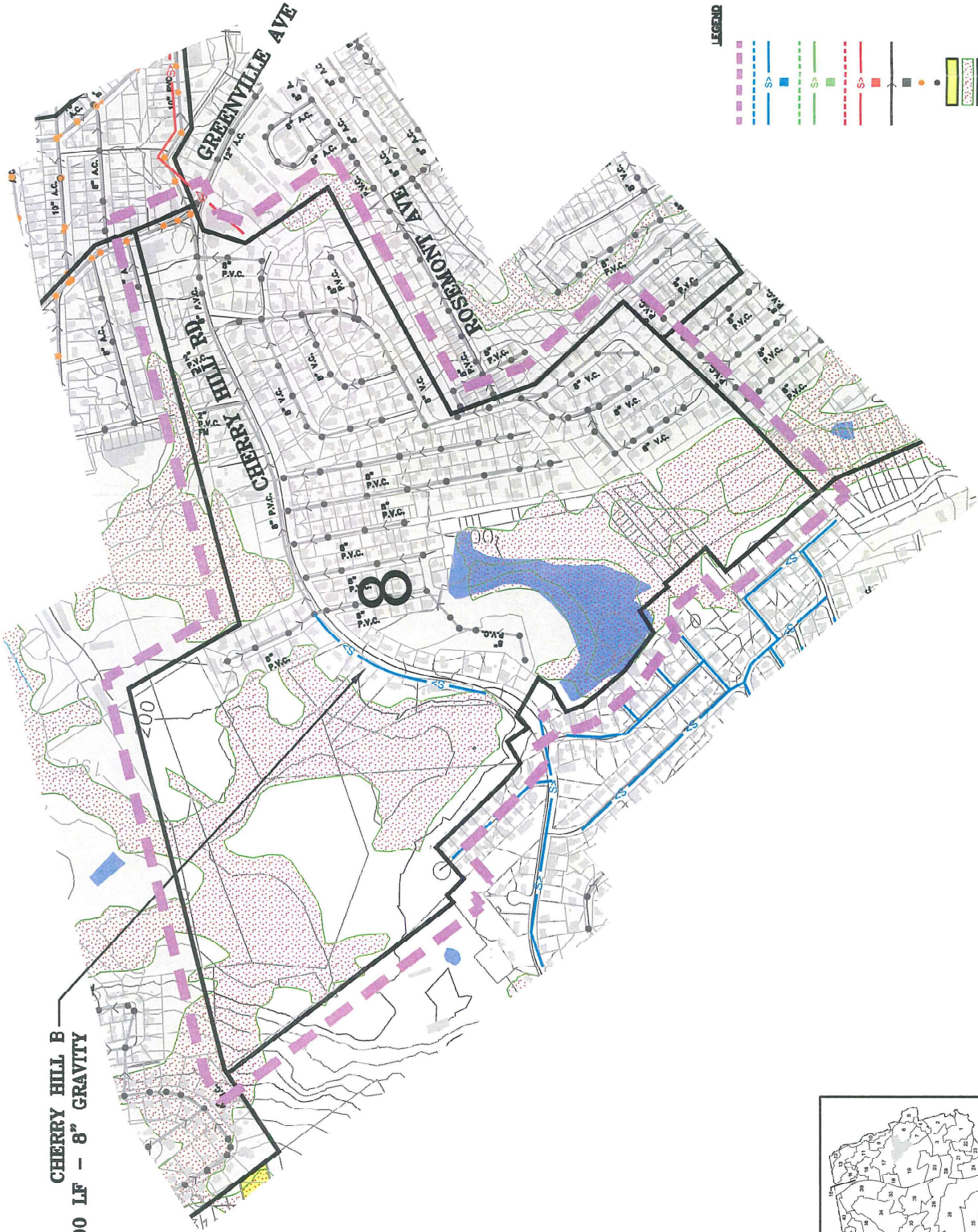


TOWN OF JOHNSTON FACILITIES PLAN
 SEWERED NO. 8
 CHERRY HILL RD & GREENVILLE AVE

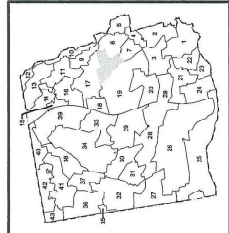
SCALE: 1" = 600'
 FIGURE:

6-6

- LEGEND**
- SEWERED LAYOUT DELINEATION
 - 10-20 YR. FORCEMAIN SEWER PIPE
 - 10-20 YR. GRAVITY SEWER PIPE
 - 10-20 YR. LIFT STATION
 - 5-10 YR. FORCEMAIN SEWER PIPE
 - 5-10 YR. GRAVITY SEWER PIPE
 - 5-10 YR. LIFT STATION
 - 0-5 YR. FORCEMAIN SEWER PIPE
 - 0-5 YR. GRAVITY SEWER PIPE
 - 0-5 YR. LIFT STATION
 - EXISTING SEWER PIPE
 - EXISTING LIFT STATION
 - EXISTING INC. MANHOLE
 - EXISTING JOHNSTON MANHOLE
 - 5-YR. HORIZON DEVELOPMENT
 - 0.1% DELINEATED WETLANDS
 - EXISTING SEWER SERVICED AREAS



CHERRY HILL B
 1,200 LF - 8" GRAVITY



6.1.7 Sewershed No.9

Sewershed 9 is located in the northeastern part of Johnston near the town line west of the City of Providence. The entire sewershed encompasses approximately 163 acres, of which approximately 20 acres are RIGIS delineated wetlands. Refer to Figure 6-7.

Constraints to future development within the sewershed include the presence of streams and RI DEM regulated wetlands. Existing developed areas within the sewershed include scattered commercial development along George Waterman Road, and residential neighborhoods east and west of the commercial corridor. Remaining undeveloped areas are zoned General Business (B-1 Zone) and Residential (R-20 Zone). The build-out of vacant parcels within this sewershed identified potential for 23,000 SF of commercial development (B-2 Zone) along George Waterman Road projected within the 5 – 10 Year Planning Horizon and an additional 10 residential units (within land between Greenville Avenue and George Waterman Road), also projected within the 5 – 10 Year Planning Horizon. It is not anticipated that these future connections within this sewershed will require sewer infrastructure upgrades.

Approximately 98 percent of the overall 163-acre sewershed is provided with sanitary sewer service. The existing sewers within sewershed 9 consist of Town-owned 8-inch asbestos cement sewer pipe. This sewershed also contains an NBC-owned secondary branch within George Waterman Road that consists of 10- and 12-inch asbestos cement pipes. Several pipe segments along this secondary branch exceed their theoretical pipe capacity during wet weather events. Although some pipes are installed at inadequate slopes in relation to each particular pipe size, previous studies indicate that full build-out will not exceed 50% of theoretical pipe capacity if majority of the inflow/infiltration issues are resolved. In addition, approximately 1,300 linear feet of the Greenville Avenue secondary branch travels through the sewershed on Newman Avenue. This stretch of pipe will undergo an upgrade from 10-inch pipe to 12-inch pipe as a result of upstream service extensions in Sewersheds 8 and 17.

Capital improvements associated with this sewershed consist of the Greenville Avenue secondary branch upgrades that account for the installation of 1,300 linear feet of 12-inch pipe. Costs associated with service connections of this sewershed during the 0 – 5 Year Horizon of the Planning Period have also been included in Table 6-8 below.