CONCORD STREET
SEWER FEASIBILITY EVALUATION

for

NORTH READING, MASSACHUSETTS

JUNE 30, 2017

WRIGHT-PIERCE
Engineering a Better Environment
70 YEARS 1947 - 2017

CONCORD STREET
SEWER FEASIBILITY EVALUATION

FOR

NORTH READING, MASSACHUSETTS]

JUNE 30, 2017

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TOWN OF NORTH READING, MASSACHUSETTS

CONCORD STREET SEWER FEASIBILITY EVALUATION

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SECTION 1

INTRODUCTION

1.1 INTRODUCTION

The town of North Reading (the "Town") is a community located north of the city of Boston with direct access to and from Interstate 93. The Town is bound by the towns of Andover and North Andover to the north, towns of Reading and Lynnfield to the south, town of Wilmington to the west and town of Middleton to the east. The Town has a limited wastewater collection system with a wastewater treatment facility and a groundwater discharge located at the North Reading Public School Department campus on Park Street. The only connections allowed to this wastewater collection and treatment system are municipally owned buildings.

1.2 STUDY AREA

The Study Area encompasses 296 acres and includes the Concord Street corridor from the Wilmington town line to Park Street. The Study Area contains 54 parcels, which are a mix of residential, commercial, and industrial properties. The Study Area is delineated in Figure 1.

The general topography of the Study Area slopes from Concord Street downgradient to the Ipswich River. Also, the Concord Street profile from the Wilmington town line to Park Street is relatively flat with two distinct low areas.

Since the Town does not have a wastewater collection and treatment system other than the limited wastewater system at the North Reading Public School Department campus, the closest wastewater collection system to the Study Area is in the town of Reading, which connects to the Massachusetts Water Resource Authority (MWRA) interceptor in the city of Woburn and flows to the MWRA treatment plant located on Deer Island.

The parcels in the Study Area, excluding the RiverPark93 Business Park, have onsite Massachusetts Title 5 septic systems and the Town's Board of Health has reported no known failed systems in the Study Area. RiverPark93 Business Park is managed by Farley White Property Management and has a privately-owned wastewater pump station that pumps the wastewater

generated in the RiverPark93 Business Park to the MWRA interceptor via a connection to the wastewater collection system on Grove Street in the town of Reading. The connection to the town of Reading's wastewater collection system is a 6-inch diameter force main pipe approximately 3,000 linear feet that is located adjacent to Interstate 93 from the pump station to Grove Street. This pump station also has underground storage for 180,000 gallons. Reference the RiverPark93 Sewer Extension Design progress drawings in Appendix A. Under agreement with the MWRA, the flow from the RiverPark93 pump station to the MWRA interceptor in the city of Woburn, through the town of Reading's wastewater collection system is limited to 60,000 gallons per day (gpd). This facility is currently using approximately one-third of the overall capacity allocated to it through the agreement.

1.3 PROJECT NEED

The Town desires to further evaluate the feasibility of installing a wastewater collection system in the Study Area. The impetus for this feasibility evaluation is economic redevelopment as several hotels have approached the Town with expressed interest in the Study Area due to its proximity to the city of Boston and direct access to and from Interstate 93.

2012 Parcels from North Reading;
Hydrography - USGS;
Wetlands - USF&W;
Roads - MassGIS;
Imagery - ESRI World Imagery.

Legend

- Study Area
- Stream/River
- Open Water
- Wetlands

GORDON ROAD
KRISTYN LANE
JILL CIRCLE
SURREY LANE
OAKLAND ROAD
WEST VILLAGE DRIVE
REDMOND AVENUE
FURBISH POND LANE
SOUTHWICK ROAD
GLORIA LANE
KINGSTON STREET
MAIN STREET
NUTTER ROAD
BURDITT ROAD
EAMES STREET
PARK STREET
MILL STREET
CONCORD STREET
RIVERPARK DRIVE
WILMINGTON
READING

N

0 150 300 600 Feet

Study Area - Concord Street Sewer Feasibility Evaluation North Reading, MA

PROJ NO:	DATE:	FIGURE:
13745A	6/22/2017	1-1

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SECTION 2

WASTEWATER FLOW AND LOADS

2.1 GENERAL

This section summarizes the current average water use, the estimated current wastewater flow, and the projected future (20-year) wastewater flow and loads for the Study Area. These projected future flows will be used to size the wastewater collection infrastructure as part of the Feasibility Evaluation and the potential effects the projected future flow will have on existing downstream sewer infrastructure.

2.2 LAND USE IN STUDY AREA

There are two zoning districts within the Study area and they are designated as IO (Industrial Office) and RA (Residential A). As indicated previously in this memorandum, the Study Area encompasses 296 acres and is a mix of residential, commercial, and industrial properties. Assuming no development will be allowed in wetlands, the total of the developed / developable land is 188 acres. Reference Table 2-1 for the acres in each zoning district.

TABLE 2-1

ZONING DISTRICT ACRES

	ZONING DISTRICT		
	IO	RA	TOTAL
Total Acres	266	30	296
Waterbodies / Wetlands Acres	103	5	108
Developed / Developable Acres	163	25	188

2.3 CURRENT WATER USE

Approximately four years of water use data (2014-2017) was obtained from the town of North Reading for 43 of the 54 parcels in the Study Area. Parcels in the IO and RA zones that had no water use data from the town of North Reading were assumed to have an estimated water use based

on a gallons per day (gpd) per acre of similar parcels in the IO and RA zones, respectively. Reference the Parcel Current Average Water Use and Wastewater Flow Projection table in Appendix B and Table 2-2 for the current average water use for the Study Area.

TABLE 2-2

CURRENT AVERAGE WATER USE

	ZONING DISTRICT		
	IO	**RA**	**TOTAL**
North Reading Water Use Data (gpd)	26,230	1,140	27,370
Estimated Water Use (gpd)	5,820	500	6,320
Total Current Water Use (gpd)	32,050	1,640	33,690

The estimated current wastewater flow is based on the total current average water use indicated in Table 2-2 with a reduction of ten percent (10%) to account for consumptive use. The current wastewater density is calculated from the total current wastewater flow divided by the total developed acres excluding waterbodies and wetlands. Reference Table 2-3 for the current estimated wastewater flow and current wastewater density for the Study Area.

TABLE 2-3

ESTIMATED CURRENT WASTEWATER FLOW AND DENSITY

	ZONING DISTRICT		
	IO	**RA**	**TOTAL**
Estimated Flow (gpd)	28,840	1,470	30,310
Estimated Density (gpd per acre)	177	58	161

2.4 WASTEWATER FLOW PROJECTION

The projected future (20-year) wastewater flow is based on potential redevelopment of the Study Area. It is important to note the time to reach the potential redevelopment may be well beyond 20 years and will be dependent on the Town's zoning ordinance, growth of the local economy, and pressure by local developers. We have outlined three scenarios for projecting the future wastewater flow.

2.4.1 Wastewater Flow Projection Scenario One

The following assumptions were made in developing Scenario One for the redevelopment of the Study Area and projecting the future wastewater flow:

- Current developed / developable parcels have a daily flow rate equal to a fifty percent (50%) increase in the current estimated wastewater flow.
- No development is allowed in wetlands.

Reference Table 2-4 for Scenario One projected future (20-year) wastewater annual average daily flow, peak hourly flow, and infiltration allowance for the Study Area.

2.4.2 Wastewater Flow Projection Scenario Two

The following assumptions were made in developing Scenario Two for the redevelopment of the Study Area and projecting the future wastewater flow:

- Current developed / developable parcels have a daily flow rate equal to a fifty percent (50%) increase in the current estimated wastewater flow.
- Commercial development (i.e., hotel and restaurants) in the Study Area equal to one quarter of the IO zone developed / developable 163 acres. "Wastewater Engineering Treatment and Reuse, Fourth Edition" by Metcalf & Eddy states typical wastewater density allowances for commercial developments range from 800 gpd per acre to 1,500 gpd per acre. Assuming an additional wastewater density allowance of 800 gpd per acre for commercial development results in an additional average daily flow of 32,600 gpd.
- No development is allowed in wetlands.

Reference Table 2-5 for Scenario Two projected future (20-year) wastewater annual average daily flow, peak hourly flow, and infiltration allowance for the Study Area

2.4.3 Wastewater Flow Projection Scenario Three

The following assumptions were made in developing Scenario Three for the redevelopment of the Study Area and projecting the future wastewater flow:

- Current developed / developable parcels have a daily flow rate equal to a fifty percent (50%) increase in the current estimated wastewater flow.
- Commercial development (i.e., hotel and restaurants) in the Study Area equal to one quarter of the IO zone developed / developable 163 acres. "Wastewater Engineering Treatment and Reuse, Fourth Edition" by Metcalf & Eddy states typical wastewater density allowances for commercial developments range from 800 gpd per acre to 1,500 gpd per acre. Assuming an additional wastewater density allowance of 1,500 gpd per acre for commercial development results in an additional average daily flow of 61,100 gpd.
- No development is allowed in wetlands.

Reference Table 2-6 for Scenario Three projected future (20-year) wastewater annual average daily flow, peak hourly flow, and infiltration allowance for the Study Area.

2.4.4 Infiltration Allowance

An infiltration allowance is included in the total future wastewater flow projection. According to the "Guides for the Design of Wastewater Treatment Works, New England Interstate Water Pollution Control Commission, 2011 Edition" commonly referenced as TR-16, it states a minimum allowance of 250-500 gpd per inch diameter per mile of sewer is suggested as an infiltration allowance. Based on our experience, an infiltration allowance of 300-gpd per inch diameter per mile of sewer is a conservative value and is included in the total future wastewater flow projection. Assuming an 8-inch pipe diameter and total length of approximately 6,000 linear feet results in an infiltration allowance of 2,700 gpd.

2.4.5 Peak Hourly Ratio

To account for the peak hourly flow rates, a peaking factor is applied to the average daily flow. According to Figure 2-1 in TR-16, it indicates for average daily flows less than 100,000 gpd the peaking factor is 5.6. The following equation was applied to calculate peak daily flow (PDF) from average daily flow (ADF) using the peaking factor (PF). PDF = (ADF x PF) + Infiltration Allowance.

TABLE 2-4

SCENARIO ONE

PROJECTED FUTURE WASTEWATER FLOW

	ZONE		
	IO	**RA**	**TOTAL**
Wastewater Projection (gpd)			
Average Daily Flow	43,300	2,200	**45,500**
Peak Hourly Flow	242,500	12,300	**254,800**
Infiltration Allowance			**2,700**
Peak Daily Flow			**257,500**

TABLE 2-5

SCENARIO TWO

PROJECTED FUTURE WASTEWATER FLOW

	ZONE		
	IO	**RA**	**TOTAL**
Wastewater Projection (gpd)			
Average Daily Flow	75,900	2,200	**78,100**
Peak Hourly Flow	425,100	12,300	**437,400**
Infiltration Allowance			**2,700**
Peak Daily Flow			**440,100**

TABLE 2-6

SCENARIO THREE

PROJECTED FUTURE WASTEWATER FLOW

	ZONE		
	IO	**RA**	**TOTAL**
Wastewater Projection (gpd)			
Average Daily Flow	104,400	2,200	**106,600**
Peak Hourly Flow	584,700	12,300	**597,000**
Infiltration Allowance			**2,700**
Peak Daily Flow			**599,700**

2.5 WASTEWATER FLOW PROJECTION SUMMARY

The projected future (20-year) wastewater flow is based on potential redevelopment of the Study Area. The time to reach the potential redevelopment may be well beyond 20 years and will be dependent on the Town's zoning ordinance, growth of the local economy, and pressure by local developers. From the three scenarios outlined for projecting the future wastewater flow, the projected future wastewater average daily flow ranges from 45,500 gpd to 106,600 gpd with the peak hourly flow ranging from 254,800 gpd to 597,000 gpd. The wastewater collection infrastructure (i.e., gravity pipe, force main, and pump station) will be designed to support the peak daily flow which, depending on the scenario, ranges from 257,500 gpd to 599,700 gpd or 180 gallons per minute (gpm) to 420 gpm. This Report will be based on Wastewater Flow Projection Scenario Three which is the most conservative.

2.6 WASTEWATER LOADING PROJECTION

When referencing wastewater loading; the major constituents in wastewater are Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Nitrogen (N), and Phosphorus (P); and the amount that is contributed by each is in pounds per day (lbs/day). Reference Table 2-7 which outlines the projected wastewater loading based on the average daily flow of 106,600 gpd for Wastewater Flow Projection Scenario Three. The design concentrations of these four major constituents, indicated in milligrams per liter (mg/L), are based on medium strength wastewater as stated in "Wastewater Engineering Treatment and Reuse, Fourth Edition" by Metcalf & Eddy.

TABLE 2-7

PROJECTED WASTEWATER LOADING

	DESIGN CONCENTRATION (mg/L)	DESIGN LOADING (lbs/day)
Constituent		
BOD	190	169
TSS	210	187
Total N	40	36
Total P	7	6

The design loadings are typical for the average daily flow based on medium strength wastewater.

SECTION 3

WASTEWATER COLLECTION SYSTEM

3.1 GENERAL

The Town's 2008 Comprehensive Wastewater Management Plan (CWMP) evaluated decentralized, centralized, and regional wastewater treatment systems for treatment of wastewater generated in Town. Decentralized and centralized wastewater treatment systems have limitations based on the method of final effluent disposal. Disposal of treated wastewater effluent from decentralized or centralized wastewater treatment systems can be accomplished by either surface water discharge, groundwater discharge, or beneficial reuse and are further discussed below.

- Surface Water Discharge: The closest surface water to the Study Area for effluent discharge is the Ipswich River, which is a threatened river and a National Pollutant Discharge Elimination System (NPDES) discharge permit would be very difficult through the United States Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (DEP). Furthermore, since the Town's water supply is currently from groundwater wells replenishing the groundwater supply within the basin with treated effluent will be required for new discharge permits. With this in mind, the Town is pursuing changing their water source from groundwater wells to the MWRA, which may affect this requirement for keeping any discharge of water within the basin it is derived from.

- Groundwater Discharge: The Town's 2008 CWMP indicated soils in the Study Area are generally characterized with variable restrictions resulting in variable percolation rates. A system to dispose of the volume of treated effluent generated in the Study Area outlined in Section 2 of this report, will be difficult due to available land and the required setbacks from wetlands, 100-year flood, and surface water.

- Beneficial Reuse: The Town's 2008 CWMP discussed the re-use of treated effluent as a benefit to the environment in re-charging the Town's groundwater but will likely be difficult to gain support.

Given the challenges of the three methods of effluent disposal noted and ability to connect to an existing sewer system via a neighboring municipality, it is assumed the connection of the Study area to the MWRA interceptor in the city of Woburn, through the town of Reading's wastewater collection system is the best and most viable solution.

This Section presents a description of the wastewater collection system that will be necessary for the Study Area. Total project, operational, and maintenance costs are summarized in Section 4.

3.2 WASTEWATER COLLECTION SYSTEM

A wastewater collection system is comprised of several components including gravity sewers, pump stations, and force mains. A description of these components is described below.

3.2.1 Gravity Sewers

The typical wastewater collection system for municipalities or districts throughout the State consist of 8-inch or larger diameter gravity sewer mains with the most common pipe material being PVC, precast concrete sanitary sewer manholes installed approximately 300 feet apart or at key locations, and 6-inch diameter PVC sewer service laterals to individual properties. A gravity sewer system is typically installed 6 to 12 feet deep, but can be deeper based on topography, within the public right-of-way and slope from the high point to the low point to facilitate gravity flow. Sewer services are typically installed from the sewer main to the edge of the public right-of-way. The sewer user is typically responsible for installing the sewer service on private property. In some instances where the building is below the sewer main or a gravity sewer service cannot be installed from the building to the gravity sewer main, an individual grinder pump station and a small diameter pressure sewer lateral is utilized to transport the wastewater to the gravity sewer. A gravity sewer system may also require the installation of a common pump station to collect the wastewater at the low point of the collection system and convey the wastewater upgradient towards its discharge location via a pressurized force main pipe. Specifics on the gravity sewer proposed are described in Section 3.3.

3.2.2 Submersible Pump Stations

Sewer systems typically may require pump stations to transport wastewater from the low point of the collection system to the discharge location. Submersible pump stations for flows in the range required for the Study Area represents the most economical pump station option for the Town. A preliminary review of the available topographic mapping indicates that one submersible type pump station would be required to serve the Study Area. Note the final location of the pump station depends upon the Town's acquisition of available land and will require either a land purchase or easement.

A submersible pump station consists of a precast concrete wet well and valve pit, two submersible pumps on slide rails to raise and lower the pumps, discharge piping, valves, flow meter, instrumentation, control system, permanent emergency generator, and possibly odor control. Typically, larger submersible pump stations have a building that would house the permanent emergency generator, control system, and the odor control equipment. Specifics on the submersible pump station proposed are described in Section 3.3.

3.2.3 Force Mains

The pump station will require a force main pipe that will transport the wastewater to the discharge location in the town of Reading. Force main piping typically consists of either ductile iron, pressure rated PVC, or high-density polyethylene piping and is usually installed within the same trench as the gravity sewer line where both pipes run parallel to each other. The recommended diameter of the force main piping is sized to maintain a minimum scouring velocity of 3 feet per second, but not more 8 feet per second. Specifics on the force main proposed are described in Section 3.3.

3.3 DESCRIPTION OF THE WASTEWATER FACILITIES

A wastewater collection system for the Study Area is proposed to connect to the MWRA interceptor in the city of Woburn, through the town of Reading's wastewater collection system and includes gravity sewer, one pump station and force main. The gravity sewer system would require one pump station to transport wastewater from the low point of the collection system to the discharge location in the town of Reading.

A description of the proposed wastewater facilities is described below.

- All parcels will connect to the gravity sewer on Concord Street. Concord Street will have a minimum 8-inch diameter PVC gravity sewer from the Wilmington town line to Park Street and flow to a low point on Concord Street where a submersible pump station will be located. This pump station be will be municipally owned and the capacity of the gravity pipe will be designed to handle the average day and peak hourly flow as summarized in Section 2.

- The wastewater generated in the RiverPark93 Business Park will continue to flow to the existing RiverPark93 Pump Station and will remain privately owned. The RiverPark93 Pump Station will be disconnected from the existing 6-inch diameter force main to the town of Reading and will pump via new force main to the new gravity sewer on Concord Street and discharge to the new municipally owned pump station. This will result in the RiverPark93 business park becoming a user of the Town's sewer system.

- The municipally owned pump station to be located in the low point on Concord Street will pump all wastewater to the town of Reading's wastewater collection system via a 6-inch diameter force main that will connect to the existing 6-inch diameter force main to the town of Reading adjacent to the RiverPark93 Pump Station. Note this will result in the Town having ownership of the existing 6-inch diameter force main to Reading. Upon review of information received from the town of Reading it is concluded the wastewater flow from the Study Area to the town of Reading will need to be limited to approximately 200 gpm. Reference paragraph 3.4.2 for further discussion on the 200 gpm limit.

- Previous discussions with the MWRA during development of the Draft Environmental Impact Report indicated the MWRA will require the Town to construct flow equalization or storage tanks to retain wastewater under high flow conditions in the MWRA interceptor system for three days. Using Wastewater Flow Projection Scenario Three with an average daily flow of approximately 100,000 gallons, assuming this will be the agreed daily flow with the MWRA, will result in 300,000 gallons for three days of storage, as well as associated odor control facilities to meet this requirement. However, equalization or storage will also be necessary for

the peak daily flow as the flow rate to the town of Reading's wastewater collection system will be limited to 200 gpm. Therefore, the actual equalization or storage necessary will be sized to accommodate 500,000 gallons based on a peak day flow of approximately 600,000 gallons minus the average daily flow or the MWRA agreed flow of approximately 100,000 gallons. The flow equalization or storage tanks would be located adjacent to the Concord Street Pump Station and be pumped down during low flow time periods.

- The installation of the wastewater collection system will eliminate the need for the existing Title 5 septic system for the parcels when they connect to the gravity sewer. As part of the project, the existing septic tank or holding tank would first be pumped out and then either removed completely or have the cover removed, holes drilled in the bottom, and filled with compacted gravel borrow to grade. The existing disposal field would be left abandoned in pl**a**ce. The abandonment and demolition of the Title 5 septic systems will be in accordance with the Town's Board of Health regulations.

Based on a cursory review of topographic mapping and site visits to the area, a conceptual plan for a gravity sewer system was developed and is illustrated in Figure 3-1. A list of the major components for the gravity collection system is summarized in Table 3-1.

TABLE 3-1

WASTEWATER COLLECTION SYSTEM COMPONENTS

Item	Estimated Quantity
8-inch Diameter PVC Gravity Sewer	6,000 LF
6-inch Diameter PVC Sewer Laterals	1,700 LF
6-inch Diameter HDPE Force Main	6,300 LF
Precast Concrete Sewer Manholes	30 units
Submersible Pump Station and Equalization/Storage	1 unit

2012 Parcels from North Reading;
Hydrography - USGS;
Wetlands - USF&W;
Roads - MassGIS;
Imagery - ESRI World Imagery.

Legend

- Pump Station
- New 6" Concord Street Pump Station Force Main
- New 8" Gravity Sewer
- Existing 6" Force Main
- Existing River Park 93 Pump Station Force Main
- Stream/River
- Open Water
- Wetlands

WILMINGTON

READING

Proposed Concord Street Pump Station

Existing RiverPark93 Pump Station

KRISTYN LANE
JILL CIRCLE
GORDON ROAD
SURREY LANE
OAKLAND ROAD
SOUTHWICK ROAD
PARK STREET
WEST VILLAGE DRIVE
REDMOND AVENUE
FURBISH POND LANE
NUTTER ROAD
MILL STREET
CONCORD STREET
RIVERPARK DRIVE

N

0 150 300 600 Feet

T:\At WG\GIS_Development\Projects\MA\NorthReading\13745A_ConcordSSEwerStudy\MXDs\FIGure3-1-ProposedWWCollectionSystem-v1-24-36-1.mxd

Proposed Wastewater Collection System
Concord Street
Sewer Feasibility Evaluation
North Reading, MA

PROJ NO: 13745A | DATE: 6/22/2017

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FIGURE: 3-1

3.4 SEWER FLOW PATH TO MWRA CONNECTION

The sewer path to the MWRA connection will require further discussions and possible negotiations with several entities including the RiverPark93 Business Park, town of Reading, and the MWRA. Each of the entities referenced for further discussion are listed below.

3.4.1 RiverPark93 Business Park

Further discussions will be necessary with Farley White Property Management who manages the RiverPark93 Business Park. Discussions will include three items. The first, the potential of the Business Park becoming a user of the Town's wastewater collection system on Concord Street. The second, the need for the Town to obtain a sewer easement through the business park for the new 6-inch diameter force main from the municipally owned pump station on Concord street to the connection of the existing 6-inch diameter force main adjacent to the RiverPark93 pump station. The third, the transfer of ownership of the existing 6-inch diameter force main that is adjacent to Interstate 93 that connects to the town of Reading's wastewater collection system on Grove Street from the RiverPark93 Business Park pump station. This existing 6-inch diameter force main includes approximately 3,000 linear feet of pipe and a bridge crossing on the Interstate 93 Ipswich River bridge.

3.4.2 Town of Reading

Further discussions will be necessary with the town of Reading who owns and operates the wastewater collection system within its municipality. Wright-Pierce requested data from the town of Reading to understand the sewer flow path from the Grove Street connecting point to the MWRA interceptor. Based on GIS data received from the town of Reading's Engineering Department, the sewer flow path from the connecting point on Grove Street to the MWRA interceptor in Woburn is illustrated in Figure 3-2. Pipe diameters range from 8-inches to 30-inches. There are two pump stations identified as the Strout Avenue Pump Station and the Grove Street Pump Station, each with a 6-inch diameter force main, along the sewer flow path both located adjacent to Grove Street. The review of the "Town of Reading Massachusetts Pump Station Evaluation Report" by CDM, dated July 2010, received from the town of Reading, indicated the design capacity of both the Strout Avenue Pump Station and the Grove Street Pump Station. From

the review, it is concluded the wastewater flow from the Study Area to the town of Reading wastewater collection system would be limited to approximately 200 gpm based on the design capacity of the Strout Avenue Pump Station.

Additionally, the following information and data has been requested or will need to be requested from the town of Reading.

- Verification of the maximum flow rate (gallons per minute) allowed in the sewer flow path from the Study Area.
- Town of Reading's monthly or annual user fee (cost per gallon) for the flow from the Study Area.
- Verification of the interceptor ownership in the City of Woburn from the town of Reading municipal town line to the MWRA interceptor.

3.4.3 MWRA

The final connection of the wastewater generated in the Concord Street corridor is the MWRA interceptor in the city of Woburn. Further discussions will be needed with the MWRA to discuss the projected wastewater flow to the MWRA interceptor, the infiltration and inflow (I/I) reduction policy based on the agreed daily flow volume, and the sewer charge.

Based on the projected wastewater flow indicated in Section 2 of this report, the MWRA will need to model their downstream infrastructure based on this increased flow. It has been noted that there is a known flow restriction in the MWRA interceptor in the town of Winchester, where a Combined Sewer Overflow (CSO) structure is located. As previously discussed in this Section, approximately three days of flow equalization or storage will be necessary.

The MWRA has an inflow reduction program based on the agreed daily flow. This program states for every gallon of wastewater going into the MWRA interceptor that four gallons of inflow must be removed from municipal collection systems that contribute wastewater flow to the MWRA system within that specific sewer basin area. For example, if the agreed daily flow to the MWRA is 100,000 gallons, then 400,000 gallons of inflow will have to be removed.

Sewer Data from North Reading, 2017;
2012 Parcels from North Reading;
Hydrography - USGS;
Wetlands - USF&W;
Roads - MassGIS;
Imagery - ESRI World Imagery.

WOBURN

WILMINGTON

READING

Legend

Structure Type

- Pump Station
- Manhole

Diameter

- 8
- 10
- 12
- 24
- 30
- Other Grav Main
- Force Main
- Flow Path to MWRA Connection
- Stream/River
- Open Water
- Wetlands

N

0 200 400 800 Feet

Sewer Flow Path to MWRA Connection
Concord Street
Sewer Feasibility Evaluation
North Reading, MA

PROJ NO: 13745A | DATE: 6/22/2017

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FIGURE: 3-2

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The MWRA sewer charge is based on flow and population. The MWRA website states "Sewer charges are computed on a proportional allocation basis utilizing total flow, contributing population and census population for each community. The total amount of required revenue for the sewer system is allocated either to operating costs or capital costs. Operating costs are allocated to each community based on the average of the prior three calendar years' total flow, with adjustments for strength of flow. Capital costs, including debt service, are allocated to each community based on a combination of (1) average of the prior three years' peak month wastewater flow and average concentrations of total suspended solids and biochemical oxygen demand; (2) the proportion of the population of the community that is served by the local sewer system; and (3) the proportion of the community's U.S. census population to the total census population in the sewer system."

3.5 PERMITTING

There are several federal, state and local permits that may be applicable for this project. The following permits were evaluated for applicability:

- National Pollutant Discharge Elimination System (NPDES) – Construction General Permit and Dewatering General Permit
- Massachusetts Environmental Policy Act
- Town of North Reading Conservation Commission
- Town of North Reading Street Opening Permit
- MWRA
- Town of Reading

SECTION 4

PROJECT COSTS

4.1 GENERAL

The purpose of this section is to present the estimated total project cost, the annual operation and maintenance (O&M) cost, and the present worth cost associated with this project.

4.2 ESTIMATED PROJECT COSTS

The total project costs consist of construction costs, construction contingency, engineering services (design phase services, bidding phase services, construction phase services, permitting, surveying), land acquisition, legal/bond counsel, permitting fees, accounting, interim financing, reserve capacity (buy-in) fees and the cost associated with the MWRA Inflow Reduction Policy. The estimated total project costs were developed based on historical costs for similar type of projects. Total project capital costs include a contingency of 40-percent of the estimated construction to account for engineering services (design phase services, bidding phase services, construction phase services, permitting, surveying), land acquisition, legal/bond counsel, permitting fees, accounting and interim financing. The project costs estimates are for preliminary planning (budgeting) purposes only and are based on an ENR Construction Cost Index 20 City Average 10,692 (May 2017). Reference Table 4-1 for a summary of the estimated total project cost.

Many factors arise during the final design that cannot be definitively identified and estimated at this time. These factors are typically covered by the 40-percent contingency described above; however, this allowance may not be adequate for all circumstances.

TABLE 4-1

ESTIMATE OF TOTAL PROJECT COST

Description	Estimated Quantity	Unit	Unit Price	Total
8" PVC Sanitary Sewer Pipe	6,000	LF	$200	$1,200,000
6" PVC Sanitary Sewer Laterals	1,700	LF	$100	$170,000
4-ft Diameter Sanitary Manhole	30	EA	$7,000	$210,000
6" HDPE Force main RiverPark93 PS	1,600	LF	$150	$240,000
6" HDPE Force main Concord Street PS	4,700	LF	$150	$705,000
Concord Street Pump Station and Storage[1]	1	EA	$1,200,000	$1,200,000
Police Traffic Detail				$100,000
Subtotal Construction Cost				$3,825,000
Construction Contingency			25%	$956,000
Total Construction Cost				$4,781,000
Engineering and Professional Servcies[2]			40%	$1,912,000
MWRA Connection Fee[3]				$380,000
MWRA Inflow Reduction[4]				$1,200,000
Town of Reading Connection Fee[5]				$400,000
Estimate of Total Project Cost				**$8,673,000**

Notes:

1. Includes 500,000 gallons of wastewater equalization or storage.

2. Engineering services, land acquisition, legal/bond counsel, permitting fees, accounting and interim financing

3. MWRA connection fee based on an agreed daily flow of 100,000-gallons at approximately $3.8-million per 1-million gallons. This cost can be paid over a ten-year period.

4. MWRA Inflow Reduction cost based on 400,000 gallons (reference Section 3.4.3) to be removed at an assumed average cost of $3 per gallon.

5. Town of Reading connection fee based on an agreed daily flow of 100,000 gallons at a cost of $4 per gallon.

4.3 ANNUAL OPERATION & MAINTENANCE COSTS

The O&M operations budget from similar wastewater collection system projects were used for determining the likely O&M budgets. The estimated O&M costs are preliminary in nature and include salaries, wages, benefits insurance and taxes; vehicle and vehicle maintenance; collection and pump station maintenance and cleaning; pump station utilities; reserve, debt service and debt reserve accounts; and town of Reading and MWRA user fees. Reference Table 4-2 for a summary of the estimated annual O&M costs.

TABLE 4-2

ESTIMATE OF ANNUAL O&M COSTS

Description	Estimated O&M Costs
Salaries, Wages, Benefits Insurance and Taxes[1]	$25,000
Vehicle	$4,000
Vehicle Maintenance	$3,000
Collection System Maintenance and Cleaning	$2,000
Pump Station Maintenance and Cleaning	$9,000
Pump Station Utilities	$7,000
Estimate of O&M Costs[2]	**$50,000**

Notes:

1. Employee from another Town department designated part-time to wastewater collection system.

2. Estimated of annual O&M costs does not include reserve, debt service and debt reserve accounts and the town of Reading and MWRA user fees.

4.4 PRESENT WORTH COSTS

Based on the estimated project cost and the annual O&M costs, the present worth cost to recover the capital cost and twenty years of O&M costs is outlined in Table 4-3.

TABLE 4-3

PRESENT WORTH COSTS

Description	Cost
Initial Capital Costs	$0
Present Worth of Future Capital Costs	$8,673,000
Present Worth of O&M Costs[1]	$744,000
Total Present Worth Costs	**$9,417,000**
Number of Parcels in Study Area	54
Total Present Worth Cost per Parcel[2]	**$175,000**

Notes:

1. Based on annual inflation rate of 3-percent.

2. Assuming all parcels are assessed equally.

SECTION 5

PROJECT FUNDING

5.1 GENERAL

Financing this project will require a balance of the costs between the Town and the beneficial users of the system within the Study Area. The purpose of this section is to suggest potential opportunities to fund the completion of this project. The estimate of total project cost per parcel based on the average daily wastewater flow projection ranges from approximately $6,100 to $1,568,000 with an average estimate of total project cost per parcel of $161,000. Reference the Estimate of Total Project Cost Per Parcel table in Appendix C.

5.2 PROJECT FUNDING

There are several funding sources to finance this project including grants, low interest loans, betterments, property taxes, tax increment financing (TIF) or a combination of these. The funding sources listed are summarized below.

5.2.1 Grants

A potential grant funding source is the MassWorks Infrastructure Program which provides grants for municipalities and other eligible public entities seeking public infrastructure funding to support economic development and job creation.

The design and engineering costs of the project will not be 100-percent eligible for the grant as the population of North Reading is over 7,000. Municipalities with a population over 7,000 are eligible to apply for design and engineering costs along with a grant for construction, however no more than 10-percent of the total grant may be used for design and engineering. The 2017 Program applications need to be submitted online between July 24, 2017 and August 4, 2017.

The MassWorks Infrastructure Program is a competitive process with other municipalities and other eligible public entities in Massachusetts and projects demonstrating the greatest need, with completed planning, are most likely to be selected. The MassWorks Infrastructure Program is

administered by the Executive Office of Housing and Economic Development, in cooperation with the Department of Transportation and Executive Office for Administration & Finance.

5.2.2 Low Interest Loans

A potential funding source for a low interest loan is the Clean Water State Revolving Fund (CWSRF) which provides a low-interest financing mechanism to assist local governments in complying with federal and state water quality requirements. The CWSRF Program is jointly administered by the Division of Municipal Services of the MassDEP and the Massachusetts Clean Water Trust (CWT). The CWSRF Program continues to emphasize watershed management priorities, storm water management, and green infrastructure. A major goal is to provide incentives to communities to undertake projects with meaningful water quality and public health benefits and addresses the needs of the communities and the watersheds. The current loan money is provided at an equivalent two percent interest loan.

The CWSRF is a competitive process with other municipalities and other eligible public entities in Massachusetts. Projects most likely to be selected are projects demonstrating water quality benefits, mitigation to a public health risk, or if the project is consistent with watershed management plans and local and regional growth plans. The first step is to submit the Project Evaluation Form (PEF) which is typically due to the MassDEP in mid-August. The PEF is used to determine the extent to which projects meets the goals of the CWSRF program. The PEF measures the applicant's motivation for undertaking the project and the MassDEP places great importance on the project planning component of the PEF. For the 2018 CWSRF Program funding the PEF is due on August 11, 2017.

5.2.3 Betterments

A potential funding source is the use of betterments. Potential beneficial users of the wastewater collection system or parcel (property) owners with frontage on Concord Street, where the wastewater collection system is located, could be charged a connection fee or a special assessment or fee referenced as a "betterment". Parcel (property) owners are required to pay the betterment whether they connect to the wastewater collection system or not and is typically included as part of the property tax. Betterments are usually charged on a flow basis or on a street frontage basis.

5.2.4 Property Taxes

A potential funding source is the use of property taxes. Unlike betterments where only the beneficial users of the wastewater collection system are assessed a special fee, the cost of the project is included in the tax base for the entire municipality and is therefore included as part of the property tax**.**

5.2.5 Tax Increment Financing

A potential funding source is the Tax Increment Financing (TIF) program. To have a TIF program to fund the project, the Study Area will have to be designated as a TIF Zone. A TIF Zone must be in an area approved by the Economic Assistance Coordinating Council (EACC) as an economic opportunity area or found to be an area presenting exceptional opportunities for economic development and must be accepted through the municipal vote process. TIF is an economic mechanism to promote redevelopment by use of public/private partnerships. TIF provides a direct upfront benefit to developers, in the Study Area, in the form of tax relief. The money saved on taxes could help pay the construction cost of the wastewater collection system.

5.2.6 Combination of Funding and Financing Options

With the numerous funding opportunities outlined above we recommend further evaluation of each as the project costs and O&M costs are refined to better understand the best approach for the Town and the beneficial users of the wastewater collection system as not to place a financial burden on any one entity. The best approach is to maximize the grant opportunities and then typically a combination of two to three of the other funding opportunities outlined to be used to allocate costs to fund the project.

SECTION 6

CONCLUSION

6.1 GENERAL

This evaluation considered the feasibility of installing a wastewater collection system in the Study Area. The impetus for the feasibility evaluation is economic redevelopment as several hotels have approached the Town with expressed interest in the Study Area due to its proximity to the city of Boston and direct access to and from Interstate 93.

The Study Area consists of 54 parcels and are estimated to generate a projected average daily (20 year) wastewater flow of approximately of 100,000 gpd. The wastewater collection system for the Study Area is proposed to connect to the MWRA interceptor in the city of Woburn, via the town of Reading's wastewater collection system, and includes gravity sewer, one pump station and force main. The gravity sewer system would require a pump station to transport wastewater from the low point of the collection system to the discharge location in the town of Reading. A description of the proposed wastewater facilities is described below.

- All parcels will connect to the gravity sewer on Concord Street. Concord Street will have a minimum 8-inch diameter PVC gravity sewer from the Wilmington town line to Park Street and flow to a low point on Concord Street where a submersible pump station will be located. This pump station be will be municipally owned and the capacity of the gravity pipe will be designed to handle the average day and peak hourly flow.

- The wastewater generated in the RiverPark93 Business Park will continue to flow to the existing RiverPark93 Pump Station and will remain privately owned. The RiverPark93 Pump Station will be disconnected from the existing 6-inch diameter force main to the town of Reading and will pump via new force main to the new gravity sewer on Concord Street and discharge to the new municipally owned pump station. This will result in the RiverPark93 business park becoming a user of the Town's sewer system.

- The municipally owned pump station to be located in the low point on Concord Street will pump all wastewater to the town of Reading's wastewater collection system via a 6-inch diameter force main that will connect to the existing 6-inch diameter force main to the town of Reading adjacent to the RiverPark93 Pump Station. Note this will result in the Town having ownership of the existing 6-inch diameter force main to Reading. Upon review of information received from the town of Reading it is concluded the wastewater flow from the Study Area to the town of Reading will need to be limited to approximately 200 gpm based on the design capacity of the Strout Avenue Pump Station.

- Previous discussions with the MWRA during development of the Draft Environmental Impact Report indicated the MWRA will require the Town to construct flow equalization or storage tanks to retain wastewater under high flow conditions in the MWRA interceptor system for three days. Using Wastewater Flow Projection Scenario Three with an average daily flow of approximately 100,000 gallons, assuming this will be the agreed daily flow with the MWRA, will result in 300,000 gallons for three days of storage, as well as associated odor control facilities to meet this requirement. However, equalization or storage will also be necessary for the peak daily flow as the flow rate to the town of Reading's wastewater collection system will be limited to 200 gpm. Therefore, the actual equalization or storage necessary will be sized to accommodate 500,000 gallons based on a peak day flow of approximately 600,000 gallons minus the average daily flow or the MWRA agreed flow of approximately 100,000 gallons. The flow equalization or storage tanks would be located adjacent to the Concord Street Pump Station and be pumped down during low flow time periods.

- The installation of the wastewater collection system will eliminate the need for the existing Title 5 septic system for the parcels when they connect to the gravity sewer. As part of the project, the existing septic tank or holding tank would first be pumped out and then either removed completely or have the cover removed, holes drilled in the bottom, and filled with compacted gravel borrow to grade. The existing disposal field would be left abandoned in place. The abandonment and demolition of the Title 5 septic systems will be in accordance with the Town's Board of Health regulations.

The estimated project cost is $8,673,000 and includes construction costs, construction contingency, engineering services (design phase services, bidding phase services, construction phase services, permitting, surveying), land acquisition, legal/bond counsel, permitting fees, accounting, interim financing, and the town of Reading and the MWRA connection fees and the cost associated with the MWRA Inflow Reduction Policy.

There are several funding sources to finance this project including grants, low interest loans, betterments, property taxes, tax increment financing (TIF) or a combination of these. With the numerous funding opportunities outlined, further evaluation of each is recommended as the project costs and O&M costs are refined to better understand the best approach for the Town and the beneficial users of the wastewater collection system so as not to place a financial burden on any one entity. The best approach is to maximize the grant opportunities and then typically a combination of two to three of the other funding opportunities outlined to be used to allocate costs to fund the project.

6.2 IMPLEMENTATION PLAN

There are several steps identified and necessary for the Town to implement this project. With the project being in a relatively small Study Area there is not a need for project phasing, therefore the project will be implemented as a complete project.

The following is the suggested implementation plan for this project going forward.

- Meet and discuss with the town of Reading: July 2017 – September 2017
    - Verification of the maximum flow rate (gallons per minute) allowed in the sewer flow path from the Study Area.
    - Town of Reading's monthly or annual user fee (cost per gallon) for proposed flow from the Study Area.
    - Verification of the interceptor ownership in the City of Woburn from the town of Reading municipal town line to the MWRA interceptor.

- Meet and discuss with the MWRA: July 2017 – September 2017

    - Based on the projected wastewater flow, the MWRA will need to model their downstream infrastructure based on estimated increased flow of approximately 100,000 gpd. It has been noted that there is a known flow restriction in the MWRA interceptor in the town of Winchester, where a Combined Sewer Overflow (CSO) structure is located.
    - MWRA's monthly or annual user fee (cost per gallon) for proposed flow from the Study Area.

- Meet and discuss with the Farley White Property Management: August 2017 – November 2017

    - Terminating RiverPark93 Business Park wastewater flow agreement with the town of Reading and the MWRA, including the transfer of the 60,000 gallons agreed daily flow to the Town.
    - Town taking ownership of the existing 6-inch diameter force main to the town of Reading from the RiverPark93 pump station.
    - RiverPark93 Business Park becoming a sewer user of the Town's wastewater collection system.
    - Town acquiring easement for 6-inch force main.

- Land Requirements: November 2017 – December 2017

    - Identify the necessary land area to locate the Concord Street Pump Station and the equalization/storage tanks.
    - Site the Concord Street Pump Station and the equalization/storage tanks and begin discussions with property owner(s).

- Develop Financial Plan: January 2018 – August 2018

    - Develop financial plan, including developing local funding appropriation schedule, based on the Concord Street Sewer Feasibility Evaluation and the knowledge gained from the tasks outlined in the implementation plan.

- Prepare MassWorks Infrastructure Program application for submission end of July 2018.
- Prepare MassDEP CWSRF PER application for submission mid-August 2018.

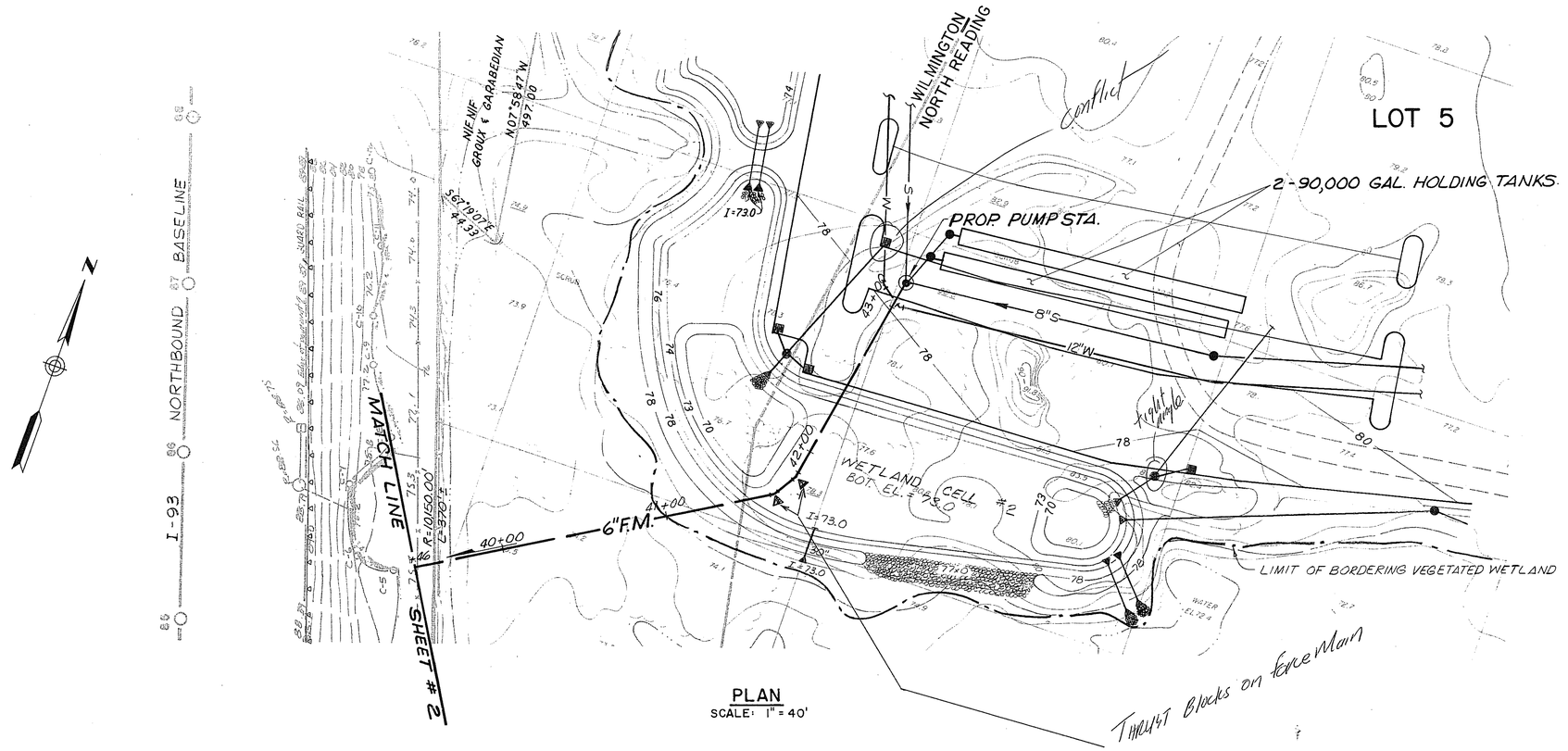
This implementation plan leads up to the commencement of preliminary design and the final design phase, followed by the bidding and construction of the project. As the Town progresses with the implementation plan it will need to be continually reviewed and updated based on progress including the addition of items as they are identified during the process.

APPENDIX A

RiverPark93

Sewer Extension Design

Progress Drawings



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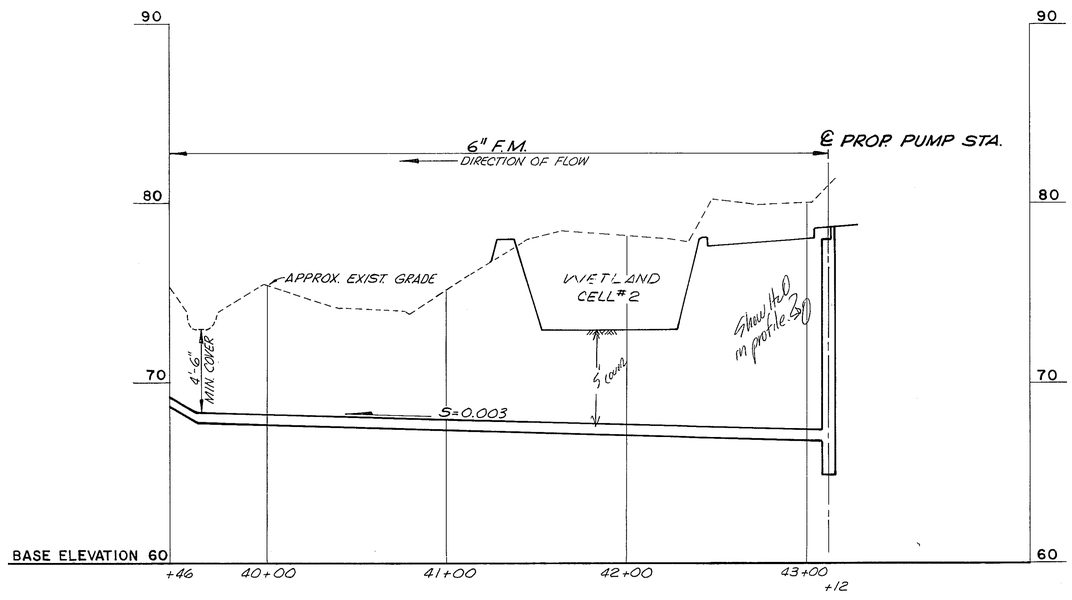

PROFILE
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1"=4' VERT.

08.11.87 SAC
Easement required for sewer line?

To Steve 7/23/87

PROGRESS PRINT

"SEWER EXTENSION DESIGN"

RIVERPARK 93

WILMINGTON / NORTH READING, MA.

PLAN / PROFILE

ISSUE	DATE	DESCRIPTION	BY	CHKD.	APP.

H.W. MOORE ASSOCIATES, INC.
ENGINEERS & PLANNERS
BOSTON MASS.

DATE
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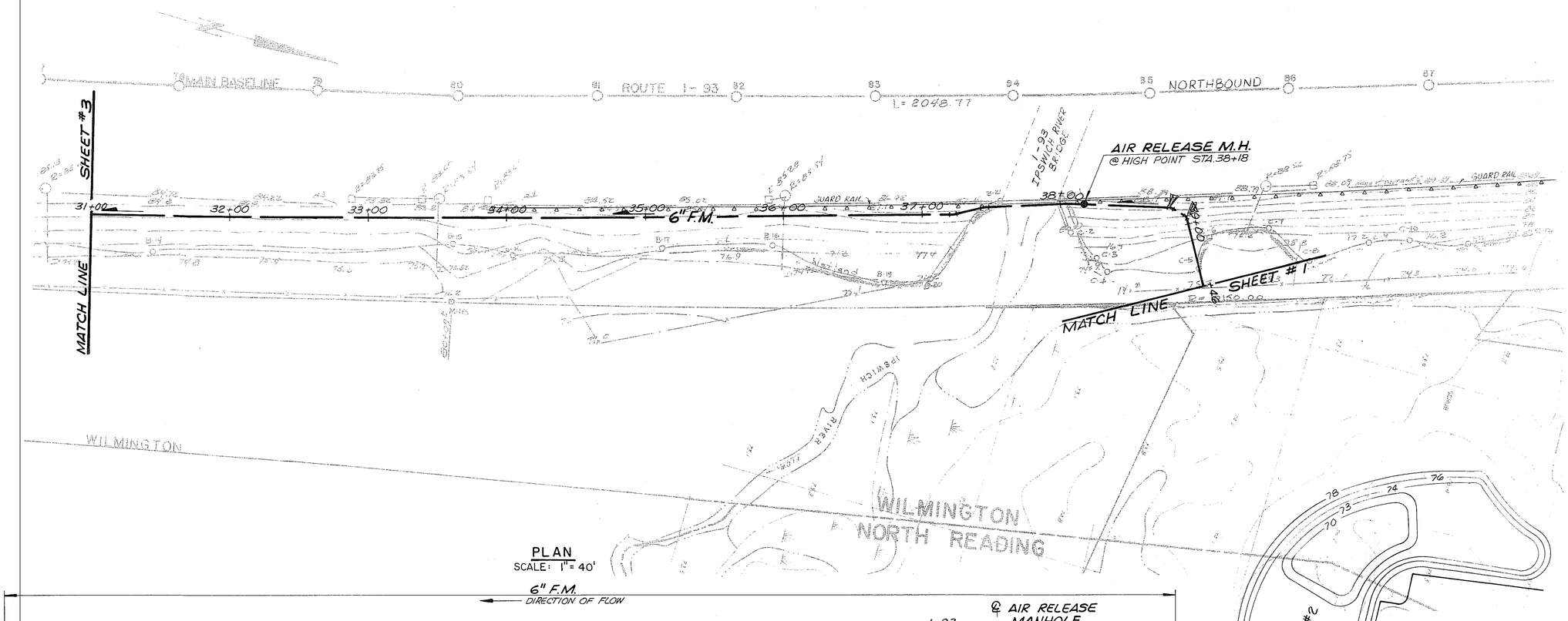

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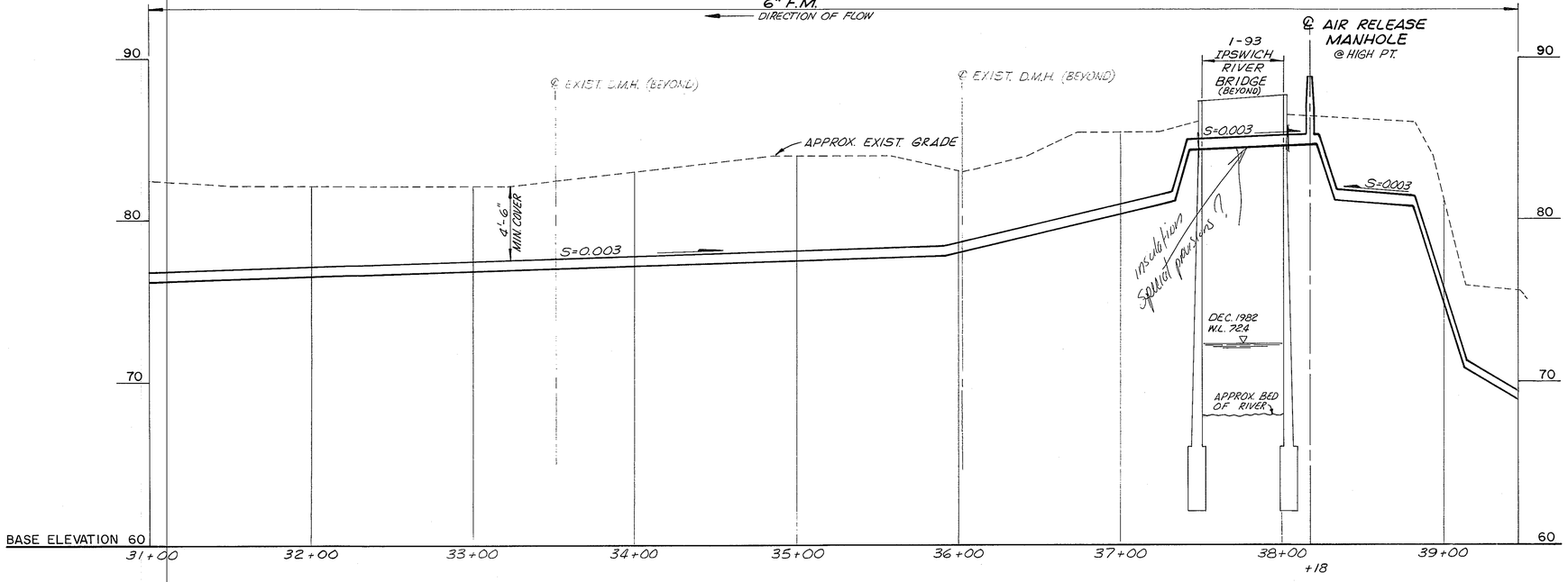

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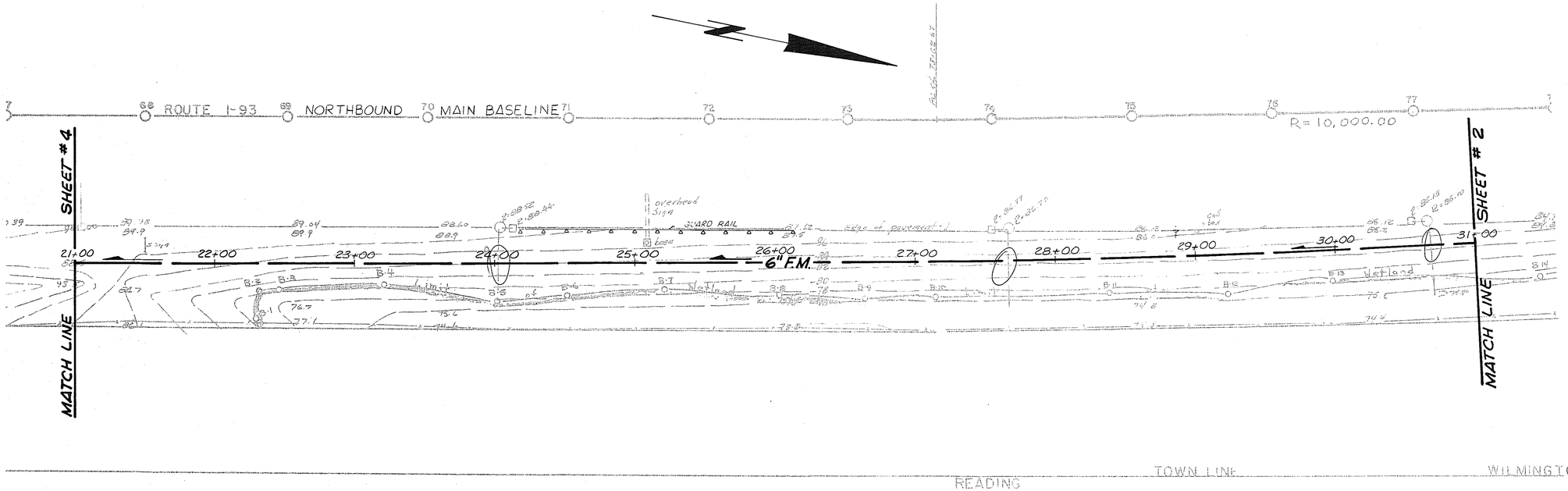

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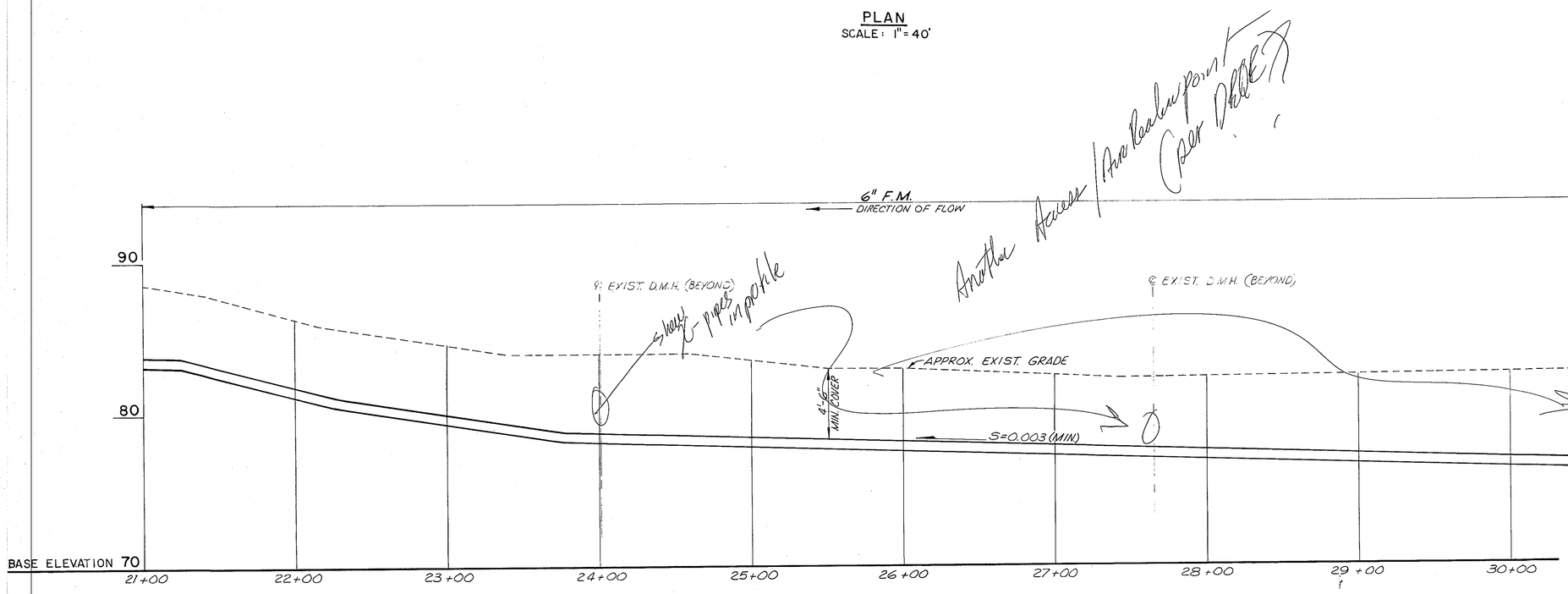

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RIVERPARK 93

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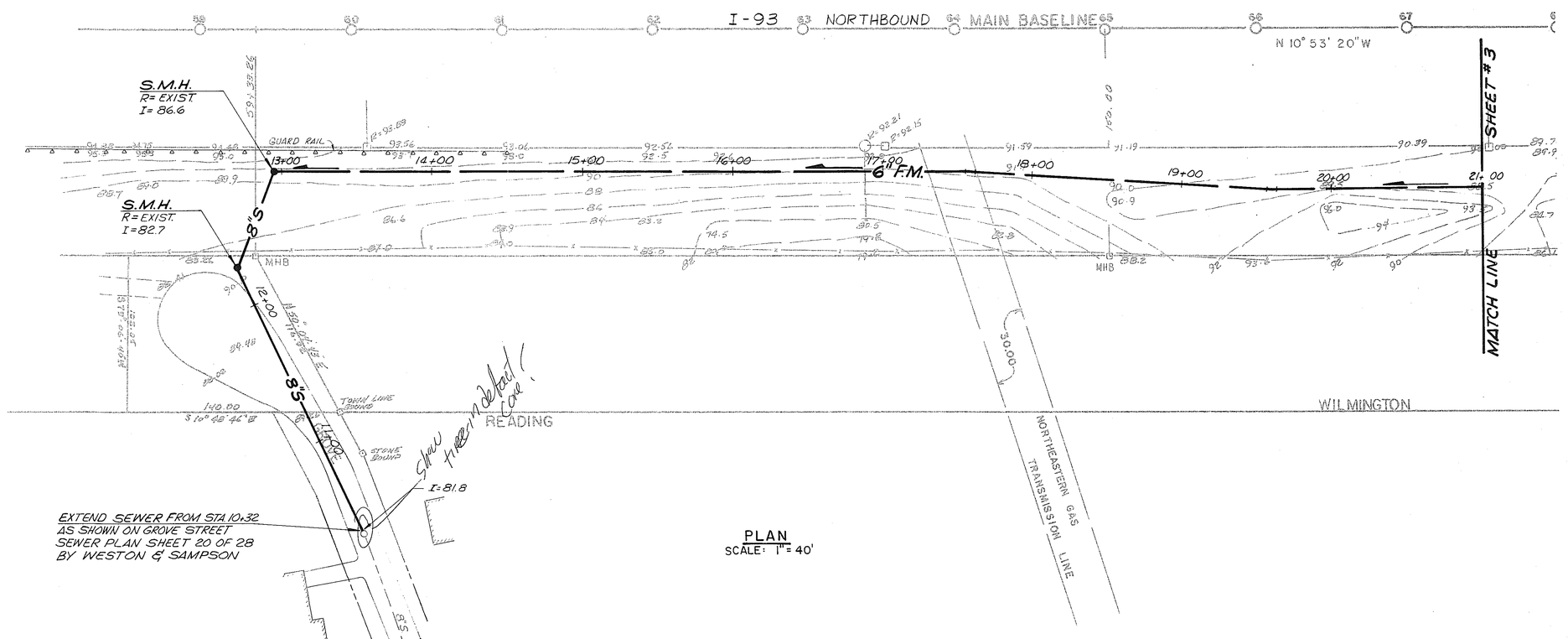

PLAN
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PROFILE
SCALE: 1"= 40' HOR.
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PROGRESS PRINT

"SEWER EXTENSION DESIGN"

RIVERPARK 93

WILMINGTON / NORTH READING, MA.

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APPENDIX B

Parcel Current Average Water Use and Wastewater Flow Projection Table

WRIGHT-PIERCE
Engineering a Better Environment

CLIENT	North Reading, Massachusetts
PROJECT	Concord Street Sewer Study
PROJECT NO.	13475A
DESIGNED BY	MAS2
DATE	05/23/2017

Purpose: The table below shows the current water use, average daily wastewater projection, and peak hourly wastewater projection for the Study Area.

Assumptions: It is assumed that there is 50% growth for the future scenario. When converting from water use to wastewater, a 90% consumptive use is assumed. When converting from average daily wastewater to peak hourly wastewater, a 5.6 peaking factor is used. This does not include the I/I allowance.

Parcel Current Average Water Use and Wastewater Flow Projection

Location	Map ID	Zone	Parcel Acres	Waterbody Acres	Wetlands Acres	Parcel Acres (Excluding Waterbodies and Wetlands)	Current Average Water Use (gpd)	Current Water Use (gpd/acre, no wetlands)	Average Daily Wastewater Projection (gpd)	Peak Hourly Wastewater Projection (gpd)	Comments
200 River Park Drive	001-0000-0002	Industrial Office (IO)	5.4	0.0	0.2	5.2	672	130	907	5,080	
300 River Park Drive	001-0000-0003	Industrial Office (IO)	21.2	6.8	3.7	10.7	2,961	276	3,997	22,385	
400 River Park Drive	001-0000-0004	Industrial Office (IO)	12.8	2.6	1.1	9.1	2,828	311	3,818	21,380	
500 River Park Drive	001-0000-0005	Industrial Office (IO)	11.0	0.0	3.5	7.4	6,086	819	8,216	46,010	
700 River Park Drive (1)	001-0000-0006	Industrial Office (IO)	0.8	0.0	0.0	0.8	310	368	418	2,340	Projected Current Average Water Use = 14,575gpd/39.6acres=368gpd/acre (RiverPark Dr Area)
700 River Park Drive (2)	001-0000-0007	Industrial Office (IO)	8.2	0.0	0.0	8.2	3,027	368	4,086	22,881	Projected Current Average Water Use = 14,575gpd/39.6acres=368gpd/acre (RiverPark Dr Area)
100 River Park Drive	002-0000-0002	Industrial Office (IO)	7.2	0.0	0.0	7.2	2,028	283	2,738	15,332	
92 Concord Street	002-0000-0003	Industrial Office (IO)	1.5	0.0	0.0	1.5	65	43	88	491	
90 Concord Street	002-0000-0004	Industrial Office (IO)	10.4	1.8	1.1	7.6	631	83	852	4,770	
72 Concord Street	002-0000-0005	Industrial Office (IO)	0.9	0.0	0.0	0.9	128	139	173	968	
79 Concord Street	002-0000-0007	Industrial Office (IO)	2.1	0.0	0.0	2.1	131	63	177	990	
0 Concord Street (2)	002-0000-0008	Industrial Office (IO)	9.7	8.3	0.6	0.8	53	63	71	399	Projected Current Average Water Use = 63gpd/acre same as 002-0000-0007
83 Concord Street	002-0000-0009	Industrial Office (IO)	19.3	16.8	2.1	0.4	24	63	32	179	Projected Current Average Water Use = 63gpd/acre same as 002-0000-0007
95 Concord Street	002-0000-0010	Industrial Office (IO)	10.4	2.4	0.4	7.6	467	61	630	3,531	
99 Concord Street	002-0000-0011	Industrial Office (IO)	11.2	1.0	0.7	9.5	1,100	116	1,485	8,316	
3 Fordham Road	002-0000-0012	Industrial Office (IO)	3.9	0.3	0.7	2.9	1,084	368	1,463	8,192	Projected Current Average Water Use = 14,575gpd/39.6acres=368gpd/acre (RiverPark Dr Area)
91 Concord Street	002-0000-0014	Industrial Office (IO)	9.1	2.3	0.1	6.6	328	50	443	2,480	
87 Concord Street	002-0000-0015	Industrial Office (IO)	8.2	3.7	0.0	4.5	80	18	108	605	
84 Concord Street	002-0000-0016	Industrial Office (IO)	12.5	2.0	2.8	7.7	232	30	313	1,754	
80 Concord Street	002-0000-0017	Industrial Office (IO)	11.3	2.5	3.2	5.6	349	62	471	2,638	
74 Concord Street	002-0000-0018	Industrial Office (IO)	3.8	1.1	0.3	2.4	471	195	636	3,561	
77 Concord Street	002-0000-0019	Industrial Office (IO)	1.0	0.0	0.0	1.0	61	63	82	461	
75 Concord Street	002-0000-0020	Industrial Office (IO)	1.1	0.0	0.0	1.1	3,983	3,695	5,377	30,111	
73 Concord Street	002-0000-0021	Industrial Office (IO)	1.0	0.0	0.0	0.9	43	45	58	325	
404 Park Street	018-0000-0004	Residence A (RA)	0.7	0.0	0.0	0.7	139	209	188	1,051	
402 Park Street	018-0000-0005	Residence A (RA)	7.4	0.0	1.8	5.6	147	26	198	1,111	
4 Concord Street	018-0000-0013	Residence A (RA)	0.9	0.0	0.0	0.9	214	241	289	1,618	Projected Current Average Water Use same as 018-0000-0014
12 Concord Street	018-0000-0014	Residence A (RA)	0.9	0.0	0.0	0.9	214	236	289	1,618	
14 Concord Street	018-0000-0015	Residence A (RA)	13.8	0.2	3.2	10.3	214	21	289	1,618	Projected Current Average Water Use same as 018-0000-0014
21 Concord Street	018-0000-0016	Residence A (RA)	1.5	0.0	0.0	1.5	137	94	185	1,036	
15 Concord Street	018-0000-0017	Residence A (RA)	0.6	0.0	0.0	0.6	67	107	90	507	
13 Concord Street	018-0000-0018	Residence A (RA)	0.5	0.0	0.0	0.5	66	133	89	499	
11 Concord Street	018-0000-0019	Residence A (RA)	0.4	0.0	0.0	0.4	66	147	89	499	Projected Current Average Water Use same as 018-0000-0018
408 Park Street	018-0000-0020	Residence A (RA)	0.7	0.0	0.0	0.7	119	178	161	900	
410 Park Street	018-0000-0021	Residence A (RA)	0.5	0.0	0.0	0.5	67	134	90	507	
20 Concord Street	018-0000-0079	Industrial Office (IO)	5.6	0.0	1.9	3.7	188	51	254	1,421	
25 Concord Street	018-0000-0083	Industrial Office (IO)	2.8	0.0	0.0	2.8	199	72	269	1,504	
17 Concord Street	018-0000-0095	Residence A (RA)	2.6	0.0	0.2	2.4	178	74	240	1,346	
37 Concord Street	019-0000-0001	Industrial Office (IO)	10.4	6.5	1.0	3.0	134	45	180	1,010	Projected Current Average Water Use = 45gpd/acre (Average of 019-0000-0020 and 019-0000-00021)
4 Hallberg Park	019-0000-0005	Industrial Office (IO)	0.9	0.0	0.0	0.9	78	88	105	590	
70 Concord Street	019-0000-0006	Industrial Office (IO)	1.8	0.0	0.0	1.8	454	248	613	3,431	Projected Current Average Water Use = 248gpd/acre (Average of 019-0000-0005, 019-0000-0007, and 019-0000-00090

Location	Map ID	Zone	Parcel Acres	Waterbody Acres	Wetlands Acres	Parcel Acres (Excluding Waterbodies and Wetlands)	Current Average Water Use (gpd)	Current Water Use (gpd/acre, no wetlands)	Average Daily Wastewater Projection (gpd)	Peak Hourly Wastewater Projection (gpd)	Comments
66 Concord Street	019-0000-0007	Industrial Office (IO)	0.8	0.0	0.0	0.8	159	195	215	1,202	
5 Hallberg Park	019-0000-0009	Industrial Office (IO)	1.1	0.0	0.0	1.1	458	422	618	3,462	
6 Hallberg Park	019-0000-0010	Industrial Office (IO)	4.8	3.0	0.9	0.9	212	248	287	1,605	Projected Current Average Water Use = 248gpd/acre (Average of 019-0000-0005, 019-0000-0007, and 019-0000-00090
62 Concord Street	019-0000-0011	Industrial Office (IO)	1.8	0.3	0.1	1.4	58	41	78	438	
60 Concord Street	019-0000-0013	Industrial Office (IO)	3.1	0.6	0.3	2.3	570	252	770	4,309	
58 Concord Street	019-0000-0014	Industrial Office (IO)	1.4	0.3	0.2	0.9	391	423	528	2,956	
54 Concord Street	019-0000-0015	Industrial Office (IO)	2.9	0.1	0.7	2.0	732	361	988	5,534	
50 Concord Street	019-0000-0018	Industrial Office (IO)	4.9	0.0	1.2	3.7	392	106	529	2,964	
0 Concord Street (1)	019-0000-0019	Industrial Office (IO)	5.0	3.1	1.7	0.1	0	0	0	0	Parcel Not Developable
55 Concord Street	019-0000-0020	Industrial Office (IO)	2.8	0.1	0.0	2.7	124	46	167	937	
45 Concord Street	019-0000-0021	Industrial Office (IO)	2.9	0.0	0.0	2.9	162	56	219	1,225	
65 Concord Street	019-0000-0022	Industrial Office (IO)	4.0	0.7	1.2	2.1	516	248	697	3,902	Projected Current Average Water Use = 248gpd/acre (Average of 019-0000-0005, 019-0000-0007, and 019-0000-00090
29 Concord Street	019-0000-0023	Industrial Office (IO)	24.3	0.4	6.1	17.7	74	4	100	559	
		54	**296**	**67**	**41.3**	**188**	**33,669**		**45,453**	**254,538**	

APPENDIX C

Estimate of Total Project Cost

Per Parcel

Table

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Engineering a Better Environment

North Reading, Massachusetts
Concord Street Sewer Study
13475A
MAS2
06/27/2017

Purpose: The table below shows the estimate of total project cost per parcel based on average daily wastewater flow projection.

Estimate of Total Project Cost Per Parcel based on Wastewater Flow Projection

Location	Map ID	Zone	Average Daily Wastewater Projection (gpd)	Estimate of Total Project Cost
200 River Park Drive	001-0000-0002	Industrial Office (IO)	907	$173,105
300 River Park Drive	001-0000-0003	Industrial Office (IO)	3,997	$762,742
400 River Park Drive	001-0000-0004	Industrial Office (IO)	3,818	$728,482
500 River Park Drive	001-0000-0005	Industrial Office (IO)	8,216	$1,567,730
700 River Park Drive (1)	001-0000-0006	Industrial Office (IO)	418	$79,732
700 River Park Drive (2)	001-0000-0007	Industrial Office (IO)	4,086	$779,622
100 River Park Drive	002-0000-0002	Industrial Office (IO)	2,738	$522,405
92 Concord Street	002-0000-0003	Industrial Office (IO)	88	$16,744
90 Concord Street	002-0000-0004	Industrial Office (IO)	852	$162,543
72 Concord Street	002-0000-0005	Industrial Office (IO)	173	$32,972
79 Concord Street	002-0000-0007	Industrial Office (IO)	177	$33,745
0 Concord Street (2)	002-0000-0008	Industrial Office (IO)	71	$13,604
83 Concord Street	002-0000-0009	Industrial Office (IO)	32	$6,109
95 Concord Street	002-0000-0010	Industrial Office (IO)	630	$120,297
99 Concord Street	002-0000-0011	Industrial Office (IO)	1,485	$283,356
3 Fordham Road	002-0000-0012	Industrial Office (IO)	1,463	$279,142
91 Concord Street	002-0000-0014	Industrial Office (IO)	443	$84,492
87 Concord Street	002-0000-0015	Industrial Office (IO)	108	$20,608
84 Concord Street	002-0000-0016	Industrial Office (IO)	313	$59,762
80 Concord Street	002-0000-0017	Industrial Office (IO)	471	$89,901
74 Concord Street	002-0000-0018	Industrial Office (IO)	636	$121,328
77 Concord Street	002-0000-0019	Industrial Office (IO)	82	$15,713
75 Concord Street	002-0000-0020	Industrial Office (IO)	5,377	$1,026,005
73 Concord Street	002-0000-0021	Industrial Office (IO)	58	$11,077
404 Park Street	018-0000-0004	Residence A (RA)	188	$35,806
402 Park Street	018-0000-0005	Residence A (RA)	198	$37,867
4 Concord Street	018-0000-0013	Residence A (RA)	289	$55,126
12 Concord Street	018-0000-0014	Residence A (RA)	289	$55,126
14 Concord Street	018-0000-0015	Residence A (RA)	289	$55,126
21 Concord Street	018-0000-0016	Residence A (RA)	185	$35,291
15 Concord Street	018-0000-0017	Residence A (RA)	90	$17,259
13 Concord Street	018-0000-0018	Residence A (RA)	89	$17,001
11 Concord Street	018-0000-0019	Residence A (RA)	89	$17,001
408 Park Street	018-0000-0020	Residence A (RA)	161	$30,654
410 Park Street	018-0000-0021	Residence A (RA)	90	$17,259
20 Concord Street	018-0000-0079	Industrial Office (IO)	254	$48,428
25 Concord Street	018-0000-0083	Industrial Office (IO)	269	$51,262
17 Concord Street	018-0000-0095	Residence A (RA)	240	$45,852
37 Concord Street	019-0000-0001	Industrial Office (IO)	180	$34,406
4 Hallberg Park	019-0000-0005	Industrial Office (IO)	105	$20,092
70 Concord Street	019-0000-0006	Industrial Office (IO)	613	$116,902

Location	Map ID	Zone	Average Daily Wastewater Projection (gpd)	Estimate of Total Project Cost
66 Concord Street	019-0000-0007	Industrial Office (IO)	215	$40,958
5 Hallberg Park	019-0000-0009	Industrial Office (IO)	618	$117,979
6 Hallberg Park	019-0000-0010	Industrial Office (IO)	287	$54,679
62 Concord Street	019-0000-0011	Industrial Office (IO)	78	$14,941
60 Concord Street	019-0000-0013	Industrial Office (IO)	770	$146,830
58 Concord Street	019-0000-0014	Industrial Office (IO)	528	$100,720
54 Concord Street	019-0000-0015	Industrial Office (IO)	988	$188,560
50 Concord Street	019-0000-0018	Industrial Office (IO)	529	$100,978
0 Concord Street (1)	019-0000-0019	Industrial Office (IO)	0	$0
55 Concord Street	019-0000-0020	Industrial Office (IO)	167	$31,942
45 Concord Street	019-0000-0021	Industrial Office (IO)	219	$41,731
65 Concord Street	019-0000-0022	Industrial Office (IO)	697	$132,951
29 Concord Street	019-0000-0023	Industrial Office (IO)	100	$19,062
		54	**45,453**	**$8,673,000**

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