RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
235 Promenade Street, Providence, Rhode Island 02908

July 6, 2021

CERTIFIED MAIL

Ms. Laurie Horridge, Executive Director
The Narragansett Bay Commission
1 Service Road
Providence, RI 02905

RE: Phase III CSO Program – Pawtucket Tunnel Construction Dewatering Site
Final Permit No. RI0023990

Dear Ms. Horridge:

Enclosed is the final Rhode Island Pollutant Discharge Elimination System (RIPDES) Permit issued for the discharge of treated construction dewatering wastewater that will be generated during the construction of the Pawtucket Tunnel and associated tunnel shafts located at 804 School Street in Pawtucket, RI. State regulations, promulgated under Chapter 46-12 of the Rhode Island General Laws of 1956, as amended, require this permit to become effective on the date specified in the permit.

Also enclosed is information relative to hearing requests and stays of RIPDES Permits.

We appreciate your cooperation throughout the development of this permit. Should the Narragansett Bay Commission have any questions concerning this permit, feel free to contact Aaron Mello of the State Permits Staff at (401) 222-4700, extension 7405.

Sincerely,

Joseph B. Haberek, P.E.
Environmental Engineer IV
Office of Water Resources

JBH:am

Enclosures

cc: James McCaughey, NBC (Electronic Copy)
Kathryn Kelly, NBC (Electronic Copy)
Dennis Ferreira Jr., CBNA Barletta (Electronic Copy)
Chris Feeney, Stantec (Electronic Copy)
Brandon Blanchard, Pare Corporation (Electronic Copy)
David Turin, EPA Region 1 (Electronic Copy)
Crystal Charbonneau, DEM/OWR (Electronic Copy)
Traci Pena, DEM/OWR (Electronic Copy)
Neal Personeus, DEM/OWR (Electronic Copy)

RESPONSE TO COMMENTS

NO SIGNIFICANT COMMENTS WERE RECEIVED ON THE DRAFT PERMIT FOR THIS FACILITY; THEREFORE, NO RESPONSE WAS PREPARED.

HEARING REQUESTS

If you wish to contest any of the provisions of this permit, you must request a formal hearing within thirty (30) days of receipt of this letter. The request should be submitted to the Administrative Adjudication Division at the following address:

Mary Dalton, Clerk
Department of Environmental Management
Office of Administrative Adjudication
235 Promenade Street
3rd Floor, Rm 350
Providence, RI 02908

Any request for a formal hearing must conform to the requirements of §1.50 of the Regulations for the Rhode Island Pollutant Discharge Elimination System (RI Code of Regulations; 250-RICR-150-10-1.50).

STAYS OF RIPDES PERMITS

Should the Department receive and grant a request for a formal hearing, the contested conditions of the permit will not automatically be stayed. However, the permittee, in accordance with §1.51 of the Regulations for the Rhode Island Pollutant Discharge Elimination System (RI Code of Regulations; 250-RICR-150-10-1.51), may request a temporary stay for the duration of adjudicatory hearing proceedings. Requests for stays of permit conditions should be submitted to the Office of Water Resources at the following address:

Angelo S. Liberti, P.E.
Chief of Surface Water Protection
Office of Water Resources
235 Promenade Street
Providence, Rhode Island 02908

All uncontested conditions of the permit will be effective and enforceable in accordance with the provisions of §1.50 of the Regulations for the Rhode Island Pollutant Discharge Elimination System (RI Code of Regulations; 250-RICR-150-10-1.50).

AUTHORIZATION TO DISCHARGE UNDER THE
RHODE ISLAND POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of Chapter 46-12 of the Rhode Island General Laws, as amended,

The Narragansett Bay Commission
1 Service Road
Providence, RI 02905

&

CBNA Barletta Phase IIIA CSO JV
40 Shawmut Road, Suite 200
Canton, MA 02021

is authorized to discharge from a facility located at the

Phase III CSO Program - Pawtucket Tunnel Construction Dewatering Site
804 School Street
Pawtucket, Rhode Island 02860

to receiving waters named

Seekonk River
(Waterbody ID: RI0007019E-01)

in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

This permit shall become effective on September 1, 2021.

This permit and the authorization to discharge expire at midnight, five (5) years from the effective date.

This permit consists of 9 pages in Part I including effluent limitations, monitoring requirements, etc. and 10 pages in Part II including General Conditions.

Signed this 6th day of July, 2021.

Angelo S. Liberti

Angelo S. Liberti, P.E., Administrator of Surface Water Protection
Office of Water Resources
Rhode Island Department of Environmental Management
Providence, Rhode Island

PART I

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date and lasting through permit expiration, the permittee is authorized to discharge from outfall serial number 001A. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations					Monitoring Requirement	
	Quantity - lbs./day		Concentration - specify units				
	Average Monthly	Maximum Daily	Average Monthly *(Minimum)	Average Weekly *(Average)	Maximum Daily *(Maximum)	Measurement Frequency	Sample Type
Flow	--- GPM	2,400 GPM				Continuous[1]	Recorder
Total Suspended Solids (TSS)			--- µg/L		30,000 µg/L	1/Week	Grab
Total Petroleum Hydrocarbons			--- ug/l		1,000 ug/l	1/Week	Grab
Tetrachloroethene			264 µg/L		--- µg/L	1/Week	Grab
Trichloroethylene			2,400 µg/L		--- µg/L	1/Week	Grab
Total Arsenic			3.24 µg/L		611.64 µg/L	1/Week	Grab
Total Copper			36.47 µg/L		59.31 µg/L	1/Week	Grab
Total Iron			--- µg/L		--- µg/L	1/Week	Grab

[1] Monitor flow and submit a flow log with the discharge monitoring reports (DMRs) required under Part I.C. The flow log shall include the rate and duration of flow including the time(s) of day when flow commences and ceases. At a minimum, the flow must be determined each time a sample is collected.

--- Signifies a parameter which must be monitored and data must be reported; no limit has been established at this time.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location: Outfall 001A – The Final Discharge from the Treatment System.

PART I

A. **EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS**

2. During the period beginning on the effective date and lasting through permit expiration, the permittee is authorized to discharge from outfall serial number 001A. Such discharges shall be limited and monitored by the permittee as specified below:

Effluent Characteristic	Discharge Limitations					Monitoring Requirement	
	Quantity - lbs./day		Concentration - specify units				
	Average Monthly	Maximum Daily	Average Monthly	Average Weekly	Maximum Daily	Measurement Frequency	Sample Type
Benzo (a) Anthracene			1.44 µg/l		--- µg/l	1/Week	Grab
Benzo (a) Pyrene			1.44 µg/l		--- µg/l	1/Week	Grab
Benzo (b) Fluoranthene			1.44 µg/l		--- µg/l	1/Week	Grab
Benzo (k) Fluoranthene			1.44 µg/l		--- µg/l	1/Week	Grab
Chrysene			1.44 µg/l		--- µg/l	1/Week	Grab
Dibenzo (a,h) Anthracene			1.44 µg/l		--- µg/l	1/Week	Grab
Indeno (1, 2, 3 - cd) Pyrene			1.44 µg/l		--- µg/l	1/Week	Grab

--- Signifies a parameter which must be monitored and data must be reported; no limit has been established at this time.

Samples taken in compliance with the monitoring requirements specified above shall be taken at the following location: Outfall 001A – The Final Discharge from the Treatment System.

3. a. The pH of the effluent shall not be less than 6.5 standard units nor greater than 8.5 standard units at any time unless these values are exceeded due to natural causes or as a result of the approved treatment processes.

   b. The discharge shall not cause visible discoloration of the receiving waters.

   c. The effluent shall contain neither a visible oil sheen, foam, nor floating solids at any time.

   d. The permittee shall analyze the influent to and effluent from Outfall 001A annually for the EPA Priority Pollutants as listed in 40 CFR 122, Appendix D, Tables II and III. The results of these analyses shall be submitted to the Department of Environmental Management by January 15th for the previous calendar year. All sampling and analysis shall be done in accordance with EPA Regulations, including 40 CFR 136 or other methods approved in this permit, grab and composite samples shall be taken as appropriate.

4. The permittee shall treat all groundwater pumped at the Pawtucket Tunnel Phase III CSO site with a treatment system that consists of a flow equalization basin, two (2) parallel settling basins with a polymer injection system, three (3) parallel 4-pod 54-inch diameter sand filters, two (2) parallel 8-inch 12-bag filter units, and a totalizing flow meter (see Treatment System Flow Schematic in Attachment A-3). The permittee may not modify the treatment system without prior written approval from the Office of Water Resources.

5. The permittee shall at all times properly operate and maintain the dewatering treatment system. Notification of mechanical failure or breakthrough of the treatment system (exceedance of any permit limits) shall be reported to the Office of Water Resources within one (1) business day of either the mechanical failure or receiving the analytical results indicating that contaminants are found in the effluent (Outfall 001A) above the limits listed in Parts I.A.1 – 2. The notification shall include a summary of the total flow, operation and maintenance activities, and any recent laboratory results. Written documentation of the notification required above shall be submitted to the Office of Water Resources within five (5) days along with a description of the corrective actions which were taken to resolve the non-compliant status.

6. The treatment system shall be inspected a minimum of weekly to assure the system is operating properly and to look for evidence of iron build-up and/or sludge build-up in the settling basins. As a result of these or any other inspections, appropriate action shall be taken, as soon as practicable, to resolve any problems discovered during an inspection. Records documenting inspections and any actions taken (i.e. changing media, bag filters, sludge removal, etc.) shall be retained and made available upon request to the Office of Water Resources.

7. The permittee must monitor flow and submit a flow log with the monthly DMRs required under Part I.C. The flow log shall include the rate and duration of flow including the time(s) of day when flow commences and ceases. At a minimum the flow must be reported each time a sample is collected.

8. This permit authorizes the use of the chemical additive HaloKlear BHR-P50 in the Pawtucket Tunnel construction dewatering treatment system, manufactured by Dober Chemical Corp. at concentrations in the discharge not to exceed 3,222 mg/L.

9. The permittee shall obtain Department approval before increasing the amount of the treatment chemical listed in Part I.A.8 or prior to using any other additive(s) in conjunction with or in place of the treatment chemical listed in Part I.A.8 of this permit. Prior to using any other chemical additives, the permittee shall submit for DEM approval a complete list of all chemical additives, including Safety Data Sheets (SDS).

10. All existing manufacturing, commercial, mining, and silvicultural dischargers must notify the Director as soon as they know or have reason to believe:

    a. That any activity has occurred or will occur which would result in the discharge, on a routine or frequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

        (1) One hundred micrograms per liter (100 µg/L);

        (2) Two hundred micrograms per liter (200 µg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 µg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitro-phenol; and one milligram per liter (1 mg/L) for antimony;

        (3) Five (5) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

        (4) Any other notification level established by the Director in accordance with 40 CFR 122.44(f) and Rhode Island Regulations.

    b. That any activity has occurred or will occur which would result in the discharge, on a non-routine or infrequent basis, of any toxic pollutant which is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

        (1) Five hundred micrograms per liter (500 µg/L);

        (2) One milligram per liter (1 mg/L) for antimony;

        (3) Ten (10) times the maximum concentration value reported for that pollutant in the permit application in accordance with 40 CFR 122.21(g)(7); or

        (4) other notification level established by the Director in accordance with 40 CFR 122.44(f) and Rhode Island Regulations.

    c. That they have begun or expect to begin to use or manufacture as an intermediate or final product or by-product any toxic pollutant, which was not reported in the permit application.

11. This permit serves as the State's Water Quality Certificate for the discharges described herein.

B. DETECTION LIMITS

All analyses of parameters under this permit must comply with the *National Pollutant Discharge Elimination System (NPDES): Use of Sufficiently Sensitive Test Methods for Permit Applications and Reporting* rule. Only sufficiently sensitive test methods may be used for analyses of parameters under this permit. The permittee shall assure that all testing required by this permit, is performed in conformance with methods listed in 40 CFR 136. In accordance with 40 CFR 136, EPA approved analysis techniques, quality assurance procedures and quality control procedures shall be followed for all reports required to be submitted under the Rhode Island Pollutant Discharge Elimination System (RIPDES) program. These procedures are described in "Methods for the Determination of Metals in Environmental Samples" (EPA/600/4-91/010) and "Methods for Chemical Analysis of Water and Wastes" (EPA/600/4-79/020).

If after conducting the complete Method of Standard Additions analysis, the laboratory is unable to determine a valid result, the laboratory shall report "could not be analyzed". Documentation supporting this claim shall be submitted along with the monitoring report. If valid analytical results are repeatedly unobtainable, DEM may require that the permittee determine a method detection limit (MDL) for their effluent or sludge as outlined in 40 CFR 136, Appendix B.

When calculating sample averages for reporting on discharge monitoring reports (DMRs):

1. "could not be analyzed" data shall be excluded, and shall not be considered as failure to comply with the permit sampling requirements;

2. results reported as less than the MDL shall be included as zeros in accordance with the DEM's DMR Instructions, provided that all appropriate EPA approved methods were followed.

Therefore, all sample results shall be reported as: an actual value, "could not be analyzed", or zero. The effluent or sludge specific MDL must be calculated using the methods outlined in 40 CFR 136, Appendix B. Samples which have been diluted to ensure that the sample concentration will be within the linear dynamic range shall not be diluted to the extent that the analyte is not detected. If this should occur the analysis shall be repeated using a lower degree of dilution.

LIST OF TOXIC POLLUTANTS

The following list of toxic pollutants has been designated pursuant to Section 307(a)(1) of the Clean Water Act. The Method Detection Limits (MDLs) represent the required Rhode Island MDLs.

Volatiles - EPA Method 624.1		MDL µg/l (ppb)
1V	acrolein	10.0
2V	acrylonitrile	5.0
3V	benzene	1.0
5V	bromoform	1.0
6V	carbon tetrachloride	1.0
7V	chlorobenzene	1.0
8V	chlorodibromomethane	1.0
9V	chloroethane	1.0
10V	2-chloroethylvinyl ether	5.0
11V	chloroform	1.0
12V	dichlorobromomethane	1.0
14V	1,1-dichloroethane	1.0
15V	1,2-dichloroethane	1.0
16V	1,1-dichloroethylene	1.0
17V	1,2-dichloropropane	1.0
18V	1,3-dichloropropylene	1.0
19V	ethylbenzene	1.0
20V	methyl bromide	1.0
21V	methyl chloride	1.0
22V	methylene chloride	1.0
23V	1,1,2,2-tetrachloroethane	1.0
24V	tetrachloroethylene	1.0
25V	toluene	1.0
26V	1,2-trans-dichloroethylene	1.0
27V	1,1,1-trichloroethane	1.0
28V	1,1,2-trichloroethane	1.0
29V	trichloroethylene	1.0
31V	vinyl chloride	1.0

Acids - EPA Method 625.1		MDL µg/L (ppb)
1A	2-chlorophenol	1.0
2A	2,4-dichlorophenol	1.0
3A	2,4-dimethylphenol	1.0
4A	4,6-dinitro-o-cresol	1.0
5A	2,4-dinitrophenol	2.0
6A	2-nitrophenol	1.0
7A	4-nitrophenol	1.0
8A	p-chloro-m-cresol	2.0
9A	pentachlorophenol	1.0
10A	phenol	1.0
11A	2,4,6-trichlorophenol	1.0

Pesticides - EPA Method 608.3		MDL µg/L (ppb)
1P	aldrin	0.059
2P	alpha-BHC	0.058
3P	beta-BHC	0.043
4P	gamma-BHC	0.048
5P	delta-BHC	0.034
6P	chlordane	0.211
7P	4,4'-DDT	0.251
8P	4,4'-DDE	0.049
9P	4,4'-DDD	0.139
10P	dieldrin	0.082
11P	alpha-endosulfan	0.031
12P	beta-endosulfan	0.036
13P	endosulfan sulfate	0.109
14P	endrin	0.050
15P	endrin aldehyde	0.062
16P	heptachlor	0.029
17P	heptachlor epoxide	0.040

Pesticides - EPA Method 608.3		MDL µg/L (ppb)
18P	PCB-1242	0.289
19P	PCB-1254	0.298
20P	PCB-1221	0.723
21P	PCB-1232	0.387
22P	PCB-1248	0.283
23P	PCB-1260	0.222
24P	PCB-1016	0.494
25P	toxaphene	1.670

Base/Neutrals - EPA Method 625.1		MDL µg/L (ppb)
1B	acenaphthene *	1.0
2B	acenaphthylene *	1.0
3B	anthracene *	1.0
4B	benzidine	4.0
5B	benzo(a)anthracene *	0.02
6B	benzo(a)pyrene *	0.03
7B	3,4-benzofluoranthene *	0.018
8B	benzo(ghi)perylene *	2.0
9B	benzo(k)fluoranthene *	0.02
10B	bis(2-chloroethoxy)methane	2.0
11B	bis(2-chloroethyl)ether	1.0
12B	bis(2-chloroisopropyl)ether	1.0
13B	bis(2-ethylhexyl)phthalate	1.0
14B	4-bromophenyl phenyl ether	1.0
15B	butylbenzyl phthalate	1.0
16B	2-chloronaphthalene	1.0
17B	4-chlorophenyl phenyl ether	1.0
18B	chrysene *	0.15
19B	dibenzo (a,h)anthracene *	0.04
20B	1,2-dichlorobenzene	1.0
21B	1,3-dichlorobenzene	1.0
22B	1,4-dichlorobenzene	1.0
23B	3,3'-dichlorobenzidine	2.0
24B	diethyl phthalate	1.0
25B	dimethyl phthalate	1.0
26B	di-n-butyl phthalate	1.0
27B	2,4-dinitrotoluene	2.0
28B	2,6-dinitrotoluene	2.0
29B	di-n-octyl phthalate	1.0
30B	1,2-diphenylhydrazine (as azobenzene)	1.0
31B	fluoranthene *	1.0
32B	fluorene *	1.0
33B	hexachlorobenzene	1.0
34B	hexachlorobutadiene	1.0
35B	hexachlorocyclopentadiene	2.0
36B	hexachloroethane	1.0
37B	indeno(1,2,3-cd)pyrene *	0.043
38B	isophorone	1.0
39B	naphthalene *	1.0
40B	nitrobenzene	1.0
41B	N-nitrosodimethylamine	1.0
42B	N-nitrosodi-n-propylamine	1.0
43B	N-nitrosodiphenylamine	1.0
44B	phenanthrene *	1.0
45B	pyrene *	1.0
46B	1,2,4-trichlorobenzene	1.0

OTHER TOXIC POLLUTANTS

	MDL µg/L (ppb)
TSS	2,000.0
TPH	5.0
Antimony, Total	0.5
Arsenic, Total	0.1
Aluminum, Total	20.0
Beryllium, Total	0.2
Cadmium, Total	0.2
Chromium, Total	1.0
Chromium, Hexavalent	1.0
Copper, Total	0.2
Iron, Total	20.0
Lead, Total	0.2
Mercury, Total	0.2
Nickel, Total	0.2
Selenium, Total	1.0
Silver, Total	0.2
Thallium, Total	5.0
Zinc, Total	2.0
Asbestos	**
Cyanide, Total	5.0
Phenols, Total	2.0
TCDD	**
Phosphorous, Total	0.1
MTBE (Methyl Tert Butyl Ether)	0.5

* Polynuclear Aromatic Hydrocarbons

** No Rhode Island Department of Environmental Management MDL

NOTE:

The MDL for a given analyte may vary with the type of sample. MDLs which are determined in reagent water may be lower than those determined in wastewater due to fewer matrix interferences. Wastewater is variable in composition and may therefore contain substances (interferents) that could affect MDLs for some analytes of interest. Variability in instrument performance can also lead to inconsistencies in determinations of MDLs.

C. MONITORING AND REPORTING

1. Monitoring

All monitoring required by this permit shall be done in accordance with sampling and analytical testing procedures specified in Federal Regulations 40 CFR 136.

2. Submittal of DMRs Using NetDMR

Monitoring results obtained during the previous month shall be summarized and reported to DEM in discharge monitoring reports (DMRs) submitted electronically using the NetDMR reporting tool (https://netdmr.epa.gov) no later than the 15th day of the month following the completed reporting period. When the permittee submits DMRs using NetDMR, it is not required to submit hard copies of DMRs to DEM.

3. Submittal of Reports as NetDMR Attachments

Unless otherwise specified in this permit, the permittee must submit electronic copies of documents in NetDMR that are directly related to the DMR. These include the following:

- DMR Cover Letters
- Below Detection Limit summary tables
- Flow Logs required under Part I.A.7

All other reports should be submitted to DEM as a hard copy via regular US mail (see Part I.C.4 below).

4. Submittal of Requests and Reports to DEM

The following requests, reports, and information described in this permit shall be submitted as hard copy to the DEM.

- Transfer of Permit notice
- Written notifications required under Part II
- Notice of unauthorized discharges
- Priority Pollutants Scan results per Part I.A.3.d
- Request to modify the treatment system per Part I.A.4 of the permit
- Request to increase the amount of chemicals or add chemicals to the treatment system per Part I.A.9 of the permit

These reports, information, and requests shall be submitted to DEM by hard copy mail to the following address:

Rhode Island Department of Environmental Management
RIPDES Program
235 Promenade Street
Providence, RI 02908

5. Verbal Reports and Verbal Notifications

Any verbal reports or verbal notifications, if required in Parts I and/or II of this permit, shall be made to the DEM. This includes verbal reports and notifications required under Part II.(I)(5) General Requirements. Verbal reports and verbal notifications shall be made to DEM at (401) 222-4700 or (401) 222-3070 at night.

PART II
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GENERAL REQUIREMENTS

DEFINITIONS

GENERAL REQUIREMENTS

(a) Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of Chapter 46-12 of the Rhode Island General Laws and the Clean Water Act (CWA) and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

(1) The permittee shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants within the time provided in the regulations that establish these standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

(2) The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the CWA is subject to a civil penalty not to exceed $10,000 per day of such violation. Any person who willfully or negligently violates permit conditions implementing Sections 301, 302, 306, 307 or 308 of the Act is subject to a fine of not less than $2,500 nor more than $25,000 per day of violation, or by imprisonment of not more than 1 year, or both.

(3) Chapter 46-12 of the Rhode Island General Laws provides that any person who violates a permit condition is subject to a civil penalty of not more than $5,000 per day of such violation. Any person who willfully or negligently violates a permit condition is subject to a criminal penalty of not more than $10,000 per day of such violation and imprisonment for not more than 30 days, or both. Any person who knowingly makes any false statement in connection with the permit is subject to a criminal penalty of not more than $5,000 for each instance of violation or by imprisonment for not more than 30 days, or both.

(b) Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and obtain a new permit. The permittee shall submit a new application at least 180 days before the expiration date of the existing permit, unless permission for a later date has been granted by the Director. (The Director shall not grant permission for applications to be submitted later than the expiration date of the existing permit.)

(c) Need to Halt or Reduce Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

(d) Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

(e) Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures, and, where applicable, compliance with DEM "Rules and Regulations Pertaining to the Operation and Maintenance of Wastewater Treatment Facilities" and "Rules and Regulations Pertaining to the Disposal and Utilization of Wastewater Treatment Facility Sludge." This provision requires the operation of back-up or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of the permit.

(f) Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause, including but not limited to: (1) Violation of any terms or conditions of this permit; (2) Obtaining this permit by misrepresentation or failure to disclose all relevant facts; or (3) A change in any conditions that requires either a temporary or permanent reduction or elimination of the authorized discharge. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

(g) Property Rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

(h) Duty to Provide Information

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

(i) Inspection and Entry

The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to:

(1) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

(2) Have access to and copy, at reasonable times any records that must be kept under the conditions of this permit;

(3) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit; and

(4) Sample or monitor any substances or parameters at any location, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the CWA or Rhode Island law.

(j) Monitoring and Records

(1) Samples and measurements taken for the purpose of monitoring shall be representative of the volume and nature of the discharge over the sampling and reporting period.

(2) The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings from continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 5 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

(3) Records of monitoring information shall include:

(i) The date, exact place, and time of sampling or measurements;

(ii) The individual(s) who performed the sampling or measurements;

(iii) The date(s) analyses were performed;

(iv) The individual(s) who performed the analyses;

(v) The analytical techniques or methods used; and

(vi) The results of such analyses.

(4) Monitoring must be conducted according to test procedures approved under 40 CFR Part 136 and applicable Rhode Island regulations, unless other test procedures have been specified in this permit.

(5) The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall upon conviction, be punished by a fine of not more than $10,000 per violation or by imprisonment for not more than 6 months per violation or by both. Chapter 46-12 of the Rhode Island General Laws also provides that such acts are subject to a fine of not more than $5,000 per violation, or by imprisonment for not more than 30 days per violation, or by both.

(6) Monitoring results must be reported on a Discharge Monitoring Report (DMR).

(7) If the permittee monitors any pollutant more frequently than required by the permit, using test procedures approved under 40 CFR Part 136, applicable State regulations, or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.

(k) Signatory Requirement

All applications, reports, or information submitted to the Director shall be signed and certified in accordance with 250-RICR-150-10-1.12 of the Rhode Island Pollutant Discharge Elimination System (RIPDES) Regulations. Rhode Island General Laws, Chapter 46-12 provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine of not more than $5,000 per violation, or by imprisonment for not more than 30 days per violation, or by both.

(l) Reporting Requirements

(1) Planned changes. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility.

(2) Anticipated noncompliance. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with the permit requirements.

(3) Transfers. This permit is not transferable to any person except after written notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under State and Federal law.

(4) Monitoring reports. Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(5) Twenty-four hour reporting. The permittee shall immediately report any noncompliance which may endanger health or the environment by calling DEM at (401) 222-4700 or (401) 222-3070 at night.

A written submission shall also be provided within five (5) days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

The following information must be reported immediately:

(i) Any unanticipated bypass which causes a violation of any effluent limitation in the permit; or

(ii) Any upset which causes a violation of any effluent limitation in the permit; or

(iii) Any violation of a maximum daily discharge limitation for any of the pollutants specifically listed by the Director in the permit.

The Director may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

(6) Other noncompliance. The permittee shall report all instances of noncompliance not reported under paragraphs (1), (2), and (5), of this section, at the time monitoring reports are submitted. The reports shall contain the information required in paragraph (l)(5) of the section.

(7) Other information. Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, they shall promptly submit such facts or information.

(m) Bypass

"Bypass" means the intentional diversion of waste streams from any portion of a treatment facility.

(1) Bypass not exceeding limitations. The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of paragraphs (2) and (3) of this section.

(2) Notice.

(i) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten (10) days before the date of the bypass.

(ii) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in 250-RICR-150-10-1.14(R) of the RIPDES Regulations.

(3) Prohibition of bypass.

(i) Bypass is prohibited, and the Director may take enforcement action against a permittee for bypass, unless:

(A) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage, where "severe property damage" means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production;

(B) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

(C) The permittee submitted notices as required under paragraph (2) of this section.

(ii) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three conditions listed above in paragraph (3)(i) of this section.

(n) Upset

"Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

(1) Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of paragraph (2) of this section are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

(2) Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(a) An upset occurred and that the permittee can identify the cause(s) of the upset;

(b) The permitted facility was at the time being properly operated;

(c) The permittee submitted notice of the upset as required in 250-RICR-150-10-1.14(R) of the RIPDES Regulations; and

(d) The permittee complied with any remedial measures required under 250-RICR-150-10-1.14(E) of the RIPDES Regulations.

(3) Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

(o) Change in Discharge

All discharges authorized herein shall be consistent with the terms and conditions of this permit. Discharges which cause a violation of water quality standards are prohibited. The discharge of any pollutant identified in this permit more frequently than or at a level in excess of that authorized shall constitute a violation of the permit. Any anticipated facility expansions, production increases, or process modifications which will result in new, different or increased discharges of pollutants must be reported by submission of a new NPDES application at least 180 days prior to commencement of such discharges, or if such changes will not violate the effluent limitations specified in this permit, by notice, in writing, to the Director of such changes. Following such notice, the permit may be modified to specify and limit any pollutants not previously limited.

Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by the permit constitutes a violation.

(p) Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in a manner consistent with applicable Federal and State laws and regulations including, but not limited to the CWA and the Federal Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq., Rhode Island General Laws, Chapters 46-12, 23-19.1 and regulations promulgated thereunder.

(q) Power Failures

In order to maintain compliance with the effluent limitation and prohibitions of this permit, the permittee shall either:

> In accordance with the Schedule of Compliance contained in Part I, provide an alternative power source sufficient to operate the wastewater control facilities;

or if such alternative power source is not in existence, and no date for its implementation appears in Part I,

> Halt reduce or otherwise control production and/or all discharges upon the reduction, loss, or failure of the primary source of power to the wastewater control facilities.

(r) Availability of Reports

Except for data determined to be confidential under paragraph (w) below, all reports prepared in accordance with the terms of this permit shall be available for public inspection at the DEM, 235 Promenade Street, Providence, Rhode Island 02908. As required by the CWA, effluent data shall not be considered confidential. Knowingly making any false statement on any such report may result in the imposition of criminal penalties as provided for in Section 309 of the CWA and under Section 46-12-14 of the Rhode Island General Laws.

(s) State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law.

(t) Other Laws

The issuance of a permit does not authorize any injury to persons or property or invasion of other private rights, nor does it relieve the permittee of its obligation to comply with any other applicable Federal, State, and local laws and regulations.

(u) Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

(v) Reopener Clause

The Director reserves the right to make appropriate revisions to this permit in order to incorporate any appropriate effluent limitations, schedules of compliance, or other provisions which may be authorized under the CWA or State law. In accordance with 250-RICR-150-10-1.16 and 250-RICR-150-10-1.24 of the RIPDES Regulations, if any effluent standard or prohibition, or water quality standard is promulgated under the CWA or under State law which is more stringent than any limitation on the pollutant in the permit, or controls a pollutant not limited in the permit, then the Director may promptly reopen the permit and modify or revoke and reissue the permit to conform to the applicable standard.

(w) Confidentiality of Information

(1) Any information submitted to DEM pursuant to these regulations may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission in the manner prescribed on the application form or instructions or, in the case of other submissions, by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, DEM may make the information available to the pubic without further notice.

(2) Claims of confidentiality for the following information will be denied:

(i) The name and address of any permit applicant or permittee;

(ii) Permit applications, permits and any attachments thereto; and

(iii) NPDES effluent data.

(x) Best Management Practices

The permittee shall adopt Best Management Practices (BMP) to control or abate the discharge of toxic pollutants and hazardous substances associated with or ancillary to the industrial manufacturing or treatment process and the Director may request the submission of a BMP plan where the Director determines that a permittee's practices may contribute significant amounts of such pollutants to waters of the State.

(y) Right of Appeal

Within thirty (30) days of receipt of notice of a final permit decision, the permittee or any interested person may submit a request to the Director for an adjudicatory hearing to reconsider or contest that decision. The request for a hearing must conform to the requirements of 250-RICR-150-10-1.50 of the RIPDES Regulations.

DEFINITIONS

1. For purposes of this permit, those definitions contained in the RIPDES Regulations and the Rhode Island Pretreatment Regulations shall apply.

2. The following abbreviations, when used, are defined below.

cu. M/day or M^3/day	cubic meters per day
mg/l	milligrams per liter
ug/l	micrograms per liter
lbs/day	pounds per day
kg/day	kilograms per day
Temp. °C	temperature in degrees Centigrade
Temp. °F	temperature in degrees Fahrenheit
Turb.	turbidity measured by the Nephelometric Method (NTU)
TNFR or TSS	total nonfilterable residue or total suspended solids
DO	dissolved oxygen
BOD	five-day biochemical oxygen demand unless otherwise specified
TKN	total Kjeldahl nitrogen as nitrogen
Total N	total nitrogen
NH_3-N	ammonia nitrogen as nitrogen
Total P	total phosphorus
COD	chemical oxygen demand
TOC	total organic carbon
Surfactant	surface-active agent
pH	a measure of the hydrogen ion concentration
PCB	polychlorinated biphenyl
CFS	cubic feet per second
MGD	million gallons per day
Oil & Grease	Freon extractable material
Total Coliform	total coliform bacteria
Fecal Coliform	total fecal coliform bacteria
ml/l	milliliter(s) per liter
NO_3-N	nitrate nitrogen as nitrogen
NO_2-N	nitrite nitrogen as nitrogen
NO_3-NO_2	combined nitrate and nitrite nitrogen as nitrogen
Cl_2	total residual chlorine

RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
235 PROMENADE STREET
PROVIDENCE, RHODE ISLAND 02908-5767

STATEMENT OF BASIS

RHODE ISLAND POLLUTANT DISCHARGE ELIMINATION SYSTEM (RIPDES) PERMIT TO DISCHARGE TO WATERS OF THE STATE

RIPDES PERMIT NO.

RI0023990

NAME AND ADDRESS OF APPLICANT:

The Narragansett Bay Commission
1 Service Road
Providence, RI 02905

&

CBNA Barletta Phase IIIA CSO JV
40 Shawmut Road, Suite 200
Canton, MA 02021

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Phase III CSO Program - Pawtucket Tunnel Construction Dewatering Site
804 School Street
Pawtucket, Rhode Island 02860

RECEIVING WATER:

Seekonk River
(Waterbody ID: RI0007019E-01)

CLASSIFICATION:

SB1{a}

Statement of Basis Table of Contents

I. Proposed Action, Type of Facility, and Discharge Location

The above-named applicant has applied to the Rhode Island Department of Environmental Management (DEM) for issuance of a RIPDES Permit to discharge into the designated receiving water. The discharge consists of treated construction dewatering wastewater that is generated during construction of the Pawtucket Tunnel and associated tunnel shafts located at 804 School Street, Pawtucket, RI. The discharge is to the Seekonk River. Attachment A-1 includes a site location map; Attachment A-2 includes a site plan for the Pawtucket Tunnel launch shaft and the location of the dewatering treatment system and proposed Outfall 001A; and Attachment A-3 includes a treatment system flow schematic.

II. Description of Discharge

The discharge from Outfall 001A consists of treated effluent from a dewatering treatment system associated with construction of the Narragansett Bay Commission (NBC) Phase III Combined Sewer Overflow (CSO) Program's Pawtucket Tunnel site. The treated construction-phase dewatering effluent will be discharged to the Seekonk River from Outfall 001 through one of two submerged multiport diffusers.

III. Permit Limitations and Conditions

The final effluent limitations and monitoring requirements may be found in the permit.

IV. Permit Basis and Explanation of Effluent Limitation Derivation

Variances, Alternatives, and Justifications for Waivers of Application Requirements

No variances or alternatives to required standards were requested or granted.

No waivers were requested or granted for any application requirements per 40 CFR §122.21(j) or (q).

Facility Description

The NBC submitted an application for the proposed discharge to the DEM on June 1, 2020 and amended on March 22, 2021 and May 10, 2021. The application submission included NPDES Forms 1 and 2D and a technical supporting document entitled 'Phase III CSO Program: Engineering Report – Pawtucket Tunnel Temporary Construction Discharge; Dated May 29, 2020; Prepared by Stantec and Pare Corporation on behalf of NBC' (the "Engineering Report").

NBC embarked on a three-phase CSO control program in 1998, aimed at lowering annual CSO volumes and reducing annual shellfish bed closures in accordance with a Consent Agreement with the DEM. Phases I and II of this program, which focused on the Fields Point Service Area in Providence, were completed in 2008 and 2015, respectively. Phase III of the program, which began in 2016, is focused primarily on the Bucklin Point Service Area in the communities of Pawtucket and Central Falls. The Phase III CSO Program has been subdivided into four sub-phases. The current Phase IIIA is in regard to the Pawtucket Tunnel and Tunnel Pump Station. The final sub-phase of the CSO program also addresses the final remaining outfalls in the Fields Point Service Area.

NBC and DEM have entered into an updated Consent Agreement (RIA-424) dated January 8, 2019 for both Fields Point and Bucklin Point Wastewater Treatment Facilities (WWTF) and their sewer collection system, which defines the implementation schedule for the Phase III CSO Program. The Pawtucket Tunnel Project (i.e. NBC Contract 308.01C) includes the tunnel and ancillary underground features (i.e. drop shafts, vent shafts, launch shaft, receiving shaft, tunnel pump station shaft, adit tunnels) to support the functionality of the tunnel to serve as a CSO storage facility. The tunnel is designed to provide volume to store all contributing overflows during a storm

event up to the three-month storm for subsequent pump-out and treatment at the Bucklin Point WWTF.

In previous phases of the CSO program, construction dewatering discharges were directed to the NBC sewer system and conveyed to the Fields Point WWTF in compliance with a pretreatment permit. However, given the limited capacity of the Bucklin Point facility, NBC decided to pursue a RIPDES permit to temporarily discharge construction dewatering to the Seekonk River to reduce the risk of negative impacts and permit non-compliance at the Bucklin Point WWTF.

The Engineering Report (available upon request from the DEM) provides background information on the Pawtucket Tunnel and its expected effluent and proposed outfall pipe characteristics. The Engineering Report was submitted to DEM to support NBC's application for an individual RIPDES Permit to authorize a temporary discharge of construction dewatering effluent to the Seekonk River. Construction dewatering is a required element on the Phase III CSO project because it involves excavation below the groundwater table. Controlling groundwater is necessary to maintain safe, structurally stable working conditions. The majority of tunnel support construction activities will be conducted at 804 School Street in Pawtucket, RI. This site (aka, launch shaft site) is the location for the following facilities: launch shaft, tunnel pump station shaft, OF-218 drop shaft, and emergency overflow structure. The 60-ft diameter launch shaft provides a clear opening anticipated to support construction access, muck conveyance, and access for the tunnel boring machine (TBM). The launch shaft is the primary collection point for dewatering flows associated with tunnel construction. All the dewatering flows collected at the launch shaft site will be conveyed to the proposed treatment system and multiport diffuser outfall system, as described below.

This Engineering Report addresses the following:

- Anticipated flows and data evaluation for the Pawtucket Tunnel
- Mixing zone analysis from CORMIX model results
- Treatment system data evaluation
- Proposed outfall pipe alignment and configuration
- Application for an individual RIPDES Permit

The Pawtucket Tunnel is a rock tunnel, 140-ft to 180-ft below the ground surface, located north of the Bucklin Point WWTF from 804 School Street to 660 Roosevelt Avenue in Pawtucket, RI, adjacent to the Seekonk and Blackstone Rivers. The tunnel is approximately 11,600 feet in length with a 30-foot inside diameter. The tunnel is being designed as a single-pass, gasketed, precast-concrete, segmental tunnel liner. This lining system has been selected to control groundwater inflows, maintain rock stability, control quality and reduce time of installation. Construction of the Phase III CSO project has a likely start of July 2021. The need for construction-phase dewatering will start with the construction of these early facilities. Tunnel mining is scheduled to commence in November/December 2022 and continue for upwards of twelve to eighteen months.

Groundwater Evaluation

The data from monitoring wells along the proposed alignment of the Pawtucket Tunnel were analyzed for groundwater chemistry to identify any potential contaminants. Nine (9) groundwater samples were collected at different times and analyzed for metals, organics and cyanide. Appendix A of the Engineering Report provides a summary of available groundwater chemistry for deep rock aquifer along the alignment.

Groundwater Treatment System

Construction dewatering flows during tunnel mining will receive treatment onsite prior to being discharged to the Seekonk River. At the launch shaft site, dewatering flows will be collected at each of the shaft excavations: launch shaft, tunnel pump station shaft, and OF-218 drop shafts. The flows will be pumped to the surface and directed to the proposed treatment system. A single treatment system is proposed to treat all construction flows generated at the launch shaft site prior to discharge to the Seekonk River. The launch shaft site is the primary location to control flows for

the tunnel.

The design-builder is responsible for final design of the treatment system and selection of final equipment. However, treatment shall consist of the following minimum elements to meet effluent limits: flow equalization, sedimentation with polymer addition, sand filter, and bag filter. The effluent will be discharged to the Seekonk River via a submerged outfall diffuser system to achieve the required dilution.

Average flow rates during tunneling are estimated at 800 gpm, or 1.152 million gallons per day (MGD). A factor of 3 is used for determining a peak dewatering flow rate, or 2,400 gpm (3.45 MGD). It is noted that flow rates would increase as the tunnel is mined and longer drill and blast adits are mined and prior to final lining of the adits. The design-builder may elect to utilize a modular approach bringing on treatment trains, as the mining operations increase.

Provided in Attachment A-3 is the recommended treatment system flow schematic to meet the proposed effluent limits. The proposed system is described in additional detail in the following sections.

Flow Equalization Basin

Construction dewatering flows are pumped from the excavations to a flow equalization basin prior to treatment to account for peak flow rates. As previously noted, flow rates vary depending on stage of construction and ground conditions along the tunnel alignment. Flow equalization can be achieved by utilizing sedimentation tanks. The objective of this process is to narrow the flow range to the downstream settling basins. Flow from the equalization basin is pumped to the downstream settling basins.

Settling Basins

Following flow equalization, flows are pumped to one of two parallel settling basins. Each basin will be designed for average flow of 400 gpm to 800 gpm and peak flow rate of 1,200 gpm. Both basins would be activated for flush flows greater than 1,200 gpm. Flows can be temporarily throttled with flow equalization and storage in the tunnel until both basins can be activated.

Coagulation and flocculation processes are to be applied in the settling basin to enhance removal of suspended material in water. Polymer chemicals will be injected as liquid solutions via chemical feeding pumps into the influent feeding the settling basins. The purpose of the chemical addition is to enhance the settling properties of the materials in the tunnel construction dewatering stream and improve removal efficiencies of solids and metals. During preliminary design phase, a polymer chemical, HaloKlear BHR-P50, was selected to serve as both coagulant and flocculant. It is designed to work with a high pH water environment as typically seen in construction dewatering waste streams. The Safety Data Sheet (SDS) for this polymer can be found in Appendix H of the Engineering Report. Based on the chemical ingredient (aluminum chloride hydroxide sulfate) and application dosage (typically no more than 100 ppm), the addition of such chemical will not add any pollutants in concentrations which exceed permit effluent limitations, exceed any applicable State water quality standard/criteria, or cause toxicity. If other polymer products to serve similar functions are selected in the final detail design phase, they must also meet the aforementioned requirements regarding water quality and permit effluent limitations.

The settling basins will include internal overflow and underflow weir walls to achieve the required detention time for the solid particles to settle out. The settling basins will remove the bulk heavier solids from the dewatering flows.

The effluent from the settling basins accomplish TSS removal for solids with particle size greater than 250 microns. Smaller sized particles are removed through the downstream filtration process. Periodically, one of the basins will be taken out of service for maintenance and removal of settled solids. These solids will be removed from the tanks and transported with the tunnel muck for

disposal.

Filtration

The filtration process is achieved in two-steps by using sand media filters and bag filters for varying particle sizes. Sand media filters remove solids with particle sizes between 50 to 250 microns. Backwashing is done by utilizing the effluent water, and backwashed flows are recycled back to the settling basin. The bag filters achieve solids removal with particle sizes down to 1 micron. The removal capability depends on the micron size of the filter bags. A combination of sand media and bag filters can be adjusted to suit field conditions of actual flows and particle size during construction. Turbidity monitoring will be utilized to guide operational decisions.

For the preliminary design of the filtration process, three (3) parallel 4-pod 54-inch diameter sand filters followed by two (2) parallel 8-inch 12-bag filter units were chosen. Appendix H of the Engineering Report includes manufacturers specification sheets that provide a summary of dimensions and media or bag element information on the sand filter and bag filters being evaluated for the project. Final design is being prepared by the Pawtucket Tunnel Design Builder which is expected to be substantially consistent with the information provided in Appendix H of the Engineering Report to ensure treated effluent meets the stipulated discharge permit limits.

No additional pumping is required for the effluent water following the filtration process. After the effluent water is pumped from the sedimentation weir tanks through the sand media filters, bag/canister filters, it discharges by gravity to the desired discharge location.

Outfall Pipe

Treated construction-phase dewatering effluent will discharge to the Seekonk River near the launch shaft site at 804 School Street in Pawtucket, RI.

The discharge system will be designed for an average flow rate of 400 gpm to 800 gpm and maximum capacity of 2400 gpm. Discharge, however, will vary based on the amount of groundwater encountered. Piping will be sized to maintain a minimum flow velocity of 3 feet per second in most flow conditions and multiple pipes will be used to accommodate a range of flow rates. At this time, two parallel 8-inch diameter HDPE discharge pipes are proposed, each designed for 2,400 gpm. Treated effluent will be discharged to the Seekonk River via a sub-surface discharge system that will extend approximately 470 feet into the river from a location just south of Bucklin Brook. To reduce impact, the discharge pipes will terminate on the east bank of the federal navigation channel, which is the deepest location in the river. Each of the three diffuser ports is equipped with Tideflex duckbill check valves to increase dilution and reduce the risk of clogging. A riser will extend from the end of each buried discharge pipe into the channel, and each riser will have a multi-port diffuser with three, 4-inch diameter ports each spaced 6 feet apart to facilitate mixing with the ambient surface water. The nozzles will be oriented slightly upward at 15 degrees from vertical and will be set parallel to the diffuser (i.e., perpendicular to the current). To prevent movement due to tidal influence and storm effects, the pipes will be either anchored to the bottom of the riverbed with concrete ballast blocks or buried in the river bottom sediments. Provided in Attachment A-2 is the proposed site plan that identifies the location of the treatment system and outfall pipe/diffuser system.

The discharge pipes are proposed to be installed side by side in a common trench using open cut methods on land, with a minimum burial of four feet to avoid utility conflicts, except where laid on the surface down the steep embankment between the upland area and shoreline. The anticipated trench width is 4 to 5 feet.

Operation and Maintenance

In addition to compliance monitoring, the treatment system operation will involve routine measuring of sludge depth, monitoring of pressure gauges on filters, and sampling per permit requirements.

Periodically, one of the settling basins will be taken out of service for solids removal. Settled solids from the settling basins will be transported off-site with the tunnel muck for disposal. Inspection forms will be maintained to record daily operation and maintenance activities. Operation and maintenance activities for pumps, filters, and other manufactured elements will be in accordance with manufacturer's recommendation.

Receiving Water Description

Outfall 001 discharges to the Seekonk River in the segment defined at water body ID number RI0007019E-01 that is located in the cities of Pawtucket, Providence, and East Providence. This water body segment is delineated by Slater Mill Dam at Main Street in Pawtucket to India Point in Providence. This water body segment for the Seekonk River is classified as an SB1{a} water body according to the Rhode Island Water Quality Regulations. Class SB1{a} waters 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. Class SB1{a} 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. These waters will likely be impacted by combined sewer overflows in accordance with approved CSO Facilities Plans. Therefore, primary contact recreational activities, shellfishing uses, and fish and wildlife habitat will likely be restricted. This segment of the Seekonk River is listed as a Category 5/303(d) Listed Water during the 2016 assessment cycle for not supporting fish and wildlife habitat due to Total Nitrogen and Dissolved Oxygen impairments with a target date of 2022 for a TMDL dependent on upgrades to nearby wastewater treatment facilities. In addition, this segment was listed as not supporting primary and secondary contact recreation due to Fecal Coliform impairments with a target date of 2025 for a TMDL. It was noted for the latter that compliance with an existing Consent Agreement for CSO abatement is expected to negate the need for a TMDL analysis by the DEM.

Permit Limit Development

The requirements set forth in this permit are from the State's Water Quality Regulations and the State's Regulations for the Rhode Island Pollutant Discharge Elimination System, both filed pursuant to RIGL Chapter 46-12, as amended. RIDEM's primary authority over the permit comes from EPA's delegation of the program in September 1984 under the Federal Clean Water Act (CWA).

Development of RIPDES permit limitations is a multi-step process consisting of: determining if Federal effluent guidelines apply; calculation of allowable water quality-based discharge levels based on background data and available dilution; assigning appropriate Best Professional Judgement (BPJ) based limits; comparing existing and proposed limits; comparing discharge data to proposed limits; performing an antidegradation/antibacksliding analysis to determine the final permit limits; and developing interim limits as appropriate.

Water quality criteria are comprised of numeric and narrative criteria. Numeric criteria are scientifically derived ambient concentrations developed by EPA or the State for various pollutants of concern to protect human health and aquatic life. Narrative criteria are statements that describe the desired water quality goal. A technology-based limit is a numeric limit, which is determined by examining the capability of a treatment process to reduce or eliminate pollutants.

Effluent limitations in the permit are placed on pollutants of concern (POCs) that were found to be present in samples taken during the groundwater investigation performed on monitoring wells along the proposed alignment of the Pawtucket Tunnel and other pollutants, as described above in the Facility Description. The pollutants that were found present during the groundwater investigation include:

- Total Petroleum Hydrocarbons (TPH)
- Tetrachloroethylene
- Trichloroethylene
- Total Arsenic
- Total Copper

- Total Iron
- Group I PAHs (Benzo (a) Anthracene, Benzo (a) Pyrene, Benzo (b) Fluoranthene, Benzo (k) Fluoranthene, Chrysene, Indeno (1,2,3-cd) Pyrene, Dibenzo (a,h) Anthracene)

The effluent limitations and/or monitor-only requirements proposed in this permit are listed in Table 1 below. The once per week monitoring frequency has been required in order to ensure the effectiveness of the treatment system.

Parameter	**Effluent Limitation**	
	Monthly Average	**Daily Maximum**
Total Suspended Solids (TSS)	--- µg/L	30,000 µg/L
Total Petroleum Hydrocarbons	--- µg/L	1,000 µg/L
Tetrachloroethylene	264 µg/L	--- µg/L
Trichloroethylene	2,400 µg/L	--- µg/L
Total Arsenic	3.24 µg/L	611.64 µg/L
Total Copper	36.47 µg/L	59.31 µg/L
Total Iron	--- µg/L	--- µg/L
Benzo (a) Anthracene	1.44 µg/L	--- µg/L
Benzo (a) Pyrene	1.44 µg/L	--- µg/L
Benzo (b) Fluoranthene	1.44 µg/L	--- µg/L
Benzo (k) Fluoranthene	1.44 µg/L	--- µg/L
Chrysene	1.44 µg/L	--- µg/L
Dibenzo (a,h) Anthracene	1.44 µg/L	--- µg/L
Indeno (1,2,3-cd) Pyrene	1.44 µg/L	--- µg/L
pH	Narrative Criteria	Narrative Criteria

Table 1

Water Quality-Based Limit (WQBEL) Calculations

The allowable effluent limitations were established on the basis of acute and chronic aquatic life criteria and human health criteria using the following: available instream dilution; an allocation factor; and background concentrations when available and/or appropriate. The aquatic life and human health criteria are specified in the Rhode Island Water Quality Regulations (250-RICR-150-05-1). Aquatic life criteria have been established to ensure the protection and propagation of aquatic life while human health criteria represent the pollutant levels that would not result in a significant risk to public health from ingestion of aquatic organisms. The more stringent of the two criteria was then used in establishing allowable effluent limitations. Details concerning the calculation of potential permit limitations, selection of factors, which influence their calculation, and the selection of final permit limitations are included below or in the attached documents. This is NBC's first permit to contain WQBELs for the proposed discharge of treated wastewater from construction dewatering associated with the Pawtucket Tunnel and associated tunnel shafts located at 804 School Street.

Mixing Zones and Dilution Factors

Mixing zone and dilution factor information for the proposed construction dewatering treatment

system's discharge to the Seekonk River is based on the findings of the technical supporting document entitled 'Phase III CSO Program: Engineering Report – Pawtucket Tunnel Temporary Construction Discharge; Dated May 29, 2020; Prepared by Stantec and Pare Corporation on behalf of NBC' (the "Engineering Report").

Provided in Attachment A-4 is the CORMIX Mixing Zone Analysis, performed by Stantec on behalf of NBC, and included in Section 3.0 of the Engineering Report. CORMIX was used in the attached study to simulate a mixing zone in the Seekonk River and to estimate dilution factors. The CORMIX model inputs, scenarios, and results are detailed in the attached study for the discharge of tunnel construction dewatering flows from a multiport diffuser into the Seekonk River.

The size of the acute mixing zone was determined using the EPA's recommended criteria from the "Technical Support Document for Water Quality-based Toxics Control" (TSD). EPA's TSD indicates that the most stringent of the following criteria should be used:

a) The CMC (Criteria Maximum Concentration) must be met within 10% of the distance from the edge of the outfall to the edge of the regulatory mixing zone. This is dependent upon the size of the Regulatory (chronic) Mixing Zone (RMZ). Since the EPA has not provided specific guidance regarding the sizing of chronic mixing zones, the chronic mixing zone may be limited to a maximum size of ten times that of the acute zone.

b) The CMC must be met within a distance of fifty times (50x) the discharge length scale in any spatial direction. The discharge length scale equals the square root of the cross-sectional area of the discharge outlet. For an 8" diameter diffuser/outfall pipe with three (3) 4.0" diameter ports:

$$Radius = 50 * \sqrt[2]{(3) * \left(\frac{\pi}{4}\right) * (4.0" * .3048\ \mathrm{m}/12")^2} = 7.80\ m\ (25.6\ feet)$$

This criteria yields and acute mixing zone radius of 7.80 meters.

c) The CMC must be met within a distance of five times (5x) the local water depth in any horizontal direction. Using a local water depth of 7.7 feet (approximately 2.35 m)(Mean Low Low Water (MLLW); Seekonk River NOAA Chart provided in Figure 3.5 of the Engineering Report):

$$Radius\ = 5\ *\ 2.35\ meters\ =\ 11.73\ meters\ (38.5\ feet)$$

This criteria gives an acute mixing zone radius of 11.73 meters.

The most stringent of the above criteria would be condition b, an acute mixing zone radius of 7.80 meters.

The chronic mixing zone was chosen in such a way as to allow a zone of safe passage equivalent to three-quarters (3/4) of the width of the estuary. Figure 3.5 contained in Section 3 of the Engineering Report provides a Seekonk River NOAA Chart that provides a river channel width of 150 – 180 feet at the approximate location of the proposed discharge. Taking the river channel to be 150 feet (45.7 m), a distance of 37.5 feet (11.43 m) would allow for a sufficient zone of safe passage. Since the discharge pipes are going to terminate on the east bank of the above navigation channel, this gives a chronic mixing zone radius of 37.5 feet (11.43 m).

The in-stream dilution factors provided in the Engineering Report were determined based on the results of computer modeling of the proposed Outfall 001 into the Seekonk River using the CORMIX2 model, which is designed to simulate the dilution characteristics of submerged multiport diffuser discharges. Discharge flows of 400, 800, 1200, and 2400 gpm were simulated to estimate dilution factors under different discharge conditions and different current conditions for the

proposed dual discharge pipes. Each discharge pipe is connected to a 3-port diffuser with port diameter of 4 inches and at least 6 feet apart. Tidal simulations were repeated for several time intervals before and after slack tide to determine plume characteristics in unsteady ambient conditions. It was noted in the model simulations that for the purpose of evaluating dilution factors in the vicinity of the discharge location, no water quality standard and no mixing zones were specified.

The CORMIX results for the four tidal simulations concluded that dilution factors of 10 were attainable at maximum downstream distances of 15, 16, 8 and 16 feet for tunnel dewatering rates of 400, 800, 1200, and 2400 gpm, respectively. All other simulations achieved a dilution factor of 10 at a downstream distance within the acute mixing zone radius. Also, from plots of dilution factor versus downstream distance for all the above simulations, it can be extrapolated that the dilution factor achieved would be greater than 10 within the chronic mixing zone radius.

The maximum allowable dilution factor for groundwater remediation projects (per RIDEM policy) is 10:1. Therefore, acute and chronic dilution factors of 10:1 were used to establish the permit limits, assuring a significant margin of safety.

Using the above-mentioned dilution factors and mixing zone, the allowable discharge limits were calculated as follows:

a) Background concentration unknown or available date is impacted by sources that have not yet achieved water quality-based limits.

$$Limit_1 = (DF)^* (Criteria)^* (80\%)$$

Where: DF = acute or chronic dilution factor, as appropriate
Note: The right side of the above-referenced formula is divided by the appropriate metals translator when this formula is used to calculate limits for metals.

b) Using available background concentration data.[1]

$$Limit_1 = (DF)^* (Criteria)^* 90\% - (Background)^* (DF-1)$$

Where: DF = acute or chronic dilution factor, as appropriate
Note: The right side of the above-referenced formula is divided by the appropriate metals translator when this formula is used to calculate limits for metals.

Since background concentrations were available for Arsenic, Cadmium, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Silver, and Zinc, 90% of criteria was allocated for these pollutants. All other limits were calculated using 80% allocation, due to a lack of background data.

Metals Translators

On September 30, 2004, the NBC submitted a Final Metals Compliance Evaluation Report to the DEM as required under consent agreement RIA-330. This Final Metals Compliance Evaluation Report included the results of the NBC's metals translator study. Water quality criteria for metals are applicable to the dissolved form. A translator study is performed to evaluate the degree to which particulate metals will become dissolved (i.e. translate into dissolved) once discharged into the environment. Several factors can affect this process and DEM reviewed the metals translator study to determine if the data had any seasonal, tidal, and/or spatial (transects) variability.

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[1] Source of background data for Arsenic, Cadmium, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Silver, and Zinc is Table 3-10 from the Army Corps of Engineers' and EPA's "Draft Environmental Impact Statement for the Rhode Island Region Long-Term Dredged Material Disposal Site" 2004 OCLC # 71790716 with corrections made to the average concentrations to account for arithmetic errors as noted in file correspondence between the NBC and RIDEM.

Based on this analysis, the DEM determined that the most appropriate metals translator data set to use is the data from the October 2001 surveys. This data set was selected since more of the particulate metals became dissolved than it did during the other surveys (i.e. the translators calculated from this survey were consistently higher). Therefore, it was determined that translators from this survey will ensure that the dissolved metals criteria are met during all seasons. Further after evaluation of the translators at various transects and tides, it was determined that there is not significant variability caused by tides and transects. As a result, the DEM determined that the appropriate translators to use are the ones calculated from the October 2001 survey. The following table is a summary of the final metals translator values for the Providence and Seekonk Rivers after including a 5% margin of safety. Note: After incorporating a 5% margin of safety into the Providence River's nickel translator the value was greater than 1.0, therefore, this translator was set equal to 1.0.

Table 2: Final Metals Translators for Each River (ug/L)

River	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)				
	Cadmium	Copper	Lead	Nickel	Silver
Providence	0.935	0.818	0.217	1.000	0.420
Seekonk	0.952	0.670	0.138	0.947	0.489

Although the facility discharges into the Seekonk River, which subsequently flows into the Providence River, a review of the September 1991 dye study for the Bucklin Point WWTF indicates that the dilution by the time that effluent reaches the Providence River is at least 30:1. Therefore, since there will be significantly more dilution at the point where effluent eventually enters the Providence River vs. the near-field dilution, the DEM has determined that using the translators for the Seekonk and the near-field dilution factors to assign metals limits will be protective of both rivers. Table 3 lists the final metals translator values assigned to the discharge.

Table 3: Final Metals Translators for the Wastewater Treatment Facility (WWTF)

WWTF	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)				
	Cadmium	Copper	Lead	Nickel	Silver
Bucklin Point	0.952	0.670	0.138	0.947	0.489

Provided in Attachment A-5 is a report on the DEM's review of the NBC's metals translator study.

Reference Attachment A-6 for calculations of allowable limits based on Saltwater Aquatic Life and Human Health Criteria.

The formulas and data noted above were applied with the following exceptions:

I. Pollutants that, based on the acute and chronic dilution factors, have a higher allowable chronic limit than allowable acute limit. For this situation, both the "Monthly Average" and "Daily Maximum" limits were set at the allowable acute limit.

II. Total residual chlorine. The limits for total residual chlorine (TRC) were established in accordance with the RIDEM Effluent Disinfection Policy. The "Monthly Average" and "Daily Maximum" were based on a 100% allocation, a zero background concentration, and the appropriate dilution factor(s). The 100% allocation factor for TRC was used due to the non-conservative nature of chlorine and the improbability of the receiving water having a detectable background TRC concentration.

Antibacksliding

Provided below is a brief introduction to Antibacksliding and Antidegradation; as well as a discussion on how the two policies were used to calculate water quality-based limits.

Antibacksliding restricts the level of relaxation of water quality-based limits from the previous permit. Section 303(d)(4) of the Clean Water Act addresses antibacksliding as the following:

Section 303(d)(4)

1. Standards not attained – For receiving waters that have not attained the applicable water quality standards, limits based on a TMDL or WLA can only be revised if the water quality standards will be met. This may be done by (i) determining that the cumulative effect of all such revised limits would assure the attainment of such water quality standards; or (ii) removing the designated use which is not being attained in accordance with regulations under Section 303.

2. Standards attained – For receiving waters achieving or exceeding applicable water quality standards, limits can be relaxed if the revision is consistent with the State's Antidegradation Policy.

Therefore, in order to determine whether backsliding is permissible, the first question that must be asked is whether or not the receiving water is attaining the water quality standard. The Office has determined the most appropriate evaluation of existing water quality is by calculating pollutant levels, which would result after the consideration of all currently valid RIPDES permit limits or historic discharge data (whichever is greater), background data (when available), and any new information (i.e., dilution factors).

Antidegradation

The DEM's "*Policy on the Implementation of the Antidegradation Provisions of the Rhode Island Water Quality Regulations July 2006*" (the Policy) established four tiers of water quality protection:

Tier 1. In all surface waters, existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

Tier 2. In waters where the existing water quality criteria exceeds the levels necessary to support the propagation of fish and wildlife and recreation in and on the water, that quality shall be maintained and protected except for insignificant changes in water quality as determined by the Director and in accordance with the Antidegradation Implementation Policy, as amended. In addition, the Director may allow significant degradation, which is determined to be necessary to achieve important economic or social benefits to the State in accordance with the Antidegradation Policy.

Tier 2½. Where high quality waters constitute Special Resource Protection Waters SRPWs[2], there shall be no measurable degradation of the existing water quality necessary to protect the characteristics which cause the waterbody to be designated a SRPW. Notwithstanding that all public drinking water supplies are SRPWs, public drinking water suppliers may undertake temporary and short-term activities within the boundary perimeter of a public drinking water supply impoundment for essential maintenance or to address emergency conditions in order to prevent adverse effect on public health or safety. These activities must comply with the requirements set forth in Tier 1 and Tier 2.

Tier 3. Where high quality waters constitute an Outstanding Natural Resource ONRWs[3], that water quality shall be maintained and protected. The State may allow some limited activities that result in temporary or short-term changes in the water quality of an ONRW. Such activities must not permanently degrade water quality or result in water quality lower than necessary to protect the existing uses in the ONRW.

[2] SRPWs are surface waters identified by the Director as having significant recreational or ecological uses.
[3] ONRWs are a special subset of high-quality water bodies, identified by the State as having significant recreational or ecological water uses.

The formulas previously presented ensure that permit limitations are based upon water quality criteria and methodologies established to ensure that all designated uses will be met.

In terms of the applicability of Tier 2 of the Policy, a water body is assessed as being high quality on a parameter-by-parameter basis. In accordance with Part II of the Policy, "Antidegradation applies to all new or increased projects or activities which may lower water quality or affect existing water uses, including but not limited to all 401 Water Quality Certification reviews and any new, reissued, or modified RIPDES permits." Part VI.A of the Policy indicates that it is not applicable to activities which result in insignificant (i.e., short-term minor) changes in water quality and that significant changes in water quality will only be allowed if it is necessary to accommodate important economic and social development in the area in which the receiving waters are located (important benefits demonstration). Part VI.B.4 of the Policy states that: "Theoretically, any new or increased discharge or activity could lower existing water quality and thus require the important benefits demonstration. Since the proposed discharge will only be a temporary discharge to accommodate the construction of the Phase III CSO Tunnel, the policy is not applicable to the proposed discharge.

The limits contained in this permit are consistent with the Department's anti-degradation policy and were determined to be protective of the receiving water.

Wasteload Allocation

As indicated above, based on the above dilution factors and the saltwater aquatic life and human health criteria, from the Rhode Island Water Quality Regulations, allowable discharge concentrations were established using 80% allocation where no background data was available and 90% allocation for those metals with background data, and 100% allocation of total residual chlorine (TRC) due to the fact that Chlorine is not expected to be found in ambient water and it is a non-conservative pollutant.

In accordance with 40 CFR Part 122.4(d)(1)(iii), it is only necessary to establish limitations for those pollutants in the discharge which have the reasonable potential to cause or contribute to the exceedance of the in-stream criteria. In order to evaluate the need for permit limitations, the allowable discharge levels (permit limits) provided in Attachment A-6 were compared to data provided in the permit application and in the Engineering Report. Based on these comparisons, water quality limitations have been deemed necessary for Tetrachloroethylene, Trichloroethylene, Total Arsenic, Total Copper, and Group I PAHs (Benzo (a) Anthracene, Benzo (a) Pyrene, Benzo (b) Fluoranthene, Benzo (k) Fluoranthene, Chrysene, Indeno (1,2,3-cd) Pyrene, Dibenzo (a,h) Anthracene). In addition, monitoring for Total Iron has been included in the permit to ensure treatment system effectiveness and to prevent iron fouling of treatment system components.

The permit includes water quality-based discharge limits for the following POC:

- Tetrachloroethene (Monthly Average)
- Trichloroethylene (Monthly Average)
- Total Arsenic (Monthly Average / Daily Maximum)
- Total Copper (Monthly Average / Daily Maximum)
- Group I PAHs (Benzo (a) Anthracene, Benzo (a) Pyrene, Benzo (b) Fluoranthene, Benzo (k) Fluoranthene, Chrysene, Indeno (1,2,3-cd) Pyrene, Dibenzo (a,h) Anthracene) (Monthly Average)
- pH (Narrative standards)

pH

The narrative effluent limitations for pH are based on water quality criteria established in the State's Water Quality Regulations for Saltwater Receiving Waters. Narrative conditions in Part I.A.3.a of this permit require pH of the effluent not be less than 6.5 standard units nor greater than 8.5 SU at any time unless these values are exceeded due to natural causes or as a result of the approved treatment processes.

Tetrachloroethene

The DEM calculated a water quality-based monthly average discharge limit of 264 µg/L for Tetrachloroethylene (Note: there is no acute criterion).

Trichloroethene

The DEM calculated a water quality-based monthly average discharge limit of 2,400 µg/L for Trichloroethylene (Note: there is no acute criterion).

Total Arsenic

The DEM calculated water quality-based monthly average and daily maximum discharge limits of 3.24 µg/L and 611.64 µg/L, respectively, for Total Arsenic.

Total Copper

The DEM calculated water quality-based monthly average and daily maximum discharge limits of 36.47 µg/L and 59.31 µg/L, respectively, for Total Copper.

Group I PAHs (Benzo (a) Anthracene, Benzo (a) Pyrene, Benzo (b) Fluoranthene, Benzo (k) Fluoranthene, Chrysene, Indeno (1,2,3-cd) Pyrene, Dibenzo (a,h) Anthracene)

The DEM calculated a water quality-based monthly average discharge limit of 1.44 µg/L for all Group I PAH parameters (Note: there are no acute criterion).

Total Iron

In the case of Iron, a water quality standard does not exist for this parameter in the water quality regulations for discharges to saltwaters. Monitoring only and reporting is required for this parameter.

Technology-based Limits

A technology-based limit is a numeric limit, which is determined by examining the capability of a treatment process to reduce or eliminate pollutants. The DEM is required to consider technology and water quality requirements when developing permit effluent limitations. Technology based treatment requirements represent the minimum level of control that must be imposed under Section 402 and 301(b) of the Act (see 40 CFR 125 Subpart A) to meet Best Practicable Control Technology Currently Available (BPT), Best Conventional Control Technology (BCT) for conventional pollutants, and Best Available Technology Economically Achievable (BAT) for toxic pollutants. In the absence of technology-based guidelines, DEM is authorized to use BPJ to establish effluent limitations, in accordance with Section 402(a)(1) of the CWA. Since EPA has not established technology-based treatment standards for this discharge, the Department was authorized to use BPJ.

Effluent limitations for Outfall 001A was established for TSS and TPH to monitor the effectiveness of the Pawtucket Tunnel dewatering treatment system as they are indicators used to characterize contamination discovered during the groundwater investigation from construction activities and monitoring wells along the proposed alignment of the Pawtucket Tunnel.

The permit includes technology-based discharge limits for the following POC:

- Total Suspended Solids (Daily Maximum)
- Total Petroleum Hydrocarbons (Daily Maximum)

Flow

The discharge shall not exceed a daily maximum flow rate of 2,400 gallons per minute (GPM), which was based on the maximum anticipated flows from the construction dewatering and the treatment system design, as described above in the Groundwater Treatment System section of the Facility Description.

Total Suspended Solids (TSS)

The DEM added this BPJ limit to be to consistent with the RIPDES 2019 Remediation General Permit (RGP). The daily maximum discharge limit for TSS is 30,000 µg/L while the monthly average limit is "monitor only." This limit was developed using BPJ as authorized by § 402(a)(1) of the CWA.

Total Petroleum Hydrocarbons (TPH)

The DEM added this BPJ limit to be to consistent with the RIPDES 2019 Remediation General Permit (RGP). The daily maximum discharge limit for TPH is 1,000 µg/L while the monthly average limit is "monitor only." This limit was developed using BPJ as authorized by § 402(a)(1) of the CWA.

Additional Permit Requirements

NBC has proposed using the chemical HaloKlear BHR-P50 at a rate of 100 ppm or less, to be injected into the influent of the settling basins as a coagulant aid to increase the floc size and settling rate of any floating solid particles coming from the construction dewatering flows of the Pawtucket Tunnel mining. This dosing rate was for a daily maximum discharge flow rate of 2,400 gpm of the dewatering treatment system. Part I.A.8 of the permit limits the types of treatment chemicals used to ensure that their use will not result in aquatic life toxicity, based on a comparison of treatment chemical concentrations against the toxic levels listed in the applicable Safety Data Sheets (SDS). The permit includes the following conditions for the Pawtucket Tunnel dewatering treatment system: proper operation and maintenance; the permittee shall treat all wastewaters above with the system as described, which can be modified with written approval of the DEM; flow measurement and recordkeeping requirements; inspection of the system at a minimum of once per week; notification if the permit limits are exceeded; approval of the use of the above treatment chemical HaloKlear BHR-P50 at 100 ppm; and the permittee must obtain written approval from the DEM before increasing the amount of any of the treatment chemicals listed in Part I.A.8 or prior to using any other additive(s) in conjunction with or in place of the treatment chemicals listed above.

Priority Pollutants Scan (PPS)

The required priority pollutant scans are to be performed annually for the EPA Priority Pollutants as listed in 40 CFR 122, Appendix D, Tables II and III. The requirement to conduct a Priority Pollutants scan on the influent and effluent of the treatment system and submit the results to the DEM annually was added to the permit requirements to ensure discharge meets the State's Water Quality Standards for a wide variety of pollutants not monitored on a regular basis using BPJ as authorized by § 402(a)(1) of the CWA.

Whole Effluent Toxicity (WET) Testing

WET testing is the aggregate toxic effect of an effluent measured directly by an aquatic toxicity test. Under §§ 402(a)(2) and 308(a) of the CWA, States are authorized to require toxicity testing. The RI Water Quality regulations § 1.10(D)(1) under Chemical Constituents have narrative requirements that prohibits the discharge of pollutants in concentration or combinations that could be harmful to humans or fish and wildlife for the most sensitive and governing water class use.

40 CFR 122.44(d)(1)(ii) requires states to use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing, and where appropriate, the dilution of the effluent in the receiving water when conducting reasonable potential analysis. Permits are required to contain WET limitations when a discharge causes or has a reasonable potential to cause or contribute to an excursion above the State's narrative criterion for toxicity under 40 CFR 122.44(d)(1)(v).

After review of treatment system, it was determined that chemical-specific limits should be sufficient to attain and maintain the applicable Rhode Island Water Quality Standards. Therefore, WET limits were not included in this permit

The remaining general and specific conditions of the permit are based on the RIPDES regulations as well as 40 CFR Parts 122 through 125 and consist primarily of management requirements common to all permits.

V. Comment Period, Hearing Requests, and Procedures for Final Decisions

All persons, including applicants, who believe any condition of the draft permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to the Rhode Island Department of Environmental Management, Office of Water Resources, 235 Promenade Street, Providence, Rhode Island, 02908-5767. In accordance with Chapter 46-17.4 of Rhode Island General Laws, a public hearing will be held prior to the close of the public comment period, if requested. In reaching a final decision on the draft permit the Director will respond to all significant comments and make these responses available to the public at DEM's Providence office.

Following the close of the comment period, and after a public hearing, if requested, the Director will issue a final permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments, provided oral testimony, or requested notice. Within thirty (30) days following the notice of the final permit decision any interested person may submit a request for a formal hearing to reconsider or contest the final decision. Requests for formal hearings must satisfy the requirements of 250-RICR-150-10-1.50 of the Regulations for the Rhode Island Pollutant Discharge Elimination System.

VI. DEM Contact

Additional information concerning the permit may be obtained between the hours of 8:30 a.m. and 4:00 p.m., Monday through Friday, excluding holidays from:

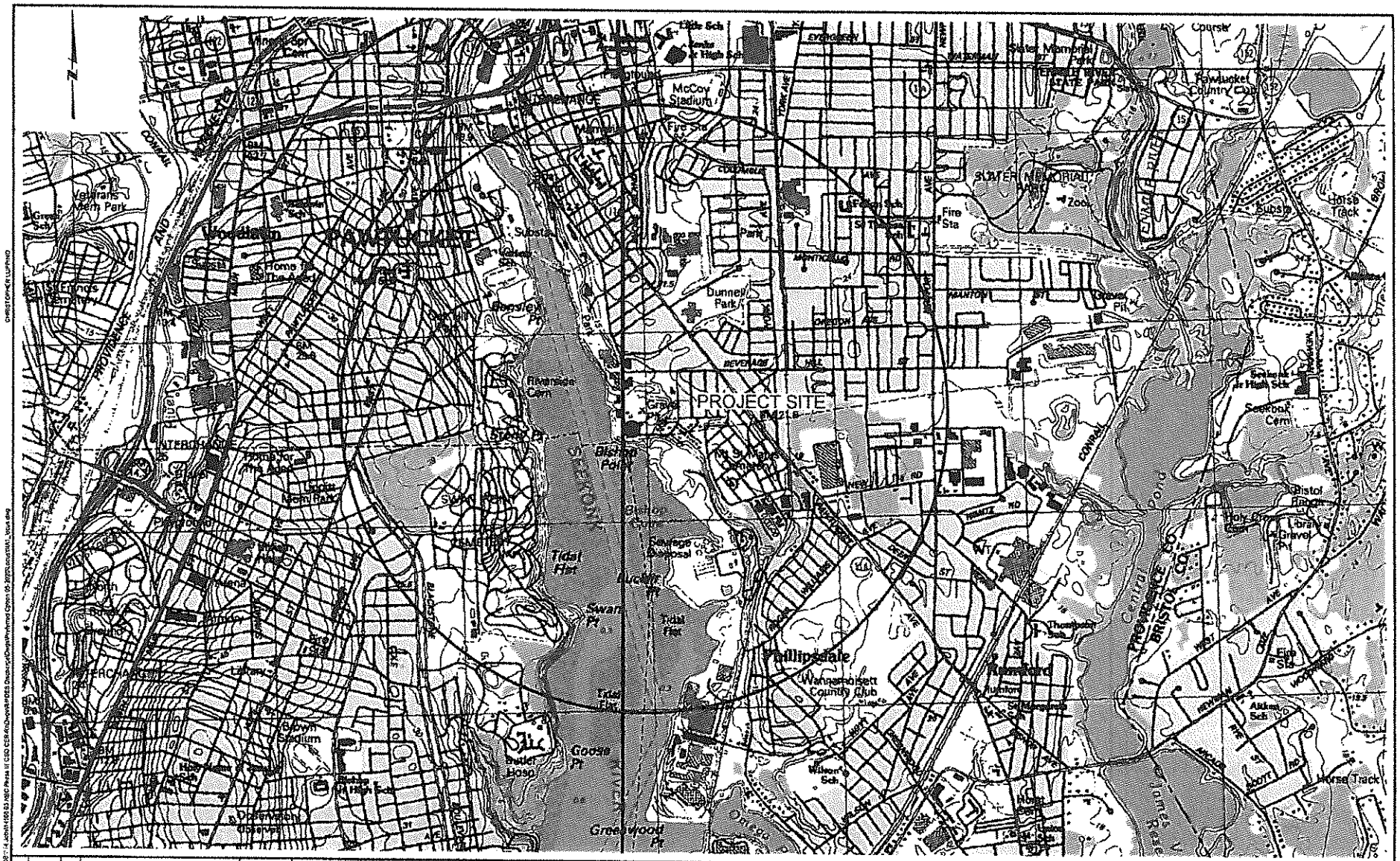
Aaron Mello, Environmental Engineer II
Department of Environmental Management/ Office of Water Resources
235 Promenade Street
Providence, Rhode Island 02908
Telephone: (401) 222-4700, ext: 77405
Email: aaron.mello@dem.ri.gov

5/17/2021
Date

Joseph B. Haberek, P.E.
Environmental Engineer IV
RIPDES Program
Office of Water Resources
Department of Environmental Management

ATTACHMENT A-1

Site Location Map



REV	DATE	BY	DESCRIPTION

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DESIGNED: DRAWN: CHECKED:

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Stantec

NARRAGANSETT BAY COMMISSION
PHASE III COMBINED SEWER OVERFLOW PROGRAM

Stantec

NBC CONTRACT NO 306.01C

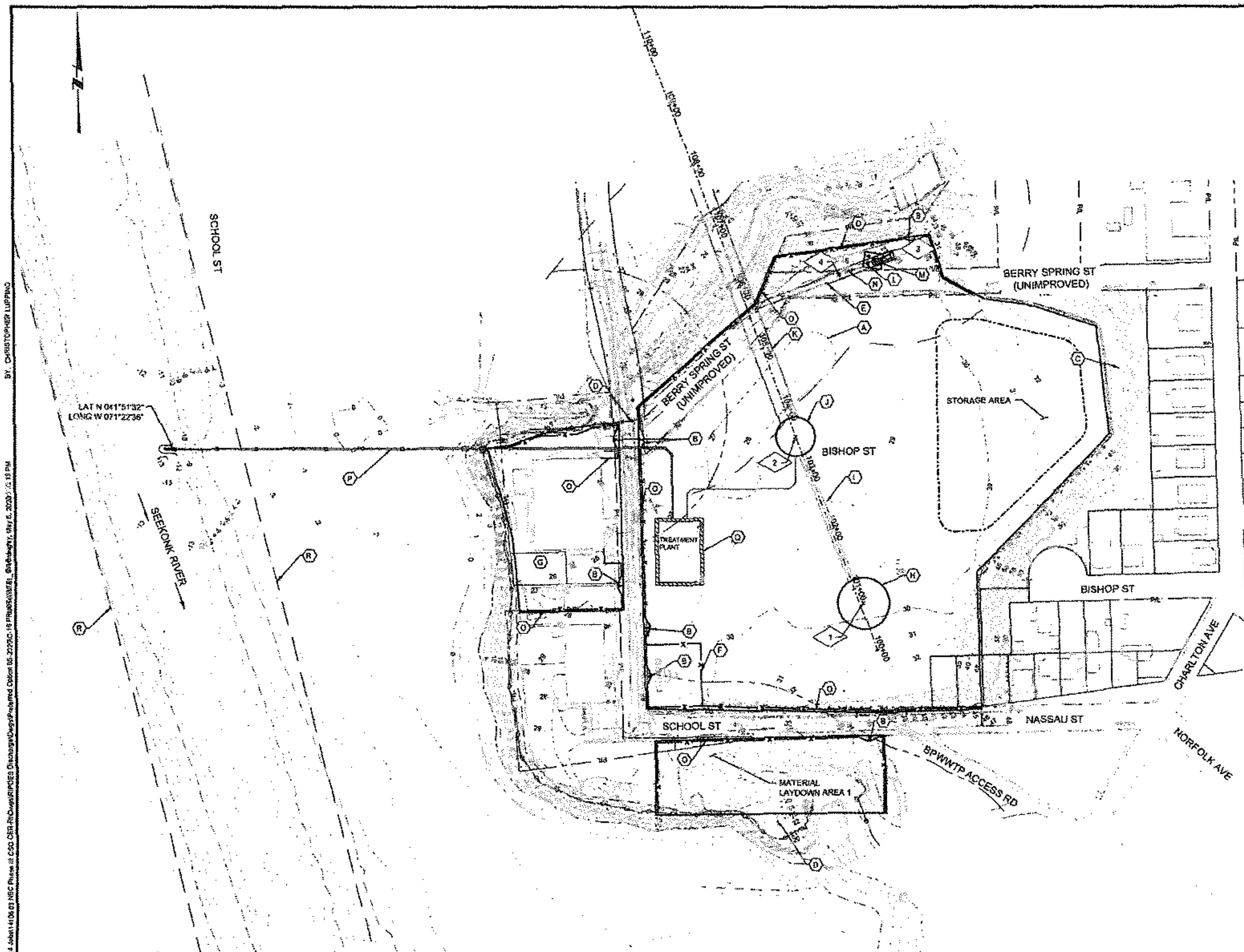
PAWTUCKET TUNNEL
LAUNCH SHAFT AND OF-21B
LOCUS

SHEET 3

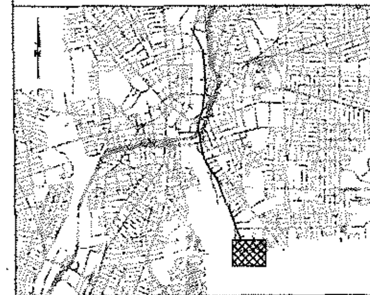
160120227

ATTACHMENT A-2

Site Plan – Pawtucket Tunnel Launch Shaft



KEY PLAN



GENERAL SHEET NOTES

1. DB SHALL DESIGN SITE DRAINAGE TO CONTROL RUNOFF TO PREVENT PEAK FLOWS FROM 25-YEAR, 24 HOUR STORM FROM LEAVING SITE. STORMWATER PONDS AND/OR DRAINAGE FEATURES SHALL BE RELOCATED AND/OR REPLACED PER THE DESIGN OF DB.

SHEET KEYNOTES

A. BACKFILL EXISTING STORMWATER POND
B. CHAINLINK ACCESS GATE
C. HILLSIDE EAST OF RETAINING WALL IS NOT USABLE FOR CONSTRUCTION STAGING
D. ROAD CLOSED SIGN - LOCAL TRAFFIC ONLY
E. ADIT TO TUNNEL
F. ELECTRICAL UTILITIES AREA
G. BUILDING AVAILABLE TO CONTRACTOR FOR DURATION OF PROJECT
H. EXCAVATE AND SUPPORT 80' TUNNEL PUMP STATION SHAFT
I. 42" SUCTION HEADER
J. 60' TUNNEL LAUNCH SHAFT
K. 30' PAWTUCKET TUNNEL
L. VENT SHAFT
M. DROP SHAFT AND VORTEX CHAMBER
N. 13'-6" DEAERATION CHAMBER
O. 8-FT HIGH CONSTRUCTION FENCE
P. DISCHARGE PIPING
Q. TREATMENT PLANT
R. LIMITS OF FEDERAL CHANNEL

POINT TABLE

POINT	NORTHING	EASTING	DESCRIPTION
1	282342.77	362710.51	PS SHAFT CP
2	282603.05	362607.13	LAUNCH SHAFT CP
3	282872.74	362735.26	DROP SHAFT CP
4	282857.36	362694.03	VENT SHAFT CP

REV	DATE	BY	DESCRIPTION

SCALE 1" = 75'

WARNING: IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE

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DRAWN D.WAIS
CHECKED

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Stantec

NARRAGANSETT BAY COMMISSION
PHASE III COMBINED SEWER OVERFLOW PROGRAM

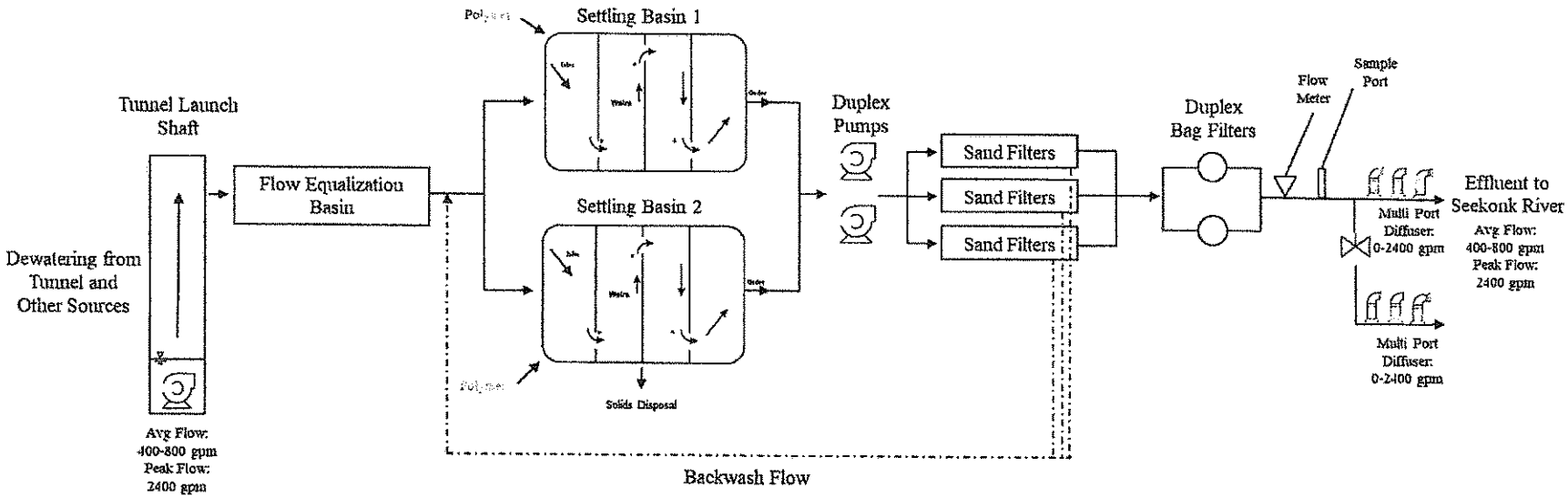
NBC CONTRACT NO 308.01C
CIVIL
PAWTUCKET TUNNEL
LAUNCH SHAFT AND OF-218
CONSTRUCTION WATER EFFLUENT PIPE PROPOSED SITE PLAN

SHEET 5
195130227

ATTACHMENT A-3

Treatment System Flow Schematic

Treatment System Flow Schematic



ATTACHMENT A-4

CORMIX Mixing Zone Analysis

Section 3.0
Mixing Zone Analysis

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3.0 Mixing Zone Analysis

3.1 Background

The Seekonk River is classified as a Class SB receiving water by RIDEM. Compliance with effluent limits for discharges to the Seekonk River are unlikely unless a mixing zone and corresponding dilution factors are defined. A comparison of the groundwater data (see Appendix B) to the limits within the RIPDES General Permit for saltwater indicate chrysene, antimony, arsenic, copper, lead, mercury, nickel, silver, and zinc would exceed effluent limits. Comparison of influent data from the previous Providence tunnel project and the ongoing Hartford tunnel project in similar geology yields the same conclusion.

CORMIX, a USEPA-supported mixing zone model and decision support system, was used in this study to simulate a mixing zone in the Seekonk River and to estimate dilution factors. CORMIX model inputs, model scenarios, and modeling results are detailed in the subsequent sections.

3.2 CORMIX Model Input

Five categories of data inputs are needed for simulating mixing zones in CORMIX, including 1) Project Information, 2) Effluent Properties, 3) Ambient Geometry and Flow Conditions, 4) Discharge Port Configuration, and 5) Mixing Zone Specification. A brief overview of model input for each of the five categories is provided in the following sections.

3.2.1 Project Information (Input 1)

This data input category "Project Information" determines basic information needed for the program to operate, store files, and label simulations for later use. Inputs for this category include project file name, design case, site name, model author, creation date, and project note. Project information inputs were modified according to individual modeling scenarios.

3.2.2 Effluent Properties (Input 2)

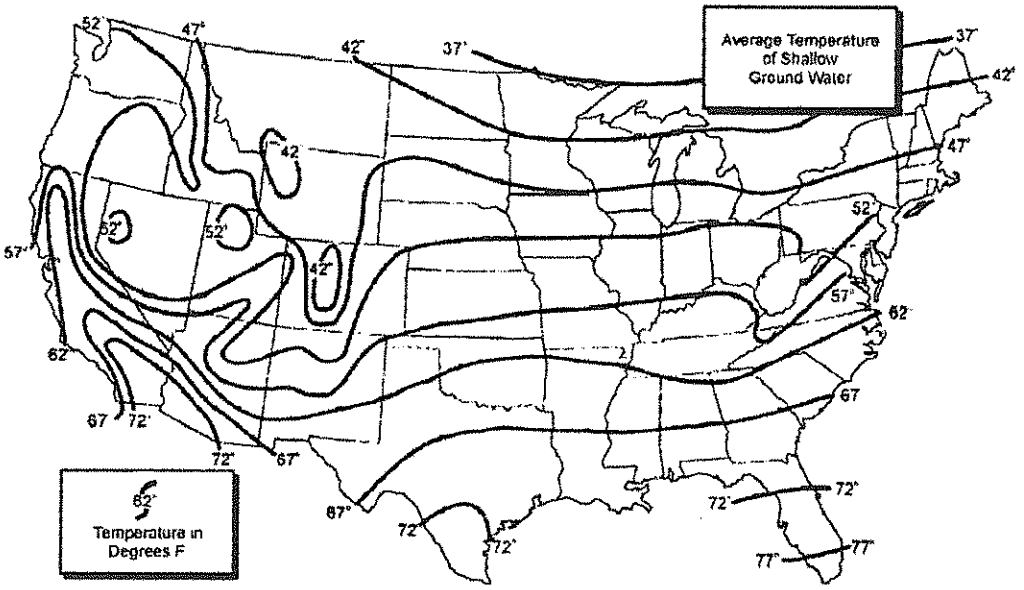
The second data input category "Effluent" is used to specify effluent properties in CORMIX, including effluent characterization (discharge pollutant type and concentration), effluent flow rate (or velocity), and effluent density.

- For the purpose of mixing zone analysis, the effluent pollutant concentration is conservatively set at 100%. No decay (or removal) rate due to sedimentation, bioaccumulation and parameter transformation was applied in CORMIX.
- The flow rate of Pawtucket Tunnel construction dewatering is estimated to be 800 gpm at average level, and 2,400 gpm for maximum peak flow.
- The discharge is assumed to have a density close to fresh water. The treated effluent temperature was assumed to be 51°F based on the map of "Average Temperature of Shallow Ground Water" in Figure 3-1 below. The temperature was used in CORMIX to estimate effluent density.

Most of the inputs in this category remained the same for all modeling scenarios, except that the discharge flow rates were modified in individual modeling scenarios, including 400, 800, 1200, and 2,400 gpm.

Figure 3-1 - Average Temperature of Shallow Ground Water

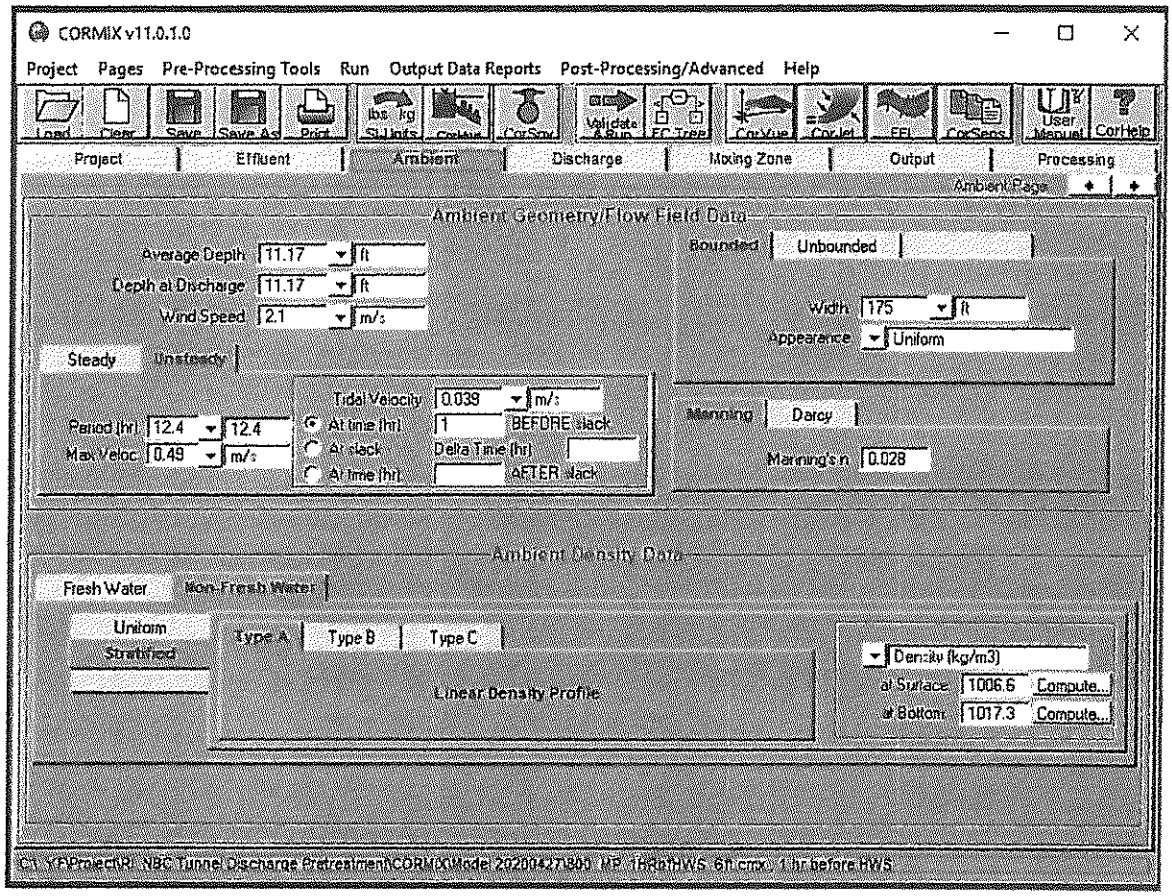
(USEPA, https://www3.epa.gov/ceampubl/learn2model/part-two/onsite/ex/jne_henrys_map.html)



3.2.3 Ambient Geometry and Flow Conditions (Input 3)

The third data input category "Ambient" is used to define ambient conditions by geometric and hydrographic conditions in the discharge vicinity. Figure 3-2 shows an example input interface for this tab.

Figure 3-2 - Data Input Interface – Ambient Conditions



Key documents and resources used to develop inputs for this tab are listed below:

1) Pawtucket Geophysical Survey Report, December 2017 (prepared by Hydroterra Environmental Services for Stantec/NBC). Cross sectional river profile (Line 931, slightly upstream of the end Shaft of Pawtucket Tunnel) in this survey is used to develop discharge channel cross section. Location of this cross section is shown in Figure 3-3 and the details of the cross-sectional river profile are shown in Figure 3-4.

Figure 3-3 - Map of Reference Data

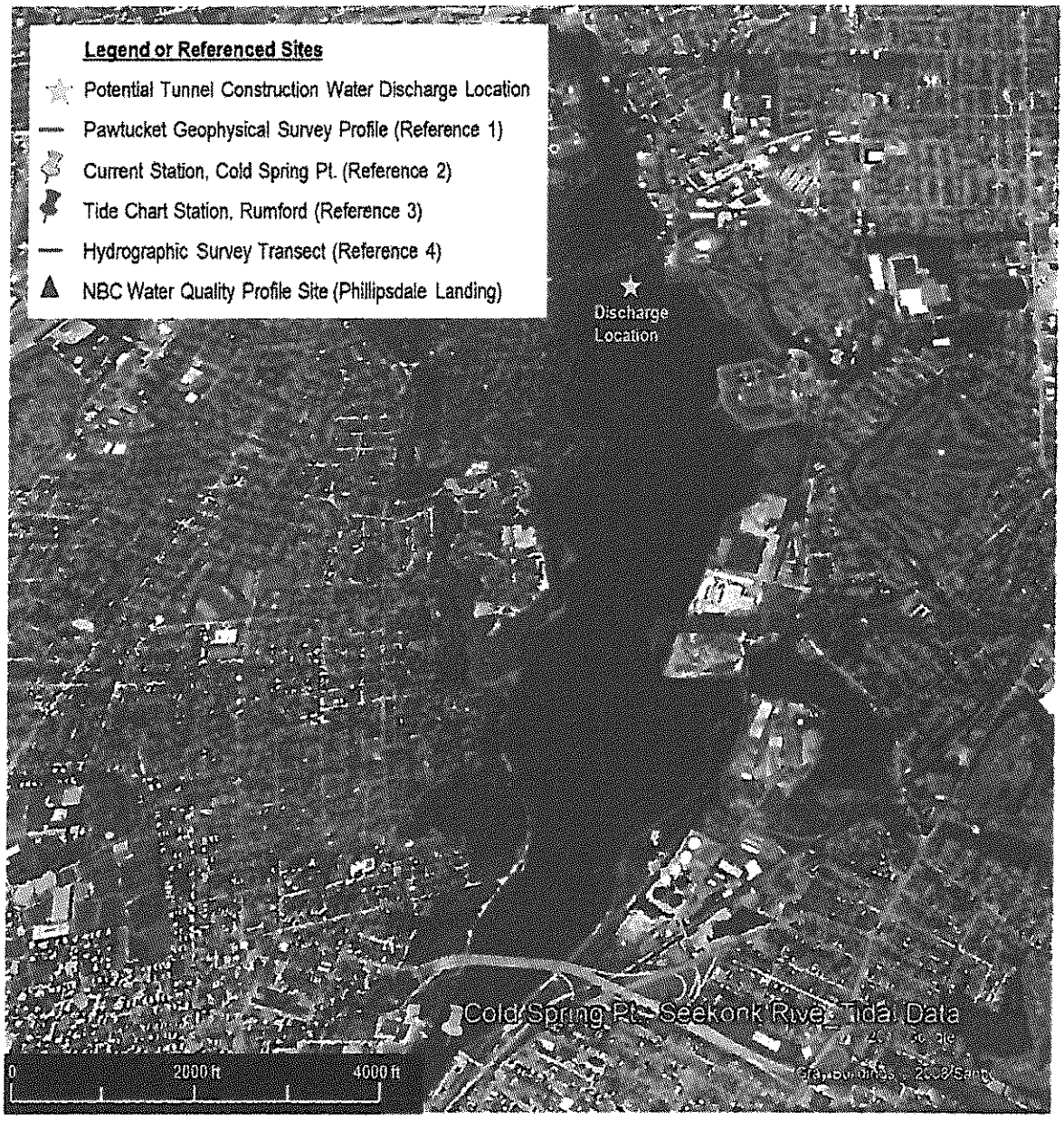
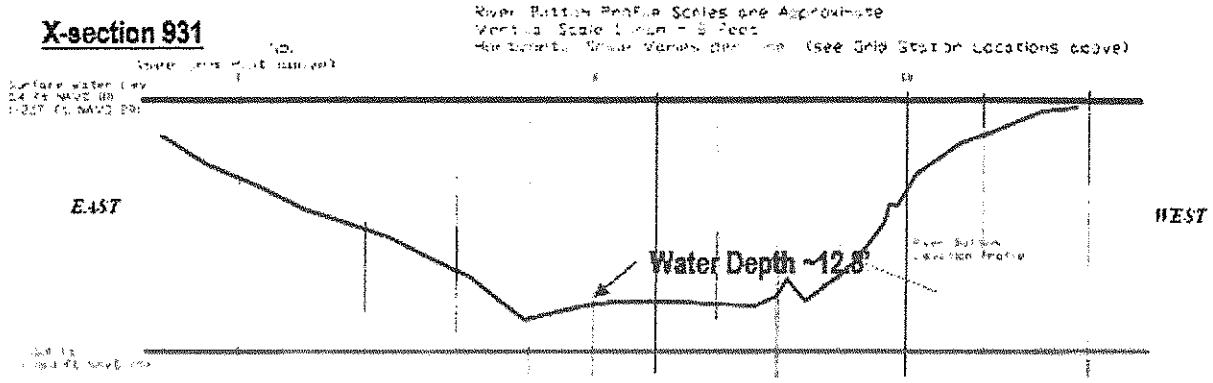


Figure 3-4 - Seekonk River Cross Sectional Profiles at Bishop Point, Line 931



Note: The distance between two adjoining stations is estimated to be 25ft based on survey document - Pawtucket Geophysical Survey Report, December 2017.

2) Online Narragansett Bay Tidal Information, Cold Spring Pt., 2015 Tidal Current Predictions. Data available for 2007 through 2015. The latest available data in year 2015 is used in this study. This reference provides slack water time, maximum current time and velocity at Cold Spring Point. Cold Spring Point is about two (2) miles downstream of the potential discharge location in the Seekonk River (Figure 3-3), and it is the closest station with current velocity data available. Considering river channel width and depth are comparable at Cold Spring Point and Bishop Point (Figure 3-5), current velocities at Cold Spring Point were used to represent velocities at the discharge location.

https://tidesandcurrents.noaa.gov/get_predc.shtml?year=2015&stn=5594+Pollock Rip Channel&secstn=Cold+Spring+Pt.,+Seekonk+River&sbfh=%2D1&sbfm=48&fldh=%2D4&fldm=14&sbeh=%2D1&sbem=31&ebbh=%2D1&ebbm=02&fldr=0.4&ebbr=0.8&fldavgd=030&ebbavgd=210&footnote=ac10

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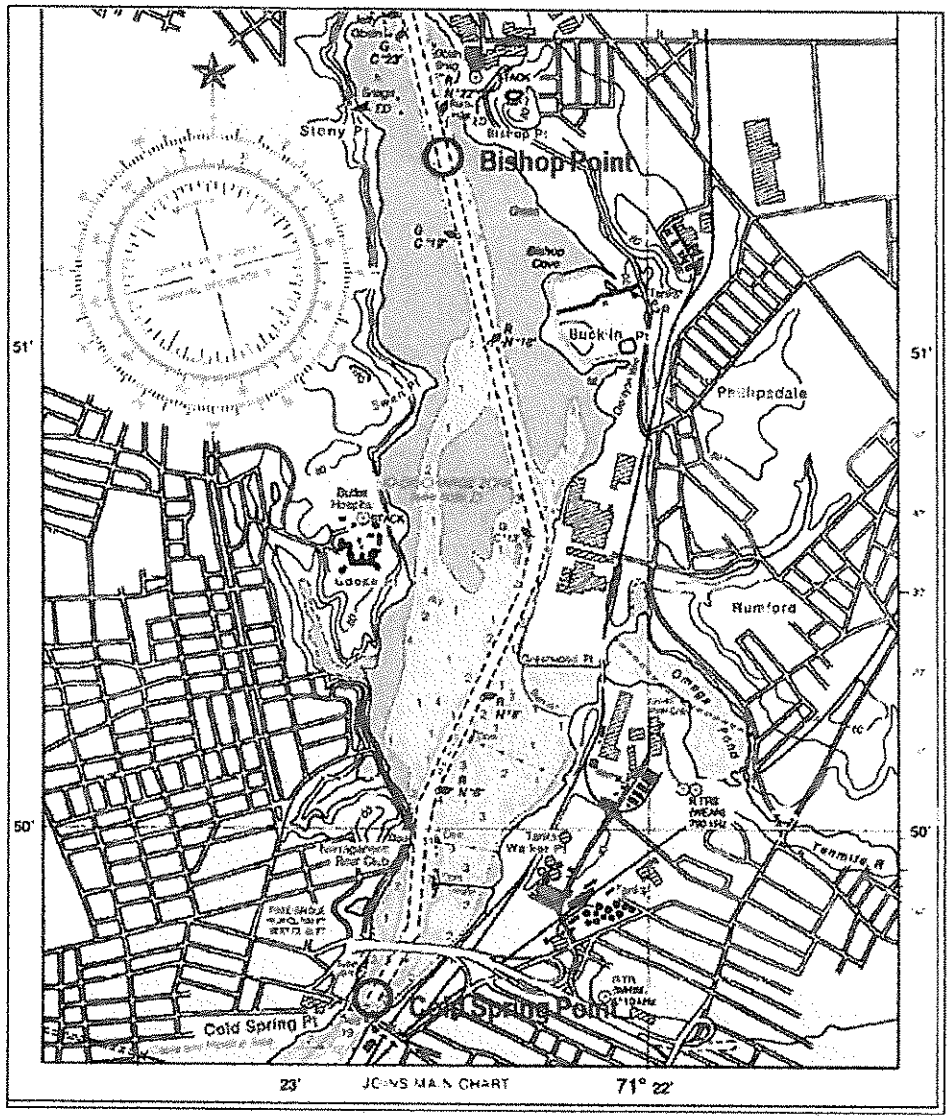
Figure 3-5 - Seekonk River NOAA Chart and Rumford Tide Chart



SEEKONK RIVER CHANNEL DEPTHS
TABULATED FROM SURVEYS BY THE CORPS OF ENGINEERS - REPORT OF AUG 2013
AND SURVEYS TO AUG 2012

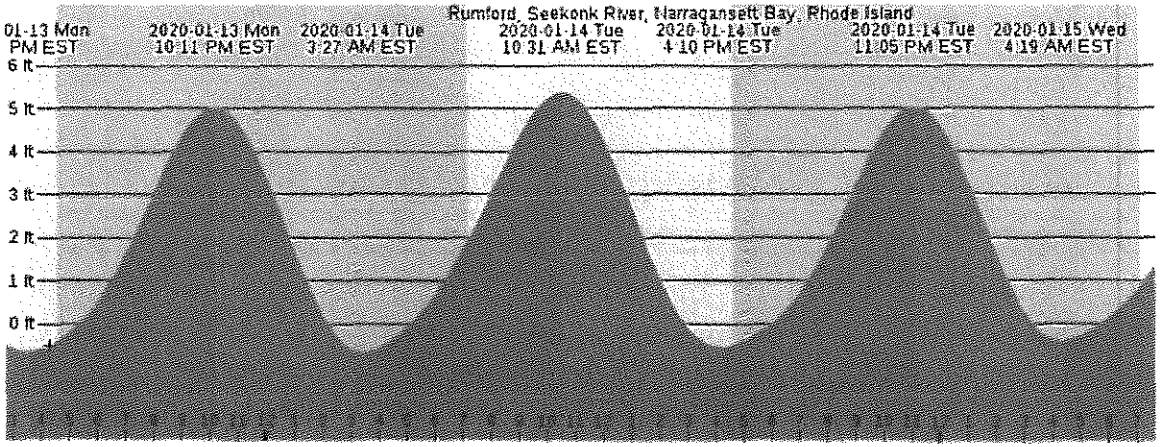
CONTROLLING DEPTHS FROM SEAWARD IN FEET AT MEAN LOWER LOW WATER (MLLW)					PROJECT DIMENSIONS		
NAME OF CHANNEL	LEFT OUTSIDE QUARTER	MIDDLE HALF OF CHANNEL	RIGHT OUTSIDE QUARTER	DATE OF SURVEY	WIDTH (FEET)	LENGTH (NAUT. MILES)	DEPTH MLLW (FEET)
CHANNEL ENTRANCE TO A POINT AT 41°50'30.0"N, 71°22'20.5"W	5.8	7.6	8.9	8-12	150	0.9	16
THENCE TO BISHOP POINT	5.3	7.7	5.0	8-12	150-160	1.1	16
BISHOP POINT TO NORTH END OF STATE PIER	4.1	5.4	4.0	8-12	150	0.7	16
THENCE 370 YARDS	7.7	5.9	6.4	8-12	60-150	0.2	16

NOTE - CONSULT THE CORPS OF ENGINEERS FOR CHANGES SUBSEQUENT TO THE ABOVE INFORMATION

Rumford, Seekonk River, Narragansett Bay, Rhode Island Tide Chart

Not the place you expected to see? Try https://tideslegacy.mobilegeographics.com.

Local time: 2020-01-13 Mon 4:16 PM EST



3) Rumford, Seekonk River Tidal Chart, 2015. 2015 data is used for being consistent with the latest available current data in 2015. This reference provides high and low tide time and elevation during tidal cycles. Rumford is slightly less than one (1) mile downstream of the potential discharge location in the Seekonk River (Figure 3-3), and it is the closest station with tidal elevation data available.

https://tides.mobilegeographics.com/locations/6922.html

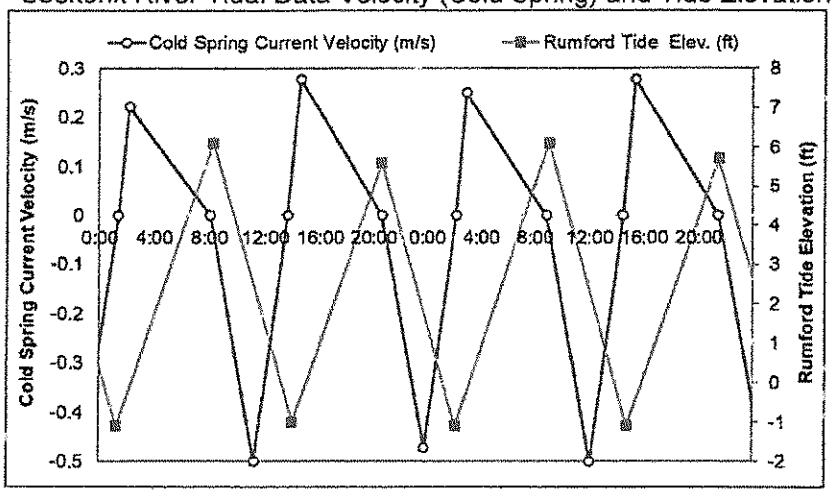
Data from References 2 and 3 were analyzed together to estimate tidal velocity and elevation corresponding to four tidal intervals, including 1 hour before the High Water Slack (HWS), 1 hour after the HWS, 1 hour before the Low Water Slack (LWS), and 1 hour after the LWS (Figure 3-6). Table 3-1 summarizes current velocity, average depth, and bounded width at these four intervals, which provides the basis of ambient inputs in the mixing zone model.

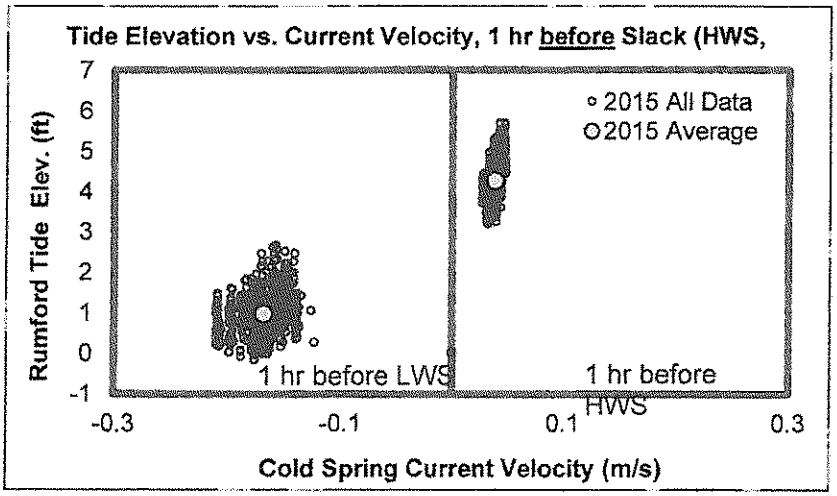
Table 3-1 - Current Velocity, Tide Elevation and Seekonk Channel Depth at 1 hour before and after High Water Slack (HWS) and Low Water Slack (LWS)

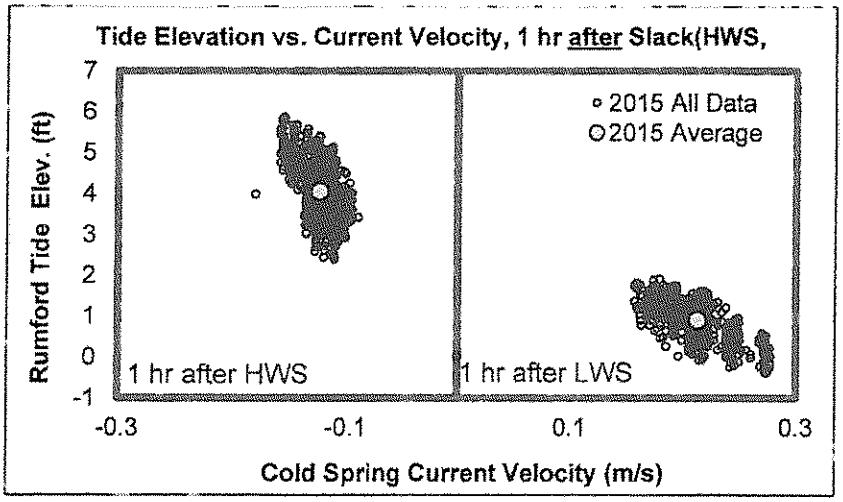
Simulation Time	Current Velocity[1] (m/s)	Average Depth (ft)	Bounded Width (ft)
1hr before LWS	-0.168	8.38	150
1hr after LWS	0.213	8.38	150
1hr before HWS	0.039	11.17	175
1hr after HWS	-0.124	11.57	175

1. Negative velocity means ebb current flowing seaward

Figure 3-6 - Seekonk River Tidal Data Velocity (Cold Spring) and Tide Elevation (Rumford)







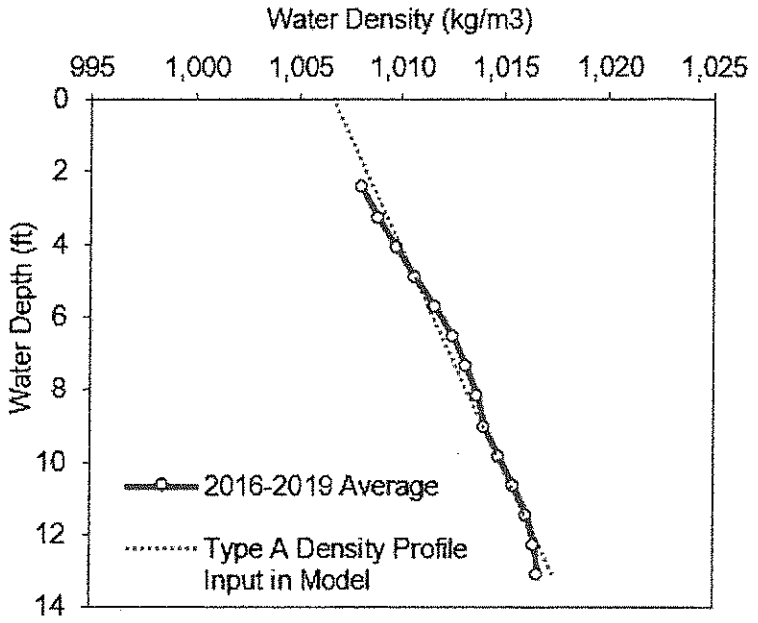
4) Hydrographic Surveys on the Providence and Seekonk Rivers, December 2001. This survey has circuit velocity contours along several transect lines in the Seekonk River and Providence River. Transact 1 is close to the discharge location (Figure 3-3). It is observed that current velocities at this transact are comparable to the current velocity at the Cold Spring Point from Reference #2 above, therefore current velocity at Cold Spring Point was used to provide tidal data in CORMIX. (https://snapshot.narrabay.com/app/Services/MossFile.ashx?file=/s/emda/snapshot/Documents/Publications/Modeling%20Project/2001-12_Fall%20Hydro%20report.pdf)
5) NOAA Chart of Providence River and Head of Narragansett Bay, by US Department of Commerce, National Oceanic and Atmospheric Administration (NOAA) National Ocean Service. The Seekonk River Channel Depths in the chart (Figure 3-5) are used to estimate river channel depth at mean lower low water (MLLW).
6) NBC Water Quality Monitoring, Water Column Profile Data 2016-2019. NBC water quality monitoring program measured density along water column depth. There are 75 water density profiles available for April 2016 through September 2019 at Phillipsdale Landing. Phillipsdale Landing is approximately 0.4 mile downstream of the BPWWTF (Figure 3-3). All 75 profiles were used to derive an overall density profile for the ambient water density input. http://snapshot.narrabay.com/WaterQualityInitiatives/Profiles
7) Seekonk River Weather Station. 2015 data is used for consistency with the latest available current data in 2015. Monthly wind speeds in 2015 were extracted and analyzed for annual average wind speed, which is approximately 2.1 meter per second (4.8 mile per hour). https://www.wunderground.com/dashboard/pws/KRIPROVI15/table/2015-01-30/2015-01-30/monthly

Main ambient inputs are summarized below.

- **Average Depth**: The average depth of mixing zone varied during tidal cycles, detailed in Table 3-1.
- **Depth at Discharge**: same as average depth
- **Bounded Width**: detailed in Table 3-1.
- **Wind Speed**: 2.1 m/s, based on Reference 7 above.
- **Manning's n**: 0.028, within the typical range (0.025-0.030) for clean and straight natural rivers.
- **Unsteady tidal data** (derived based on Cold Spring Point current velocity and Rumford tidal data, Figure 3-6):
    - **Period** of 12.4 hours
    - **Max velocity** 0.49 m/s,
    - **Tidal velocity** detailed in Table 3-1.
- **Density**: Non-freshwater density profile is selected because the discharge location is in the tidal reach of the Seekonk River. Type A density profile (linear density profile) is used based on water density data at Phillipsdale Landing (Figure 3-7).
    - Density at Surface: 1006.6 kg/m^3
    - Density at Bottom: 1017.3 kg/m^3

The ambient density data shown in Figure 3-2 remained the same. However, the ambient geometry/flow field data were modified based on modeling scenarios.

Figure 3-7 - Seekonk River Water Density Along Depth (Phillipsdale Landing)



3.2.4 Discharge Port Configuration (Input 4)

The fourth data input category "Discharge" is used to define discharge properties. Three options are available in the CORMIX model, including single port discharge, multiport diffuser, and surface (shoreline) discharge. It is determined that submerged multiport diffuser discharge located near the channel bottom will be used in this application.

- Nearest bank is on the: right or left, location of the nearest back is as seen by an observer looking downstream in the direction of the Seekonk river flow.
- Distance to nearest bank: 50 ft for high tides and 25 ft for low tides, assuming the tunnel construction dewatering system is to be discharged in the river channel. Please note that the actual distance from the bank to the discharge outfall in the river channel is about 500-600 feet. The input of 50/25 ft in the model does not count the distance of shoal outside of the river channel.
- Port Diameter: 0.333 ft (4 inches), determined by assuming average discharging velocity around 10 feet per second through the port opening.
- Vertical Angle THETA: 15 degrees, selected for optimal mixing. Vertical angel of discharge is the angle between the port centerline and a horizontal plane. The nozzles will point slightly upwards to reduce disturbance to the channel bottom.
- Horizontal Angle SIGMA: 90 or 270 degrees depending on tidal current direction. Horizontal angel of discharge is measured counterclockwise from the ambient current

direction to the plan projection of the port centerline. All ports/nozzles will point toward the west and perpendicular to the ambient flow.

- Port Height Above Channel Bottom: 2.5 ft, the diffuser port is submerged and 2.5 feet above the bottom.

3.2.5 Mixing Zone Specifications (Input 5)

The fifth data category "Mixing Zone" is used to define 1) whether EPA's toxic dilution zone (TDZ) definitions apply, 2) whether an ambient water quality standards exists, 3) whether a regulatory mixing zone (RMZ) definition exists, 4) the spatial region of interest (ROI) over which information is desired, and 5) number of locations (grid intervals) in the ROI to display output details.

- For the purpose of evaluating dilution factors in the vicinity of discharging location, no water quality standard and no mixing zone were specified in this tab.
- Region of Interest: 2000 ft. The intense mixing zone is estimated to be within 100 ft, setting region of interest of 2000 ft is enough to cover the intense mixing zone and meet the requirement that the ROI should be at least 10 times the channel width.
- Output Steps per Module: 1500. There will be 1500 grids for displaying output details.

Figure 3-8 summarizes data input discussed above in an overall data preparation checklist for scenario of discharging 800 gpm using a 3-port diffuser and simulated for 1 hour before high water slack. For other simulated scenarios, majority of the inputs in the figure stay unchanged, however, the effluent discharge flow rate, tidal velocity at different time after slack, and discharge geometry data were modified accordingly in different modeling scenarios.

Figure 3-8 - CORMIX Checklist for Data Preparation

CORMIX Checklist for Data Preparation – Version v5.0

PROJECT LEGEND

Project File Name: 800_MP_1HRbfHWS Design Case: 1 hr before HWS
Site Name: Seekonk River (Tidal) Prepared By: Yuan Fang Date: 4/22/2020

EFFLUENT DATA

☐ Non-Fresh Water Effluent Density
Density ρ_o: ..... kg/m³

☒ Fresh Water Effluent Density
☒ Temperature T_o: 51 ° F ☐ Density ρ_o: ..... kg/m³
Discharge Excess Concentration: 100 % ☒ Effluent Flowrate Q_o: 800 GPM ☐ Effluent Velocity U_o: ..... m/s

Pollutant Types

☒ Conservative ☐ Non Conservative: ..... /day ☐ Heated – Heat Loss Coefficient: ..... W/m²/°C
☐ Brine ☐ Sediment: Chunks: ..... % Sand: ..... % Coarse Silt: ..... % Fine Silt: ..... % Clay: ..... %
Total Sediment Concentration: ..... kg/m³

AMBIENT GEOMETRY / FLOW FIELD DATA

Average Depth H_a: 11.17 ft ☐ Unbounded ☒ Bounded: Width BS: 175 ft
Depth at Discharge H_d: 11.17 Appearance: ☒ Uniform ☐ Slight Meander ☐ Highly Irregular

☐ Steady
☐ Ambient Flowrate Q_a ..... m³/s
☐ Ambient Velocity U_a ..... m/s

☒ Unsteady
Period 12.4 hr Max Velocity U_m 0.49 m/s Tidal Velocity at this Time U_a: 0.039 m/s
☒ At Time: 1 hr Before Slack ☐ At Slack – Δ Time: ..... hr ☐ At Time: ..... hr After Slack

☐ Single Slope
Slope S: ..... %
Near Shore Velocity: ..... m/s
Near Shore Darcy-Weisbach f: .....

☐ Near & Far Slope
☐ Near Shore Slope S_1 ..... % ☐ Far Slope S_2: ..... %
☐ Near Shore Velocity U_{a1} ..... m/s ☐ Far Shore Velocity U_{a2}: ..... m/s
☐ Near Shore Darcy-Weisbach f_1: ..... ☐ Far Shore Darcy-Weisbach f_2: .....
☐ Breakpoint: ..... m

☒ Manning's n: 0.028 Wind Speed: 2.1 m/s

AMBIENT DENSITY DATA

Water Body: ☐ Fresh Water ☒ Non-Fresh Water

☐ Uniform Fresh: ☐ Temperature: ..... °C ☐ Density ρ_a: ..... kg/m³ Non-Fresh: Density ρ_a: ..... kg/m³
☒ Stratified ☒ Type A ☐ Type B: Pycnocline Height: ..... m ☐ Type C: Pycnocline Height: ..... Jump: ..... kg/m³
Density ρ: At Surface ρ_{as} 1006.6 kg/m³ At Bottom ρ_{ab}: 1017.3 kg/m³
☐ Brine & Sediment Only Level 1 Density ρ_1: ..... kg/m³ Sub 1: ..... m; Level 2 Density ρ_2: ..... kg/m³ Sub 2: ..... m

DISCHARGE GEOMETRY DATA

CORMIX 1 – Single Port

Nearest Bank: ☐ Left ☐ Right
Dist. to Nearest Bank: ..... m
Vert. Angle θ_o: ..... °; Horiz. Angle σ_o: ..... °
☐ Port Diameter D_o: ..... m
☐ Port Area A_o: ..... m²

Submerged
Port Height above Bottom h_a: ..... m

Above Surface
Port Height above Surface ..... m
☐ Jet-like ☐ Spray ☐ Area
Deflector Plate: ☐ With or ☐ Without

CORMIX 2 – Multiport

Nearest Bank: ☐ Left ☒ Right
☒ Unidirectional ☐ Staged ☐ Altern./ Vert.
N° of openings: 3 ; Diffuser Length: 12 ft
Dist. to 1st end-point YB_1: 50 ft
Dist. to 2nd far end-point YB_2: 62 ft
Port Height h_a: 2.5 ft Port Diameter D_o: 0.333 ft
Contraction Ratio: 1

Angles (degrees)
Vert. Angle θ: 15 °; Horiz. Angle σ: 90 °
Align. Angle γ: 90 °; Relat.Orient. Angle β: 0 °
Nozzle Direction: ☒ Same or ☐ Fanned Out

CORMIX 3 – Surface Discharge

Discharge Located: ☐ Left ☐ Right
Horiz. Angle σ: ..... °
Local Depth at Discharge Outlet: ..... m
☐ Flush ☐ Co-flowing
☐ Protruding: Distance from Bank: ..... m

Discharge Outlet
☐ Channel: Width: ..... m; Depth b_o: ..... m
☐ Pipe: Diameter D_o: ..... m
Bottom Invert Depth: ..... m
Local Bottom Slope at Chanel Entry: ..... °

MIXING ZONE DATA

☒ Non-Toxic Effluent
☐ WQ Standard: ..... ☒ No WQ Standard

☐ Toxic Effluent
CMC: ..... CCC: .....

☐ Mixing Zone Specified
☐ Trajectory: ..... m ☐ Downstream Distance: ..... m
Region of Interest: 2000 ft

☒ No Mixing Zone Specified
☐ Width: ..... % / m ☐ Area: ..... %
Grid Intervals for Display: 1500

3.3 CORMIX Model Scenarios

Discharge flows of 400, 800, 1200 and 2400 gpm were simulated to estimate dilution factors under different discharge conditions and different current conditions. The rate reversal near slack tides is of considerable importance for the concentration build-up in the transient discharge plume, as tidal reversals will reduce the effective dilution of a discharge by re-entraining the discharge plume remaining from the previous tidal cycle. Therefore, tidal simulations were repeated for several time intervals before and after slack time to determine plume characteristics in unsteady ambient conditions. For each flow, tidal simulations were repeated for four time intervals in this study, including 1 hour before HWS, 1 hour after HWS, 1 hour before LWS, and 1 hour after LWS.

Dual discharge pipes, each connected to a 3-port diffuser with port diameter of 4 inches and at least 6-ft apart, will be used to convey tunnel construction discharge water to the Seekonk River channel. One pipe (and its connected diffuser) could provide conveyance capacity up to 2,400 gpm. The other pipe (and its connected diffuser) will serve as redundancy. Table 3-2 summarizes modeling scenarios simulated in this study.

Key model inputs, including tidal velocities, ambient depth, bounded width, and discharge configurations are summarized in Table 3-3 for multiple port simulations.

Table 3-2 - CORMIX Modeling Scenarios

Modeling Scenario	Discharge Flow (gpm)	Simulation Time	# of Diffuser
400_MP_1HRbfLWS	400	1hr before LWS	1 (3 discharging ports)
400_MP_1HRafLWS	400	1hr after LWS	
400_MP_1HRbfHWS	400	1hr before HWS	
400_MP_1HRafHWS	400	1hr after HWS	
800_MP_1HRbfLWS	800	1hr before LWS	1 (3 discharging ports)
800_MP_1HRafLWS	800	1hr after LWS	
800_MP_1HRbfHWS	800	1hr before HWS	
800_MP_1HRafHWS	800	1hr after HWS	
1200_MP_1HRbfLWS	1200	1hr before LWS	1 (3 discharging ports)
1200_MP_1HRafLWS	1200	1hr after LWS	
1200_MP_1HRbfHWS	1200	1hr before HWS	
1200_MP_1HRafHWS	1200	1hr after HWS	
2400_MP_1HRbfLWS	2400	1hr before LWS	1 (3 discharging ports)
2400_MP_1HRafLWS	2400	1hr after LWS	
2400_MP_1HRbfHWS	2400	1hr before HWS	
2400_MP_1HRafHWS	2400	1hr after HWS	

Table 3-3 - CORMIX Input Summary

Tidal Cycle	Current Velocity[1] (m/s)	Average Depth(ft)	Average Width(ft)	Number of Ports	Port Diameter (in)	Theta, degree	Sigma, degree	Beta, degree	Port above channel (ft)
1hr before LWS	-0.168	8.38	150	3	4	15	270	0	2.5
1hr after LWS	0.213	8.38	150	3	4	15	90	0	2.5
1hr before HWS	0.039	11.17	175	3	4	15	90	0	2.5
1hr after HWS	-0.124	11.57	175	3	4	15	270	0	2.5

[1] Negative values mean current flowing southward to the bay, and positive values mean current flowing northward.

3.4 CORMIX Model Results

Dilution factors along downstream distance are plotted in Figure 3-9, Figure 3-10, Figure 3-11, and Figure 3-12 for discharges of 400 gpm, 800 gpm, 1200 gpm, and 2400 gpm respectively. Provided in Appendix D are the CORMIX model inputs and results for each run listed in Table 3-2.

Figure 3-9 - Dilution Factors for Discharge of 400 gpm

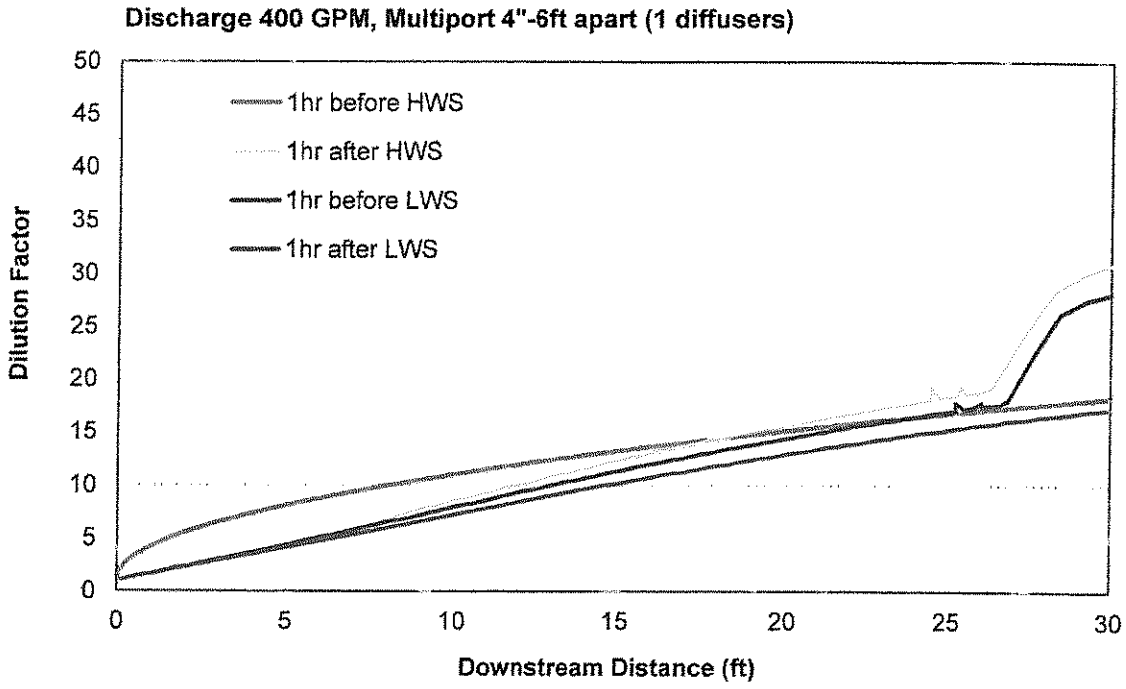


Figure 3-10 - Dilution Factors for Discharge of 800 gpm

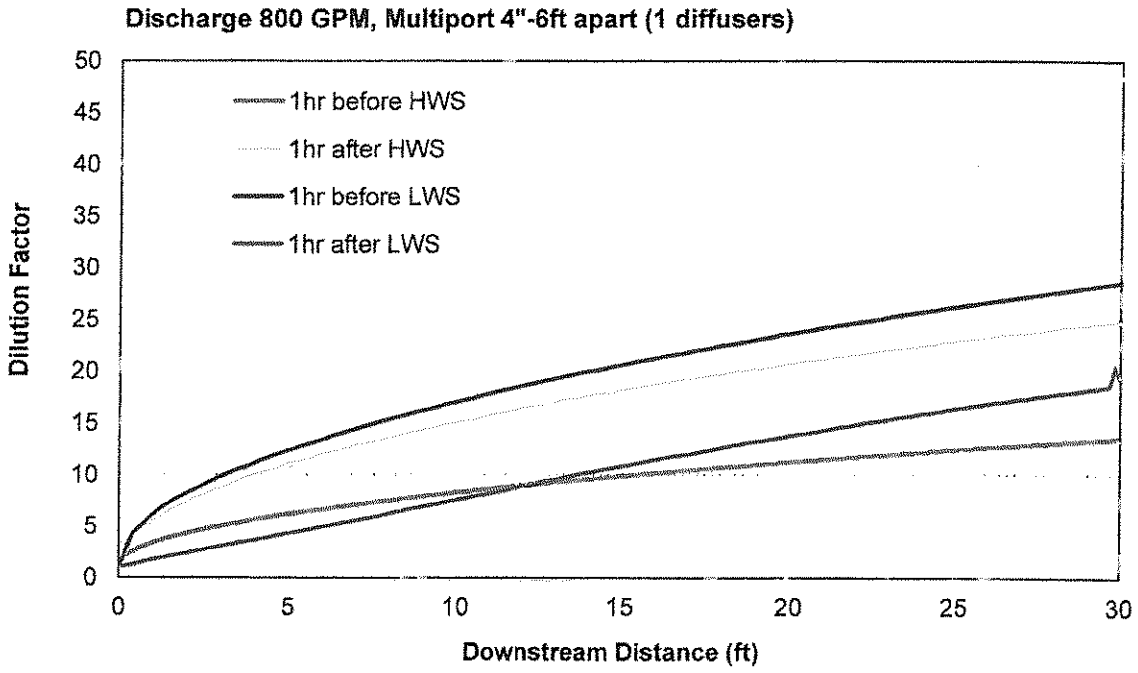


Figure 3-11 - Dilution Factors for Single Port Discharge of 1200 gpm

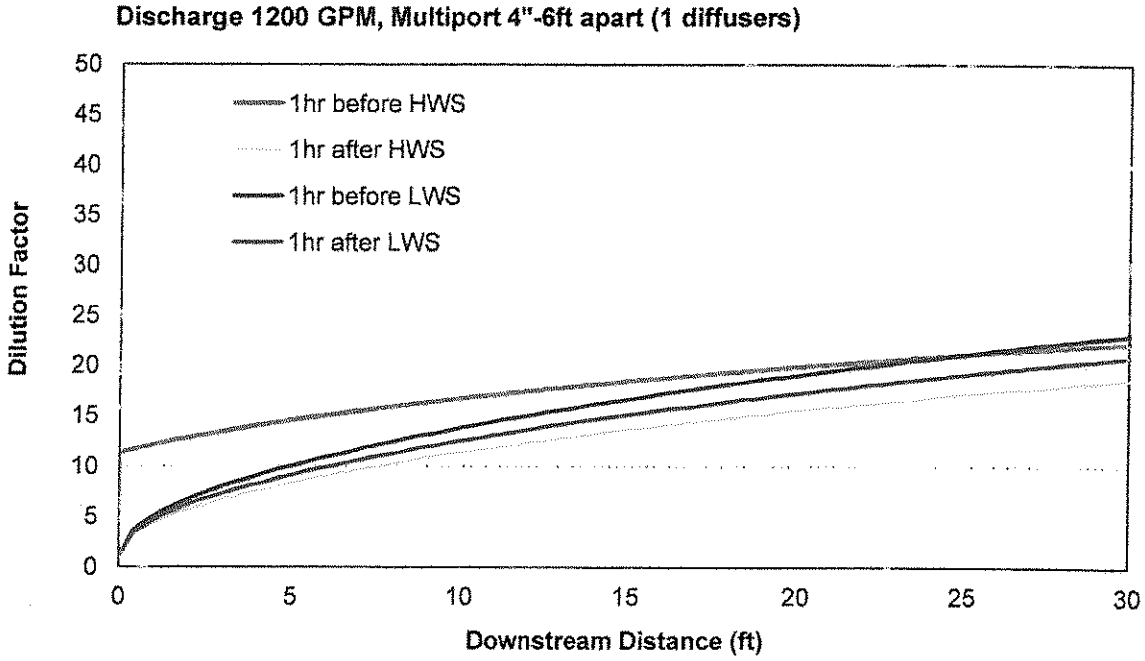


Figure 3-12 - Dilution Factors for Discharge of 2400 gpm

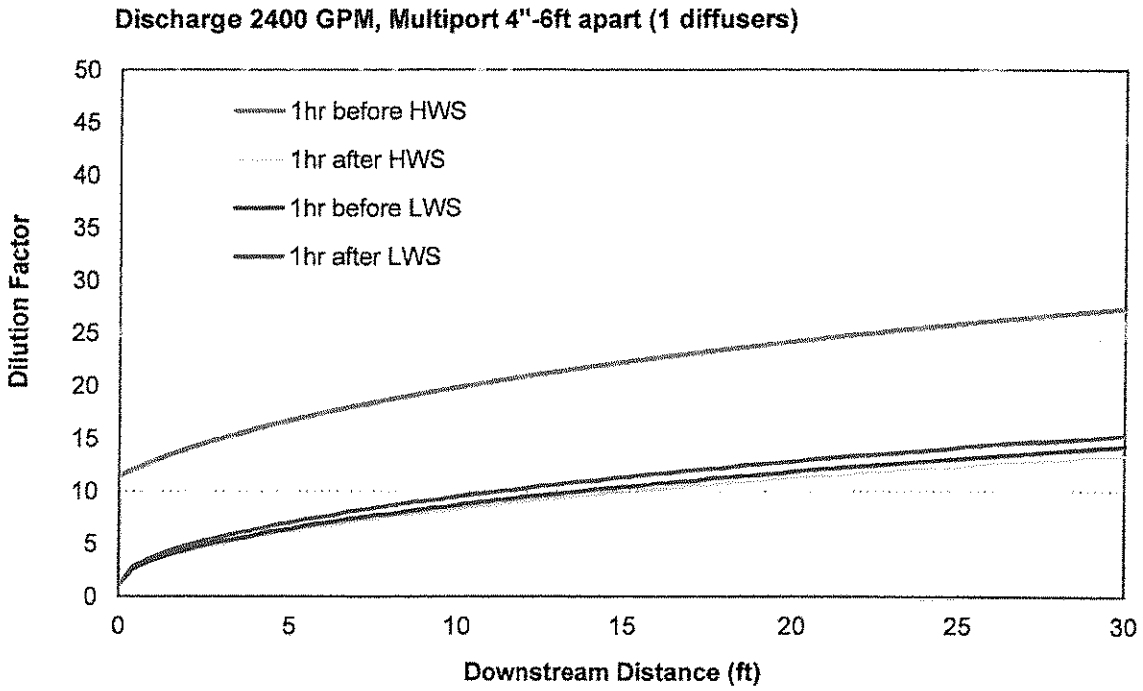


Table 3-4 summarizes downstream distances needed to achieve dilution factors of 10. For all modeling scenarios. Dilution factors of 10 can be achieved within 20 ft downstream of the discharge location. Model predicted dilution factors of 10 are attainable at downstream distances of 15, 16, 8, and 16 ft for tunnel dewatering discharge rates of 400, 800, 1200 and 2400 gpm respectively. The distance to attain a dilution factor of 10 is impacted by key factors including jet velocities (velocity through port opening), discharge flow rates, discharge port size and configuration, tidal velocity and direction, and ambient conditions.

Table 3-4 - Downstream Distance to Achieve Dilution Factor 10

Discharge Flow (gpm)	Simulation Time	Downstream Distance Needed for DF 10 (ft)	Max Distance (of Four Simulation Time)
400	1hr before LWS	13.3	15
	1hr after LWS	14.7	
	1hr before HWS	8.3	
	1hr after HWS	12.2	
800	1hr before LWS	3.4	16
	1hr after LWS	14.1	
	1hr before HWS	16.0	
	1hr after HWS	4.6	
1200	1hr before LWS	5.5	8
	1hr after LWS	6.3	
	1hr before HWS	0.1	
	1hr after HWS	8.1	
2400	1hr before LWS	14.2	16
	1hr after LWS	11.7	
	1hr before HWS	0.1	
	1hr after HWS	15.6	

3.5 RIPDES Permit Compliance Evaluation

RIDEM has provided proposed effluent limits for the discharge (see Appendix C). The purpose of this section is to provide an evaluation of anticipated compliance with the proposed effluent limits. Evaluation and comparison with limits are based upon historical data and effluent data from the South Hartford Tunnel in Hartford, CT and the Providence Tunnel because effluent quality of the Pawtucket Tunnel construction dewatering is not yet known. For NBC construction projects, dewatering effluent quality was obtained from Providence Tunnel near the dewatering point, the Foundry Shaft, and at the Seekonk CSO Interceptor (CSOI). The evaluation is also based upon the proposed treatment system described in Section 4.

3.5.1 South Hartford Tunnel Construction Dewatering

On October 23, 2019, Stantec collected samples from the influent and effluent of the construction dewatering system in place at the South Hartford Conveyance and Storage Tunnel. The pre-treatment system involves chemical addition for coagulation, followed by sedimentation and filtration processes for TSS and other contaminant removal, and CO_2 sparging for pH control. The influent samples have been anticipated to be representative of the water expected to be collected at the Pawtucket Tunnel construction site. Effluent samples were also collected as these were anticipated to be representative of what a similar pretreatment system would achieve if also put in place at the Pawtucket Tunnel construction site.

Table 3-5 provides a summary of the data collected and compares them with the RIPDES General Permit for both dilution factor of 1 (no dilution) and dilution factor of 10. Data in blue font indicates the value is greater than RIPDES maximum daily limits, and data in red font indicates the value is greater than the average monthly limits.

- With no dilution, copper, lead, nickel, zinc, iron, and TSS concentration in the pre-treatment influent (i.e., raw tunnel dewatering discharge) are greater than max daily or average monthly discharge limits.
- With dilution factor of 10, the pre-treatment effluent will be able to meet all the discharge limits.

Table 3-5 - South Hartford Tunnel Construction Dewatering Data vs. RIPDES General Permit

(a) Dilution Not Considered

		South Hartford Conveyance Tunnel Construction Dewatering Samples[1]								RIPDES GP G No Dilution (DF=1)	
Parameter	**Unit**	**INF 1**	**INF 3**	**INF 4**	**INF 6**	**Influent Average**	**EFF 3**	**EFF 6**	**Effluent Average**	**Maximum Daily**	**Average Monthly**
Antimony	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	5.6	5.6
Arsenic	µg/L	6	4	ND	ND	**3.5**	ND	ND	**ND**	55.2	1.12
Cadmium	µg/L	1	1	ND	ND	**1**	ND	ND	**ND**	10.2	7.08
Chromium	µg/L	29	40	16	21	**26.5**	9	7	**8**	323	100
Copper	µg/L	19.5	22.5	6.5	6.4	**13.7**	3.1	2.7	**2.9**	4.62	2.98
Cyanide	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	0.8	0.8
Lead	µg/L	13	17	4	10	**11**	ND	ND	**ND**	160	6.81
Mercury	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	1.69	0.12
Nickel	µg/L	31	36	11	16	**23.5**	3	3	**3**	59.79	6.62
pH (S.U.)		9.6	11.1	10.6	10.6	**10.5**	7.5	6.7	**7.1**	5.0-11.0	
Selenium	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	232.46	56.91
Silver	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	1.78	1.78
Zinc	µg/L	136	194	43	89	**116**	15	16	**15.5**	76.11	68.5
TSS	mg/L	280	970	6300	1200	**860**[2]	75	77	**104**[2]	30	
Iron	mg/L	29.6	33.6	11.3	14.5	**22.3**	2.59	2.82	**2.7**	1	

1. ND: not detected. Blue font: data over monthly limit; Red font: data over maximum daily limit.
2. Influent and effluent average TSS concentrations were calculated based on a total of six samples, only four influent TSS and two effluent TSS are shown in the table, others were not shown.

(b) Dilution Factor 10 Considered

South Hartford Conveyance Tunnel Construction Dewatering Samples[1]										RIPDES (DF=10)	
Parameter	**Unit**	**INF 1**	**INF 3**	**INF 4**	**INF 6**	**Influent Average**	**EFF 3**	**EFF 6**	**Effluent Average**	**Maximum Daily**	**Average Monthly**
Antimony	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	No Criteria	5120
Arsenic	µg/L	6	4	ND	ND	**3.5**	ND	ND	**ND**	611.64	3.24
Cadmium	µg/L	1	1	ND	ND	**1**	ND	ND	**ND**	377.82	82.86
Chromium	µg/L	29	40	16	21	**26.5**	9	7	**8**	9967.33	450.7
Copper	µg/L	19.5	22.5	6.5	6.4	**13.7**	3.1	2.7	**2.9**	59.30	36.47
Cyanide	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	8	8
Lead	µg/L	13	17	4	10	**11**	ND	ND	**ND**	13690.50	523.11
Mercury	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	19.05	1.34
Nickel	µg/L	31	36	11	16	**23.5**	3	3	**3**	698.76	73.42
pH (S.U.)		9.65	11.09	10.63	10.62	**10.5**	7.51	6.71	**7.1**	---	---
Selenium	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	264.59	639.65
Silver	µg/L	ND	ND	ND	ND	**ND**	ND	ND	**ND**	34.54	---
Zinc	µg/L	136	194	43	89	**115.5**	15	16	**15.5**	843.58	757.959
TSS	mg/L	280	970	6300	1200	**860**[2]	75	77	**104**[2]	300	---
Iron	mg/L	29.6	33.6	11.3	14.5	**22.3**	2.59	2.82	**2.7**	No Criteria	No Criteria

1. ND: not detected. Blue font: data over monthly limit; Red font: data over maximum daily limit.
2. Influent and effluent average TSS concentrations were calculated based on a total of six samples, only four influent TSS and two effluent TSS are shown in the table, others were not shown.

3.5.2 Providence Tunnel, Foundry, Seekonk CSO Interceptor

Three other sources that relate to tunnel dewatering are listed in Table 3-6. Tested samples were taken from the Providence Tunnel near the dewatering point, the Foundry Shaft, and at the Seekonk CSOI. Again, the RIPDES discharge limits with DF 1 and DF 10 are included in Table 3-6 for comparison.

- With no dilution, cadmium, copper, lead, nickel, silver, and zinc are greater than max daily or average monthly discharge limits.
- With dilution factor of 10, most of the mean values (other than copper) meet the monthly discharge limits.

Table 3-6 - Providence Tunnel, Foundry, and Seekonk CSO Interceptor Dewatering Data

(a) Dilution Not Considered

Parameter [1]	Unit	Providence Tunnel		Foundry		Seekonk CSO Interceptor		RIPDES GP G No Dilution (DF=1)	
		Mean	95% CI	Mean	95% CI	Mean	95% CI	Maximum Daily	Average Monthly
Antimony	µg/L	1	NA	NA	NA	NA	NA	5.6	5.6
Arsenic	µg/L	NA	NA	NA	NA	NA	NA	55.2	1.12
Cadmium	µg/L	6.2	14	8.5	41.9	5.5	18.8	10.2	7.08
Chromium	µg/L	27.9	67	31.6	60	11.9	75	323	100
Copper	µg/L	36.8	50	41.5	50	21.5	40	4.62	2.98
Cyanide	µg/L	NA	NA	NA	NA	NA	NA	0.8	0.8
Lead	µg/L	41.9	80	43.3	87	10.9	63.5	160	6.81
Mercury	µg/L	NA	NA	NA	NA	NA	NA	1.69	0.12
Nickel	µg/L	25.3	50	23	58	8.5	44	59.79	6.62
pH (S.U.)		NA	NA	NA	NA	NA	NA	5.0-11.0	
Selenium	µg/L	NA	NA	NA	NA	NA	NA	232.46	56.91
Silver	µg/L	19.4	20	19.6	20	7.4	23.8	1.78	1.78
Zinc	µg/L	57.7	150	51	91	23.8	60	76.11	68.5
TSS	mg/L	NA	NA	NA	NA	NA	NA	30	
Iron	mg/L	NA	NA	NA	NA	NA	NA	1	

(b) Dilution Factor 10 Considered

Parameter [1]	Unit	Providence Tunnel		Foundry		Seekonk CSO Interceptor		RIPDES (DF=10)	
		Mean	95% CI	Mean	95% CI	Mean	95% CI	Maximum Daily	Average Monthly
Antimony	µg/L	1	NA	NA	NA	NA	NA	No Criteria	5120
Arsenic	µg/L	NA	NA	NA	NA	NA	NA	611.64	3.24
Cadmium	µg/L	6.2	14	8.5	41.9	5.5	18.8	377.82	82.86
Chromium	µg/L	27.9	67	31.6	60	11.9	75	9967.33	450.7
Copper	µg/L	36.8	50	41.5	50	21.5	40	59.30	36.47
Cyanide	µg/L	NA	NA	NA	NA	NA	NA	8	8
Lead	µg/L	41.9	80	43.3	87	10.9	63.5	13690.50	523.11
Mercury	µg/L	NA	NA	NA	NA	NA	NA	19.05	1.34
Nickel	µg/L	25.3	50	23	58	8.5	44	698.76	73.42
pH (S.U.)		NA	NA	NA	NA	NA	NA	---	---
Selenium	µg/L	NA	NA	NA	NA	NA	NA	264.59	639.65
Silver	µg/L	19.4	20	19.6	20	7.4	23.8	34.54	---
Zinc	µg/L	57.7	150	51	91	23.8	60	843.58	757.959
TSS	mg/L	NA	NA	NA	NA	NA	NA	300	---
Iron	mg/L	NA	NA	NA	NA	NA	NA	No Criteria	No Criteria

1. NA: Data not available. Blue font: data over monthly limit; Red font: data over maximum daily limit.
2. Discharge limit for dilution factor 10 is calculated by Limit (DF10) = Limit (DF1) x 10.

3.6 Conclusion

A dilution factor of 10 within 20-ft downstream of the discharge point is predicted by CORMIX for the anticipated average flow of 400 gpm to 800 gpm. At maximum peak flow rate of 2400 gpm, a dilution factor of 10 can also be achieved within 20-ft using multiport discharge.

Provided in Appendix C is a summary table comparing available historic data to the proposed effluent limits, which are based upon a dilution factor of 10. This data indicates that arsenic and copper are the only parameters that may exceed the permissible limits. All other effluent levels are well below the proposed limits.

ATTACHMENT A-5

DEM Metals Translator Study Review Memo

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

INTER-OFFICE MEMO

TO: Eric A. Beck, P.E. DATE: September 20, 2016
Supervising Sanitary Engineer
DEPT: Environmental Management

FROM: Joseph B. Haberek, P.E.
Principal Sanitary Engineer
DEPT: Environmental Management

CC: Samuel Kaplan, P.E. and Angelo Liberti, P.E.

SUBJECT: Review of NBC's Final Metals Compliance Report

This memo is being written in response to the Department of Environmental Management's (DEM's) review of the Narragansett Bay Commission's (NBC's) Final Metals Compliance Evaluation Report that was dated September 30, 2004 (the Report). This report was submitted to the DEM as required under paragraph 14(a) of consent agreement RIA-330. Specifically, paragraph 14(a) required that the NBC submit a Final Metals Compliance Evaluation Report that included the following elements: 1) a summary of the results of the NBC's metals translator sampling including all data from field metals translator studies and the seasonal surveys of the Providence and Seekonk Rivers and a recommendation on the appropriate metals translator to be used in calculating Rhode Island Pollutant Discharge Elimination System (RIPDES) limits, 2) any additional data collected since the submission of the Interim Metals Compliance Report, including potable water supply sampling, river monitoring, and domestic wastewater characterization sampling, 3) revised RIPDES permit limits calculated using the recommended metals translator and the new background receiving water concentrations, 4) a new local limits evaluation using the updated domestic wastewater characterization and the revised RIPDES limits, and 5) an evaluation of the NBC's ability to comply with the revised RIPDES limits.

Based upon a review of the September 30, 2004 Report, it has been determined that it includes all of the elements required under paragraph 14(a) of the NBC's consent agreement. However, since the recently revised Rhode Island Water Quality Regulations includes several changes to water quality criteria, a detailed review of items 3 (revised RIPDES limit calculations), 4 (updated local limits), or 5 (NBC's compliance evaluation) were not conducted. As we previously agreed, since the changes to the Rhode Island Water Quality Regulations will impact the RIPDES limits that the NBC would have calculated, we decided not to perform a detailed review of items 3,4, and 5. Instead, we agreed that we would review the metals translators and, once we came to an agreement on these translators, use them to calculate revised RIPDES limits that would be included in a draft RIPDES permit. We would then have the NBC update their local limits evaluation using these new RIPDES limits and perform a new compliance evaluation as part of the permit reissuance process. Therefore, this memo focuses on my review of the results of the NBC's metals translator study.

The following table summarizes the Environmental Protection Agency's (EPA's) requirements for a metals translator study, from the EPA's June 1996 document "The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion". The table also includes columns that identify how the NBC proposed to address the EPA requirements in their metals translator scope of work that was submitted with the May 16, 2001 Interim Metals Compliance Report and what activities they actually undertook as part of their metals translator study.

EPA Metals Translator Guidance Requirement	*Scope of Work Specification*	*Actually Achieved*
3.1.1 – sample during critical (i.e., low flow) conditions	Surveys will be planned to coincide with critical conditions for pH and flow	Surveys were conducted during 4 seasons at a variety of sites and depths over a full tidal cycle and under different environmental and wastewater effluent conditions
3.1.2 – field study should extend over several months	4 seasonal receiving water surveys over the course of a year	4 seasonal surveys were conducted over the course of a 10 month period
3.2.1 – collect samples at or beyond the edge of the mixing zone from a point where complete mixing has occurred	4 seasonal surveys of the Providence and Seekonk Rivers will be conducted	4 seasonal surveys conducted for both the Providence and Seekonk Rivers on 7/23/01, 10/28/01, 12/16/01, and 5/8/02
3.2.2 – collect samples from the far field to ensure that the translator will be protective of the characteristics of the receiving water not just the effluent	The study area will include the entire length of the Providence and Seekonk Rivers	The study area for the Providence River included 1 transect upstream of the Fields Point WWTF and 3 transects downstream. The study area for the Seekonk River included 1 transect above the Bucklin Point WWTF, 1 transect at the outfall, and 4 transects downstream.
3.2.3 – collect samples from effluent and the upstream ambient water and combine in the laboratory at the design dilution factor to ensure that the translator is protective at design conditions (i.e., 7Q10 and design flow)	Ambient samples will be collected from GSO dock and Fields Point effluent samples will be mixed at a 10:1 ratio and analyzed	Ambient and WWTF effluent samples were collected, but were not analyzed at the 10:1 dilution ratio.
3.3 – at least 10 sets of total and dissolved metals samples should be collected during low flow conditions or 20 pairs over all flow conditions	4 surveys will be conducted and a total of 60 sample sets will be collected during each survey (40 in the Providence River and 20 in the Seekonk River)	A total of 106 sample sets were taken from the Providence River and a total of 103 sample sets were taken from the Seekonk River
3.4 – sample for total, dissolved, and particulate metals fractions as well as TSS, Particulate Organic Carbon (POC), pH, hardness and flow	Samples will be analyzed for total and dissolved metals	Samples were analyzed for total and dissolved metals, TSS, POC, pH, salinity, chlorophyll, silicate, phosphate, ammonia, nitrate, nitrite, total nitrogen, total phosphorus, Dissolved Organic Carbon (DOC), and particulate nitrogen
3.5 – use trace metals sampling (i.e., clean sampling) techniques	EPA Method 1669 trace metals sampling methods will be used	Trace metals methods were used

As can be seen from the table above, the NBC's metals translator study that was submitted as part of the September 30, 2004 Report generally concurs with the EPA's guidance and with the scope of work from the Interim Metal Compliance Report. The only exception is that the NBC did not mix ambient samples and Fields Point effluent samples at a 10:1 ratio and analyze the combined sample. However, due to the number of in-stream samples (209 total sets of samples) and the seasonal and flow variability that they obtained from the four (4) surveys, it does not appear that this is a major issue due to the fact that they were able to get such a large data set at various dilutions. Therefore, it has been determined that, although the NBC did not analyze a mixture of the receiving water and effluent at the 10:1 dilution factor specified in the permit, the metals translator data collected by the NBC is adequate to determine a site-specific metals translator provided that a conservative evaluation is used.

When analyzing the metals translator data, the EPA's guidance document recommends using the geometric mean of the calculated translators if the data is log-normally distributed plus an appropriate margin of safety. The NBC indicated that the data is lognormal. Therefore, the use of the geometric mean metals translator values is appropriate.

Based upon a review of the seasonal metals translator data for each river, the DEM has determined that there is a significant difference in the translators measured between the seasons. Specifically, the DEM has determined that the geometric means of the translators for each river for the October 2001 survey were significantly higher than the other three surveys. Therefore, since the higher metals translators results in lower total metals permit limits, the DEM has determined that it is appropriate to focus on the October 2001 survey as the most conservative survey. The following table demonstrates that the translators calculated from the October 2001 survey were either the maximum or very close to the maximum of the translators calculated during all four surveys for both rivers.

Table 1: Seasonal Variability Analysis (Maximum Values are in Bold)

Date	River	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)				
		Cadmium	Copper	Lead	Nickel	Silver
July 2001	Providence	0.830	0.631	0.077	0.907	0.281
	Seekonk	0.361	0.272	0.022	0.790	0.161
October 2001	Providence	0.890	**0.779**	**0.207**	**0.975**	0.400
	Seekonk	**0.907**	**0.638**	**0.131**	0.902	0.466
December 2001	Providence	**0.918**	0.651	0.054	0.974	0.404
	Seekonk	0.749	0.475	0.070	0.853	**0.480**
May 2002	Providence	0.791	0.754	0.097	0.918	**0.414**
	Seekonk	0.721	0.455	0.084	**0.908**	0.239

In addition to analyzing the translator data for seasonal variability, the DEM also evaluated the data for tidal variability. After comparing the geometric means of the translators for the Providence and Seekonk Rivers during the incoming and outgoing tides against each other, it was determined that there is not a significant correlation between the translators and the tides. Therefore, it is appropriate to use both tides when determining the translators for the October 2001 survey. The following table illustrates this point for the October 2001 data. Note: Other surveys had similar correlations.

Table 2: Tidal Variability Analysis

River	Tide	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)				
		Cadmium	Copper	Lead	Nickel	Silver
Providence	In	0.894	0.765	0.236	0.954	0.460
	Out	0.887	0.793	0.182	0.996	0.348
Seekonk	In	0.935	0.613	0.131	0.929	0.479
	Out	0.880	0.665	0.132	0.876	0.454

The DEM also evaluated the data for spatial variability (i.e., variability from transect to transect). After comparing the geometric means of the translators for each of the Providence and Seekonk Rivers' transects against each other, it was determined that there is not a significant correlation between the translators for each transect (e.g., no transect consistently had the highest translators). Therefore, it is appropriate to use data from all transects when calculating the translators for the October 2001 survey. The following table illustrates this point for the October 2001 data. Note: Data from the Providence River's transect 5 was not used since it only consisted of one data point.

Table 3: Transect Variability Analysis

River	Transect	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)				
		Cadmium	Copper	Lead	Nickel	Silver
Providence	1	0.916	0.732	0.169	0.991	0.341
	2	0.871	0.770	0.180	0.962	0.380
	3	0.886	0.806	0.229	0.984	0.457
	4	0.861	0.751	0.267	0.959	0.364
	All Data	0.890	0.779	0.207	0.975	0.400
Seekonk	1	0.859	0.672	0.107	0.861	0.621
	2	0.930	0.650	0.139	0.950	0.452
	3	0.910	0.583	0.091	0.922	0.487
	4	0.849	0.668	0.139	0.894	0.461
	All Data	0.907	0.638	0.131	0.902	0.466

Based on the analysis above, the DEM has determined that the most appropriate metals translator data set to use is the data from the October 2001 surveys. This data set was selected since the translators calculated from this survey were consistently higher than the translators calculated from the other surveys. Therefore, it was determined that this survey is representative of the most conservative season. Further after evaluation of the translators at various transects and tides, it was determined that there is not significant variability caused by tides and transects. As a result, the DEM determined that the appropriate translators to use are the ones calculated from the October 2001 survey. The following table is a summary of the final metals translator values for the Providence and Seekonk Rivers after including a 5% margin of safety. Note: After incorporating a 5% margin of safety into the Providence River's nickel translator the value was greater than 1.0, therefore, this translator was set equal to 1.0.

Table 4: Final Metals Translators for Each River

River	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)				
	Cadmium	Copper	Lead	Nickel	Silver
Providence	0.935	0.818	0.217	1.000	0.420
Seekonk	0.952	0.670	0.138	0.947	0.489

Although the Bucklin Point facility discharges into the Seekonk River, which subsequently flows into the Providence River, a review of the September 1991 dye study for the Bucklin Point WWTF indicates that the dilution by the time that Bucklin Point's effluent reaches the Providence River is at least 30:1. Therefore, since there will be significantly more dilution at the point where Bucklin Point's effluent eventually enters the Providence River vs. the near-field dilution of (1:1 acute and 2:1 chronic), using the translators for the Seekonk and the near-field dilution factors to assign metals limits for the Bucklin Point facility will be protective of both rivers. As a result, the following table includes the final translators that will be assigned:

Table 5: Final Metals Translators for Each Wastewater Treatment Facility (WWTF)

WWTF	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)				
	Cadmium	Copper	Lead	Nickel	Silver
Fields Point	0.935	0.818	0.217	1.000	0.420
Bucklin Point	0.952	0.670	0.138	0.947	0.489

Prior to making a final decision regarding the metals translators to be applied to the NBC's facilities, it was decided that we should look at the dissolved/total metals ratios in the upstream water and the NBC's outfalls.

To evaluate the dissolved and total metals concentrations in the upstream water, I contacted Connie Carey and Elizabeth Scott and requested that they provide me with any data that they have which includes both total and dissolved metals for the Blackstone River. The only data that we found, which included both dissolved and total metals for the same sample sets, was from the Blackstone River Initiative (BRI). The BRI included dissolved and total metals data for Cadmium, Copper, Lead, and Nickel from three surveys conducted in July 1991, August 1991, and October 1991. The following data is a summary of this data for the last two stations in the Blackstone River (Lonsdale Avenue – Station #: BLK20 and Slater Mill Dam – Station #: BLK 21). All other stations in the BRI were significantly upstream of the Slater Mill Dam.

Table 6: Metals Translators Calculated from the BRI Report

River	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)			
	Cadmium	Copper	Lead	Nickel
BLK20	0.545	0.610	0.337	0.831
BLK21	0.363	0.613	0.276	0.743

To evaluate the dissolved and total metals concentrations in the outfalls, I used the data presented in attachment 2J of the NBC's 2004 Final Metals Compliance Report. The following table is a summary of this data from attachment 2J.

Table 7: Metals Translators Calculated at the Outfalls

River	Translator (Geometric Mean w/ Fd>1.0 set at 1.0)				
	Cadmium	Copper	Lead	Nickel	Silver
FP Outfall	0.916	0.763	0.093	0.963	0.334
BP Outfall	0.844	0.667	0.175	0.871	0.408

As can be seen from the data in tables 6 and 7, there is a significant increase in the percent of dissolved metals in the Rivers in the immediate vicinity of the treatment facilities. This is a result of the discharges from the WWTF's having high levels of treatment and, therefore, predominantly dissolved metals. The only metal that does not follow this trend is Lead. This may be a result of lead in the WWTF's primarily consisting of particulate lead.

Table 5 is a summary of the metals translator values recommended for each facility. Based upon a review of Table 5 against Table 6, it would appear that the final recommended metals translators are conservative when compared to the translators obtained from the BRI (i.e., the recommended translators are significantly higher than the BRI translators). This is true for all metals except Lead. In addition, the translators in Table 5 are also conservative relative to the translators calculated at the outfalls (i.e., the translators in Table 5 are greater than the translators in Table 7). This holds true for all metals, including Lead. Therefore, it appears that the translators included in Table 5 will be protective of water quality and they will be used as the final metals translators for the NBC's WWTFs.

The metals translators in table 5 will be used to calculate permit limits in the NBC's RIPDES permits. When calculating RIPDES permit limits, the DEM will also use the following background metals concentrations from the Army Corps of Engineers and EPA's "Draft Environmental Impact Statement for the Rhode Island Region Long-Term Dredged Material Disposal Site" (see Table 3-10 of the Draft Environmental Impact Statement Report) with corrections made to account for arithmetic errors as noted in file correspondence between the NBC and DEM..

Table 8: Background Concentrations

Pollutant	Background Conc. (ug/l)
As	1.04
Cd	0.035
Cr (VI)	0.272
Cu	0.385
Pb	0.079
Hg	0.000636
Ni	0.475
Se	0.07
Ag	0.023
Zn	1.33

ATTACHMENT A-6

Calculation of Allowable Acute and Chronic Discharge Limitations Based on Saltwater Aquatic Life Criteria and Human Health Criteria

CALCULATION OF WATER QUALITY BASED SALTWATER DISCHARGE LIMITS

FACILITY SPECIFIC DATA INPUT SHEET

NOTE: LIMITS BASED ON RI WATER QUALITY CRITERIA DATED JULY 2006

FACILITY NAME: **NBC Pawtucket Tunnel Construction Dewatering**

RIPDES PERMIT #: **RI0023990**

	DISSOLVED BACKGROUND DATA (ug/L)	ACUTE METAL TRANSLATOR	CHRONIC METAL TRANSLATOR
ALUMINUM	NA	NA	NA
ARSENIC	1.04	1	1
CADMIUM	0.035	0.952	0.952
CHROMIUM III	NA	NA	NA
CHROMIUM VI	0.272	0.993	0.993
COPPER	0.385	0.67	0.67
LEAD	0.079	0.138	0.138
MERCURY	0.000636	0.85	NA
NICKEL	0.475	0.947	0.947
SELENIUM	0.07	0.998	0.998
SILVER	0.023	0.489	0.489
ZINC	1.33	0.946	0.946

USE NA WHEN NO DATA IS AVAILABLE

NOTE 1: BACKGROUND DATA BASED ON CONCENTRATIONS OBTAINED FROM THE ARMY CORPS OF ENGINEERS AND EPA'S 2004 "DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE RHODE ISLAND REGION LONG-TERM DREDGED MATERIAL DISPOSAL SITE"

DILUTION FACTORS	
ACUTE =	10 x
CHRONIC =	10 x
HUMAN HEALTH =	10 x

NOTE: TEST WWTF'S DILUTION FACTORS OBTAINED FROM A DYE STUDY.

TOTAL AMMONIA CRITERIA (ug/L)		
WINTER	ACUTE =	79000
	CHRONIC =	12000
SUMMER	ACUTE =	27000
	CHRONIC =	4100

NOTE 1: LIMITS ARE FROM TABLE 3 IN THE RI WATER QUALITY REGS. USING:
SALINITY = 20 g/Kg; pH = 7.4 s.u.
WINTER (NOV-APRIL) TEMP=5.0 C;
SUMMER (MAY-OCT) TEMP=20.0 C.
(SEE JULY 11, 1996 LETTER)

NOTE 2: METALS TRANSLATORS FOR CADMIUM, COPPER, LEAD, NICKEL, AND SILVER ARE CALCULATED FROM NBC SAMPLING OF PROVIDENCE AND SEEKONK RIVERS, OCTOBER 2001 SURVEY. ALL OTHER METALS TRANSLATORS ARE FROM THE RHODE ISLAND WATER QUALITY REGULATIONS

CALCULATION OF WATER QUALITY BASED SALTWATER DISCHARGE LIMITS

FACILITY NAME: NBC Pawtucket Tunnel Construction Dewatering RIPDES PERMIT #: RI0023990

NOTE: METALS CRITERIA ARE DISSOLVED, METALS LIMITS ARE TOTAL; AMMONIA CRITERIA AND LIMITS HAVE BEEN CONVERTED TO ug/l N.

CHEMICAL NAME	CAS #	BACKGROUND CONCENTRATION (ug/L)	SALTWATER CRITERIA ACUTE (ug/L)	DAILY MAX LIMIT (ug/L)	SALTWATER CRITERIA CHRONIC (ug/L)	HUMAN HEALTH NON-CLASS A CRITERIA (ug/L)	MONTHLY AVE LIMIT (ug/L)
PRIORITY POLLUTANTS:							
TOXIC METALS AND CYANIDE							
ANTIMONY	7440360			No Criteria		640	5120
ARSENIC (limits are total recoverable)	7440382	1.04	69	611.64	36	1.4	3.24
ASBESTOS	1332214			No Criteria			No Criteria
BERYLLIUM	7440417			No Criteria			No Criteria
CADMIUM (limits are total recoverable)	7440439	0.035	40	377.8203782	8.8		82.86239496
CHROMIUM III (limits are total recoverable)	16065831	NA		No Criteria			No Criteria
CHROMIUM VI (limits are total recoverable)	18540299	0.272	1100	9967.323263	50		450.7069486
COPPER (limits are total recoverable)	7440508	0.385	4.8	59.30597015	3.1		36.47014925
CYANIDE	57125		1	8.00	1	140	8
LEAD (limits are total recoverable)	7439921	0.079	210	13690.5	8.1		523.1086957
MERCURY (limits are total recoverable)	7439976	0.000636	1.8	19.05208941	0.94	0.15	1.344276
NICKEL (limits are total recoverable)	7440020	0.475	74	698.7592397	8.2	4600	73.41605069
SELENIUM (limits are total recoverable)	7782492	0.07	290	2614.599198	71	4200	639.6492986
SILVER (limits are total recoverable)	7440224	0.023	1.9	34.54601227			No Criteria
THALLIUM	7440280			No Criteria		0.47	3.76
ZINC (limits are total recoverable)	7440666	1.33	90	843.5835095	81	26000	757.9598309
VOLATILE ORGANIC COMPOUNDS							
ACROLEIN	107028			No Criteria		290	2320
ACRYLONITRILE	107131			No Criteria		2.5	20
BENZENE	71432			No Criteria		510	4080
BROMOFORM	75252			No Criteria		1400	11200
CARBON TETRACHLORIDE	56235			No Criteria		16	128
CHLOROBENZENE	108907			No Criteria		1600	12800
CHLORODIBROMOMETHANE	124481			No Criteria		130	1040
CHLOROFORM	67663			No Criteria		4700	37600
DICHLOROBROMOMETHANE	75274			No Criteria		170	1360
1,2DICHLOROETHANE	107062			No Criteria		370	2960
1,1DICHLOROETHYLENE	75354			No Criteria		7100	56800
1,2DICHLOROPROPANE	78875			No Criteria		150	1200
1,3DICHLOROPROPYLENE	542756			No Criteria		21	168
ETHYLBENZENE	100414			No Criteria		2100	16800
BROMOMETHANE (methyl bromide)	74839			No Criteria		1500	12000
CHLOROMETHANE (methyl chloride)	74873			No Criteria			No Criteria
METHYLENE CHLORIDE	75092			No Criteria		5900	47200

CALCULATION OF WATER QUALITY BASED SALTWATER DISCHARGE LIMITS

FACILITY NAME: NBC Pawtucket Tunnel Construction Dewatering RIPDES PERMIT #: RI0023990

NOTE: METALS CRITERIA ARE DISSOLVED, METALS LIMITS ARE TOTAL; AMMONIA CRITERIA AND LIMITS HAVE BEEN CONVERTED TO ug/l N.

CHEMICAL NAME	CAS #	BACKGROUND CONCENTRATION (ug/L)	SALTWATER CRITERIA ACUTE (ug/L)	DAILY MAX LIMIT (ug/L)	SALTWATER CRITERIA CHRONIC (ug/L)	HUMAN HEALTH NON-CLASS A CRITERIA (ug/L)	MONTHLY AVE LIMIT (ug/L)
1,1,2,2TETRACHLOROETHANE	79345			No Criteria		40	320
TETRACHLOROETHYLENE	127184			No Criteria		33	264
TOLUENE	108883			No Criteria		15000	120000
1,2TRANSDICHLOROETHYLENE	156605			No Criteria		10000	80000
1,1,1TRICHLOROETHANE	71556			No Criteria			No Criteria
1,1,2TRICHLOROETHANE	79005			No Criteria		160	1280
TRICHLOROETHYLENE	79016			No Criteria		300	2400
VINYL CHLORIDE	75014			No Criteria		2.4	19.2
ACID ORGANIC COMPOUNDS							
2CHLOROPHENOL	95578			No Criteria		150	1200
2,4DICHLOROPHENOL	120832			No Criteria		290	2320
2,4DIMETHYLPHENOL	105679			No Criteria		850	6800
4,6DINITRO2METHYL PHENOL	534521			No Criteria		280	2240
2,4DINITROPHENOL	51285			No Criteria		5300	42400
4NITROPHENOL	88755			No Criteria			No Criteria
PENTACHLOROPHENOL	87865		13	104	7.9	30	63.2
PHENOL	108952			No Criteria		1700000	13600000
2,4,6TRICHLOROPHENOL	88062			No Criteria		24	192
BASE NEUTRAL COMPUNDS							
ACENAPHTHENE	83329			No Criteria		990	7920
ANTHRACENE	120127			No Criteria		40000	320000
BENZIDINE	92875			No Criteria		0.002	0.016
POLYCYCLIC AROMATIC HYDROCARBONS				No Criteria		0.18	1.44
BIS(2CHLOROETHYL)ETHER	111444			No Criteria		5.3	42.4
BIS(2CHLOROISOPROPYL)ETHER	108601			No Criteria		65000	520000
BIS(2ETHYLHEXYL)PHTHALATE	117817			No Criteria		22	176
BUTYL BENZYL PHTHALATE	85687			No Criteria		1900	15200
2CHLORONAPHTHALENE	91587			No Criteria		1600	12800
1,2DICHLOROBENZENE	95501			No Criteria		1300	10400
1,3DICHLOROBENZENE	541731			No Criteria		960	7680
1,4DICHLOROBENZENE	106467			No Criteria		190	1520
3,3DICHLOROBENZIDENE	91941			No Criteria		0.28	2.24
DIETHYL PHTHALATE	84662			No Criteria		44000	352000
DIMETHYL PHTHALATE	131113			No Criteria		1100000	8800000
DInBUTYL PHTHALATE	84742			No Criteria		4500	36000
2,4DINITROTOLUENE	121142			No Criteria		34	272

CALCULATION OF WATER QUALITY BASED SALTWATER DISCHARGE LIMITS

FACILITY NAME: NBC Pawtucket Tunnel Construction Dewatering RIPDES PERMIT #: RI0023990

NOTE: METALS CRITERIA ARE DISSOLVED, METALS LIMITS ARE TOTAL; AMMONIA CRITERIA AND LIMITS HAVE BEEN CONVERTED TO ug/l N.

CHEMICAL NAME	CAS #	BACKGROUND CONCENTRATION (ug/L)	SALTWATER CRITERIA ACUTE (ug/L)	DAILY MAX LIMIT (ug/L)	SALTWATER CRITERIA CHRONIC (ug/L)	HUMAN HEALTH NON-CLASS A CRITERIA (ug/L)	MONTHLY AVE LIMIT (ug/L)
1,2DIPHENYLHYDRAZINE	122667			No Criteria		2	16
FLUORANTHENE	206440			No Criteria		140	1120
FLUORENE	86737			No Criteria		5300	42400
HEXACHLOROBENZENE	118741			No Criteria		0.0029	0.0232
HEXACHLOROBUTADIENE	87683			No Criteria		180	1440
HEXACHLOROCYCLOPENTADIENE	77474			No Criteria		1100	8800
HEXACHLOROETHANE	67721			No Criteria		33	264
ISOPHORONE	78591			No Criteria		9600	76800
NAPHTHALENE	91203			No Criteria			No Criteria
NITROBENZENE	98953			No Criteria		690	5520
NNITROSODIMETHYLAMINE	62759			No Criteria		30	240
NNITROSODINPROPYLAMINE	621647			No Criteria		5.1	40.8
NNITROSODIPHENYLAMINE	86306			No Criteria		60	480
PYRENE	129000			No Criteria		4000	32000
1,2,4trichlorobenzene	120821			No Criteria		70	560
PESTICIDES/PCBs							
ALDRIN	309002		1.3	10.4		0.0005	0.004
Alpha BHC	319846			No Criteria		0.049	0.392
Beta BHC	319857			No Criteria		0.17	1.36
Gamma BHC (Lindane)	58899		0.16	1.28		1.8	14.4
CHLORDANE	57749		0.09	0.72	0.004	0.0081	0.032
4,4DDT	50293		0.13	1.04	0.001	0.0022	0.008
4,4DDE	72559			No Criteria		0.0022	0.0176
4,4DDD	72548			No Criteria		0.0031	0.0248
DIELDRIN	60571		0.71	5.68	0.0019	0.00054	0.00432
ENDOSULFAN (alpha)	959988		0.034	0.272	0.0087	89	0.0696
ENDOSULFAN (beta)	33213659		0.034	0.272	0.0087	89	0.0696
ENDOSULFAN (sulfate)	1031078			No Criteria		89	712
ENDRIN	72208		0.037	0.296	0.0023	0.06	0.0184
ENDRIN ALDEHYDE	7421934			No Criteria		0.3	2.4
HEPTACHLOR	76448		0.053	0.424	0.0036	0.00079	0.00632
HEPTACHLOR EPOXIDE	1024573		0.053	0.424	0.0036	0.00039	0.00312
POLYCHLORINATED BIPHENYLS3	1336363			No Criteria	0.03	0.00064	0.00512
2,3,7,8TCDD (Dioxin)	1746016			No Criteria		0.000000051	0.000000408
TOXAPHENE	8001352		0.21	1.68	0.0002	0.0028	0.0016
TRIBUTYLTIN			0.42	3.36	0.0074		0.0592

CALCULATION OF WATER QUALITY BASED SALTWATER DISCHARGE LIMITS

FACILITY NAME: NBC Pawtucket Tunnel Construction for Dewatering RIPDES PERMIT #: RI0023990

NOTE: METALS CRITERIA ARE DISSOLVED, METALS LIMITS ARE TOTAL; AMMONIA CRITERIA AND LIMITS HAVE BEEN CONVERTED TO ug/l N.

CHEMICAL NAME	CAS #	BACKGROUND CONCENTRATION (ug/L)	SALTWATER CRITERIA ACUTE (ug/L)	DAILY MAX LIMIT (ug/L)	SALTWATER CRITERIA CHRONIC (ug/L)	HUMAN HEALTH NON-CLASS A CRITERIA (ug/L)	MONTHLY AVE LIMIT (ug/L)
NON PRIORITY POLLUTANTS: OTHER SUBSTANCES							
ALUMINUM (limits are total recoverable)	7429905	NA		No Criteria			No Criteria
AMMONIA as N (winter/summer)	7664417		64938 | 22194	519504 177552	9864 | 3370		78912 | 26961.6
4BROMOPHENYL PHENYL ETHER				No Criteria			No Criteria
CHLORIDE	16887006			No Criteria			No Criteria
CHLORINE	7782505		13	130	7.5		75
4CHLORO2METHYLPHENOL				No Criteria			No Criteria
1CHLORONAPHTHALENE				No Criteria			No Criteria
4CHLOROPHENOL	106489			No Criteria			No Criteria
2,4DICHLORO6METHYLPHENOL				No Criteria			No Criteria
1,1DICHLOROPROPANE				No Criteria			No Criteria
1,3DICHLOROPROPANE	142289			No Criteria			No Criteria
2,3DINITROTOLUENE				No Criteria			No Criteria
2,4DINITRO6METHYL PHENOL				No Criteria			No Criteria
IRON	7439896			No Criteria			No Criteria
pentachlorobenzene	608935			No Criteria			No Criteria
PENTACHLOROETHANE				No Criteria			No Criteria
1,2,3,5tetrachlorobenzene				No Criteria			No Criteria
1,1,1,2TETRACHLOROETHANE	630206			No Criteria			No Criteria
2,3,4,6TETRACHLOROPHENOL	58902			No Criteria			No Criteria
2,3,5,6TETRACHLOROPHENOL				No Criteria			No Criteria
2,4,5TRICHLOROPHENOL	95954			No Criteria			No Criteria
2,4,6TRINITROPHENOL	88062			No Criteria			No Criteria
XYLENE	1330207			No Criteria			No Criteria

CALCULATION OF WATER QUALITY BASED SALTWATER DISCHARGE LIMITS

FACILITY NAME: NBC Pawtucket Tunnel Construction Dev RIPDES PERMIT #: RI0023990

CHEMICAL NAME	CAS#	DAILY MAX LIMIT (ug/L)	MONTHLY AVE LIMIT (ug/L)
PRIORITY POLLUTANTS:			
TOXIC METALS AND CYANIDE			
ANTIMONY	7440360	No Criteria	5120.00
ARSENIC, TOTAL	7440382	611.64	3.24
ASBESTOS	1332214	No Criteria	No Criteria
BERYLLIUM	7440417	No Criteria	No Criteria
CADMIUM, TOTAL	7440439	377.82	82.86
CHROMIUM III, TOTAL	16065831	No Criteria	No Criteria
CHROMIUM VI, TOTAL	18540299	9967.32	450.71
COPPER, TOTAL	7440508	59.31	36.47
CYANIDE	57125	8.00	8.00
LEAD, TOTAL	7439921	13690.50	523.11
MERCURY, TOTAL	7439976	19.05	1.34
NICKEL, TOTAL	7440020	698.76	73.42
SELENIUM, TOTAL	7782492	2614.60	639.65
SILVER, TOTAL	7440224	34.55	No Criteria
THALLIUM	7440280	No Criteria	3.76
ZINC, TOTAL	7440666	843.58	757.96
VOLATILE ORGANIC COMPOUNDS			
ACROLEIN	107028	No Criteria	2320.00
ACRYLONITRILE	107131	No Criteria	20.00
BENZENE	71432	No Criteria	4080.00
BROMOFORM	75252	No Criteria	11200.00
CARBON TETRACHLORIDE	56235	No Criteria	128.00
CHLOROBENZENE	108907	No Criteria	12800.00
CHLORODIBROMOMETHANE	124481	No Criteria	1040.00
CHLOROFORM	67663	No Criteria	37600.00
DICHLOROBROMOMETHANE	75274	No Criteria	1360.00
1,2DICHLOROETHANE	107062	No Criteria	2960.00
1,1DICHLOROETHYLENE	75354	No Criteria	56800.00
1,2DICHLOROPROPANE	78875	No Criteria	1200.00
1,3DICHLOROPROPYLENE	542756	No Criteria	168.00
ETHYLBENZENE	100414	No Criteria	16800.00
BROMOMETHANE (methyl bromide)	74839	No Criteria	12000.00
CHLOROMETHANE (methyl chloride)	74873	No Criteria	No Criteria
METHYLENE CHLORIDE	75092	No Criteria	47200.00
1,1,2,2TETRACHLOROETHANE	79345	No Criteria	320.00

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CHEMICAL NAME	CAS#	DAILY MAX LIMIT (ug/L)	MONTHLY AVE LIMIT (ug/L)
TETRACHLOROETHYLENE	127184	No Criteria	264.00
TOLUENE	108883	No Criteria	120000.00
1,2TRANSDICHLOROETHYLENE	156605	No Criteria	80000.00
1,1,1TRICHLOROETHANE	71556	No Criteria	No Criteria
1,1,2TRICHLOROETHANE	79005	No Criteria	1280.00
TRICHLOROETHYLENE	79016	No Criteria	2400.00
VINYL CHLORIDE	75014	No Criteria	19.20
ACID ORGANIC COMPOUNDS			
2CHLOROPHENOL	95578	No Criteria	1200.00
2,4DICHLOROPHENOL	120832	No Criteria	2320.00
2,4DIMETHYLPHENOL	105679	No Criteria	6800.00
4,6DINITRO2METHYL PHENOL	534521	No Criteria	2240.00
2,4DINITROPHENOL	51285	No Criteria	42400.00
4NITROPHENOL	88755	No Criteria	No Criteria
PENTACHLOROPHENOL	87865	104.00	63.20
PHENOL	108952	No Criteria	13600000.00
2,4,6TRICHLOROPHENOL	88062	No Criteria	192.00
BASE NEUTRAL COMPUNDS			
ACENAPHTHENE	83329	No Criteria	7920.00
ANTHRACENE	120127	No Criteria	320000.00
BENZIDINE	92875	No Criteria	0.02
PAHs		No Criteria	1.44
BIS(2CHLOROETHYL)ETHER	111444	No Criteria	42.40
	108601	No Criteria	520000.00
BIS(2ETHYLHEXYL)PHTHALATE	117817	No Criteria	176.00
BUTYL BENZYL PHTHALATE	85687	No Criteria	15200.00
2CHLORONAPHTHALENE	91587	No Criteria	12800.00
1,2DICHLOROBENZENE	95501	No Criteria	10400.00
1,3DICHLOROBENZENE	541731	No Criteria	7680.00
1,4DICHLOROBENZENE	106467	No Criteria	1520.00
3,3DICHLOROBENZIDENE	91941	No Criteria	2.24
DIETHYL PHTHALATE	84662	No Criteria	352000.00
DIMETHYL PHTHALATE	131113	No Criteria	8800000.00
DI-n-BUTYL PHTHALATE	84742	No Criteria	36000.00
2,4DINITROTOLUENE	121142	No Criteria	272.00
1,2DIPHENYLHYDRAZINE	122667	No Criteria	16.00
FLUORANTHENE	206440	No Criteria	1120.00

CALCULATION OF WATER QUALITY BASED SALTWATER DISCHARGE LIMITS

FACILITY NAME: NBC Pawtucket Tunnel Construction Dev RIPDES PERMIT #: RI0023990

CHEMICAL NAME	CAS#	DAILY MAX LIMIT (ug/L)	MONTHLY AVE LIMIT (ug/L)
FLUORENE	86737	No Criteria	42400.00
HEXACHLOROBENZENE	118741	No Criteria	0.02
HEXACHLOROBUTADIENE	87683	No Criteria	1440.00
HEXACHLOROCYCLOPENTADIENE	77474	No Criteria	8800.00
HEXACHLOROETHANE	67721	No Criteria	264.00
ISOPHORONE	78591	No Criteria	76800.00
NAPHTHALENE	91203	No Criteria	No Criteria
NITROBENZENE	98953	No Criteria	5520.00
N-NITROSODIMETHYLAMINE	62759	No Criteria	240.00
N-NITROSODI-N-PROPYLAMINE	621647	No Criteria	40.80
N-NITROSODIPHENYLAMINE	86306	No Criteria	480.00
PYRENE	129000	No Criteria	32000.00
1,2,4trichlorobenzene	120821	No Criteria	560.00
PESTICIDES/PCBs			
ALDRIN	309002	10.40	0.00
Alpha BHC	319846	No Criteria	0.39
Beta BHC	319857	No Criteria	1.36
Gamma BHC (Lindane)	58899	1.28	1.28
CHLORDANE	57749	0.72	0.03
4,4DDT	50293	1.04	0.01
4,4DDE	72559	No Criteria	0.02
4,4DDD	72548	No Criteria	0.02
DIELDRIN	60571	5.68	0.00
ENDOSULFAN (alpha)	959988	0.27	0.07
ENDOSULFAN (beta)	33213659	0.27	0.07
ENDOSULFAN (sulfate)	1031078	No Criteria	712.00
ENDRIN	72208	0.30	0.02
ENDRIN ALDEHYDE	7421934	No Criteria	2.40
HEPTACHLOR	76448	0.42	0.01
HEPTACHLOR EPOXIDE	1024573	0.42	0.00
POLYCHLORINATED BIPHENYLS3	1336363	No Criteria	0.01
2,3,7,8TCDD (Dioxin)	1746016	No Criteria	0.00
TOXAPHENE	8001352	1.68	0.00
TRIBUTYLTIN		3.36	0.06

CHEMICAL NAME	CAS#	DAILY MAX LIMIT (ug/L)	MONTHLY AVE LIMIT (ug/L)
NON PRIORITY POLLUTANTS:			
OTHER SUBSTANCES			
ALUMINUM, TOTAL	7429905	No Criteria	No Criteria
AMMONIA (as N), WINTER (NOV-APR	7664417	519504.00	78912.00
AMMONIA (as N), SUMMER (MAY-OC	7664417	177552.00	26961.60
4BROMOPHENYL PHENYL ETHER		No Criteria	No Criteria
CHLORIDE	16887006	No Criteria	No Criteria
CHLORINE	7782505	130.00	75.00
4CHLORO2METHYLPHENOL		No Criteria	No Criteria
1CHLORONAPHTHALENE		No Criteria	No Criteria
4CHLOROPHENOL	106489	No Criteria	No Criteria
2,4DICHLORO6METHYLPHENOL		No Criteria	No Criteria
1,1DICHLOROPROPANE		No Criteria	No Criteria
1,3DICHLOROPROPANE	142289	No Criteria	No Criteria
2,3DINITROTOLUENE		No Criteria	No Criteria
2,4DINITRO6METHYL PHENOL		No Criteria	No Criteria
IRON	7439896	No Criteria	No Criteria
pentachlorobenzene	608935	No Criteria	No Criteria
PENTACHLOROETHANE		No Criteria	No Criteria
1,2,3,5tetrachlorobenzene		No Criteria	No Criteria
1,1,1,2TETRACHLOROETHANE	630206	No Criteria	No Criteria
2,3,4,6TETRACHLOROPHENOL	58902	No Criteria	No Criteria
2,3,5,6TETRACHLOROPHENOL		No Criteria	No Criteria
2,4,5TRICHLOROPHENOL	95954	No Criteria	No Criteria
2,4,6TRINITROPHENOL	88062	No Criteria	No Criteria
XYLENE	1330207	No Criteria	No Criteria