B. Suggested Form for Notice of Intent (NOI) for the Remediation General Permit

1. General facility/site information. Please provide the following information about the site:

a) Name of **facility/site**: MBTA Cabot Yard Bus Garage		**Facility/site** mailing address:		
Location of **facility/site**: longitude: 70o 3' 30" latitude: 42o 20' 24"	Facility SIC code(s): 4111	Street: 275 Dorchester Avenue		
b) Name of **facility/site owner:**		Town: South Boston		
Email address of facility/site owner: jflynn@mbta.com		State: MA	Zip: 02127	County: Suffolk
Telephone no. of facility/site **owner**: (617) 222-4616				
Fax no. of facility/site **owner**: (617) 222-2994		**Owner** is (check one): 1. Federal ○ 2. State/Tribal ⊙ 3. Private ○ 4. Other ○ if so, describe:		
Address of **owner** (if different from site):				
Street: 21 Arlington Avenue, Building #2				
Town: Charlestown	State: MA	Zip: 02129	County: Suffolk	
c) Legal name of **operator**:		**Operator** telephone no: (617) 222-4616		
Massachusetts Bay Transportation Authority		**Operator** fax no.: (617) 222-2994	**Operator** email: jflynn@mbta.com	
Operator contact name and title: James Flynn, Environmental Coordinator				
Address of **operator** (if different from owner):		Street:		
Town:	State:	Zip:	County:	

d) Check Y for "yes" or N for "no" for the following:
1. Has a prior NPDES permit exclusion been granted for the discharge? Y ◉ N ○, if Y, number: MA-04I-002
2. Has a prior NPDES application (Form 1 & 2C) ever been filed for the discharge?
Y ○ N ◉, if Y, date and tracking #:
3. Is the discharge a "new discharge" as defined by 40 CFR 122.2? Y ○ N ◉
4. For sites in Massachusetts, is the discharge covered under the Massachusetts Contingency Plan (MCP) and exempt from state permitting? Y ○ N ◉ *

e) Is site/facility subject to any State permitting, license, or other action which is causing the generation of discharge? Y ◉ N ○
If Y, please list:
1. site identification # assigned by the state of NH or MA: RTN 3-3096
2. permit or license # assigned: RTN 3-2096
3. state agency contact information: name, location, and telephone number:
Tim Boyle, DEP-NERO, 205B Lowell Street; Wilmington, MA 01887

f) Is the site/facility covered by any other EPA permit, including:
1. Multi-Sector General Permit? Y ◉ N ○,
if Y, number: MAR05C027
2. Final Dewatering General Permit? Y ○ N ◉,
if Y, number:
3. EPA Construction General Permit? Y ○ N ◉,
if Y, number:
4. Individual NPDES permit? Y ○ N ◉,
if Y, number:
5. any other water quality related individual or general permit? Y ○ N ◉, if Y, number:

g) Is the site/facility located within or does it discharge to an Area of Critical Environmental Concern (ACEC)? Y ○ N ◉

h) Based on the facility/site information and any historical sampling data, identify the sub-category into which the potential discharge falls.

Activity Category	**Activity Sub-Category**
I - Petroleum Related Site Remediation	A. Gasoline Only Sites ☐ B. Fuel Oils and Other Oil Sites (including Residential Non-Business Remediation Discharges) ☒ C. Petroleum Sites with Additional Contamination ☐
II - Non Petroleum Site Remediation	A. Volatile Organic Compound (VOC) Only Sites ☐ B. VOC Sites with Additional Contamination ☐ C. Primarily Heavy Metal Sites ☐
III - Contaminated Construction Dewatering	A. General Urban Fill Sites ☐ B. Known Contaminated Sites ☐

*The site is currently regulated under the MCP; however, discharge is to surface water, requiring a NPDES permit

IV - Miscellaneous Related Discharges	A. Aquifer Pump Testing to Evaluate Formerly Contaminated Sites ☐ B. Well Development/Rehabilitation at Contaminated/Formerly Contaminated Sites ☐ C. Hydrostatic Testing of Pipelines and Tanks ☐ D. Long-Term Remediation of Contaminated Sumps and Dikes ☐ E. Short-term Contaminated Dredging Drain Back Waters (if not covered by 401/404 permit) ☐

2. Discharge information. Please provide information about the discharge, (attaching additional sheets as necessary) including:

a) Describe the discharge activities for which the owner/applicant is seeking coverage:

Discharge of treated groundwater from a groundwater remediation system to a City of Boston stormdrain/combined sewer overflow system with an outfall at the Fort Point Channel in Boston Harbor.

b) Provide the following information about each discharge:

1) Number of discharge points: 1

2) What is the **maximum** and **average flow rate** of discharge (in cubic feet per second, ft^3/s)?
Max. flow: 0.28** Is maximum flow a **design value**? Y ◉ N ○
Average flow (include units) 24 gpm Is average flow a design value or estimate? design value

3) Latitude and longitude of each discharge within 100 feet:
pt.1: lat. 71o3'30" long. 42o20'21" pt.2: lat. _____ long. _____;
pt.3: lat. _____ long. _____ pt.4: lat. _____ long. _____;
pt.5: lat. _____ long. _____ pt.6: lat. _____ long. _____;
pt.7: lat. _____ long. _____ pt.8: lat. _____ long. _____; etc.

4) If hydrostatic testing, total volume of the discharge (gals): 40000

5) Is the discharge intermittent ○ or seasonal ○?
Is discharge ongoing? Y ◉ N ○

c) Expected dates of discharge (mm/dd/yy): start Jun 1, 2006 end Jun 1, 2016

d) Please attach a line drawing or flow schematic showing water flow through the facility including:
1. sources of intake water, 2. contributing flow from the operation, 3. treatment units, and 4. discharge points and receiving waters(s). Refer to attached Figure 1, Remediation System Layout and Flow Schematic

**Maximum flow includes 0.18 cfs of flow from Treatment Train 2 (TT2) which is not currently used. Flow from TT2 includes treated stormwater.

3. Contaminant information.

a) Based on the sub-category selected (see Appendix III), indicate whether each listed chemical is **believed present** or **believed absent** in the potential discharge. Attach additional sheets as needed.

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
1. Total Suspended Solids (TSS)		☐	☒	12	grab	SM2540D	4.0 mg/L	24,000	16.44	4,833	0.632
2. Total Residual Chlorine (TRC)		☒	☐								
3. Total Petroleum Hydrocarbons (TPH)		☐	☒	12	grab	8100M	0.174 mg/L	ND		ND	
4. Cyanide (CN)	57125	☒	☐								
5. Benzene (B)	71432	☐	☒	12	grab	SW8260B	2.00 ug/L	ND			
6. Toluene (T)	108883	☒	☐	12	grab	SW8260B	2.00 ug/L	ND			
7. Ethylbenzene (E)	100414	☒	☐	12	grab	SW8260B	2.00 ug/L	ND			
8. (m,p,o) Xylenes (X)	108883; 106423; 95476; 1330207	☒	☐	12	grab	SW8260B	2.00 ug/L	ND			
9. Total BTEX [2]	n/a	☐	☒	12	grab	SW8260B	2.00 ug/L	ND			
10. Ethylene Dibromide (EDB) (1,2-Dibromoethane) [3]	106934	☒	☐								
11. Methyl-tert-Butyl Ether (MtBE)	1634044	☒	☐	12	grab	SW8260B	2.00 ug/L	ND			
12. tert-Butyl Alcohol (TBA) (Tertiary-Butanol)	75650	☒	☐								

***** Numbering system is provided to allow cross-referencing to Effluent Limits and Monitoring Requirements by Sub-Category included in Appendix III, as well as the Test Methods and Minimum Levels associated with each parameter provided in Appendix VI.

[2] BTEX = Sum of Benzene, Toluene, Ethylbenzene, total Xylenes.

[3] EDB is a groundwater contaminant at fuel spill and pesticide application sites in New England.

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
13. tert-Amyl Methyl Ether (TAME)	9940508	☒	☐								
14. Naphthalene	91203	☐	☒	12	Grab	SW8270C	1.11 ug/L	ND		ND	
15. Carbon Tetrachloride	56235	☒	☐								
16. 1,2 Dichlorobenzene (o-DCB)	95501	☒	☐								
17. 1,3 Dichlorobenzene (m-DCB)	541731	☒	☐								
18. 1,4 Dichlorobenzene (p-DCB)	106467	☒	☐								
18a. Total dichlorobenzene		☒	☐								
19. 1,1 Dichloroethane (DCA)	75343	☒	☐								
20. 1,2 Dichloroethane (DCA)	107062	☒	☐								
21. 1,1 Dichloroethene (DCE)	75354	☒	☐								
22. cis-1,2 Dichloroethene (DCE)	156592	☒	☐								
23. Methylene Chloride	75092	☒	☐								
24. Tetrachloroethene (PCE)	127184	☒	☐								
25. 1,1,1 Trichloro-ethane (TCA)	71556	☒	☐								
26. 1,1,2 Trichloro-ethane (TCA)	79005	☒	☐								
27. Trichloroethene (TCE)	79016	☒	☐								

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
28. Vinyl Chloride (Chloroethene)	75014	☒	☐								
29. Acetone	67641	☐	☒	2	grab	SW8260B	50.0 ug/L	ND		ND	
30. 1,4 Dioxane	123911	☒	☐								
31. Total Phenols	108952	☒	☐								
32. Pentachlorophenol (PCP)	87865	☒	☐								
33. Total Phthalates (Phthalate esters) [4]		☒	☐								
34. Bis (2-Ethylhexyl) Phthalate [Di-(ethylhexyl) Phthalate]	117817	☒	☐								
35. Total Group I Polycyclic Aromatic Hydrocarbons (PAH)		☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
a. Benzo(a) Anthracene	56553	☐	☒	12	grab	SW8270C	0.222 ug/L	ND		ND	
b. Benzo(a) Pyrene	50328	☐	☒	12	grab	SW8270C	0.111 ug/L	ND		ND	
c. Benzo(b)Fluoranthene	205992	☐	☒	12	grab	SW8270C	0.556 ug/L	ND		ND	
d. Benzo(k)Fluoranthene	207089	☐	☒	12	grab	SW8270C	0.556 ug/L	ND		ND	
e. Chrysene	21801	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
f. Dibenzo(a,h)anthracene	53703	☐	☒	12	grab	SW8270C	0.333 ug/L	ND		ND	
g. Indeno(1,2,3-cd) Pyrene	193395	☐	☒	12	grab	SW8270C	0.333 ug/L	ND		ND	
36. Total Group II Polycyclic Aromatic Hydrocarbons (PAH)		☐	☒	12	grab	SW8270C	1.11ug/L	ND		ND	

[4] The sum of individual phthalate compounds.

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
h. Acenaphthene	83329	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
i. Acenaphthylene	208968	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
j. Anthracene	120127	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
k. Benzo(ghi) Perylene	191242	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
l. Fluoranthene	206440	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
m. Fluorene	86737	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
n. Naphthalene	91203	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
o. Phenanthrene	85018	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
p. Pyrene	129000	☐	☒	12	grab	SW8270C	1.11 ug/L	ND		ND	
37. Total Polychlorinated Biphenyls (PCBs)	85687; 84742; 117840; 84662; 131113; 117817.	☒	☐								
38. Chloride	16887006	☒	☐								
39. Antimony	7440360	☒	☐								
40. Arsenic	7440382	☐	☒	12	grab	GFAA-E200.9	0.002 mg/L	143	0.098	21.37	0.003
41. Cadmium	7440439	☒	☐								
42. Chromium III (trivalent)	16065831	☐	☒	2	grab	200.7&3500	0.060 mg/L	ND		ND	
43. Chromium VI (hexavalent)	18540299	☐	☒	2	grab	SM3500CR-D	0.050 mg/L	ND		ND	
44. Copper	7440508	☒	☐								
45. Lead	7439921	☒	☐								
46. Mercury	7439976	☒	☐								
47. Nickel	7440020	☐	☒	2	grab	SW6010B	0.100 mg/L	ND		ND	
48. Selenium	7782492	☒	☐								
49. Silver	7440224	☒	☐								
50. Zinc	7440666	☐	☒	2	grab	SW3010A	0.180 mg/L	ND			
51. Iron	7439896	☐	☒	12	Grab	ICP-SW6010B	0.060 mg/L	1,480	1.01	313	0.04
Other (describe):		☐	☐								

Parameter *	CAS Number	Believed Absent	Believed Present	# of Samples	Sample Type (e.g., grab)	Analytical Method Used (method #)	Minimum Level (ML) of Test Method	Maximum daily value		Average daily value	
								concentration (ug/l)	mass (kg)	concentration (ug/l)	mass (kg)
2-Methylnaphthalene	91576	☐	☒	12	grab	SW8270C	1.11	ND		ND	
		☐	☐								

b) For discharges where **metals** are believed present, please fill out the following (attach results of any calculations):

Step 1: Do any of the metals in the influent exceed the effluent limits in Appendix III (i.e., the limits set at zero dilution)? Y◉ N○	If yes, which metals? iron
Step 2: For any metals which exceed the **Appendix III** limits, calculate the **dilution factor (DF)** using the formula in Part I.A.3.c (step 2) of the NOI instructions or as determined by the State prior to the submission of this NOI. What is the dilution factor for applicable metals? Metal: Iron DF: >5 Metal: DF: Metal: DF: Metal: DF: Etc.	Look up the limit calculated at the corresponding dilution factor in **Appendix IV.** Do any of the metals in the **influent** have the potential to exceed the corresponding **effluent** limits in Appendix IV (i.e., is the influent concentration above the limit set at the calculated dilution factor)? Y◉ N○ If Y, list which metals: Iron

4. Treatment system information. Please describe the treatment system using separate sheets as necessary, including:

a) A description of the treatment system, including a schematic of the proposed or existing treatment system:

Free-phase petroleum is removed via oil/water separation. Recovered oil temporarily stored and disposed of off-site. Separated water is further treated by pH adjustment to precipitate metals and solids, micro-filtration, and by activated carbon. Refer to the attached Remediation System Layout and Flow Schematic, Figure 1, for further details.

b) Identify each applicable treatment unit (check all that apply):	Frac. tank ☐	Air stripper ☐	Oil/water separator ☒	Equalization tanks ☒	Bag filter ☒	GAC filter ☒
	Chlorination ☐	De-chlorination ☐	Other (please describe):	pH adjustment for metals precipitation.		

c) Proposed **average** and **maximum flow rates** (gallons per minute) for the discharge and the **design flow rate**(s) (gallons per minute) of the treatment system:
Average flow rate of discharge 24 gpm Maximum flow rate of treatment system 130*** gpm
Design flow rate of treatment system 130*** gpm

d) A description of chemical additives being used or planned to be used (attach MSDS sheets):

Sodium hydroxide and sodium hypochlorite are used for metals precipitation. Hydrochloric acid is used for pH adjustment. Vinegar (acetic acid) is added to the treatment train as part of chlorine analysis.

5. Receiving surface water(s). Please provide information about the receiving water(s), using separate sheets as necessary:

a) Identify the discharge pathway:	Direct to receiving water ☐	Within facility (sewer) ☐	Storm drain ☒	Wetlands ☐	Other (describe):

b) Provide a narrative description of the discharge pathway, including the name(s) of the receiving waters:

To a Boston Water and Sewer Commission drain manhole and combined sewer overflow conduit, ultimately discharging to the Fort Point Channel (Outfall #CSO070)

c) Attach a detailed map(s) indicating the site location and location of the outfall to the receiving water:
1. For multiple discharges, number the discharges sequentially.
2. For indirect dischargers, indicate the location of the discharge to the indirect conveyance and the discharge to surface water
The map should also include the location and distance to the nearest sanitary sewer as well as the locus of nearby sensitive receptors (based on USGS topographical mapping), such as surface waters, drinking water supplies, and wetland areas.

d) Provide the state water quality classification of the receiving water SB

e) Provide the reported or calculated seven day-ten year low flow (7Q10) of the receiving water NA cfs
Please attach any calculation sheets used to support stream flow and dilution calculations.

f) Is the receiving water a listed 303(d) water quality impaired or limited water? Y ◉ N ○ If yes, for which pollutant(s)?
Pathogens,priority organics.

Is there a final TMDL? Y ○ N ◉ If yes, for which pollutant(s)?

***Approximately 80 gpm of maximum flow is from TT 2 which is not in use at this time. TT 2 discharges include treated stormwater.

6. ESA and NHPA Eligibility.

Please provide the following information according to requirements of Permit Parts I.A.4 and I.A.5 Appendices II and VII.

a) Using the instructions in Appendix VII and information on Appendix II, under which criterion listed in Part I.C are you eligible for coverage under this general permit?

A ◉ B ○ C ○ D ○ E ○ F ○

b) If you selected Criterion D or F, has consultation with the federal services been completed? Y ○ N ○ Underway ○

c) If consultation with U.S. Fish and Wildlife Service and/or NOAA Fisheries Service was completed, was a written concurrence finding that the discharge is "not likely to adversely affect" listed species or critical habitat received? Y ○ N ○

d) Attach documentation of ESA eligibility as described in the NOI instructions and required by Appendix VII, Part I.C, Step 4.

e) Using the instructions in Appendix VII, under which criterion listed in Part II.C are you eligible for coverage under this general permit?

1 ◉ 2 ○ 3 ○

f) If Criterion 3 was selected, attach all written correspondence with the State or Tribal historic preservation officers, including any terms and conditions that outline measures the applicant must follow to mitigate or prevent adverse effects due to activities regulated by the RGP.

7. Supplemental information.

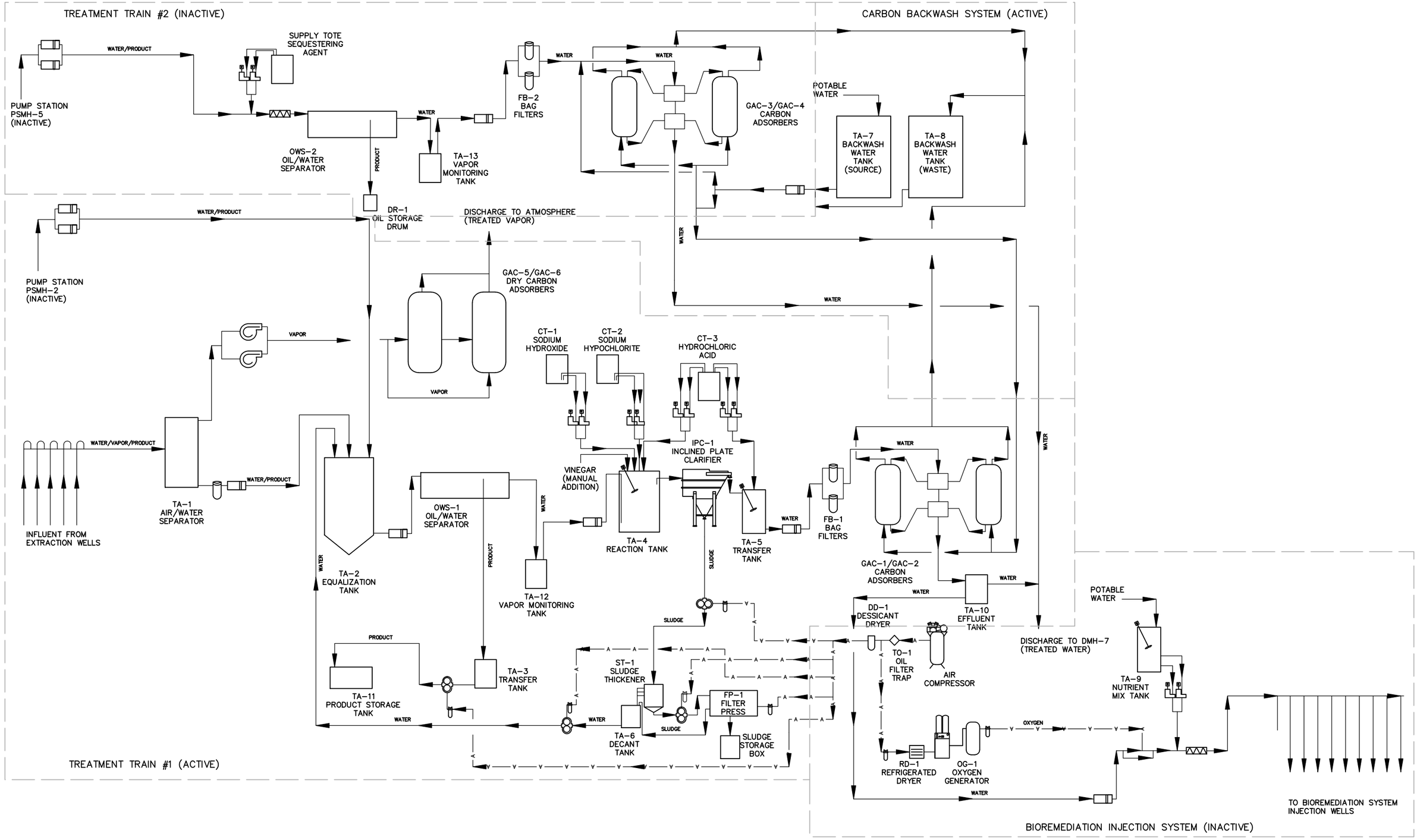
Please provide any supplemental information. Attach any analytical data used to support the application. Attach any certification(s) required by the general permit.

Figure 1: Remediation System Layout and Flow Schematic
Figure 2: Site Location Map
Figure 3: Area Receptors Map
Dilution Factor Calculations
MSDS for Blue Shield Liquid Shock (Sodium Hypochlorite), Caustic Soda (Sodium Hydroxide), Hydrochloric Acid, Vinegar (Acetic Acid)

8. Signature Requirements: The Notice of Intent must be signed by the operator in accordance with the signatory requirements of 40 CFR Section 122.22, including the following certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I certify that I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Facility/Site Name:	MBTA Cabot Bus Garage
Operator signature:	R. McLaughlin for James Flynn
Printed Name &Title:	James Flynn, Environmental Coordinator
Date:	12/8/10



MALCOLM PIRNIE

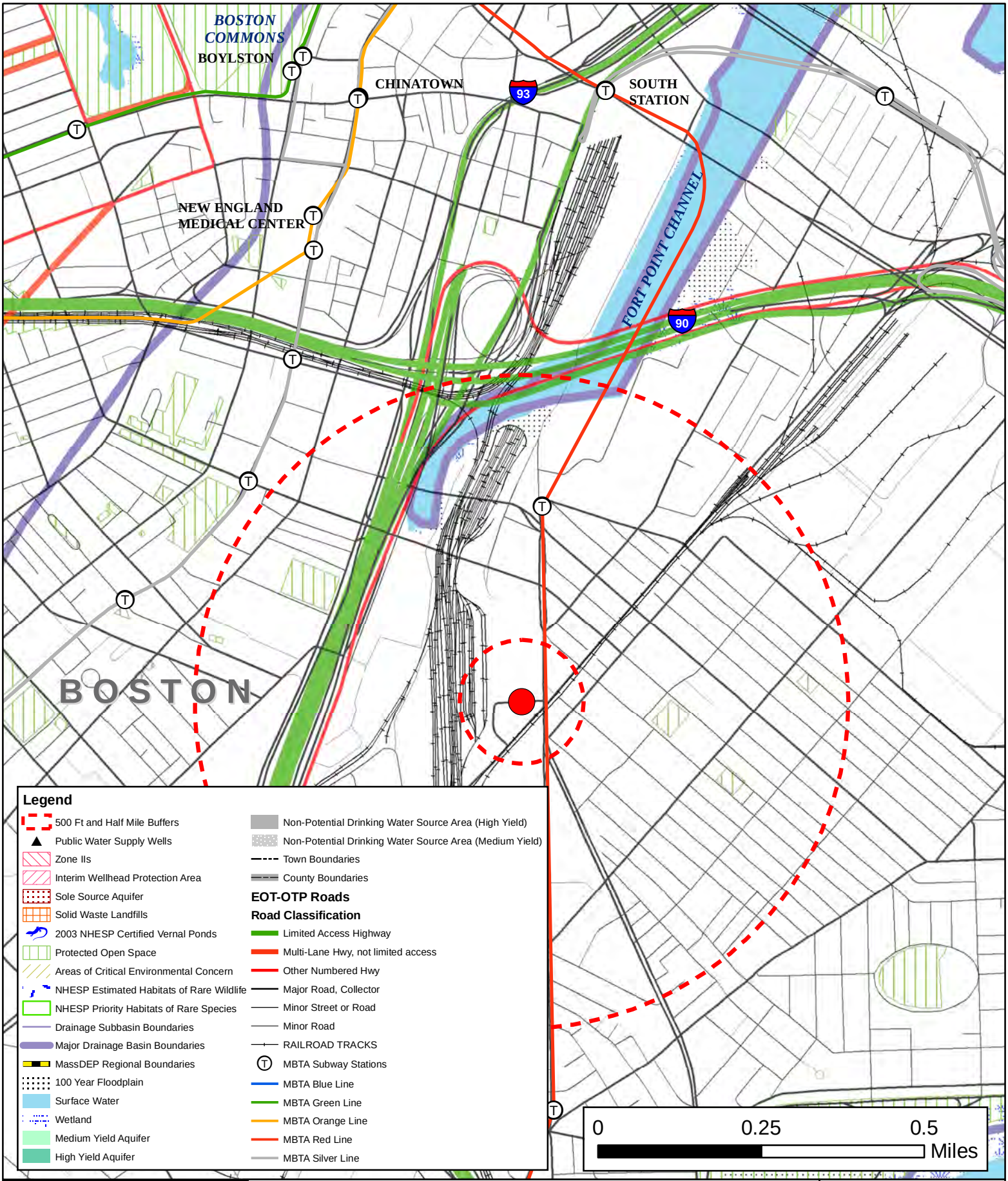
MASSACHUSETTS BAY TRANPORTATION AUTHORITY
SOUTH BOSTON, MA
CABOT YARD REMEDIATION SYSTEM
6201004

CABOT YARD
FIGURE 1
REMEDIATION SYSTEM LAYOUT AND FLOW SCHEMATIC
NOT TO SCALE

MALCOLM PIRNIE, INC.
OCTOBER 2010

MALCOLM PIRNIE

FIGURE 2: SITE LOCATION MAP
MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
CABOT YARD REMEDIATION SYSTEM
BOSTON, MASSACHUSETTS



MALCOLM PIRNIE

FIGURE 3: ENVIRONMENTAL RECEPTORS MAP

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
CABOT YARD REMEDIATION SYSTEM
BOSTON, MASSACHUSETTS

N
W E
S

Dilution Factor Calculations

From Cabot Yard Notice of Intent by Weston & Sampson Engineers, Inc dated 10/21/05.

$$Dilution\ Factor\ (DF) = \frac{Flow\ In\ (Q_i) + Flow\ Out\ (Q_o)}{Flow\ In\ (Q_i)}$$

$Flow\ In\ (Qi)$ = Maximum discharge from remediation system = $130\ gpm = 0.28\ cfs$

$Flow\ Out\ (Qo)$ =Flushing flow in the Fort Point Channel

Note: For the purposes of this calculation, all other flows into the Fort Point Channel, such as Combined Sewer Overflows, stormdrains, etc. are ignored and their corresponding dilution effects are not calculated. This will result in a more conservative dilution factor calculation.

General Approach

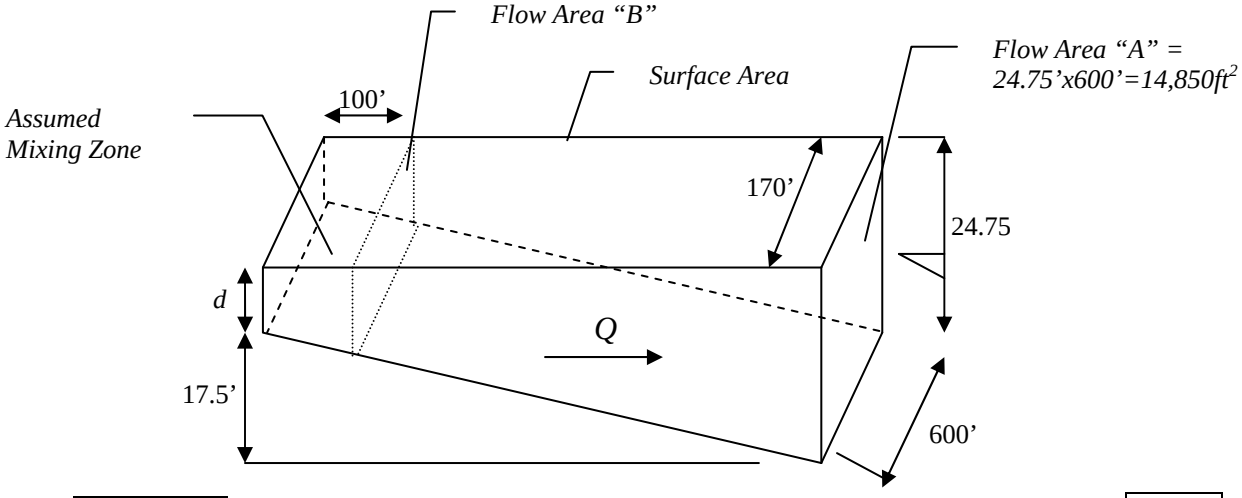
Determine flushing flow in an assumed 100-foot mixing zone at the head of the Fort Point Channel, corresponding to the location of the discharge outfall

$$Flushing\ Flow = \frac{Volume\ of\ Fort\ Point\ Channel}{Retention\ Time}$$

Note: Dimensions for calculation of Fort Point Channel volume are taken from: "Fort Point Channel Watersheet Activation Plan," 2001, Vanasse Hangen Brustlin, Inc. (VHB).

The retention time for the Fort Point Channel is taken from: "The Stat of Boston Harbor – Mapping the Harbor's Recovery," 2002, Massachusetts Water Resources Authority (MWRA).

Idealized Channel Diagram:



$$d = low\ tide\ water\ depth + \frac{tidal\ fluctuation}{2} = 2.5' + \frac{9.5'}{2} = 7.25'$$

Calculate Flow through Flow Area A

$$Channel\ Volume = Average\ Depth \times Surface\ Area$$

$$Average\ Depth = 7.25' + \frac{17.5'}{2} = 16'$$

$Surface\ Area = 2{,}136{,}750 ft^2$ (From VHB 2001 map)

$$Volume\ of\ Channel = 2{,}136{,}750 ft^2 \times 16 ft = 34.2 \times 10^6 ft^3$$

$Retention\ Time = 7\ days = 604{,}800 seconds$ (from MWRA 2002)

$$Flow\ (Q) = \frac{Volume\ of\ Channel}{Retention\ Time} = \frac{34.2 \times 10^6 ft^3}{604{,}800 seconds} = 56 cfs$$

$$\begin{matrix} Flow\ through\ flow\ area\ \text{"A"} \\ per\ square\ flow\ of\ area \end{matrix} = \frac{56 cfs}{14.85 \times 10^3 ft^2} = 0.0037\ {}^{cfs}/_{ft^2}$$

Assume constant flow throughout channel

Calculate flow through mixing zone (Flow Area B)
This is the flushing flow needed for the calculation of Dilution Factor.

Area of Flow Area B:

$$Channel\ Slope = \frac{total\ channel\ length}{change\ in\ depth} = 0.0031\ {}^{ft}/_{ft}$$

$$Depth\ at\ Flow\ Area\ B = 7.25 + 100' \times 0.0031\ {}^{ft}/_{ft} = 7.55'$$

$$Area\ of\ Flow\ Area\ B = depth \times width\ at\ area\ B = 7.55 ft \times 170 ft = 1283.5 ft^2$$

$$Flow\ through\ Area\ B = 1283.5 ft^2 \times 0.0037\ {}^{cfs}/_{ft^2} = 4.75 cfs$$

$$DF = \frac{Q_i + Q_o}{Q_i} = \frac{0.28 cfs + 4.75 cfs}{0.28\ cfs} = 17.96 \approx 18$$

Material Safety Data Sheet

BSC 37257

BLUE SHIELD 12.5% LIQUID SHOCK

EDP# 37257

Section I - Identification

Company Name
North American Marketing Corp.
(NAMCO)

Company's Address
100 Sanrico Drive
Manchester, CT 06040

Emergency Contact
Chemtrec 1-800-424-9300 U.S.
Chemtrec 1-202-483-7616 International

Non-Emergency Information
1-860-649-3666

Revised Date	**1/01/99**
Chemical Name	Sodium Hypochlorite
Trade Name	Blue Shield Liquid Shock
Chemical Family	Oxidizing Agent
Chemical Formula	NaOCL
Product Composition	Sodium Hypochlorite 12.5%
Component Data	Inert: Water 87.5%
Chemical Name	Sodium Hypochlorite Solution
Cas#	7681-52-9
EPA REG#	**21268-10**
Percent Range	12.5%---15%

Section II - Hazardous Ingredients

Hazardous Components	Hazardous %	Prod Cas#	PEL/TLV
Hypochlorous Acid	14%	7681-52-9	1ppmC12/ 1ppm TWA
Sodium Hydroxide	1%	1310-72-3	2mg/m3 / 2mg / m3

Section IIA - Toxic Ingredients

This product contains the following toxic chemicals subject to the reporting requirements of section 313 of the emergency planning community right-to-know act of 1986 and of 40 CFR 372: All components of this product that are required to be on the TSCA Inventory are listed above.

Cas#	Chemical Name	% by wt.	De Minimis Level

EPA, Pesticides regulations applicable and registration as a pesticide are required when used for disinfection purposes. This product is listed on the Toxic Substance Control Act (TCSA) inventory of Chemical Substances. This product is toxic to fish. Do not discard in lakes, streams, ponds, estuaries, oceans, or public waters unless this product is specifically identified and addressed in an NPDES permit. **EPA REG# 21268-10**

Material Safety Data Sheet
BSC 37257
BLUE SHIELD 12.5% LIQUID SHOCK

Section III -Physical Data

Boiling Point (F)	@760 MM hg: Decomposes above 110* C (230*F)
Freezing Point (F)	ND
Volatility/Vol (%)	Variable water vapor plus products of decomposition.
Melting Point	NA
Vapor Pressure	NA
Vapor Density (Air=1)	NA
Solubility in H_2O	100%
Appearance/Odor	Colorless to light yellow-green liquid with chlorine like odor.
Specific Gravity(H_2O=1)	1.27
Evaporation Rate	NA
pH	12@100GM/L
Flash Point	Nonflammable

Section IV - Fire and Explosion Hazard Data

Flash Point	NA
Lower Flame Limit	NA
Higher Flame Limit	NA
Extinguish Media	Use water spray, fog, foam, dry chemical, or carbon dioxide or agents suitable for materials in surrounding fire.
For Fire	Use self-contained breathing apparatus and full protective equipment.
Unusual Fire Hazard	Sodium Hypochlorite decomposes when heated. Decomposition products may cause containers to rupture or explode.

Material Safety Data Sheet
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BLUE SHIELD 12.5% LIQUID SHOCK

Section V - Health Hazard Data

First Aid Procedures

Emergency First Aid*

Inhalation:
Remove to fresh air. If individual experiences nausea, headache, dizziness, has difficulty in breathing or is cyanotic, get medical attention immediately.

Skin Contact:
Wash thoroughly- Remove contaminated clothing- Wash with soap and water.

Eye Contact:
Flush immediately with water for at least 15 min. Get medical attention. **

Ingestion:
Do not induce vomiting. Rinse mouth with copious amounts of water or milk first. Irrigate the esophagus and dilute stomach contents by slowly giving one (1) to two(2) glasses of water or milk. Avoid giving alcohol or alcohol related products. Get medical attention immediately.

Listed Carcinogen
Not listed as carcinogen - IARC, NTP, OSHA.

Threshold Limit Value
See section IIA Hazardous Ingredients.

Over Exposure Effects
Corrosive and strongly irritating to the eyes, skin, and respiratory tract. Inhalation of fumes may cause pulmonary edema. Ingestion may cause burns to the mouth and digestive tract and abdominal distress.

*** Never give anything by mouth to an unconscious person***
****Do not wear contact lenses when handling chemicals****

Material Safety Data Sheet
BSC 37257
BLUE SHIELD 12.5% LIQUID SHOCK

Section VI -Reactivity Data

Chemical Stability	Degrades with age.
Conditions to Avoid	Strong oxidizers, stability decreases with concentration, heat, light, decreases in ph and contamination with heavy metals.
Incompatible Materials	Avoid contamination with heavy metals, reducing agents, organics, ether, ammonia, and acids.
Decomposition Products	Acid fumes.
Hazardous Polymerization	Material is not known to polymerize.
Polymerization Avoid	NA

Section VII -Spill or Leak Procedure

Waste Disposal Method	Follow all Federal, State, and Local Regulations.

Section VIII -Special Protection

Respiratory Protection	If needed use an NIOSH/MSHA approved respirator.
Ventilation	Use in well ventilated area.
Protective Gloves	Rubber Gloves.
Eye Protection	Safety Goggles
Other Protective Equipment	Protective work clothing should be worn and standard industrial hygiene practices followed.
Handling & Storage	Containers of this material may be hazardous when emptied. Since emptied containers retain product residues (vapor, liquid and/or solid) all hazard precautions given in this data sheet must be observed. Keep out of reach of children.

Material Safety Data Sheet
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BLUE SHIELD 12.5% LIQUID SHOCK

Section IX -Shipping Information

Hazard Class	8
DOT Shipping Name	Hypochlorite Solution
Reportable Quantity(R.Q.)	RQ 100#
UN Number	1791
NA Number	NA
Packaging Size	1 (Gallon)

Section X -Toxicological Information

Acute Effects:	The toxicity and corrosiveness of sodium hypochlorite is a function of concentration.
Acute Dermal LD50:	(Rabbit)---10,000 mg/kg
Acute Inhalation LC50:	(Rat)---------8910 mg/kg
Irritant Effects:	Corrosive and strongly irritating to eyes, skin, and respiratory tract. Inhalation of fumes may cause burns to the mouth and digestive tract and abdominal distress.
Sensitization Effects:	Severe burns.
Carcinogenic Potential:	Not listed as carcinogen - IARC, NTP, OSHA.
Other Health Effects:	NA
Environmental Toxicological Information:	The EPA Pesticides Regulations applicable and a registration as a pesticide are required when used for disinfection purposes. This product is listed on the Toxic Substance Control Act (TCSA) inventory of Chemical Substances. This product is toxic to fish. Do not discard in lakes, streams, ponds, estuaries, oceans, or public waters unless this product is specifically identified and addressed in an NPDEA permit.
Acute Aquatic LC50's	NA
Acute Marine LC50's	NA
Avian Acute Oral LD50's	NA
Avian Dietary LC50's	NA

Material Safety Data Sheet

BSC 37257

BLUE SHIELD 12.5% LIQUID SHOCK

North American Marketing Corp.
100 Sanrico Drive, Manchester, CT 06040

In accordance with good practices of personal hygiene, handle with due care and avoid any unnecessary contact with this product.

This information is being supplied to you under OSHA "Right to Know" Regulation 29CFR 1910, 1200 and is believed to be true and accurate. No warranty or guaranty expressed or implied is made regarding the accuracy of this data or the results obtained from the reliance on this data. The hazard connected with use of the material, or the results to be obtained from the use thereof, is made. NAMCO, Inc. And its suppliers assume no responsibility for damage or injury from the use of the product described herein.

The data and information given in this material data sheet are accurate on the day of preparation. It does not indicate any warranty or representation. We disclaim all liability relating to use of material since this is beyond our control.

SAFETY DATA SHEET

OxyChem®

Responsible Care® Good Chemistry at Work

CAUSTIC SODA LIQUID (ALL GRADES)

MSDS No.: M32415 **Rev. Date:** 05/29/2009 **Rev. Num.:** 08

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Company Identification:	Occidental Chemical Corporation 5005 LBJ Freeway P.O. Box 809050 Dallas, Tx 75380-9050
24 Hour Emergency Telephone Number:	1-800-733-3665 or 1-972-404-3228 (U.S.); 32.3.575.55.55 (Europe); 1800-033-111 (Australia)
To Request an MSDS: **Customer Service:**	MSDS@oxy.com or 1-972-404-3245 1-800-752-5151 or 1-972-404-3700
Trade Name:	Caustic Soda Diaphragm Grade 10%, 15%, 18%, 20%, 25%, 30%, 35%, 40%, 50%, Caustic Soda Rayon Grade 18%, 20%, 25%, 30%, 50%, 50% Caustic Soda Rayon Grade OS, Caustic Soda Membrane 6%, 18%, 20%, 25%, 30%, 48%, 50%, 50% Caustic Soda Membrane OS, 50% Caustic Soda Diaphragm OS, Caustic Soda Low Salt 50%, 25% Caustic Soda Purified, 50% Caustic Soda Purified, 50% Caustic Soda Purified OS, Caustic Soda Liquid 70/30, Membrane Blended, 50% Caustic Soda Membrane (Northeast), 50% Caustic Soda Diaphragm (West Coast), 50% Blended Rayon Grade Blended, Membrane Cell Liquor
Synonyms:	Sodium hydroxide solution, Liquid Caustic, Lye Solution, Caustic, Lye, Soda Lye
Product Use:	Metal finishing, Cleaner, Process chemical, Petroleum industry

2. HAZARDS IDENTIFICATION

****

EMERGENCY OVERVIEW:

Color:	Colorless to slightly colored
Physical State:	Liquid
Odor:	Odorless
Signal Word:	Danger

MAJOR HEALTH HAZARDS: CORROSIVE. CAUSES BURNS TO THE RESPIRATORY TRACT, SKIN, EYES AND GASTROINTESTINAL TRACT. CAUSES PERMANENT EYE DAMAGE.
PHYSICAL HAZARDS: CORROSIVE. Mixing with water, acid or incompatible materials may cause splattering and release of heat.
ECOLOGICAL HAZARDS: Keep out of water supplies and sewers. This material is alkaline and may raise the pH of surface waters. This material has exhibited moderate toxicity to aquatic organisms.
PRECAUTIONARY STATEMENTS: Avoid breathing vapors or mist. Avoid contact with skin, eyes and clothing. Keep container tightly closed. Wash thoroughly after handling. Use only with adequate ventilation.
****

POTENTIAL HEALTH EFFECTS:

Inhalation: May cause irritation (possibly severe), chemical burns, and pulmonary edema.

Skin contact: May cause irritation (possibly severe) and chemical burns.

Eye contact: May cause irritation (possibly severe), chemical burns, eye damage, and blindness.

Ingestion: May cause irritation (possibly severe), chemical burns, nausea, and vomiting.

Target Organs Effected: Respiratory System, Skin, Eye

Medical Conditions Aggravated by Exposure: Asthma, Respiratory disorders

See Section 11: TOXICOLOGICAL INFORMATION

3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Component	Concentration (by weight %)	CAS - No.
Water	48.5 - 94.5	7732-18-5
Sodium hydroxide	5.5 - 51.5	1310-73-2
Sodium chloride (NaCl)	1 - 5	7647-14-5

4. FIRST AID MEASURES

Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, have a trained person administer basic life support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY.

Skin Contact: Immediately flush contaminated areas with water. Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing before reuse. Discard contaminated leather goods. GET MEDICAL ATTENTION IMMEDIATELY.

4. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

Ingestion: Never give anything by mouth to an unconscious or convulsive person. If swallowed, do not induce vomiting. Give large amounts of water. If vomiting occurs spontaneously, keep airway clear. Give more water when vomiting stops. GET MEDICAL ATTENTION IMMEDIATELY.

Notes to Physician: The absence of visible signs or symptoms of burns does NOT reliably exclude the presence of actual tissue damage. Probable mucosal damage may contraindicate the use of gastric lavage.

5. FIRE-FIGHTING MEASURES

Fire Hazard: Negligible fire hazard.

Extinguishing Media: Use media appropriate for surrounding fire

Fire Fighting: Move container from fire area if it can be done without risk. Cool containers with water. Avoid contact with skin.

Sensitivity to Mechanical Impact: Not sensitive.

Sensitivity to Static Discharge: Not sensitive.

Flash point: Not flammable

6. ACCIDENTAL RELEASE MEASURES

Occupational Release:
Wear appropriate personal protective equipment recommended in Section 8 of the MSDS. Completely contain spilled material with dikes, sandbags, etc. Shovel dry material into suitable container. Liquid material may be removed with a vacuum truck. Remaining material may be diluted with water and neutralized with dilute acid, then absorbed and collected. Flush spill area with water, if appropriate. Keep product and flush water out of water supplies and sewers. This material is alkaline and may raise the pH of surface waters with low buffering capacity. Releases should be reported, if required, to appropriate agencies.

7. HANDLING AND STORAGE

Storage Conditions: Store and handle in accordance with all current regulations and standards. Keep container tightly closed and properly labeled. Do not store in aluminum container or use aluminum fittings or transfer lines, as flammable hydrogen gas may be generated. Keep separated from incompatible substances.

7. HANDLING AND STORAGE

Handling Procedures: Avoid breathing vapor or mist. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. When mixing, slowly add to water to minimize heat generation and spattering.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

OSHA Regulatory Exposure limit(s):

Hazardous Component	CAS - No.	OSHA Final PEL TWA	OSHA Final PEL STEL	OSHA Final PEL Ceiling
Sodium hydroxide	1310-73-2	2 mg/m^3	-----	-----

Non-Regulatory Exposure Limit(s):
The Non-Regulatory OSHA limits shown in the table are the Vacated 1989 PEL's (vacated by 58 FR 35338, June 30, 1993).

Hazardous Component	CAS - No.	ACGIH TWA	ACGIH STEL	ACGIH Ceiling	OSHA TWA (Vacated)	OSHA STEL (Vacated)	OSHA Ceiling (Vacated)
Sodium hydroxide	1310-73-2	-----	-----	2 mg/m^3	-----	-----	2 mg/m^3

ENGINEERING CONTROLS: Provide local exhaust ventilation where dust or mist may be generated. Ensure compliance with applicable exposure limits.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Wear chemical safety goggles with a faceshield to protect against eye and skin contact when appropriate. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin and Body Protection: Wear chemical resistant clothing and rubber boots when potential for contact with the material exists. Contaminated clothing should be removed, then discarded or laundered.

Hand Protection: Wear appropriate chemical resistant gloves

Protective Material Types: Natural rubber, Neoprene, Nitrile

Hazardous Component	Immediately Dangerous to Life/ Health (IDLH)
Sodium hydroxide	10 mg/m^3 IDLH

Respiratory Protection: A NIOSH approved respirator with N95 (dust, fume, mist) cartridges may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits, or when symptoms have been observed that are indicative of overexposure. If eye irritation occurs, a full face style mask should be used. A respiratory protection program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid
Appearance:	Clear to opaque
Color:	Colorless to slightly colored
Odor:	Odorless
Boiling Point/Range:	230 – 291 F (110 – 144 C)

9. PHYSICAL AND CHEMICAL PROPERTIES

Freezing Point/Range:	-26 to 59 F (-32 to 15 C)
Vapor Pressure:	13 - 135 mmHg @ 60 C
Vapor Density (air=1):	No data available
Specific Gravity (water=1):	1.11 – 1.53 @ 15.6 C
Water Solubility:	100%
pH:	14.0 (7.5% solution)
Volatility:	No data available
Evaporation Rate (ether=1):	No data available
Partition Coefficient (n-octanol/water):	No data available

10. STABILITY AND REACTIVITY

Reactivity/ Stability: Stable at normal temperatures and pressures.

Conditions to Avoid: Mixing with water, acid or incompatible materials may cause splattering and release of large amounts of heat. Will react with some metals forming flammable hydrogen gas. Carbon monoxide gas may form upon contact with reducing sugars, food and beverage products in enclosed spaces.

Incompatibilities/ Materials to Avoid: Acids, Halogenated compounds, Prolonged contact with aluminum, brass, bronze, copper, lead, tin, zinc or other alkali sensitive metals or alloys

Hazardous Decomposition Products: Toxic fumes of sodium oxide

Hazardous Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA:

Hazardous Component	LD50 Oral	LC50 Inhalation	LD50 Dermal
Sodium hydroxide	Not listed	Not listed	1350 mg/kg (Rabbit)
Sodium chloride (NaCl)	3 g/kg (Rat)	42 g/m^3 (1 hr-Rat)	10 g/kg (Rabbit)

TOXICITY:
The severity of the tissue damage is a function of its concentration, the length of tissue contact time, and local tissue conditions. After exposure there may be a time delay before irritation and other effects occur. This material is a strong irritant and is corrosive to the skin, eyes, and mucous membranes. This material may cause severe burns and permanent damage to any tissue with which it comes into contact. Inhalation will cause severe irritation, possible burns with pulmonary edema, which may lead to pneumonitis. Skin contact with this material may cause severe irritation and corrosion of tissue. Repeated exposure may cause dermatitis. Eye contact can cause severe irritation, corrosion with possible corneal damage and blindness. Ingestion may cause irritation, corrosion/ulceration, nausea, and vomiting.

CARCINOGENICITY: This product is not classified as a carcinogen by NTP, IARC or OSHA.

12. ECOLOGICAL INFORMATION

AQUATIC TOXICITY: This material has exhibited moderate toxicity to aquatic organisms. Data provided are for sodium hydroxide.

Freshwater Fish Data:
LC50 brook trout: 25 ppm/24 hr
LC50 king salmon: 48 ppm
Invertebrate Toxicity Data:
EC50 daphnia magna: 100 ppm
EC50 shrimp: 33 – 100 ppm/48 hr
EC50 cockle: 330 – 1000 ppm/48 hr

BIODEGRADATION: This material is inorganic and not subject to biodegradation.

PERSISTENCE: This material is alkaline and may raise the pH of surface waters with low buffering capacity. This material is believed to exist in the disassociated state in the environment.

BIOCONCENTRATION: This material is not expected to bioconcentrate in organisms.

ADDITIONAL ECOLOGICAL INFORMATION: This material has exhibited slight toxicity to terrestrial organisms.

13. DISPOSAL CONSIDERATIONS

Reuse or reprocess, if possible. Dispose in accordance with all applicable regulations. May be subject to disposal regulations: U.S. EPA 40 CFR 261. Hazardous Waste Number(s): D002

14. TRANSPORT INFORMATION

U.S.DOT 49 CFR 172.101:

PROPER SHIPPING NAME:	Sodium Hydroxide Solution
DOT UN NUMBER:	UN1824
HAZARD CLASS/ DIVISION:	8
PACKING GROUP:	II
LABELING REQUIREMENTS:	8
DOT RQ (lbs):	RQ 1000 lbs. (Sodium Hydroxide)

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

SHIPPING NAME:	Sodium hydroxide solution
UN NUMBER:	UN1824
CLASS:	8
PACKING/RISK GROUP:	II

15. REGULATORY INFORMATION

U.S. REGULATIONS

- **OSHA REGULATORY STATUS:**
  This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200) (US).

- **CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):**
  If a release is reportable under CERCLA section 103, notify the state emergency response commission and local emergency planning committee. In addition, notify the National Response Center at (800) 424-8802 or (202) 426-2675.

Hazardous Component	CERCLA Reportable Quantities:
Sodium hydroxide	1000 lb (final RQ)

- **EPCRA EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):** No components are listed.

- **EPCRA SECTIONS 311/312 HAZARD CATEGORIES (40 CFR 370.21):**
  Acute Health Hazard

- **EPCRA SECTION 313 (40 CFR 372.65):** No components are listed.

- **OSHA PROCESS SAFETY (29 CFR 1910.119):** Not regulated

NATIONAL INVENTORY STATUS

- **U.S. INVENTORY STATUS (TSCA):** All components are listed or exempt

- **TSCA 12(b):** This product is not subject to export notification

CANADIAN DOMESTIC SUBSTANCE LIST (DSL/NDSL): All components are listed.

STATE REGULATIONS

California Proposition 65: This product is not listed, but it may contain contaminants known to the State of California to cause cancer or reproductive toxicity as listed under Proposition 65 State Drinking Water and Toxic Enforcement Act. For additional information, contact OxyChem Customer Service.

	Hazardous Component	Sodium hydroxide
	California Proposition 65 Cancer WARNING:	Not Listed
	California Proposition 65 CRT List - Male reproductive toxin:	Not Listed
	California Proposition 65 CRT List - Female reproductive toxin:	Not Listed
	Massachusetts Right to Know Hazardous Substance List	Listed
	New Jersey Right to Know Hazardous Substance List	Listed
	New Jersey Special Health Hazards Substance List	Listed
	Pennsylvania Right to Know Hazardous Substance List	Listed
	Pennsylvania Right to Know Environmental Hazard List	Listed
	Rhode Island Right to Know Hazardous Substance List	Listed

CANADIAN REGULATIONS:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:	E

16. OTHER INFORMATION

Prepared by: OxyChem Corporate HESS - Health Risk Management

HMIS: (SCALE 0-4) (Rated using National Paint & Coatings Association HMIS: Rating Instructions, 2nd Edition)
Health: 3 **Flammability:** 0 **Reactivity:** 1
NFPA 704 - Hazard Identification Ratings (SCALE 0-4)
Health: 3 **Flammability:** 0 **Reactivity:** 1

Reason for Revision:
1. Removed Chronic Toxicity: SEE SECTION 11

IMPORTANT:
The information presented herein, while not guaranteed, was prepared by technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTY OR GUARANTY OF ANY OTHER KIND, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, SAFETY, SUITABILITY, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling, storage, disposal and other factors that may involve other or additional legal, environmental, safety or performance considerations, and OxyChem assumes no liability whatsoever for the use of or reliance upon this information. While our technical personnel will be happy to respond to questions, safe handling and use of the product remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as, a recommendation to infringe any existing patents or to violate any Federal, State, local or foreign laws.

Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, material safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Material Safety Data Sheet available to your employees.

HCl CC2

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

REAGENT CHEMICAL & RESEARCH, INC.
115 US Hwy 202 Ringoes, NJ 08551

REVISED DATE: 1/1/2006 VALID UNTIL 1/1/2011

IDENTITY
Hydrochloric Acid, 20° Baume

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I - Product Information

Product Name	CAS #
Hydrochloric Acid	7647-01-0
Synonym	Chemical Formula
Muriatic Acid	HCl
Chemical Name	Chemical Family
Hydrochloric Acid Solution	Inorganic Acid

Section II - Manufacturers Information

Manufacturers Name	Address
Reagent Chemical & Research, Inc.	124 River Road Middlesex, NJ 08846
Emergency Contact	Country
Robert Dritschel	United States
Emergency Telephone	Emergency Telephone #2
1-409-962-5769	CHEMTREC 1-800-424-9300

Section III - Ingredients/Regulatory Information

Substance Description	Percent	CAS #
Hydrogen Chloride	31.45 - 33.30	7647-01-0
Water	66.70 - 68.55	7732-18-5

EXPOSURE LIMITS/REGULATORY INFORMATION

Substance	PEL	TLV	STEL	TWA	CEILING
Hydrogen Chloride	C-7 mg/m3	C-5 ppm	50 ppm	N/D	5 ppm
Water	N/D	N/D	N/D	N/D	N/D

N/D - Not Determined C = Ceiling Level

Section IV - Hazards Identification

Appearance & Odor
Clear/Pale Yellow Liquid/Pungent Odor

Statement of Hazards
Severe and painful burns upon contact

Primary Route of Exposure
Skin, eye and inhalation contact are the primary routes of exposure to this product

Inhalation Acute Exposure Effects
Inhalation of excessive concentrations of Hydrogen Chloride vapors immediately produces severe irritation of the upper respiratory tract; resulting in coughing, burning of the throat, and a choking sensation. Reactions encountered in man have usually been limited to inflammation occasional ulceration of the nose, throat and larynx. If inhaled deeply, edema of the lungs may occur.

Skin Contact Acute Exposure Effects
Concentrated solutions are destructive to clothing and on contact with skin, causes severe burns unless promptly washed off. Repeated skin contact with dilute solutions may lead to the development of dermatitis. Exposure to the concentrated vapors of Hydrogen Chloride may also result in burns and dermatitis.

Section IV - Hazards Identification (continued)

Eye Contact Acute Exposure Effects

Contact of the eyes with Hydrogen Chloride, either as a gas or in solution, rapidly causes severe irritation and painful burns of the eyes and eyelids. If the acid is not quickly removed by thorough irrigation with water, there may be prolonged or permanent visual impairment or total loss of sight.

Ingestion Acute Exposure Effects

When concentrated Hydrochloric Acid is swallowed, it causes severe burns of the mucous membranes of the mouth, esophagus and stomach. The lips and mouth usually turn white, and later brown. There is pain in the throat and stomach, difficulty in swallowing, intense thirst, nausea and in severe cases, collapse and unconsciousness.

Fire and Explosion Hazards

Non-flammable, but Hydrochloric Acid reacts with all metals, except gold and platinum, with rapid evolution of Hydrogen which is flammable and explosive in air. Firefighters exposed to Hydrochloric Acid vapors should wear Scott Air-Pak, or equivalent. Hydrogen Chloride vapors are extremely irritating to the respiratory tract and may cause breathing difficulty.

Carcinogenicity

IARC	...No	OSHA	...No	ACGIH	...No

Section V - First Aid Measures

General

If a known exposure occurs or is suspected, immediately initiate the recommended procedures below. Simultaneously contact a physician, or the nearest Poison Control Center. Inform the person contacted of the type and extent of exposure, describe the victim's symptoms and follow the advice given. For additional information, call day or night, Reagent Chemical (409) 962-5769 or Chemtrec (800) 424-9300.

Inhalation

Remove from contaminated atmosphere. If breathing has ceased, clear the victim's airway and start mouth-to-mouth artificial respiration, which may be supplemented by the use of a bag-mask respirator, or a manually-triggered, oxygen supply capable of delivering 1 liter/second or more. If the victim is breathing, oxygen may be administered from a demand-type or continuous-flow inhalator, preferably with a physician's advice. Contact a physician immediately.

Eye Contact

Immediately flush the eyes with large quantities of running water for 15 minutes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eyes and lids with water. DO NOT attempt to neutralize with chemical agents. Obtain medical attention as soon as possible. Oils or ointments should not be used. Continue the flushing for an additional 15 minutes if the physician is not available.

Section V - First Aid Measures (continued)

Skin Contact

Immediately remove contaminated clothing under a safety shower. Flush all affected areas with large amounts of water for 15 minutes. DO NOT attempt to neutralize with chemical agents. Obtain medical advice.

Ingestion

DO NOT induce vomiting. Immediately give large quantities of water or milk, if available. If vomiting does occur, give fluids again. Never give anything by mouth to an unconscious person. Call a physician of the nearest Poison Control Center.

Medical Conditions Generally Aggravated by Exposure

Hydrogen Chloride will aggravate breathing disorders

Note to Physician

Attending Physician should treat exposed patients symptomatically

Section VI - Fire Fighting Measures

Flash Point

N.A.

Flash Method

N.A.

Extinguishing Method

Not Applicable

Unusual Fire and Explosion Hazards

Non-flammable, but Hydrochloric Acid reacts with metals.

Special Firefighting Procedures

Non-flammable, but Hydrochloric Acid reacts with all metals, except gold and platinum, with rapid evolution of Hydrogen which is flammable and explosive in air. Firefighters exposed to Hydrochloric Acid vapors should wear Scott Air-Pak, or equivalent. Hydrogen Chloride vapors are extremely irritating to the respiratory tract and may cause breathing difficulty.

Section VII - Accidental Release Measures

Steps to be Taken in Case Material is Released or Spilled

Spills or discharges into the environment involving large quantities of Hydrochloric Acid should be controlled and cleaned-up according to a pre-determined, affirmative written Spill Prevention and Control Program. For assistance in developing a SPCP contact your nearest Reagent Sales Office.

Spills should be handled immediately by neutralization and dilution of the spilled product by the use of Soda Ash (Sodium Carbonate), Lime (Calcium Hydroxide), or Limestone (Calcium Carbonate) with large amounts of water. For an interior (inside a closed space) spill be aware that the use of Soda Ash, Lime and Limestone will evolve heat and carbon dioxide and that ample ventilation must be provided.

Waste Disposal

Under Federal RCRA, it is the responsibility of the user of products to determine, at the time of disposal, whether the product falls under RCRA as a hazardous waste. This is because product uses, transformations, mixcures, etc. may render the resulting end-product hazardous.

Container Disposal

Containers should be cleaned of residual product before disposal. Empty containers should be disposed of in accordance with all applicable laws and regulations.

Section VII - Accidental Release Measures (continued)

Precautions to be Taken in Handling and Storage
Make sure all personnel involved in housekeeping and spill clean-up follow good Industrial Hygiene practices and wear proper protective equipment.

Section VIII - Handling/Storage/Transportation

Handling
Chemical goggles and full face shield must be worn at all times by personnel exposed to or handling Hydrochloric Acid. The use of a NIOSH approved cartridge respirator or a Scott Air-Pak should be used by all personnel exposed.

Storage
Store containers in a cool, dry location away from direct sunlight, sources of intense heat, or where freezing may occur. Store material in acid-proof container. Keep container tightly closed when not in use. Keep container away from incompatible materials. All loading, unloading, and storage equipment must be inspected prior to any transfer operations are initiated.

General Comments
Impervious clothing, gloves, footwear and head gear must be worn at all times by personnel exposed to or handling Hydrochloric Acid.

Section IX - Exposure Controls/Personal Protection

Respiratory Protection (Specify Type)
Maintain airborne contaminate levels below listed guidelines. Use with adequate ventilation. Use a mechanical fan or vent area to scrubber.

Ventilation		
	Local Exhaust If PEL exceeded	Special Vent fumes to appropriate scrubber
	Mechanical (General) If PEL exceeded	Other Not Applicable

Skin Protection
Wear neoprene rubber gloves to minimize skin contact.

Eye Protection
Splash goggles or safety glasses. Face shields are recommended.

Other Protection
Use body protection appropriate for task. An apron or other impermeable body protection is suggested. Full body chemical protection is recommended for emergency response procedures.

Applicable Exposure Limits
Other than any exposure limits which may be displayed in Section 3, there are no other known exposure limits applicable to this product or its components.

Section X - Physical and Chemical Properties

Boiling Point	230 F	Specific Gravity (H2O = 1)	1.160 - 1.1693
Vapor Pressure (mm Hg)	50 - 60 mm	Freezing Point	.-12 F to -63 F
Vapor Density (AIR = 1)	N.A.	Density	9.671 - 9.748

Solubility in Water
miscible

Appearance and Odor
Clear/Slightly yellow with a sharp pungent odor

Section XI - Stability and Reactivity

Stability		Conditions to Avoid
	Unstable	Hydrochloric Acid is extremely reactive. Avoid contact with
	Stable X	metal surfaces and oxidizing agents.

Incompatibility (Materials to Avoid)
Hydrochloric Acid is chemically stable when properly contained and handled. It is a strong mineral acid and reacts with many metals and metal oxides and hydroxides to form the equivalent metal chloride. It reacts with zeolites and other silicious compounds to form Hydrosilicic Acid; it reacts with carbonates to form Carbon Dioxide and Water. It is oxidized by Oxygen or electrolysis to form Chlorine, a lethal, poisonous gas. It reacts with alkaline compounds to form a neutral salt. It is a hydrolyzing agent for carbohydrates, esters and other compounds. Its reaction with most metals will produce Hydrogen, an explosive gas. Violent reactions will result when Hydrochloric Acid Reacts with acetic anhydride, 2-aminoethanol, ammonium hydroxide, calcium phosphide, chlorosulfonic acid, ethylene diamine, ethylene imine, oleum (fuming sulfuric acid), perchloric acid, beta propiolactone, propylene oxide, sodium hydroxide, sulfuric acid, uranium phosphide and vinyl acetate. This listing is not all-inclusive.

Hazardous Decomposition or By-products
Extreme heat may cause the product to decompose, producing toxic fumes which may include chlorine compounds.

Hazardous Polymerization		Conditions to Avoid
	May Occur	Extreme heat and contact with incompatible materials
	Will Not Occur X	

Section XII - Toxicological Information

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	Yes	Yes	Yes

Health Hazards (Acute and Chronic)
Hydrogen Chloride, both as a gas and in a solution as Hydrochloric Acid, is a corrosive substance and can cause severe and painful burns on contact with any part of the body or if taken internally. The mucous membranes of the eyes and the upper respiratory tract are especially susceptible to the irritating effects of high atmospheric concentrations of Hydrogen Chloride. The gas or vapor is so penetrating and pungent that when high concentrations do occur, those exposed should immediately leave the contaminated area.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
	No	No	No

Signs and Symptoms of Exposure
Exposure to Hydrochloric acid may cause severe burns at the contact points
Medical Conditions Generally Aggravated by Exposure
Exposure to fumes may aggravate dermatitis and breathing disorders.

Section XII - Toxicological Information (cont.)

Toxicology	Inhalation Data
Hydrogen Chloride	Human LCLo - 1300 ppm/30 min
	Rat LC_{50} - 4701 ppm/30 min
	Oral (rabbit)
	LD_{50} - 900 mg/kg
	Mutagenic Effects
	Inhalation: 100 ppm/24 hrs (Chromosome damage)
	Oral:: 100 ppm (Chromosome damage)
	Parental: 20 mg (Cytogenic effects)

Section XIII - Ecological Information

Ecological Toxicity

Animals exposed to hydrochloric acid solution will experience tissue damage, burns and may be killed. Plants contaminated with hydrochloric acid solutions of low pH may be adversely effected or destroyed. High concentrations have been shown to be detrimental to aquatic life. A release into a body of water will kill fish and other aquatic life.

Other Ecological Information

Hydrochloric acid is stable and found naturally in the environment. All work practices should be aimed at eliminating environmental contamination.

Chemical Fate Information

Hydrochloric acid is naturally occurring in the environment.

Other Regulatory Information

No other regulatory information is available on this product.

Section XIV - Transportation Information

Regulated Material

Hydrochloric Acid is defined as hazardous by the US Dot and Transport Canada

DOMESTIC SHIPPING INFORMATION

Proper Shipping Name	Hydrochloric Acid	Hazard Classification	Corrosive
UN/NA Identification	UN 1789	Hazard Class	Class 8
DOT Labels Required	Corrosive	Packaging Group	II

INTERNATIONAL SHIPPING INFORMATION

Proper Shipping Name	Hydrochloric Acid	Hazard Classification	Corrosive
UN/NA Identification	UN 1789	Hazard Class	Class 8
Labels Required	Corrosive	Packaging Group	II

Section XV - Other Information

Created By Product Safety - 4/20/99	MSDS Revision Number Revision # 005
Toxic Substances Control Act TSCA listed 7647-01-0	Superfund Amendment & Reauthorization Act, Title III Acute & Hazard Categories HEALTH: Chronic
Emergency Planning & Community Right to Know EHS - Threshold Quantity: None	PHYSICAL: None
Is product Regulated Under 1990 Clean Air Act? No	Does Product Contain, or is Manufactured with, CFC's? No
Reportable Quantity: RQ - 5000 lbs	NSF Listing Scale & Corrosion control at maximum 40 mg/l
NFPA 3 - 0 - 0 - Acid	HMIS 3 - 0 - 0 - X

Is This Product Regulated Under the EPA's Risk Management Plans

No, Hydrochloric Acid Solution under 37% is not regulated.

North American Emergency Response Guide Book

ID # 1789 Guide #157 1996 Revision

Disclaimer of Liability

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U.S DEPARTMENT OF LABOR
Occupational Safety and Health Administration

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations.
29 CFR 1915, 1916, 1917

1. PRODUCT AND COMPANY IDENTIFICATION

Date Issued: **January 3,2006**
Trade Name: **Vinegar, All Varieties (CAS#8028-52-2)**
Definition: **Product made by acetic fermentation of ethyl alcohol.**

Manufacture Name and Address: ADMIRATION FODS
80 South Dean Street,
Englewood, NJ 07631
201-567-3177

2. COMPOSITION:

Chemical Name	Chemical Formula	Concentration	CAS number
Acetic Acid	CH3COOH	4 to 20 % wt/vol 40 to 200 Grain	64-19-7

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
Vapors irritating to eyes and respiratory tract. Avoid inhalation.
Liquid may cause eye burns and damage to cornea, possibly
Leading to blindness. Causes skin irritation.

HEALTH HAZARD DATA

Inhalation: Inhalation of vapors can cause irritation to respiratory tract. Avoid Breathing or mists.

Skin: Contact may cause mild injury and burns from vinegar of 10% acetic acid And greater. Dilute solutions may cause dermatitis in some sensitive Individuals.

Eyes: Contact may cause sever burns and permanent corneal injury from concentrated vinegar. May be followed by blindness. High vapor concentrations may result in conjunctivitis.

Ingestion: Concentrated vinegar may cause pain, irritation and burns in mouth, esophagus and stomach.

4. EMERGENCY & FIRST-AID PROCEDURES.

In case of eye or skin contact, flush immediately and thoroughly with water. Saturated clothing should be removed and washed. If vapor are inhaled extensively, Move to fresh air immediately. If swallowed in large quantities, water may be consumed to dilute. Do not give emetics or baking soda. Call a physician.

5. Fire AND EXPLOSION HAZARD DATA

	VINEGAR
Flash Point:	Does not flash.
Auto Ignition Temperature:	N/A
Flammable Limits in Air	N/A

FIRE EXTENGUISHING AGENTS RECOMMENDED

Vinegar is not flammable.

UNIVERSAL FIRE AND EXPLOSION HAZARDS:

Toxic gases and vapors may be released in a fire involving concentrated vinegar.

NFPA RATING

RED DIMOND (Flammability)	**YELLOW DIMOND** (Reactivity)	**BLUE DIMOND** (Health)	**WHITE DIMOND** (Special Warning)
Code 0	Code 0	Code 1	None

6. ACCIDENTAL RELEASE MEASURES

SAFEGARDS (PERSONNEL)

Protect Skin and Eyes from exposure. Avoid breathing vapor.

INITIAL CONTAINMENT:

Contain spilled material, water may be used to dilute. Treat and dispose of waste material in accordance with local, state/provincial and national requirements.

LARGE SPILL PROCEDURE:

Contain spilled material. Large spills may be neutralized with dilute alkaline solutions of soda ash or lime. Avoid runoff in to sewers and ditches that lead to waterways. Treat or dispose of waste material in accordance with all local, state/provincial and national requirements.

SMALL SPILL PROCEDURE:

Water may be used to dilute. Treat or dispose of waste material in accordance with all local, state/provincial and national requirements.

7. HANDELLING AND STORAGE

ENGINEERING CONTROLS:

Facility storing or utilizing this material should be equipped with an eye wash facility and safety shower. Local exhaust ventilation may be necessary to control any air contaminants to within their LTV's during the use of this product.

EYE / FACE PROTECTION REQUIREMENTS:

Wear safety glasses.

SKIN PROTECTION REQUIREMENTS:

When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Wear protective glove to minimize skin contamination.

RESPIRATORY PROTECTION REQUIREMENTS:

When there is a potential for airborne exposures in excess of application limits, wear NIOSH/MSHA approved respiratory protection. Under normal use conditions, with adequate ventilation, no special handling is required.

EXPOSURE GUIDELINES FOR ACETIC ACID:

Recommended Exposure Limit:	10 PPM
Odor Threshold:	0.037 – 0.15 PPM
Immediately Dangerous to Life or Health(IDLH)	1000PPM
OSHA TWA:	10PPM
ACGIH TWA:	10PPM
OSHA STEL:	15PPM
Skin Designation	Yes

8. PHYSICAL AND CHEMICAL PROPERTIES

Form:	Liquid
Color	Appropriate color for type of vinegar
Odor:	Appropriate odor for type of vinegar
Boiling Point:	215 degrees F @ 760mm Hg and 100 grain
Vapor pressure	(Acetic acid) 11mmHg @ 68 degree F
Vapor density:	2.1 (Air=1)
Solubility in water:	Complete
Specific gravity:	1.01 to 1.04 (Water = 1)
PH	200 grain 2.25 +/- .05
% Volatiles:	100%

9. STABILITY AND REACTIVITY

STABILITY: Stable

POLYMERIZATION: Product will not undergo polymerization.

INCOMPATIBILITY WITH MATERIALS: Avoid contact with strong oxidizing agents. Avoid contact with strong bases.

DECOMPOSITION: Decomposition will not occur if handled and stored properly. In case of a fire, oxides of carbon, fumes and smoke may be produced.

10. TOXICOLOGICAL INFORMATION

MISCELLANEOUS:

No toxic effects are likely (other than contact-site irritation/damage).

11. ECOLOGICAL INFORMATION

No information available.

12. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Treat or dispose of waste material in accordance with all local, state/provincial; and national requirements.

13. TRANSPORTATION INFORMATION

PRODUCT LABEL:	Vinegar
DOT SHIPPING NAME	N/A
TECHNICAL SHIPPING NAME	N/A
DOT HAZARD CLASS	N/A
UN NUMBER	40-100 grain: UN2789 101-300 grain: UN2790
PRODUCT RQ	5000 lb (Acetic Acid)
DOT LABEL	N/A

14. REGULATORY INFORMATION

FDA (Food and Drug Administration)
Material is a GRAS (Generally Recognized as Safe) food ingredient.

Canadian Disclosure List
Acetic Acid (64-19-7)

The information is furnished without warranty, expressed or implied, except that it is accurate to the best of the preparer's knowledge. The data on this sheet are related only to the specific material designated herein. The preparer assumes no Legal responsibility.