NEW YORK
AMERICAN WATER

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April 29, 2013

**Via Email**
The Honorable Jeffrey C. Cohen
Acting Secretary
State of New York Public Service Commission
Building 3, Empire State Plaza
Albany, New York 12223

**Re: Petition for Emergency Approval of Easement by and Between New York American Water Company, Inc. and United States Navy under PSL 89-h of the Public Service Law**
**Case No. 13-W-____**

Dear Acting Secretary Cohen:

Enclosed for filing on behalf of New York American Water Company, Inc., f/k/a Long Island Water Corporation (the "Company"), is the Company's petition, with related exhibits, requesting emergency approval of an easement under Section 89-f of the Public Service Law. The Company respectfully requests that the Commission grant the requested authorization as soon as possible.

Please do not hesitate to contact me if any further information would be helpful to the Commission in considering this request.

Very truly yours,

*/s/ Suzana Duby*

Suzana Duby

State of New York
Public Service Commission

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In the Matter of the Petition for Emergency Approval of Easement by and Between New York American Water Company, Inc. and United States Navy under PSL 89-h of the Public Service Law

Case 13-W-____

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## I. INTRODUCTION

New York American Water Company, Inc. ("NYAW" or the "Company") hereby petitions the New York State Public Service Commission (the "Commission"), under Section 89-h of the Public Service Law and 16 NYCRR 31.1, for emergency approval of an Easement agreement ("Easement") by and between the Company and the United States Navy ("Navy"). The Company also seeks to invoke the emergency adoption notice provisions under Section 202(6) of the State Administrative Procedure Act ("SAPA"). As discussed below, emergency approval is needed for the preservation of the public health, safety and general welfare, and compliance with the requirements of the subdivisions of this section would be contrary to the public interest.

## II. THE PARTIES TO THE EASEMENT

1. The Company is a wholly-owned subsidiary of American Water Works Company, Inc. NYAW is a corporation duly organized and existing under the Transportation Corporations Law of the State of New York, having its principal office in the Village of Lynbrook, Nassau County. It is a public water utility engaged in the gathering, collecting, transmitting, distributing and supplying of water for domestic, commercial, industrial and public use in

various communities in the Counties of Nassau, Westchester, Ulster and Washington, State of New York.

2. On August 17, 2012, the Commission issued an order approving the merger of Aqua NY of Sea Cliff, Aqua NY, Inc. and New York Water Service Corporation with and into Long Island Water Corporation, with Long Island Water Corporation emerging as the surviving entity and with the name of this new entity being New York American Water Company, Inc. This merger was completed on October 4, 2012, when merger certificates were filed with the New York Secretary of State.
3. Copies of the aforementioned merger certificates and a certified copy of the Company's certificate of incorporation are annexed hereto as Exhibit A.
4. The Department of the Navy ("Navy") is currently the party conducting the remediation activities that are being overseen by the New York State Department of Environmental Conservation ("NYSDEC") at NYAW's Seaman's Neck Road Facility in Bethpage, NY, which is located near the former Naval Weapons Industrial Reserve Plant in Bethpage, NY ("NWIRP-Bethpage") and the Northrop Grumman Corporation ("NG")-Bethpage facility, both of which were operated for decades by NGC and its predecessors. The NG-Bethpage and the NWIRP-Bethpage facilities were both listed in the *Registry of Inactive Hazardous Waste Disposal Sites in New York State* in 1983. NYSDEC later listed the NWIRP-Bethpage as a separate Class 2 Registry Site, separate from NG-Bethpage, in 1993. In addition to Northrop Grumman and the Navy, another potentially responsible party for the Operable Unit ("OU") 2 groundwater contamination is the Occidental Corporation/Hooker-RUCO.[1]

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[1] The Occidental Corporation/Hooker-RUCO site, located to the northwest of the NWIRP facility, is a Superfund site on the National Priorities List. Groundwater contamination from this site is contributing to the OU2 plume. To date Northrop Grumman has not signed a Remedial Design and Remedial Action Order on Consent for Operable

## III. HISTORICAL OVERVIEW OF THE REMEDIATION SITE (OPERABLE UNIT 2)

5. Detailed descriptions of the site's history, activities conducted thereon, and contamination resulting from said activities are set forth in the following documents, annexed hereto as Exhibit B: Record of Decision, Naval Weapons Industrial Reserve Plant, Bethpage, New York Operable Unit 2 – Groundwater, NYS Registry: 1-30-003B; Prepared by Engineering Field Activity, Northeast, Naval Facilities Engineering Command, Jan. 2003 (April 2003 – Rev. 1) ("2003 ROD"); Record of Decision, Operable Unit 2, Groundwater, Northrop Grumman and Naval Weapons, Industrial Reserve Plant Sites, Nassau County, Site Nos. 1-30-003A & B, March 2001, NYS Department of Environmental Conservation ("2001 ROD"). What follows is a summary of issues and events that have impacted NYAW's Seaman's Neck Road Facility.

6. The remedial sites at issue were formerly a government-owned, contractor-operated ("GOCO") facility and an adjacent contractor-owned facility, both of which were operated by the Northrop Grumman Corporation ("NGC") and its predecessors. The NWIRP GOCO facility was operated by NGC until September 1998. It is located in Bethpage, east-central Nassau County, Long Island, New York.

7. NWIRP-Bethpage was established in 1941.[2] Work performed at this facility included research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. The NWIRP-Bethpage facilities included four plants that were used for assembly and prototype testing and quality control laboratories, two warehouse complexes, a

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Unit 2. The Navy signed a Federal Facilities Site Remediation Agreement in 2005 for implementation of the Operable Unit 2 remedy.

[2] *See* https://portal.navfac.navy.mil/portal/page/portal/navfac/navfac_ww_pp/navfac_hq_pp/navfac_env_pp/env_restoration_installations/lant/midlant/bethpage/welcome

salvage storage area, water recharge basins, an industrial wastewater treatment plant and several, smaller support buildings.[3]

\- **Waste Handling Practices at NWIRP-Bethpage**

8. As set forth in greater detail in the 2003 ROD, various liquid wastes, solvents and industrial wastewaters were stored and disposed of at the site over the several decades that NWIRP-Bethpage was in operation. These substances included cadmium and cyanide wastes, aluminum and titanium scraps, and halogenated and non-halogenated waste solvents.

9. Based upon the studies conducted at NWIRP-Bethpage, the main categories of contaminants that exceed environmental standards, criteria and guidance values include the following:

    - Inorganics (metals)
    - Volatile organic compounds (VOCs)
    - Semivolatile organic compounds (SVOCs)
    - Pesticides and polychlorinated biphenyls (PCBs)

10. The identified groundwater contaminants are chlorinated VOCs which were either used and disposed of at the sites or are breakdowns of these chemicals and include the following:

    - Perchloroethene (PCE)
    - Trichloroethene (TCE)
    - Dichloroethenes (DCEs)
    - Vinyl chloride
    - 1,1,1-trichloroethane (1,1,1-TCA)[4]

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[3] 2003 ROD at 6.

[4] *See* 2003 ROD at 11.

11. Current estimates indicate that the contaminated groundwater plumes for the Navy and NGC sites in OU2 affect more than 2,000 acres in area and over 700 feet in depth in places.[5] Recent investigations also indicate that the OU2 plume has migrated south beyond the Hempstead Turnpike; one of the areas affected includes the Seaman's Neck Road Facility.

12. The Navy is undertaking remedial activities for OU2 contamination pursuant to its responsibilities under the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") and the 2003 ROD. The OU2 groundwater contamination is what affects the Company's Seaman's Neck Road Facility and is the reason that the Navy is seeking to implement response actions on this property. The Navy has been prepared to begin construction of the Permanent Remedial Facilities as of April 1, 2013.

## - **The Seaman's Neck Road Facility and the Planned Permanent Treatment Facility**

13. The Seaman's Neck Road facility, which is located at 670 Seaman's Neck Road, Seaford, NY 11783, provides water service mainly to the northeastern portion of the former New York Water Service Corporation territory, which is now part of NYAW.

14. In December 2010, the Navy developed a Basis of Design Report ("BODR") which is the basis for the design of the permanent treatment for this facility – a well-head treatment remedy that will be implemented at NYAW's Seaman's Neck Road Facility as authorized under the Navy's 2003 ROD. As set forth in the BODR, TCE has been detected in the water supply wells at concentrations up to approximately 2.1 micrograms per liter, and this has been trending upward since first detected in 2006, especially during the summer. (See BODR at 1, annexed hereto as Exhibit C.) Currently, the Navy, through its contractors, has implemented a temporary remediation facility at Seaman's Neck Road.

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[5] *Id.*

15. Higher concentrations of TCE have been detected in groundwater samples from below the depth of the Seaman's Neck Road Facility supply wells and in monitoring wells to the east of this facility.[6]

16. The New York State Department of Health drinking water standard for TCE is 5 micrograms per liter in potable water supply systems. Notification, additional monitoring and treatment are required at lower concentrations. The objective of the remediation is to reduce TCE concentrations in the plant effluent to 0.5 micrograms per liter or less.[7]

17. As set forth within the BODR, the Navy will fund the implementation of a well-head treatment remedy for the affected wells located at the Seaman's Neck Road Facility.[8] The treatment will involve liquid phase granular activated carbon ("GAC") after the iron-removal plant to address TCE in the water supply wells. Additional monitoring wells will be installed in this area to better evaluate the nature and duration of VOCs that may enter the well field in the future. Space is also being reserved at the Seaman's Neck Road Facility should it become necessary to install an air-stripping pre-treatment system.[9]

18. The affected Nassau County communities are aware of the planned remediation. This project has been discussed at several Bethpage Restoration Advisory Board meetings, which are open to the public. The Navy held a public meeting about this project in December 2011 to inform local residents and answer questions. Additionally, this project was also the subject of a January 2012 informational public hearing before the Town of Hempstead Board of Zoning Appeals.

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[6] BODR at 4.
[7] *Ibid*.
[8] *Id.*at 1.
[9] *Id* at 4.

## IV. THE EASEMENT

19. A copy of the Easement is annexed hereto as Exhibit D.

20. Because this remediation project is being implemented on land not owned by the United States, before the Navy is allowed to expend the amount of money it will be committing to build the facility, the Navy is required to obtain an interest in the land that is sufficient for the purposes of the project. For the protection of taxpayer environmental restoration dollars, the Navy therefore must obtain from NYAW a non-revocable interest in the property that will both guarantee sufficient long term access to complete the remedial activities needed and provide authority from NYAW to construct the wellhead treatment facility on its property.

21. As set forth in greater detail within the terms of the Easement, and within this petition, *supra*, the Navy is being provided this Easement in order that it may access the Seaman's Neck Road Facility to construct, install, maintain, operate, repair and replace permanent treatment facilities that are required in order to mitigate the groundwater contamination emanating from OU2. The Navy has agreed to perform this work and to fund the related expenses and operating costs. According to the Navy, construction of the permanent treatment facilities is currently estimated at $5,428,000, and operating and maintenance costs of the facilities over 50 years is currently estimated at $10 million[10] (but see ¶ 22, *infra*.).

22. Given the nature of the contamination and the Navy's responsibility for maintaining and operating the remedial facility, the Navy has, through its current studies, estimated that it may require between 50 – 100 years to complete treatment of the groundwater contamination. Therefore, the term of the Easement will run until such time as it is determined by the Navy and appropriate regulatory authorities that a complete closeout of the facilities may be commenced. At such time, the Navy will completely remove all equipment

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[10] Note this amount is not in net present value dollars.

and structures utilized for purposes of groundwater remediation, and bear the costs of same.[11] Throughout the term of the Easement, NYAW will continue to provide water service to its customers from the Seaman's Neck Road facility.

## V. REQUIREMENTS OF 16 NYCRR 31.1

23. The following requirements under this section apply to the request for approval of the Easement under consideration in this matter:

    (b) General description of the property to be transferred or leased.

    (Please refer to Exhibit A of the Easement, annexed hereto as Exhibit D)

    (e) A copy of the proposed agreement to be approved.

    (Please see the Exhibit D, Easement, annexed hereto)

24. 16 NYCRR 31.1, subdivisions (a), (c), (d), (f), (g), (h), (i), (j), (k) and (l), do not apply to the matter at hand. The Navy is not purchasing the property from NYAW. NYAW will retain ownership and use of the property as part of the Seaman's Neck Road Facility. Thus, the information required under these subdivisions is not applicable. Accordingly, NYAW respectfully requests that the Commission waive these requirements in this situation.

25. Given the nature and extent of the groundwater contamination as summarized above and presented in more detail in the annexed documents, the start date of May 1, 2013 for construction of the permanent facility, and potential for delay and thus significant construction cost increases if traditional Commission procedures were followed. The Navy is currently paying its contractors to "stand by" during pendency of the easement approval process. Should additional delay occur, the Navy will likely have to demobilize the contractor to end the requirement to pay them for remaining idle and available to begin work.

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[11] See Exhibit D, Easement.

The contractor and its subcontractors would then be free to move on to other jobs, and might not be available to return to this project until well into the fall. Finally, the temporary facility currently in place is not designed to provide long-term remediation. The delay that could be caused by the need to demobilize the contractor may pose serious issues with respect to the timely implementation of the permanent treatment facility. NYAW therefore requests that the review and approval of this easement be completed on an emergency basis.

## VI. APPLICATION OF SAPA § 202(6)

26. Approval of the Easement is also sought on an emergency basis under SAPA § 202(6). As discussed below, immediate approval is necessary for the preservation of public health, safety and general welfare. Compliance with SAPA § 202(1), requiring prior notice and comments, would be contrary to the public interest.

27. As set forth within this petition and the annexed documents, remediation is necessary to protect the public drinking water supply provided to certain NYAW customers. Numerous RI/FS' on the nature of contamination at NWIRP-Bethpage have been prepared over the past decade; the BODR has been reviewed by the Nassau County Department of Health and has been subject to extensive notice and comment. TCE levels are trending upward. Given these factors, it is imperative that the Easement be approved as expeditiously as possible in order that construction may begin immediately.

28. Moreover, construction under the Navy's contract with the contractor selected for the work was set to begin April 1, 2013. Any additional delay could result in significant cost overruns to this construction as well as delay the implementation of permanent treatment protocols, thus delaying permanent health benefits that the customers of NYAW would receive as a result.

29. The Commission has previously recognized other instances in which expedited action was warranted to serve the public interest.[12] NYAW respectfully submits that moving expeditiously to implement a permanent treatment facility to treat potable water used for cooking, bathing, washing and cleaning in order to rid it of contaminants that threaten public health and welfare is yet another example of a situation warranting a waiver under SAPA § 202(6).

30. In the matter at issue herein, establishment of permanent treatment protocols for the public drinking water supply warrants swift action. Adherence to routine SAPA procedural requirements would not, in this case, serve the public interest.

## VII. CONTACT INFORMATION

31. All communications and notices in relation to this proceeding should be addressed to Suzana Duby, Corporate Counsel, 167 J.F. Kennedy Parkway, Short Hills, New Jersey 07078.

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[12] See, *e.g.*, Case 08-E-0231, *I/M/O the Petition of Noble Altona Windpark, LLC, Noble Wethersfield Windpark, LLC, Noble Chateaugay Windpark, LLC, and Noble Bellmont Windpark, LLC for Emergency Approval of Financing Under Section 69 of the Public Service Law*; *see also* CASE 07-M-0954 - *Joint Petition of Orange and Rockland Utilities, Inc. and Sprint Spectrum, L.P. Request for Approval under Section 70 of the PSL for Attachment of Wireless Facilities to Transmission Facilities,* CASE 09-M-0683 - *Petition of Orange and Rockland Utilities, Inc. and New York SMSA Limited Partnership d/b/a Verizon Wireless for Approval Pursuant to Section 70 of the PSL for Authorization for Verizon Wireless' Existing Wireless Equipment Attached to Orange & Rockland's Electric Transmission Facilities (Tower 163),* CASE 09-M-0684 - *Petition of Orange and Rockland Utilities, Inc. and New York SMSA Limited Partnership d/b/a Verizon Wireless for Approval Pursuant to Section 70 of the PSL for Authorization for Verizon Wireless' Existing Wireless Equipment Attached to Orange & Rockland's Electric Transmission Facilities (Tower 46),* CASE 09-M-0685 - *Petition of Orange and Rockland Utilities, Inc. and New York SMSA Limited Partnership d/b/a Verizon Wireless for Approval Pursuant to Section 70 of the PSL for Authorization for Verizon Wireless' Existing Wireless Equipment Attached to Orange & Rockland's Electric Transmission Facilities (Pole 69C),* CASE 09-M-0686 - *Petition of Orange and Rockland Utilities, Inc. and New York SMSA Limited Partnership d/b/a Verizon Wireless for Approval Pursuant to Section 70 of the PSL for Authorization for Verizon Wireless' Existing Wireless Equipment Attached to Orange & Rockland's Electric Transmission Facilities (Pole 1),* and CASE 09-M-0687 - *Petition of Orange and Rockland Utilities, Inc. and New York SMSA Limited Partnership d/b/a Verizon Wireless for Approval Pursuant to Section 70 of the PSL for Authorization for Verizon Wireless' Existing Wireless Equipment Attached to Orange & Rockland's Electric Transmission Facilities (Tower 222),* Order Issued and Effective December 11, 2011.

## VIII. CONCLUSION

Based upon the foregoing, the Company hereby respectfully requests that the Commission issue an order approving, on a emergent basis, the Easement as set forth herein pursuant to Section 89-h of the PSL using the emergency procedures provided under SAPA § 202(6).

Respectfully submitted,
NEW YORK AMERICAN WATER COMPANY, INC.

By: /s/ Suzana Duby
Suzana Duby
Corporate Counsel

Dated: April 26, 2013

State of New York
Public Service Commission

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In the Matter of the Petition for Emergency Approval of Easement by and Between New York American Water Company, Inc. and United States Navy under PSL 89-h of the Public Service Law

**VERIFICATION**

Case 13-W-____

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STATE OF NEW YORK ) ss.:
COUNTY OF NASSAU )

Matthew Snyder, being duly sworn, deposes and says:

I am Matthew Snyder, Director of Operations of New York American Water Company, Inc. I am fully familiar with the facts presented in the petition for approval of the easement as they pertain to the location of the NYAW Seaman's Neck Road Facility and the nature of the contamination that the Navy proposes to remediate at this Facility, through the construction of the permanent treatment facilities, as set forth therein. The pertinent facts set forth within this petition regarding the historical overview of the remediation site (Operable Unit 2) and waste and handling practices at NWIRP-Bethpage are supported by Exhibits B and C to this petition.

I have read the foregoing Petition and know the contents thereof. The facts asserted in the above-referenced Petition as they pertain to the Facility, and the nature of the contamination that the Navy proposes to remediate at this Facility through the construction of the permanent treatment facilities, are true to the best of my knowledge.

Matthew Snyder
Name MATTHEW SNYDER
Title DIRECTOR OF OPERATIONS
NEW YORK AMERICAN

Sworn to before me this
26 day of April, 2013

(Notary Public)

JUSTYNA MAZEWSKA
Notary Public, State of New York
Qualified in Suffolk County
No. 01MA6268034
My Commission Expires 08-27-2016

617.20

# Appendix C

## State Environmental Quality Review

# SHORT ENVIRONMENTAL ASSESSMENT FORM

## For UNLISTED ACTIONS Only

### PART I - PROJECT INFORMATION (To be completed by Applicant or Project Sponsor)

1. APPLICANT/SPONSOR
New York American Water Company, Inc. (NYAW)

2. PROJECT NAME
Easement by and between NYAW and Dept. of the Navy

3. PROJECT LOCATION:
Municipality Seaford
County Nassau

4. PRECISE LOCATION (Street address and road intersections, prominent landmarks, etc., or provide map)
670 Seaman's Neck Road
Seaford, NY 11783

5. PROPOSED ACTION IS:
☐ New ☐ Expansion ☑ Modification/alteration

6. DESCRIBE PROJECT BRIEFLY:

Pursuant to its environmental and enforcement responsibilities under the CERCLA as amended, 42 USC 9601, et. seq., the Navy is performing remedial actions at NYAW's Seaman's Neck Road facility including the construction of a permanent treatment facility to address a release or threat of release of hazardous substances or pollutants that may impact the water supply plant at the facility.

7. AMOUNT OF LAND AFFECTED:
Initially ______ acres Ultimately ~0.25 acres

8. WILL PROPOSED ACTION COMPLY WITH EXISTING ZONING OR OTHER EXISTING LAND USE RESTRICTIONS?
☑ Yes ☐ No If No, describe briefly

9. WHAT IS PRESENT LAND USE IN VICINITY OF PROJECT?
☑ Residential ☑ Industrial ☑ Commercial ☐ Agriculture ☑ Park/Forest/Open Space ☐ Other
Describe:

10. DOES ACTION INVOLVE A PERMIT APPROVAL, OR FUNDING, NOW OR ULTIMATELY FROM ANY OTHER GOVERNMENTAL AGENCY (FEDERAL, STATE OR LOCAL)?
☑ Yes ☐ No If Yes, list agency(s) name and permit/approvals:

New York State Department of Environmental Conservation (approvals), Nassau County Department of Health (approvals), and the Department of the Navy (funding)

11. DOES ANY ASPECT OF THE ACTION HAVE A CURRENTLY VALID PERMIT OR APPROVAL?
☑ Yes ☐ No If Yes, list agency(s) name and permit/approvals:

NYSDEC - Record of Decision ("ROD"), Site #'s 1-30-003A & B, March 2001; ROD, Operable Unit 2, Groundwater NY State Registry 1-30-003B, January 2003, April 2003 (Revision 1)

12. AS A RESULT OF PROPOSED ACTION WILL EXISTING PERMIT/APPROVAL REQUIRE MODIFICATION?
☐ Yes ☑ No

I CERTIFY THAT THE INFORMATION PROVIDED ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE

Applicant/sponsor name: Suzana Duby Date: 4/26/13

Signature: Suzana Duby

**If the action is in the Coastal Area, and you are a state agency, complete the Coastal Assessment Form before proceeding with this assessment**

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## PART II - IMPACT ASSESSMENT (To be completed by Lead Agency)

A. DOES ACTION EXCEED ANY TYPE I THRESHOLD IN 6 NYCRR, PART 617.4? If yes, coordinate the review process and use the FULL EAF.

☐ Yes ☐ No

B. WILL ACTION RECEIVE COORDINATED REVIEW AS PROVIDED FOR UNLISTED ACTIONS IN 6 NYCRR, PART 617.6? If No, a negative declaration may be superseded by another involved agency.

☐ Yes ☐ No

C. COULD ACTION RESULT IN **ANY** ADVERSE EFFECTS ASSOCIATED WITH THE FOLLOWING: (Answers may be handwritten, if legible)

C1. Existing air quality, surface or groundwater quality or quantity, noise levels, existing traffic pattern, solid waste production or disposal, potential for erosion, drainage or flooding problems? Explain briefly:

C2. Aesthetic, agricultural, archaeological, historic, or other natural or cultural resources; or community or neighborhood character? Explain briefly:

C3. Vegetation or fauna, fish, shellfish or wildlife species, significant habitats, or threatened or endangered species? Explain briefly:

C4. A community's existing plans or goals as officially adopted, or a change in use or intensity of use of land or other natural resources? Explain briefly:

C5. Growth, subsequent development, or related activities likely to be induced by the proposed action? Explain briefly:

C6. Long term, short term, cumulative, or other effects not identified in C1-C5? Explain briefly:

C7. Other impacts (including changes in use of either quantity or type of energy)? Explain briefly:

D. WILL THE PROJECT HAVE AN IMPACT ON THE ENVIRONMENTAL CHARACTERISTICS THAT CAUSED THE ESTABLISHMENT OF A CRITICAL ENVIRONMENTAL AREA (CEA)?

☐ Yes ☐ No If Yes, explain briefly:

E. IS THERE, OR IS THERE LIKELY TO BE, CONTROVERSY RELATED TO POTENTIAL ADVERSE ENVIRONMENTAL IMPACTS?

☐ Yes ☐ No If Yes, explain briefly:

## PART III - DETERMINATION OF SIGNIFICANCE (To be completed by Agency)

**INSTRUCTIONS:** For each adverse effect identified above, determine whether it is substantial, large, important or otherwise significant. Each effect should be assessed in connection with its (a) setting (i.e. urban or rural); (b) probability of occurring; (c) duration; (d) irreversibility; (e) geographic scope; and (f) magnitude. If necessary, add attachments or reference supporting materials. Ensure that explanations contain sufficient detail to show that all relevant adverse impacts have been identified and adequately addressed. If question D of Part II was checked yes, the determination of significance must evaluate the potential impact of the proposed action on the environmental characteristics of the CEA.

☐ Check this box if you have identified one or more potentially large or significant adverse impacts which **MAY** occur. Then proceed directly to the FULL EAF and/or prepare a positive declaration.

☐ Check this box if you have determined, based on the information and analysis above and any supporting documentation, that the proposed action **WILL NOT** result in any significant adverse environmental impacts **AND** provide, on attachments as necessary, the reasons supporting this determination.

Name of Lead Agency

Date

Print or Type Name of Responsible Officer in Lead Agency

Title of Responsible Officer

Signature of Responsible Officer in Lead Agency

Signature of Preparer (If different from responsible officer)

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Exhibit A

# STATE OF NEW YORK

# DEPARTMENT OF STATE

I hereby certify that the annexed copy has been compared with the original document in the custody of the Secretary of State and that the same is a true copy of said original.

WITNESS my hand and official seal of the Department of State, at the City of Albany, on October 10, 2012.

Daniel E. Shapiro
First Deputy Secretary of State

Rev. 06/07

121004000892

## CERTIFICATE OF MERGER

## OF

## NEW YORK AMERICAN WATER COMPANY, INC.

## WITH AND INTO

## LONG ISLAND WATER CORPORATION

## UNDER SECTION 904 OF THE BUSINESS CORPORATION LAW

New York American Water Company, Inc., a New York corporation ("ANY"), and Long Island Water Corporation, a New York corporation ("LIAW"), DO HEREBY CERTIFY AS FOLLOWS:

FIRST: That ANY was originally incorporated under the laws of the State of New York with its certificate of incorporation filed with the New York Department of State on May 7, 1956 as Kingsvale Water Company, Inc., and changed its name on August 3, 2005 to "Aqua New York, Inc." and again on June 15, 2012 to "New York American Water Company, Inc."; and, that LIAW was originally incorporated under the laws of the State of New York with its certificate of incorporation filed with the New York Department of State on May 4, 1925, as the "Bellport Water Supply Company, Inc." and changed its name on May 6, 1925 to "Long Island Water Corporation."

SECOND: That a Plan of Merger dated as of May 1, 2012 (the "Plan of Merger") between ANY and LIAW has been approved, adopted, certified, executed and acknowledged by each of ANY and LIAW in accordance with the New York Business Corporation Law.

THIRD: That the designation and number, as of the date hereof, of outstanding shares of capital stock of each class of the ANY and LIAW are as follows:

(a) ANY: 1,500 shares of Common Stock with 1,000 shares outstanding, par value $100.00 per share, which are entitled to vote in connection with the Plan of Merger.

(b) LIAW: 225,000 shares of Common Stock with 225,000 shares outstanding, without par value, which are entitled to vote in connection with the Plan of Merger.

FOURTH: That the Plan of Merger has been authorized, with respect to ANY and LIAW, by the consent of each of their respective sole stockholders.

FIFTH: That the name of the surviving corporation (the "Surviving Corporation") shall be Long Island Water Corporation.

SIXTH: That the Certificate of Incorporation of LIAW, which was filed May 4, 1925 with the New York Secretary of State, shall, as amended, be the Certificate of Incorporation of the Surviving Corporation, and such Certificate shall be amended to change the name of the Surviving Corporation to "New York American Water Company, Inc."

SEVENTH: This merger shall be effective upon the filing of this Certificate of Merger.

IN WITNESS WHEREOF, ANY has caused this Certificate of Merger to be signed by William Varley, its President, and attested by Suzana Duby, its Secretary, and LIAW has caused this Certificate of Merger to be signed by William Varley, its President, and attested by Suzana Duby, its Secretary, each as of this 23rd day of October 2012.

[SIGNATURE PAGE FOLLOWS]

NEW YORK AMERICAN WATER COMPANY, INC.

By: ______________________
Title: PRESIDENT, WILLIAM VARLEY

ATTEST:

Secretary

LONG ISLAND WATER COMPANY

By: ______________________
Title: PRESIDENT, WILLIAM VARLEY

ATTEST:

Secretary

ENDORSED:

NEW YORK STATE PUBLIC SERVICE COMMISSION

By: Jaclyn A Brilling
Title: Secretary

121004000892

# Certificate of Merger

## Of

New York American Water Company, Inc.

**with and into**

Long Island Water Corporation

Pursuant to Section 904 of the Business Corporation Law

Filed by: Gregory G. Nickson
Cullen and Dykman, LLP
99 Washington Avenue, Suite 2020
Albany, NY 12210

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STATE OF NEW YORK
DEPARTMENT OF STATE
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# *STATE OF NEW YORK*

## *DEPARTMENT OF STATE*

I hereby certify that the annexed copy has been compared with the original document in the custody of the Secretary of State and that the same is a true copy of said original.

WITNESS my hand and official seal of the Department of State, at the City of Albany, on October 10, 2012.

Daniel E. Shapiro
First Deputy Secretary of State

Rev. 06/07

121004000884

# CERTIFICATE OF MERGER

# OF

# SEA CLIFF WATER COMPANY, INC.

# AND

# NEW YORK WATER SERVICE CORPORATION

# WITH AND INTO

# NEW YORK AMERICAN WATER COMPANY, INC.

# UNDER SECTION 904 OF THE BUSINESS CORPORATION LAW

Sea Cliff Water Company, Inc., a New York corporation ("SCWC"), New York Water Service Corporation, a New York corporation ("NYWSC") and New York American Water Company, Inc. ("NYAWC"), DO HEREBY CERTIFY AS FOLLOWS:

FIRST: (a) That SCWC was originally incorporated under the laws of the State of New York with its certificate of incorporation filed with the New York Secretary of State on March 17, 1898 as "Sea Cliff Water Company", and changed its name on July 29, 2004 to "Aquarion Water Company of Sea Cliff, Inc.", and again on May 2, 2007 to "Aqua New York of Sea Cliff, Inc." and again on June 14, 2012 to "Sea Cliff Water Company, Inc."; (b) that NYWSC was originally incorporated under the laws of the State of New York with its certificate of incorporation filed with the New York Secretary of State on February 28, 1888 as "Woodhaven Water Supply Company", and changed its name on December 21, 1926 to "New York Water Service Corporation", and again on May 19, 1960 to "Utilities & Industries Corp." and again on November 19, 1974 to "New York Water Service Corporation"; and (c) that NYAWC was originally incorporated under the laws of the State of New York with its certificate of incorporation filed with the New York Department of State on May 7, 1956 as Kingsvale Water Company, Inc., and changed its name on August 3, 2005 to "Aqua New York, Inc." and again on June 15, 2012 to "New York American Water Company, Inc."

SECOND: That a Plan of Merger dated as of May 1, 2012 (the "Plan of Merger") by and among SCWC, NYWSC and NYAWC has been approved, adopted, certified, executed and acknowledged by each of SCWC, NYWSC and NYAWC in accordance with the New York Business Corporation Law.

THIRD: That the designation and number, as of the date hereof, of outstanding shares of capital stock of each class of the SCWC, NYWSC and NYAWC are as follows:

(a) SCWC: 500 shares of Common Stock with 499 shares outstanding, par value $50.00 per share, which are entitled to vote in connection with the Plan of Merger.

(b) NYWSC: 2,500,000 shares of Common Stock with 1,837,235 shares outstanding, par value $2.00 per share, which are entitled to vote in connection with the Plan of Merger.

(c) NYAWC: 1,500 shares of Common Stock with 1,000 shares outstanding, par value $100.00 per share, which are entitled to vote in connection with the Plan of Merger.

FOURTH: That the Plan of Merger has been authorized, with respect to SCWC, NYWSC and NYAWC, by the consent of each of their respective sole stockholders.

FIFTH: That the name of the surviving corporation (the "Surviving Corporation") shall be New York American Water Company, Inc.

SIXTH: That the Certificate of Incorporation of NYAWC, which was filed May 7, 1956 with the New York Secretary of State, shall, as amended, be the Certificate of Incorporation of the Surviving Corporation.

SEVENTH: This merger shall be effective upon the filing of this Certificate of Merger.

IN WITNESS WHEREOF, SCWC has caused this Certificate of Merger to be signed by William Varley, its President, and attested by Suzana Duby, its Secretary, NYWSC has caused this Certificate of Merger to be signed by William Varley, its President, and attested by Suzana Duby, its Secretary and NYAWC has caused this Certificate of Merger to be signed by William Varley, its President, and attested by Suzana Duby, its Secretary, each as of this 2nd day of October 2012.

[SIGNATURE PAGE FOLLOWS]

NEW YORK AMERICAN WATER COMPANY, INC.

By:

Title: PRESIDENT, WILLIAM VARLEY

ATTEST:

Secretary

SEA CLIFF WATER COMPANY, INC.

By:

Title: PRESIDENT, WILLIAM VARLEY

ATTEST:

Secretary

NEW YORK WATER SERVICE CORPORATION

By:

Title: PRESIDENT, WILLIAM VARLEY

ATTEST:

Secretary

ENDORSED:

NEW YORK STATE PUBLIC SERVICE COMMISSION

By: Jaclyn A Brilling
Title: Secretary

121004000884

# Certificate of Merger

**Of**

Sea Cliff Water Company, Inc.

**and**

New York Water Service Corporation

**with and into**

New York American Water Company, Inc.

Pursuant to Section 904 of the Business Corporation Law

Filed by:
Gregory G. Nickson
Cullen and Dykman, LLP
99 Washington Avenue, Suite 2020
Albany, NY 12210

STATE OF NEW YORK
DEPARTMENT OF STATE
FILED OCT 04 2012
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2012 OCT -4 PM 3:06
FILED

2012 OCT -4 PM 2:22
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*State of New York*
*Department of State* } *ss:*

*I hereby certify that the annexed copy has been compared with the original document in the custody of the Secretary of State and that the same is a true copy of said original.*

*Witness my hand and seal of the Department of State on* AUG 12 1997

*Special Deputy Secretary of State*

DOS-1266 (5/96)

was filed by the Department of State on the 4th day of May, 1925.

3. The certificate of incorporation is amended as authorized by Section 801 of the Business Corporation Law to effect the following amendments:

a. To amend an Article that was designated as Article "Third" in the Certificate of Incorporation filed May 4, 1925 relating to the corporate purposes of the Corporation.

b. To renumber an Article that was designated as Article "Seventh" in the Certificate of Amendment filed December 2, F970808000443

# RESTATED CERTIFICATE OF INCORPORATION
# OF
# LONG ISLAND WATER CORPORATION
# PURSUANT TO SECTION 807 OF THE BUSINESS CORPORATION LAW

THE UNDERSIGNED, the President and Secretary, respectively, of LONG ISLAND WATER CORPORATION, pursuant to Section 807 of the Business Corporation Law, hereby certify as follows:

1. The name of the Corporation is LONG ISLAND WATER CORPORATION. The name under which the Corporation was formed is BELLPORT WATER SUPPLY COMPANY, INC.

2. The certificate of incorporation of the Corporation was filed by the Department of State on the 4th day of May, 1925.

3. The certificate of incorporation is amended as authorized by Section 801 of the Business Corporation Law to effect the following amendments:

a. To amend an Article that was designated as Article "Third" in the Certificate of Incorporation filed May 4, 1925 relating to the corporate purposes of the Corporation.

b. To renumber an Article that was designated as Article "Seventh" in the Certificate of Amendment filed December 2, 1949, and amended in the Certificate of Amendment filed May 7, 1974, relating to the increase of the number of authorized shares, as Article "Fourth" of the restated certificate of incorporation.

c. To renumber an Article that was designated as Article "Ninth" in the Certificate of Amendment filed December 2, 1949, relating to the designations, preferences, privileges and voting powers of the Preferred Stock and Common Stock and the restrictions or qualifications thereof, as Article "Fifth" of the restated certificate of incorporation.

d. To renumber Article "Fifth", relating to capital, as Article "Sixth" of the restated certificate of incorporation.

e. To renumber Article "Sixth", relating to the consideration for which authorized shares may be sold, as Article "Seventh" of the restated certificate of incorporation.

f. To renumber Article "Seventh", relating to the duration of the Corporation, as Article "Eighth" of the restated certificate of incorporation.

g. To renumber Article "Eighth", relating to the location of the principal office, as Article "Ninth" of the restated certificate of incorporation.

h. To renumber an Article that was designated as Article "Ninth" in the Certificate of Amendment filed March 6, 1947, relating to the number of directors, as Article "Tenth" of the restated certificate of incorporation.

i. To amend the provision in the certificate of incorporation, relating to the address to which the Secretary of State shall mail a copy of any process against the Corporation served upon him by designating the Secretary of State as agent of the Corporation and to number such provision as Article "Eleventh" of the restated certificate of incorporation.

j. To number the provision in the certificate of incorporation, relating to the designation of a registered agent as Article "Twelfth" of the restated certificate of incorporation.

k. To delete an Article that was designated as Article "Eighth" in the Certificate of Amendment filed December 2, 1949, relating to the change and reclassification of shares made by said amendment.

4. The text of the certificate of incorporation, as amended heretofore, is hereby restated as further amended to read as herein set forth in full:

FIRST: The name of the Corporation is LONG ISLAND WATER CORPORATION.

SECOND: The Corporation supplies water in the Town of Hempstead and the consents of the authorities of the Town of Hempstead have been obtained and are annexed hereto.

THIRD: The Corporation shall be authorized to purchase, acquire, hold and dispose of the stocks, bonds and other evidences of indebtedness of any corporation, domestic or foreign, and to issue in exchange therefor its stocks, bonds or other obligations, and in respect of any stocks so held shall possess and exercise all the rights, powers and privileges of individual owners or holders thereof, and to engage in any lawful act or activity for which corporations may be organized under the Business Corporation Law of the State of New York, provided that any act or activity requiring the consent or approval of any state official, department, board, agency or other body shall not be engaged in without such consent or approval first being obtained.

FOURTH: The total number of shares, including those previously authorized, which the Corporation may henceforth have is Two Hundred Thirty-six Thousand Two Hundred Fifty (236,250) of which Eleven Thousand Two Hundred Fifty (11,250) shares are to have a par value of One Hundred Dollars ($100) per share and shall be Preferred Stock and Two Hundred Twenty-five Thousand (225,000) shares are to be without par value and shall be Common Stock.

FIFTH: The designations, preferences, privileges and voting powers of the Preferred Stock and Common Stock and the restrictions or qualifications thereof are as follows:

> (1) The holders of the Preferred Stock shall be entitled to receive from the surplus of the Corporation available for dividends, but only if, as and when declared by the Board of Directors, dividends aggregating, but not exceeding One Dollar Twelve and One-Half Cents ($1.125) per share in any one quarterly period of three consecutive calendar months, payable on such date or dates as the Board of Directors shall from time to time determine. Such dividends shall be non-cumulative, even though earned, but shall be declared and paid or set aside in full for any period of three consecutive calendar months before any dividends shall be declared and paid or set aside on the Common Stock for the same period. Whenever the Board of Directors shall have declared such dividends upon the Preferred Stock for any period of three consecutive calendar months aggregating One Dollar Twelve and One-Half Cents ($1.125) per share and shall have paid the

same or set aside from its surplus a sum sufficient for the payment thereof, then, and not otherwise, and subject to any provisions herein inconsistent therewith, the holders of the Common Stock at the time outstanding shall be entitled to receive, but only if and when declared, out of any remaining surplus legally available for the payment of dividends, such dividends as may from time to time be declared by the Board of Directors.

(2) In the event of any liquidation, dissolution or winding up (whether voluntary or involuntary) of the Corporation, and the distribution among the stockholders thereof of the assets of the Corporation remaining after the payment of creditors,

(a) the holders of the Preferred Stock shall be entitled to be paid the sum of One Hundred Dollars ($100) per share; and

(b) after the payment to or the setting aside for the holders of the Preferred Stock of the amount above provided, but not otherwise, the remaining assets and funds shall be distributed wholly and exclusively among and paid to the holders of the Common Stock pro rata according to their respective shares.

In no event shall the holders of the Preferred Stock be entitled to participate in or receive any share of the assets (including surplus and profits) of the Corporation in excess of the amount per share specified in Clause (a) of this Subdivision (2) and dividends declared in accordance with Subdivision (1) hereof.

Any such distribution to either class of stock shall be subject, however, to the rights of the holders of any other class or classes of stock, if any, hereafter created and at the time outstanding.

(3) At the election of the Corporation, to be exercised by resolution of its Board of Directors, the Preferred Stock, in whole or in part, may be redeemed at any time and from time to time, on the first day of any month, upon thirty days previous notice given in such manner as may be prescribed by the by-laws or by resolution of the Board of

Directors, at the price of One Hundred Three Dollars ($103) per share. In the event that a part and not the whole of the Preferred Stock shall be redeemed, the shares to be redeemed shall be determined in such manner as shall be prescribed by the by-laws or by resolution of the Board of Directors. From and after the date fixed in any such notice as the date of redemption (unless default shall be made by the Corporation in the payment of the redemption price pursuant to such notice) all rights of the holders thereof as stockholders of the Corporation, except the right to receive the redemption price, without interest thereon, shall cease and terminate.

(4) The Preferred Stock shall be non-voting and in consideration of the preferences herein created in favor of the holders of the Preferred Stock, as aforesaid, the holders of the Preferred Stock, shall and do hereby waive and relinquish, in favor of the Common Stock, and are hereby specifically excluded from, all voice and vote in the election of directors, in the management of the Corporation, in any proceeding for mortgaging its property and franchises pursuant to Section Sixteen, for conferring on the holder of any debt or obligation the right to convert the principal thereof into stock pursuant to Section Sixteen, for the issuance of stock to employees pursuant to Section Fourteen, for guaranteeing the bonds of another corporation pursuant to Section Nineteen, for sale of its franchises and property pursuant to Section Twenty, for change of purposes, powers or provisions, number of directors or location of office pursuant to Section Thirty-Five, in any proceeding pursuant to Section Thirty-Five of the Stock Corporation Law except when the right to vote is specifically granted by Section Fifty-One of said Law; for consolidation pursuant to Section Eighty-Six, or for voluntary dissolution pursuant to Section One Hundred and Five, of the Stock Corporation Law, or pursuant to any amendment or amendments to said sections or any of them or to any section or sections substituted therefor or to any other provision of law now or hereafter in force, or for change of name pursuant to the General Corporation Law or other law, or in any other proceeding or upon or in respect of any other matter or question requiring the vote or consent of stockholders, now or hereafter provided by law, the Preferred Stock being specifically excluded from the right to vote in any such

proceeding or upon or in respect of any such matter or question as fully and with the same force and effect as if such proceeding, matter or question were expressly named herein; all such voice and vote being hereby vested exclusively in, and reserved to and for, the holders of the Common Stock. Nothing herein shall prevent the Board of Directors of the Corporation at any time from requesting or obtaining the vote or consent of the holders of the Preferred Stock whenever it may become necessary or requisite or desirable in the judgment of said Board to obtain the vote or consent of a specified percentage of the outstanding capital stock of the Corporation, without regard to the classification thereof, or a specified percentage of the outstanding shares of any one or more of such classes of stock; but nothing herein shall, or is intended to, authorize or empower the Board of Directors to waive, relinquish or impair the voting and other rights herein conferred upon the holders of the Common Stock.

(5) Upon any issuance for money or other consideration of any stock of the Corporation or of any security convertible into or carrying options or warrants to purchase any stock of the Corporation (hereinafter referred to as "Convertible Securities"), whether such stock or Convertible Securities are now or hereafter from time to time authorized, no holder of stock of any kind shall have any preemptive or other right to subscribe for, purchase or receive any proportionate or other share of the stock of Convertible Securities so issued; but the Board of Directors may dispose of all or any portion of such stock or Convertible Securities as and when it may determine, free of any such rights, whether by offering the same to stockholders or by sale or other disposition as said Board may deem advisable; provided, however, that if the Board of Directors shall determine to offer any new or additional shares of Common Stock (including, for the purposes of this paragraph (5), any security convertible into, or carrying options or warrants to purchase, Common Stock) for money, other than by (i) a public offering or (ii) an offering thereof to or through underwriters or investment bankers who shall agree promptly to make a public offering thereof, such shares shall first be offered substantially pro rata to the holders of the shares of the Common Stock of the Corporation

outstanding as of such record date as shall be fixed by the Board of Directors (but not more than 40 days prior to the mailing of the notice hereinafter provided for) upon terms and conditions which, in the judgment of the Board, shall be not less favorable to the stockholders than the terms and conditions upon which the stock is issued or proposed to be issued to persons other than stockholders, except that, in determining whether the terms and conditions upon which the stock is issued or proposed to be issued to stockholders are at least as favorable as those upon which the stock is issued or proposed to be issued to persons other than the stockholders, there shall not be deducted from the price at which the stock is sold or proposed to be sold to persons other than stockholders such reasonable compensation for the sale, underwriting or purchase of such shares by underwriters or dealers as may be fixed by the Board of Directors of the Corporation; and provided further, that the time within which such preemptive rights may be exercised may be limited by the Board of Directors to such time as the Board may deem proper, not less, however, than 15 days after the mailing of notice that such stock rights are available and may be exercised; and provided further that shares of Common Stock (including any security convertible into Common Stock) which have been offered to stockholders substantially pro rata and which have not been purchased by them within the time fixed by the Board may thereafter, unless otherwise prohibited by law, be issued, sold or optioned to any person or persons upon such terms and conditions as may be fixed by the Board.

The Corporation shall be entitled to treat the person in whose name any share or other security is registered as the owner thereof, for all purposes, and shall not be bound to recognize any equitable or other claim to or interest in such share or other security on the part of any other person, whether or not the Corporation shall have notice thereof, save as may be expressly provided by the laws of the State of New York, and any notice mailed to a person entitled to receive notice as in this paragraph (5) provided at his address as it appears on the stock transfer books of the Corporation shall be deemed to satisfy the requirements of this paragraph (5).

The Corporation from time to time may resell any of its own stock or Convertible Securities, purchased or otherwise acquired by it, at such price as may be fixed by its Board of Directors or Executive Committee.

The provisions of this paragraph (5) may be altered, amended, changed, added to or repealed by a vote only of the holders of Two-Thirds of all the shares of Common Stock then outstanding and entitled to vote.

(6) Dividends on all classes of stock shall be declared only when and as the Board of Directors shall in their sole discretion deem the same advisable, and only from the surplus of the Corporation as such shall be fixed and determined by said Board.

SIXTH: The capital of the Corporation shall be at least equal to the sum of the aggregate par value of all issued shares having par value, plus One Dollar ($1.00) in respect of every issued share without par value, plus such amounts as, from time to time, by resolution of the Board of Directors, may be transferred thereto.

SEVENTH: The sum of One Dollar ($1.00) per share is hereby prescribed as the consideration for which the Corporation may issue and sell its authorized shares without par value from time to time. The Corporation may also issue and sell its authorized shares without par value, from time to time, for such consideration as, from time to time, may be fixed by the Board of Directors.

EIGHTH: The Corporation shall exist perpetually.

NINTH: The principal office of the Corporation shall be located in the Village of Lynbrook, County of Nassau, New York.

TENTH: The number of directors of the Corporation shall be not less than three nor more than fifteen. Directors need not be stockholders.

ELEVENTH: The Secretary of State is designated as the agent of the Corporation upon whom process against the Corporation may be served. The post office address to which the Secretary of State shall mail a copy of process in any action or proceeding against the Corporation which may be served on him shall be c/o CT Corporation System, 1633 Broadway, New York, New York 10019.

TWELFTH: CT Corporation System, 1633 Broadway, New York, New York 10019 is designated as registered agent of the Corporation in New York upon whom all process against the Corporation may be served.

5. This amendment and restatement of the certificate of incorporation was authorized by the Board of Directors of the Corporation by unanimous written consent dated July 23, 1997 and by the written consent of the holder of all the outstanding

shares of Common Stock of the Corporation entitled to vote thereon dated July 24, 1997.

IN WITNESS WHEREOF, the undersigned have subscribed and Thomas J. Huber has verified this certificate this 6th day of August, 1997.

William J. Ring, President

Thomas J. Huber, Vice President,
Secretary, Comptroller and
Assistant Treasurer

STATE OF NEW YORK)
) SS.:
COUNTY OF NASSAU )

Thomas J. Huber, being duly sworn, deposes and says: that he is the Vice President, Secretary, Comptroller and Assistant Treasurer of Long Island Water Corporation; that the foregoing Certificate has been executed by authority of resolutions of the Board of Directors and of the sole stockholder adopted by written consents dated July 23, 1997 and July 24, 1997, respectively; that he has read and signed the foregoing Certificate and the statements contained therein are true.

Thomas J. Huber, Vice President,
Secretary, Comptroller and
Assistant Treasurer

Subscribed and sworn to before me
this 6th day of August, 1997.

Kelly Pedone

Notary Public

**KELLY PEDONE**
**Notary Public, State of New York**
**No. 01PE5030019**
**Qualified in Nassau County**
**Commission Expires July 5, 19**95

# Restated Certificate of Incorporation
# of
# Long Island Water Corporation

2.00 Mass

2.00

[illegible]

Mass

Filed By: Tobin and Dempf
33 Elk St.
Albany, NY 12207

# RECORD OF DECISION

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK
OPERABLE UNIT 2 - GROUNDWATER
NYS REGISTRY: 1-30-003B

PREPARED BY

ENGINEERING FIELD ACTIVITY, NORTHEAST
NAVAL FACILITIES ENGINEERING COMMAND
10 INDUSTRIAL HIGHWAY, MAIL STOP 82
LESTER, PENNSYLVANIA 19113-2090

JANUARY 2003
APRIL 2003 (REVISION 1)

# TABLE OF CONTENTS

**SECTION**

**FIGURES**

**APPENDIX**

# DECLARATION STATEMENT – RECORD OF DECISION

## Site Name and Location

Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage
Town of Oyster Bay
Nassau County, New York
New York Registry Number: 1-30-003B
Funding Source: Environmental Restoration, Navy (ER,N)

## Statement of Basis and Purpose

This Record of Decision (ROD) document presents the selected remedial action for Operable Unit (OU) 2 – Groundwater at the Naval Weapons Industrial Reserve Plant (NWIRP) in Bethpage, New York. The Department of Navy (Navy), in consultation with New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH), is issuing this remedy in accordance with New York State applicable requirements. The site is not listed on the National Priorities List (NPL); however, a copy of this document will be sent to the USEPA Region II offices for information.

The Navy's decision for groundwater is based on the Administrative Record for NWIRP Bethpage. A listing of the documents in the Administrative Record are provided in Appendix B of this ROD. The Navy's remedy for groundwater was also based upon public input to a Proposed Remedial Action Plan (PRAP) for regional groundwater prepared and presented by NYSDEC in December 2000. NYSDEC then issued *a Record of Decision for Operable Unit 2 Groundwater Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites, Nassau County Site Numbers 1-30-003A&B* in March 2001. Much of the information presented in this Navy ROD for Groundwater was taken from the NYSDEC OU 2 ROD referenced above.

## Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action described in this Record of Decision, present a current or potential threat to human health and the environment.

## Description of the Selected Remedy

*The remedial action described in this document represents the second remedial phase or operable unit* involving the NWIRP Bethpage site. It addresses on-site contaminated groundwater beneath the Navy's 105-acre parcel and it also addresses contaminated groundwater that, over the years, has migrated off-site beyond the boundaries of NWIRP Bethpage. In addition, there also exists groundwater contamination from other source areas from neighboring property owned by the Northrop Grumman Corporation (NGC). Due to the existence and proximity of these groundwater contaminant plumes, NYSDEC issued a Record of Decision for "regional groundwater" that described a remedial strategy to address contaminated groundwater beneath both Navy and NGC property and also addresses that portion of contaminated groundwater that has migrated downgradient of both properties into the surrounding community. The United States Environmental Protection Agency (USEPA) Region II previously issued a Record of Decision in September 2000 for that portion of the groundwater contaminant plume that lies beneath and downgradient of property owned by Occidental Chemical since this facility is presently designated as a National Priorities List (NPL) site.

The NYSDEC Groundwater ROD was based on the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Northrop Grumman and the Naval Weapons Industrial Reserve Plant Class 2 Inactive Hazardous Waste Disposal Sites and the criteria identified for evaluation of alternatives. The selected remedy included a number of response measures that were categorized into a Groundwater Remedial Program and *a Public Water Supply Protection Program.*

This document describes those components of NYSDEC's OU 2 ROD that will be implemented by the Department of Navy subject to the availability of Environmental Restoration, Navy (ER,N) funds in future fiscal years that will allow for implementation of the various remedial groundwater components discussed below.

NYSDEC's Groundwater ROD discusses regional groundwater beneath the Navy and NGC properties plus the downgradient components of these plumes as a single entity or operable unit. For the purposes of the Navy's Groundwater ROD, groundwater has been subdivided into an on-site and off-site component. The Navy's selected remedy for ON-SITE GROUNDWATER includes the following:

1. An **institutional control** consisting of the placement of a restriction in the deed of transfer to the County of Nassau, New York prohibiting extraction of groundwater from within the boundaries of the 105-acre or Plant 20 parcels located at the Navy's former Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage facility. In order to aid in the compliance with the deed restriction, the Navy has completed the abandonment of the seven (7) deep production wells formerly located on the 105-acre parcel. The production wells were used for the extraction of groundwater as non-contact cooling water to support

operations conducted by NGC during a time when Northrop Grumman leased the 105-acres from the Navy. If a future occupant of the Navy's 105-acre parcel wishes to pursue groundwater extraction, language will be included in the appropriate deed(s) of transfer requiring prior notification to and securing written permission from the Nassau County Department of Health and/or NYSDEC.

Further, the selected remedy for ON-SITE GROUNDWATER is also based on the recognition that an existing groundwater extraction and treatment system, known as the Onsite Containment (ONCT) System, continues to contain and remediate VOC-contaminated groundwater emanating from the Navy's property. The ONCT system was constructed, and is currently being operated on an annual basis, by the Northrop Grumman Corporation and was installed as a component of NYSDEC's Regional Groundwater ROD. The Navy recognizes that continued operation of the ONCT system is paramount to ensuring that the Navy's selected remedy for ON-SITE GROUNDWATER remains protective of human health and the environment. In the event that the ONCT system fails to continue to operate along with the corresponding long-term maintenance and monitoring program for the ONCT system, the Navy also recognizes that it's ON-SITE GROUNDWATER remedy would no longer be protective of human health or the environment. In this case, the Navy will re-evaluate the protectiveness of the ON-SITE GROUNDWATER remedy and implement all requisite measures as determined by the Navy in consultation with NYSDEC, NYSDOH, and the Nassau County Department of Health to ensure the continued protection of human health and the environment.

As stated above, NYSDEC's selected remedy for groundwater included a number of response measures that were categorized into a Groundwater Remedial Program and a Public Water Supply Protection Program. The components of these two programs for which the Department of Navy has agreed to implement are all considered to be located off of Navy property and are, therefore, being considered as OFF-SITE GROUNDWATER issues. The Navy's selected remedy for OFF-SITE GROUNDWATER includes the following:

### Groundwater Remedial Program

- mass contaminant removal through groundwater extraction and treatment in an offsite area near the GM 38 monitoring well cluster;
- pre-design investigation to determine the optimal groundwater extraction location(s) in the GM 38 offsite treatment area(s);
- operation and maintenance of the GM 38 area remedy;

- additional groundwater investigation in the vicinity of well GM-75D2, or any other area identified as requiring additional groundwater investigation, in order to determine whether groundwater contamination represents a significant threat to downgradient public water supply wells and to further determine if a contaminant mass removal program, similar to the GM-38 Area program, is necessary. These actions will be implemented if a determination has been made by the Navy and NYSDEC that a significant threat to a downgradient public water supply exists.
- continued participation on the Technical Advisory Committee (TAC) that was established by NYSDEC that is comprised, at a minimum, of the involved regulatory Agencies, participating local water districts, and the Northrop Grumman Corporation.

## Public Water Supply Protection Program

The Navy recognizes the importance of continued provision of potable water to those communities/populations served by water supply wells that are, or that may become, impacted by site-related contamination. To this end, the NYSDEC Groundwater ROD required that a public water supply protection program be implemented. The components of this program for which the Department of Navy will implement include:

- installation of Vertical Profile Borings (VPBs) to gather water quality and lithologic data that will be used in the regional groundwater computer model to aid in the placement of outpost monitoring wells;
- development of a Public Water Supply Well Contingency Plan that uses data gathered during the VPB installation program and the regional groundwater computer model to identify the locations of the outpost monitoring wells and to also assign "trigger values" to each outpost well in order to determine if treatment or other comparable alternative measure will be required for other public water supply wellfields located downgradient of the VOC-contaminant plume. If triggered, this will alert the Navy to begin discussions with the appropriate water district regarding various treatment alternatives;
- installation of the outpost monitoring wells in areas upgradient of potentially affected water supply wellfields as outlined in the Public Water Supply Well Contingency Plan. To date, the regional groundwater computer model is predicting potential future impacts to the South Farmingdale Water District (SFWD) Wellfield that contains Well 4043 and a separate SFWD Wellfield containing Well 6150, as well as to the New York Water Service (NYWS) Wellfield containing Well 8480. If future modeling efforts suggest that a water supply well may be impacted within some reasonable timeframe and it has been further determined that the projected contaminant flow path will not intercept an existing outpost monitoring well, then additional outpost monitoring well(s) would be designed, installed, and monitored.

- public water supply wellhead treatment or comparable alternative measures, as necessary, for the wellfields that become affected in the future, including but not limited to the wells listed above, from site-related contaminants.
- provision of public water to residential or commercial users that have private drinking water wells determined to be affected or potentially affected by the offsite migration of site-related contaminants.

It should be noted that another component of the Public Water Supply Protection Program was the treatment of wellfields 4, 5, and 6 associated with the Bethpage Water District (BWD). Wells at these Plants had either been, or would likely be, adversely impacted by VOC-contaminated groundwater emanating from Navy and NGC properties prior to issuance of NYSDEC's Groundwater ROD in 2001. Due to the immediate threat to public health, the Navy supplied funding to BWD, in June 1996, for the construction and 30-year operation of an air stripping treatment system for BWD's Plant 5 facility. This action was considered to be an interim action that was part of the Navy's Operable Unit 1 Soils ROD issued by the Navy in July 1995. In the mid-1990's, NGC took similar action to protect the water supplies at BWD Plants 4 and 6. In the event that the treatment systems installed on BWD Plants 4 and 6 are no longer funded, the Navy recognizes that its OFF-SITE GROUNDWATER remedy would no longer be protective of human health or the environment. In this case, the Navy will re-evaluate the protectiveness of the OFF-SITE GROUNDWATER remedy and implement all requisite measures as determined by the Navy in consultation with NYSDEC, NYSDOH, and the Nassau County Department of Health to ensure the continued protection of human health and the environment.

## Regulatory Acceptance

The New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH) concur with the components identified in this document and that their implementation will result in the protection of human health and the environment. In addition, NYSDEC has indicated that the Navy's ROD for Groundwater would have to include all elements of the remedial strategy outlined in NYSDEC's OU 2 ROD issued in March 2001 before State concurrence would be issued. However, the only components of NYSDEC's OU 2 ROD that are not included in the Navy's ROD for Groundwater is the continuing operation of the ONCT system, monitoring of the permanent groundwater well network and continued payments to Bethpage Water District for the Plants 4 and 6 treatment systems. Therefore, the Navy feels that with these components already in place and being operated by another party, it is not necessary for the Navy to include them in this document. Further, the Navy recognizes that the continued operation of the ONCT system is paramount to ensuring that the Navy's ROD remains protective of human health and the environment. In the event that the other party fails to continue to operate the ONCT system or the corresponding maintenance and monitoring program associated with the ONCT system, or fails to continue to provide funding for BWD Plants 4 and 6, then the Navy also recognizes that the Navy would have to re-evaluate the effectiveness of the on-site and off-site remedies and propose changes that would ensure that the remedies remains protective of human health and the environment.

## Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable to the remedial action to the extent practicable. Because this remedy will result in hazardous substances remaining at the Site above levels that allow for unlimited use of and unrestricted exposure to the Site, a review will be conducted at least every five years after commencement of remedial action to ensure that the remedy continues to be protective of human health and the environment.

13 APRIL 03
**Date**

Francis P Castaldo
FRANCIS P. CASTALDO, CAPT, CEC, USN
Deputy, Shore Station Management
Naval Air Systems Command

# RECORD OF DECISION
## OPERABLE UNIT 2
## Naval Weapons Industrial Reserve Plant
## Bethpage, New York
## January 2003
## April 2003 (Revision 1)

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## SECTION 1: SUMMARY OF THE RECORD OF DECISION

The Department of Navy in consultation with the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health has selected this remedy to address the significant threat to human health and/or the environment created by the presence of hazardous waste at the Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, an inactive hazardous waste disposal site. In particular, this ROD addresses contaminated groundwater located beneath NWIRP Bethpage and also includes a portion of contaminated groundwater that has migrated off of NWIRP Bethpage property. As more fully described in Sections 3 and 4 of this document, historical operations that resulted in hazardous material generation at the facility included, but were not limited to, metal finishing processes, maintenance operations, painting of aircraft and components and other activities that involve aircraft manufacturing. Wastes generated by plant operations were disposed directly into either drainage sumps, dry wells and/or on the ground surface resulting in the disposal of a number of hazardous wastes, including the volatile organic compounds (VOCs) perchloroethene (PCE) and trichloroethene (TCE), the semi-volatile organic compound (SVOC) polychlorinated biphenyls (PCBs) and the inorganics chromium and cadmium at the site. Some of these contaminants have migrated from the points of disposal to surrounding areas, including the soils of these sites and the groundwater beneath and downgradient of NWIRP Bethpage property.

These disposal activities have resulted in the following significant threats to the public health and/or the environment:

- a significant threat to public health associated with contaminated soils, groundwater and drinking water;
- a significant threat to the environment associated with contaminated soils and groundwater.

A previous record of decision for soils (Operable Unit 1) was issued by the Navy in July 1995 and is currently being implemented to address the significant threat to human health and the environment from the hazardous waste disposal activities mentioned above.

The Department of Navy is the lead agency for this project and provides funding for remedial activity to address contamination that has occurred on or has emanated from Navy-owned property. This authority has been delegated to the Department of Navy as part of Presidential Executive Order 12580. Regarding groundwater, the remedy discussed below was selected by the Department of Navy in order to eliminate the significant threats to the public health and/or the environment to the maximum extent practicable caused by the hazardous waste disposal activities that occurred at NWIRP Bethpage.

The Navy's selection, however, was heavily based upon a Record of Decision for Regional Groundwater developed by NYSDEC to address groundwater contaminant plumes located beneath properties owned by the Navy as well as property's owned by the Northrop Grumman and Occidental Chemical Corporations. NYSDEC's Operable Unit 2 ROD described a remedial strategy that would address contaminated groundwater beneath both Navy and Northrop Grumman Corporation (NGC) property and also addresses that portion of contaminated groundwater that has migrated downgradient of both properties into the surrounding community. The United States Environmental Protection Agency (USEPA) Region II previously issued a Record of Decision in September 2000 for that portion of the groundwater contaminant plume that lies beneath and downgradient of property owned by Occidental Chemical since this facility is presently designated as a National Priorities List (NPL) site.

NYSDEC's Groundwater ROD discusses regional groundwater beneath the Navy and NGC properties plus the downgradient components of these plumes as a single entity or operable unit. The Navy's ROD, however, will describe those components of NYSDEC's Groundwater ROD that will be implemented by the Department of Navy. For the purposes of the Navy's Groundwater ROD, groundwater has been subdivided into an on-site and off-site component. The Navy's selected remedy for ON-SITE GROUNDWATER includes the following:

1. An **institutional control** consisting of the placement of a restriction in the deed of transfer to the County of Nassau, New York prohibiting extraction of groundwater from within the boundaries of the 105-acre or Plant 20 parcels located at the Navy's former Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage facility. In order to aid in the compliance with the deed restriction, the Navy has completed the abandonment of the seven (7) deep production wells formerly located on the 105-acre parcel. The production wells were used for the extraction of groundwater as non-contact cooling water to support operations conducted by NGC during a time when Northrop Grumman leased the 105-acres from the Navy. If a future occupant of the Navy's 105-acre parcel wishes to pursue groundwater extraction, language will be included in the appropriate deed(s) of transfer requiring prior notification to and securing written permission from the Nassau County Department of Health and/or NYSDEC.

Further, the selected remedy for ON-SITE GROUNDWATER is also based on the recognition that an existing groundwater extraction and treatment system, known as the Onsite Containment (ONCT) System, continues to contain and remediate VOC-contaminated groundwater emanating from the Navy's property. The ONCT system was constructed, and is currently being operated on an annual basis, by the Northrop Grumman Corporation and was installed as a component of NYSDEC's Regional Groundwater ROD. The Navy recognizes that continued operation of the ONCT system is paramount to ensuring that the Navy's selected remedy of ON-SITE GROUNDWATER remains protective of human health and the environment. In the event that the ONCT system fails to continue to operate, along with the corresponding long-term maintenance and monitoring program for the ONCT system, the Navy also recognizes that it's ON-SITE GROUNDWATER remedy would no longer be protective of human health or the environment. In this case the Navy will re-evaluate the protectiveness of the selected remedy for ON-SITE GROUNDWATER and implement all requisite measures as determined by the Navy in consultation with NYSDEC, NYSDOH, and the Nassau County Department of Health to ensure the continued protection of human health and the environment.

As stated above, NYSDEC's selected remedy for groundwater included a number of response measures that were categorized into a Groundwater Remedial Program and a Public Water Supply Protection Program. The components of these two programs for which the Department of Navy has agreed to implement are all considered to be located off of Navy property and are, therefore, being considered as OFF-SITE GROUNDWATER issues. The Navy's selected remedy for OFF-SITE GROUNDWATER includes the following:

**Groundwater Remedial Program**

- mass contaminant removal through groundwater extraction and treatment in an offsite area near the GM38 monitoring well cluster;
- pre-design investigation to determine the optimal groundwater extraction location(s) in the GM 38 offsite treatment area(s);
- operation and maintenance of the GM38 area remedy;
- additional groundwater investigation in the vicinity of well GM-75D2, or any other area identified as requiring additional groundwater investigation, in order to determine whether groundwater contamination represents a significant threat to downgradient public water supply wells and to further determine if a contaminant mass removal program, similar to the GM-38 Area program, is necessary. These actions will be implemented if a determination has been made by the Navy and NYSDEC that a significant threat to a downgradient public water supply exists.

- continued participation on the Technical Advisory Committee (TAC) that was established by NYSDEC that is comprised, at a minimum, of the involved regulatory Agencies, participating local water districts, and the Northrop Grumman Corporation.

**Public Water Supply Protection Program**

The Navy recognizes the importance of continued provision of potable water to those communities/populations served by water supply wells that are, or that may become, impacted by site-related contamination. To this end, the NYSDEC Groundwater ROD required that a public water supply protection program be implemented. The components of this program for which the Department of Navy will implement include:

- installation of Vertical Profile Borings (VPBs) to gather water quality and lithologic data that will be used in the regional groundwater computer model to aid in the placement of outpost monitoring wells;
- development of a Public Water Supply Well Contingency Plan that uses data gathered during the VPB installation program and the regional groundwater computer model to identify the locations of the outpost monitoring wells and to also assign "trigger values" to each outpost well in order to determine if treatment or other comparable alternative measure will be required for other public water supply wellfields located downgradient of the VOC-contaminant plume. If triggered, this will alert the Navy to begin discussions with the appropriate water district regarding various treatment alternatives;
- installation of the outpost monitoring wells in areas upgradient of potentially affected water supply wellfields as outlined in the Public Water Supply Well Contingency Plan. To date, the regional groundwater computer model is predicting potential future impacts to the South Farmingdale Water District (SFWD) Wellfield that contains Well 4043 and a separate SFWD Wellfield containing Well 6150, as well as to the New York Water Service (NYWS) Wellfield containing Well 8480. If future modeling efforts suggest that a water supply well may be impacted within some reasonable timeframe and it has been further determined that the projected contaminant flow path will not intercept an existing outpost monitoring well, then additional outpost monitoring well(s) would be designed, installed, and monitored.
- public water supply wellhead treatment or comparable alternative measures, as necessary, for the wellfields that become affected in the future, including but not limited to the wells listed above, from site-related contaminants.
- The provision of public water to residential or commercial structures that have private drinking water wells determined to be affected or potentially affected by the offsite migration of the NWIRP groundwater plume.

It should be noted that another component of the Public Water Supply Protection Program was the treatment of wellfields 4, 5, and 6 associated with the Bethpage Water District (BWD). Wells at these Plants had either been, or would likely be, adversely impacted by VOC-contaminated groundwater emanating from Navy and NGC properties prior to issuance of NYSDEC's Groundwater ROD in 2001. Due to the immediate threat to public health, the Navy, in June 1996, supplied funding to BWD for the construction and 30-year operation of an air stripping treatment system installed on the BWD Plant 5 facility. This action was considered to be an interim action that was part of the Navy's Operable Unit 1 Soils ROD issued by the Navy in July 1995. In the mid-1990's, NGC took similar action to protect the water supplies at BWD Plants 4 and 6. In the event that the treatment systems installed on BWD Plants 4 and 6 are no longer funded, the Navy recognizes that its OFF-SITE GROUNDWATER remedy would no longer be protective of human health or the environment. In this case, the Navy will re-evaluate the protectiveness of the OFF-SITE GROUNDWATER remedy and implement all requisite measures as determined by the Navy in consultation with NYSDEC, NYSDOH, and the Nassau County Department of Health to ensure the continued protection of human health and the environment.

## SECTION 2: SITE LOCATION AND DESCRIPTION

NWIRP Bethapge is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The Navy's property totaled approximately 109.5 acres and was formerly a Government-Owned Contractor-Operated (GOCO) facility that was operated by the Northrop Grumman Corporation (NGC) until September 1998. As shown on Figure 1, NWIRP Bethpage is bordered on the north, west, and south by property owned, or formerly owned, by NGC that covered approximately 605 acres, and, on the east, by a residential neighborhood.

NWIRP Bethpage is currently listed by NYSDEC as an "inactive hazardous waste site" (#1-30-003B) as is the Northrop Grumman Corporation (#1-30-003A) and the Hooker/RUCO site (#1-30-004) located less than 1/2 mile west of the NWIRP Bethpage.

## SECTION 3: SITE HISTORY

### 3.1: Operational/Disposal History

NWIRP Bethpage was established in 1933. Since its inception, the primary mission for the facility has been the research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft.

The facilities at NWIRP Bethpage include four plants (No. 3, 5, and 20, used for assembly and prototype testing; and No. 10, which contains a group of quality control laboratories), two warehouse complexes, a salvage storage area, water recharge basins, an industrial wastewater treatment plant, and several smaller support buildings.

The following is a discussion of the waste handling practices at the three identified disposal areas at the NWIRP facility (see Figure 2 for area locations):

Site 1 - Former Drum Marshaling Area

From the early 1950's to 1978, drums containing liquid wastes were stored on a cinder covered area over a cesspool leach field. This leach field may have been used to discharge process wastewater. In 1978, the drum storage area was moved a few yards to the south to a 100- by 100-foot concrete pad. This pad did not have a cover or berms around it. In 1982, the drum storage area was moved to Site 3.

Various solvents were stored at Site 1. Cadmium and cyanide wastes were also stored in this area from the early 1950's through 1974. Approximately 200 to 300 drums were stored at these locations at any given time. Reportedly, all drums of waste, which were stored at these areas, were taken offsite by a private contractor for treatment and disposal.

Site 2 - Recharge Basin Area

Prior to 1984, some Plant 3 production-line rinse waters were discharged in the three on-site recharge basins. These waters were directly exposed to chemicals used in the industrial processes (rinsing of manufactured parts). Only non-contact cooling water has been discharged into these basins since 1984. The source of this non-contact cooling water has been on-site production wells.

On at least one occasion (1956), hexavalent chromium was detected in the water in the recharge basins at concentrations in excess of allowable limits. This matter was discovered and handled by the Nassau County Department of Health.

Adjacent to and west of the recharge basins are the former sludge drying beds. Sludge from the Plant 2 Industrial Waste Treatment Plant (part of the Grumman Site as described above) was dewatered in these beds before being disposed of off-site.

Site 3 - Salvage Storage Area

The NWIRP salvage storage area is located to the west of Site 2. This area has been used for the storage of fixtures, tools, and metallic wastes such as aluminum and titanium scraps, since the early 1950's.

Located within the salvage storage area was a 100 by 100-foot area that was used for the storage of drummed waste. This 100 by 100-foot area was reportedly covered with coal ash cinders. Halogenated and non-halogenated waste solvents were stored in this area from the early 1950's through 1969. The exact location of this drum storage area is not known. Since 1982, drums have been stored in a covered area with a concrete pad and berms.

## 3.2: Remedial History

An Initial Assessment Study was conducted at the NWIRP-Bethpage site in 1986. Based upon the results of this study, it was concluded that three areas at the site posed a threat to human health or the environment. A description of the NWIRP sites is presented in Section 3.1. In March 1993, NYSDEC listed the NWIRP as a separate Class 2 Registry Site, distinct from the Northrop Grumman Site.

An RI/FS was conducted at the site from August 1991 through July 1995. The purpose of the RI was to determine the nature and extent of the contamination that was found during the Initial Assessment Study. The OU-1 NWIRP ROD called for addressing soils contamination at the three areas of concern. The NWIRP remedies called for the excavation and removal of specific areas of PCB and solvent contamination and the reduction of soils to be excavated by the implementation of a soil vapor extraction system in conjunction with shallow groundwater remediation through air sparging.

## 3.3: Enforcement History

The United States Navy has undertaken their environmental studies pursuant to the Navy's Installation Restoration Program. The State of New York provides oversight of the work conducted by the Navy pursuant to a Memorandum of Understanding between the State and the Department of Defense.

### Resource Conservation and Recovery Act

The Navy's property is also under a Resource Conservation and Recovery Act (RCRA) program that is regulated under 6 NYCRR Part 373. This is New York State's permitting process for facilities that are designated as a large quantity generator of hazardous waste and ultimately the closure process for active facilities that store, generate, and treat hazardous wastes over a certain quantity as defined under this regulation. The RCRA program as promulgated under NYSDEC regulations is authorized by the USEPA to issue RCRA permits.

## SECTION 4: SITE CONTAMINATION

To evaluate the contamination present at the site and to evaluate alternatives to address the significant threat to human health and the environment posed by the presence of hazardous waste, the Navy has conducted a basewide remedial investigation and feasibility study (RI/FS).

### 4.1: Summary of the Remedial Investigation and Feasibility Study

The purpose of the RI was to define the nature and extent of any soil and groundwater contamination resulting from previous activities at the Site. The RI was conducted in two phases. The first phase was conducted between February 1991 and October 1991 and the second phase between August 1992 and September 1993. Two reports were prepared entitled "Final Remedial Investigation Report NWIRP, May 1992," and "Phase 2 Remedial Investigation Report, NWIRP, October 1993," that described the field activities and findings of the RIs in detail.

The following environmental investigation techniques were used in order to achieve the goals for the RIs:

- Soil gas surveys were conducted in various locations throughout the site in order to locate potential areas that could be sources of groundwater contamination.
- Soil samples were collected in various locations throughout the site to confirm the results of the soil gas surveys and to identify source areas that could not initially be located using soil gas techniques.
- Groundwater samples were collected from monitoring wells that were installed as part of the two Remedial Investigations and by other organizations (such as the United States Geological Survey).

After completion of the Remedial Investigation, a Feasibility Study (FS) was developed. The objectives of this study were to take the information gathered during both phases of the RI and develop remedial action objectives and goals for soils and, to a limited extent groundwater, that would minimize and/or prevent risks to human health and the environment while complying with ARARs.

A Proposed Remedial Action Plant (PRAP) was prepared for soils and a Record of Decision for soils, designated as Operable Unit (OU) 1, was issued by the Navy in July 1995. As mentioned earlier, the Navy is currently implementing the various components of the OU 1 Soils ROD.

### 4.1.1: Site Geology and Hydrogeology

The sites are underlain by five geologic/hydrogeologic formations (descending from ground surface):

- Pleistocene deposits (Upper Glacial Aquifer) consisting of various sands and gravels intermixed with discontinuous low permeability clay lenses, approximately 100 feet thick
- Magothy Formation (Magothy Aquifer) consisting of various sands and gravels varying in thickness interlaced with low permeability confining layers,
- Raritan Clay Formation
- Lloyd Sand Formation (Lloyd Aquifer)
- Bedrock

The Upper Glacial Formation (commonly referred to as glacial deposits) forms the surface deposits across the entire NWIRP. The glacial deposits beneath the site consist of coarse sands and gravels. These deposits are generally about 30 to 45 feet thick; local variations in thickness are common due to the irregular and undulating interface of the glacial deposits with the underlying Magothy Formation. The interface between the two formations was defined in the field as the horizon where gravel becomes very rare to absent, and finer sands, silts, and clays predominate. The generally coarse nature of both formations near their interface, however, may make this differentiation either difficult or rather subjective.

The results of the drilling program at the facility appear to confirm the regional observation that there are no singular, extensive clay units beneath the NWIRP. Clay units encountered at any particular location do not persist along strike or in either direction of dip. The stratigraphic section at and below subsurface depths of about 100 feet may be considered "clay-prone" because the number of individual clay units significantly increases below this depth, but none of these clays are laterally persistent.

The Upper Glacial Formation and the Magothy Formation comprise the aquifer of concern at the NWIRP. Regionally, these formations are generally considered to form a common, interconnected aquifer as the coarse nature of each unit near their interface and the lack of any regionally confining clay unit allow for the unrestricted flow of groundwater between these two formations.

Although the water table beneath the NWIRP occurs below the glacial deposits, these deposits are hydrogeologically important because their high permeability allows for the rapid recharge of precipitation to the underlying Magothy Formation. In addition, the large quantities of groundwater withdrawn daily from the Magothy passes back through part of the glacial deposits via the recharge basins to the Magothy Formation. The Magothy aquifer is the major source of public water in Nassau County. The most productive water-bearing zones are the discontinuous lenses of sand and gravel that occur within the generally siltier matrix. The major water-bearing zone is the base gravel.

The Magothy aquifer is commonly regarded to function as an unconfined aquifer at shallow depths and a confined aquifer at deeper depths. Drilling at Bethpage has revealed that clay zones beneath the facility are common but laterally discontinuous. No confining clay units of facility-wide extent were encountered.

The groundwater beneath the NWIRP dominantly flows to the southwest and, to a lesser extent, top the south. The flow is greatly influenced by groundwater mounding that occurs at the recharge basins, and by the withdrawal of water at numerous facility wells. The wells have the potential to significantly change the local flow pattern. These wells were operated on an irregular basis and in various combinations. Consequently, their influence on the local flow at any time was difficult to predict.

The horizontal hydraulic gradient varies throughout the facility due to the recharge basins and the facility wells. The average gradient calculated across the facility is 5.3 feet/mile, which is significantly lower than the published regional gradient of 10 feet/mile. The average linear velocity of the groundwater at the water table is estimated to range from 0.2 feet/day to 0.9 feet/day, which is significantly less that the previously estimate of 50 to 70 feet/day. The facility occupies an area of recharge. Vertical hydraulic gradients are downward, but are very low, and this agrees with previously published regional data.

### 4.1.2: Regional Groundwater Study

Around the same time as the Navy was conducting it's basewide investigation of soils and groundwater, NGC was conducting similar investigations on it's property. Due to the proximity of Navy contaminated groundwater with NGC contaminated groundwater, an approach was taken to combine the analytical data gathered by both agencies and investigate groundwater on a regional basis. To determine whether the groundwater was contaminated at levels of concern, the analytical data collected from both the Navy and NGC RI efforts were compared to environmental Standards, Criteria, and Guidance values (SCGs). Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, it was determined that the groundwater required remediation.

The information gathered from the onsite and offsite groundwater contamination associated with NGC and NWIRP Bethpage was used to screen alternatives in a combined Navy-NGC Regional Groundwater Feasibility Study. The results of the FS have estimated that the groundwater plume extends over an area of more than 2,000 acres and to a depth of approximately 700 feet. Due to the magnitude of this contamination and the multiple sources of the contamination, a regional remedy for addressing the groundwater contamination was pursued.

### 4.1.3: Nature of Contamination

As described in the RI report, numerous soil, soil gas, groundwater and sediment samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants which exceed the SCGs at the NWIRP site are inorganics (metals), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs).

The groundwater contaminants are chlorinated VOCs which were either used and disposed of at the sites or are breakdown products of these chemicals. These compounds are:

- perchloroethene (PCE)
- trichloroethene (TCE)
- dichloroethenes (DCE)
- vinyl chloride
- 1,1,1-trichloroethane (1,1,1–TCA)

### 4.1.4: Extent of Groundwater Contamination

By current estimates, the contaminated groundwater plumes emanating from the Navy and NGC sites totals more than 2,000 acres in area and are over 700 feet deep in places. An estimate of the aerial extent of the plume is presented on Figure 3. Recent groundwater data from the Navy vertical profile borings indicates that the contaminated groundwater plume has migrated south beyond the Hempstead Turnpike.

#### On-Site Groundwater Plume

The primary on site source of groundwater contamination was identified with Site 1. Groundwater was found to be contaminated with VOCs at a maximum total concentration of approximately 16,000 ug/l and the associated groundwater plume extended approximately 3,700 feet down gradient of Site 1. A Site 1 source area remediation consisting of air sparging/soil vapor extraction removed approximately 4,500 pounds of VOCs from contaminated soils and shallow groundwater at this site. By April 2002, the maximum concentration of VOCs detected in the shallow groundwater at Site 1 was less than 50 ug/l.

The highest concentration of VOCs detected in the on site groundwater was TCE in monitoring well HN-24I in 1991. At that time, TCE was detected at a concentration of 58,000 ppb. A groundwater investigation in this area in the early 1990s did not identify an extensive plume associated with this area. This well was sampled several times over a 10-year period. During this period, the concentration in the well was noted to decrease steadily. By 2000, the concentration in this well had decreased to less than 500 ug/l. An investigation of potential sources of the contamination upgradient of this area did not identify a significant source for this groundwater contamination. However, VOC contaminated soils in a maintenance area within Plant No. 3 near HN-24I were identified and removed in the late 1990s.

### Off-Site Groundwater Plume

To date, the plume(s) emanating from the sites have impacted or threatened three public water supply wellfields operated by the Bethpage Water District. There are treatment systems in place at each of the three impacted or threatened wellfields (see section 4.2). The water that is distributed to the community is tested on a monthly basis to ensure that the drinking water standards promulgated by the NYSDOH are met. In addition, the Bethpage Water District has a policy of providing its consumers with drinking water that contains no detectable concentrations of site-related contaminants. Given the proximity of the contaminants to the Bethpage Water District (BWD) well fields, nine (9) outpost or sentry wells were installed upgradient of the water supplies. These wells have been sampled on a quarterly basis since March 1995. The purpose of this quarterly sampling is to provide the BWD with the data necessary to ensure that the existing treatment systems are adequate to treat the level of contaminants that may impact their public supply wells. The data are also used to make decisions about the need for groundwater remediation.

Based upon a review of the sentry well data, there is an area surrounding monitoring well cluster GM-38 that contains high concentrations, in excess of 1,000 ppb, of site-related contamination. The outpost wells will continue to be monitored to determine the groundwater concentrations of these site-related contaminants.

### 4.1.5: Development of a Computer Groundwater Model

A groundwater computer model was developed as a tool for developing and evaluating remedial alternatives for addressing the groundwater contamination. The study area that is encompassed in the model is 24.1 square miles in area. The model was constructed in order to simulate groundwater flow throughout the entire thickness of the Upper Glacial and Magothy aquifers. A detailed description of the model is presented in the Northrop Grumman Groundwater Feasibility Study Report, Appendix B, dated October 2000. Copies of this report are on file at the Navy's information repository located at the Bethpage Public Library.

### 4.2: Interim Remedial Measures

An Interim Remedial Measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS. Information obtained during the development of the Regional Groundwater RI and FS revealed that wells associated with Plants 4, 5 and 6 of the Bethpage Water District (BWD) had either been, or would likely be, adversely impacted by VOC-contaminated groundwater emanating from Navy and NGC properties. Due to the immediate threat to public health, the Navy, in June 1996, supplied funding to BWD for the construction and 30-year operation of an air stripping treatment system that was installed on the BWD Plant 5 facility. This interim measure was part of the Navy's Operable Unit 1 Soils ROD issued by the Navy in July 1995.

Other IRMs have been implemented over the last several years by NGC for groundwater including the construction and current operation of a pump and treat system designed to capture and contain all groundwater from both NGC and Navy property to eliminate any further migration of VOC-contaminated groundwater. In addition, NGC also took steps to protect the water supplies at BWD Plants 4 and 6.

### 4.3: Summary of Human Exposure Pathways:

An exposure pathway is the manner by which an individual may come in contact with a contaminant. The five elements of an exposure pathway are; 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

A potential human exposure pathway that could be relative to this operable unit is direct contact with (dermal adsorption), ingestion of, and inhalation associated with contaminated groundwater through residential or commercial use.

Human exposures could occur by ingesting or coming into direct contact with untreated, contaminated groundwater pumped from a water supply well. Additionally, inhalation of VOCs could occur if contaminated water is used for cooking, cleaning or bathing. As stated above, several BWD public water supply wells were impacted by contamination from the Site. Water from the affected municipal wells is either no longer used or treated to remove the contaminants prior to distribution to the community. Routine monitoring of the treated water supplies has demonstrated the effectiveness of these treatment systems in mitigating exposures to groundwater contaminants.

There are no known private drinking water wells in use within the contaminated aquifer area. The nearest down gradient private well, a non-contact cooling water well at a hospital, was tested in 1998 and found to be free of site-related contaminants.

In summary, while human exposures to contaminated groundwater may have occurred in the past, there are no known exposures that are presently occurring due to the implementation of appropriate response measures.

### 4.4: Summary of Environmental Exposure Pathways

There are no surface water bodies or other environmentally sensitive areas within a two-mile radius of the site. Therefore, it was concluded that there is a negligible risk to wildlife in the area from the disposal of hazardous wastes at the sites.

## SECTION 5: ENFORCEMENT STATUS

### Resource Conservation and Recovery Act

The purpose of this ROD is to set forth the groundwater remedial program for NWIRP Bethpage as set forth in 6 NYCRR Part 375, "Inactive Hazardous Waste Disposal Sites." The site is also regulated under 6 NYCRR Part 373, commonly known as the Resource, Conservation and Recovery Act, (RCRA) program. This is the permitting and ultimately the closure process for active facilities that store, generate, and treat hazardous wastes over a certain quantity as defined under this regulation. The RCRA program as promulgated under NYSDEC regulations is authorized by the USEPA to issue RCRA permits.

### NWIRP Bethpage

The United States Navy has undertaken their environmental studies pursuant to the Navy's Installation Restoration Program. The State of New York provided oversight of the work conducted by the Navy pursuant to a Memorandum of Understanding (MOU) between the State and the Department of Defense. The Department of the Navy entered into a Memorandum of Understanding (MOU) with the NYSDEC in 1993. The MOU brought the NYSDEC into the Department of the Navy's Installation Restoration (IR) program. Upon issuance of the Navy's Record of Decision for Groundwater, NYSDEC will approach the Department of the Navy to implement the selected remedy under a Federal Facility Site Remediation Agreement.

## SECTION 6: SUMMARY OF THE REMEDIATION GOALS

The primary goals for any remedial program, as stated in the National Contingency Plan (NCP), is that the selected remedy is to be protective of human health and the environment and comply with Applicable and Relevant and Appropriate Requirements (ARARs). At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Eliminate, to the extent practicable, site-related contaminants from the affected public water supplies and to prevent, to the extent practicable, the future contamination of public water supplies through the implementation of the offsite groundwater remediation.
- Eliminate, to the extent practicable, exposures to contaminated groundwater.
- Eliminate, to the extent practicable, off-site migration of contaminated groundwater and, where practicable, to restore the groundwater to pre-disposal conditions.
- Eliminate, to the extent practicable, exceedances of applicable environmental quality standards related to releases of contaminants to the waters of the state.
- Eliminate, to the extent practicable, detections of site-related VOC contamination for affected drinking water supplies using USEPA Method 502.2 to a detection limit of 0.5 micrograms per liter (ug/l).

## SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost effective, comply with ARARs and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for Regional Groundwater at both Northrop Grumman and NWIRP Bethpage were identified, screened and evaluated in the Operable Unit 2 (OU2) Report entitled "Groundwater Feasibility Study, Northrop Grumman, Bethpage."

Common elements to all of the Navy's potential remedial alternatives for groundwater include response actions that are currently being implemented by Northrop Grumman. These response actions include the continued operation of the On-Site Containment (ONCT) System, continued monitoring of on-site and off-site permanent monitoring wells on a quarterly basis, and the wellhead treatment for the BWD wells. Since completion of the ONCT system in 1998, NGC has operated the system continuously and has been conducting quarterly sampling of on-site wells since 1995 and both on-site and off-site wells since 1998. As of the date of this ROD, the Navy has no reason to believe that NGC will not continue to implement these components of the groundwater remedial strategy. In addition and as stated earlier, both the Navy and NGC have completed response actions associated with BWD Plants 4, 5 and 6.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to put the remedy in place, and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with other potentially responsible parties for implementation of the remedy.

### 7.1: Description of Alternatives

As stated previously, the remedial strategy for groundwater was developed by NYSDEC with input from the Navy and NGC. The following potential response actions were developed by NYSDEC during the preparation of the State's Record of Decision for Groundwater and were intended to address contaminated groundwater beneath both NGC-property and NWIRP Bethpage as well as the downgradient components of both contaminant groundwater plumes. For the purposes of this ROD, the Navy has adopted the same potential response actions.

As stated throughout this document, this ROD describes those components of the groundwater remedial strategy that will be implemented by the Department of Navy. Each of the alternatives discussed below contains common components that will be implemented by the Navy along with the selected alternative. The Navy's determination that implementation of the selected alternative will be protective of human health and the environment is based on the recognition that Northrop Grumman also continues to implement certain common components of the groundwater remedial strategy as they have since issuance of NYSDEC's ROD in March 2001.

**The following Items A through C, are common to Some or All of the Alternatives and are expected to be implemented by Northrop Grumman:**

### A. On-Site Plume Containment (ONCT), Treatment, and Discharge to On-Site Recharge Basins via the On-going ONCT System (formerly called the ONCT IRM):

Under this component of each Alternative, the existing ONCT System will continue operating. The pumping rate from the ONCT system would continue at the approximate rate of 3,375 gallons per minute. The water would be recharged into the recharge basins located adjacent to Plant 5 and to the southern recharge basins. Costs for this option do not include the already completed design and construction but do include operation and maintenance.

### B. Long Term Operation and Maintenance of VOC Removal Systems At Two Off-Site Bethpage Public Water Supply Well Fields (BWD Plants 4 and 6):

A long-term agreement is being renegotiated between the BWD and Northrop Grumman to pay for the operation and maintenance of the treatment systems at BWD well fields 4 and 6. This agreement would be required to be effective for at least 30 years, until the treatment at a public supply well(s) is no longer necessary to meet appropriate performance objectives, or until BWD decides to shut down any given supply well.

The Bethpage Water District has a policy of providing its consumers with drinking water that contains no detectable concentrations of VOC contaminants. As of the date of this ROD, Northrop Grumman through its agreement with the BWD for Plants 4 and 6 have paid for VOC removal treatment that is sufficient to meet this District policy.

### C. Long-Term Operation Maintenance and Monitoring (OM&M) That Includes Comprehensive Monitoring of Plume Attenuation, Outpost Groundwater Monitoring and Long-Term Operation and Maintenance of the ONCT System:

A long-term operation, maintenance and monitoring (OM&M) program would be designed and implemented and is included with each Alternative. This OM&M plan includes the installation of at least twenty new monitoring wells and specific vertical profile borings. The OM&M plan includes a specific task to verify that the system achieves the goals of the system, which are defined as preventing the off-site migration of NGC and NWIRP site-related VOC-impacted groundwater that is located within the boundaries of the sites (*i.e.*, on-site contaminant mass containment).

The goals for the long term monitoring program would be to:

- monitor the on-site groundwater plume; and
- monitor the effectiveness of the groundwater remedy.

Samples will be collected on a quarterly, semi-annual or annual basis from a monitoring well network. The specific sampling locations and the specific analyses would be based upon periodic reviews under the ongoing long term OM&M program. In addition, water level data would be collected on a regular basis. These results would be evaluated by means of periodic updating of the computer groundwater model that has been developed (see Section 4.1.3) for this site.

The ongoing ONCT system requires a long-term operation and maintenance plan. This plan was developed and submitted to NYSDEC for review.

**For Alternatives 1 through 5, the following Items D through I, are common to Some or All of the Alternatives and will be implemented by the Department of Navy:**

### D. A Deed Restriction Prohibiting the Extraction of Groundwater from beneath NWIRP Bethpage

This item is an **institutional control** consisting of the placement of a restriction in the deed of transfer to the County of Nassau, New York prohibiting extraction of groundwater from within the boundaries of the 105-acre or Plant 20 parcels located at the Navy's former Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage facility. In order to aid in the compliance with the deed restriction, the Navy has completed the abandonment of the seven (7) deep production wells formerly located on the 105-acre parcel. The production wells were used for the extraction of groundwater as non-contact cooling water to support operations conducted by NGC during a time when Northrop Grumman leased the 105-acres from the Navy. If a future occupant of the Navy's 105-acre parcel wishes to pursue groundwater extraction, language will be included in the appropriate deed(s) of transfer requiring prior notification to and securing written permission from the Nassau County Department of Health and/or NYSDEC.

### E. Long Term Operation and Maintenance of VOC Removal Systems At One Off-Site Bethpage Public Water Supply Well Fields (BWD Plant 5):

The Department of the Navy entered into a cash-out agreement with the BWD for the installation, permanent operation and maintenance of a treatment system at BWD Plant 5.

The Bethpage Water District has a policy of providing its consumers with drinking water that contains no detectable concentrations of VOC contaminants. As of the date of this ROD, the Department of the Navy has paid for VOC removal treatment for Plant 5 that is sufficient to meet this District policy.

### F. Offsite GM 38 Area Remedy:

This offsite groundwater extraction and treatment remedy would be located in the monitoring well GM38 area. This remedial technology would address elevated concentrations of total volatile organic compounds (TVOCs) in groundwater because deep groundwater at the GM-38 well area has been identified as an off-site "hotspot". This process option would be operated as a mass removal option to prevent further degradation of the aquifer. The modeling data from the OU 2 Groundwater FS indicates 7,000 pounds of the contaminant mass could be removed at this location.

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| Capital Cost: | $ 4,390,000 |
| Annual O&M Cost: | $ 220,000 |
| Present Worth: | $ 6,673,000 |

### G. Long-Term Operation Maintenance and Monitoring (OM&M) of the GM-38 Remedy:

Installation of vertical profile borings and/or monitoring wells in offsite areas would be included in the outpost monitoring, remedial design, and plume tracking programs. The OM&M vertical profile boring program has been expanded to cover areas south of Hempstead Turnpike. The goals for this OM&M program would be to monitor the groundwater plume(s) both on-site and off-site, monitor the effectiveness of the groundwater remedy or remedies and determine if wellhead treatment is necessary. Comprehensive monitoring of plume attenuation would also be used with respect to the fate and transport of site contamination. This component would also contain operation and maintenance provisions for all treatment systems.

The goals for the long term monitoring program would be to:

- monitor the GM-38 Area groundwater plume; and
- monitor the effectiveness of the GM-38 Area groundwater remedy.

Samples will be collected on a quarterly, semi-annual or annual basis from a monitoring well network. The specific sampling locations and the specific analyses would be based upon periodic reviews under the ongoing long term OM&M program. In addition, water level data would be collected on a regular basis. These results would be evaluated by means of periodic updating of the computer groundwater model that has been developed (see Section 4.1.3) for this site.

**H. Development and Implementation of a Public Water Supply Well Contingency Plan:**

Installation of vertical profile borings and/or monitoring wells in offsite areas would be included in the outpost monitoring, remedial design, and plume tracking programs. The vertical profile boring program has been expanded to cover areas south of Hempstead Turnpike. The goals for this OM&M program would be to monitor the groundwater plume(s) both on-site and off-site, monitor the effectiveness of the groundwater remedy or remedies and determine if wellhead treatment is necessary. Comprehensive monitoring of plume attenuation would also be used with respect to the fate and transport of site contamination. This component would also contain operation and maintenance provisions for all treatment systems.

All the alternatives contain a contingency for public water supply wellhead treatment or comparable alternative measures. Outpost monitoring would indicate if VOC concentrations in the groundwater would potentially threaten a public supply well. A wellhead treatment system would be designed and installed or comparable alternative water supply measures would be implemented if outpost monitoring well data indicates that a trigger value has been exceeded and that a determination has been made that treatment of a public supply well or provision of an alternative water source is necessary to protect public health from exposure to site-related contamination. The above determination would be made jointly with participation by the Navy, NYSDEC, State and County Health Departments, and the appropriate water district whose well is of concern.

**I. Department of the Navy Implementation of "Non-Detect" Policy for Affected Public Water Supplies:**

The State of New York, under its State Superfund Program, must ensure that all remedies selected for the remediation of inactive hazardous waste sites are protective of public health and the environment. With respect to the protection of drinking water supplies, the NYSDOH has promulgated Maximum Contaminant Levels (MCLs) for drinking water contaminants in Part 5 of the State Sanitary Code (10 NYCRR Part 5). For the most part, the respective MCLs for the VOC contaminants associated with the Northrop Grumman and Navy sites are 5 micrograms per liter (ug/L or parts per billion (ppb) for water).

Many Water Districts in the vicinity of the OU 2 regional groundwater contaminant plume have policies of providing their consumers with drinking water that contains no detectable concentrations of VOC contaminants. This is sometimes known as a "zero tolerance policy" with respect to VOCs. The Department of the Navy has agreed to establish a goal for any given wellhead treatment or comparable technology for affected drinking water supplies which will provide water that is non-detect using USEPA Method 502.2 to a detection limit of 0.5 micrograms per liter (ug/l) with respect to VOCs for site related contamination as cited in the 2001 Water Quality Monitoring Requirements for Nassau County Public Water Systems. Additional costs to implement this policy relative to the Alternatives considered in the OU 2 FS, if any, fall within the plus fifty and minus thirty percent of CERCLA cost requirements, and therefore will not significantly change the cost estimates for Alternatives 2 through 5.

**Alternative 1: No Further Navy Action with Continuation of A, B, and C above:** This Alternative is the baseline Alternative to which the other alternatives will be compared. Under this Alternative, no additional remedial actions would be incorporated into the existing on-site groundwater IRM that has been installed and is now operating. This Alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment than that already provided. Under this Alternative, no additional remedial actions would be taken and the existing on-site groundwater IRM which has been installed and is now operating would continue to be operated over the next 30 years.

In order to maintain hydraulic containment of the groundwater plume(s), production well GP-1 has been included in the ONCT pump and treatment system design. The GP 1 water would be treated at the IRM treatment system located to the north of Plant 2 and discharged to recharge basins to the west of Plant 2. The ONCT wells are treated by a separate air stripper. The water would be recharged into the southern recharge basins located adjacent to Plant 1.

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| Capital Cost: | $ 3,670,000 |
| O&M Cost: | $ 1,480,000 |
| Present Worth: | $26,700,000 |

**Alternative 2: Continuation of A, B, and C above with Implementation of D through I above, and HN-24 Area Treatment:** Alternative 2 would add treatment of the HN-24 area on the Navy Plant 3 property. Treatment at the HN-24 area would consist of the use of reactive iron powder injected into the impacted groundwater through a series of injection wells. After injection the reactive iron powder would become immobilized within the soil pore space and begin to react with the contaminants of concern (COCs).

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| Capital Cost: | $ 9,290,000 |
| O&M Cost: | $ 1,725,500 |
| Present Worth: | $35,000,000 |

**Alternative 3: Continuation of A, B, and C above with Implementation of D through I above:** Alternative 3 contains the addition of groundwater extraction and treatment system at the GM-38 area. The purpose of the GM-38 groundwater extraction and treatment system would accelerate off-site contaminant mass removal and to restore the off-site portion of the impacted aquifer in the vicinity of BWD Supply Well fields 4, 5 and 6 to remedial action objectives (RAOs) in a shorter time frame than under Alternative 2. The GM-38 area is located approximately 4,500 feet southeast of the Northrop Grumman south recharge basin area, and is defined by the inferred 1 ppm TVOC contour line drawn around Well GM-38D2.

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| Capital Cost: | $ 8,060,000 |
| O&M Cost: | $ 1,660,700 |
| Present Worth: | $33,600,000 |

**Alternative 4: Continuation of A, B, and C above with Implementation of D through I above and Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers:** Alternative 4 would add six new off-site groundwater extraction wells to achieve containment of the full extent of the off-site portion of the TVOC plume. Alternative 4 would provide mass removal from the entire aquifer by the installation of a groundwater extraction and treatment system at the farthest downgradient edge of the plume, to contain the full extent (off-site as well as on-site portions) of the plume. The off-site wells would be installed south of the Hempstead Turnpike.

Under Alternative 4, the six new off-site extraction wells (OFCT-1, OFCT-2, OFCT-3, OFCT-4, OFCT-5, and OFCT-6) would be installed. Each off-site well would require an individual treatment system to remove VOCs from the pumped groundwater. Construction of one central treatment facility, in lieu of six individual systems, would be impractical due to the dense residential development in the area, the substantial distances between proposed off-site extraction well locations, and the large quantity of water to be discharged. It is estimated that the total quantity of water to be pumped from the proposed off-site extraction wells would be 3,635 gpm (equal to 5.2 million gallons per day, or MGD).

Where necessary, monitoring wells would be installed to supplement the existing monitoring well network. The number, location, and depth of wells to be installed will be evaluated during the remedial design phase of the project.

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| Capital Cost: | $21,860,000 |
| O&M Cost: | $ 3,200,000 |
| Present Worth: | $63,300,000 |

**Alternative 5: Continuation of A, B, and C above with Implementation of D through I above and Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers, and HN-24 Area Treatment:** Alternative 5 contains the elements of Alternative 4 as described above, with the addition of treatment at the HN-24 area, as described above in Alternative 2.

Alternative 5 would provide mass removal from the aquifer through groundwater extraction and treatment at the farthest downgradient edge of the plume, to contain the full extent (both off-site as well as on-site portions) of the plume. Furthermore, Alternative 5 would provide localized groundwater treatment of the HN-24 areas.

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| Capital Cost: | $23,090,000 |
| O&M Cost: | $ 3,300,000 |
| Present Worth: | $64,700,000 |

## 7.2 Evaluation of Alternatives

The criteria used to compare potential remedial alternatives are defined in Section 300.430(e) of the National Contingency Plan (NCP). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Groundwater Feasibility Study developed by Northrop Grumman. The HN-24 treatment process will be carried through this evaluation of remedial alternatives even though it has now been deemed unnecessary given the substantial drop in the HN-24 area concentrations.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an Alternative to be considered for selection.

1. **Compliance with Applicable and Relevant and Appropriate Requirements (ARARs):** Compliance with ARARs addresses whether or not a remedy will meet the requirements of Federal statutes. A discussion of how the alternatives meet or do not meet ARARs was provided in Section 2.2.3 of Northrop Grumman's Groundwater Feasibility Study. With regards to the requirements of New York State, it has been determined by the Navy that the selected remedy will satisfy all substantive requirements of New York State Environmental Conservation Law (ECL) which are considered to be applicable.

The most significant portion of New York State's ECL are the New York State Water Quality Regulations: Part 5 Drinking Water Standards Title 10, New York Codes Rules and Regulations (10 NYCRR) and NYSDEC Groundwater Standards (6 NYCRR Part 700).

Alternatives 1, 2 and 3 would be compliant with NYSDEC's Water Quality Regulations for the portion of the groundwater plume addressed by each Alternative. Alternatives 4 and 5 would be compliant with NYSDEC's Water Quality Regulations for the entire groundwater plume.

The applicable NYSDEC's Water Quality Regulations for the drinking water are the State's maximum contaminant levels, or MCLs, as specified in Part 5 of the NYS Sanitary Code. These standards are currently being met for treated water at each of the affected public supply well fields in the area. In addition, the Department of the Navy has agreed to a goal for this project, for any given wellhead treatment or comparable alternative implemented due to site-related contamination, to provide water that is non-detect using USEPA Method 502.2 to a detection limit of 0.5 micrograms per liter (ug/l) with respect to VOCs, as cited in the 2001 Water Quality Monitoring Requirements for Nassau County Public Water Systems.

Item E, the GM-38 area offsite remedy, was included in order to provide mass contaminant removal through groundwater extraction and treatment in an offsite area near the GM-38 monitoring well cluster. The groundwater treatment system would be designed to be compliant with the NYSDEC Part 200 Air Quality Regulations.

The 5 ppb groundwater standard for principle organic contaminants would not be met with respect to full plume interception for alternatives 1 through 3, although natural attenuation should reduce site related contaminant concentrations to below 5 ppb over time.

**2. Protection of Human Health and the Environment**. This criterion is an overall evaluation of each Alternative's ability to protect public health and the environment.

The NYSDEC's Water Quality Regulations that are contaminant-specific are currently being met with respect to treated water at the municipal water supplies (specifically the BWD). This is being accomplished via VOC-removal treatment systems that are operating at the wellheads. In addition, the Department of the Navy has agreed to a goal for this project, that for any given wellhead treatment or comparable alternative implemented due to site-related contamination, to provide water that contains no detectable concentrations of site-related contaminants.

The plume(s) would be contained along the southern boundary of the Grumman site under each Alternative based upon the computer modeling work that was conducted as part of the Feasibility Study. By containing the portion of the plume(s) that are on-site, the future contaminant load to the downgradient public water supplies would be reduced.

It is anticipated that the extraction and treatment programs for the ONCT system that are incorporated into each of the eight remedial alternatives under consideration here would need to be operated for 30 years or more. At that point there would be residual contamination remaining in the aquifers. The amount of remaining contamination, however, would be incrementally less as additional remedies are implemented under the various alternatives. As contaminant mass loading decreases, the relative importance of reliance upon the wellhead controls also diminishes.

Deep groundwater at the GM-38 well area has been identified as an off-site "hotspot" because concentrations of TVOCs exceed 1,000 ppb (equal to 1 ppm) at that location. The main objective of the GM-38 well area remedy would be additional protection of human health by reducing the future elevated mass contaminant load to the down gradient public water supplies. The remedy would also enhance the long-term natural process of aquifer restoration.

There could be incremental potentials for exposure to VOCs in air posed to downwind populations due to emissions from each additional groundwater treatment plant installed under the eight alternatives. Air pollution and monitoring controls would be implemented as necessary to ensure that the air emissions from these treatment facilities are within the criteria set by the regulatory agencies. Additional engineering controls could be used to further reduce the potential of exposure.

There is a potential for exposure to VOCs in air if the vinyl chloride plume(s) is captured in the ONCT extraction wells. The treatment systems for these wells were not designed to treat vinyl chloride and could result in air effluent concentrations of vinyl chloride that exceed state air discharge guidelines. This potential exposure pathway would be minimized by implementing the vinyl chloride contingency plan.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

**3. Short-term Effectiveness.** The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

There could be short-term impacts to the community if Alternatives 2 through 5 were implemented. The impacts could be dust emissions, VOC emissions and noise during construction activities. Engineering controls would be employed to minimize these impacts.

No short-term impacts to the community or the environment would be expected to occur as the result of implementing Alternative 1. The HN24 area remedy short-term impacts would be negligible, as the Navy property is now vacant.

The GM38 area remedy would have slightly higher short-term impacts. This groundwater extraction and treatment system would be located closer to residential areas. Potential impacts would be addressed under the site specific community health and safety plan through emission control technologies.

For Alternatives 4 and 5, the short-term impacts would be much greater than alternatives 1 through 3. The offsite containment (OFCT) system would, in most if not all the locations, be placed on or near residential properties, streets and neighborhoods. In addition, it is envisioned that each OFCT location would require its own treatment system.

**4. Long-term Effectiveness and Permanence.** This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

The sources of the groundwater contamination are being addressed as operable units for the Northrop Grumman-Bethpage Facility, NWIRP-Bethpage, and the RUCO Inactive Hazardous Waste Disposal Sites. The long-term effectiveness of each of the source area remedial actions was addressed in the RODs previously issued for these sites.

The time required to remediate the aquifer system is a function of the quantity and location of groundwater that is pumped and treated. It is projected that it would take more than 30 years to remediate the aquifer system onsite for each of the eight Alternatives. However, the ONCT system would prevent any further migration of onsite contamination into the Bethpage regional aquifer.

The OFCT Containment extraction and treatment system that is incorporated into Alternatives 4 and 5 would likely be operated for 30 years or longer. Based on the groundwater modeling, after 30 years of operation, residual contamination would likely exist onsite at concentrations slightly greater than the current drinking water standards.

The GM38 area remedy is a hot spot remedy that was evaluated in the FS for 15 years. The long-term effectiveness for this remedy would be to potentially reduce the contamination loading to the BWD public supply wells on a permanent basis. Performance results from the ONCT IRM already demonstrate that TVOC concentrations in groundwater immediately down gradient from the ONCT system are diminishing. The GM38 area remedy would enhance this permanent restoration of the natural resource.

5. **Reduction of Toxicity, Mobility or Volume.** Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Reduction of toxicity, mobility, and volume for the onsite groundwater contamination would be realized by the ONCT groundwater extraction and treatment system for all eight alternatives. These reductions would be achieved as a result of the extraction (reduction of mobility and volume) and treatment (reduction of toxicity) components which are incorporated into the ONCT system.

The greatest reductions in toxicity, mobility and volume would be realized under Alternatives 4 and 5 with the OFCT system. Alternative 5 has the highest reduction in mobility with the HN 24 area treatment, GM38 area remedy and the ONCT and OFCT systems. Alternative 1 has the least reduction in toxicity, mobility and volume because it targets the on-site contamination only via the ONCT system.

6. **Implementability.** The technical and administrative feasibility of implementing each Alternative is evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

The HN24 remedy of alternatives 2 and 5 would be fairly easy to implement technically and administratively. There are several vendors who could supply the treatment technologies, which are incorporated into these alternatives. Alternatives 2 and 3 are readily implementable with respect to the GM38 area remedy that would be located near an existing Nassau County recharge basin in an open space area. However, easements would have to be obtained from the municipal and private parties that own the property. Alternative 1 is already in place and therefore is the easiest to implement.

Alternatives 4 and 5 would be substantially more difficult to implement administratively with respect to the OFCT system. Private property would have to be purchased or accessed and potentially, zoning changes would be required in order to construct the off-site extraction wells and treatment plants. The permit-related tasks would be difficult to implement. In addition construction of one central treatment facility, in lieu of six individual systems, would be impractical due to the dense residential development in the area, the substantial distances between proposed off-site extraction well locations, and the large quantity of water to be discharged.

7. **Cost.** Capital and operation and maintenance costs are estimated for each Alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision.

8. **Community Acceptance**. Concerns of the community regarding the RI/FS reports, the NYSDEC PRAP and ROD for Groundwater and a Draft version of the Navy's ROD for Groundwater have been evaluated. A "Responsiveness Summary" was prepared by NYSDEC that described public comments received during a Public Meeting sponsored by NYSDEC in December 2000 to discuss their PRAP for Groundwater and the manner in which the NYSDEC would address the concerns raised. In addition, a Responsiveness Summary was prepared by the Navy that also described regulatory and public water supply concerns regarding the Navy's ROD for groundwater and is attached as Appendix A.

In addition, members of the community at large have expressed their concerns about site contamination during various gatherings of NWIRP Bethpage's Restoration Advisory Board (RAB) sponsored by the Department of the Navy. As a result, a number of response actions were included in the NYSDEC ROD that will address community, local official, water district, and public health concerns. These response actions include: the ONCT system, the GM 38 area remedy, the outpost groundwater monitoring program, the public water supply contingency for wellhead treatment or comparable alternative measures, the Northrop Grumman and the Department of the Navy agreement to achieve no detectable concentrations of site contaminants in affected water supply wells, additional groundwater investigation to determine if an Operable Unit 3 is necessary, and the long term OM&M systems. Additionally, NYSDEC modified it's selected remedy to incorporate groundwater remediation measures into a Groundwater Remedial Program whereas response measures related to public water supplies have been incorporated into a Public Water Supply Protection Program.

## SECTION 8: SUMMARY OF THE SELECTED REMEDY

The remedial action described in this section represents the second remedial phase or operable unit involving the NWIRP Bethpage site. It addresses on-site contaminated groundwater beneath the Navy's 105-acre parcel and it also addresses contaminated groundwater that, over the years, has migrated off-site beyond the boundaries of NWIRP Bethpage. In addition, there also exists groundwater contamination from other source areas from neighboring property owned by the Northrop Grumman Corporation (NGC). Due to the existence and proximity of these groundwater contaminant plumes, NYSDEC issued a Record of Decision for "regional groundwater" that described a remedial strategy to address contaminated groundwater beneath both Navy and NGC property and also addresses that portion of contaminated groundwater that has migrated downgradient of both properties into the surrounding community.

Based upon the results of the RI/FS, supplemental investigative data and the evaluation presented in Section 7, the NYSDEC proposed the selection of Alternative 3, as described in detail in this document. NYSDEC's selected remedy, Alternative 3, consisted of the following Groundwater Remedial Program components: the ongoing ONCT system (formerly known as the ONCT IRM), the off-site GM-38 area groundwater extraction and treatment system, a vinyl chloride treatment contingency plan for the ONCT system, long-term groundwater monitoring, and long-term operation and maintenance of all operating treatment systems onsite and off-site. Additionally, the selected Alternative included the following Public Water Supply Protection Program components: the operation and maintenance of air strippers for BWD well fields 4, 5 and 6, and preparation of a contingency plan for wellhead treatment or comparable alternative measures for public supply wells not currently affected but that may become affected by site-related VOCs in the future. The Department of Navy concurred with the selection of Alternative 3 by NYSDEC.

Similarly, the Department of Navy has also chose Alternative 3 as described in Section 7 of this document. The selection was based on the evaluation of each of the five alternatives developed to address Navy contaminated groundwater both on-site and for that portion of contaminated groundwater that has migrated from Navy property. It was determined that Alternative 3 will meet standards, criteria and guidance for the containment portion of the groundwater plume remedy, prevent exposure to site related contaminants in the groundwater, actively restore a natural resource (sole source aquifer), and prevent further deterioration of downgradient groundwater conditions. Alternative 3 was also chosen based on the fact that it is not economically or technically feasible to contain and treat all the contaminated groundwater that has migrated from the NWIRP site to groundwater quality standards.

Further, Alternative 3 was selected since it incorporated a response action to account for the possibility of site-related contamination impacting additional public water supply wells in the future. It called for the wells to be protected by the implementation of a long term monitoring program that will include sampling of wells upgradient of the public water supply wells with a contingency to provide wellhead treatment or comparable alternative measures, if necessary.

The selection of Alternative 3 also satisfies the preference to permanently and significantly reduce the toxicity, mobility or volume of VOCs in groundwater by reducing the mass of VOCs in the groundwater by recovering, treating and discharging contaminated groundwater. The remedial goal for attainment of the 5 ppb groundwater standard will be met in the treated aquifer segment, to the extent practicable.

It is understood that the remedy that the Navy will be implementing, as discussed in this document, will not address all of the contamination attributable to NWIRP Bethpage. Therefore, the public water supply contingency plan is a necessary component to address the potential of future exposure to site-related VOCs.

The following paragraphs describe the selected remedy that will be implemented by the Department of Navy. For the purposes of the Navy's Groundwater ROD, groundwater has been subdivided into an on-site and off-site component. The Navy's selected remedy for ON-SITE GROUNDWATER includes the following:

1. An **institutional control** consisting of the placement of a restriction in the deed of transfer to the County of Nassau, New York prohibiting extraction of groundwater from within the boundaries of the 105-acre or Plant 20 parcels located at the Navy's former Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage facility. In order to aid in the compliance with the deed restriction, the Navy has completed the abandonment of the seven (7) deep production wells formerly located on the 105-acre parcel. The production wells were used for the extraction of groundwater as non-contact cooling water to support operations conducted by NGC during a time when Northrop Grumman leased the 105-acres from the Navy. If a future occupant of the Navy's 105-acre parcel wishes to pursue groundwater extraction, language will be included in the appropriate deed(s) of transfer requiring prior notification to and securing written permission from the Nassau County Department of Health and/or NYSDEC.

Further, the selected remedy for ON-SITE GROUNDWATER is also based on the recognition that an existing groundwater extraction and treatment system, known as the Onsite Containment (ONCT) System, continues to contain and remediate VOC-contaminated groundwater emanating from the Navy's property. The ONCT system was constructed, and is currently being operated on an annual basis, by the Northrop Grumman Corporation and is being operated as a component of NYSDEC's Regional Groundwater ROD. The Navy recognizes that continued operation of the ONCT system is paramount to ensuring that the Navy's selected remedy of ON-SITE GROUNDWATER remains protective of human health and the environment. In the event that the ONCT system fails to continue to operate, along with the corresponding long-term maintenance and monitoring program for the ONCT system, the Navy also recognizes that it's ON-SITE GROUNDWATER remedy would no longer be protective of human health or the environment. In this case the Navy will re-evaluate the protectiveness of the selected remedy for ON-SITE GROUNDWATER and implement all requisite measures as determined by the Navy in consultation with NYSDEC, NYSDOH, and the Nassau County Department of Health to ensure the continued protection of human health and the environment.

As stated above, NYSDEC's selected remedy for groundwater included a number of response measures that were categorized into a Groundwater Remedial Program and a Public Water Supply Protection Program. The components of these two programs for which the Department of Navy has agreed to implement are all considered to be located off of Navy property and are, therefore, being considered as OFF-SITE GROUNDWATER issues.

The Navy's selected remedy for OFF-SITE GROUNDWATER includes the following:

**Groundwater Remedial Program**

- mass contaminant removal through groundwater extraction and treatment in an offsite area near the GM 38 monitoring well cluster shown on Figure 4;
- pre-design investigation to determine the optimal groundwater extraction location(s) in the GM 38 offsite treatment area(s);
- operation and maintenance of the GM 38 area remedy;
- additional groundwater investigation in the vicinity of well GM-75D2, or any other area identified as requiring additional groundwater investigation, in order to determine whether groundwater contamination represents a significant threat to downgradient public water supply wells and to further determine if a contaminant mass removal program, similar to the GM-38 Area program, is necessary. These actions will be implemented if a determination has been made by the Navy and NYSDEC that a significant threat to a downgradient public water supply exists.

**Public Water Supply Protection Program**

The Navy recognizes the importance of continued provision of potable water to those communities/populations served by water supply wells that are, or that may become, impacted by site-related contamination (see Figure 5). To this end, the NYSDEC Groundwater ROD required that a public water supply protection program be implemented. The components of this program for which the Department of Navy will implement include:

- installation of Vertical Profile Borings (VPBs) to gather water quality and lithologic data that will be used in the regional groundwater computer model to aid in the placement of outpost monitoring wells;
- development of a Public Water Supply Well Contingency Plan
- installation of the outpost monitoring wells in areas upgradient of potentially affected water supply wellfields as outlined in the Public Water Supply Well Contingency Plan. To date, the regional groundwater computer model is predicting potential future impacts to the South Farmingdale Water District (SFWD) Wellfield that contains Well 4043 and a separate SFWD Wellfield containing Well 6150,

as well as to the New York Water Service (NYWS) Wellfield containing Well 8480. If future modeling efforts suggest that a water supply well may be impacted within some reasonable timeframe and it has been further determined that the projected contaminant flow path will not intercept an existing outpost monitoring well, then additional outpost monitoring well(s) would be designed, installed, and monitored.

- public water supply wellhead treatment or comparable alternative measures, as necessary, for the wellfields that become affected in the future, including but not limited to the wells listed above, from site-related contaminants.
- The provision of public water to residential or commercial structures that have private drinking water wells determined to be affected or potentially affected by the offsite migration of the NWIRP groundwater plume.

It should be noted that another component of the Public Water Supply Protection Program was the treatment of wellfields 4, 5, and 6 associated with the Bethpage Water District (BWD). Wells at these Plants had either been, or would likely be, adversely impacted by VOC-contaminated groundwater emanating from Navy and NGC properties prior to issuance of NYSDEC's Groundwater ROD in 2001. Due to the immediate threat to public health, the Navy, in June 1996, supplied funding to BWD for the construction and 30-year operation of an air stripping treatment system installed on the BWD Plant 5 facility. This action was considered to be an interim action that was part of the Navy's Operable Unit 1 Soils ROD issued by the Navy in July 1995. In the mid-1990's, NGC took similar action to protect the water supplies at BWD Plants 4 and 6. In the event that the treatment systems installed on BWD Plants 4 and 6 are no longer funded, the Navy recognizes that its OFF-SITE GROUNDWATER remedy would no longer be protective of human health or the environment. In this case, the Navy will re-evaluate the protectiveness of the OFF-SITE GROUNDWATER remedy and implement all requisite measures as determined by the Navy in consultation with NYSDEC, NYSDOH, and the Nassau County Department of Health to ensure the continued protection of human health and the environment.

**The detailed elements of the Navy's selected remedy are as follows:**

**Groundwater Remedial Program**

1. Mass removal of VOC contamination from groundwater in the vicinity of the GM-38 Area. Components that will be required to achieve this goal include:

a. A pre-design investigation to determine the optimum location(s) for the GM-38 area groundwater extraction well(s). This pre-design investigation will derive the data necessary to determine the screen zone of the extraction well(s). In addition, the number of extraction wells will be substantiated and the potential need to cluster these wells will be determined.

b. The installation of at least one groundwater extraction well, or comparable remedial technology, at the approximate location of the GM-38 area, with all necessary piping to install the wells and properly run the discharge to the groundwater treatment systems.

c. Utilization of an existing storm water collection and groundwater recharge system(s) for discharge of treated groundwater. If one is not available, then a suitable method of system discharge and groundwater recharge will be developed.

d. The installation of the necessary air stripping systems or comparable remedial technology designed to remove VOCs from all the extracted groundwater to meet the State Pollutant Discharge Elimination System (SPDES) discharge limitations.

2. The installation of air emission controls, if required, to comply with the NYSDEC and any other applicable air regulations.

3. The operation, maintenance and monitoring (OM&M) of the GM-38 area extraction well(s). Monitoring will include the installation and use of upgradient and downgradient groundwater shallow, intermediate, deep and very deep monitoring wells. Analytical testing and monitoring of groundwater elevations will be done on a quarterly basis for the first year and annually thereafter.

4. A specific investigative task will be undertaken that includes, but is not necessarily limited to, installation of additional groundwater monitoring wells, vertical profile borings, and groundwater sampling to determine the extent of contamination in the vicinity of monitoring well GM-75D2, or any other area where additional groundwater investigations have been determined to be required, and whether groundwater contamination represents a significant threat to downgradient public water supply wells. The trigger value used to determine if additional groundwater investigations are necessary is a detection of 1 ppm of TVOCs in three consecutive sampling events in any one well. After the area is assessed, a determination will also be made regarding the necessity for implementation of a contaminant mass removal program, similar to the GM-38 Area program. If a determination is made by either the Navy and/or NYSDEC, that a significant threat to a downgradient public water supply exists, then a plan of action will be documented in a report and forwarded to the NYSDEC.

5. Continued participation on the Technical Advisory Committee (TAC) that was established by NYSDEC that is comprised, at a minimum, of the involved regulatory Agencies, participating local water districts, and the Northrop Grumman Corporation.

**Public Water Supply Protection Program**

6. Development of a Public Supply Well Contingency Plan that uses data gathered during the VPB installation program and the regional groundwater computer model to identify the locations of the outpost monitoring wells and to also assign "trigger values" to each outpost well in order to determine if treatment or other comparable alternative measure will be required for a potentially impacted public water supply wellfield(s). Assignment of "trigger values" for each of the outpost wells will not be considered final until concurred with by NYSDEC and NYSDOH.

7. The installation of outpost monitoring wells as recommended in the Public Supply Well Contingency Plan. A Field Implementation Workplan will be developed and submitted to NYSDEC prior to the installation of any outpost monitoring well detailing drilling techniques and proposed construction details of the outpost well(s).

8. A detection of site-related contamination in an outpost or long-term groundwater monitoring wells upgradient of a public supply well at concentration greater than the trigger values for that well will cause the Department of the Navy to evaluate the rate of movement of contaminants towards the public supply wells. If VOC concentrations in the outpost well(s) meet or exceed the respective performance objectives, additional confirmatory samples will be collected, as specified in the Public Supply Well Contingency Plan, and the results evaluated by the Navy with consultation from NYSDEC and the State and County Health Departments. If triggered, this will alert the Navy to begin discussions with the appropriate water district regarding various treatment altematives. Assignment of "trigger values" for each of the outpost wells will not be considered final until concurred with by NYSDEC and NYSDOH.

9. The design, construction, operation and maintenance of wellhead treatment system and/or the evaluation of comparable alternative measures, if necessary. If evaluation of the long term groundwater monitoring or the outpost well data indicates that a public supply well has been or is in imminent danger of being impacted by NWIRP site-related contaminants, then wellhead treatment or comparable alternative measure(s) for the impacted public water supply well(s) will be necessary. A treatment system or comparable alternative measure(s) to produce potable water will be designed and constructed. Alternatively, if the Department of Navy and an affected Water District reach a cash settlement, then each settling Water District will be responsible for its respective monitoring and implementation of, as necessary, wellhead treatment, or

comparable technology. Operation and maintenance of all public supply well treatment systems, or comparable technology, will be assumed, at a minimum, to operate for a 30-year time frame as required by CERCLA. At a minimum, the NYSDOH Part 5 drinking water standards will always be met.

The Department of the Navy has agreed to establish a goal for any given wellhead treatment or comparable technology for affected drinking water supplies which will provide water that is non-detect using USEPA Method 502.2 to a detection limit of 0.5 micrograms per liter (ug/l) with respect to VOCs for site related contamination as cited in the 2001 Water Quality Monitoring Requirements for Nassau County Public Water Systems.

10. The provision of public water to residential or commercial structures that have private drinking water wells determined to be affected or potentially affected by the offsite migration of the NWIRP groundwater plume.

### Common Program Elements

11. A long term operation, maintenance and monitoring plan will be prepared that details all of the monitoring requirements and contingency aspects associated with Navy-operated treatment systems.

12. A performance evaluation conducted at least once a year for Navy-operated treatment systems to determine whether the remedial goals and performance objectives of that system(s) have been or can be achieved, and whether treatment should continue.

13. A plan to properly close all monitoring wells associated with the NWIRP Bethpage site at such time th at the wells are no longer necessary.

## SECTION 9: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- A repository for documents pertaining to the site was established at the Bethpage Public Library.

- A site mailing list was established which included nearby property owners, local political officials, local media and other interested parties.
- In October 2000, the NYSDEC sent out a mailing to the public announcing the finalized OU2 feasibility study was available to the public.
- In November 2000, NYSDEC issued a press release and a mailing was sent out to the public, announcing to the addressees the release of the OU2 PRAP.
- In March 2001, a Responsiveness Summary was prepared and made available to the public, to address the comments received during the public comment period for the NYSDEC PRAP.
- In May 2002, Navy prepared a Public Notice announcing that a 30-day comment period had commenced for the review of the Navy's ROD for groundwater.
- In September 2001 and June 2002, Restoration Advisory Board (RAB) meetings were held with community and Navy representatives whose agenda's included discussions regarding efforts to address regional groundwater contamination.

# GLOSSARY OF TERMS

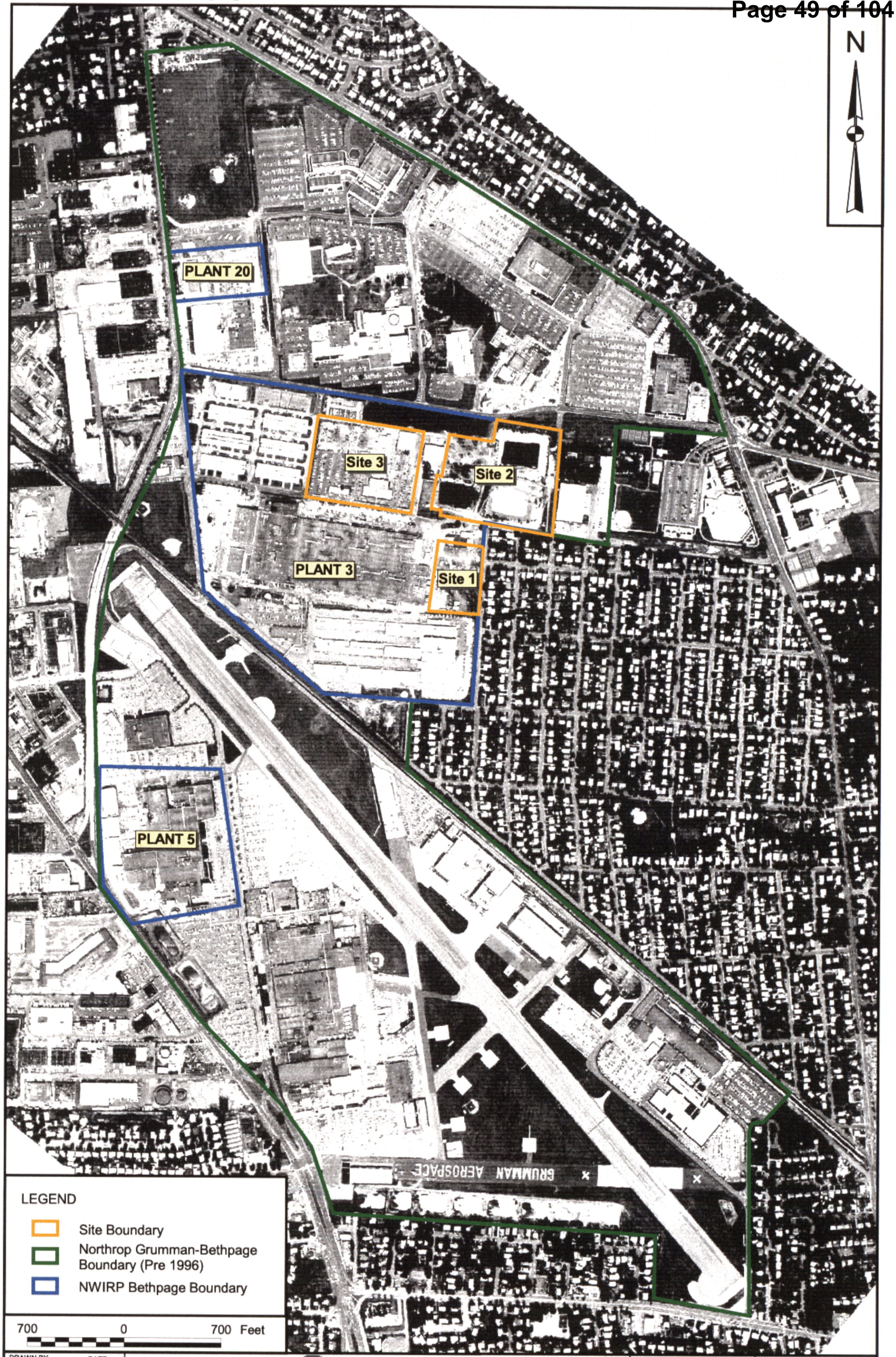
| | |
|---|---|
| **ARAR:** | Applicable or Relevant and Appropriate Requirement. |
| **BWD:** | Bethpage Water District. |
| **Capital Cost:** | Refers to the up front cost of constructing a remedial alternative. |
| **CERCLA:** | Comprehensive Environmental Response, Compensation and Liability Act |
| **Chromium:** | An inorganic element used in various manufacturing processes. |
| **DCE:** | Dichloroethene. |
| **ECL:** | Environmental Conservation Law. |
| **FS:** | Feasibility Study. |
| **GM:** | Refers to monitoring wells installed for Northrop Grumman by ARCADIS (formerly Geraghty and Miller). |
| **Groundwater Contours:** | Equipotential lines of groundwater elevation above mean sea level. |
| **Glacial:** | Refers the Glacial or shallow aquifer associated with Long Island. |
| **GOCO:** | Government-Owned, Contractor-Operated. |
| **HN:** | Refers to monitoring wells installed for the Navy by Tetra Tech NUS (formerly Halliburton NUS). |
| **IRM:** | Interim Remedial Measure. |
| **Magothy:** | Refers to the section of the Long Island aquifer below the Glacial and above the Lloyd. |
| **MPS:** | The Main Plant Site, or the former Fairchild Republic Aircraft manufacturing facility. |
| **MCLs:** | Maximum contaminant levels. |
| **MGD:** | Million gallons per day. Refers to daily rate of pumping groundwater. |

| | |
|---|---|
| **mg/l** | Milligrams per liter. See also ppm. |
| **MNA:** | Monitored Natural Attenuation. |
| **NASA:** | National Aeronautics and Space Administration |
| **ND:** | Non-detect or below the detection limit of the analytical equipment. |
| **NWIRP:** | Naval Weapons Industrial Reserve Plant. |
| **NYCRR:** | New York State Codes, Rules and Regulations. |
| **NYSDEC:** | New York State Department of Environmental Conservation. |
| **NYSDOH:** | New York State Department of Health. |
| **OFCT:** | Offsite containment system. |
| **ONCT:** | Onsite containment system. |
| **OM&M:** | Refers to operation, maintenance and monitoring, of remedial alternatives. |
| **OU:** | Operable unit. Refers to portion of the remedial program that has been divided into sections. |
| **PCB:** | Polychlorinated Biphenyl. |
| **PCE:** | Perchloroethylene or tetrachloroethylene. A chlorinated, aliphatic organic solvent |
| **Plume:** | Contaminant dispersion in the groundwater. |
| **POTW:** | Publicly owned treatment works or sewage treatment plant |
| **ppb:** | Part per billion. For water samples also termed micrograms per liter (ug/l) and for soil samples termed micrograms per kilogram (ug/kg). |
| **ppm:** | Part per million. For water samples also termed milligrams per liter (mg/l) and for soil samples termed milligrams per kilogram (mg/kg). |
| **ppmv:** | Part per million by volume. Used to quantify concentrations of contaminants in air samples. |

| | |
|---|---|
| **PRAP:** | Proposed Remedial Action Plan. This is a document listing the remedy(s) proposed to mitigate the threat of hazardous waste disposal to human health and the environment. |
| **PRP:** | Potential Responsible Party. |
| **RAOs:** | Remedial Action Objectives, or the goals established to remedy a site based on findings of the RI (CERCLA). |
| **RCRA:** | Resource Conservation and Recovery Act. |
| **RI/FS:** | Remedial Investigation and Feasibility Study. |
| **ROD:** | Record of Decision. |
| **RUCO:** | Rubber Corporation of America. |
| **SCGs:** | Standards, Criteria and guidance. |
| **SVOCs:** | Semi-volatile organic compound |
| **TAGM:** | Technical Assistance and Guidance Memorandum. Issued by NYSDEC. |
| **TCA:** | Trichloroethane. A chlorinated aliphatic organic solvent. |
| **TCLP:** | Toxicity Characteristic Leaching Procedure. Test used to determine if a waste media contained chemicals at concentrations that would be considered hazardous. |
| **TCE:** | Trichloroethylene. A chlorinated, aliphatic organic solvent. |
| **TVOC:** | Total volatile organic compounds. |
| **ug/l:** | Micrograms per liter. See also ppb. |
| **UIC:** | Underground Injection Control Program. |
| **UST:** | Underground Storage Tank. |
| **VCM:** | Vinyl chloride monomer. |
| **VOC:** | Volatile Organic Compound |

# FIGURES

P:\GIS\NWIRP_BETHPAGE\APR\BETHPAGE_RAB_21700 SITE MAP-1985 AERIAL 2/15/00 JAL



LEGEND

- 🟧 Site Boundary
- 🟩 Northrop Grumman-Bethpage Boundary (Pre 1996)
- 🟦 NWIRP Bethpage Boundary

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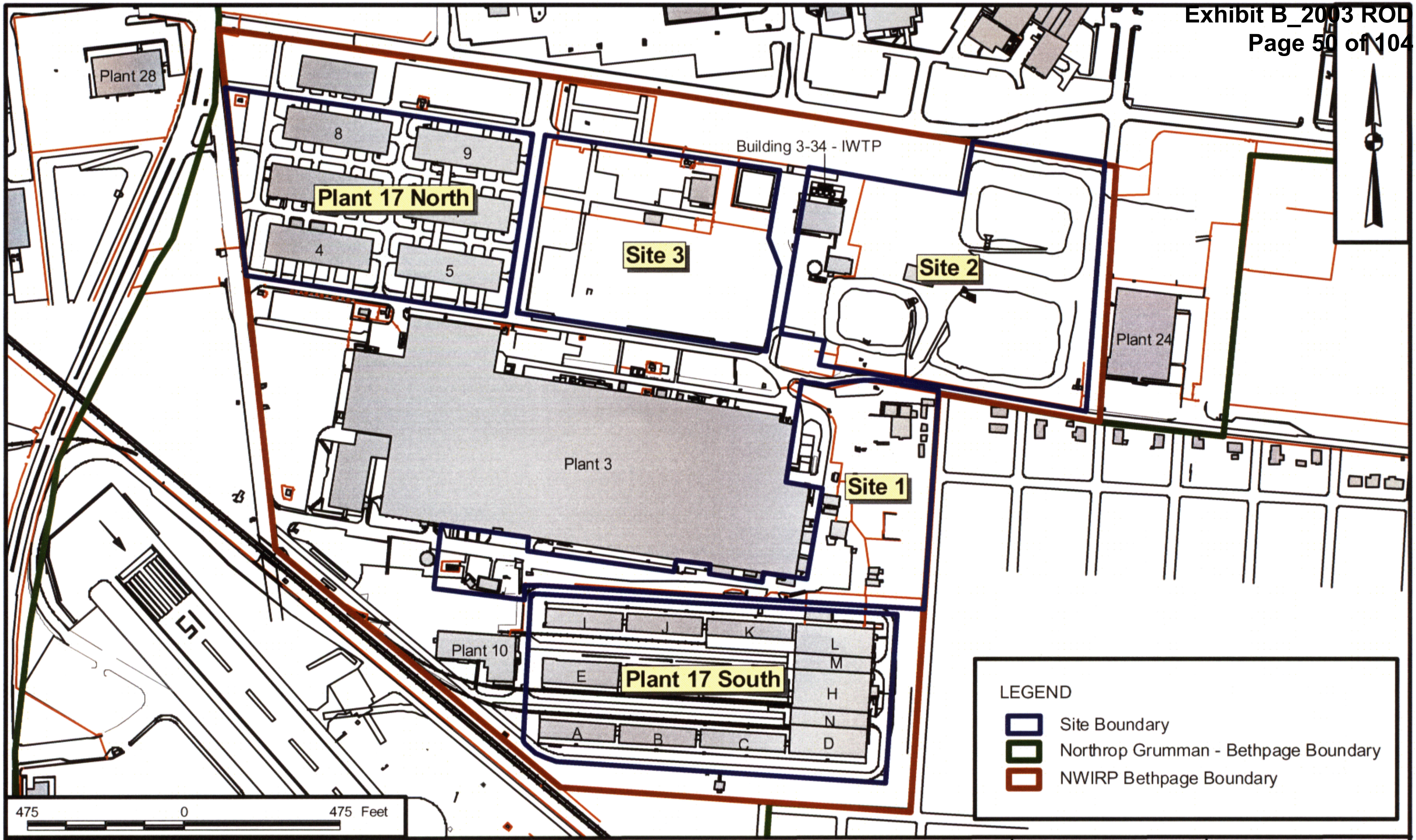
|---|---|---|---|---|
| DRAWN BY<br>J. LAMEY | DATE<br>2/8/00 | Tetra Tech NUS, Inc. | CONTRACT NUMBER<br>N5174 | OWNER NUMBER<br>CTO 208 |
| CHECKED BY | DATE | SITE MAP<br>NAVAL WEAPONS INDUSTRIAL RESERVE PLANT<br>BETHPAGE, NEW YORK | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | | APPROVED BY | DATE |
| SCALE<br>AS NOTED | | | DRAWING NO.<br>FIGURE 1 | REV<br>0 |



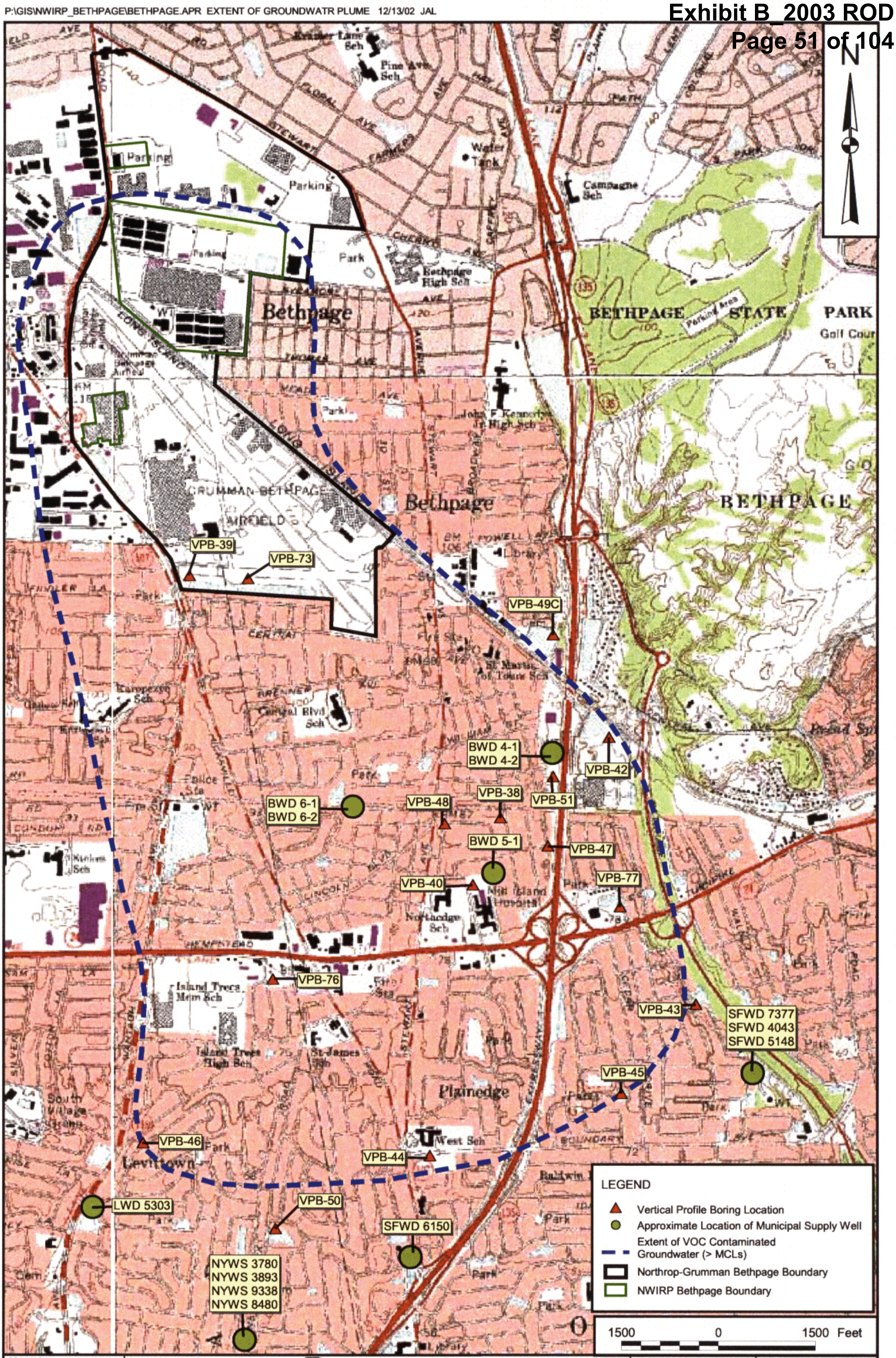
**Tetra Tech NUS, Inc.**

| | | | |
|---|---|---|---|
| DRAWN BY<br>J. LAMEY | DATE<br>9/21/00 | CONTRACT NUMBER<br>— | OWNER NUMBER<br>— |
| CHECKED BY<br>— | DATE<br>— | APPROVED BY<br>— | DATE<br>— |
| COST/SCHEDULE-AREA | | APPROVED BY<br>— | DATE<br>— |
| SCALE<br>AS NOTED | | DRAWING NO.<br>FIGURE 2 | REV<br>0 |

105 ACRE PARCEL MAP
NWIRP BETHPAGE
BETHPAGE, NEW YORK

P:\GIS\NWIRP_BETHPAGE\APR\BETHPAGE_RAB_21700.APR 105 ACRE PARCEL MAP 9/21/00 JAL

P:\GIS\NWIRP_BETHPAGE\BETHPAGE.APR EXTENT OF GROUNDWATR PLUME 12/13/02 JAL



| | | | | |
|---|---|---|---|---|
| DRAWN BY<br>J. LAMEY | DATE<br>12/13/02 | Tetra Tech NUS, Inc. | CONTRACT NUMBER<br>N4037 | OWNER NUMBER |
| CHECKED BY | DATE | EXTENT OF GROUNDWATER PLUME<br>NAVAL WEAPONS INDUSTRIAL RESERVE PLANT<br>BETHPAGE, NEW YORK | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | | APPROVED BY | DATE |
| SCALE<br>AS NOTED | | | DRAWING NO.<br>FIGURE 3 | REV<br>0 |

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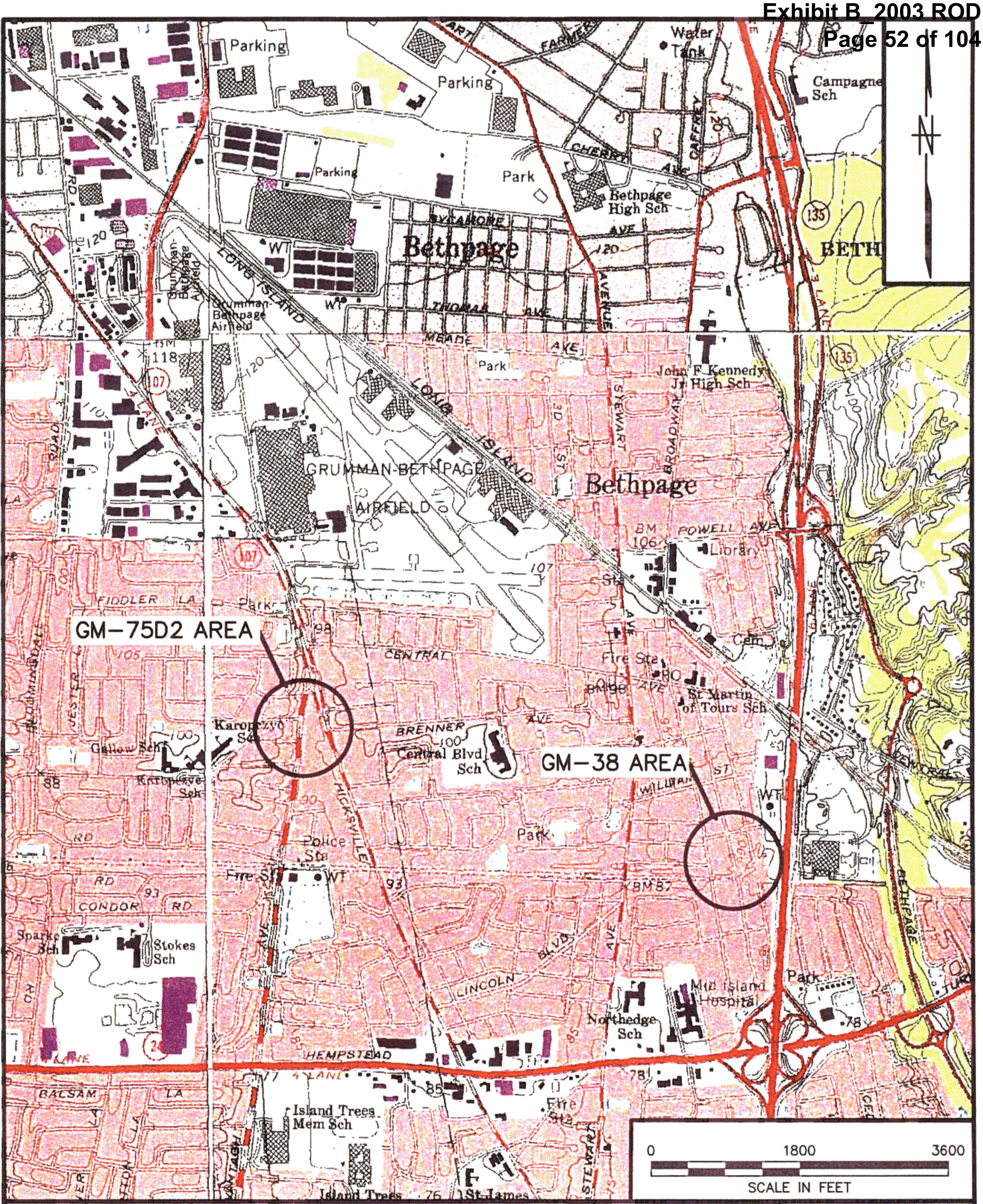

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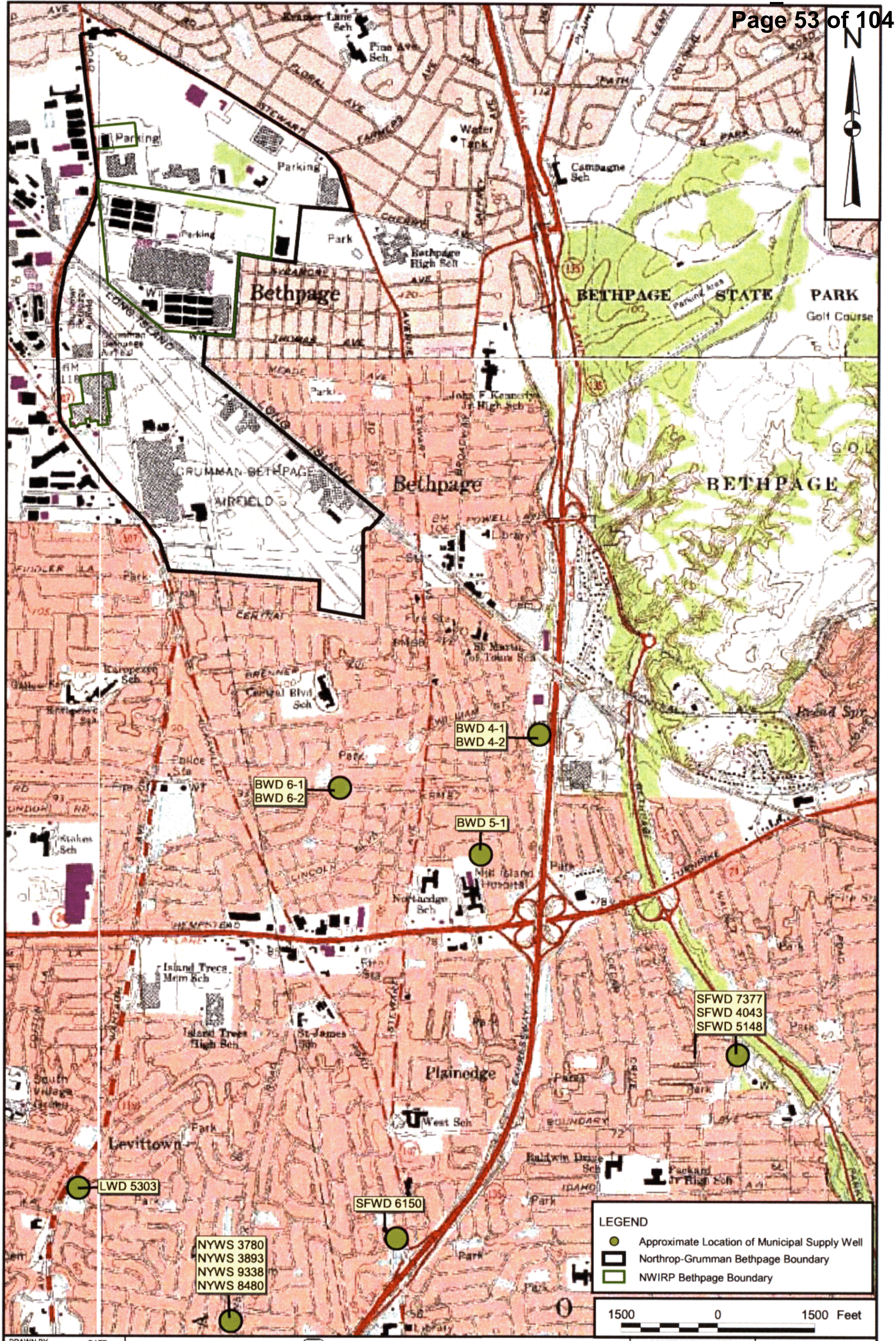
|---|---|---|---|
| DRAWN BY DM | DATE 10/15/02 | Tetra Tech NUS, Inc. | CONTRACT NO. 4037 | OWNER NO. ——— |
| CHECKED BY | DATE | SITE LOCATION MAP<br>OFFSITE GM–38 AREA REMEDY<br>NAVAL WEAPONS INDUSTRIAL RESERVE PLANT<br>BETHPAGE, NEW YORK | APPROVED BY | DATE |
| COST/SCHED–AREA |  |  | APPROVED BY | DATE |
| SCALE AS NOTED |  |  | DRAWING NO. FIGURE 4 | REV. 0 |

P:\GIS\NWIRP_BETHPAGE\BETHPAGE.APR PUBLIC SUPPLY WELLS 3/14/03 JAL



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| DRAWN BY<br>J. LAMEY | DATE<br>12/13/02 |
| CHECKED BY | DATE |
| COST/SCHEDULE-AREA | |
| SCALE<br>AS NOTED | |

Tetra Tech NUS, Inc.

LOCATION OF PUBLIC SUPPLY WELLS
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

| | |
|---|---|
| CONTRACT NUMBER<br>N4037 | OWNER NUMBER |
| APPROVED BY | DATE |
| APPROVED BY | DATE |
| DRAWING NO.<br>FIGURE 5 | REV<br>0 |

# APPENDIX A1
# RESPONSIVENESS SUMMARY REGARDING COMMENTS ON FINAL GROUNDWATER ROD DATED JANUARY 2003

# COMMENT RESPONSES FROM ENGINEERING FIELD ACTIVITY, NORTHEAST REGARDING FINAL NAVY RECORD OF DECISION FOR GROUNDWATER (JANUARY 2003) NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP) BETHPAGE, NEW YORK

## Comments from New York State Department of Environmental Conservation (NYSDEC) dated February 6, 2003:

**COMMENT 1: Page DS-3, First Paragraph, Page DS-5, Regulatory Acceptance, Last Two Sentences Page 3, First Sentence; Page 32 and 33, Groundwater Remedial Program, Public Water Supply Protection Program and Responsiveness summary First Two comment Responses on Page A-5:** The Navy ROD must state that the remedy also fails if the long term operation, maintenance and monitoring program is not being implemented or if treatment for Bethpage Water District Wells 4 and 6 are no longer being funded.

**RESPONSE to 1**: The following language was inserted into Page DS-3, First Paragraph; Page 3, First Sentence; and on Page 31: "along with the corresponding long-term maintenance and monitoring program for the ONCT system"

The following language was inserted at the end of the last paragraph on Pages DS-4; Page 4; and Page 32: "In the event that the treatment systems installed on BWD Plants 4 and 6 are no longer funded, the Navy recognizes that it's OFF-SITE GROUNDWATER remedy would no longer be protective of human health or the environment. In this case, the Navy will re-evaluate the protectiveness of the OFF-SITE GROUNDWATER remedy and implement all requisite measures as determined by the Navy in consultation with NYSDEC, NYSDOH, and the Nassau County Department of Health to ensure the continued protection of human health and the environment."

Appropriate language regarding the above was also included into the Regulatory Acceptance section on Page DS-5.

**COMMENT 2: Page DS-4, Page 4 and Page 33, Public Water Supply Protection Program:**

**a**. This section needs to include the Technical Advisory Committee (TAC) Meetings. The TAC meetings will be held at the discretion of the NYSDEC.

**b**. Add a bullet for the Navy's non-detect goal for this project.

**c**. Add a bullet that states any private well/residence that has been or will potentially be impacted by Site related contamination will be connected to public water.

d. **Last Bullet**: Add a statement that if the public wellhead treat contingency program identifies the need for wellhead treatment, the NYSDEC will direct the Navy to implement this program.

**RESPONSE TO 2a**: The following language was added as a bullet under Groundwater Remedial Program on Pages DS-4, 4 and 33: "continued participation on the Technical Advisory Committee (TAC) that was established by NYSDEC that is comprised, at a minimum, of the involved regulatory Agencies, participating local water districts, and the Northrop Grumman Corporation."

**RESPONSE TO 2b**: The language regarding the Navy's non-detect goal for this project was previously discussed in Section 8 under the subheading "Detailed elements of the Navy's selected remedy". Item 8 on Page 34 (of the Navy's previous version of this ROD) discusses that non-detect will be the goal of any remedy or comparative alternative that is chosen to protect the public water supplies, if found to be necessary. Section 8 is used to expand upon the details of the elements of the Navy's remedy that were previously shown as bullets. The bullets are used throughout the document so as not to get into too much detail regarding the elements of the remedy and to utilize Section 8 in order to provide those details.

Therefore, since the language requested by NYSDEC is already provided under Section 8, no additional changes to the ROD are necessary.

**RESPONSE TO 2c**: The appropriate language as suggested in NYSDEC's comment was added to the recommended pages.

**RESPONSE TO 2d**: The Navy cannot agree to the addition of the recommended language stating that NYSDEC will direct the Navy to implement the wellhead contingency program. Due to the language contained in Executive Order 12580, the Navy has been given CERCLA authority to direct the type of remedial actions that are taken on Navy property or off of Navy property due to an on-site migrating source of contamination. As stated in this document, if trigger values are exceeded, then the Navy has agreed to take action by first consulting with all of the appropriate parties and a collective decision would then be made regarding how best to proceed.

Therefore, no changes to the document will be made regarding this comment.

**COMMENT 3: Page DS-3, Page 3 and Page 31 and Page 34, Groundwater Remedial Program, Bullet 4:**

a. Add "or any other area identified as requiring such determination."
b. Add "and determine if a contaminant mass removal program as per the GM 38 D2 program is necessary."

**RESPONSE TO 3a**: The appropriate language as suggested in NYSDEC's comment was added to the recommended pages. Expanded details were also provided under Item 4 on Page 34.

**RESPONSE TO 3b**: The appropriate language as suggested in NYSDEC's comment was added to the recommended pages. Expanded details were also provided under Item 4 on Page 34.

**COMMENT 4**: **Page 19, Section G, Last Paragraph, Second to Last Sentence and Page 34, No. 7:** This sentence needs to read: "The above determination would be made by the NYSDEC and State and County Health Departments, in consultation with the Department of the Navy."

**RESPONSE TO 4**: The Navy can not agree to the addition of the recommended language for the same reason as stated in the Navy's Response to Item 2d above.

**COMMENT 5**: **Page 20, Section 7: Summary of Alternatives:** Alternative's 2 through 8 must include items F, G and H.

**RESPONSE TO 5**: Agreed. The oversight has been corrected. Inclusion of the 3 items listed in the above comment has resulted in redundancy between Alternatives 2 and 4, 5 and 7, 6 and 8. Therefore, alternatives 4, 7, and 8 have been deleted and the remaining 5 alternatives renumbered.

**COMMENT 6**: **Page 31, First Paragraph:** Change the last three sentences to read "implement the remedies selected by the NYSDEC ROD to ensure continued protection of human health and the environment."

**RESPONSE TO 6**: The Navy can not agree to the addition of the recommended language for the same reason as stated in the Navy's Responses to Items 2d and 4 above. However, it should be noted that by the authority granted to the Navy under Executive Order 12580, the Navy has the same goal of Protection of Human Health and the Environment as NYSDEC.

**COMMENT 7**: **Page 33. Bullets 5 and 7:** Add "trigger values must be accepted by the NYSDEC and NYSDOH."

**RESPONSE TO 7**: In this case, the Navy can agree that it will not take any action with regards to the "trigger values" until those values are concurred with by NYSDEC and NYSDOH. The appropriate language as suggested in NYSDEC's comment was added to the appropriate page using the word "concurred" to replace "accepted". The bullets affected are now shown in the revised ROD as numbers 6 and 8 due to a previous addition.

## Comments from Environmental Protection Agency, Region II dated February 14, 2003:

**COMMENT**: Section 6: Summary of the Remediation Goals - Among the goals selected for the site, the Navy does not include the following goal which was included in the March 2001 ROD for Operable Unit 2 - Groundwater prepared by NYSDEC:

> Eliminate, to the maximum extent practicable, the offsite migration of soils contamination entering the groundwater.

The omission should be evaluated and corrected if necessary.

**RESPONSE**: The remediation or elimination of the offsite migration of soil contamination into groundwater was previously addressed in the Navy's July 1995 Operable Unit 1 Soils ROD. Therefore, the inclusion of this goal into this Operable Unit 2 ROD is not necessary.

**COMMENT**: Section 7: Summary of the Evaluation of Alternatives - The selected remedy is Alternative 3 and is summarized on Page 21, but omits the components F, G and H as follows:

F. Long-Term Operation, Maintenance and Monitoring (OM&M) of the GM-38 Remedy
G. Development and Implementation of a Public Water Supply Well Contingency Plan
H. Department of the Navy Implementation of "Non-Detect" Policy for Affected Public Water Supplies

The text should be corrected.

**RESPONSE**: Agreed. The oversight has been corrected. Inclusion of the 3 items listed in the above comment has resulted in redundancy between Alternatives 2 and 4, 5 and 7, 6 and 8. Therefore, alternatives 4, 7, and 8 have been deleted and the remaining 5 alternatives renumbered.

**COMMENT**: Section 8: Summary of the Selected Remedy - The second paragraph on Page 29 describes the remedy to include long-term groundwater monitoring including monitored natural attenuation. However, the March 2001 ROD for Operable Unit 2 - Groundwater prepared by NYSDEC mentions long term monitoring of the groundwater. This discrepancy should be looked into and corrected if necessary.

**RESPONSE**: Agreed. The phrase "monitored natural attenuation" should not be included in this paragraph that describes NYSDEC's preferred remedy. The EPA correctly points out that NYSDEC is only requiring long term groundwater monitoring. The above phrase was deleted from this paragraph.

## Comments from Dvirka and Bartilucci Consulting Engineers on behalf of the Massapequa Water District dated February 14, 2003:

### *Primary Concern*

1. According to the Declaration Statement (page DS-2), implementation of the selected remedy will be subject to the availability of funds in future fiscal years. This statement is extremely disconcerting and unacceptable. The Navy, as part of the United States Government, is a responsible party for the contamination of a federally designated Sole Source Aquifer, known contamination of two public water supply well fields, which serve approximately 36,000 people, and a documented threat to at least five other public water supply wells, which serve an additional approximately 69,000 people. As being a responsible party, the Navy and the United States Government shall make the financial commitment to ensure that funds will be available to take whatever remediation actions are necessary to protect human health and the environment. Nothing less will be acceptable.

**RESPONSE TO 1**: The Navy acknowledges the concerns of the Massapequa Water District with regards to insuring that funding is available to protect the public water supplies if action is determined to be necessary. However, due to the language contained in the federal Anti-Deficiency Act, the Navy is not permitted to obligate funds for work that has not been appropriated by Congress. Since the Navy's ER,N funding, which is the source of funding to implement the requirements of this ROD, is an annual Congressional appropriation, the Navy can only commit to funding work in a specific fiscal year.

However, the Navy will include the necessary funding associated with this ROD in future budget requests. In this case, the appropriate funds required to fully implement this ROD have been included in the Navy's funding budget that currently extends out until 2015. Any funding that is thought to be required after 2015 has been included into the 2015 budget. As the Navy has proven in the past with the remediation of Bethpage, every effort is made to acquire sufficient funds each fiscal year to accomplish necessary environmental restoration, and this effort will continue.

### *Prior Comments from the Massapequa Water District*

2. In the response to our comments regarding the May 2002 draft ROD (page A-1 of Appendix A to the ROD), it is stated that the purpose of the vertical profile boring program was to gather data necessary to calibrate the regional groundwater model rather than to delineate the contaminant plume. Since the outpost well locations and depths are being determined based solely on the model results and prior groundwater modeling performed during the Feasibility Study did not accurately delineate the extent of contamination, we have requested on several occasions that additional groundwater sampling be conducted downgradient of the modeled extent of contamination to verify the accuracy of the model. The statement in the ROD that the need for additional vertical profile borings will be evaluated based on water

quality information obtained from the outpost wells and any other investigations that may be conducted in the future does not address our concern regarding the adequacy of the model to determine the locations and depths of outpost monitoring wells.

**RESPONSE TO 2**: While actual analytical data may be preferred, the Navy, Northrop Grumman and NYSDEC agreed to use a groundwater computer model to help predict groundwater flow and reduce the investigative costs associated with this project, knowing that these savings could be better utilized for actual groundwater remediation. The groundwater model has undergone rigorous calibration; and the PRP group, with NYSDEC concurrence, will use this tool. To date, data collected verifies that the model is useful in predicting groundwater response. In addition, NYSDEC has not expressed a desire for the Navy or Northrop Grumman to collect additional groundwater data downgradient for the sole purpose of pinpointing the extent of the groundwater plume. The edge of the plume that is being predicted by the model has been sufficient. The Navy has full confidence in the model in that the environmental firm that developed it has many years of experience regarding the hydrogeology of the Long Island area.

Based on the above, the Navy has decided, with NYSDEC concurrence, to utilize the results of the groundwater model to make a prediction as to the most likely location of the outpost monitoring wells. Only, when we actually install the wells, will we know if the model predictions were accurate. If it is found that the model was not accurate, then the Navy will have to re-evaluate the data, including the data collected upon installation of each outpost well, and re-locate the well(s).

3. In the ROD (page A-2 of Appendix A), it is stated "the Navy concurs that the water districts can decide what alternative is best for the district and its customers.. .." This statement should be directly incorporated into the ROD, specifically in items 7 and 8 of the detailed description of the Navy's selected remedy.

**RESPONSE TO 3**: The appropriate water district(s) will be heavily involved in the treatment decisions associated with their respective wells but will not have unilateral authority regarding the decision. The Navy must protect the interests of the federal government and the federal budget from which funds for remediation will be appropriated. Based on cooperation to date, the Navy expects decisions will be acceptable to all parties.

The following language was added to Page 20 under Item H that describes the Development and Implementation of the Public Water Supply Well Contingency Plan, to better clarify the involvement of all parties as it relates to this issue:

> "All the alternatives contain a contingency for public water supply wellhead treatment or comparable alternative measures. Outpost monitoring would indicate if VOC concentrations in the groundwater would potentially threaten a public supply well. A wellhead treatment system would be designed and installed or

comparable alternative water supply measures would be implemented if outpost monitoring well data indicates that a trigger value has been exceeded and that a determination has been made that treatment of a public supply well or provision of an alternative water source is necessary to protect public health from exposure to site-related contamination. The above determination would be made jointly with participation by the Navy, NYSDEC, State and County Health Departments, and the appropriate water district whose well is of concern."

***Other Comments Regarding the Record of Decision***

4. The ROD assumes that certain activities, including sampling of the planned outpost monitoring wells, will continue to be conducted by the Northrop Grumman Corporation. The ROD should include a commitment by the Navy that these activities will continue, even if the Northrop Grumman Corporation will no longer conduct them, to ensure the continued protection of the downgradient public water supply wells.

**RESPONSE TO 4**: Agreed. Based on a similar comment submitted by NYSDEC, the Navy has expanded those activities that, if failed to continue, would constitute that the Navy's Off-Site Remedy is no longer protective of human health and the environment.

5. According to the ROD, to date, three public water supply well fields operated by the Bethpage Water District have been impacted or threatened by the off-site groundwater contaminant plume. However, according to information presented at the October 2002 Technical Advisory Committee meeting, groundwater modeling shows that three South Farmingdale Water District public water supply wells and two New York Water Service public water supply wells will impacted by site-related contamination in as little as four years. This information should be incorporated into the ROD.

**RESPONSE TO 5**: Text was inserted into the various sections that discusses the Public Water Supply Well Protection Program, that references the models predicted impacts to the SFWD Wellfield that contains Well 4043 and a separate SFWD Wellfield containing Well 6150, as well as the NYWS Wellfield containing Well 8480.

6. Alternatives 5,6, 7 and 8 all include off-site plume containment, treatment and discharge to off-site storm sewers, and describe installation of extraction wells north of Hempstead Turnpike to "provide mass removal from the entire aquifer.. .at the farthest downgradient edge of the plume.. . ." While it is recognized that the alternatives were developed as part of the 2000 Feasibility Study Report for the site, the ROD should incorporate the results of the recent vertical profile boring program which showed that the extent of the contaminant plume is currently well south of Hempstead Turnpike.

**RESPONSE TO 6**: The Navy agrees with this comment. The last sentence of the first paragraph under Alternative 4 has been modified to state that the wells that would need to be installed to capture the entire groundwater contaminant plume would have to be installed to the south of the Hempstead Turnpike.

7. As listed, Alternatives 5 and 6 include Item E (Off-site GM-38 Area Remedy). However, since the descriptions for these alternatives do not make reference to the GM-38 Area, it appears that these two alternatives should only include Items A through D.

**RESPONSE TO 7**: Due to comments made by NYSDEC, the Navy has revised the description of alternatives. The result was redundancy between Alternatives 2 and 4, 5 and 7, 6 and 8. Therefore, alternatives 4, 7, and 8 have been deleted and the remaining 5 alternatives renumbered.

8. Figure 3 should be modified so that the extent of the groundwater plume can be clearly identified, even on a photocopied page.

**RESPONSE TO 8**: Comment noted. A revised Figure 3 was inserted.

9. Pages 5 and 6 of the ROD identify the former disposal areas as "Area 1," "Area 2" and "Area 3." These areas are described as "Site 1," " Site 2" and "Site 3" on Figure 2 and on page 11. Identification of the area should be consistent.

**RESPONSE TO 9:** References made to the former disposal areas will be revised on pages 5 and 6 to match the term "Site" used on Figure 2.

10. Attachment A (list of documents in the Administrative Record) was not provided.

**RESPONSE TO 10**: The Administrative Record index will be included as Appendix B in the Final version.

11. We note several apparent typographical errors within the ROD, as described below:

a. The second sentence of the third paragraph of page 9 should read "confining clay unit" rather than "confirming clay unit."
b. The first sentence of the first full paragraph of page 13 should read "IRMs" rather than "IRAs." If "IRAs" is correct, then the acronym should be defined. Also, the definition of IRM on page 12 (Interim Remedial Measure) is different from the definition in the Glossary of Terms (Initial Remedial Measure).
c. Since the last paragraph on page 27 describes Alternatives 5 through 8, which include off-site extraction and treatment systems, the first sentence should refer to the "OFCT" system rather than the "ONCT" system.

**RESPONSES TO 11a, b and c**: All typographical errors discussed in the comments above have been changed as recommended.

## Comments from Northrop Grumman Corporation dated February 14, 2003:

### General Comment

NGC believes that the Navy ROD improperly seeks to institutionalize the current status quo for the remedial activities being undertaken by the Navy and NGC. NGC is willing to maintain this status quo only until it can be modified, and we have been actively seeking to modify the present suite of activities to be more consistent with the historical allocation of responsibilities between the Navy and other Government-Owned, Contractor-Operated (GOCO) facility operators. We believe this is essential to provide for a more equitable treatment of NGC, ensure a more appropriate allocation of costs over the long term and preserve our competitiveness in the marketplace. With the exception of the Navy-imposed "institutional control" for onsite groundwater (which consists of a deed restriction prohibiting the extraction of groundwater from within the boundaries of the Naval Weapons Industrial Reserve Plant (NWIRP) - Bethpage facility), the Navy ROD should be revised to acknowledge its joint and several responsibility for all the requirements and remedial measures mandated in the March 2001 ROD for Operable Unit 2 (OU-2) Groundwater issued by the New York State Department of Environmental Conservation (NYSDEC) for the NWIRP - Bethpage and Northrop Grumman - Bethpage sites (hereinafter referred to as the NYSDEC ROD).

To that end, NGC offers legal comments below, followed by specific technical comments on various sections of the ROD.

### Legal Comments

#### The Navy is Subject to New York State Law

Congress has waived "sovereign immunity" and thus the Navy (as well as NGC), is subject to the New York State Environmental Conservation Law (ECL) and the regulations promulgated thereunder which govern the remedial activities proscribed by the NYSDEC ROD for OU-2.

> "[S]tate laws concerning removal and remedial action, including state laws regarding <u>enforcement</u> (emphasis supplied) shall apply to removal and remedial action at facilities owned or operated by a Department agency, agency, or instrumentality of the United States . . . when such facilities are not included on the National Priority List." CERCLA § 120(a)(4), U.S.C. § 9620(a)(4).

The NWIRP, the NGC facilities and the environmental conditions which are the subject of both the NYSDEC and the Navy RODs are not listed on the NPL, and thus, clearly fall within the ambit of CERCLA's waiver of sovereign immunity. Section 120(a)(1) does not provide that governmental entities such as the Navy are exempt from liability.

Rather, it provides that the federal government, in this case the Navy, is liable in the same manner and to the same extent as any non-governmental entity. CERCLA § 120(a)(4) unambiguously provides that the waiver broadly applies to state laws pertaining to enforcement, and is not limited to state law clean up standards or ARARS.

In the instant case, Article 27, Title 13 of the ECL and the regulations promulgated thereunder at 6 NYCRR Part 375 establishes New York's enforcement mechanism for implementing the remediation of OU-2, as well as New York's clean up goals, objectives and methodologies. Importantly, New York's regulations, which establish the basis for the NYSDEC's ROD, track its federal counterpart and incorporate by reference the National Contingency Plan. *See* 6 NYCRR § 375-1.10. Consequently, the Navy is subject to the ECL § 27-1313 and the regulations promulgated at 6 NYCRR § 375-1.3(u) which establish the Navy's strict, joint, and several liability for the entire OU-2 remedy as prescribed by the NYSDEC ROD. This does not allow the *de facto* allocation of responsibility as proposed in the Navy ROD.

Specifically, the Navy is not entitled to "accept" certain obligations and delegate others. In an attempt to escape liability, the Navy relies on *United States Department of Energy v. Ohio* in the responsiveness summary of the Navy ROD. That case pertains to RCRA and CWA only, and the ambiguous language of those statutes[1] is dissimilar to the express language contained in CERCLA § 120(a)(4). Thus, under the unambiguous provisions of CERCLA, state laws concerning removal and remedial action, including laws regarding enforcement, do apply at Federal facilities not on the NPL. Moreover, in light of CERCLA's broad remedial goals, the interpretation that the

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[1] The citizen suit provision of the CWA reads:

> Any citizen may commence a civil action on his own behalf-- (1) against any person (including the United States ...) who is alleged to be in violation of (A) an effluent standard or limitation under this chapter or (B) an order issued by the Administrator or a State with respect to such a standard or limitation....
>
> The district courts shall have jurisdiction ... to enforce an effluent standard or limitation, or such order ... as the case may be, and to apply any appropriate civil penalties under [33 U.S.C. § 1319(d) ].
> CWA § 505(a), 33 U.S.C. § 1365(a).

The RCRA provision reads:

> (a) In general . . . . [a]ny person may commence a civil action on his own behalf—
> (1)(A) against any person (including . . . the United States . . .) who is alleged to be in violation of any permit, standard, regulation, condition, requirement, prohibition, or order which has become effective pursuant to this chapter . . . or (B) against any person, including the United States . . . who has contributed or who is contributing to the past or present handling, storage, treatment, transportation, or disposal of any solid or hazardous waste which may present an imminent and substantial endangerment to health or the environment . . . . The district court shall have jurisdiction . . . to enforce the permit, standard, regulation, requirement, prohibition, or order, referred to in paragraph (1)(A), to restrain any person . . . and to apply any appropriate civil penalties under [42 U.S.C. §§ 6928(a) and (g) ].
> RCRA § 7002, 42 U.S.C. § 6972.

Navy seeks to apply in these circumstances would lead to irreconcilable and inconsistent results and remedies. To avoid such inconsistent results and remedies, as in this instance, Congress expressly gave state law precedence.

**RESPONSE**: The current and prevailing appellate court opinion is that CERCLA 120(a)(4) does not satisfy the threshold test required by the United States Supreme Court to be a clear and unambiguous (see, Department of Energy v Ohio, 503 U.S. 607 (1992) waiver of Sovereign immunity that showing a clear congressional intent to require federal agencies to comply with non-substantive state requirements (see, Hancock v. Train (426 US 167 (1978). In particular, the United States Court of Appeals (1st. Circuit), addressed the scope of CERCLA 120(a)(4) in a case questioning whether a non-substantive state requirement of the imposition of fines can be enforced against the Department of the Navy. That court held, "We therefore conclude that Department of Energy requires us to hold that CERCLA section 120, like RCRA section 6961, does not provide an adequately clear waiver of sovereign immunity from civil penalties sought by Maine." Maine v. Navy 973 F.2d 1007 (1st. Circ., 1992). In response to Hancock v. Train and Maine v. Navy, Congress amended the Clean Water Act and RCRA respectively to broaden the scope of the waivers and to include state and local procedural requirements within the language of the provision. No such language was added nor presently exists in CERCLA 120(a)4. Accordingly, as required by CERCLA, all state substantive requirements which are Applicable, Relevant and Appropriate have been satisfied.

**The Navy's Position is Contrary to Navy Policy**

Moreover, to suggest that CERCLA Section 120 is "ambiguous" or otherwise fails to enable the State of New York to compel complete Department of Defense (DOD) action at Bethpage is a dramatic departure from Navy's own Environmental and Natural Resources Program Manual (OPNAVINST 5090.1B) ("Navy Policy Manual").

Chapter 15 of the Navy Policy Manual pertains to the very Installation Restoration Program at issue here and "non-government owned sites that have been contaminated by the disposal of Navy-generated waste and other [hazardous substances] for which the Navy is a potentially responsible party." (Emphasis added.) Of note, Section 15-2.6 (State laws) reaffirms that, "under CERCLA Section 120(a)(4), State laws concerning removal, remedial action, and enforcement apply to Federal facilities not listed on the National Priorities List (NPL)." Indeed, "Navy policy is to comply with all State laws which are consistent with CERCLA, SARA and the NCP." Section 15-5.29. In addition, "Navy actions to fulfill its CERCLA responsibilities shall be consistent with its contractual requirements with the GOCO contractor." Section 15-5.28 (emphasis added). Section 15-5.17 of the Navy Policy Manual confirms that "[a]lthough neither a ROD nor an IAG [interagency agreement] is required under CERCLA at non-NPL sites[e.g., Bethpage], State remediation laws may contain requirements for decision documentation. Where such requirements apply, the cognizant NAVFACENGCOM activity shall write a decision document for submittal to the installation that satisfies State law." Navy Policy Manual Section 15-5.17 (emphasis added).

**RESPONSE**: See Response to Legal Comment above regarding the satisfaction of the substantive requirements of State Law.

### The Navy's Position is a Material Deviation from the Prior Course of Dealing

NGC has also found that the NWIRP-specific ROD conflicts with not only New York State law and published Navy policy, but also pre-existing facility contracts and the prior course of dealing.

In the face of a comprehensive March 2001 NYSDEC ROD for groundwater, the Navy purports to "accept" almost two years later only certain aspects of the Bethpage groundwater remedy mandated by the NYSDEC ROD and relegate other substantive aspects of the NYSDEC ROD to its contractor (NGC) over NGC's objection. According to the Navy, the purpose of its considerably narrower and competing Navy ROD is purportedly to authorize DOD funding for those limited tasks that "Navy feels" are "acceptable" for it in regard to implementation of the OU-2 remedy.

Promptly after the issuance of the NYSDEC ROD in March 2001, NGC attempted without success to enter into an "Environmental Matters Agreement" with the Navy to allocate voluntarily responsibility under OU-2. Where the Government has failed to fund 100% cleanup, the Navy and other DOD departments have occasionally entered into such agreements with contractors at a number of contaminated industrial reserve plants. The Navy terminated those discussions with NGC over one year ago and now seeks to impose its own allocation formula under the veil of a "Navy ROD."

The Navy ROD is plainly calculated to impose what Navy admits is an incomplete solution for OU-2 over the objections of both NYSDEC and NGC. Navy concedes that, when it could not delegate responsibility for OU-2 to NGC in the face of contractual guarantees to the contrary, Navy first approached NYSDEC to enter into a Federal Facilities Site Remediation Agreement to bind DOD to only certain aspects of OU-2: "That is why the Navy approached NYSDEC to enter into a Federal Facilities Site Remediation Agreement (FFSRA) with the Department of the Navy that binds the Navy to accept responsibility for certain portions of groundwater remedy." Navy Comments at A-11.

Thus, in the absence of an Environmental Matters Agreement, the Navy ROD evidently became its third option to delegate OU-2's obligations and impose a Navy-sponsored allocation formula, regardless of controlling state and federal law, and its own contractual obligations to its contractor.

The history of the NGC facility compels a contrary conclusion. For example, since the 1930s, production at the adjoining and highly integrated Navy- and NGC-owned parcels has related almost exclusively (98%) to DOD requirements, DOD production and DOD product specifications. Thus, the environmental degradation attributable to 98% DOD production is not susceptible to the arbitrary allocation formula imposed by Navy in its ROD.

Moreover, the Navy assumes erroneously that the activities and operations on the Navy parcels and NGC parcels were unrelated and independent, which is more accurately the case with the activities at the Occidental Petroleum/RUCO site under EPA jurisdiction. To the contrary, the activities at Bethpage that led to historical releases to groundwater were in direct support of DOD programs and in compliance with DOD specifications and oversight. Further, the Navy ROD ignores the applicable Bethpage facility use and production contracts that plainly allocate responsibility for damages arising from DOD-related production activities to the Navy, regardless of whether part or all the DOD work occurred on a specific Navy/NGC parcel or within a specific Navy/NGC building. Over the six decades of DOD production at Bethpage, the ownership of various parcels and production buildings has changed back and forth between DOD and NGC or its predecessor. Accordingly, the Navy's approach to limit its responsibility in the manner set forth in its narrow and self-serving ROD is both arbitrary and capricious.

It is noteworthy that all costs pertaining to OU-1 (soils) and the interim OU-2 groundwater measures undertaken at NWIRP and on the adjoining NGC parcels, including all downgradient off-site locations, have been assumed directly or indirectly by Navy, as required by applicable contracts, federal regulations and New York State Law. This interim allocation for OU-2 is far more consistent with applicable law and DOD practices at hundreds of other former industrial reserve plants and military installations. The Navy ROD departs from its practices over the last 10 years at Bethpage and Calverton and is remarkably silent on Navy's obligations under its own Bethpage contracts to assume the cost of cleanup of OU-2. Navy simply states that in the event its former GOCO contractor fails to perform certain key tasks necessary to implement the NYSDEC ROD, NYSDEC may exercise its option to revisit the Navy ROD every 5 years.

At Bethpage, the Navy represents to NYSDEC that a competing ROD that selects certain more favorable portions of a pre-existing state ROD (and unilaterally allocates substantive obligations to other parties) is "required" in order to obtain DOD funding. Navy's own policy manual instructs otherwise. The Navy's own practices at Bethpage, Calverton and other GOCO facilities also instruct otherwise.

In light of the foregoing, it is clear the Navy ROD is legally defective and has no purpose other than to limit NYSDEC's enforcement options, override controlling state law and mitigate controlling facility contracts in order to achieve an outcome favored by the Navy.

**RESPONSE**: Navy asserts that its CERCLA authority prevails as to Navy decision-making at this non-NPL site as described in the response to items above. Resolution of financial responsibility for contamination from operations conducted by Northrop Grumman has been remanded to the Navy Litigation Office for resolution. Navy intends to go ahead with remedies as described in this ROD in order to protect human health and the environment and to transfer property to Nassau County as authorized by federal law while matters of financial responsibility are being resolved. The Navy recognizes the efforts made on the part of NGC to enter into an Environmental Matters Agreement and notes NGC's objection to the course of action chosen by the Navy.

**Technical Comments**

1. The description of the "commingled plume" should be revised to include that portion of the plume that is off-site, downgradient of the NWIRP and Northrop Grumman sites. See Page DS-2 (1st paragraph).

**RESPONSE TO 1**: The phrase, "Over the years, a portion of this Navy/NGC commingled plume has migrated further downgradient and beyond the property boundaries of both the Navy and NGC." was incorporated.

2. The ON-SITE GROUNDWATER remedy should be revised to include the NYSDEC ROD-required ONCT System Hydraulic Effectiveness Evaluation, including any follow-up activities required by the NYSDEC. See Pages DS-3 (1st full paragraph); 3 (1st paragraph); 17 (Section C, 1st paragraph); 18; and 31 (top of page).

**RESPONSE TO 2**: The components of this ROD in combination with actions being taken by other parties, including the identified evaluation, provide a remedy that is protective of human health and the environment. If necessary actions taken by others, including the suggested evaluation, fail to be implemented, then the Navy's ROD would no longer be protective and the ROD would have to be amended.

3. The description of the GM-38 Area remedy should be revised to include the following components. See Pages DS-3 (Groundwater Remedial Program Section); 3 (Groundwater Remedial Program Section); 18 (Section E); 31 (Groundwater Remedial Program Section); and 32 (Groundwater Remedial Program Section).
   a. Remedial design of GM-38 remedy.
   b. Construction of GM-38 remedy.
   c. Monitoring of GM-38 remedy (consistent with Page 18, Section E of Navy ROD).

**RESPONSE TO 3**: Agreed. The recommended changes on the suggested pages have been made with regards to the description of the GM-38 remedy.

4. The Groundwater Remedial Program Section should be revised to include the recognition of responsibility for implementing any investigation, RD/RA, OMM, or other activity required by the NYSDEC. See Pages DS-3 (Groundwater Remedial Program Section); 3 (Groundwater Remedial Program Section); 31 (Groundwater Remedial Program Section); and 33 (Groundwater Remedial Program Section).

**RESPONSE TO 4**: The following phrase was added to the appropriate bullets that describe the Groundwater Remedial Program, "The trigger value used to determine if additional groundwater investigations are necessary is a detection of 1 ppm of TVOCs in three consecutive sampling events in any one well. After the area is assessed, a determination will also be made regarding the necessity for implementation of a contaminant mass removal program, similar to the GM-38 Area program."

5. The phrase "by the commingled plume from the NWIRP and Northrop Grumman sites" should be added to the end of the last bullet on Pages DS-4; 32 (top of page - last bullet); and 34 (Item No.9).

**RESPONSE TO 5**: This exact phrase was not added as recommended. The phrase was slightly modified to read, "from site-related contaminants." and added to the recommended pages.

6. Monitoring of Outpost Wells should be added to the 3rd bullet on Pages DS-4; 4; and 33 (Item No. 6). Furthermore, the goal of the vertical profile boring program stated under the Public Water Supply Protection Program heading should be revised to indicate that the goal was to collect depth-specific lithologic and groundwater samples to establish a vertical profile of the geology and groundwater quality at each investigation location in support of groundwater modeling efforts, not to delineate the extent of the plume.

**RESPONSE TO 6**: The Navy does not agree to the addition of this item in the Navy's ROD. Currently, and over the last couple of years, NGC has been tasking their environmental contractor with the quarterly sampling and analysis of groundwater monitoring wells located downgradient of NGC property in accordance with OM&M activities associated with the ONCT system. Collection of this data is used to describe groundwater flow conditions and groundwater quality observed on a quarterly basis. Based on discussions with NGC and their environmental consultant, it is the Navy's understanding that the sampling and analysis of the outpost monitoring wells will be included into the quarterly efforts associated with OM&M of the ONCT system since the data collected from the outpost wells could also be used to describe groundwater flow conditions and groundwater quality (see Item C in Section 7.1).

7. Change the phrase "NWIRP ROD" to "OU-1 NWIRP ROD", on Page 7 (1st full paragraph).

**RESPONSE TO 7**: Agreed. The recommended change has been made.

8. Insert the phrase "at the NWIRP site" after the phrase "SCGs" on Page 10 (last paragraph).

**RESPONSE TO 8**: Agreed. The recommended change has been made.

9. Change the phrase "IRAs" to "IRMs", on Page 13 (1st full paragraph).

**RESPONSE TO 9**: Agreed. The recommended change has been made.

10. Delete the phrase "known to presently exist or that have historically existed at the site" from the 2nd paragraph under Section 4.3 on Page 13. NGC is not aware of any human exposures that exist, either historically or currently.

**RESPONSE TO 10**: Agreed. The following phrase has been substituted, "A potential human exposure pathway that could be relative to this operable unit is direct contact with (dermal adsorption), ingestion of, and inhalation associated with contaminated groundwater through residential or commercial use."

11. Add the NYSDEC ROD-required Non-Detect Performance Standard for affected public supply wells to the list of goals on Page 15 (2nd paragraph).

**RESPONSE TO 11**: Agreed. The following phrase has been added, "Eliminate, to the extent practicable, detections of site-related VOC contamination for affected drinking water supplies using USEPA Method 502.2 to a detection limit of 0.5 micrograms per liter (ug/l)."

12. The 3rd sentence in the last paragraph on Page 15 should be revised to say "Since completion of the ONCT system in 1998, NGC has operated the system continuously and has been conducting quarterly sampling of on-site wells since 1995 and both on-site and off-site wells since 1998."

**RESPONSE TO 12**: The recommended change has been added to the text.

13. Delete the 2nd sentence in the 1st paragraph on Page 18. The public supply wells that are presently equipped with wellhead treatment systems are operated and maintained by the water districts. Therefore, the preparation and implementation of the associated operation and maintenance plan would be the responsibility of the respective water district, not Northrop Grumman.

**RESPONSE TO 13**: Agreed. This statement has been deleted. The remaining text was also changed to present tense to reflect that an O&M plan associated with the ONCT system has been prepared and submitted to NYSDEC for review.

14. The text for Page 18, Section E and Page 19, Section G do not match the titles given for these sections. These sections should be revised, as follows: Section E should include the components of the GM-38 Area remedy discussed herein as Specific Comment No. 3; Section G should include preparation of the Water Supply Contingency Plan, including trigger values, installation of VPBs and outpost wells, and outpost monitoring.

**RESPONSE TO 14**: The texts within these two items were updated to reflect more of the components of each task as suggested with the exception of the inclusion of outpost monitoring under Item G for the reasons stated in the Navy's response to Comment 6.

15. The 4th paragraph on page 24 should be deleted and replaced with the wording provided by the NYSDEC on Page 4 (2nd bullet) of the NYSDEC ROD.

**RESPONSE TO 15**: The recommended text was included as suggested.

16. Add language to address implementation of any NYSDEC-required follow-up (including Pre-Design investigation, RD/RA, OMM, etc.) to the GM-75D2 investigation.

**RESPONSE TO 16**: The follow-up taskings were added with language that also states that these actions will be implemented if a determination has been made that a significant threat to a downgradient public water supply exists. Further language was added to state that the determination of a significant threat will be made by the Navy and NYSDEC. This change was made to the 75D2 bullet on all pages where the Groundwater Remedial Program was described.

17. Figure 3 should be revised to better illustrate the extent of the VOC plume. The plume extent is not apparent in the figure supplied.

**RESPONSE TO 17**: Agreed. Figure 3 has been modified.

18. The statement made on Page 17, Item C, 1st paragraph, second sentence is incorrect, as the OMM Plan does not include a specific task to verify the NWIRP contamination does not pass beyond the ONCT system. As referred to in Specific Comment No. 2, herein, the ROD requires that a hydraulic effectiveness evaluation of the ONCT system be performed to verify that the system achieves the goals of the system, which are defined as preventing the off-site migration of NGC and NWIRP site-related VOC-impacted groundwater that is located within the boundaries of the sites (*i.e.*, on-site contaminant mass containment). Further, this ROD requirement is not limited to the NWIRP site contaminants.

**RESPONSE TO 18**: The clarification to the language was made.

**Comments from Holzmacher, McLendon & Murrell, P.C. (H2M Group) on behalf of the South Farmingdale Water District and New York Water Service dated February 14, 2003:**

- Pages DS-3 and 3 - We believe that the data in the vicinity of Well 75D2 already demonstrates the need for extraction and treatment and request that the Navy implement a remedy to minimize any further migration of this concentrated VOC plume to the south. Consideration should be given to pumping the extracted water back to the Grumman-Navy site where additional treatment facilities could be constructed adjacent to the on-site treatment system (ONCT).

**RESPONSE**: The data collected from Well 75D2 has been incorporated into the groundwater computer model and the output of the model has indicated that collection and treatment of contamination from this area will not change the predicted impacts to the downgradient public supply wells. Therefore, the Navy does not agree that the installation of the suggested system is necessary. Rather the Navy will utilize available resources on other priorities of the groundwater remedy.

- Pages DS-3 and 3 - We are reiterating our comments that we previously provided on the proposed groundwater remedial program at GM-38. The proposed program should include a collection of extraction wells that optimizes the effectiveness of the remedial action in removing contaminants in the GM-38 area and reduces the potential impact of the contaminant plume on downgradient water supply wells. While the modeling results presented at the June 26, 2002 and October 22, 2002 TAC meetings suggested little difference to the downgradient wells regardless of whether two or three extraction wells were installed, it is our opinion that this conclusion is biased due to the proposed location and minimal pumping rate of the third extraction well and the slow rate of groundwater travel in the deeper Magothy aquifer. It is our opinion that if extraction well(s) at more significant pumping rates (1000 gpm +) were installed further south (on Hempstead Turnpike, in the vicinity of Mid-Island Hospital) coupled with looking at a longer period of time (in excess of 30 years), the benefit of adding additional extraction well(s) would be more significant to downgradient water suppliers. The proposed GM-38 area is upgradient of SFWD's largest well field (plant 1) where the SFWD has three of its eleven wells. Consequently, we are recommending that additional extraction wells with adequate pumping capacity (1000 gpm +) be added in the vicinity of Mid-Island Hospital to minimize the size and concentration of the contaminant plume traveling south of Hempstead Turnpike beyond the proposed capture zone for GM-38.

**RESPONSE**: ARCADIS is currently running a model simulation based on the recommendation provided in the comment above to determine if there are any readily apparent benefits of implementing this scenario.

- Pages DS-4 and 19 - As part of the Public Water Supply Well Contingency Plan, consideration should be given to modifying the wording such that if either the outpost monitoring well data OR the ongoing modeling indicates that a water supply well will be impacted within five years or less, that the Navy will commence negotiations with the affected water supplier. This will minimize the possibility of contamination bypassing the outpost monitoring well and subsequently impacting the water supply well thereby putting the water supplier at risk with insufficient time to design and construct treatment facilities or implement an alternative measure.

**RESPONSE**: Navy intends to use both means to determine if a potential problem exists, but will rely on actual groundwater data as confirmation before committing to the installation of a multi-million dollar treatment system or other comparative alternative. However, the comment made above is valid, therefore, the Navy has included the following language to all bullets that describe the installation of Outpost Monitoring Wells:

> "If future modeling efforts suggest that a water supply well may be impacted within some reasonable timeframe and it has been further determined that the projected contaminant flow path will not intercept an existing outpost monitoring well, then additional outpost monitoring well(s) would be designed, installed, and monitored."

- Page 19 - Section G - second paragraph and 34 - Article 7 - last line: In addition to the Navy, NYSDEC and the Health Department, the affected Water Districts must also be a participant in any discussion relative of the evaluation of outpost monitoring well data and the need to implement an appropriate remedy.

**RESPONSE**: Agreed. This comment was previously addressed in the Navy's response to Dvirka & Bartilucci's Comment 3. Specifically, the following language was added to Page 20 under Item H, "All the alternatives contain a contingency for public water supply wellhead treatment or comparable alternative measures. Outpost monitoring would indicate if VOC concentrations in the groundwater would potentially threaten a public supply well. A wellhead treatment system would be designed and installed or comparable alternative water supply measures would be implemented if outpost monitoring well data indicates that *a* trigger value has been exceeded and that a determination has been made that treatment of a public supply well or provision of an alternative water source is necessary to protect public health from exposure to site-related contamination. The above determination would be made jointly with participation by the Navy, NYSDEC, State and County Health Departments, and the appropriate water district whose well is of concern."

- Figures 3 and 5 - Please correct the location of the wells at Plant site 1. Wells N-4043, N-5148 and N-7377 are on the same Plant site (1) and well N-4042 no longer exists.

**RESPONSE**: Changes to the well locations have been made.

- Figure 3 - Based on the latest data, this figure does not appear to accurately and clearly show the extent of VOC contaminated groundwater (>MCLs).

**RESPONSE**: Figure 3 has been revised to better reflect the extent of the groundwater contaminant plume. However, no change in the outline was made since the figure provides an accurate representation of the extent of the groundwater contaminant plume.

**Comments from Holzmacher, McLendon & Murrell, P.C. (H2M Group) on behalf of the Bethpage Water District dated February 14, 2003:**

- Pages DS-3 and 3 - As the District has already been on record, the groundwater data for the plume in the area of GM-75D2 already demonstrates that remediation at this location is warranted and required. We request that the Navy concur that remediation at this location will minimize further migration of the contamination plume to the south. Since past data has already shown high levels of contamination, additional investigation at this point will only prolong the plume migration. With the location of this site near to the on-site treatment system, extraction wells piped back to the on-site treatment system for groundwater remediation should be considered. As a note, we suggest that a figure indicating the location of the GM-75D2 area be provided as part of the ROD.

**RESPONSE**: The data collected from Well 75D2 has been incorporated into the groundwater computer model and the output of the model has indicated that collection and treatment of contamination from this area will not change the predicted impacts to the downgradient public supply wells. Therefore, the Navy does not agree that the installation of the suggested system is necessary. Rather the Navy will utilize available resources on other priorities of the groundwater remedy.

The Navy will, however, revise Figure 4 to include the location of the 75D2 Area.

- Pages DS-3 and 3 - In our letter of December 2,2002, which commented on the information provided at the October 22, 2002 Technical Advisory Committee (TAC) meeting, we reiterate our comments related to the design parameters of the GM-38 area remediation. Without reiterating all the details included in the December 2nd letter, we are still very concerned about the basis of design for the treatment system and question its effectiveness for fully accomplishing its intent of groundwater remediation. Since we are in disagreement with the preliminary design of the extraction wells in number, location and capacity, we recommend that the Navy hold open the final design of the GM-38 remediation system so that discussion and comment on the technical approach can be agreed upon by the District to maximize the groundwater clean up in the area.

**RESPONSE**: All design assumptions and any design-related calculations will be part of the Implementation Plan for the GM-38 remedy that will be developed and submitted by the Navy's Remedial Action Contractor (RAC), Foster Wheeler Environmental Corporation. A draft version of this document will be made available to the members of the Technical Advisory Committee for review.

- DS-5 - Under "Regulatory Acceptance," the ROD states "However, the only components of the NYSDEC's OU 2 ROD that are not included in the Navy's ROD for Groundwater is the continuing operation of the ONCT system, monitoring of the permanent groundwater well network and continued payments to the Bethpage Water District for the Plants 4 and 6 treatment systems. Therefore, the Navy feels that with these components already in place and being operated by another party, it is not necessary for the Navy to include them in this document. Further, the Navy recognizes that tie continued operation of the ONCT system is paramount to ensuring that the Navy's ROD remains protective of human health and the environment. In the event that the other party fails to continue to operate the ONCT system, then the Navy also recognizes that the Navy would have to re-evaluate the effectiveness of the remedy and propose changes that would ensure that the remedy remains protective of human health and the environment." This statement implies that the Navy will be responsible should Northrop Grumman fail to continue to operate the ONCT. The statement does not make the Navy responsible for monitoring of the permanent groundwater well network and continued payments to the Bethpage Water District for the Plants 4 and 6 treatment systems should Northrop Grumman fail to do so. The Navy should be responsible for these two items as well, and we recommend that the ROD be revised accordingly.

**RESPONSE**: Agreed. Based on a similar comment submitted by NYSDEC, the Navy has expanded those activities that, if failed to continue, would constitute that the Navy's Off-Site Remedy is no longer protective of human health and the environment.

The following language was inserted into Page DS-3, First Paragraph; Page 3, First Sentence; and on Page 31: "along with the corresponding long-term maintenance and monitoring program for the ONCT system"

In addition, the following language was inserted at the end of the last paragraph on Pages DS-4; Page 4; and Page 32: "In the event that the treatment systems installed on BWD Plants 4 and 6 are no longer funded, the Navy recognizes that it's OFF-SITE GROUNDWATER remedy would no longer be protective of human health or the environment. In this case, the Navy will re-evaluate the protectiveness of the OFF-SITE GROUNDWATER remedy and implement all requisite measures as determined by the Navy in consultation with NYSDEC, NYSDOH, and the Nassau County Department of Health to ensure the continued protection of human health and the environment."

- Figure 3 - This figure intends to delineate the extent of groundwater contamination above the MCL. The figure is very unclear, and the delineation line cannot be seen. We recommend that the figure be revised so that the necessary information can be more easily seen.

**RESPONSE**: Figure 3 has been modified.

# APPENDIX A2
# RESPONSIVENESS SUMMARY REGARDING COMMENTS ON DRAFT GROUNDWATER ROD DATED MAY 2002

# COMMENT RESPONSES FROM ENGINEERING FIELD ACTIVITY, NORTHEAST REGARDING DRAFT NAVY RECORD OF DECISION FOR GROUNDWATER (MAY 2002) NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP) BETHPAGE, NEW YORK

## Comments from Dvirka and Bartilucci Consulting Engineers on behalf of the Massapequa Water District dated June 5, 2002:

**COMMENT**: The ROD appears to imply that data collected from the Vertical Profile Boring Program, and groundwater modeling based on the data, will determine the location of the outpost wells and the vertical placement of the well screens. Based on the information contained in the report "Southern area Vertical Profile Bring Installation Summary Report" and "GM-38 Area Vertical Profile Boring Installation Summary Report", the downgradient and lateral extent of the contaminant plume originating from NWIRP/Northrop Grumman Corporation Facility has not been defined and, therefore, existing data, as well as model input data to predict migration of the plume in the future and the threat to public water supply wells, is not sufficient to locate the early warning wells and screen depths. As a result, as previously stated in our letter to the New York State Department of Environmental Conservation (NYSDEC, Mr. Steven Scharf), dated April 25, 2002, additional vertical profile borings need to be constructed south, east and west of the previous borings to determine the extent of the plume and the current threat to the public water supply wells, as well as to provide accurate input data/leading edge of plume information to the groundwater model for calibration purposes. This will provide the data and model results that will allow the appropriate placement of the outpost monitoring wells for protection of the potentially impacted water supply wells.

**RESPONSE**: The goal of the Navy's Vertical Profile Boring Program was never to delineate the full extent of the off-site contaminant plume. Rather, it was to gather lithological and water quality data in order to calibrate the regional computer model which was to be used in combination with the vertical profile boring data, regional lithology mapping, groundwater hydraulic measurements, precipitation infiltration, and effects from other water users in the area, to determine effective outpost monitoring well locations. This process was described at the October 22, 2002 TAC meeting.

In addition, and as requested at the October 22, 2002 TAC meeting, ARCADIS has supplied the Draft Regional Modeling Report to the members of the TAC committee for their information and review.

Also discussed at the last TAC meeting was the fact that as additional water quality information is gathered from the outpost wells and any other investigations that may be conducted in the future, this information would be fed into the regional groundwater model in order to re-evaluate movement of the VOC-contaminant plume. During these future evaluations of the site, the need for additional vertical profile borings to the south will then be re-evaluated.

**COMMENT**: The ROD states that the remedial action will consist (in addition to the outpost wells) well head treatment or comparable alternative measures, as necessary, for public water supply wells that become affected in the future. However, the ROD does not define "comparable alternative measures", which it should in order for the water districts to know if the comparable measures are appropriate for their potential needs. Such comparable measure should include, but not be limited to, relocation of water supply wells to new well fields or transmission of water from unaffected wells.

In addition, the ROD appears to imply that the remedial action will consist of (up front) payment to an "appropriate (also requires definition) water district to compensate for capital and O&M expenditures that would be limited to the installation of well head treatment. Again, the affected water district should decide what alternative is best for the district and its customers, whether it be well head treatment, well relocation, water transmission, etc., and that whatever the affected district chooses, it should receive full payment for capital and O&M expenditures. Also, the payment for O&M expenditures should not be limited to 30 years.

**RESPONSE**: The Navy concurs that the water districts can decide what alternative is best for the district and it's customers including relocation of water supply wells. "Comparative alternative measures" was mainly referring to treatment alternatives, such as liquid phase granular activated carbon adsorption that could be a more timely and less costly alternative than air stripping. Although the Navy does not preclude re-siting of a new well field as a "comparable alternative measure", the Navy feels that, based on the industrial history and geology of the area, that it is unlikely that a new well field could be successfully developed and maintained in the long term without similar impacts from contaminant plumes and also believes that obtaining the necessary permits from NYSDEC would be difficult.

### Comments from ARCADIS G&M on behalf of the Northrop Grumman Corporation dated June 21, 2002:

**COMMENT**: While the selected remedy presented in the Navy's draft ROD appears to be generally consistent with the requirements of the OU2 ROD, dated March 29, 2001, which was issued by the New York State Department of Environmental Conservation (NYSDEC) for the Northrop Grumman and NWIRP Bethpage facilities, certain of the essential elements required in the NYSDEC ROD were omitted. For this reason, the draft ROD must be revised to include the following items:

1. Conduct the ONCT Hydraulic Effectiveness Investigation to assess the performance/effectiveness of the on-site pump and treat system.
2. Conduct any required pre-design investigation, and/or remedial design/remedial actions necessary for the off-site GM-75D2 area.

**RESPONSE**: The Navy agrees. Since the time that this draft ROD was issued, the Navy has agreed to conduct the fieldwork necessary to gather data to support the development of an ONCT Hydraulic Effectiveness Report. Bear in mind, that Northrop Grumman agreed to write this report based on the analytical data collected by the Navy.

The Navy also agreed to conduct the necessary fieldwork related to the further delineation of the GM-75D2 area. As stated at the TAC Meeting held on October 22, 2002, the Navy will budget for this effort but will prioritize it accordingly after installation of the GM-38 remedy and installation of the Outpost Monitoring Wells and will also be based upon the availability of future Navy funds.

**COMMENT**: As you are aware, under New York State law, both Northrop Grumman and the U.S. Navy are obligated to carry out all the work specified in the NYSDEC ROD.

**RESPONSE**: The Navy has agreed, in principle, to the components of the NYSDEC ROD for Operable Unit 2. However, the Federal government is not legally bound to the NYSDEC ROD. It is for this reason, that the Navy had to issue it's own ROD for groundwater in accordance with the President's Executive Order 12580 that delegates the President's CERLCA authority down to the various branches of the armed forces including the Department of Navy.

**COMMENT**: Furthermore, the goal of the vertical profile boring program stated under the Public Water Supply Protection Program heading should be revised to indicate that the goal was to collect depth specific lithologic and groundwater samples to establish a vertical profile of the geology and groundwater quality at each location investigation in support of groundwater modeling efforts, NOT to delineate the extent of the plume.

Also under the Public Water Supply Protection Program heading, Item 4, the following should be added to the end of the first sentence "by the commingled plume from the Navy and Northrop Grumman Sites."

**RESPONSE**: The language will be revised as suggested.

**COMMENT**: Also under the Public Water Supply Protection Program heading, Item 4, the following should be added to the end of the first sentence "by the commingled plume from the Navy and Northrop Grumman Sites." Additionally, the paragraph before the "Declaration" section of the Draft ROD should be revised to broaden the language to include both on-site and off-site issues, particularly the GM-38 remedy, the GM-75D2 area, public supply well measure, or any other currently undiscovered site-related issue. This paragraph should also be revised to extend the timeframe from the period ". . . during the implementation of the selected remedy . . ." to a period that extends through site closure.

**RESPONSE**: The language will be revised as suggested.

**Comments from Holzmacher, McLendon & Murrell, P.C. (H2M Group) on behalf of the South Farmingdale Water District dated July 8, 2002:**

**COMMENT**: In reviewing the Navy issued draft ROD and the NYSDEC issued (March 2001) ROD, we are concerned relative to a number of changes in the previously "negotiated" wording. We have highlighted some of these concerns below:

**Groundwater Remedial Program**

The proposed groundwater remedial program should include a collection of extraction wells that optimizes that effectiveness of the remedial action in removing contaminants in the GM-38 area AND reduces the potential impact of the contaminant plume on downgradient water supply wells. The modeling results verbally presented at the June 26, 2002 TAC meeting indicated little difference to the downgradient wells regardless of whether two or three extraction wells were installed. Our concern is that this conclusion is somewhat biased due to the proposed location of the third extraction well and the slow rate of groundwater travel in the deeper Magothy aquifer. It is our speculation that if a third extraction well were to be installed further south (on Hempstead Turnpike, in the vicinity of Mid-Island Hospital), and if we were looking out a longer period of time (> 30 years), the benefit of adding the third extraction well would be more significant to downgradient water suppliers.

**RESPONSE**: The GM-38 Area remedial system is being designed to intercept the majority of the contamination in this area, such that at the end of operation, the quality of the remaining groundwater in the area will be similar to or less than the remainder of the off site plume. By meeting this objective, potential impacts to down gradient water receptors will be minimized. The third extraction well was evaluated in the model in an attempt to minimize the VOC loading to Bethpage Water District Wells. Based on the proximity of the contaminated groundwater to these wells at this time, minimal benefit would be realized by the addition of a third extraction well and the option was not carried any further.

Based on the Vertical Profile Boring Program, there is relatively little mass of VOCs in the area of the Mid-Island Hospital. Even though TCE was detected in one sample interval at a concentration of 320 ug/l, additional detections of VOCs in the boring were sporadic and at much lower concentrations. The next highest VOC concentration detected in this boring was 28 ug/l.

**Public Water Supply Protection Program**

**COMMENT**: Sections 9, 10, 11 and 12 (pages 30-31) of the Public water Supply Protection Program in the NYSDEC issued ROD includes the appropriate language that was previously discussed and agreed to by the affected parties. The proposed language in the Navy issued draft ROD differs from that which was previously agreed to and is not acceptable to the SFWD and NYWS. We request that the Navy issued ROD reflect the previously agreed language. Some examples are:

**RESPONSE**: The Navy's ROD parallels but is not identical to the NYSDEC ROD. The Navy's ROD only identifies the actions that will be taken by the Navy. The Navy ROD does not identify nor will take responsibility for actions that will be taken by other parties.

**COMMENT**: The Navy issued ROD does not address the frequency of sampling and the sampling/analytical costs for the outpost monitoring wells and water supply wells determined to be potentially impacted or impacted by the plume.

**RESPONSE**: Sampling and analysis of outpost monitoring wells and water supply wells is being conducted by Northrop Grumman, and therefore is not part of the Navy ROD.

**COMMENT**: It was our understanding that any site contaminant at a concentration of 1 ppb or higher identified in a sample taken from an outpost monitoring well, once confirmed by a second sample, would trigger action on the part of the NYSDEC, the PRPs and water district relative to the implementation of a wellhead treatment system or a comparable alternative measure, as selected by the water supplier. The Navy issued draft ROD indicates the development of trigger values for each well using groundwater modeling data to aid [in] the determination for the earliest possible date to initiate discussions with the water supplier to address the issue of wellhead treatment.

**RESPONSE**: The Navy's approach utilizes a rigid technical determination of a value that is protective of the water districts and, as such, will develop a technically defensible value for each of the outpost monitoring wells. This approach was presented to the members of the TAC in a presentation given by ARCADIS on October 22, 2002. To date, no adverse comments have been received by any member of the TAC regarding that presentation.

**COMMENT**: The Navy issued ROD is not based on the water supplier determining whether a well impacted by the Grumman/Navy groundwater plume should be treated or whether the water supplier should implement an alternative action to treatment.

**RESPONSE**: The water suppliers can implement any alternative action that they choose for impacted water supplies, providing that they continue to operate the effected well.

**COMMENT**: The Navy issued ROD is also silent on the frequency of conducting treatment system performance evaluation and whether the remedial goals have been met.

**RESPONSE**: The Navy agrees that the issues mentioned in the comment above are an essential part of the remedy. However, it has been the Navy's experience that it is often difficult to come to an agreement with any regulatory agency regarding frequency of sampling and whether the remedial goals have been met up front in the ROD. It is for this reason that these items are often discussed as part of an Operations, Maintenance, and Monitoring (OM&M) Report that often accompanies a remedial action workplan. This way, disagreement regarding sampling frequency and exit strategies does not preclude the construction of the remedy itself. Often times, quarterly sampling is the standard when a new remedy is first initiated and then based on the data collected, modifications to the sampling frequency and exit strategies can be discussed.

### Time Period for Treatment

**COMMENT**: When the Grumman onsite treatment system and the Navy's selected remedy at GM-38 are both operating as designed, they will certainly decrease the concentration of contaminants down-gradient of these two sites. However, due to the extent of contamination and the rate of groundwater travel in the deeper aquifers, these two treatment systems alone are not going to eliminate the potential impact on the SFWD and NYWS well fields from this plume. The time frame before these well fields are impacted will vary from plant site to plant site and the time frame during which the well will be impacted will also vary. Consequently, it is premature to determine whether the time frame considered as required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) should be for a minimum of 30 years.

**RESPONSE**: A 30 year time period is being used at this time primarily to evaluate activities that need to be conducted in the near term (e.g. 5 to 10 years). Over time, as the plume migrates, contaminants attenuate, and additional data becomes available, additional actions may be determined to be required that extend beyond 30 years. Also, since computer modeling is being used to such a significant extent to predict the future movement of the contaminant plume, using timeframes in excess of 30 years makes the conclusions of the model less reliable.

## Comments from Holzmacher, McLendon & Murrell, P.C. (H2M Group) on behalf of the Bethpage Water District dated July 10, 2002:

**COMMENT**: This office is writing to you on behalf of the Bethpage Water District regarding the Navy's draft Record of Decision [ROD] for Operable Unit 2 [OU2]. I do not understand the need for a separate ROD for the Navy on the very same OU2, since it will no doubt cause conflict and confusion with the earlier [March 29, 2001] DEC ROD for OU2. Therefore, it is my suggestion that the Navy simply incorporate the identical language that was developed by the DEC. The DEC's ROD also provides specificity that is lacking in the Navy ROD.

**RESPONSE**: The Navy's ROD can only address those activities that will be conducted by the Navy. As a result, activities being conducted by Northrop Grumman cannot be included in the Navy ROD.

**COMMENT**: I offer the following comments on specific items of note in the proposed Navy ROD.

With respect to the Groundwater Remedial Program, the Bethpage Water District is fully aware that a number of the action items outlined are already well underway but it is important to restate our objective that the Navy [and Northrop Grumman] maximize their extraction volume at the location 38D. This should be done not only to protect the long-term interests of the Bethpage Water District with respect to plant nos. 4 and 5, but also to benefit the Water Districts south of Bethpage. As outlined in Arcadis-G&M's modeling presentation at our TAC meeting of June 26, the off-site extraction wells will provide a major long-term benefit to the environment. Of particular interest to the Water District is the option that includes the three extraction wells, since this approach can maximize contaminant removal from the groundwater system. The District also wants to restate its desire that the program be pushed forward as quickly as possible for it seems that every time we see a schedule, the schedule is extended.

**RESPONSE**: The remedy, as established, meets the objectives as listed in the comment. Of note is that the current proposed remedy identifies two recovery wells operating at combined flow rate 1100 gpm. This extraction rate is higher than the previously submitted two well-combined 900 gpm rate, but is less than the three well - combined 1200 gpm rate.

Note that the three well option was not selected because it did not provide any significant additional reductions of VOC impacts to the Bethpage Water District.

**COMMENT**: Although it is outside of Bethpage, the District notes that at least one of the South Farmingdale Water District well fields is likely to be impacted in only a few years based upon the recent modeling results. For this well field, the Public Water Supply Contingency Program should move directly into treatment plant design and installation. Here the issue is not one of "contingency" plans but necessary and immediate "action". The experience of Bethpage speaks quite directly to this point. The implementation of treatment in anticipation of impact is a decision of the water supplier. Decision making here is a matter of their sole responsibility and prerogative.

**RESPONSE**: Comment noted.

**COMMENT**: The cost recovery period for operation and maintenance at an affected well field is stated in the Navy ROD to be limited to 30 years. It should be clear that the clock should start when the remedy is first implemented. For example, if treatment were installed in 15 years because that is when it is needed, then the 30-year clock for O&M cost recovery would still govern.

**RESPONSE**: The Navy agrees and will revise the language in the ROD accordingly.

## Comments from New York State Department of Environmental Conservation (NYSDEC) dated July 10, 2002:

**GENERAL COMMENTS:**

**COMMENT 1**: There was no Proposed Plan issued by the Navy. A Proposed Plan is a prerequisite for a ROD in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as detailed in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and as required by New York Environmental Conservation Law (ECL) Title 6 New York Codes Rules and Regulations (NYCRR) Part 375.

**RESPONSE**: The Navy agrees that a Proposed Plan is a prerequisite for a Record of Decision (ROD). However, the Navy believes that a Proposed Plan for the remediation of groundwater has already been developed and that CERCLA, the NCP, and New York law have all been satisfied. Although the Navy was not the author of the Proposed Plan for Groundwater, the Navy did participate in its development by reviewing, commenting and concurring with the contents of the NYSDEC Proposed Plan. Since the Navy is not proposing to add, delete, or otherwise change the various components of the groundwater remedial strategy, the Navy feels that developing a Navy Proposed Plan would be redundant.

The main point here is that the Navy must develop it's own Record of Decision to document any remedial actions that are to be taken to address contamination that exists on Navy-owned property or that emanated from Navy-owned property but has migrated beyond property boundaries. The Navy can not appropriate funding to implement a remedial strategy if a Navy ROD is not developed. In this instance, the Navy's ROD for Groundwater is being developed so that congressional funding can be appropriated for those components of NYSDEC's ROD for which the Department of Navy will be implementing.

Another important factor of the Navy's ROD for Groundwater is the recognition of the existence of another remedial system that has been implemented by another party. With this component already in place and being operated by the other party, it is not necessary for the Navy to include this component in it's ROD. However, the Navy recognizes that its continued operation is paramount to ensuring that the Navy's ROD remains protective of human health and the environment. In the event that the other party fails to continue to operate it's system, then the Navy also recognizes that the Navy's remedy would no longer be protective of human health or the environment. In this case, the NYSDEC would have every legal right to inform the Navy of this failure and begin discussions with the Navy to have this failure corrected.

**COMMENT 2**: The NCP and the ECL require that any proposed action be screened for protection of human health and the environment, short term effectiveness, long term effectiveness, reduction of toxicity, mobility and volume, feasibility, and community acceptance. This has not been done.

**RESPONSE**: See the first paragraph of the Navy's response to Comment 1 above. The Navy did participate in the development of NYSDEC's Proposed Plan by reviewing, commenting and concurring with the contents of the document including the screening of the various criteria items. The Navy is not proposing any changes to the components of NYSDEC's remedial strategy therefore, a re-screening of the proposed actions that will be implemented by the Navy alternatives with regards to the various criteria items listed above would be redundant.

**COMMENT 3**: The Department of the Navy reviewed the NYSDEC PRAP and ROD for the OU 2 Groundwater remedy for the Northrop Grumman and the NWIRP sites, commented on these documents and subsequently concurred with the NYSDEC OU2 ROD. The Navy originally proposed an individual ROD for the NWIRP Bethpage groundwater but instead agreed to the NYSDEC Groundwater OU 2 ROD. Therefore, any ROD issued by the Navy for the NWIRP Plant site alone, should not be entitled, or referred to as the OU 2 Groundwater ROD since that nomenclature would create confusion by having two definitions for the term OU2.

**RESPONSE**: The term "Operable Unit 2" is defined as the groundwater media that exists beneath and downgradient of property owned by Northrop Grumman, Department of Navy, and Occidental Chemical. The term "Operable Unit 2" is NOT defined by the components of the remedial strategy for groundwater chosen to protect human health and the environment. The Navy does not feel that there would be any confusion created by use of the term "OU 2 Groundwater" in it's Record of Decision. Rather, it is fairly clear that the Navy's ROD is merely stating which of the various components of the groundwater remedial strategy that the Department of Navy has chosen to implement.

**COMMENT 4**: Overall, the language in both the Groundwater Remedial Program and the Public Water Supply Protection Program are not consistent with the language from the NYSDEC's OU2 Groundwater ROD. One way to ensure State acceptance is to copy verbatim language from the NYSDEC's ROD
into the Navy's ROD (see also Table 1).

**RESPONSE**: The Navy will amend it's ROD to include verbatim language from NYSDEC's ROD for those components of the groundwater remedial strategy that the Department of Navy will be implementing.

**COMMENT 5**: The Navy's ROD only "recognizes" the existing groundwater extraction and treatment system downgradient of the NWIRP site. This is inconsistent with the NYSDEC's OU 2 ROD, which specifies that the contamination attributable to the Northrop Grumman and NWIRP sites will be actively addressed by the on-site Containment system. (See also legal comment Roman Numeral I (3)(A)).

**RESPONSE**: See the third paragraph of the Navy's response to Comment 1 above. In addition to the Navy's recognition of the existence of the downgradient groundwater extraction and treatment system is the Navy's recognition that the Navy's ROD would no longer be protective of human health and the environment if the extraction and treatment system fails to continue to operate.

**COMMENT 6**: In order for the Navy ROD to be consistent with New York State ECL, this ROD must be consistent with the NYSDEC Operable Unit 2 ROD; which it is not (see also Table 1).

**RESPONSE**: As discussed above, the Navy will modify it's ROD for groundwater to more closely match the language contained in NYSDEC's ROD for those components of NYSDEC's remedial groundwater strategy that the Navy will be implementing.

## DETAILED COMMENTS:

### Declaration for the Record for Decision

**1. Statement of Basis and Purpose**: The ROD issued by the Navy in the State of New York must state that the Navy ROD will comply with New York State Environmental Conservation Law (ECL). Also refer to Roman Numeral II, Legal Comments. Also, the reference to the NYSDEC ROD must specify the exact title (i.e. Operable Unit 2 Groundwater Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites, Nassau County Site Numbers 1-30-003A&B).

**RESPONSE**: The Navy ROD will be amended to state that the ROD issued by the Navy in the State of New York will satisfy all substantive requirements of New York State Environmental Conservation Law (ECL) which are considered to be applicable.

The Navy's ROD will also be amended to specify the exact title of the NYSDEC ROD for Groundwater when referenced.

**2. Institutional Controls**: The groundwater beneath the NWIRP Site can be "extracted" with permission from the Nassau County Department of Health and/or the NYSDEC with an appropriate technology to treat groundwater to applicable standards. The text must be changed accordingly.

**RESPONSE**: Agreed.

**3. Page 2, Paragraph 2 & 3**: Each potentially responsible party (PM') is jointly and severally liable for the scope of the remedial work. The NYSDEC cannot accept one parties official decision document that unilaterally allocates the responsibility to implement the NYSDEC's OU 2 Groundwater ROD.

**RESPONSE**: The Navy understands and respects the position of NYSDEC with regards to this issue. However, the Navy can not go on the record stating that the Navy will address ALL components of the groundwater remedial strategy when other parties are also responsible for implementation of some of the components. The Navy understands that if the PRPs could have come to some type of written agreement regarding the allocation of responsibility for implementation of the groundwater remedial strategy, that there would be no objection to the Navy writing a ROD for the Navy's portion of the liability.

The Navy has tried on several occasions to enter into a formal cost sharing agreement with Northrop Grumman regarding allocation of responsibility to implement certain aspects of NYSDEC's groundwater ROD. However, to date, the parties can not agree on what is fair and equitable with regards to the sharing of costs to implement the groundwater remedy and it seems unlikely that this disparity will be resolved in a timeframe that is acceptable to NYSDEC. That is why the Navy approached NYSDEC to enter into a Federal Facility Site Remediation Agreement (FFSRA) with the Department of Navy that binds the Navy to accept responsibility for certain portions of groundwater remedy. It is the Navy's intention to modify this Record of Decision so that it more closely agrees with the contents of the latest version of the FFSRA as discussed at a meeting held between NYSDEC and Navy Offices of Counsel on September 24, 2002.

### 4. Groundwater Remedial Program (GRP), Public Water Supple Protection Program (PWSP) and Elements Common To Both Programs

A. Table 1 (enclosed with this letter) summarizes the difference between the NYSDEC's ROD and the Navy's draft ROD for the GRP and PWSP program.
B. The On-site Containment System must be included in the Groundwater Remedial Program.
C. The differences listed in Table 1 for the GRP and the PWSP must be resolved before the NYSDEC can concur with this ROD.
D. Long term groundwater monitoring is missing from the GRP program.
E. The "Elements Common To Both Programs" section is completely missing from the Navy ROD.
F. PWSP program item 3 in the Navy ROD is not a "remedial action" and would be better described as a monitoring activity.
G. PWSP program item 4 in the Navy ROD should be not termed a remedial action, but rather an engineering control.
H. Item 4 of the Navy ROD should state "this action will be sufficient to cover capital costs and long term operation and maintenance expenditures that would be required to install, operate and maintain the wellhead treatment or comparable alternative." The remaining sentences should be deleted.
I. The final sentence on page 3 of the Navy ROD should continue "...the Navy will re-evaluate the protectiveness of the selected remedy and implement all requisite measures as determined by the NYSDEC and the NYSDOH in consultation with

the Nassau County Department of Health and the affected water districts."

**RESPONSE TO 4A**: The Navy is in receipt of Table 1 prepared by NYSDEC and will make appropriate changes to the Navy's ROD.

**RESPONSE TO 4B**: The Navy does not understand NYSDEC's continued objection of withholding the inclusion of the On-Site Containment System from the Navy's ROD since NYSDEC concurred with a similar approach used by U.S. EPA Region II in it's ROD for Occidental Chemical's Operable Unit 3 issued in September 2000. In that document, several actions were mandated by the U.S. EPA that required implementation by Occidental Chemical with the recognition that another parties off-site remedy, that was currently in place, would address the VOC-contaminated groundwater emanating from property owned by Occidental Chemical.

The Navy's approach is similar. As a matter of fact, the language included in the Navy's ROD comes from the last paragraph on Page 2 that continues onto Page 3 of the Declaration for the Record of Decision prepared by the U.S. EPA for Occidental Chemical's OU 3. On Page 1 of that Declaration under Statement of Basis and Purpose is the statement that the New York State Department of Environmental Conservation concurred with this approach and a letter of concurrence was issued.

As stated in previous responses, the Navy is taking responsibility for all components of NYSDEC's groundwater remedial strategy with the exception of the On-Site Containment System and associated Groundwater and Hydraulic Monitoring Program, with the recognition that these two components must continue to be implemented for the Navy's remedy to continue to be protective of human health and the environment. If continuation of these components fails in the future, then NYSDEC has the legal recourse to inform the Navy that it's remedy is no longer protective of human health and the environment and the Navy will then address the issue.

**RESPONSE TO 4C**: The Navy will address the differences listed in Table 1 with regards to the GRP and the PWSP to the maximum extent possible with the hope that NYSDEC finds the changes acceptable. However, it must be pointed out that due to the Navy's authority to implement CERCLA response actions for contamination on or emanating from Navy property, as mandated as part of the President's Executive Order 12580, the Navy seeks the concurrence of the State but does not require it in order to implement remedial actions.

**RESPONSE TO 4D**: See the Navy's response to Item 4B above.

**RESPONSE TO 4E**: Navy agrees. A section that discusses OM&M plans, performance evaluations and a monitoring well close-out plan, as they relate to the GM-38 remedy, will be added to the Navy's ROD.

**RESPONSE TO 4F**: Navy agrees. This item will be moved as suggested.

**RESPONSE TO 4G**: This change will be made as suggested.

**RESPONSE TO 4H**: These changes will be made as suggested.

**RESPONSE TO 4I**: Due to the Navy's authority to act as lead agency, as mandated as part of the President's Executive Order 12580, it is the Navy that re-evaluates the protectiveness of a selected remedy and it is the main purpose for conducting five-year reviews. This does not mean that the Navy's determination will be made without consultation from NYSDEC, NYSDOH, Nassau County DOH, or the affected water districts.

**5. Closing Declaration**: The NYSDEC ROD requires annual review, not five year reviews specified in the Navy ROD.

**RESPONSE**: Comment noted.

CERCLA, as amended by SARA of 1986, requires that remedial actions resulting in any hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure be reviewed every five years regardless of a site's NPL status. Similar to the Navy's response to Item 4C above, the President's CERCLA authority, including the policy on five-year reviews, has been handed down to various federal agencies including the Department of Navy. This five-year review is a status of a remedies ability to continue to be protective of human health and the environment on a five year basis.

However, the above does not preclude the development of annual operating, maintenance, or monitoring reports which, in most cases, are used as the basis for development of the five-year review report.

The statement in the closing declaration is simply stating that review of the components of the remedy will be required every five years as established by CERCLA. The Navy will be developing an Operations, Maintenance, and Monitoring (OM&M) Report that will outline the frequency of sampling to ensure that the components of the remedy that are installed are operating as designed and will also recommend a timeframe for issuing a report documenting those findings.

**LEGAL COMMENTS**:

**COMMENT I**: The Navy **is** subject to federal law just as much as the Environmental Protection Agency See CERCLA & 120(a), which provides, in pertinent part,

> (1) Each department, agency, and instrumentality of the United States (including the executive, legislative, and judicial branches of government) shall be subject to, and comply with, this chapter in the same manner and to the same extent, both procedurally and substantively, as an nongovernmental entity ....

> (2) All guidelines, rules, regulations, and criteria which are . . . applicable to remedial actions at such facilities shall also be applicable to facilities which are owned or operated by a department, agency, or instrumentality of the United States in the same manner and to the extent as such guidelines, rules, regulations, and criteria are applicable to other facilities. No department, agency, or instrumentality of the United States may adopt or utilize any such guidelines, rules, regulations, or criteria which are inconsistent with the guidelines, rules, regulations, and criteria established by the Administrator under this chapter.

See also CERCLA 3 120(f), which provides:

> The Administrator and each department, agency, or instrumentality responsible for compliance with this section shall afford to relevant State and local officials the opportunity to participate in the planning and selection of the remedial action, including but not limited to the review of all applicable data as it becomes available and the development of studies, reports, and action plans. In the case of State officials, the opportunity to participate shall be provided in accordance with section (121) of this title.

And see also CERCLA & 121(f), which provides:

> (3)(A) This paragraph shall apply to remedial actions at facilities owned or operated by a department, agency, or instrumentality of the United States. At least 30 days prior to the publication of the President's final remedial action plan, if the President proposes to select a remedial action that does not attain a legally applicable or relevent and appropriate standard requirement, criteria, or limitation, under the authority of subsection (d)(4) of this section, the President shall provide an opportunity for the State to concur or not concur in such selection. If the State concurs, or does not act within 30 days, the remedial action may proceed.
>
> If the State does not concur in such selection as provided in subparagraph (A), and desires to have the remedial action conform to such standard, requirement, criteria, or limitation, the State may maintain an action as follows:
> (i) If the President has notified the State of selection of such a remedial action, the State may bring an action within 30 days of such notification for the sole purpose of determining whether the finding of the President is supported by substantial evidence. Such action shall be brought in the United States district court for the district in which the facility is located.
> (ii) If the State establishes, on the administrative record, that the President's finding is not supported by substantial evidence, the remedial action shall be modified to conform to such standard, requirement, criteria, or limitation.

> (iii) If the State fails to establish that the President's finding was not supported by substantial evidence and if the State pays, within 60 days of judgment, the additional costs attributable to meeting such standard, requirement, criteria, or limitation, the remedial action shall be selected to meet such standard, requirement, criteria, or limitation. If the State fails to pay within 60 days, the remedial action selected by the President shall proceed through completion.
>
> Nothing in this section precludes, and the court shall not enjoin, the federal agency from taking any remedial action unrelated to or not inconsistent with such standard, requirement, criteria, or limitation.

It is fundamental that a remedial action must attain ARARs, unless attainment is waived. However, in the instant matter, the draft Record Of Decision simply recites, "The selected remedy . . . complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action **to the extent practicable** [emphasis added]". The statute requires that the Record of Decision must clearly state, either that the selected remedy will attain ARARs, or that the selected remedy will not attain some ARAR and that attainment has been waived on the ground of technical impracticability which is a proper ground for waiver per CERCLA & 121 (d)(4)(C). The draft Record of Decision in the instant matter does neither. The significance of this omission is that CERCLA & 121 (f)(3), quoted supra, requires that the federal agency give notice of its intent to select a remedy that does not attain ARARs so that the State has an opportunity to address it.

**RESPONSE TO I**: The Final ROD has been amended to include a discussion of the ARARs and how they were attained.

**COMMENT II**: The Navy is subject to State law just as much as a private-sector person. See CERCLA & 120(a), which provides, in pertinent part:

> State laws concerning removal and remedial action, including State laws regarding enforcement, shall apply to removal and remedial action at facilities owned or operated by a department, agency, or instrumentality of the United States . . . when such facilities are not included on the National Priorities List. The preceding sentence shall not apply to the extent that a State law would apply any standard or requirement to such facilities which is more stringent than the standards and requirements applicable to facilities which are not owned or operated by any such department, agency, or instrumentality.

This paragraph has been construed to mean exactly what it seems to mean, that the United States has waived its sovereign immunity with the result that a federal agency is subject to State CERCLA-like law to the same extent as a private-sector person. *See: United States vs. Commonwealth of Pennsylvania, Department of Natural Resources, 778*

F.Supp. 1328,34 ERC 1779, _ ELR (Middle Dist. Pennsylvania 1991); *Crowley Marine Services Inc. vs. Fednav Ltd.,* 915 F.Supp. 218, 42 ERC 1045.26 ELR 21105 (Eastern Dist. Washington 1995)

**RESPONSE TO II**: The current and prevailing appellate court opinion is that CERCLA 120(a)(4) does not satisfy the threshold test required by the United States Supreme Court to be a clear and unambiguous (see, Department of Energy v Ohio, 503 U.S. 607 (1992) waiver of Sovereign immunity that showing a clear congressional intent to require federal agencies to comply with non-substantive state requirements (see, Hancock v. Train (426 US 167 (1978). In particular, the United States Court of Appeals (1st. Circuit), addressed the scope of CERCLA 120(a)(4) in a case questioning whether a non-substantive state requirement of the imposition of fines can be enforced against the Department of the Navy. That court held, "We therefore conclude that Department of Energy requires us to hold that CERCLA section 120, like RCRA section 6961, does not provide an adequately clear waiver of sovereign immunity from civil penalties sought by Maine." Maine v. Navy 973 F.2d 1007 (1st. Circ., 1992). In response to Hancock v. Train and Maine v. Navy, Congress amended the Clean Water Act and RCRA respectively to broaden the scope of the waivers and to include state and local procedural requirements within the language of the provision. No such language was added nor presently exists in CERCLA 120(a)4. Accordingly, as required by CERCLA, all state substantive requirements which are Applicable, Relevant and Appropriate have been satisfied.

# APPENDIX B
# ADMINISTRATIVE RECORD

# APPENDIX B
# ADMINISTRATIVE RECORD INDEX
# FOR
# NWIRP BETHPAGE, NEW YORK

## REPORTS

1. "Initial Assessment Study", Naval Environmental, Energy, and Support Activity, December 1986
2. "Final Remedial Investigation Quality Assurance Plan", Halliburton NUS, August 1991
3. "Final Remedial Investigation Site and Data Management Plan", Halliburton NUS, August 1991
4. "Final Health and Safety Plan", Halliburton NUS, August 1991
5. "Final Remedial Investigation Workplan", Halliburton NUS, August 1991
6. "Final Hazard Ranking System Preliminary Scoring and Site Inspection Report Form", Halliburton NUS, February 1992
7. "Final Remedial Investigation Report - Volumes I, II, III, and IV", Halliburton NUS, May 1992
8. "Final Phase 2 RI Workplan Addendum", Halliburton NUS, November 1992
9. "Final EPA Region II Federal Facility SI Review Documentation Package", Malcolm Pirnie, Inc., September 1992, Updated August 1993
10. "Phase 2 Remedial Investigation Report - Volumes I and II", Halliburton NUS, October 1993
11. "Feasibility Study Report - Volumes I and II", Halliburton NUS, March 1994
12. "Record of Decision, Naval Weapons Industrial Reserve Plant Bethpage, New York, Sites 1, 2, and 3", Northern Division Naval Facilities Engineering Command and New York State Department of Environmental Conservation, May 1995.
13. "Phase 1 Environmental Baseline Survey, NWIRP Bethpage, New York", CF Braun Engineering Corporation, January 1998.
14. "Work Plan, Construction of a Soil Vapor Extraction/Air Sparing System, Naval Weapons Industrial Reserve Plant Bethpage, NY", Foster Wheeler Environmental Corporation, January 1998.

## REPORTS (CONTINUED)

15. "On-Site Monitoring Well Installation Summary Report, NWIRP Bethpage, New York", Tetra Tech NUS, October 2000.
16. "Groundwater Feasibility Study, Grumman Aerospace-Bethpage, NY Site #130003A and Naval Weapons Industrial Reserve Plant Bethpage, NY, NY Site #130003B" Arcadis Geraghty & Miller,, October 2000.
17. "Vertical Profile Borings VPB-38, -76, -77 Summary Report, NWIRP Bethpage, New York", Tetra Tech NUS, November 2000.
18. "Record of Decision, Operable Unit 2 Groundwater, Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites, Nassau County, Site Numbers 1-30-003A", New York State Department of Environmental Conservation, March 2001.
19. "2001 Annual Groundwater Monitoring Report, Operable Unit 2, Northrop Grumman Corporation, Bethpage, New York", Arcadis, June 2001.
20. "GM-38 Vertical Profile Boring Installation Summary Report, NWIRP Bethpage, New York", Tetra Tech NUS, May 2002.
21. "Southern Area Vertical Profile Boring Installation Summary Report, NWIRP Bethpage, New York", Tetra Tech NUS, February 2002.
22. "Off-Site Monitoring Well Installation Summary Report, NWIRP Bethpage, New York", Tetra Tech NUS, April 2002.
23. "Phase II Environmental Baseline Survey, NWIRP Bethpage, New York", Tetra Tech NUS, May 2002.
24. "GM-39 and GM-73 Vertical Profile Boring and Monitoring Wells Installation Summary Report, NWIRP Bethpage, New York", Tetra Tech NUS, November 2002.
25. "Second Quarter 2002 Groundwater Monitoring Report, Operable Unit 2, Northrop Grumman Corporation, Bethpage, New York", Arcadis, January 2003.

## CORRESPONDENCE REGARDING IR PROGRAM

1. Letter to A. Karas (EPA Region II) from S. Eikenberry (NEESA), Distribution of IAS to EPA, April 1988
2. Letter to Commanding Officer (NAVAIRSYSCOM) from R.P. Dillman (CO NorthDiv), IR Program at Bethpage, June 1989

CORRESPONDENCE REGARDING IR PROGRAM (CONTINUED)

3. Letter to Abe Kern (DPRO) from Bob Wing (EPA Region II), Comments on IAS, December 1989
4. Letter to Helen Shannon (EPA Region II) from Tom Sheckels (NorthDiv), IR Program at Bethpage, January 1990
5. Letter to Tom Sheckels (NorthDiv) from V. Pitruzzello (EPA Region II), Information required for NWIRP Bethpage, June 1991
6. Letter to John Barnes (NYSDEC) from Tom Sheckels (NorthDiv), Submission of Draft RI Workplan, July 1991
7. Letter to Helen Shannon (EPA Region II) from Tom Sheckels (NorthDiv), Submission of Draft RI Workplan, July 1991
8. Letter to Frank Klanchar (Navy RPM) from John Barnes (NYSDEC), Comments on Draft RI Workplan, August 1991
9. Letter to Helen Shannon (EPA Region II) from Tom Sheckels (NorthDiv), Interim Response to EPA, August 1991
10. Letter to Technical Review Committee from Frank Klanchar (Navy RPM), Submission of Final RI Workplan, September 1991
11. Letter to John Barnes (NYSDEC) from Frank Klanchar (Navy RPM), Addendum to RI Workplan, October 1991
12. Letter to Technical Review Committee from Frank Klanchar (Navy RPM), Submission of Draft RI Report, March 1992
13. Letter to Technical Review Committee from Frank Klanchar (Navy RPM), Submission of Addendum to Draft RI Report, March 1992
14. Letter to Frank Klanchar (Navy RPM) from John Barnes (NYSDEC), Comments on Draft RI Report, April 1992
15. Letter to Frank Klanchar (Navy RPM) from John Molloy (Bethpage Water District), Comments on Draft RI Report, April 1992

## CORRESPONDENCE REGARDING IR PROGRAM (CONTINUED)

16. Letter to Frank Klanchar (Navy RPM) from Carlo San Giovanni (Geraghty & Miller), Comments on Draft RI Report, April 1992
17. Letter to Dave Brayack (HNUS) from Frank Klanchar (Navy RPM), Submission of Navy Review Comments on Draft RI, May 1992
18. Letter to Technical Review Committee from Frank Klanchar (Navy RPM), Submission of Final RI Report, May 1992
19. Letter to John Barnes (NYSDEC) from Frank Klanchar (Navy RPM), Intention to Perform Phase 2 RI, May 1992
20. Letter to Frank Klanchar (Navy RPM) from Dave Brayack (HNUS), RI-Derived Residue Management, June 1992
21. Letter to John Barnes (NYSDEC) from Lloyd Wilson (NYSDOH), Off-Site Soil Sampling, July 1992
22. Letter to Technical Review Committee from Frank Klanchar (Navy RPM), Submission of Draft Phase 2 RI Workplan Addendum, October 1992
23. Letter to Frank Klanchar (Navy RPM) from John Barnes (NYSDEC), Comments on Draft Phase 2 Workplan Addendum, November 1992
24. Letter to Frank Klanchar (Navy RPM) from Carlo San Giovanni (Geraghty & Miller), Comments on Draft Phase 2 Workplan Addendum, November 1992
25. Letter to Dave Brayack (HNUS) from Frank Klanchar (Navy RPM), Submission of Comments on Draft Phase 2 RI Workplan Addendum, November 1992
26. Letter to Technical Review Committee from Frank Klanchar (Navy RPM), Submission of Final Phase 2 RI Workplan Addendum, November 1992
27. Letter to James Colter (Navy RPM) from Dave Brayack (HNUS), Pump Test Results, January 1993
28. Letter to James Colter (Navy RPM) from Dave Brayack (HNUS), Plant 3 Soil Gas Survey Results, March 1993
29. Letter to James Colter (Navy RPM) from John Barnes (NYSDEC), Comments regarding Draft Feasibility Study ARAR's, April 1993

## CORRESPONDENCE REGARDING IR PROGRAM (CONTINUED)

30. Letter to James Colter (Navy RPM) from Mary Logan (EPA Region II), Comments regarding Draft Feasibility Study ARAR's, May 1993
31. Letter to Technical Review Committee from James Colter (Navy RPM), Submission of Draft Phase 2 RI Report, July 1993
32. Letter to John Barnes (NYSDEC) from James Shafer (NorthDiv), Results of Interim Action to isolate PCB Hot Spot, July 1993
33. Letter to James Colter (Navy RPM) from Mary Logan (EPA Region II), Comments regarding Draft Phase 2 RI Report, August 1993
34. Letter to James Colter (Navy RPM) from Carlo San Giovanni (Geraghty & Miller), Comments regarding Draft Phase 2 RI Report, August 1993
35. Various Phone Conversation Records to James Colter (Navy RPM) from TRC Members, Comments regarding Draft Phase 2 RI Report, August through September 1993
36. Letter to James Colter (Navy RPM) from John Barnes (NYSDEC), Comments regarding Draft Phase 2 RI Report, September 1993
37. Fax Transmission to James Colter (Navy RPM) from Carol Stein (EPA Region II), Comments regarding Draft Phase 2 RI Report, September 1993
38. Letter to James Colter (Navy RPM) from John Molloy (Bethpage Water District), Comments regarding Draft Phase 2 RI Report, September 1993
39. Letter to John Barnes (NYSDEC) from Lloyd Wilson (NYSDOH), Comments regarding Draft Phase 2 RI Report, September 1993
40. Letter to James Colter (Navy RPM) from Steven Silvers (Nassau County DOH), Comments on Draft FS, September 1993
41. Letter to Dave Brayack (HNUS) from James Colter (Navy RPM), Submission of Comments on Draft Phase 2 RI Report, October 1993
42. Letter to Technical Review Committee from James Colter (Navy RPM), Submission of Final Phase 2 RI Report, October 1993
43. Letter to James Colter (Navy RPM) from Carlo San Giovanni (Geraghty & Miller), Comments regarding Draft FS Report, October 1993
44. Various Phone Conversation Records to James Colter (Navy RPM) from TRC Members, Comments regarding Draft FS Report, October 1993
45. Letter to James Colter (Navy RPM) from John Barnes (NYSDEC), Comments regarding Draft FS Report, October 1993

## CORRESPONDENCE REGARDING IR PROGRAM (CONTINUED)

46. Letter to James Colter (Navy RPM) from Dave Brayack (HNUS), Update on RI-Derived Residue Management, October 1993
47. Fax Transmission to James Colter (Navy RPM) from Carol Stein (EPA Region II), Comments regarding Draft FS Report, December 1993
48. Various Fax Transmissions to TRC Members from James Colter (Navy RPM), Draft Responses to Comments on Draft FS Report, January 1994
49. Letter to James Colter (Navy RPM) from Andrew Bellina (EPA Region II), Responses to EPA Comments on Draft FS Report, March 1994
50. Letter to Technical Review Committee from James Colter (Navy RPM), Submission of Final FS Report, March 1994
51. Letter to Dale Carpenter (EPA Region II) from John Barnes (NYSDEC), Recharge Basins, May 1994
52. Letter to James Colter (Navy RPM) from Anthony Sabino (Attorney, Bethpage Water District), Interim Action to protect BWD Plant #5, September 1994
53. Letter to James Colter (Navy RPM) from John Barnes (NYSDEC), Announcement of October 7 Meeting to Discuss Regional Groundwater, September 1994
54. Letter to James Colter (Navy RPM) from John Barnes (NYSDEC), Minutes of October 7 Meeting to Discuss Regional Groundwater, October 1994
55. Letter to Steve Scharf (NYSDEC) from William Gilday (NYSDOH), Acceptance of Groundwater Feasibility Study, September 2000.
56. Letter to John Cofman (Northrop Grumman Corporation) from Steve Scharf (NYSDEC), Acceptance of Groundwater Feasibility Study, October, 2000.
57. Letter to David Stern (Arcadis) from Steven Scharf (NYSDEC), Comments on Vertical Profile Boring Program, April 2002.

## COMMUNITY RELATIONS

1. "Community Relations Plan", Halliburton NUS, August 1992
2. "Installation Restoration Fact Sheet", Department of Navy, April 1992
3. "Installation Restoration Fact Sheet", Department of Navy, October 1992
4. "Installation Restoration Fact Sheet", Department of Navy, November 1992
5. "Installation Restoration Fact Sheet", Department of Navy, February 1993
6. "Installation Restoration Fact Sheet", Department of Navy, September 1993

## COMMUNITY RELATIONS (CONTINUED)

7. Letter to Technical Review Committee from James Colter (Navy RPM), Submission of Draft PRAP, May 1994
8. Letter to James Colter (Navy RPM) from Laurie Lutzker (Nassau County DOH), Comments on Draft Prap, June 1994
9. Phone Conversation Record to James Colter (Navy RPM) from Bob Booth (NAVAIRSYSCOM), Comments on Draft PRAP, June 1994
10. Phone Conversation Record to James Colter (Navy RPM) from Carlo San Giovanni (Geraghty & Miller), Comments on Draft PRAP, July 1994
11. Letter to James Colter (Navy RPM) from John Barnes (NYSDEC), Comments on Draft PRAP, July 1994
12. Letter to James Colter (Navy RPM) from Andrew Ballina (EPA Region II), Comments on Draft PRAP, July 1994
13. Comment Responses on Draft PRAP, Department of Navy, October 1994
14. Letter to Technical Review Committee from James Colter (Navy RPM), Submission of Final PRAP, October 1994
15. "Public Meeting Invitation and Fact Sheet", Department of Navy and NYSDEC, October 1994
16. "Final Proposed Remedial Action Plan", Department of Navy and NYSDEC, November 1994
17. "Transcript from Public Meeting", MGM Court Reporting, November 1994
18. Letter to John Barnes (NYSDEC) from Mrs. Marilyn Humphrey (Resident), November 1994
19. Letter to John Barnes (NYSDEC) from David Nydick (Superintendent of Schools, Bethpage), November 1994
20. Letter to James Colter (Navy RPM) from John Barnes (NYSDEC), December 1994
21. Letter to James Colter (Navy RPM) from Dr. Alan F. Weston (Occidental Chemical Corp.) December 1994
22. Letter to James Colter (Navy RPM) from Anthony J. Sabino (Attorney for Bethpage Water District), December 1994

## COMMUNITY RELATIONS (CONTINUED)

23. Letter to James Colter (Navy RPM) from Andrew Bellina (EPA Region II), January 1995
24. Letter from John Barnes (NYSDEC) to Mr. Richard Pfaender (Town Hall), January 1995
25. Letter from John Barnes (NYSDEC) to Mr. Alan Phillips (Assistant Superintendent, Bethpage Schools), January 1995.
26. Letter from Judithanne Hare to Community Members, Announcement for the start of a Restoration Advisory Board (RAB) at NWIRP Bethpage, April 1999.
27. Restoration Advisory Board Fact Sheet, NWIRP Bethpage, April 1999.
28. Letter from Judithanne Hare to Residents, Announcement of September 1999 RAB Meeting, September 1999.
29. Letter from James Colter (Navy RPM) to RAB Members, Announcement of Technical Subcommittee and RAB Meetings in February 2000, Transmittal of September 1999 RAB Meeting Minutes and transcript, January 2000.
30. Letter from James Colter (Navy RPM) to RAB Members, Announcement of March 2001 RAB Meeting, Transmittal of October 2000 RAB Meeting Minutes, March 2001.
31. Letter from James Colter (Navy RPM) to RAB Members, Announcement of September 2001 RAB Meeting, Distribution of March 2001 RAB Meeting Minutes and transcript, September 2001.
32. Letter from James Colter (Navy RPM) to RAB Members, Announcement of June 2002 RAB Meeting, Distribution of September 2001 RAB Meeting Minutes and transcript, June 2002.
33. Letter from James Colter (Navy RPM) to RAB Members, Announcement of January 2003 RAB Meeting, December 2002.

## TECHNICAL REVIEW COMMITTEE ACTIVITIES

1. Letter to Kim Mann (NYSDOH) from Judith Hare (NAVAIRSYSCOM), TRC Invitation, October 1991
2. Letter to John Barnes (NYSDEC) from Judith Hare (NAVAIRSYSCOM), TRC Invitation, October 1991

## TECHNICAL REVIEW COMMITTEE ACTIVITIES (CONTINUED)

3. Letter to Helen Shannon (EPA Region II) from Judith Hare (NAVAIRSYSCOM), TRC Invitation, October 1991
4. Letter to Marty Simonson (DPRO) from Judith Hare (NAVAIRSYSCOM), TRC Invitation, October 1991
5. Letter to John Ohlmann (Grumman Aerospace) from Judith Hare (NAVAIRSYSCOM), TRC Invitation, October 1991
6. Letter to John Molloy (Bethpage Water District) from Judith Hare (NAVAIRSYSCOM), TRC Invitation, October 1991
7. Letter to Joseph Schecter (Nassau County DOH) from Judith Hare (NAVAIRSYSCOM), TRC Invitation, October 1991
8. Letter to TRC Members from Frank Klanchar (Navy RPM), Announcement of TRC Meeting #1, March 1992
9. Letter to TRC Members from Frank Klanchar (Navy RPM), Minutes from TRC Meeting #1, May 1992
10. Letter to TRC Members from Frank Klanchar (Navy RPM), Minutes from TRC Meeting #2, August 1992
11. Letter to TRC Members from Frank Klanchar (Navy RPM), Announcement of TRC Meeting #3, October 1992
12. Letter to TRC Members from Frank Klanchar (Navy RPM), Minutes from TRC Meeting #3, December 1992
13. Letter to TRC Members from Tom Sheckels (NorthDiv), Rescheduling of TRC Meeting #4, February 1993
14. Letter to TRC Members from Tom Sheckels (NorthDiv), Minutes from TRC Meeting #4, April 1993
15. Letter to TRC Members from James Shafer (NorthDiv), Cancellation of TRC Meeting #5, July 1993
16. Letter to TRC Members from James Shafer (NorthDiv), Announcement of TRC Meeting #5, September 1993
17. Letter to TRC Members from James Colter (Navy RPM), Minutes from TRC Meeting #5, October 1993
18. Letter to TRC Members from James Colter (Navy RPM), Offsite Soil Test Results, May 1995.

## TECHNICAL REVIEW COMMITTEE ACTIVITIES (CONTINUED)

19. Letter to John Ohlmann (Northrop Grumman), Alan Weston (Occidental), and James Colter (Navy RPM) from John Barnes (NYSDEC), Announcement of September 1997 Technical Committee Meeting, August 1997.
20. Letter to Technical Committee Members from John Barnes (NYSDEC), Minutes from September 1997 Meeting, September 1997.
21. Letter from Steven Scharf (NYSDEC) to TAC Members, Minutes from TAC Meeting #1, October 2001.
22. Letter from Steven Scharf (NYSDEC) to TAC Members, Announcement of TAC Meeting #2, December 2001.

Department of Environmental Conservation

**Division of Environmental Remediation**

# Record of Decision
## Operable Unit 2 Groundwater
## Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites
## Nassau County
## Site Numbers 1-30-003A & B

**March 2001**

New York State Department of Environmental Conservation
GEORGE E. PATAKI, *Governor* ERIN M. CROTTY, *Commissioner*

Exhibit B_2001 ROD

# DECLARATION STATEMENT - RECORD OF DECISION

## Operable Unit 2 Groundwater
## Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites Inactive Hazardous Waste Disposal Sites
## Town of Oyster Bay, Nassau County, New York
## Site Nos. 1-30-003A & B

## Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the Northrop Grumman and the Naval Weapons Industrial Reserve Plant Class 2 Inactive Hazardous Waste Disposal Sites Operable Unit 2 regional groundwater contaminant plume. This plan was chosen in accordance with the New York State Environmental Conservation Law. The remedy selected is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300).

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (NYSDEC) for the Northrop Grumman and the Naval Weapons Industrial Reserve Plant Class 2 inactive hazardous waste disposal sites and upon public input to the Proposed Remedial Action Plan (PRAP) presented by the NYSDEC. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

### Assessment of the Site

Actual or threatened release of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential significant threat to public health and the environment.

## Description of Selected Remedy

Based on the results of the Remedial Investigation/Feasibility Study (RI/FS) for the Northrop Grumman and the Naval Weapons Industrial Reserve Plant (NWIRP) Class 2 Inactive Hazardous Waste Disposal Sites and the criteria identified for evaluation of alternatives, the NYSDEC has selected Alternative 3. The selected remedy includes a number of response measures which have been categorized into a Groundwater Remedial Program and a Public Water Supply Protection Program.

## Groundwater Remedial Program

The selected remedy includes a groundwater remedial program to address the regional groundwater contaminant plume associated with the Northrop Grumman and NWIRP sites. The components of this program are as follows:

- continued operation of the on-site containment (ONCT) groundwater extraction and treatment system (formerly known as an Interim Remedial Measure) at Northrop Grumman's southern property line;

- an evaluation of the ONCT system to confirm that it is performing effectively;

- mass contaminant removal through groundwater extraction and treatment in an offsite area near the GM 38 monitoring well cluster;

- predesign investigation to determine the optimal groundwater extraction location(s) in the GM 38 offsite treatment area(s);

- long term operation and maintenance of all operating systems, including the ONCT (or former IRM) system and the GM 38 area remedy;

- additional groundwater investigation to better define the groundwater contaminant plume and to determine whether additional groundwater remediation is required under this ROD, under an amended OU2 ROD, and/or if an Operable Unit 3 Groundwater RI/FS is warranted;

- long term monitoring of the groundwater including a comprehensive monitoring of plume attenuation;

- the formation of a technical advisory committee (TAC) as deemed necessary by the NYSDEC, to be comprised at a minimum, of the involved Agencies, participating local water districts, Northrop Grumman and the Department of the Navy. The main purpose is to review and provide input on all materials relating to the implementation of the Northrop Grumman and NWIRP OU2 Groundwater remedy.

## Public Water Supply Protection Program

The ROD recognizes the importance of continued provision of potable water to those communities/populations served by water supply wells that are or that become impacted by site-related contamination. To this end, the ROD requires that a public water supply protection program be implemented. The components of this program are as follows:

- continued public water supply wellhead treatment to meet appropriate drinking water quality performance objectives at wellfields already affected by the groundwater contaminant plume for as long as these affected wellfields are used as community water supply sources;

- public water supply wellhead treatment or comparable alternative measures, as necessary, for wellfields that become affected in the future; and

- long term monitoring of the groundwater contaminant plume including outpost monitoring wells upgradient of potentially affected water supply wells.

**New York State Department of Health Acceptance**

The New York State Department of Health concurs with the remedy selected for this site as being protective of human health.

**Declaration**

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

3/29/2001
Date

Michael J O'Toole Jr
Michael J. O'Toole, Jr., Director
Division of Environmental Remediation

# TABLE OF CONTENTS

# RECORD OF DECISION

**Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites**
**Town of Oyster Bay, Nassau County**
**Site Nos. 1-30-003A & B**
**March 2001**

## SECTION 1: SUMMARY OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health has selected this remedy to address the significant threat to human health and/or the environment created by the presence of hazardous waste at the Northrop Grumman Bethpage Plant and the Naval Weapons Industrial Reserve Plant-Bethpage (NWIRP), both class 2, inactive hazardous waste disposal sites. In particular, this ROD addresses Operable Unit 2 (OU2), the regional groundwater contaminant plume associated with these sites. As more fully described in Sections 3 and 4 of this document, plant wastes were disposed directly into either drainage sumps, dry wells and/or on the ground surface resulting in the disposal of a number of hazardous wastes, including the volatile organic compounds (VOCs) perchloroethene (PCE) and trichloroethene (TCE), the semi-volatile organic compound (SVOC) polychlorinated bi-phenyls (PCBs) and the inorganics chromium and cadmium at the site. Some of these contaminants have migrated from the points of disposal to surrounding areas, including the soils of these sites and the groundwater beneath and down gradient of Northrop Grumman, NWIRP and the Grumman-Steel Los Plant 2 facilities. Contaminated groundwater originating from the Grumman-Steel Los Plant 2 Site, formerly part of the Northrop Grumman site, now a Class 4 site, is included within the scope of the Northrop Grumman and NWIRP OU2 groundwater remedial action and long-term management plan.

These disposal activities have resulted in the following significant threats to the public health and/or the environment:

- a significant threat to public health associated with contaminated soils, groundwater and drinking water;
- a significant threat to the environment associated with contaminated soils and groundwater;

In order to restore the Northrop Grumman and Naval Weapons Industrial Reserve Plant Site inactive hazardous waste disposal sites to pre-disposal conditions to the extent feasible and authorized by law, but at a minimum to eliminate or mitigate the significant threats to the public health and/or the environment that the hazardous waste disposed at the site has caused, the following remedy was selected:

### Groundwater Remedial Program

- continued operation of the on-site containment (ONCT) groundwater extraction and treatment system (formerly known as an Interim Remedial Measure (IRM)) at Northrop Grumman's southern property line;

- an evaluation of the ONCT system to confirm that it is performing effectively;

- mass contaminant removal through groundwater extraction and treatment in an offsite area near the GM 38 monitoring well cluster;

- predesign investigation to determine the optimal groundwater extraction location(s) in the GM 38 offsite treatment area(s);

- long term operation and maintenance of all operating systems, including the ONCT (or former IRM) and the GM 38 area remedy;

- additional groundwater investigation to better define the groundwater contaminant plume and to determine whether additional groundwater remediation is required under this ROD, under an amended OU2 ROD, and/or if an Operable Unit 3 Groundwater RI/FS is warranted;

- long term monitoring of the groundwater including a comprehensive monitoring of plume attenuation;

- the formation of a technical advisory committee (TAC) as deemed necessary by the NYSDEC, to be comprised at a minimum, of the involved Agencies, participating local water districts, Northrop Grumman and the Department of the Navy. The main purpose is to review and provide input on all materials relating to the implementation of the Northrop Grumman and NWIRP OU2 Groundwater remedy.

**Public Water Supply Protection Program**

- continued public water supply wellhead treatment to meet appropriate drinking water quality performance objectives at wellfields already affected by the groundwater contaminant plume for as long as these affected wellfields are used as community water supply sources;

- public water supply wellhead treatment or comparable alternative measures, as necessary, for wellfields that become affected in the future; and

- long term monitoring of the groundwater contaminant plume including outpost monitoring wells upgradient of potentially affected water supply wells.

During the course of the OU2 remedial investigation certain actions, known as Interim Remedial Measures (IRMs), were undertaken by Northrop Grumman and/or the Department of the Navy in response to the threats identified above. An IRM is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS. A major groundwater IRM undertaken at this site was installation of the onsite containment, or ONCT System, at Northrop Grumman's southern property line. This IRM is described in more detail in Section 4.

Additional response measures taken during the course of the OU2 investigation include installation of wellhead treatment systems at the Bethpage Water District (BWD) Wellfields 4, 5 and 6. This response measure is described in more detail in Section 4.

The selected remedy, discussed in detail in Section 8 of this document, is intended to attain the goals selected for this site in Section 6 of this Record of Decision (ROD), in conformity with applicable standards, criteria, and guidance (SCGs).

## SECTION 2: SITE LOCATION AND DESCRIPTION

The Northrop Grumman and NWIRP inactive hazardous waste disposal sites are located in east-central Nassau County, Long Island (see Figures 1 and 2).

The entire Northrop Grumman site was initially more than 600 acres in area, but has been reduced in size through previous remedial activities and confirmatory sampling events. The portions of the former Northrop Grumman site that remain listed in the New York State Registry of Inactive Hazardous Waste Disposal Sites include the southern recharge basins, the NWIRP and the Grumman-Steel Los Plant 2 site (formerly the Grumman Plant 2 facility). The southern recharge basins and the Grumman-Steel Los Plant 2 facility currently total about 35 acres in size. The NWIRP site is approximately 105 acres in size. There are numerous groundwater industrial supply wells and recharge basins at these sites.

The RUCO Polymer site, site No. 1-30-004, (see figure 4) is located to the northwest of the Northrop Grumman Site and west-northwest of the NWIRP. There are other industrial and commercial facilities in the area along with several residential communities. There are several public supply wells within a two-mile radius of the sites.

## SECTION 3: SITE HISTORY

### 3.1: Operational/Disposal History

### Northrop Grumman Site No. 1-30-003A

The Grumman Aerospace Corporation was established in the early 1930s at the present site in Bethpage. Several naval aircraft were developed and manufactured at the site. Other activities at the site included the manufacturing of naval amphibious craft and the manufacturing of various satellites, etc. for the National Aeronautics and Space Administration (NASA).

From 1943 to 949, Grumman disposed of chromic acid wastes directly on the ground or in open seepage basins. In 1949, a chromic acid treatment system was put on-line at Plant 2. In addition to the chromic acid treatment system located at Plant 2, systems for treating phenols, oils, and other organic compounds, and for recovering silver were also used at Plant 2. Since the early 1950s, some of the wastes generated by Grumman were taken to the NWIRP property for treatment or storage before being taken off site by private haulers. These wastes included common organic solvents consisting of chlorinated hydrocarbons. There were several locations on the Grumman site where wastes were stored, treated, or disposed of. Trichloroethene (TCE) was stored in an above ground tank along the northeastern corner of Plant 2. A release of TCE from this tank (or the associated piping system) occurred and was discovered during the Grumman Remedial Investigation.

## NWIRP Site No. 1-30-003B:

The NWIRP was established in 1933. The NWIRP is known as a government owned, contractor operated (GOCO) facility. Since its inception, the primary mission for the facility has been the research, prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft.

The facilities at the NWIRP include four plants (No. 3, 5, and 20, used for assembly and prototype testing; and No. 10, which contains a group of quality control laboratories), two warehouse complexes, a salvage storage area, water recharge basins, an industrial wastewater treatment plant, and several smaller support buildings.

The following is a discussion of the waste handling practices at the three identified disposal areas at the NWIRP facility (see Figure 3 or area locations):

### Area 1 - Former Drum Marshaling Area

From the early 1950's to 1978, drums containing liquid wastes were stored on a cinder covered area over a cesspool leach field. This leach field may have been used to discharge process wastewater. In 1978, the drum storage area was moved a few yards to the south to a 100- by 100-foot concrete pad. This pad did not have a cover or berms around it. In 1982, the drum storage area was moved to Area 3.

Various solvents were stored at Area 1. Cadmium and cyanide wastes were also stored in this area from the early 1950's through 1974. Approximately 200 to 300 drums were stored at these locations at any given time. Reportedly, all drums of waste which were stored at these areas were taken offsite by a private contractor for treatment and disposal.

### Area 2 - Recharge Basin Area

Prior to 1984, some Plant 3 production-line rinse waters were discharged in the three on-site recharge basins. These waters were directly exposed to chemicals used in the industrial processes (rinsing of manufactured parts). Only non-contact cooling water has been discharged into these basins since 1984. The source of this non-contact cooling water has been on-site production wells.

On at least one occasion (1956), hexavalent chromium was detected in the water in the recharge basins at concentrations in excess of allowable limits. This matter was discovered and handled by the Nassau County Department of Health.

Adjacent to and west of the recharge basins are the former sludge drying beds. Sludge from the Plant 2 Industrial Waste Treatment Plant (part of the Grumman Site as described above) was dewatered in these beds before being disposed of off-site.

### Area 3 - Salvage Storage Area

The NWIRP salvage storage area is located to the west of Area 2. This area has been used for the storage of fixtures, tools, and metallic wastes such as aluminum and titanium scraps, since the early-1950's.

Located within the salvage storage area was a 100- by 100 foot area that was used for the storage of drummed waste. This 100 by 100-foot area was reportedly covered with coal ash cinders. Halogenated and non-halogenated waste solvents were stored in this area from the early-1950's through 1969. The exact location of this drum storage area is not known. Since 1982, drums have been stored in a covered area with a concrete pad and berms.

### Grumman-Steel Los Plant 2, Site No. 1-30-003C (Groundwater Contamination):

In 1994, the Grumman Aerospace Corporation was purchased by the Northrop Corporation and became known as the Northrop Grumman Corporation. In December 1996, Northrop Grumman sold Plant 2 and the surrounding land to the Steel Los III Corporation (Steel Los). Steel Los refurbished the Plant 2 complex and now leases the former Plant 2 as commercial real estate.

The Plant 2 facility, listed as site No. 1-30-003C on the New York State Registry of Inactive Hazardous Waste Sites, was originally part of Site 1-30-003A, the Northrop Grumman Site. Now known as the Grumman Steel Los site, this site was addressed by the Operable Unit One (OU1) soils remedy for the Northrop Grumman Site. The OU1 ROD deferred groundwater contamination issues to this OU2 groundwater remedy. The Grumman Steel Los Site is now a class 4 site, and long term monitoring will be required, in part due to residual cadmium and chromium contamination beneath the site. A deed restriction for the property has been filed to minimize the potential for exposure to residual contamination and to minimize the potential for groundwater leaching of residual contaminants.

### OXY Hooker Ruco, Site No. 1-30-004 (Not the Subject of this ROD):

The RUCO Polymer site (see figure 4) was originally the Rubber Corporation of America. The Hooker Chemical Corporation (now the Occidental Chemical Corporation, also known as OCC or OXY) purchased the Rubber Corporation of America (RUCO) in 1965. The RUCO plant was sold to the employees in 1982. The site is now a subsidiary of the Sybron Corporation under the name RUCO Chemical Corporation (RUCO Site). OXY has retained the environmental liability for the past disposal practices.

Between 1956 and 1975, industrial process wastewater and storm water runoff from the facility was discharged to six (6) on-site recharge basins or sumps. This wastewater contained chlorinated hydrocarbons including PCE, TCE and vinyl chloride monomer (VCM), as well as other organic and inorganic wastes. These waste waters have contributed to the contamination of the Bethpage regional aquifer upgradient and beneath the Northrop Grumman, NWIRP and Grumman-Steel Los facilities. The OXY Hooker Ruco Site is listed on the National Priorities List (NPL) of the United States Environmental Protection Agency (USEPA). A separate remedial program is being carried out for the Ruco site under the oversight of the USEPA. Therefore, the Ruco site is not a direct focus of this ROD except inasmuch as it may affect the effectiveness of groundwater remedies (see for example Item D in Section 7.1).

## 3.2: Remedial History

### Northrop Grumman and Grumman Steel Los Plant 2:

Grumman was reportedly notified in December 1947 that a sample collected from Well No. 3 of the Central Park Water District (predecessor of the Bethpage Water District) contained chromium at a concentration of 1.4 parts per million (ppm). As a result, the District's well No.s 1, 2 and 3, located on Jackson Avenue near the train station, were permanently closed. Eventually Grumman Aerospace reimbursed the District for these wells. Grumman installed a chromic acid treatment system for its Plant 2 waste waters. This system went on-line in 1949.

Odor and taste problems were discovered in water pumped from some of Grumman's on-site production wells in 1973. Several investigations into the source(s) of this problem were conducted from 1973 through the early 1980's. It was ultimately determined that these problems were due to chlorinated hydrocarbons in the groundwater.

The Northrop Grumman site was added to the New York State Department of Environmental Conservation's Registry of Inactive Hazardous Waste Disposal Sites in New York State (Registry) in 1983. At the time, the NWIRP-Bethpage site was considered part of the Northrop Grumman site. The site was initially listed as a Class 2a site because there was insufficient data to assign it a classification set forth in the Environmental Conservation Law (ECL).

Based on a subsequent review of existing data, the Grumman site was reclassified to a Class 2 site by the NYSDEC in December 1987. A Class 2 site is a site which poses a significant threat to human health and/or the environment, and for which action is required.

Northrop Grumman conducted a remedial investigation (RI) on site between October 1989 and September 1994. As a result of this investigation, two source areas were identified. The NYSDEC also divided the remedial programs at the Northrop Grumman Site and the NWIRP site into two operable units; site soils and the regional groundwater. An operable unit is designated to represent a portion of the site remedy which for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from contamination at a site.

The purpose of the Feasibility Studies on the Northrop Grumman and NWIRP sites was to develop and evaluate remedial alternatives for remediating the soils contamination defined during the RI(s). A Record of Decision (ROD) for operable unit one (OU1) for the Northrop Grumman site was issued in March 1995 and for the NWIRP site in July 1995.

A soil vapor extraction system was installed adjacent to a former storage tank that was used to store trichloroethene (TCE) at Plant 2. This system was shut down for a short period of time and was used to remediate a small area of contamination (perchloroethene or PCE) at Plant 15. The Plant 15 source area has been adequately remediated. The adequacy of the Plant 2 remediation will be determined after confirmatory sampling.

In addition to the hazardous waste remediation program, the parts and parcels of the former Grumman Aerospace facility have been regulated under the Resource, Conservation and Recovery Act, (RCRA), or active facility permitting program. Under the RCRA program, other remedial measures (sometimes called corrective actions), have been implemented by the NYSDECs RCRA program (also discussed in section 4) and under the USEPA's underground injection control (UIC) program.

Contaminated soil and dry well sediments, at known or potential source areas (such as various Northrop Grumman and NWIRP facilities), have been or are being addressed under OU 1 and/or appropriate RCRA and UIC closure programs.

Certain specific areas of the former Plant 2, or Steel Los property, have elevated levels of chromium and cadmium. The Steel Los Corporation opted to remove only the hazardous waste levels of contamination and then restrict access to the remainder of the soils with contamination above NYSDEC soil cleanup objectives. These areas are well below ground surface and have been deed restricted. The restriction requires maintenance of a cap or cover system at the site and special measures prior to and during ground intrusive activities. These provisions are intended to minimize the potential for leaching of residual contaminants and to minimize the potential for exposure to subsurface contaminants, respectively. The Steel Los property has been reclassified to a class 4, which means the remedial actions are in place and proper long term operation, maintenance and monitoring is required. Cadmium and chromium are included as analytes in the long term hydro-geologic monitoring plan.

### NWIRP

An Initial Assessment Study was conducted at the NWIRP-Bethpage site in 1986. Based upon the results of this study, it was concluded that three areas at the site posed a threat to human health or the environment. A description of the Northrop Grumman and NWIRP sites is presented in Section 3.1. In March 1993, NYSDEC listed the NWIRP as a separate Class 2 Registry Site, distinct from the Northrop Grumman Site. The NWIRP site was excluded from the 1990 Northrop Grumman RI/FS Order on Consent and therefore, a separate investigation was required.

An RI/FS was conducted at the site from August 1991 through July 1995. The purpose of the RI was to determine the nature and extent of the contamination that was found during the Initial Assessment Study. The NWIRP ROD called for addressing soils contamination at the three areas of concern. The NWIRP remedies called for the excavation and removal of specific areas of PCB and solvent contamination and the reduction of soils to be excavated by the implementation of a soil vapor extraction system in conjunction with shallow groundwater remediation through air sparging.

### OXY Hooker RUCO

The RUCO Site is broken into three operable units. OU 1 addresses site soils and adjacent groundwater, OU 2 addresses soils associated with a particular recharge basin, and OU 3 addresses the offsite migration of groundwater contaminated with VOCs including vinyl chloride and tentatively identified compounds, or TICs, that generally fall into the category of semi-volatile organic compounds (SVOCs). The USEPA issued a Record of Decision for the offsite groundwater contamination, or Operable Unit 3 (OU3) in September 2000. The USEPA OU 3 ROD remedy includes enhanced natural attenuation and long term monitoring of a concentrated groundwater contaminant plume known as "the vinyl chloride subplume" that is immediately northwest of the Northrop Grumman site. The USEPA OU 3 ROD remedy recognizes the importance of preventing the vinyl chloride subplume from adversely affecting the performance and regulatory compliance of Northrop Grumman's groundwater remedial systems and requires that RUCO will take necessary steps to protect the Northrop Grumman groundwater treatment system.

### 3.3: Enforcement History

**Grumman**

Grumman entered into a Consent Order with the NYSDEC on October 25, 1990 in which Grumman agreed to conduct a RI/FS at the Northrop Grumman site.

**NWIRP**

The United States Navy has undertaken their environmental studies pursuant to the Navy's Installation Restoration Program. The State of New York provided oversight of the work conducted by the Navy pursuant to a Memorandum of Understanding between the State and the Department of Defense.

**Resource Conservation and Recovery Act**

The purpose of this ROD is to set forth the groundwater remedial program and the public water supply protection program for the Northrop Grumman and NWIRP Sites as set forth in 6 NYCRR Part 375, "Inactive Hazardous Waste Disposal Sites." These two sites are also regulated under 6 NYCRR Part 373, commonly known as the Resource, Conservation and Recovery Act, (RCRA) program. This is the permitting and ultimately the closure process for active facilities that store, generate, and treat hazardous wastes over a certain quantity as defined under this regulation. The RCRA program as promulgated under NYSDEC regulations is authorized by the USEPA to issue RCRA permits.

## SECTION 4: SITE CONTAMINATION

To evaluate the contamination present at the site and to evaluate alternatives to address the significant threat to human health and the environment posed by the presence of hazardous waste, the Northrop Grumman Corporation and the Navy have conducted two area-wide remedial investigation and feasibility studies (RI/FS's) and a smaller focused RI/FS on the Navy property.

The RCRA program is addressing the contaminated soils beneath the Northrop Grumman and NWIRP buildings. In addition, both Grumman and the Navy are working towards completing the remediation of large capacity underground fuel oil tanks that historically leaked. All the tanks have been removed and residual contaminants in these areas are being remediated under the NYSDEC Division of Environmental Remediation Underground Storage Tanks (UST) program.

### 4.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any soil and groundwater contamination resulting from previous activities at the Site. The RI was conducted in two phases. The first phase was conducted between February, 1991 and October, 1991 and the second phase between August 1992 and September 1993. For the Northrop Grumman property, a report entitled "Remedial Investigation Report, Grumman Aerospace Corporation, Bethpage, New York, May 1994," has been prepared. For the NWIRP, two reports entitled "Final Remedial Investigation Report NWIRP, May 1992," and "Phase 2 Remedial Investigation Report, NWIRP, October 1993," describe the field activities and findings of the RIs in detail.

The first two FSs were for soils remedies covered under OU 1 RODs with the Navy and Northrop Grumman. The Focused RI/FS, being conducted by Northrop Grumman, is still ongoing for the two remaining PCB contaminated dry wells at the NWIRP. An additional FS, which is the subject of this PRAP, was prepared for offsite groundwater issues.

The following investigatory techniques were used in order to achieve the goals for the RIs:

- Soil gas surveys were conducted in various locations throughout the site in order to locate potential areas which could be sources of groundwater contamination.
- Soil samples were collected in various locations throughout the site to confirm the results of the soil gas surveys and to identify source areas that could not initially be located using the soil gas survey technique.
- Groundwater samples were collected from monitoring wells that were installed as part of the two Remedial Investigations and by other organizations (such as the United States Geological Survey).

To determine whether the groundwater is contaminated at levels of concern, the RI analytical data were compared to environmental Standards, Criteria, and Guidance values (SCGs). Groundwater, drinking water and surface water SCGs identified for the Northrop Grumman and NWIRP Sites are based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part 5 of the New York State Sanitary Code. Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, the groundwater requires remediation. The RI results are summarized below. More complete information can be found in the RI Report on file in the document repositories.

Chemical concentrations are reported in parts per billion (ppb) or parts per million (ppm). For comparison purposes, where applicable, SCGs are provided for each medium.

### 4.1.1: Site Geology and Hydrogeology

The sites are underlain by five geologic/hydrogeologic formations (descending from ground surface):

- Pleistocene deposits (Upper Glacial Aquifer) consisting of various sands and gravels intermixed with discontinuous low permeability clay lenses, approximately 100 feet thick
- Magothy Formation (Magothy Aquifer) consisting of various sands and gravels varying in thickness interlaced with low permeabililty confining layers,
- Raritan Clay Formation
- Lloyd Sand Formation (Lloyd Aquifer)
- Bedrock

The Upper Glacial, Magothy and Lloyd aquifers are all important formations for the purposes of this ROD. Groundwater from the Upper Glacial aquifer in this area eventually percolates to the Magothy aquifer. The Magothy Aquifer is the aquifer that is utilized the most as a source of drinking water.

### 4.1.2: Regional Groundwater Study

The investigation of onsite and offsite groundwater contamination associated with the Northrop Grumman and NWIRP Sites is referred to as the regional groundwater study. The information gathered was used to screen alternatives in the Operable Unit 2 (OU 2) Groundwater Feasibility Study. The groundwater plume is estimated to extend over an area of more than 2,000 acres and to a depth of approximately 700 feet. Due to the magnitude of this contamination and the multiple sources of the contamination, a regional remedy for addressing the groundwater contamination was required. The process of developing a regional remedy began in October 1994 and originally included Northrop Grumman, the NWIRP and the RUCO Sites. Subsequently, in September 1998, the involved Agencies determined that the RUCO Site would be most appropriately addressed separately under the USEPA's RI/FS program for that site.

### 4.1.3: Nature of Contamination

As described in the RI report, numerous soil, soil gas, groundwater and sediment samples were collected at the site to characterize the nature and extent of contamination. The main categories of contaminants which exceed their SCGs are inorganics (metals), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (PCBs).

A summary of the groundwater analytical data generated during the RIs is presented in Table 1. Summaries of the soils analytical data are presented in the RODs for onsite soils that are referenced in Section 3.2. It is recognized that residual soil contaminants such as chromium and cadmium beneath the Plant 2 property could serve as a source of groundwater contamination in the future. Although this ROD addresses groundwater contaminants, this relationship between soils and groundwater is recognized throughout the ROD.

The sites are located in an area of deep aquifer recharge. Precipitation that percolates through the soil and enters the aquifer system travels vertically down through the aquifers thus replenishing the water that is pumped for potable uses. Pollutants in the unsaturated soils and upper reaches of the aquifer system also migrate downward with infiltrating water.

The primary groundwater contaminants are chlorinated VOCs which were either used and disposed of at the sites or are breakdown products of these chemicals. These compounds are:

- perchloroethene (PCE)
- trichloroethene (TCE)
- dichloroethenes (DCE)
- vinyl chloride
- 1,1,1-trichloroethane

Inorganic analytes (metals), specifically arsenic, cadmium and chromium were detected in groundwater samples that were collected at the sites. The arsenic, cadmium, and chromium were detected at concentrations greater than the corresponding standards, though only in a small number of on-site monitoring wells.

### 4.1.4: Extent of Contamination

### Groundwater

By current estimates, the groundwater plumes emanating from the two sites total more than 2,000 acres in area and are over 700 feet deep in places. An estimate of the areal extent of the plume, based on 1993 groundwater data, is presented on Figure 5. Recent groundwater Data from the Navy vertical profile borings indicates that Northrop Grumman contamination has migrated southward beyond the Hempstead Turnpike.

#### On-Site Groundwater Plume

The highest concentrations of VOCs in groundwater were detected in samples collected from on-site wells. The most contaminated on-site well was the intermediate depth well of the HN-24 well cluster (see Figure 6), located on the southwest corner of the Navy property, in which TCE was detected at a concentration of 58,000 ppb (the drinking water standard is 5 ppb). An attempt to isolate the source of this contamination was unsuccessful. Concentrations greater than 1,000 ppb have been detected in some of Grumman's and the Navy's production wells. Consistently high concentrations of VOCs have been detected in Grumman production well GP-1 for some time, and a treatment system has been installed to treat the water that is pumped from that well (see Section 4.2).

#### Off-Site Groundwater Plume

To date, the plume(s) emanating from the sites have impacted or threaten three public water supply wellfields operated by the Bethpage Water District (see Figure 5). There are treatment systems in place at each of these three impacted or threatened wellfields (see section 4.2). The water that is distributed to the community is tested on a monthly basis to ensure that the drinking water standards promulgated by the NYSDOH are met. In addition, the Bethpage Water District has a policy of providing its consumers with drinking water that contains no detectable concentrations of site-related contaminants. Given the proximity of the contaminants to the Bethpage Water District (BWD) well fields, nine (9) outpost or sentry wells were installed upgradient of the water supplies. These wells have been sampled on a quarterly basis since March 1995. The purpose of this quarterly sampling is to provide the BWD with the data necessary to ensure that the existing treatment systems are adequate to treat the level of contaminants that may impact their public supply wells. The data are also used to make decisions about the need for groundwater remediation.

Based upon a review of the sentry well data, there is an area surrounding monitoring well cluster GM-38 that contains high concentrations, in excess of 1,000 ppb, of site-related contamination. The outpost wells will continue to be monitored to determine the groundwater concentrations of these site-related contaminants.

### Soil

The Northrop Grumman and NWIRP OU1 RODs dealt with soil contamination outside the areas of the site buildings at the Northrop Grumman and NWIRP sites. Contaminated soils beneath the site buildings are being addressed by the RCRA program, or active facilities permitting program. This is being accomplished by sampling, excavation and offsite disposal of contaminated soils.

### Sediments

Sediments in some of the onsite recharge basins contained elevated levels of inorganics. All sediments that were removed from the recharge basins were characterized and sent offsite for disposal. The closure of the onsite storm drains was through the USEPA underground injection control (UIC) program.

### 4.1.5: Development of a Computer Groundwater Model

A groundwater computer model was developed as a tool for developing and evaluating remedial alternatives for addressing the groundwater contamination. The study area that is encompassed in the model is 24.1 square miles in area (see Figure 8). The model was constructed in order to simulate groundwater flow throughout the entire thickness of the Upper Glacial and Magothy aquifers. A detailed description of the model is presented in the Northrop Grumman Groundwater Feasibility Study Report, Appendix B, dated October, 2000. Copies of this report are on file at the document repositories listed on Page 2 of this document.

### 4.2: Interim Remedial Measures

An Interim Remedial Measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS. Two major groundwater response actions, the ONCT IRM and the provision of wellhead treatment for impacted public supply wells, have been implemented over the past seven years and have been incorporated into the selected remedy for these sites.

### On-Site Containment IRM

The On-Site Containment (ONCT) IRM was installed by Northrop Grumman. It was realized during the early stages of the feasibility study that one of the components of the final remedy for addressing the groundwater contamination was the containment of the portions of the plume(s) that are still beneath the sites (i.e. - prevent further migration of contaminants off site to the extent practicable). Pumping at the onsite production wells had helped contain much of the contamination onsite. However, as Northrop Grumman and the Navy began closing down their Bethpage operations, many of the on-site production wells were slated to be removed from service. Therefore, it was decided to implement a specific groundwater containment remedy as an Interim Remedial Measure (IRM) in advance of making a decision regarding the final groundwater remedy. This system went on-line in November 1997.

As designed, the ONCT IRM system consists of four extraction wells; one of which was pre-existing (GP-1), and three others that were installed in 1996-97 (see Figure 7). The bulk of the contaminant removal is predicted to occur in wells ONCT-1 and GP-1, with lesser amounts of contaminants extracted from wells ONCT-2 and ONCT-3. The combined pumping rate for wells GP-1, ONCT-1, ONCT-2, and ONCT-3 is 3,375 gallons per minute.

The groundwater that is pumped from these wells is treated to remove VOC contaminants prior to being recharged back into the aquifer via on-site recharge basins. This combination of pumping, treating and recharge are the factors by which the on-site plumes will be contained ("hydraulic containment"). Eventually, most of the Northrop Grumman production (GP) wells that added additional pumping will be closed and only the ONCT system, consisting of GP-1 and ONCT extraction wells 1, 2 and 3 will be left in place. The closure of most of the production wells was incorporated into the design of the containment system.

### Protection of the Bethpage Water District Public Supply Wells

Treatment systems have been installed at the three currently operated and impacted or threatened public supply wellfields operated by the BWD (see also section 4.1.2). The treatment systems at BWD Plants 4, 5 and 6 were installed by the district. Plant 4 and 6 costs were reimbursed by Grumman. The treatment system at BWD Plant 5 was reimbursed by the U.S. Navy as specified in the May 1995 OU 1 ROD for the NWIRP-Bethpage site.

### 4.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in Section 5 of the RI report entitled, "Contaminant Fate and Transport."

An exposure pathway is the manner by which an individual may come in contact with a contaminant. The five elements of an exposure pathway are; 1) the source of contamination; 2) the environmental media and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Human exposure pathways, relative to this operable unit (groundwater), known to presently exist or that have historically existed at the site include:

- direct contact with (dermal absorption), ingestion of, and inhalation of vapor from contaminated onsite groundwater; and
- direct contact with (dermal absorption), ingestion of, and inhalation associated with contaminated groundwater through residential or commercial use.

Human exposures could occur by ingesting or coming into direct contact with untreated, contaminated groundwater pumped from a water supply well. Additionally, inhalation of VOCs could occur if contaminated water is used for cooking, cleaning or bathing. Several BWD public water supply wells were impacted by contamination from the Site. Water from the affected municipal wells is either no longer used or treated to remove the contaminants prior to distribution to the community. Routine monitoring of the treated water supplies has demonstrated the effectiveness of these treatment systems in preventing exposures to groundwater contaminants.

There are no known private drinking water wells in use within the contaminated aquifer area. The nearest down gradient private well, a non-contact cooling water well at a hospital, was tested in 1998 and found to be free of site-related contaminants.

In summary, while human exposures to contaminated groundwater may have occurred in the past, there are no known exposures that are presently occurring due to the implementation of appropriate response measures.

It should be noted that exposures to contaminated soil, dry well sediments, and groundwater at known or potential source areas (such as various Northrop Grumman and NWIRP facilities) have been or are being addressed under OU1 and/or appropriate RCA and UIC closure programs.

### 4.4: Summary of Environmental Exposure Pathways

There are no surface water bodies or other environmentally sensitive areas within a two-mile radius of the sites. Therefore, it was concluded that there is a negligible risk to wildlife in the area from the disposal of hazardous wastes at the sites.

## SECTION 5: ENFORCEMENT STATUS

Grumman entered into a Consent Order with the NYSDEC on October 25, 1990 in which Grumman agreed to conduct a RI/FS at the Northrop Grumman site.

### Resource Conservation and Recovery Act

The purpose of this ROD is to set forth the groundwater remedial program for the Northrop Grumman and NWIRP Sites as set forth in 6 NYCRR Part 375, "Inactive Hazardous Waste Disposal Sites." These two sites are also regulated under 6 NYCRR Part 373, commonly known as the Resource, Conservation and Recovery Act, (RCRA) program. This is the permitting and ultimately the closure process for active facilities that store, generate, and treat hazardous wastes over a certain quantity as defined under this regulation. The RCRA program as promulgated under NYSDEC regulations is authorized by the USEPA to issue RCRA permits.

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers. The NYSDEC and the Northrop Grumman Corporation (Grumman Aerospace) entered into a Consent Order on October 25, 1990. The Order obligated Northrop Grumman to implement an RI/FS.

### NWIRP

The United States Navy has undertaken their environmental studies pursuant to the Navy's Installation Restoration Program. The State of New York provided oversight of the work conducted by the Navy pursuant to a Memorandum of Understanding (MOU) between the State and the Department of Defense. The Department of the Navy entered into a Memorandum of Understanding (MOU) with the NYSDEC in 1993. The MOU brought the NYSDEC into the Department of the Navy's Installation Restoration (IR) program. Upon issuance of the Record of Decision for Operable Unit 2 (OU2) the NYSDEC will approach the Northrop Grumman Corporation and the Department of the Navy to implement the selected remedy under an Order on Consent and a Federal Facility Site Remediation Agreement respectively.

## SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria and Guidance (SCGs) and be protective of human health and the environment. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Eliminate, to the extent practicable, site-related contaminants from the affected public water supplies and to prevent, to the extent practicable, the future contamination of public water supplies through the implementation of the offsite groundwater remediation.
- Eliminate, to the extent practicable, exposures to contaminated groundwater.
- Eliminate, to the extent practicable, off-site migration of contaminated groundwater and, where practicable, to restore the groundwater to pre-disposal conditions.
- Eliminate, to the extent practicable, the offsite migration of soils contamination entering the groundwater.
- Eliminate, to the extent practicable, exceedances of applicable environmental quality standards related to releases of contaminants to the waters of the state.

## SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, Alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Northrop Grumman and the NWIRP sites were identified, screened and evaluated in the Operable Unit 2 (OU2) Report entitled "Groundwater Feasibility Study, Northrop Grumman, Bethpage."

The On Site Containment System (ONCT) and the wellhead treatment for the BWD Wells are response actions that have already been implemented and that will be incorporated into the selected remedy for this site. All of the alternatives contained in the OU2 Groundwater ROD include the continued operation, maintenance and monitoring (OM&M) of the ONCT system and the BWD wellhead treatment.

A summary of the detailed analysis follows. As presented below, the time to implement reflects only the time required to put the remedy in place, and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with responsible parties for implementation of the remedy.

### 7.1: Description of Alternatives

The following potential response actions are intended to address contaminated groundwater associated with the site and to protect affected or potentially affected public water supply systems.

**For Alternatives 1 thru 8, the following Items A through F, are included in Some or All of the Alternatives:**

**A. On-Site Plume Containment (ONCT), Treatment, and Discharge to On-Site Recharge Basins via the On-going ONCT System ( formerly called the ONCT IRM):**

Under this component of each Alternative, the existing ONCT System will continue operating. The pumping rate from the ONCT system (See Figure 9) would continue at the approximate rate of 3,375 gallons per minute.

The water would be recharged into the recharge basins located adjacent to Plant 5 and to the southern recharge basins. Costs for this option do not include the already completed design and construction but do include operation and maintenance.

### B. Long Term Operation and Maintenance of VOC Removal Systems At Three Off-Site Bethpage Public Water Supply Well Fields:

A long-term agreement is being renegotiated between the BWD and Northrop Grumman to pay for the operation and maintenance of the treatment systems at BWD well fields 4, and 6. This agreement would be required to be effective for at least 30 years or until the treatment at a public supply well(s) is no longer necessary to meet appropriate remedial goals, or until BWD decides to shut down any given supply well. The Department of the Navy entered into a cash out agreement with the BWD for the installation, permanent operation and maintenance of a treatment system at BWD wellfield 5.

The Bethpage Water District has a policy of providing its consumers with drinking water that contains no detectable concentrations of VOC contaminants. As of the date of this ROD, Northrop Grumman through its agreement with the BWD for Plants 4 and 6 and the Department of the Navy for Plant 5 have paid for VOC removal treatment that is sufficient to meet this District policy.

### C. Long-Term Operation Maintenance and Monitoring (OM&M) That Includes Comprehensive Monitoring of Plume Attenuation, Outpost Groundwater Monitoring with a Public Water Supply Protection Contingency, and Long-Term Operation and Maintenance of All Operating Treatment Systems On-site.

A long-term operation, maintenance and monitoring (OM&M) program would be designed and implemented and is included with each Alternative. This OM&M plan includes the installation of at least twenty new monitoring wells and specific vertical profile borings. The OM&M plan includes a specific task for verifying the Grumman Steel Los Plant 2 and the NWIRP source area contamination does not pass beyond the ONCT system.

Installation of vertical profile borings and/or monitoring wells in offsite areas would be included in the outpost monitoring, remedial design, and plume tracking programs. The OM&M vertical profile boring program has been expanded to cover areas south of Hempstead Turnpike. The goals for this OM&M program would be to monitor the groundwater plume(s) both on-site and off-site, monitor the effectiveness of the groundwater remedy or remedies and determine if wellhead treatment is necessary. Comprehensive monitoring of plume attenuation would also be used with respect to the fate and transport of site contamination. This component would also contain operation and maintenance provisions for all treatment systems.

The goals for the long term monitoring program would be to:

- monitor the groundwater plume(s) both on-site and off-site; and
- monitor the effectiveness of the groundwater remedy.

Samples will be collected on a quarterly, semi-annual or annual basis from a monitoring well network (approximately 20 - 40 wells). The specific sampling locations and the specific analyses would be based upon periodic reviews under the ongoing long term OM&M program. In addition, water level data would be collected on a regular basis. These results would be evaluated by means of periodic updating of the computer groundwater model that has been developed (see Section 4.1.3) for this site.

All the alternatives contain a contingency for public water supply wellhead treatment or comparable alternative measures. The treatment or alternative measures will be sufficient to meet the appropriate remedial goals for this project (see item F below). Outpost monitoring would indicate if VOC concentrations in the groundwater would potentially threaten a public supply well. A wellhead treatment system would be designed and installed or comparable alternative water supply measures would be implemented if outpost monitoring well data, as determined by the NYSDEC and State and County Health Departments, indicate that treatment of a public supply well or provision of an alternative water source is necessary to protect public health from exposure to site-related contamination. The determination of appropriate water supply protection measures will be made with input from the affected water district(s).

The ongoing ONCT system would require a long term operation and maintenance plan to be submitted to the Department for review, acceptance and periodic updates. The public supply wellhead treatment systems currently in place will also require an operation and maintenance plan both of which would be for the minimum of the thirty year CERCLA time frame or until the treatment systems are no longer required.

### D. Vinyl Chloride Contingency Plan

The feasibility study does not include specific treatment for vinyl chloride. The RUCO site is upgradient of the Northrop Grumman Site and historically upgradient of the NWIRP Site due to large scale pumping by Northrop Grumman. The RUCO site discharged vinyl chloride, other chlorinated solvents and other organic compounds directly into the aquifer through on-site recharge basins. The USEPA has selected a remedy for the RUCO site vinyl chloride subplume. The existing ONCT system was not designed to treat vinyl chloride, a VOC that requires unique methods of treatment to meet stringent air discharge limits. Thus, the NYSDEC directed Northrop Grumman to develop a continency treatment plan. The USEPA OU 3 ROD remedy includes enhanced natural attenuation and long term monitoring of the vinyl chloride subplume. The USEPA OU 3 ROD remedy recognizes the importance of preventing the vinyl chloride subplume from adversely affecting the performance and regulatory compliance ofNorthrop Grumman's groundwater remedial systems. Vinyl chloride was recently detected in Northrop production well GP-3, suggesting continued migration of the vinyl chloride subplume. Northrop Grumman has notified the USEPA and OXY that the vinyl chloride treatment contingency plan must now be invoked.

### E. Offsite GM 38 Area Remedy:

This offsite groundwater extraction and treatment remedy would be located in the monitoring well GM38 area. This remedial technology would address elevated concentrations of total volatile organic compounds (TVOCs) in groundwater because deep groundwater at the GM-38 well area has been identified as an off-site "hotspot". This process option would be operated as a mass removal option to prevent further degradation of the aquifer. The modeling data from the OU 2 Groundwater FS indicates 7,000 pounds of the contaminant mass could be removed at this location.

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| Capital Cost: | $ 4,390,000 |
| Annual O&M Cost: | $ 220,000 |
| Present Worth: | $ 6,673,000 |

**F. Northrop Grumman and the Department of the Navy Implementation of "Non-Detect" Policy for Affected Public Water Supplies:**

The State of New York, under its State Superfund Program, must ensure that all remedies selected for the remediation of inactive hazardous waste sites are protective of public health and the environment. With respect to the protection of drinking water supplies, the NYSDOH has promulgated Maximum Contaminant Levels (MCLs) for drinking water contaminants in Part 5 of the State Sanitary Code (10 NYCRR Part 5). For the most part, the respective MCLs for the VOC contaminants associated with the Northrop Grumman and Navy sites are 5 micrograms per liter (ug/L or parts per billion (ppb) for water).

Many Water Districts in the vicinity of the OU 2 regional groundwater contaminant plume have policies of providing their consumers with drinking water that contains no detectable concentrations of VOC contaminants. This is sometimes known as a "zero tolerance policy" with respect to VOCs. Northrop Grumman and the Department of the Navy have agreed to establish a goal for any given wellhead treatment or comparable alternative measures for affected drinking water supplies which will provide water that is non-detect using USEPA Method 502.2 to a detection limit of 0.5 micrograms per liter (ug/l) with respect to VOCs for site related contamination as cited in the 2001 Water Quality Monitoring Requirements for Nassau County Public Water Systems. Additional costs to implement this policy relative to the Alternatives considered in the OU 2 FS, if any, fall within the plus fifty and minus thirty percent of CERCLA cost requirements, and therefore will not significantly change the cost estimates for Alternatives 2 through 8.

The Bethpage Water District has a policy that only non-detect water be provided with their treatment system. As of the date of this ROD, Northrop Grumman through its agreement with the Bethpage Water District has reimbursed the District for Plants 4 and 6 and the Department of the Navy has reimbursed BWD for Plant 5 with such treatment technology. It is anticipated that Northrop Grumman and the Department of the Navy will enter into future agreements to implement this policy, as detailed in bullet 9 of section 8 of this ROD, with all water districts affected by site-related contamination.

**Alternative 1: No Further Action, A, B, C and D above:** This Alternative is the baseline Alternative to which the other alternatives will be compared. Under this Alternative, no additional remedial actions would be incorporated into the existing on-site groundwater IRM which has been installed and is now operating. This Alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment than that already provided. Under this Alternative, no additional remedial actions would be taken and the existing on-site groundwater IRM which has been installed and is now operating would continue to be operated over the next 30 years.

In order to maintain hydraulic containment of the groundwater plume(s), production well GP-1 has been included in the ONCT pump and treatment system design. The GP 1 water would be treated at the IRM treatment system located to the north of Plant 2 and discharged to recharge basins to the west of Plant 2. The ONCT wells are treated by a separate air stripper . The water would be recharged into the southern recharge basins located adjacent to Plant 1.

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| Capital Cost: | $ 3,670,000 |

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| O&M Cost: | $ 1,480,000 |
| Present Worth: | $26,700,000 |

**Alternative 2: A, B, C, D and F above, and HN-24 Area Treatment:**
Alternative 2 would add treatment of the HN-24 area on the Navy Plant 3 property. Treatment at the HN-24 area would consist of the use of reactive iron powder injected into the impacted groundwater through a series of injection wells. After injection the reactive iron powder would become immobilized within the soil pore space and begin to react with the contaminants of concern (COCs).

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| Capital Cost: | $ 4,390,000 |
| O&M Cost: | $ 1,506,000 |
| Present Worth: | $ 28,830,000 |

**Alternative 3: A, B, C, D, E and F above:**
Alternative 3 contains the addition of groundwater extraction and treatment system at the GM-38 area. The purpose of the GM-38 groundwater extraction and treatment system would accelerate off-site contaminant mass removal and to restore the off-site portion of the impacted aquifer in the vicinity of BWD Supply Well fields 4, 5 and 6 to remedial action objectives (RAOs) in a shorter time frame than under Alternative 2. The GM-38 area is located approximately 4,500 feet southeast of the Northrop Grumman south recharge basin area, and is defined by the inferred 1 ppm TVOC contour line drawn around Well GM-38D2.

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| Capital Cost: | $ 8,060,000 |
| O&M Cost: | $ 1,700,500 |
| Present Worth: | $ 33,600,000 |

**Alternative 4: A, B, C, D, E and F above, with HN-24 Area Treatment:**
Alternative 4 is the combination of Alternatives 2 and 3. Alternative 4, is undertaken in an attempt to accelerate on-site contaminant mass removal, and restore groundwater quality in these localized areas to RAOs in a shorter time frame than under Alternative 1.

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| Capital Cost: | $ 9,290,000 |
| O&M Cost: | $ 1,725,500 |
| Present Worth: | $ 35,000,000 |

**Alternative 5: A, B, C, D and F above, and Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers:**
Alternative 5 would add six new off-site groundwater extraction wells to achieve containment of the full extent of the off-site portion of the TVOC plume. Alternative 5 would provide mass removal from the entire aquifer by the installation of a groundwater extraction and treatment system at the farthest downgradient edge of the plume, to contain the full extent (off-site as well as on-site portions) of the plume. The off-site wells would be installed south of the Northrop Grumman facility and north of Hempstead Turnpike (see Figure 7).

Under Alternative 5, the six new off-site extraction wells (OFCT-1, OFCT-2, OFCT-3, OFCT-4, OFCT-5, and OFCT-6) would be installed. Each off-site well would require an individual treatment system to remove VOCs from the pumped groundwater. Construction of one central treatment facility, in lieu of six individual systems, would be impractical due to the dense residential development in the area, the substantial distances between proposed off-site extraction well locations, and the large quantity of water to be discharged. It is estimated that the total quantity of water to be pumped from the proposed off-site extraction wells would be 3,635 gpm (equal to 5.2 million gallons per day, or MGD).

Where necessary, monitoring wells would be installed to supplement the existing monitoring well network. The number, location, and depth of wells to be installed will be evaluated during the remedial design phase of the project.

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| Capital Cost: | $ 21,390,000 |
| O&M Cost: | $ 2,700,000 |
| Present Worth: | $ 62,800,000 |

**Alternative 6: A, B, C, D and F above, Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers, and HN-24 Area Treatment:**
Alternative 6 contains the elements of Alternative 5 as described above, with the addition of treatment at the HN-24 area, as described above in Alternative 3.

Alternative 6 would provide mass removal from the aquifer through groundwater extraction and treatment at the farthest downgradient edge of the plume, to contain the full extent (both off-site as well as on-site portions) of the plume. Furthermore, Alternative 6 would provide localized groundwater treatment of the HN-24 areas.

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| Capital Cost: | $ 22,620,000 |
| O&M Cost: | $ 3,080,000 |
| Present Worth: | $ 64,100,000 |

**Alternative 7: A, B, C, D, E and F above, Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers:**
Alternative 7 contains the elements of Alternative 5 as described above, with the addition of treatment at the GM-38 area, as described in Item E and Alternative 3. Under Alternative 7, Well ONCT-6 would be relocated approximately 500 feet to the northwest and at this location serves the dual purpose of being a local extraction well for the GM-38 area and also being part of the off-site containment well system.

Alternative 7 would provide mass removal from the aquifer through groundwater extraction and treatment. Alterative 7 would also provide groundwater pumping at the farthest down gradient edge of the plume to contain the off-site as well as on-site portions of the plume. In addition, Alternative 7 would provide treatment of the GM-38 area.

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| Capital Cost: | $ 21,860,000 |
| O&M Cost: | $ 3,200,000 |
| Present Worth: | $ 63,300,000 |

**Alternative 8: A, B, C, D, E and F above, Off-Site Plume Containment, Treatment, and Discharge to Off-Site Storm Sewers and HN-24 Area Treatment:**
Alternative 8 is the combination of Alternatives 6 and 7. This Alternative includes all of the remedial process options discussed above.

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| Capital Cost: | $ 23,090,000 |
| O&M Cost: | $ 3,300,000 |
| Present Worth: | $ 64,700,000 |

## 7.2 Evaluation of Alternatives

The criteria used to compare potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided, followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is included in the Feasibility Study. The HN-24 treatment process will be carried through this evaluation of remedial alternatives even though it has now been deemed unnecessary given the substantial drop in the HN-24 area concentrations.

The first two evaluation criteria are termed threshold criteria and must be satisfied in order for an Alternative to be considered for selection.

1. **Compliance with New York State Standards, Criteria, and Guidance (SCGs).** Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance.

The most significant SCGs for this ROD are the New York State Water Quality Regulations: Part 5 Drinking Water Standards Title 10, New York Codes Rules and Regulations (10 NYCRR) and NYSDEC Groundwater Standards (6 NYCRR Part 700). Air Quality Regulations (6 NYCRR Part 200 series) are relevant to the air discharges from each groundwater treatment system.

Alternatives 1, 2, 3 and 4 would be compliant with SCGs for the portion of the groundwater plume addressed by each Alternative. Alternatives 5, 6, 7 and 8 would be compliant with SCGs for the entire groundwater plume.

The applicable SCGs for the drinking water are the State's maximum contaminant levels, or MCLs, as specified in Part 5 of the NYS Sanitary Code. These standards are currently being met for treated water at each of the affected public supply well fields in the area. In addition, Northrop Grumman and the Department of the Navy have agreed to a goal for this project, for any given wellhead treatment or comparable alternative implemented due to site-related contamination, to provide water that is non-detect using USEPA Method 502.2 to a detection limit of 0.5 micrograms per liter (ug/l) with respect to VOCs, as cited in the 2001 Water Quality Monitoring Requirements for Nassau County Public Water Systems.

The GM-38 area offsite remedy was added to the feasibility study in order to evaluate the reduction of future contaminant loading to the BWD well fields and any public wellfields downgradient. The groundwater treatment system(s) would be designed to be compliant with the NYSDEC Part 200 Air Quality Regulations.

The air treatment systems for the IRM wells were not designed to treat vinyl chloride and may need to be modified if the vinyl chloride concentrations in the air discharge exceeds state air discharge guidelines. The raw and treated groundwater at the ONCT system, as well as the effluent air stream, would need to be monitored for vinyl chloride. If necessary, a vinyl chloride treatment component would be incorporated into existing treatment system.

The 5 ppb groundwater standard for principle organic contaminants would not be met with respect to full plume interception for alternatives 1 through 4, although natural attenuation should reduce site related contaminant concentrations to below 5 ppb over time.

2. **Protection of Human Health and the Environment**. This criterion is an overall evaluation of each Alternative's ability to protect public health and the environment.

The contaminant-specific SCGs are currently being met with respect to treated water at the municipal water supplies (specifically the BWD). This is being accomplished via VOC-removal treatment systems that are operating at the wellheads. In addition, Northrop Grumman and the Department of the Navy have agreed to a goal for this project, for any given wellhead treatment or comparable alternative implemented due to site-related contamination, to provide water that contains no detectable concentrations of site-related contaminants.

The plume(s) would be contained along the southern boundary of the Grumman site under each Alternative based upon the computer modeling work that was conducted as part of the Feasibility Study. By containing the portion of the plume(s) that are on-site, the future contaminant load to the downgradient public water supplies would be reduced.

It is anticipated that the extraction and treatment programs for the ONCT system that are incorporated into each of the eight remedial alternatives under consideration here would need to be operated for 30 years or more. At that point there would be residual contamination remaining in the aquifers. The amount of remaining contamination, however, would be incrementally less as additional remedies are implemented under the various alternatives. As contaminant mass loading decreases, the relative importance of reliance upon the wellhead controls also diminishes.

Deep groundwater at the GM-38 well area has been identified as an off-site "hotspot" because concentrations of TVOCs exceed 1,000 ppb (equal to 1 ppm) at that location. The main objective of the GM-38 well area remedy would be to reduce mass contaminant load in the aquifer in the vicinity of three public water supply wellfields. Depending upon placement of the extraction well(s) and system performance, this could also result in reduced loading to the public water supply wells. The remedy would also enhance the long-term natural process of aquifer restoration.

There could be incremental potentials for exposure to VOCs in air posed to downwind populations due to emissions from each additional groundwater treatment plant installed under the eight alternatives. Air pollution and monitoring controls would be implemented as necessary to ensure that the air emissions from these treatment facilities are within the criteria set by the regulatory agencies. Additional engineering controls could be used to further reduce the potential of exposure.

There is a potential for exposure to VOCs in air if the vinyl chloride plume(s) is captured in the ONCT extraction wells. The treatment systems for these wells were not designed to treat vinyl chloride and could result in air effluent concentrations of vinyl chloride that exceed state air discharge guidelines. This potential exposure pathway would be minimized by implementing the vinyl chloride contingency plan.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

> 3. **Short-term Effectiveness.** The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

There could be short-term impacts to the community if Alternatives 2 through 4 were implemented. The impacts could be dust emissions, VOC emissions and noise during construction activities. Engineering controls would be employed to minimize these impacts.

No short-term impacts to the community or the environment would be expected to occur as the result of implementing Alternative 1. The HN24 area remedy short term impacts would be negligible as the Navy property is now vacant.

The GM38 area remedy would have slightly higher short term impacts. This groundwater extraction and treatment system would be located closer to residential areas. Potential impacts would be addressed under the site specific community health and safety plan through emission control technologies.

For Alternatives 5 through 8, the short term impacts would be much greater than alternatives 1 through 4. The offsite containment (OFCT) system would, in most if not all the locations, be placed on or near residential properties, streets and neighborhoods. In addition, it is envisioned that each OFCT location would require its own treatment system.

> 4. **Long-term Effectiveness and Permanence.** This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

The sources of the groundwater contamination are being addressed as operable units for the Northrop Grumman-Bethpage Facility, NWIRP-Bethpage, and the RUCO Inactive Hazardous Waste Disposal Sites. The long-term effectiveness of each of the source area remedial actions was addressed in the RODs previously issued for these sites.

The time required to remediate the aquifer system is a function of the quantity and location of groundwater that is pumped and treated. It is projected that it would take more than 30 years to remediate the aquifer system onsite for each of the eight Alternatives. However, the ONCT system will be operated, monitored, and enhanced as necessary to prevent any further migration of onsite contamination into the Bethpage regional aquifer.

The OFCT Containment extraction and treatment system that is incorporated into Alternatives 5 through 8 would likely be operated for 30 years or longer. Based on the groundwater modeling, after 30 years of operation, residual contamination would likely exist onsite at concentrations slightly greater than the current drinking water standards.

The GM 38 area remedy is a hot spot remedy that was evaluated in the FS for 15 years. The long term effectiveness for this remedy would be to potentially reduce the contamination loading to the BWD public supply wells on a permanent basis. Performance results from the ONCT IRM already demonstrate that TVOC concentrations in groundwater immediately down gradient from the ONCT system are diminishing. The GM 38 area remedy would enhance this permanent restoration of the natural resource.

5. **Reduction of Toxicity, Mobility or Volume**. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Reduction of toxicity, mobility, and volume for the onsite groundwater contamination would be realized by the ONCT groundwater extraction and treatment system for all eight alternatives. These reductions would be achieved as a result of the extraction (reduction of mobility and volume) and treatment (reduction of toxicity) components which are incorporated into the ONCT system.

The greatest reductions in toxicity, mobility and volume would be realized under Alternatives 5 through 8 with the OFCT system. Alternative 8 has the highest reduction in mobility with the HN 24 area treatment, GM 38 area remedy and the ONCT and OFCT systems. Alternative 1 has the least reduction in toxicity, mobility and volume because it targets the on-site contamination only via the ONCT system.

6. **Implementability**. The technical and administrative feasibility of implementing each Alternative are evaluated. Technical feasibility includes the difficulties associated with the construction and the ability to monitor the effectiveness of the remedy. For administrative feasibility, the availability of the necessary personnel and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc.

The HN 24 remedy of alternatives 2, 4, 6 and 8 would be fairly easy to implement technically and administratively. There are several vendors who could supply the treatment technologies which are incorporated into these alternatives. Alternatives 2, 3 and 4 are readily implementable with respect to the GM38 area remedy that would be located near an existing Nassau County recharge basin in an open space area. However, easements would have to be obtained from the municipal and private parties that own the property. Alternative 1 is already in place and therefore is the most easily implementable.

Alternatives 5, 6, 7 and 8 would be substantially more difficult to implement administratively with respect to the OFCT system. Private property would have to be purchased or accessed and potentially, zoning changes would be required in order to construct the off-site extraction wells and treatment plants. The permit-related tasks would be difficult to implement. In addition construction of one central treatment facility, in lieu of six individual systems, would be impractical due to the dense residential development in the area, the substantial distances between proposed off-site extraction well locations, and the large quantity of water to be discharged.

7. **Cost.** Capital and operation and maintenance costs are estimated for each Alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each Alternative are presented in Table 2.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is evaluated after public comments on the PRAP have been received.

8. **Community Acceptance**. Concerns of the community regarding the RI/FS reports and the PRAP have been evaluated. A "Responsiveness Summary"has been prepared that describes public comments received and the manner in which the Department will address the concerns raised.

Members of the community at large, particularly in the BWD, have expressed their concerns about site contamination during the Remedial Advisory Board (RAB) meetings sponsored by the Department of the Navy, at the December 13, 2000 PRAP public meeting and in writing during the public comment period. A number of response actions included in this ROD will address community, local official, water district, and public health concerns. These include: the ONCT system, the GM38 area remedy, the outpost groundwater monitoring program, the public water supply contingency for wellhead treatment or comparable alternative measures, the Northrop Grumman and the Department of the Navy agreement to achieve no detectable concentrations of site contaminants in affected water supply wells, additional groundwater investigation to determine if an Operable Unit 3 is necessary, and the long term OM&M systems. It is noteworthy that the PRAP proposal for granular activated carbon (GAC) polishing at affected public water supply wells has been replaced by a contingency for wellhead treatment or comparable alternative measures, with recognition of Northrop Grumman's and the Department of the Navy's stated agreement to use "non-detect" levels as the design goal for the provision of such treatment or measures. Additionally, the selected remedy has been modified to incorporate groundwater remediation measures into a Groundwater Remedial Program whereas response measures related to public water supplies have been incorporated into a Public Water Supply Protection Program.

## SECTION 8: SUMMARY OF THE SELECTED REMEDY

Based upon the results of the RI/FS, supplemental investigative data, the evaluation presented in section 7 and the reasons presented below, the NYSDEC is proposing selecting Alternative 3, as described in detail in this ROD. The selected remedy, Alternative 3, consists of the following Groundwater Remedial Program components: the ongoing ONCT system (formerly known as the IRM), the off-site GM-38 area groundwater extraction and treatment system, a vinyl chloride treatment contingency plan for the ONCT system, long-term groundwater monitoring including monitored natural attenuation, and long-term operation and maintenance of all operating treatment systems onsite and off-site. Additionally, the selected Alternative includes the following Public Water Supply Protection Program components: the operation and maintenance of air strippers for BWD well fields 4, 5 and 6, and preparation of a contingency plan for wellhead treatment or comparable alternative measures for public supply wells not currently affected but that may become affected by site-related VOCs in the future.

The selection of Alternative 3 is based on the evaluation of each of the eight Alternatives developed for this site. It was determined that Alternative 3 will meet standards, criteria and guidance for the containment portion of the groundwater plume remedy, prevent exposure to site related contaminants in the groundwater, actively restore a natural resource (sole source aquifer), and prevent further deterioration of down gradient groundwater conditions. Alternative 3 was also chosen based on the fact that it is not economically or technically feasible to contain and treat all the contaminated groundwater that has migrated from the Northrop Grumman and NWIRP sites to groundwater quality standards.

There is a possibility of site-related contamination impacting additional public water supply wells. These wells will be protected by a long term monitoring program that includes sampling of wells upgradient of the public water supply wells and by a contingency to provide wellhead treatment or comparable alternative measures, if necessary.

The preference to permanently and significantly reduce the toxicity, mobility or volume of VOCs in groundwater is satisfied by the selected remedy since it will reduce the mass of VOCs in the groundwater by recovering, treating and discharging groundwater contaminated by the Northrop Grumman and NWIRP sites plume(s). The remedial goal for attainment of the 5 ppb groundwater standard will be met in the treated aquifer segment, to the extent practicable.

Part of the remedy may address contamination that has not been conclusively attributable to Northrop Grumman and/or the NWIRP. In the same manner, not all of the contamination attributable to Northrop Grumman and the NWIRP will be actively addressed by the selected groundwater remedy. Therefore, the public water supply contingency plan will be necessary to address the potential of future exposure to site-related VOCs.

As more data become available, other PRPs may be identified (for example, the RUCO Site). The USEPA has concluded the RI/FS process for the RUCO OU 3 project and has selected a groundwater remedy for the RUCO Site that will address the additional VOC loading, including vinyl chloride, to the Bethpage regional aquifer.

The estimated present worth cost to implement the remedy proposed in this ROD is $33,600,000. The cost to construct the remedy is estimated to be $8,060,000 and the estimated average annual operation and maintenance cost for 30 years is $1,660,700.

**The elements of the selected remedy are as follows:**

**Groundwater Remedial Program**

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS will be resolved.

   Since the remedy results in untreated hazardous waste remaining at the site, a long term monitoring program, including comprehensive monitoring of plume attenuation will be instituted. This monitoring will evaluate the effectiveness of the ONCT groundwater extraction and treatment system, monitor the levels of select inorganics (e.g., chromium and cadmium) and volatile organic compound (VOC) contaminants in the groundwater upgradient and downgradient of the ONCT system, monitor the effectiveness of the offsite component of this remedy and the wellhead treatment systems, and better define and track the offsite groundwater contaminant plume. This combined monitoring effort will allow the effectiveness of this remedy to be monitored and will be a component of the operation, maintenance and monitoring (OM&M) program for the site.

2. Continued operation of the Onsite Containment (ONCT) IRM groundwater extraction system to address the onsite TVOC groundwater contamination emanating from the former and current onsite source areas. This system must be sufficient to intercept the width and depth of the entire TVOC plume migrating from the Northrop Grumman Site.

3. A study to confirm the hydrogeologic effectiveness of the onsite containment (ONCT) system. This will, if necessary, include, but not necessarily be limited to, the installation of any required monitoring wells, piezometric measurements, a groundwater modeling effort and a hydrogeologic report, independent of any quarterly monitoring report on the ONCT system predesign study findings.

4. a. A predesign investigation to determine the optimum location(s) for the GM38 area groundwater extraction well(s). This predesign investigation will derive the data necessary to determine the screen zone of the extraction well(s). In addition, the number of extraction wells will be substantiated and the potential need to cluster these wells will be determined.

   b. The installation of at least one groundwater extraction well, or comparable remedial technology, at the approximate location of the GM38 area, depicted on Figure 7 and as detailed in the Northrop Grumman OU2 FS, with all necessary piping to install the wells and properly run the discharge to the groundwater treatment systems.

   c. Utilization an existing storm water collection and groundwater recharge system for discharge of treated groundwater. If one is not available, then a suitable method of system discharge and groundwater recharge will be developed.

   d. The installation of the necessary air stripping systems or comparable remedial technology designed to remove VOCs from all the extracted groundwater to meet the State Pollutant Discharge Elimination System (SPDES) discharge limitations.

5. The installation of air emission controls, if required, to comply with the NYSDEC air regulations.

6. The long-term operation, maintenance and monitoring (OM&M) of the ONCT and GM-38 area extraction well(s). Monitoring will include the installation and use of upgradient and downgradient groundwater shallow, intermediate, deep and very deep monitoring wells. Testing will be done, at a minimum, on a quarterly basis unless otherwise approved by the NYSDEC, to verify the system performance. Additionally, monitoring of groundwater elevations will be done, initially on a quarterly basis (unless otherwise approved by the NYSDEC) to determine the groundwater capture zone in different seasons, and annually thereafter.

7. A specific investigative task will include current work and potentially include, but is not necessarily limited to, installation of additional groundwater monitoring wells, vertical profile borings (VPBs), and groundwater sampling to determine if there are any other areas of elevated groundwater contamination that warrant additional remediation under OU2 and/or creation of an Operable Unit 3. This task, which includes the recent and ongoing installation of VPBs, will be documented in a report to the NYSDEC. The NYSDEC will then, based on the report, make a final determination.

8. The formation of a technical advisory committee (TAC) as deemed necessary by the NYSDEC, to be comprised at a minimum, of the involved Agencies, participating local water districts, Northrop Grumman and the Department of the Navy. The main purpose is to review and provide input on all materials relating to the implementation of the Northrop Grumman and NWIRP OU2 Groundwater Remedial Program and Public Water Supply Protection Program.

## Public Water Supply Protection Program

9. The installation and/or quarterly monitoring for VOCs of outpost monitoring wells installed with respect to potentially affected public and private water supply wells, including BWD well fields 4, 5 and 6. The remedial design will evaluate and determine the best locations for any additional outpost wells required for this program. Outpost monitoring wells will be sampled quarterly.

10. A public water supply contingency plan for the design, construction, operation and maintenance of wellhead treatment systems and/or the evaluation of comparable alternative measures, if necessary. If evaluation of the long term groundwater monitoring or the outpost well data indicates that a public supply well has been or is in imminent danger of being impacted by Northrop Grumman/NWIRP site-related contaminants, then wellhead treatment or comparable alternative measure(s) for the impacted public water supply well(s) will be necessary. This determination will be made by NYSDEC, NYSDOH, and the Nassau County Department of Health in conjunction with the potentially impacted water district. The treatment system or comparable alternative measure(s) to produce potable water will be designed and constructed with input from the affected water district. Alternatively, if Northrop Grumman/NWIRP reaches a cash settlement with an affected Water District, then each settling District will be responsible for its respective monitoring and implementation of, as necessary, wellhead treatment, or comparable alternative measures. Operation and maintenance of all public supply well treatment systems, or comparable alternative measures, will be assumed, at a minimum, to operate for the required 30 year time frame as required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). At a minimum, the NYSDOH Part 5 drinking water standards will always be met.

    Northrop Grumman and the Department of the Navy have agreed to establish a goal for any given wellhead treatment or comparable technology for affected drinking water supplies which will provide water that is non-detect using USEPA Method 502.2 to a detection limit of 0.5 micrograms per liter (ug/l) with respect to VOCs for site related contamination as cited in the 2001 Water Quality Monitoring Requirements for Nassau County Public Water Systems.

11. a. Any repeated detection of 1 ppb or more of Northrop Grumman/NWIRP Site-related contamination in the outpost or long term groundwater monitoring wells upgradient of a public supply well will

"trigger" Northrop Grumman or the Department of the Navy to notify the NYSDEC and the potentially impacted water district and to evaluate the rate of movement of the Northrop Grumman/NWIRP contaminants towards the public supply wells.

b. If VOC concentrations in the outpost well(s) approach or exceed a predetermined, outpost well-specific action level, a minimum of one and a maximum of three confirmatory samples will be collected within 30 days and the results evaluated by the NYSDEC and the State and County Health Departments with input from the affected water district(s). If the NYSDEC's and the Health Departments' evaluation indicates that treatment is necessary, the design and construction phase of the water treatment system(s) or comparable alternative measure will begin.

12. The BWD public supply wells and any other supply wells determined to be impacted or potentially impacted based on the long term OM&M, would be sampled on a monthly basis for total volatile organic compounds.

13. The provision of public water to residential or commercial structures that have private drinking water wells determined to be affected or potentially affected by the offsite migration of the Northrop Grumman and NWIRP groundwater plume(s).

### Elements Common to Both Programs

14. A long term operation, maintenance and monitoring plan will be prepared that details all of the specific operation and maintenance of the ONCT and the GM 38 area systems and all the monitoring requirements and contingency aspects of this project.

15. A performance evaluation conducted at least once a year to determine whether the remedial goals and performance objectives of all systems have been or can be achieved, and whether the monitoring should continue.

16. A plan to properly close all monitoring wells associated with the Northrop Grumman and NWIRP sites at such time that the wells are no longer necessary.

## SECTION 9: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken in an effort to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- A repository for documents pertaining to the site was established.
- A site mailing list was established which included nearby property owners, local political officials, local media and other interested parties.

- In October 2000, the NYSDEC sent out a  mailing the public. NYSDEC also announcing the finalized OU2 feasibility study was available to the public.

- In November 2000, issued a press release and a mailing was sent out to the public, announcing the to address ed the release of the OU2 PRAP.

- In March 2001, a Responsiveness Summary was prepared and made available to the public, to address the comments received during the public comment period for the PRAP.

# Table 1
# Nature and Extent of Contamination

| MEDIUM | CATEGORY | CONTAMINANT OF CONCERN | CONCENTRATION RANGE (ppb) | FREQUENCY of EXCEEDING SCGs | SCGs (ppb) |
|---|---|---|---|---|---|
| Groundwater (On-Site Monitoring and production Wells) | Volatile Organic Compounds (VOCs) | Perchloroethene | ND-3,600 | 39/121 | 5 |
| | | Trichloroethene | ND-58,000 | 55/121 | 5 |
| | | 1,1-Dichloroethene | 0.38-620 | 11/121 | 5 |
| | | 1,2-Dichloroethene | ND-3,850 | 21/121 | 5 |
| | | Vinyl Chloride | ND-6,400 | 11/121 | 2 |
| | | 1,1-Dichloroethane | ND-880 | 8/121 | 5 |
| | | 1,1,1-Trichloroethane | ND-10,000 | 21/121 | 5 |
| Groundwater (On-Site Monitoring and production Wells) | Inorganic Analytes (Metals) | arsenic | ND(1)-68 | 7/82 | 25 |
| | | barium | ND(2)-164 | 0/82 | 1,000 |
| | | cadmium | ND(1)-130 | 3/82 | 10 |
| | | chromium | ND(1)-160 | 4/82 | 50 |
| | | lead | ND(1)-7.2 | 0/82 | 25 |
| | | mercury | ND(0.2)-1.2 | 0/82 | 2 |
| | | selenium | ND(1)-4 | 0/82 | 10 |
| | | silver | ND(1)-6 | 0/82 | 50 |
| Groundwater Outpost Monitoring Wells for the BWD September 1997 | | Perchloroethene | ND(0.5)-10 | 1/9 | 5 |
| | | Trichloroethene | ND(1)-1,300 | 5/9 | 5 |
| | | 1,1-Dichloroethene | ND(0.5)-5.1 | 1/9 | 5 |
| | | 1,2-Dichlorethene | ND(0.5)-1 | 0/9 | 5 |
| | | Vinyl Chloride | ND(0.5)-1 | 0/9 | 2 |
| | | 1,1-Dichloroethane | ND(0.5)-12 | 1/9 | 5 |
| | | 1,1,1-Trichloroethane | ND(.5)-7 | 1/9 | 5 |

| MEDIUM | CATEGORY | CONTAMINANT OF CONCERN | CONCENTRATION RANGE (ppb) | FREQUENCY of EXCEEDING SCGs/Background | SCG/ Bkgd. (ppb) |
|---|---|---|---|---|---|
| Groundwater Long Term Monitoring Data 1997-Present | | Trichloroethene | ND-15,000 | 25/106 | 5 |
| | | Tetrachloroethene | ND-44 | 11/106 | 5 |
| | | 1,1-Dichloroethene | ND–39 | 3/106 | 5 |
| | | 1,2-Dichlorethene | ND-6 | 3/106 | 5 |
| | | Vinyl Chloride | ND-2,000 | 3/106 | 2 |
| | | 1,1-Dichloroethane | ND-10 | 3/106 | 5 |

## Table 2
## Remedial Alternative Costs

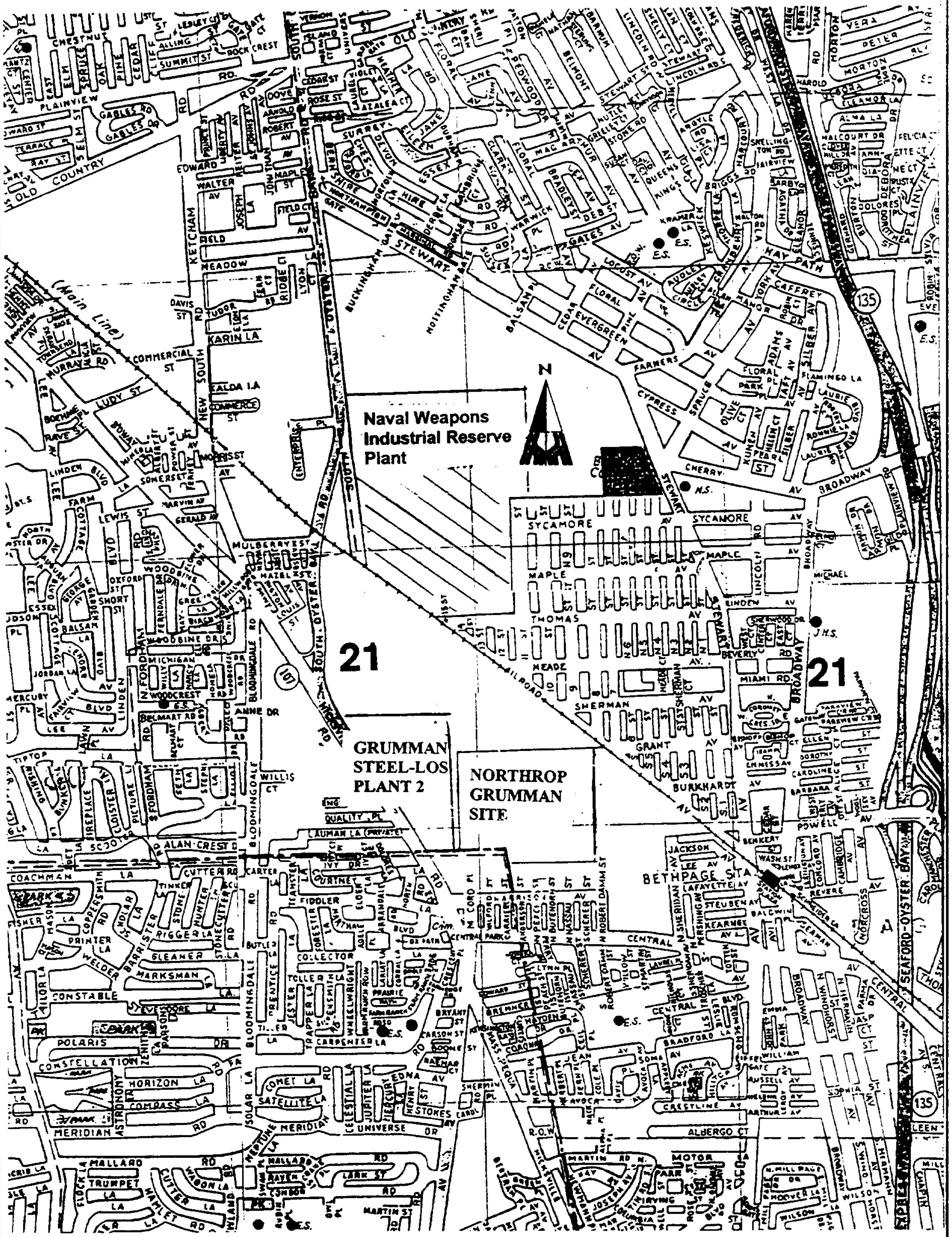
| Remedial Alternative | Capital Cost | Annual O&M | Total Present Worth |
|---|---|---|---|
| 1. Alternative 1: | $3,670,000 | $1,480,000 | $26,700,000 |
| 2. Alternative 2: | $4,390,000 | $1,480,000 | $28,200,000 |
| 3. Alternative 3: | $8,060,000 | $1,700,500 | $33,600,000 |
| 4. Alternative 4: | $9,290,000 | $1,725,400 | $35,000,000 |
| 5. Alternative 5: | $21,390,000 | $2,980,000 | $62,800,000 |
| 6. Alternative 6: | $22,620,000 | $3,080,000 | $64,100,000 |
| 7. Alternative 7: | $21,860,000 | $3,200,000 | $63,300,000 |
| 8. Alternative 8: | $23,090,000 | $3,300,000 | $64,700,000 |

# GLOSSARY OF TERMS

| | |
|---|---|
| **ARAR:** | Applicable or relevant and appropriate requirement. |
| **BWD:** | Bethpage Water District. |
| **Capital Cost:** | Refers to the up front cost of constructing a remedial Alternative. |
| **CERCLA:** | Comprehensive Environmental Response, and Comprehensive Liability Act (USEPA). |
| **Chromium:** | An inorganic element used in various manufacturing processes. |
| **DCE:** | Dichloroethene. |
| **ECL:** | Environmental Conservation Law. |
| **FS:** | Feasibility study. |
| **GM:** | Refers to monitoring wells installed for Northrop Grumman by Geraghty and Miller. |
| **Groundwater Contours:** | Equipotential lines of groundwater elevation above mean sea level. |
| **Glacial:** | Refers the Glacial or shallow aquifer associated with Long Island. |
| **GOCO:** | Government owned, contractor operated facility. |
| **HN:** | Refers to monitoring wells installed for the Navy by Halliburtan NUS. |
| **IRM:** | Initial Remedial Measure. |
| **Magothy:** | Refers to the section of the Long Island aquifer below the Glacial and above the Lloyd. |
| MPS: | The Main Plant Site, or the former Fairchild Republic Aircraft manufacturing facility. |
| **MCLs:** | Maximum contaminant levels. |
| **MGD:** | Million gallons per day, refers to daily rate of pumping groundwater. |
| **MNA:** | Monitored natural attenuation. |
| **NASA:** | National Aeronautics and Space Administration |

| | |
|---|---|
| **ND:** | Non-detect or below the detection limit of the analytical equipment. |
| **NWIRP:** | Naval weapons Industrial Reserve Plant. |
| **NYCRR:** | New York State Codes, Rules and Regulations. |
| **NYSDEC:** | New York State Department of Environmental Conservation. |
| **NYSDOH:** | New York State Department of Health. |
| **OFCT:** | Offsite containment system. |
| **ONCT:** | Onsite containment system. |
| **O,M&M:** | Refers to operation, maintenance and monitoring, of remedial alternatives. |
| **OU:** | Operable unit. Refers to portions of the remedial program divided into sections. |
| **PCB:** | Poly-chlorinated Bi-phenyl. |
| **PCE:** | (Perchloroethylene or tetrachloroethylene) A chlorinated, aliphatic organic solvent |
| **Plume:** | Contaminant dispersion in the groundwater. |
| **POTW:** | Publicly owned treatment works or sewage treatment plant |
| **PPB:** | Part per billion. For water samples also termed micrograms per liter (ug/l) and for soil samples termed micrograms per kilogram (ug/kg). |
| **PPM:** | Part per million. For water samples also termed milligrams per liter (mg/l) and for soil samples termed milligrams per kilogram (mg/kg). |
| **PPMV:** | Part per million volume, used for air samples. |
| **PRAP:** | Proposed Remedial Action Plan. This is a document listing the remedy(s) proposed to mitigate the threat of hazardous waste disposal to human health and the environment. |
| **PRP:** | Potential Responsible Party. |
| **RAOs:** | Remedial Action Objectives, or the goals established to remedy a site based on findings of the RI (CERCLA). |
| **RCRA:** | Resource Conservation and Recovery Act. |

| | |
|---|---|
| **RI/FS:** | Remedial Investigation an Feasibility Study. |
| **ROD:** | Record of Decision. |
| **RUCO:** | Rubber Corporation of America. |
| **SCGs:** | Standards, Criteria and guidance. |
| **SVOCs:** | Semi-volatile organic compounds. Semivolatile Compounds- compounds amenable to analysis by extraction of the sample with an organic solvent. Used synonymously with Base/Neutral/Acid (BNA) compounds. Also, organic compounds with boiling points above 150 degrees Celsius. |
| **TAGM:** | Technical Assistance and Guidance Memorandum. These guidance documents are used by the NYSDEC. |
| **TCA:** | (Trichloroethane) A chlorinated aliphatic organic solvent. |
| **TCLP:** | Toxicity Characteristic Leaching Procedure, is one test used to determine if hazardous waste is present. |
| **TCE:** | (Trichloroethylene) A chlorinated, aliphatic organic solvent. |
| **TVOC:** | Total volatile organic compounds. |
| **ug/l:** | Micrograms per liter. See also PPB. |
| **UIC:** | Underground Injection Control Program. |
| **UST:** | Underground Storage Tank. |
| **VCM:** | Vinyl chloride monomer. |
| **VOC:** | Volatile organic compound. Amenable to identification by gas chromatography analysis. Also, an organic compound that is readily vaporizable at a relatively low temperature. |



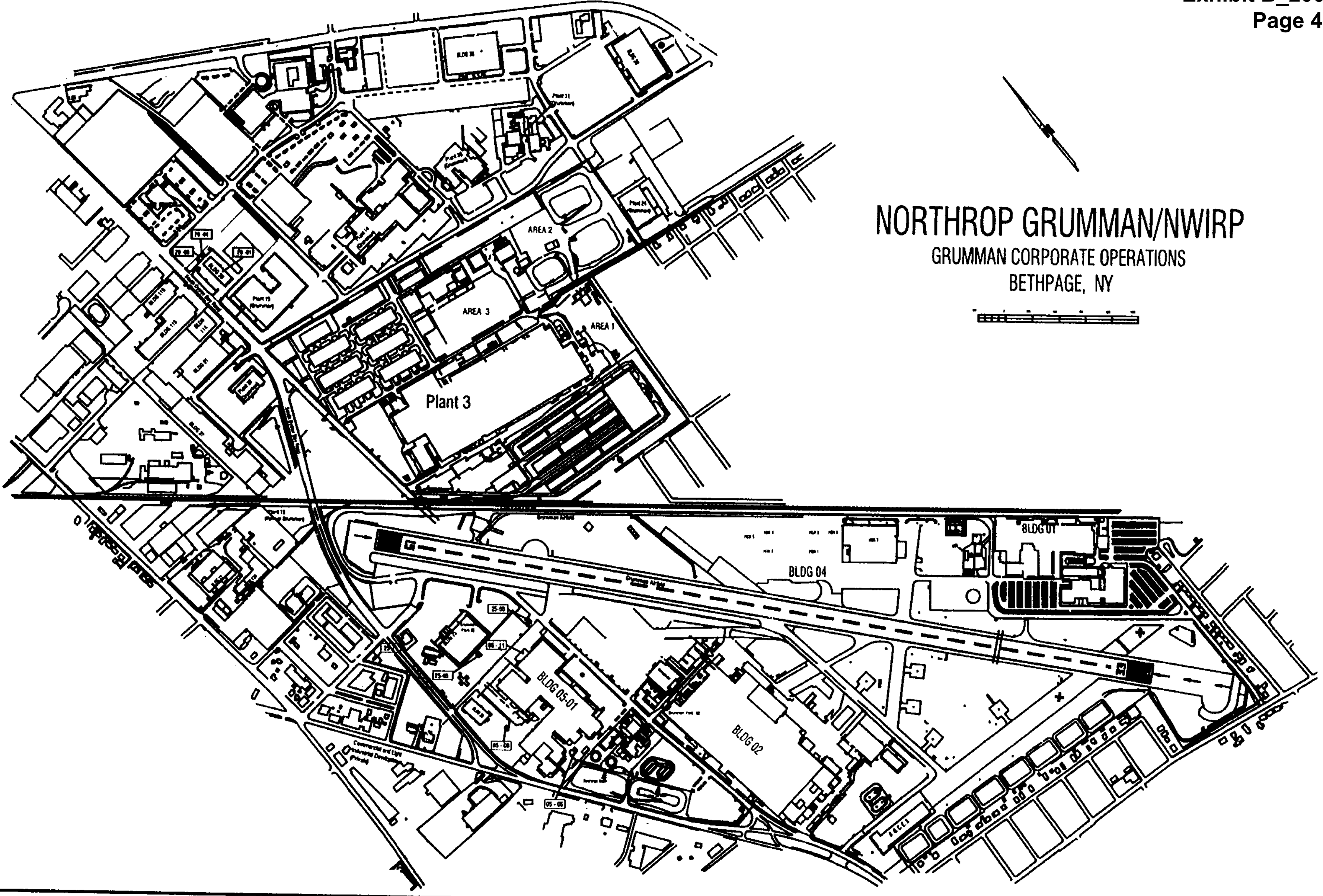
Northrop Grumman

Figure 1– Area Location Map

DIVISION OF ENVIRONMENTAL REMEDIATION

REVISED:
DATE: 03/21/00
DRAWING:

Town of Oyster Bay, Site No.s 1–30–003A, B and C

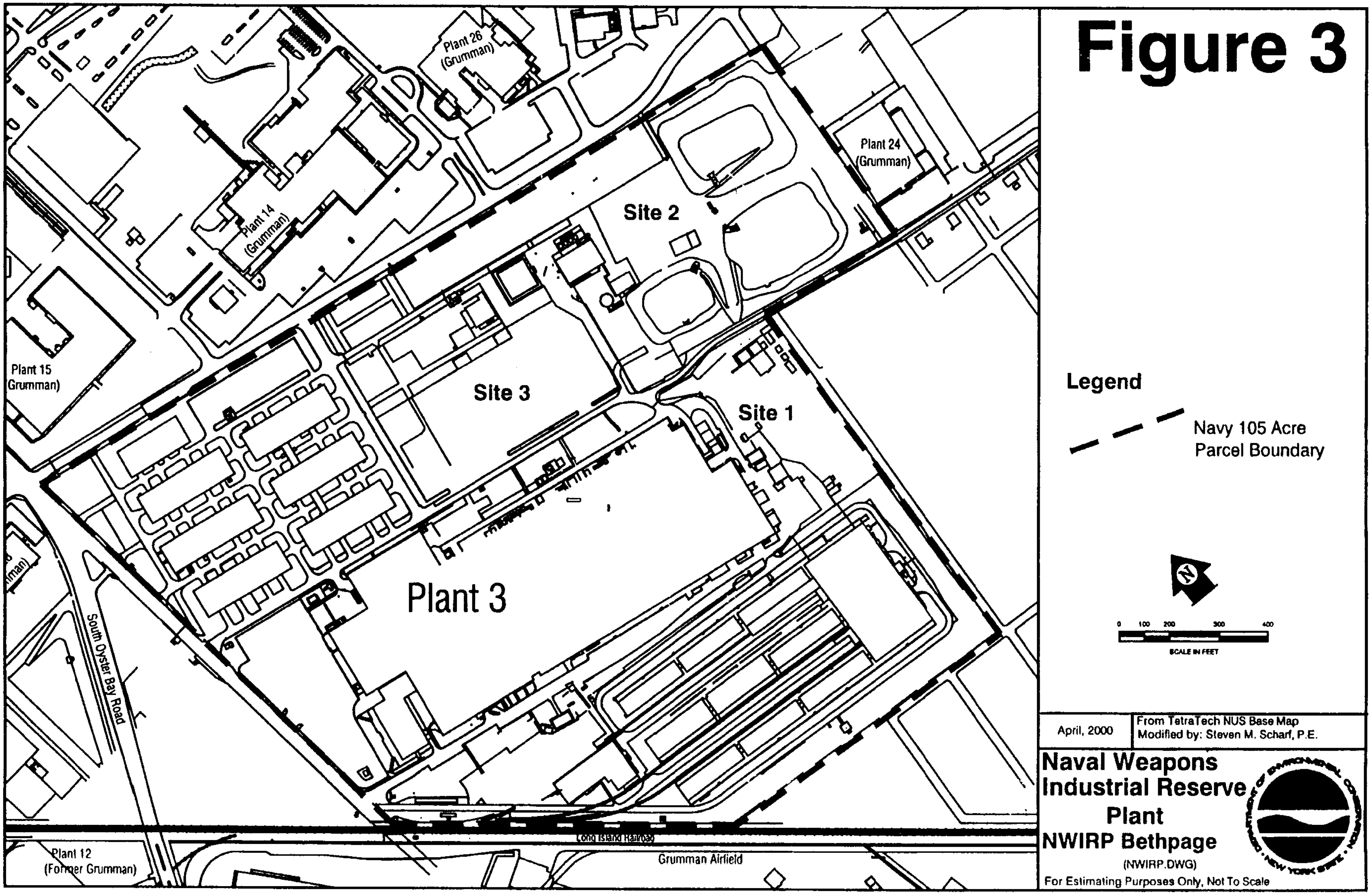


NORTHROP GRUMMAN/NWIRP SITE
BETHPAGE, NASSAU COUNTY, NEW YORK

GENERAL SITE LOCATION

FIGURE 2

# Figure 3



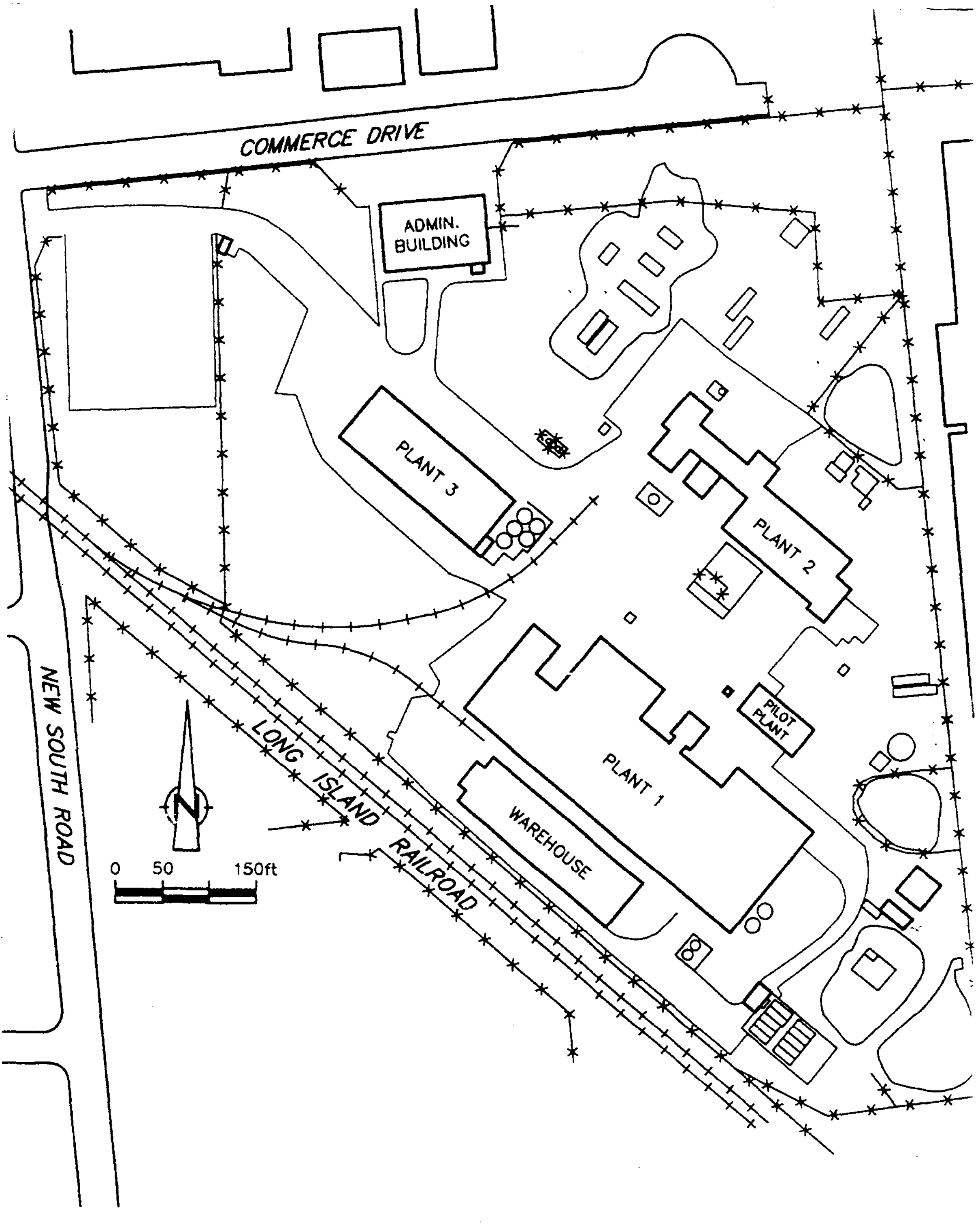
April, 2000

From TetraTech NUS Base Map
Modified by: Steven M. Scharf, P.E.

**Naval Weapons Industrial Reserve Plant NWIRP Bethpage**

(NWIRP.DWG)

For Estimating Purposes Only, Not To Scale

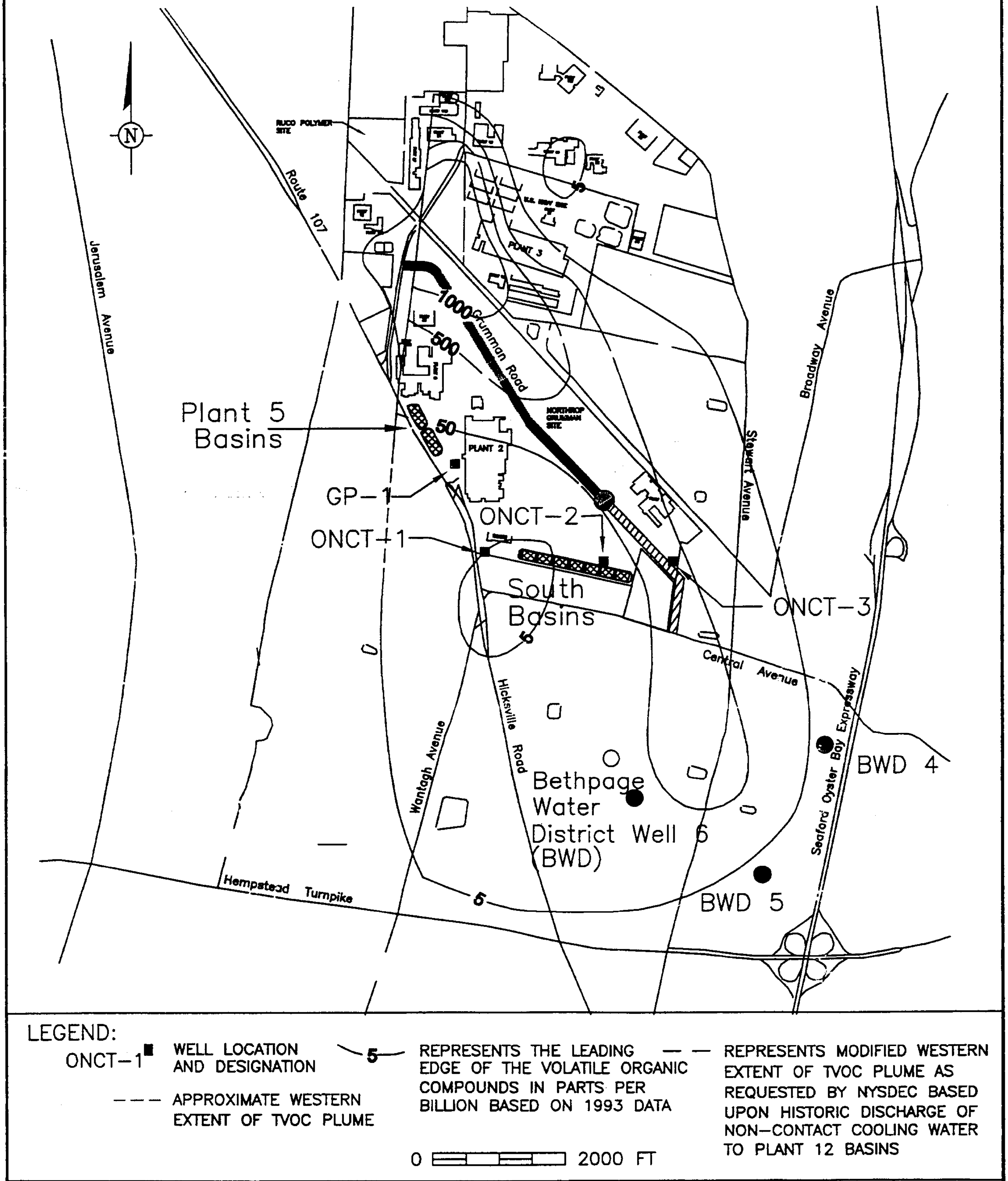


OXY Hooker Ruco Site
Figure 4

**DIVISION OF ENVIRONMENTAL REMEDIATION**

REVISED:
DATE: 04/25/00
DRAWING:

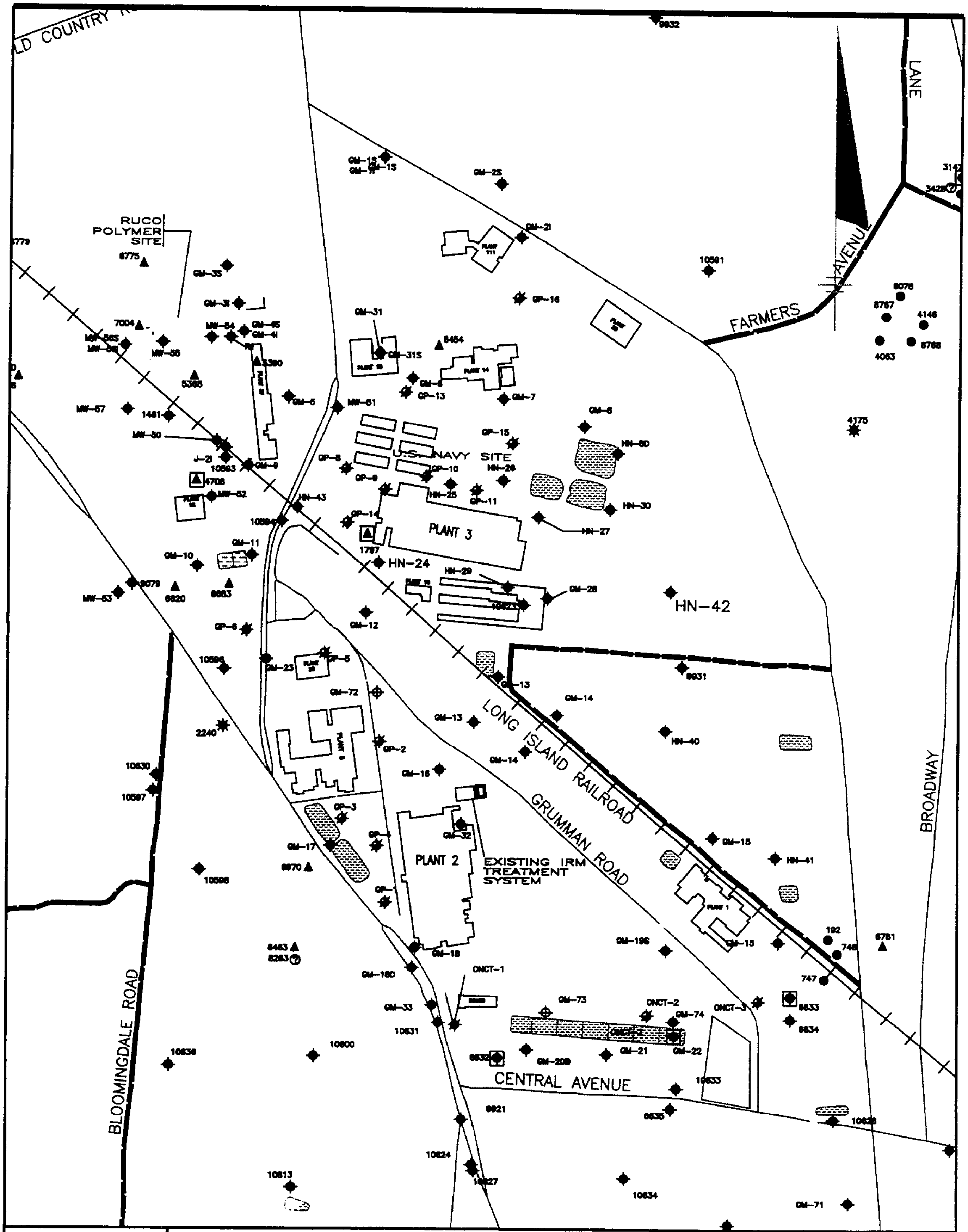
Town of Oyster Bay, Site No.s 1-30-004



Modified by:
Steven M. Scharf, P.E.
From Original Map prepared
Arcadis Geraghty and Miller

INITIAL CONTOURED CONCENTRATIONS
OF TOTAL VOLATILE ORGANIC COMPOUNDS
IN MODEL LAYER 4

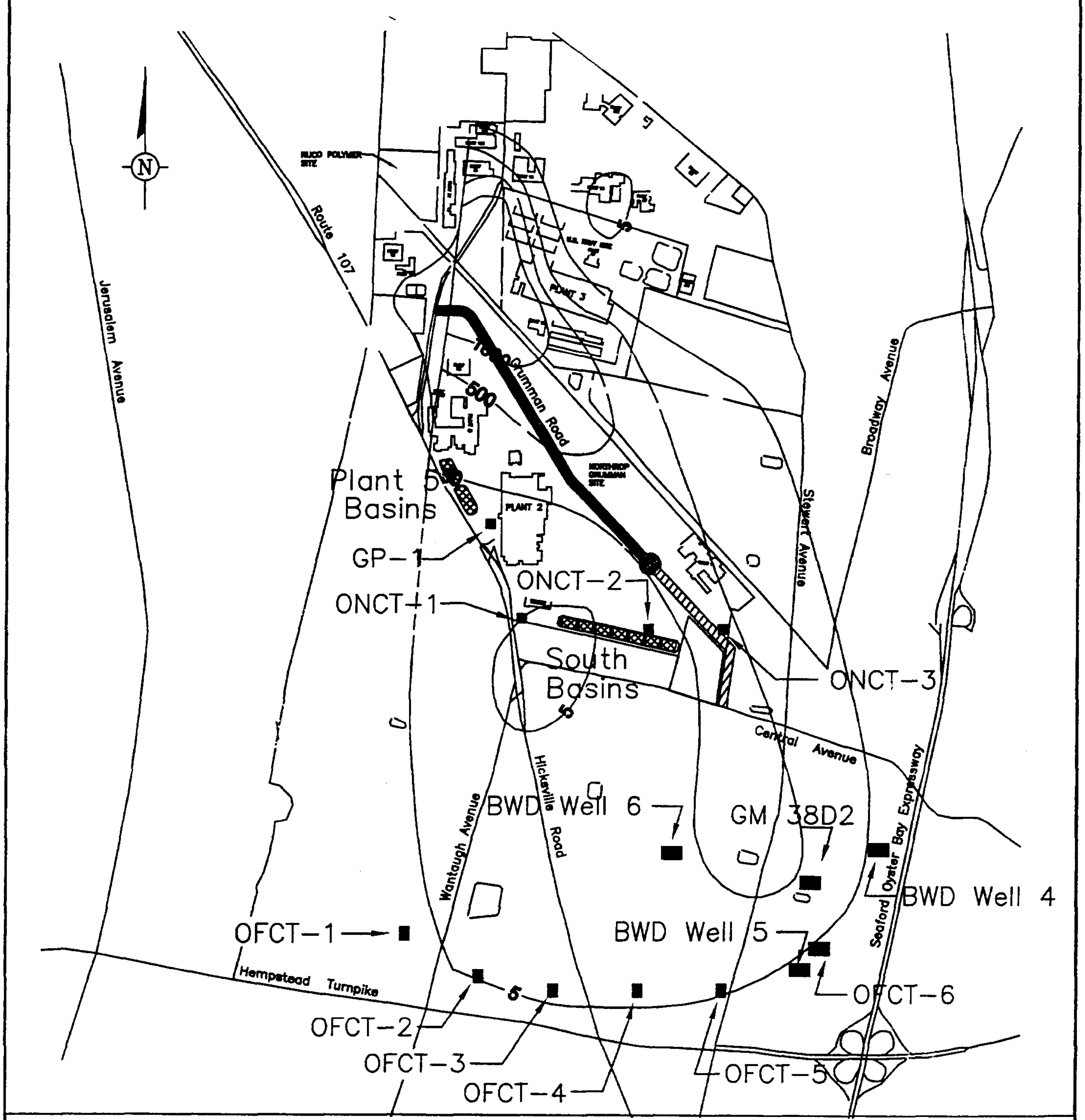
Figure 5



Northrop Grumman/ Naval Weapons Industrial Reserve Plant
Bethpage, New York

SITE MONITORING WELL LOCATIONS

FIGURE 6



LEGEND:

| | | |
|---|---|---|
| OFCT-1 ■ | WELL LOCATION AND DESIGNATION | |
| ~5~ | LINE OF EQUAL TOTAL VOLATILE ORGANIC COMPOUND CONCENTRATION IN PARTS PER BILLION | |
| – – – | APPROXIMATE WESTERN EXTENT OF TVOC PLUME | |
| — — | REPRESENTS MODIFIED WESTERN EXTENT OF TVOC PLUME AS REQUESTED BY NYSDEC BASED UPON HISTORIC DISCHARGE OF NON-CONTACT COOLING WATER TO PLANT 12 BASINS | |

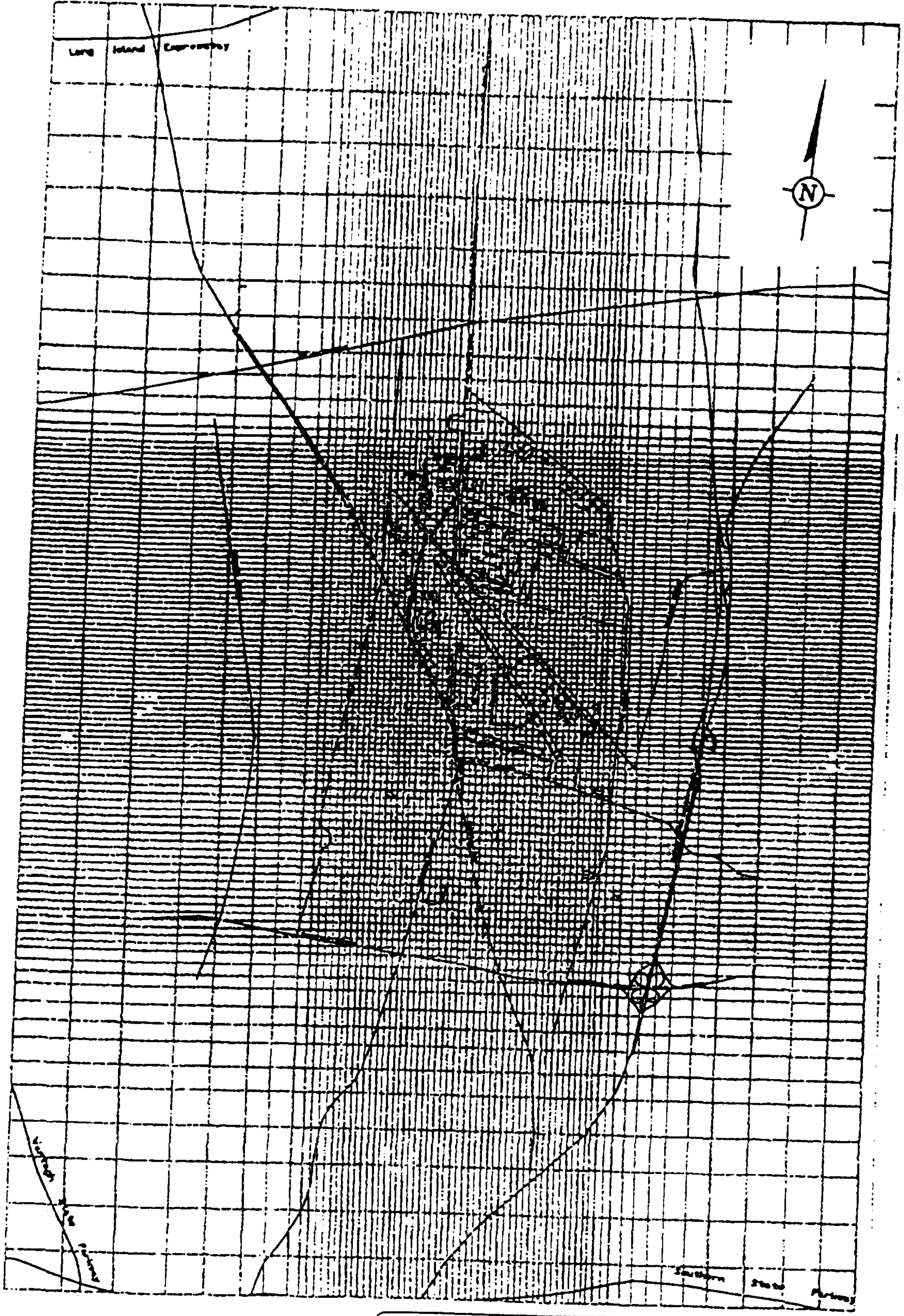
figure7.dwg

0 ▭▭▭▭ 2000 FT

Modified by:
Steven M. Scharf, P.E.
From Original Map prepared
Arcadis Geraghty and Miller

NORTHROP GRUMMAN FEASIBILITY STUDY
VARIOUS EXTRACTION WELL LOCATIONS

Figure 7



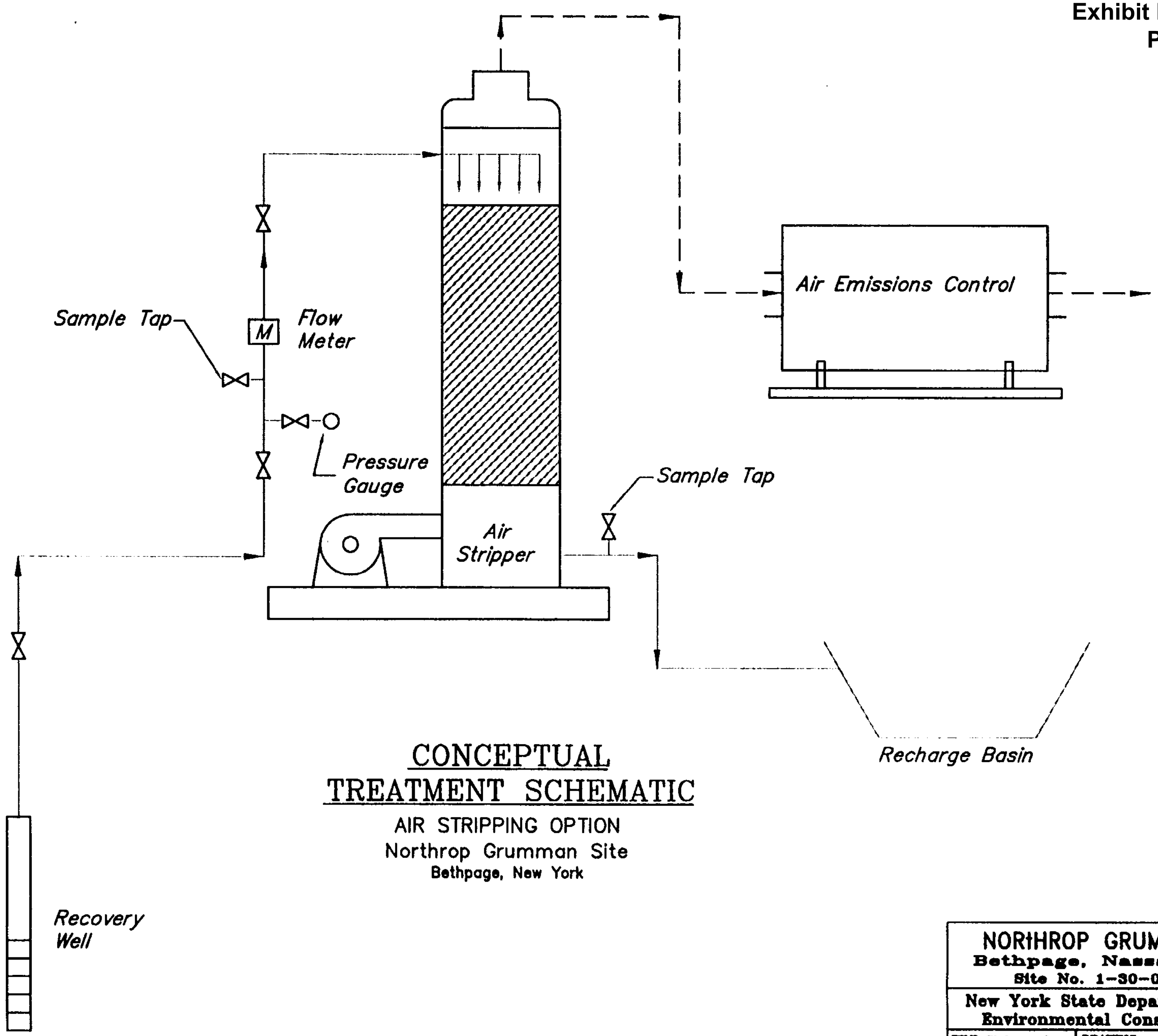
0 4000 FT

Groundwater Model Grid
Figure 8

DIVISION OF ENVIRONMENTAL REMEDIATION

REVISED:
DATE: 06/22/00
DRAWING:

Northrop Grumman Site



## CONCEPTUAL TREATMENT SCHEMATIC

AIR STRIPPING OPTION
Northrop Grumman Site
Bethpage, New York

NORTHROP GRUMMAN SITE
**Bethpage, Nassau County**
**Site No. 1-30-003A, B, C**

**New York State Department of Environmental Conservation**

| | |
|---|---|
| **FILE: Stripper.dwg** | **DRAWING:** Base Map |

GROUNDWATER REMEDIATION
SCHEMATIC VIEW

| | |
|---|---|
| **DATE: 04/26/00** | **FIGURE 9** |

# APPENDIX A

## Responsiveness Summary

### Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites
### Record of Decision
### Town of Oyster Bay, Nassau County
### Site Nos. 1-30-003A & B

The Proposed Remedial Action Plan (PRAP) for the Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites (NWIRP), was prepared by the New York State Department of Environmental Conservation (NYSDEC) and issued to the local document repository on October 24, 2000. This Plan outlined the preferred remedy proposed for the remediation of contaminated groundwater associated with these two sites and for the protection of nearby public water supplies. The preferred remedy was based, for the most part, on the results of the Operable Unit 2 (OU2) Remedial Investigation/Feasibility Study (RI/FS) for the Northrop Grumman and the Naval Weapons Industrial Reserve Plant Class 2 inactive hazardous waste disposal sites. Based upon the criteria identified for evaluation of alternatives, comments received during the PRAP public comment period, recent supplemental investigative data from areas downgradient of the sites, and several discussions with affected and potentially affected water districts, the NYSDEC has selected Alternative 3 of the Operable Unit 2 Groundwater Feasibility Study, with some modification. The modifications, based primarily on comments received from the public and water districts, are noted in Section 7.2.8 ("Community Acceptance") of the Record of Decision (ROD). The modifications and other comments, where applicable, have been incorporated into the ROD. The selected remedy includes a number of response measures which have now been categorized into a Groundwater Remedial Program and a Public Water Supply Protection Program.

The components of the remedy are as follows:

**Groundwater Remedial Program**

The selected remedy includes a groundwater remedial program to address the regional groundwater contaminant plume associated with the Northrop Grumman and NWIRP sites. The components of this program are as follows:

- continued operation of the on-site containment (ONCT) groundwater extraction and treatment system (formerly known as an Interim Remedial Measure) at Northrop Grumman's southern property line;

- an evaluation of the ONCT system to confirm that it is performing effectively;

- mass contaminant removal through groundwater extraction and treatment in an offsite area near the GM 38 monitoring well cluster;

- predesign investigation to determine the optimal groundwater extraction location(s) in the GM 38 offsite treatment area(s);

- long term operation and maintenance of all operating systems, including the ONCT (or former IRM) system and the GM 38 area remedy;

- additional groundwater investigation to better define the groundwater contaminant plume and to determine whether an Operable Unit 3 Groundwater RI/FS is warranted;

- long term monitoring of the groundwater including a comprehensive monitoring of plume attenuation; and

- the formation of a technical advisory committee (TAC) as deemed necessary by the NYSDEC, to be comprised at a minimum, of the involved Agencies, participating local water districts, Northrop Grumman and the Department of the Navy. The main purpose is to review and provide input on all materials relating to the implementation of the Northrop Grumman and NWIRP OU2 Groundwater remedy.

## Public Water Supply Protection Program

The ROD recognizes the importance of continued provision of potable water to those communities/populations served by water supply wells that are or that become impacted by site-related contamination. To this end, the ROD requires that a public water supply protection program be implemented. The components of this program are as follows:

- continued public water supply wellhead treatment to meet appropriate drinking water quality performance objectives at wellfields already affected by the groundwater contaminant plume for as long as these affected wellfields are used as community water supply sources;

- public water supply wellhead treatment or comparable alternative measures, as necessary, for wellfields that become affected in the future; and

- long term monitoring of the groundwater contaminant plume including outpost monitoring wells upgradient of potentially affected water supply wells.

The release of the PRAP was announced via a public notice to the mailing list, informing the public of the PRAP's availability.

A public availability/poster session featuring a walk-through presentation of the RI/FS (upon which the PRAP was based) with representatives of government, Northrop Grumman, and the Navy, was held on December 8, 2000. A public meeting was held on December 13, 2000 which included an overview of the Remedial Investigation (RI) and the Feasibility Study (FS) as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. Written comments were received from Water Districts south of the Northrop Grumman Site, from Northrop Grumman Corporation, from the U.S. Department of the Navy, and from the OXY Corporation. Two letters and one telephone inquiry from individual citizens of the community were also received.

The public comment period for the PRAP ended on **February 5, 2001**. This Responsiveness Summary responds to all questions and comments raised at the December 13, 2001 public meeting and to the written comments received.

The following are the comments received at the public meeting, with the NYSDEC/NYSDOH responses:

**Question No. 1:**

a. The groundwater problem took place in the mid 70s, is that not correct?

b. Why did it take the time from the mid 70s, to date, to come up with an answer that was already answered in 1992, but the Board of Health did nothing for the people?

c. How could they have taken care of it if they only picked it up in the mid-70s, which it took at least 15 years for it to be detected, and it's still now ongoing, and this is 2000?

**Response No. 1:** It is not known when groundwater contamination with volatile organic compounds (VOCs) first occurred at the Grumman Aerospace and Naval Weapons Industrial Reserve Plant (NWIRP) sites. It is correct that VOC contamination problems with some of the groundwater production wells on the Grumman and NWIRP properties were first identified in the 1970s. Northrop Grumman (former Grumman Aerospace) and the Navy had identified groundwater problems within their site. In response, Northrop Grumman added treatment to their non-contact cooling water discharges. Initially, this was in the form of aeration basins. As the problem was evaluated in more detail, Northrop Grumman and the Navy eventually added air strippers to the treatment system.

With respect to the Nassau County Department of Health ("Board of Health"), starting in about 1977, a systematic program was implemented in conjunction with the New York State Department of Health (NYSDOH) to test all public water supply wells in Nassau County for the type of contaminants associated with the Northrop Grumman and NWIRP sites. The first downgradient public supply well discovered to be impacted by VOC contaminants in the groundwater was one of the two wells at Bethpage Water District (BWD) Plant 6. When Plant 6 began to show trace levels of contaminants, BWD took the well offline. BWD subsequently paid for VOC removal treatment at Plant 6 that was sufficient to decrease the contaminant levels to non-detectable concentrations in treated water. Only then was the well put back on line. The BWD was later reimbursed by Northrop Grumman for installation of the treatment system, operational expenses of the treatment system, and a subsequent upgrade of the system. A similar scenario and sequence of events occurred at BWD's Plant 4. More recently, the Department of the Navy paid for VOC removal treatment at BWD's Plant 5 after groundwater modeling suggested that the Plant 5 wellfield might eventually be impacted by VOC contamination.

The Nassau County Department of Health (NCDOH) continued to monitor public water supply wells for VOC contamination during the 1980s, and NYSDOH promulgated a requirement for quarterly VOC monitoring beginning in 1989 along with maximum contaminant levels (MCLs) for VOCs in drinking water (10 NYCRR Part 5). NCDOH requires monthly monitoring for VOCs in public supply wells, such as those at BWD Plants 4, 5, and 6, that are affected by VOC contamination.

**Question No. 2**: There's 400 superfund sites on Long Island, and each one of those superfund sites has the same chemicals and compounds that only the Navy is and was allowed to use, as only 50 companies in all of United States, including Alaska and Hawaii, could use this chemical. Isn't that the reason why the Lloyd Aquifer is now polluted?

**Response No. 2**: It's not clear what chemicals are being referred to in the question. The chemicals at the Northrop Grumman and NWIRP sites are volatile organic chemicals, such as trichloroethylene (TCE). These chemicals are fairly common in industry and commerce, are used throughout the country, and are not limited to just 50 companies. Under a federal program called the Installation Restoration (IR) Program, the Navy and other Defense Department branches are required to identify the contamination at their facilities and address it.

Long Island groundwater is a sole source aquifer for drinking water. Therefore, over the course of time, as the agencies became aware of groundwater contamination, it became a priority to identify the hazardous waste sites that exist. These sites are then characterized and, as required, remediated. If these sources are affecting the groundwater, we also address the groundwater contamination.

**Question No. 3**: The Constitution clearly states if the Navy or the Army or any one of those agencies did cause any kind of contamination they must correct the problem and pay compensation to each of the families or home owners that have loss, whatever the loss may be.

**Response No. 3:** The Department of the Navy, along with Northrop Grumman, has stepped in to correct the problems associated with these sites under NYSDEC and NYSDOH review and approval. Several corrective measures have been implemented, including the treatment systems added to the Bethpage Water District wells, the ongoing onsite containment (ONCT) system and the source removals completed at the plant sites. Both the Department of the Navy and Northrop Grumman have verbally committed to implement the remed(ies) detailed in the Proposed Plan.

With respect to the Department of the Navy compensating families and/or homeowners for any losses they have incurred, that issue is beyond the scope of this project. It is noteworthy, however, that offsite sampling of residential yards in the area did not indicate significant offsite impacts via aerial transport/deposition of contaminants. With respect to contaminated groundwater, the route of potential exposure would be through the water supply. Because of VOC monitoring and regulatory involvement, the Water Districts were able to detect the contaminants in the water supply wells and implement appropriate controls in a timely manner.

**Question No. 4:** Regarding the chemicals that were found in the water and in the soil, why doesn't the PRAP have the specific breakdown of the chemicals that were found, the material safety data sheets (MSDS) associated with them, and the permissible exposure levels that OSHA has set on these chemicals. Grumman and the Navy should provide these as they are not exempt from the Right-to-Know requirements.

**Response No. 4:** The chemicals found at the site are listed in Table 1in the PRAP; which lists the concentration ranges of chemicals for the environmental sample results. For a more detailed evaluation of the site, information can be found in the remedial investigation and additional sampling reports on file in the document repository located in the Bethpage Community Library on Powell Avenue. With respect to the MSDS sheets, NYSDEC does not normally require that these be included in document repositories; some responsible parties provide these, others don't. These would be available to workers at the facility where in use. Between 1980 and 1986, under the New York State Right-to-Know Law employers were required to provide information on workplace exposures to employees. After this time, OSHA required the provision of similar information under the federal Hazard Communication Standard. Under these rules, employers were required to inform employees of any hazardous materials they were potentially exposed to in the performance of their job as well as potential health effects, appropriate protective equipment, and spill remediation methods.

Material Safety Data Sheets (MSDSs) for chemical products are available from the manufacturers of the respective chemicals. With respect to health effects information on common chemicals, interested readers may access toxicological profile reports at the following website: www.atsdr.cdc.gov/tfacts.

Regarding the OSHA Permissible Exposure Limits (PELs), these are air levels that pertain to occupational exposures and are not applicable to the subject groundwater investigation.

**Question No. 5:** Is the chemical data available in one place in the FS Report that's available in the Bethpage Library? Why isn't this very important information more accessible to the homeowners? Shouldn't it be part of a group mailing since it does have the potential to affect all of us?

**Response No. 5:** All of the information gathered from the groundwater sampling under this project is available at the document repository located in the Bethpage Community Library on Powell Avenue. The reports are too voluminous to supply the thousands of local residences with an independent copy. Under New York State Law, specifically Title 6 NYCRR Part 375, the NYSDEC has to meet specific citizen participation requirements. One of those requirements is to make site information available to the general public at such document repositories. NYSDEC has sent several thousand fact sheets to area residents notifying them about the sites, the environmental issues, the proposed remedial action plan, and directing the interested citizen to the document repositories and/or NYSDEC and NYSDOH toll-free numbers (NYSDEC: 1-800-342-9296; NYSDOH: 1-800-458-1158) for additional information.

**Question No. 6:** a) Where is the breakdown of the exact chemicals that were found, what are the hazards associated with each and every chemical that has been found, and what were the specific levels that were found in ground soil and groundwater? b) If there is any discharge or contaminated discharge from these air stripping water purification systems, and who is monitoring the air discharge from this, since it's air based, what type of filtration, are there any levels of exposure we should know about regarding the discharge from these units?

**Response No. 6:**

a) With respect to the breakdown of chemicals and specific levels in various media and the hazards associated with each and every chemical found, please refer to the response to question 5 above.

b) The groundwater that Grumman is extracting for both production purposes and now the onsite containment system is treated on-site with an air stripper. The air discharge from these air strippers, due to the elevated levels of contamination in some of the onsite groundwater at the site, is treated with activated carbon. This removes the volatile organic compounds from the airstream before it is released into the air. The carbon is then periodically steam stripped, the product is recovered and sent offsite for disposal. Northrop Grumman is required to test the air discharges, among other things, and submit regular monitoring reports to the NYSDEC.

**Question No. 7:** Is there any monitoring of the discharge that goes through the activated charcoal filters?

**Response No. 7:** As noted above, Grumman monitors the discharge(s) to evaluate system effectiveness and for compliance with air quality standards.

**Question No.8:** Shouldn't there be an independent third party monitoring?

**Response No. 8:** . Grumman has professional engineers working for them in a consulting capacity whom are obligated to submit certified data used for site characterization. The State of New York uses the same types of certified consultants to take environmental samples. Similarly, Grumman must use analytical laboratories that are certified under NYSDOH's Environmental Laboratory Approval Program (ELAP).

**Question No.9:** Most hazardous waste situations do require the hiring of an dependent third party monitor, and that's true with lead abatements and asbestos abatements.

**Response No. 9:** Northrop Grumman is monitored by professional staff at the NYSDEC, the NYSDOH and various officials from Nassau County. These agencies periodically take independent samples to check the reliability of (Northrop Grumman's) samples. The labs used to analyze the samples are are required to produce quality assurance (QA) reports on the accuracy and precision of their analytical equipment. Additionally, NYSDEC often requires that independent laboratories review all the data, reports, and QA programs of the analytical laboratory.

**Question No. 10:** So if a bad report does come back, and let's say your engineers do detect a higher than normal level, or possible contamination level, are we to get a phone call? That's what I'm looking for, a little more freedom of information here and a free flow of information and having it more accessible to the homeowners; it's the 25,000 other people that couldn't make it here tonight.

**Response No. 10:** Potential routes of exposure from site-related contamination have been evaluated and the State has not found any ongoing exposures to the site-related contamination. If significant exposures are discovered, programs and requirements do exist to notify affected individuals. The water that the local water districts provide to consumers meets the NYSDOH drinking water quality standards. With respect to drinking water, consumers do have to be notified about the quality of their water whether or not there is an exposure. Customers receive an annual water supply statement, called a Consumer Confidence Report, which summarizes the water quality. Any violation of the State's drinking water regulations pertaining to maximum contaminant levels would require prompt notification through radio and the printed media.

**Question No. 11:** Is there an upcoming website that's going to be available for the residents of Bethpage, or someplace where this information is more accessible?

**Response No. 11:** Forming a website is feasible since the consultants for Northrop Grumman and the Navy have most data in tabular form and/or on disks from different sources. Establishing a website is not required, but it is something that can be further considered.

**Question No. 12:** What I would like to know, one question is has the chromium been speciated?

**Response No. 12:** Specific groundwater samples that were taken as part of the remedial investigation were analyzed for the varying states of chromium. This information is available in the remedial investigation report(s) for the two sites at the document repository.

**Question No. 13:** My main concern is the offsite contamination, the tremendous area of contamination, and what is being done. I heard tonight about wells on Central Avenue, but it is my understanding, from having read quite a bit on the site, that this contamination is falling south of Hempstead Turnpike. That's quite an area. What is being done in that area, anything?

**Response No. 13:** As groundwater in the Upper Glacial and Magothy aquifers moves towards those areas south of Hempstead Turnpike, the concentrations drop off dramatically compared to what they are in onsite groundwater. The FS evaluated full containment of all of the groundwater contamination associated with the site, but found that it was technically infeasible. Although NYSDEC's goal is to restore the site to pre-disposal conditions to the extent feasible and authorized by law, this goal is very difficult to achieve. The Navy is conducting additional investigation south of the Hempstead Turnpike to better determine the extent of contamination in that area and to place outpost monitoring wells upgradient of potentially affected water supply wells.

**Question No. 14:** Could you give me, for instance, what I'm trying to get for some of the people here, rather than say 3,000 feet wide, could you tell me like there's an area of contamination from Wantagh Avenue to past the high school? Could you tell me where the plume exists?

**Response No. 14:** The contaminant plume is roughly bounded by Cherry Avenue to the North, the Oyster Bay Expressway to the East, New South Road and Massapequa-Hicksville Road /Route 107 to the West, and some point South of the Hempstead Turnpike. It was already known that the projected edge of the groundwater plume was approaching Hempstead Turnpike from the information detailed in remedial investigation reports. Therefore, the NYSDEC directed Northrop Grumman and the Navy to install a number of off-site monitoring wells to begin looking further down gradient, south of Hempstead Turnpike.

The Navy took the lead on this portion of the project and began with the installation of groundwater profiles. They went to areas thought to be the end of the plume. However, this current data generated by the Navy indicated contamination has gone beyond Hempstead Turnpike. In response to this, the Navy agreed to install additional borings to delineate the leading edge and locate outpost monitoring wells before the Record of Decision is signed.

In terms of contaminant mass, approximately 75 percent of volatile organic contamination is still underneath the two sites. The volatile organic concentrations down gradient are, for the most part, an order of magnitude lower, with the exception of the highly elevated concentrations around monitoring well GM-38-D2.

**Question No. 15:** How about cadmium and chromium?

**Response No. 15:** Chromium, and to a less extent cadmium and arsenic, in groundwater is limited to specific areas beneath the Northrop Grumman and Navy Sites. These contaminants will be tested for under the long term Hydrogeologic Monitoring Plan.

**Question No. 16**: It does not exist off-site at all?

**Response No. 16:** Only in a few shallow groundwater wells in the area near Plant 2. The concentrations were only slightly above groundwater standards.

**Question No. 17:** You mentioned that Grumman had (to) have long-term operation, and, you know, oversight monitoring and maintenance. What exactly does that mean?

**Response No. 17:** As part of the remedy implementation, groundwater recovery systems are being operated by Northrop Grumman to contain the plume on the site. There are four wells pumping close to 4,000 gallons a minute to an air stripper and an air treatment system. Groundwater will have to be monitored to a) confirm the containment system is working, b) track the leading edges of the plume and c) indicate whether any municipal well will be impacted. An approved plan must be established that will cover these items and all the other aspects of the long term operation, maintenance and monitoring required for the remedial systems at these two sites.

**Question No. 18:** Would you let us know exactly what "long-term" means, does it mean somebody is going to come there once a year, etc?

**Response No. 18:** Long-term, under the CERCLA process, is a thirty year time frame. Thirty years is used to estimate the cost, In all likelihood, in 30 years those on-site containment wells will still be necessary based on the time rate of travel of contamination present at his site.

**Question No. 19:** How deep is the plume?

**Response No. 19:** It varies in different parts of the study area. Not all groundwater data points are on a continuous plane. In some areas the affected groundwater is as deep as six hundred feet. Also the volatile organic contamination, mainly trichloroethylene, is heavier than water. These volatile organic compounds therefore tend to sink in the aquifer as they move down gradient. However at lower concentrations it has some degree of solubility, so it moves slower than the groundwater, and tends to sink as it moves.

**Question No. 20:** Which is where our wells are?

**Response No. 20:** Some of the municipal wells are screened at some of the similar depths the site related contamination. This explains the need for the wellhead treatment contingency plan, to make ensure that a treatment system will be put in place before any there are any affects on any of the municipal wells.

**Question No. 21:** I bought a house in Levittown 17 years ago, I guess before this whole thing became a festering problem or people heard about it. I live two blocks away from the BOCES school that you mentioned, a half a mile or 11 blocks away from the Grumman and Navy facility, and naturally I'm concerned about what

I have been ingesting in one way or another during the past 17 years. Just as an example, I love to grow vegetables and fruit trees on my property, and I thought I was doing a great job of keeping myself free of contaminants, and the question is what have I been absorbing through my produce as a result of this?

**Response No. 21:** The volatile organic compounds associated with this site tend to sink in the aquifer as they move down gradient. Therefore, this is not a route of potential exposure. Local residential areas next to and near the Grumman Site were tested for any surficial soil impacts by the NYSDOH and found that there were none.

**Question No. 22:** My basic question is, when I bought the house nobody told me that there was any problem. Now if I want to sell my house, how does that affect what I am going to be able to sell it for, and naturally I will have to explain to buyers that there is a problem.

**Response No. 22:** Technically speaking, there is no defect in your property. The plume, for the sake of argument, may be passing in the groundwater, beneath your house. However, there's no exposure pathway for you to come in contact with the dissolved contamination that's more than fifty feet below in the groundwater.

**Question No. 23:** The gentleman who spoke before mentioned, for example, BOCES school. Now, I can throw a baseball from my house and land it in the BOCES school yard, and I know water doesn't really adhere to county lines or state lines or any kind of lines that are drawn by planners, water just flows. So that it's hard for me to agree that I have no contamination on my property, unless a test is made. And so I wonder whether the town, the county, somebody, could arrange that, before a sale is made, or when it's contemplated, that a test is made of the property and an affidavit issued that it is or is not contaminated that the homeowner has to give to the potential buyer. I think that would be fair.

**Response No. 23 :** There is no reason to do that, with respect to your particular site. The areas around the facility that were thought to have the potential to be impacted, for instance, from a surface deposition of contaminants, were tested and there was no problem found. The area where you live is too far from the plant site itself to have any surface contamination from operations at the facility, and there's absolutely no way for your property to be contaminated by groundwater 100 or 200 or 400 feet below, it's just not possible.

**Question No. 24:** How come you're not talking about the Levittown water and you're only talking about Bethpage? Because Levittown is like right there, too.

**Response No. 24:** The Bethpage Water District is foremost in the plan because they already have treatment in place that was made a requirement of this project and that was paid for by Grumman and the Navy. The groundwater in the far eastern parts of Levittown is also down gradient of the site. However, one of the integral parts of this project is the long-term monitoring and wellhead treatment contingency program. This program also covers outpost monitoring for any down gradient municipal supply well(s) that might be affected in the future. This program wants to make sure that any municipal well that might be affected will have treatment in place before the contamination reaches the supply wells. In addition, all the water supplies in Nassau County are sampled on a routine basis.

**Question No. 25:** But Levittown hasn't been treated at all yet is what you're saying?

**Response No. 25:** The Town of Hempstead municipal supply wells located in Levittown have not been impacted by site related contamination.

**Question No. 26:** You (NYSDOH) were saying statistics on adults, how many adults get cancer in their life. How about kids under 18; do you have any statistics on that? And you should have some statistics about our area. Because I could tell you, we have a very small school district, I can tell you five kids off the top of my head right now being treated, and that's a scary thought. We have a very small school district, under 16 years old. So that's what my concern is.

**Response No. 26:** All the cancers have to be reported To the NYSDOH regardless of age. Statistics are available on a county-wide, and in some cases, a zip code basis. The NYSDOH has recently published cancer maps for New York State. This information and these maps are accessible at the NYSDOH website: /www.health.state.ny.us. Individuals may also call the NYSDOH toll free number (1-800-458-1158 ext. 27950) to inquire about local area cancer incidence investigations.

**Question No. 27:** And how do we get those (maps)?

**Response No. 27:** They're on the web, they are at www.health.state.ny.us. At the toll free number, enter extension 27950, and you can ask about specific studies, local area, small area studies where there's unusual disease patterns where the NYSDOH has looked into those areas.

**Question No. 28:** And so our area in Levittown has not even been addressed to try to decontaminate yet. So we're long-term?

**Response No. 28:** The onsite groundwater contamination is being addressed with the containment systems. Groundwater wells are now being monitored quarterly. The municipal wells are also sampled on a regular basis to insure that the wells have not been impacted. Groundwater is approximately 50 to 60 feet below the ground surface in the area adjacent to the two facilities. The groundwater contamination flows downgradient and gets deeper as it migrates from the Sites and does not move upward towards the residences.

The width of the plume is going to be studied further and action will be taken accordingly, but right now Levittown wells have not had any contamination detected.

**Question No. 29:** The NYSDOH just said that Levittown is not affected, as the plume is not moving in that direction. I assume you're talking about the vinyl chloride plume is that correct?

**Response No. 29:** What's being discussed are the flow components of the Northrop Grumman-Navy groundwater contaminant plume. The vinyl chloride plume is associated with the OXY Hooker Ruco site, which is under the United States Environmental Protection Agency (USEPA) control.

**Question No. 30:** If the contaminants go down to 800 feet, isn't it true that the Lloyd's Aquifer, which extends from Queens to Montauk, is being contaminated with these chemicals?

**Response No. 30:** It is possible that, at some point in the future, the Lloyd Aquifer in this area might be impacted. However, even the most recent vertical profiles to 800 feet show no contamination. There are also various layers and lenses of clays that tend to isolate parts of the aquifer from other parts of the aquifer. Further, at that depth there is a Raritan clay unit which prohibits the transfer of contaminants into the Lloyd Aquifer.

**Question No. 31:** Isn't the Lloyd's Aquifer one contiguous aquifer which extends from Queens to Montauk?

**Response No. 31:** The Lloyd Aquifer does not exist in the eastern part of Long Island. The groundwater direction in the area of the site, and on Long Island in general, are north and south in the Upper Glacial, Magothy and the Lloyd Aquifer. There's no east-west flow component in the aquifer system.

**Question No. 32:** This transparency, which is your own figure 4.2 (Hooker RUCO OU3 RI Report), which shows the Lloyd's Aquifer extending from one area to the other.

**Response No. 32:** The figure you have shows the north-south hydro geologic cross-section from the Long Island Sound south to the Atlantic Ocean.

**Question No. 33:** And you are saying that contaminants have gone down to the Lloyd's Aquifer in some areas that have been tested; is that correct?

**Response No. 34:** What the testing to date has indicated is that contamination has not penetrated the Raritan clay in this area. In addition, given the known flow patterns of site related contamination and the fact that the Lloyd Aquifer is a confined aquifer, site related contamination from the Northrop Grumman site is not expected to impact the Lloyd.

**Question No. 35**: All of Long Island is contaminated, contaminated by Grumman and the Navy.

**Response No. 35:** That's absolutely untrue.

**Question No. 36:** Is the only chemical being addressed presently the vinyl chloride, which is being addressed by the biosparging which you've been proposing in the newspaper, etc.?

**Response No. 36:**. Much more than VCM, or vinyl chloride, is being addressed here. The RUCO polymers facility discharged pure vinyl chloride in the recharge basins from the late '50s to the early '70s. It was mixed in with their other wastewater discharges out to their recharge basins located on-site. And that's in the location of the RUCO Polymers Site; to the north-northwest. What was read in the newspaper about the RUCO Site is what the USEPA is doing to remediate that site.

Most of the RUCO contamination has migrated off-site from the RUCO facility onto the Navy and the Grumman property. During their high period of production, the groundwater wells on the Grumman property drew groundwater over to the east, so it commingled the plume. The proposed plan being referred to was issued by the EPA. This proposed plan subsequently became a Record of Decision and covers the off-site groundwater component of the Ruco facility. The USEPA ROD selected biosparging. This technology enhances the bacterial break down the vinyl chloride found in the groundwater on the Northrop Grumman and Navy Sites. In addition, the offsite migration of contamination from RUCO will be addressed by the Northrop Grumman ONCT system.

**Question No. 37:** So you're containing them, but you're not getting rid of them, the other chemicals. Would you let me just mention some of them. Trichloroethylene, tetrachloroethylene, dichloroethylene, dichloroethene, trichloroethene, dichloroethelene, hydrocarbons, polychlorinated biphenyls and semi-volatile organic compounds. These are all listed in your own report as contaminants which are in the water, they all cause cancer. Why is not more than containment being done?

**Response No. 37:** The word "containment" is being used to describe the fact that no more of those chemicals are being allowed to migrate off site in the groundwater regime. They are being removed from the groundwater, treated through a stripper system, and the vapor phase of that stripper is being further treated with activated carbon so that none of those chemicals are being discharged to the environment. Some of the other contaminants mentioned were only a problem at the source areas on site, and have been addressed through the various soils remediation programs.

**Question No. 38:** I'd like to know-- well, actually, what I wanted to get to before, throughout the program before, 50 parts per billion was considered the risk, the permissible exposure level back 25 years ago, and since then the number has been moved down to five parts per billion. How do we know in five more years it's not going to be down to one part per billion, and exactly how many different toxic chemicals are we talking about the water being contaminated with? I hear so many numbers being thrown around tonight, and everybody likes that catchall VOCs, which seems kind of harmless, but how many different chemicals are we talking about in the water?

**Response No. 38:** As far as the offsite groundwater plume, the main concern is tetrachloroethylene, trichloroethylene, dichloroethylene (cis and trans) and vinyl chloride. These compounds are very similar and are outlined in the table in the PRAP. Standards are always under review, and there is no guarantee that they will not go lower in the future. Certainly it's always a possibility. The current technology has resulted in the current standard of 5 micrograms per liter or 5 parts per billion for those VOC's present at the site.

**Question No. 39:** Again, if it is only 5 that are in the drinking water, then why hasn't the information on these five chemicals been provided in more detailed form, including, while the level might be below the 5 parts per billion, is it 4, 4-1/2?Any one of the five different chemicals that you say are in the water (supply)?

**Response No. 39:** The water supply is continually monitored and is non-detect. That information comes from the water suppliers, and can be made available to you as a consumer.

**Question No. 40:** You're saying there's only approximately five chemicals that are contaminating the water supply within this plume area?

**Response No. 40:** We're dealing primarily with TCE, or trichloroethylene. There are lesser concentrations of some related contaminants, dichlorethenes, ethanes and perchloroethene.

Question No. 41: How far exactly has this plume moved since you began tracking it back in the '70s, and to date, and how much further is it expected to move before you actually enact some of these plans that you're talking about?

Response No. 41: Figure 5 of the Proposed Plan shows the approximate extent of the plume from 1993 data. This does not detail all the all the groundwater concentrations vertically, much of which is non-detect, but basically the horizontal extent. Recent vertical profile sampling from the Navy has shown that the leading edge of the plume is now past Hempstead Turnpike. The Navy has submitted a new work plan to add additional profile borings to locate the edge of the plume.

Through the use of IRM's, much of the proposed remedy is already in place. The Navy has also agreed to begin the predesign work for the monitoring well GM38 D2 groundwater extraction remedy. Once the Record of Decision is signed, the wellhead treatment contingency plan will be put into effect. In the meantime, if groundwater monitoring indicates that a municipal water supply well is threatened, the NYSDEC will still require Northrop Grumman and the Navy to install treatment.

Question No. 42: Is it moving a mile a year, 500 yards a year?

Response No. 42: The shallow groundwater is moving at about a foot and a half a day. However, most of the contamination is deeper and this part of the aquifer is moving at approximately .25 feet per day.

Question No. 43: Actually I asked about the contaminated area, and is it spreading beyond this (Northrop Grumman Site)?

Response No. 43: Yes. There is a portion of the groundwater pume that has moved beyond the ONCT system.

Question No. 44: Can you guarantee that it's not spreading, and are these wells and test wells being moved out accordingly with the rate of movement (groundwater).

Response No.44: The Navy has agreed to begin installing these wells even before we get a Record of Decision that will require installation of outpost monitoring wells to track the plume. They're submitting a work plan to install wells further down gradient beyond the current edge of the plume. The proposed remedy will require treatment of contaminated groundwater at the site boundary, treatment of the elevated concentrations of groundwater in the GM 38 D2 monitoring well location, and natural attenuation. The progress of natural attenuation will be verified through a comprehensive monitoring plan.

Question No. 45: That's just our neighboring communities will have to worry?

Response No. 45: We have to monitor groundwater, outpost and municipal wells and make sure, up gradient to the supply wells, they won't be affected, and that's what all the different monitoring programs are involved in. The pathways of exposure are being monitored and people are not being exposed to the site related contamination in the groundwater.

**Question No. 46:** I want to show the public what the water line divide is on my slide. Right in the center, you see the highest point of the line that runs right from the top down into the bottom lower green. That's called the water line divide. That's approximately, supposedly, according to the record, a mile and a quarter away from the study site. Now, the study site, which we're talking about right now, is a place where there are chemicals, as the Board of Health just acknowledged that. It is correct in saying that there were other chemicals in there, approximately 113. Now, we'll go one step further. Being one mile and one quarter away from the waterline divide, which is the replenishing system for all of Long Island's Lloyd's Aquifer, is now being, as they say, polluted due to the fact that the heavy compounds, as they start to move, they lay and they lay flat, they start to move out. And as they drive outward in a circular area, as it rains, these contaminants run down into the waterline divide, there is nothing to stop it, as this gentleman over here says, there is a wall.

**Response No. 46:** The deep groundwater recharge area being referred to is about a mile and one half north of the site. Beneath and down gradient of the Northrop Grumman Site, The groundwater moves, by orders of magnitude, horizontally. However, the main contaminants of concern do tend to sink in the aquifer as they move out horizontally from the site. In addition, due to the numerous production wells used by Northrop Grumman, contamination was drawn down deeper before moving offsite.

**Question No. 47:** My question is why, number one, didn't the Board of Health, in 1992, put out an advisory to pregnant women and women who get breast cancer, when they had the complete study, and that study was dropped, put into the hands of the people, you people, when it clearly stated 100 percent that there were eleven chemicals that causes cancer, and each cancer, these cancer-causing elements, which has been proven in laboratory rodents, okay, was never given to the general public to go buy bottled water. But bottled water can't help; can it, sir, because they take showers. And when you take a shower, your skin opens up, and you know what, when your skin opens up, all those chemicals go inside of you, because your pores are now opened up, that's why you say breast cancer; a woman stands in front of a shower with their breasts first.

**Response No. 47:** Both the New York State Department of Health and the Nassau County Department of Health have been closely monitoring the situation whereby public water supplies could potentially have been impacted by groundwater contamination. The State and the County require routine monitoring to ensure that contaminants are detected and appropriate action taken promptly. If groundwater contamination has been determined to potentially impact a public water supply well, then the respective water district typically initiates their own response, most notably taking the well offline, so that people are not exposed to any contamination. The NYSDOH has promulgated maximum contaminant levels for drinking water in 10 NYCRR Part 5. These levels are based on conservative assumptions and consideration of exposures via ingestion, contact and inhalation. Thus, exposures related to cooking, showering and bathing are reflected in the standards. The standards also reflect available toxicologic data for the contaminants with respect to potential carcinogenicity (i.e. cancer causing) and non-carcinogenic (e.g. systemic) health effects. The standards also reflect consideration of differences, if any, with respect to gender, race and age.

**Question No. 48:** The question is why was it not reported to the people on Long Island that there were chemicals inside this water that causes cancer for each and every one of the people on Long Island.

**Response No. 48:** To the extent that any water supply on Long Island has chemicals in it, those results are routinely available to the public. Individuals can request copies of these results from their respective water district. This information is also provided to consumers by the water districts on a routine basis.

**Question No. 49:** Long-term is equivalent, then, equivalent to walking into a situation and getting one good hit of anything; long-term exposure, and it takes long-term exposure to show and prove; doesn't it, sir? The question is if you're taking these chemicals, these contaminants and you're wearing them by going into the shower and it gets into your system, does it not take long term to get into your system before you get sick?

**Response No. 49:** The maximum contaminant levels referred to above are based upon the assumption of long term exposure to the chemical(s) in question. This is usually seventy years for an adult. Shorter durations, as in the case of childhood exposure, are also reflected in the drinking water standards.

**Question No. 50:** Do you know how many times water companies have told everyone that there is a problem, please boil your water? You know when you boil that water it makes those chemicals more intense, they cannot come out?

**Response No. 50:** Boiling the water has nothing to do with chemical contamination. When a pipe breaks, or a water main needs repair it may temporarily impair what is known as the break point chlorination. Break point chlorination is the ability of the water district to provide potable water that is free of water borne diseases. Therefore, the water supplier requests people to boil water to attenuate any pathogens until breakpoint chlorination can be re-established.

**Question No. 51:** The question I have is, has Northrop Grumman and/or the Navy fully disclosed any and all contamination, storage of chemicals that they are aware of and sent it to the DEC?

**Response No. 51:** There are the two different programs administered by the NYSDEC which regulates to the use and storage of chemicals and the clean-up of those chemicals if they happen to get into the environment. The program that regulate the use and storage of those chemicals under is called the Resource, Conservation and Recovery Act or RCRA program. That program has evaluated this Grumman facility and the Navy facility with respect to the buildings where the chemicals are used. All of the various chemical use areas have been investigated and, as of now, closed.

In addition, under the New York State Superfund program areas of soil contamination have been identified and remediated. Northrop Grumman and/or the Department of the Navy have identified areas where chemicals were used and all areas have been cleaned up properly.

**Question No. 52:** The only other question I would have then is why, as recently as three months ago, the new construction that's going on in those sites that have been sold, etc. have there been discoveries of in excess of 200 fifty-five gallon drums of contaminated materials and toxic waste that one of Grumman's representatives show up at the site, they show up with paperwork indicating, oh, yes, there's 200 buried over here and there's a sewage treatment plant that was abandoned, buried over there. If full disclosure was given, then why haven't those chemicals been removed out of the ground, which are now still seeping into the ground water? Not only drums. There were numerous sites, numerous different area locations. On the Grumman's property, or what was owned by the Grumman or part of the Grumman property.

**Response No. 52:** The NYSDEC is not aware of that occurring. But if Northrop Grumman uncovered any drums during any construction activities, they would have notified this Department. Any contractors for any of the new property owners would do the same.

**Question No. 53:** I'm talking about construction that is underway right now on sites that were sold by Grumman to individuals, that as they excavate they are bringing up contaminants.

**Response No. 53:** Again, the NYSDEC is not aware of any sites that were sold to individuals that are encountering drums as excavation occurs. Before Northrop Grumman sold any of the property (ies), they did their own environmental assessments to determine what was there, and if there was anything that was there, to address the problem. Some properties were sold with the understanding that if any work was required, the new owner fully understood the terms of the property transfer and agreed to assume the remedial work that would be required.

In addition, when Northrop Grumman knew there was a groundwater contamination problem, they wanted to know where this groundwater contamination was coming from. They did source area investigations all across the property,. thousands of soil samples have been collected from the Northrop Grumman and the Navy parcels. If contaminated areas were found, they were addressed. When these areas were cleaned up, then endpoint samples were taken to ensure that the soil had been completely cleaned up.

**Question No. 54:** The Lloyd Aquifer, you did say that it was contaminated. I was led to believe by members of the EPA that if the Lloyd Aquifer is contaminated, there is no remediation, that's it. We cannot remediate the Lloyd Aquifer. If that's the case, all of our water is doomed.

**Response No. 54:** An important aspect of this project is acquiring an understanding about the hydro geology of Long Island. What you state is not the case. In certain places in Nassau County it is believed that there is contamination in the Lloyd Aquifer. However, where the Lloyd does exist in the area of these sites, there is a very thick clay unit, known as the Raritan clay separating the Lloyd form the Magothy. This would, for the most part, prevent the contaminant plume from migrating to the Lloyd Aquifer.

**Question No. 54:** Well, is it true that--can it be remediated? Let me ask that question.

**Response No. 55:** Anything can be re remediated. If the contamination does reach the Lloyd Aquifer, it usually is in very, very minute quantities , because of confining material, makes it difficult for contaminants to migrate through.

The Lloyd Aquifer is what's known as a confined aquifer, there is an aquitard or aquiclude, which is another name for clay, over the top of the Lloyd Aquifer which pretty well protects it from above. It is true that it does get recharged from water above at a very, very slow rate; in the order of 4,000 years for the water to get down into the Lloyd Aquifer. By contrast, the Glacial Aquifer is young. It takes a matter of decades, that water comes down and runs to the Sound or to the Atlantic.

**Question No. 56:** We know that the Magothy has been contaminated, that we know from other sites that I've worked on. But I have been told time and time again is that the Lloyd Aquifer has not been contaminated, and if it ever is contaminated, we're in trouble. Where, in fact, one man said we're doomed, and that scares the hell out of me, so I'm going to check this out.

**Response No. 56:** The statement about the Lloyd being contaminated has to do with certain wells in Nassau County here and there that are showing extremely minute traces, and the likelihood is that those traces of contamination have come from the well itself in its penetration down through all those layers. Since the casing itself is not always a perfect seal, sometimes the well will draw contaminants down along the casing.

There are no drinking water wells in the Lloyd Aquifer in the area of the sites, so even if it did become contaminated, that's not where the drinking water is coming water from. There are only a few wells on the south shore and a few on the north shore that get their water from the Lloyd.

Bethpage has made it a policy not to supply water to their customers that has any detectable contamination of VOCs. With respect to Levittown, no contamination has reached the Levittown wells yet.

**Question No. 57:** Why are there no PCBs listed in the water? There's no pesticides listed in the water. Why is it in your own Federal Report it states that?

**Response No. 57:** PCBs, or polychlorinated biphenyls, are highly insoluble compounds. The remedial investigation did not find PCB contamination from site soils was impacting offsite groundwater. With respect to pesticides, these compounds were eliminated as site related contamination. However, groundwater for Nassau County is monitored on a County-wide basis for pesticide contamination.

**Question No. 58:** The statement that I would like to have for the record is I do not agree with the phase that's being proposed. I do not feel the public has been given sufficient time to review a compilation of approximately 25 years worth of records and testing when it was just brought to our attention that they were available for review last week, and in order to comment intelligently, we've only had approximately seven days to review those documents, which, at the Bethpage Public Library, are kept in the basement in numerous, numerous boxes, which I viewed.

**Response No. 58:** Unfortunately, there is a lot of historic material associated with the Northrop Grumman and NWIRP sites. Most of this material has been on file for several years or more. This OU2 proposed remedial action plan (PRAP) was first released in October 2000. At that time, many people first became aware of this project. As part of the Navy Remedial Advisory Board meeting in October, the NYSDEC issued a 4,000 piece community mailing and a notice was published in Newsday. A press release was issued in November 2000 to get the local media to publish the information available at the Bethpage library. The NYSDEC makes the best attempt possible to get the word out about the PRAP and other site related documents. However, doing a mailing to the entire communities of Bethpage, Levittown and Hicksville is beyond the scope of this project.

**Question No. 59:** I believe that the situation is a little out of control and there's an easy way to fix the situation, and it would be the intake of everybody's home water system, a computerized water system. You guys want to take 15 or 30 years to fix and repair it, it can be repaired one, two, three, cheaper and at a lesser cost by doing this. It costs us a lot of money to have filtering systems put in, aerators, air strippers put in, that the public has to pay for, that they are now using to say that it is going to clean the water of the chemicals.

**Response No. 59:** There is no need to place an activated carbon filter on every individual residence. The water supply is sampled at the source to ensure that it meets drinking water standards. It is much easier and more cost effective to analyze water from several wellhead points than from several thousand plus individual homes. Additionally, the presence of thousands of government provided homeowner filters would necessitate an ambitious bacteriological monitoring plan to control the risk associated with the unregulated filters. If an individual resident wants to add a carbon filter to their residence system, then that is their personal choice.

**Question No. 60**: I'm a water commissioner with the Massapequa Water District. We just, in brief, this morning for the first time, although my fellow Commissioner, Frank Flood, and I have served on the Nassau County Department of Public Works and are thoroughly familiar with the plume, we at the Massapequa Water District do not agree with any kind of wellhead treatment. We agree that the plume can be confined to the site which it's on; we believe that you should recover the plume and flow that are now probably down near Jerusalem Avenue and close to our northwest wellfield. We've gone through a similar problem with the Liberty site, and our position is clear on this.

And we also believe that there hasn't been enough modeling or testing done. We think that you must take your model to another extent, as we discussed this morning. And we also want you to know that in the 1980s, I am old enough to remember that, we had to clean up the Purex site, which was very similar to this site. We did the on-site confinement, we did not allow the plume to migrate to Hempstead Turnpike, we recovered the plume, the cost in those days was 30 million.

**Response No. 60:** Based on the extent of the Northrop Grumman contamination, full plume containment is not a feasible option. This is even more evident given the recent vertical profile data received by the NYSDEC from the Department of the Navy and referred to in your Statement.

The remedial investigation for the Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites began almost 10 years ago. Since then, numerous samples have been taken of the site soils and groundwater for the full range of analytes. This information was compiled into a number of independent groundwater models and have been run more than once by Northrop Grumman, the Navy and the Occidental Chemical Corporation (as former owners of the RUCO site). Even without including the 2000 vertical profile data, it is clear that full plume containment wold be too extensive in nature, and is just not feasible.

With respect to wellhead treatment, there are approximately 48 treatment systems for VOC removal for 72 public water supply wells that have been contaminated with VOCs. This technology is widely available and is used as appropriate at the locations to ensure that human health is protected by preventing human exposures to potentially harmful chemicals.

## Written Comments Received by the NYSDEC

This section responds to the following letters that were received by the NYSDEC from technical and legal representatives of water districts located in the vicinity and downgradient of the Northrop Grumman and the Naval Weapons Industrial Reserve Plant (NWIRP) Sites, from the Northrop Grumman Corporation, from the Department of the Navy, and from OXY Glenn Springs Holdings, Inc.:

1. A letter dated November 3, 2000 was received from Anthony Sabino, Attorney and Board member of the Bethpage Water District.

2. A letter dated January 11, 2001 was received from Gary Loesch, P.E. of the H2M Group, representing The South Farmingdale Water District and the New York Water Service.

3. A letter dated January 16, 2001 was received from William Carmen, Attorney for the South Farmingdale Water District.

4. A letter dated January 17, 2001 from Frank Flood, Jr., John Caruso and Vincent Guardino, Commissioners for the Massapequa Water District.

5. A letter dated January 19, 2001 received from John Molloy, P.E. of the H2M Group, representing the Bethpage Water District.

6. A letter dated January 19, 2001 was received from Steve Whyte of the OXY Glenn Springs Holdings Inc.

7. A letter dated January 29, 2001 was received from John H. Young of the Northrop Grumman Corporation

8. A letter dated January 31, 2001 was received from Frank Flood, Jr., John Caruso and Vincent Guardin Commissioners for the Massapequa Water District.

9. A letter dated February 2, 2001 was received from Arcadis Geraghty and Miller, Inc., on behalf of t Northrop Grumman Corporation.

10. A letter dated February 2, 2001 was received from James Colter, for the Department of the Navy, Na Facilities Engineering Command, Northern Division.

11. A letter dated February 5, 2001 received from Arnold Palleschi, Commissioner, Town of Hempstead W District.

As many of the comments and the questions raised in the above referenced comment letters have a com theme, responses have been grouped by category.

**General Responses**

One of the cornerstones of the operable unit 2 (OU2) groundwater selected remedy is the comprehensive groundwater monitoring program. This includes outpost monitoring for public water supply wells, monitoring of the onsite containment (ONCT) system, overall groundwater quality monitoring for comprehensive evaluation of plume attenuation and the performance monitoring of the treatment system of the GM 38 area groundwater remediation. Along with the outpost monitoring is a public water supply contingency consisting of addition of wellhead treatment systems or comparable technology, or other comparable alternative measures, for impacted public water supply wells.

There were a number of concerns raised by the water districts affected or potentially affected by the groundwater contamination. Foremost, any costs associated with implementation of the selected remedy will be borne by the potential responsible parties. Also, public water supply wells are never considered part of any groundwater remediation strategy. When appropriate treatment is necessary for continued operation, that operation is strictly for the purposes of providing potable water to the public, and not part of any groundwater remediation strategy. This has been clarified in the ROD by separating those measures addressing public water supply issues from those measures addressing groundwater remediation.

Historically, public water supplies affected by volatile organic compound (VOC) contamination have been protected by the provision of wellhead treatment for VOC removal at the impacted wells. This treatment has consisted of packed tower aeration (also known as "air stripping"), granular activated carbon (GAC) filtration or, in select cases, some combination of both. In the subject ROD, comparable technology and alternative measures have been added to the public water supply contingency to address the concerns of the local water districts that they are able to select the most appropriate course of action for affected wells in their district. This will provide the affected water districts with the option of, within the limits of reasonable cost, designing and constructing a comparable technology or selecting an alternative measure, including well replacement or relocation, to produce potable water. The measure selected will be sufficient to reflect the policies of the districts that all water provided to their customers contain no detectable levels of VOC contaminants.

There were concerns raised regarding an adequate time to review technical materials related to and including the PRAP. In order to address this, the public comment period was extended from December 22, 2000 to February 5, 2001. Concerns were also raised by the water districts about not being copied on all test results and pumpage lata generated by Northrop Grumman and the Navy. The NYSDEC will ensure that the interested water districts re given copies of pertinent materials. With respect to prompt access to relevant information and corresponding put to decisions made, a number of the potentially affected water districts have requested the formation of a echnical Advisory Committee (TAC). NYSDEC has, therefore, reconvened a previous TAC (most recently rmant) for these sites, expanding its members to include potentially affected water districts south of the empstead Turnpike.

st Water Districts wanted greater involvement in decisions made with respect to groundwater remedial isions and public water supply protection. The ROD includes water district input as a factor in such isions. Additionally, the re-constitution of the TAC will provide a forum for such input on an ongoing basis.

## Specific Responses

### emedial Investigation and Feasibility Study.

Comments were raised during the public meeting and in writing questioning the completeness of the remedial investigation (RI) with respect to the regional groundwater. In responding to these questions, the following site history is presented. The RI for the Northrop Grumman and NWIRP Sites dates back to 1990 when the RI/FS order on consent was first signed with what was then Grumman Aerospace and a memorandum of understanding (MOU) was entered into between the NYSDEC and the Department of the Navy.

A number of groundwater monitoring wells, at varying depths, both onsite and down-gradient offsite were installed during the RI to supplement previously installed monitoring wells. Several monitoring wells had been installed earlier by Nassau County and the U.S. Geological Survey (USGS) during investigations of VOC contamination in the aquifer near Bethpage. In addition, over the course of time, several discrete quarterly groundwater monitoring programs, that also included rounds of well installations, were initiated to monitor specific portions of groundwater related to interim remedial measures (IRMs) being conducted at the sites. Numerous analytical data results and geologic cross sections, combined with groundwater modeling efforts from Northrop Grumman, the Department of the Navy and the Occidental Chemical Corporation (OXY) for the nearby Hooker RUCO site, were used to estimate the lateral and vertical extent of the groundwater contamination. This information was used to identify Interim Remedial Measures (IRMs) for site soils and groundwater. This information was also used to assemble, screen and evaluate remedial alternatives in the Northrop Grumman "Regional Groundwater Feasibility Study" (RGWFS)

After the execution of the 1995 OU 1 Soils Records of Decision for the Northrop Grumman and Navy Sites, the NYSDEC and the USEPA attempted to produce one RGWFS Report concerning the Northrop Grumman Corporation, the Department of the Navy and OXY (Hooker RUCO Site) co-mingled regional VOC contaminant groundwater plume. Ultimately, it was determined that separate groundwater feasibility studies would facilitate conclusion of the RI/FS process for these sites.

The offsite portion of the Northrop Grumman plume was always seen as extensive, based on the RI data. The RI also identified an offsite location, known as the GM 38 monitoring well area, that contained significantly elevated concentrations of site-related groundwater contaminants.

Recent vertical, hydrogeological profile borings completed by the Department of the Navy, indicated that the leading edge of contaminated groundwater is beyond those areas originally identified and/or projected during the RI/FS process. The latest groundwater data generated by the vertical profile borings shows the extent of the plume is beyond Hempstead Turnpike in the deeper parts of the Magothy aquifer. Therefore, a rigorous vertical profiling program has been initiated, with each boring being installed to the Raritan Clay (approximately 750 to 800 feet below ground surface), to define the limits of the groundwater contaminant plume.

The groundwater profiling data indicates offsite contaminant concentrations much less than the range of the concentrations found in the GM 38 monitoring well area. The OU2 groundwater remedy does not include full plume containment due to the technical infeasibility of implementing such a program in the extensive and diffuse offsite plume. This is based on the sheer width, depth, and overall area of the plume and on comparison of this plume information with ONCT extraction system data and data from other sites on Long Island where groundwater extraction and treatment is being implemented. In addition, the area is densely developed and finding the necessary locations to implement total plume containment would be difficult at best and, more likely, infeasible to implement.

As part of the selection of this remedy, the NYSDEC will implement specific tasks, covered in more detail in the following sections, to ensure that the selected remedy is protective of human health and the environment.

## II. Interim Remedial Measures

**a. Onsite Containment (ONCT) System:** The groundwater IRM, or ONCT system, has been designed to intercept contaminated groundwater at the downgradient edge of the Grumman/Navy property, thereby preventing continued offsite migration of site-related contaminants. As part of the startup of the ONCT system, Northrop Grumman began to routinely sample a number of groundwater wells in the area to monitor the ONCT effectiveness. Analytical results generated by this program indicated the ONCT system is achieving it's primary goals. Subsequently, the NYSDEC directed Northrop Grumman to assemble an overall hydrogeologic monitoring plan to cover all the various quarterly sampling events and install additional wells necessary to complete this task.

As part of the implementation of the final remedy for this site, Northrop Grumman will be required to do a comprehensive evaluation of the ONCT system to demonstrate that it is effective in containing the plume from the site, or whether any modifications are necessary to ensure hydraulic containment onsite. Northrop Grumman has acknowledged that there were some initial start up issues with down time that unavoidably occurs with mechanical equipment. At one point, the new owners of Plant 2 inadvertently severed the fiber optic control cables during construction activities. The ONCT system must be operated to the satisfaction of the NYSDEC. Accordingly it is expected that, as time progresses, the ONCT system will approach 100 percent operating time.

**b. Treatment for the Bethpage Water District Wells:** Treatment systems for VOC removal at BWD Plants 4, 5 and 6 were installed either before or during the RI/FS phase of this project. Therefore, in order to document this wellhead treatment as being included in this remedy, these systems are being termed IRMs with respect to their design, construction and initial operation and ongoing maintenance. The outpost monitoring wells for these Plants are already in place and operation, maintenance and monitoring will be covered for the duration of these systems. Public water supply wells are not a part of groundwater remediation, they are being treated solely because they have been impacted by the site.

**III. Record of Decision (ROD):** The ROD presents the selected remedy for the Northrop Grumman and NWIRP site. However, given the complexity of this site, there is a contingency to create an Operable Unit 3 (OU 3) in the event that the groundwater evaluation conducted as part of this ROD indicates further remediation is required. Additional groundwater remediation may also be carried out under the OU2 ROD. An updated groundwater model will be run to select additional locations that need outpost monitoring wells using data gathered during the implementation of the OM&M plan and the vertical profile borings.

Once the ROD is executed, the NYSDEC will approach Northrop Grumman to enter into an order on consent, and approach the Department of the Navy to enter into a consent order or memorandum of understanding to implement the selected remedy. A remedial action work plan will be prepared listing all the work that needs to be done, including a project schedule. The NYSDEC has already directed Grumman and the Navy to finalize and implement the hydrogeologic monitoring plan and the installation of the outpost monitoring wells. The vertical profile borings are a subpart of this hydro-geologic plan which, in turn, is part of the overall operation, maintenance and monitoring program.

**A. Operation, Maintenance and Monitoring (OM&M) Plan:** Part of the final remedy will include an operation maintenance and monitoring (OM&M) plan. Monitoring requirements for any and all the water districts will be covered as part of the monitoring requirements of this project. This Plan will include the following subcategories:

**1. Onsite Containment System:** The monitoring requirements for the ONCT system have been included in the hydrogeologic monitoring plan. Northrop Grumman will also undertake a specific task of evaluating the performance of the ONCT system to ensure that hydraulic containment of the site is being achieved.

**2. Hydrogeologic Monitoring Plan:** Plume tracking will be made a requirement of the Hydrogeologic monitoring program. This will more accurately monitor the fate and transport of the groundwater contamination not specifically addressed by active remediation through comprehensive monitoring of plume attenuation. Another requirement of the ROD is periodically re-run the groundwater model with all of the updated information. This information will be evaluated along with other aspects of the long term monitoring program.

This plan also includes the existing outpost monitoring wells for the BWD, specific groundwater monitoring for inorganic contamination and performance monitoring of the ONCT system. The Plan will include additional outpost monitoring wells as these are installed. The hydrogeologic monitoring plan has already been approved and is being implemented by Northrop Grumman. It is a living document that can be modified as current information directs.

**3. Vinyl Chloride Contingency Plan:** Vinyl chloride is a volatile organic compound (VOC) that has a vapor pressure higher than trichloroethylene (TCE) or perchlorethylene (PCE). Using current air stripper technology, vinyl chloride can be safely removed from groundwater. Vinyl chloride is related to the OXY Hooker RUCO site and has not been found anywhere downgradient of Northrop Grumman property. The vinyl chloride has been identified in the upgradient portions of the Northrop Grumman and Navy Sites. Recent sampling of Northrop Grumman production well 3 (GP-3) indicates that vinyl chloride is now approaching the ONCT system and that additional air emissions treatment will soon be required. The subject ROD includes a contingency for this treatment and the US EPA ROD for the RUCO site contains a similar provision.

**4. Public Water Supply Contingency for Wellhead Treatment or Comparable Alternative Measures:** The public water supply contingency for wellhead treatment or comparable alternative measures, as detailed in the selected remedy section of the ROD, will be implemented if outpost monitoring indicates treatment, or a comparable alternative, is necessary. The selected remedy section of the ROD addresses the process for implementing the wellhead treatment.

The Department of the Navy is currently implementing a vertical profile boring program to locate adequate outpost monitoring well locations and to close any data gaps from the RI. This work is being done now to better delineate the leading edge of the Northrop Grumman and Navy contamination plume and to find appropriate locations for outpost wells. This will give ample time to identify if any given public supply well is in danger of being affected.

As part of any treatment system, to address the concerns of local water districts, Northrop Grumman and the Department of the Navy have agreed to establish as a goal for this remedy, to the extent practicable, for any given wellhead treatment, or comparable technology, to provide water that is non-detect for site related contamination for the affected drinking water supplies, to the current analytical standards of non-detect as of the date of this ROD. This is of paramount importance to all of the water districts involved with this project. This also replaces the PRAP carbon polishing contingency since having the goal of attaining non-detect with wellhead treatment or comparable technology replaces the need for specifically requiring this technology.

The option of "comparable alternative measures" addresses the concern of replacing an existing supply well with a new well at a different location, or providing some other means to maintain a suitable potable water supply. If, at the time treatment is deemed necessary at a public supply well, a justification can be made to replace a well rather than add treatment to an existing well. Then a new well location will fall under "comparable alternative measure." This justification would include feasibility and comparable cost.

**Offsite Groundwater Treatment Additional to the GM 38 Monitoring Well Area:** The predesign investigation work and the offsite long term monitoring may identify areas that have similar contaminant concentrations that were found at the GM 38 area. If such information comes to light, the NYSDEC will evaluate this information and determine if treatment is required in a similar manner as the GM 38 area remedy.

**Remedial Design:** The Navy has undertaken a geo-technical program of installing vertical profile borings in the Bethpage, Levittown, Farmingdale and Massapequa areas. Profile borings include the collection of groundwater samples for VOC analysis at discrete intervals from the shallow groundwater all the way to the Raritan Clay. The information obtained from this fieldwork is part of the long term monitoring and plume tracking, outpost monitoring for the public water supply contingency program and the remedial design for operable unit 2.

The Navy borings will verify the hydrogeology and those areas that are contaminant free. For the purposes of the public water supply contingency program, the borings will locate the proper place for installing outpost monitoring wells. An additional task of the Navy program is to initiate the predesign study necessary to implement the GM 38 area remedy. All the other aspects of remedial design are based on contingency plans. If any part of the long term OM&M identifies the need to implement a remedial design program, then such a program will be implemented.

## Miscellaneous Water District Comments

A number of water districts suggested that full containment of the groundwater contaminant plume should be the preferred remedy or, at a minimum, interception of contamination before it impacts downgradient public supply wells. Based on the extent of the Northrop Grumman contamination, full plume containment is not a technically feasible nor cost effective option. This option was evaluated in detail in the OU 2 FS. The option of full containment has since been rendered less feasible given the recent vertical profile data received by the NYSDEC from the Department of the Navy. The above assessment notwithstanding, the ROD does contain a provision for additional "hot spot" remediation of localized areas if the data indicate such action is warranted. The use of groundwater extraction wells to "intercept" contaminant plumes upgradient of public supply wells, where feasible, could be considered during the evaluation of comparable alternative measures under the public water supply contingency program.

Some water districts asked that metals, particularly chromium, be included in groundwater tests. One district also asked for radiologic testing. Inorganic constituents will be included as analytes for samples from select monitoring wells under the long-term Hydrogeologic Monitoring Plan; radiologic parameters will be considered. The districts are encouraged to comment on the locations and numbers of such samples via future TAC reviews.

One water district requested that public water connections be provided if private wells that are used for potable water are discovered. Although no such wells are known to exist, this provision has been included in the ROD.

### Miscellaneous Northrop Grumman Comments

Northrop Grumman submitted some additional comments that are not addressed above.

Grumman opposes the specification of "trigger values" within the ROD, favoring the development of these in subsequent work plans and contingency plans. The ROD retains one "trigger value," that of the 1 ppb repeated detection in the outpost monitoring wells to begin the process of groundwater modeling and projected impacts specific to the threatened well. This "trigger" is also expected to begin the process of evaluating wellhead treatment options and comparable alternative measures for the threatened supply well(s). Practically speaking, the modeling will be ongoing up to that point and minimal revisions/reruns would be likely. The commencement of alternatives evaluation is considered to be a prudent step at such time. It is noted that outpost well-specific action levels are expected to be developed within work plans and contingency plans with input from the TAC and potentially affected water districts.

Grumman generally opposed the use of language in the PRAP that suggested redundant engineering controls offered additional protection of public health. Some of this language had been part of the PRAP discussion on the carbon polishing option for affected public supply wells. The carbon polishing option has been deleted from the ROD along with the disputed language. This option was removed in favor of Northrop Grumman's and the Navy's stated agreement to use "non-detect" as the design goal for treatment systems installed at affected wellheads. One section of the PRAP had suggested that the GM-38 well area remedy offered additional protection of public health by decreasing the contaminant mass that would pass through public supply wells, even though such wells had VOC removal treatment. The statement hinged on the concept that the magnitude of exposure would be less in the event of system (treatment and monitoring) failure if lower VOC concentrations were present in the source water. The language has been changed in the ROD to simply state that the GM-38 well area remedy may result in reduced loading to nearby public water supply wells.

## Responses to Written Comments from Citizens

### Written Comment Letter Re: Cancer and Occupational Exposure

Two written comment letters/submittals were received from individual citizens. One expressed concern about a relative who was a former employee at Grumman and was subsequently diagnosed with cancer of the kidney. The writer suggested that the cancer may have resulted from occupational exposure to VOCs at Grumman. The writer also implied that Grumman showed negligence in allowing employees to be exposed to VOCs in water used at the site and to VOC vapors in the plant.

At this time, the causes of kidney cancer are not well understood. Although scientists do not know exactly why kidney cancer develops, they have learned that some things, called risk factors, increase a person's chance of getting this disease. For kidney cancer, these risk factors are believed to include smoking, use of the pain-killing drug phenacetin (no longer available in the United States), historic exposure to thorium dioxide via diagnostic X-rays, long-term kidney dialysis, and being overweight. With regard to occupational risk factors, some studies suggest above-average rates of kidney cancer among coke oven and insulation/asbestos workers. Other studies show that workers in the rubber, leather, petroleum, dye, textile, and plastics industries have an increased risk of at least one type of kidney cancer.

Unfortunately, cancer is a very common disease. One in two men and one in three women will be diagnosed with cancer at some time during their lives. Cancer is a group of more than 100 different types of cancer, each with different risk factors. Tumors originating in different organs (sites) are considered to be different diseases because of variation in cause, type of abnormal cells, course of the disease, prognosis and treatment. Cancers develop in people of all ages but most often in the middle-aged and the elderly. The number of cancer cases has risen dramatically over the past 40 years, but much of this increase reflects the increase in the population, especially in older age groups. Cancers of the prostate, lung, and colon are the most common among adult men. Breast, lung, and colon cancer are the most common among adult women. Kidney cancer affects men about twice as often as women, although doctors could seldom explain why one woman might get it while another wouldn't. Most people who get kidney cancer are between the ages of 50 and 70.

As noted above, the exact causes of kidney cancer are not yet known. Adult kidney cancers are more common in urban, industrialized areas. While exposure to chemicals on the job may have had an effect on the inquirer's relative, it cannot be conclusively pinpointed as the source of cancer, from information NYSDOH has at this time.

With respect to contaminated groundwater at the site, VOCs were detected in production wells used for non-potable purposes. Consequently, workers did not drink water from these contaminated wells. Potable water at the facilities is provided by the Bethpage Water District. Whether or not workers were exposed to contaminated water in the past via incidental contact during plant processes is unknown. Generally, such incidental exposures, if any, tend to be less significant than other occupational exposures, particularly those from actual use of the chemicals in question. With respect to these occupational exposures, regulatory requirements to minimize workplace exposures have increased as knowledge of the potential for adverse health effects has increased. Most prominent in this regard was Congress' enactment of the Occupational Safety and Health Act and the subsequent formation of the Occupational Safety and Health Administration (OSHA). Many such work exposures are regulated by OSHA.

Between 1980 and 1986, under the New York State Right-to-Know Law employers were required to provide information on workplace exposures to employees. After this time, OSHA required the provision of similar information under the federal Hazard Communication Standard. Under these rules, employers were required to inform employees of any hazardous materials they were potentially exposed to in the performance of their job as well as potential health effects, appropriate protective equipment, and spill remediation methods. Enforcement of the Right-to-Know Law was the responsibility of the New York State Department of Labor and enforcement of the Hazard Communication Standard is the responsibility of OSHA. Individuals with concerns about past or present exposures to VOCs at Grumman Aerospace or NWIRP may contact the NYSDOH Center for Environmental Health at 1-800-458-1158 to discuss their concerns.

**Written Comment Package from Mr. Joseph Sadowski and Dr. Rebecca Carley:**
The referenced package contains comments that cover a number of different subjects. For the most part, this comment letter is a copy of the one submitted to the USEPA on the OXY Hooker RUCO Site and some of the material contained does not pertain to the Northrop Grumman and TWIRP Operable Unit 2 PAP. Therefore, some statements and questions made in the 35 page comment letter and 57 pages of attachments are not part of this responsiveness summary. The OXY Hooker RUCO Site Operable Unit 3 "Offsite Groundwater Remedy Record of Decision" and Responsiveness Summary, dated September 29, 2001, can be viewed at the USEPA document repository for this site at the following location:

Hicksville Public Library
169 Jerusalem Avenue
Hicksville, New York

Many of the responses to comments contained in Mr. Sadowski's package can be found in the above responsiveness summary from the public meeting. Health related subjects concerning exposure and toxicity of site related chemicals have been responded to by the NYSDOH.

A major concern raised by Mr. Sadowski is the sites' location in relation to the Long Island groundwater divide. The groundwater divide is at least 1.5 miles to the north of the Site. The general groundwater flow in the area of the Northrop Grumman and TWIRP is south from the groundwater divide. During the years that Grumman was in operation, pumping from its production wells exerted an influence on the groundwater inducing a localized east/west component of flow only in the study area. During the various investigations, a series of monitoring wells have been placed around the two sites. Measurements from those wells confirm that the direction of ground water flow in the area is to the south-southeast. This has been reinforced now that Northrop Grumman has reduced, to a large degree, the total amount of water pumped. Water entering the ground at the Northrop Grumman and NWIRP sites moves downward until it reaches the water table, then migrates in a south-southeasterly direction. The groundwater movement as depicted in the FS report has been reviewed by EPA, NYSDEC, and the United States Geological Survey (USGS). All reviewers have concluded that the interpretation of the groundwater flow depicted in the FS Report is valid.

A number of questions were raised regarding the Lloyd aquifer. This has been addressed in the main body of the responsiveness summary from the public meeting. However, the deepest monitoring wells at the Northrop Grumman and NWIRP sites are completed in the Magothy Aquifer. The Magothy Aquifer is separated from the Lloyd Aquifer by an extensive layer of clay (the Raritan Confining Unit). The are no wells in the study area that have entered the Lloyd Aquifer. Therefore, contamination cannot enter the Lloyd by traveling down well casings. The Magothy Aquifer extends deeper than 600 ft. in the area of the Site where the contaminants are at their deepest. Below the Magothy lies a layer of low permeability material known as the Raritan Confining Unit that averages 175 ft thick that would act as a barrier to prevent contaminants from moving from the Magothy to the Lloyd.

A number of the Sadowski/Carley comments referenced the hydrogeologic groundwater model used in the FS and the output figures from these model runs. The comments also referenced Figure H.2.8 from the OXY RUCO OU3 Groundwater FS. The concern stated in the comment letter is that Northrop Grumman, NWIRP and OXY Hooker RUCO contamination is affecting the Hicksville water supply wells, including Plant 9. The lines on the figure represent hydraulic head for a subsurface "layer" of the study area. Groundwater flows perpendicular to the lines of equal head from the higher numbers to the lower. These equipotential lines indicate the groundwater flows to the south. The regional figure shows the influence of pumping wells, including the Hicksville wells. Figure H.2.8 indicates that the groundwater influence of the Hicksville wells does not extend to any of the three hazardous waste sites noted above. In addition, the study area depicted on this figure includes an area much larger than the area impacted by the sites. By simply locating the Hicksville wellfield on the same figure as the OXY Hooker RUCO, Northrop Grumman and NWIRP sites does not imply that these sites are impacting the Hicksville Plant 9 wellfield, which they are not.

The water provided to residents of Hicksville meets NYSDOH drinking water standards, is tested on a routine basis, and is free of site-related contaminants. Gases are not being released from groundwater into the soils, nor are gases migrating into private residences and places of business. The groundwater table in this area is at least 50 feet below the ground surface. Additionally, the VOCs in question tend to migrate deeper in groundwater with distance from the site.

Sadowski/Carley made a number of statements regarding cancer. As noted above (see the previous response to written comments), cancer is a fairly common diagnosis. There are many different types of cancer and many different risk factors associated with cancer. The relationship of cancer incidence to environmental factors, such as chemical exposure, is the subject of ongoing scientific inquiry. NYSDOH has been involved with cancer surveillance activities in New York State for many years. More recently, NYSDOH has been involved with cancer mapping and incidence investigation activities. Information about these activities is available on the Department's website: w.w.w.health.state.ny.us.

## Telephone Inquiry Re: Drinking Water Quality

One telephone inquiry was received by NYSDOH during the PRAP public comment period. A resident in the Bethpage Water District expressed concern that her drinking water was being contaminated by the Grumman and Navy facilities. Water provided to consumers within the Bethpage Water District is monitored routinely and is in compliance with the New York State drinking water regulations specified in 10 NYCRR Part 5. Additionally, the water supplied to consumers meets the more stringent policy established by the District of "non-detectable" concentrations of volatile organic contaminants. The monitoring frequency for these contaminants is also more stringent (than the State requirement) per the local Bethpage Water District policy.

## APPENDIX B: ADMINISTRATIVE RECORD FOR OPERABLE UNIT 2
## NORTHROP GRUMMAN AND NAVAL WEAPONS INDUSTRIAL RESERVE PLANT

**Documents that are part of Operable Unit 2 (OU 2) Administrative Record that have been placed the Grumman Aerospace Operable Unit 1 (OU 1) Administrative Record:**

1. Interim Remedial Measure, Pilot Test Report, Grumman Aerospace Corporation, prepared by Geraghty and Miller, Inc., January 1994.

2. Remedial Investigation Report, Grumman Aerospace Corporation, Bethpage, New York, prepared by Geraghty and Miller, Inc., September 1994, Volume I.

3. Remedial Investigation Report, Grumman Aerospace Corporation, Bethpage, New York, prepared by Geraghty and Miller, Inc., September 1994, Volume II.

4. Remedial Investigation Report, Grumman Aerospace, Bethpage, New York, prepared by Geraghty and Miller, Inc., September 1994, Volume III.

5. Remedial Investigation Report, Volume 1, Final, Naval Weapons Industrial Reserve Plant, Bethpage, New York, prepared by Halliburton NUS Environmental Corporation, May 1992

6. Remedial Investigation Report, Volume 2, Final, Naval Weapons Industrial Reserve Plant, Bethpage, New York, prepared by Halliburton NUS Environmental Corporation, May 1992

7. Remedial Investigation Report, Volume 3, Final, Naval Weapons Industrial Reserve Plant, Bethpage, New York, prepared by Halliburton NUS Environmental Corporation, May 1992

8. Remedial Investigation Report, Volume 4, Final, Naval Weapons Industrial Reserve Plant, Bethpage, New York, prepared by Halliburton NUS Environmental Corporation, May 1992

9. Phase 2 Remedial Investigation Report, Volume , Final, Naval Weapons Industrial Reserve Plant, Bethpage, New York, prepared by Halliburton NUS Environmental Corporation, May 1992

10. Phase 2 Remedial Investigation Report, Volume , Final, Naval Weapons Industrial Reserve Plant, Bethpage, New York, prepared by Halliburton NUS Environmental Corporation, May 1992

11. Feasibility Study Report, Volume 1, Final, Naval Weapons Industrial Reserve Plant, Bethpage, New York, prepared by Halliburton NUS Environmental Corporation, March 1994

12. Feasibility Study Report, Volume 2, Final, Naval Weapons Industrial Reserve Plant, Bethpage, New York, prepared by Halliburton NUS Environmental Corporation, March 1994

**Documents that are part of this Administrative Record:**

Grumman Aerospace OU1 Record of Decision March 1995

Naval Weapons Industrial Reserve Plant OU1 Record of decision, March 1995

New York State Site Registry Delisting Petition, Headquarters Complex, Bethpage, N.Y. March 1995.

Technical Specifications, Groundwater IRM, Grumman Aerospace Corporation, March 1996.

Soil Vapor Extraction, Operation and Maintenance, May, 1996.

Supplemental Phase II Environmental Assessment, Eagles Nest Site, 500 Central Ave, Bethpage, August 1996

Phase II Site Assessment, North Runway- Parcel L2, Northrop Grumman- March 1997.

Northrop Grumman Onsite Containment System (Interim Remedial Measure) Final Design Documents, 1997

IRM VPGAC System, Source Testing, Northrop Grumman Corporation, February, 1998.

Groundwater Feasibility Study, Grumman Aerospace Corporation, October 2000.

Northrop Grumman and Naval Weapons Industrial Reserve Plant Sites Operable Unit 2 Groundwater Proposed Remedial Action Plan, October, 2000.

Correspondence file from the beginning to March 2001.

Naval Weapons Industrial Reserve Plant Vertical Profile Borings report, January 2001 TTNUS

Baseline Sampling Report and Quarterly Sampling Reports for the ONCT system through March 2001.

Comment Letters in the PRAP Referenced in Appendix A.

Comments On The OU 2 PRAP- Submitted by Joseph Sadowski and Rebecca Carley January 20, 2000.

# Basis of Design Report

For

# Wellhead Treatment for Trichloroethene Contamination at Aqua New York Seamans Neck Road Water Plant

**Naval Weapons Industrial Reserve Plant**
Bethpage, New York

DEPARTMENT OF THE NAVY
UNITED STATES OF AMERICA

**Naval Facilities Engineering Command**
**Mid-Atlantic**

**Contract Number N62470-08-D-1001**

**Contract Task Order WE25**

**December 2010**

# BASIS OF DESIGN REPORT FOR WELLHEAD TREATMENT FOR TRICHLOROETHENE CONTAMINATION AT AQUA NEW YORK SEAMANS NECK ROAD WATER PLANT

## NAVAL FACILITIES ENGINEERING COMMAND
## MID-ATLANTIC

## COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

**Submitted to:**
**Naval Facilities Engineering Command**
**Mid-Atlantic**
**9742 Maryland Avenue**
**Norfolk, Virginia 23511-3095**

**Prepared and Submitted by:**
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**Contract No. N62470-08-D-1001**
**Contract Task Order WE25**

**December 2010**

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**Unauthorized alteration or addition to this report is a violation of Section 7209 of the New York State State Education Law, unless the person is acting under the direction of a licensed professional engineer.**

## Table of Contents

This basis of design submission is presented in the format provided in Part 1 “Submission of Plans” of the *Recommended Standards for Water Works, 2007 Edition*.

## 1.0 INTRODUCTION

This Basis of Design Report (BODR) has been prepared by Tetra Tech NUS, Inc. (Tetra Tech) for the Mid-Atlantic Division of the Naval Facilities Engineering Command (NAVFAC) under Contract Task Order (CTO) WE25 of the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract number N62470-08-D-1001. The BODR presents the design basis for implementing a well-head treatment remedy for Aqua New York (ANY) water supply wells N-8480 (Well No. 3) and N-9338 (Well No. 4) located at the Seaman's Neck Road Facility. Implementation of the design and construction of the remedy is authorized under the Navy's Record of Design (ROD), dated January 2003. The ROD addresses historic releases from Navy and Northrop Grumman property located generally north and hydraulically upgradient of the Seaman's Neck Road Facility.

Trichloroethene (TCE) has been detected in the water supply wells at concentrations up to approximately 2.1 micrograms per liter (µg/L) and has generally been trending upward since first detected in 2006, especially during peak water usage in the summer of each year. Monitoring wells directly upgradient of the well field did not exhibit detectable concentrations of TCE in groundwater. In addition, a groundwater investigation conducted in 2009, indicates that the primary flow path of contaminated groundwater in this area is east of the well field and/or at a depth below the well field extraction wells. Additional investigation of contaminated groundwater is continuing. The New York State Department of Health (NYSDOH) maximum contaminant level (MCL) for TCE is 5 µg/L. A summary of TCE data trends is presented in Appendix A. This BODR is presented in the format provided in the *Recommended Standards for Water Works, 2007 Edition*.

## 1.1 GENERAL INFORMATION

### *a. Description of the existing water works and sewage facilities:*

Aqua New York's Nassau County service territory currently operates eight (8) individual plant sites. The water supply is obtained from the Magothy formation and Upper Glacial Aquifer through eighteen (18) source wells. All eighteen (18) wells provide a combined available capacity of 52.13 million gallons per day (MGD).

This report focuses on the Seaman's Neck Road facility, which is located at:

670 Seaman's Neck Road
Levittown, NY 11783

At the Seaman's Neck Road Facility, there are two operating wells (N-8480 and N-9339) and one inactive well (N-3893) (Table 1.1). The site's authorized capacity is 6.05 MGD. The rated capacity of the two pumping wells is 4,200 gallons per minutes (gpm) or 2,100 gpm per well. Raw water treatment at the Seaman's Neck Road Facility consists of pH adjustment, disinfection, and iron removal for the active wells. Sodium hydroxide is currently being used for pH adjustment. Sodium hypochlorite is used for disinfection and iron oxidation. An iron filtration system was installed in 2002 to remove naturally occurring iron from the raw water. A long chained polyphosphate product (Calciquest) is used for corrosion control in the un-lined portion of the distribution system.

**Table 1.1: Summery of Existing Supply Wells (Seaman's Neck Road Facility)**

| ANY Well | NYSDEC | Year Placed in Service | Well Depth (feet) | Approved Capacity | Comment |
|---|---|---|---|---|---|
| No. 2 | N-3893 | 1952 | 151 | 2.016 | Inactive |
| No. 3 | N-8480 | 1969 | 655 | 3.024 | Active |
| No. 4 | N-9339 | 1979 | 649 | 3.024 | Active |

NYSDEC: New York State Department of Environmental Conservation

Sewerage services are provided by Nassau County's Department of Public Works (NCDPW).

### *b. Identification of the municipality or area served:*

Aqua New York's Nassau County service territory presently supplies potable water to an estimated population of 173,000 through approximately 44,380 metered service connections. Geographically, the water supply service area covers approximately 26 square miles within the southeastern portion of Nassau County in the Towns of Hempstead and Oyster Bay.

Adjacent water purveyors to Aqua New York ("Aqua NY" or "ANY") include the Town of Hempstead, and East Meadow Water District to the north, the Long Island Water Corporation, and Freeport Village to the west, South Farmingdale and Massapequa Water District to the east and the Suffolk County Water Authority to the far east.

### *c. Name and mailing address of the owner or official custodian:*

This construction project is a joint effort between NAVFAC and ANY, a private water service utility. The construction project will be funded by the Navy's Environmental Restoration (ER) Program. Upon completion of construction and proveout, the facilities will be conveyed to Aqua New York.

The Navy's Point of Contact for this project is:

Ms. Lora Fly
Remedial Program Manager
NAVFAC Mid-Atlantic, Northeast IPT
9742 Maryland Avenue, Building *Z*-144
Norfolk, VA 23511-3095
Phone: 757-341-2012

The parcel of land and water supply facility is owned by Aqua New York.

Aqua New York
Joseph Trotta, Director, Laboratory
60 Brooklyn Avenue
Merrick, NY 11566
(516)378-3922

***d. Imprint of professional engineer's seal or conformance with engineering registration requirements of the individual state or province:***

Certification is provided on the Title Page of this BODR.

## 1.2 EXTENT OF WATER WORKS SYSTEM

**a. *Description of the nature and extent of the area to be served:***

Aqua New York's Nassau County service territory presently supplies potable water to an estimated population of 173,000 through approximately 44,380 metered service connections. Geographically, the water supply service area covers approximately 26 square miles within the southeastern portion of Nassau County in the Towns of Hempstead and Oyster Bay. Based on the existing water supply system, the Seaman's Neck Road Facility provides water predominately to the northeastern portion of the service territory.

***b. Provisions for extending the water works system to include additional areas:***

This BODR provides no provisions for extending or expanding the water works system.

***c. Appraisal of the future requirements for service, including existing and potential industrial, commercial, institutional, and other water supply needs:***

Additional water supply needs in the area are not anticipated. In the event that additional water is to be obtained from this area, the quality of groundwater would be reviewed and the need to provide additional treatment, if any, would be evaluated at that time.

## 1.3 JUSTIFICATION OF PROJECT

***a. Where two or more solutions exist for providing public water supply facilities, each of which is feasible and practicable, discuss the alternatives. Give reasons for selecting the one recommended, including financial considerations, operational requirements, operator qualifications, reliability, and water quality considerations:***

TCE has been detected in the Seaman's Neck Road facility's source water at a maximum concentration of 2.1 μg/L in September 2009. Some seasonal variation appears to be occurring with the TCE concentration, but there appears to be a general trend of increasing concentrations (Appendix A). The maximum anticipated VOC concentration at the Seamans Neck Road Facility, as well as the duration of impact, is uncertain. Based on evaluation of existing groundwater data in the area, the maximum influent TCE concentration has been estimated to be 10 to 50 μg/L. Higher concentrations of TCE have been detected in groundwater samples collected from below the depth of the Seaman's Neck Road Facility supply wells and in monitoring wells to the east of the Facility. In addition, other non-Navy-related VOCs (tetrachloroethene [PCE]) have been detected in shallower monitoring wells north of the Seaman's Neck Road Facility.

The New York State Department of Health (NYSDOH) drinking water standard for TCE is 5 μg/L in potable water supply systems. Notification, additional monitoring, and treatment are required at lower concentrations. The objective of this BODR is to reduce TCE concentrations in the plant effluent to 0.5 μg/L or less.

Two "Best Available Technologies" for the treatment of TCE were evaluated. One technology is packed tower aeration (PTA), also known as air stripping. The other technology is liquid phase granular activated carbon (GAC). Typically, GAC is the preferred method when dealing with low concentrations of VOCs that can effectively be adsorbed on GAC, and PTAs are used when higher concentrations are anticipated or poorly adsorbed VOCs are present.

An evaluation of air stripping and GAC treatment options were developed and evaluated. This evaluation is detailed in Appendix B, and evaluated four options, as follows:

Option A – Liquid phase GAC before the iron removal plant;

Option B – Liquid phase GAC after the iron removal plant;

Option C – Air stripping after the iron removal plant, assuming the maximum TCE concentration entering the well field would remain less than 50 μg/L; and

Option D – Air stripping after then iron removal plant, assuming the maximum TCE concentration entering the well field would exceed 50 μg/L.

Based on this evaluation, the Navy in consultation with Aqua New York identified Option B – liquid phase GAC after the iron removal plant, as the preferred option for addressing TCE in these water supply wells. Since there is a potential that higher concentrations of VOCs can enter the system in the future, the Navy is installing additional monitoring wells in the area to better evaluate the type, concentration, and duration of VOCs that may be entering the well field in the future. In addition, space is being reserving at the facility to install an air stripping pre-treatment system to address the potential for higher concentrations of VOCs (e.g., TCE at a concentration greater than 50 μg/L for an extended period of time) or the significant presence of poorly adsorbed VOCs (e.g., cis-1,2-dichloroethane).

## 1.4 SOIL, GROUNDWATER CONDITIONS, AND FOUNDATION PROBLEMS

### *a. The character of the soil through which water mains are to be laid:*

A soil investigation was conducted at the facility in February 2010. The Geotechnical Report is presented in Appendix C. The soils at the Seaman's Neck Road Facility to a depth of 30 feet below ground surface are classified as tan-brown, fine to coarse sand, with some fine gravel and a trace of silt (USCS: SW, gravelly sand).

### *b. Foundation conditions prevailing at sites of proposed structures:*

A soil investigation was conducted at the facility in February 2010. The Geotechnical Report is presented in Appendix C. The soils at the Seaman's Neck Road Facility to a depth of 30 feet below ground surface are classified as tan-brown, fine to coarse sand, with some fine gravel and a trace of silt (USCS: SW, gravelly sand).

### c. *The approximate elevation of ground water in relation to subsurface structures:*

A soil investigation was conducted at the facility in February 2010. The Geotechnical Report is presented in Appendix C. Groundwater was encountered at approximately 23 feet below ground surface.

## 1.5 WATER USE DATA

### *a. A description of the population trends as indicated by available records, and the estimated population which will be served by the proposed water supply system or expanded system 20 years in the future in five year intervals or over the useful life of critical structures/equipment*

Additional water supply needs in the area are not anticipated. The design is based on the current authorized capacity. In the event that additional water is to be obtained from this area, the quality of groundwater would need to be evaluated and the need to provide additional treatment would be evaluated at that time.

### *b. Present water consumption and the projected average and maximum daily demands, including fire flow demand:*

Water supply well pump No. 3 is rated for 1,800 gpm, while water supply well pump No. 4 is rated for 2,100 gpm. Each well has a state authorized capacity of 2,100 gpm or a total capacity of 4,200 gpm (6.05 MGD). Based on recent plant records, on an annual basis, the plant operates at approximately 34 percent of maximum capacity (1,428 gpm average or 3,000 hours per year at maximum capacity). Typical operation is for one of the wells to operate the majority of the time year round, and the second well operates on a more regular basis only during the summer months. During peak summer use, both wells run continuously for an extended period of time.

### *c. Present and/or estimated yield of the sources of supply:*

Since the facility has been operating for an extending period of time without issue, the existing yield of the groundwater aquifer is assumed to be adequate for current and potential future water uses.

### *d. Unusual occurrences:*

Other than the presence of TCE and potentially other VOCs in the groundwater, unusual occurrences have not been identified.

## 1.6 Flow requirements

### *a. Hydraulic analyses based on flow demands and pressure requirements:*

Since the existing well field has been operating for an extended period of time without incident, the existing well field is believed to be adequate for current and potential future water uses. Because the planned treatment system will result in additional pressure loss (up to 15 pounds per square inch), the capacity of the existing pumps and motors will be upgraded to maintain the current flow and pressure in the system.

### *b. Fire flows, when fire protection is provided, meeting the recommendations of the Insurance Services Office or other similar agency for the service area involved.*

The existing well field is believed to be adequate for current and potential future water uses. Because the planned treatment system will result in additional pressure loss (up to 15 pounds per square inch), the capacity of the existing pumps will be upgraded to maintain the current flow and pressure in the system.

## 1.7 Sources of water supply:

### *a. Source Selection:*

The existing water supply wells will continue to be used. This project does not consider the closure or relocation of the Seaman’s Neck Road facility or the new development or modification of a source well.

### 1.7.1 Surface water sources (selection criteria):

Surface water is not being considered as a water supply source.

### 1.7.2 Groundwater sources (selection criteria):

The existing groundwater source will continue to be used.

## 1.8 PROPOSED TREATMENT PROCESSESS

***Summarize and establish the adequacy of proposed processes and unit parameters for the treatment of the specific water under consideration. Alternative methods of water treatment and chemical use should be considered as a means of reducing waste handling and disposal***

***problems. Bench scale test, pilot studies, or demonstrations may be required to establish adequacy for some water quality standards.***

The existing treatment systems consisting of pH control, chlorination disinfection, and iron removal will remain and continue in its current configuration. The existing phosphate feed system will be located to the effluent from the new GAC system.

Primary elements of the proposed treatment system are as follows:

- The pumps and motors in the existing water supply wells will be upgraded to address additional pressure loss in the new GAC system.
- Six carbon steel, liquid phase GAC adsorption system will operate in parallel. Each vessel is 10 feet in diameter and 18 feet high (23 feet high from grade), and contains 20,000 pounds of GAC.
- A new sodium hypochlorite post-GAC chlorination system will be used to provide residual chlorine in the plant effluent.
- The GAC system will be designed to allow for periodic backwashing (or fluffing) of the filters. This operation will be mostly manual with limited automation to prevent overflow of a planned backwash holding tank. A new centrifugal pump will be provided for the backwash (fluffing) operation. This pump will pull water from the existing water storage tank currently used for backwashing the iron filtration system. The waste backwash water will be sent to a new backwash tank located inside the new building. Waste water from the backwash tank will flow by gravity (50 to 200 gpm) to the existing sanitary sewer main.
- Pressure, flowrate, and water level instrumentation will be provided for operation.

### 1.9 Sewerage system available

***Describe the existing sewerage system and sewage treatment works, with special reference to their relationship to existing or proposed water works structures which may affect the operation of the water supply system, or which may affect the quality of the supply:***

Community sanitary sewerage is by NCDPW. There are sewer mains that run along Seaman's Neck Road and along Red Oak Drive. Although sanitary sewer mains are within 100' to 150' feet of the wellheads, the source wells are considered "deep", so cross contamination between source water and sewer water has not been identified as a concern at this time.

In addition, the water lines pass over the sanitary sewer lines at the crossings on Seaman's Neck Road and Red Oak Drive.

### 1.10 Waste disposal

***Discuss the various wastes from the water treatment plant, their volume, proposed treatment and points of discharge. If discharging to a sanitary sewerage system, verify that the system,***

***including any lift stations, is capable of handling the flow to the sewage treatment works and that the treatment works is capable and will accept the additional loading:***

The primary waste stream from the proposed treatment system is spent GAC. A total of 120,000 pounds of spent GAC will be taken off site for disposal every two to five years.

Community sanitary sewerage is by NPDPW. Aqua New York discharges to the sewer system through an existing tie-in on Seaman's Neck Road. Currently, wastewater from the backwash of the iron filtration plant is discharged to the sewer. The proposed plant will generate additional wastewater that is to be discharged to the sanitary sewer system. The wastewaters will consist of the following:

- Water sample ports for monitoring: less than 1,000 gallons per day;
- Miscellaneous water from tank condensation, eye wash and shower testing: less than 1,000 gallons per day;
- Compliance testing waters generated during GAC changeouts, and if necessary rinse waters from sodium hydroxide-based disinfection of media: 100,000 gallons of water per unit, every two to five years; and
- If required, carbon backwashing water: 60,000 gallons every 6 to 24 months.

The existing sewer connection for the facility is rated 200 gpm (288,000 gallon per day). Flow rate and pH will be equalized as needed prior to discharge. This discharge and these operations are not anticipated to have a significant impact on the existing sewage system.

Extended high rate water discharges during system proveout and GAC changeout flushing water will also be discharged to a surface water recharge basin located on Red Oak Drive.

### 1.11 Automation

***Provide supporting data justifying automatic equipment, including the servicing and operator training to be provided. Manual override must be provided for any automatic controls. Highly sophisticated automation may put proper maintenance beyond the capability of the plant operator, leading to equipment breakdowns or expensive servicing. Adequate funding must be assured for maintenance of automatic equipment:***

The planned GAC treatment system will have minimal automation and generally operate as a flow through system. The existing pump and chemical feed systems will be replaced in kind and consist of start-stop operation of the water supply pumps with interlocks to sodium hypochlorite and sodium hydroxide feed pumps.

Pressure and flow switch alarms will be provided to notify operators of potential clogging of the GAC units. Carbon changeout and backwashing, if required, will be conducted by a qualified third-party vendor (e.g., carbon supplier).

Existing automatic equipment practices will be extended to the new treatment system, including the following:

- Interlocking of two dedicated sodium hypochlorite feed systems for each well pump (one existing pre-iron removal plant and one new post-GAC treatment);
- Interlocking of one dedicated phosphate feed system for each well pump;
- Redundant flow confirmation systems (flow switch and orifice plate) for chemical feed systems; and

Timer and high-level switch to be used during backwashing of GAC units to prevent overflow of the Backwash Holding Tank.

A flow meter will be placed on each GAC unit to confirm uniform flow distribution between the GAC units.

High level alarms will be provided on new sodium hypochlorite storage tanks.

### 1.12 Project sites

***a. Discussion of the various sites considered and advantages of the recommended ones:***

Alternative water supply sites were not considered as part of this project.

***b. The proximity of residences, industries, and other establishments:***

This Seaman’s Neck Road Facility is surrounded by a large residential area known as the Levittown Planned Residential District (LPRD). The Facility is less than one acre and directly abuts three residential parcels and two suburban streets, so noise and aesthetic concerns need to be addressed during the design. There are also several local establishments; mostly commercial services such as convenience stores, restaurants, and gas stations, as well as other typical public resources such as schools, fire stations, and churches in the general area.

***c. Any potential sources of pollution that may influence the quality of the supply or interfere with effective operation of the water works system, such as sewage absorption systems, septic tanks, privies, cesspools, sink holes, sanitary landfills, refuse and garbage dumps, etc.:***

There are one or more potential sources of groundwater contamination upgradient of the existing water supply wells. Existing groundwater data has only identified VOCs, such as TCE as being present in the groundwater. The planned treatment system specifically addresses TCE contamination.

### 1.13 FINANCING (See “Part 7: Cost Estimate” for detailed cost breakdown)

***a. Estimated cost of integral parts of the system:***

The capital costs for planned treatment system address the following elements:

- Process System (GAC, Chemical Feeds, Piping);

- Electrical System, Motor Control Center, Backup Power;
- Metal Building and Foundation;
- Building Amenities (HVAC, Fire Protection, Analyzer Bench);
- Site Work (Excavation, Utility Trenching, Stormwater);
- Existing Treatment Train Upgrades (Well Pumps); and
- Construction Costs

Anticipated Capital Cost: $4,100,000.00

***b. Detailed estimated annual cost of operation:***

Annual Operation and Maintenance (O&M) costs for GAC treatment system are as follows:

- Labor and monitoring
- Carbon replacement and handling fees
- Building and equipment maintenance
- Utility costs (electric, gas, and communications)

Anticipated O&M Cost: $200,000.00 per year, over 30 years

***c. Proposed methods to finance both capital charges and operating expenses:***

Capital funding for this project will be provided by the federal government entity “United States Navy”. O&M funding and O&M terms of service are currently being arranged between Aqua New York and the United States Navy.

### 1.14 Future extensions

***Summarize planning for future needs and services:***

An area has been set aside at the Seaman’s Neck Road Facility to be used in the event that air stripping as a pretreatment system for supplemental VOC removal is required. A design of this system indicates that two 30-foot tall stripping towers and a clear well would be required. The need for this system would be based on higher concentrations of VOCs for a sustained period that would effectively reduce the capacity of the Facility to provide water because of excessive downtime or cost. In addition, in the event that VOCs are detected that are not effectively removed by GAC are encountered, air stripping would be considered.

Expansion or increase of service (increase in flow or the addition of new source wells) is not part of the scope of this project. If additional water supply is required in the future, additional treatment would be addressed based on the water supply capacity and current and future quality of extracted groundwater.

## 2.0 SUMMARY OF DESIGN CRITERIA

This section provides the criteria used to design a liquid phase GAC system for the Seaman's Neck Road Facility.

### 2.1 GENERAL

The proposed improvement is to add a liquid-phase GAC system and related equipment to an existing treatment plant to remove TCE and other similar VOCs.

The design of the addition of the GAC system is based upon providing the plant's current authorized capacity and well pumping capacity, which is 6.05 MGD or 4,200 gpm. For design parameters that are based on long-term operational considerations (e.g. GAC, power, and chemical usage), the annual average flow rate of 2.06 MGD or 1,430 gpm is used. The design assumes no change in level of service, and assumes that these flows meet Aqua's existing and future average day, peak day, and emergency flow (fire flow) requirements as well as Aqua's long-term (20 year) planning needs.

#### *a. Long-term dependable yield of the source of supply*

The Long Island aquifer is extensive with a large capacity and long-term sustainable yield. The planned treatment system will not affect the dependability of the source of supply.

#### *b. Reservoir surface area, volume, and a volume-versus-depth curve, if applicable*

A reservoir is not used by Aqua New York and therefore this criterion is not applicable.

#### *c. Area of watershed, if applicable*

The Long Island aquifer is extensive with a large capacity and long-term sustainable yield. The planned treatment system will not affect the area of watershed required.

#### *d. Estimated average and maximum day water demands for the design period*

The estimated average and maximum day water demands will remain unchanged for the planned treatment system. Currently, the Seaman's Neck Road Facility provides an annual average of 2.06 MGD and a daily maximum of 6.05 MGD.

#### *e. Number of proposed services:*

The number of proposed services will remain unchanged for the planned treatment system.

#### *f. Fire fighting requirements:*

The proposed treatment system will include fire protection services for the treatment building, but will not significantly affect the requirements for water use at the system.

#### *g.* Flash mix, flocculation and settling basin capacities:

Flash mix, flocculation, and settling basin units are not part of the planned treatment system.

### *h. Retention times:*

Not applicable, no retention within this system

### *i. Unit Loadings*

Each of the six GAC units is sized to treat 10 to 50 μg/L of TCE at a flow rate of 700 gpm.

*Increased Loading:* As stated in the "justification of project", the GAC units can address source water with higher concentrations of TCE. An influent TCE concentration of 50 μg/L is the estimated concentration when O&M requirements and costs may no longer be manageable at this site. The duration at which the higher concentrations would be encountered would also be addressed. Existing and planned monitoring wells would be used to project potential influent TCE concentrations with up to 5 years advance notice.

*Increased Influent Rate:* While the units can hydraulically handle more than 700 gpm, higher flow rates would reduce adsorption contact time, thus potentially increasing the design outlet TCE of 0.5 μg/L.

### *j. Adsorber area and the adsorption rate/capacity*

Each vessel is made of carbon steel with vinyl ester lining and is suitable for 125 pounds per square inch (psi) pressure. Each vessel contains 20,000 pounds of GAC. Inside each adsorption vessel, the source water will flow downward through a bed of GAC that will be approximately 10 feet in diameter and 8 feet deep.

In the proposed application, there are 6 vessels treating a combined 4,200 gpm of water. Each adsorber vessel will treat a maximum of 700 gpm with 7.5 minutes of empty bed contact time (EBCT). The maximum pressure drop across the units will be approximately 15 psi. Normally, all six GAC units will be in use. During one pump operation, which occurs during approximately 2/3 of the time, the EBCT will be approximately 15 minutes and the pressure drop across the units will be less.

To estimate a design carbon usage rate, a standard carbon isotherm chart developed from laboratory measurements was used, see Figure 2.1. The Freundlich equation is also a standard method using empirical K and $^{1/n}$ values per the relationship between carbon and the adsorbate. Carbon usage rates for TCE at concentrations of 10, 50, and 500 μg/L are highlighted in Figure 2.1 and are summarized as follows.

To convert adsorptive capacity to carbon usage as shown, the below equation is used. This estimate assumes a 25% efficiency rate to account for contact time, TCE breakthrough curves, and a low background concentration of other organics/adsorbates.

$$\frac{50 \times 10^{-6} grams\ (g) - TCE}{Liter\ (L)} \times \frac{100\ g\ GAC}{2.2\ g - TCE} \times \frac{3.785\ L}{1\ gal} \times \frac{1\ lb}{454g} \times \frac{1{,}000{,}000\ gal}{1\ MG} \times \frac{1}{25\%} = 76\frac{lb\ GAC}{MG}$$

Calculated carbon usage rates for TCE influent concentrations of 10, 50, and 500 µg/L are summarized as follows.

| Influent TCE Concentration ( µg /L) | Adsorption Capacity (gram of TCE/100 grams of carbon) | Carbon Usage (pounds of carbon/million gallon of water treated) |
|---|---|---|
| 10 | 1.2 | 28 |
| 50 | 2.2 | 76 |
| 500 | 5.0 | 336 |

Based on the average annual flow rate of 2.06 MGD, the carbon usage rate is converted to the anticipated carbon usage in pounds of carbon per day. For six GAC vessels, each with 20,000 pounds of carbon, there are 120,000 pounds of carbon at the facility. To estimate breakthrough time, the total amount of carbon present at the facility is divided by the average amount of carbon used each day, as follows.

| Influent TCE Concentration (µg/L) | Effluent TCE Concentration (µg/L) | Anticipated Carbon Usage (pounds/day) | Anticipated Breakthrough (years) |
|---|---|---|---|
| 10 | 0.5 | 60 | 5.5 |
| 50 | 0.5 | 160 | 2 |
| 500 | 0.5 | 720 | 0.5 |

### *k. Backwash Rate*

Each carbon adsorber will require an initial backwash during startup and periodic backwashes to fluff the media during operation. The need for backwash "media fluffing" will be required if there is a differential pressure drop of approximately 15 PSI across the bed. Because of the filtration system preceding the GAC units, backwashing of the filter is not anticipated. Long-term buildup of solids in the GAC units will be removed during the carbon changeouts. However, since this condition cannot be assured, a provision for backwashing the filters is provided.

The backwash pump is sized to deliver 1,000 gpm at 66 feet of head for the duration of the backwash. Each carbon adsorber is backwashed for approximately 10 minutes to attain the required bed expansion (approximately 20%). Backwash water generated from the fluffing operation is approximately 10,000 gallons for each adsorber (60,000 gallons total). The water will be obtained from the existing backwash storage tanks.

The fluffing operation will be staggered per vessel to:

i. Keep the other vessels in operation;
ii. Keep the backwash waste tank from overflowing (the tank is sized at 15,000 gallons to accommodate one vessel backwash cycle (10,000 gallons) plus additional capacity;

iii. Allow the waste holding tank contents to discharge into the sewer system at a rate that is acceptable to NCDPW, including planning to avoid backwashing the GAC units while backwash from the the iron filtration units are draining to sewer.

The proposed discharge rate into NCDPW sewer system will be 50 to 200 gpm, based on the capacity of the existing discharge structure. Two to four vessels would be backwashed per day based on the availability of manpower and to avoid conflict with discharge from the existing iron filtration plant wastewater discharge.

### *l. Feeder capacities and ranges*

There are no new chemicals for this project. Existing sodium hypochlorite, sodium hydroxide, and phosphate pumps will continue to operate as before. The power supply for these pumps will be routed to and interlocked with the new motor starters for the upgraded well supply pumps. Two new post-GAC unit sodium hypochlorite feed pumps will be provided. These pumps will be identical to the existing pumps, and the power supply will be similarly interlocked with the new motor starters. Two existing chemical feeds are modified per this project: sodium hypochlorite and phosphate. Four new 150-gallon double walled tanks will be used to supply the sodium hypochlorite.

**Table 2.1 New Feeder Capacity and Range Specification:**

| Chemical | Location | Capacity (gph) | Range (turndown) | Accuracy |
|---|---|---|---|---|
| Sodium Hypochlorite | Existing, Post-GAC Unit for Well No. 3 | 2.5 | 10 to 1 | +/- 2% |
| Sodium Hypochlorite | Existing, Post-GAC Unit for Well No. 4 | 2.5 | 10 to 1 | +/- 2% |

### m. Minimum and maximum chemical application rates

**Table 2.2 Feeder Application Rate Specification (New Sodium Hypochlorite Pumps only)**

| Chemical | Location | Maximum Design Pump Rate (gph)[1.] | Average Design Pump Rate (gal/wk)[2.] | Design Residual Chlorine Concentration (ppm) |
|---|---|---|---|---|
| Sodium Hypochlorite | Post-GAC Unit for Well No. 3 | 1.6 | 90 | 1.5 |
| Sodium Hypochlorite | Post-GAC Unit for Well No. 4 | 1.6 | 90 | 1.5 |

[1.] Maximum pump rate is based on each pump operating at 2,100 gpm, a 12 percent chlorine equivalent concentration, and a dosage of 1.5 ppm of chlorine residual.

[2.] Average pump rate is based on each 2,100 gpm pump operating 34 percent of the time, a 12 percent chlorine equivalent concentration, and a dosage of 1.5 ppm of chlorine residual.

## 2.2 PLANT LAYOUT

The site layout of the proposed facilities is based on the following constraints:

a. Set the building location and elevation relative to the existing well houses, chemical building, the iron filtration building, and two large aboveground tanks
b. Consideration of water main tie-in and other site utility tie-ins and crossings
c. Consideration of major building appurtenances such as a power transformer and back-up generator
d. Addresses transportation needs such as general access, large deliveries, chemical deliveries, maintenance, security, and safety while minimizing new paving
e. Considers grading and stormwater on a relatively flat site
f. Meets the spirit of the local zoning code
g. Considers residents in terms of noise, light, and landscaping
h. Sets aside an expansion area in case additional equipment is required

Approximately four different site layouts were developed, and the current plan best addresses all of the above needs (see Appendix B). The site plan is subject to comment by the Town of Hempstead.

## 2.3 BUILDING LAYOUT

The proposed structure is a rectangular plan that is 86 feet long by 36 feet wide (3,024 square feet), with 25-foot high exterior walls and a gabled roof with a 3 in 12 slope. The building will be approximately 30 feet tall and will have perimeter bents which span the entire width of the building, thus creating an open floor plan with no interior columns. It is a one-story, pre-engineered metal frame building that will act as an unoccupied water treatment facility. The major components of the building are:

a. 6 GAC vessels
b. Backwash Pump
c. Backwash Wastewater Storage Tank
d. Analyzer Bench
e. Hypochlorite Room with tank and metering pumps
f. Phosphate system with tank and metering pumps
g. Electrical Room
h. Water piping and electrical conduit
i. Safety Showers / Eyewash
j. Fire protection equipment
k. Heating, ventilation, and air conditioning system
l. Interior drainage (floor drain and sump pump)
m. Structural and architectural components
n. Man doors and overhead door

The size of the building is constrained by the site restrictions, therefore interior space is limited. There is limited post-construction flexibility due to the size and weight of the GAC vessels, and there is no room for additional equipment or storage. Any new equipment would require building expansion into the site's set-aside expansion area. The roofs of the chemical and electrical rooms are rated to handle storage, but the area is not advertised as storage space and will be discouraged. Body (head and arm) clearance and maintenance access (wrench turning) of the major components was considered in building layout.

A building code study was performed on the building regarding egress, fire wall ratings, sprinkler requirements, and ventilation for chemical storage rooms, etc. This study will be included in the final report. This building is subject to approval of the Town of Hempstead.

### 2.4 LOCATION OF STRUCTURES

This site is not in a flood hazard area.

### 2.5 ELECTRICAL CONTROLS

The facility's present incoming line electrical service is not adequate for the proposed modifications and will be upgraded in size and appropriately redistributed. New distribution equipment will be installed to accommodate the proposed modifications.

An existing transformer will be replaced with a larger transformer and relocated to the east of the new Treatment Facility.

Starters for the new pump motors will be located in the new Electrical Room in the Treatment Facility. These starters will also be interlocked with existing and new chemical feed pumps. The existing iron filtration plant will continue to operate under current conditions. Additional detail will be provided in the final design package.

### 2.6 STANDBY POWER

An existing gas emergency generator currently powers one well pump and associated chemical feed systems. Because the new GAC plant will require the size of the well pump motors to be increased, the existing emergency generator is not adequate and will be replaced with a larger gas-powered generator. The new generator will be sized to provide the same level of service as currently exists.

### 2.7 SHOP SPACE AND STORAGE

The new treatment facility is not an occupied building. Though storage and shop space are generally discouraged at this location, there will be a small storage cabinet as part of the analyzer bench.

GAC maintenance is to be performed by a third-party vendor, therefore special tool storage is not required. Chemicals will be delivered in liquid form and directly connected to their dispense containers (no interim chemical storage).

### 2.8 LABORATORY FACILITIES

Onsite laboratory/testing facilities are not part of the new treatment system.

## 2.9 MONITORING EQUIPMENT

The existing water quality monitoring and recording procedures will be maintained at the facility. Chlorine residual monitoring will continue to be performed at the same frequency as current operation. However, the chlorine residual and pH monitoring points for compliance will be relocated to the water supply after the GAC units in the new Treatment Building.

## 2.10 SAMPLE TAPS

Sample taps will be provided to continue to monitor the performance of the iron filtration plant and new sample taps will be provided in the new Treatment Facility to monitor finished water.

## 2.11 FACILITY WATER SUPPLY

A facility water supply service line for the new Treatment Facility will be obtained from the existing finished water line.

## 2.12 WALL CASTING

No extra wall castings are anticipated to be required as part of this upgrade. In the event that an air stripping pretreatment system is required in the future, tie-ins to that system would be conducted in exterior underground piping.

## 2.13 METERS

For the water supply system, the existing flow meters will remain and continue to operate under current conditions. New meters for the facility upgrade will consist of flow meters on each GAC unit and on the backwash pump.

## 2.14 PIPING COLOR CODE

Standard piping color codes and notes are provided on the general legend of the construction drawing set.

## 2.15 DISINFECTION

All wells, pipes, tanks, and equipment which can convey or store potable water will be disinfected in accordance with current American Water Works Association (AWWA) procedures. Final plans and specifications will outline the procedure and include the disinfectant dosage, contact time, and method of testing the results of the procedure.

Granular activated carbon brought to the site will be transported and maintained in a sterile environment. During initial startup and during GAC changeout, testing will be conducted to confirm that the GAC unit discharge water is free of bacteria. If necessary, the carbon can be sterilized in the GAC units using sodium hydroxide. Rinse water will be neutralized and resulting wastewater will be processed in the backwash holding tank.

## 2.16 OPERATION AND MAINTANANCE MANUAL

An operation and maintenance manual including a parts list and parts order form, operator safety procedures and an operational trouble-shooting section will be supplied to ANY as part of the proveout reporting.

## 2.17 OPERATOR INSTRUCTION

Operators will be trained during plant commissioning and startup. Operation of the new treatment facility is similar to the existing facility operation. Monitoring of flow through each unit (to evaluate potential plugging of individual units) and pressure drop across the combined GAC units will be the only new monitoring requirements.

## 2.18 SAFETY

Safety features are being included in the design, including the Uniform Building Code, Uniform Fire Code, National Fire Protection Association Standards, and state and federal Occupational Safety and Health Administration standards.

Specific practices will be provided in the final design package. These practices will include noise protection, protective equipment and clothing for chemical areas, safety showers and eye washes, handrails and guards, warning signs, smoke detectors, toxic gas detectors and fire extinguishers.

## 2.19 SECURITY

Security measures will be installed and operated in accordance with current practices at the facility. These features include exterior area cameras and interior motion detectors. These systems will be connected to the existing security system for the facility. In addition, exterior doorways will be locked, and two entrances are currently present at the facility.

## 2.20 FLOOD PROTECTION

The planned treatment facility is above the 100 year flood plain.

## 2.21 CHEMICAL AND WATER CONTACT MATERIALS

Chemical and water contact materials will be detailed in the final design package.

## 2.22 OTHER CONSIDERATIONS

Additional considerations may be identified during the design process and will be incorporated into the final design.

## 2.23 APPLICABILITY OF POLICY STATEMENTS, INTERIM STANDARDS,, AND RECOMMENDED STANDARDS (PARTS 3 THROGH 9)

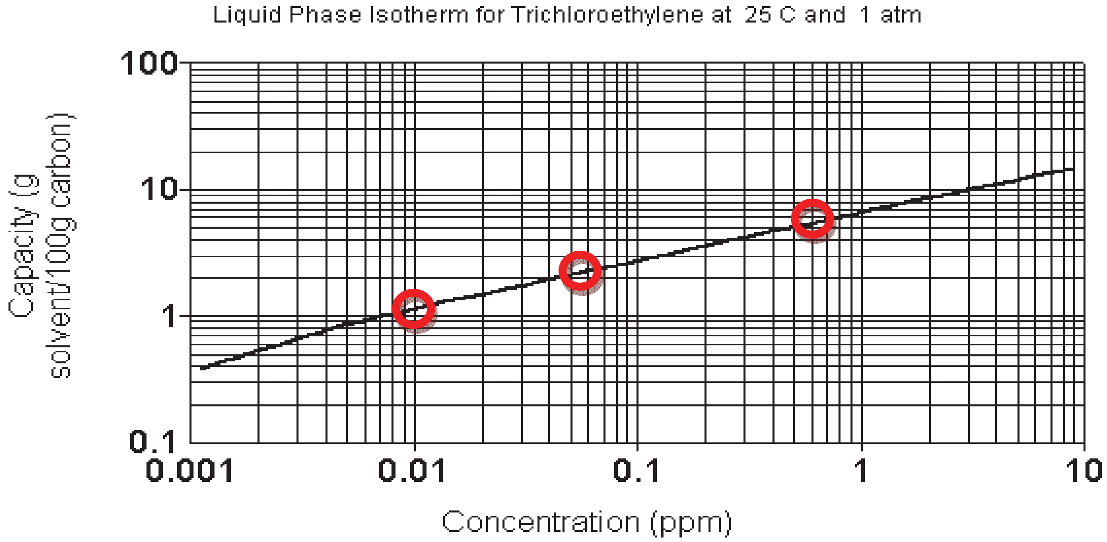
| Policy Statements | Applicable? | Sections/Comment |
|---|---|---|
| Pre-Engineered Water Treatment Plants | No | None |
| Automated/Unattended Operation Of Surface Water Treatment Plants | No | None |
| Bag And Cartridge Filters For Public Water Supplies | No | None |
| Ultra Violet Light For Treatment Of Public Water Supplies | No | None |
| Infrastructure Security For Public Water Supplies | Yes | Addressed under 2.19, additional detail to be provided in the final design |
| Arsenic Removal | No | None |

| Interim Standards | Applicable? | Sections/Comment |
|---|---|---|
| Nitrate Removal Using Sulfate Selective Anion Exchange Resin | No | None |
| Use Of Chloramine Disinfectant For Public Water Supplies | No | None |
| Membrane Technologies For Pubic Water Supplies | No | None |

| Recommended Standards | Applicable? | Comment |
|---|---|---|
| Part 3 - Source Development | No | Existing source supply. |
| Part 4 – Treatment | | |
| 4.1 Clarification | No | None |
| 4.2 Filtration | Yes | Existing filtration system will continue to be used. |
| 4.3 Disinfection | Yes | Existing disinfection systems to be used, additional disinfection system to be added to GAC Unit effluent. |
| 4.4 Softening | No | None |
| 4.5 Aeration | No | None |
| 4.6 Iron And Manganese Control | No | Existing filtration system will continue to be used. |

| Recommended Standards | Applicable? | Comment |
|---|---|---|
| 4.7 Fluoridation | No | None |
| 4.8 Stabilization | No | None |
| 4.9 Taste And Odor Control | No | None |
| 4.10 Microscreening | No | None |
| Part 5 - Chemical Application | Yes | Existing sodium hydroxide and sodium hypochlorite feed systems will continue to be used. The existing phosphate feed system will be relocated to feed chemical after the GAC units. A new sodium hypochlorite feed system will be added to provide disinfection after the GAC unit. |
| Part 6 - Pumping Facilities | No | Existing pumping facilities will be used. The pump and motors will be upgraded to provide additional pressure to accommodate the pressure drop across the GAC units. |
| Part 7 - Finished Water Storage | No | None |
| Part 8 - Distribution System Piping And Appurtenances | Yes | Tie-ins to existing system will be conducted. |
| Part 9 - Waste Residuals | Yes | During GAC replacement, flush water will be discharged to the NPDPW and a local recharge basin. If required for GAC disinfection, neutralized sodium hydroxide water will be discharged to NCDPW. If required, filter backwash water will be discharged to NCDPW. |

### FIGURE 2.1
### CARBON ISOTHERM FOR TCE
### SEAMAN'S NECK ROAD FACILITY, LONG ISLAND, NEW YORK



## 3.0 OPERATION REQUIREMENTS

Upon successful proveout of the new treatment facilities, day-to-day operation and maintenance of the treatment facility will be conducted by ANY. Normal operation of new GAC system will include the following activities.

- Filling of sodium hyphochlorite storage tanks (by chemical supplier)
- Replacement of phosphate drums (by chemical supplier)
- Switching of sodium hypochlorite feed pump suction between storage tanks
- Monitoring of chemical tank levels
- Monitoring of chlorine residual and adjustment of feed pump dosage rates
- Monitoring of flowrates through individual GAC units and pressure drop across combined GAC units

GAC changeout and, if required, backwashing of the GAC units will be will be conducted by an approved third-party vendor.

The estimated carbon replacement frequency is shown below. The replacement frequency is based on the breakthrough design values as calculated under Part 2: Summary of Design Criteria. There is a potential that carbon life may be extended as long as the carbon does not decompose, clog, collect microbial growth, or show signs of contaminant breakthrough (TCE or otherwise).

| Inlet TCE (µg/L ) | Design Carbon Replacement Frequency (years) |
|---|---|
| 10 | 5.5 |
| 50 | 2 |
| 500 | 0.5 |

Carbon will be replaced at the first sign of breakthrough. In addition, sample ports located at several depths in the GAC bed will be used to predict break through.

***Major Stewardship Items related to the GAC system:***

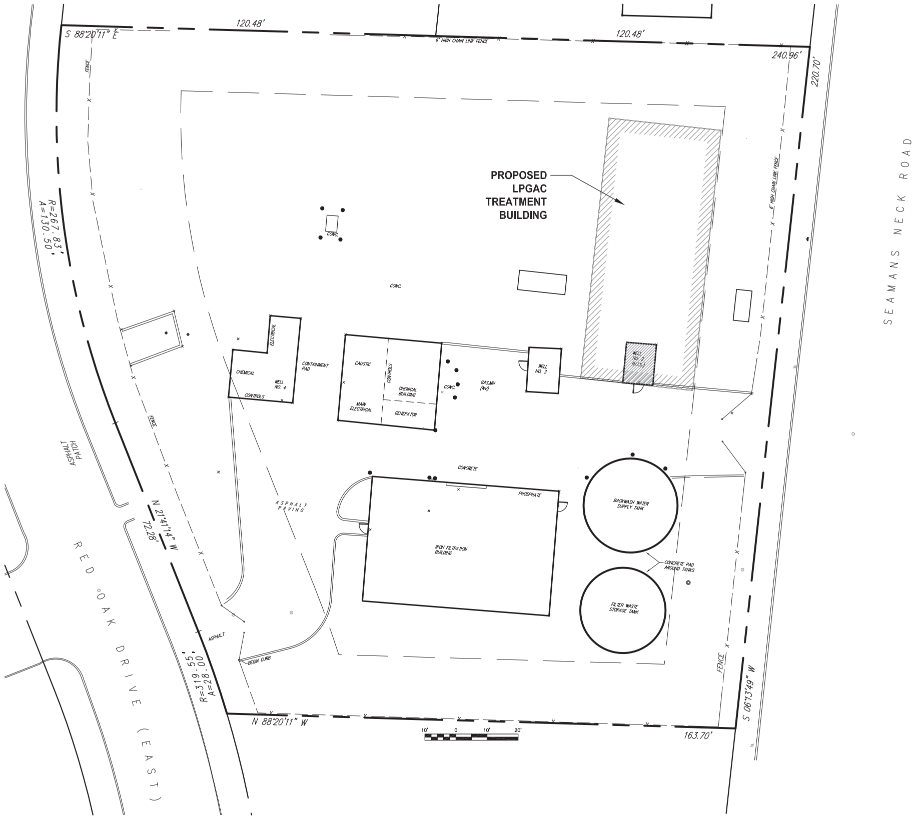
a. GAC vessels – 30 years
b. GAC building roof replacement – 30 years

## 4.0 GENERAL LAYOUT

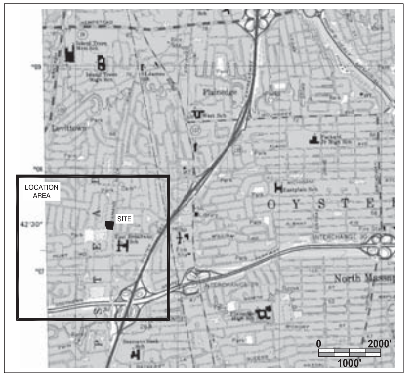
The following general layout drawings are presented in attached figures:

- G-1 – Cover
- C-1 – Site Layout Plan
- C-2 – Site Utility Plan
- C-3 – Site Grading Plan
- A-1 – Floor Plan
- A-2 – Roof Plan and Building Elevations
- L-1 – Site Landscape Plan

# MODIFICATIONS TO
# AQUA NEW YORK, INC.
# WATER TREATMENT FACILITY
# SEAMANS NECK ROAD
# NASSAU COUNTY, NEW YORK



PROPERTY PLAN - 1"=20'



GENERAL VICINITY MAP - 1"=2000'

SOURCE: USGS - AMITYVILLE, NY - 7.5 MINUTE QUADRANGLE - 1994

SITE DATA:

| | | |
|---|---|---|
| 1. | PREPARED FOR: | UNITED STATES NAVY |
| 2. | OWNER: | AQUA AMERICA - NEW YORK |
| 3. | PROPERTY ADDRESS: | 670 SEAMANS NECK ROAD<br>LEVITTOWN, N.Y. 11783<br>TOWN OF HEMPSTEAD, NASSAU COUNTY, NEW YORK |
| 4. | TAX PARCEL NUMBER: | BLOCK 403, SECTION 51, LOT 27<br>(FORMERLY LOT 8. SUBDIVIDED INTO LOTS 25 & 27. LOT 25 WAS TAKEN FOR ROAD WIDENING) |
| 5. | SCHOOL DISTRICT: | LEVITTOWN SCHOOL DISTRICT |
| 6. | SOURCE OF TITLE: | DEED BOOK 4725, PAGES 33-36 |
| 7. | PARCEL AREA: | 1.0705± ACRES (CALCULATED PER DEED) |
| 8. | ZONING: | LEVITTOWN PLANNED RESIDENCE DISTRICT (LPRD). |
| 9. | SETBACKS: | FRONT YARD: AVERAGE FRONT YARD DEPTH<br>SIDE YARD: 20 FEET (OTHER THAN SINGLE FAMILY RESIDENCE)<br>REAR YARD: 25 FEET |
| 10. | TOPOGRAPHY: | TOPOGRAPHY IS BASED ON A FIELD SURVEY PERFORMED BY TETRA TECH ON SEPTEMBER 26-27, 2009, AN. |
| 11. | DATUM: | HORIZONTAL=DEED REFERENCE, VERTICAL=NASSAU COUNTY. |
| 12. | BENCHMARK: | SANITARY MANHOLE AT RED OAK DRIVE, RIM = 55.36. |
| 13. | BOUNDARY: | BOUNDARY LINES SHOWN HEREIN ARE BASED ON PHYSICAL FIELD EVIDENCE, AERIAL PHOTOGRAPHS, RECORD DEED 4725, PAGE 33, AND AVAILABLE PLANS AND WAS BEST FIT TO THE EXISTING CONDITIONS. NO PINS OR MONUMENTS WERE FOUND DURING THE FIELD SURVEY. |
| 13. | SANITARY SEWER: | NASSAU COUNTY SEWAGE DISPOSAL DISTRICT NO. 3. |
| 14. | UTILITIES: | UTILITIES ARE SHOWN ACCORDING TO FIELD SURVEYED FOUND SURFACE EVIDENCE AND BEST AVAILABLE PLANS. ALL UTILITIES ARE APPROXIMATE AND MUST BE VERIFIED PRIOR TO COMMENCING EXCAVATION OPERATIONS. |
| 15. | FEMA | THIS SITE IN LOCATED ON THE FEMA FIRM PANEL 36059C0253-G. THE PANEL IS LISTED AS "PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS" ON FEMA FIRM INDEX MAP NUMBER 36059CIND1-B. |
| 16. | REFERENCE PLANS: | "MAP SHOWING REAL PROPERTY TO BE ACQUIRED FOR THE ALTERATION OF ALIGNMENT OF SEAMANS NECK ROAD", SHEET 5 OF 9, PREPARED BY BRUIN & KING, DATED AUGUST 1962. |

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% - INTERIM DESIGN | 4/16/10 | N/A |

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SUBMISSION
REVIEW
12/17/2010

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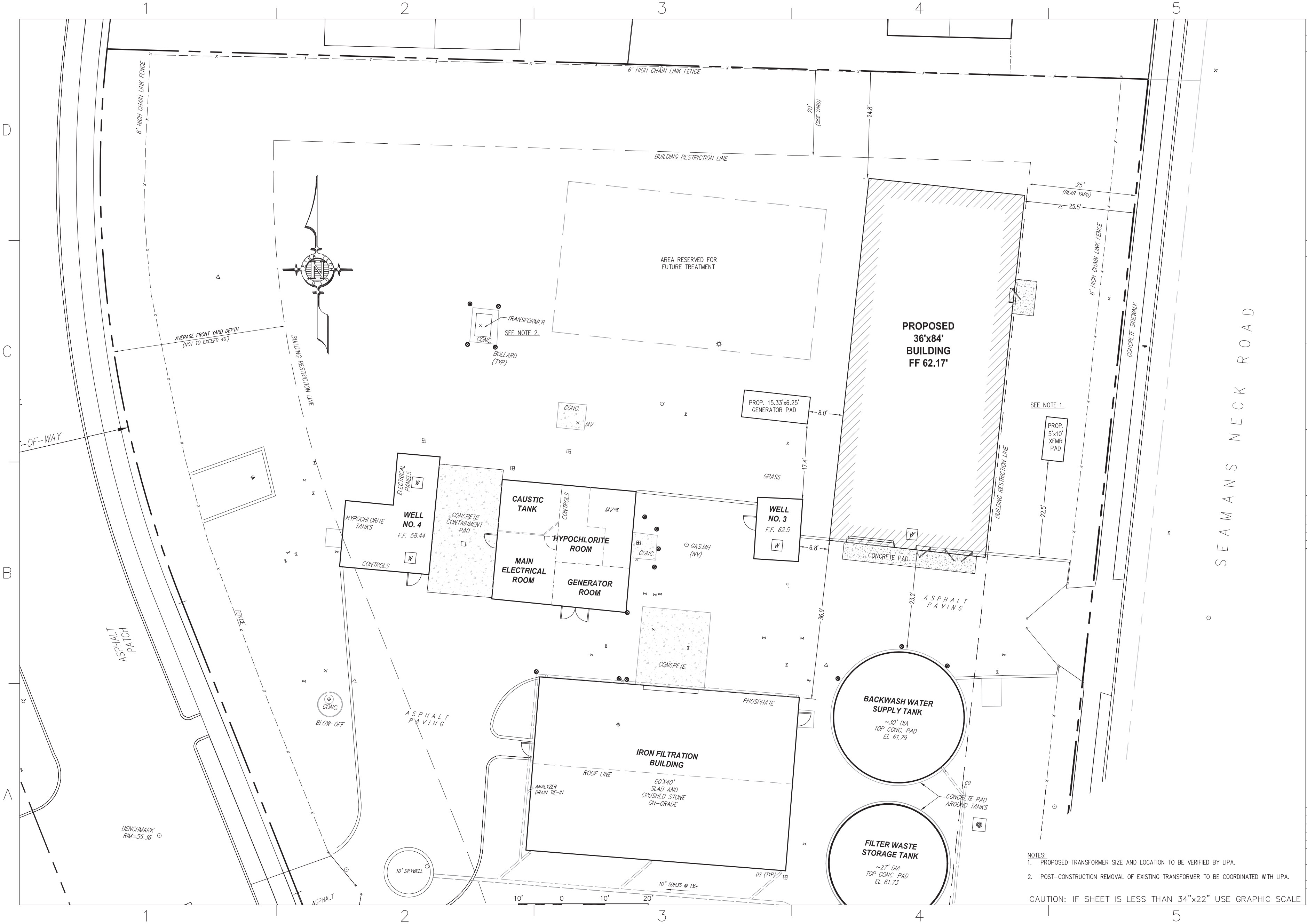
|---|---|---|---|
| DES | HKM | DR | SNL |
| REVIEWED BY | | | HKM |
| PM/DM | | | HKM |
| CHIEF ENG/ARCH | | | HKM |

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT
NAVAL STATION - NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT FACILITY

COVER SHEET

CODE ID. NO. 80091 SIZE D
SCALE: SEE INSET
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF --
G-1



NOTES:
1. PROPOSED TRANSFORMER SIZE AND LOCATION TO BE VERIFIED BY LIPA.
2. POST-CONSTRUCTION REMOVAL OF EXISTING TRANSFORMER TO BE COORDINATED WITH LIPA.

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |
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REVIEW
12/17/2010

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|---|---|
| DES HKM | DR SNL |
| REVIEWED BY | HKM |
| PM/DM | HKM |
| CHIEF ENG/ARCH | HKM |

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
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NORTHEAST IPT
NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT
FACILITY

**SITE LAYOUT PLAN**

CODE ID. NO. 80091
SIZE D
SCALE: 1"=10'-0"
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO.
112G02223
NAVFAC DRAWING NO.
SHEET OF – –
C-1

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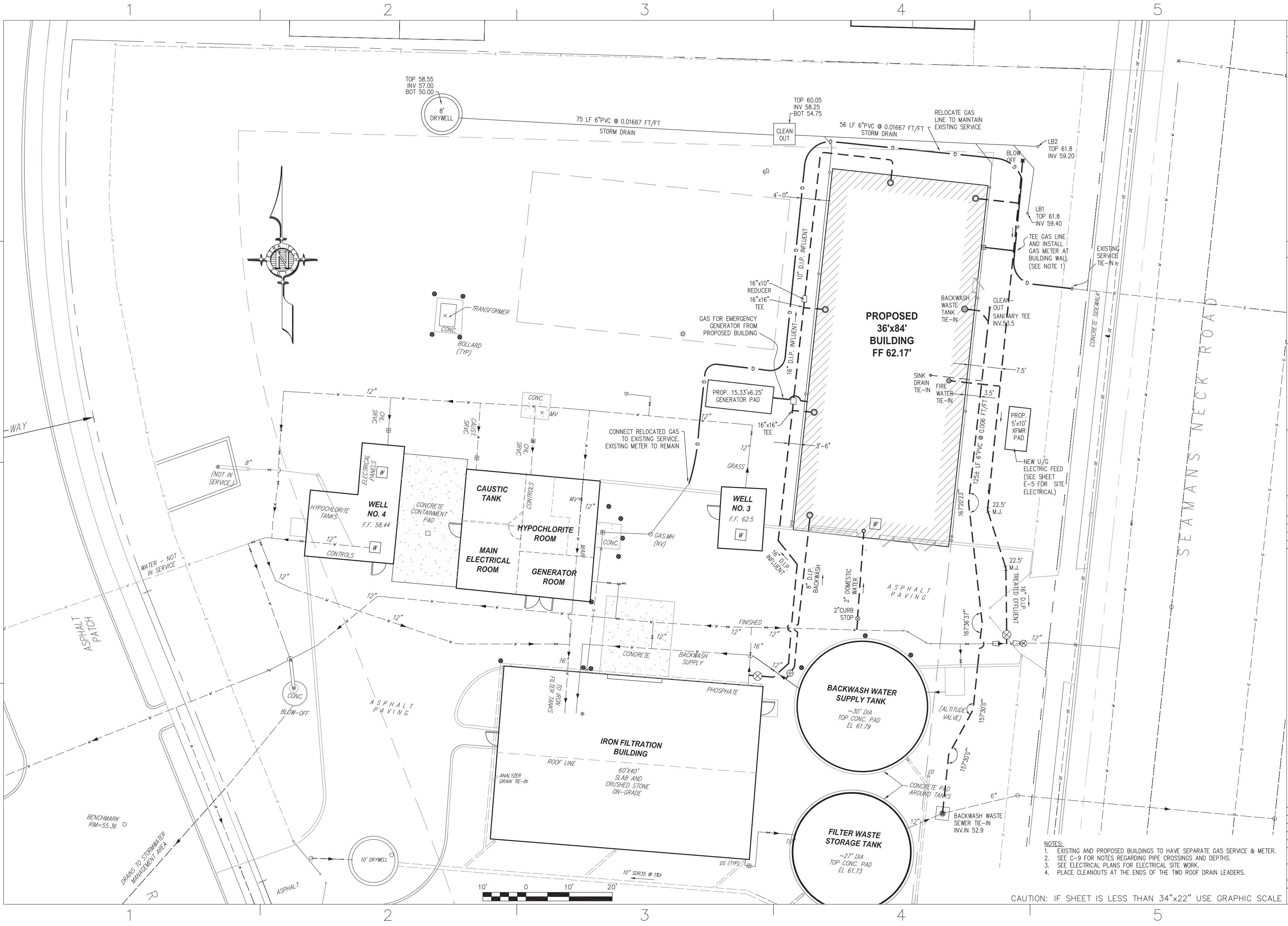

NOTES:
1. EXISTING AND PROPOSED BUILDINGS TO HAVE SEPARATE GAS SERVICE & METER.
2. SEE C-9 FOR NOTES REGARDING PIPE CROSSINGS AND DEPTHS.
3. SEE ELECTRICAL PLANS FOR ELECTRICAL SITE WORK.
4. PLACE CLEANOUTS AT THE ENDS OF THE TWO ROOF DRAIN LEADERS.

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% - INTERIM DESIGN | 4/16/10 | N/A |
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SUBMISSION
REVIEW
12/17/2010

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|---|---|---|---|
| DES | HKM | DR | SNL |
| REVIEWED BY | HKM | | |
| PM/DM | HKM | | |
| CHIEF ENG/ARCH | HKM | | |

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NORTHEAST IPT
NAVAL STATION - NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT
FACILITY

**SITE UTILITY PLAN**

CODE ID. NO. 80091 SIZE D
SCALE: 1"=10'-0"
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF --
C-2

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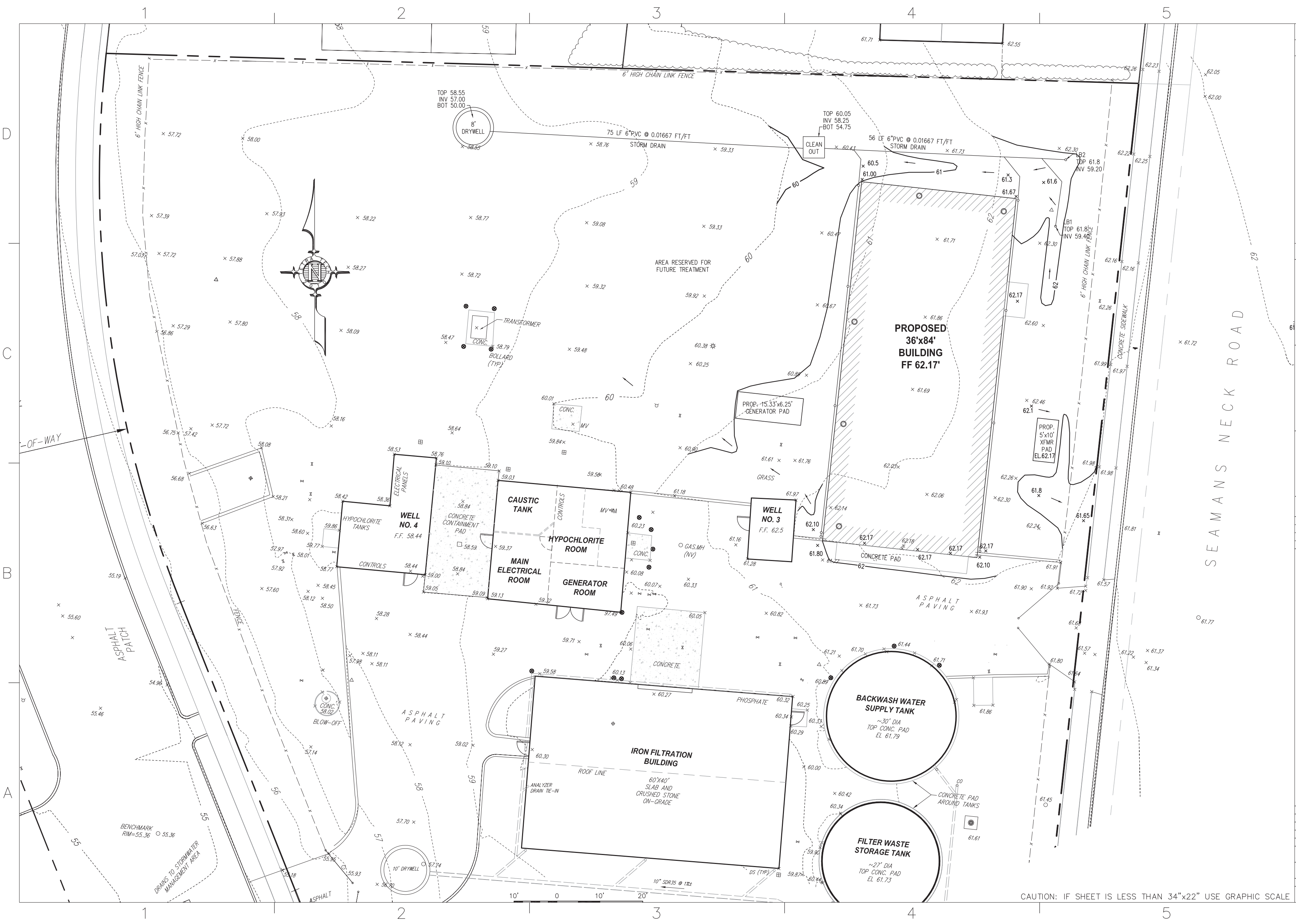
Exhibit C_BODR
Page 30 of 112



CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

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REVIEW
12/17/2010

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|---|---|
| DES HKM | DR SNL |
| REVIEWED BY | HKM |
| PM/DM | HKM |
| CHIEF ENG/ARCH | HKM |

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NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT
NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT
FACILITY

SITE GRADING PLAN

CODE ID. NO. 80091
SIZE D
SCALE: 1"=10'-0"
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO.
112G02223
NAVFAC DRAWING NO.
SHEET OF ––
C-3

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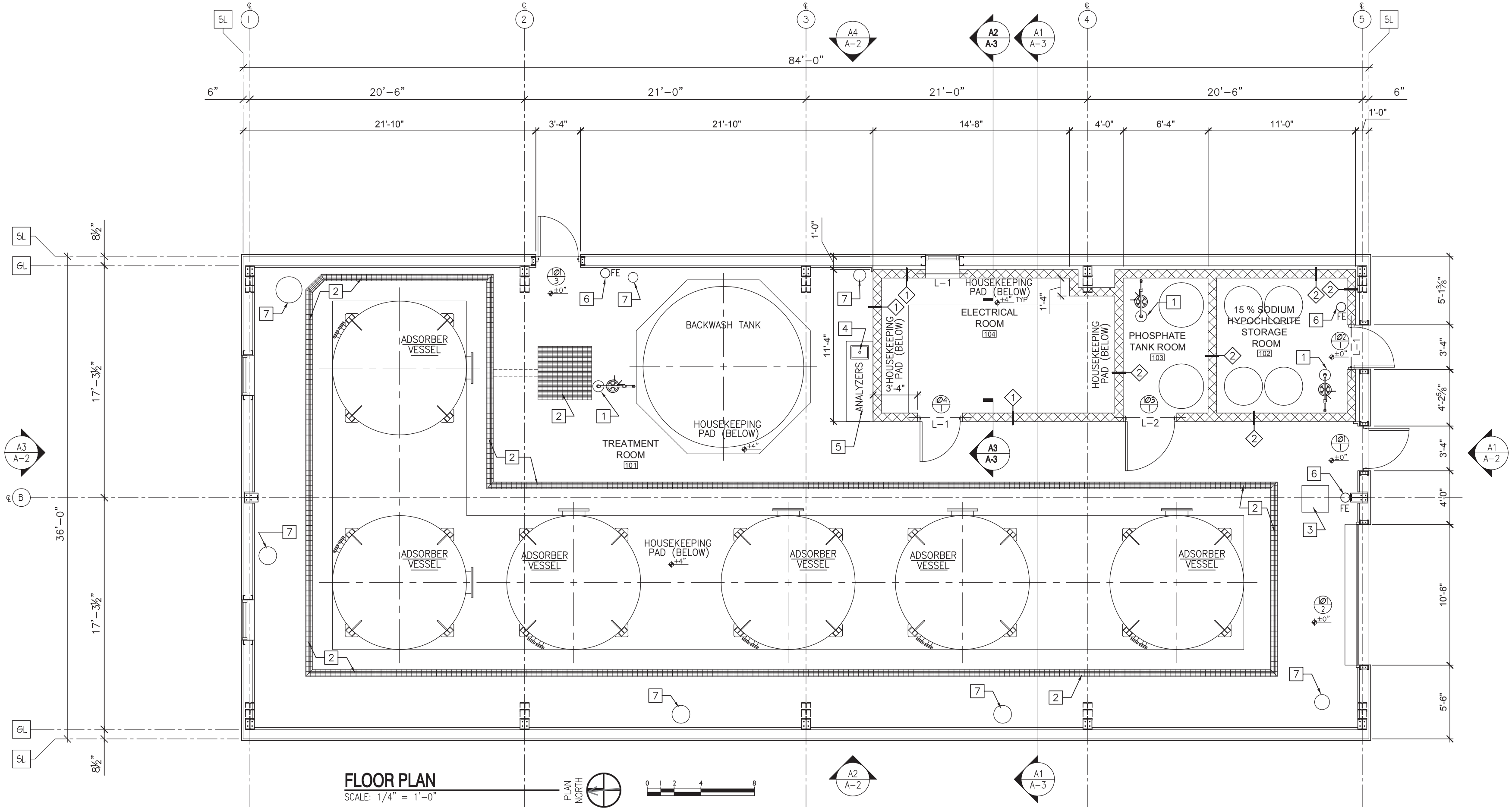

## FLOOR PLAN

SCALE: 1/4" = 1'-0"

## GENERAL NOTES:

1. MAINTAIN MINIMUM ADA PUSH/PULL REQUIRED CLEARANCES TO OBSTRUCTIONS (IE. WALLS, COLUMN WRAPS, ETC.). MAINTAIN THE FOLLOWING MINIMUM CLEARANCES FOR ALL SWING DOORS:

   - LATCH JAMB ON PULL SIDE OF DOOR = 1'-6"

   - LATCH JAMB ON PUSH SIDE OF DOOR = 1'-0" MIN.

2. SEE STRUCTURAL DRAWINGS FOR GROUTING & REINFORCING REQUIREMENTS.

3. VERIFY ALL EXG CONDITIONS AND DIMENSIONS IN THE FIELD, INCLUDING THOSE MARKED AS "+/-" AND "VIF". IMMEDIATELY NOTIFY THE ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCING ANY WORK IN AFFECTED AREA(S).

4. DO NOT SCALE DWGS TO OBTAIN DIMENSIONS. REFER TO STRU AND ARCH DWGS FOR DIMENSIONS REQUIRED. CRITICAL DIMENSIONS NOT FOUND SHOULD BE FIELD VERIFIED OR OBTAINED FROM THE ARCHITECT. IMMEDIATELY NOTIFY THE ARCHITECT OF ANY DISCREPANCIES BETWEEN THE STRU AND ARCH DWGS.

5. NOTES ON ONE DWG OR DETAIL APPLY TO ALL SIM DWGS OR DETAILS.

6. DIMENSIONS ARE ACTUAL TAKEN FROM STRUCTURAL COMPONENTS. IE: FACE OF MASONRY, FACE OF METAL STUDS, ETC. TYP UNO. MASONRY DIMENSIONS ARE ACTUAL.

7. SEE STRU DWGS FOR SLAB, HOUSEKEEPING PADS, FOUNDATION, SUBSURFACE DRAINAGE INFORMATION AND DETAILS.

8. TOP OF SLAB ELEVATION 0'-0" ON ARCH DWGS CORRESPONDS TO DATUM ELEVATION 62.17' ON CIVIL DWGS.

9. APPLY CONTINUOUS JOINT SEALANT WHERE INDICATED ON DWGS AND AT ALL JOINTS BETWEEN DISSIMILAR MATERIALS.

10. ALL WORK IS TO BE IN STRICT COMPLIANCE WITH ALL FEDERAL, STATE AND LOCAL LAWS AND CODES WHICH APPLY TO THIS USE AND TO GENERALLY ACCEPTED CONSTRUCTION TRADE PRACTICES.

11. PAINT ALL EXPOSED PIPING, CONDUIT AND MECHANICAL EQUIPMENT IN AREAS NOTED TO BE PAINTED.

12. PROVIDE FIRE EXTINGUISHERS (FE) AS LOCATED ON FLOOR PLAN AND AS REQUIRED BY AUTHORITIES HAVING JURISDICTION.

13. SEE FLOOR PLAN ON THIS SHEET FOR MASONRY LINTEL LOCATIONS, NOTED AS L-#. SEE STRUCTURAL DRAWINGS FOR LINTEL SCHEDULE AND ADDITIONAL INFORMATION.

14. SEE PLUMBING DRAWINGS FOR ADDITIONAL FLOOR DRAIN LOCATIONS AND INFORMATION.

15. SEE MECHANICAL AND STRUCTURAL DRAWINGS FOR ADDITIONAL INFORMATION ON HOUSEKEEPING PADS.

16. NOT ALL LOUVERS ARE SHOWN ON FLOOR PLAN DUE TO HEIGHT DIFFERENCES. SEE HVAC DWGS FOR FINAL QUANITITY, LOCATIONS, AND SIZES. SEE STRUCTURAL DWGS FOR LINTEL SCHEDULE.

## PLAN KEY NOTES: 4

1. SAFETY SHOWER AND EYE WASH-SEE MECH/PLUMB DWGS.

2. TRENCH DRAIN AND SUMP – SEE MECH/PLUMB AND STRU DWGS FOR FINAL SIZE, LOCATION AND ADDITIONAL INFORMATION.

3. EXISTING WELL NUMBER 2 ENCLOSURE – SEE STRUCTURAL DWGS. SEE MECH/PLUMB AND CIVIL DWGS FOR ACTUAL LOCATION AND ADD'L INFORMATION.

4. SERVICE SINK – SEE MECH/PLUMB DWGS.

5. ANALIZERS AREA – SEE MECH DWGS. FOR ADDITIONAL INFORMATION.

6. FIRE EXTINGUISHERS (FE) SEE CODE PLAN CP-1.

7. PIPE DOWN THRU SLAB – SEE STRU AND MECH DWGS.

## PARTITION TYPES 1

1. 8" CMU – HEIGHT OF WALL SHALL BE 12'-0" ABOVE FINISH FLOOR. PROVIDE HORIZONTAL JOINT REINFORCING IN FIRST COURSE AND THEN AT 16" O.C. VERTICALLY. SEE STRUCTURAL DWGS FOR ADDITIONAL INFORMATION.
CMU WALL THICKNESS: 7 ⅝".

2. 8" CMU – CLASS D-2 HOLLOW CORE.
HEIGHT OF WALL SHALL BE 12'-0" ABOVE FINISH FLOOR. PROVIDE HORIZONTAL JOINT REINFORCING IN FIRST COURSE AND THEN AT 16" O.C. VERTICALLY. SEE STRUCTURAL DWGS FOR ADDITIONAL INFORMATION.
CMU WALL THICKNESS: 7 ⅝".
2-HOUR RATED UL DESIGN NO. U905

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
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| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |
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12/17/2010

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| REVIEWED BY HKM | |
| PM/DM HKM | |
| CHIEF ENG/ARCH HKM | |

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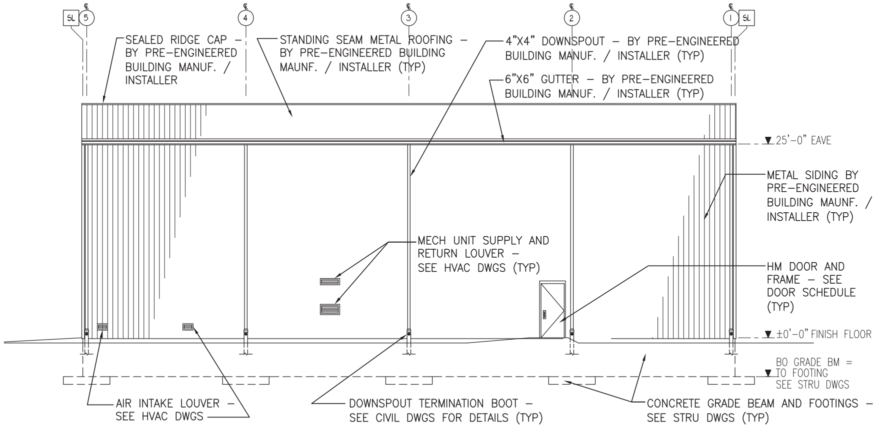
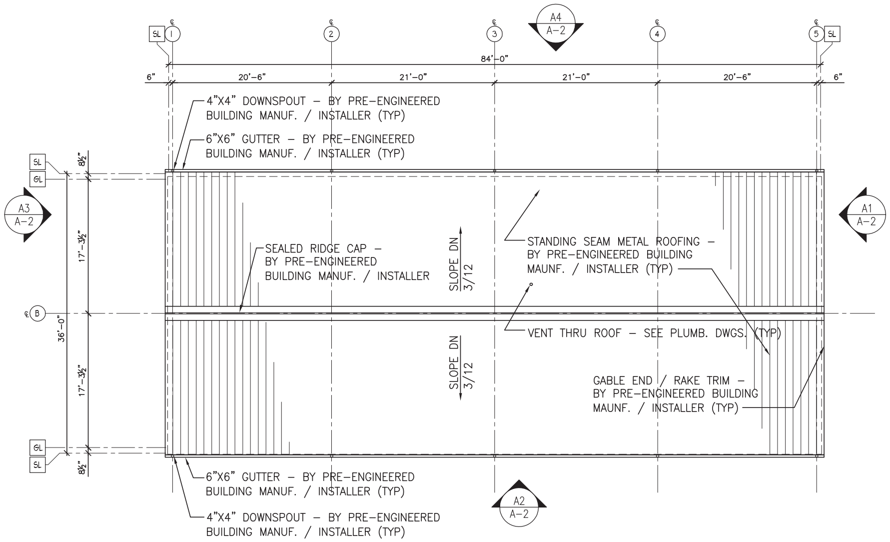
NORTHEAST IPT
NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT FACILITY

**FLOOR PLAN**

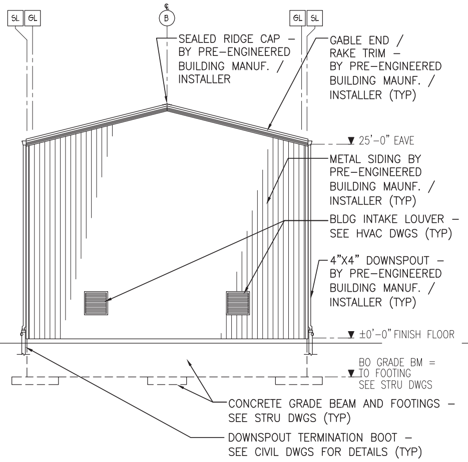
| | |
|---|---|
| CODE ID. NO. 80091 | SIZE D |
| SCALE: 1/4"=1'-0" | |
| MAXIMO NO. N62470-08-D-1001 | |
| JOB ORDER NO. WE-25 | |
| SPEC. NO. | |
| CONSTR. CONTR. NO. 112G02223 | |
| NAVFAC DRAWING NO. | |
| SHEET OF – – | |
| A-1 | |



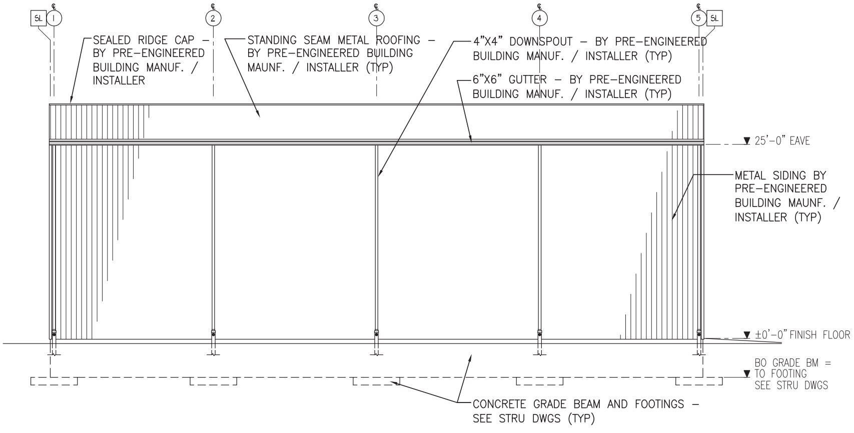
**EAST ELEVATION**
SCALE: 1/8" = 1'-0"
A-1, A-2
A4



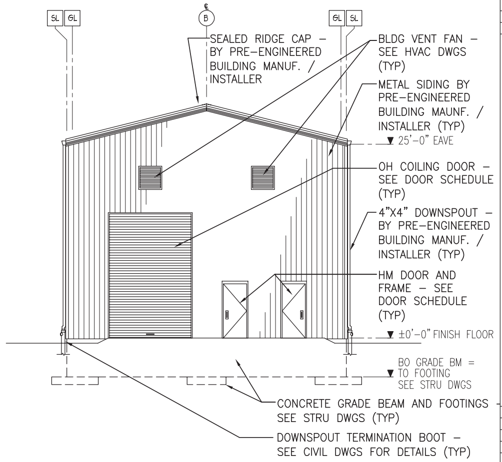
**ROOF PLAN**
SCALE: 1/8" = 1'-0"
A-2
A5



**NORTH ELEVATION**
SCALE: 1/8" = 1'-0"
A-1, A-2
A3



**WEST ELEVATION**
SCALE: 1/8" = 1'-0"
A-1, A-2
A2



**SOUTH ELEVATION**
SCALE: 1/8" = 1'-0"
A-1, A-2
A1

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |
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REVIEW
12/17/2010

DES HKM DR SNL
REVIEWED BY HKM
PM/DM HKM
CHIEF ENG/ARCH HKM

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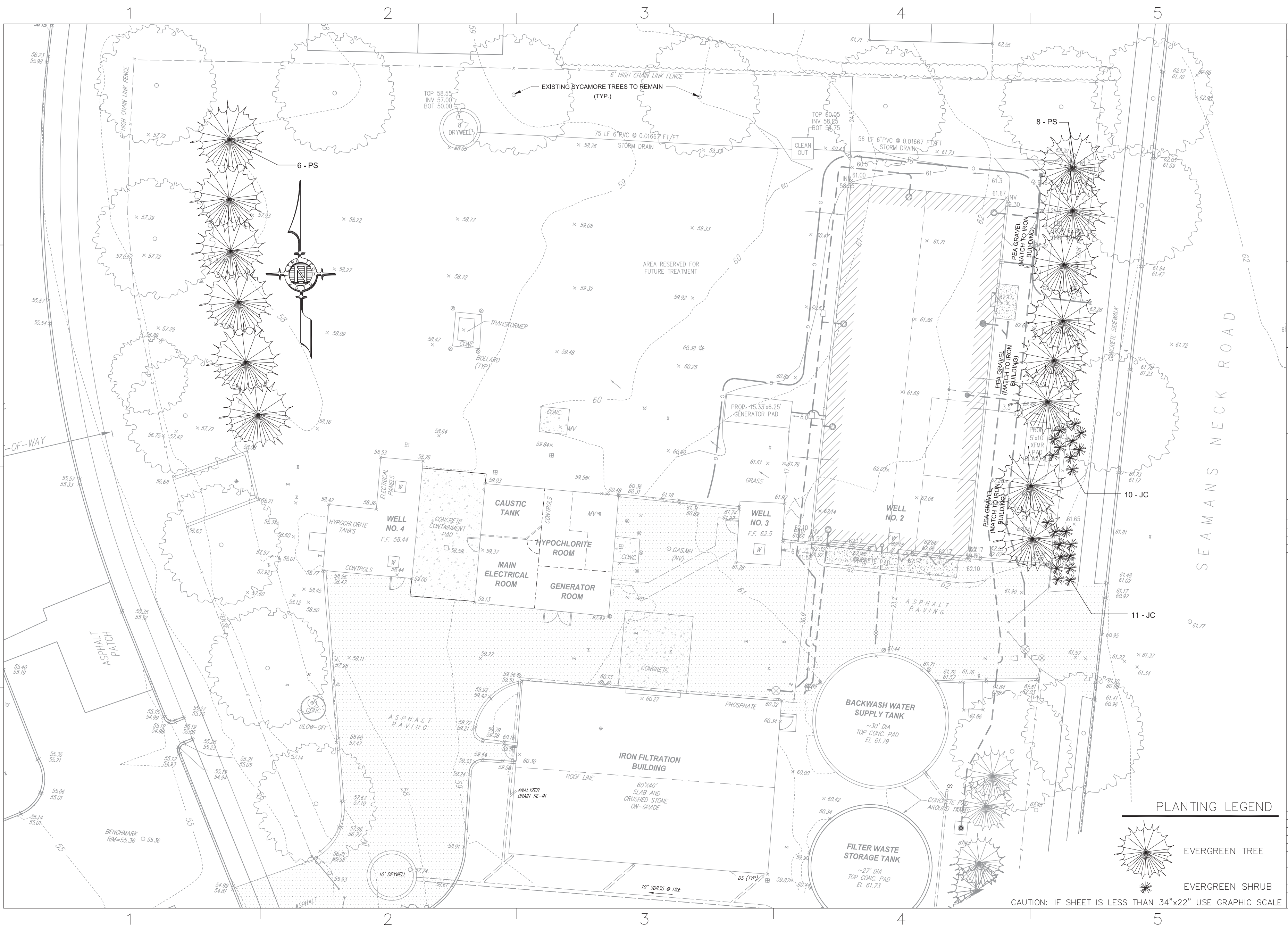
NORTHEAST IPT
NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT
FACILITY

## ROOF PLAN AND BUILDING ELEVATIONS

CODE ID. NO. 80091 SIZE D
SCALE: 1/4"=1'-0"
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF ––
A-2



PLANTING LEGEND

- EVERGREEN TREE
- EVERGREEN SHRUB

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |

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DES HKM DR SNL
REVIEWED BY HKM
PM/DM HKM
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DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT
NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK

# MODIFICATIONS TO WATER TREATMENT FACILITY

## SITE LANDSCAPE PLAN

CODE ID. NO. 80091
SIZE D
SCALE: 1"=10'-0"
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25 bbb
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF ——
L-1

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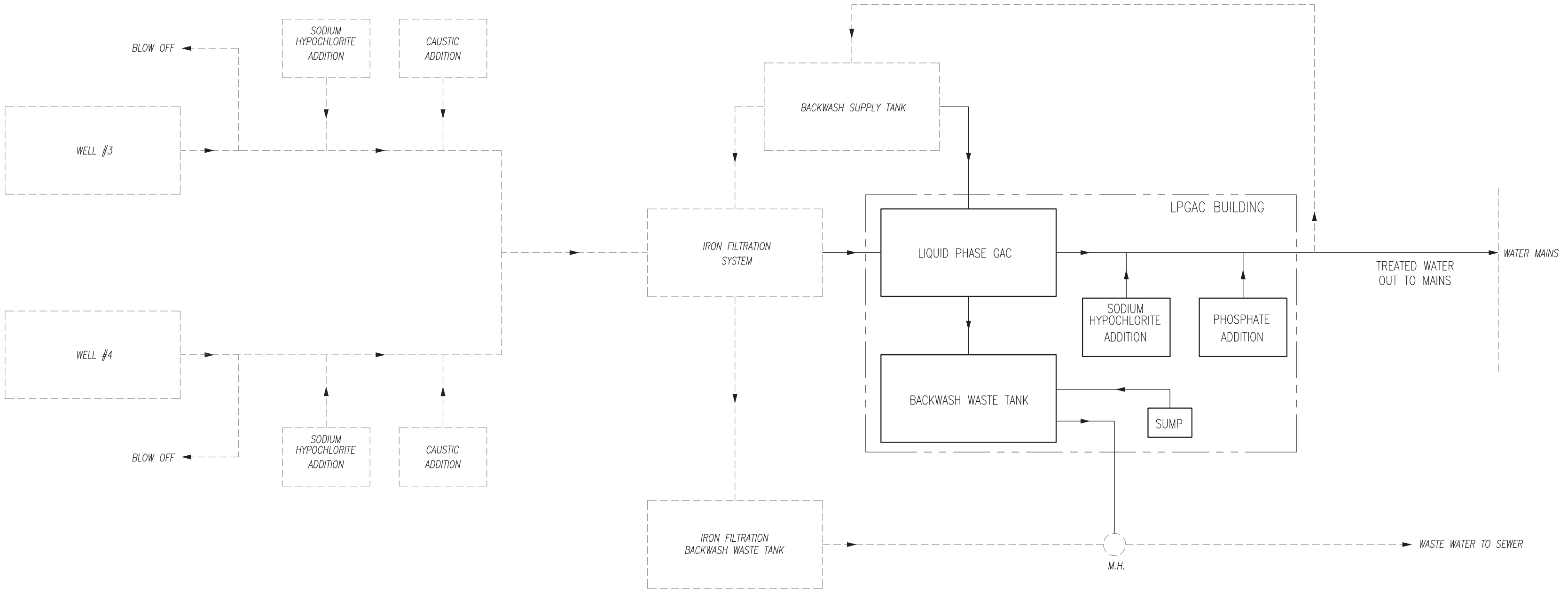
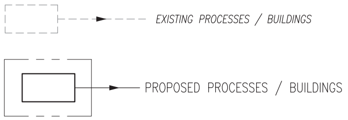
## 5.0 DETAILED PLANS

The process flow, piping and instrumentation diagram, and mechanical plans are provided herein as:

- PFD-1 – Process Flow Diagram
- PID-1 - P&ID – Existing System Tie-in
- PID-2 – P&ID
- PID-3 – P&ID – LPGAC 100/200
- PID-4 – P&ID – LPGAC 300/400
- PID-5 – P&ID – LPGAC 500/600
- M-1 – Proposed LPGAC Building Equipment Layout
- M-2 – Proposed LPGAC Piping Layout
- M-3 – Building Sections
- M-4 – Building Sections



## BLOCK PROCESS FLOW DIAGRAM



CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |

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SUBMISSION
REVIEW
12/17/2010

| | | | |
|---|---|---|---|
| DES | HKM | DR | SNL |
| REVIEWED BY | HKM | | |
| PM/DM | HKM | | |
| CHIEF ENG/ARCH | HKM | | |

DEPARTMENT OF THE NAVY
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NORTHEAST IPT
NAVAL STATION – NORFOLK, VIRGINIA
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT
FACILITY

**PROCESS FLOW DIAGRAM**

CODE ID. NO. 80091 SIZE D
SCALE: NTS
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF ——

PFD-1

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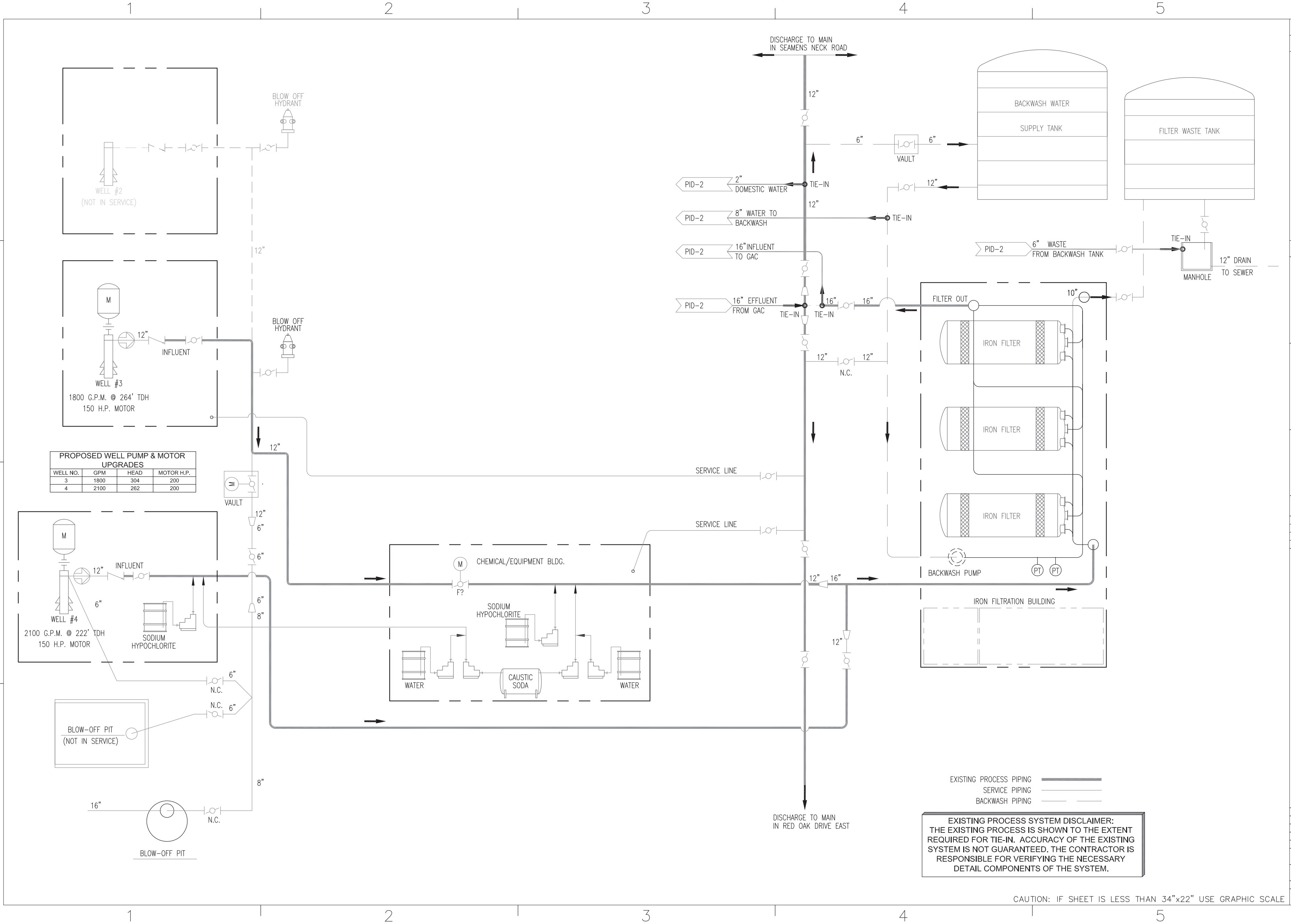

| PROPOSED WELL PUMP & MOTOR UPGRADES | | | |
|---|---|---|---|
| WELL NO. | GPM | HEAD | MOTOR H.P. |
| 3 | 1800 | 304 | 200 |
| 4 | 2100 | 262 | 200 |

EXISTING PROCESS SYSTEM DISCLAIMER:
THE EXISTING PROCESS IS SHOWN TO THE EXTENT REQUIRED FOR TIE-IN. ACCURACY OF THE EXISTING SYSTEM IS NOT GUARANTEED. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE NECESSARY DETAIL COMPONENTS OF THE SYSTEM.

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |

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12/17/2010

DES HKM DR SNL
REVIEWED BY HKM
PM/DM HKM
CHIEF ENG/ARCH HKM

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AQUA NY
NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT
FACILITY

## P&ID - EXISTING SYSTEM TIE-IN

CODE ID. NO. 80091
SIZE D
SCALE: NTS
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF – –

PID-1

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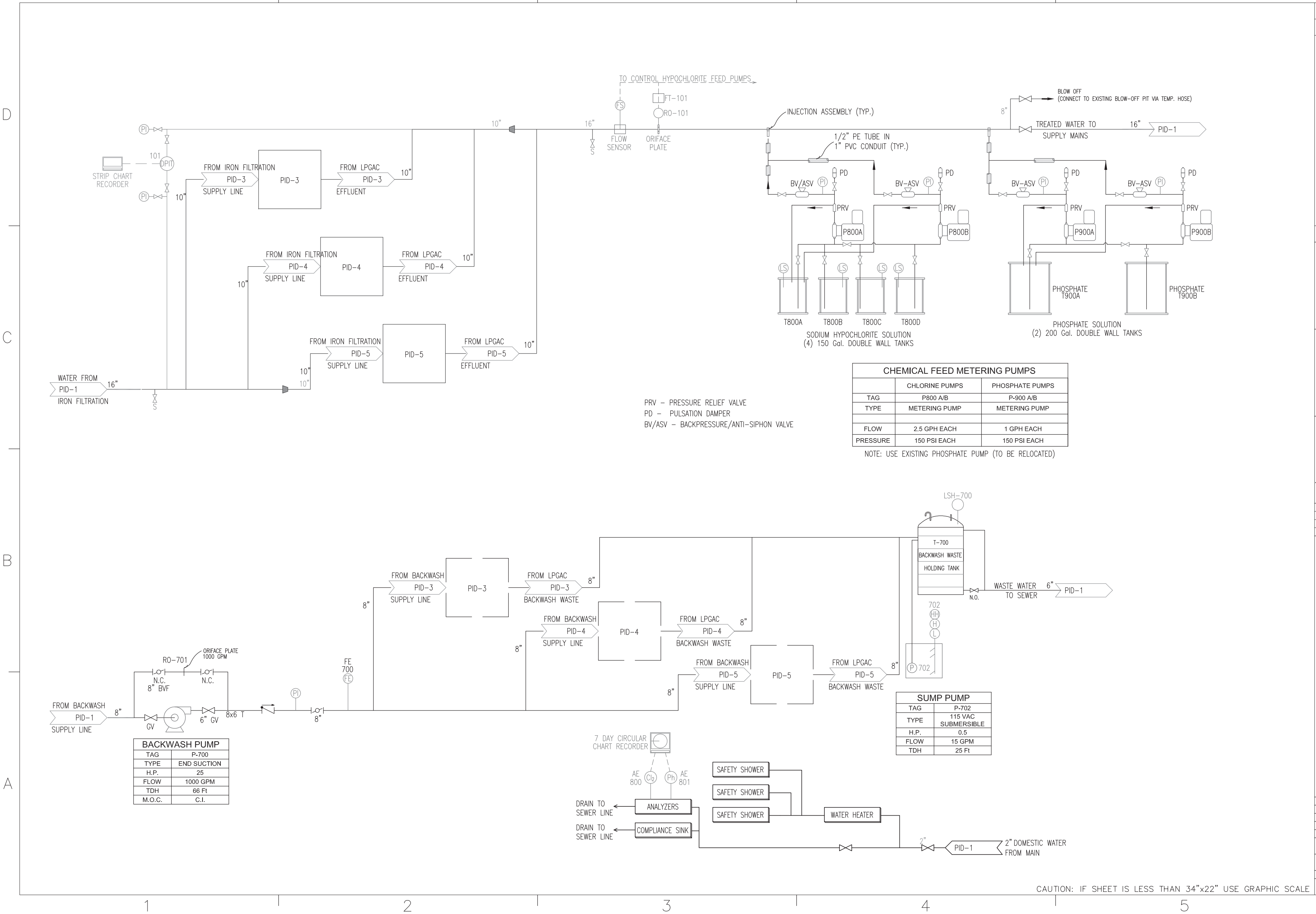

PRV – PRESSURE RELIEF VALVE
PD – PULSATION DAMPER
BV/ASV – BACKPRESSURE/ANTI-SIPHON VALVE

**CHEMICAL FEED METERING PUMPS**

| | CHLORINE PUMPS | PHOSPHATE PUMPS |
|---|---|---|
| TAG | P800 A/B | P-900 A/B |
| TYPE | METERING PUMP | METERING PUMP |
| | | |
| FLOW | 2.5 GPH EACH | 1 GPH EACH |
| PRESSURE | 150 PSI EACH | 150 PSI EACH |

NOTE: USE EXISTING PHOSPHATE PUMP (TO BE RELOCATED)

**SUMP PUMP**

| | |
|---|---|
| TAG | P-702 |
| TYPE | 115 VAC SUBMERSIBLE |
| H.P. | 0.5 |
| FLOW | 15 GPM |
| TDH | 25 Ft |

**BACKWASH PUMP**

| | |
|---|---|
| TAG | P-700 |
| TYPE | END SUCTION |
| H.P. | 25 |
| FLOW | 1000 GPM |
| TDH | 66 Ft |
| M.O.C. | C.I. |

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |

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AQUA NY
NASSAU COUNTY, NEW YORK

# MODIFICATIONS TO WATER TREATMENT FACILITY

## P&ID

CODE ID. NO. 80091 SIZE D
SCALE: NTS
MAXIMO NO. N62470-08-D-1001 .
JOB ORDER NO. WE-25 -
SPEC. NO. ..
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO. ....
SHEET ..... OF – –

PID-2

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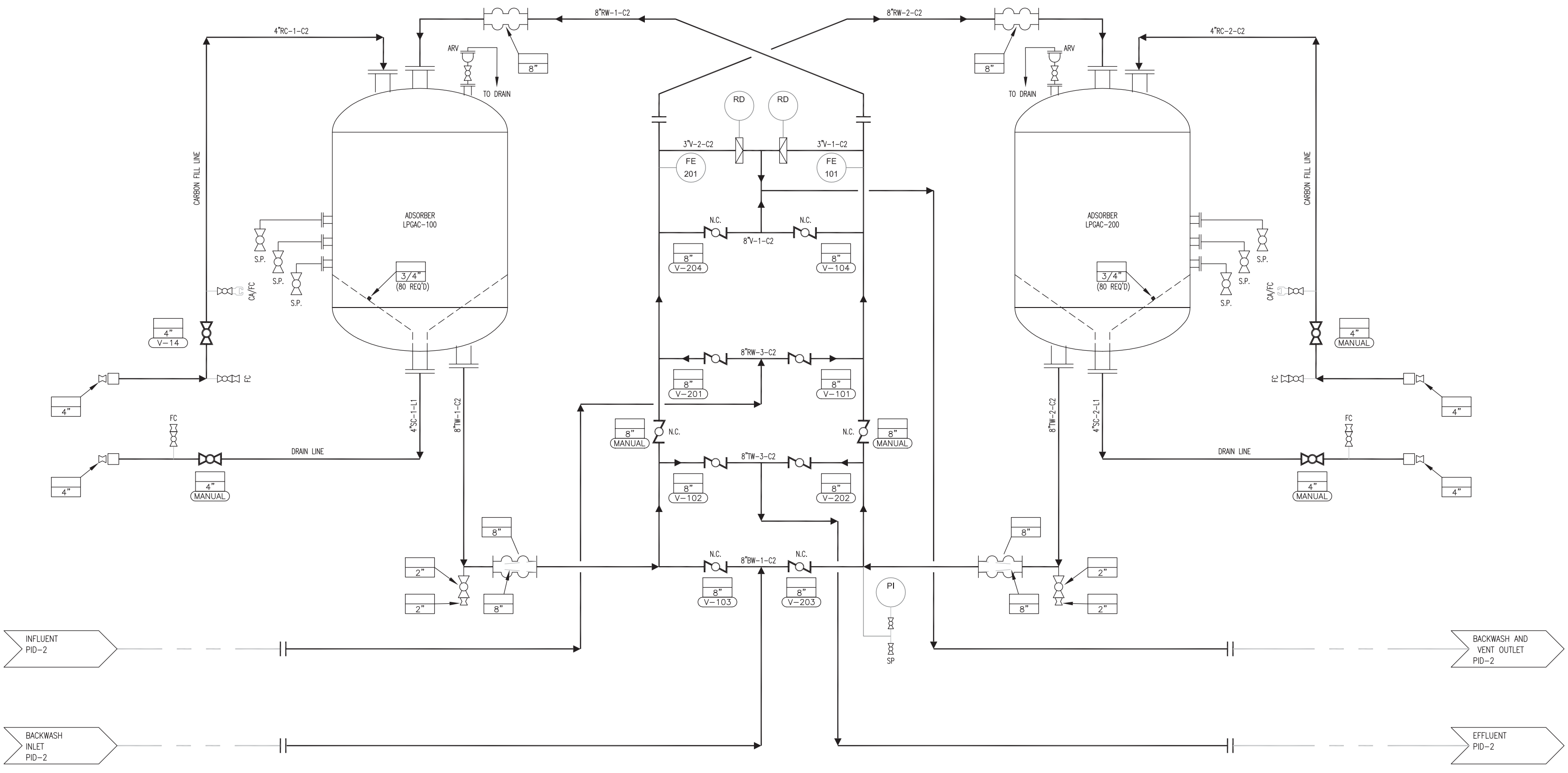

## MEDIA

MEDIA: GAC
QUANTITY PER VESSEL: 20,000 LBS.
SERVICE: POTABLE

## INSTRUMENTATION

PI 217
PSE 577 FOR 125 psig MAX. OPER. PRESS.
PDS 294

## DESIGN CONDITIONS

FLOW RATE – 700 GPM
INFLUENT PRESSURE – 125 PSIG MAX.
INFLUENT TEMP. – 120°F MAX.
BACKWASH RATE – 1000 GPM MAX.
ELECTRIC POWER – 120 V, 60~ SINGLE PHASE, 15 AMP

## LEGEND

BW – BACKWASH WATER
FC – FLUSH CONNECTION
RC – REACT.(OR VIRGIN) CARBON
RW – RAW WATER
SC – SPENT CARBON SLURRY
SP – SAMPLE PORT
TW – TREATED WATER
V – VENT
NC – NORMALLY CLOSED

## ADSORBERS

10'-0" O.D. x 12'-0" S.S.
ASME 2:1 ELLIPTICAL TOP AND BOTTOM HEADS.
CARBON STEEL CONSTRUCTION.
ASME SECT. VIII, DIV. 1
W/ PLASITE 4110 LINING
125 PSIG @ 140°F DESIGN.

## UTILITY REQUIREMENTS

AIR, CARBON TRANSFER –
100 SCFM @ 30 PSIG MIN.
PLANT WATER –
100 GPM @ 30 PSIG MIN. WIRING –
MIN. AWG #16 TO PDS 294

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |
| | | | |
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| | | | |
|---|---|---|---|
| DES | HKM | DR | SNL |
| REVIEWED BY | HKM | | |
| PM/DM | HKM | | |
| CHIEF ENG/ARCH | HKM | | |

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NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT
FACILITY

**P&ID - LPGAC 100/200**

CODE ID. NO. 80091 SIZE D
SCALE: NTS
MAXIMO NO. N62470-08-D-1001 .
JOB ORDER NO. WE-25 .
SPEC. NO. ..
CONSTR. CONTR. NO.
112G02223
NAVFAC DRAWING NO.
....
SHEET ..... OF — —
PID-3

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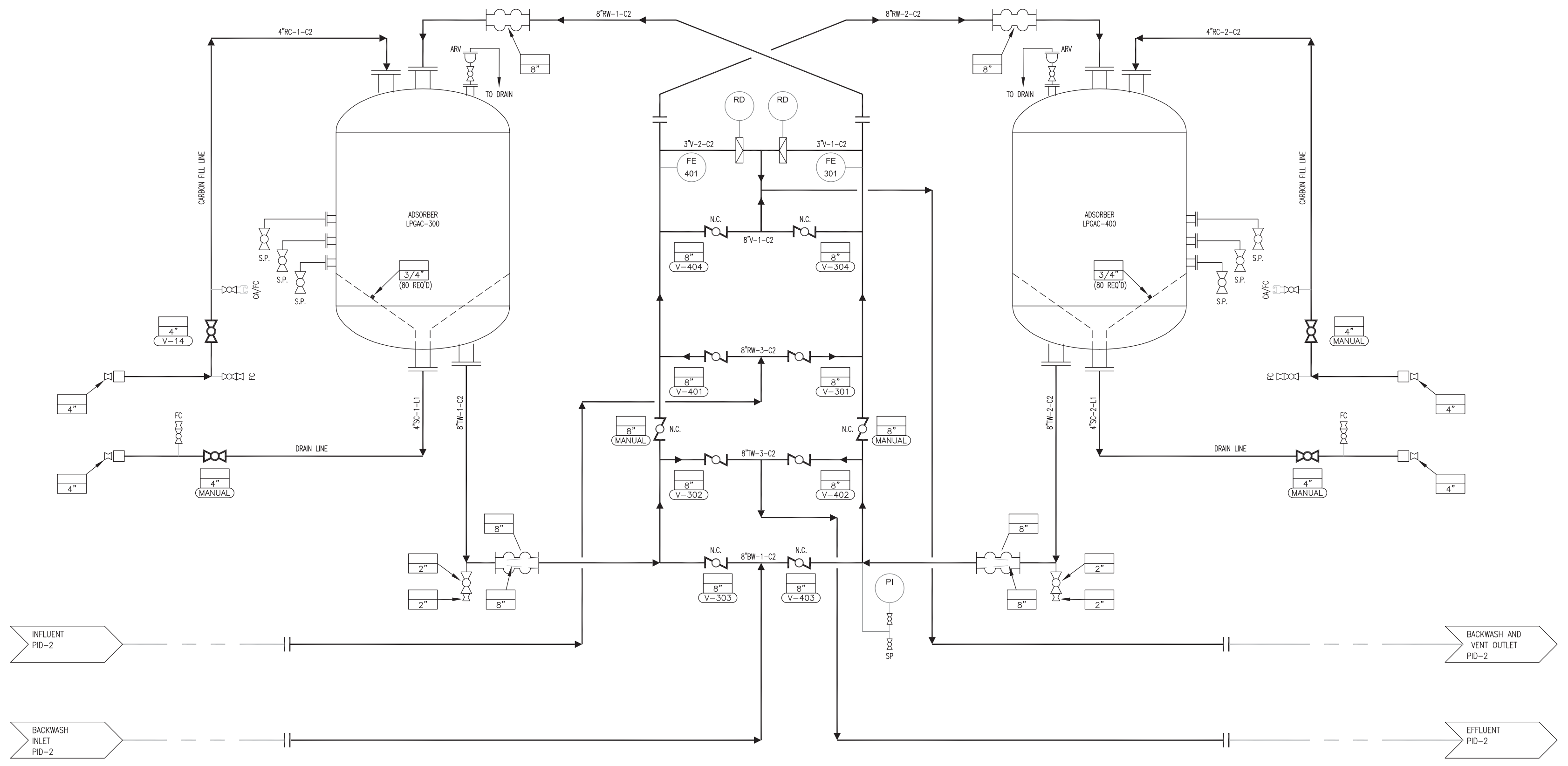

## MEDIA

MEDIA: GAC
QUANTITY PER VESSEL: 20,000 LBS.
SERVICE: POTABLE

## INSTRUMENTATION

PI 217
PSE 577 FOR 125 psig MAX. OPER. PRESS.
PDS 294

## DESIGN CONDITIONS

FLOW RATE – 700 GPM
INFLUENT PRESSURE – 125 PSIG MAX.
INFLUENT TEMP. – 120°F MAX.
BACKWASH RATE – 1000 GPM MAX.
ELECTRIC POWER – 120 V, 60~ SINGLE PHASE, 15 AMP

## LEGEND

BW – BACKWASH WATER
FC – FLUSH CONNECTION
RC – REACT.(OR VIRGIN) CARBON
RW – RAW WATER
SC – SPENT CARBON SLURRY
SP – SAMPLE PORT
TW – TREATED WATER
V – VENT
NC – NORMALLY CLOSED

## ADSORBERS

10'-0" O.D. x 12'-0" S.S.
ASME 2:1 ELLIPTICAL TOP AND BOTTOM HEADS.
CARBON STEEL CONSTRUCTION.
ASME SECT. VIII, DIV. 1
W/ PLASITE 4110 LINING
125 PSIG @ 140°F DESIGN.

## UTILITY REQUIREMENTS

AIR, CARBON TRANSFER –
    100 SCFM @ 30 PSIG MIN.
PLANT WATER –
    100 GPM @ 30 PSIG MIN. WIRING –
    MIN. AWG #16 TO PDS 294

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |

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AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT
FACILITY
**P&ID 300/400**

CODE ID. NO. 80091 | SIZE D
SCALE: NTS
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF – –
**PID-4**

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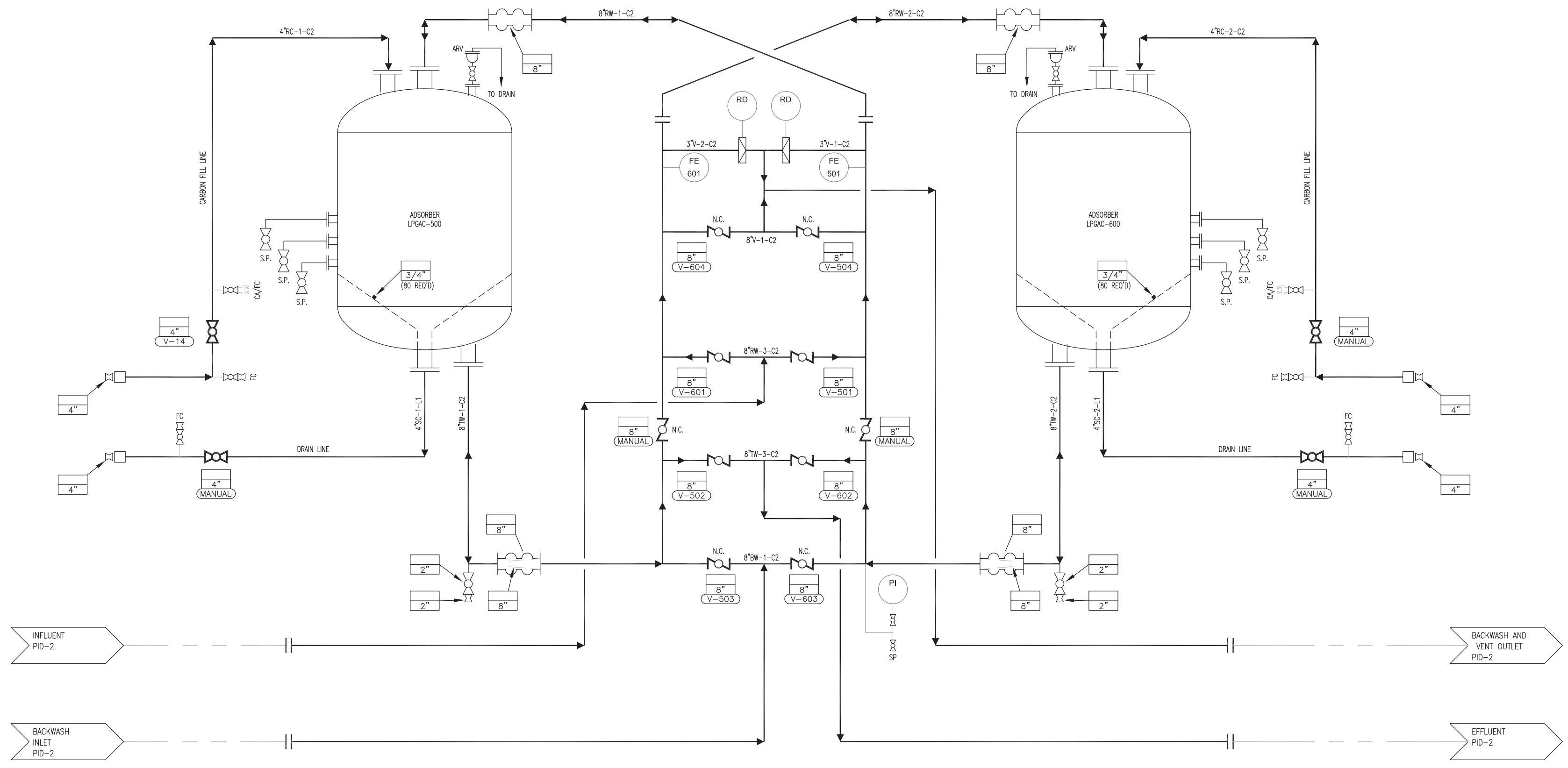
Exhibit C_BODR
Page 40 of 112



## MEDIA

MEDIA: GAC
QUANTITY PER VESSEL: 20,000 LBS.
SERVICE: POTABLE

## INSTRUMENTATION

PI 217
PSE 577 FOR 125 psig MAX. OPER. PRESS.
PDS 294

## DESIGN CONDITIONS

FLOW RATE – 700 GPM
INFLUENT PRESSURE – 125 PSIG MAX.
INFLUENT TEMP. – 120°F MAX.
BACKWASH RATE – 1000 GPM MAX.
ELECTRIC POWER – 120 V, 60~ SINGLE PHASE, 15 AMP

## LEGEND

BW – BACKWASH WATER
FC – FLUSH CONNECTION
RC – REACT.(OR VIRGIN) CARBON
RW – RAW WATER
SC – SPENT CARBON SLURRY
SP – SAMPLE PORT
TW – TREATED WATER
V – VENT
NC – NORMALLY CLOSED

## ADSORBERS

10'-0" O.D. x 12'-0" S.S.
ASME 2:1 ELLIPTICAL TOP AND BOTTOM HEADS.
CARBON STEEL CONSTRUCTION.
ASME SECT. VIII, DIV. 1
W/ PLASITE 4110 LINING
125 PSIG @ 140°F DESIGN.

## UTILITY REQUIREMENTS

AIR, CARBON TRANSFER –
100 SCFM @ 30 PSIG MIN.
PLANT WATER –
100 GPM @ 30 PSIG MIN. WIRING –
MIN. AWG #16 TO PDS 294

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |

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NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT
FACILITY

**P&ID - LPGAC 500/600**

CODE ID. NO. 80091 | SIZE D
SCALE: NTS
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO.
112G02223
NAVFAC DRAWING NO.
SHEET OF – –

PID-5

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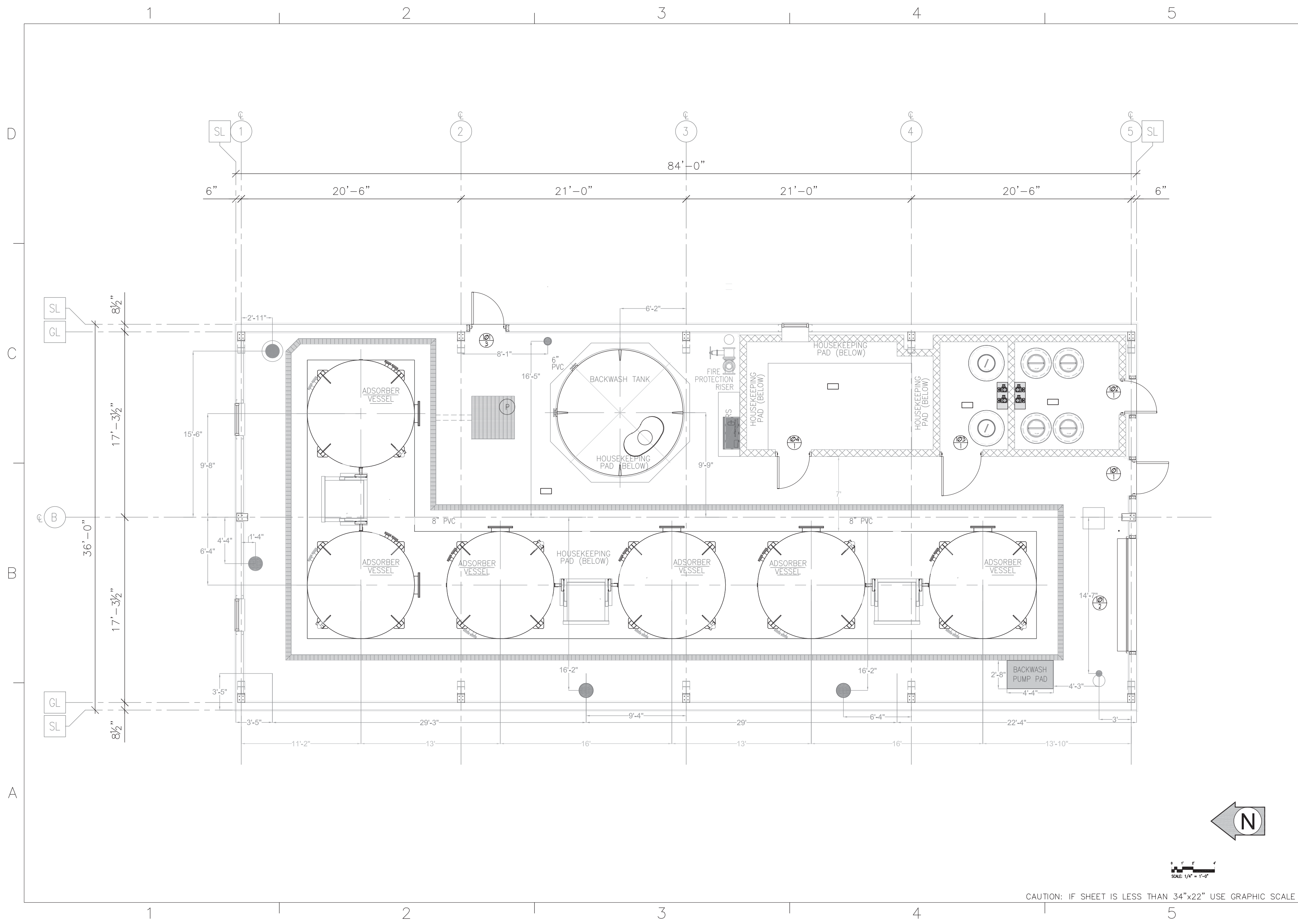
Exhibit C_BODR
Page 41 of 112



CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% – INTERIM DESIGN | 4/16/10 | N/A |

NAVFAC

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NASSAU COUNTY, NEW YORK

MODIFICATIONS TO WATER TREATMENT
FACILITY

# PROPOSED LPGAC BUILDING EQUIPMENT LAYOUT

CODE ID. NO. 80091 SIZE D
SCALE: 1/4"=1'-0"
MAXIMO NO. N62470–08–D–1001
JOB ORDER NO. WE–25
SPEC. NO.
CONSTR. CONTR. NO.
112G02223
NAVFAC DRAWING NO.
SHEET OF ––

M-1

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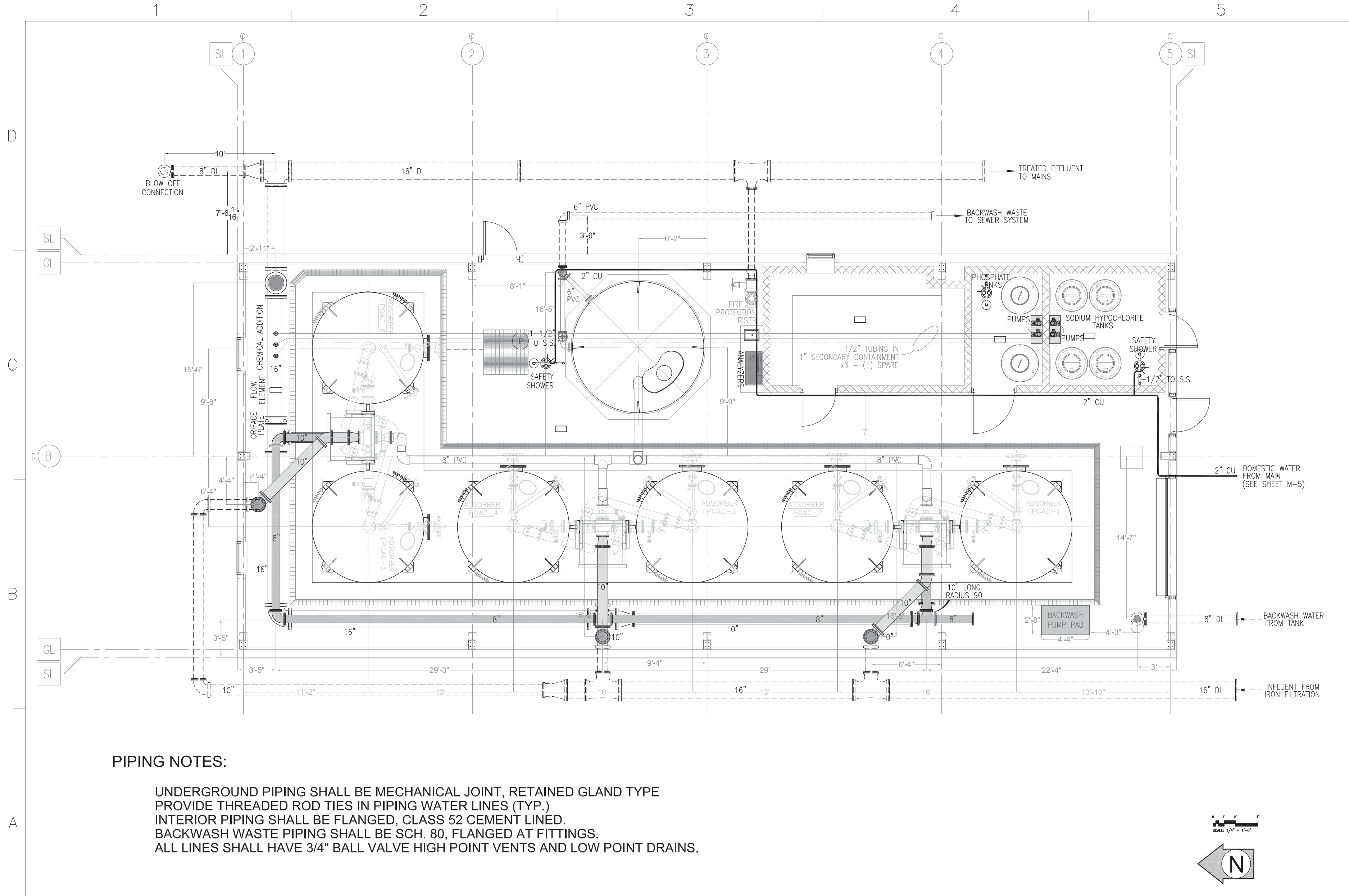

## PIPING NOTES:

UNDERGROUND PIPING SHALL BE MECHANICAL JOINT, RETAINED GLAND TYPE
PROVIDE THREADED ROD TIES IN PIPING WATER LINES (TYP.)
INTERIOR PIPING SHALL BE FLANGED, CLASS 52 CEMENT LINED.
BACKWASH WASTE PIPING SHALL BE SCH. 80, FLANGED AT FITTINGS.
ALL LINES SHALL HAVE 3/4" BALL VALVE HIGH POINT VENTS AND LOW POINT DRAINS.

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
| 60% | 60% - INTERIM DESIGN | 4/16/10 | N/A |

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FACILITY

PROPOSED LPGAC PIPING LAYOUT

CODE ID. NO. 80091 | SIZE D
SCALE: 1/4"=1'-0"
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF --
M-2

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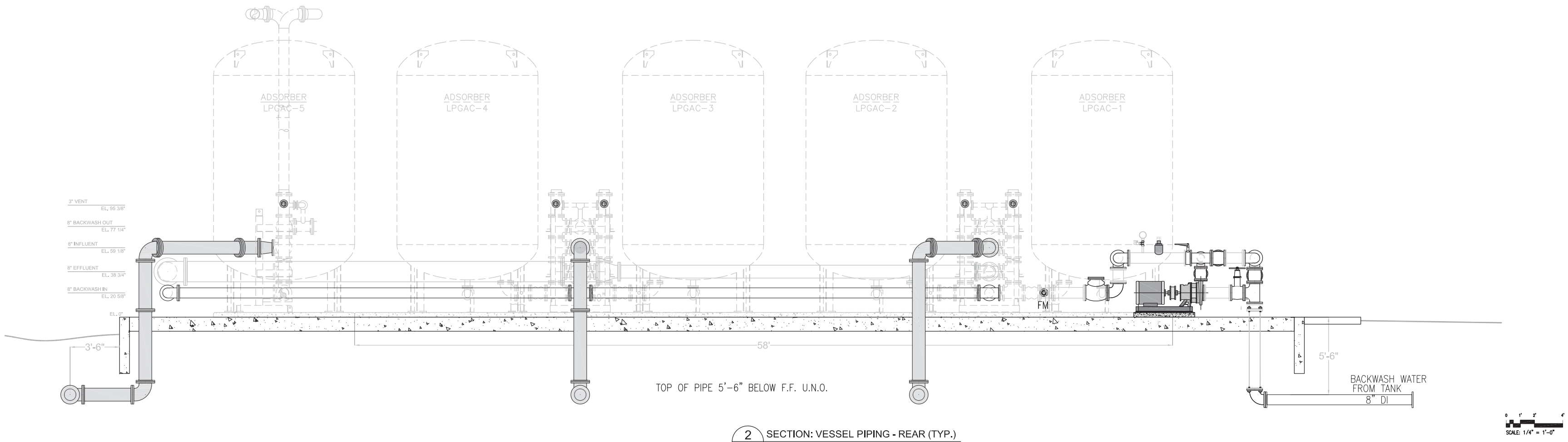
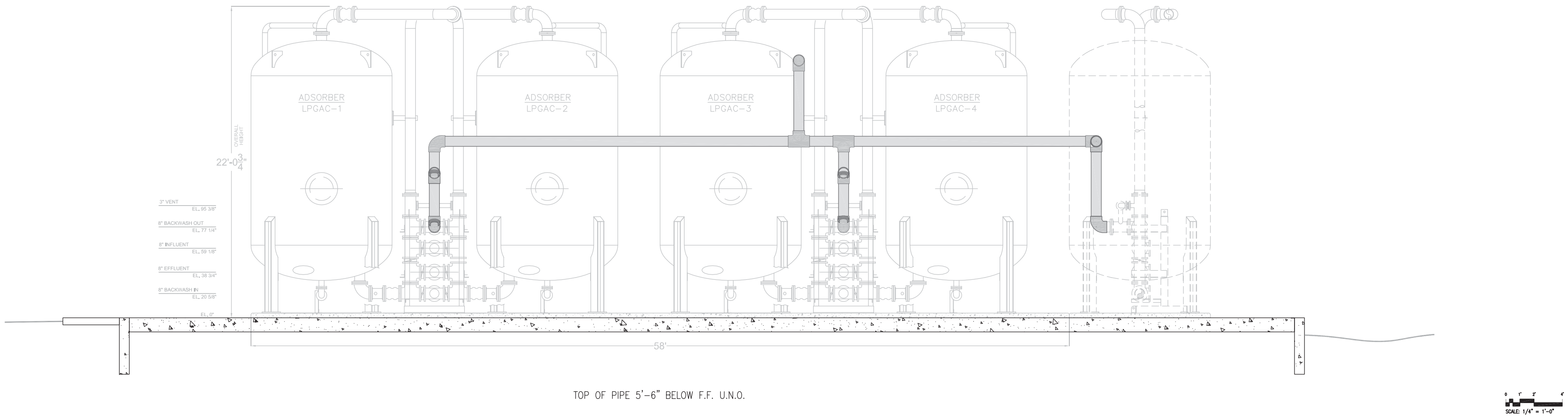


2
M-3 SECTION: VESSEL PIPING - REAR (TYP.)
SCALE: 1/4" =1'-0"



1
M-3 SECTION: VESSEL PIPING - FRONT (TYP.)
SCALE: 1/4" =1'-0"

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
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FACILITY

**BUILDING SECTIONS**

CODE ID. NO. 80091 SIZE D
SCALE: 1/4"=1'-0"
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF – –
M-3

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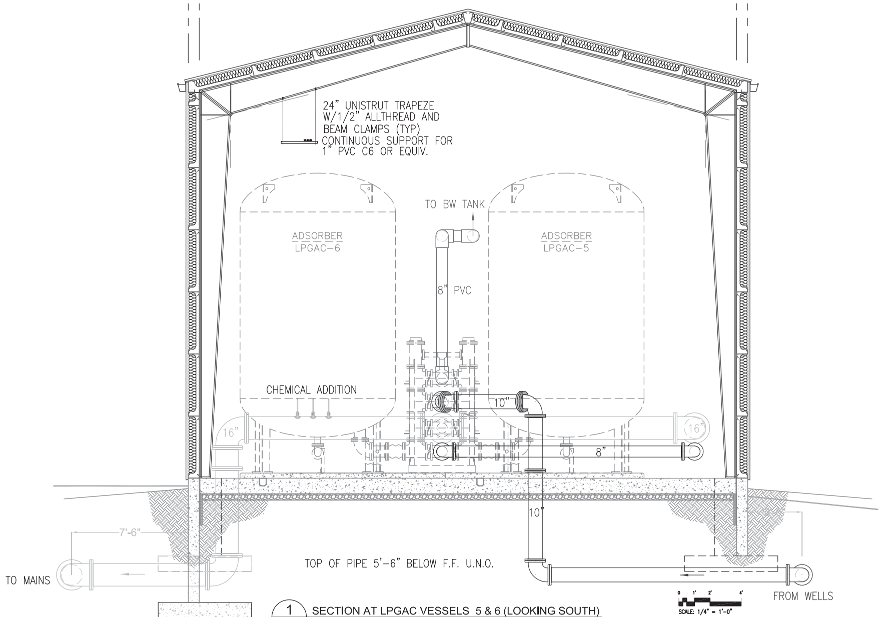
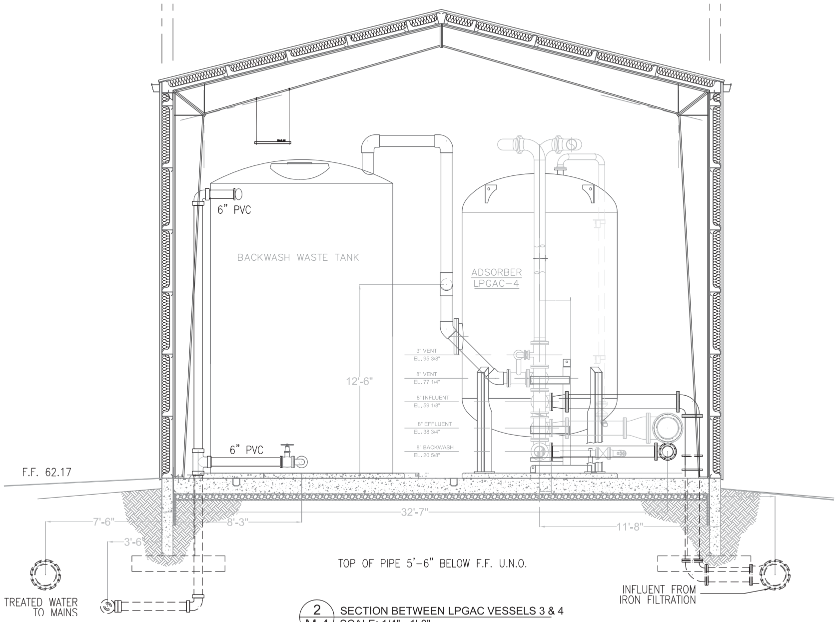
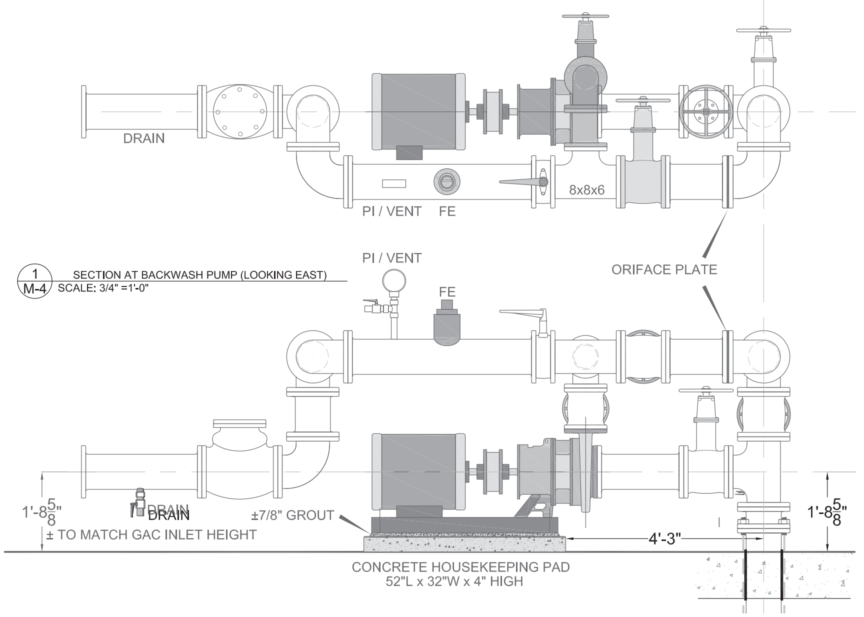


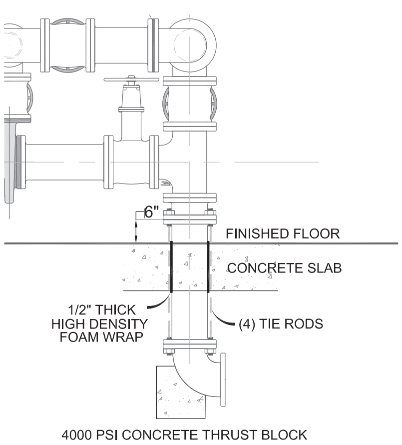
1 M-4 SECTION AT LPGAC VESSELS 5 & 6 (LOOKING SOUTH)
SCALE: 1/4" =1'-0"



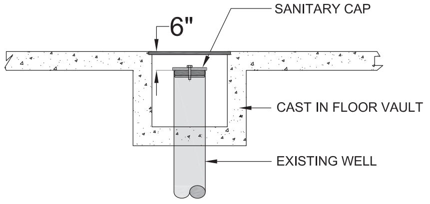
2 M-4 SECTION BETWEEN LPGAC VESSELS 3 & 4
SCALE: 1/4" =1'-0"



1 M-4 SECTION AT BACKWASH PUMP (LOOKING EAST)
SCALE: 3/4" =1'-0"



5 M-4 PIPE PENETRATION THROUGH FLOOR (TYP.)
SCALE: NTS



4 M-4 WELL#2 SANITARY CAP DETAIL
SCALE: NTS

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

| SYM | DESCRIPTION | DATE | APPR |
|---|---|---|---|
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AQUA NY
NASSAU COUNTY, NEW YORK
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FACILITY

**BUILDING SECTIONS**

CODE ID. NO. 80091 SIZE D
SCALE: 1/4"=1'-0"
MAXIMO NO. N62470-08-D-1001
JOB ORDER NO. WE-25
SPEC. NO.
CONSTR. CONTR. NO. 112G02223
NAVFAC DRAWING NO.
SHEET OF – –
M-4

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## 6.0 SPECIFICATIONS

Technical specifications will be provided in the final report. An equipment list (Table 6.1), instrument list (Table 6.2), system control list (Table 6.3) and the anticipated specification table of contents (Table 6.4) are provided at this time.

## Table 6.1 Equipment List

| ID Number | Equipment | Quantity | Dimensions/Capacity | Remarks |
|---|---|---|---|---|
| No. 3 | Existing Well Pump | 1 | 1,800 gpm @ 304' TDH, 200 HP | Retrofit with additional bowl and new motor to maintain flowrate with an additional 15 psi. |
| No. 4 | Existing Well Pump | 1 | 2,100 gpm, @ 262' TDH, 200 HP | Retrofit with additional bowl and new motor to maintain flowrate with an additional 15 psi. |
| LPGAC-100 to -600 | GAC Adsorbers | 6 | 10' diameter x 18' high, 20,000 pounds | 700 gpm each unit, 125 psig design pressure |
| T-700 | Backwash Holding Tank | 1 | 12' diameter x 19.5' high (15,000 gallon capacity) | Capacity for 1.5 backwashes. |
| P-700 | Backwash Pump | 1 | 1,000 gpm at 66' TDH | End suction, centrifugal type |
| T-800 | Hypochlorite Storage Tanks | 4 | 150 gallons | Double wall tank |
| P-800 A&B | Hypochlorite Feed Pumps | 2 | 2.5 gph, 150 psi | Positive displacement |
| T-900 A&B | Phosphate Storage Tanks | 2 | 200 gallons | Double wall tank |
| P-900 A&B | Phosphate Feed Pumps | 2 | Existing pumps to be relocated | Positive displacement |
| P-702 | Sump Pump | 1 | 15 gpm @ 25' TDH, 0.5 HP | Building sump |
|  | Backup Generator | 1 | 260 KW, 325 KVA | Gas powered. |

## Table 6.2 Instrument List

| INSTRUMENTATION | ID | LOCATION | QTY | Comments |
|---|---|---|---|---|
| Flow sensor/transmitter | FE 101/FT 101 | GAC 101- inlet flow | 1 | local display only |
| Flow sensor/transmitter | FE 201/FT 201 | GAC 201- inlet flow | 1 | local display only |
| Flow sensor/transmitter | FE 301/FT 301 | GAC 301- inlet flow | 1 | local display only |
| Flow sensor/transmitter | FE 401/FT 401 | GAC 401- inlet flow | 1 | local display only |
| Flow sensor/transmitter | FE 501/FT 501 | GAC 501- inlet flow | 1 | local display only |
| Flow sensor/transmitter | FE 601/FT 601 | GAC 601- inlet flow | 1 | local display only |
| Flow sensor/transmitter | FE 700/FT 700 | Backwash Pump discharge line | 1 | local display only |
| Level switch-High | LSH 700 | BW tank T-700 | 1 | controls BW pump's operation |
| Level switches- High | LSH 800 A thru D | Hypochlorite Tanks T800 A thru D | 4 | to audible alarm |
| Differential Pressure Transmitter | DPIT 100 | Carbon Filter Inlet/Outlet header | 1 | local display only |
| Strip chart recorder | | Treatment Building | 1 | for DPIT 100 |
| Chlorine Analyzer | CL/PH 100 | Treated water header | 2 | signals to local recorders |
| and pH analyzer | | | | |
| Circular chart- 7-day | | Treatment Building | 2 | for pH and chlorine analyzers |
| Float Switches | | Sump pump | 3 | controls sump pump locally |
| Orifice plate | RO-101 | plant effluent line | 1 | detects plant effluent flow (redundent signal) |
| flow transmitter | FT-101 | plant effluent line | 1 | signal from RO-101 |
| Flow switch | FS-101 | plant effluent line | 1 | detects plant effluent signal |
| Orifice plate | RO-701 | Backwash Pump bypass line | 1 | regulate flow from plant effluent in bypass mode |
| pressure relief valves | PRV 800A thru D | Hypochlorite Feed Pump discharge | 2 | supplied by chemical pump vendor |
| back pressure/anti-siphon valve | BP 800A thru D | Hypochlorite Feed Pump discharge | 2 | supplied by chemical pump vendor |
| pulsation dampener | PD 800A thru D | Hypochlorite Feed Pump discharge | 2 | supplied by chemical pump vendor |
| pressure relief valves | PRV 900A thru B | Phosphate Feed Pump discharge | 2 | supplied by chemical pump vendor |
| back pressure/anti-siphon valve | BP 900A thru B | Phosphate Feed Pump discharge | 2 | supplied by chemical pump vendor |
| pulsation dampener | PD 900A thru B | Phosphate Feed Pump discharge | 2 | supplied by chemical pump vendor |
| Pressure Gauge | Various | pump discharge and all GACs | | local reading only |
| Rupture Disks | RD -101 thru 601 | GAC inlet line | 6 | supplied by LPGAC vendor |

## Table 6.3
## System Control List

| System | Number | Function | Remarks |
|---|---|---|---|
| Well | WP-03 | Well Pump No. 3 operation, Hand-Off-Auto Switch | New motor starter to be located in Electrical Room, starter is interlocked to operation of two hypochlorite pumps (existing and P-800A) and phosphate pump (P-900A) |
| Well | WP-04 | Well Pump No. 4 operation, Hand-Off-Auto Switch | New motor starter to be located in Electrical Room, starter is interlocked to operation of two hypochlorite pumps (existing and P-800B) and phosphate pump (P-900B) |
| GAC | DP101<br>FQ-100 to FQ-600 | Monitor for high pressure drop across GAC units and individual unit flow totals. | Monitor and record increase in pressure differential across GAC unit. Local flow meter on each filter effluent to evaluate uniform flow through GAC units |
| Backwash Pump System | P-700<br>FI-700<br>LS-700 | Backwash Pump (P-700) operation, Hand-Off-Auto Switch. | New motor starter to be located in Electrical Room. Starter is interlocked to high level switch on Backwash Tank. High level will disable pump. Local flow meter to monitor/confirm flow rate during backwash. Timer to allow pump to operate for 10 minutes. |
| Sodium Hypochlorite Feed System | P-800A and -800B<br>LA-800A to -800D | Sodium Hypochlorite feed system, Hand-Off-Auto Switch | Pumps are interlocked with WP-3 and WP-04 operation. Pump operation requires redundant confirmation of flow (flow switch-FS101 and orifice plate – RO101). Feed rate is manually adjusted via stroke control on pump. Check valve prevents backflow of water.<br>Local audible alarms for high level in tanks T-800A to -800D during filling operation. |
| Phosphate Feed System | P-900A and -900B | Phosphate feed system, Hand-Off-Auto Switch | Pumps are interlocked into WP-3 and WP-04 operation. Pump operation requires redundant confirmation of flow ((flow switch-FS101 and orifice plate – RO101). Feed rate is manually adjusted via stroke control on pump. Check valve prevents backflow of water. |
| Effluent Monitoring of pH and Chlorine | AE-800 and -801 | Continuous chlorine and pH monitors with strip chart recorders. | Compliance monitoring, new equipment identical to existing system. |

## Table 6.4

## Preliminary Specification Table of Contents

| | |
|---|---|
| **DIVISION 03 - CONCRETE** | |
| 03 30 00 | CAST-IN-PLACE CONCRETE |
| **DIVISION 04 - MASONRY** | |
| 04 20 00 | MASONRY |
| **DIVISION 05 - METALS** | |
| 05 05 23 | WELDING, STRUCTURAL |
| 05 30 00 | STEEL DECKS |
| 05 40 00 | COLD-FORMED METAL FRAMING |
| 05 50 13 | MISCELLANEOUS METAL FABRICATIONS |
| **DIVISION 07 - THERMAL AND MOISTURE PROTECTION** | |
| 07 21 13 | BOARD AND BLOCK INSULATION |
| 07 84 00 | FIRESTOPPING |
| 07 92 00 | JOINT SEALANTS |
| **DIVISION 08 - OPENINGS** | |
| 08 11 13 | STEEL DOORS AND FRAMES |
| 08 33 23 | OVERHEAD COILING DOORS |
| 08 71 00 | DOOR HARDWARE |
| 08 91 00 | METAL WALL AND DOOR LOUVERS |
| **DIVISION 09 - FINISHES** | |
| 09 29 00 | GYPSUM BOARD |
| 09 90 00 | PAINTS AND COATINGS |
| **DIVISION 10 - SPECIALTIES** | |
| 10 14 01 | EXTERIOR SIGNAGE |
| 10 14 02 | INTERIOR SIGNAGE |
| 10 44 16 | FIRE EXTINGUISHERS |

### DIVISION 13 - SPECIAL CONSTRUCTION

| | |
|---|---|
| 13 34 19 | METAL BUILDING SYSTEMS |

### DIVISION 22 - PLUMBING

| | |
|---|---|
| 22 00 00 | PLUMBING, GENERAL PURPOSE |
| 22 07 19 | PLUMBING PIPING INSULATION |

### DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING

| | |
|---|---|
| 23 05 93 | TESTING, ADJUSTING, AND BALANCING FOR HVAC |
| 23 11 25 | FACILITY GAS PIPING |
| 23 82 23 | UNIT VENTILATORS |

### DIVISION 26 - ELECTRICAL

| | |
|---|---|
| 26 00 00.00 20 | BASIC ELECTRICAL MATERIALS AND METHODS |
| 26 05 00.00 40 | COMMON WORK RESULTS FOR ELECTRICAL |
| 26 05 19.00 10 | INSULATED WIRE AND CABLE |
| 26 05 71.00 40 | LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES |
| 26 08 00 | APPARATUS INSPECTION AND TESTING |
| 26 12 19.10 | THREE-PHASE PAD-MOUNTED TRANSFORMERS |
| 26 20 00 | INTERIOR DISTRIBUTION SYSTEM |
| 26 24 16.00 40 | PANELBOARDS |
| 26 24 19.00 40 | MOTOR CONTROL CENTERS |
| 26 27 13.10 30 | ELECTRIC METERS |
| 26 28 21.00 40 | AUTOMATIC TRANSFER SWITCHES |
| 26 29 01.00 10 | ELECTRIC MOTORS, 3-PHASE VERTICAL INDUCTION TYPE |
| 26 32 14.00 10 | DIESEL-GENERATOR SET, STATIONARY 15-300 KW, STANDBY APPLICATIONS |
| 26 41 00.00 20 | LIGHTNING PROTECTION SYSTEM |
| 26 51 00.00 40 | INTERIOR LIGHTING |
| 26 52 00.00 40 | EMERGENCY LIGHTING |
| 26 53 00.00 40 | EXIT SIGNS |
| 26 56 23.00 40 | AREA LIGHTING |

## DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

| | |
|---|---|
| 28 05 26.00 40 | GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY |

## DIVISION 31 - EARTHWORK

| | |
|---|---|
| 31 00 00 | EARTHWORK |
| 31 05 19 | GEOTEXTILE |
| 31 11 00 | CLEARING AND GRUBBING |
| 31 32 11 | SOIL SURFACE EROSION CONTROL |

## DIVISION 32 - EXTERIOR IMPROVEMENTS

| | |
|---|---|
| 32 05 33 | LANDSCAPE ESTABLISHMENT |
| 32 11 23 | AGGREGATE AND/OR GRADED-CRUSHED AGGREGATE BASE COURSE |
| 32 12 17 | HOT MIX BITUMINOUS PAVEMENT |
| 32 13 73 | COMPRESSION JOINT SEALS FOR CONCRETE PAVEMENTS |
| 32 16 13 | CONCRETE SIDEWALKS AND CURBS AND GUTTERS |
| 32 31 13 | CHAIN LINK FENCES AND GATES |
| 32 92 19 | SEEDING |
| 32 92 23 | SODDING |
| 32 93 00 | EXTERIOR PLANTS |

## DIVISION 33 - UTILITIES

| | |
|---|---|
| 33 11 00 | WATER DISTRIBUTION |
| 33 40 00 | STORM DRAINAGE UTILITIES |

## DIVISION 40 - PROCESS INTEGRATION

| | |
|---|---|
| 40 05 13 | PIPELINES, LIQUID PROCESS PIPING |
| 40 17 26.00 20 | WELDING PRESSURE PIPING |
| 40 17 30.00 40 | WELDING GENERAL PIPING |
| 40 95 00 | PROCESS CONTROL |

## DIVISION 43 - PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE EQUIPMENT

| | |
|---|---|
| 43 21 13 | PUMPS: WATER, CENTRIFUGAL |

-- End of Project Table of Contents --

## 7.0 COST ESTIMATES

Capital (Table 7.1) and Operation and Maintenance (Table 7.2) costs estimates are presented in this section.

## Table 7.1 Capital Cost Estimate

| Description | Quantity | Unit Price | Unit | Cost | Comment |
|---|---|---|---|---|---|
| Vessels+ frontal piping | 6 | $120,000 | EA | $720,000 | 20,000 lbs carbon ea. |
| Existing equipment upgrades | 1 | $150,000 | LS | $150,000 | Wells 3 and 4 pump & motor |
| Hypochlorite system new | 1 | $75,000 | LS | $75,000 | |
| Relocate phosphate system | 1 | $20,000 | LS | $20,000 | |
| Backwash tank and pump | 1 | $40,000 | EA | $40,000 | 15,000 gallon HDPE |
| Aboveground piping and valves | 1 | $100,000 | LS | $100,000 | |
| Underground piping+ valves | 1 | $150,000 | LS | $150,000 | |
| Equipment/Piping installation | 1 | $375,000 | LS | $375,000 | 30% of equip cost |
| Buildings | 3,024 | $400 | SF | $1,209,600 | |
| Fire Suppession system | 1 | $30,000 | EA | $30,000 | |
| HVAC | 1 | $75,000 | EA | $75,000 | |
| Electrical material and installation | 1 | $250,000 | LS | $250,000 | |
| Instrumentation and installation | 1 | $80,000 | LS | $80,000 | |
| **Construction Cost** | | | | **$3,274,600** | |
| | | | | | |
| Project /Construction Management | 10% | Const. Cost | LS | $327,460 | |
| Contingency | 15% | Const. Cost | LS | $491,190 | |
| **Overhead Cost** | | | | **$818,650** | |
| | | | | | |
| **Total Capital Cost** | | | | **$4,093,250** | |
| | | | | | |

### Table 7.2  Annual O&M Cost Estimate

| Activity | Quantity | Unit | Unit Rate ($/ea) | Subtotal ($) | Notes |
|---|---|---|---|---|---|
| Carbon Replacement Costs | 21,900 | lbs | 3.85 | 84,315 | 60 lb/day, tranportation, testing, virgin GAC, and disposal. |
| Labor | 365 | hours | 80 | 29,200 | 2 hours per day |
| Sampling and Analytical | 56 | sample | 150 | 8,400 | Monthly sampling of Influent and effluent, and quarterly sampling within one unit. |
| Power (No. 3 and 4 pumps) | 180,000 | kwhr | 0.17 | 30,600 | Incremental power, 60 KW, 3000 hr/year |
| Power (Misc) | 40,000 | kwhr | 0.17 | 6,800 | Lighting, instruments, and misc. |
| Sodium Hyypochlorite | 9,882 | lbs | 1.20 | 11,859 | 1.5 ppm, 4,200 gpm, 34% |
| Building Heat | 6 | month | 2,500 | 15,000 | Four full months and four half months. |
| Filter Backwash | 2 | Each | 6,000 | 12,000 | Two backwashs per year |
| Total | | | | 198,174 | Say $200,000 per year. |

## 8.0 WATER PURCHASE CONTRACTS BETWEEN WATER SUPPLIES

This water works improvement does not include modification to water purchase contracts.

Exhibit C_BODR
Page 57 of 112

## 9.0 OTHER INFORMATION AS REQUIRED BY REVIEWING ATHORITY

To be determined.

# APPENDIX A
# GROUNDWATER DATA

## Appendix A-1: Groundwater Data

A-1, Table 1: Groundwater TCE Concentration Data:

| Well No. 3 (N-8480) | | | Well No. 4 (N-9338) | | |
|---|---|---|---|---|---|
| Date | TCE µg/L | LAB | Date | TCE µg/L | LAB |
| 09.11.06 | 0.6 | ECOTEST | 09.21.06 | ND | ECOTEST |
| 10.02.06 | 0.5 | ECOTEST | 02.02.07 | ND | ECOTEST |
| Out of service | | | 03.27.07 | ND | ECOTEST |
| 04.10.07 | 0.4 | ECOTEST | | | |
| 04.25.07 | 0.5 | H2M | 04.25.07 | ND | H2M |
| 05.14.07 | 0.6 | ECOTEST | 05.14.07 | ND | ECOTEST |
| 06.05.07 | 0.6 | ECOTEST | 06.05.07 | ND | ECOTEST |
| 07.19.07 | 0.8 | ECOTEST | 07.19.07 | ND | ECOTEST |
| 08.07.07 | 0.6 | ECOTEST | 08.07.07 | ND | ECOTEST |
| 09.07.07 | 0.8 | ECOTEST | 09.07.07 | ND | ECOTEST |
| 10.04.07 | 0.8 | ECOTEST | 10.04.07 | ND | ECOTEST |
| 11.02.07 | 0.6 | ECOTEST | 11.02.07 | ND | ECOTEST |
| 12.10.07 | 0.5 | ECOTEST | 12.05.07 | ND | ECOTEST |
| 01.09.08 | 0.7 | ECOTEST | 01.07.08 | ND | ECOTEST |
| 02.04.08 | 0.5 | ECOTEST | 02.04.08 | ND | ECOTEST |
| 03.06.08 | 0.6 | ECOTEST | 03.06.08 | 0.5 | ECOTEST |
| | | | 03.14.08 | 0.5 | ECOTEST |
| | | | 03.19.08 | 0.5 | ECOTEST |
| | | | 03.24.08 | <0.5 | ECOTEST |
| 04.02.08 | <0.5 | ECOTEST | 04.02.08 | <0.5 | ECOTEST |
| 05.01.08 | 0.6 | ECOTEST | 05.15.08 | <0.5 | ECOTEST |
| 06.16.08 | 1.0 | ECOTEST | 06.05.08 | <0.5 | ECOTEST |
| 07.15.08 | 1.2 | ECOTEST | 07.15.08 | <0.5 | ECOTEST |
| 08.15.08 | 1.1 | ECOTEST | 08.15.08 | <0.5 | ECOTEST |
| 09.03.08 | 1.4 | ECOTEST | 09.03.08 | <0.5 | ECOTEST |
| 10.06.08 | 0.9 | ECOTEST | 10.07.08 | <0.5 | ECOTEST |
| 11.07.08 | 0.7 | ECOTEST | 11.10.08 | <0.5 | ECOTEST |
| 12.02.08 | 0.8 | ECOTEST | 12.02.08 | <0.5 | ECOTEST |
| 01.07.09 | 0.8 | ECOTEST | 01.06.09 | 0.5 | ECOTEST |
| 02.13.09 | 0.8 | ECOTEST | 02.13.09 | <0.5 | ECOTEST |
| 03.04.09 | 0.9 | ECOTEST | 03.04.09 | <0.5 | ECOTEST |
| 04.20.09 | 0.9 | ECOTEST | 04.06.09 | <0.5 | ECOTEST |
| 05.13.09 | 0.9 | ECOTEST | 05.13.09 | 0.5 | ECOTEST |
| 07.16.09 | 1.2 | ECOTEST | 07.14.09 | <0.5 | ECOTEST |
| 08.11.09 | 1.2 | ECOTEST | 08.11.09 | <0.5 | ECOTEST |
| 09.11.09 | 1.6 | ECOTEST | 09.11.09 | <0.5 | ECOTEST |
| 10.08.09 | 0.9 | ECOTEST | 10.08.09 | <0.5 | ECOTEST |
| | | | 12.08.09 | 0.6 | ECOTEST |
| 01.28.10 | 1.1 | ECOTEST | | | |
| 03.09.10 | 1.4 | ECOTEST | 03.08.10 | 0.7 | ECOTEST |
| 06.02.10 | 1.9 | ECOTEST | 06.08.10 | <0.5 | ECOTEST |
| 07.28.10 | 2.0 | ECOTEST | 07.28.10 | <0.5 | ECOTEST |
| 10.05.10 | 2.1 | ECOTEST | 10.05.10 | <0.5 | ECOTEST |

A-1, Table 2: Groundwater Analysis Data (Year 2008):

| Parameter (s) | NY Limit | LEVITTOWN | |
|---|---|---|---|
| Well No | | N-8480 | N-9338 |
| Date Sampled | | 5/19/08 | 6/25/08 |
| Antimony | 6.0 µg/L | <5.0 | <5.0 |
| Arsenic | 50.0 µg/L | <5.0 | <5.0 |
| Barium | 2.0 mg/L | 0.006 | 0.006 |
| Beryllium | 4.0 µg/L | <1.0 | <1.0 |
| Cadmium | 5.0 µg/L | <1.0 | <1.0 |
| Chromium | 100.0 µg/L | <5.0 | <5.0 |
| Copper | 1.3[A] mg/L | 0.03 | 0.05 |
| Iron | 0.3[B] mg/L | 1.4 | 1.7 |
| Lead | 15.0[A] µg/L | <1 | 2.3 |
| Mercury | 2.0 µg/L | <0.25 | <0.25 |
| Nickel | 100 µg/L | <10.0 | <10.0 |
| Selenium | 50 µg/L | <2.0 | <2.0 |
| Silver | 100 µg/L | <1.0 | <1.0 |
| Thallium | 2.0 µg/L | <2.0 | <2.0 |
| Sodium | mg/L | 10 | 9 |
| Manganese | 0.3[B] mg/L | 0.03 | 0.02 |
| Zinc | 5.0 mg/L | 0.4 | 0.03 |
| Total Hardness | mg/L | 17 | 14 |
| Calcium Hardness | mg/L | 10 | 8.4 |
| Ammonia (NH3) | mg/L | <0.05 | <0.05 |
| Free Cyanide | 200.0 µg/L | <20.0 | <20.0 |
| Fluoride | 2.2 mg/L | <0.2 | <0.2 |
| Chloride | 250 mg/L | 16 | 13 |
| Sulfate | 250 mg/L | 22 | 18 |
| Nitrite (as N) | 100 µg/L | <2.0 | <2.0 |
| Detergents (MBAs) | mg/L | <0.1 | <0.1 |
| pH | S.U. | 4.9 | 4.8 |
| Total Alkalinity | mg/L | <2 | <2 |
| TDS | mg/L | 70 | 70 |
| Nitrate (as N) | 10.0 mg/L | <0.05 | <0.05 |
| Turbidity | 5.0 UNITS | 2.5 | <1 |
| Color | 15 0 units | <5 | <5 |
| Odor | 3.0 units | <1.0 | <1.0 |
| LSI | mg/L | -6 | -6 |
| Perchlorate | µg/L | <0.5 | <0.5 |

# APPENDIX B
# PREDESIGN INVESTIGATION

# APPENDIX B – PREDESIGN INVESTIGATION
# SEAMAN'S NECK ROAD WATER TREATMENT PLANT UPGRADE

## 1.0 Design Basis and Background

This pre-design evaluation addresses treatment requirements for two existing potable water supply wells (Wells 3 and 4) located at the Seaman's Neck Road Plant of Aqua New York (Aqua). The purpose of this evaluation is to investigate potential remedial options for addressing volatile organic compound (VOC) contamination in the well field. Since 2007, Trichloroethene (TCE) has been detected consistently in the water supply wells at a concentration up to approximately 1.6 micrograms per liter (µg/L). In addition, the TCE concentration has been generally increasing over the past three years.

The source of the TCE has been linked to a groundwater plume originating near the Northrop Grumman Complex. Near this source (8,300 feet upgradient of the Aqua well field), TCE has been detected at a concentration up to 840 µg/L in a permanent monitoring well, see Figure 1. Near the Aqua well field, (approximately 1,100 feet upgradient of the Aqua well field), there are outpost monitoring wells screened at the depth of the Aqua supply well screens. These outpost monitoring wells do not contain detectable concentrations of VOCs. During the 2009 vertical profile boring, VOCs (TCE and tetrachloroethene [PCE}) were detected at concentrations greater than 100 µg/L at depths above and below the Aqua supply well screens. Based on the presence of VOC-contaminated groundwater upgradient of the Aqua well field, the maximum VOC concentration anticipated at the Seaman's Neck Road Plant, as well as the duration of impact, is uncertain.

Aqua water supply well No. 3 pump is rated for 1,800 gallons per minutes (gpm), while Aqua water supply well No. 4 pump is rated for 2,100 gpm. Each well has a state-authorized capacity of 2,100 gpm or a total capacity of 4,200 gpm (6 million gallons per day [MGD]). Based on recent plant records, the plant operates at an average of 34 percent of the maximum pump capacity (1,428 gpm average or 3,000 hr/year at capacity) on an annual basis. Typical operation is for one of the wells to operate the majority of the time year round, and the second well operates on a more regular basis only during the summer months.

Because of uncertainty with the magnitude of the upgradient groundwater contamination, this report describes design schemes to treat influent TCE concentrations of 10 µg/L, 100 µg/L and 500 µg/L to 0.5 µg/L in the effluent. TCE is the primary organic constituent of concern. Dissolved iron is also present, and the facility has in place an iron removal plant.

Two general treatment technologies are being evaluated under four options.

- Option A - Liquid phase granular activated carbon (LPGAC), before the iron removal plant.
- Option B – LPGAC, after the iron removal plant.

- Option C - Air stripping tower (AST), after the iron removal plant, less than 50 µg/L TCE.
- Option D - Air stripping tower (AST), after the iron removal plant, greater than 50 µg/L TCE.

**Option A - Liquid phase granular activated carbon (LPGAC), before the iron removal plant**

1. Raw well water from each well (pre-chlorination and pH adjustment) will be diverted to a separate LPGAC treatment system. Following LPGAC treatment, the water will be diverted back to the existing chlorinated and pH facilities.
2. Two existing well pumps and motors will be modified or replaced to address additional head loss in pre-filters, LPGAC and associated piping (expected <50'). New motors will be 200 HP instead of the current 150 HP. Pumps will be modified to develop more pressure.
3. Each treatment system will consist of four 10' diameter vessels and contain 20,000 lbs of virgin carbon (total eight vessels).
4. The vessels will be running in parallel, with each vessel will be treating a maximum flow of 525 gpm (10 minute of EBCT).
5. The Well No. 3 discharge line after LPGAC will be rerouted back to existing chemical treatment room (near pump). The Well No. 4 discharge line after LPGAC will be diverted parallel to Well No. 3 line, but will be reconnected outside the existing chemical room. A new (small) building will be required for this tie-in and chemical addition. Existing chemical feed system from Well No. 4 will be relocated. This way each well will have their separate chemical feed system and maximum reuse of the existing chemical feed systems.
6. LPGAC treated water from Well Nos. 3 and 4 will be joined just prior to iron removal system.
7. Each filter will require initial backwash during startup and periodic backwash to fluff the media. The need for backwash will be based on pressure drop (e.g., 10 psi) and is expected to occur every 4 to 8 weeks. Backwash will require 1,000 gpm of water for 10 minutes per vessel. This water will be taken from the treated water header. During backwash, the associated water supply well will be taken off line. The backwash wastewater will be sent to a new 12,000 gallon tank. This water will then be transferred to existing wastewater tank at 50 gpm.
8. A duplex pre-filter will be added before LPGAC to remove any fine suspended solids from the well.
9. Carbon replacement will depend on TCE concentrations. At 4,200 gpm and the annual average flow, carbon usage and TCE break-thru will be as follows:

| Inlet TCE (µg/L) | Outlet TCE (µg/L) | Carbon Usage (pounds/day)(1) | Break-through (days)(1) |
|---|---|---|---|
| 10 | 0.5 | 15 to 60 | 2,700 to 10,700 |
| 100 | 0.5 | 60 to 240 | 650 to 2,600 |
| 500 | 0.5 | 170 to 640 | 240 to 950 |

(1) The range is carbon usage is based on assumptions regarding the sharpness of the breakthrough curve and competition of carbon adsorption sites with other naturally occurring organics.

### Option B - Liquid phase granular activated carbon, after iron removal plant

1. Combined Well water from the iron removal system will be discharged to the LPGAC treatment system. Following LPGAC treatment, new chemical feed facilities will be used to treat the water prior to distribution.
2. Two existing well pumps and motors will be modified or replaced to address additional head loss in pre-filters, LPGAC and associated piping (expected less than 50 feet). New motors will be 200 HP instead of the current 150 HP. Pumps will be modified to develop more pressure.
3. The LPGAC system will consist of six 10' diameter vessels each containing 20,000 lbs of virgin carbon.
4. These vessels will be running in parallel, thus each vessel will be treating a maximum flow of 700 gpm (7.5 minute of EBCT).
5. Each filter will require initial backwash during startup and periodic backwash to fluff the media. The need for backwash will be based on pressure drop (e.g., 10 pounds per square inch) and is expected to occur every 6 to 12 months. Backwash will require 1,000 gpm of water for 10 minutes per vessel. This water will be taken from the treated water header. During backwash, the one raw water well will also be taken off line. The backwash wastewater will be sent to a new 12,000 gal tank. This water will then be transferred to existing wastewater tank at 50 gpm.
6. There is no need of a duplex pre-filter before the LPGAC as the IR plant will remove bulk of the iron and turbidity as well.
7. A new post-LPGAC chlorination system will be used to provide residual chlorine.
8. Existing phosphate feed system will be relocated in the new building.
9. Carbon replacement will depend on TCE concentrations. At 4,200 gpm and the annual average flow, carbon usage and TCE Carbon Usage will be the same as Option A. Breakthrough will occur sooner than Option A, because there are only 6 vessels instead of 8 vessels.

### Evaluation of Options A and B

Option A

- Maintains a separate treatment system for each well, to the iron removal system.
- LPGAC may be prone to increased fouling because of dissolved iron adsorption and require more frequent backwashing.
- Low pH inhibits bacterial growth.
- Carbon vessels may need to be coated internally for low pH (4 to 5 S.U.).

Option B

- Iron removal prior to LPGAC reduces concerns with iron fouling of media from raw water.
- Problems with iron removal system operation could discharge suspended solids to LPGAC and increase backwashing frequency.
- Water to LPGAC will have some chlorine residual that will increase carbon use and require slightly higher overall chlorine use.

**Option C - Air stripping tower (AST)**

This system would be added after the existing iron removal system to minimize iron precipitation in the air stripping towers. For the air stripper design, packed vertical tower was considered. Depending on TCE concentrations, tower height will vary as illustrated in below:

| Inlet TCE (µg/L) | Outlet TCE (µg/L) | Number of towers/ Tower height (feet) |
|---|---|---|
| 10 | 0.5 | Two/ 33 |
| 100 | 0.5 | Two/48 |
| 500 | 0.5 | Two/60 |
| 500 | 0.5 | Four/36’ |

Since the site is located in a residential neighborhood, the height of the building is limited to 35 feet. Thus to meet 0.5 µg/L TCE in plant effluent, a single stage AST can treat a maximum of 50 µg/L of influent TCE. TCE concentrations greater than 50 µg/L will require two stage AST treatment systems (Option D).

**Option C: Single Stage AST for TCE less than 50 µg/L**

Single stage air stripping can treat water to obtain effluent quality of 0.5 µg/L as long as the influent concentration is below or equal to 50 µg/L. Under this system:

1. Treated water from iron removal plant will be diverted to AST. Existing well pump operation will be modified to reflect lower discharge pressure. Post AST chlorination will be required.
2. There will be two packed towers running in parallel. Each tower will treat 2,100 gpm of groundwater.
3. Based on a flow rate of 2100 gpm per well, a 10-foot diameter is the recommended diameter required for each tower. With packing height of 20 feet total AST height will be about 32 feet.
4. Effluent from AST will discharge into an underground clear well. Based on 25 minute storage at 4,200 gpm, approximately 100,000 gallon sump will be provided in this stage.
5. There will be three booster pumps at this clear well each rated at 2,100 gpm to discharge treated water to the water main.

6. Building to house the system will be approximately 2000 square feet with 600 square feet having a height of 35 feet to accommodate the towers and the balance having a height of 25 feet.
7. Post chlorination system will be provided to maintain residual chlorine.
8. Existing phosphate feed system will be relocated in the new building.
9. No changes will be made to caustic systems

Table below illustrates the tower sizes and performance of this arrangement. Design is slightly conservative to take care of low temperature impact on performance.

| TCE Influent (µg/L) | TCE Effluent (µg/L) | Removal Efficiency (%) | Tower Height (feet) | Air flow CFM | TCE in air (mg/l) |
|---|---|---|---|---|---|
| 10-50 | 0.5 | 99% | 32 | 15,500 | <0.5 |

**Option D: Two-Stage AST for TCE greater than 50 µg/L:**

For influent concentrations greater than 50 µg/l and to achieve a target concentration of 0.5 µg/l and maintain the AST within reasonable height (below 35 feet), two stage air stripping will be required, consisting of a primary stage where a bulk of the load will be removed followed by a secondary stage where the water will be polished. Under this system:

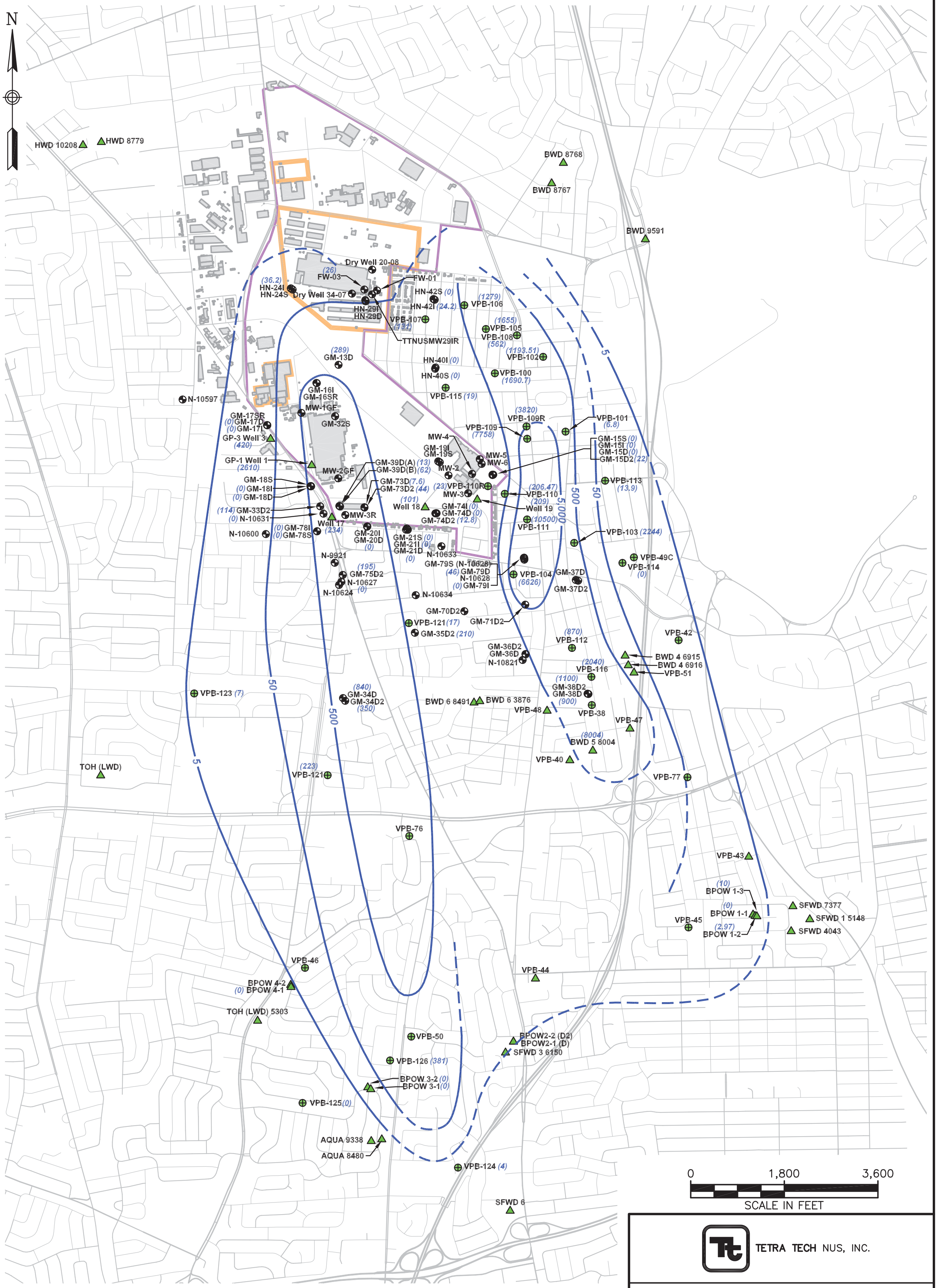
1. Treated water from iron removal plant will be diverted to AST. Existing well pump operation will be modified to reflect lower discharge pressure. Post AST chlorination will be required.
2. There will be two towers in each stage. The first set of two towers will be a primary stage and a similar set will form the secondary stage.
3. The plant will be designed such that 2100 gallons per minute (gpm) of groundwater will be treated through one tower. Hence two towers will be required to treat the total flow of 4200 gpm in each stage.
4. A 10 feet diameter is the recommend diameter required for the tower design irrespective of the stage.
5. Effluent from first stage will discharge into an underground clear well.
6. There will be three transfer pumps at this clear well each rated at 2,100 gpm to discharge treated water to the second stage air stripping columns.
7. Effluent from the second stage will discharge into an underground clear well.
8. From the second sump, treated water will be pumped to the water main for distribution.
9. Building to house the system will be approximately 3700 square feet with 1700 square feet having a height of 35 feet to accommodate the towers and the balance having a height of 25 feet.
10. Chemical systems will be same as Option C above.

Table below illustrates the sizes and performance of the twin stage arrangement.

| TCE Influent (μg/L) | TCE Effluent (μg/L) | Removal Efficiency (%) | Tower Height (Feet) | Air flow CFM | TCE in air (mg/L) |
|---|---|---|---|---|---|
| 500 | 15 | 97 | 32 | 12,500 | 3.5 |
| 15 | 0.5 | 97 | 32 | 12,500 | < 0.5 |

**Evaluation of Options C and D**

- As long as the iron removal plant precedes the air stripping plant (either one stage or two stages) there is a low chance of iron fouling and consequently the need for acid washing etc.
- In case of dual stage system, the equipment cost does not come down even if influent TCE is low as diameter is governed by flow and minimal height of packing has to be maintained.
- If high concentrations of VOCs occur for an extended period of time, the operating costs of AST are lower than LPGAC.



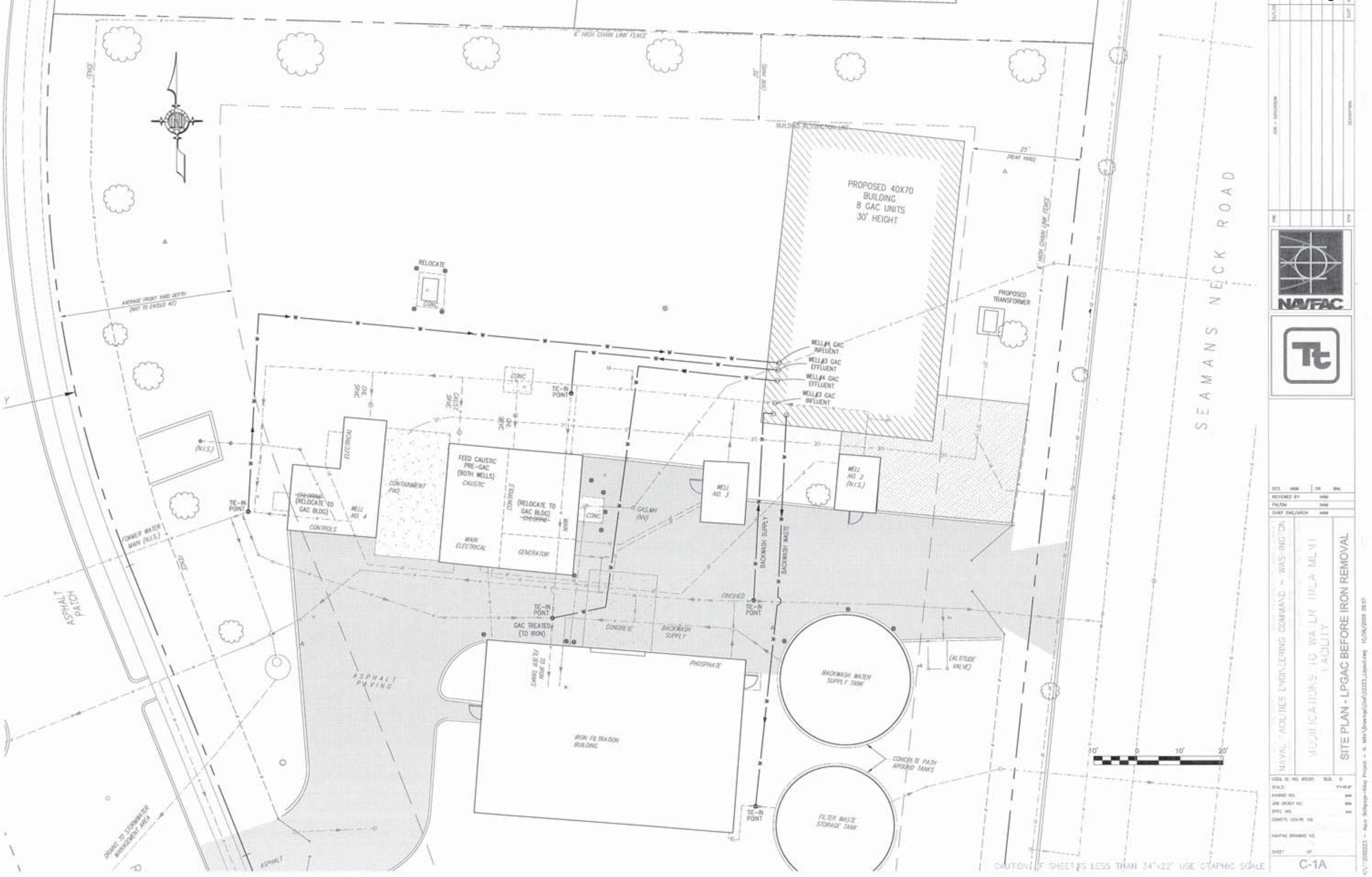
LEGEND

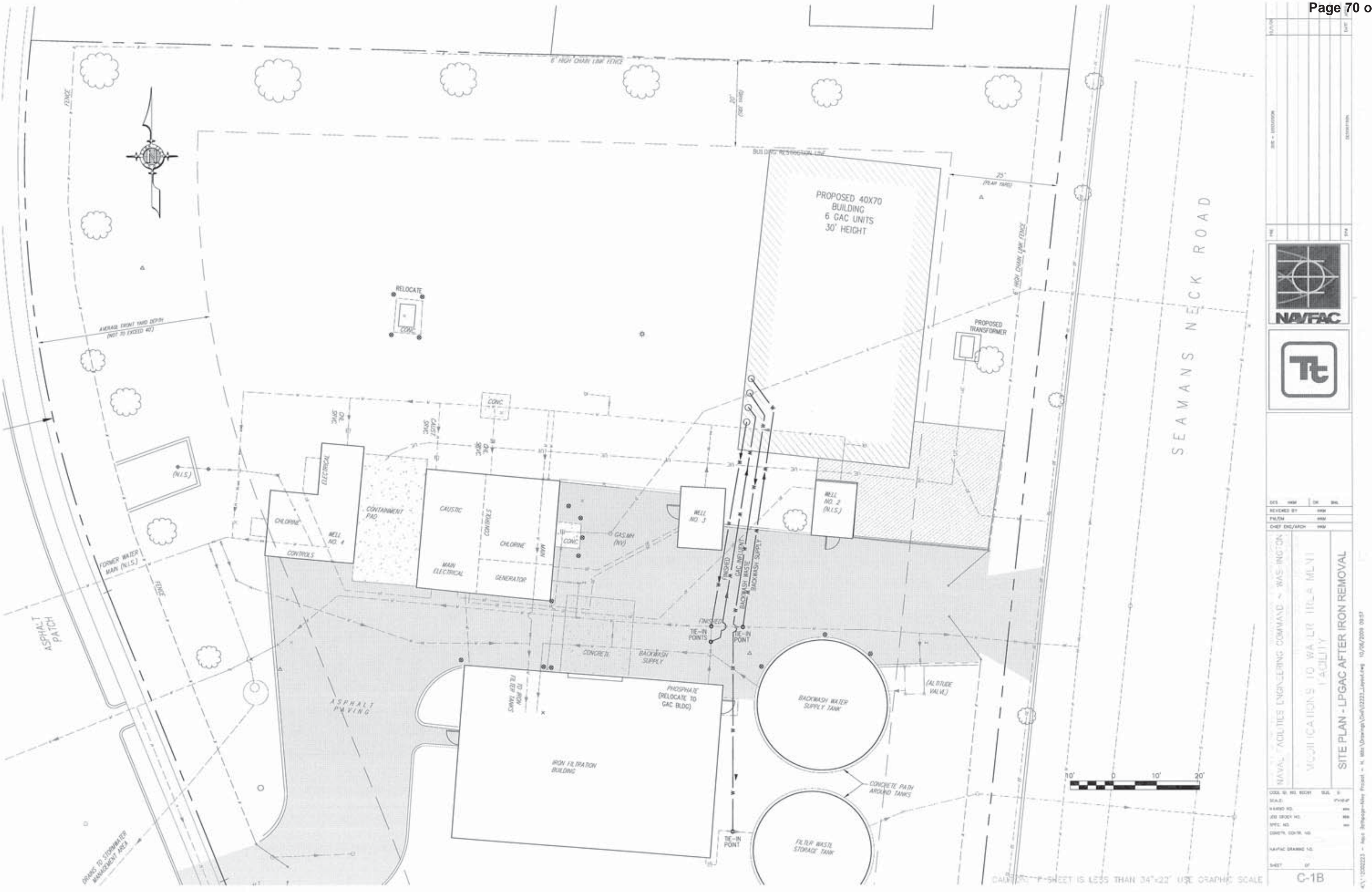
| | | | |
|---|---|---|---|
| ⊙ | GROUNDWATER SAMPLING LOCATION | ISOCONCENTRATION CONTOUR (DASHED WHERE INFERRED, IN ug/L) | BUILDING |
| ⊕ | VERTICAL PROFILE BORING | | HIGHWAY |
| ▲ | WATER SUPPLY WELL | 1997 NORTHROP-GRUMMAN BETHPAGE BOUNDARY | MAJOR LOCAL ROAD |
| (840) | TVOC CONCENTRATION IN ug/L | 1997 NWIRP BETHPAGE BOUNDARY | MINOR LOCAL ROAD |

**TETRA TECH NUS, INC.**

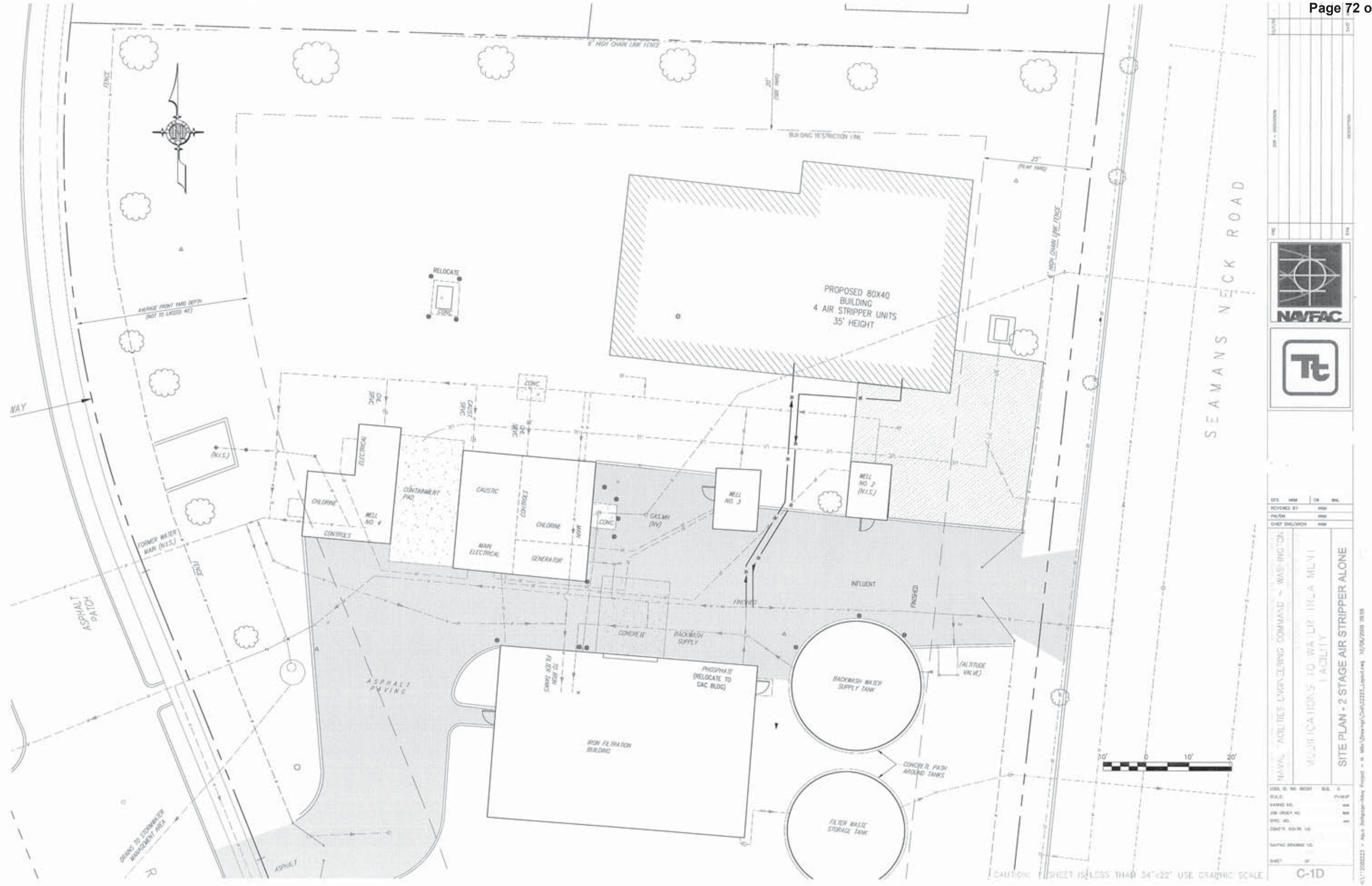
OPERABLE UNIT 2 (SITE 1) GROUNDWATER
TOTAL VOLATILE ORGANIC COMPOUND
NAVAL WEAPONS INDUSTRIAL
RESERVE PLANT
BETHPAGE, NEW YORK

| | | | |
|---|---|---|---|
| FILE<br>112G00622GM03.dwg | | SCALE<br>AS NOTED | |
| FIGURE NUMBER<br>FIGURE 1 | | REV<br>0 | DATE<br>10/05/09 |


SEAMANS NECK ROAD
PROPOSED 40X70 BUILDING 8 GAC UNITS 30' HEIGHT
PROPOSED TRANSFORMER
6' HIGH CHAIN LINK FENCE
25' (REAR YARD)
20' (SIDE YARD)
BUILDING RESTRICTION LINE
AVERAGE FRONT YARD DEPTH (NOT TO EXCEED 40')
FENCE
RELOCATE
CONC
WELL#4 GAC INFLUENT
WELL#3 GAC EFFLUENT
WELL#4 GAC EFFLUENT
WELL#3 GAC INFLUENT
TIE-IN POINT
CHL SRVC
CAUST. SRVC
WELL NO. 2 (N.I.S.)
WELL NO. 3
WELL NO. 4
FEED CAUSTIC PRE-GAC (BOTH WELLS)
CAUSTIC
CONTROLS
(RELOCATE TO GAC BLDG)
CHLORINE
MAIN
MAIN ELECTRICAL
GENERATOR
CONTAINMENT PAD
ELECTRICAL
GAS,MH (NV)
BACKWASH SUPPLY
BACKWASH WASTE
FINISHED
GAC TREATED (TO IRON)
TO IRON FILTER TANKS
CONCRETE
PHOSPHATE
IRON FILTRATION BUILDING
BACKWASH WATER SUPPLY TANK
FILTER WASTE STORAGE TANK
CONCRETE PATH AROUND TANKS
(ALTITUDE VALVE)
ASPHALT PAVING
ASPHALT
ASPHALT PATCH
FORMER WATER MAIN (N.I.S.)
(N.I.S.)
DRAINS TO STORMWATER MANAGEMENT AREA
0' 0 10' 20'
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE
NAVFAC
Tt
DES. HHM DR. BNL
REVIEWED BY HHM
PM/DM HHM
CHIEF ENG/ARCH HHM
NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON
MODIFICATIONS TO WATER TREATMENT FACILITY
SITE PLAN - LPGAC BEFORE IRON REMOVAL
CODE ID. NO. 80091 SIZE D
SCALE: 1"=10'-0"
SHEET OF
C-1A
10/06/2009 09:57


SEAMANS NECK ROAD
PROPOSED 40X70
BUILDING
6 GAC UNITS
30' HEIGHT
BUILDING RESTRICTION LINE
25'
(PLAY YARD)
20'
(SIDE YARD)
6' HIGH CHAIN LINK FENCE
PROPOSED TRANSFORMER
RELOCATE
CONC
AVERAGE FRONT YARD DEPTH
(NOT TO EXCEED 40')
FENCE
(N.I.S.)
FORMER WATER MAIN (N.I.S.)
ASPHALT PATCH
CHLORINE
WELL NO. 4
CONTROLS
ELECTRICAL
CONTAINMENT PAD
CHL SRVC
CAUST SRVC
CAUSTIC
CONTROLS
CHLORINE
MAIN ELECTRICAL
GENERATOR
MAIN
CONC
GAS MH (NV)
WELL NO. 3
WELL NO. 2 (N.I.S.)
FINISHED
GAC INFLUENT
BACKWASH WASTE
BACKWASH SUPPLY
FINISHED
TIE-IN POINTS
TIE-IN POINT
CONCRETE
BACKWASH SUPPLY
TO IRON FILTER TANKS
PHOSPHATE (RELOCATE TO GAC BLDG)
IRON FILTRATION BUILDING
ASPHALT PAVING
DRAINS TO STORMWATER MANAGEMENT AREA
BACKWASH WATER SUPPLY TANK
(ALTITUDE VALVE)
CONCRETE PATH AROUND TANKS
FILTER WASTE STORAGE TANK
TIE-IN POINT
10'
0
10'
20'
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE
NAVFAC
DES HKM
CK BHL
REVIEWED BY HKM
PM/DM HKM
CHIEF ENG/ARCH HKM
NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON
MODIFICATIONS TO WATER TREATMENT FACILITY
SITE PLAN - LPGAC AFTER IRON REMOVAL
SCALE:
NAVFAC DRAWING NO.
SHEET OF
C-1B


SEAMANS NECK ROAD
PROPOSED 50X40 BUILDING 2 AIR STRIPPER UNITS 35' HEIGHT
BUILDING RESTRICTION LINE
6' HIGH CHAIN LINK FENCE
25' (REAR YARD)
20' (SIDE YARD)
AVERAGE FRONT YARD DEPTH (NOT TO EXCEED 40')
RELOCATE
CONC.
WELL NO. 2 (N.I.S.)
WELL NO. 3
WELL NO. 4
GAS MH (NV)
CAUSTIC
CONTROLS
CHLORINE
MAIN
MAIN ELECTRICAL
GENERATOR
CONTAINMENT PAD
ELECTRICAL
CHL. SRVC.
CAUST. SRVC.
CONTROLS
INFLUENT
FINISHED
BACKWASH SUPPLY
TO IRON FILTER TANKS
PHOSPHATE (RELOCATE TO GAC BLDG)
IRON FILTRATION BUILDING
BACKWASH WATER SUPPLY TANK
FILTER WASTE STORAGE TANK
CONCRETE PATH AROUND TANKS
(ALTITUDE VALVE)
ASPHALT PAVING
ASPHALT
ASPHALT PATCH
FORMER WATER MAIN (N.I.S.)
FENCE
(N.I.S.)
DRAINS TO STORMWATER MANAGEMENT AREA
10' 0 10' 20'
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE
NAVFAC
Tt
DES HKM CK BHL
REVIEWED BY HKM
PM/EM HKM
CHIEF ENG/ARCH HKM
NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON
MODIFICATIONS TO WATER TREATMENT FACILITY
SITE PLAN - SINGLE STAGE AIR STRIPPER
SCALE:
SHEET OF
C-1C


SEAMANS NECK ROAD
6' HIGH CHAIN LINK FENCE
BUILDING RESTRICTION LINE
20' (SIDE YARD)
25' (REAR YARD)
PROPOSED 80X40 BUILDING 4 AIR STRIPPER UNITS 35' HEIGHT
RELOCATE
CONC.
AVERAGE FRONT YARD DEPTH (NOT TO EXCEED 40')
FENCE
(N.I.S.)
FORMER WATER MAIN (N.I.S.)
OIL SRVC
CAUST. SRVC
CHL SRVC
ELECTRICAL
CHLORINE
WELL NO. 4
CONTROLS
CONTAINMENT PAD
CAUSTIC
CONTROLS
CHLORINE
MAIN
MAIN ELECTRICAL
GENERATOR
GAS.MH (NV)
WELL NO. 3
WELL NO. 2 (N.I.S.)
INFLUENT
FINISHED
CONCRETE
BACKWASH SUPPLY
TO IRON FILTER TANKS
PHOSPHATE (RELOCATE TO GAC BLDG)
IRON FILTRATION BUILDING
BACKWASH WATER SUPPLY TANK
FILTER WASTE STORAGE TANK
CONCRETE PATH AROUND TANKS
(ALTITUDE VALVE)
ASPHALT PAVING
ASPHALT PATCH
ASPHALT
DRAINS TO STORMWATER MANAGEMENT AREA
WAY
10' 0 10' 20'
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE
NAVFAC
Tt
DES. HHW
DR. BNL
REVIEWED BY HHW
PM/DM HHW
CHIEF ENG/ARCH HHW
NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON
MODIFICATIONS TO WATER TREATMENT FACILITY
SITE PLAN - 2 STAGE AIR STRIPPER ALONE
SCALE:
NAVFAC DRAWING NO.
SHEET OF
C-1D
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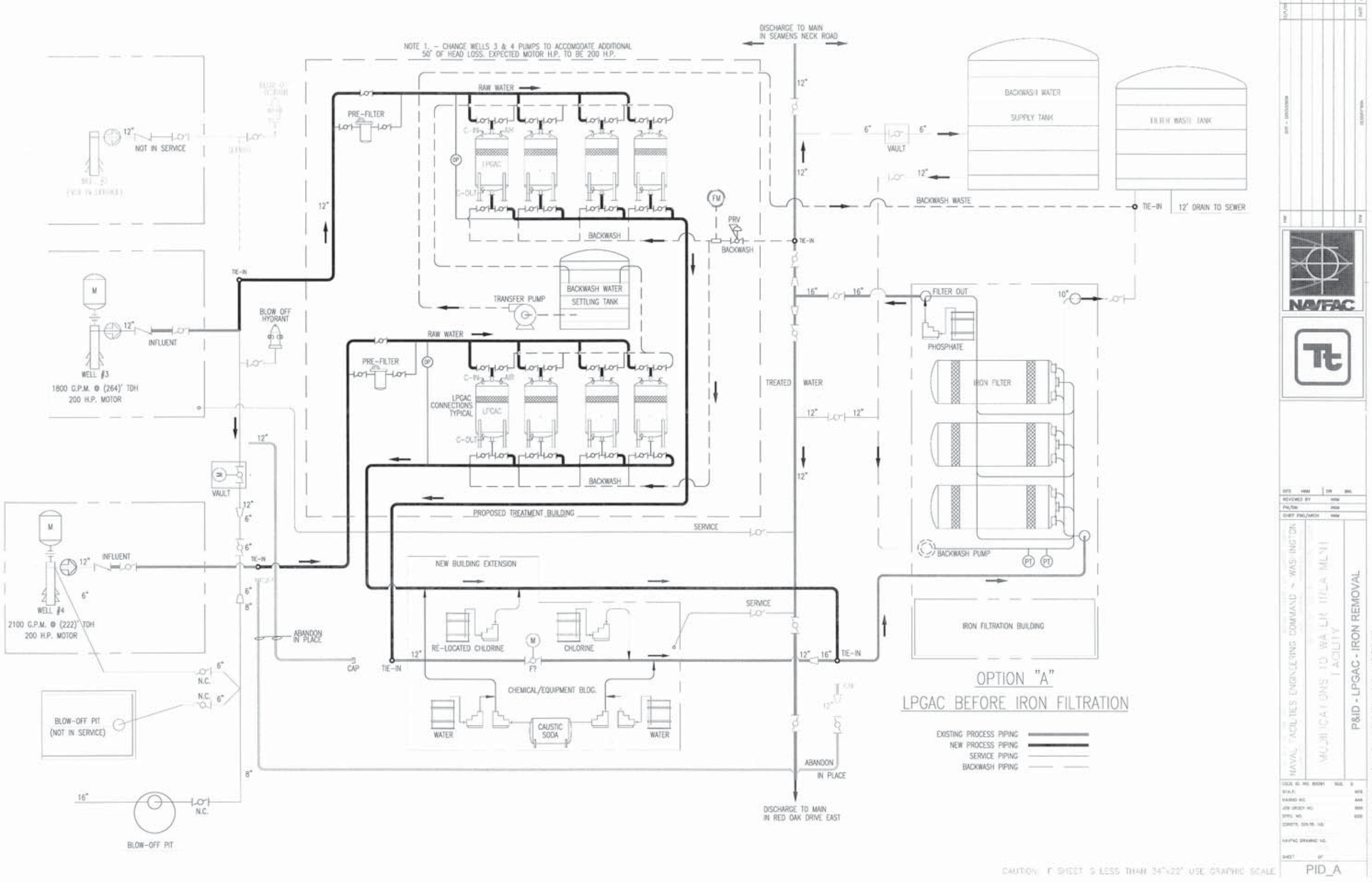
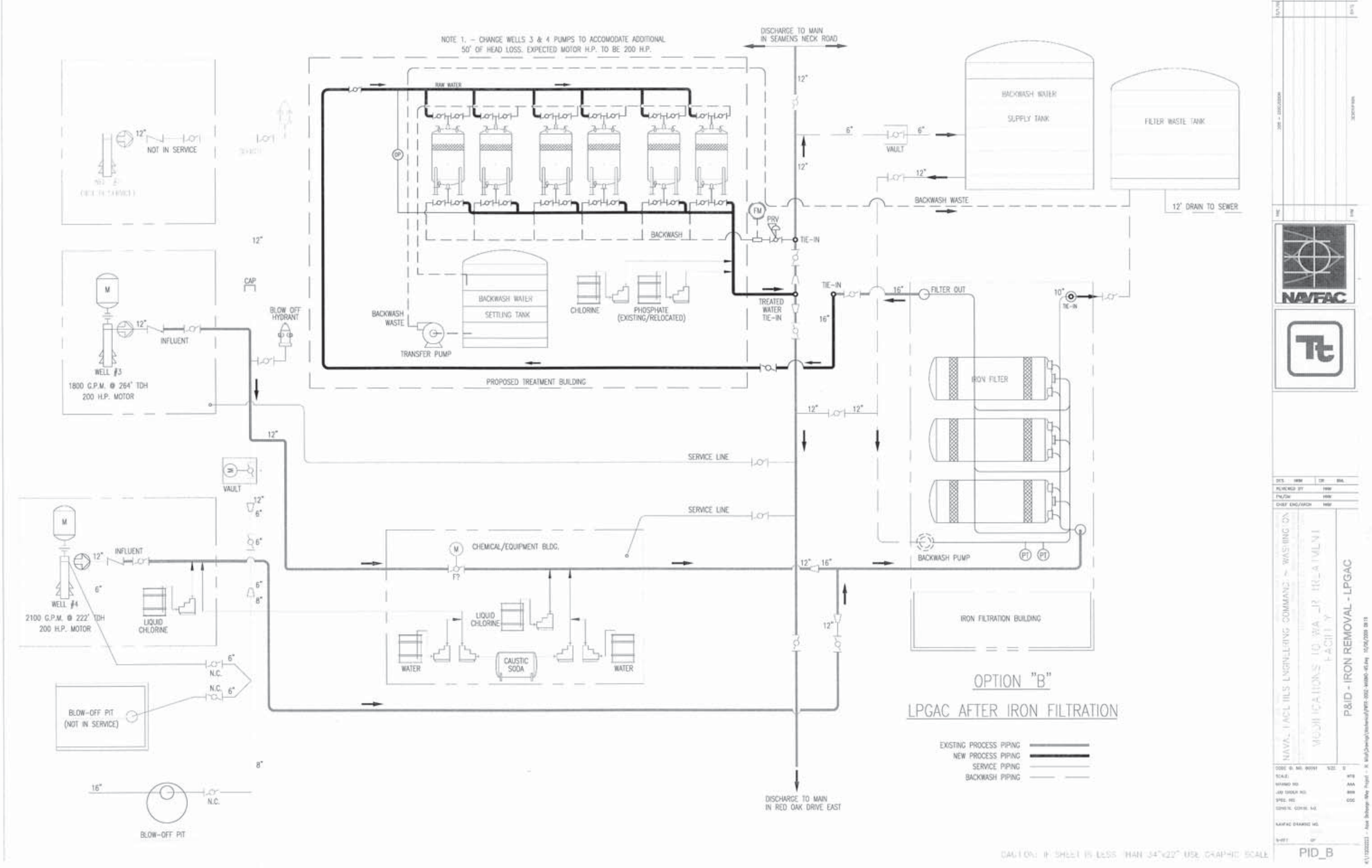
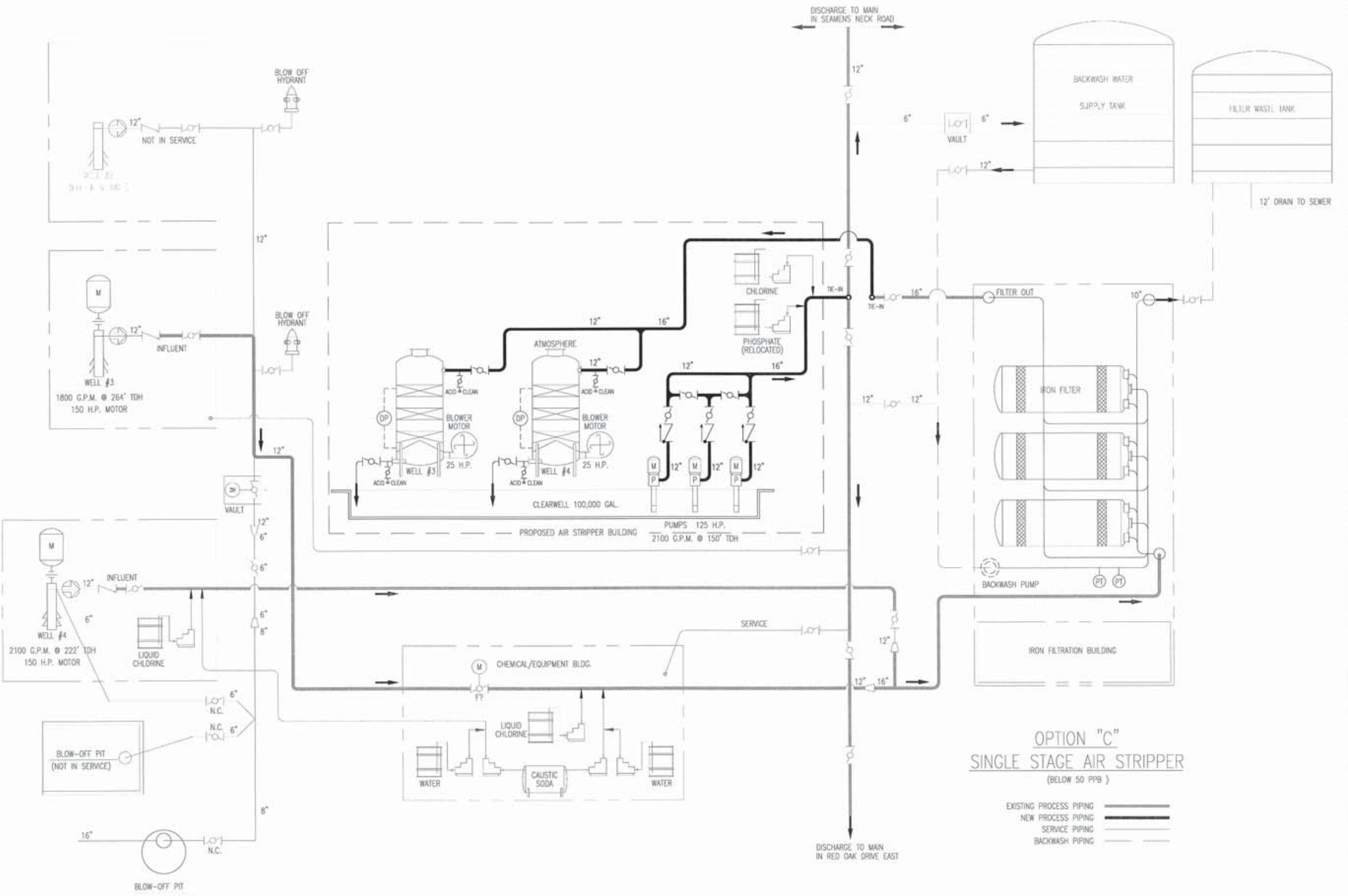

NOTE 1. - CHANGE WELLS 3 & 4 PUMPS TO ACCOMODATE ADDITIONAL 50' OF HEAD LOSS. EXPECTED MOTOR H.P. TO BE 200 H.P.
DISCHARGE TO MAIN IN SEAMENS NECK ROAD
12"
NOT IN SERVICE
RAW WATER
PRE-FILTER
C-IN
AIR
LPGAC
C-OUT
DP
12"
TIE-IN
BACKWASH
FM
PRV
BACKWASH
TIE-IN
BACKWASH WATER SUPPLY TANK
FILTER WASTE TANK
6"
VAULT
6"
12"
BACKWASH WASTE
TIE-IN
12' DRAIN TO SEWER
M
12"
INFLUENT
WELL #3
1800 G.P.M. @ (264)' TDH
200 H.P. MOTOR
BLOW OFF HYDRANT
TRANSFER PUMP
BACKWASH WATER SETTLING TANK
RAW WATER
PRE-FILTER
LPGAC CONNECTIONS TYPICAL
16"
16"
FILTER OUT
PHOSPHATE
10"
IRON FILTER
TREATED WATER
12"
12"
12"
BACKWASH
PROPOSED TREATMENT BUILDING
M
VAULT
12"
6"
6"
TIE-IN
SERVICE
BACKWASH PUMP
PT
PT
M
12"
INFLUENT
6"
8"
WELL #4
2100 G.P.M. @ (222)' TDH
200 H.P. MOTOR
NEW BUILDING EXTENSION
SERVICE
ABANDON IN PLACE
CAP
TIE-IN
RE-LOCATED CHLORINE
M
F?
CHLORINE
12"
16"
TIE-IN
IRON FILTRATION BUILDING
CHEMICAL/EQUIPMENT BLDG.
WATER
CAUSTIC SODA
WATER
6"
N.C.
N.C.
6"
BLOW-OFF PIT (NOT IN SERVICE)
8"
ABANDON IN PLACE
16"
N.C.
BLOW-OFF PIT
DISCHARGE TO MAIN IN RED OAK DRIVE EAST
OPTION "A"
LPGAC BEFORE IRON FILTRATION
EXISTING PROCESS PIPING
NEW PROCESS PIPING
SERVICE PIPING
BACKWASH PIPING
NAVFAC
Tt
REVIEWED BY
PM/DM
CHIEF ENG/ARCH
NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON
P&ID - LPGAC - IRON REMOVAL
SCALE
NTS
NAVFAC DRAWING NO.
SHEET
OF
PID_A
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE


NOTE 1. – CHANGE WELLS 3 & 4 PUMPS TO ACCOMODATE ADDITIONAL 50' OF HEAD LOSS. EXPECTED MOTOR H.P. TO BE 200 H.P.
DISCHARGE TO MAIN IN SEAMENS NECK ROAD
RAW WATER
BACKWASH
FM
PRV
TIE-IN
TREATED WATER TIE-IN
BACKWASH WATER SETTLING TANK
BACKWASH WASTE
TRANSFER PUMP
CHLORINE
PHOSPHATE (EXISTING/RELOCATED)
PROPOSED TREATMENT BUILDING
BACKWASH WATER SUPPLY TANK
FILTER WASTE TANK
VAULT
BACKWASH WASTE
12" DRAIN TO SEWER
FILTER OUT
10"
IRON FILTER
BACKWASH PUMP
PT
IRON FILTRATION BUILDING
NOT IN SERVICE
12"
6"
16"
8"
CAP
BLOW OFF HYDRANT
INFLUENT
WELL #3
1800 G.P.M. @ 264' TDH
200 H.P. MOTOR
SERVICE LINE
CHEMICAL/EQUIPMENT BLDG.
LIQUID CHLORINE
CAUSTIC SODA
WATER
WELL #4
2100 G.P.M. @ 222' TDH
200 H.P. MOTOR
N.C.
BLOW-OFF PIT (NOT IN SERVICE)
BLOW-OFF PIT
DISCHARGE TO MAIN IN RED OAK DRIVE EAST
OPTION "B"
LPGAC AFTER IRON FILTRATION
EXISTING PROCESS PIPING
NEW PROCESS PIPING
SERVICE PIPING
BACKWASH PIPING
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE
NAVFAC
NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON
MODIFICATIONS TO WATER TREATMENT FACILITY
P&ID - IRON REMOVAL - LPGAC
PID_B



## OPTION "C"
## SINGLE STAGE AIR STRIPPER

(BELOW 50 PPB )

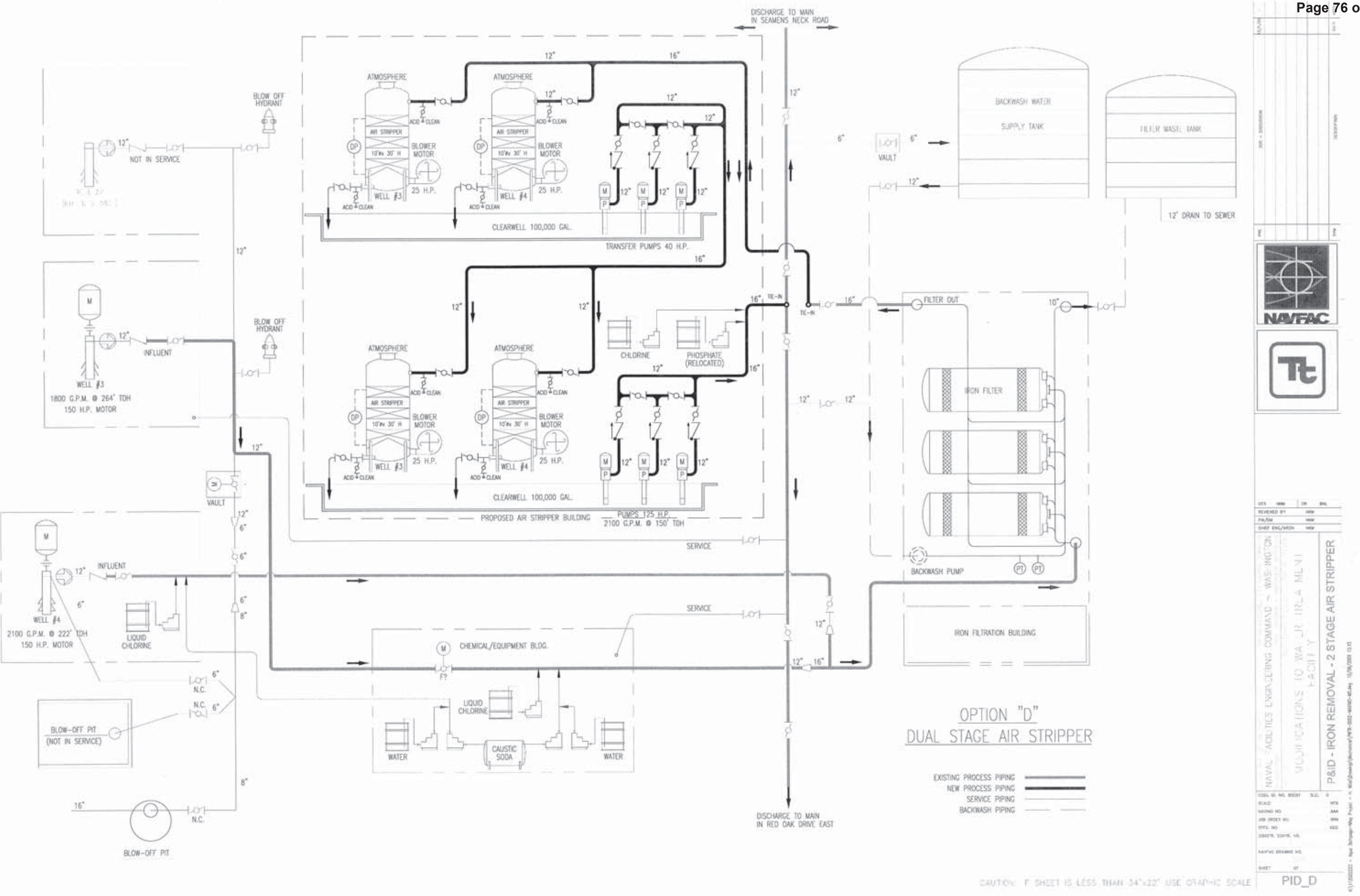
| | |
|---|---|
| EXISTING PROCESS PIPING | ▬ |
| NEW PROCESS PIPING | ━ |
| SERVICE PIPING | — |
| BACKWASH PIPING | – – |

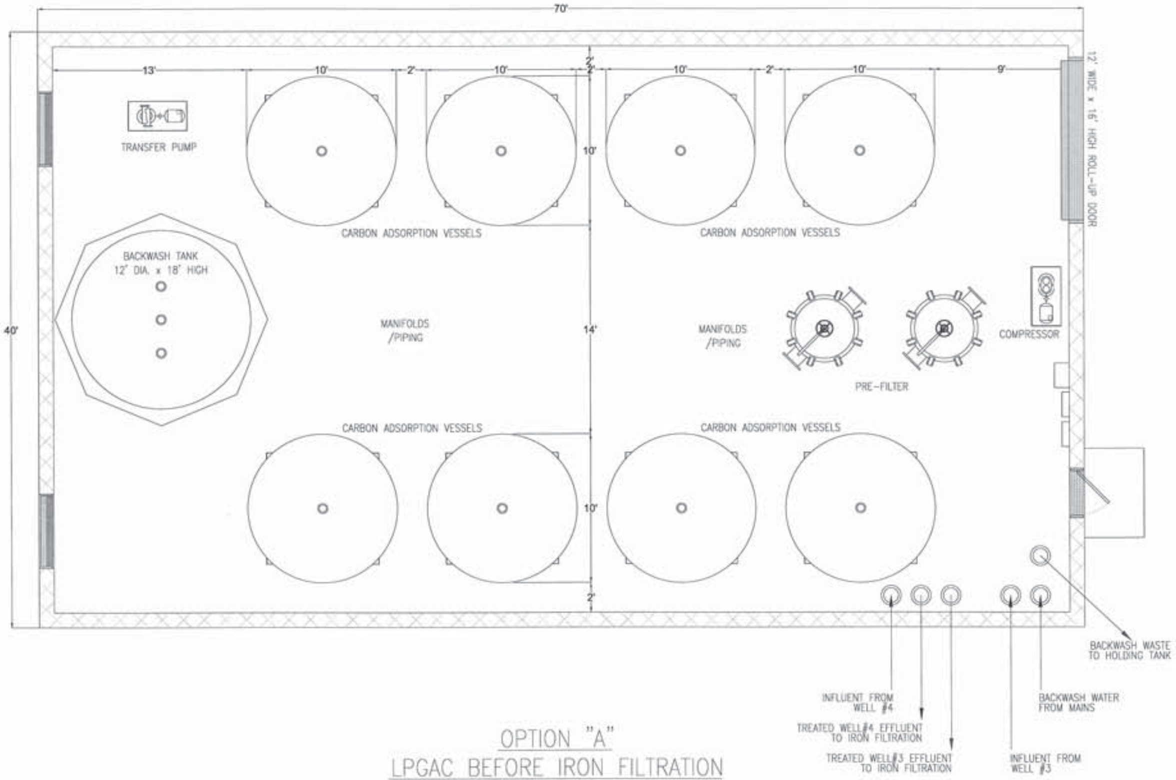
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

DCS HMM TR BNL
REVIEWED BY HMM
FAL/DM HMM
CHIEF ENG/ARCH HMM

NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON
MODIFICATIONS TO WATER TREATMENT FACILITY
P&ID - IRON REMOVAL - AIR STRIPPER

CODE ID. NO. 80091 SIZE D
SCALE: NTS
NAVFAC NO. AAA
JOB ORDER NO. BBB
SPEC. NO. CCC
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET OF
PID_C


DISCHARGE TO MAIN IN SEAMENS NECK ROAD
ATMOSPHERE
AIR STRIPPER
10'Ø x 30' H
DP
BLOWER MOTOR
25 H.P.
WELL #3
WELL #4
ACID CLEAN
CLEARWELL 100,000 GAL.
TRANSFER PUMPS 40 H.P.
PUMPS 125 H.P.
2100 G.P.M. @ 150' TDH
PROPOSED AIR STRIPPER BUILDING
M
P
12"
16"
6"
8"
10"
TIE-IN
CHLORINE
PHOSPHATE (RELOCATED)
BLOW OFF HYDRANT
NOT IN SERVICE
INFLUENT
WELL #3
1800 G.P.M. @ 264' TDH
150 H.P. MOTOR
WELL #4
2100 G.P.M. @ 222' TDH
150 H.P. MOTOR
VAULT
LIQUID CHLORINE
SERVICE
CHEMICAL/EQUIPMENT BLDG.
F?
WATER
CAUSTIC SODA
N.C.
BLOW-OFF PIT (NOT IN SERVICE)
BLOW-OFF PIT
DISCHARGE TO MAIN IN RED OAK DRIVE EAST
BACKWASH WATER SUPPLY TANK
FILTER WASTE TANK
12" DRAIN TO SEWER
FILTER OUT
IRON FILTER
PT
BACKWASH PUMP
IRON FILTRATION BUILDING
OPTION "D"
DUAL STAGE AIR STRIPPER
EXISTING PROCESS PIPING
NEW PROCESS PIPING
SERVICE PIPING
BACKWASH PIPING
NAVFAC
NAVAL FACILITIES ENGINEERING COMMAND – WASHINGTON
MODIFICATIONS TO WATER TREATMENT FACILITY
P&ID - IRON REMOVAL - 2 STAGE AIR STRIPPER
REVIEWED BY
PM/DM
CHIEF ENG/ARCH
SCALE
NTS
SHEET
PID_D
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE



OPTION "A"
LPGAC BEFORE IRON FILTRATION

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

NAVFAC

| | |
|---|---|
| DES HRM | DR BHL |
| REVIEWED BY | HRM |
| PM/DM | HRM |
| CHIEF ENG/ARCH | HRM |

NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON
MODIFICATIONS TO WATER TREATMENT FACILITY
LPGAC BEFORE IRON BUILDING LAYOUT

| | |
|---|---|
| CODE ID. NO. 80091 | SIZE D |
| SCALE | 3/4"=1'-0" |
| NAVFAC NO. | AAA |
| JOB ORDER NO. | BBB |
| SPEC. NO. | CCC |
| CONSTR. CONTR. NO. | |
| NAVFAC DRAWING NO. | |
| SHEET | OF |

M-1A

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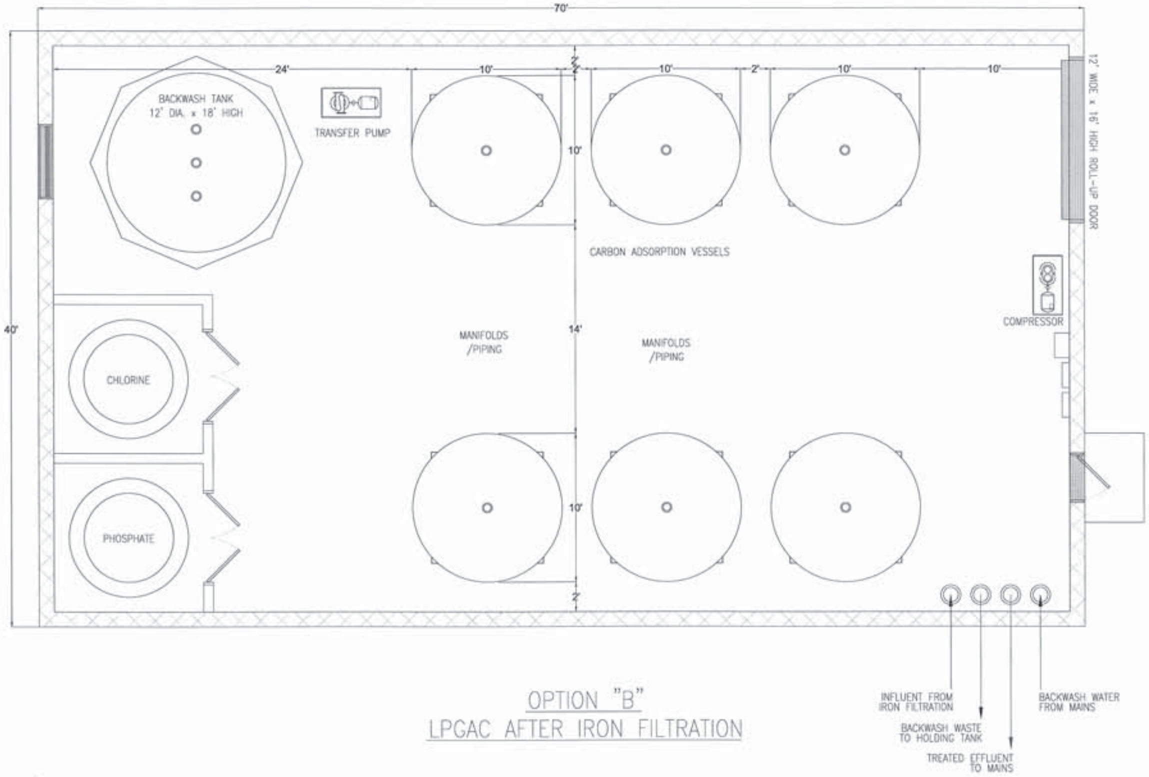


OPTION "B"
LPGAC AFTER IRON FILTRATION

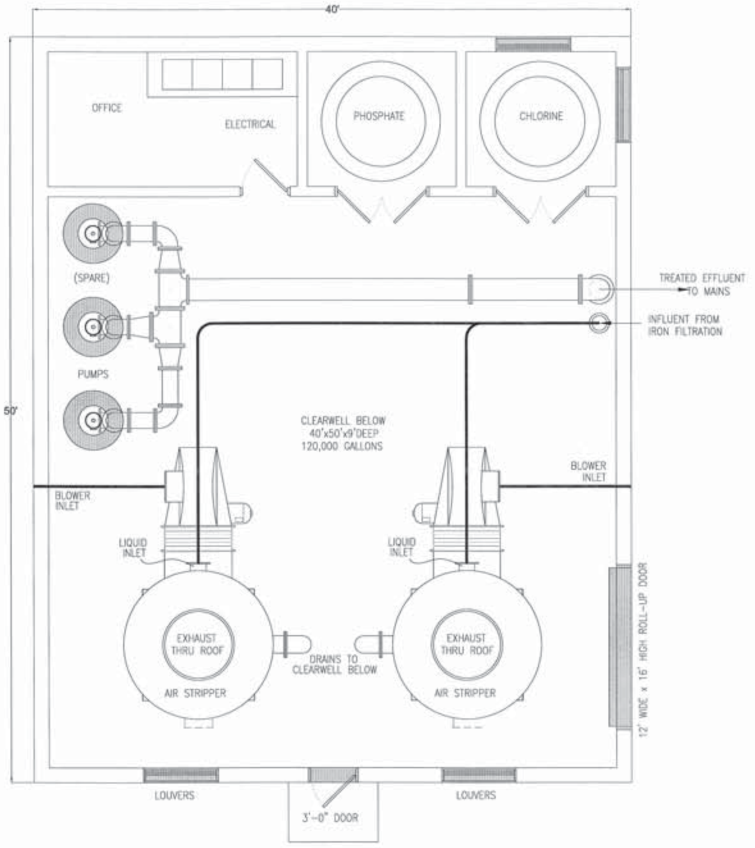
NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON

MODIFICATIONS TO WATER TREATMENT FACILITY

LPGAC AFTER IRON BUILDING LAYOUT

M-1B

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE



OPTION "C"
SINGLE STAGE AIR STRIPPER TREATMENT

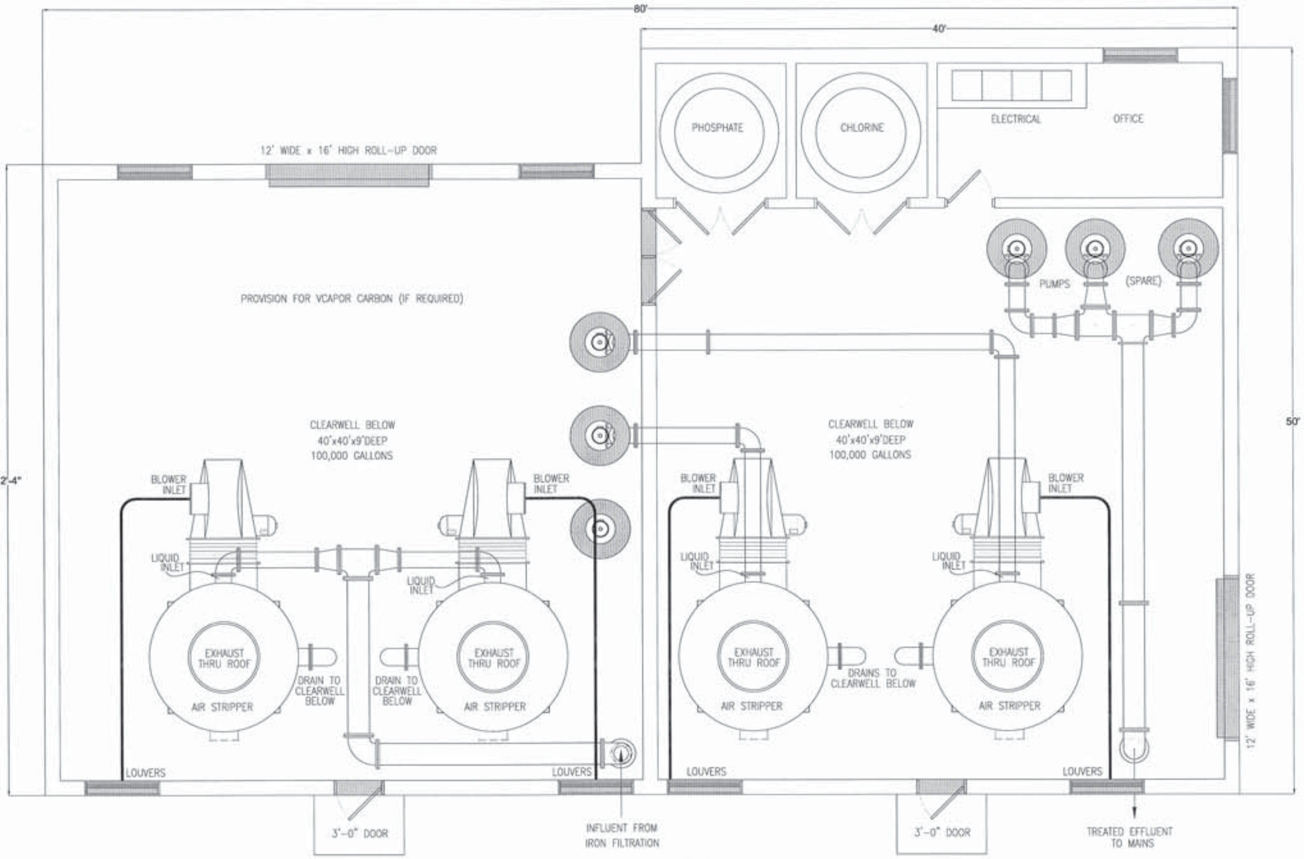
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON

MODIFICATIONS TO WATER TREATMENT FACILITY

SINGLE STAGE AIR STRIPPER BUILDING LAYOUT

SHEET
M-1C



OPTION "D"
AIR STRIPPER TREATMENT

CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE

NAVFAC

DES HMM | DR BNL
REVIEWED BY HMM
PM/DM HMM
CHIEF ENG/ARCH HMM

NAVAL FACILITIES ENGINEERING COMMAND ~ WASHINGTON

MODIFICATIONS TO WATER TREATMENT
FACILITY

DUAL STAGE AIR STRIPPER BUILDING LAYOUT

CODE ID. NO. 80091 SIZE D
SCALE: NTS
NAVFAC N.C. AAA
JOB ORDER NO. BBB
SPEC. NO. CCC
CONSTR. CONTR. NO.
NAVFAC DRAWING NO.
SHEET OF
M-1D

# APPENDIX C
# GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT

# GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT

## For the proposed

# SEAMANS NECK ROAD WATER TREATMENT PLANT AQUA, NEW YORK

NOVEMBER 2010

*Prepared by:*

Tetra Tech
240 Continental Drive, Suite 200
Newark, DE 19713

112G02223

# GEOTECHNICAL SUBSURFACE INVESTIGATION REPORT

## FOR THE PROPOSED

## SEAMANS NECK ROAD
## WATER TREATMENT PLANT
## AQUA, NEW YORK

November 2010

*Prepared by:*

Tetra Tech
240 Continental Drive, Suite 200
Newark, DE 19713

112G02223

Prepared By: Ralph Boedeker

Ralph H. Boedeker, P.E. (DE, PA, MD, VA)
Manager, Geotechnical Engineering Department

Approved By:

Matthew C. McCarty, P.E.
Senior Structural Engineer

STATE OF NEW YORK ★ LICENSED PROFESSIONAL
MATTHEW CORBRIDGE McCA
No. 0794

# TABLE OF CONTENTS

## ATTACHMENTS

## 1.0 INTRODUCTION

This report presents the results of a geotechnical subsurface investigation performed for a new water treatment plant to be located at the Seamans Neck Road Plant of Aqua, New York. The purpose of this study was to investigate subsurface conditions within the project site, formulate foundation design criteria for the proposed treatment plant structure, and provide pertinent geotechnical site recommendations for construction.

This geotechnical study represents an evaluation of subsurface conditions within the project site, and provides recommendations based on an exploration of subsurface soil conditions by means of Standard Penetration Test (SPT) Borings (ASTM D1586). The scope of this investigation included a test boring program, laboratory testing of representative soil samples, engineering analyses of the available data, and preparation of this engineering report.

## 2.0 DESCRIPTIONS, INVESTIGATIONS AND SUBSURFACE CONDITIONS

### 2.1 General Site and Facility Description

A site plan depicting the location of the investigation area is attached to this report. The site is relatively flat and grass covered. The proposed treatment plant structure is to consist of an approximately 85-foot long by 35-foot wide pre-engineered building. The structure will be single-story, approximately 25 feet tall, and have perimeter bents that span the entire width of the building, thus creating an open floor plan with no interior columns. The perimeter wall construction will consist of metal siding and girt framing between bents; therefore, the anticipated foundation wall load between girts will be negligible. The finished floor of the treatment plant will be constructed at or near existing grades.

Structural information pertaining to the pre-engineered building, as well as various tanks to be located within the building, is as follows:

- Per the project structural engineer, the maximum building column load (dead load plus live load) is estimated to be 20 kips.

- The treatment plant will contain a series of six carbon adsorption tanks, with an operating weight of approximately 215,000 pounds per tank pair. The tanks are to be supported by structural steel support legs; each leg supporting approximately 27 kips.
- The treatment plant will also contain a large backwash tank, measuring approximately 12 feet in diameter and 18 feet tall. A water fluid height of 18 feet would produce a uniform pressure of approximately 1,125 pounds per square foot (psf) at the base of the 12-foot diameter tank. The treatment plant will contain several other miscellaneous tanks; however, it is assumed that the actual base loading of the tanks will be less than that of the backwash tank.

## 2.2 Subsurface Investigation Program

Three SPT borings (BP-ANY-SB01 through BP-ANY-SB03) were performed during this investigation, each boring advanced to a final depth of 30 feet. The borings were performed at the locations depicted on the attached site plan. Final boring locations were adjusted to avoid existing underground utilities. A fourth boring was planned; however, could not be performed due to access constraints. The test borings were performed to collect representative soil samples and to determine subsurface soil and groundwater conditions. The borings were performed on February 2, 2010, using a CME 75 drilling rig. SPT split-spoon samples (ASTM D1586) were obtained within each of the borings. In this procedure, a 2-inch O.D. split-barrel sampler is driven into the soil a distance of 18 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler through the final 12-inch interval is termed the Standard Penetration Resistance (SPR) N-value. After hand auguring boreholes to a depth of 4.0 feet (to avoid damaging potential underground utilities), split-spoon samples were collected continuously from depths of 4 to 10 feet, and thereafter at 5-foot intervals. The performance of the test borings was reviewed by a representative of Tetra Tech NUS. Test boring logs, as prepared by the field representative, are attached. Following completion of the drilling, the boreholes were backfilled with the soil cuttings.

All of the collected soil samples were inspected and described visually during the field exploration program. Select samples were identified for geotechnical laboratory testing. Two Mechanical Sieve Tests (ASTM D422), and 19 Water Content Tests (ASTM D2216) and Percent Finer than a No. 200 Sieve Tests (ASTM D1140) were performed to aid in defining the general site stratigraphy and to measure the amount of silt and clay particulate in the soil samples. Laboratory testing results are attached to this report.

## 2.3 Subsurface Conditions

Subsurface conditions within the investigation area can generally be described as granular alluvial deposits varying in thickness, gradation and density. Subsurface conditions are described in detail in the test boring logs, and are also depicted on a generalized stratigraphic profile attached to this report as a visual aid in depicting subsurface soil and groundwater conditions. It should be noted that subsurface conditions between boring locations were interpolated and may not be precise.

A generalized description for each of the various subsurface soil strata encountered is presented in the following paragraphs.

- Topsoil/Rootmat
  The thickness of the surficial topsoil/root mat zone varied at boring locations, ranging from negligible to several inches. Contractors bidding on site work for the proposed development should not rely on the limited topsoil data included in this report, but should perform their own investigations to develop their estimate on the quality and availability of topsoil.

- Stratum A - Alluvial Coarse-Grained Soils
  Underlying the surficial layer of topsoil/root mat at the site, Stratum A was encountered at each of the three borings, and can generally be described as a tan-brown, fine to coarse sand, with some fine gravel and a trace to little silt (USCS: SW, gravelly sand). The thickness of Stratum A is approximately 8 feet. SPR values within Stratum A ranged from 33 to 60 blows per final foot of spoon penetration, with an average SPR value of 49 blows (dense). Laboratory and field SPR test data indicate the granular soils of Stratum A to have relatively high shear strength and relatively low compressibility characteristics.

- Stratum B - Alluvial Coarse-Grained Soils

  Underlying Stratum A, Stratum B was encountered at each of the three borings, and can generally be described as a tan-brown, fine to coarse sand, with some fine gravel and a trace silt (USCS: SP, gravelly sand). Each of the borings terminated within Stratum B, with a penetrated thickness of approximately 22 feet. SPR values within Stratum B ranged from 7 to 20 blows per final foot of spoon penetration, with an average SPR value of 15 blows (medium dense). Laboratory and field SPR test data indicate the granular residual soils of Stratum B to have relatively moderate shear strength and relatively low compressibility properties.

Apparent groundwater (unconfined) was encountered at each of the boring locations during the performance of the test borings at an approximate depth of 23 feet below existing ground surfaces. Groundwater elevations will fluctuate throughout a given year depending on actual field porosity and seasonal and annual variations of precipitation.

## 3.0 ANALYSIS AND DESIGN RECOMMENDATIONS

Tetra Tech evaluated the subsurface conditions at the project site for suitability for the proposed development. It is Tetra Tech's opinion that the site subsurface conditions are suitable for placement of the proposed structure within certain limitations. The design and construction of building foundations and other aspects of the proposed site development that would be influenced by the geotechnical conditions are discussed in the follow sections.

### 3.1 Shallow Foundation Systems – Building and Adsorber Spread Footings

After all site preparation work has been completed as recommended herein, all shallow foundations should be placed on or within properly placed structural fill material (used to bring the site to design subgrade elevations) and/or the undisturbed soils of Stratum A. Based on field and laboratory testing of soils encountered during this evaluation, as well as estimated maximum column loads, an engineering analysis indicates that shallow spread footings may be designed for a maximum total allowable bearing capacity of 4,000 pounds per square foot (psf).

Based on a total allowable soil bearing load of 4,000 psf, it is estimated that maximum total foundation settlement will be in the order of one-quarter inch (¼") or less. Differential settlements between spread footings are also estimated to be one-quarter inch (¼"), or less. Due to the granular consistency of the Stratum A soils (or placed structural fill), it is estimated that approximately 90% of the building's structural dead-load induced settlement will occur quickly (elastic settlement) and should be built-out during construction. For the adsorption tanks, it is estimated that approximately 90% of the settlement will occur quickly (elastic settlement) as the tanks are filled to their maximum operating capacities.

Interior footings should be placed at least 18 inches below the finished floor grades. Exterior footings exposed to freezing conditions should be placed at least 36 inches below finished exterior grade. Shallow spread footings should have a minimum width of 3.0 feet regardless of bearing pressure.

## 3.2 Backwash Tank Mat Foundation

After all site preparation work has been completed as recommended herein, a mat foundation for the plant backwash tank should be placed on or within properly placed structural fill material (used to bring the site to design subgrade elevations) and/or the undisturbed soils of Stratum A. Based on field and laboratory testing of soils encountered during this evaluation, as well as the diameter and anticipated loading of the backwash tank, an engineering analysis indicates that tank pad mat foundation may be designed for a maximum total allowable bearing capacity of 4,000 pounds per square foot (psf).

The actual tank load has been estimated to be approximately 1,125 psf spread over a 12-foot diameter area. Based on the anticipated loading of a full tank, it is estimated that maximum total foundation settlement will be in the order of one-quarter inch (¼") or less. Due to the granular consistency of the Stratum A soils (or placed structural fill), it is estimated that approximately 90% of the settlement will occur quickly (elastic settlement) as the tanks are filled to their maximum capacities.

### 3.3 Ground-Supported Floor Slabs

After all site preparation work has been completed as recommended herein, all ground-supported floor slabs should be placed over properly placed structural fill material (used to bring the site to design subgrade elevations) and/or the undisturbed soils of Stratum A.

All ground-supported floor slabs should be designed as free-floating and not connected to other structural elements. Isolation joints should be utilized in ground-supported floor slabs to accommodate potential differential settlement between the floor slab and adjacent columns. Control joints should also be provided in floor slabs to provide a “preferred” location for possible differential slab settlement. All floor slabs should be structurally reinforced to control cracking, more evenly distribute applied loads, and bridge localized zones of lower density material. A minimum 10-mil polyethylene vapor barrier and free-draining subbase, consisting of at least 6 inches of poorly graded crushed stone aggregate should be provided beneath all floor slabs. For floor slabs installed as recommended herein, a modulus of subgrade reaction (Ks) of 200 pci is estimated for use in concrete slab-on-grade design.

The actual stress distribution and settlement response under the floor slabs will be a function of the structural rigidity of the slab and uniformity of the applied loads. Individual equipment, machinery and tanks should be supported on their own foundations and isolated from the floor slab to avoid localized cracking of the floor slab.

### 3.4 Seismic Design

Based on the subsurface conditions encountered during the test boring program, it is recommended that a site Class D be utilized for seismic design purposes. The site class definition is as defined by Table 1615.1.1 of the International Building Code.

## 4.0 CONSTRUCTION RECOMMENDATIONS

### 4.1 Site Preparation in Structural Areas

At the start of construction all existing vegetation, roots and topsoil should be removed in their entirety from the proposed building area. Following rough grading, and prior to any structural fill/backfill placement, the building area should be proof-rolled in the presence of a qualified soils technician with a minimum 10-ton smooth-wheeled roller, or other approved equipment. The purpose of the proof-rolling is to densify the exposed subgrade areas that have been loosened or disturbed during the stripping/grading operation. In addition, proof-rolling will expose any localized soft areas not encountered during the test boring program. In subgrade areas to receive structural fill, the exposed subgrade areas should be compacted to a visually firm and stable condition. This subgrade compaction effort will enable any structural fill to be placed and compacted at the required densities. Any localized soft and/or excessively wet areas encountered during this program that cannot be adequately stabilized and compacted should be undercut and replaced in accordance with the compacted structural fill recommendations. Subgrade disturbance should be minimized by maintaining positive surface drainage and by limiting construction traffic on the exposed subgrade soils.

### 4.2 Compacted Structural Fill

All structural load-bearing fill/backfill material required to bring structural building areas to grade, and to backfill utility trenches within slab areas, should be a well-graded granular material containing no organic or other deleterious materials. The granular soils of Stratum A are considered suitable for use as structural fill. Imported structural fill should meet the USCS classification of SW, SP or SM, and should have no more than 25% material passing a No. 200 Sieve (ASTM D1140). AASHTO No. 57 Stone can also be utilized as structural fill at locations approved by the geotechnical engineer, and can be considered for localized, relatively deep fills, such as foundation undercuts and utility trenches.

Structural fill material should be placed in horizontal thin lifts with a compacted thickness no greater than 8 inches. Each thin lift of fill/backfill material placed below structural elements (i.e., foundations and floor slabs) should be compacted to a minimum 95% of its maximum dry density, as determined by the Modified Proctor Test (ASTM D1557). The placement and compaction of structural fill should be monitored on a full-time basis by a qualified technician under the supervision of a geotechnical engineer. Compacted structural fill should be placed at moisture contents to facilitate compaction. Fill lifts for hand tampers should not exceed 4 inches.

### 4.3 Shallow Foundation Construction

All foundations should be placed on dry, non-frozen, firm soil. When excessively wet or frozen soil is encountered at the footing base, this material should be undercut to suitable bearing materials. The undercut zone may be replaced in accordance with the compacted structural fill recommendations or with lean concrete. During excavation of individual footings, disturbance of the subgrade soils may occur; therefore, compaction of the footing subgrades prior to placement of any reinforcing steel or concrete should be performed.

All footing excavations should be reviewed to verify the quality of the bearing material. Footing excavations should be reviewed by a qualified geotechnical technician working under the supervision of a geotechnical engineer who is familiar with the recommendations of this report. Subgrade review should be performed prior to placement of reinforcing steel or concrete and should verify the presence of suitable bearing soils.

All footing excavations should be protected from ponding water and freezing conditions, and backfilled as soon as practical after the foundation concrete has been placed. Backfilling should follow the compacted structural fill recommendations previously described.

### 4.4 Underground Utilities

It is recommended that any existing underground utilities within proposed structural areas be relocated outside of the proposed building area. In-place abandonment of existing utilities is not recommended because of the unknown quality and density of previously placed trench backfill material. Therefore, any existing utility trenches within building areas should be backfilled in accordance with the structural fill recommendations after the utility line has been removed.

Exhibit C_BODR
Page 93 of 112

### 4.5 Site Work Quality Control and Assurance

It is recommended that all site clearing, grading, foundation excavation/construction, and fill/backfill placement be monitored by a qualified technician working under the supervision of a geotechnical engineer who is familiar with the recommendations of this report. The technician should observe and document appropriate site preparation, foundation subgrades, and fill/backfill construction work and make appropriate field tests, as necessary, to verify that acceptable fill materials are being used and construction is being performed in accordance with applicable plans, specifications and acceptable construction practice.

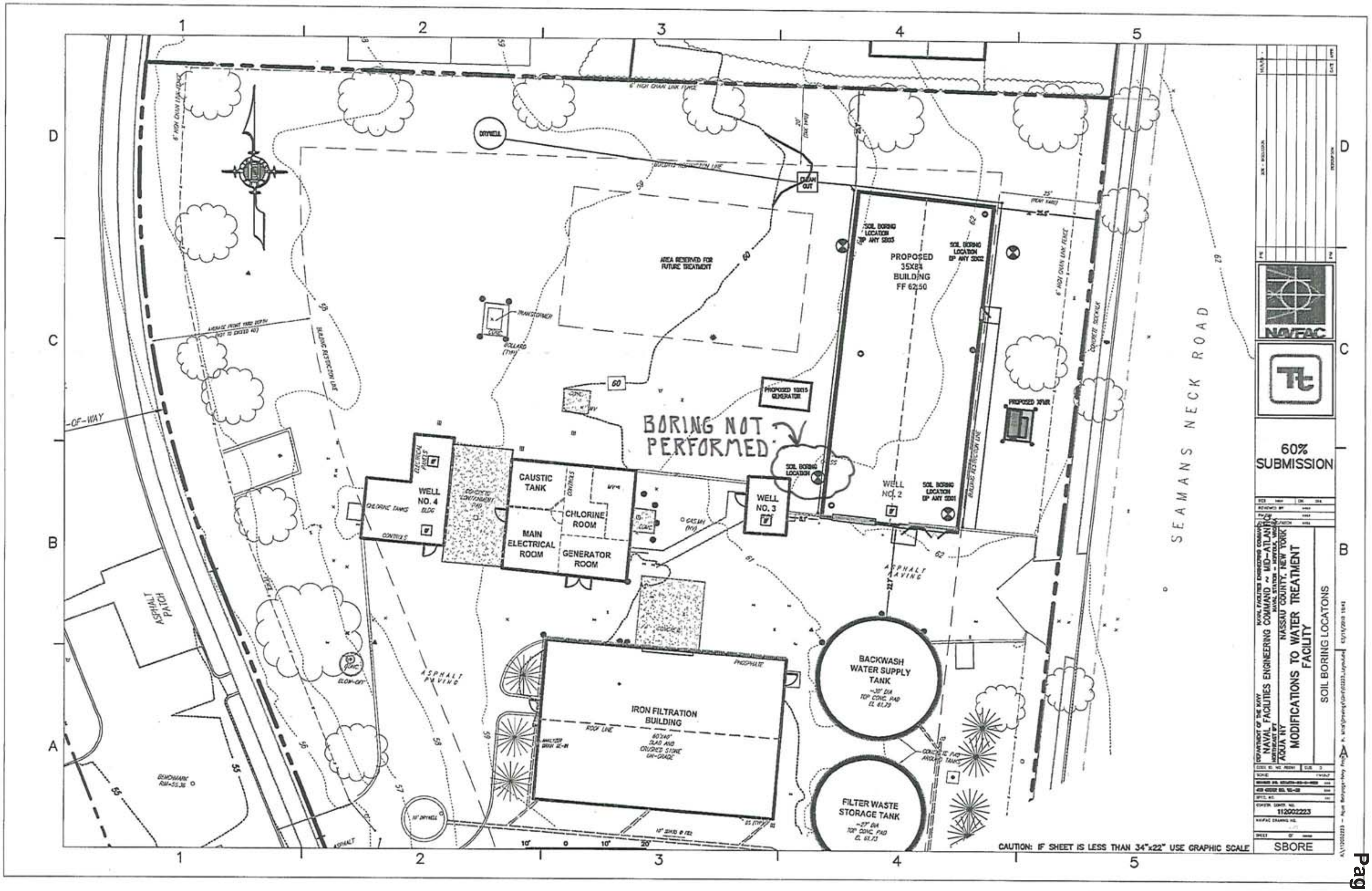
The conclusions and recommendations in this report are based on the premise of competent field engineering and monitoring during construction. All contractors bidding on work involving subsurface conditions should be given full access to this report so that they can develop their own interpretations of the available data.

## 5.0 REPRESENTATIONS

The above recommendations have been prepared in accordance with generally accepted soil and foundation engineering standards, and are based on soil and groundwater conditions encountered by the test borings. It should be noted that, although soil quality has been inferred from the interpolation of the test boring data, actual subsurface conditions between boring locations are, in fact, unknown. As a result, these recommendations may require modifications based on subsurface conditions encountered during construction. If conditions are encountered during construction that appear to be different than those shown by the test borings, Tetra Tech should be notified, and recommendations in this report may need to be re-evaluated.

# ATTACHMENTS

- Site Plan with Test Boring Locations
- Test Boring Logs
- Generalized Stratigraphic Profile
- Laboratory Testing Results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SUBMISSION
NAVFAC
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
AQUA NY
NASSAU COUNTY, NEW YORK
MODIFICATIONS TO WATER TREATMENT FACILITY
SOIL BORING LOCATONS
112002223
SBORE
CAUTION: IF SHEET IS LESS THAN 34"x22" USE GRAPHIC SCALE
SEAMANS NECK ROAD
BORING NOT PERFORMED
PROPOSED 35X84 BUILDING FF 62.50
SOIL BORING LOCATION EP ANY SB01
SOIL BORING LOCATION EP ANY SB02
SOIL BORING LOCATION EP ANY SB03
SOIL BORING LOCATION
WELL NO. 2
WELL NO. 3
WELL NO. 4 BLDG
CHLORINE TANKS
ELECTRICAL PANELS
CONTROLS
CAUSTIC TANK
CHLORINE ROOM
MAIN ELECTRICAL ROOM
GENERATOR ROOM
BACKWASH WATER SUPPLY TANK
FILTER WASTE STORAGE TANK
IRON FILTRATION BUILDING
ROOF LINE
PHOSPHATE
AREA RESERVED FOR FUTURE TREATMENT
PROPOSED 10X15 GENERATOR
PROPOSED XFMR
TRANSFORMER
BOLLARD (TYP)
DRYWELL
CLEAN OUT
6' HIGH CHAIN LINK FENCE
BUILDING RESTRICTION LINE
CONCRETE SIDEWALK
ASPHALT PAVING
ASPHALT PATCH
BLOW-OFF
-OF-WAY
BENCHMARK
1
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4
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Tetra Tech NUS, Inc.

# BORING LOG

Page _1_ of _2_

PROJECT NAME: NWIRP Bethpage
PROJECT NUMBER:
DRILLING COMPANY: ADT
DRILLING RIG: CME 75
BORING No.: BP-ANY-SB01
DATE: 2/2/2010
GEOLOGIST: Vince Shickora
DRILLER: Joe McGill

| Sample No. and Type or RQD | Depth (Ft.) or Run No. | Blows / 6" or RQD (%) | Standard Penetration Resistance (SPR) Number | Sample Recovery / Sample Length | Lithology Change (Depth/Ft.) or Screened Interval | MATERIAL DESCRIPTION | | | USCS * | Remarks | PID/FID Reading (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Soil Density/ Consistency or Rock Hardness | Color | Material Classification | | | Sample | Sampler BZ | Borehole** | Driller BZ** |
| | 1 | | | | | | Brn | Silty Sand with fine gravel | | Frozen to 12" BGS | - | - | - | - |
| | 2 | | | | | | | | | moist | - | - | - | - |
| | 3 | | | | | | Dk Brn | Silty fine to med. Sand with fine gravel trace silt | | moist | - | - | - | - |
| | 4 | | | | | | | | | | - | - | - | - |
| S-1 | 5 | 7/14 | | | | Stiff | Tan Brn | Fine to med. Sand some course sand and fine gravel | | moist | - | - | - | - |
| | 6 | 19/27 | 33 | 18/24 | | Very Stiff | | | | collect sample | - | - | - | - |
| S-2 | 7 | 21/34 | | | | Med-Dense | Tan Brn | FGR to CGR sand with some FGR to MGR Gravel | | moist | - | - | - | - |
| | 8 | 25/25 | 59 | 20/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| S-3 | 9 | 7/8 | | | | Loose | Tan Brn | Same as above | | moist | - | - | - | - |
| | 10 | 12/14 | 20 | 19/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| | 11 | | | | | | | | | | | | | |
| | 12 | | | | | | | | | | | | | |
| | 13 | | | | | | | | | | | | | |
| S-4 | 14 | 5/6 | | | | Loose | Tan Brn | FGR to CGR sand with some FGR to MGR Gravel | | moist | - | - | - | - |
| | 15 | 8/9 | 14 | 19/24 | | Loose | | | | collect sample | - | - | - | - |
| | 16 | | | | | | | | | | | | | |
| | 17 | | | | | | | | | | | | | |
| | 18 | | | | | | | | | | | | | |
| S-5 | 19 | 6/7 | | | | Loose | Tan Brn | FGR to CGR sand with some FGR to MGR gravel | | moist | - | - | - | - |
| | 20 | 7/10 | 14 | 18/24 | | Loose | | | | collect sample | - | - | - | - |
| | 21 | | | | | | | | | | | | | |
| | 22 | | | | | | | | | | | | | |
| | 23 | | | | ▽ | | | | | water at ~23' BGS | | | | |
| S-6 | 24 | 4/6 | | | | Loose | Tan Brn | MGR to CGR sand with some FGR to MGR gravel trace FGR sand | | wet saturated | - | - | - | - |
| | 25 | 8/7 | 14 | 19/24 | | Loose | | | | collect sample | - | - | - | - |

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" X 2' stainless split spoon. 3.25" ID Hollow Stem Auger
140 pound auto Hammer

Drilling Area Background (ppm): NA

Converted to Well: Yes ______ No X ______ Well I.D. #: ______

Tetra Tech NUS, Inc.

# BORING LOG

Page _2_ of _2_

PROJECT NAME: NWIRP Bethpage
PROJECT NUMBER:
DRILLING COMPANY: ADT
DRILLING RIG: CME 75

BORING No.: BP-ANY-SB01
DATE: 2/2/2010
GEOLOGIST: Vince Shickora
DRILLER: Joe McGill

| Sample No. and Type or RQD | Depth (Ft.) or Run No. | Blows / 6" or RQD (%) | Standard Penetration Resistance (SPR) Number | Sample Recovery / Sample Length | Lithology Change (Depth/Ft.) or Screened Interval | MATERIAL DESCRIPTION |  |  | USCS * | Remarks | PID/FID Reading (ppm) |  |  |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | Soil Density/ Consistency or Rock Hardness | Color | Material Classification |  |  | Sample | Sampler BZ | Borehole** | Driller BZ** |
|  | 26 |  |  |  |  |  |  |  |  |  | - | - | - | - |
|  | 27 |  |  |  |  |  |  |  |  |  | - | - | - | - |
|  | 28 |  |  |  |  |  |  |  |  |  | - | - | - | - |
| S-7 | 29 | 5 / 6 |  |  |  | Loose | Brn<br>Tan | MGR to CGR sand with FGR to MGR gravel |  |  | - | - | - | - |
|  | 30 | 5 / 5 | 11 | 17/24 |  | Loose |  |  |  | wet saturated | - | - | - | - |
|  |  |  |  |  | EOB |  |  |  |  | collect sample |  |  |  |  |

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" X 2' stainless split spoon. 3.25" ID Hollow Stem Auger
140 pound auto Hammer

Drilling Area Background (ppm): NA

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

# BORING LOG

Page _1_ of _2_

PROJECT NAME: NWIRP Bethpage
PROJECT NUMBER:
DRILLING COMPANY: ADT
DRILLING RIG: CME 75

BORING No.: BP-ANY-SB02
DATE: 2/2/2010
GEOLOGIST: Vince Shickora
DRILLER: Joe McGill

| Sample No. and Type or RQD | Depth (Ft.) or Run No. | Blows / 6" or RQD (%) | Standard Penetration Resistance (SPR) Number | Sample Recovery / Sample Length | Lithology Change (Depth/Ft.) or Screened Interval | MATERIAL DESCRIPTION | | | USCS * | Remarks | PID/FID Reading (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Soil Density/ Consistency or Rock Hardness | Color | Material Classification | | | Sample | Sampler BZ | Borehole** | Driller BZ** |
| | 1 | | | | | | Dk Brn | Sandy silt with some fine gravel | | Frozen to 12" BGS | - | - | - | - |
| | 2 | | | | | | | | | moist | - | - | - | - |
| | 3 | | | | | | Tan Brn | FGR to MGR sand with some CGR sand/FGR to MGR gravel trace silt | | moist | - | - | - | - |
| | 4 | | | | | | | | | | - | - | - | - |
| S-1 | 5 | 8<br>17 | | | | med-Dense | Tan Brn | FGR to MGR sand with some CGR sand/ FGR to MGR gravel | | moist | - | - | - | - |
| | 6 | 25<br>28 | 42 | 19/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| S-2 | 7 | 33<br>29 | | | | Dense | Tan Brn | FGR to CGR sand with some FGR to MGR Gravel | | moist | - | - | - | - |
| | 8 | 31<br>26 | 60 | 18/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| S-3 | 9 | 4<br>7 | | | | Loose | Tan Brn | Same as above | | moist | - | - | - | - |
| | 10 | 10<br>12 | 17 | 20/24 | | Med-Danse | | | | collect sample | - | - | - | - |
| | 11 | | | | | | | | | | | | | |
| | 12 | | | | | | | | | | | | | |
| | 13 | | | | | | | | | | | | | |
| S-4 | 14 | 4<br>8 | | | | Loose | Brn Tan | FGR to CGR sand with some FGR to MGR Gravel | | moist | - | - | - | - |
| | 15 | 10<br>14 | 18 | 19/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| | 16 | | | | | | | | | | | | | |
| | 17 | | | | | | | | | | | | | |
| | 18 | | | | | | | | | | | | | |
| S-5 | 19 | 6<br>7 | | | | Loose | Brn Tan | FGR to MGR sand with some CGR sand and FGR to MGR gravel | | moist | - | - | - | - |
| | 20 | 11<br>12 | 18 | 20/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| | 21 | | | | | | | | | | | | | |
| | 22 | | | | | | | | | | | | | |
| | 23 | | | | ▽ | | | | | water at ~23' BGS | | | | |
| S-6 | 24 | 4<br>5 | | | | Loose | Brn Tan | FGR to CGR sand and FGR to MGR gravel | | wet saturated | - | - | - | - |
| | 25 | 8<br>9 | 13 | 19/24 | | Loose | | | | collect sample | - | - | - | - |

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" X 2' stainless split spoon. 3.25" ID Hollow Stem Auger
140 pound auto Hammer

Drilling Area Background (ppm): NA

Converted to Well: Yes ____ No X ____ Well I.D. #: ____

Tetra Tech NUS, Inc.

# BORING LOG

Page _2_ of _2_

PROJECT NAME: NWIRP Bethpage
PROJECT NUMBER:
DRILLING COMPANY: ADT
DRILLING RIG: CME 75

BORING No.: BP-ANY-SB02
DATE: 2/2/2010
GEOLOGIST: Vince Shickora
DRILLER: Joe McGill

| | | | | | | MATERIAL DESCRIPTION | | | | | PID/FID Reading (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample No. and Type or RQD | Depth (Ft.) or Run No. | Blows / 6" or RQD (%) | Standard Penetration Resistance (SPR) Number | Sample Recovery / Sample Length | Lithology Change (Depth/Ft.) or Screened Interval | Soil Density/ Consistency or Rock Hardness | Color | Material Classification | USCS * | Remarks | Sample | Sampler BZ | Borehole** | Driller BZ** |
| | 26 | | | | | | | | | | - | - | - | - |
| | 27 | | | | | | | | | | - | - | - | - |
| | 28 | | | | | | | | | | - | - | - | - |
| S-7 | 29 | 8 / 9 | | | | Loose | Brn Tan | FGR to CGR sand and FGR to MGR gravel | | | - | - | - | - |
| | 30 | 8 / 8 | 17 | 1/24 | | Loose | | | | wet saturated | - | - | - | - |
| | | | | | EOB | | | | | small sample no recovery | | | | |
| | | | | | | | | | | | | | | |
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* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" X 2' stainless split spoon. 3.25" ID Hollow Stem Auger
140 pound auto Hammer

Drilling Area Background (ppm): NA

Converted to Well: Yes ______ No X ______ Well I.D. #: ______

Tetra Tech NUS, Inc.

# BORING LOG

Page _1_ of _2_

PROJECT NAME: NWIRP Bethpage
PROJECT NUMBER:
DRILLING COMPANY: ADT
DRILLING RIG: CME 75

BORING No.: BP-ANY-SB03
DATE: 2/2/2010
GEOLOGIST: Vince Shickora
DRILLER: Joe McGill

| Sample No. and Type or RQD | Depth (Ft.) or Run No. | Blows / 6" or RQD (%) | Standard Penetration Resistance (SPR) Number | Sample Recovery / Sample Length | Lithology Change (Depth/Ft.) or Screened Interval | MATERIAL DESCRIPTION | | | USCS * | Remarks | PID/FID Reading (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Soil Density/ Consistency or Rock Hardness | Color | Material Classification | | | Sample | Sampler BZ | Borehole** | Driller BZ** |
| | 1 | | | | | | Dk Brn | Sandy silt with some fine gravel | | Frozen to 12" BGS | - | - | - | - |
| | 2 | | | | | | | | | moist | - | - | - | - |
| | 3 | | | | | | Tan Brn | FGR to MGR sand with some CGR sand and fine gravel trace silt | | moist | - | - | - | - |
| | 4 | | | | | | | | | | - | - | - | - |
| S-1 | 5 | 11 / 13 | | | | med-Dense | Brn Tan | FGR to CGR sand with some FGR to MGR gravel | | moist | - | - | - | - |
| | 6 | 23 / 24 | 36 | 20/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| S-2 | 7 | 15 / 25 | | | | Med-Dense | Brn Tan | Same as above | | moist | - | - | - | - |
| | 8 | 28 / 26 | 53 | 19/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| S-3 | 9 | 9 / 9 | | | | Loose | Wht Brn Tan | Same as above | | moist | - | - | - | - |
| | 10 | 11 / 13 | 20 | 18/24 | | Med-Dense | | | | collect sample | - | - | - | - |
| | 11 | | | | | | | | | | | | | |
| | 12 | | | | | | | | | | | | | |
| | 13 | | | | | | | | | | | | | |
| S-4 | 14 | 3 / 4 | | | | Very Loose | Tan Brn | FGR to CGR sand with some FGR to CGR Gravel trace silt | | moist | - | - | - | - |
| | 15 | 3 / 7 | 7 | 3/24 | | Loose | | | | collect sample | - | - | - | - |
| | 16 | | | | | | | | | | | | | |
| | 17 | | | | | | | | | | | | | |
| | 18 | | | | | | | | | | | | | |
| S-5 | 19 | 6 / 7 | | | | Loose | Brn Tan | FGR to CGR sand with some FGR to CGR gravel | | moist | - | - | - | - |
| | 20 | 9 / 10 | 16 | 20/24 | | Loose | | | | collect sample | - | - | - | - |
| | 21 | | | | | | | | | | | | | |
| | 22 | | | | | | | | | | | | | |
| | 23 | | | | ▽ | | | | | water at ~23' BGS | | | | |
| S-6 | 24 | 7 / 8 | | | | Loose | Brn Tan | FGR to CGR sand and FGR to MGR gravel | | wet saturated | - | - | - | - |
| | 25 | 11 / 12 | 19 | 20/24 | | Med-Dense | | | | collect sample | - | - | - | - |

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" X 2' stainless split spoon. 3.25" ID Hollow Stem Auger
140 pound auto Hammer

Drilling Area Background (ppm): NA

Converted to Well: Yes ______ No X ______ Well I.D. #: ______

Tetra Tech NUS, Inc.

# BORING LOG

Page _2_ of _2_

PROJECT NAME: NWIRP Bethpage
PROJECT NUMBER:
DRILLING COMPANY: ADT
DRILLING RIG: CME 75

BORING No.: BP-ANY-SB03
DATE: 2/2/2010
GEOLOGIST: Vince Shickora
DRILLER: Joe McGill

| | | | | | | MATERIAL DESCRIPTION | | | | | PID/FID Reading (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample No. and Type or RQD | Depth (Ft.) or Run No. | Blows / 6" or RQD (%) | Standard Penetration Resistance (SPR) Number | Sample Recovery / Sample Length | Lithology Change (Depth/Ft.) or Screened Interval | Soil Density/ Consistency or Rock Hardness | Color | Material Classification | U S C S * | Remarks | Sample | Sampler BZ | Borehole** | Driller BZ** |
| | 26 | | | | | | | | | | - | - | - | - |
| | 27 | | | | | | | | | | - | - | - | - |
| | 28 | | | | | | | | | | - | - | - | - |
| S-7 | 29 | 9 / 6 | | | | Loose | Brn<br>Tan | FGR to CGR sand and FGR to MGR gravel | | wet saturated | - | - | - | - |
| | 30 | 8 / 8 | 14 | 17/24 | | Loose | | | | collect sample | - | - | - | - |
| | | | | | EOB | | | | | | | | | |
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| | | | | | | | | | | | | | | |

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

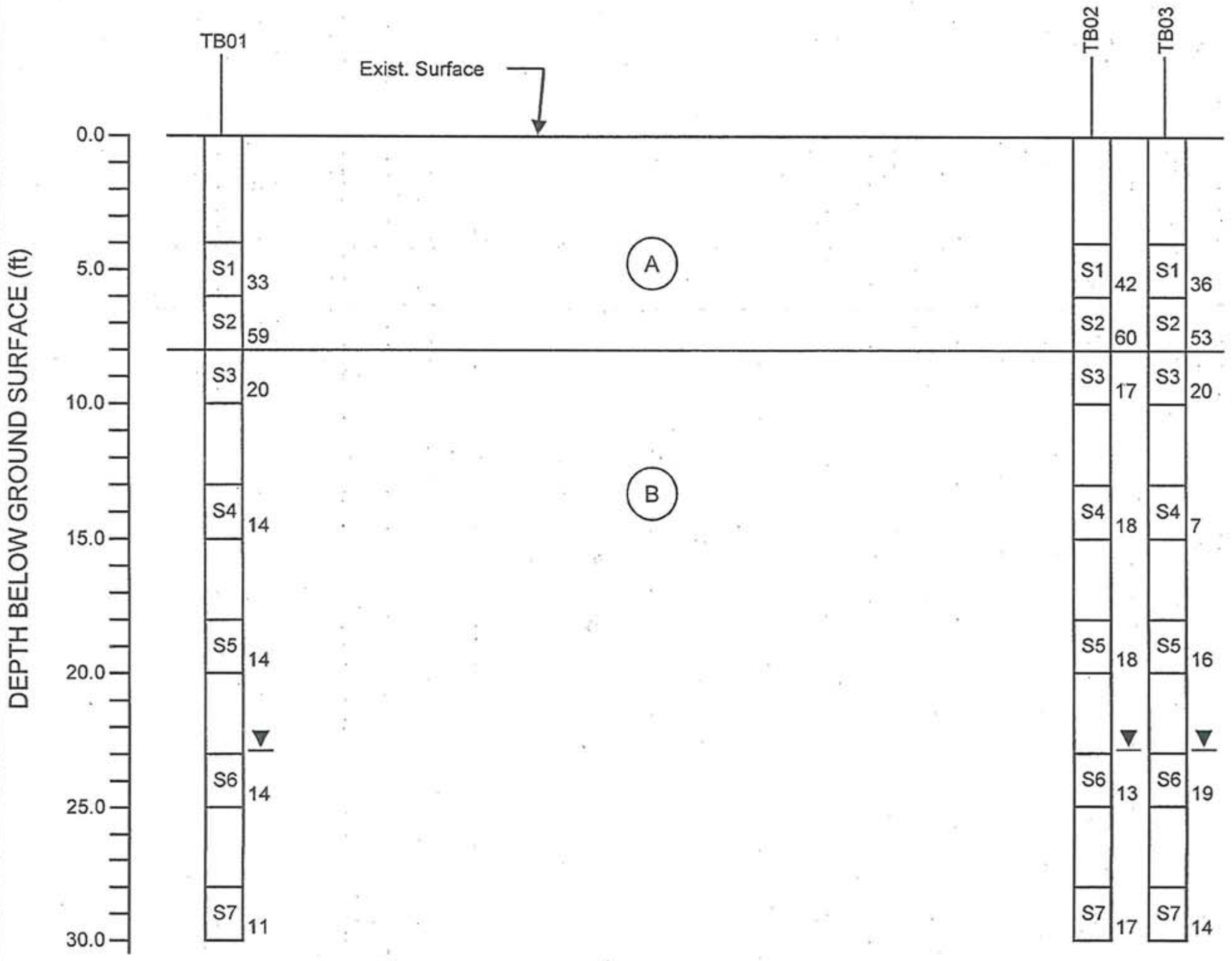
Drilling Area
Background (ppm): NA

Remarks: 2" X 2' stainless split spoon. 3.25" ID Hollow Stem Auger
140 pound auto Hammer

Converted to Well: Yes ______ No X ______ Well I.D. #: ______

**TETRA TECH**

# AQUA BETHPAGE NEW YORK - WATER TREATMENT PLANT UPGRADE
# GENERALIZED STRATIGRAPHIC PROFILE (TB01, TB02 AND TB03)



**GENERALIZED STRATUM DESCRIPTIONS**

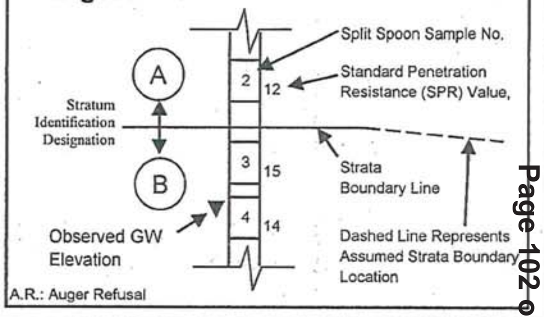
STRATUM A: DENSE, TAN BROWN, FINE TO COARSE SAND WITH SOME FINE GRAVEL AND A TRACE TO LITTLE SILT.

STRATUM B: MEDIUM DENSE, TAN BROWN, FINE TO COARSE SAND WITH SOME FINE GRAVEL AND TRACE SILT.

NOTES:

1) The profiles shown are based on our description of the samples. The test borings represent subsurface conditions encountered at each test boring location, and the profile is based on straight-line interpolation between borings. Conditions between boring location are relatively unknown.

**Legend:**



A.R.: Auger Refusal

# FIELD DESCRIPTION AND LOGGING SYSTEM FOR SOIL EXPLORATION

## NONCOHESIVE SOILS
(Sand, Gravel & Combinations)

***Density***

| | |
|---|---|
| Very Loose | - 5 blows/ft. or less |
| Loose | - 6 to 10 blows/ft. |
| Medium Dense | - 11 to 30 blows/ft. |
| Dense | - 31 to 50 blows/ft. |
| Very Dense | - 51 blows/ft. or more |

***Relative Proportions***

| Description Term | Percent |
|---|---|
| Trace | 1 - 10 |
| Little | 11 - 20 |
| Some | 21 - 35 |
| And | 36 - 50 |

***Particle Size Identification***

| | | |
|---|---|---|
| Boulders | - 8 in. diameter or more | |
| Cobbles | - 3 to 8 in. diameter | |
| Gravel | - Coarse | -3 in. to 3/4 in. sieve |
| | - Fine | - 3/4 in. to No. 4 sieve |
| Sand | - Coarse | - No. 4 to No. 10 sieve (4.75mm - 2.00mm) |
| | - Medium | - No. 10 to No. 40 sieve (2.00mm - 0.425mm) |
| | - Fine | - No. 40 to No. 200 sieve (0.425mm - 0.074mm) |
| Silt/Clay | - Less Than a No. 200 sieve (<0.074mm) | |

## COHESIVE SOILS
(Silt, Clay & Combinations)

***Consistency***

| | |
|---|---|
| Very Soft | - 3 blows/ft. or less |
| Soft | - 4 to 5 blows/ft. |
| Medium Stiff | - 6 to 10 blows/ft. |
| Stiff | - 11 to 15 blows/ft. |
| Very Stiff | - 16 to 30 blows/ft. |
| Hard | - 31 blows/ft. or more |

***Plasticity***

| Degree of Plasticity | Plasticity Index |
|---|---|
| None to Slight | 0 - 4 |
| Slight | 5 - 7 |
| Medium | 8 - 22 |
| High to Very High | >22 |

***Visual Description*** on Drillers' Logs are made by drillers visual inspection.

***Standard Penetration.*** Driving a 2.0" O.D., 1-3/8" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the drill log (i.e., 6/8/9). The standard penetration test results can be obtained by adding the last two numbers (i.e., 8+9=17 blows/ft.).

***Groundwater*** observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

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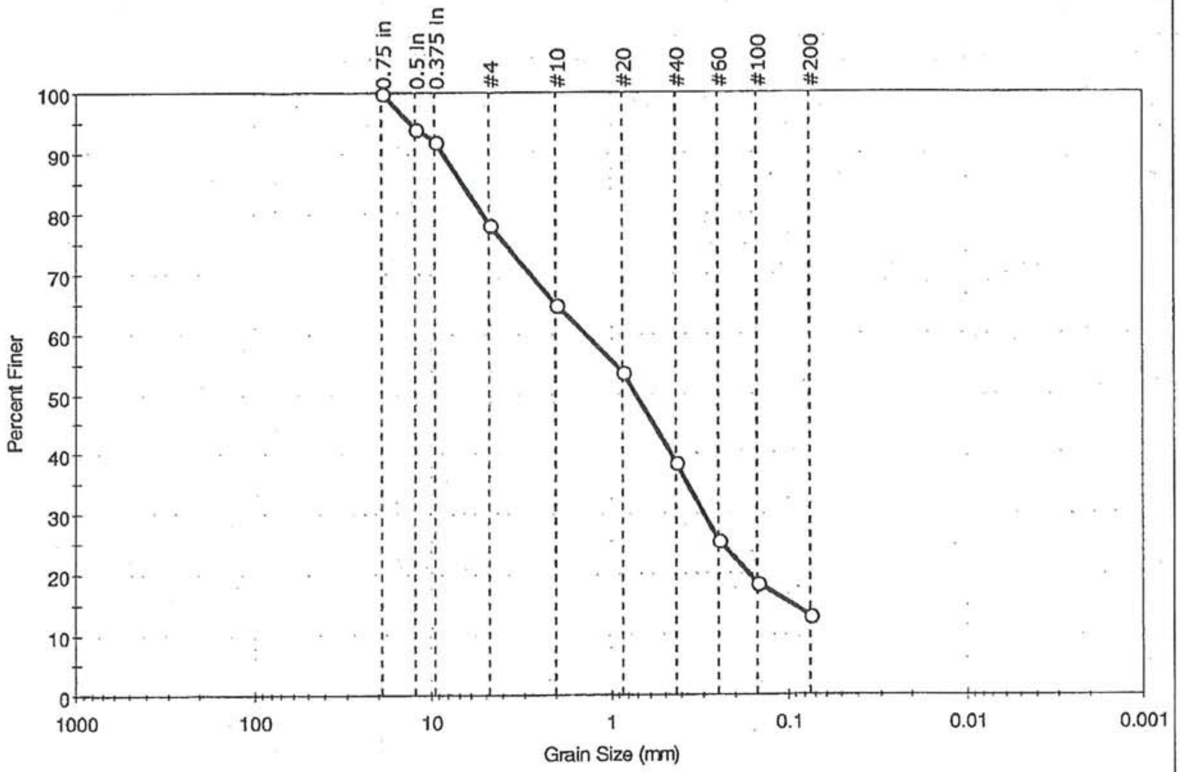
**express**
a subsidiary of Geocomp Corporation

| | | | | | |
|---|---|---|---|---|---|
| Client: | Tetra Tech, NUS Inc. | | | | |
| Project: | NWIRP Bethpage CTO WE25 | | | | |
| Location: | Bethpage, NY | | | Project No: | GTX-9643 |
| Boring ID: | --- | Sample Type: | jar | Tested By: | jbr |
| Sample ID: | BP-ANY-SB02-0608 | Test Date: | 02/12/10 | Checked By: | jdt |
| Depth : | --- | Test Id: | 173596 | | |

Test Comment: ---
Sample Description: Moist, yellow silty sand with gravel
Sample Comment: ---

# Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|---|---|---|---|
| --- | 22.0 | 64.8 | 13.2 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.75 in | 19.00 | 100 | | |
| 0.5 in | 12.50 | 94 | | |
| 0.375 in | 9.50 | 92 | | |
| #4 | 4.75 | 78 | | |
| #10 | 2.00 | 65 | | |
| #20 | 0.85 | 54 | | |
| #40 | 0.42 | 39 | | |
| #60 | 0.25 | 26 | | |
| #100 | 0.15 | 18 | | |
| #200 | 0.075 | 13 | | |

## Coefficients

| | |
|---|---|
| $D_{85}$ =6.7062 mm | $D_{30}$ =0.2994 mm |
| $D_{60}$ =1.3769 mm | $D_{15}$ =0.0949 mm |
| $D_{50}$ =0.7178 mm | $D_{10}$ =0.0488 mm |
| $C_u$ =N/A | $C_c$ =N/A |

## Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

## Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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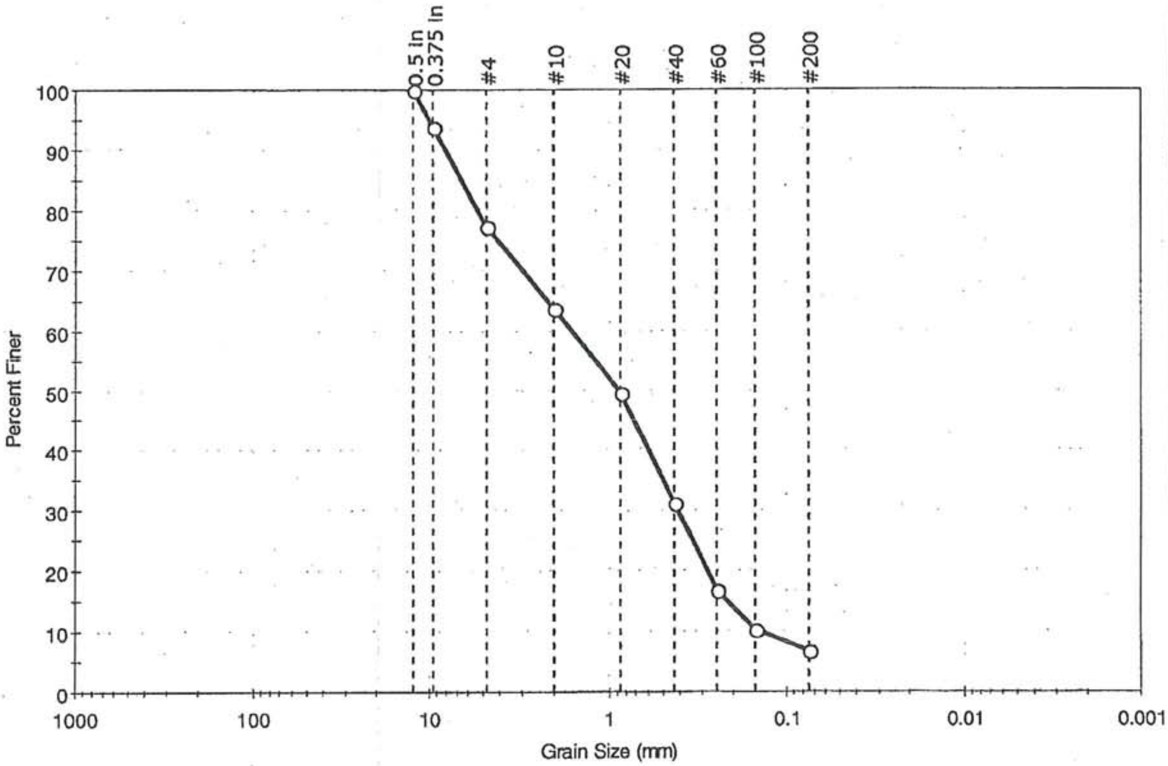
Client: Tetra Tech, NUS Inc.
Project: NWIRP Bethpage CTO WE25
Location: Bethpage, NY
Project No: GTX-9643

Boring ID: ---
Sample ID:BP-ANY-SB02-1315
Depth : ---
Sample Type: jar
Test Date: 02/12/10
Test Id: 173597
Tested By: jbr
Checked By: jdt

Test Comment: ---
Sample Description: Moist, yellow sand with silt and gravel
Sample Comment: ---

# Particle Size Analysis - ASTM D 422-63 (reapproved 2002)



| %Cobble | %Gravel | %Sand | %Silt & Clay Size |
|---|---|---|---|
| — | 22.7 | 70.6 | 6.7 |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|---|---|---|---|---|
| 0.5 in | 12.50 | 100 | | |
| 0.375 in | 9.50 | 94 | | |
| #4 | 4.75 | 77 | | |
| #10 | 2.00 | 64 | | |
| #20 | 0.85 | 50 | | |
| #40 | 0.42 | 31 | | |
| #60 | 0.25 | 17 | | |
| #100 | 0.15 | 10 | | |
| #200 | 0.075 | 7 | | |

## Coefficients

| | |
|---|---|
| $D_{85}$ =6.5708 mm | $D_{30}$ =0.4069 mm |
| $D_{60}$ =1.5970 mm | $D_{15}$ =0.2175 mm |
| $D_{50}$ =0.8656 mm | $D_{10}$ =0.1393 mm |
| $C_u$ =11.464 | $C_c$ =0.744 |

## Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

## Sample/Test Description

Sand/Gravel Particle Shape : ROUNDED

Sand/Gravel Hardness : HARD

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Client: Tetra Tech, NUS Inc.
Project: NWIRP Bethpage CTO WE25
Location: Bethpage, NY
Project No: GTX-9643
Boring ID: ---
Sample Type: ---
Tested By: mmd
Sample ID:---
Test Date: 02/22/10
Checked By: jdt
Depth : ---
Sample Id: ---

# Moisture Content of Soil - ASTM D 2216-05

| Boring ID | Sample ID | Depth | Description | Moisture Content,% |
|---|---|---|---|---|
| --- | BP-ANY-SB01-0406 | --- | Moist, yellow sand with silt | 2.6 |
| --- | BP-ANY-SB01-0608 | --- | Moist, yellow silty sand | 2 |
| --- | BP-ANY-SB01-0810 | --- | Moist, yellowish brown sand with silt | 2.7 |
| --- | BP-ANY-SB01-1315 | --- | Moist, yellow sand with silt | 2.5 |
| --- | BP-ANY-SB01-1820 | --- | Moist, brownish yellow sand with silt | 3.1 |
| --- | BP-ANY-SB01-2325 | --- | Moist, yellow sand with gravel | 11.3 |
| --- | BP-ANY-SB01-2830 | --- | Moist, yellow sand with silt and gravel | 15.1 |

Notes: Temperature of Drying : 110° Celsius

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| | | | | | |
|---|---|---|---|---|---|
| Client: | Tetra Tech, NUS Inc. | | | | |
| Project: | NWIRP Bethpage CTO WE25 | | | | |
| Location: | Bethpage, NY | | | Project No: | GTX-9643 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | mmd |
| Sample ID: | --- | Test Date: | 02/22/10 | Checked By: | jdt |
| Depth : | --- | Sample Id: | --- | | |

# Moisture Content of Soil - ASTM D 2216-05

| Boring ID | Sample ID | Depth | Description | Moisture Content,% |
|---|---|---|---|---|
| --- | BP-ANY-SB02-0406 | --- | Moist, brownish yellow sand with silt | 4.2 |
| --- | BP-ANY-SB02-0810 | --- | Moist, brownish yellow sand with silt | 3.5 |
| --- | BP-ANY-SB02-1820 | --- | Moist, yellow sand with silt | 2.6 |
| --- | BP-ANY-SB02-2325 | --- | Moist, yellow sand with gravel | 11.6 |
| --- | BP-ANY-SB02-2830 | --- | Moist, yellow sand with gravel | 11.2 |

Notes: Temperature of Drying : 110° Celsius

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a subsidiary of Geocomp Corporation

| | | | | | |
|---|---|---|---|---|---|
| Client: | Tetra Tech, NUS Inc. | | | | |
| Project: | NWIRP Bethpage CTO WE25 | | | | |
| Location: | Bethpage, NY | | | Project No: | GTX-9643 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | mmd |
| Sample ID: | --- | Test Date: | 02/22/10 | Checked By: | jdt |
| Depth : | --- | Sample Id: | --- | | |

# Moisture Content of Soil - ASTM D 2216-05

| Boring ID | Sample ID | Depth | Description | Moisture Content,% |
|---|---|---|---|---|
| --- | BP-ANY-SB03-0406 | --- | Moist, yellow sand with silt | 2.1 |
| --- | BP-ANY-SB03-0608 | --- | Moist, yellowish brown silty sand | 3.7 |
| --- | BP-ANY-SB03-0810 | --- | Moist, yellow sand with silt | 3.7 |
| --- | BP-ANY-SB03-1315 | --- | Moist, brownish yellow sand with silt | 4.6 |
| --- | BP-ANY-SB03-1820 | --- | Moist, yellow sand with silt | 2.5 |
| --- | BP-ANY-SB03-2325 | --- | Moist, yellow sand with gravel | 11.3 |
| --- | BP-ANY-SB03-2830 | --- | Moist, yellow sand with silt and gravel | 9.9 |

Notes: Temperature of Drying : 110° Celsius

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| | | | |
|---|---|---|---|
| Client: Tetra Tech, NUS Inc. | | | |
| Project: NWIRP Bethpage CTO WE25 | | | |
| Location: Bethpage, NY | | Project No: | GTX-9643 |
| Boring ID: --- | Sample Type: --- | Tested By: | mmd |
| Sample ID:--- | Test Date: 02/12/10 | Checked By: | jdt |
| Depth : --- | Test Id: 173604 | | |

# Percent Passing #200 Sieve - ASTM D 1140-00

| Boring ID | Sample ID | Depth | Visual Description | Fines, % |
|---|---|---|---|---|
| --- | BP-ANY-SB01-0406 | --- | Moist, yellow sand with silt | 8.5 |
| --- | BP-ANY-SB01-0608 | --- | Moist, yellow silty sand | 13.8 |
| --- | BP-ANY-SB01-0810 | --- | Moist, yellowish brown sand with silt | 8.1 |
| --- | BP-ANY-SB01-1315 | --- | Moist, yellow sand with silt | 5.7 |
| --- | BP-ANY-SB01-1820 | --- | Moist, brownish yellow sand with silt | 6.4 |
| --- | BP-ANY-SB01-2325 | --- | Moist, yellow sand with gravel | 3.8 |
| --- | BP-ANY-SB01-2830 | --- | Moist, yellow sand with silt and gravel | 6.6 |

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| | | | |
|---|---|---|---|
| Client: | Tetra Tech, NUS Inc. | | |
| Project: | NWIRP Bethpage CTO WE25 | | |
| Location: | Bethpage, NY | Project No: | GTX-9643 |

| | | | | | |
|---|---|---|---|---|---|
| Boring ID: | --- | Sample Type: | --- | Tested By: | mmd |
| Sample ID: | --- | Test Date: | 02/12/10 | Checked By: | jdt |
| Depth : | --- | Test Id: | 173609 | | |

# Percent Passing #200 Sieve - ASTM D 1140-00

| Boring ID | Sample ID | Depth | Visual Description | Fines, % |
|---|---|---|---|---|
| --- | BP-ANY-SB02-0406 | --- | Moist, brownish yellow sand with silt | 8.3 |
| --- | BP-ANY-SB02-0810 | --- | Moist, brownish yellow sand with silt | 6.3 |
| --- | BP-ANY-SB02-1820 | --- | Moist, yellow sand with silt | 6.3 |
| --- | BP-ANY-SB02-2325 | --- | Moist, yellow sand with gravel | 2.9 |
| --- | BP-ANY-SB02-2830 | --- | Moist, yellow sand with gravel | 2.2 |

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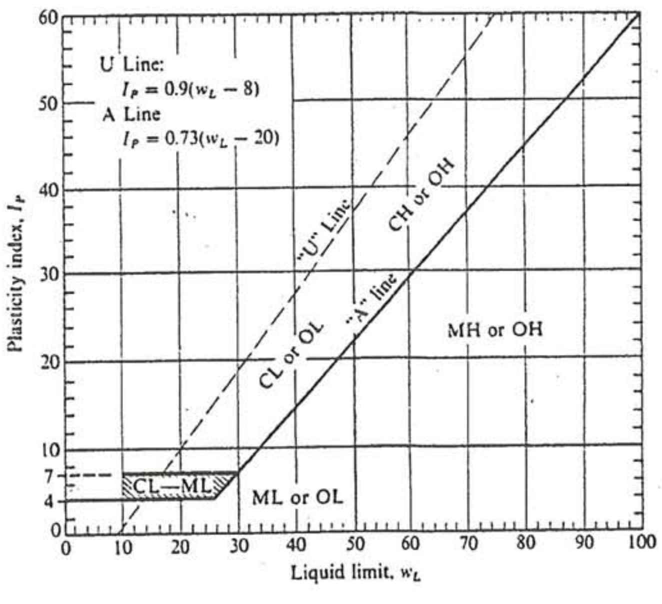
| | | | | | |
|---|---|---|---|---|---|
| Client: | Tetra Tech, NUS Inc. | | | | |
| Project: | NWIRP Bethpage CTO WE25 | | | | |
| Location: | Bethpage, NY | | | Project No: | GTX-9643 |
| Boring ID: | --- | Sample Type: | --- | Tested By: | mmd |
| Sample ID: | --- | Test Date: | 02/12/10 | Checked By: | jdt |
| Depth : | --- | Test Id: | 173616 | | |

# Percent Passing #200 Sieve - ASTM D 1140-00

| Boring ID | Sample ID | Depth | Visual Description | Fines, % |
|---|---|---|---|---|
| --- | BP-ANY-SB03-0406 | --- | Moist, yellow sand with silt | 9.2 |
| --- | BP-ANY-SB03-0608 | --- | Moist, yellowish brown silty sand | 12.2 |
| --- | BP-ANY-SB03-0810 | --- | Moist, yellow sand with silt | 7.1 |
| --- | BP-ANY-SB03-1315 | --- | Moist, brownish yellow sand with silt | 5.2 |
| --- | BP-ANY-SB03-1820 | --- | Moist, yellow sand with silt | 6 |
| --- | BP-ANY-SB03-2325 | --- | Moist, yellow sand with gravel | 3.4 |
| --- | BP-ANY-SB03-2830 | --- | Moist, yellow sand with silt and gravel | 6.6 |

## Unified soil classification [Casagrande (1948)]

| Major divisions | | | Group symbols | | Typical names | Laboratory classification criteria | | |
|---|---|---|---|---|---|---|---|---|
| Coarse-grained soils (More than half of material is larger than No. 200 sieve size) | Gravels (More than half of coarse fraction is larger than No. 4 sieve size) | Clean gravels (Little or no fines) | GW | | Well-graded gravels, gravel-sand mixtures, little or no fines | Determine percentages of sand and gravel from grain-size curve.<br>Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:<br>Less than 5 percent GW, GP, SW, SP<br>More than 12 percent GM, GC, SM, SC<br>5 to 12 percent *Borderline* cases requiring dual symbols‡ | $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 | |
| | | | GP | | Poorly graded gravels, gravel-sand mixtures, little or no fines | | Not meeting $C_u$ or $C_c$ requirements for GW | |
| | | Gravels with fines (Appreciable amount of fines) | GM† | d<br>u | Silty gravels, gravel-sand-silt mixtures | | Atterberg limits below A line or $I_P$ less than 4 | Limits plotting in hatched zone with $I_P$ between 4 and 7 are *borderline* cases requiring use of dual symbols |
| | | | GC | | Clayey gravels, gravel-sand-clay mixtures | | Atterberg limits above A line with $I_P$ greater than 7 | |
| | Sands (More than half of coarse fraction is smaller than No. 4 sieve size) | Clean sands (Little or no fines) | SW | | Well-graded sands, gravelly sands, little or no fines | | $C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3 | |
| | | | SP | | Poorly graded sands, gravelly sands, little or no fines | | Not meeting $C_u$ or $C_c$ requirements for SW | |
| | | Sands with fines (Appreciable amount of fines) | SM† | d<br>u | Silty sands, sand-silt mixtures | | Atterberg limits below A line or $I_P$ less than 4 | Limits plotting in hatched zone with $I_P$ between 4 and 7 are *borderline* cases requiring use of dual symbols |
| | | | SC | | Clayey sands, sand-clay mixtures | | Atterberg limits above A line with $I_P$ greater than 7 | |
| Fine-grained soils (More than half of material is smaller than No. 200 sieve) | Silts and clays (Liquid limit less than 50) | | ML | | Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity | For all soils plotting nearly on A line use dual symbols, i.e., $I_P = 29.5$, $w_L = 60$ gives CH–OH or CH–MH. When $w_L$ is near 50 use CL, CH, ML, MH. Take near as ±2 percent.<br> | | |
| | | | CL | | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays | | | |
| | | | OL | | Organic silts and organic silty clays of low plasticity | | | |
| | Silts and clays (Liquid limit greater than 50) | | MH | | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts | | | |
| | | | CH | | Inorganic clays of high plasticity, fat clays | | | |
| | | | OH | | Organic clays of medium to high plasticity, organic silts | | | |
| | Highly organic soils | | Pt | | Peat and other highly organic soils | | | |

---

† Division of GM and SM groups into subdivisions of d and u are for roads and airfields only. Subdivision is based on Atterberg limits; suffix d used when $w_L$ is 28 or less and the $I_P$ is 6 or less; suffix u used when $w_L$ is greater than 28.

‡ Borderline classifications, used for soils possessing characteristics of two groups, are designated by combinations of group symbols. For example: GW-GC, well-graded gravel-sand mixture with clay binder.

All correspondence relating to this instrument will refer to Identification Number N40085-13-RP-00053

This instrument was prepared by the Naval Facilities Engineering Command, Mid-Atlantic, 9742 Maryland Avenue, Norfolk, Va., 23511

Return to C. HOPE MARINI, Real Estate Contracting Officer, at the above address

# GRANT OF EASEMENT

THIS GRANT OF EASEMENT, is made and entered into upon execution by New York American Water Company, Inc., f/k/a New York Water Service Corporation, a privately owned utility corporation of the State of New York, hereinafter called the COMPANY, having its principal place of business located at 733 Sunrise Highway, Lynbrook, NY 11563, and the UNITED STATES OF AMERICA and its assigns, acting by and through the NAVAL FACILITIES ENGINEERING COMMAND, MID-ATLANTIC, hereinafter called the NAVY, having a business address at 9742 Maryland Avenue, Norfolk, VA 23511.

WITNESSETH:

WHEREAS, COMPANY is the owner of title in fee simple of certain improved real property located at 670 Seaman's Neck Road, Seaford, NY 11783, (the "PROPERTY") on which is located a water treatment facility; and

WHEREAS, NAVY is performing remedial actions at the PROPERTY using temporary treatment facilities pursuant to its environmental response and enforcement responsibilities under the Comprehensive Environmental Response Compensation and Liability Act, as amended, 42 U.S.C. 9601, et seq. ("CERCLA") as further described below ("Navy Response Actions") and is currently authorized access to the PROPERTY through a license agreement from COMPANY (License No. N40085-12-RP-00149; PI-10274) dated January 4, 2013; hereinafter the "LICENSE"; and

WHEREAS, NAVY now needs to construct more permanent treatment facilities as further described below on the PROPERTY and requires a long term right of access in order to continue its Navy Response Actions; and

WHEREAS, the COMPANY is agreeable to the granting of such easement on the terms and conditions hereinafter set forth.

NOW, THEREFORE, in consideration of the promises and the mutual agreements hereinafter set forth, the COMPANY does hereby GRANT and CONVEY to the NAVY and its successors and assigns, an easement appurtenant, herein after called EASEMENT, for the access, construction, installation, maintenance, operation, repair, replacement of permanent treatment facilities and related appurtenances hereinafter (the "PERMANENT FACILITIES"), upon the PROPERTYdescribed hereinafter, to wit:

All that certain strip or parcel of land situate, lying and being in Levittown, in the Town of Hempstead, Nassau County, New York located on Seaman's Neck Road and being shown on the attached survey attached hereto and incorporated herein as Exhibit "A":

This easement is granted subject to the following terms and conditions:

1. Navy Response Actions. The NAVY and its contractors, employees and/or representatives shall be allowed to enter upon the PROPERTY to carry out such actions as may be necessary to address a release or threat of release of a hazardous substance or pollutant or contaminant that may impact the water supply plant that is located at the PROPERTY. These Response Actions include, but are not limited to, the activities that are described in the Construction Work Plan and Specifications dated December 2012 and as may be amended in the future, a copy of which has been provided to Company separately. All work shall be done in accordance with all applicable laws and the technical specifications submitted by the Navy and approved by Nassau County Department of Health for the modification of the water treatment facility, Seaman's Neck Road, Nassau County, New York.

2. Liability. (a) Claims against the United States for money damages for injury or loss of property, or personal injury or death caused by the negligent or wrongful act or omission of any employee of the NAVY while acting within the scope of his office or employment are subject to the Federal Tort Claims Act, Chapter 171 of Title 28 of the United States Code.

(b) The Navy and its contractors and representatives understand and acknowledge that the COMPANY assumes no liability for any property damage, personal injury or death of any NAVY employee, agent, representative, and/or contractor related to work performed by the Navy or any of its employees, agents, contractors, or representatives at the PROPERTY.

3. Restoration of Easement Area. The NAVY shall restore the portion of the EASEMENT AREA that is termporarily disturbed during construction of the PERMANENT FACILITIES to substantially the same condition that it was in prior to the construction, reasonable wear and tear excepted.

4. Use of Property by Company. NAVY agrees that its entry onto the PROPERTY and its activities thereon as set forth in this EASEMENT by the NAVY and its contractors, employees and/or representatives shall not unreasonably interfere with or hinder the use of the PROPERTY by COMPANY.

5. Costs. NAVY agrees to bear all costs for activities conducted by its designated representatives and/or contractors under this EASEMENT.

6. Insurance. The COMPANY recognizes that the NAVY is self-insured; however, the NAVY will require that any prime contractor, prior to being allowed access to the PROPERTY as set forth herein, shall carry commercial general liability insurance, automobile liability insurance, worker's compensation and employer's liability insurance and professional liability insurance in full force and effect within limits of coverage not less than the amounts shown on

Exhibit "B" attached hereto and made a part hereof. Such insurance shall be kept in full force and effect for so long as the contractor is under contract to the NAVY and is authorized access to the PROPERTY pursuant to this EASEMENT. The insurance set forth herein may be carried in any combination of primary and excess liability policies so long as the total insurance coverage meets the requirements of this Section 6. Commercial General Liability insurance shall include Premises and Operations Coverage, Products and Completed Operations, Coverage for Independent contractors , Personal Injury Coverage, and Blanket Contractual Liability.

All such insurance should be primary and non-contributory, and is required to respond and pay prior to any other insurance or self-insurance available to the COMPANY.

Contractor shall furnish, prior to the start of work, certificates or adequate proof of the foregoing insurance. Current certificates of insurance shall be provided prior to the commencement of work and shall be maintained until completion of the Agreement. Such certificates shall evidence that COMPANY is included as an Additional Insured, except workers compensation and professional liability, if applicable. Such insurance shall include appropriate clauses pursuant to which the insurance companies shall waive its rights of subrogation, in states where such waiver is allowed, against COMPANY. Contractor shall notify in writing, at least thirty (30) days prior to cancellation, of or a material change in a policy. Such certificate(s) shall name the COMPANY as an additional insured.

7. Notice Prior to Entry. The NAVY agrees to provide to the COMPANY a list of the names of the individuals who will be working to complete the Navy's Response Actions on the PROPERTY on the NAVY's behalf in order that the COMPANY may provide these individuals with badges for access to the PROPERTY. The NAVY shall also provide to the COMPANY a list of all contractors which will be working on the PROPERTY. This list shall be promptly updated by NAVY upon any change to or addition of contractors performing this work. The list and any future updates shall be submitted to the Vice President of Operations, New York American Water Company, Inc., 733 Sunrise Highway, Lynbrook, NY 11563.

8. Term. This Easement shall remain in effect until the NAVY is deemed by the New York State Department of Environmental Conservation or the lead regulatory authority in charge of overseeing the completion of the Navy Response Actions at the time such actions are concluded ("Lead Regulator") to have completed the Navy Response Actions at this location. This Easement shall commence on the date on which the Company receives approval of this easement by the New York State Public Service Commission.

9. Expiration of Easement. Once the NAVY RESPONSE ACTIONS have been deemed to be complete by the Lead Regulator and the PERMANENT FACILITIES are no longer required, NAVY shall provide to COMPANY written notice of the termination of the easement, closeout the PERMANENT FACILITIES in accordance with applicable Federal and State laws and completely remove the structures that comprise the PERMANENT FACILITIES. The NAVY shall be responsible for the proper removal and disposal of the PERMANENT FACILITIES, any remediation needed as a result of the operation, removal and/or disposal of the PERMANENT FACILITIES, and the cost of the foregoing.

10. Title to Improvements. Title to the PERMANENT FACILITIES shall remain with the NAVY, and the NAVY may remove all or a portion of the PERMANENT FACILITIES therefrom at any time, provided advance notice of removal shall be given to the COMPANY.

11. Covenant of Title. The COMPANY covenants that it is vested with the fee simple title to the aforesaid property; that it has the right to convey the aforesaid easement to the NAVY; that the NAVY shall have quiet and peaceful possession and enjoyment of the aforesaid easement rights so long as the Navy's activities on the easement area do not unreasonably interfere with or hinder the use of the PROPERTY by COMPANY.

12. Authority to Execute. Each of the parties warrants to the other that the person or persons executing this Easement on behalf of such party has the full right, power and authority to enter into and execute this Easement on such party's behalf and that, except for the pre-approval of the New York Public Service Commission, which COMPANY acknowledges by its signature below it has already obtained, no consent from any other person or entity is necessary as a condition precedent to the legal effect of this Easement.

13. Termination of Existing License Agreement. Upon execution of EASEMENT, License No. N40085-12-RP-00149; PI-10274 shall be superceded and terminated.

14. Entire Agreement. This Easement contains the entire agreement with respect to access to the PROPERTY for purposes stated herein. No addition to or modification or cancellation of any term or provision of this Easement shall be effective unless set forth in writing and signed by the parties hereto.

15. Notices. Unless otherwise specifically provided for in this Easement, all notices or other communications required or permitted under this Easement shall be in writing and shall be sent either (a) through the United States Postal Service, designated as registered or certified mail, return receipt requested and bearing adequate postage, (b) by means of an express delivery service if it obtains a written receipt to confirm delivery, (c) by hand delivery or (d) facsimile transmission. Each such notice shall be effective upon the receipt thereof by the addressee. Rejection or refusal to accept or inability to deliver because of change of address of which no notice was given as provided herein shall be deemed to be receipt of the notice sent. By giving the other parties hereto at least seven (7) days notice thereof, any party thereto shall have the right from time to time and at any time while this Easement is in effect to change its address for purposes of this provision, and each party shall have the right to specify as its address any other address within the continental United States of America. Each notice or other communication shall be addressed, until notice of change of address as aforesaid, as follows:

If to Company:
New York American Water Company, Inc.
1025 Laurel Oak Road
Voorhees, NJ 08043
Attn: Michael Sgro, General Counsel
Phone: (856) 782-2314
Fax: (856) 782-2482

If to Navy:
Asset Management
Naval Facilities Engineering Command, Mid-Atlantic
Attention: Code OPTB1-SW
9742 Maryland Ave
Norfolk, VA 23511
Phone: (757) 341-2005
Fax: (757) 341-2096

16. Successors and Assigns. The Navy may not assign its interest in the PROPERTY or delegate any obligation hereunder without prior written notice to COMPANY. Any transfer of ownership or operation of the PROPERTY by COMPANY to any other person or entity shall provide written notice to the transferee of the existence of this EASEMENT and that transferee takes ownership or control subject to this Easement. It is the intention of the parties herein that the rights granted herein shall run with the PROPERTY until otherwise terminated as set forth herein.

17. Reservation of Rights. Notwithstanding any provision of this Easement, NAVY retains all of its authorities and rights, including its access authorities, under CERCLA, and any other applicable statutes or regulations. This includes, but is not limited to, the NAVY's reservation of all of its rights to enter at reasonable times to perform response actions, and to issue or seek orders directing compliance with its request to enter the PROPERTY, including but not limited to those set forth under Sections 104(e) and 106 of CERCLA.

18. Anti-Deficiency Act. Nothing contained in this Easement is intended or should be interpreted to require any obligation or expenditure of funds in violation of the Anti-Deficiency Act, 31 U.S.C. §1341 *et seq*.

19. Section Headings; Whereas Clauses. Paragraph headings are provided herein for convenience only and shall not serve as a basis for interpretation or construction of this Easement, nor as evidence of the intention of the parties hereto. The Whereas clauses of this Easement are hereby incorporated as substantive terms and conditions of this Easement.

20. Waiver. Any party hereto may specifically waive any breach of this Easement by any other party, but no such waiver shall constitute a continuing waiver of similar or other breaches. A waiving party may at any time, upon notice given in writing to the breaching party, direct future compliance with the waived term or terms of this Easement, in which event the breaching party shall comply as directed from such time forward. All remedies, rights, undertakings, obligations and agreements contained in this Easement shall be cumulative and not mutually exclusive.

21. Severability. If any provision of this Easement as applied to either party or to any circumstance shall be adjudged by a court to be void or unenforceable, the same shall in no way affect any other provision of this Easement, the application of any such provision in any other circumstances or the validity or enforceability of the Easement as a whole.

22. Counterparts. This Easement may be executed in one or more counterparts, each of which shall be deemed an original, but all of which together shall constitute but one and the same instrument.

23. Applicable Law. This Easement shall be governed by and construed in accordance with applicable Federal and State law.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in their behalf by its proper officers.

**GRANTOR:**

**NEW YORK AMERICAN WATER COMPANY, INC. f/k/a NEW YORK WATER SERVICE CORPORATION**

By:_____________________________________________
___________, President

**STATE OF NEW YORK**
**NASSAU COUNTY**

In Town of Hempstead on this ______ day of __________________, A.D. 2013, before me personally appeared__________________, to me known and known by me to be the President of the New York American Water Company and the party for and on behalf of the New York American Water Company who executed the foregoing instrument and he acknowledged said instrument by him so executed to be his free act and deed individually and in his said capacity and the free act and deed of the New York American Water Company.

_____________________________________________
**NOTARY PUBLIC**
Print Name:_______________________________________
My commission expires:______________________________

**GRANTEE**:

**UNITES STATES OF AMERICA, NAVAL FACILITIES ENGINEERING COMMAND MID-ATLANTIC**

By:____________________________________________
C. HOPE MARINI
Real Estate Contracting Officer
NAVFAC, Mid-Atlantic

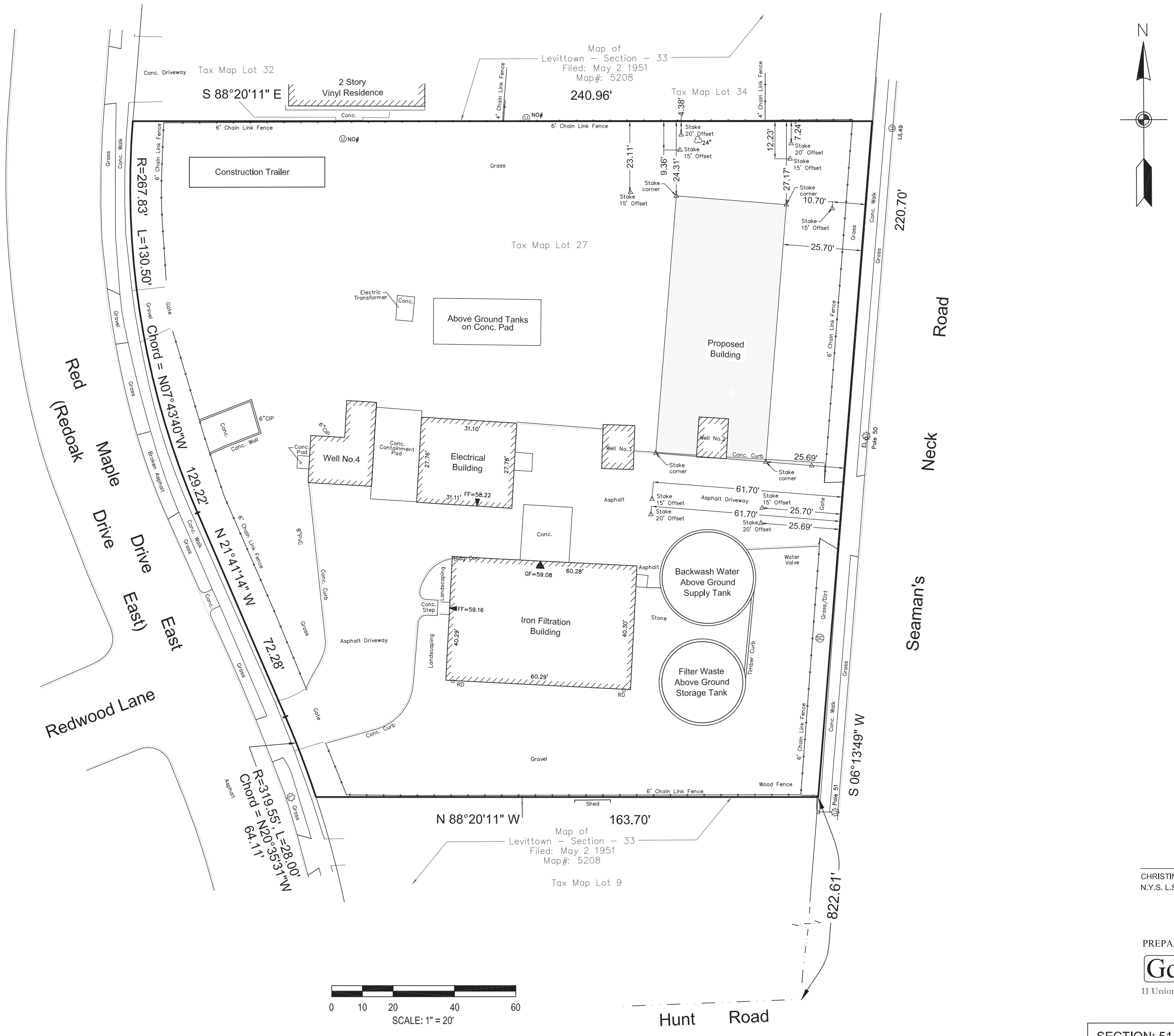
**COMMONWEALTH OF VIRGINA**
**CITY OF NORFOLK______________________**

I, _____________________________________________,a Notary Public for the State at Large, do hereby certify that ______________________.whose name as such is signed to the foregoing Easement has this day acknowledged the same before me in the City and State aforesaid.

Given under my hand this _________day of __________2013.

__________________________________________________
**NOTARY PUBLIC**
Print Name:__________________________________________
My commission expires:________________________________

# Exhibit A



CHRISTINE GAYRON, L.S. DATE
N.Y.S. L.S. No. 050760

PREPARED BY:
GdB GAYRON de BRUIN
Land Surveying & Engineering, PC
11 Union Avenue | Bethpage, NY 11714 | 516.579.3111
GayrondeBruin.com

| SECTION: 51 | BLOCK: 403 | LOT: 27 |
|---|---|---|

NOTES:

1. Field work was performed by Gayron de Bruin Land Surveying and Engineering on January 4, 2013.
2. All measurements are U.S. Survey Feet.
3. Easements, if any, not shown.
4. Unauthorized alteration or addition to this survey is a violation of section 7209 of the New York State Education Law.
5. Copies of this survey map not bearing the land surveyor's inked seal or embossed seal shall not be considered valid true copies.
6. Certifications indicated herein shall run only to the person for whom the survey map is prepared, and on his behalf to the title company, governmental agency and lending institution. Certifications are not transferrable to additional institutions or subsequent owners.

## LEGEND

### MANHOLES

| | |
|---|---|
| CATV | Ⓒ |
| DRAIN | Ⓓ |
| ELECTRIC | Ⓔ |
| GAS | Ⓖ |
| SEWER | Ⓢ |
| SEWER CLEANOUT | (SC) |
| TRAFFIC | TR |
| TELEPHONE | Ⓣ |
| UNKNOWN | (?) |
| WATER | Ⓦ |

### UTILITY HARDWARE

| | | | |
|---|---|---|---|
| ELECTRIC VAULT | E | POLE RISER - TELEPHONE | ○T |
| GAS MAIN VALVE | Ⓖ | ROOF DRAIN | ○RD |
| GAS METER | ⒼM | SEWER VENT | ○S |
| GAS SERVICE VALVE | G | TRAFFIC DETECTOR | ▭ |
| GAS VENT | ○G | TRAFFIC LOOP | ▯ |
| HYDRANT | ♉ | UNIDENTIFIED VAULT | V |
| HYDRANT VALVE | Ⓗ | UNKNOWN VALVE | V |
| IRRIGATION VALVE | I | WATER MAIN VALVE | Ⓦ |
| OIL FILLER VALVE | ○FV | WATER METER | ⓌM |
| POLE RISER - ELECTRIC | ○EL | WATER SERVICE VALVE | W |

### UTILITY POLES

| | |
|---|---|
| LIGHT POLE BASE | Ⓑ |
| METAL POLE W/LIGHT | Ⓛ |
| METAL POLE WITH TRAFFIC | Ⓛ |
| WOODEN UTILITY POLE | Ⓤ |
| WOODEN UTILITY POLE W/LIGHT | Ⓤ |

### FENCES

| | |
|---|---|
| GUARD RAIL | —□— |
| CHAIN LINK FENCE | —×— |
| WOODEN FENCE | —//— |
| METAL FENCE | —○— |
| VINYL FENCE | —△— |

### VEGETATION

| | |
|---|---|
| BUSH | ○ |
| HEDGE | ≈≈≈ |
| TREE (WITH SIZE) | ♣ |
| TREELINE | ⌒⌒⌒ |

### CATCH BASINS

| | |
|---|---|
| TYPE "A" | ▦ |
| TYPE 1 | ⊡ |
| FLUSH GRATE | ▦ |
| ROUND GRATE | ⊜ |

### MISCELLANEOUS

| | |
|---|---|
| CELLAR DOOR | CE |
| GUARDPOST | ○GP |
| GUYWIRE & ANCHOR | —< |
| HANDICAP RAMP | ⊓ |
| MAILBOX | MB |
| PARKING METER | ⌓ |
| SIGN - SINGLE POST | ▷ |
| SIGN - DOUBLE POST | ⊕—⊕ |
| TELEPHONE BOOTH | TB |

### ABBREVIATIONS

| | | | |
|---|---|---|---|
| ABANDONED | ABAND. | GARAGE FLOOR ELEVATION | GF=18.30 |
| ALUMINUM | ALUM | INVERT ELEVATION | I=1.6 |
| BELGIAN BLOCK | B. BLK | MANHOLE RIM ELEVATION | R=32.65 |
| BLACKTOP | B.T. | OVER ALL | O.A. |
| BLOCK | BLK | POINT OF BEGINNING | P.O.B. |
| BRICK | BRK | POST AND RAIL | RAIL FE. |
| CONCRETE | CONC. | STOCKADE FENCE | STOCK FE. |
| CHAIN LINK FENCE | CH. LK. FE. | STORY | STY |
| FIRST FLOOR ELEVATION | FF=7.25 | VACANT | VAC. |
| FRAME | FR | WOOD | WD |

SYM DESCRIPTION DATE APPR

NAVFAC

SEAL

A/E INFO

APPROVED

FOR COMMANDER NAVFAC

ACTIVITY
–

SATISFACTORY TO DATE 23/01/2013

| | | |
|---|---|---|
| DES | DRW K.K. | CHK J.G. |
| <<PM/DM>> | – | |
| BRANCH MANAGER | – | |
| CHIEF ENG/ARCH | – | |
| <<XX>> | – | |

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL FACILITIES ENGINEERING COMMAND ~ MID-ATLANTIC
NORTHEAST IPT
NWIRP Bethpage
NEW YORK AMERICAN WATER NASSAU COUNTY, NEW YORK
Modifications To Water Treatment Facility
Existing Conditions Site Survey

SCALE: 1" = 20'–0"
EPROJECT NO.: WE–23
CONSTR. CONTR. NO. N62470–08–D–1006
NAVFAC DRAWING NO.
SHEET 1 OF 1
C-10

DRAWFORM REVISION: 10 MARCH 2009

FILE NAME: P:\4854\Survey\CAD\4854 Basemap.dwg LAYOUT NAME: Stake Points PLOTTED: Wednesday, January 23, 2013 – 12:10pm USER: kkhaterzai

# Exhibit B

| | | |
|---|---|---|
| Comprehensive General Liability | Combined Single Limit | |
| | General Aggregate | $2,000.000 |
| | Each Occurrence | $1,000,000 |
| | Personal Injury | |
| | Property Damage | |
| Automobile Liability | Combined Single Limit | $1,000,000 |
| | Bodily Injury (per occurrence) | |
| | Bodily Injury (per accident) | |
| | Property Damage | |
| Worker’s Compensation and Statutory Employer Liability | Policy Limit $1,000,000<br>subject to Self-Insured deductible | |