Naval Facilities Engineering Systems Command
Mid-Atlantic, Norfolk, Virginia

Draft

Explanation of Significant Differences
Operable Unit 2 Record of Decision

Former Naval Weapons Industrial Reserve Plant

Bethpage, New York

February 2021

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Acronyms and Abbreviations

AOP	Advanced Oxidation Process
ARARs	Applicable or Relevant and Appropriate Requirements
AROD	Amended Record of Decision
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
EC	Emerging Chemical of Environmental Concern
ESD	Explanation of Significant Differences
EX	Mass Flux Extraction Well
FYR	Five Year Review
GWTP	Groundwater Treatment Plant
HC	Hydraulic Containment
LUCs	Land Use Controls
MCL	Maximum Contaminant Level
µg/L	Microgram per liter
NAVFAC	Naval Facilities Engineering Systems Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NG	Northrop Grumman
NWIRP	Naval Weapons Industrial Reserve Plant
NYS	New York State
NYSDEC	New York State Department of Environmental Conversation
NYSDOH	New York State Department of Health
ONCT	On-Site Containment
OU	Operable Unit
PDI	Pre-Design Investigation
PWSCP	Public Water Supply Contingency Plan
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
ROD	Record of Decision
RW	Recovery Well
TCA	Trichloroethane
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
VPB	Vertical Profile Boring

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1.0 Introduction and Statement of Purpose

1.1 Introduction

This document is an Explanation of Significant Differences (ESD) for the addition of supplemental groundwater extraction and treatment systems and to incorporate 1,4-dioxane as a chemical of concern to the Department of the Navy's (Navy) 2003 Operable Unit 2 (OU2) Groundwater Record of Decision (ROD) for the Naval Weapons Industrial Reserve Plant (NWIRP) – Bethpage, New York (NAVFAC, 2003). The site is also listed on the New York State Registry of Inactive Hazardous Waste Sites, (Number 1-30-003B).

The Navy's 2003 OU2 ROD was signed on April 13, 2003. It was developed, in part, based on the New York State Department of Environmental Conservation (NYSDEC) OU2 ROD, which was signed in March of 2001 to address the NWIRP OU2 regional groundwater contaminant plumes from both the NWIRP Bethpage and Northrop Grumman (NG) Bethpage facilities (NYSDEC, 2001). The 2003 OU2 ROD was developed to identify the actions to be conducted by the Navy regarding OU2 groundwater contamination. Since then, the Navy has implemented most of the actions outlined in its 2003 ROD, with the outstanding items resulting from new findings or continued migration of the OU2 plumes.

Non-minor changes to a remedy selected in a ROD that occur during the remedial design or remedial action phase must be documented in an ESD or a ROD Amendment. Non-minor changes are defined as having a fundamental (requiring ROD amendment) or significant (requiring ESD) effect on the scope, performance, and/or cost of a ROD's Selected Alternative (USEPA 1999). A significant change in the remedy generally involves a change to a component of a remedy that does not fundamentally alter the overall cleanup approach. It can be based on new information acquired or generated by the lead agency (i.e., Navy) during the remedial process. Examples in USEPA guidance of significant, non-fundamental changes include attainment of a new applicable or relevant and appropriate requirement (ARAR) in order to maintain or re-attain protectiveness; significant changes in timing, volume, cost, or secondary technology but which maintain the same overall pump and treat cleanup approach; or implementation of a contingency remedy.

As described in this ESD, based on information gained during the implementation of the OU2 ROD required remedial actions, the Navy identified the need for a change to its OU2 remedy during completion of the most recent NWIRP Bethpage Five Year Review (FYR), as described in Section 3.

This ESD was developed in accordance with the United States Environmental Protection Agency's (USEPA) “A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents” (USEPA, 1999). The lead agency for implementing the ROD is the Navy, with execution of environmental restoration assigned to the Naval Facilities Engineering Systems Command (NAVFAC) Mid-Atlantic Region.

The preparation and public notice of this ESD is pursuant to Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and pursuant to 40 CFR Section 300.435(c)(2)(i). This ESD includes a brief summary of the remedy selected in the OU2 ROD, a description of the changes, and a description of why the Navy is making these changes to the selected remedy.

1.2 Statement of Purpose

The purpose of this ESD is to describe and justify changes to the selected remedial action for OU2 Groundwater, originally presented in the Navy OU2 ROD (NAVFAC, 2003). The selected changes to the OU2 ROD are additional applications of or build upon the primary treatment technology (groundwater extraction/pump and treat) selected in the Navy’s 2003 CERCLA OU2 ROD, and are as follows:

- Addition of 1,4-dioxane as an emerging chemical of concern in OU2 groundwater and addition of a secondary technology to the primary treatment technology to specifically address 1,4-dioxane where required;
- Extension of the RE108 Phase II Treatment System to extract and treat non-hotspot OU2 groundwater (i.e., volatile organic compound [VOC] concentrations of less than 1,000 micrograms per liter [µg/L]); and
- Construction and operation of additional extraction and treatment systems for addressing OU2 groundwater near the leading edge of the OU2 plumes.

1.3 Availability for Public Review

This ESD will become part of the administrative record for the site (National Oil and Hazardous Substances Pollution Contingency Plan [NCP], 40 CFR Section 300.825 (a)(2)).

Following regulatory agency review, a notification specifying that the ESD is available for public review will be placed in a major local newspaper. An information repository is located at the Bethpage Public Library, where the ESD will be available for public review:

Bethpage Public Library
47 Powell Avenue
Bethpage, NY 11714

Hours:	Monday - Friday:	9:00 A.M. to 9:00 P.M.
	Saturday:	9:00 A.M. to 5:00 P.M.
	Sunday:	Noon to 4:00 P.M (Closed July to Labor Day).

The ESD will also be made available online at the following address:

https://go.usa.gov/DyXF

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2.0 Summary of Site History, Contamination and Selected Remedy

2.1 Site History

The location of NWIRP Bethpage is shown on Figure 1. NWIRP Bethpage is no longer an active Navy installation. Historically, the installation that would later become NWIRP Bethpage began operations in the early 1940s. Since its inception, the NWIRP's primary mission was research prototyping, testing, design engineering, fabrication, and primary assembly of military aircraft. At its peak operation, the facilities at the former NWIRP Bethpage included four plants used for assembly and prototype testing, a group of quality control laboratories, two warehouse complexes (north and south), a salvage storage area, water recharge basins, the Industrial Wastewater Treatment Facility, and several smaller support buildings (Figure 2). The NWIRP was a Government-Owned/Contractor Operated facility that was operated by NG and its predecessors until September 1996 when operations at NWIRP Bethpage ceased.

The former 105-acre parcel that comprises NWIRP Bethpage is located in east-central Nassau County, Long Island, New York, approximately 30 miles east of New York City. The area is relatively flat, and most of the site is paved. NWIRP Bethpage was bordered on the north, west, and south by property owned or formerly owned by NG that covered approximately 500 acres, and on the east by a residential neighborhood.

The facility is currently used for commercial purposes. The land surrounding the former NWIRP Bethpage is primarily a mixture of commercial and residential development. The residential development surrounding much of the former NWIRP Bethpage and NG facilities is located in the Hamlets of Bethpage and Plainedge, in the Town of Oyster Bay, and the Hamlets of Levittown and Hicksville, in the Town of Hempstead.

One primary source of the OU2 VOC-contaminated groundwater is NWIRP Site 1. Site 1 originally consisted of two former drum marshalling pads used to store drums containing waste materials from operations at Plant 3 (aircraft assembly and prototype testing) and potentially other sources at the installation. Among the waste materials stored at Site 1, the waste drums contained chlorinated and non-chlorinated solvents and liquid cadmium and chromium wastes. In addition, underlying most of Site 1 was an abandoned septic drainage system consisting of approximately 120 abandoned cesspools that were designed to discharge sanitary waste waters from Plant 3. Based on the widespread distribution of VOCs within the cesspools, it is believed that non-sanitary wastes had also been discharged through this system.

2.2 Operable Unit 2 Nature and Extent of Contamination

OU2 consists of site-related VOC-contaminated groundwater beneath the Navy's former 105-acre parcel and VOC-contaminated groundwater that has migrated and continues to migrate south and east off property, where it becomes mixed with contamination originating on former NG-owned manufacturing property. The conceptual site model showing the current understanding of the Navy and NG OU2 and the NG OU3[1] groundwater plumes is presented in Figure 3. Note that the plumes are not continuous across the site horizontally or vertically. These plumes result from multiple releases of VOCs in various locations and times.

The Navy OU2 ROD (NAVFAC, 2003) and Public Water Supply Contingency Plan (PWSCP) (Arcadis, 2003) identified the following chemicals of concern in groundwater, which were associated with the NG and NWIRP facilities in Bethpage, NY:

- Tetrachloroethene (Perchloroethene)
- Trichloroethene (TCE)
- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- Carbon Disulfide
- Carbon Tetrachloride
- Chlorobenzene
- Chloroform
- 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)
- 1,2-Dichloroethene
- 1,2-Dichloroethane
- 1,1-Dichloroethene
- 1,1-Dichloroethane
- 1,1,2-Trichloroethane
- 1,1,2,2-Tetrachloroethane
- Vinyl Chloride
- 1,1,1-Trichloroethane

The current chlorinated VOC-contaminated groundwater plumes that originated from the Navy and NG properties prior to operation of the On-Site Containment (ONCT) System

[1] In this context, "OU3" refers to the NYSDEC operable unit related to contaminated groundwater at and migrating from the former Grumman settling ponds at what is now the Bethpage Community Park. This should not be confused with the Navy's "OU3," which refers to an NWIRP operable unit addressing contamination at NWIRP "Site 4 – Former Underground Storage Tank Area" and for which the Navy issued its CERCLA ROD in September 2015.

span more than 3,000 acres and are over 700 feet deep in some places. The approximate layout of the OU2 and OU3 plumes are shown on Figure 4.

The ONCT System was constructed by NG as an interim remedial measure and then continued as part of NG's remedial action obligations for OU2 under the NYSDEC's January 2001 OU2 ROD. As such, neither the Navy's 2003 OU2 CERCLA ROD nor this ESD directly cover the implementation of the ONCT System response actions. Nevertheless, the Navy's OU2 ROD and this ESD recognize that NG's operation of the ONCT System is vital to containment of groundwater contamination on the former NWIRP and NG properties. This action has ensured that contaminated groundwater is no longer being released from the properties. The Navy's OU2 response actions concentrate on plumes that resulted from migration downgradient that occurred prior to the operation of the ONCT System.

There is also strong evidence of a relatively pure Freon-113 plume along and under the western edge of the Deep Western Plume (OU2) that does not appear to be associated with the former NWIRP Bethpage or NG properties. In this Freon-113 plume, TCE and other chlorinated VOCs are present in minor amounts (less than 20%) relative to the Freon-113. This other plume is evidenced by Freon-113 found in groundwater samples collected from monitoring wells BPOW4-2R (18.8 µg/L), RE131D3 (300 µg/L), RE134D4 (180 µg/L) indicating that it is running parallel to the OU2 plume and the source(s) for which appear(s) to be shallower plumes further west of the former NWIRP Bethpage and NG properties. The plumes associated with the former NWIRP Bethpage and NG properties have TCE as the primary component of the total VOCs present, whereas Freon-113 is only a minor component (range of 0.7% to 11%). Investigations conducted in 2019 including samples collected from Vertical Profile Boring (VPB)176 and groundwater sampling data from monitoring well clusters RE134, RE131, and RE124 provided information to further support the estimated western edge of the Deep Western Plume (Tetra Tech, 2020 and Resolution, 2020). The source of this other contamination is currently unknown.

The plumes that originated on NWIRP Bethpage or NG prior to operation of the ONCT System have impacted or threatened public water supply well fields within the footprint of the plumes. The United States government has provided funding for five public water supply systems. In addition, public water supplies that are south-southeast of the NWIRP and NG facilities are potentially downgradient of the OU2 plumes and could be impacted in the future. Plume migration is ongoing at approximately 100 to 300 feet per year. In accordance with the OU2 ROD, remedial actions to address the VOC-contaminated groundwater plumes and migration have been and continue to be implemented as discussed below.

2.3 OU2 Record of Decision

The Navy OU2 ROD was signed on April 13, 2003. The ROD identified on-NWIRP land use controls (LUCs), as well as continued reliance upon the groundwater ONCT System owned and operated by NG to control migration of groundwater from both the NWIRP and NG-owned properties. The ROD also identified off-property response actions consisting of mass contaminant removal (e.g., GM38 Groundwater Treatment Plant [GWTP]), protection of the public water supplies, natural attenuation, and continued plume delineation and groundwater monitoring (NAVFAC, 2003).

2.3.1 Remedial Action Objectives[2]

As stated in the OU2 ROD, the following remedial action objectives (RAOs) were developed to achieve protectiveness of human health and the environment, and comply with ARARs:

- 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 implementation of off-site 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 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 microgram per liter (μg/L).

2.3.2 Remedy

Remedial actions required for OU2 groundwater were identified in the Navy OU2 ROD and were separated into on-property and off-property components.

On-Property Groundwater Actions

In accordance with the ROD, the Navy has implemented LUCs to address on-property groundwater contamination by restricting groundwater use. Further, the selected

[2] The Navy 2003 OU2 ROD uses the term “Remediation Goals” to describe what are also commonly referred to as Remediation Action Objectives (RAOs) in CERCLA guidance. For consistency, this ESD uses the term RAOs to describe the objective statements.

remedy for on-property groundwater recognizes that NG's ONCT System continues to contain and remediate VOC-contaminated groundwater originating from the Navy's and NG's properties.

Off-Property Groundwater Actions

The Navy's ROD also specified that off-property groundwater would be addressed through the following:

Groundwater Remedial Program

1. An active remedial program including design, implementation, and operation and maintenance of a groundwater extraction and treatment system near the GM38 groundwater hotspot location.

2. Evaluation of the GM-75 Area groundwater or any other area 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 that at GM38, is necessary.

3. Installation of VPBs and monitoring wells to allow for identification and monitoring of groundwater contamination.

Public Water Supply Protection Plan

4. Development of a PWSCP (Arcadis, 2003) that would use the VPB data along with groundwater modeling to target outpost well locations and to develop groundwater monitoring trigger values. Trigger values are site-related VOC concentrations established for outpost well groundwater samples that when exceeded signify that wellhead treatment or comparable alternative measures are required to address the potential for a public supply well or well field to be impacted. The PWSCP developed numerical trigger values for South Farmingdale Wells Field 1, supply wells 4043 and 5148; South Farmingdale Well Field 3, supply well 6150; and New York American Water Supply Wells 3S and 4S, wells 8480 and 9338. A fourth well field identified in the PWSCP, Town of Hempstead (Levittown) Well 13, did not have a projected OU2 groundwater impact within 30 years.

   An addendum (Resolution, 2015A) to the PWSCP was generated to provide trigger values for 13 outpost wells installed to provide early warning for two additional public water supply well fields (South Farmingdale Water District Plant 6 and Massapequa Water District supply wells 6442 and 6443). A second addendum (Resolution, 2016) to the PWSCP was generated to provide trigger values for eight outpost wells installed to supplement or replace existing outpost

wells for South Farmingdale Well Fields 1 and 3, New York American Water Wells 3S and 4S, and Town of Hempstead Well 13.

The elements of the PWSCP are as follows:

a. Installation of outpost wells for public water supplies that have the potential to be impacted by the OU2 VOC-contaminated groundwater. Outpost wells are located between the leading edge of the plumes and public water supply wells and provide early (five-year) warning of plumes migration towards public water supply well fields.

b. A provision for wellhead treatment for public water supply systems or an alternative approach pursuant to the PWSCP.

In the implementation of the OU2 ROD, the Navy had focused on the identification of groundwater hot spots (identified as an area of VOC concentrations of greater than 1,000 µg/L) to define the area(s) of groundwater contamination where based on location, groundwater migration, and quantity of contaminant mass, it was deemed technically practicable to implement off-property groundwater remediation systems in order to effectively reduce the magnitude and duration of potential impacts to downgradient public water supply wells. Direct wellhead treatment has also been implemented to protect these public water supply wells.

The OU2 groundwater remedy is predominately in the remedial action operation phase of the Navy Environmental Restoration Process. Because of the complexity of the site, portions of the remedy are also in the remedial design, remedial action construction, and long-term management phases of the process as described in Section 3.2.

3.0 Basis for this Explanation of Significant Differences

The Navy has recently completed a FYR of the ongoing and planned remedial actions for all OUs at NWIRP Bethpage. This review was conducted pursuant to the CERCLA Section §121(c), 42 U.S.C. §9621(c), and the NCP in Title 40 of the Code of Federal Regulations (CFR), §300.430(f)(4)(ii) and the USEPA Comprehensive Five-Year Review Guidance (USEPA, 2001). The recommendations which are being adopted from this review include significant changes to the Navy's ongoing and planned remedial actions and therefore require an ESD from the Navy's April 2003 CERCLA OU2 Record of Decision.

As part of the CERCLA FYR, the Navy evaluated 1,4-dioxane as an emerging chemical of environmental concern for the OU2 groundwater and is currently conducting a Preliminary Assessment/Site Inspection (PA/SI) to supplement its source area information about this chemical. While this PA/SI is not complete, based on site records that document the use of 1,1,1-trichloroethane (TCA) at the facility and the results of groundwater testing showing the presence of 1,4-dioxane in groundwater on and downgradient of the NWIRP, the report makes it clear that at least a portion of the 1,4-dioxane in the groundwater downgradient of the site is sourced from the NWIRP property, as well as the NG property. Similarly, there is evidence that a portion of the 1,4-dioxane in this groundwater does not originate on NWIRP or NG properties, but originates from an upgradient source and flows with groundwater under the facility. In addition, as a part of its CERCLA FYR of OU2, the Navy also took a "hard look" at NYSDEC's Selected Remedy for the plumes, as set forth in its Final Amended Record of Decision (AROD) (NYSDEC, 2019), in order to evaluate whether the Navy's existing OU2 CERCLA remedy could be improved by adopting components or concepts from the NYSDEC AROD without adversely affecting the existing CERCLA remedy and achievement of its RAOs. The NYSDEC AROD proposes multiple potential changes to ongoing remedial actions under the existing NYSDEC OU2 ROD to address contamination allegedly sourced from the NG or NWIRP properties, as well as to address NYSDEC's existing OU3 groundwater ROD concerning contamination from the former Grumman Settling Ponds site (HDR, 2019). The AROD also addresses regional contamination from sources other than OU2 or NYSDEC OU3. The AROD identified Alternative 5B (Hydraulic Containment of Site Contaminants Above SCGs [Standards, Criteria, and Guidance] Combined with Mass Flux Remediation – Centralized Treatment Plants with a Centralized Recharge Basin) as the NYSDEC Selected Remedy.

With the understanding that the Navy can only address contamination associated with releases from the NWIRP to the OU2 plumes, the Navy reviewed additional data, conducted additional modeling, and had productive meetings with NYSDEC that have

resulted in the Navy's development of plans including the following CERCLA response actions (detailed later in this ESD):

- Implementation of an interim mass removal system at the existing Navy well RE137.
- Implementation of an extension to the RE108 Phase II Treatment System further to the south to the planned Navy Recovery Well (RW) 7 location (which approximates NYSDEC hydraulic containment (HC) well location HC03).
- Implementation of the Phase III Southern Plume Intercept Treatment System in the area of the Southern State Parkway (Navy RW8, RW9, RW10, and RW11), which approximate NYSDEC well locations HC07, HC09, HC10, and HC11).
- Based on a future mass removal evaluation, consideration of the use of existing or planned NYSDEC mass flux extraction (EX) wells EX1 to EX5, or other similar Navy wells in this area (e.g., long term use of RE137).
- Future consideration, as a contingency, of the installation and operation of a Navy RW in the area of RE117D1 and with a screen interval similar to that of RE117D1 (which approximates NYSDEC well HC08 location), if RW7 does not achieve sufficient OU2 mass capture and control of the plume in that area. This well would be located in the OU2 plume between the RW7 location and extraction wells along the Southern State Parkway. Extraction of groundwater at this location would further enhance early removal of OU2 plume contaminants from the aquifer and slow plume migration.

This section describes the basis for this determination.

3.1 Addition of 1,4-Dioxane as an Emerging Chemical of Environmental Concern in OU2 Groundwater

The sites included in the CERCLA FYR were reviewed for the potential future changes that might be needed to address the presence of emerging chemicals (ECs)[3], including 1,4-dioxane. Department of Defense Instruction 4715.18 (2019) defines an emerging chemical of environmental concern as a chemical that is characterized by a perceived or real threat to human health or the environment and that has new or changing toxicity values or new or changing human health or environmental regulatory standards. Changes may be due to new science discoveries, detection capabilities, or exposure pathways.

1,4-Dioxane is used in many commercial products, including paint strippers, dyes, greases, varnishes, and waxes and can be introduced into the environment through

[3] ECs are also known as chemicals of emerging concern.

wastewater systems (e.g., sanitary and industrial discharges). In addition, 1,4-dioxane is a common additive to some chlorinated solvents similar to those found in the OU2 plumes. Historically it was used as a solvent stabilizer, most commonly associated with TCA, in which it was present at a concentration of approximately 3 percent. TCA was used at the NWIRP Bethpage facility since at least 1952. Therefore, 1,4-dioxane is considered potentially present at NWIRP Bethpage sites contaminated with TCA and its daughter compounds.

TCA and its daughter compounds are also present in the OU2 plumes, although not at levels that would account for the concentrations of 1,4-dioxane measured in the groundwater, i.e., there is not enough TCA and daughter products present in groundwater to account for the widespread distribution and concentration of 1,4-dioxane. 1,4-Dioxane may also be associated with other chlorinated VOCs such as TCE, although the link between 1,4-dioxane and TCE is not as well defined as it is with TCA. TCE products reportedly contained chemical stabilizers, but manufacturers did not report on the addition, if any, of 1,4-dioxane as a stabilizer, or the concentrations used.

The USEPA has not established a Safe Drinking Water Act maximum contaminant level (MCL) for 1,4-dioxane in drinking water. Under CERCLA, the USEPA and Navy make risk management decisions to select risk-based cleanup levels that fall within the 1×10^{-4} to 1×10^{-6} risk range and, application of this range of screening levels, provides a conservative acceptable risk range concentration of 0.46 µg/L to 46 µg/L (USEPA, 2020). The USEPA has also established a screening level of 57 µg/L for tap water, which is based on a hazard index of 1, a concentration below which non-carcinogenic health effects would not be anticipated (USEPA, 2020).

In 2019, the New York State Department of Health (NYSDOH) proposed an MCL for 1,4-dioxane of 1 µg/L. On August 26, 2020, New York State finalized this MCL. The NYSDOH MCL of 1 µg/L is near the lower range of the USEPA risk-based screening level (0.46 µg/L).

At the time of the 2003 Navy OU2 ROD, 1,4-dioxane was not identified as a chemical of concern. It wasn't until after the third Unregulated Contaminant Monitoring Rule was published by the USEPA on May 2, 2012, that 1,4-dioxane began to draw attention as a potential risk to human health and the environment. Since that time, 1,4-dioxane has been considered an EC and has been subject to ongoing regulatory debate about the concentrations at which it presents unacceptable risk to human health depending upon the exposure situation.

Prior to 2012, groundwater sample results for 1,4-dioxane in the area were limited. In November 2012, groundwater samples were collected from several groundwater

monitoring wells at the NWIRP. 1,4-Dioxane was reported as being quantitatively measured in two on-property monitoring wells: MW306I (21 µg/L) and MW302I1 (70 µg/L and 81 µg/L in the associated duplicate) (Tetra Tech, 2013). The laboratory reporting limit for the analytical method was 25 µg/L. Analysis for 1,4-dioxane was performed using VOC Method 8260C. Groundwater results from monitoring well MW302I1 exceeded the pre-July 2020 NYSDOH MCL of 50 µg/L as well as the upper bounds of carcinogenic and noncarcinogenic risk values of 46 µg/L and 57 µg/L, respectively.

Between 2014 and 2018, groundwater samples from a limited number of on-property and off-property monitoring wells were analyzed for 1,4-dioxane. Within the area identified as the OU2 plumes, the maximum 1,4-dioxane concentration measured was 30 µg/L from off-property monitoring well RE120D1 in 2014 (Resolution, 2015B). The associated carcinogenic risk associated with this sample result would be 7×10^{-5} and the hazard index would be 0.5. The corresponding TCE and TCA concentrations in this well were 1,300 µg/L and 1.9 µg/L, respectively. The sum of TCA, dichloroethanes, dichloroethenes, and chloroethane (potential degradation of products of TCE and TCA) was only 30 µg/L. A concentration of approximately 2,300 µg/L in on-property groundwater and 1,000 µg/L in off-property groundwater of TCA and associated degradation products would be required to produce a 1,4-dioxane concentration of 70 µg/L in on-property groundwater and 30 µg/L in off-property groundwater, which was not observed. This comparison suggests that one or more other non-TCA sources of 1,4-dioxane may be responsible for the presence of 1,4-dioxane in on-property and off-property groundwater.

In 2018, a more extensive CERCLA PA/SI process, including on-property groundwater investigation for 1,4-dioxane was initiated. This investigation consisted of five quarterly groundwater sampling events from April 2018 through June 2019. These samples were analyzed using Method 8270SIM and the 1,4-dioxane reporting limit for this analysis was 0.05 µg/L. The results indicate that while 1,4 dioxane was found in many of these samples, none of the concentrations were greater than the pre-July 2020 NYSDOH MCL of 50 µg/L in 2018 or the upper bounds of carcinogenic and noncarcinogenic risk values, including results from MW302I1 (with 1,4-dioxane at concentrations of 70 µg/L and 81 µg/L in the associated duplicate during 2012 sampling). During the 2018/2019 sampling events, the maximum 1,4-dioxane concentration in MW302I1 was 6.3 µg/L. The maximum 1,4-dioxane concentration in on-property groundwater during these sampling events, was 8.7 µg/L in MW305I, which also corresponds to the location where the maximum TCE concentration of 1,400 µg/L was measured in the on-property wells. At a 1,4-dixoane concentration of 8.7 µg/L, the associated carcinogenic risk would be 2×10^{-5} and the hazard index would be 0.2. Of the 57 monitoring wells

located on property, 6 wells (one of which is representative of groundwater flowing onto the property), had 1,4-dioxane concentrations greater than the recently adopted NYS MCL of 1.0 µg/L.

As evidenced by the results for RE120D1 discussed above, 1,4-dioxane has already migrated off-property with the VOCs and continues to be discharged off-property through the NG ONCT System in accordance with a State Pollutant Discharge Elimination System Equivalence Permit (i.e., 1,4-dioxane concentrations of 6.8 µg/L to 10 µg/L in December 2019 in the two ONCT System discharge locations) (Arcadis, 2020). NYSDEC reports that with the adoption of a drinking water MCL for 1,4-dioxane, the NG State Pollutant Discharge Elimination System Equivalence Permit will be updated to reflect 1,4-dioxane discharge criterion.

Public water systems in the area that could have been affected by activities on NWIRP (and NG) property are also being tested for 1,4-dioxane. As of March 2020, the reported concentrations were within the USEPA acceptable risk range (i.e. within the $1x10^{-4}$ to $1x10^{-6}$ incremental lifetime cancer risk) and were less than a hazard index of 1.

On August 26, 2020, the New York State Department of Health promulgated a chemical-specific drinking water MCL for 1,4-dioxane at a limit of 1.0 µg/L[4]. For those public water supplies in which VOC treatment has been installed in accordance with the Navy's OU2 ROD, the concentration of 1,4-dioxane exceeds 1 µg/L in six water supply wells (Bethpage Water District Wells 5-1, 6-1 and 6-2, New York American Water Wells 3A and 4S, and South Farmingdale Water District Well 3-1). Treatment for 1,4-dioxane is in place or under construction for Bethpage Water District Wells 5-1, 6-1, and 6-2. There is no 1,4-dioxane treatment at South Farmingdale Water District Well 3-1 or New York American Water Wells 3A and 4S.

For South Farmingdale Water District Well 1-3, which has treatment for VOCs, the 1,4-dioxane concentration is significantly less than the NYSDOH MCL (0.047 µg/L). For South Farmingdale Water District Wells 6-1 and 6-2, which are approximately ½ mile south of South Farmingdale Water District Well 3-1 and which have the potential to be impacted by OU2 VOCs within the next 20 years under current pumping conditions, the 1,4 dioxane concentrations are also less than the MCL (0.046 µg/L and 0.28 µg/L, respectively).

[4] A public water supply system implementing corrective actions to comply with the MCL for 1,4-dioxane may request that the State defer actions for determining MCL violations for up to 24 months past the effective date of the 1,4-dioxane MCL (August 26, 2020). Systems operating with a deferral approved by the State may request an extension for up to an additional twelve months (10 NYCRR Subpart 5-1).

Additional investigations will need to be conducted to determine whether individual public water systems in the area have been or will be impacted with 1,4-dioxane associated with releases from the NWIRP Bethpage and the OU2 plumes.

The Navy has evaluated the foregoing OU2 groundwater data and the associated risks to human health with the newly promulgated standard and finds there is a basis for adding 1,4-dioxane as a site-specific chemical of concern for the NWIRP contribution to the OU2 plumes. 1,4-Dioxane would also be added to the list of chemicals of concern included in the PWSCP.

3.2 Additional Capture and Treatment of OU2 Contaminated Groundwater

As part of the CERCLA FYR, the Navy conducted extensive groundwater flow modeling and analysis of the components of the NYSDEC AROD Selected Remedy for both potential interference (and resolution of interferences) with the Navy's OU2 existing and planned remedial actions and for potential improvements to the existing remedy. The recommendations from the FYR evaluation for OU2 identified some significant changes to the remedial actions identified in the 2003 OU2 ROD, consisting of the following:

- Extension of the RE108 Phase II Treatment System area to extract and treat non-hotspot OU2 groundwater (i.e., VOCs concentrations less than 1,000 µg/L), and
- Construction and operation of additional extraction and treatment systems to address OU2 groundwater near the leading edge of the OU2 plumes.

3.2.1 Extension of RE108 Phase II Treatment System

As described below, and in detail in Section 4.0, the RE-108 Phase II Extension includes the installation of an extraction well at the RW7 location (Figure 5). OU2 plume migration in the area at a depth of RE-117D1 would also be evaluated for a potential future deep groundwater extraction well near this area (Figure 4).

Based on review of new and historic off-property groundwater data performed for the FYR, the Navy assessed technically practicable opportunities (which includes the NCP concept of proportionality between technical benefit and cost-effectiveness) to further reduce potential future impacts to downgradient receptors such as public water supplies. Of particular value in this assessment is the Navy's recent delineation of the Deep Western Plume portion of the OU2 groundwater (Figure 4). Because the Deep Western Plume is relatively compact laterally and vertically, it is practicable to intercept more of it using groundwater extraction wells.

In 2018 and 2019, VOCs were measured in several wells south of and beyond the anticipated capture zone for the planned location of a RE108 Phase II Treatment System groundwater extraction well designated as RW5 (see Figure 5 for location of RW5). For example, TCE was measured at a maximum concentration of 610 µg/L in RE115D2, 1,500 feet south of RW5; TCE was measured at a maximum concentration of 217 µg/L in BPOW3-4, 2,700 feet south of RW5; and TCE was measured at a maximum concentration of 78 µg/L in RE117D1, 6,000 feet south of RW5 (see Figures 4 and 5 for well locations). In addition, the TCE concentrations have been increasing over time in this portion of the Deep Western Plume, (see Figure 6, RE115D2, BPOW3-4, and RE117D1). Based on groundwater data in the RE108 Area Hotspot that is north (upgradient) of these monitoring wells, TCE concentrations in the monitoring wells are expected to continue to increase over time, until the operation of RW5 and RW6 begin to remove contaminant mass from the aquifer and to have a positive impact on the quality of groundwater in these southern areas.

RE115D2 is located approximately 1,500 feet north of BPOW3-4. Using an estimated groundwater seepage velocity of 300 feet per year, groundwater from the area of RW115D2 could reach BPOW3-4 in approximately 4.5 years.

BPOW3-4 is an outpost monitoring well for a public water supply facility (NYAW Seamans Neck Road) that is approximately 2,000 to the south. Although this public water supply facility has treatment for VOCs, the TCE concentrations are increasing in the public water supply well and supplemental treatment will likely be required in the future in order to treat the anticipated higher concentrations of VOCs. If the plume were to be effectively intercepted at the location of the BPOW3-4, based on computer modeling, the long term mass of OU2 VOCs being captured by the NYAW Seamans Neck Road facility would decrease by approximately 33 percent, which is expected to reduce but not eliminate the need for an upgrade in treatment at the facility. The operation of a recovery well in the BPOW 3-4 area would similarly reduce potential VOC impacts to other public water supply wells in the area, including SFWD Plant 3 by a projected 16 percent and SFWD Plant 6 by a projected 31 percent.

Operation of a potential future deep extraction well at the RE117D1 (approximate location of NYSDEC well HC08, Figure 5) would not be expected to provide any benefit to public water supplies north of the Southern State Parkway but would be expected to reduce OU2 plume migration south of this area to the extent practicable.

Because these actions would be an extension of the existing primary treatment technology used under the OU2 ROD, and because the OU2 ROD provided for the potential extension of mass contaminant removal to downgradient groundwater areas which represent a significant threat to public water supply wells, this change falls within

USEPA criteria for a “significant” rather than “fundamental” change, thereby supporting the use of an ESD.

3.2.2 Interception of OU2 Plumes at their Southern Extent

Based on data evaluated since the 2003 ROD, including NYSDEC’s Feasibility Study (HDR, 2019) and AROD (NYSDEC, 2019), the Navy evaluated opportunities to further reduce potential future contamination of public water supplies and migration of contaminated groundwater, as technically practicable. After NYSDEC finalized its groundwater AROD, the Navy evaluated the OU2-related concepts and remedy components of NYSDEC’s Selected Remedy for consideration of improvements to the Navy’s existing CERCLA OU2 remedy. This evaluation included assessing the value of installing four additional groundwater recovery wells (RW8 through RW11) and treatment facilities to the south (downgradient) of the RE108 Area Hotspot and other VOC-impacted groundwater potentially associated with OU2. Open, publicly-owned space near the Southern State Parkway, approximately 4,000 feet south of BPOW3-4, was identified as an area where extraction, conveyance, and treatment systems could be installed. These wells would be used to further limit (intercept) the migration of OU2 VOCs to the extent technically practicable toward the area south of the Southern State Parkway.

Because this groundwater extraction and treatment approach along the Southern State Parkway is also an extension of the existing primary treatment technology used under the OU2 ROD, and because the OU2 ROD provided for the potential extension of mass contaminant removal to downgradient groundwater areas which represent a significant threat to public water supply wells, this change falls within USEPA criteria for a “significant” rather than “fundamental” change, thereby supporting the use of an Explanation of Significant Differences.

4.0 Description of Significant Differences

The remedial action selected in the Navy OU2 ROD is being changed as described below. An ESD is the appropriate means to document changes to a remedy when the changes do not fundamentally alter the overall cleanup approach of the CERCLA remedy. The target cleanup goals of this ESD and the method of treatment for VOCs, remain the same as those originally documented in the Navy OU2 - Groundwater ROD, namely groundwater extraction and treatment.

Air stripping and granular activated carbon treatment technologies identified in the Navy OU2 – Groundwater ROD will continue to be used to remove VOCs. As discussed below, treatment for 1,4-dioxane will require the addition of a secondary treatment technology – Advanced Oxidation Process (AOP) treatment. AOP uses ultraviolet light and/or ozone to react with hydrogen peroxide in a closed reactor to destroy many organic compounds, including TCE, TCA, and 1,4-dioxane. The remedy will still comply with the RAOs and ARARs identified and documented in the Navy OU2 ROD as well as compliance with the recently promulgated NYSDOH MCL for 1,4-dioxane. These changes maintain or improve levels of protection to human health and the environment as intended under the selected remedy documented in the 2003 Navy OU2 ROD and subsequent CERCLA FYRs.

This ESD also identifies the installation of groundwater extraction and treatment systems downgradient of the RE108 Area Hotspot to further enhance capture of VOC mass to provide additional protection of the public water supplies within and downgradient of the OU2 plumes. These systems will target groundwater with:

- A sustained[5] concentration of site-related chlorinated VOCs greater than 150 µg/L, upgradient of the Southern State Parkway, that can be practicably captured.
- A sustained[5] concentration of site-related chlorinated VOCs greater than 5 µg/L near the Southern State Parkway that can be practicably captured.

4.1 Addition of 1,4-Dioxane As a Chemical of Concern in Groundwater

4.1.1 Current OU2 ROD

The Navy OU2 ROD (NAVFAC, 2003) and PWSCP (Arcadis, 2003) have identified 17 VOCs as chemicals of concern in groundwater which were associated with the NG and

[5]Sustained is determined based on a minimum of four consecutive quarterly sampling events in a well.

NWIRP facilities in Bethpage, NY (see Section 2.2). This list was developed in 2003; and 1,4-dioxane was not on the list since it was not considered to be a chemical of concern at that time.

4.1.2 Proposed Modifications to OU2 ROD

As discussed in Section 3.1, at the time of the 2003 Navy OU2 ROD, 1,4-dioxane was not identified as a chemical of concern. Based on recent groundwater data from both on-property and off-property monitoring wells, if this groundwater was used as a source of drinking water, the associated incremental lifetime cancer risk would be in the range of 1×10^{-4} to 1×10^{-6} and the hazard index would be less than 1.

As part of this ESD, the Navy is selecting a treatment goal of 1.0 µg/L for site-related 1,4-dioxane, which is based on the recently promulgated NYSDOH MCL, and is being adopted by the Navy as an ARAR for its cleanup program at NWIRP Bethpage. This MCL has an equivalent lifetime excess cancer risk of 2×10^{-6} (based on a risk ratio calculation [USEPA, 2020]).

Using pilot-scale and full-scale test results on groundwater in the NWIRP area, the AOP technology is able to effectively reduce 1,4-dioxane to concentrations less than 0.1 µg/L and there is little equipment sizing or operating cost difference between achieving 1,4-dioxane concentrations of 0.1 µg/L and 1.0 µg/L. Although the Navy expects to routinely achieve 1,4-dioxane concentrations less than 0.1 µg/L during treatment, to account for variability in groundwater concentrations and treatment efficiency from fluctuations in chemical dosing, deterioration of lamp intensity over time, and fouling of reactor tubes, the Navy is selecting a practicable operational target of 0.5 µg/L, or one half of the MCL.

The following discussion presents the proposed specific actions planned to be used to address the presence of 1,4-dioxane in OU2 groundwater.

Northrop Grumman On-Site Containment (ONCT) System

This ESD does not address NG's obligations under the NYSDEC AROD with respect to operation of the ONCT System. NG and NYSDEC will determine the steps needed to treat 1,4-dioxane in NWIRP and NG property groundwater at the ONCT System, in light of the recently promulgated State MCL.

GM38 Groundwater Treatment Plant

The Navy is currently upgrading the GM38 Groundwater Treatment Plant (GWTP) to remove 1,4-dioxane from the extracted groundwater, prior to discharge back into the aquifer. This work is being conducted as a CERCLA non-time critical removal action,

since treatment will not be required within six months from when its need was first identified. In June 2020, the concentration of 1,4-dioxane in GM38 Recovery Wells RW1, RW3, and the combined RW1 and RW3 waters was 2.6 µg/L, 6.3 µg/L, and 3.4 µg/L, respectively. An Engineering Evaluation/Cost Analysis is being prepared and will be made available for a public comment period. The GM38 GWTP upgrade will include the addition of an AOP treatment system to the existing treatment system. Installation of the AOP treatment system is expected to be operational by early 2021.

RE108 Phase I Treatment System

The RE108 Area Hotspot Phase I Treatment System includes the addition of a recovery well (RW4 on Figure 3) to address contamination in the northern portion of the RE108 Area Hotspot. Construction is currently (Fall 2020) underway, but once construction is complete, the extracted groundwater from RW4 will be pumped to the existing GM38 GWTP for treatment. Based on groundwater sampling and analysis, the groundwater extracted at the RW4 location is anticipated to have an estimated 1,4-dioxane concentration of 12.4 µg/L. Once the GM38 GWTP upgrade has been completed to include AOP treatment, extracted groundwater from this recovery well will also receive treatment for 1,4-dioxane.

RE108 Phase II Treatment System

The objective of the RE108 Area Phase II Treatment System (Phase II Treatment System) is to extract groundwater contaminated with chlorinated VOCs at concentrations greater than 1,000 µg/L for treatment using recovery wells (RW5 and RW6 on Figure 5) located near the leading edge of the hotspot. In light of New York State recently promulgating an MCL for 1,4-dioxane, the Phase II Treatment System is currently being designed to address 1,4-dioxane as well as chlorinated VOC contamination, by including AOP in the planned treatment system. Before treatment at the RE108 Phase II Treatment System (Figure 5), the 1,4-dioxane concentration in the combined flow from RW5 and RW6 recovery wells is anticipated to be 5 µg/L. Even though the AOP will add to the overall capital and operational cost of the treatment system, the use of AOP will decrease a portion of the granular activated carbon cost associated with treating the VOCs.

RE108 Phase II Treatment System Extension

The RE108 Phase II Treatment System Extension (Phase II Extension) includes the addition of two recovery wells (RW7A and RW7B collectively shown as RW7 on Figure 5) to address chlorinated VOC contamination in excess of 150 µg/L, south of the planned RE108 Phase II Treatment System. Groundwater extracted by RW7 will be piped to the Phase II Treatment System. The 1,4-dioxane concentration in RW7, prior to treatment, is expected to be 5 µg/L. The Phase II Treatment System is being

designed to address 1,4-dioxane to comply with the recently promulgated NYSDOH MCL, as well as to treat chlorinated VOC contamination, by including AOP in the planned treatment system.

Phase III Southern Plume Intercept Treatment System

The Phase III Southern Plume Intercept Treatment System (Phase III System) would add up to four recovery wells and one or two treatment systems to capture, or intercept, as practicable, the OU2 plumes to maintain their approximate current footprint. The 1,4-dioxane concentration in the Phase III wells is anticipated to be 0.5 to 2 µg/L. There is insufficient data at this time to refine this estimate but the actual 1,4-dioxane concentrations in this groundwater will be determined during pre-design investigations. The Phase III Treatment System would likely be designed to address 1,4-dioxane as well as chlorinated VOC contamination, by including AOP in the planned treatment system.

Public Water Supplies

As part of this ESD, the following actions will be taken to address the presence of 1,4-dioxane in public supply wells:

- For those public water supply wells where the concentration of site-related 1,4-dioxane currently exceeds, or is projected to exceed in the next five years 1.0 µg/L, which is equivalent to 2 x 10^{-6} incremental lifetime, and the Navy determines is associated with the NWIRP Bethpage and OU2 plumes, the Navy will take action, in cooperation with the respective Water District, to reduce the 1,4-dioxane concentration to less than 1.0 µg/L. Although the Navy expects the water districts to routinely achieve 1,4-dioxane concentrations less than 0.1 µg/L through treatment, to account for variability in groundwater concentrations and treatment efficiency from fluctuations in chemical dosing, deterioration of lamp intensity overtime, and fouling of reactor tubes, the Navy is selecting a target operational goal of 0.5 µg/L, which is one half of the MCL.

Summary

The addition of 1,4-dioxane to the PWSCP ensures continued compliance with the RAOs from the Navy OU2 ROD, such that it “eliminates, 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 implementation of off-site groundwater remediation” (NAVFAC, 2003).

4.2 Extension of RE108 Phase II Treatment System

4.2.1 Current OU2 ROD

One of the Navy's elements of the selected remedy for the Off-Property Groundwater Remedial Program identified in the Navy OU2 ROD is as follows:

> "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."

The RE108 Area Hotspot (located approximately 1,500 feet southeast of GM-75D2) was identified as a significant threat to downgradient public water supply wells because sustained VOC concentrations measured in groundwater samples in this area exceeded 1,000 µg/L; similar to the GM38 Area Hotspot. A VOC concentration of greater than 1,000 µg/L was used to define the area(s) of groundwater contamination where based on location, groundwater migration, and quantity of contaminant mass, it was technically practicable to implement off-property groundwater remediation systems in order to effectively reduce the magnitude and duration of potential impacts to public water suppliers. The RE108 Area Hotspot groundwater will be treated in accordance with the existing OU2 ROD by using five recovery wells (RW4, RW5A and RW5B [collectively referred to as RW5], RW6A, and RW6B [collectively referred to RW6]) to intercept this groundwater and treating it with air stripping and granular activated carbon. In accordance with this ESD, AOP treatment will be used to remove 1,4-dioxane from this groundwater prior to discharge.

At present, the Navy has acquired property for the construction of the Phase II Treatment System building (Figure 5) and is working to obtain access for use of Nassau County recharge basins and Town of Oyster Bay property for installation of recovery wells and/or for treated water discharge. The Navy is also in the process of obtaining access to property owned by the Town of Hempstead, Town of Oyster Bay, NYS Department of Transportation and Nassau County for pipeline installation. Scheduled startup of the Phase II Treatment System is late 2022.

4.2.2 Modifications to OU2 ROD

These additions are significant, but non-fundamental changes to the existing Navy OU2 ROD due to consistency of primary technology and RAOs. In order to further enhance the capture of higher VOC concentrations in the RE108 Hotspot Area (i.e., VOC concentrations of greater than 150 µg/L), two additional recovery wells (RW7A and 7B, collectively referred to as RW7) are planned to be installed in the area of well BPOW3-4, as an extension of the Phase II RE-108 Treatment System. Extracted groundwater from the RW7 recovery wells will be piped to and treated at the Phase II Treatment System along with groundwater extracted from recovery wells RW5 and RW6. The pipeline connecting the RW7 recovery wells to the Phase II Treatment System will need to be installed.

A pre-design investigation (PDI) in the vicinity of the proposed RW7 locations will be needed to collect data for the construction of recovery wells. A VPB will be drilled and will provide in-situ data through visual logging of lithology by the site geologist, down-hole geophysical logging, collection of split spoon samples for grain size analysis, and VOC data via collection and analysis of groundwater grab samples. This data will be used to confirm RW7 screen depth intervals and screen slot size. In addition, this data will be incorporated into the Navy's groundwater model to improve understanding of groundwater flow and plume migration.

The implementation of the existing OU2 ROD focused on treating hotspot areas with VOC concentrations exceeding 1,000 µg/L. The ESD modification specifies the application of existing primary treatment technology, groundwater extraction and treatment (to which AOP treatment for 1,4-dioxane is added as previously discussed), to an area south of the proposed Phase II Treatment System, which has VOC concentrations exceeding 150 µg/L. This modification is being made to improve capture of the OU2 groundwater plume and because of the close proximity of public water supply wells to the RE108 Area Hotspot.

This modification maintains compliance with the RAOs established in the Navy OU2 ROD, specifically:

- 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 implementation of off-site groundwater remediation.

Because this is an extension of the use of the existing primary treatment technology used under the OU2 ROD, and because the OU2 ROD provided for the potential extension of mass contaminant removal to downgradient groundwater areas which

represent a significant threat to public water supply wells, this change falls within USEPA criteria for a “significant” rather than “fundamental” change, thereby supporting the use of an Explanation of Significant Differences.

During operation of the remedy, the Navy will conduct regular evaluations of the RE108 Phase I and Phase II Treatment System components to ensure the OU2 plumes are being intercepted and remediated as anticipated by this ESD. These evaluations will be summarized in future FYR reports. Operation of the Phase I system is intended to shorten the time required for operation of the Phase II Treatment System. Similarly, the Phase II and Phase II Extension Systems are intended to shorten the time required for operation of extraction wells at the leading edge of the OU2 plumes and to reduce to the extent practicable, impacts to downgradient public water supplies and the aquifer south of Southern State Parkway.

To support these evaluations, hydraulic potentiometric surfaces (i.e., monitoring well groundwater elevations) and chemical results from sampling of monitoring wells will be measured throughout the RE108 Area Hotspot and areas side gradient and downgradient of the hotspot on an annual basis and used in conjunction with groundwater modeling to confirm effectiveness of these actions, identify any steps that could be conducted to optimize operations, and determine whether any additional actions would be needed.

Three-dimensional capture zone evaluations are important to ensure that contaminated portions of the aquifer are being effectively intercepted. Dynamic hydraulic testing is used to evaluate connection between pumping wells and the chemicals that are targeted within the OU2 VOC plumes. VOC concentration trend analysis is used to verify that plumes are overall decreasing in VOC concentration as anticipated. Generally, decreasing concentrations are used to provide evidence of aquifer cleanup. In some cases, short-term increasing trends may be observed and be an indicator that capture of distal portions of the plumes is occurring. During these evaluations, additional monitoring wells may be needed to assess specific portions of the plumes. System optimization would typically consist of maximizing OU2 VOC mass removal (e.g., pumping the highest concentration wells at higher rates), to ensure capture of the Deep Western Plume, including those parts of the plumes that may be distant from the recovery wells.

As part of these evaluations, in the event that sufficient capture of the OU2 plumes does not occur, the Navy may modify the pumping rates of individual extraction wells and consider the use of additional extraction wells in the area (e.g., a NYSDEC EX1, EX2, EX3, EX4, and EX5 or other similar Navy wells in the area (e.g., short- or long-term use of RE137, Figure 5).

In addition, and as part of this ESD, the Navy will be conducting short term operation of the groundwater extraction and treatment in the area of Navy well RE137 (e.g., 1.5 to 2 years). RE137 was constructed in 2017 as a pumping test well and was originally considered as a potential location for the RW5 well. While this location produced high volumes of groundwater with TCE concentrations greater than 1,000 µg/L, it was considered too far north at that time to effectively capture the leading edge of the RE108 Area Hotspot. As indicated on Figure 5, the RE137 recovery well is in the vicinity of the NYSDEC EX2 well and would provide a similar function to that well.

The RE137 well testing will be conducted to further evaluate capture zone, monitoring well VOC trend analysis, and support groundwater modeling, and will also provide significant mass removal of TCE and other VOCs, during its operation, with initial removal estimates of 100 to 200 pounds per month. Bag filtration for particulate removal, AOP for destruction of TCE, most other VOCS and 1,4-dioxane, and granular activated carbon for removal of residual VOCs and decomposition of residual hydrogen peroxide, will be used to treat the extracted groundwater prior to discharge in the nearby basin.

4.3 Interception of OU2 Plumes at their Southern Extent

4.3.1 Current OU2 ROD

The Navy OU2 ROD identifies the need for the groundwater extraction and treatment system at GM38 GWTP and the potential need for similar systems in the vicinity of well GM-75D2 or any other off-NWIRP area where additional investigation leads to a determination that groundwater contamination represents a significant threat to downgradient public water supply wells. The Navy originally focused its implementation of this ROD requirement on hot spot areas (i.e., where VOC groundwater concentrations were above 1,000 µg/L), such as the GM38 Hotspot Area and RE108 Hotspot Area; but recognizes that the broad ROD language also serves to support additional investigation and potential installation of additional mass extraction systems in plume areas which do not meet the “hot spot” definition, but where the contamination may nevertheless present a significant threat to public water supply wells.

Further, the OU2 ROD also contains the following RAO for the protection of public water supplies:

> “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 implementation of off-site groundwater remediation.”

This RAO also supports the following specified significant, but non-fundamental changes to the 2003 ROD.

4.3.2 Proposed Modifications to OU2 ROD

In order to intercept the OU2 plumes at their southern extent, the Navy plans to install up to four additional groundwater recovery wells (RW8 through RW11 on Figure 5) and one to two additional treatment facilities to the south (downgradient) of the RE108 Area Hotspot, near the near Southern State Parkway, approximately 4,000 feet south of RW7 (Figure 5). This system would be considered the Phase III Southern Plume Intercept Treatment System and its purpose is to intercept, as technically practicable, the OU2 plumes at the southern extent of its approximate current footprint. The following are components that will consist of the Phase III Southern Plume Intercept Treatment System:

- Conduct a PDI in this area of the Southern State Parkway to identify the lithology and determine the locations, depths and sizing of recovery wells to intercept the OU2-impacted groundwater and prevent further, uncontrolled migration to the south. The drilling of VPBs as part of the PDI will be necessary to collect this information.
- Incorporate the results of the PDI into the Navy's conceptual site model and groundwater flow model to refine the basis of the plume intercept design. In addition, use the Navy's groundwater flow model to assist in design of the recovery wells, such as depths for screen intervals and pumping rates. The recovery wells would be used to intercept the deep western portions of the OU2 plumes south of RW7, as practicable.
- Install and operate RW8 and RW9 recovery wells and the associated treatment and discharge system. The final number of recovery wells will be determined based on the PDI and the results of Navy's groundwater modeling analysis. These wells would be used to intercept the deep western OU2 plume contamination. Aquifer testing will be used to evaluate RW8 and RW9 capture effectiveness and update the Navy's groundwater flow model.
- Install and operate RW10 and RW11 recovery wells and the associated treatment and discharge system. These wells would be used to intercept the shallow OU2 plumes (located east of the deeper western portion of the plume), near the Southern State Parkway, as practicable. The planned locations of RW10 and RW11 are in an area that may also intercept the OU3 plume, or a commingling of OU2 and OU3 groundwater, as well as contamination from other potential non-NWIRP or non-NG sources. During design and operation, steps may be considered to minimize or eliminate intercepting this other non-OU2 contamination.

Current preliminary groundwater flow modeling indicates that four new recovery wells (RW8, RW9, RW10, and RW11 on Figure 5) will intercept and control the migration of the deep western and shallow eastern portions of the OU2 plumes, as practicable. The Phase III PDI will be used to determine if recovery well pairs similar to Phase II RWs, are necessary to maximize plume capture.

The NYSDEC AROD identifies actions with a goal of obtaining full hydraulic containment of plumes identified by NYSDEC. The Navy provided comments on the associated Proposed Remedial Action Plan and expressed concerns about possible uncertainty in the overall ability of the NYSDEC Selected Remedy to achieve all of the stated RAOs due to the complex hydrogeology in the area; and due to the Selected Remedy's potential impacts to public water supplies in the area resulting from distortion of the public water supply well capture zones. Nevertheless, the Navy is seeking to implement the Phase III System recognizing that there are limitations to the effectiveness of this approach. The Navy does expect to perform PDI testing, further groundwater flow modeling, and long-term monitoring to optimize plume interception and to install the recovery wells to control the migration of the OU2 plumes. In addition, portions of the NYSDEC Selected Remedy address groundwater contamination not associated with the NWIRP Bethpage and are not addressed by this ESD. NYSDEC has indicated that the state will be pursuing separate responsible parties for groundwater contamination that is not associated with the former NWIRP and NG facilities.

Preliminary Phase III System recovery well locations are provided in Figure 5. Also shown on this figure are the extraction wells necessary for implementation of the Selected Remedy as presented in the NYSDEC AROD (NYSDEC, 2019). Based on close proximity, the Navy recovery wells identified in this ESD would reduce or eliminate the need for some of the NYSDEC proposed extraction wells in the area, including HC07, HC09, HC10, and HC11 (Figure 5).

The undeveloped greenspace along the Southern State Parkway represents open public space where it may be practicable to install extraction, conveyance, and treatment systems for the Phase III Southern Plume Intercept Treatment System. The Navy will use groundwater flow modeling combined with information from VPBs drilled during the PDI to determine the best locations for additional recovery wells that will be positioned to intercept the OU2 plumes, as practicable.

While the proposed interception of the OU2 plumes at their southern border is a modification to the Navy OU2 ROD, the addition of groundwater extraction and treatment systems near the southern extent of the OU2 plumes uses the same primary

treatment technologies and complies with the existing RAOs established for the Navy OU2 ROD.

Similar to the Phase II and Phase II Extension System discussion above, during operation of the remedy, the Navy will conduct regular evaluations of the Phase III System components to ensure the OU2 plumes are being intercepted and remediated as anticipated by this ESD. These evaluations will be summarized in the FYR reports. Operation of the Phase II and Phase II Extension System is intended to shorten the time required for operation of the Phase III System. Similarly, the Phase III System is intended to reduce potential impacts to downgradient public water supplies and the aquifer south of Southern State Parkway and accelerate aquifer restoration.

To support these evaluations, hydraulic potentiometric surfaces and chemical results will be measured throughout the Phase III System area and areas side gradient and downgradient of the Phase III System area on an annual basis and be used in conjunction with groundwater modeling to confirm effectiveness of these actions, identify any steps that could be conducted to optimize operations, and determine whether any additional actions would be needed.

It is anticipated that one area of particular future interest is the area of south of the Phase II Extension (in the approximate location of NYSDEC HC08, Figure 5). As currently planned, RW8 and RW9 would be used to intercept groundwater from this area. The Navy will use the Phase II Extension and Phase III performance evaluations to determine if a future deep extraction well is needed in the vicinity of HC08.

Three-dimensional capture zone evaluations are important to ensure that contaminated portions of the aquifer are being effectively intercepted. Dynamic hydraulic testing is used to evaluate connection between pumping wells and the VOC plumes. VOC concentration trend analysis is used to show that the plume VOC concentrations are overall decreasing as anticipated, with generally decreasing concentrations used to provide evidence of aquifer cleanup. In some cases, increasing trends may be observed and be an indicator that capture of distal portions of the plume is occurring. During these evaluations, additional monitoring wells may be needed to assess specific portions of the plumes. System optimization will typically consist of minimizing the removal of clean water, although this evaluation must also consider capture of the OU2 plumes, even portions of the plume that may be remote from the recovery wells.

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5.0 Support Agency Comments

NYSDEC provided initial comments on a draft version of this ESD on January 6, 2021. Specific comments are addressed in this report. NYSDEC stated “The actions outlined in the ESD are consistent with the objectives of the Department’s AROD and represent remediation of a significant portion of Navy’s responsibility for the Navy Grumman plume”. NYSDEC may provide additional comment on this ESD during the public comment period.

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6.0 Statutory Determination Affirmation

The remedy as changed pursuant to this ESD complies with CERCLA §121 and the NCP, remains protective of human health and the environment, and complies with ARARs identified in the ROD.

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7.0 Public Participation

This ESD is a part of the administrative record for the site (NCP, 40 CFR Section 300.825 (a)(2)). An information repository is located at the Bethpage Public Library, where the ESD was made available for public review:

Bethpage Public Library
47 Powell Avenue
Bethpage, NY 11714

Hours: Monday – Friday: 9:00 A.M. to 9:00 P.M.
Saturday: 9:00 A.M. to 5:00 P.M.
Sunday: Noon to 4:00 P.M (Closed July to Labor Day).

The ESD will also be made available online at the following address:

https://go.usa.gov/DyXF

The preparation and public notice of this ESD is pursuant to Section 117(c) of the CERCLA of 1980, as amended by the Superfund Amendment and Reauthorization Act of 1986, and pursuant to 40 CFR Section 300.435(c)(2)(i). The Navy has published a notice describing the ESD and the availability of the administrative record file in a local newspaper and provided information to community Restoration Advisory Board (RAB) members. A 30-day public comment period is being held. The public notification of the availability of the ESD for review, will be presented as an attachment in the final ESD.

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8.0 Authorizing Signature

_____

CAPT Gordon E. Meek III
Commanding Officer, NAVFAC MIDLANT

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9.0 References

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FIGURES

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GENERAL LOCATION MAP
NWIRP BETHPAGE, NEW YORK

NAVFAC Naval Facilities Engineering Systems Command

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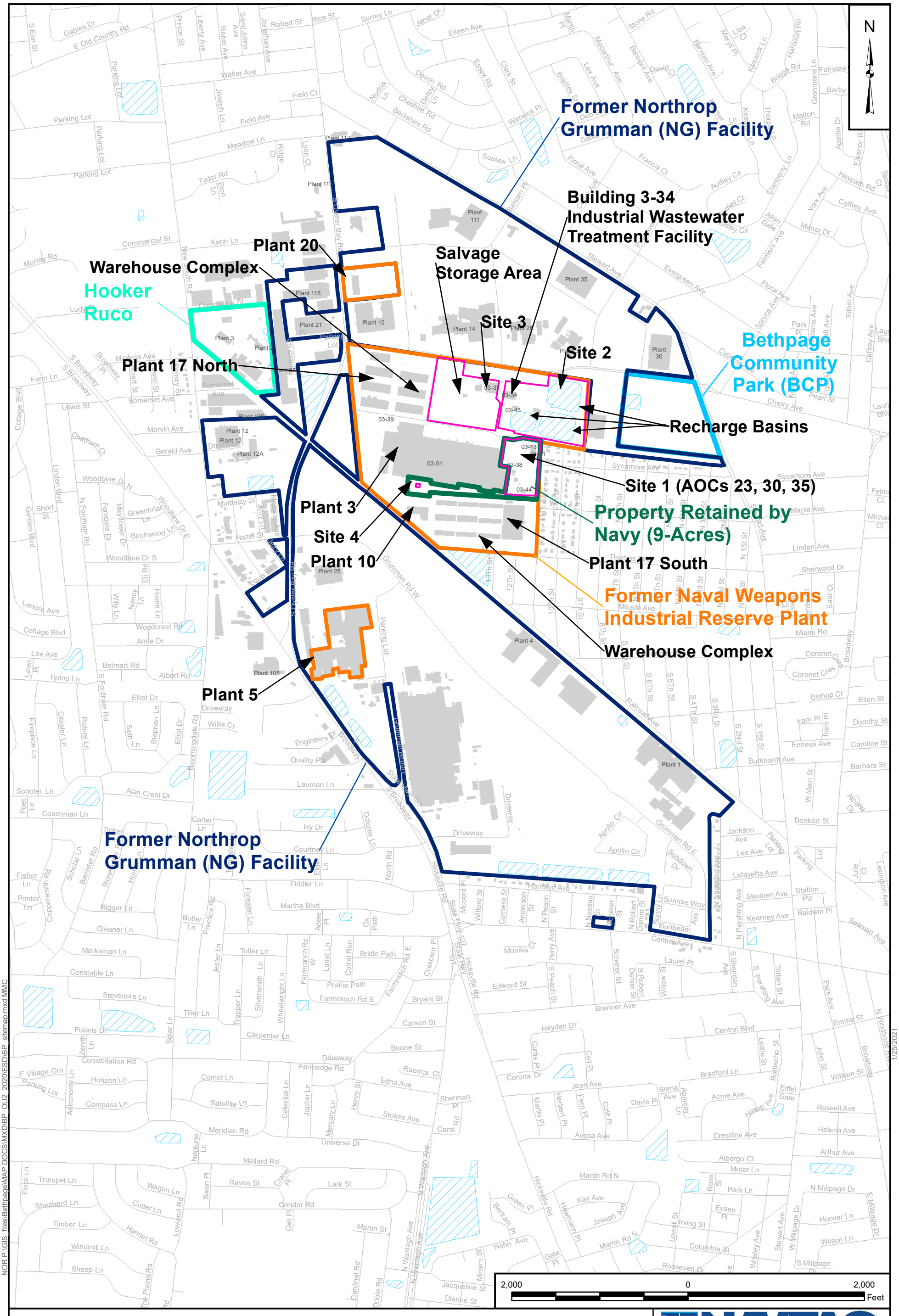

SITE MAP

NWIRP BETHPAGE, NEW YORK

NAVFAC Naval Facilities Engineering Systems Command

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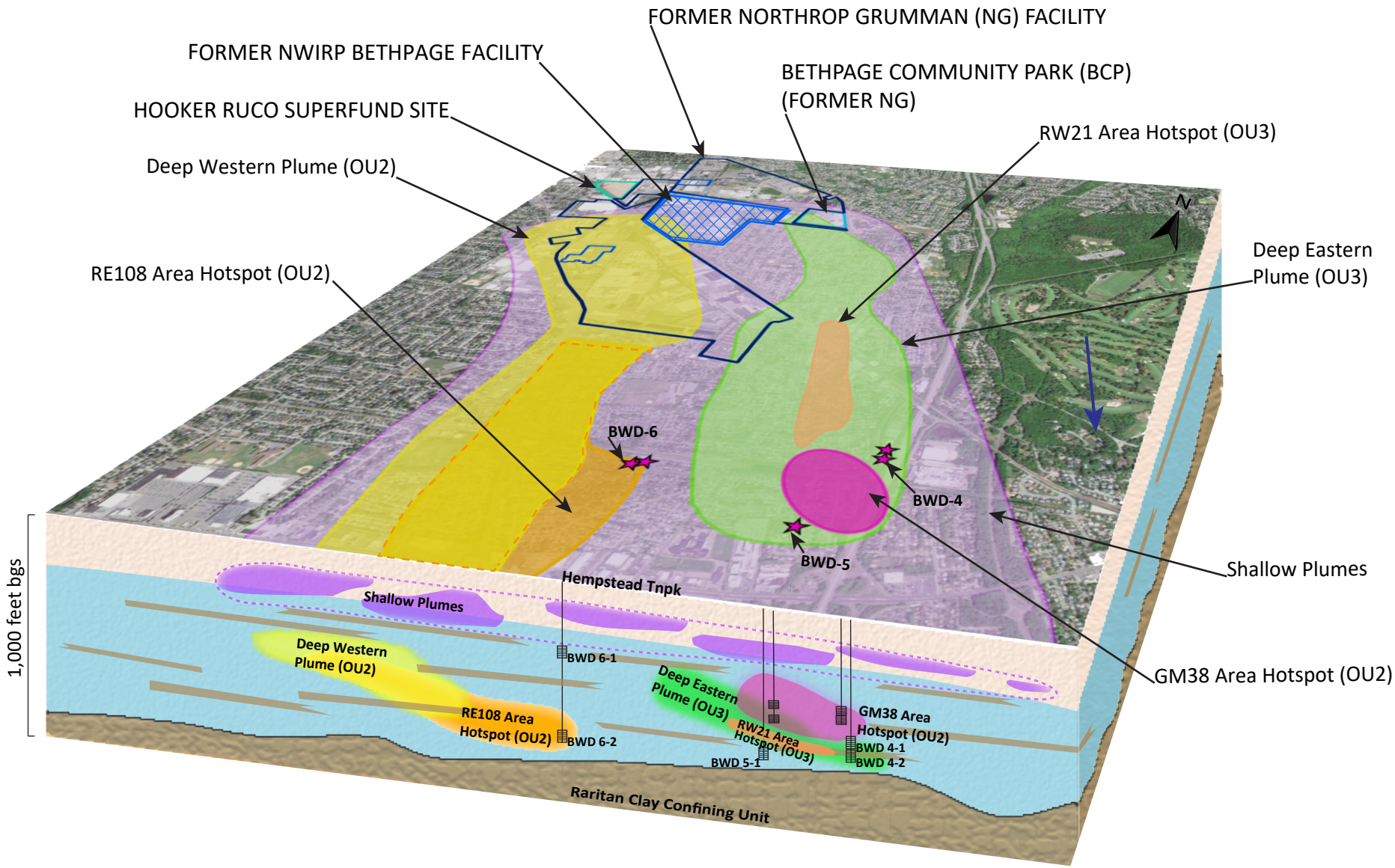

CONCEPTUAL SITE MODEL
GROUNDWATER
NWIRP BETHPAGE, NEW YORK

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Map does not depict HR VOC contamination to OU2 Plume

HR

NG

NWIRP

BCP

RW-1

RW-2

RW-3

RW-4

DEP (OU3)

RE21 Area Hotspot (OU3)

Well 3R

NG

Well 1

Well 17

Well 18

Well 19

RW-21

RW-20

GM38 Area Hotspot (OU2)

RE108 Area Hotspot (OU2)

RW4

GM38 Groundwater Treatment Plant

RE108 Phase II Treatment Plant (Planned)

Deep Western Plume (OU2)

Shallow (OU3) Plume

South Oyster Bay ~ 3.6 Miles

Shallow (OU2) Plume

HWD-9-3
HWD-9-1
HWD-9-2
HWD-8-3
HWD-8-1
HWD-3-2
BWD-8
BWD-7
BWD-1
VPB176
FWD-11004
FWD-6644
BWD-4-1
BWD-4-2
RE134D4
BWD-6-1
BWD-6-2
BWD-5-1
LWD-5A
RE131D3
RE137
SFWD-5-1
SFWD-5-2
LWD-7A
LWD-8A
SFWD-1-4
SFWD-1-2
SFWD-1-3
RE115D2
BPOW 4-2R
LWD-13
BPOW 3-4
SFWD-3-1
LWD-14
NYAW-3S
NYAW-4S
RE117D1
SFWD-6-1
SFWD-6-2
SFWD-4-1
MWD-4
MWD-5

Legend

- Recovery Well
- Existing Navy Recovery Well
- Vertical Profile Boring
- Monitoring Well
- Public Water Supply Well
- Groundwater Flow Direction
- GM38 Groundwater Treatment Plant
- RE108 Phase II Treatment Plant

2019 TCE Plume (All Depths)

- 5 to100 µg/L TCE
- >1,000 µg/L TCE
- >100 to 1,000 µg/L TCE

Notes:

BCP- Bethpage Community Park (OU3)
bgs- below ground surface
BWD- Bethpage Water District
DEP- Deep Eastern Plume (OU3)
DWP- Deep Western Plume (OU2)
HR- Hooker Ruco Superfund Site
HWD- Hempstead Water District
LWD- Levittown Water District
MWD-Massapequa Water District
NG- Former Northrop Grumman Facility
NWIRP- Former Naval Weapons Industrial Reserve Plant
NYAW- New York American Water
OU- Operable Unit
PWD- Plainview Water District
SFWD- South Farmingdale Water District
TCE- Trichloroethene
µg/L- microgram per liter

2,000 0 2,000 Feet

OU2 & OU3 PLUME- LAYOUT IN GROUNDWATER NWIRP BETHPAGE, NEW YORK

Naval Facilities Engineering Systems Command

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Map does not depict HR VOC contamination contribution to OU2 Plume

N

HR

NG

NWIRP

BCP

RW-1

RW-2

RW-3

RW-4

Deep Eastern Plume (OU3)

RE21 Area Hotspot (OU3)

Former GM38 Area Hotspot (OU2)

RE108 Area Hotspot (OU2)

GM38 Groundwater Treatment Plant

RE108 Phase II Treatment Plant (Planned)

Deep Western Plume (OU2)

Shallow Plume (OU3)

Proposed Phase III Treatment Plants

Shallow Plume (OU2)

South Oyster Bay ~ 3.6 Miles

HWD-9-3
HWD-9-1
HWD-9-2
HWD-8-3
HWD-8-1
HWD-3-2
LWD-5A
LWD-7A
LWD-8A
LWD-13
LWD-14
BWD-8
BWD-7
BWD-1
BWD-4-1
BWD-4-2
BWD-6-1
BWD-6-2
BWD-5-1
FWD-11004
FWD-6644
SFWD-5-1
SFWD-5-2
SFWD-1-4
SFWD-1-2
SFWD-1-3
SFWD-3-1
SFWD-6-1
SFWD-6-2
SFWD-4-1
NYAW-3S
NYAW-4S
MWD-4
MWD-5

Well 3R
Well 17
Well 18
Well 19

EX01
EX02
EX03
EX04
EX05
EX06
EX07
EX08

RE137

RW4
RW5
RW6
RW7
RW8
RW9
RW10
RW11
RW-20
RW-21

HC02
HC03
HC04
HC05
HC06
HC07
HC08
HC09
HC10
HC11
HC12
HC13
HC14
HC15
HC16
HC17

Legend

- Proposed Recovery Well
- Existing Navy Recovery Well
- Existing NG Recovery Well
- NYSDEC Proposed EX and HC Wells
- Public Water Supply Well
- Groundwater Flow Direction

2019 TCE Plume (All Depths)

- 5 to100 µg/L TCE
- >100 to 1,000 µg/L TCE
- >1,000 µg/L TCE
- GM38 Groundwater Treatment Plant
- RE108 Phase II Treatment Plant and Phase III Plume Interception Plant
- * Scenario 5- Navy/NYSDEC Plume Capture

Notes:

* See FYR for explanation of Scenario 5
BCP- Bethpage Community Park (OU3)
bgs- below ground surface
BWD- Bethpage Water District
EX- Mass Flux Extraction Well
HC- Hydraulic Containment Extraction Well
HR- Hooker Ruco Superfund Site
HWD- Hempstead Water District
LWD- Levittown Water District
MWD-Massapequa Water District
NG- Former Northrop Grumman Facility
NWIRP- Former Naval Weapons Industrial Reserve Plant
NYAW- New York American Water
OU- Operable Unit
SFWD- South Farmingdale Water District
TCE- Trichloroethene
µg/L- microgram per liter

2,000 0 2,000 Feet

PLANNED AND POTENTIAL OU2 & OU3 GROUNDWATER INFRASTRUCTURE NWIRP BETHPAGE, NEW YORK

NAVFAC Naval Facilities Engineering Systems Command

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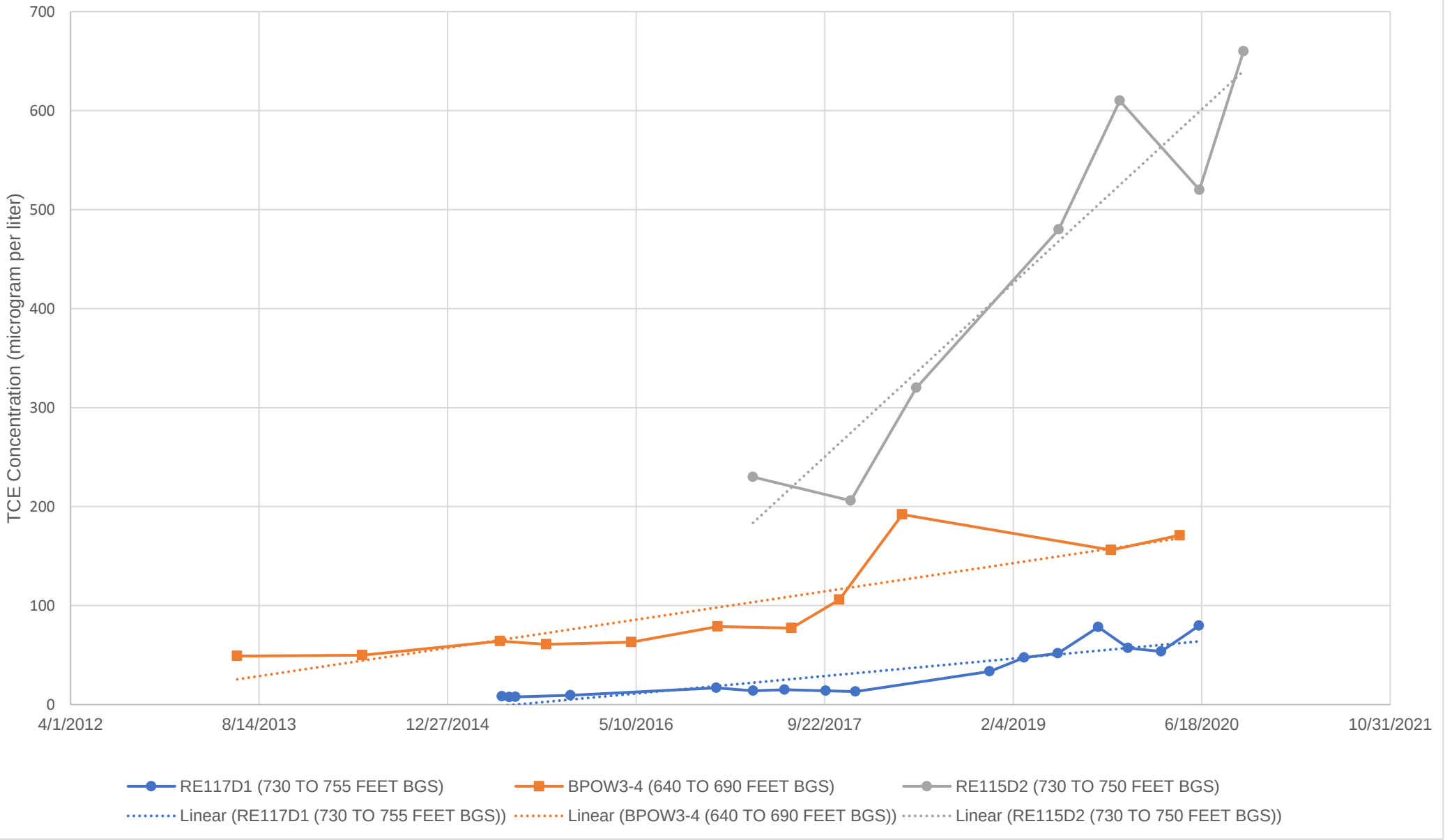
FIGURE 6
TREND ANALYSIS OF TCE IN THE SOUTHERN PORTION OF THE DEEP WESTERN PLUME
(DEPTH OF 500 TO 700 FEET AND GREATER THAN 700 FEET BELOW GROUND SURFACE)



Well Locations are shown on Figure 4

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ATTACHMENT

PUBLIC NOTICE

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