NORTHROP GRUMMAN

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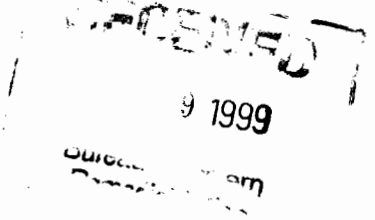

ETC99L-154
August 16, 1999

Steve Kaminski, P.E., Supervisor
Corrective Action Section
Bureau of Radiation and Hazardous Site Management
Division of Solid and Hazardous Materials
New York State Department of
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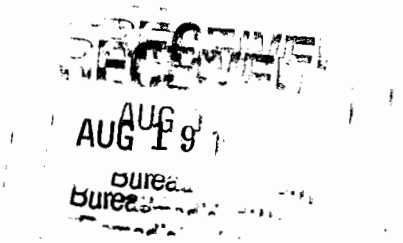

Re: Northrop Grumman Corporation
Remediation Plan - Plant 12
Bethpage, New York

Dear Mr. Karninski:

As a follow-up to our meeting on April 14, 1999 which primarily focused on the development of a remediation plan to address the Plant 5 site located at our Bethpage facility, Northrop Grumman Corporation has enclosed for your review a remediation plan for the Plant 12 site. As with the case for the Plant 5 plan, the remediation plan for Plant 12 presents a summary of those areas of concern recommended for remediation and recommends action levels consistent with site specific considerations which are similar to those previously proposed and approved by the Department for Plant 5.

As you may recall, Northrop Grumman Corporation (NGC) has conducted Phase I and Phase II Site Assessments for the Plant 12 site in which potential areas of concern (AOCs) where identified by screening the sampling data against TAGM 4046, as well as alternative numerical values currently being used by the NYSDEC in specific situations.

The attached site-specific remediation plan evaluates the data in greater detail by giving consideration to other site-specific environmental and physical factors at the site which ultimately determine the need for and degree of clean up. This site-specific plan addresses remediation with respect to considerations such as the future industrial land use of the site, the depth of impacted soil, depth to groundwater, groundwater quality and immobility of constituents of concern.

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In order to facilitate remediation and land transfer, your prompt attention and response to this remedial plan would be greatly appreciated. Towards that end, I would like to request that a meeting among all stakeholders (similar to that which occurred for Plant 5) be scheduled in the near future to facilitate discussion regarding this important matter. I will contact you within the next week to arrange for such a meeting at your convenience.

If you have any questions and/or comments, please do not hesitate to contact me at (516) 575-2333, or John Cofman of this office at (516) 575-4680.

Very truly yours,

NORTHROP GRUMMAN CORPORATION

Larry L. Leskovjan, Manager
Environmental Technology & Compliance
M/S D08-001

Attachment

cc: w/attachment
S. Farkas
B. Gilday (NYSDOH)
J. Kaminski
S. McCormick (NYSDEC)
H. Wilkie (NYSDEC)

NORTHROP GRUMMAN CORPORATION

REMEDIATION PLAN
PLANT 12
BETHPAGE, NEW YORK

Prepared For:

NORTHROP GRUMMAN CORPORATION
SOUTH OYSTER BAY ROAD
BETHPAGE, NEW YORK

Prepared By:

DVIRKA AND BARTILUCCI CONSULTING ENGINEERS
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AUGUST 1999

INTRODUCTION

The Northrop Grumman Corporation (NGC) is planning to deactivate and sell the Plant 12 facility as part of its overall Bethpage consolidation program. As previously implemented for other properties of the Bethpage campus, NGC intends to undertake environmental cleanup activities (detailed in this Remediation Plan) pursuant to a New York State Department of Environmental Conservation (NYSDEC) Resource Conservation and Recovery Act (RCRA) Corrective Action Program. In addition, it should be noted that several areas of concern (AOCs) previously investigated at the site were remediated and closed pursuant to the United States Environmental Protection Agency (USEPA) Underground Injection Control (UIC) Program. One remaining AOC recommended for closure pursuant to the UIC Program will be addressed in a separate document.

BACKGROUND

The Plant 12 site is located on the east side of New South Road and north of Mulberry Street in Hicksville, New York. A site location map is presented on Figure 1. The site is approximately 11.4 acres. The land and buildings comprising the site are currently owned by NGC, formerly known as Grumman Aerospace Corporation (GAC) or Grumman.

Plant 12 site was initially occupied by the fiberglass division of Pittsburgh Plate Glass (Glass Manufacturing Company, Inc.) who leased the site from the mid-1940's through 1954, and owned the site from 1954 through 1959. Pittsburgh Plate Glass was involved in the manufacture of fiberglass products. NGC acquired the site in 1959 and historically utilized it as a chemical, physical, and mechanical test facility to support NGC aerospace manufacturing activities in Bethpage. Based upon a review of available information, the original portion of the Plant 12 complex was constructed in about 1944.

PREVIOUS INVESTIGATIONS

It is important to note that several previous investigations have been conducted at the Plant 12 site. The first study entitled "Phase I/Phase II Environmental Baseline Study", prepared by Dvirka and Bartilucci Consulting Engineers (D&B), dated March 1996 was conducted at the Plant 12 site between September 1994 and January 1995. The Environmental Baseline Study report was initially prepared as part of an effort to satisfy the requirements for delisting the Plant 12 property from the New York State Registry of Inactive Hazardous Waste Disposal Sites. However, based upon the findings of the analytical sampling program, it was determined that further investigation activities were warranted prior to continuing with the delisting effort. As a result, the objective of the Baseline Study was limited to documenting the Phase I and Phase II investigation activities to establish baseline environmental conditions with regard to soil and groundwater. Subsequent to the Phase I/Phase II Environmental Baseline Study, several parcels of the NGC Bethpage facility, including the Plant 12 site, were delisted by the New York State Department of Environmental Conservation (NYSDEC) on October 1, 1996. However, the findings of the Phase I/Phase II Environmental Baseline Study, indicated that several potential AOCs warranted further investigation.

Subsequent to the Phase I/Phase II Environmental Baseline Study, an ASTM Phase I Site Assessment was conducted at the Plant 12 site between April 1996 and February 1997 and was finalized March 1997. The ASTM Phase I Site Assessment, prepared by D&B, was conducted to document recent environmental conditions in support of future real estate transactions. The findings of the ASTM Phase I Site Assessment also identified several areas of concern (AOCs) that warranted further investigation.

A Supplemental Phase II Site Assessment was conducted in order to further investigate the findings of the Phase I/Phase II Environmental Baseline Study, and the ASTM Phase I Site Assessment. The Supplemental Phase II Site Assessment, conducted by D&B, consisted of two field programs. Field program No. 1, which was initially conducted during April and May 1996 with subsequent activities completed in July 1996, addressed the recommendations of the

Environmental Baseline Study. Similarly, field program No. 2, which was conducted during April and May of 1997, was based on the findings of the ASTM Phase I Site Assessment.

The findings of the Supplemental Phase II Site Assessment indicated that an additional investigation was needed to determine the horizontal and vertical extent of impacted soil and to further characterize on-site groundwater quality. Therefore, a Delineation Phase II Site Assessment was conducted by D&B during August 1998 and January 1999 as documented by the report entitled "Delineation Phase II Site Assessment - Plant 12, dated February 1999.

As previously discussed, a number of AOCs found to be regulated by the USEPA UIC Program have already been remediated and closed. The Plant 12 UIC remediation and closure activities are documented in the report entitled "Dry Well and Leaching Pool Closure Report - Plant 12", dated May 1998. It should be noted that subsequent to the completion of the UIC field program, the Nassau County Department of Health (NCDH) requested that an additional interior floor drain (AOC 25) in Plant 12A be closed in accordance with the UIC Program. Consequently, NGC plans to address the proper closure of this floor drain at a later date.

The Plant 12 Phase II Site Assessment documents referenced above screened the analytical data against the comparison values summarized in Table 1 to identify potential AOCs. This Remediation Plan examines the data in more detail and considers various exposure pathway related factors which will ultimately determine the need for and degree of cleanup.

CLEANUP OBJECTIVES

The Plant 12 site has been zoned for industrial use since the land was developed in approximately 1944. According to NGC real estate representatives, the company is pursuing potential buyers who plan to maintain an industrial use at the Plant 12 site. Therefore, NGC's goal is to restore the property to support and continue the existing industrial land use.

The ultimate objective of remediating impacted soil at an industrial site is to protect human health and the environment. In an industrial setting on Long Island, New York, this

objective can be simplified to protecting groundwater quality, preventing dermal exposure to surface soil, and protecting indoor air quality. The development of numerical criteria to define cleanup requirements is a complex and site-specific process. In the State of New York, these numerical criteria have taken different forms. The NYSDEC developed Technical and Administrative Guidance Memorandum 4046 (TAGM 4046) as a basis and procedure to determine numerical soil cleanup criteria. The basis of these criteria are to support the protection of groundwater quality and are essentially human health based levels for systematic toxicants. The assumed exposure scenario for the systematic toxicant evaluation in TAGM 4046 is a 1 to 6 year old child who ingests 0.2 grams/day of the impacted soil for a period of 5 years. In layman's terms, the TAGM 4046 numerical criteria support protection of groundwater (where precipitation percolates through an impacted soil area) and "residential" land use scenarios. As part of the Phase II Site Assessment process, we have basically utilized the TAGM's Eastern Background numerical values as a starting point in the initial screening (identification) of AOCs at the Plant 12 property. At this time, unlike neighboring states such as New Jersey, Connecticut and Massachusetts, New York State has not developed "look up" tables of soil cleanup criteria for other land uses such as industrial and commercial scenarios. In New York State, these types of criteria are developed on a case-by-case, site-specific basis. The purpose of this section is to identify the framework from which site-specific numeric values are developed to guide the AOC remediation process consistent with the current and future industrial land use scenario.

In keeping with recent technical discussions with the New York State Department of Health (NYSDOH) and NYSDEC, we have reviewed a number of sources of guidance related to assigning cleanup levels at residential, commercial and industrial sites. In addition to the USEPA Soil Screening Levels (SSLs) and the TAGM 4046 criteria, information was compiled from the States of New Jersey, Massachusetts, Connecticut and New York (Risk-Based Corrective Action), as well as USEPA – Region III and American Society for Testing Materials (ASTM). For discussion and comparison purposes, we have presented this information on Table 2.

As was mentioned briefly above, the analytical results from the Phase II Site Assessments were initially compared to the criteria presented in Table 1. Specifically, Table 1 presents a combination of soil guidance values obtained from the NYSDEC as published in its TAGM 4046

dated January 24, 1994, the proposed revised NYSDEC TAGM 4046 criteria for cadmium and chromium (NYSDEC TAGM 4046 amendment dated April 1995) and USEPA SSLs. It is worthy to note, at this juncture, that we have utilized the criterion for total SVOCs of 500,000 ug/kg, the criterion for total polycyclic aromatic hydrocarbons (PAHs) of 100,000 ug/kg and the criterion for total carcinogenic polycyclic aromatic hydrocarbons (CaPAHs) of 10,000 ug/kg for comparison.

As summarized in the Phase II Site Assessments for Plant 12, for purposes of initial screening, AOCs at which the analytical results of soil samples exhibited exceedances of the comparison values presented in Table 1 were identified and recommended for possible remediation. Since that time a number of additional considerations have come to light, most importantly, that NGC has made a corporate decision to market the property only to potential buyers who would continue to maintain the industrial zoning of the property. This information gave cause for us to revisit the initial screening process while considering an alternate, site-specific evaluation of remedial approaches. This approach will be discussed in the section that follows.

SITE-SPECIFIC CRITERIA

As described above, the analytical results from the Phase II Site Assessments were initially compared to the values summarized in Table 1. However, it was determined that many of these values, which were developed from health-based risk analysis scenarios that were not directly applicable to a majority of AOCs due to either the concentration and mass of constituents detected, or the relative location of the AOC and/or the depth of impacted soil and the industrial land use. As a result, each AOC was re-evaluated on an individual basis to identify additional factors, such as exposure routes and the ultimate potential fate and transport of the constituents of concern, that should be considered to determine whether remediation is warranted. Such additional factors include: the mass and concentration of constituents detected; specific depth of impacted soil; whether groundwater has known to have been impacted; whether exposure pathways have been minimized or eliminated (i.e., existing concrete slabs, asphalt,

isolated depth of impacted soil, etc.); immobility of constituents of concern; and industrial land use.

While New York State does not currently have specific "look-up" tables addressing residential and nonresidential (or commercial) remediation scenarios, there is a wealth of information published by the USEPA and NYSDEC that is available; however, not all the cleanup levels have given consideration to, or are indexed to, a specific land use, such as commercial or industrial scenarios. In addition, and perhaps more important than these published numerical "cleanup objectives" and "screening levels," is the collective knowledge accumulated through years of remedial practice.

Presented below is a framework around which a rationale for selecting site-specific numerical cleanup levels from existing published guidance. Again, these levels will be based on the following major technical, environmental and land use considerations:

- ***Industrial Land Use*** - The property is currently zoned industrial and has been utilized as such since approximately 1944. NGC is aggressively marketing the Plant 12 site for continued industrial land use.

- ***Depth of Areas of Concern*** - An evaluation of the presence of specific constituents of concern indicates that, in general, the concentrations decrease dramatically with depth and are typically located at depths no greater than 22 feet below grade. In most all situations, these depths do not lend themselves to direct exposure to human receptors.

- ***Immobility of Constituents of Concern*** - As mentioned above, the concentration of constituents of concern are generally limited to soil horizons to a depth of 22 feet below ground surface. These soil horizons appear to have a high affinity to bind these constituents and there appears to be no direct evidence that migration has been occurring over approximately the last 50 years.

- ***Depth to Groundwater Pathway*** - The depth to groundwater is approximately 55 feet below ground surface. Given the fact that the concentrations of existing constituents of concern are generally located no greater than 22 feet below grade and do not appear to have migrated vertically over the last 50 years, the groundwater pathway does not appear to be a concern.

- ***Groundwater Quality*** - Groundwater samples analyzed from monitoring wells located on-site and immediately downgradient from the site shows no indication of being impacted by migration of constituents of concern from the unsaturated to the

saturated zone. Again, this situation has existed for approximately the last 50 years with no apparent adverse impact to groundwater quality.

Metals

The following metals have been identified as constituents of concern:

- *Arsenic*
- *Cadmium*
- *Chromium*
- *Copper*
- *Mercury*
- *Nickel*
- *Lead*
- *Selenium*
- *Zinc*

Presented below is a discussion of what we believe to be the appropriate level of remediation for each constituent based on the maintenance of industrial land use, the potential for direct exposure, potential to migrate, the localized nature of the contamination at a specific range of depth below ground surface, the depth to groundwater and groundwater quality.

Arsenic

The results of the Phase II investigations conducted at the Plant 12 site indicate that arsenic ranges in concentration from "non-detect" to approximately 83.6 mg/kg. While most of the areas of concern containing arsenic have been identified at some depth below ground surface, arsenic is one of five constituents detected in AOCs which could be characterized as posing a potential "direct exposure" scenario due to its presence in soil at or near the surface.

Over the last 6 to 8 years, Grumman Aerospace Corporation and, more recently NGC, has been undertaking a major investigation program to identify and clean up its properties prior to executing real estate transactions. Based on investigations completed at dozens of properties at the Bethpage complex, we have observed that low levels of arsenic have been detected

throughout the complex. Other than the possible use of arsenical herbicides/pesticides for farming prior to the development of the site or for pest and weed control during site operations, which were commercially available products, extensive research by NGC and a number of its environmental consultants has uncovered that arsenic was not utilized to any great extent in products utilized for manufacturing, subassembly, assembly or testing. Quite frankly, we have been perplexed by the seemingly ubiquitous nature of this constituent throughout the complex. Given this phenomena, we have concluded that a contributing factor in this situation may lie in the fact that arsenic levels that have been detected in the recent past are due to naturally occurring, *existing background concentrations*. Given this situation, we believe it is prudent to rely on the logic and rationale of TAGM 4046 and its use of on-site background. Utilizing the TAGM 4046 guidance, as well as general discussions with representatives of NYSDEC and NYSDOH at recent meetings, we have conducted a review of arsenic analytical results obtained from approximately 236 soil samples collected at properties within the confines of the Bethpage complex adjacent to Plant 12 property. After identifying the concentration of arsenic in each soil sample, we proceeded to calculate an average concentration across the properties in question. Based on the calculations, arsenic is present in an average concentration of 19.6 mg/kg across approximately 22.5 acres of adjacent property. As a result of this exercise, we are proposing that 20 mg/kg be established as the remediation value for arsenic in this continued industrial use scenario.

Cadmium

The results of the Phase II investigations at the Plant 12 site indicate that cadmium ranges in concentration from "non-detect" to approximately 15.9 mg/kg. In the case of cadmium, all of the areas of concern have been identified at some depth below ground surface. Cadmium is not one of the five constituents detected in AOCs which could be characterized as a "direct exposure" scenario.

With regard to the constituent cadmium, we offer the following. With the exception of arsenic and copper, we are generally recommending the use of the USEPA SSLs. The reason for recommending the SSL is due to the fact that the SSL concentration is derived from a calculated

quantitative hazard assessment for a *residential* land use scenario as opposed to the selection of a concentration at some point within a range of published Eastern Background concentrations. Therefore, although the residential scenario presents a potentially overly conservative approach given the continued commercial/industrial nature of the property cadmium will be screened against the SSL of 78 mg/kg for the purpose of remediation.

Chromium

The results of the Phase II investigations at the Plant 12 site indicate that chromium ranges in concentration from "non-detect" to approximately 180 mg/kg. While most of the areas of concern containing chromium have been identified at some depth below ground surface, chromium is another one of five constituents detected in AOCs which could be characterized as posing a potential "direct exposure" scenario.

As with previous metal constituents described above, we reviewed the soil screening levels published by the USEPA in June 1996. The merits of utilizing this guidance is particularly important since, for the first time, it identifies and evaluates each of the two species of chromium (trivalent and hexavalent), as well as total chromium, with regard to environmental impact due to ingestion. The USEPA document establishes a level of 390 mg/kg for chromium (total) and hexavalent chromium (VI) and a level of 78,000 mg/kg for trivalent chromium (III). This is an important departure from the values provided in the NYSDEC TAGM as either soil cleanup objectives or Eastern USA background levels. The important differentiation is that the most recent work published by the USEPA identifies not only total chromium, which the TAGM addresses, but also each of the two species of chromium that can exist (in theory) in the environment and assigns a specific, calculated soil screening level based on its hazard assessment model. The TAGM, on the other hand, does not address chromium in this specific manner and is therefore overly conservative with respect to the risk it assigns to chromium as a *total* concentration.

Chromium (VI) is the most toxic species of chromium and is the reason that USEPA assigned a soil screening level of 390 mg/kg. Standard contract laboratory protocol imposes a

maximum 24-hour holding time on any sample being analyzed for chromium (VI). The reason for this very stringent holding time, as opposed to 6 months for either chromium (total) or chromium (III) is quite simple. Chromium (VI) is a species of chromium which exists in an "excited" ionic state and is therefore relatively unstable and increasingly reactive. Therefore, the chromium (VI) species will either react with other compatible species in the environment or possibly transform to chromium (III). As a result, the general thinking is that it is likely that chromium (III) is the dominant species found in the environment, particularly if it has had the benefit of being present over a longer period of time. This fact is generally recognized by the scientific community and the laboratory industry.

The reason that USEPA's SSL are unique from a risk assessment perspective is that for the first time each of the two species of chromium (III and VI), as well as total chromium, have a separate and distinct calculated threshold level for hazard management and decision making. We believe that this methodology of identifying individual species and calculating a separate risk assessment for each provides for a more sound and accurate measure of the impact of chromium on environmental receptors. While our field investigation program did not analyze for the separate species of chromium, we still believe that the quantitative and calculated methodology of presenting a hazard assessment presents a more realistic approach than simply comparing this industrial site is to a published background concentration. This holds particularly true with regard to the fact that chromium (total) has been detected in AOCs which potentially pose a "direct exposure" scenario. In addition, as was stated above for cadmium, the use of the SSL as a cleanup level (390 mg/kg) affords some additional protection in that it is a calculated quantitative numerical value based on a hazard assessment and assumes a "residential" scenario even though the property in question is "industrial" land use.

Therefore, based on the above, chromium will be screened against the SSL of 390 mg/kg for the purpose of remediation.

Copper

The results of the Phase II investigations at the Plant 12 site indicate that copper ranges in concentration from "non-detect" to approximately 959 mg/kg. In the case of copper, all of the areas of concern have been identified at some depth below ground surface. Copper is not one of the five constituents detected in AOCs which could be characterized as a "direct exposure" scenario.

With regard to the constituent copper, we offer the following. With the exception of arsenic presented above, we are generally recommending the use of the USEPA SSLs. However, since there is no SSL for copper, we have relied on a similarly based criterion for copper from the Connecticut Department of Environmental Protection (CTDEP). The CTDEP criterion for copper is based upon a direct exposure scenario for residential land use as opposed to the selection of a concentration at some point within a range of published Eastern Background concentrations. Therefore, copper (at depth) will be screened against the CTDEP criterion of 2,500 ppm for the purpose of remediation.

Mercury

The results of the Phase II investigations for the Plant 12 site indicate that mercury ranges in concentration from "non-detect" to approximately 15.7 mg/kg. While most of the areas of concern containing mercury have been identified at some depth below ground surface, mercury is another one of five constituents detected in AOCs which could be characterized as posing a potential "direct exposure" scenario.

With regard to mercury, we offer the following. Mercury is one of the metals detected within soil horizons isolated at depth as well as in AOCs which could potentially pose a "direct exposure" scenario. Again, for the same basic reasons as stated for chromium and cadmium, we are proposing to utilize the SSLs. The reasons are as follows:

- The SSLs are based on a "residential" land use hazard assessment. While the land use at the property in question will remain "industrial," we believe that the additional protection obtained by utilizing a more conservative ("residential") approach, particularly for AOCs posing a potential "direct exposure" scenario, is acceptable.

- The SSLs are derived from a calculated quantitative hazard assessment as opposed to the selection of a concentration at some point within a range of published Eastern Background concentrations.

Therefore, mercury will be screened against the SSL of 23 mg/kg for the purpose of remediation.

Nickel

The results of the Phase II investigations at the Plant 12 site indicate that nickel ranges in concentration from "non-detect" to approximately 67.9 mg/kg. In the case of nickel, all of the areas of concern have been identified at some depth below ground surface. Nickel is not one of the five constituents detected in AOCs which could be characterized as a "direct exposure" scenario.

With regard to the constituent nickel, we offer the following. With the exception of arsenic and copper discussed above, we are generally recommending the use of the USEPA SSLs. The reason for again recommending the SSL is due to the fact that the SSL concentration is derived from a calculated quantitative hazard assessment as opposed to the selection of a concentration at some point within a range of published Eastern Background concentrations. Therefore, nickel (at depth) will be screened against the SSL of 1600 ppm for the purpose of remediation.

Lead

The results of the Phase II investigations at the Plant 12 site indicate that lead ranges in concentration from "non-detect" to approximately 3,140 mg/kg. While most of the areas of concern containing lead have been identified at some depth below ground surface, lead is one of

five constituents detected in AOCs which could be characterized as posing a potential "direct exposure" scenario due to its presence in soil at or near the surface.

With regard to the constituent lead, we offer the following. With the exception of arsenic and copper discussed above, we are generally recommending the use of the USEPA SSLs. The reason for again recommending the SSL is due to the fact that the SSL concentration is derived from a calculated quantitative hazard assessment as opposed to the selection of a concentration at some point within a range of published Eastern background concentrations. Therefore, lead (at depth) will be screened against the SSL of 400 ppm for the purpose of remediation.

Selenium

The results of the Phase II investigations at the Plant 12 site indicate that selenium ranges in concentration from "non-detect" to approximately 7.0 mg/kg. In the case of selenium, all of the areas of concern have been identified at some depth below ground surface, therefore, selenium is not one of five constituents detected in AOCs which could be characterized as posing a potential "direct exposure" scenario.

With regard to selenium, we offer the following. The reason for recommending the SSLs is due to the fact that the SSLs are derived from a calculated quantitative hazard assessment as opposed to the selection of a concentration at some point within a range of published Eastern background concentrations. Therefore selenium (at depth) will be screened against the SSL of 390 mg/kg for the purpose of remediation.

Zinc

The results of the Phase II investigations at the Plant 12 site indicate that zinc ranges in concentration from "non-detect" to approximately 1,550 mg/kg. While most of the areas of concern containing zinc have been identified at some depth below ground surface, zinc is one of five constituents detected in AOCs which could be characterized as posing a potential "direct exposure" scenario due to its presence in soil at or near the surface.

With regard to the constituent zinc, we offer the following. With the exception of arsenic and copper discussed above, we are generally recommending the use of the USEPA SSLs. The reason for again recommending the SSL is due to the fact that the SSL concentration is derived from a calculated quantitative hazard assessment as opposed to the selection of a concentration at some point within a range of published Eastern background concentrations. Therefore, zinc (at depth) will be screened against the SSL of 23,000 ppm for the purpose of remediation.

Semivolatile Organic Compounds (SVOCs)

As was stated earlier, the goal of this section is to present the framework around which a site-specific cleanup program is designed and implemented. In the introductory remarks presented earlier, we indicated that the basis of this plan would be a review of existing, available published information regarding numerical cleanup values and "the collective knowledge accumulated through years of remedial practice." For the discussion that follows with regard to SVOCs and CaPAHs, considerable reliance on remediation practice will be brought to bear in developing the site-specific cleanup levels for these compounds. Specifically, we have referred to various Records of Decision (RODs) for Site Registry properties in New York State at industrial facilities in identifying site-specific cleanup levels. In addition, we have referred to levels for SVOCs and CaPAHs that have been accepted for various NGC properties at the Bethpage complex in consultation with NYSDEC, as well as other properties throughout New York State.

The following discussion provides further information to support "remedial goals" for total SVOCs and total CaPAHs without consideration of individual SVOC concentrations.

As examples, the Proposed Remedial Action Plans (PRAPs) for the G.E. Hornell Site and the Buffalo Outer Harbor Site were prepared by the NYSDEC and NYSDOH to address soil contamination at two separate State Superfund Sites which had been subjected to regulatory agency and public review. The PRAPs for both sites provided the "remedial goals" established for soil at each site. For the G.E. Hornell Site, the remedial goals selected by NYSDOH and

NYSDEC included the objective of 500 mg/kg (500,000 ug/kg) for total SVOCs. It should be noted that "remedial goals" were not established for any individual SVOC constituents. For the Buffalo Outer Harbor Site, a screening level selected to determine the need for remediation was 10,000 ug/kg for CaPAHs.

In addition, the TAGM 4046 criteria for total SVOCs and total CaPAHs of 500,000 ug/kg and 10,000 ug/kg have been accepted at other NGC properties at the Bethpage complex in consultation with NYSDEC. Most recently, the level of 10,000 ug/kg for CaPAHs was utilized for the Phase II investigation and Phase III remediation of the 105-acre, Navy-owned property (a.k.a., Plant 3) at the Bethpage complex.

Total Semivolatile Organic Compounds (SVOCs)

The results of the Phase II investigations at Plant 12 indicate that SVOCs were detected at concentrations ranging from "non-detect" to approximately 410,000 ug/kg. While most of the AOCs containing SVOCs have been identified at some depth below ground surface, SVOCs have not been detected in AOCs which could be characterized as posing a potential "direct exposure" scenario.

With regard to SVOCs, we offer the following. We believe the logic presented in TAGM 4046 for SVOCs offers a protective as well as practical approach. Therefore, as has been utilized at other NGC properties in consultation with NYSDEC and the State Superfund RODs referenced above, we are recommending that a cleanup level for total SVOCs be established at 500,000 ug/kg.

Total Carcinogenic Polycyclic Aromatic Hydrocarbons (CaPAHs)

The results of the Phase II investigations at Plant 12 indicate that CaPAHs were detected at concentrations ranging from "non-detect" to 51,100 ug/kg.

While most of the AOCs containing CaPAHs have been identified at some depth below ground surface, CaPAHs are a suite of compounds detected at AOCs which could be characterized as posing a potential "direct exposure" scenario.

Therefore, as has been utilized at other NGC properties in consultation with NYSDEC and the State Superfund RODs referenced above, we are recommending that a cleanup level for total CaPAHs be established at 10,000 ug/kg.

Volatile Organic Compounds (VOCs)

The results of the Phase II investigations at the Plant 12 site indicate that only one VOC (1,1,1 - Trichloroethane) was identified as a constituent of concern. Specifically, 1,1,1 - Trichloroethane (1,1,1-TCA) was detected at concentrations ranging from "non-detect" to approximately 3,600 ug/kg. While the two AOCs exhibiting elevated levels of 1,1,1-TCA have been identified at some depth below ground surface, 1,1,1-TCA has not been detected at these AOCs which could be characterized as posing a potential "direct exposure" scenario.

With regard to the constituent 1,1,1-TCA, we offer the following. With the exception of arsenic and copper discussed above, we are generally recommending the use of the USEPA SSLs. Therefore, 1,1,1-TCA will be screened against the SSL of 1,200,000 ppb for the purpose of remediation.

Polychlorinated Biphenyls (PCBs)

The results of the Phase II investigations at the Plant 12 site indicate that total PCBs ranges in concentration from "non-detect" to approximately 230,000 µg/kg. While most of the AOCs containing PCBs have been identified at some depth below ground surface, PCBs are a suite of compounds detected at AOCs which could be characterized as posing a potential "direct exposure" scenario.

With regard to PCBs, we offer the following. In accordance with the provisions for Self-Implementing Disposal of PCB Remediation Waste found at 761.61(a) (4), the EPA presents cleanup levels for four general waste categories. With regard to bulk PCB remediation waste, which includes soil, the EPA has developed cleanup for two types of areas: low occupancy areas and high occupancy areas.

Low occupancy areas are defined as ...*"any area where PCB remediation waste has been disposed of on-site and where occupancy for any individual not wearing dermal and respiratory protection for a calendar year is: less than 840 hours for non-porous surfaces and less than 335 hours bulk PCB remediation waste. Examples could include an electrical substation or a location in an industrial facility where a worker spends small amount so time per week (such as an unoccupied area outside a building, an electrical equipment vault, or in the non-office space in a warehouse where occupancy is transitory)."*

The areas at the facility which have been identified during the Phase II investigations at the Plant 12 site which have been impacted by PCBs meet the definition of low occupancy area. We are therefore recommending the utilization of the self-implementing disposal procedure and the cleanup levels associated with low occupancy areas. As a result, we are proposing that 25 ppm be established as the remediation value for PCBs. It should be noted, however, that the use of the cleanup levels and procedures associated with a low occupancy area requires that a notification of this fact be placed in the deed for the property.

Groundwater

Generally speaking, the constituents of concern detected at the Plant 12 site (metals, SVOCs, and PCBs) are relatively immobile in soil due to the following: high affinity/cohesion to soil; concentrations of contaminants decrease with depth and depth of impacted soil is limited; groundwater does not appear to be impacted; and migration pathways have been eliminated.

It is also important to note that five groundwater monitoring wells located on the Plant 12 site and two off-site wells were installed during the Delineation Phase II Site Assessment for

Plant 12. The monitoring well locations are shown in Figure 2. The report indicated that 1,1,1-trichloroethane was detected slightly above NYSDEC Class GA groundwater standards in groundwater monitoring well P12MW-2. Based on the groundwater level measurements from surveyed monitoring wells, groundwater flow was determined during the Delineation Phase II Site Assessment, to be in the southerly direction at the Plant 12 site. Consequently, groundwater monitoring well P12MW-2 is located immediately downgradient of the former Resin Waste Pit. It is important to note that 1,1,1-trichloroethane was also detected above NYSDEC Class GA groundwater standards in groundwater monitoring well P12MW-3 which is located upgradient of the former location of the former Resin Waste Pit along the northern property boundary for the Plant 12 site. Because the upgradient well (P12MW-3) was also shown to be impacted by 1,1,1-trichloroethane, the source of this contamination is likely attributed to an off-site, upgradient location.

In addition, PCBs were detected above NYSDEC Class GA groundwater standards (0.09 ug/l), at a concentration of 0.94 ug/l in the groundwater sample collected on August 31, 1998 at groundwater monitoring well P12MW-2 (downgradient of the former Resin Waste Pit). However, PCBs were not detected above the method detection limit, of 0.50 ug/l, in a groundwater sample collected on January 14, 1999 from groundwater monitoring well P12MW-2. Since there were no other exceedances of the NYSDEC Class GA groundwater standard for PCBs from the other on-site groundwater monitoring wells, it appears that on-site groundwater quality has not been impacted by PCBs.

SITE-SPECIFIC EVALUATION

A summary of the soil comparison values being proposed for each constituent of concern described above for evaluating the need for remediation at each AOC is presented in Table 3.

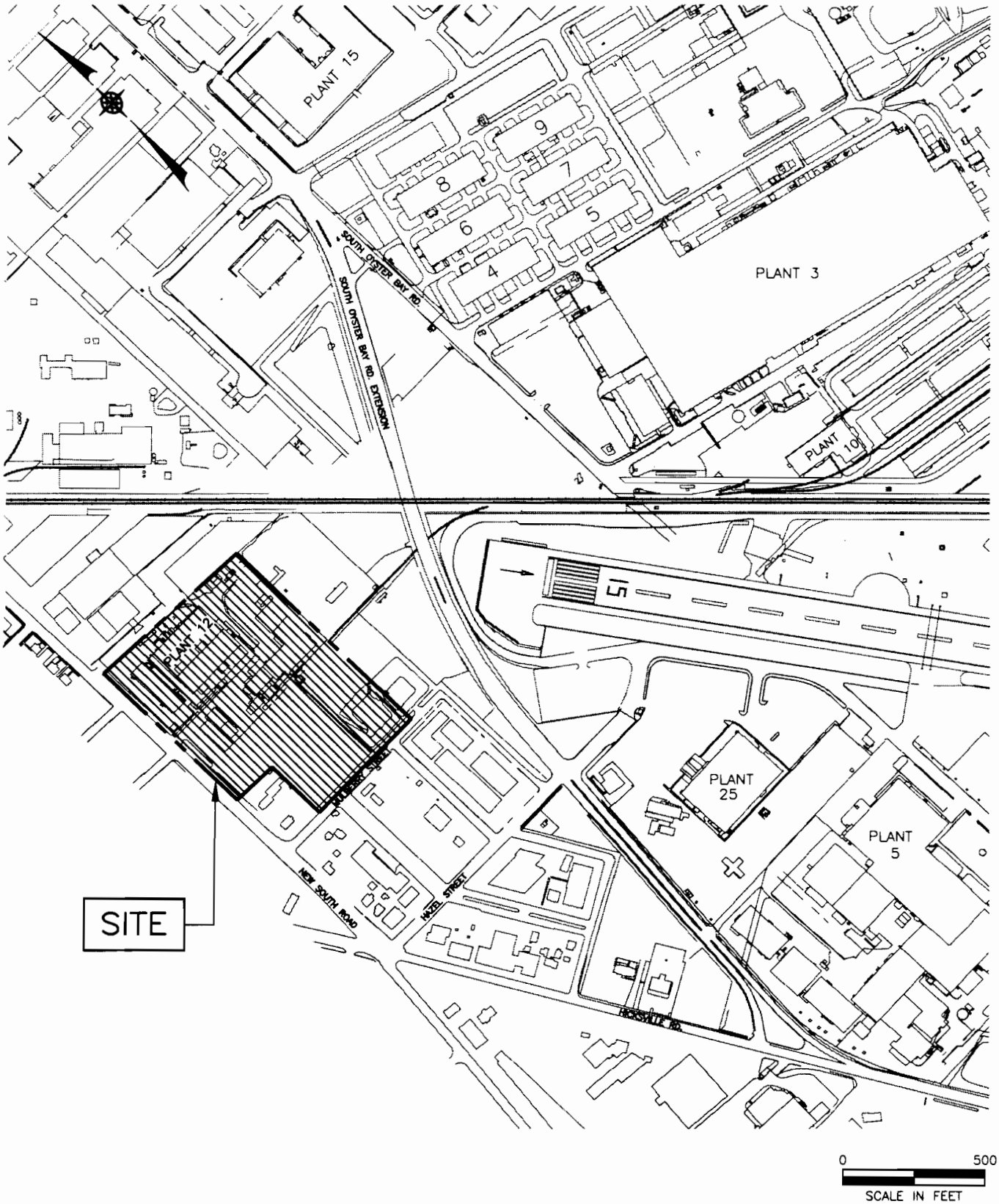
A summary of the site-specific evaluation performed for each individual AOC at the Plant 12 site is provided in Table 4. Based on the site-specific evaluation, each AOC was either recommended for no further action or remediation.

REMEDIAL APPROACH

In order to meet NGC's aggressive Plant 12 consolidation schedule, soil excavation was the only remedial approach considered for those AOCs recommended for remediation. In general, remediation activities will consist of the following:

- Saw cut concrete and/or asphalt;
- Excavate non-impacted overburden material (if necessary) and stockpile for re-use;
- Excavate impacted soil and properly containerize for off-site transportation and disposal;
- Collect endpoint samples from the bottom of the excavation (only where in-situ endpoint samples are not available);
- After NYSDEC regulatory review and approval, backfill the excavation with overburden material (if available) supplemented with certified clean bank-run sand;
- Restore concrete and/or asphalt as necessary; and
- Former sanitary leaching pools previously abandoned will be backfilled with certified clean fill to grade to account for compaction (as needed). In addition, all former sanitary leaching pools will be sealed with approximately 6 inches of concrete.

All AOCs recommended for remediation are presented on Table 5. The interior/exterior AOCs recommended for remediation are shown on Figure 3. The recommended remedial activities are summarized in Table 5. Table 5 lists the approximate proposed area and depth of remediation, as well as the proposed endpoint sampling approach for each AOC recommended for remediation.



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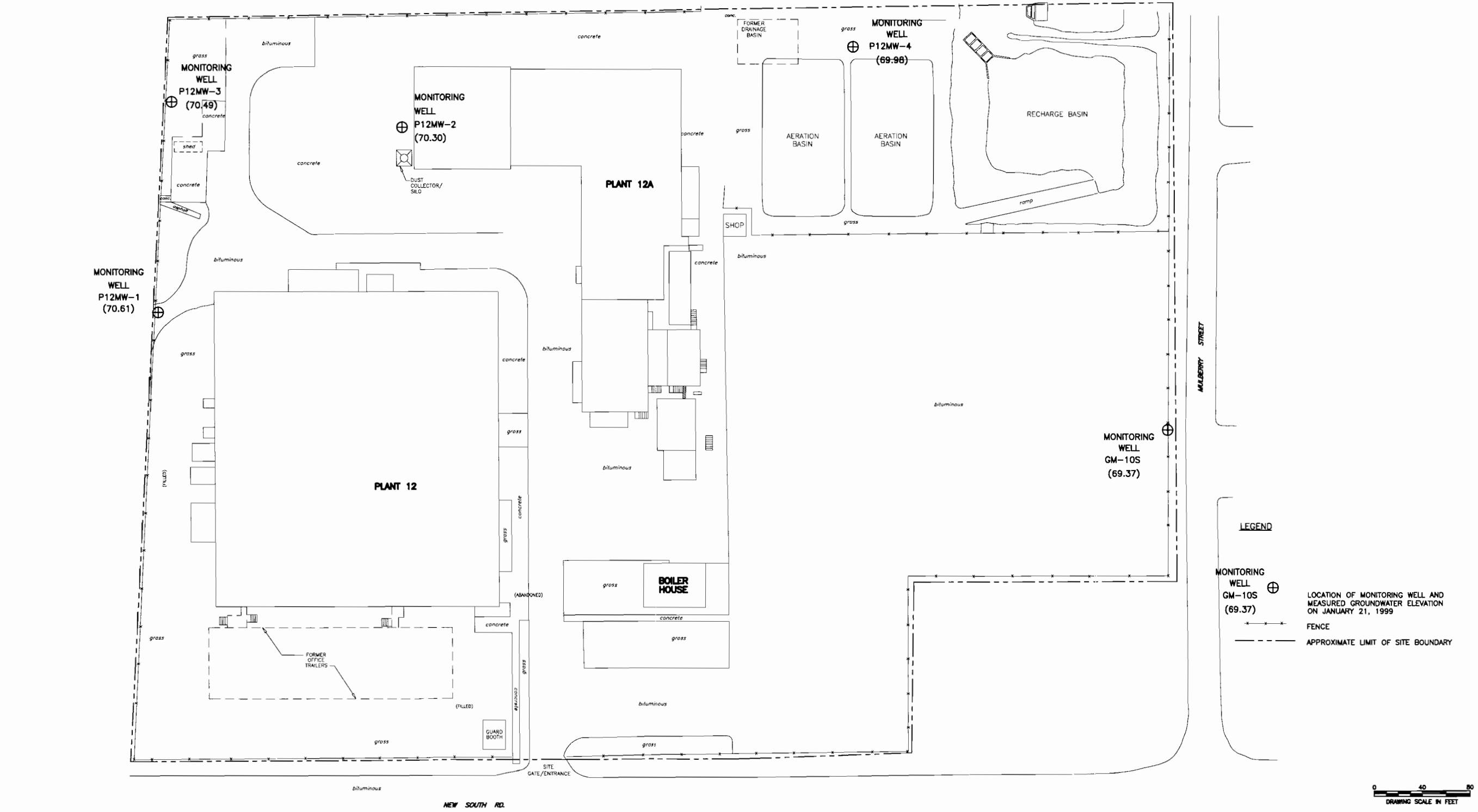
NORTHROP GRUMMAN CORPORATION
BETHPAGE, NEW YORK
PLANT 12 – REMEDIATION PLAN

SITE LOCATION MAP

FIGURE 1

Dvirka and Bartilucci
Consulting Engineers
A Division of William F. Cosulich Associates, P.C.



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PLANT 12 – REMEDIATION PLAN

MONITORING WELL LOCATION MAP

DVIRKA AND BARTILUCCI
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

FIGURE 2

Table 1
Northrop Grumman Corporation
Plant 12 - Remediation Plan
SUMMARY OF SOIL COMPARISON VALUES USED FOR PHASE II INVESTIGATION

Constituent of Concern	Comparison Value
VOCs (ug/kg or ppb)	
1,1-Dichloroethane	200
1,1,1-Trichloroethane	800
Toluene	1,500
CaPAHs (ug/kg or ppb)	
Benzo(a)anthracene	--
Chrysene	--
Benzo(b)fluoranthene	--
Benzo(k)fluoranthene	--
Benzo(a)pyrene	--
Dibenzo(a,h)anthracene	--
Indeno(1,2,3-cd)pyrene	--
Total CaPAHs	10,000 [1]
Total PAHs	100,000
Total SVOCs	500,000
SVOCs (ug/kg or ppb)	
2,4,5-Trichlorophenol	7,800,000
Bis(2-ethylhexyl)phthalate	46,000
2,4-Dichlorophenol	230,000
Phenol	47,000,000
Phenanthrene	50,000
Fluoranthene	3,100,000
Naphthalene	3,100,000
Pyrene	2,300,000
Metals (mg/kg or ppm)	
Arsenic	12
Cadmium	10
Chromium (total)	50
Copper	50
Mercury	0.2
Lead	500
Nickel	25
Selenium	3.9
Zinc	50
PCBs (ug/kg or ppb)	
Total PCBs	10,000

Notes:

-- :No standard/guideline.
[1] A comparison value of 10,000 ug/kg, as presented in TAGM 4046, has been utilized for total carcinogenic polycyclic aromatic hydrocarbons (CaPAHs).

Dvirka and Bartilucci CONSULTING ENGINEERS
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Table 2
Northrop Grumman Corporation
Plant 12 - Remediation Plan
COMPARISON OF SOIL CLEANUP LEVELS
BASED ON DIRECT EXPOSURE

Note: These may not be the latest values

	USEPA		New Jersey			Massachusetts			Connecticut		New York	New York				USEPA - Region III	
	Soil Screening Levels (Residental)		Soil Cleanup Criteria			Soil Standards			Direct Exposure Criteria		TAGM 4046	Petroleum RBCA				Risk-Based Concentrations	
Compound/Constituent	Ingestion (mg/kg)	Inhalation (mg/kg)	Residential (mg/kg)	Non-Residential (mg/kg)	Impact To Ground Water (mg/kg)	S-1 (Residential) (mg/kg)	S-2 (Commercial) (mg/kg)	S-3 (Industrial) (mg/kg)	Residential (mg/kg)	Industrial/ Commercial (mg/kg)	Cleanup Objective (mg/kg)	Resident/ Child (mg/kg)	Resident/ Adult (mg/kg)	Commercial Worker (mg/kg)	Construction Worker (mg/kg)	Residential (mg/kg)	Industrial (mg/kg)
Benzene	22	0.8	3	13	1	40	60	200	21	200	0.06	10.5	13.5	19.5	265	22	200
Ethylbenzene	7,800	400	1,000	1,000	100	500	1,000	2,500	500	1,000	5.5	2,620	16,800	20,800	40,000	7,800	200,000
Tetrachloroethene	12	11	4	6	1	200	300	1,000	12	110	1.4	--	--	--	--	12	110
1,1,1-Trichloroethane	--	1,200	210	1,000	50	100	500	500	500	1,000	0.8	--	--	--	--	2,700	72,000
Trichloroethene	58	5	23	54	1	70	100	500	56	520	0.7	--	--	--	--	58	520
Toluene	16,000	650	1,000	1,000	500	500	1,000	2,500	500	1,000	1.5	5,200	33,400	39,000	35,200	16,000	410,000
Vinyl Chloride	0.3	0.03	2	7	10	0.3	0.5	2	0.32	3	0.2	--	--	--	--	0.34	3
Xylene (Total)	160,000	410 (a)	410	1,000	10	500	1,000	2,500	500	1,000	1.2	45,300	82,100	206,000	38,400	160,000	1000000
Benzo(a)anthracene	0.9	--	0.9	4	500	0.7	1	4	1	7.8	0.224 or MDL	1.02	2.2	1.93	185	0.88	7.8
Benzo(b)fluoranthene	0.9	--	0.9	4	50	0.7	1	4	1	7.8	1.1	1.02	2.2	1.93	185	0.88	7.8
Benzo(k)fluoranthene	9	--	0.9	4	500	7	10	40	8.4	78	1.1	10.2	22	19.3	1,850	8.8	78
Benzo(a)pyrene	0.09	--	0.66	0.66	100	0.7	0.7	0.7	1	1	0.061 or MDL	0.102	0.22	0.19	18.3	0.088	0.78
Chrysene	88	--	9	40	500	7	10	40	--	--	0.4	102	220	193	18,500	88	780
Fluoranthene	3,100	--	2,300	10,000	100	1,000	2,000	5,000	1,000	2,500	50	--	--	--	--	3,100	82,000
Naphthalene	3,100	--	230	4,200	100	100	2,500	2,500	1,000	2,500	13	3,540	46,800	10,400	1,380	3,100	82,000
Phenanthrene	--	--	--	--	--	1,000	2,500	2,500	1,000	2,500	50	3,780	41,000	24,900	41,400	--	--
Phenol	47,000	--	10,000	10,000	50	500	1,000	2,500	1,000	2,500	0.03 or MDL	--	--	--	--	47,000	1000000
Pyrene	2,300	--	1,700	10,000	100	700	2,000	5,000	1,000	2,500	50	3,830	41,500	29,600	92,800	2,300	61,000
PCBs (Total)	1	--	0.49	2	50	2	2	2	1	10	1 / 10 (b)	--	--	--	--	0.32	2.9
Arsenic	0.4	750	20	20	(f)	30	30	30	10	10	7.5 or SB	--	--	--	--	0.43	3.8 (e)
Cadmium	78	1,800	1	100	(f)	30	80	80	34	1,000	10 (c)	--	--	--	--	39	1,000
Chromium (Total)	390	270	--	--	--	1,000	2,500	5,000	--	--	50 (c)	--	--	--	--	--	--
Chromium (III)	78,000	--	78,000	--	--	1,000	2,500	5,000	3,900	51,000	--	110	2,900	135	13.4	78,000	1000000
Chromium (VI)	390	270	130	190	--	200	600	1,000	100	100	--	0.254	1.3	0.0746	0.185	390	10,000
Copper	--	--	600	600	(f)	--	--	--	2,500	--	25 or SB	--	--	--	--	3,100(g)	82,000(g)
Selenium	390	--	63	3,100	(f)	300	2,500	2,500	340	10,000	2 or SB	--	--	--	--	390	10,000
Barium	5,500	690,000	700	47,000	(f)	1,000	2,500	5,000	4,700	--	300 or SB	--	--	--	--	5,500(g)	140,000(g)
Lead	400	--	400	600	(f)	300	600	600	500	1,000	400 (d)	400	400	400	400	--	--
Mercury	23	10	14	270	(f)	20	60	60	20	610	0.1	--	--	--	--	23	610
Nickel	1,600	13,000	250	2,400	(f)	300	700	700	1,400	7,500	13 or SB	21.6	278	15.6	2.64	1,600	41,000
Zinc	23,000	--	1,500	1,500	(f)	2,500	2,500	5,000	20,000	610,000	20 or SB	--	--	--	--	23,000	610,000
Cyanide	1,600	--	1,100	21,000	(f)	100	100	400	1,400	41,000	--	--	--	--	--	1,600	41,000

Notes:

--: No Standard or Guideline.
NA: Not Applicable.
SB: Site Background.
MDL: Method Detection Limit.

(a) Level is for o-Xylene.
(b) Surface/Subsurface.
(c) Proposed.
(d) Urban/suburban background levels of lead typically range from 200-500 ppm. USEPA's Interim Residential Screening Level for lead is 400 ppm.
(e) As a carcinogen.
(f) The impact to ground water values for inorganics will be developed based upon site specific chemical and physical parameters.
(g) And compounds.

Cleanup levels for USEPA, New Jersey, Massachusetts and Connecticut are based on a Carcinogenic Risk Factor (CRF) of 1x10-6 (New Jersey also uses 1x10-5 for contaminants if no Reference Concentration is available). For non-carcinogens, all states use a Hazard Index/Quotient of 1.0.

Table 3
Northrop Grumman Corporation
Plant 12 - Remediation Plan
PROPOSED SITE-SPECIFIC CLEANUP CRITERIA

Constituent of Concern	Comparison Value
VOCs (ug/kg or ppb)	
1,1-Dichloroethane	78,000,000
1,1,1-Trichloroethane	1,200,000
Toluene	16,000,000
SVOCs (ug/kg or ppb)	
Total CaPAHs	10,000
Total PAHs	100,000
Total SVOCs	500,000
Metals (mg/kg or ppm)	
Arsenic	20
Barium	5,500
Cadmium	78
Chromium (total)	390
Chromium (hexavalent)	390
Copper	2,500
Mercury	23
Lead	400
Nickel	1,600
Selenium	390
Zinc	23,000
PCBs (ug/kg or ppb)	
Total PCBs	25,000

Table 4
Northrop Grumman Corporation
Plant 12 - Remediation Plan
SITE-SPECIFIC EVALUATION FOR RCRA CORRECTIVE ACTION

Areas of Concern (AOCs)	Boring Location(s)	Constituents of Concern [1]	Maximum Constituent Concentration and Depth [1]	Description	Remediation Recommended
Trench in EMT Lab No. 1	B-7A and B-7AN7	Hg	10.6 mg/kg (0 - 2 feet)	The Phase II sample results indicate that mercury impacted soil extend to a depth of 2 feet beneath the trench floor in the vicinity of soil borings B-7AA and B-7AN7. However, the USEPA SSL for mercury of 23 mg/kg has not been exceeded. In addition, the impacted soil is located beneath approximately 6 inches of concrete, thus virtually eliminating ingestion exposure pathways. Furthermore, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No
Trench in Staffed Machine Shop	B-8A	Hg	1.8 mg/kg (2 - 4 feet)	The Phase II sample results indicate the soil 4 feet beneath the trench floor in the vicinity of soil boring B-8AA and the soil 2 feet beneath the trench floor in the vicinity of soil boring B-8BA is primarily impacted by mercury. However, the USEPA SSL for mercury of 23 mg/kg has not been exceeded. In addition, the impacted soil is located beneath approximately 6 inches of concrete, thus virtually eliminating ingestion exposure pathways. Furthermore, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No
Machine Pit Sump	MTL-B	Hg TPHCs as Lube Oil	0.23 mg/kg 15,000 mg/kg (2 - 4 feet)	Based on the Phase II program results, remediation is warranted at soil boring location MTL-B. Soil impacted by TPHCs has been identified at the 2 to 4-foot interval bpb. Therefore, soil will be excavated to a depth of at least 6 feet bpb for proper off-site transportation and disposal.	Yes
Chemical Storage Area/Concrete Platform	B-17BA B-17B	PCBs As Cd Cr Cu Hg Ni Zn	130,000 µg/kg (4 - 6 feet) 33.9 mg/kg 15.9 mg/kg 95.4 mg/kg 411 mg/kg 2.8 mg/kg 57.3 mg/kg 1,550 mg/kg (0 - 2 feet)	Based on the Phase II program results, remediation is warranted at the Chemical Storage Area/Concrete Platform. Soil impacted by PCBs and metals has been identified at soil boring locations B-17BA, B-17BN7, B-17BN14, B-17BS7, B-17BS14 and B-17BE7. Therefore, soil will be excavated to varying depths of 2, 8, and 10 feet bgs for proper off-site transportation and disposal.	Yes

Table 4 (continued)
Northrop Grumman Corporation
Plant 12 - Remediation Plan
SITE-SPECIFIC EVALUATION FOR RCRA CORRECTIVE ACTION

Areas of Concern (AOCs)	Boring Location(s)	Constituents of Concern [1]	Maximum Constituent Concentration and Depth [1]	Description	Remediation Recommended
Former Fuel USTs East of Plant 12	B-18B	As TPHCs as #2 Fuel Oil	19.4 mg/kg 602 mg/kg (4 - 6 feet)	Based on the Phase II program results, petroleum impacted soil was identified in soil samples B-18A (6'-8') and B-18B (4'-6'). In addition, "refusal" of the split spoon sampling equipment was experienced at 11 and 12 feet bgs for borings B-18A and B-18B, respectively. Therefore, a UST closure program will be conducted in this area. The area will be excavated to determine whether abandoned USTs or remnants of USTs and/or associated structures are present below the surface. Any impacted soil and concrete will be excavated for proper off-site transportation and disposal.	Yes
Area Outside of Machine Shop	B-19A	1,1,1-TCA CaPAHs As Cr Pb Hg Zn	3,600 µg/kg (2 - 4 feet) 22,800 µg/kg 23 mg/kg 60.2 mg/kg 2,400 mg/kg 1.1 mg/kg 137 mg/kg (0 - 2 feet)	Based on the Phase II program results, the soil in the vicinity of the Area Outside of the Machine Shop is impacted by 1,1,1-TCA, CaPAHs, arsenic, chromium, lead, mercury and zinc. It is noteworthy that the USEPA SSL 1,1,1-TCA, chromium, mercury, and zinc have not been exceeded. Therefore, soil impacted by CaPAHs, arsenic, and lead will be excavated to varying depths of 2 and 4 feet bgs for proper off-site transportation and disposal.	Yes
Sanitary Leaching Pools (North and South)	B-22BA	Cu Hg	149 mg/kg 0.4 mg/kg (8 - 10 feet)	The Phase II sample results indicate that copper and mercury impacted soil extend to a depth of of 8'-10' below grade in the vicinity of boring B-22BA. However, the CTDEP criterion for copper of 2,500 mg/kg and the USEPA SSL for mercury of 23 mg/kg have not been exceeded. It should be noted that former leaching pool B-22B has been backfilled to grade thus virtually eliminating ingestion exposure pathways. In addition, the 10 to 12-foot interval did not exhibit any TAGM exceedances, suggesting that a relatively small volume of soil has been impacted. Furthermore, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No
Sanitary Leaching Pools (North and South)	B-22C	Cr Cu Hg Zn	54.6 mg/kg 959 mg/kg 2.1 mg/kg 96.1 mg/kg (10 - 12 feet)	The Phase II sample results indicate that chromium, copper, mercury, and zinc impacted soil extend to a depth of of 10' - 12' below grade in the vicinity of boring B-22C. However, the proposed criteria listed in Table 3 have not been exceeded. It should be noted that former leaching pool B-22C has been backfilled to grade thus virtually eliminating ingestion exposure pathways. In addition, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No

Table 4 (continued)
Northrop Grumman Corporation
Plant 12 - Remediation Plan
SITE-SPECIFIC EVALUATION FOR RCRA CORRECTIVE ACTION

Areas of Concern (AOCs)	Boring Location(s)	Constituents of Concern [1]	Maximum Constituent Concentration and Depth [1]	Description	Remediation Recommended
Sanitary Leaching Pools (North and South)	B-22E	PCBs Cu Hg Zn	12,000 µg/kg 102 mg/kg 4.1 mg/kg 205 mg/kg (20 - 22 feet)	The Phase II sample results indicate that soil impacted by PCBs, copper, mercury, and zinc extends to a depth of 20'-22' below grade in the vicinity of boring B-22E. However, the proposed criteria listed in Table 3 have not been exceeded. In addition, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No
Sanitary Leaching Pools (North and South)	B-22F	CaPAHs PCBs	26,630 µg/kg 27,000 µg/kg (10 - 12 feet)	Based on the Phase II program results, the soil in the vicinity of the Leaching Pool 22F is impacted by CaPAHs and PCBs. Therefore, soil impacted by CaPAHs and PCBs will be excavated to a depth of 12 feet bgs for proper off-site transportation and disposal. It is important to note that the 12' - 14' interval did not exhibit any TAGM exceedances.	Yes
Anomalous Features/Unknown Buried Structures (North)	B-22GE7	As Hg	50.5 mg/kg 0.62 mg/kg (0 - 2 feet)	The Phase II sample results indicate that arsenic and mercury impacted soil extend to a depth of of 0'-2' below grade in the vicinity of boring B-22GE7. Therefore, impacted soil will be excavated to a depth of 2 feet bgs for proper off-site transportation and disposal.	Yes
Anomalous Features/Unknown Buried Structures (North)	B-22H	CaPAHs As Zn	44,000 µg/kg 35.7 mg/kg 54 mg/kg (0 - 2 feet)	Based on the Phase II program results, the soil in the vicinity of boring B-22H is impacted by CaPAHs, arsenic, and zinc. Therefore, impacted soil will be excavated to a depth of 2 feet bgs for proper off-site transportation and disposal.	Yes
Anomalous Features/Unknown Buried Structures (North)	B-22J	Cr CaPAHs PCBs As Hg Zn	53 mg/kg (2 - 4 feet) 15,020 µg/kg 74,000 µg/kg 17 mg/kg 0.29 mg/kg 60.8 mg/kg (0 - 2 feet)	Based on the Phase II program results, the soil in the vicinity of boring B-22J is primarily impacted by chromium, CaPAHs, PCBs, arsenic, mercury, and zinc. Therefore, impacted soil will be excavated to a depth of 2 feet bgs for proper off-site transportation and disposal.	Yes
Former Trenches to Resin Waste Pit (Sump #1)	B-43AE5	PCBs	19,000 µg/kg (2 - 4 feet)	The Phase II sample results indicate that PCB impacted soil extends to a depth of 2'-4' below grade in the vicinity of boring B-43AE5. However, the proposed criterion for PCBs of 25,000 µg/kg has not been exceeded. In addition, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No

Table 4 (continued)
Northrop Grumman Corporation
Plant 12 - Remediation Plan
SITE-SPECIFIC EVALUATION FOR RCRA CORRECTIVE ACTION

Areas of Concern (AOCs)	Boring Location(s)	Constituents of Concern [1]	Maximum Constituent Concentration and Depth [1]	Description	Remediation Recommended
Dry Well Northeast of Plant 12	B-45A	PCBs Zn	16,000 µg/kg 66.2 mg/kg (4 - 6 feet)	The Phase II sample results indicate that PCB and zinc impacted soil extends to a depth of 4'-6' below grade in the vicinity of boring B-45A. However, the proposed criteria for PCBs and zinc of of 25,000 µg/kg and 23,000 mg/kg, respectively, have not been exceeded. In addition, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No
Center Courtyard Area	B-28A	Cu Hg Zn	167 mg/kg 0.39 mg/kg 1,340 mg/kg (4 - 6 feet)	The Phase II sample results indicate that copper, mercury, and zinc impacted soil extend to a depth of 4'-6' below grade in the vicinity of boring B-28A. However, the proposed criteria listed in Table 3 have not been exceeded. In addition, the 6 to 8-foot interval did not exhibit any TAGM exceedances, suggesting that a relatively small volume of soil has been impacted. Furthermore, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No
Drainage Chamber North Lobby Loading Area	B-30A	CaPAHs Cd Cr Cu Hg Ni Zn	10,070 µg/kg 14.8 mg/kg 76.7 mg/kg 171 mg/kg 2.7 mg/kg 27 mg/kg 741 mg/kg (4 - 6 feet)	Based on the delineation Phase II program results, soil impacted by CaPAHs, cadmium, chromium, copper, mercury, nickel, and zinc has been identified at the 4 to 6-foot interval bgs in the vicinity of boring B-30A. With the exception of CaPAHs, the proposed criteria listed in Table 3 have not been exceeded. It should be noted that the 6 to 8-foot interval did not exhibit any TAGM exceedances, suggesting that a relatively small volume of soil has been impacted. Furthermore, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No
Dry Well in Stairwell Between Megapound and Plant 12A	B-31A	As Cr Cu Hg Ni Zn	20.9 mg/kg 98.6 mg/kg 89.5 mg/kg 1.1 mg/kg 33.7 mg/kg 884 mg/kg (1 - 3 feet)	Based on the delineation Phase II program results, soil impacted by arsenic, chromium, copper, mercury, nickel, and zinc has been identified at the 1 to 3-foot interval bgs in the vicinity of boring B-31A. The proposed criteria listed in Table 3 have not been exceeded. It should be noted that the 5 to 7-foot interval did not exhibit any TAGM exceedances, suggesting that a relatively small volume of soil has been impacted. Furthermore, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No

Table 4 (continued)
Northrop Grumman Corporation
Plant 12 - Remediation Plan
SITE-SPECIFIC EVALUATION FOR RCRA CORRECTIVE ACTION

Areas of Concern (AOCs)	Boring Location(s)	Constituents of Concern [1]	Maximum Constituent Concentration and Depth [1]	Description	Remediation Recommended
Dry Well East of Plant 12A	B-39A	Cu Hg Zn	50.6 mg/kg 0.65 mg/kg 447 mg/kg (6 - 8 feet)	Based on the delineation Phase II program results, soil impacted by copper, mercury and zinc has been identified at the 6 to 8-foot interval bgs in the vicinity of boring B-39A. The proposed criteria listed in Table 3 have not been exceeded. It should be noted that the 10 to 12-foot interval did not exhibit any TAGM exceedances, suggesting that a relatively small volume of soil has been impacted. Furthermore, based on the fate and transport of the constituents detected, groundwater quality has not likely been impacted.	No
Former Drainage Basin	B-37AS8 B-37AA	PCBs Cr PCBs Cr Cu Hg Zn	210,000 µg/kg 100 mg/kg (6 - 8 feet) 150,000 µg/kg 192 mg/kg 712 mg/kg 0.21 mg/kg 144 mg/kg (0 - 2 feet)	Based on the Phase II program results, the soil in the vicinity of the Former Drainage Basin is impacted by PCBs. Therefore, soil impacted by PCBs, will be excavated to varying depths of 2, 6 and 10 feet bgs for proper off-site transportation and disposal.	Yes
Petroleum/Chemical Storage Areas	PCS-AN8	CaPAHs	11,250 µg/kg (4 - 6 feet)	Based on the Phase II program results, the soil in the vicinity of Petroleum Storage Area A is impacted by CaPAHs. Therefore, soil impacted by CaPAHs, will be excavated to varying depths of 2, 4 and 8 feet bgs for proper off-site transportation and disposal.	Yes
Petroleum/Chemical Storage Areas	PCS-GA	CaPAHs	17,630 µg/kg (0 - 2 feet)	Based on the Phase II program results, the soil in the vicinity of Petroleum Storage Area G is impacted by CaPAHs. Therefore, soil impacted by CaPAHs, will be excavated to varying depths of 2 and 6 feet bgs for proper off-site transportation and disposal.	Yes

Notes:
bpb: Below pit bottom.
bgs: Below ground surface.
CaPAHs: Carcinogenic Polycyclic Aromatic Hydrocarbons

1. Based on the initial screening of the Phase II data to the values presented in Table 1 of this document.

Table 5
Northrop Grumman Corporation
Plant 12 - Remediation Plan
SUMMARY OF REMEDIAL ACTIVITIES

Areas of Concern (AOCs)	Boring Location(s)	Area of Excavation	Depth of Excavation	Endpoint Sample Analysis	Endpoint Analysis Method
Machine Pit Sump	MTL-B	15' x 20'	6' bpb	STARS Table 2 total VOCs/SVOCs and by TCLP	8021/8270
Chemical Storage Area/Concrete Platform	B-17B	14' x 14' 14' x 14' 12' x 14'	2' bgs 6' bgs 8' bgs	Arsenic PCBs	6010 8081
Former Fuel USTs East of Plant 12 (1)	B-18B	30' x 35'	14' bgs	STARS Table 2 total VOCs/SVOCs and by TCLP	8021/8270
Area Outside of Machine Shop	B-19A	16' x 12' 16' x 14'	4' bgs 2' bgs	CaPAHs, RCRA Metals, and 1,1,1-TCA	8270 6010/8260
Sanitary Leaching Pools (North and South)	B-22F	12' diameter	9' - 12' bgs	N/A	N/A
Anomalous Features/Unknown Buried Structures (North)	B-22G	16' x 30'	2' bgs	N/A	N/A
Anomalous Features/Unknown Buried Structures (North)	B-22H	28' x 27'	2' bgs	N/A	N/A
Anomalous Features/Unknown Buried Structures (North)	B-22J	28' x 35'	2' bgs	N/A	N/A
Former Drainage Basin	B-37	8' x 11' ≈ 22' x 22' ≈ 29' x 29'	6' bgs 2' bgs 10' bgs	PCBs	8081
Petroleum/Chemical Storage Areas	PCS-A	31' x 13' 17' x 10' 17' x 9' 17' x 10'	8' bgs 4' bgs 2' bgs 4' bgs	STARS Table 2 total VOCs/SVOCs and by TCLP	8021/8270
Petroleum/Chemical Storage Areas	PCS-G	21' x 17' 11' x 7'	2' bgs 6' bgs	STARS Table 2 total VOCs/SVOCs and by TCLP	8021/8270

Notes:

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N/A: Not Applicable

1. An underground storage tank closure will be conducted. The area will be excavated to determine whether abandoned USTs or remnants of USTs and/or associated structures are present below the surface. Any impacted soil and concrete will be excavated for proper off-site transportation and disposal