US Army Corps
of Engineers

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REMEDIAL INVESTIGATION, FINAL REPORT

FORT TOTTEN COAST GUARD STATION
QUEENS, NEW YORK

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EXECUTIVE SUMMARY

Fort Totten occupies approximately 147 acres on Little Bay at the mouth of the East River in Bayside, New York. It is located approximately 20 miles east of Manhattan. In 1968, the Department of the Army conveyed 9.6 acres of the northwestern portion of the Fort to the U.S. Coast Guard. The portion of Fort Totten covered in this report is only this 9.6 acres, which comprise 15 buildings and a pier. During the period that the Army owned the property, mercury was handled in Building 615, pesticides were stored in Buildings 619 and 624, and transformers containing polychlorinated biphenyls (PCBs) were used.

Since 1997, the U.S. Army Corps of Engineers (USACE) has spent more than $1.3 million to investigate and clean up the Fort Totten Coast Guard Station under the Formerly Used Defense Sites (FUDS) Program. During earlier investigations of the site, mercury was discovered in the floor drains of Building 615 and the sediment of Little Bay. Concentrations of some metals and organic compounds in the soil and groundwater in upland areas exceeded cleanup objectives of the New York State Department of Environmental Conservation (NYSDEC). Therefore, USACE conducted a remedial investigation of the site in two phases. This report discusses the results of those investigations.

USACE collected and analyzed 92 soil samples from 70 different locations in upland areas of the Coast Guard Station. In soil, concentrations of 4 metals (arsenic, cadmium, chromium, and mercury) and some semivolatile organic compounds occasionally exceeded NYSDEC’s cleanup objectives. No significant levels of pesticides or PCBs were detected in the soil. Aluminum, antimony, iron, sodium, and some organic compounds were detected in the groundwater at concentrations exceeding NYSDEC’s drinking water levels; however, the groundwater is not used for drinking water.

In Little Bay, USACE collected sediment samples at 131 locations and analyzed more than 400 samples. Sediment samples were collected to a depth of 10 feet (ft) at some locations. While most sediment samples came from areas within 400 ft of the shoreline, two locations 800 ft from the shore were sampled. Other possible contaminants were investigated, but mercury was the principal contaminant of concern. The exposure point concentration of mercury in the shallow sediments is 0.38 parts per million (ppm). Mercury concentrations tended to increase with depth to a depth of 5-8 ft, where the average concentration of mercury exceeded 2 ppm. At one location, a subsurface sample contained 5.25 ppm of mercury. The levels of mercury in Little Bay were not substantially higher than the concentrations of mercury in sediment in other portions of Long Island Sound and New York Harbor; this suggests that substantial quantities of mercury were not released from Building 615 into the Bay.

Eighteen (18) water samples from Little Bay were also analyzed. Both filtered and unfiltered samples were collected. Mercury was not detected in the filtered samples, but was detected in 5 of the 12 unfiltered samples. The exposure point concentration for mercury in surface water is 0.27 parts per billion (ppb), which is less than the NYDEC ambient drinking water quality criterion of 0.7 ppb.

USACE also investigated biota in Little Bay. Five (5) mussel, 10 oyster, 5 blue crab, 10 mummichog, 5 striped bass, and 10 flounder samples were analyzed for mercury. Significant concentrations of mercury were only observed in 2 samples. Both samples were flounder filets with a mercury concentration of 0.27 ppm. This concentration is slightly higher than the average concentration (0.19 ppm) of mercury observed in flounder caught in Long Island Sound and New York Harbor. Little Bay sediment also was tested to determine whether it is toxic to benthic organisms, *Leptocheirus plumulosus*, which live in the sediment. The survival, growth, and reproduction of *L. plumulosus* in Little Bay sediment samples were comparable to the laboratory control and reference control samples.

The data were used to complete human health and ecological risk assessments for Little Bay and the upland areas at Fort Totten. The chemicals in the soil at the upland areas do not pose a significant cancer or non-cancer health risk. Metals, VOC and SVOC have been detected in monitoring wells. The human health risk assessment showed high levels of risk to future residential adults and children using this groundwater as a water supply. The human health assessment for Little Bay concluded that mercury in the water does not pose a human health risk. Mercury in the sediment poses a slight risk from direct contact, but no adverse human health effects are expected to result from exposure to the sediment. Similarly, mercury ingested by eating fish from Little Bay poses a slight risk, but again no adverse health effects are expected to result from this exposure. The cumulative impacts from all exposures to water, sediment, and fish from Little Bay may pose an adverse health risk. The hazard index for Little Bay is 1.2, which means that extended contact with the sediment of the Bay and consumption of fish and water from it on a regular basis, may present potential adverse health effects. However, given the conservative nature of the risk assessment and its tendency to over-predict health effects, USACE feels that the mercury in Little Bay does not pose a significant risk to human health.

While the concentration of mercury in fish does not pose a hazard, it is the largest contributor to the hazard index. The risk assessment for ingestion of fish is based upon the maximum concentration of mercury that was observed in 2 of 10 flounder samples. For all practical purpose, mercury was not detected in the other flounder and striped bass samples that were analyzed. The concentration of mercury in the fish that is producing the risk, 0.27 ppm, is almost four times lower than the concentration of mercury that is the U.S. Food and Drug Administration's (USFDA's) limit for human consumption, 1 ppm. USFDA suggests that you should eat only 7 ounces of fish per week if it contains 1 ppm of mercury and 14 ounces of fish with 0.5 ppm of mercury. Therefore, you could safely eat each week 28 ounces of the flounder with the highest level of mercury. Moreover, scientists disagree about mercury's toxicity. Toxicity data for mercury from the U.S. Environmental Protection Agency was used in the risk assessment. If USFDA data or data from the Department of Health and Human Services' Agency for Toxic Substances and Disease Registry were used, the risk of eating fish would be significantly smaller and the hazard index for the Bay would be less than 1. Therefore, the mercury in Little Bay does not pose a significant health risk.

Ecological risk assessments were completed for the aquatic and shoreline areas proximate to Building 615 and Little Bay (mercury only), and upland areas designated as fill, other, and pesticide areas. Based on evaluation of mercury concentrations in oyster, mussel, crab, and fish tissue, and sediment toxicity tests, it was concluded that mercury posed no risk in the aquatic environment of Little Bay. Based on the results of the ecological risk screening in the upland area, USACE, NYDEC, and the public concluded, as part of the Scientific Management Decision Point process, that further refinement of the identified hazards in the upland area was unwarranted. Further refinement of the identified hazards was unnecessary because of the conservative nature of the screening assessment, which overestimated exposure and hazards to the selected receptors.

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LIST OF ACRONYMS AND ABBREVIATIONS

µg	Microgram(s)
µm	Micrometer(s)
ABS	Absorption Factors
ADI	Average Daily Intake
ARARs	Applicable or Relevant and Appropriate Requirements
ASTM	American Society for Testing and Materials
AT	Averaging Time
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
BAF	Bioaccumulation Factor
BGS	Below Ground Surface
BRAC	Base Realignment and Closure
BW	Body Weight
°C	Degrees Celsius
CARP	Contaminant Assessment and Reduction Project
CCC	Criterion Continuous Concentration
CDC	Centers for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act of 1980
CFR	Code of Federal Regulations
cm	Centimeter(s)
CMC	Criterion Maximum Concentration
CNS	Central Nervous System
COPC	Constituent of Potential Concern
CRDL	Contract-Required Detection Limit
CSM	Conceptual Site Model
DERP-FUDS	Defense Environmental Restoration Program for Formerly Used Defense Sites
dL	Deciliter(s)
DoD	Department of Defense
ED	Exposure Duration
EEC	Estimated Environmental Exposure Concentration
EP Tox	Extraction Procedure Toxicity
EPC	Exposure Point Concentration
ER-L	Effects Range–Low
ER-M	Effects Range–Medium
ERA	Ecological Risk Assessment
ESL	Ecological Screening Level
°F	Degrees Fahrenheit
FR	Federal Register
ft	Foot or Feet
FTRA	Fort Totten Reuse Authority
g	Gram(s)
GMS	Groundwater Modeling System
HEAST	Health Effects Assessment Summary Tables
Hg	Mercury

HHRA	Human Health Risk Assessment
HI	Hazard Index
HOK	Hellmuth, Obata, & Kassabaum
HQ	Hazard Quotient
hr	Hour(s)
HTRW	Hazardous, Toxic, and Radioactive Waste
IDL	Instrument Detection Limit
idw	Inverse Distance Weighted
IEUBK	Integrated Exposure Uptake Biokinetic
in.	Inch(es)
IR	Intake Rate
IRIS	Integrated Risk Information System
kg	Kilogram(s)
L	Liter(s)
LADI	Lifetime Average Daily Intake
lb	Pound(s)
LOAEL	Lowest Observed Adverse Effects Level
m	Meter(s)
mg	Milligram(s)
mm	Millimeter(s)
mph	Miles Per Hour
MRL	Minimal Risk Level
MSL	Mean Sea Level
NAPL	Non-Aqueous Phase Liquid
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effects Level
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
ORNL	Oak Ridge National Laboratory
OSWER	Office of Solid Waste and Emergency Response
PAH	Polycyclic Aromatic Hydrocarbon
PCBs	Polychlorinated Biphenyls
PCP	Pentachlorophenol
ppm	Parts Per Million
ppt	Parts Per Thousand
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study

RME	Reasonable Maximum Exposure
ROC	Receptor of Concern
RPD	Relative Precision Difference
SARA	Superfund Amendments and Reauthorization Act
SF	Slope Factor
SI	Site Investigation
SMDP	Scientific Management Decision Point
SQL	Sample Quantitation Limit
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
TBC	To-Be-Considered
TDI	Tolerable Daily Intake
TEF	Toxic Equivalency Factor
TOC	Total Organic Carbon
TOGS	Technical and Operational Guidance Series
TRPH	Total Recoverable Petroleum Hydrocarbons
TRV	Toxicity Reference Value
TRW	Technical Review Workgroup
U.S.C.	United States Code
UCL	Upper Confidence Limit
UCLM	Upper Confidence Limit on the Mean
UF	Uncertainty Factor
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WHO	World Health Organization

1.0 INTRODUCTION

1.1 PURPOSE OF REPORT

The U.S. Army Corps of Engineers (USACE) has been tasked with the performance of a Remedial Investigation (RI) for the Fort Totten Coast Guard Station in Queens, New York. This action comes under the authority of the Defense Environmental Restoration Program for Formerly Used Defense Sites (DERP-FUDS). Authority for DERP-FUDS is derived from the following laws: The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); PL 96-510 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986; PL99-499 (codified as 42 U.S.C. 9601-9675); and Environmental Restoration Program, 10 U.S.C. 2701-2707.

The Fort Totten Coast Guard Station DERP-FUDS site number is C02NY0057. The objective of DERP-FUDS is to give the Department of Defense (DoD) authority to clean up hazardous substances released from formerly used DoD properties, as long as the source was not disturbed or used by a subsequent occupant of the site. Several soil, sediment, and groundwater investigations have been conducted at the Fort Totten Coast Guard Station to determine the nature and extent of contamination. This report summarizes and evaluates the results, performs a quantitative risk assessment, and provides conclusions as to whether or not further hazardous, toxic, and radioactive waste (HTRW) remedial efforts are necessary.

1.2 BACKGROUND

1.2.1 Site Description

The Fort Totten Coast Guard Station is located in northeast Queens County, Long Island, New York. The facility is situated on a peninsula extending out into Little Neck Bay. A general site location is shown in Figure 1-1, and a map of the Fort Totten Installation (Army and Coast Guard) is presented in Figure 1-2.

1.2.2 Site History

DoD acquired Fort Totten, a 146.75-acre property, between 1857 and 1943, for the coastal defense of Long Island Sound and the eastern entrance to the East River. Fort Totten also served as a post-Civil War hospital, an engineering school, and a training site for West Point Cadets. It is currently the Headquarters for the 77th Army Reserve Command. The Department of the Army conveyed

9.60 acres of the property to the U.S. Coast Guard (USCG), while still retaining ownership of the remaining 137.15 acres. This DERP-FUDS project is limited to the excessed portion (9.60 acres) of Fort Totten presently owned by the U.S. Coast Guard.

1.2.3 Previous Investigations

USACE commissioned the first Site Investigation of the Coast Guard Station in 1988. This investigation was conducted by Metcalf & Eddy. Sampling locations are shown in Figure 1-3. The Metcalf & Eddy Site Investigation analyzed eight shallow [6 inches (in.) below ground surface (BGS)] soil samples. Several of the Metcalf & Eddy surface soil samples exceeded 0.1 mg/kg for mercury. The highest detection was at Surface Soil Sample 7, east of Building 611, where mercury was detected at 1.2 mg/kg. The results of the Metcalf & Eddy Site Investigation are presented in Table 1-1.

Two soil samples were collected near Buildings 609 and 625 and analyzed for polychlorinated biphenyls (PCBs) because of the proximity of two electrical transformers. PCBs were not detected in the two samples collected at these areas. The results are presented in Table 1-2. A total of four wipe samples were taken from Buildings 619 and 624, two rooms per building. These rooms were known to be pesticide storage rooms. The samples contained DDT and its breakdown products. The results are presented in Table 1-3.

The 1988 Metcalf & Eddy Site Investigation also installed five monitoring wells. Although most total metal concentrations were below New York State groundwater standards, chromium and lead concentrations in MW-2 and MW-4 exceeded these. It is possible that the samples contained some sediment. It is not known whether the samples were filtered or unfiltered. The results of the 1988 Metcalf & Eddy Site Investigation are in Table 1-4.

Sediment sampling for volatile organic compounds, metal, and petroleum hydrocarbons was conducted in the Bay along the seawall at the U.S. Coast Guard Station. Three samples were collected at 100-foot (ft) intervals between the pier and the back of Building 615 to detect potential contaminant migration from shore. The results are in Table 1-5.

The Fill Area was created when the Army placed some excavated soil in a low spot of the recreation field to eliminate periods of standing water. The soil came from Buildings 118, 119, and 121, former and existing vehicle maintenance shops, on the Army-owned portion of Fort Totten. Parts of those buildings' parking lots were being excavated.

In June and July 1992, then Resident Engineer Donald P. Braun ordered four Fill Area surface soil samples analyzed for Total Recoverable Petroleum Hydrocarbons (TRPH) and mercury by Extraction Procedure Toxicity (EP Tox). No mercury was detected, but the TRPH concentration ranged from 193 to 695 mg/kg, probably because of the source of the Fill Area soil. The results are presented in Table 1-6.

The final investigation previous to the RI was in the baseball field next to the Fill Area. The Coast Guard collected samples from five locations (first, second, and third bases, home plate and the pitcher's mound) at three depths per location (0-1 in., 1-3 in., and 3- 6 in. BGS). The results were provided to the New York State Department of Health who concluded that the levels of contamination at the baseball field were not a health threat to the playground users.

Building 615 was originally used as a torpedo and mine repair facility. The armaments contained mercury in their guidance systems, and when repair required removal of the mercury, it was disposed of through the floor drains. Various studies starting in 1986 have analyzed the mercury contamination in Building 615 and its outfall in the adjacent bay sediments. Sampling locations are shown in Figures 1-4 and 1-5 and sample results are presented in Tables 1-7 through 1-11.

Previous studies have shown mercury contamination around Building 615 in the Bay. Levels of mercury in surrounding land and in upgradient monitoring wells were low or non-existent. The mercury contamination in the soil and sediments varied from non-detect to 2.1 mg/kg. Also, one sediment sample, from the sump of the floor drain of Building 615, contained 20-23 percent mercury. The sump sediments were removed. The drain pipes of Building 615 were also sampled and removed. Six wipe samples were analyzed from the wall in the drain pipe area during the initial phase of the RI. The results are presented in Table 1-12.

Under Phase 1 of the RI, USACE sampled Little Bay marine sediments, surface water, and biota, in January 1998. Phase 1 upland sampling was performed in August 1998. In Phase 1, soil borings were excavated to groundwater level in the Fill Area and near the locations of the Metcalf & Eddy (1988)[1] surface soil samples. Soil samples were taken from near the surface and at the water table. The results are presented in Tables 1-13 through 1-15. Buildings 619 and 624 pesticide contamination was investigated with wipe sampling of the walls and six surface soil samples around Building 624. RI Phase 1 pesticide wipe and surface soil results are presented in Tables 1-16 through 1-18. Six wipe samples of the walls of Building 615 were analyzed for mercury. RI Phase I mercury wipe sample results are presented in Table 1-12. Filtered and unfiltered samples were collected from the five existing monitoring wells. RI Phase I groundwater filtered and unfiltered results are in Tables 1-19 through 1-21.

Phase 1 results were such that additional sampling was required to characterize the environmental and public health hazards at the Coast Guard Station and off-shore in Little Bay.

See Appendix B for New York/New Jersey Harbor sediment studies.

1.2.4 Project Objectives

The project objectives for the RI at Fort Totten are as follows:

1. Surface soil, sediment, groundwater, surface water, toxicity and biota sampling sufficient to develop a risk assessment of the upland and Little Bay portions of Fort Totten. This will include sampling at each of the six areas of concern: (1) Fill Area; (2) heavy metals levels for arsenic, cadmium, chromium, and mercury in the soil near previous soil boring and surface soil samples; (3) pesticide contamination around Building and 624; (4) possible PCB contamination around Buildings 609 and 625; (5) monitoring wells; and (6) mercury contamination in Little Bay marine sediments.

2. Determine the physical, chemical and toxicological characteristics of the wastes.

3. Evaluate fate and transport pathways.

4. Define current and future routes of exposure.

5. Characterize risk to current and future exposed human and biotic populations.

6. Determine whether contaminant distribution is consistent with DoD activities or other parties.

7. Assess the hazards/risks posed by any contamination present and provide recommendations for further HTRW remedial efforts.

1.2.5 Potential Applicable or Relevant and Appropriate Requirements

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[1] Note: Literature cited throughout the text of this RI is presented in Chapter 10.0, “Literature Cited”; a bibliography of

The National Contingency Plan (NCP) (see NCP 300.430[e]) specifies that onsite Superfund remedial actions must attain federal standards, requirements, criteria, limitations, or more stringent state standards determined to be legally applicable or relevant and appropriate requirements (ARARs) to the circumstances at a given site. Such ARARs are identified during the remedial investigation/feasibility study (RI/FS) and at other stages in the remedy selection process. To be applicable, a state or federal requirement must directly and fully address the hazardous substance, the action being taken, or other circumstance at a site. A requirement that is not applicable may be relevant and appropriate if it addresses problems or pertains to circumstances similar to those encountered at a site. While legally applicable requirements must be attained, compliance with relevant and appropriate requirements is based on the discretion of the lead agency. The scope and extent of ARARs that may apply to a response action will vary depending on where remedial activities take place.

For onsite response activities, CERCLA does not require compliance with administrative requirements of other laws. CERCLA requires compliance with only the substantive elements of other laws, such as chemical concentration limits, monitoring requirements, or design and operating standards for waste management units for onsite activities. Administrative requirements, such as permits, reports, and records, along with substantive requirements, apply only to hazardous substances sent offsite for further management. The extent to which any type of ARAR may apply also depends upon where response activities take place. Applicable requirements are universally applicable, while relevant and appropriate requirements only affect onsite response activities. Many federal statutes and their accompanying regulations contain standards that may be applicable or relevant and appropriate at various stages of a response action.

Laws and requirements enforced by agencies other than the U.S. Environmental Protection Agency (USEPA) may also be applicable or relevant and appropriate at a site. During onsite response actions, ARARs may be waived under certain circumstances. A state ARAR may be waived if evidence exists that the requirement has not been applied to other sites [National Priorities List (NPL) or non-NPL] or has been applied variably or inconsistently. This waiver is intended to prevent unjustified or unreasonable state restrictions from being imposed at CERCLA sites. In other cases, the response may incorporate environmental policies or proposals that are not applicable or relevant and appropriate, but do address site- specific concerns. Such to-be-considered (TBC) standards may be used in determining the cleanup levels necessary for protection of human health and the environment. ARARs must be identified on a site-by-site basis. Features such as the

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documents used to compile the RI is included in Appendix A.

chemicals present, the location, the physical features, and the actions being considered as remedies at a given site will determine which standards must be heeded. The lead and support agencies [i.e., USACE and the New York State Department of Environmental Conservation (NYDEC)] are responsible for the identification of ARARs.

ARARs are used in conjunction with risk-based goals to govern response activities and to establish cleanup goals. ARARs are often used as the starting point for determining protectiveness. When ARARs are absent or are not sufficiently protective, USEPA uses data collected from the baseline risk assessment to determine cleanup levels. ARARs thus lend structure to the response process, but do not supplant USACE's responsibility to reduce the risk posed to an acceptable level. Determining exactly which laws and regulations will affect a response is somewhat different than determining the impact of laws and regulations on activities that take place outside the boundaries of a Superfund site. For instance, for onsite activities, CERCLA requires compliance with both directly applicable requirements (i.e., those that would apply to a given circumstance at any site or facility) and those that are deemed relevant and appropriate (even though they do not apply directly), based on the unique conditions at a Superfund site.

CERCLA, in addition to incorporating applicable environmental laws and regulations into the response process, requires compliance with other relevant and appropriate standards which serve to further reduce the risk posed by a hazardous material at a site. Relevant requirements are those cleanup standards, standards of control, or other substantive environmental provisions that do not directly and fully address site conditions, but address similar situations or problems to those encountered at a Superfund site. Resource Conservation and Recovery Act (RCRA) landfill design standards could, for example, be relevant to a landfill used at a site, if the wastes being disposed of were similar to RCRA hazardous wastes. Whether or not a requirement is appropriate (in addition to being relevant) will vary depending on factors such as the duration of the response action, the form or concentration of the chemicals present, the nature of the release, the availability of other standards that more directly match the circumstances at the site, and other factors [Section 300.400(g)(2)]. In some cases only a portion of the requirement may be relevant and appropriate. The identification of relevant and appropriate requirements is a two step process; only those requirements that are considered both relevant and appropriate must be addressed at CERCLA sites.

Environmental laws and regulations generally fit into three categories: (1) those that pertain to the management of certain chemicals; (2) those that restrict activities at a given location; and (3) those that control specific actions. There are, therefore, three primary types of ARARs. Chemical-specific ARARs are usually health- or risk-based restrictions on the amount or concentration of a chemical that may be found in or discharged to the environment. Location-specific ARARs prevent damage to unique or sensitive areas, such as floodplains, historic places, wetlands, and fragile ecosystems, and restrict other activities that are potentially harmful because of where they take place. Action-specific ARARs control remedial activities involving the design or use of certain equipment, or regulate discrete actions. Since remedial or removal actions are not yet being evaluated at this stage of the investigation, the primary focus of this task was to identify chemical- and location-specific ARARs. Action-specific requirements will be identified at a later date.

The types of legal requirements applying to responses will differ to some extent depending upon whether the activity in question takes place onsite or offsite (the term “onsite” includes not only the contaminated area at the site, but also all areas in close proximity to the contamination necessary for implementation of the response action). Remedial actions must comply with all substantive requirements that are “applicable” or “relevant and appropriate.” Offsite, compliance is required only with applicable requirements, but both substantive and administrative compliance are necessary. Thus, compliance onsite is broader in some respects, and narrower in others, than would be required where similar actions were conducted outside the CERCLA context (e.g., if a private party were doing an entirely voluntary cleanup on its own property). Onsite compliance is broadened by the need to comply with “relevant and appropriate” as well as “applicable” requirements. Activities conducted onsite would have to comply with all ARARs; those conducted offsite would have to comply only with applicable requirements. Congress limited the scope of the obligation to attain administrative ARARs through CERCLA Section 121(e), which states that no federal, state, or local permits are required for onsite Superfund response actions. The lack of permitting authority does not impede implementation of an environmentally protective remedy, since CERCLA and the NCP already provide a procedural blueprint for responding to the release or threatened release of a hazardous substance into the environment. Only the substantive elements of other laws affect onsite responses.

Applicable requirements are those cleanup standards, controls, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, or contaminant, remedial action, location, or other circumstance at a Superfund site [Section 300.400(g)]. Basically, to be applicable, a requirement must directly and fully address a CERCLA activity. Determining which standards will be applicable to a Superfund response is similar to determining the applicability of any law or regulation to any chemical, action, or location. USACE has examined federal and state statutes and regulations to identify those that directly govern response activities and summarize them in Table 1-22.

1.2.5.1 To-Be-Considered Guidelines and Other Controls

Conditions vary widely from site to site; thus, ARARs alone may not adequately protect human health and the environment. When ARARs are not fully protective, the lead agent may implement other federal or state policies, guidelines, or proposed rules capable of reducing the risks posed by a site. Such TBC guidelines, while not legally binding (since they have not been promulgated), may be used in conjunction with ARARs to achieve an acceptable level of risk. TBCs are evaluated along with ARARs as part of the RI/FS conducted for each site to set protective cleanup levels and goals. Proposed concentration-based action levels under RCRA could, for instance, be used as TBC guidelines to trigger treatment of soils contaminated with hazardous wastes. Because TBCs are not potential ARARs, their identification is not mandatory.

USACE has examined federal and state guidance documents to identify those that directly relate to response activities and summarize them in Table 1-22.

Potential To-Be Considered Guidelines:

- Technical Guidance for Screening Contaminated Sediments, NYDEC, Division of Fish, Wildlife, and Marine Resources, January 1999.

- Determination of Soil Cleanup Objectives and Cleanup Levels, NYDEC, Technical Assistance Guidance Memorandum (TAGM) HWR-94-4046 (revised).

- National Ambient Water Quality Criteria, 63 FR 68354.

- Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, NYSDEC Division of Water, 1998.

1.3 REPORT ORGANIZATION

- Chapter 1, Introduction – Outlines the purpose and objectives of the RI, provides background information about Fort Totten, summarizes previous investigation, and discusses potential regulations to be considered.

- Chapter 2, Physical Characteristics of the Study Area – Provides an overview of the location, topography, climate, geology, hydrogeology, demography, land use, and general ecology.

- Chapter 3, Study Area Investigation – Summarizes the field investigations undertaken in RI Phases 1 and 2.

- Chapter 4, Nature and Extent of Contamination – Presents RI Phase 1 and 2 results, and discusses nature and extent of contamination at the site.

- Chapter 5, Human Health Risk Assessment for Little Bay – Presents the baseline human health risk assessment for the shoreline and Little Bay.

- Chapter 6 Human Health Risk Assessment for Upland Areas – Presents the baseline human health risk assessment for the upland areas.

- Chapter 7 Ecological Risk Assessment for Little Bay – Presents the screening level evaluation of impacts to the aquatic environment.

- Chapter 8 Ecological Risk Assessment for Upland Areas – Presents the screening level evaluation of impacts to the environment for terrestrial areas.

- Chapter 9, Conclusions and Recommendations – Summarizes the findings, concludes the assessments, and recommends future action if warranted.

- Chapter 10, Literature Cited – Provides a list of literature cited throughout the text of the RI.

TABLE 1-1 RESULTS OF METCALF & EDDY SITE INVESTIGATION SURFACE SOIL SAMPLING FOR VOLATILES, SEMIVOLATILES, AND METALS AT FORT TOTTEN COAST GUARD STATION

Sample ID		**S-1**	**S-2**	**S-3**	**S-4**	**S-5**	**S-6**	**S-7**	**S-8**
	NYSDEC	2332-320	2332-321	2332-322	2332-323	2332-324	2332-325	2332-326	2332-327
Volatile Organics	**TAGM (ug/kg)**	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
Methylene Chloride	100	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Toluene	1500	< 500	< 500	< 500	< 500	< 500	< 500	< 500	< 500
Semi-volatile Organics									
Fluoranthene	50000	< 300	2,000	TRACE	< 300	TRACE	700	< 300	400
Pyrene	50000	< 300	1,700	TRACE	< 300	< 300	400	< 300	TRACE
Benzo(a)Anthracene	224 or MDL	< 300	1,300	< 300	< 300	< 300	TRACE	< 300	< 300
Chrysene	400	< 300	1,000	< 300	< 300	< 300	TRACE	< 300	< 300
Bis(2-Ethylhexyl)Phthalate	50000		700	1,500	1,400	1,700	1,300	1,500	1,000
Benzo(b)Fluoranthene	1100	< 300	2,100	< 300	< 300	TRACE	700	< 300	< 300
Benzo(a)Pyrene	61 or MDL	< 300	1,400	< 300	< 300	< 300	700	< 300	< 300
Indeno(1,2,3-cd)Pyrene	3200	< 300	600	< 300	< 300	< 300	< 300	< 300	< 300
Benzo(g,h,i)Perylene	50000	< 300	700	< 300	< 300	< 300	< 300	< 300	< 300
Total Metals									
Silver	Site Bkgd	< 1,000	< 1,100	< 1,100	< 1,000	< 1,000	< 1,000	< 1,000	4,500
Arsenic	7500 or SB	19,000	11,000	15,000	4,900	8,600	13,000	28,000	2,700
Barium	300000 or SB	94,000	88,000	76,000	69,000	58,000	100,000	57,000	16,000
Cadmium	1000 or SB	< 700	< 500	530	< 500	< 500	1,200	600	< 806
Chromium	10000 or SB	39,000	22,000	32,000	11,000	12,000	28,000	27,000	8,600
Mercury	100.0	97	148	420	830	740	390	1,200	78
Lead	SB (400000)	48,000	100,000	89,000	100,000	250,000	140,000	45,000	57,000
Selenium	2000 or SB	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000	< 1,000

TABLE 1-2 RESULTS OF METCALF & EDDY SITE INVESTIGATION SURFACE SOIL SAMPLING FOR PCBs AT FORT TOTTEN COAST GUARD STATION

Sample ID	**NYSDEC**	**S-11**	**S-12**
PCBs	**TAGM** (ug/kg)	2332-330 ug/kg*	2332-331 ug/kg*
PCB-1242	1000	< 80	< 80
PCB-1254	1000	< 160	<160
PCB-1221	1000	< 80	< 80
PCB-1232	1000	< 80	< 80
PCB-1248	1000	< 80	< 80
PCB-1260	1000	< 160	<160
PCB-1016	1000	< 80	< 80

* dry wt. basis

TABLE 1-3 RESULTS OF METCALF & EDDY SITE INVESTIGATION WIPE SAMPLES FOR PESTICIDES AT FORT TOTTEN COAST GUARD STATION

	Wipe # 1		**Wipe # 2**		**Wipe # 3**		**Wipe # 4**	
Sample ID	**2332-350**		**2332-351**		**2332-352**		**2332-353**	
	Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit	Concentration	Reporting Limit
Pesticides	mg/wipe		mg/wipe		mg/wipe		mg/wipe	
4,4' - DDT	4.2	0.01	1.7	0.01	3.2	0.01	4.1	0.01
4,4' - DDE	1.1	0.01	0.29	0.01	0.05	0.01	0.2	0.01
4,4' - DDD	0.69	0.01	0.42	0.01	0.53	0.01	0.8	0.01

TABLE 1-4 RESULTS OF METCALF & EDDY SITE INVESTIGATION GROUNDWATER SAMPLING FOR VOLATILES, SEMIVOLATILES, AND METALS AT FORT TOTTEN COAST GUARD STATION

Sample ID	**NYSDEC TOG 1.1.1**	**NYSDEC Part 5**	**NYSDEC 703.5**	**MW-1 2332-301**	**MW-2 2332-302**	**MW-3 2332-303**	**MW-4 2332-304**	**MW-5 2332-305**	**NYS GW Standards (3)**	**National Primary Drinking Water Regulations**	
	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	MCLG (1) (ug/L)	MCL (2) (ug/L)
Volatiles	**5**	**No Standard**	**5**	ND	ND	ND	ND	ND	-	-	-
Semivolatile											
Bis(2-ethylhexyl)phthalate	5	No Standard	5	**120**	**120**	**170**	**120**	**120**	4,200	-	-
Total Metals											
Arsenic	25	50	50	< 10	16	< 10	< 10	< 10	25	50	50
Barium	1000	2000	1000	200	230	< 100	150	< 100	1,000	1,500	-
Chromium	50	100	50	31	**97**	32	**72**	< 25	50	120	50
Lead	25	No Standard	25	7	**30**	7	**330**	< 5	25	20	50

ND - Not Detected

(1) - MCLG - Maximum Contaminant level goal; propose values taken from 50 Federal Register 46936

(2) - Maximum contaminant level; interim guidance levels.

(3) - Water Quality Regulations, New York State Department of Conservation 11/29/84 and Environmental 8/31/78

TABLE 1-5 RESULTS OF METCALF & EDDY SITE INVESTIGATION SEDIMENT SAMPLING FOR VOLATILES, METALS, AND PETROLEUM HYDROCARBONS AT FORT TOTTEN COAST GUARD STATION

Sample ID	**NYSDEC** **Effects Range-Low**	**NYSDEC** **Effects Range-Medium**	Sed-1 **2332-341**	Sed-2 **2332-342**	Sed-3 **2332-343**
	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg
VOC			ND	ND	ND
Total Metals					
Arsenic	8200.0	70000	4,900	5,000	2,800
Barium	No standard	No standard	< 10,000	18,000	10,000
Chromium	81000	370000	13,000	19,000	12,000
Mercury	150.00	710.00	270	200	1,500
Lead	46700.0	218000	210,000	225,000	270,000
Petroleum Hydrocarbons			220,000	280,000	150,000

ND - Not Detected

TABLE 1-6 RESULTS OF JULY 1992 SURFACE SOIL SAMPLING IN THE FILL AREA FOR PETROLEUM HYDROCARBONS AND MERCURY AT FORT TOTTEN COAST GUARD STATION

Sample #	Sample Locations	Method Detection Limit	Total Recovery Hydrocarbons Conc. (ppm)	Mercury Conc. (ppm)	EPA Max Contaminant Level for Hg (mg/L)
1	Fill Pile North of Building	1	519	< 0.05	0.2
2	Building 505 East of Ball Field	1	695	< 0.05	0.2
3	North Side of North Lake Road	1	485	< 0.05	0.2
4	East Side of Shore Road Opposite Building 511	1	193	< 0.05	0.2

CHEMICAL	NYSDEC	Units	Concentrations
Mercury	Effects Range-Low	ug/g	0.15
	Effects Range-Medium	ug/g	0.71

TABLE 1-7 RESULTS OF FEBRUARY 1986 SEDIMENT SAMPLING FOR TRACE METALS AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

Metals	**Sample ID**						
	# 21	# 22	# 23	# 24	# 25	# 26	# 27
	Concentrations (ppm)						
Arsenic	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Barium	0.05	0.05	0.03	0.04	0.06	0.05	0.05
Cadmium	< 0.01	0.02	< 0.01	0.2	< 0.01	< 0.01	0.03
Chromium	0.02	< 0.01	< 0.01	0.2	< 0.01	< 0.01	0.03
Lead	0.03	< 0.01	0.04	0.02	0.03	0.01	0.03
Mercury	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Selenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

TABLE 1-8 RESULTS OF SEPTEMBER 1989 SEDIMENT SAMPLING FOR MERCURY AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

Sample ID	Depth (in)	Concentration (ug/g)
S1-N	6	1.9
S1-E	10	0.3
S1-W	10	0.26
S1-W	24	0.7
S1-S	10	0.6
S2-N	10	0.39
S2-E	10	0.4
S2-W	10	0.61
S2-S	10	0.53
S2-S	15	0.27
S3-N	6	< 0.25
S3-N	24	0.51
S3-E	10	0.31
S3-E	12	0.42
S3-W	10	0.31
S3-S	12	0.32
S3-S	28	< 0.25
Control-1	10	< 0.25
Control-1	24	< 0.25
Control-2	10	< 0.25
Control-2	24	0.33
Control-3	10	< 0.25
Control-3	24	< 0.25

Sample ID	Depth (in)	Concentration (ug/g)
S4-E	8	0.96
S4-E	10	0.92
S4-W	8	0.28
S4-W	10	< 0.25
S4-S	10	0.28
S4-S	20	< 0.25
S4-S	24	< 0.25
S5-E	3	0.35
S5-E	6	< 0.25
S5-W	10	< 0.25
S5-W	24	< 0.25
S5-W	30	< 0.25
S5-S	6	0.28
S6-N	10	1.15
S6-N	26	1.68
S6-E	10	0.66
S6-E	30	0.26
S6-W	10	1.63
S6-W	24	0.29

TABLE 1-9 RESULTS OF SEPTEMBER 1989 SEDIMENT SAMPLING FOR TRACE METALS AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

Metals	Sample ID									
	S2-N-10"	S2-E-10"	S2-W-10"	S2-S-10"	S2-S-15"	S3-N-6"	S3-N-24"	S3-E-10"	S3-W-10"	S3-S-12"
	Concentration (ug/g wet wt.)									
Chromium	10	10	17	14	12	8	8	8	11	19
Zinc	70	296	101	55	39	48	74	93	120	88
Cadmium	0.94	0.62	1.02	0.55	0.84	0.69	2.56	0.98	1.44	0.83
Lead	494	242	76	62	31	119	95	134	517	132
Magnesium	126	113	56	66	68	45	90	43	87	66
Copper	175	36	168	22	12	37	74	49	54	63

Metals	Sample ID								
	S3-S-28	S4-E-8"	S4-W-8"	S4-S-10"	S4-S-24"	S5-E-6"	S5-W-10"	S5-W-30"	S5-S-6"
	Concentration (ug/g wet wt.)								
Chromium	9	18	13	13	20	17	14	18	16
Zinc	25	74	110	48	54	51	62	38	95
Cadmium	0.33	0.75	1.21	0.44	0.14	0.28	0.68	< 0.01	0.79
Lead	16	339	125	36	31	45	93	33	80
Magnesium	53	55	54	43	67	113	63	70	57
Copper	44	51	114	49	14	16	18	14	180

TABLE 1-10 RESULTS OF OCTOBER 1989 SEDIMENT SAMPLING FOR MERCURY AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

Sample ID	Depth (in)	Concentration (ug/g)
07-N	Surf.	< 0.25
07-N	10	< 0.25
07-N	24	0.96
07-N	28	1.03
07-W	Surf.	< 0.25
07-W	10	< 0.25
07-W	24	1.66
07-S	Surf.	0.34
07-S	10	0.35
07-S	24	< 0.25
8	Surf.	0.29
8	10	0.32
8	24	2.1
9	Surf.	< 0.25
9	10	< 0.25
9	24	< 0.25
10	Surf.	0.26
10	10	0.96
10	24	1.16

Sample ID	Depth (in)	Concentration (ug/g)
11	Surf.	< 0.25
11	10	< 0.25
12-N	6	1.15
12-S	Surf.	< 0.25
12-S	10	< 0.25
12-S	24	< 0.25
13	Surf.	< 0.25
13	10	< 0.25
13	24	< 0.25
Background-1	Surf.	< 0.25
Background-1	10	0.8
Background-1	24	< 0.25
Control-4*	Surf.	< 0.25
Control-4*	10	< 0.25
Control-4*	24	< 0.25
Control-4*	36	< 0.25

TABLE 1-11 RESULTS OF SHAPIRO ENGINEERING SEDIMENT SAMPLING FOR MERCURY AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

Contaminant	**Sample Number and Concentration (PPM) (ug/g)**				
	#1	**# 2**	**# 2 (DUP)**	**# 3**	**# 4**
Mercury	0.111	0.186	0.206	16.8	1.286
Location	Outfall A	Outfall B	Outfall B	Drain A	Drain B

CHEMICAL	**NYSDEC**	**Units**	**Concentrations**
Mercury	**Effects Range-Low**	ug/g	0.15
	Effects Range-Medium	ug/g	0.71

TABLE 1-12 RESULTS OF RI PHASE 1 SAMPLING FOR MERCURY AT BUILDING 615, FORT TOTTEN COAST GUARD STATION

Sample I.D.	Mercury Wipe Conc. ug/wipe	DL_FLAG	(Reporting Limit)	(Method Detection Limit)
B615-WP-01-01	.3	N	.01	NA
B615-WP-02-01	.01	BN	.01	NA
B615-WP-03-01	.01	BN	.01	NA
B615-WP-04-01	.01	BN	.01	NA
B615-WP-05-01	.03	N	.01	NA
B615-WP-06-01	.01	BN	.01	NA

For data qualifiers in the "DL_FLAG" column, look in list of Inorganic Lab Qualifiers for definitions.

TABLE 1-13 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SOIL BORING AND FILL AREA SAMPLING FOR VOLATILES AT FORT TOTTEN COAST GUARD STATION

ANALYTES	Sample ID			FSS-SB-01-02	FSS-SB-01-03	FSS-SB-02-02	FSS-SB-02-03	FSS-SB-03-04	FSS-SB-03-05
	Units	NYSDEC TAGM	Method Detection Limit	Sample depth 2' - 3' BGS	15' - 16' BGS	2' - 3' BGS	14' - 15' BGS	14' - 16' BGS	14' - 16' BGS
ETHYLBENZENE	ug/kg	5500.0	2	4.8 (U)	2 (J)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
1,4-DICHLOROBENZENE	ug/kg	8500.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
1,2-DICHLOROETHANE	ug/kg	100.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
4-METHYL-2-PENTANONE (MIBK)	ug/kg	1000.0		9.7 (U)	11 (U)	8.7 (U)	10 (U)	10 (U)	9.7 (U)
TOLUENE	ug/kg	1500.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
CHLOROBENZENE	ug/kg	1700.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
1,2,4-TRICHLOROBENZENE	ug/kg	3400.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
DIBROMOCHLOROMETHANE	ug/kg	Not Available	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
TETRACHLOROETHENE	ug/kg	1400.0	2	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
XYLENES (TOTAL)	ug/kg	1200.0		4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
1,3-DICHLOROPROPANE	ug/kg	300.0		4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
TRANS-1,2-DICHLOROETHENE	ug/kg	300.0		4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
1,3-DICHLOROBENZENE	ug/kg	1600.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
CARBON TETRACHLORIDE	ug/kg	600.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
ACETONE	ug/kg	200.0	3	39	11 (U)	31	3.6 (J)	89	80
CHLOROFORM	ug/kg	300.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
BENZENE	ug/kg	60.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
1,1,1-TRICHLOROETHANE	ug/kg	800.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
CHLOROETHANE	ug/kg	1900.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
VINYL CHLORIDE	ug/kg	120.0	2	2.1 (J)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	6.1
METHYLENE CHLORIDE	ug/kg	100.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
CARBON DISULFIDE	ug/kg	2700.0	2	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
1,1-DICHLOROETHANE	ug/kg	200.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
TRICHLOROTRIFLUOROETHANE	ug/kg	6000.0		4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
2-BUTANONE (MEK)	ug/kg	300.0		9.7 (U)	11 (U)	3.7 (J)	10 (U)	4 (J)	9.7 (U)
TRICHLOROETHENE	ug/kg	700.0	1	1.4 (J)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	2.2 (J)
1,1,2,2-TETRACHLOROETHANE	ug/kg	600.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)
1,2-DICHLOROBENZENE	ug/kg	7900.0	1	4.8 (U)	5.6 (U)	4.3 (U)	5.2 (U)	5.1 (U)	4.8 (U)

TABLE 1-13 (continued)

	Sample ID			FSS-SB-03-07	FSS-SB-04-02	FSS-SB-04-03	FSS-SB-05-02	FSS-SB-05-03	FSS-SB-06-02
ANALYTES	**Units**	**NYSDEC TAGM**	**Method Detection Limit**	**Sample depth** 4' - 16' BGS	2' - 3' BGS	16' - 17' BGS	2' - 3' BGS	18' - 20' BGS	2' - 3' BGS
ETHYLBENZENE	ug/kg	5500.0	2	4.7 (U)	4.9 (U)	4.6 (U)	2.6 (J)	1.6 (J)	2.7 (J)
1,4-DICHLOROBENZENE	ug/kg	8500.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
1,2-DICHLOROETHANE	ug/kg	100.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
4-METHYL-2-PENTANONE (MIBK)	ug/kg	1000.0		9.4 (U)	9.9 (U)	9.2 (U)	9.1 (U)	10 (U)	13 (U)
TOLUENE	ug/kg	1500.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
CHLOROBENZENE	ug/kg	1700.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
1,2,4-TRICHLOROBENZENE	ug/kg	3400.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
DIBROMOCHLOROMETHANE	ug/kg	Not Available	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
TETRACHLOROETHENE	ug/kg	1400.0	2	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
XYLENES (TOTAL)	ug/kg	1200.0		4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
1,3-DICHLOROPROPANE	ug/kg	300.0		4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
TRANS-1,2-DICHLOROETHENE	ug/kg	300.0		4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
1,3-DICHLOROBENZENE	ug/kg	1600.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
CARBON TETRACHLORIDE	ug/kg	600.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
ACETONE	ug/kg	200.0	3	21	43	3 (J)	46	10 (U)	38
CHLOROFORM	ug/kg	300.0	1	4.7 (U)	4.9 (U)	1.1 (J)	4.6 (U)	5.1 (U)	6.4 (U)
BENZENE	ug/kg	60.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
1,1,1-TRICHLOROETHANE	ug/kg	800.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
CHLOROETHANE	ug/kg	1900.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
VINYL CHLORIDE	ug/kg	120.0	2	4.1 (J)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	5.5 (J)
METHYLENE CHLORIDE	ug/kg	100.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
CARBON DISULFIDE	ug/kg	2700.0	2	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
1,1-DICHLOROETHANE	ug/kg	200.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
TRICHLOROTRIFLUOROETHANE	ug/kg	6000.0		4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
2-BUTANONE (MEK)	ug/kg	300.0		9.4 (U)	9.9 (U)	9.2 (U)	9.1 (U)	10 (U)	13 (U)
TRICHLOROETHENE	ug/kg	700.0	1	2 (J)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
1,1,2,2-TETRACHLOROETHANE	ug/kg	600.0	1	4.7 (U)	4.9 (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)
1,2-DICHLOROBENZENE	ug/kg	7900.0	1	4.7 (U)	4.9 (U) (U)	4.6 (U)	4.6 (U)	5.1 (U)	6.4 (U)

TABLE 1-13 (continued)

ANALYTES	Sample ID			FSS-SB-06-03	FSS-SB-07-04	FSS-SB-07-05	FSS-SB-07-07	FSS-SB-08-02	FSS-SB-08-03
	Units	NYSDEC TAGM	Method Detection Limit	Sample depth 6' - 7' BGS	2' - 3' BGS	2' - 3' BGS	17' - 17.5' BGS	2' - 3' BGS	8' - 10' BGS
ETHYLBENZENE	ug/kg	5500.0	2	3.1 (J)	5 (U)	2.8 (J)	4.6 (U)	4.8 (U)	4.7 (U)
1,4-DICHLOROBENZENE	ug/kg	8500.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
1,2-DICHLOROETHANE	ug/kg	100.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
4-METHYL-2-PENTANONE (MIBK)	ug/kg	1000.0		9.8 (U)	10 (U)	10 (U)	9.3 (U)	9.5 (U)	9.3 (U)
TOLUENE	ug/kg	1500.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
CHLOROBENZENE	ug/kg	1700.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
1,2,4-TRICHLOROBENZENE	ug/kg	3400.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
DIBROMOCHLOROMETHANE	ug/kg	Not Available	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
TETRACHLOROETHENE	ug/kg	1400.0	2	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
XYLENES (TOTAL)	ug/kg	1200.0		4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
1,3-DICHLOROPROPANE	ug/kg	300.0		4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
TRANS-1,2-DICHLOROETHENE	ug/kg	300.0		4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
1,3-DICHLOROBENZENE	ug/kg	1600.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
CARBON TETRACHLORIDE	ug/kg	600.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
ACETONE	ug/kg	200.0	3	10	81	43	3.7 (J)	13	12
CHLOROFORM	ug/kg	300.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
BENZENE	ug/kg	60.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
1,1,1-TRICHLOROETHANE	ug/kg	800.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
CHLOROETHANE	ug/kg	1900.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
VINYL CHLORIDE	ug/kg	120.0	2	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	12	4.7 (U)
METHYLENE CHLORIDE	ug/kg	100.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
CARBON DISULFIDE	ug/kg	2700.0	2	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
1,1-DICHLOROETHANE	ug/kg	200.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
TRICHLOROTRIFLUOROETHANE	ug/kg	6000.0		4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
2-BUTANONE (MEK)	ug/kg	300.0		9.8 (U)	10 (U)	2.5 (J)	9.3 (U)	9.5 (U)	9.3 (U)
TRICHLOROETHENE	ug/kg	700.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
1,1,2,2-TETRACHLOROETHANE	ug/kg	600.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)
1,2-DICHLOROBENZENE	ug/kg	7900.0	1	4.9 (U)	5 (U)	5.2 (U)	4.6 (U)	4.8 (U)	4.7 (U)

TABLE 1-13 (continued)

	Sample ID			FLA-SB-09-05	FLA-SB-09-07	FLA-SB-10-02	FLA-SB-10-03	FLA-SB-11-02	FLA-SB-11-03
ANALYTES	**Units**	**NYSDEC TAGM**	**Method Detection Limit**	**Sample depth** 15' - 16' BGS	20' - 21' BGS	2' - 3' BGS	16' - 18' BGS	2' - 3' BGS	2' - 3' BGS
ETHYLBENZENE	ug/kg	5500.0	2	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,4-DICHLOROBENZENE	ug/kg	8500.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,2-DICHLOROETHANE	ug/kg	100.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
4-METHYL-2-PENTANONE (MIBK)	ug/kg	1000.0		13 (U)	12 (U)	11 (U)	9.3 (U)	670 (U)	720 (U)
TOLUENE	ug/kg	1500.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
CHLOROBENZENE	ug/kg	1700.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,2,4-TRICHLOROBENZENE	ug/kg	3400.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
DIBROMOCHLOROMETHANE	ug/kg	Not Available	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
TETRACHLOROETHENE	ug/kg	1400.0	2	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
XYLENES (TOTAL)	ug/kg	1200.0		6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,3-DICHLOROPROPANE	ug/kg	300.0		6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
TRANS-1,2-DICHLOROETHENE	ug/kg	300.0		6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,3-DICHLOROBENZENE	ug/kg	1600.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
CARBON TETRACHLORIDE	ug/kg	600.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
ACETONE	ug/kg	200.0	3	33 (B)	12 (J)	21 (B)	5.7 (J)	410 (J)	700 (J)
CHLOROFORM	ug/kg	300.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
BENZENE	ug/kg	60.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,1,1-TRICHLOROETHANE	ug/kg	800.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
CHLOROETHANE	ug/kg	1900.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
VINYL CHLORIDE	ug/kg	120.0	2	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
METHYLENE CHLORIDE	ug/kg	100.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
CARBON DISULFIDE	ug/kg	2700.0	2	6.5 (U)	10	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,1-DICHLOROETHANE	ug/kg	200.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
TRICHLOROTRIFLUOROETHANE	ug/kg	6000.0		6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
2-BUTANONE (MEK)	ug/kg	300.0		13 (U)	12 (U)	11 (U)	9.3 (U)	670 (U)	720 (U)
TRICHLOROETHENE	ug/kg	700.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,1,2,2-TETRACHLOROETHANE	ug/kg	600.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)
1,2-DICHLOROBENZENE	ug/kg	7900.0	1	6.5 (U)	6 (U)	5.3 (U)	4.7 (U)	330 (U)	360 (U)

TABLE 1-13 (continued)

	Sample ID			FLA-SB-11-05	FLA-SB-12-02	FLA-SB-13-03
ANALYTES	**Units**	**NYSDEC TAGM**	**Method Detection Limit**	**Sample depth** 6' - 18' BGS	2' - 3' BGS	17' - 17.5' BGS
ETHYLBENZENE	ug/kg	5500.0	2	5.3 (U)	9.1 (U)	4.6 (U)
1,4-DICHLOROBENZENE	ug/kg	8500.0	1	5.3 (U)	9.1 (U)	4.6 (U)
1,2-DICHLOROETHANE	ug/kg	100.0	1	5.3 (U)	9.1 (U)	4.6 (U)
4-METHYL-2-PENTANONE (MIBK)	ug/kg	1000.0		11 (U)	18 (U)	9.2 (U)
TOLUENE	ug/kg	1500.0	1	5.3 (U)	2.2 (J)	4.6 (U)
CHLOROBENZENE	ug/kg	1700.0	1	5.3 (U)	9.1 (U)	4.6 (U)
1,2,4-TRICHLOROBENZENE	ug/kg	3400.0	1	5.3 (U)	9.1 (U)	4.6 (U)
DIBROMOCHLOROMETHANE	ug/kg	Not Available	1	5.3 (U)	9.1 (U)	4.6 (U)
TETRACHLOROETHENE	ug/kg	1400.0	2	5.3 (U)	9.1 (U)	4.6 (U)
XYLENES (TOTAL)	ug/kg	1200.0		5.3 (U)	9.1 (U)	4.6 (U)
1,3-DICHLOROPROPANE	ug/kg	300.0		5.3 (U)	9.1 (U)	4.6 (U)
TRANS-1,2-DICHLOROETHENE	ug/kg	300.0		5.3 (U)	9.1 (U)	4.6 (U)
1,3-DICHLOROBENZENE	ug/kg	1600.0	1	5.3 (U)	9.1 (U)	4.6 (U)
CARBON TETRACHLORIDE	ug/kg	600.0	1	5.3 (U)	9.1 (U)	4.6 (U)
ACETONE	ug/kg	200.0	3	24	140	8.4 (J)
CHLOROFORM	ug/kg	300.0	1	5.3 (U)	9.1 (U)	4.6 (U)
BENZENE	ug/kg	60.0	1	3.2 (J)	4.3 (J)	4.6 (U)
1,1,1-TRICHLOROETHANE	ug/kg	800.0	1	5.3 (U)	9.1 (U)	4.6 (U)
CHLOROETHANE	ug/kg	1900.0	1	5.3 (U)	9.1 (U)	4.6 (U)
VINYL CHLORIDE	ug/kg	120.0	2	5.3 (U)	10	4.6 (U)
METHYLENE CHLORIDE	ug/kg	100.0	1	5.3 (U)	9.1 (U)	4.6 (U)
CARBON DISULFIDE	ug/kg	2700.0	2	5.3 (U)	9.1 (U)	4.6 (U)
1,1-DICHLOROETHANE	ug/kg	200.0	1	5.3 (U)	9.1 (U)	4.6 (U)
TRICHLOROTRIFLUOROETHANE	ug/kg	6000.0		5.3 (U)	9.1 (U)	4.6 (U)
2-BUTANONE (MEK)	ug/kg	300.0		2.8 (J)	10 (J)	9.2 (U)
TRICHLOROETHENE	ug/kg	700.0	1	5.3 (U)	3.3 (J)	4.6 (U)
1,1,2,2-TETRACHLOROETHANE	ug/kg	600.0	1	5.3 (U)	9.1 (U)	4.6 (U)
1,2-DICHLOROBENZENE	ug/kg	7900.0	1	5.3 (U)	9.1 (U)	4.6 (U)

TABLE 1-14 RESULTS OF REMEDIAL INVESTIGATION PHASE I SOIL BORING SAMPLING FOR SEMIVOLATILES AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC**	**Sample I.D.**	FSS-SB-01-01	FSS-SB-01-03	FSS-SB-02-01	FSS-SB-02-03
	TAGM	**Sample Depth**	0 - 0.5' BGS	15' - 16' BGS	0 - 0.5' BGS	14' - 15' BGS
		and Status	mg/kg	mg/kg	mg/kg	mg/kg
	ug/kg					
ACENAPHTHENE	50000					
ACENAPHTHYLENE	41000					
ANTHRACENE	50000					
BENZ[A]ANTHRACENE	224 or MDL		.110 (J)			
BENZO[B]FLUORANTHENE	1100		.210 (J)		.110 (J)	
BENZO[K]FLUORANTHENE	1100					
BENZO[GHI]PERYLENE	50000		.095 (J)			
BENZO[A]PYRENE	61 or MDL		**.130 (J)**			
BENZYL BUTYL PHTHALATE	50000					
BIS(2-ETHYLHEXYL) PHTHALATE	50000		0.58		.094 (J)	
CHRYSENE	400		.150 (J)		.110 (J)	
DIBENZ[A,H]ANTHRACENE	14 or MDL					
DIBENZOFURAN	6200					
FLUORANTHENE	50000		.230 (J)		.140 (J)	
FLUORENE	50000					
INDENO[1,2,3-CD]PYRENE	3200		.100 (J)			
2-METHYLNAPHTHALENE	36400					
NAPHTHALENE	13000					
PHENANTHRENE	50000		.120 (J)		.081 (J)	
PYRENE	50000		.260 (J)		.130 (J)	
CARBON, TOTAL ORGANIC	None		23600		32000	

BGS = Below Ground Surface
Dupl = Duplicate sample
MDL = Method Detection Limit
For data qualifiers in parentheses "( )", look in list of Organic Lab Qualifiers for definitions.
* Samples FSS-SB-13-01 and FSS-SB-13-03 are the same as samples FLA-SB-13-01 and FLA-SB-13-03 in Tables 1-13 and 1-15.

TABLE 1-14 (continued)

CHEMICAL	**NYSDEC**	FSS-SB-03-01	FSS-SB-03-02	FSS-SB-03-07	FSS-SB-04-01	FSS-SB-04-03	FSS-SB-05-01	FSS-SB-05-03
	TAGM	0 - 0.5' BGS	0 - 0.5' BGS	14' - 16' BGS	0 - 0.5' BGS	16' - 17' BGS	0 - 0.5' BGS	18' - 20' BGS
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	ug/kg							
ACENAPHTHENE	50000							
ACENAPHTHYLENE	41000						.190 (J)	
ANTHRACENE	50000		.130 (J)				.240 (J)	
BENZ[A]ANTHRACENE	224 or MDL	**.250 (J)**	**0.57**		.082 (J)		**1.50**	
BENZO[B]FLUORANTHENE	1100	0.44	0.91		.140 (J)		**2.20**	
BENZO[K]FLUORANTHENE	1100	.160 (J)	.350 (J)				0.92	
BENZO[GHI]PERYLENE	50000	.200 (J)	0.44		.100 (J)		1.20	
BENZO[A]PYRENE	61 or MDL	**.310 (J)**	**0.62**		**.090 (J)**		**1.60**	
BENZYL BUTYL PHTHALATE	50000						.150 (J)	
BIS(2-ETHYLHEXYL) PHTHALATE	50000	.130 (J)	.360 (J)		.087 (J)	0.46	.350 (J)	
CHRYSENE	400	.330 (J)	**0.73**		.120 (J)		**1.90**	
DIBENZ[A,H]ANTHRACENE	14 or MDL		**.130 (J)**					
DIBENZOFURAN	6200							
FLUORANTHENE	50000	0.45	1.10		.130 (J)		2.00	
FLUORENE	50000							
INDENO[1,2,3-CD]PYRENE	3200	.220 (J)	0.46		.097 (J)		1.30	
2-METHYLNAPHTHALENE	36400						.110 (J)	
NAPHTHALENE	13000						.110 (J)	
PHENANTHRENE	50000	.150 (J)	0.73		.100 (J)		1.00	
PYRENE	50000	0.49	1.20		.170 (J)		2.90	
CARBON, TOTAL ORGANIC	None	27500			44100		57900	

BGS = Below Ground Surface
Dupl = Duplicate sample
MDL = Method Detection Limit
For data qualifiers in parentheses "( )", look in list of Organic Lab Qualifiers for definitions.
* Samples FSS-SB-13-01 and FSS-SB-13-03 are the same as samples FLA-SB-13-01 and FLA-SB-13-03 in Tables 1-13 and 1-15.

TABLE 1-14 (continued)

CHEMICAL	**NYSDEC**	FSS-SB-06-01	FSS-SB-06-03	FSS-SB-07-01	FSS-SB-07-02	FSS-SB-07-07	FSS-SB-08-01	FSS-SB-08-03
	TAGM	0 - 0.5' BGS	6' - 7' BGS	0 - 0.5' BGS	0 - 0.5' BGS	17' - 17.5' BGS	0 - 0.5' BGS	8' - 10' BGS
		mg/kg	mg/kg	mg/kg	Dupl of SB-07-01	mg/kg	mg/kg	mg/kg
	ug/kg				mg/kg			
ACENAPHTHENE	50000							
ACENAPHTHYLENE	41000	.075 (J)	.086 (J)					
ANTHRACENE	50000							
BENZ[A]ANTHRACENE	224 or MDL	**.240 (J)**	**.310 (J)**	**0.44**	**0.48**			
BENZO[B]FLUORANTHENE	1100	0.39	.400 (J)	0.83	0.87			
BENZO[K]FLUORANTHENE	1100	.140 (J)	.160 (J)	.260 (J)	.290 (J)			
BENZO[GHI]PERYLENE	50000	.220 (J)	.180 (J)	.210 (J)				
BENZO[A]PYRENE	61 or MDL	**.260 (J)**	**.280 (J)**	**0.46**	**0.51**			
BENZYL BUTYL PHTHALATE	50000							
BIS(2-ETHYLHEXYL) PHTHALATE	50000	.150 (J)	.350 (J)	.270 (J)	.210 (J)			
CHRYSENE	400	.310 (J)	.350 (J)	**0.66**	**0.72**			
DIBENZ[A,H]ANTHRACENE	14 or MDL							
DIBENZOFURAN	6200							
FLUORANTHENE	50000	.340 (J)	0.47	0.93	0.96			
FLUORENE	50000							
INDENO[1,2,3-CD]PYRENE	3200	.230 (J)	.220 (J)	.250 (J)	.260 (J)			
2-METHYLNAPHTHALENE	36400							
NAPHTHALENE	13000							
PHENANTHRENE	50000	.220 (J)	.250 (J)	.340 (J)	.330 (J)			
PYRENE	50000	0.46	0.53	1.10	1.20			
CARBON, TOTAL ORGANIC	None	19200	19700					

BGS = Below Ground Surface
Dupl = Duplicate sample
MDL = Method Detection Limit
For data qualifiers in parentheses "( )", look in list of Organic Lab Qualifiers for definitions.
* Samples FSS-SB-13-01 and FSS-SB-13-03 are the same as samples FLA-SB-13-01 and FLA-SB-13-03 in Tables 1-13 and 1-15.

TABLE 1-14 (continued)

CHEMICAL	**NYSDEC**	FLA-SB-09-01	FLA-SB-09-02	FLA-SB-09-07	FLA-SB-10-01	FLA-SB-11-01	FLA-SB-11-05	FLA-SB-12-01
	TAGM	0 - 0.5' BGS	0 - 0.5' BGS	20' - 21' BGS	0 - 0.5' BGS	0 - 0.5' BGS	16' - 18' BGS	0 - 0.5' BGS
		mg/kg	Dupl of SB-09-01	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	ug/kg		mg/kg					
ACENAPHTHENE	50000						.370 (J)	
ACENAPHTHYLENE	41000							
ANTHRACENE	50000	.130 (J)	.140 (J)		.140 (J)		0.88	
BENZ[A]ANTHRACENE	224 or MDL	**0.53**	**0.58**		**0.50**	**.260 (J)**	**1.10**	.180 (J)
BENZO[B]FLUORANTHENE	1100	0.70	0.78		0.85	.390 (J)	1.00	.320 (J)
BENZO[K]FLUORANTHENE	1100	.270 (J)	.260 (J)		.330 (J)	.150 (J)	.360 (J)	.120 (J)
BENZO[GHI]PERYLENE	50000	.360 (J)	0.43		.310 (J)	.230 (J)	0.43	.130 (J)
BENZO[A]PYRENE	61 or MDL	**0.52**	**0.57**		**0.60**	**.310 (J)**	**0.77**	**.220 (J)**
BENZYL BUTYL PHTHALATE	50000							
BIS(2-ETHYLHEXYL) PHTHALATE	50000			0.54	.084 (J)		.190 (J)	.110 (J)
CHRYSENE	400	**0.57**	**0.64**		**0.59**	.330 (J)	**1.20**	.250 (J)
DIBENZ[A,H]ANTHRACENE	14 or MDL	**.110 (J)**	**.120 (J)**		**.110 (J)**			
DIBENZOFURAN	6200						.280 (J)	
FLUORANTHENE	50000	0.84	0.94	.110 (J)	0.86	.370 (J)	1.90	.330 (J)
FLUORENE	50000						0.58	
INDENO[1,2,3-CD]PYRENE	3200	.280 (J)	.360 (J)		.310 (J)	.230 (J)	0.44	.150 (J)
2-METHYLNAPHTHALENE	36400						.150 (J)	
NAPHTHALENE	13000	.100 (J)	.110 (J)		.120 (J)	.130 (J)	.160 (J)	
PHENANTHRENE	50000	0.61	0.69		0.51	.230 (J)	2.70	.150 (J)
PYRENE	50000	0.98	1.10	.089 (J)	0.97	0.46	2.70	.350 (J)
CARBON, TOTAL ORGANIC	None	73900	61200	5010	70100 >	50400	6350	46700

BGS = Below Ground Surface
Dupl = Duplicate sample
MDL = Method Detection Limit
For data qualifiers in parentheses "( )", look in list of Organic Lab Qualifiers for definitions.

* Samples FSS-SB-13-01 and FSS-SB-13-03 are the same as samples FLA-SB-13-01 and FLA-SB-13-03 in Tables 1-13 and 1-15.

TABLE 1-14 (continued)

CHEMICAL	**NYSDEC** **TAGM**	FLA-SB-12-03 14' - 15' BGS mg/kg	FSS-SB-13-01* 0 - 0.5' BGS mg/kg	FSS-SB-13-03* 17' - 17.5' BGS mg/kg
	ug/kg			
ACENAPHTHENE	50000			
ACENAPHTHYLENE	41000			
ANTHRACENE	50000		.110 (J)	
BENZ[A]ANTHRACENE	224 or MDL		**.350 (J)**	
BENZO[B]FLUORANTHENE	1100		0.48	
BENZO[K]FLUORANTHENE	1100		.190 (J)	
BENZO[GHI]PERYLENE	50000		.310 (J)	
BENZO[A]PYRENE	61 or MDL		**.380 (J)**	
BENZYL BUTYL PHTHALATE	50000			
BIS(2-ETHYLHEXYL) PHTHALATE	50000		.200 (J)	
CHRYSENE	400		**0.45**	
DIBENZ[A,H]ANTHRACENE	14 or MDL		**.100 (J)**	
DIBENZOFURAN	6200			
FLUORANTHENE	50000		0.53	
FLUORENE	50000			
INDENO[1,2,3-CD]PYRENE	3200		.290 (J)	
2-METHYLNAPHTHALENE	36400		.082 (J)	
NAPHTHALENE	13000		.160 (J)	
PHENANTHRENE	50000		0.46	
PYRENE	50000		0.75	
CARBON, TOTAL ORGANIC	None		37300	

BGS = Below Ground Surface
Dupl = Duplicate sample
MDL = Method Detection Limit
For data qualifiers in parentheses "( )", look in list of Organic Lab Qualifiers for definitions.
* Samples FSS-SB-13-01 and FSS-SB-13-03 are the same as samples FLA-SB-13-01 and FLA-SB-13-03 in Tables 1-13 and 1-15.

TABLE 1-15 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SOIL BORING SAMPLING FOR METALS AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC TAGM** mg/kg	**Method Detection Limit** (mg/kg)	**Sample I.D.**	FSS-SB-01-01	FSS-SB-01-03	FSS-SB-02-01	FSS-SB-02-03
			Sample Depth and Status	0 - 0.5' BGS	15' - 16' BGS	0 - 0.5' BGS	14' - 15' BGS
ALUMINUM	Site Bkgd	6.5		11400	5610	8660	5840
ANTIMONY	Site Bkgd	.1		.93 (N)	.77 (N)	1.1	.55 (B)
ARSENIC	7.5 or SB	.2		2.9	.53 (B)	2.9	.59 (B)
BARIUM	300 or SB	.8		129	52	83.6	50.3
BERYLLIUM	0.16 or SB	.1		.53 (B)	.16 (B)	.37 (B)	.22 (B)
CADMIUM	1 or SB	.07				.14 (B)	
CALCIUM	Site Bkgd	3.9		1270 (*)	2120 (*)	2320	1780
CHROMIUM	10 or SB	.4		28.2 (*)	17.3 (*)	25.8	17
COBALT	30 or SB	.7		8.2	7	8	7.5
COPPER	25 or SB	.5		20.8	15.7	29	14.4
IRON	2000 or SB	5.3		23100	15900	18500	14900
LEAD	SB (400)	.1		175	3.5	119	3.4
MAGNESIUM	Site Bkgd	3.5		3360 (N*)	2960 (N*)	2760 (*)	2630 (*)
MANGANESE	Site Bkgd	.2		493	389	391	482
MERCURY	0.1	0.004		.16	.004 (B)	.35	
NICKEL	13 or SB	.5		23.7	21.1	20.2	20.9
POTASSIUM	Site Bkgd	7.1		843 (E)	2020 (E)	1440	1950
SELENIUM	2 or SB	.2					
SILVER	Site Bkgd	.1					
SODIUM	Site Bkgd	8.1		116 (B)	299	128	113 (B)
THALLIUM	Site Bkgd	.1			.12 (B)	.12 (B)	.17 (B)
VANADIUM	150 or SB	.3		34.7	19.3	29.6	20
ZINC	20 or SB	1.2		99.5	26.6	94.2	25.5

BGS = Below Ground Surface
Dupl = Duplicate sample
"SB" or "Site Bkgd" = Site Background
For data qualifiers in parentheses "( )", look in list of Inorganic Lab Qualifiers for definitions.

TABLE 1-15 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SOIL BORING SAMPLING FOR METALS AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	NYSDEC TAGM mg/kg	Method Detection Limit (mg/kg)	Sample I.D.	FSS-SB-03-01	FSS-SB-03-02	FSS-SB-03-07	FSS-SB-04-01	FSS-SB-04-03
			Sample Depth and Status	0 - 0.5' BGS	2' - 3' BGS	14' - 16' BGS	0 - 0.5' BGS	16' - 17' BGS
ALUMINUM	Site Bkgd	6.5		9760	8470	7040	6300	6650
ANTIMONY	Site Bkgd	.1		.12 (UN)	1.2 (N)	.61 (BN)	1.8 (N)	.73
ARSENIC	7.5 or SB	.2		4.8	4.9		3	.32 (B)
BARIUM	300 or SB	.8		98.6	90	52.8	295	48.7
BERYLLIUM	0.16 or SB	.1		.45 (B)	.42 (B)	.19 (B)	.32 (B)	.24 (B)
CADMIUM	1 or SB	.07						
CALCIUM	Site Bkgd	3.9		2480 (*)	2110 (*)	1650 (*)	2190 (*)	1450
CHROMIUM	10 or SB	.4		20.4 (*)	17.8 (*)	18.2 (*)	29.4 (*)	20.5
COBALT	30 or SB	.7		7	6.3 (B)	6.9	4.9 (B)	6.8
COPPER	25 or SB	.5		34.5	35.4	24.2	47.3	12.8
IRON	2000 or SB	5.3		19100	15600	16400	12200	13500
LEAD	SB (400)	.1		177	183	2.9	494	4.9
MAGNESIUM	Site Bkgd	3.5		2790 (N*)	2240 (N*)	3340 (N*)	1740 (N*)	2560 (*)
MANGANESE	Site Bkgd	.2		470	404	293	152	365
MERCURY	0.1	0.004		.77	.86	.01	2.3	.02
NICKEL	13 or SB	.5		18.7	16.4	29.7	16.5	18.3
POTASSIUM	Site Bkgd	7.1		1350 (E)	1170 (E)	1640 (E)	515 (E)	1490
SELENIUM	2 or SB	.2			.73		.4 (B)	
SILVER	Site Bkgd	.1			.27 (B)			
SODIUM	Site Bkgd	8.1		135	139	203	152	172
THALLIUM	Site Bkgd	.1		.15 (B)		.31 (B)		.13 (B)
VANADIUM	150 or SB	.3		33.7	28.8	24.8	26.9	19.3
ZINC	20 or SB	1.2		122	115	26.2	110	25.4

BGS = Below Ground Surface
Dupl = Duplicate sample
"SB" or "Site Bkgd" = Site Background
For data qualifiers in parentheses "( )", look in list of Inorgani

TABLE 1-15 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SOIL BORING SAMPLING FOR METALS AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC TAGM** mg/kg	**Method Detection Limit** (mg/kg)	**Sample I.D.**	FSS-SB-05-01	FSS-SB-05-03	FSS-SB-06-01	FSS-SB-06-03	FSS-SB-07-01
			Sample Depth and Status	0 - 0.5' BGS	18' - 20' BGS	0 - 0.5' BGS	6' - 7' BGS	0 - 0.5' BGS
ALUMINUM	Site Bkgd	6.5		5930	10700	6470	6760	8850
ANTIMONY	Site Bkgd	.1		1 (N)	1.2 (N)	.65 (N)	.25 (BN)	.93999
ARSENIC	7.5 or SB	.2		3.8	.62 (B)	3.6	1.2	11.7
BARIUM	300 or SB	.8		73.4	113	47.2	31.1	33.4
BERYLLIUM	0.16 or SB	.1		.27 (B)	.44 (B)	.29 (B)	.19 (B)	.36 (B)
CADMIUM	1 or SB	.07		.43 (B)			.14 (B)	
CALCIUM	Site Bkgd	3.9		13400 (*)	3050 (*)	3500	1200	390
CHROMIUM	10 or SB	.4		15.6 (*)	33.2 (*)	17.1	12.6	17.5
COBALT	30 or SB	.7		4.3 (B)	12.2	5.4	1.8 (B)	2.9 (B)
COPPER	25 or SB	.5		43.1	26.2	26.5	35.7	67.4
IRON	2000 or SB	5.3		15600	23700	13700	6930	13800
LEAD	SB (400)	.1		325	6.2	443	44.2	136
MAGNESIUM	Site Bkgd	3.5		7000 (N*)	5950 (N*)	2720 (*)	1410 (*)	1700 (*)
MANGANESE	Site Bkgd	.2		265	393	269	58.9	154
MERCURY	0.1	0.004		.35	.01	.48	.29	2.6
NICKEL	13 or SB	.5		14.7	33.7	10.7	7.8	9.7
POTASSIUM	Site Bkgd	7.1		706 (E)	4020 (E)	925	361	325
SELENIUM	2 or SB	.2		.27 (B)				.76
SILVER	Site Bkgd	.1						
SODIUM	Site Bkgd	8.1		206	167	144	296	110
THALLIUM	Site Bkgd	.1			.23 (B)	.15 (B)	.12 (B)	.12 (B)
VANADIUM	150 or SB	.3		25.5	36.1	22.8	17.5	36.6
ZINC	20 or SB	1.2		213	54.4	114	50.4	42.5

BGS = Below Ground Surface

Dupl = Duplicate sample

"SB" or "Site Bkgd" = Site Background

For data qualifiers in parentheses "( )", look in list of Inorgani

TABLE 1-15 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SOIL BORING SAMPLING FOR METALS AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC TAGM** mg/kg	**Method Detection Limit** (mg/kg)	**Sample I.D.**	FSS-SB-07-02	FSS-SB-07-07	FSS-SB-08-01	FSS-SB-08-03	FLA-SB-09-01
			Sample Depth and Status	0 - 0.5' BGS	17' - 17.5' BGS	0 - 0.5' BGS	8' - 10' BGS	0 - 0.5' BGS
				Dupl of SB-07-01				
ALUMINUM	Site Bkgd	6.5		10400	5370	9380	6180	6580
ANTIMONY	Site Bkgd	.1		.87	.51 (B)	.46 (BN)	.61 (BN)	1.8 (N)
ARSENIC	7.5 or SB	.2		12.1		2	1.4	5.5
BARIUM	300 or SB	.8		38	27.5	37.7	37.5	192
BERYLLIUM	0.16 or SB	.1		.4 (B)	.1 (B)	.34 (B)	.25 (B)	.43 (B)
CADMIUM	1 or SB	.07						1
CALCIUM	Site Bkgd	3.9		420	339	993	1180	6750 (*)
CHROMIUM	10 or SB	.4		19.8	16.3	18.1	22.7	18.8 (*)
COBALT	30 or SB	.7		3.5 (B)	3.8 (B)	5 (B)	6.6	5.7 (B)
COPPER	25 or SB	.5		68.5	3.9	9.5	13.1	108
IRON	2000 or SB	5.3		15800	7590	15300	13700	26700
LEAD	SB (400)	.1		139	3.6	13.6	42.2	352
MAGNESIUM	Site Bkgd	3.5		2010 (*)	1780 (*)	2350 (*)	2180 (*)	2960 (N*)
MANGANESE	Site Bkgd	.2		159	130	209	237	276
MERCURY	0.1	0.004		2.3	.01	1.6	.48	1.5
NICKEL	13 or SB	.5		11.8	13.2	12.7	13.1	17.2
POTASSIUM	Site Bkgd	7.1		442	962	760	1180	872 (E)
SELENIUM	2 or SB	.2		.62				.25 (B)
SILVER	Site Bkgd	.1						
SODIUM	Site Bkgd	8.1		114	105	227	236	198
THALLIUM	Site Bkgd	.1		.14 (B)	.14 (B)			
VANADIUM	150 or SB	.3		37.9	14.5	21.4	17.4	25.2
ZINC	20 or SB	1.2		47.7	19.4	37.6	39.5	325

BGS = Below Ground Surface

Dupl = Duplicate sample

"SB" or "Site Bkgd" = Site Background

For data qualifiers in parentheses "( )", look in list of Inorgani

TABLE 1-15 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SOIL BORING SAMPLING FOR METALS AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC**	**Method**	**Sample I.D.**	FLA-SB-09-02	FLA-SB-09-07	FLA-SB-10-01	FLA-SB-10-03	FLA-SB-11-01
	TAGM	**Detection**	**Sample Depth**	0 - 0.5' BGS	20' - 21' BGS	0 - 0.5' BGS	16' - 18' BGS	0 - 0.5' BGS
	mg/kg	**Limit** (mg/kg)	**and Status**	Dupl of SB-09-01				
ALUMINUM	Site Bkgd	6.5		5340	9170	4400	4910	5690
ANTIMONY	Site Bkgd	.1		1.5 (N)	1.2 (N)	2.6 (N)	.44 (BN)	1.9 (N)
ARSENIC	7.5 or SB	.2		4.5	.67 (B)	6.7	.21 (B)	6.8
BARIUM	300 or SB	.8		142	95.2	283	41.9	258
BERYLLIUM	0.16 or SB	.1		.31 (B)	.36 (B)	.37 (B)	.14 (B)	.43 (B)
CADMIUM	1 or SB	.07		.33 (B)		.92		1.1
CALCIUM	Site Bkgd	3.9		27700 (*)	2840 (*)	4890 (*)	2070 (*)	6590 (*)
CHROMIUM	10 or SB	.4		15.7 (*)	29.4 (*)	23.4 (*)	14.8 (*)	27.8 (*)
COBALT	30 or SB	.7		4.8 (B)	10.1	5.4 (B)	4 (B)	6.4
COPPER	25 or SB	.5		49.1	23.6	198	11.8	115
IRON	2000 or SB	5.3		20000	21400	26400	11400	34300
LEAD	SB (400)	.1		266	12.5	566	3.6	700
MAGNESIUM	Site Bkgd	3.5		2660 (N*)	4990 (N*)	2500 (N*)	2110 (N*)	3740 (N*)
MANGANESE	Site Bkgd	.2		229	240	238	141	259
MERCURY	0.1	0.004		.8	.05	1.3	.01	.95
NICKEL	13 or SB	.5		13.8	31.5	19.6	17	21.6
POTASSIUM	Site Bkgd	7.1		833 (E)	3520 (E)	756 (E)	1270 (E)	1030 (E)
SELENIUM	2 or SB	.2						.3 (B)
SILVER	Site Bkgd	.1				.47 (B)		.55 (B)
SODIUM	Site Bkgd	8.1		153	206	172	163	214
THALLIUM	Site Bkgd	.1			.23 (B)	.11 (B)		.15 (B)
VANADIUM	150 or SB	.3		22.4	30.3	21.2	15.8	23.70
ZINC	20 or SB	1.2		224	49.3	494	19.2	488

BGS = Below Ground Surface
Dupl = Duplicate sample
"SB" or "Site Bkgd" = Site Background
For data qualifiers in parentheses "( )", look in list of Inorgani

TABLE 1-15 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SOIL BORING SAMPLING FOR METALS AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC TAGM** mg/kg	**Method Detection Limit** (mg/kg)	**Sample I.D.**	FLA-SB-11-05	FLA-SB-12-01	FLA-SB-12-03	FLA-SB-13-01	FLA-SB-13-03
			Sample Depth and Status	16' - 18' BGS	0 - 0.5' BGS	14' - 15' BGS	0 - 0.5' BGS	17' - 17.5' BGS
ALUMINUM	Site Bkgd	6.5		5070	7750	3950	5740	4830
ANTIMONY	Site Bkgd	.1		.95 (N)	1 (N)	.61 (BN)	2.1 (N)	.58 (BN)
ARSENIC	7.5 or SB	.2		3.2	5.7		7.3	
BARIUM	300 or SB	.8		160	110	30.9	316	43.3
BERYLLIUM	0.16 or SB	.1		.24 (B)	.37 (B)	.11 (B)	.46 (B)	.14 (B)
CADMIUM	1 or SB	.07					.54 (B)	
CALCIUM	Site Bkgd	3.9		2250 (*)	2980 (*)	2490 (*)	5750 (*)	1460 (*)
CHROMIUM	10 or SB	.4		19.5 (*)	21.3 (*)	17 (*)	26.1 (*)	13.1 (*)
COBALT	30 or SB	.7		6.2	7.1	4.1 (B)	6.7	4.8 (B)
COPPER	25 or SB	.5		82.2	30.10	14.4	103	14.2
IRON	2000 or SB	5.3		17600	16100	11000	27400	6780
LEAD	SB (400)	.1		155	222	2.8	743	7.9
MAGNESIUM	Site Bkgd	3.5		1780 (N*)	2770 (N*)	2330 (N*)	2900 (N*)	2090 (N*)
MANGANESE	Site Bkgd	.2		318	296	87.3	250	257
MERCURY	0.1	0.004		.09	.72	.02	1.1	.03
NICKEL	13 or SB	.5		23.1	20.1	16.1	21.3	15.2
POTASSIUM	Site Bkgd	7.1		1100 (E)	1700 (E)	1190 (E)	867 (E)	1310 (E)
SELENIUM	2 or SB	.2						
SILVER	Site Bkgd	.1			.18 (B)		.23 (B)	
SODIUM	Site Bkgd	8.1		159	138	144	177	170
THALLIUM	Site Bkgd	.1			.18 (B)		.13 (B)	.11 (B)
VANADIUM	150 or SB	.3		18.8	33	14.9	24	13.9
ZINC	20 or SB	1.2		850	148	19.3	386	29.4

BGS = Below Ground Surface
Dupl = Duplicate sample
"SB" or "Site Bkgd" = Site Background
For data qualifiers in parentheses "( )", look in list of Inorgani

TABLE 1-16 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
BUILDING 619 WIPE SAMPLING FOR PESTICIDES AT
FORT TOTTEN COAST GUARD STATION

(Sample ID of our			(Method	(See Table		(Report-
Sampling Plan)	(Chemical Name)	(Result)	Det. Limit)	attached)		ing Limit)
SITE_ID	**LAB_CHEM**	**CONC**	**LIMIT1**	**DL_FLAG**	**UNITS**	**LIMIT2**
B619-WP-09-01	4,4'-DDD	.17	.010	P	UG/WI	.1
B619-WP-09-01	4,4'-DDE	.45	.021		UG/WI	.1
B619-WP-09-01	4,4'-DDT	1.9	.013	E	UG/WI	.1
B619-WP-09-01	HEPTACHLOR EPOXIDE	.053	.006	P	UG/WI	.05
B619-WP-10-01	4,4'-DDT	.35	.013		UG/WI	.1
B619-WP-11-02	4,4'-DDE	.21	.021		UG/WI	.1
B619-WP-11-02	4,4'-DDT	.49	.013		UG/WI	.1
B619-WP-12-01	4,4'-DDE	.14	.021		UG/WI	.1
B619-WP-12-01	4,4'-DDT	.92	.013		UG/WI	.1
B619-WP-12-01	HEPTACHLOR EPOXIDE	.053	.006	P	UG/WI	.05
B619-WP-13-01	4,4'-DDE	.17	.021		UG/WI	.1
B619-WP-13-01	4,4'-DDT	.59	.013		UG/WI	.1
B619-WP-14-01	4,4'-DDE	.15	.021		UG/WI	.1
B619-WP-14-01	4,4'-DDT	.34	.013		UG/WI	.1
B619-WP-15-01	4,4'-DDD	.11	.010	P	UG/WI	.1
B619-WP-15-01	4,4'-DDE	.82	.021		UG/WI	.1
B619-WP-15-01	4,4'-DDT	2.6	.013	E	UG/WI	.1
B619-WP-15-01	HEPTACHLOR EPOXIDE	.2	.006	P	UG/WI	.05
B619-WP-16-01	4,4'-DDE	.54	.021		UG/WI	.1
B619-WP-16-01	4,4'-DDT	1.9	.013	E	UG/WI	.1

TABLE 1-17 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
BUILDING 624 WIPE SAMPLING FOR PESTICIDES AT
FORT TOTTEN COAST GUARD STATION

(Sample ID of our Sampling Plan)	Chemical Name	Result	(Method Det. Limit)	(See Table attached)		(Reporting Limit)
SITE_ID	**LAB_CHEM**	**CONC**	**LIMIT1**	**DL_FLAG**	**UNITS**	**LIMIT2**
B624-WP-01-01	4,4'-DDT	.4	.013		UG/WI	.1
B624-WP-02-01	4,4'-DDT	.97	.013		UG/WI	.1
B624-WP-03-01	4,4'-DDT	.82	.013		UG/WI	.1
B624-WP-04-01	4,4'-DDT	1.7	.013	E	UG/WI	.1
B624-WP-05-01	4,4'-DDT	1.2	.013		UG/WI	.1
B624-WP-07-01	4,4'-DDT	.11	.013		UG/WI	.1
B624-WP-08-01	4,4'-DDT	.13	.013		UG/WI	.1

TABLE 1-18 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 BUILDING 624 SURFACE SOIL SAMPLING FOR PESTICIDES AT FORT TOTTEN COAST GUARD STATION

Sample ID	Chemical Name	NYSDEC TAGM	Concentration	Method Det. Limit	Reporting Limit
			ug/kg		
624-SS-01-01	4,4'-DDT	2100	1000	0.21	230
624-SS-02-01	4,4'-DDT	2100	1000	0.21	200
624-SS-03-01	4,4'-DDT	2100	790	0.21	220
624-SS-03-02	4,4'-DDT	2100	1400	0.21	240
624-SS-04-01	4,4'-DDT	2100	200	0.21 (J)	220
624-SS-05-01	4,4'-DDT	2100	650	0.21	200
624-SS-05-01	HEPTACHLOR EPOXIDE	20	120	0.37 (P)	100
624-SS-06-01	4,4'-DDT	2100	800	0.21	200

(S=Solid Sample
W=Water Smpl.)

TABLE 1-19 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 GROUNDWATER SAMPLING FOR VOLATILES AND SEMIVOLATILES AT FORT TOTTEN COAST GUARD STATION

Sample ID	**Chemical Name**		**NYSDEC TOG 1.1.1**	**NYSDEC Part 5**	**NYSDEC 703.5**	**Results**	**Method Detection Limit**		**Reporting Limit**
SITE_ID	**LAB CHEM**	**UNITS**				**Concentration**	**LIMIT1**	**DL FLAG**	**LIMIT2**
	Volatile								
MW1-GW-01-01	ACETONE	UG/L	50*	No Standard	No Standard	10	3		5
MW2-RIN-02-02	METHYLENE CHLORIDE	UG/L	**5**	No Standard	5	.8	.5	J	2
MW2-GW-02-01	CHLOROFORM	UG/L	7	No Standard	7	**23**	.2		2
MW2-RIN-02-02	CHLOROFORM	UG/L	7	No Standard	7	.8	.2	J	2
MW4-GW-04-01	CHLOROFORM	UG/L	7	No Standard	7	2	.2		2
MW4-GW-04-02	CHLOROFORM	UG/L	7	No Standard	7	2	.2		2
TRIP BLANK	METHYLENE CHLORIDE	UG/L	**5**	No Standard	5	.6	.5	J	2
TRIP BLANK	METHYLENE CHLORIDE	UG/L	**5**	No Standard	5	.6	.5	J	2
TRIP BLANK	METHYLENE CHLORIDE	UG/L	**5**	No Standard	5	.4	.5	J	2
TRIP BLANK	METHYLENE CHLORIDE	UG/L	**5**	No Standard	5	.4	.5	J	2
TRIP BLANK	METHYLENE CHLORIDE	UG/L	**5**	No Standard	5	.4	.5	J	2
	Semivolatiles								
MW2-GW-02-01	BENZ[A]ANTHRACENE	UG/L	0.002	No Standard	No Standard	**.02**	.02		.02
MW2-GW-02-01	BENZO[B]FLUORANTHENE	UG/L	0.002	No Standard	No Standard	**.03**	.03		.03
MW2-GW-02-01	BENZO[K]FLUORANTHENE	UG/L	0.002	No Standard	No Standard	**.01**	.01		.01
MW2-GW-02-01	BIS(2-ETHYLHEXYL) PHTHALATE	UG/L	5	No Standard	5	3	7	BJ	10
MW2-GW-02-01	CHRYSENE	UG/L	0.002	No Standard	No Standard	**.01**	.01		.01
MW2-GW-02-01	INDENO[1,2,3-CD]PYRENE	UG/L	0.002	No Standard	No Standard	**.04**	.04		.04
MW2-RIN-02-02	BENZO[K]FLUORANTHENE	UG/L	0.002	No Standard	No Standard	**.01**	.01		.01
MW2-GW-02-01	CARBON, TOTAL ORGANIC	MG/L	No Standard	No Standard	No Standard	1.2	.2		1
MW3-GW-03-01	CARBON, TOTAL ORGANIC	MG/L	No Standard	No Standard	No Standard	1.6	.2		1
MW4-GW-04-01	CARBON, TOTAL ORGANIC	MG/L	No Standard	No Standard	No Standard	2.1	.2		1
MW4-GW-04-02	CARBON, TOTAL ORGANIC	MG/L	No Standard	No Standard	No Standard	2.3	.2		1
MW5-GW-01-01	CARBON, TOTAL ORGANIC	MG/L	No Standard	No Standard	No Standard	1.1	.2		1

(S=Solid Sample W=Water Sample)

TABLE 1-20 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 GROUNDWATER SAMPLING FOR DISSOLVED TAL METALS AT FORT TOTTEN COAST GUARD STATION

Sample ID	Chemical Name		NYSDEC	NYSDEC	NYSDEC	Results	Method Detection Limit		Reporting Limit
SITE_ID	LAB_CHEM	UNITS	TOG 1.1.1	Part 5	703.5	Concentration	LIMIT1	DL FLAG	LIMIT2
MW1-GW-01-01	ALUMINUM, DISSOLVED	UG/L	**No Standard**	No Standard	No Standard	127	56	B	56
	BARIUM, DISSOLVED	UG/L	1,000	2,000	1,000	251	4		4
	CALCIUM, DISSOLVED	UG/L	None	No Standard	No Standard	85200	22		22
	CHROMIUM, DISSOLVED	UG/L	50	100	50	5.2	4.1	B	4
	IRON, DISSOLVED	UG/L	300	300	300	121	52		52
	MAGNESIUM, DISSOLVED	UG/L	35,000	No Standard	No Standard	**46500**	35		35
	MANGANESE, DISSOLVED	UG/L	300	300	300	14.6	2	B	8
	NICKEL, DISSOLVED	UG/L	100	No Standard	100	48.2	5		5
	POTASSIUM, DISSOLVED	UG/L	None	No Standard	No Standard	4420	71		71
	SODIUM, DISSOLVED	UG/L	20,000	No Standard	20,000	**26600**	81		81
	ZINC, DISSOLVED	UG/L	2000	5000	No Standard	13	12	B	12
MW2-GW-02-01	CALCIUM, DISSOLVED	UG/L	None	No Standard	No Standard	7480	22		22
	LEAD, DISSOLVED	UG/L	25	No Standard	25	2.1	1	B	1
	MAGNESIUM, DISSOLVED	UG/L	35,000	No Standard	No Standard	2680	35		35
	MERCURY, DISSOLVED	UG/L	0.7	2.0	0.7	.1	.1	UN	.1
	POTASSIUM, DISSOLVED	UG/L	None	No Standard	No Standard	520	71	B	71
	SELENIUM, DISSOLVED	UG/L	10	50	10	2.7	2	B	2
	SODIUM, DISSOLVED	UG/L	20,000	No Standard	20,000	6340	81		81
	THALLIUM, DISSOLVED	UG/L	0.5	No Standard	No Standard	**1**	1	UW	1
MW3-GW-03-01	ALUMINUM, DISSOLVED	UG/L	**No Standard**	No Standard	No Standard	78.3	56	B	56
	BARIUM, DISSOLVED	UG/L	1,000	2,000	1,000	49.3	4	B	4
	CALCIUM, DISSOLVED	UG/L	None	No Standard	No Standard	47800	22		22
	MAGNESIUM, DISSOLVED	UG/L	35,000	No Standard	No Standard	21800	35		35
	POTASSIUM, DISSOLVED	UG/L	None	No Standard	No Standard	1560	71		71
	SELENIUM, DISSOLVED	UG/L	10	50	10	4.2	2	B	2
	SODIUM, DISSOLVED	UG/L	20,000	No Standard	20,000	7150	81		81

TABLE 1-20 (continued)

Sample ID	Chemical Name		NYSDEC	NYSDEC	NYSDEC	Results	Method Detection Limit		Reporting Limit
SITE_ID	**LAB_CHEM**	**UNITS**	**TOG 1.1.1**	**Part 5**	**703.5**	**Concentration**	**LIMIT1**	**DL FLAG**	**LIMIT2**
MW4-GW-04-01	ALUMINUM, DISSOLVED	UG/L	**No Standard**	No Standard	No Standard	103	56	B	56
	BARIUM, DISSOLVED	UG/L	1,000	2,000	1,000	55.4	4	B	4
	CALCIUM, DISSOLVED	UG/L	None	No Standard	No Standard	49400	22		22
	MAGNESIUM, DISSOLVED	UG/L	35,000	No Standard	No Standard	28400	35		35
	MERCURY, DISSOLVED	UG/L	0.7	2.0	0.7	.1	.1	UN	.1
	POTASSIUM, DISSOLVED	UG/L	None	No Standard	No Standard	2140	71		71
	SELENIUM, DISSOLVED	UG/L	10	50	10	3.6	2	B	2
	SODIUM, DISSOLVED	UG/L	20,000	No Standard	20,000	**60700**	81		81
MW4-GW-04-02 (Duplicate of GW-04-01)	ALUMINUM, DISSOLVED	UG/L	**No Standard**	No Standard	No Standard	65.8	56	B	56
	ANTIMONY, DISSOLVED	UG/L	3	6	3	1.5	1	B	1
	BARIUM, DISSOLVED	UG/L	1,000	2,000	1,000	53.8	4	B	4
	CALCIUM, DISSOLVED	UG/L	None	No Standard	No Standard	48300	22		22
	COPPER, DISSOLVED	UG/L	200	No Standard	200	6.9	2	B	2
	MAGNESIUM, DISSOLVED	UG/L	35,000	No Standard	No Standard	27900	35		35
	MERCURY, DISSOLVED	UG/L	0.7	2.0	0.7	.1	.1	UN	.1
	POTASSIUM, DISSOLVED	UG/L	None	No Standard	No Standard	1980	71		71
	SELENIUM, DISSOLVED	UG/L	10	50	10	2.6	2	B	2
	SODIUM, DISSOLVED	UG/L	20,000	No Standard	20,000	**59600**	81		81
MW5-GW-01-01	BARIUM, DISSOLVED	UG/L	1,000	2,000	1,000	19.2	4	B	4
	CALCIUM, DISSOLVED	UG/L	None	No Standard	No Standard	22800	22		22
	MAGNESIUM, DISSOLVED	UG/L	35,000	No Standard	No Standard	15000	35		35
	MERCURY, DISSOLVED	UG/L	0.7	2.0	0.7	.1	.1	UN	.1
	POTASSIUM, DISSOLVED	UG/L	None	No Standard	No Standard	1110	71		71
	SODIUM, DISSOLVED	UG/L	20,000	No Standard	No Standard	18600	81		81
	THALLIUM, DISSOLVED	UG/L	0.5	No Standard	no Standard	1	1	UW	1

For data qualifiers in parentheses "( )", look in list of Inorganic Lab Qualifiers for definitions.
U - Undetected
B - Estimated in association with blanks

TABLE 1-21 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 GROUNDWATER SAMPLING FOR TOTAL TAL METALS AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC**	**NYSDEC**	**NYSDEC**	MW1-GW-01-01	MW2-GW-02-01	MW2-RIN-02-02	MW3-GW-03-01
	TOGS 1.1.1	**Part 5**	**703.5**			Rinsate	
	ug/l						
ALUMINUM, TOTAL	**No Standard**	No Standard	No Standard	437			125 (B)
ANTIMONY, TOTAL	3	6	3	3.8 (B)			
ARSENIC, TOTAL	25	50	25				
BARIUM, TOTAL	1,000	2,000	1,000	224			50.9 (B)
BERYLLIUM, TOTAL	3	4	No Standard				
CADMIUM, TOTAL	5	No Standard	No Standard				
CALCIUM, TOTAL	None	No Standard	No Standard	76300	7890	154 (B)	47500
CHROMIUM, TOTAL	50	100	50	**205**			
COBALT, TOTAL	**No Standard**	No Standard	No Standard				
COPPER, TOTAL	200	No Standard	200	5.3 (B)			
IRON, TOTAL	300	300	300	1850			74.7 (B)
LEAD, TOTAL	25	No Standard	25	1.4 (B)			
MAGNESIUM, TOTAL	35,000	No Standard	No Standard	**41900**	2880		22100
MANGANESE, TOTAL	300	300	300	60.5			
MERCURY, TOTAL	0.7	2.0	0.7	0.1 (UN)	0.1 (UN)	0.1 (UN)	0.1 (UN)
NICKEL, TOTAL	100	No Standard	100	**204**			
POTASSIUM, TOTAL	None	No Standard	No Standard	4240	552 (B)	139 (B)	1610
SELENIUM, TOTAL	10	50	10	2.3 (B)			
SILVER, TOTAL	50	100	50				
SODIUM, TOTAL	20,000	No Standard	20,000	25100	6700	777 (B)	7360
THALLIUM, TOTAL	0.5	No Standard	No Standard	**1 (UW)**			
VANADIUM, TOTAL	**No Standard**	No Standard	No Standard				
ZINC, TOTAL	2,000	5,000	5,000	18.1 (B)			

TABLE 1-21 (continued)

CHEMICAL	**NYSDEC**	**NYSDEC**	**NYSDEC**	MW4-GW-04-01	MW4-GW-04-02	MW5-GW-01-01
	TOGS 1.1.1	**Part 5**	**703.5**		Dupl of GW-04-01	
	ug/l					
ALUMINUM, TOTAL	**No Standard**	No Standard	No Standard	757	836	65.4 (B)
ANTIMONY, TOTAL	3	6	3			
ARSENIC, TOTAL	25	50	25			
BARIUM, TOTAL	1,000	2,000	1,000	58.1 (B)	58.4 (B)	19.5 (B)
BERYLLIUM, TOTAL	3	4	No Standard			
CADMIUM, TOTAL	5	No Standard	No Standard			
CALCIUM, TOTAL	None	No Standard	No Standard	47100	48300	22900
CHROMIUM, TOTAL	50	100	50			
COBALT, TOTAL	**No Standard**	No Standard	No Standard			
COPPER, TOTAL	200	No Standard	200			
IRON, TOTAL	300	300	300	**1050**	**1130**	
LEAD, TOTAL	25	No Standard	25		1.2 (B)	
MAGNESIUM, TOTAL	35,000	No Standard	No Standard	27300	27900	15100
MANGANESE, TOTAL	300	300	300	28.9	20.9	
MERCURY, TOTAL	0.7	2.0	0.7	0.1 (UN)	0.1 (UN)	0.1 (UN)
NICKEL, TOTAL	100	No Standard	100			
POTASSIUM, TOTAL	None	No Standard	No Standard	2130	2170	1080
SELENIUM, TOTAL	10	50	10		5	
SILVER, TOTAL	50	100	50			
SODIUM, TOTAL	20,000	No Standard	20,000	**56300**	**59600**	**19300**
THALLIUM, TOTAL	0.5	No Standard	No Standard	**1 (UW)**		
VANADIUM, TOTAL	**No Standard**	No Standard	No Standard			
ZINC, TOTAL	2,000	5,000	5,000			

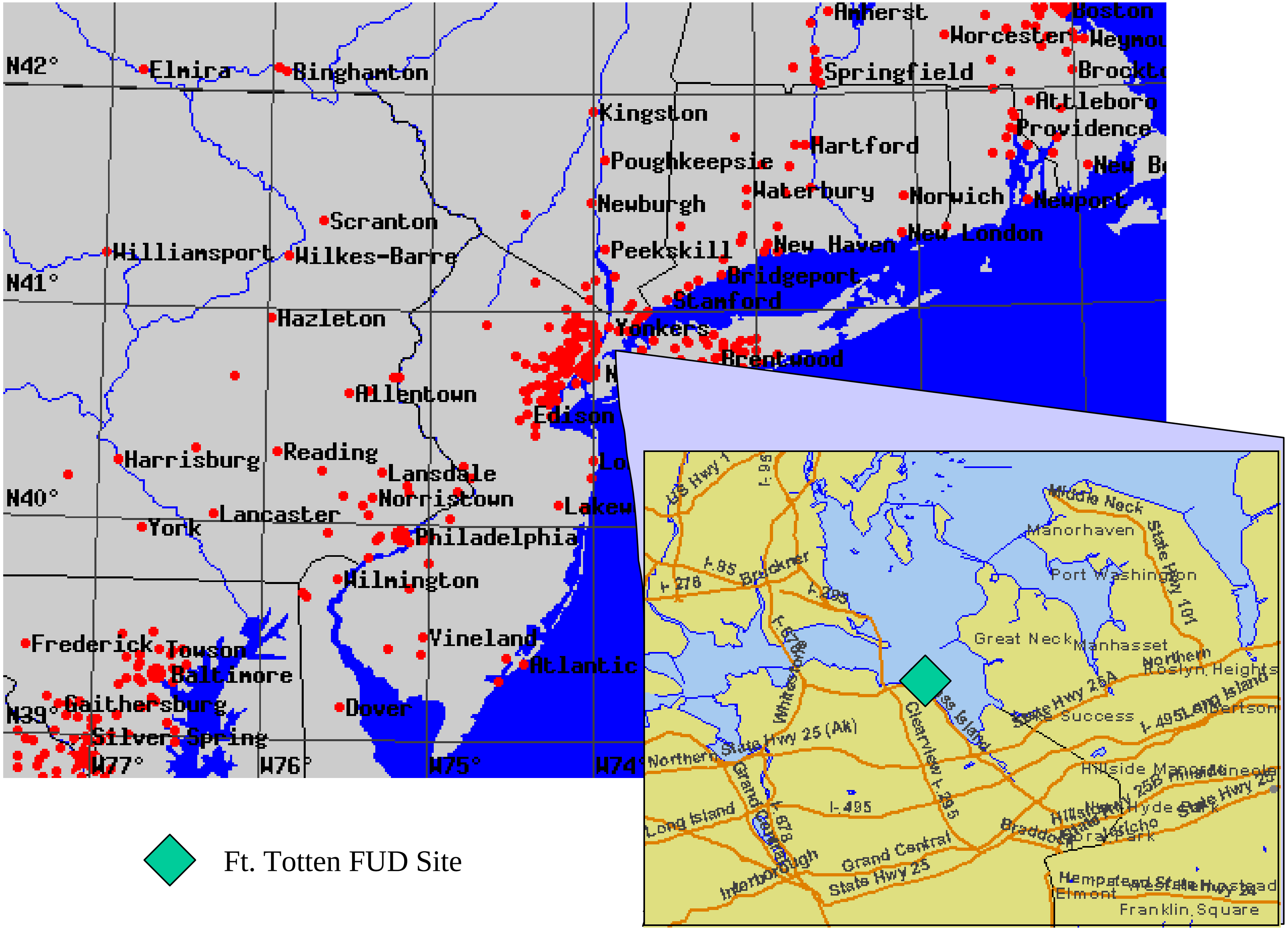
Dupl = Duplicate sample

For data qualifiers in parentheses "( )", look in list of Inorganic Lab Qualifiers for definitions.

TABLE 1-22 POTENTIAL ARARS AND TO-BE-CONSIDERED GUIDANCE
FORT TOTTEN COAST GUARD STATION

Standard, Requirement, Criteria, or Limitation	Citation	Description of Requirement and Potential ARAR Type	Applicable or Relevant and Appropriate Requirement	Comment
State Ambient Water Quality Regulations	6 NYCRR Parts 700-706	NYDEC ambient water quality criteria promulgated and placed into regulation	Relevant and Appropriate	Some but not all of the AWQC for the state are promulgated. Only those values that are promulgated are potential ARARs, the other non-promulgated values are TBC items.
State Sanitary Code	10 NYCRR Part 5-1.51	NYDOH regulations for water after treatment at a municipal drinking-water treatment plant	Relevant and Appropriate	The regulation is not applicable because there is no municipal drinking-water treatment plant being addressed. However, because the groundwater at the site could be used as a drinking water source, the regulations are relevant and appropriate.
State Groundwater Classification Standards	6 NYCRR Part 703	NYDEC regulations for groundwater.	Relevant and Appropriate	The regulation is not applicable because there are no public water supplies in the immediate area that use the groundwater as a drinking water source. However, the state has classified groundwater as “GA” indicating that it could be a source of drinking water.

Figure 1-1 General Site Location



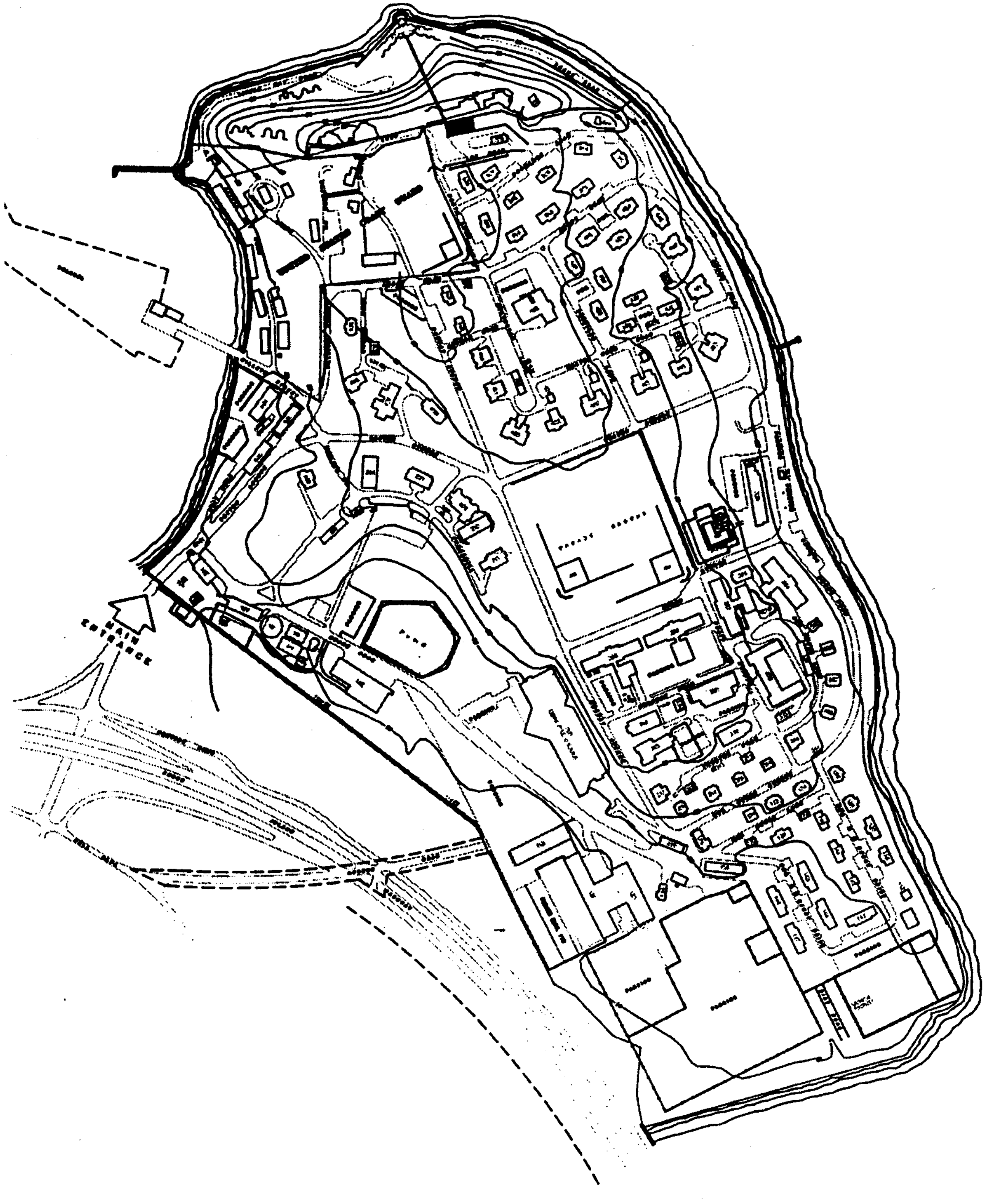


Figure 1-2. Installation Map.

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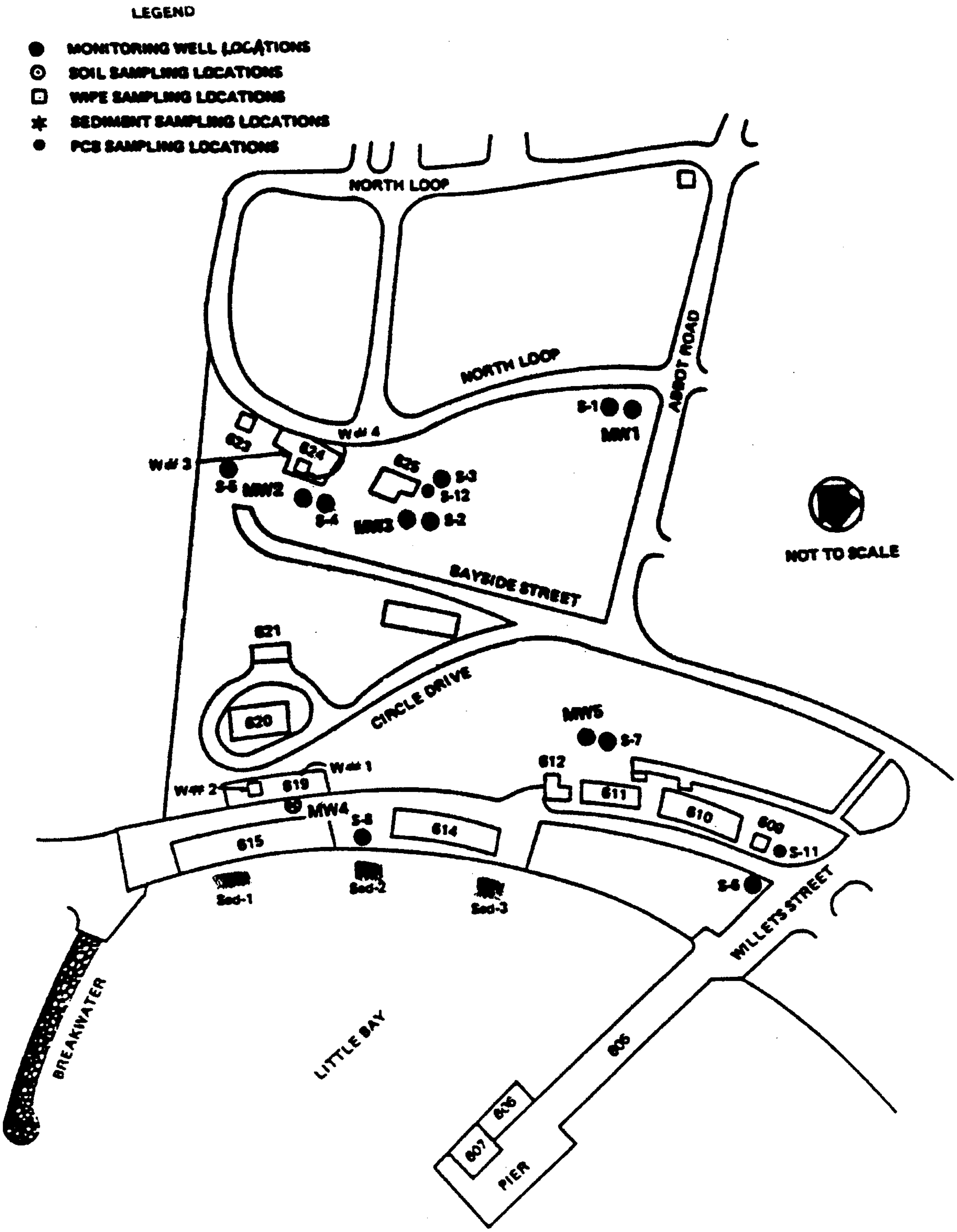

Figure 1-3. Previous Investigations Map.

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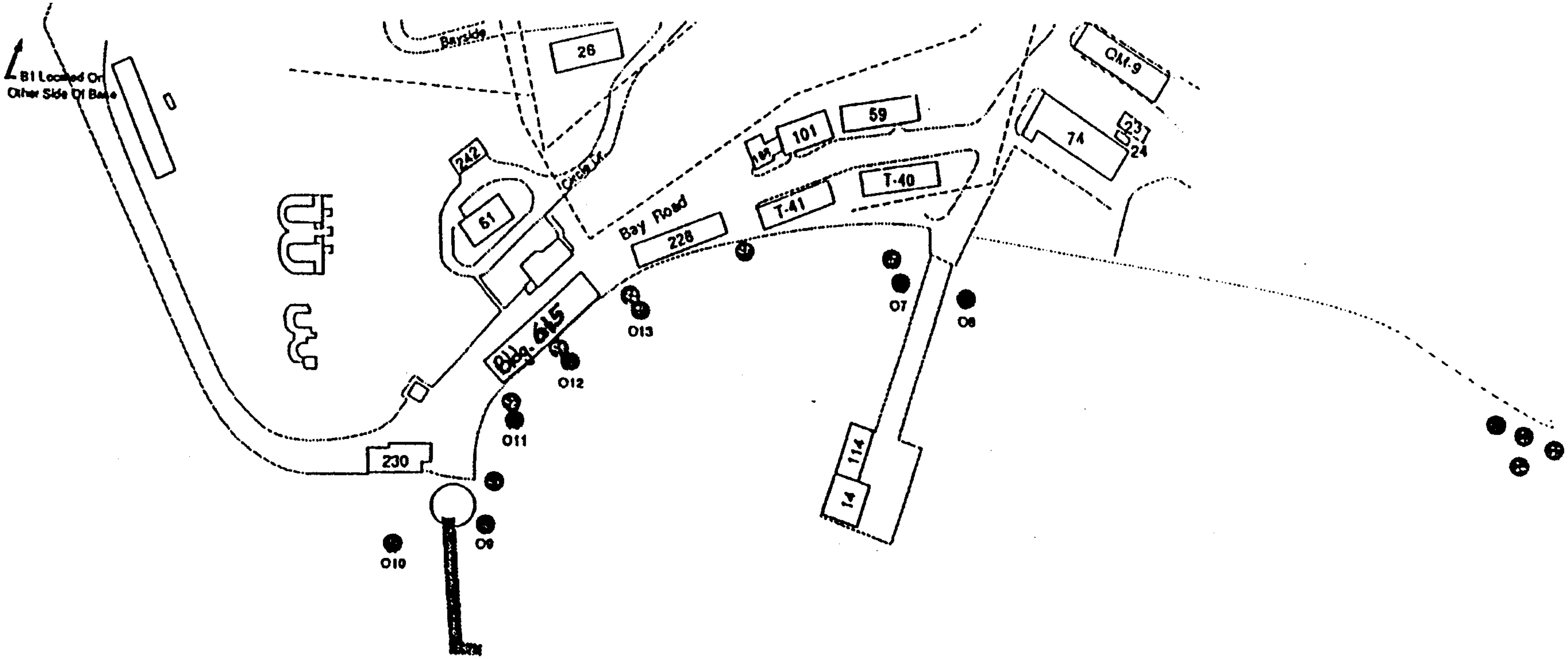

Figure 1-4. Fort Totten/Little Bay U.S. Coast Guard Previous Investigations Map.

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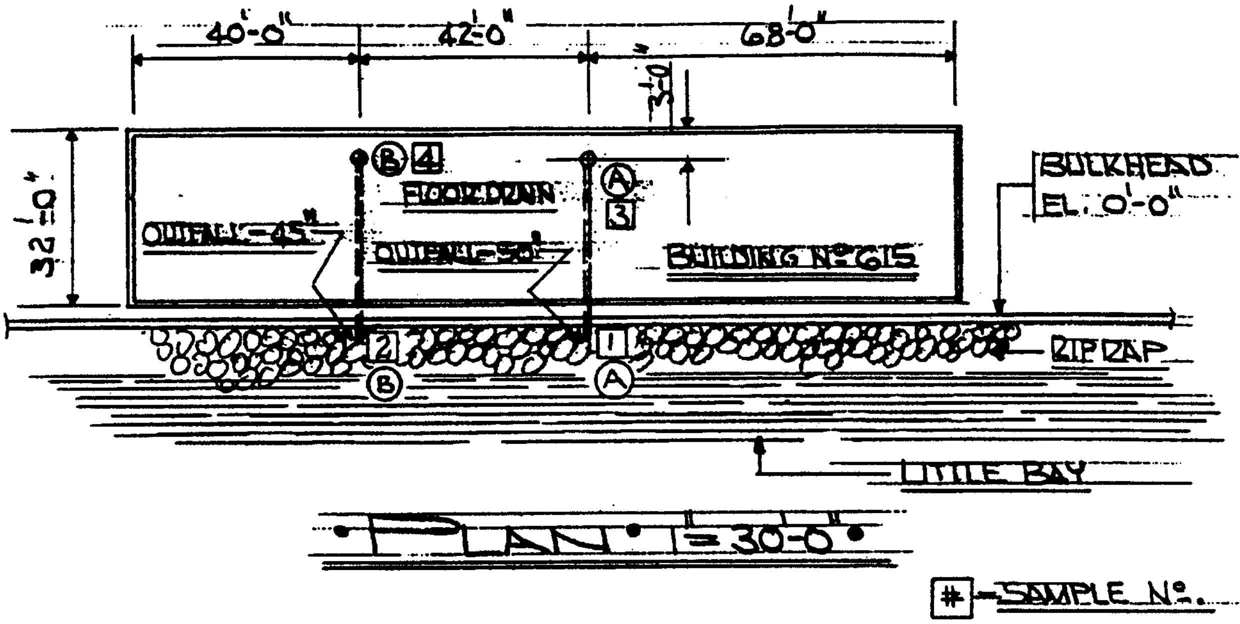


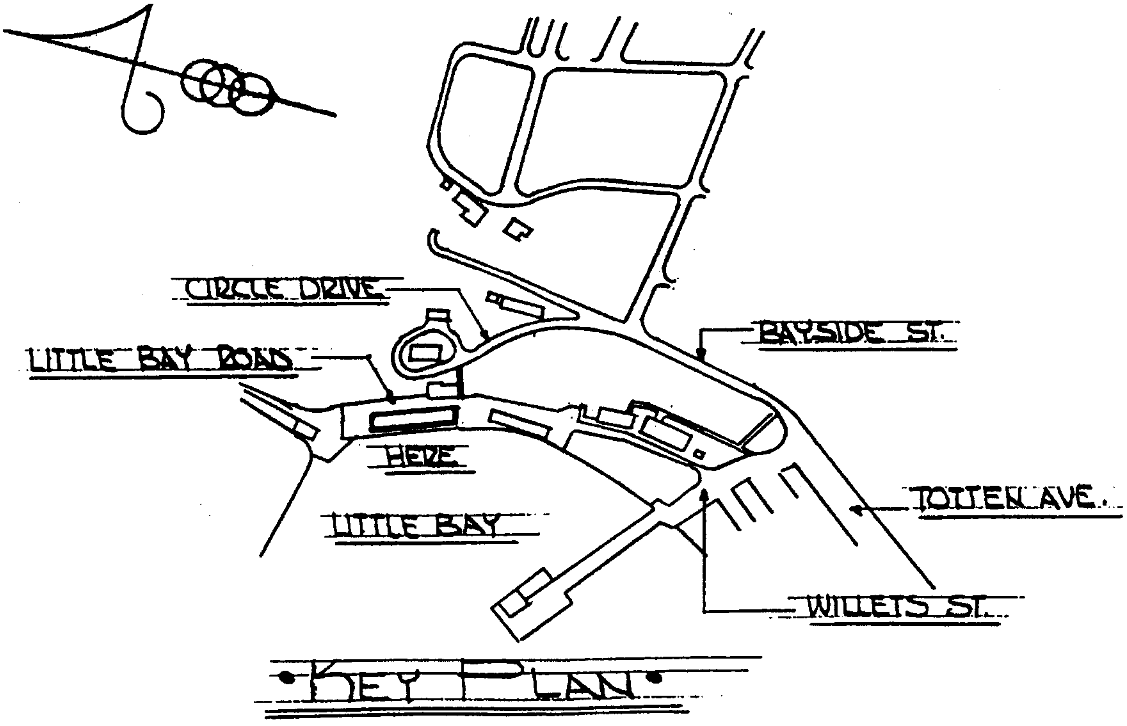


Figure 1-5. Fort Totten/Little Bay Shapiro Engineering Previous Investigations Map.

2.0 PHYSICAL CHARACTERISTICS OF THE STUDY AREA

2.1 LOCATION

The Fort Totten project site is located on the Willets Point peninsula in the northeastern region of Queens Borough, New York City (Figure 1-1). Fort Totten lies approximately ¾ mile due east of the southern reach of the Thongs Neck Bridge; it is bordered to the south and southwest by Little Bay Park and the Cross Island Parkway, to the west by Little Bay, and to the north and east by Little Neck Bay. The FUDS project site tract consists of 9.6 acres and is currently owned and utilized by USCG. The project site, USCG property, occupies the northwest region of this peninsula (Fort Totten Base) and is bordered by U.S Army property to the north, east, and west (Figure 1-2). Access to Fort Totten is via the Cross Island Parkway north on Bell Boulevard.

While the FUDS project site is the primary point of interest, the site is discussed in this section in the context of its surrounding features.

2.2 TOPOGRAPHY

The Willets Point peninsula is a promontory of land approximately 2,200 ft wide, which is generally flat to slightly sloping 200 ft from the shoreline. The elevation of the inland flat region of the peninsula is approximately 60 ft above mean sea level (MSL). Elevation rises from 0 ft MSL along the shoreline to 50 ft above MSL approximately 120 ft inland of the shoreline. The average slope along the west and east shorelines is 2:5. The northern shoreline is much steeper with slope estimated at 1:1 to 2:1. The sloping seaward feature is present along the entire shoreline of the Willets Point peninsula. Fill material of an unknown origin was used for leveling areas of higher elevations in the central flat areas of the peninsula. The majority of land surface is covered by vegetation.

2.3 GEOLOGY

2.3.1 Regional Geology

Pleistocene glaciation created the present day surface features of Long Island. The most prominent features on Long Island are hills that lie in the northern, central, and eastern region of the island, and the gently sloping plain that extends southward from those hills. The hills, referred to as moraines, are a depositional feature constructed by the accumulation of glacial drift, most of which was deposited by ice during the Wisconsin glacial period (Pleistocene

Epoch – between 8 and 70 thousand years in age). The broad, gently sloping plain that extends southward from the moraines to the south shore of Long Island are glacial outwash plains. These plains are also a glacial depositional feature and are composed mainly of sands and gravels deposited by meltwater streams from the Wisconsin period glacier. The Pleistocene glacial deposits extend across three-quarters of the surface area of Queens County.

The subsurface geologic units in Queens County beneath the project site consist of sequences of unconsolidated sediments of Late Cretaceous and Pleistocene ages that are underlain by crystalline bedrock of Precambrian age and overlain by the glacial deposits described above. Bedrock beneath the project site is described as a complexly folded and faulted unit of gneiss and schist lying 250 ft below sea level. Overlying the bedrock is the Raritan Formation consisting of the Lloyd Sand Member (50 ft thick and 200 ft below ground surface) and a relatively impermeable, unnamed clay member (200 ft thick and 20 to 40 ft below ground surface). Overlying the Raritan Formation is the Magothy Formation, Matawa Group consisting of undifferentiated units of late Cretaceous age. The Magothy Formation’s thickness in the region of Fort Totten is generally reported from 5 to 15 ft at depths approximately 20 to 30 ft BGS. Overlying the Magothy are the upper Pleistocene and Recent Deposits, which include a body of glacial till.

2.3.2 Site Geology

Information obtained from well borings and soil samples at the site by USACE and Metcalf & Eddy (1988) show areas of man-made fill underlain by silt, silty sand, and interbedded clay layers (Figure 2-1). These unconsolidated deposits range in thickness from 12 to 33 ft and consist of fine-grained brown sand and silt with occasional pebbles and cobbles. Soil samples from these studies were assigned a Unified Soil Classification System (USCS) designation by a qualified laboratory technician and consisted predominately of a silty sand (SM) interlayered with minor amounts of poorly graded sand (SP), fine-grained well-sorted sand (SW), and organic silt (ML). Index property testing consisting of mechanical analyses with a hydrometer were performed on representative samples from the investigation. Soil samples were visually classified in accordance with American Society for Testing and Material (ASTM) standard TM D 2487 – Classification of Soils for Engineering Purposes.

2.4 SURFACE DRAINAGE

The topography of the Willets Point peninsula influences surface drainage at the site. The main surface drainage pathway of precipitation falling on the majority of the peninsula not infiltrating ground surface will flow overland along the sloping landscape to the shoreline and subsequently to Long Island Sound. Secondary drainage pathways are directed along asphalt parking lots and roadways to storm drains, which discharge directly to Little Neck Bay or Little Bay.

2.5 GROUNDWATER

2.5.1 Regional Groundwater

The Magothy aquifer is Long Island's largest source of fresh water for public-supply systems. Other minor water-bearing aquifers or zones have been historically used as freshwater sources; however, these aquifers have been contaminated by saltwater intrusion or industrial development and their usage declined in the 20th century. The Magothy does not contain any extensive clay layers but has several small to extensive clay lenses.

On a regional scale, these clay lenses produce a high degree of anisotropy in the aquifer. Near the groundwater divide, which runs east to west along the Harbor Hill Moraine (along the northern length of Long Island), groundwater flows vertically downward and then horizontally. Groundwater north of the divide eventually discharges into Long Island Sound, and groundwater south of the divide discharges into the Great South Bay and the Atlantic Ocean. Discharge from the system occurs at: (1) saltwater interfaces that flank the north and south shores of Long Island and from the lateral boundaries of the groundwater reservoir; (2) stream channels that intersect the water table; and (3) nearshore marshes and wetlands which are conducive to groundwater evapotranspiration. Long Island's many streams do not replenish the groundwater system, but act as drains that receive seepage from the surrounding aquifer. Consequently, the streams are discharge areas where groundwater leaves the system and flows to the surrounding saltwater bodies.

2.5.2 Site Groundwater

Depth to groundwater ranges from approximately 6 to 17 ft BGS in monitoring wells at the project site. Groundwater levels measured in the five wells installed by Metcalf & Eddy are plotted and shown in Figure 2-2. The water-table surface shown in the figure indicates that flow is generally to the west towards Little Bay and that discharge occurs along the shoreline of the peninsula into Long Island Sound.

2.6 CLIMATE

The Fort Totten FUDS project site is east of New York City. It is situated near the mouth of the Hudson River on the Atlantic Coastal Plain in southeastern New York. All but one of the city's five boroughs are situated on islands. The FUDS project site is located at the western edge of Long Island. Close to the path of most storm and frontal systems that move across the continent, the majority of weather conditions affecting the city approach from the west. The New York City area can thus experience higher temperatures in the summer and lower temperatures in the winter than would otherwise be expected in a northern coastal area.

Although continental influence is dominant, the Atlantic Ocean influence is by no means absent. Sea breezes moderate the afternoon heat of summer and delay the advent of winter snows. The Atlantic's influence is also measured in the length of the frost-free season – more than 200 days. The climate of this area can best be characterized as humid, temperate, and semi-continental. The average daily high temperature for July, the warmest month, is 85.2°F. The average daily low temperature for January, the coldest month, is 25.3°F. Precipitation is evenly distributed throughout the year, with maximum amounts accumulating during late summer. Average annual precipitation (converted to rainfall) is 47.3 in. Average annual snowfall is 28.4 in.; however, over the winter season of 1995, a record 65.8 in. of snowfall was recorded. The prevailing wind is almost evenly balanced between northwesterly and southwesterly, and averages 9.4 mph.

The National Oceanic and Atmospheric Administration (NOAA), an agency within the U.S. Department of Commerce, maintains a weather station at the Coast Guard station within the FUDS project site. Located on the USCG Pier in Little Bay, East River at 40° 47.6' N, 73° 46.9' W, the station at Willets Point has a data set dating back to 1931.

2.7 DEMOGRAPHY

Fort Totten is in the New York City Metropolitan Area, the largest city in the United States. The main borough of New York City, Manhattan, lies across the East River from Fort Totten. The United States Bureau of Census recorded 7.3 million people living in the New York City area in 1990. According to the 2000 Census, there are 2.2 million people in Queens, New York. Approximately 14.4 percent of the population is 65 years old and over and 22.2 percent of the population is under 18 years old. The location of the property makes it potentially very lucrative for re-sale. Plans are for a future park, with perhaps a jogging trail near the shore.

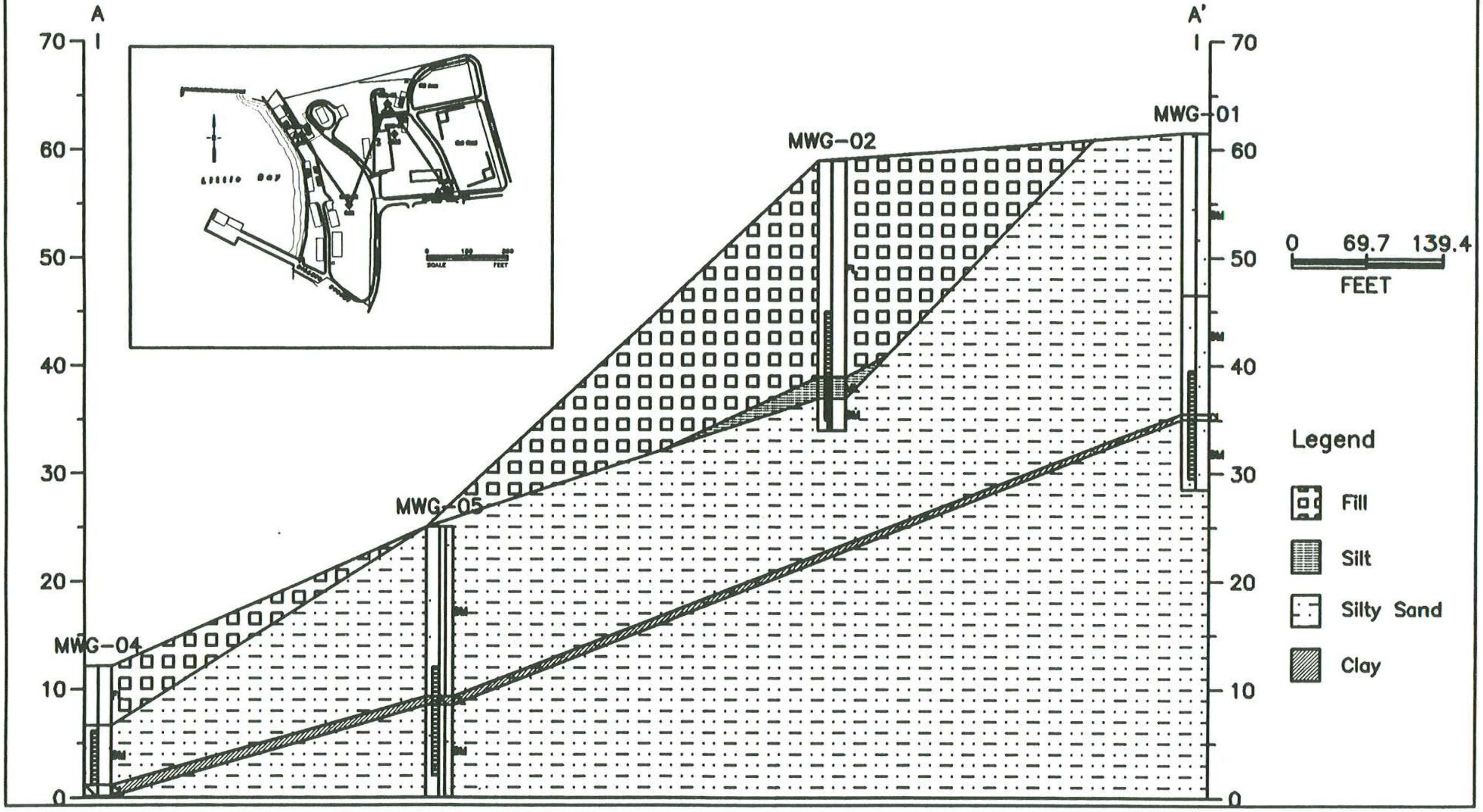
2.8 LAND USE

The land use surrounding the FUDS project site is governmental. A 92.4-acre U.S. Army Reserve property surrounds the Coast Guard part of Fort Totten on the north, east, and west. The land use outside of the government property can be generalized as dense urban residential and light commercial. There is a lack of open space in the general area, with 18,287.4 people per square mile.

2.9 GENERAL ECOLOGY

On the government property, the upland land use can generally be described as an urban campus. Most wildlife species would be expected to use the limited habitat available at Fort Totten on a transient basis. Most wildlife use would be expected when moving between the estuarine wetlands to the east, and the habitat available elsewhere and other suburban residential areas. Mammals anticipated using the area include raccoon *(Procylon lotor)* and opossum *(Didelphis virginiana*). Other small mammal species, such as mice and eastern cottontail *(Sylvilagus floridanus),* may also use the habitat in the area. Several bird species were observed in 1999 and these species may spend time foraging, resting, or collecting materials for nesting in the vegetated areas. Bird species observed in the upland areas immediately west of the site include American robin *(Turdus migratorius),* common grackle (*Quisculus quiscula),* black-capped chickadee (*Parus atricapillus),* and tree swallow *(Ifidoprocne bicolor).* No reptiles were observed onsite during the various field activities. However, as with the mammal and bird species listed above, reptile species may potentially use the site for foraging, cover, and breeding purposes. Species that may be present include the eastern garter snake (*Thamnophis s. sirtalis*), eastern milk snake (*Lampropeltist triangulum*), and eastern smooth green snake (*Opheodrys v. vernalis*).

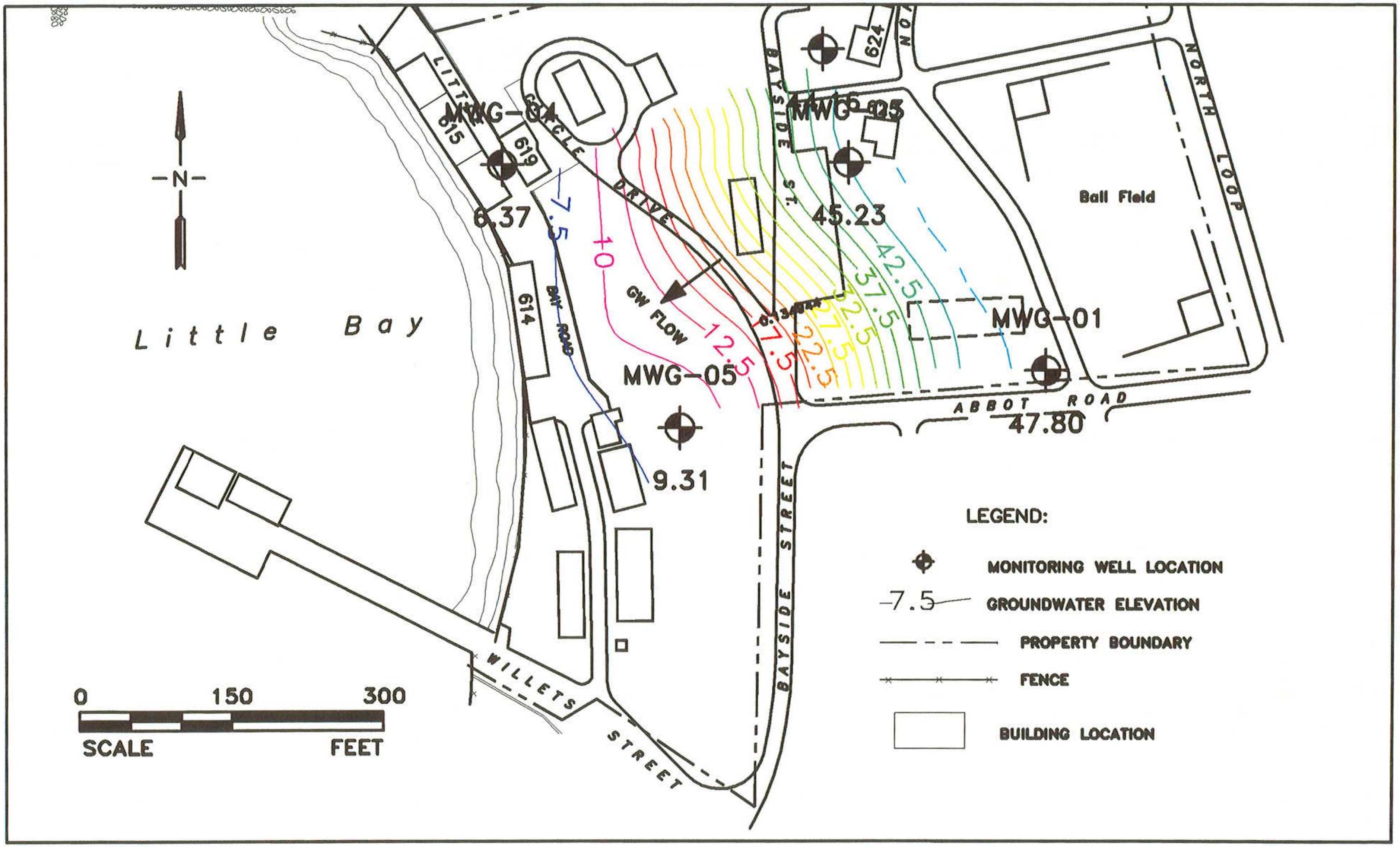
The shoreline is lacking vegetation and its dominant feature is a seawall. The seawall starts near the entrance of the facility and continues north along Little Bay Road to the historic stone fort. The shore is comprised of broken shells and large rock with little or no fine sediment visible at low tide. Urban trash (plastic bottles, tires, styrofoam, etc.) has also accumulated along the shore and seems to be concentrated near BRAC Parcel 62, which may indicate predominate circulation patterns.



U.S. Army Corps of Engineers

TITLE:
Geologic Cross Section
Ft. Totten, NY

DWN: VLT
DES.:
CHKD:
APPD:
DATE: 2/26/01
REV.: 0
PROJECT NO.:
FIGURE NO.: 2-1



U.S. Army Corps of Engineers

TITLE: Groundwater Elevation Ft. Totten, NY	DWN: VLT	DES.:	PROJECT NO.:
	CHKD:	APPD:	FIGURE NO.: 2-2
	DATE: 2/26/01	REV.: 0	

3.0 STUDY AREA INVESTIGATION

Boring logs, geotechnical reports, analytical data, statistical analyses, and sediment toxicity results are included in Appendices C through J.

3.1 SOIL BORING SAMPLES, RI PHASE 1

3.1.1 Fill Area

Five soil borings were excavated from the Fill Area during RI Phase 1. Samples taken from 0 to 6 in. BGS were analyzed for SVOCs, Target Analyte List (TAL) metals, and total organic carbon (TOC). Samples from the 2-3 ft BGS interval were analyzed for VOCs and TOC. Samples taken at the water table were analyzed for all of the analytes. Figure 3-1 shows the sampling locations.

3.1.2 Soil Borings Near Former Surface Soil Samples

Eight soil borings were advanced to the groundwater table near the locations of the former Metcalf & Eddy surface soil samples S-1 through S-8. These soil borings were numbered SB-1 through SB-8 to correspond to the former surface soil samples. The soil boring samples were analyzed for VOCs, SVOCs, TAL metals, and TOC. The soil samples were taken from 0-6 in. BGS, 2-3 ft BGS (for VOCs only), and at the water table. Figure 3-1 shows the sampling locations.

3.2 SURFACE SOIL SAMPLES, RI PHASE 2

Forty-five (45) surface soil samples were collected at 0-2 in. BGS near the locations of the former Metcalf & Eddy surface soil samples S-1 through S-8 (also near RI Phase 1 soil borings SB-1 through SB-8). The 45 surface soil samples are numbered FSS-SS-1 through FSS-SS-45. Thirty-five (35) of the surface soil samples were analyzed for SVOCs, and all 45 of the surface soil samples were analyzed for TAL metals. (Ten of the surface soil samples were in locations that did not show semivolatile contamination above TAGM in RI Phase 1, and surface soil samples at those locations were not analyzed for SVOCs.) Figure 3-2 (with additional detail in Figures 3-3 and 3-4) shows the sampling locations.

To further investigate the Fill Area, seven surface soil samples were collected from there and analyzed for SVOCs and TAL metals. The samples were taken at a depth of 0-2 in. BGS. These seven surface soil samples are numbered FLA-SS-46 through FLA-SS-52. Figure 3-2 (with additional detail in Figure 3-4) shows the sampling locations.

3.3 SUSPECTED PESTICIDE CONTAMINATION, RI PHASE 1

3.3.1 Surface Soil Samples

Six surface soil samples, at a depth of 0-6 in. BGS, were collected from around the base of the walls of Building 624, which showed pesticide contamination in the rooms (Metcalf & Eddy 1988). The DERP-FUDS mandate usually applies to soil and groundwater contamination. Pesticides generally bind strongly to the soil, and groundwater is 15-20 ft deep at the relevant locations. Building 619 has thick (approximately 18 in.) uncracked concrete walls and the outside foundation is concrete and asphalt. This makes it unlikely that pesticides ever penetrated the walls and foundations to contaminate the soil. Therefore, pesticide surface soil samples were taken at Building 624, only. Figure 3-5 shows the sampling locations.

3.3.2 Wipe Sampling

Pesticides were reportedly stored along particular walls, in four rooms of Buildings 619 and 624 (two rooms per building). Sixteen (16) pesticide wipe samples were taken from those walls (four per room, eight per building), to determine the extent of the contaminated area. Figures 3-5 and 3-6 show the sampling locations.

3.4 SUSPECTED PESTICIDE CONTAMINATION, RI PHASE 2

Two surface soil samples, at a depth of 0-2 in. BGS, were taken from the base of the walls of Building 624. These two surface soil samples were numbered 624-SS-53 and 624-SS-54. These samples were analyzed for pesticides. Figure 3-4 shows the sampling locations.

3.5 MERCURY WIPE SAMPLING OF BUILDING 615, RI PHASE 1

Since Building 615 had mercury disposed down the sink drains, and because mercury is a volatile metal, six wipe samples were analyzed from the wall in the drain pipe area. Figure 3-7 shows the sampling location.

3.6 SUSPECTED PCB CONTAMINATION AT BUILDINGS 625 AND 609, RI PHASE 2

Four surface soil samples, at a depth of 0-2 in. BGS, were taken from the base of the walls of Building 625 and from beside the concrete transformer pad adjacent to Building 609 (two samples at each location). These four surface soil samples are numbered 625-SS-55, 625-SS-56, 609-SS-57, and 609-SS-58 and they were analyzed for PCBs. Figure 3-2 (with additional detail in Figure 3-4) shows the sampling locations.

3.7 MONITORING WELLS 1 THROUGH 5, RI PHASE 1

Groundwater from the Metcalf & Eddy monitoring wells 1 through 5 was analyzed for VOCs, SVOCs, and TAL metals during RI Phase 1. Groundwater samples that were analyzed for TAL metals were always subdivided into filtered and unfiltered samples. The monitoring well locations are shown on Figure 3-1.

3.8 MONITORING WELLS 1 THROUGH 5, RI PHASE 2

During the Phase 2 investigation, monitoring wells 1 through 5 were analyzed for VOCs, SVOCs, and TAL metals. The monitoring wells were purged thoroughly and organic samples taken. Then, the wells were allowed to settle and come to equilibrium for 4 hours, whereupon metals samples were taken. Monitoring well locations are shown on Figures 3-3 and 3-4.

3.9 MONITORING WELLS 1 THROUGH 5, SPRING 2002 INVESTIGATION

The purpose of the Spring 2002 monitoring well sampling was to continue monitoring the groundwater to see if soil contaminants had entered it. The analytes that were sampled for in the Remedial Investigation, Phase 2, will be sampled in this round. NYSDEC wished for lower detection limits on groundwater samples, so the samples are being analyzed by drinking water methods. The monitoring wells were purged thoroughly and organics samples taken. Then, the wells were allowed to settle and come to equilibrium for 4 hours, whereupon metals samples (total and filtered/dissolved) were taken. The monitoring well locations are shown on Figures 3-3 and 3-4.

3.10 SEDIMENT SAMPLING IN LITTLE BAY, RI PHASE 1

Sediment sampling was divided into four areas: (1) shoreline sediment sampling; (2) underwater sediment samples 0 to 50 ft from the sea wall; (3) underwater sediment samples 100 to 400 ft from the sea wall; and (4) Base Realignment and Closure (BRAC) sampling. The BRAC sampling was performed in the Bay adjacent to the BRAC portion of Fort Totten. RI Phase 1 sediment sampling in Little Bay was performed in January 1998.

The shoreline of Fort Totten's Little Bay is bound by a sea wall, which makes a convenient reference point for locating samples. As initially scoped, sediment samples from various depths below ground surface were planned for along the seawall; however, impermeable material was usually encountered after the first 12 in. If possible, four subsamples were analyzed from each location for the following depths BGS: 0 to 6 in., 6 to 12 in., 12 to 18 in., and 18 to 24 in. Sample locations are shown in Figure 3-8. Mercury concentrations in sediment were determined using USEPA Method 7471.

3.10.1 Shoreline Sediment Sampling

The seven shoreline sediment samples were evenly spaced and collected along the Fort Totten-Coast Guard shoreline, with no more than 100 ft between samples. The shoreline sediment sample locations are shown on Figure 3-8. Three shoreline sediment samples nearest Building 615's outfalls were analyzed for VOCs, SVOCs, and TAL metals. The other four were analyzed only for the eight RCRA metals.

3.10.2 Sediment Sampling 0 to 50 ft From Sea Wall

Thirty (30) sediment sample locations are within 50 ft of the sea wall, with locations shown in Figure 3-8. A significant proportion of these close underwater sediment samples are located within Building 615's two outfall deltas. The outfall deltas are located by extending a line seaward (perpendicular to the sea wall) from the outfall's concrete cap at the sea wall. Outfall delta samples were taken at 1, 10, and 25 ft from the sea wall, and on the perpendicular axis, from each of these locations, two opposing transverse samples 10 ft away from the perpendicular line. Therefore, there are 18 outfall delta samples, 9 from each outfall.

Of the sediment samples 0 to 50 ft from the sea wall, in Building 615's outfall deltas, 15 were analyzed for VOCs, SVOCs, and TAL metals; the other three were analyzed for the eight RCRA metals. Twelve (12) sediment samples 0 to 50 ft from the sea wall were analyzed for the 8 RCRA metals.

3.10.3 Sediment Sampling 100 to 400 ft From Sea Wall

There are 26 sediment samples locations, 100 to 400 ft from the sea wall, approximately 100 ft apart, in a rectangular grid. The approximate locations are shown in Figure 3-8. These underwater sediment samples were analyzed only for mercury.

3.10.4 BRAC Sediment Sampling

BRAC portion sediment sampling locations are in two parcels: Parcel 62, north of Building 615, and Parcel 79, south of Building 615. Parcel 62 contains 19 sediment samples locations, approximately 100 ft apart, in a rectangular grid, starting from the shoreline. There are 47 sampling locations in Parcel 79, approximately 100 ft apart, in a rectangular grid, starting from the shoreline. The approximate locations are shown in Figure 3-8. These sediment samples were analyzed only for mercury.

3.11 SEDIMENT SAMPLING IN LITTLE BAY, RI PHASE 2

To further delineate the level of mercury within the sediments in Little Bay beyond that achieved from the Phase 1 RI, a total of 16 additional sediment sample locations were excavated during RI Phase 2 efforts. Eight of the locations correspond to areas determined to contain some of the higher mercury sediment concentrations just west of the Building 615 Area of Fort Totten (between the northern rock jetty and Willets Street Pier). At these eight previous sampling locations, 11 sediment subsamples were collected: “surficial” (0-3 in. depth), 3-12 in., 1-2 ft, 2-3 ft, 3-4 ft, 4-5 ft, 5-6 ft, 6-7 ft, 7-8 ft, 8-9 ft, and 9-10 ft BGS.

The other eight sediment sampling locations extend the area of sampling, in regions of suspected elevated mercury levels, from 400 to 800 ft from the sea wall. (Previous sediment sampling had been within 400 ft of the sea wall.) Figure 3-9 shows the sampling locations. At each location, 11 sediment subsamples were collected: “surficial” (0-3 in. depth), 3-12 in., 1-2 ft, 2-3 ft, 3-4 ft, 4-5 ft, 5-6 ft, 6-7 ft, 7-8 ft, 8-9 ft, and 9-10 ft BGS. A total of 176 sediment samples were collected for chemical analysis, plus additional samples for quality assurance/quality control (QA/QC) purposes. One-hundred and sixty-nine (169) of the sediment samples were analyzed for mercury. (One sample, LTB-SD-131-01, was broken during processing.) Six of the sediment samples, from toxicity sample locations, were analyzed for TAL metals, which includes mercury.

3.12 SURFACE WATER SAMPLING, RI PHASE 1

Six surface-water and six bottom-water samples were taken within 50 ft of the sea wall. The surface-water and bottom-water samples were taken as a pair; wherever a surface-water sample was taken, a bottom-water sample was also taken below it. The surface water and bottom water sample locations are shown on Figure 3-8.

Of the six surface water and six bottom water samples, the three surface/bottom water pairs nearest Building 615's outfalls were analyzed for VOCs, SVOCs, and TAL metals. The other three pairs were analyzed for the 8 RCRA metals. Water sample analysis for mercury was by USEPA Method 7470.

3.13 SURFACE WATER SAMPLING, RI PHASE 2

Four surface-water samples were collected from sediment sampling locations LTB-119, LTB-130, LTB–132, and LTB-141. These samples were collected from the top of the water column. Two of the locations, LTB-132 and LTB-141, also had bottom-water samples collected from them, for a total of six Little Bay water samples. Bottom-water samples were taken just above the sediment. The surface-water and bottom-water sample locations are shown on Figure 3-9. The water samples were collected in a Teflon bottle. All samples were analyzed for mercury by USEPA Method 1631, a special low detection limit analysis.

3.14 BIOTA SAMPLING, RI PHASE 1

Twenty-five (25) mussels and 25 oysters were collected to make five mussel and five oyster composite samples during RI Phase 1. The mussels and oysters were collected within 50 ft of the sea wall. Approximately half the mussels and oysters were collected from the deltas of the two Building 615 outfalls. The other half were collected from relatively evenly spaced locations, within 50 ft of the sea wall. Twelve (12) flounder were collected between the Coast Guard pier and the breakwater on 10-14 May 1998. All biota samples were analyzed for mercury only using USEPA Method 245.6.

3.15 TOXICITY AND BIOTA SAMPLING, RI PHASE 2

The RI Phase 2 investigation included both toxicity and biota testing programs. The objectives of the biota and toxicity sampling and analysis program were to:

- Determine if the presence of mercury is bioconcentrating and/or bioaccumulating in the food chain.

- Determine if the mercury present in the sediment is toxic to benthic organisms.

The first objective was determined by collecting and analyzing two species of fish, one species of crustacean, and one species of mollusk during late summer. The two species of finfish, juvenile striped bass (*Morone saxatilis*) and mummichogs (*Fundulus heteroclitus*), represent different levels of taxonomic interest. As such, they are good indicators of the movement of mercury into and through the foodchain. A single species of crustacean, blue crab (*Callinectes sapidus*), was also collected and analyzed. The mollusk species collected was oysters. Crustaceans are bottom-feeding and bottom-dwelling predator/scavenger species. Mollusks are bottom filter feeders. These two types of organisms are good indicators of contaminants that may bioconcentrate and bioaccumulate through several trophic levels.

The second objective was determined by exposing the benthic organism, the polychaete (*Leptocheirus plumulosus*), to sediment collected from Little Bay. This organism is ecologically important for energy flow and nutrient cycling in marine and estuarine systems. *Leptocheirus plumulosus* was chosen because it can tolerate salinity levels as low as 5 parts per thousand (ppt), which is similar to ambient conditions at Little Bay. The toxicity testing was performed using sediment from five different locations in Little Bay representative of different concentrations of mercury. The reference sample of sediment was collected from a location on the southern side of the rock jetty located at the southern border of Fort Totten. The reference sample represents conditions within New York Harbor but not directly influenced by discharge from Building 615. The toxicity test was conducted over 28 days and used survival, growth, and reproduction as the endpoints of interest. The text methods used conformed, in general, to the methods described in USEPA 1994 and 1997a. Each sediment test was run with a clean sediment control.

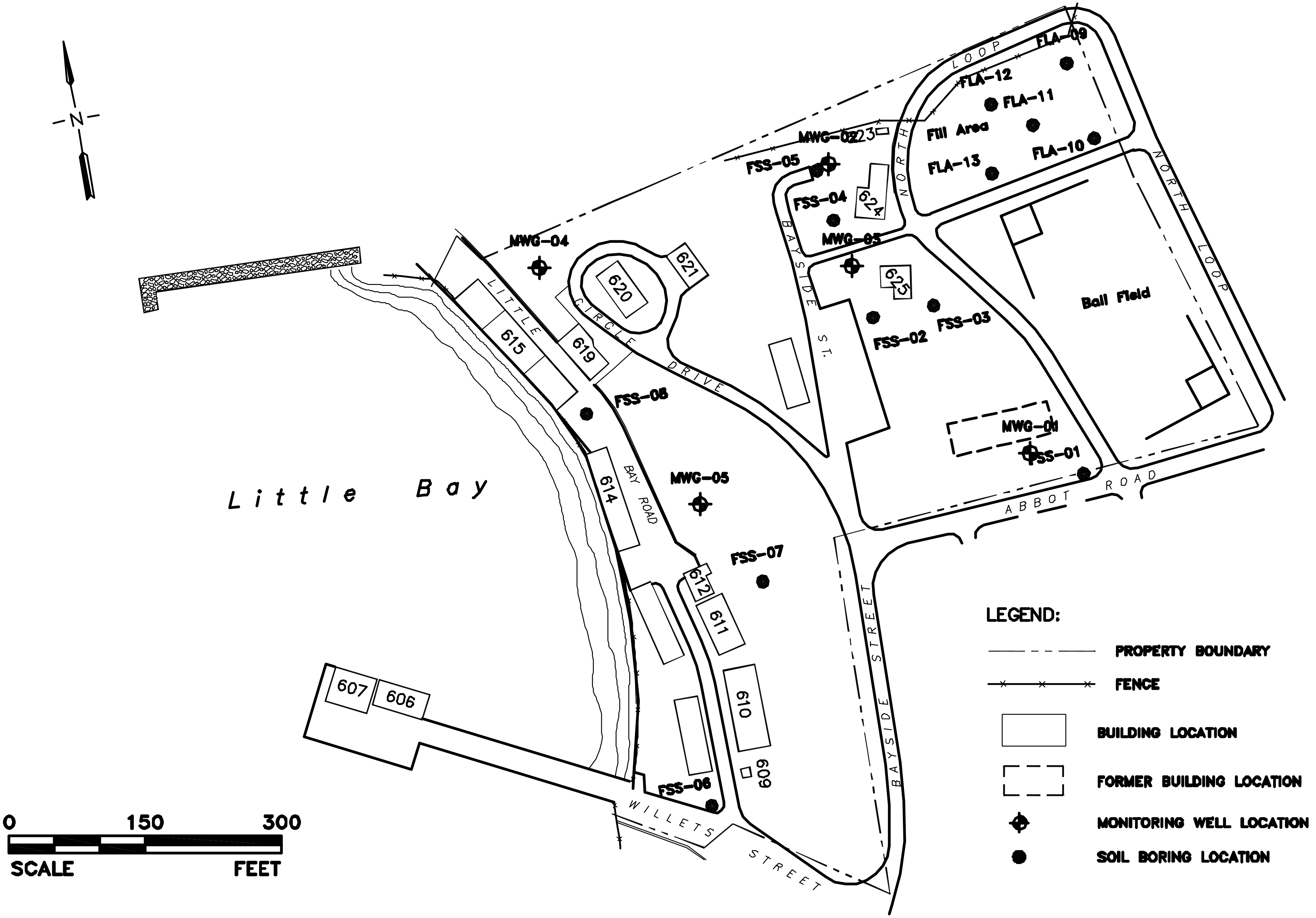
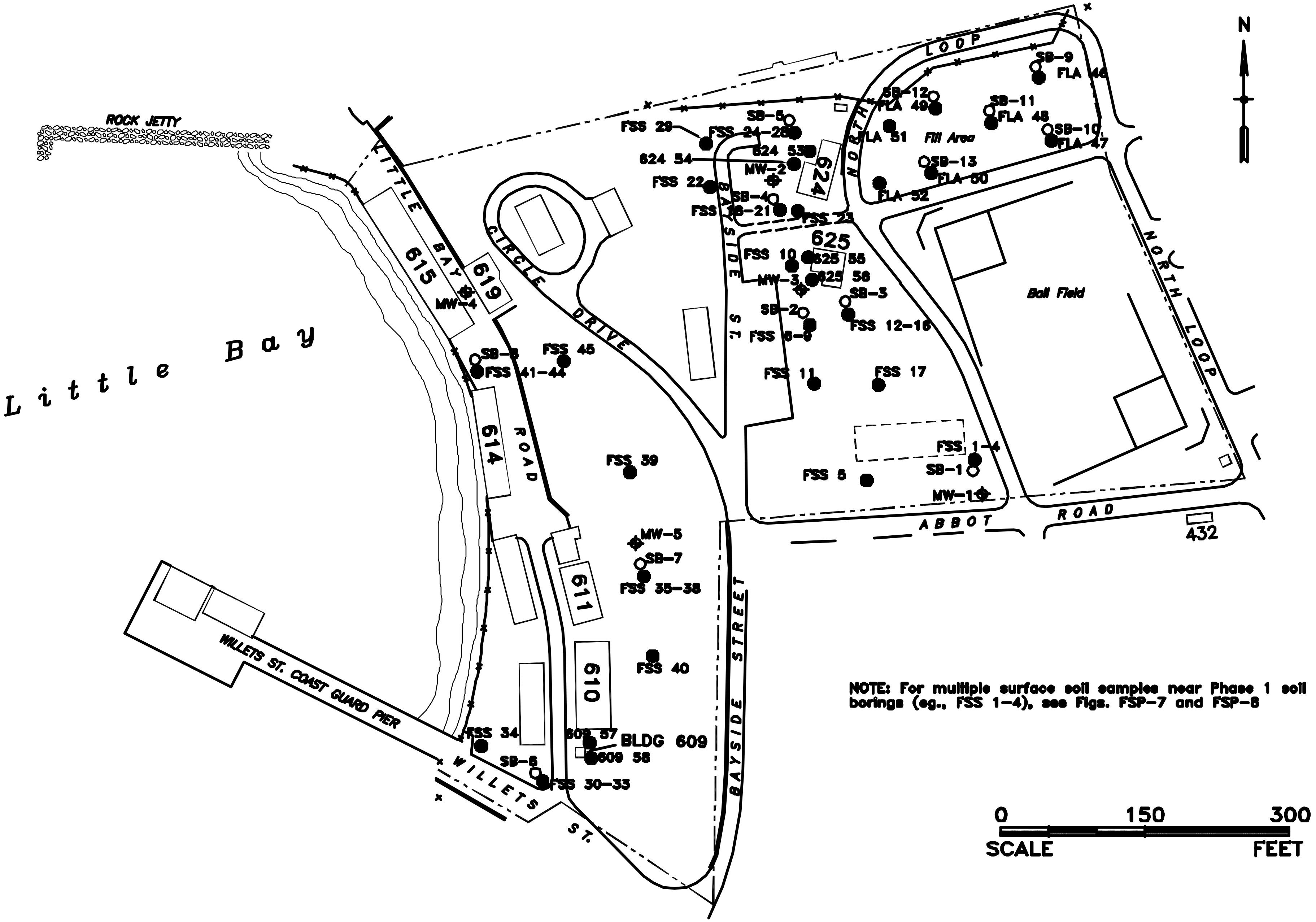


FIGURE 3-1: RI PHASE 1 SOIL BORING AND MONITORING WELL LOCATIONS



NOTE: For multiple surface soil samples near Phase 1 soil borings (eg., FSS 1-4), see Figs. FSP-7 and FSP-8

FIGURE 3-2: UPLAND SAMPLE LOCATIONS, FORT TOTTEN

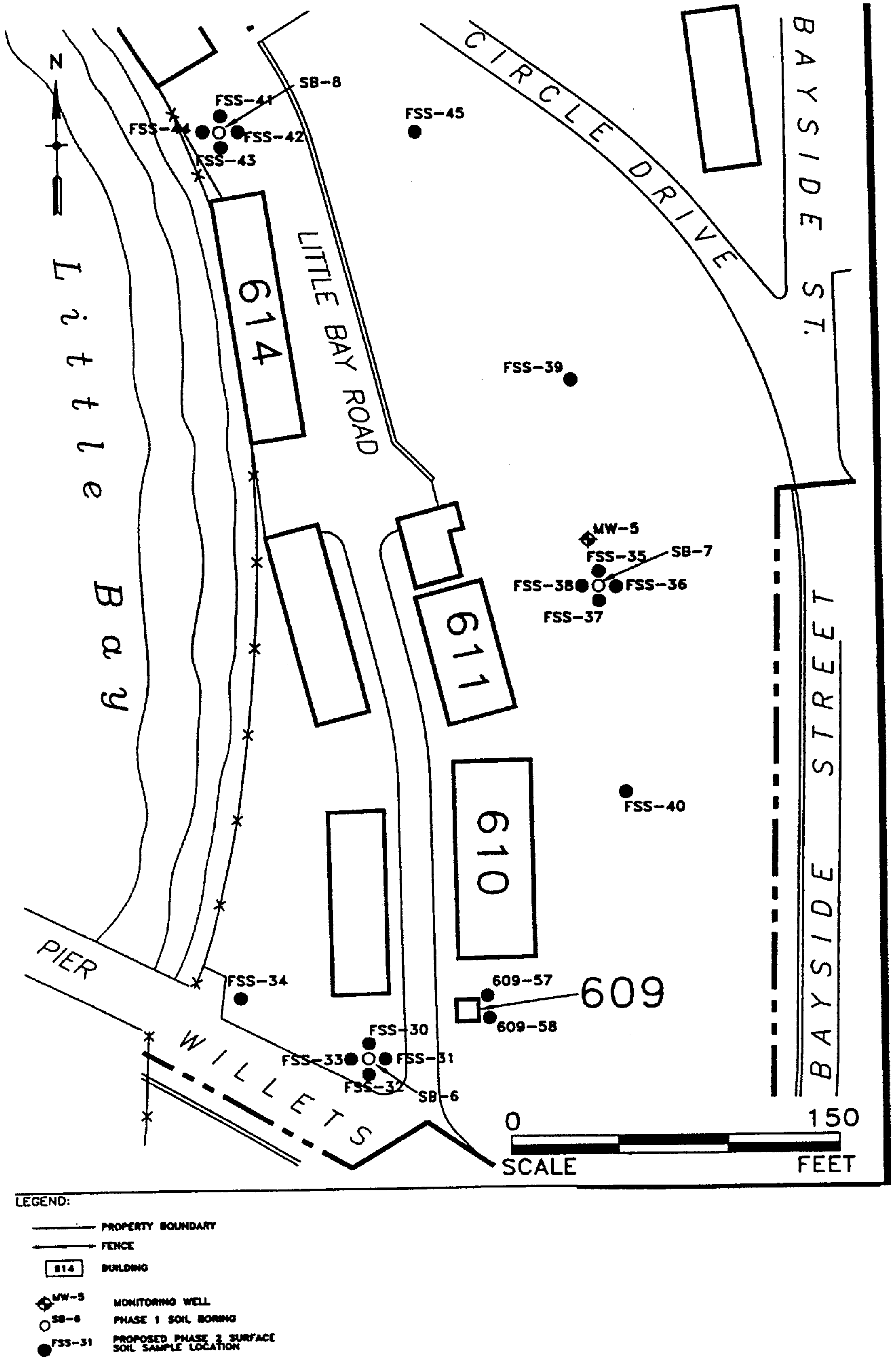


Figure 3-3. Phase 2 Detailed Upland Sampling Plan (West of Bayside Street).

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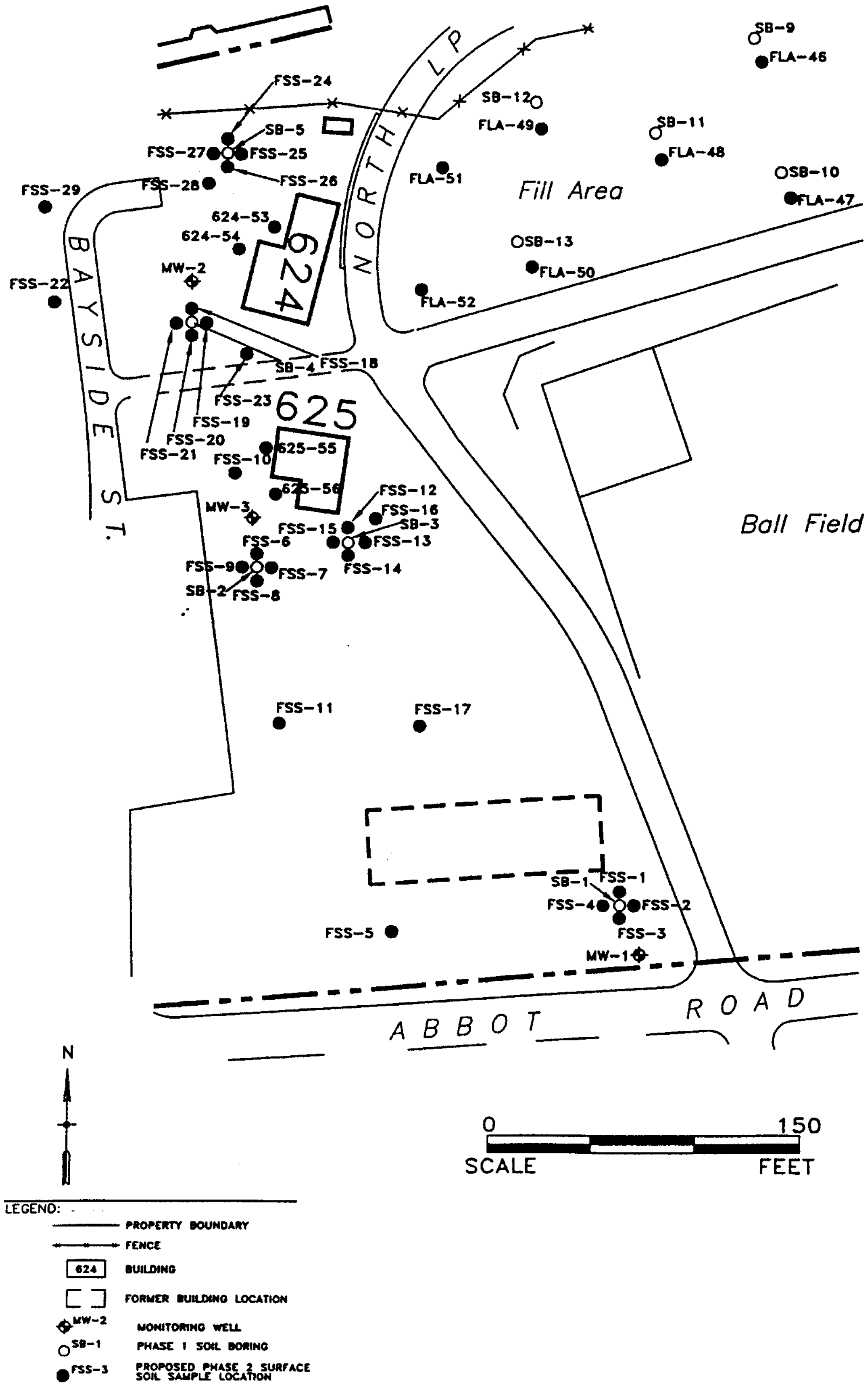

Figure 3-4. Phase 2 Detailed Upland Sampling Plan (East of Bayside Street).

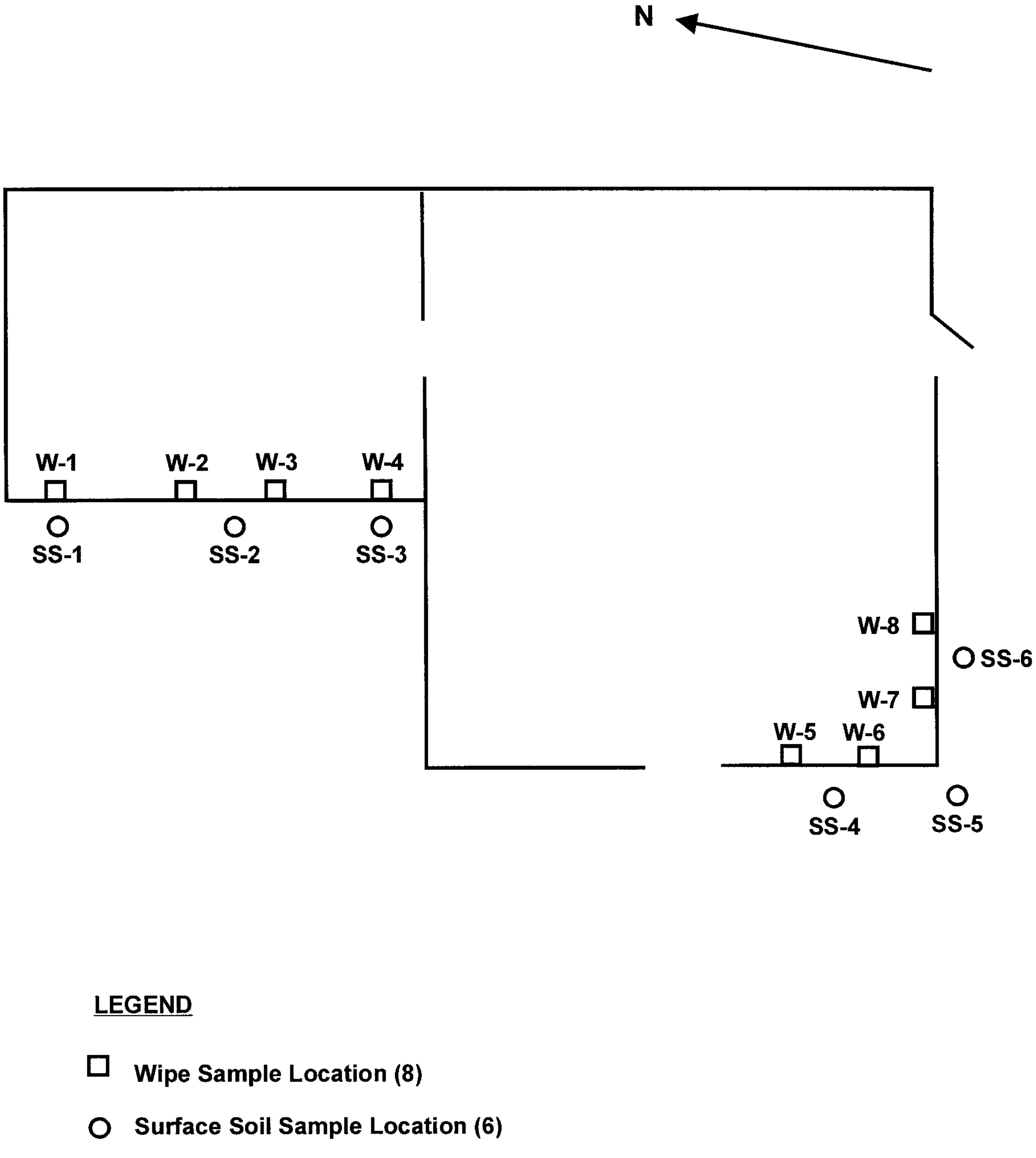

Figure 3-5. Building 624 RI Phase 1 Wipe and Surface Soil Sampling.

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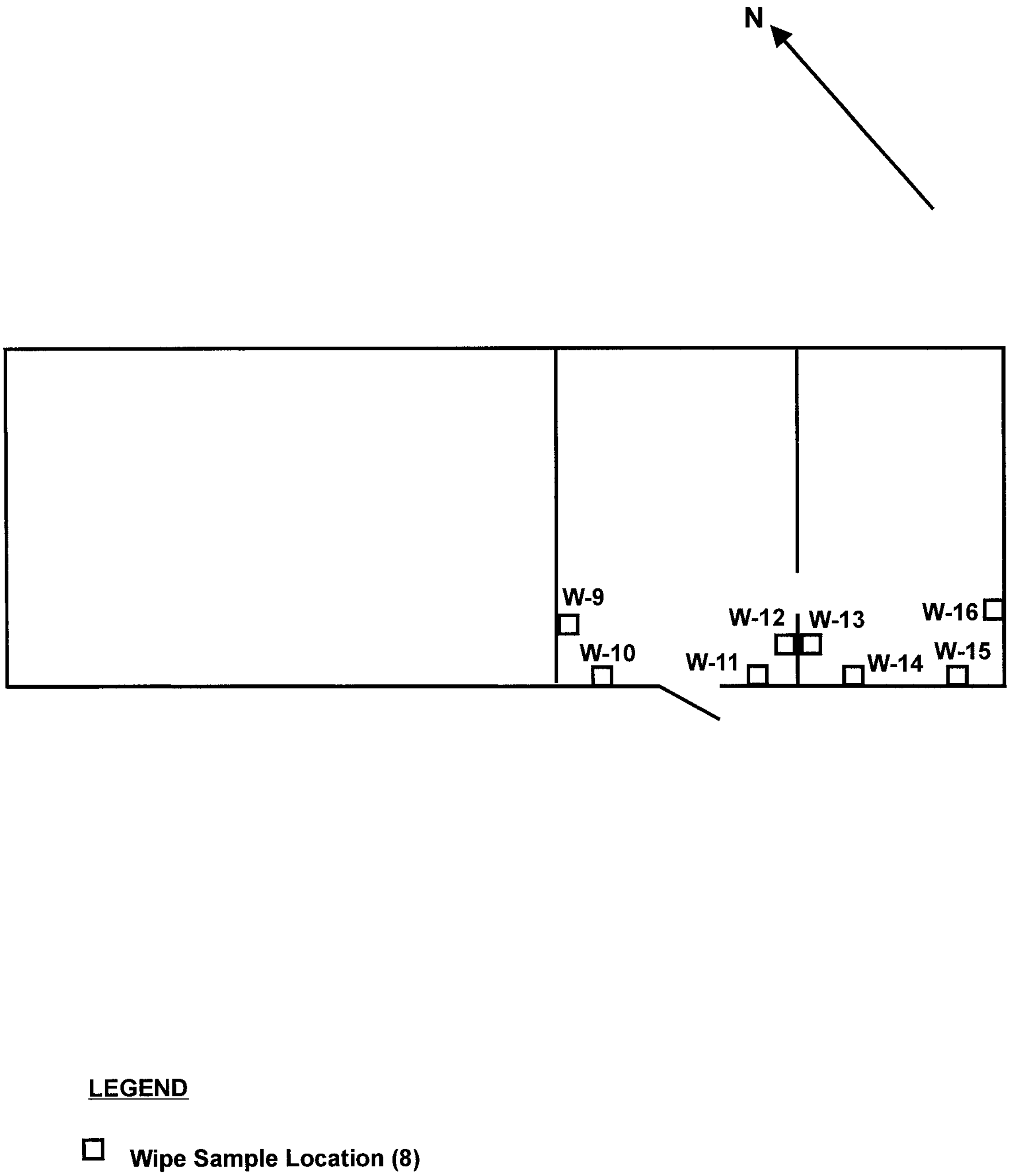

Figure 3-6. Building 619 RI Phase 1 Wipe Sampling Locations.

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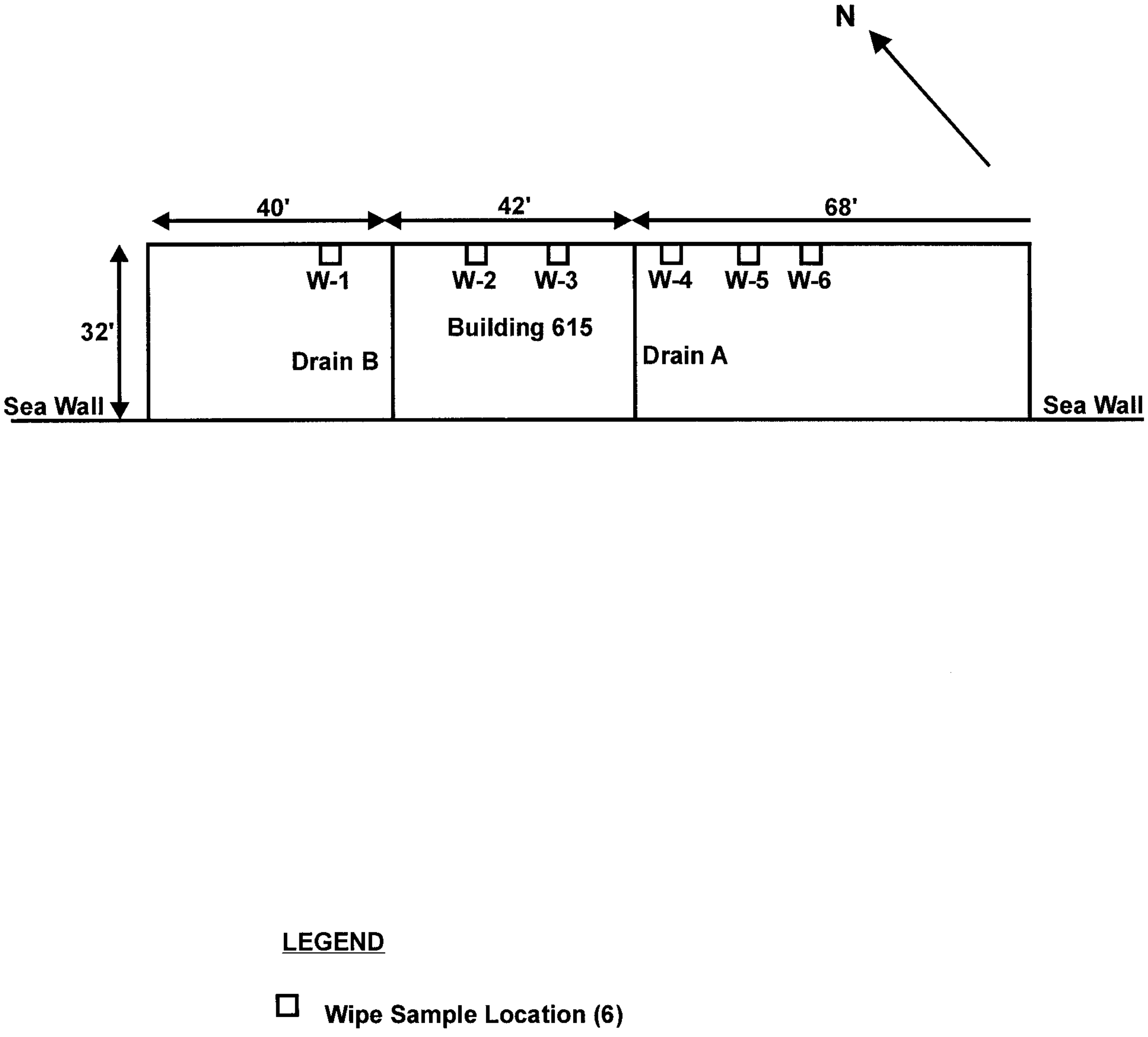

Figure 3-7. Building 615 RI Phase 1 Wipe Sampling Locations.

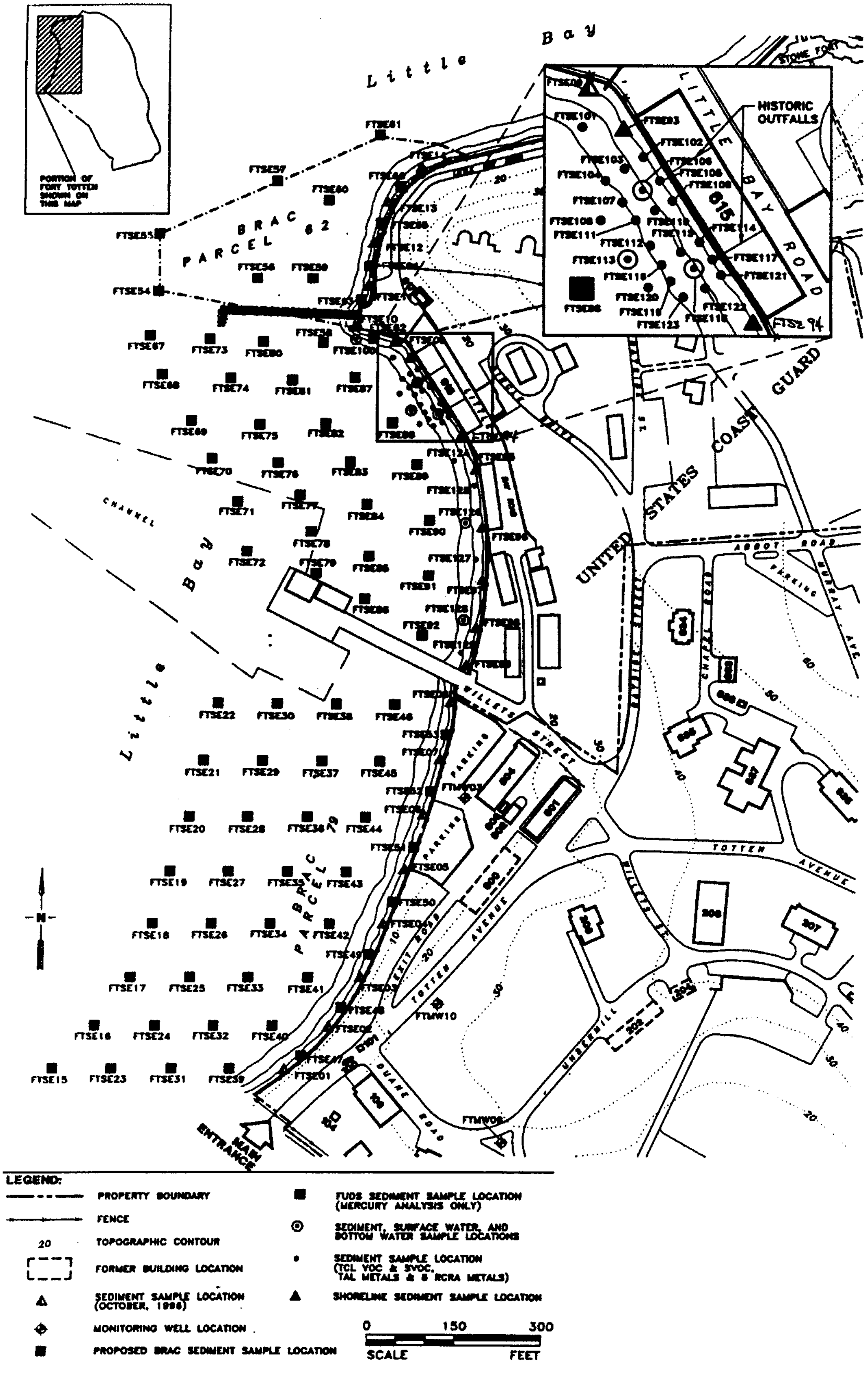

Figure 3-8. RI Phase 1 Sediment Sampling Locations Along the Little Bay Shoreline.

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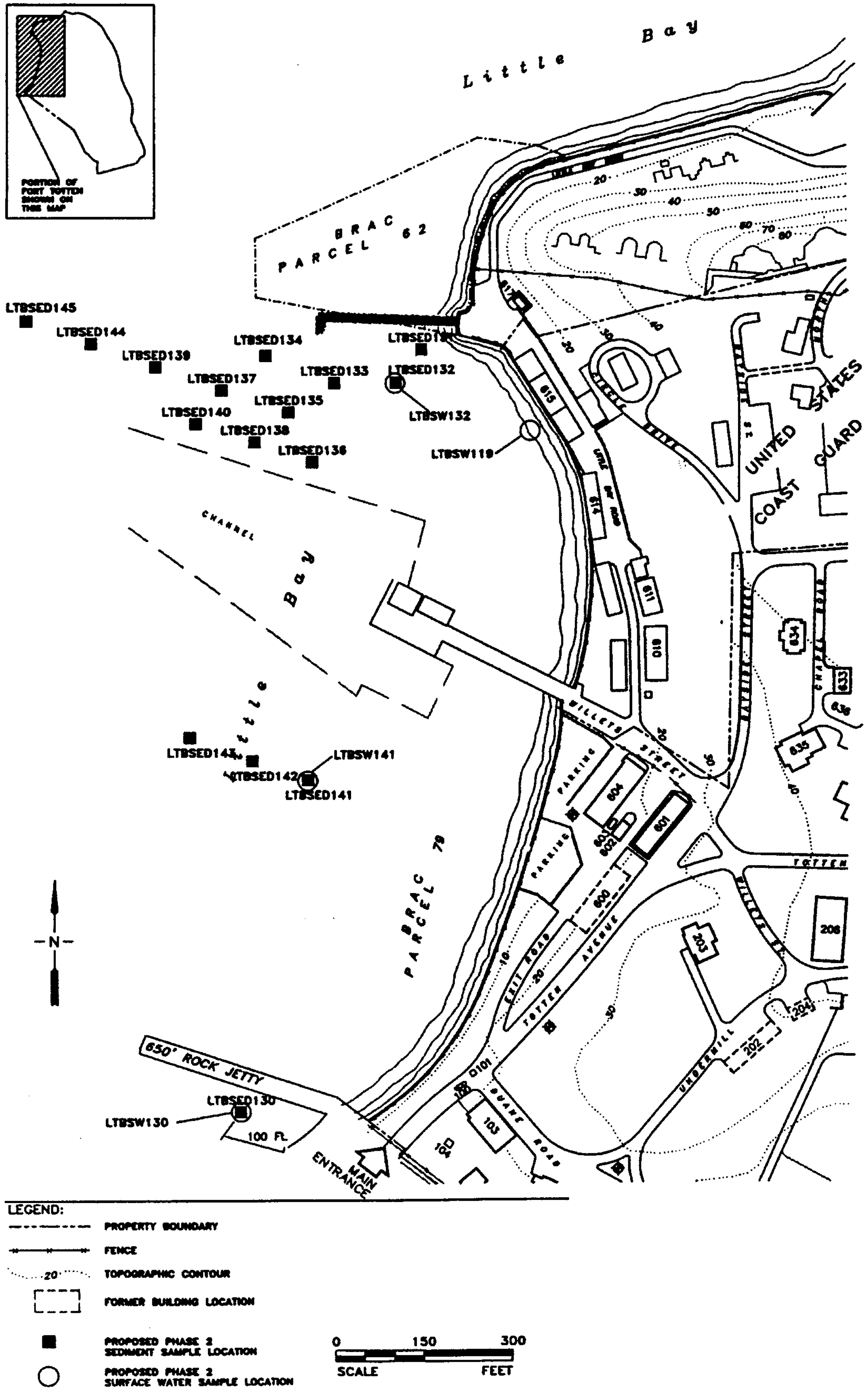

Figure 3-9. RI Phase 2 Sediment and Surface Water Sampling Locations Along Little Bay.

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4.0 NATURE AND EXTENT OF CONTAMINATION

4.1 RI PHASE 1 SOIL BORING RESULTS

Analysis for VOCs, SVOCs, and TAL metals was conducted on soil samples from the fill area and former surface soil areas. The sampling locations are shown in Figure 3-1 and the results are presented in Tables 1-13 through 1-15. There were isolated VOCs in the soil at levels less than New York State Department of Environmental Conservation (NYSDEC) Technical Administrative Guidance Memorandum (TAGM) 4046, Determination of Soil Cleanup Objectives and Cleanup Levels (i.e., TAGMs). At least one SVOC was detected above the TAGM level in every boring. Many of the semivolatile results are estimates (i.e., J-qualified data) because they are near practical quantitation limits. Concentrations of SVOCs are uniformly low at the groundwater interval. Arsenic and cadmium were seldom detected above TAGM screening levels. Concentrations of chromium were greater than the TAGM value of 10 mg/kg in every soil boring. There were several detections of mercury above the TAGM value of 0.1 mg/kg.

4.2 RI PHASE 2 SURFACE SOIL SAMPLING RESULTS

The surface soil analytical results are separated into semivolatile organic chemicals (SVOCs) (Table 4-1) and metals (Table 4-2). The following sections discuss the concentrations of these analytes relative to TAGM levels, and place site concentrations in the context of naturally occurring metals and organics commonly found in urban environments.

4.2.1 SVOC Results

SVOCs include the carcinogenic polycyclic aromatic hydrocarbons (PAH), which often are found to represent unacceptable levels of risk to humans (Chapter 6). At least one PAH was above TAGM levels in every boring, and there was a cluster of PAH exceeding TAGM values at FSS-12, FSS-13, FSS-14, and FSS-15. Many of the PAH results are estimates because the TAGM levels are near practical quantitation limits.

PAHs are introduced into the environment via natural and anthropogenic combustion processes. Volcanic eruptions and forest fires are among the major sources of naturally produced PAHs. Anthropogenic activities have dramatically increased the quantity of PAHs in the environment. The majority are emitted from fossil fuel combustion sources such as automobiles, coking plants, asphalt production, and manufacturing facilities that use fossil fuel (Menzie et al. 1992). PAHs are also present in industrial chemical wastes, such as coal tar, petroleum refinery sludges, waste oils and fuels, and wood-treating residues (Bradley et al. 1994). PAHs are ubiquitous in soil. PAH concentrations have increased over the last 100 to 150 years, especially in urban areas (Jones et al. 1989). Concentrations of benzo(a)pyrene in urban soils appear to be about two orders of magnitude higher than concentrations in rural soil (White and Vanderslice 1980).

Saltiene et al. (2001) studied urban areas throughout the world in cities including Helsinki, Chicago, London, and other urban centers. The geometric mean and range of concentrations for selected PAHs reported in Saltiene et al. (2001) are presented in Table 4-3. The geometic mean concentration of benz(b)anthracene was 0.109 mg/kg with a range of 0.0028 to 5.499 mg/kg. The geometic mean concentration of benz(a)pyrene was 0.140 mg/kg with a range of 0.0047 to 7.051 mg/kg. The geometic mean concentration of dibenz(a,h)anthracene was 0.018 mg/kg with a range of 0.0008 to 0.608 mg/kg. Bradley et al. (1994) studied surface soils in three urban areas of New England. A total of 60 samples were collected and analyzed for PAHs. The results for selected PAHs are found in Table 4-3. The arithmetic mean concentration of benz(b)anthracene was 1.32 mg/kg with a range of 0.048 to 15.0 mg/kg. The arithmetic mean concentration of benz(a)pyrene was 1.323 mg/kg with a range of 0.04 to 13.0 mg/kg. The arithmetic mean concentration of dibenz(a,h)anthracene was 0.388mg/kg with a range of 0.02 to 2.9 mg/kg. ATSDR (1995) reports urban concentrations of benz(b)anthracene to range from 0.169 to 59.0 mg/kg and benzo(a)pyrene to range from 0.165 to 0.220 mg/kg. The Massachusetts Department of the Environment Protection (MADEP) published a technical update in 2002 regarding background levels of PAHs in soil based on soil samples taken during the Central Artery/Tunnel (CA/T) big dig in Boston. The recommended state background soil concentration is shown along with the range of concentrations found during the CA/T in Table 4-3.

In the Phase 2 surface soil sampling, three PAHs (benz(a)anthracene, benzo(a)pyrene, and dibenz(a,h)anthracene), often exceeded the TAGM value. Exposure to the PAH benzo(a)pyrene was found to result in cancer risks to humans exceeding 1×10^{-6} for several human receptors (Chapter 6). However, as shown in Table 4-3, the PAH concentrations found at Fort Totten, including benzo(a)pyrene, are similar to those found in the above referenced papers. Consequently, the PAHs found at Fort Totten are reflective of urban environments where vehicular exhaust and urban combustion sources are greatest. Site activities do not appear to have added significantly to PAH loadings in surface soils at Fort Totten.

4.2.2 Inorganic Results

Arsenic, cadmium, and mercury occasionally exceeded TAGM values (Table 4-4), and exposure to arsenic resulted in cancer risks exceeding 1×10^{-6} for several human receptors (Chapter 6). Chromium was reported above the TAGM screening value of 10 mg/kg in all but one surface soil sample. There were several detections of mercury above NYSDEC's TAGM value of 0.1 mg/kg. A cluster of such readings occurred at FSS-35, FSS-36, FSS-37, and FSS-38. Concentrations of these metals are placed in the context of reference metal concentrations in the following sections:

Arsenic

Arsenic is found in various types of minerals and ores. Natural background concentrations of arsenic in soil are usually less than 10 mg/kg (Sandberg and Allen 1975). Various anthropogenic uses of arsenic include pesticides (now banned); glass, alloy, and electronics manufacturing; catalysts; feed additives; and veterinary chemicals (Bodek et al. 1988a).

In the Phase 2 surface soil sampling, arsenic was below the TAGM but, as discussed above resulted in cancer risks exceeding 1×10^{-6} for several human receptors (Chapter 6). Table 4-4 presents the range of concentrations present at Fort Totten versus literature values found for urban reference concentrations. The range of arsenic at Fort Totten was 0.125 to 19.2 mg/kg, within the range of concentrations found in urban soils reported by Shacklette and Boerngen (1984) and U.S. EPA (2000b) (Table 4-4). Consequently, the cancer risks calculated are the result of exposure to concentrations typical in the Eastern United States, and are not reflective of any practices followed at the Fort Totten Coast Guard facility.

Cadmium

Although cadmium occurs naturally in some carbonate and sulfide ores, its environmental occurrence and availability is largely due to its widespread industrial use and poor disposal practices. In addition to being a byproduct in the refining of other metals, cadmium is used in electroplating, batteries, pigments, plastic stabilizers, photovoltaic devices, and alloys (Bodek et al. 1988a).

In the Phase 2 surface soil sampling, cadmium was measured above the TAGM value in several samples. Table 4-4 presents the range of concentrations present at Fort Totten versus literature values found for urban reference concentrations. The range of cadmium at Fort Totten was 0.01

to 1.6 mg/kg within the range of concentrations found in urban soils reported by U.S. EPA (2000b), and Bradley et al. (1994).

Chromium

In addition to being widely distributed in the earth's crust, chromium is widely used in manufacturing. Large quantities of chromite ore are used to produce ferroalloys. A variety of other uses include production of stainless steel, heat and chemical-resistant bricks, pigments, electroplating, and in the textile and chemical industries (Bodek et al. 1988a).

In the Phase 2 surface soil sampling most chromium concentrations exceeded the TAGM value. However, as shown in Table 4-4, the range of concentrations present at Fort Totten (4.9 to 33.2 mg/kg) are within the range of concentrations found in urban soils reported by Shacklette and Boerngen (1984) and U.S. EPA (2000b).

Mercury

Mercury occurs naturally in sulfide ores. It is extracted by man and produced primarily in its liquid elemental form and various metal amalgams. Nearly half of its anthropogenic use is in electrical apparatus. Another 25 percent is used to make chlorine and caustic. Other uses include paint manufacturing, industrial instruments, dental preparations, fungicides, and bacteriocides (Bodek et al. 1988a). Mercury is a volatile chemical, and is released to the atmosphere during the combustion of coal. Consequently, mercury is often found in higher concentrations in urban areas such as the Fort Totten Coast Guard Station relative to background areas.

In the Phase 2 surface soil sampling, mercury concentrations exceeded the TAGM in several samples. The quantitative human health risk assessment found that there were acceptable risks to receptors from exposure to mercury (Chapter 6). Table 4-4 presents the range of concentrations present at Fort Totten versus literature values found for urban background concentrations. The range of mercury at Fort Totten was 0.0016 to 5.0 mg/kg. Three samples (FSS-SS-38-01, FSS-SS-44-01, and FSS-SS-42-01) had mercury concentrations that exceeded 4.5 mg/kg. The maximum concentration exceeded the range of concentrations found in urban soils reported by reported by Shacklette and Boerngen (1984) and Bradley et al. (1994). However, these high concentrations of mercury are not reflective of the site as a whole, resulting in acceptable risks to humans under Reasonable Maximum Exposure (RME) conditions (Chapter 6).

4.3 RI PHASE 1 PESTICIDE RESULTS

4.3.1 Buildings 619 and 624 Pesticide Wipe Sample Results

Pesticides were reportedly stored along particular walls in four rooms of Buildings 624 and 619 (two rooms per building). Sixteen (16) pesticide wipe samples were taken from those walls (four per room, eight per building) to determine the extent of the contaminated area. The pesticide wipe sampling was done with a steel wool pad moistened with high-grade ethanol and stroked three times against the wall in one direction. Figures 3-5 and 3-6 show the sampling locations, and results are presented in Tables 1-16 and 1-17.

Traces of 4,4'-DDT were found in Building 624 wipe samples B624-WP-01 through B624-WP-08. Building 619's walls showed traces of four pesticides, but the only ones commonly detected several times were 4,4'-DDE and 4,4'-DDT.

4.3.2 Building 624 Pesticide Surface Soil Sample Results

Six surface soil samples, at a depth of 0-6 in. BGS, were taken from around the base of the walls of Building 624, which showed pesticide contamination in the rooms. Surface soil samples were collected using a stainless steel trowel, and analyzed for pesticides. Figure 3-5 shows the sampling locations for the Building 624 samples, and the results are presented in Table 1-18.

The only pesticides detected were 4,4'-DDT and heptachlor epoxide. All samples, SS-01 through SS-06, showed traces of 4,4'-DDT, but were below the TAGM value of 2.1 mg/kg. The sole detection of heptachlor epoxide was qualified "P," indicating its presence is not positive.

4.4 RI PHASE 2 BUILDING 624 SURFACE SOIL PESTICIDE RESULTS

Two surface soil samples, numbered 624-SS-53 and 624-SS-54, were taken at a depth of 0-2 in. BGS from the base of the walls of Building 624. These samples were analyzed for pesticides. Figures 3-2 and 3-4 show the sampling locations, and the results are presented in Table 4-5.

The only pesticides reliably detected were 4,4'-DDT, gamma-BHC and heptachlor epoxide. Only heptachlor epoxide (0.031 mg/kg) in sample 624-SS-53-01 was reported above the TAGM screening level (0.02 mg/kg).

4.5 RI PHASE 1 BUILDING 615 MERCURY WIPE SAMPLE RESULTS

Since Building 615 had mercury disposed down the sink drains, and because mercury is a volatile metal, six wipe samples from the wall in the drain pipe area were analyzed for mercury. Figure 3-7 shows the sampling locations, and the results are presented in Table 1-12. The square of specially treated sample paper was wiped thrice against the wall, stroking in one direction.

Traces of mercury may have been detected in Building 615 wipe samples B615-WP-01 through B615-WP-06. However, all the results have lab qualifiers because they are near the lab instrumentation detection limits.

4.6 RI PHASE 2 BUILDINGS 625 AND 609 SURFACE SOIL PCB RESULTS

Four surface soil samples, at a depth of 0-2 in. BGS, were taken from the base of the walls of Building 625 and from beside the concrete transformer pad adjacent to Building 609, two samples at each location. These four surface soil samples were numbered 625-SS-55, 625-SS-56, 609-SS-57, and 609-SS-58, and they were analyzed for PCBs. Figures 3-2 through 3-4 show the sampling locations, and the results are presented in Table 4-6. No PCBs were detected in any of the samples.

4.7 RI PHASE 1 GROUNDWATER RESULTS

The groundwater at Fort Totten is class “GA,” according to NYSDEC Ambient Water Quality Standards and Guidance Values, Division of Water, Technical and Operational Guidance Series (TOGS) 1.1.1 (June 1998). Groundwater samples were taken from the existing Metcalf & Eddy monitoring wells 1 through 5 using a low flow pump. The wells were redeveloped, purged, and sampled as described in the Fort Totten Field Sampling Plan (USACE 1998). Figure 3-1 shows the monitoring well locations. The groundwater was analyzed for VOCs, SVOCs, and TAL metals. TAL metals samples were subdivided into filtered and unfiltered samples. The sample results are presented in Tables 1-19 through 1-21.

Though the wells were purged prior to sampling and sampling was done with low flow pumps, some of the samples were turbid. Three common laboratory chemicals, acetone, chloroform, and methylene chloride, were found in one, three, and two samples, respectively. Methylene chloride was also found in the trip blanks, so detections in samples should be viewed as potential laboratory contamination. Monitoring well number 2 shows detections of several semivolatiles, at low levels.

4.8 RI PHASE 2 GROUNDWATER RESULTS

Groundwater samples were taken from the existing Metcalf & Eddy monitoring wells 1 through 5 using a low flow pump. The wells were redeveloped, purged, and sampled as described in Section 4 of the Fort Totten Field Sampling Plan (USACE 2000). The groundwater was analyzed for VOCs, SVOCs, and TAL metals. TAL metals samples were not filtered. Figures 3-2 through 3-4 show the monitoring well locations.

The results of analysis for VOCs and SVOCs are presented in Tables 4-7 and 4-8. The results of analysis of pentachlorophenol (PCP) and polycyclic aromatic hydrocarbons (PAHs) are presented in Tables 4-9 and 4-10. Table 4-11 presents the metals results.

The only volatile, chloroform (9 μg/L), was found in MW-2. Chloroform is a common lab contaminant. Samples from MW-4 had low concentrations of several SVOCs. However, this is not confirmed by the Quality Assurance (QA) sample. In fact, on the PAH test, there were significant discrepancies between the laboratory sample from MW-4, which detected SVOCs, and the QA sample, which detected none. SVOCs were not detected previously at MW-4. There was no PCP detected in any of the samples.

The wells were purged prior to sampling, and sampling was done with low flow pumps. Metals in groundwater at concentrations in excess of the NYSDEC screening levels included aluminum, antimony, iron, and sodium. Mercury was not detected in any of the groundwater samples.

4.9 RI PHASE 1 SEDIMENT SAMPLE RESULTS

Figure 3-8 shows the RI Phase 1 sediment sampling locations. The results are presented in Tables 4-12 through 4-21. The following analysis is for mercury. Each location had samples taken at up to four depth intervals: 0-0.5 ft BGS (115 samples with 14 non-detects); 0.5-1 ft BGS (77 samples with 19 non-detects); 1.0-1.5 ft BGS (27 samples with 5 non-detects); and 1.5-2 ft BGS (17 samples with 2 non-detects). Since the detection limit varies from sample to sample, the statistical analyses were carried out only for sample results above the detection limit.

Therefore, for the shallowest level (0-0.5 ft BGS), the number of data points used in the statistical analysis is 115 – 14 = 101. Analogously, for 0.5-1 ft BGS, the number of data points used in the statistical analysis is 77 – 19 = 58. For 1-1.5 ft BGS, the number of data points used in the statistical analysis is 27 – 5 = 22. For 1.5-2 ft BGS, the number of data points used in the statistical analysis is 17 – 2 = 15. For all four sediment layers, the average and standard deviation were calculated.

Sediment Depth (ft BGS)	N	Average Concentration (mg/kg)	Standard Deviation (mg/kg)
0 - 0.5 (A)	101	0.4946	0.5745
0.5 – 1 (B)	58	0.9096	0.9521
1 - 1.5 (C)	22	1.7354	1.0205
1.5 – 2 (D)	15	2.1727	0.6469

BGS - below ground surface
s = standard deviation
n = the number of non-detect samples in each of these four sediment depths.

The maximum concentration for all samples, which was 5.25 mg/kg for sample FTSE 119B, was at the outfall from Building 615. The B designation means 6 in. to 1 ft sample depth (below floor surface). Analysis for volatile and semivolatile chemicals and eight metals (i.e., the RCRA metals) analysis was done on sediment samples taken within 50 ft of the shoreline. There is a moderate level of organic contamination.

4.10 RI PHASE 2 SEDIMENT SAMPLE RESULTS

To further delineate the level of mercury within the sediments in Little Bay beyond that achieved from the Phase 1 RI (Little Bay Risk Assessment draft report), a total of 176 sediment samples were collected from 16 locations. Eight of the locations correspond to areas determined to contain some of the higher mercury sediment concentrations just west of the Building 615 Area of Fort Totten (between the northern rock jetty and Willets Street Pier) in RI Phase 1. The other eight sampling locations are further away from the shoreline than was previously sampled. Each sampling location had 11 sediment subsamples taken at the following depths: “surficial” (0-3 in. depth), 3-12 in., 1-2 ft, 2-3 ft, 3-4 ft, 4-5 ft, 5-6 ft, 6-7 ft, 7-8 ft, 8-9 ft, and 9-10 ft BGS.

Figure 3-9 shows the Little Bay sampling locations. One hundred and seventy (170) of the sediment samples were analyzed for mercury. The results are presented in Table 4-22. Six of the surficial sediment samples, from toxicity sample locations LTB-SD-130, LTB-SD-133, LTB-SD-137, LTB-SD-139, LTB-SD-142, and LTB-SD-144, were analyzed for TAL metals, which includes mercury. The results are presented in Table 4-23. There are several instances of metals being detected above sediment guidance levels. However, the only source of contaminants from Fort Totten has been mercury from the drainpipes of Building 615. The other metals are probably naturally occurring at the observed concentrations.

Mercury was found in all sediment sample locations, including location LTB-SD-130, which is south of the southern rock jetty and considered the background sample. The lowest levels were found nearest Building 615, in locations LTB-SD-131 and LTB-SD-132. Sample location LTB-SD-145 also showed fairly low results. Generally, mercury concentrations were higher in the medium-depth sub-samples. NYSDEC collected several co-located sediment samples. The results of the analysis, presented in Table 4-24, demonstrate general agreement between the USACE and NYSDEC mercury concentrations, although detection limits were different between the two analyses.

Figure 4-1 shows the shallow mercury sediment concentrations (0-12 in.), and Figure 4-2 shows the deep mercury sediment concentrations (12-24 in.).

The DOD operated at Ft. Totten between 1857 and 1943, during which time mercury was released to Little Bay from Building 615. In order to provide an estimate of the time frame for accumulation of mercury in Little Bay, the chronology of sediment accumulation in Jamaica Bay developed using radionuclide markers by Bopp et. al (1993) was applied. The depositional environment of Little Bay is similar to Jamaica Bay in sources and conditions of sedimentation. Bopp et. al. reported that the accumulation rate averaged about 1.6 cm/yr between the mid-1950s and late 1980s. This estimate was based on fallout from atmospheric testing of nuclear weapons and from the disintegration of a nuclear powered satellite upon entering the atmosphere in 1964. This sedimentation rate translates to 19 years per foot of sediment, so the age of sediment and mercury at a depth of 6 ft where the highest mean concentration is found would be approximately 114 years (circa 1886). The authors note that due to compression of fine-grained sediments during gravity coring, this rate could significantly underestimate the actual sediment accumulation at the site. If the rate is actually twice what was reported, this means that the sediment would be 57 years old at a depth of 6 ft. Since onsite data are unavailable for Little Bay, a more accurate estimate of the age of sediment cannot be made.

4.10.1 Three-Dimensional Modeling of Mercury in Little Bay Sediment

Sediment sample results of mercury concentrations in Little Bay were used to model the three-dimensional distribution in the sediment to a depth of 10 ft. To provide a perspective of the samples collected with depth in the sediment, the same sample locations are shown in oblique view in Figure 4-3.

A three-dimensional computer model of mercury concentration was developed using GMS (Groundwater Modeling System) which was developed by the Environmental Modeling

Research Laboratory of Brigham Young University. The data set used in the model included the sediment results from Phase 1 and Phase 2 of the RI. Only two data points from Phase 2 were rejected which did not meet the Relative Precision Difference (RPD) Criteria of <0.20 for USACE Shell AND <0.50 for the Project Chemist.

The three-dimensional model was developed by creating a 3D grid over the study area, and interpolating data consisting of an x and y location, depth, and concentration of mercury using an inverse distance weighted (idw) interpolation scheme with gradient plane nodal functions. One of the problems with simple idw interpolations is that the interpolated data set always tends toward the mean of the data set in the voids between scatter points. As a result, local minima or maxima in the voids in the scatter point set are not properly inferred. To overcome this problem, a "nodal function" is computed at each scatter point. A nodal function is a plane or quadratic function that is forced to pass through the scatter point and approximate the nearby scatter points. When the interpolation is performed, rather than computing an average of the data set values at the scatter point locations, an average is computed of the nodal functions of the nearby scatter point evaluated at the interpolation point. This approach allows local trends to be inferred and often results in a more accurate interpolation. All data points were used in the interpolation, and contours were constrained to lie between the extreme values in the data set, rather than infer local maxima or minima implicit in the data set. The end result of this is an interpolation within the range of the actual data, with most data points honored, although it is not particularly smooth in appearance along the boundaries of the interpolated surfaces.

To effectively visualize the contaminant concentrations, iso-surfaces were created which represent a surface of constant value (mercury concentration in this case). Iso-surfaces are three-dimensional equivalents of contour lines and are shown within the model grid in Figure 4-4. The shoreline and nearby buildings and roads are also shown on the figure at an elevation of 0 ft above MSL. The color legend was constrained so that mercury concentrations below 0.15 mg/kg are shown in white; concentrations between 0.15 and 0.71 [the Effects Range–Low (ER-L) and Effects Range–Medium (ER-M) concentrations, respectively] are shown in yellow, and concentrations above 0.71 grade from yellow to red. All concentrations above 2.0 mg/kg are shown in red.

Cross sections were cut horizontally through the model at depths of 2, 4, 6, 8, and 10 ft, to show the variation with depth in the model area. These cross sections are shown in Figures 4-5 through 4-9. Also shown on each figure are the actual sample concentrations at the depth of the cross section, although the entire data set of 297 data points was used to interpolate the contoured surfaces over the entire depth of the measurements. This explains why there are contours at locations where there is not actually a data point at that depth. The contour is inferred based on the trend of the data from nearby points. The figures show that at the selected depths, the areal extent of sediment in Little Bay with mercury concentrations above the ER-L (0.15 mg/kg) is greatest at the 2-ft depth, and decreases with depth to 10 ft.

4.11 RI PHASE 1 SURFACE WATER RESULTS

The surface water sample locations for RI Phase 1 are shown on Figure 3-8 and the results are presented in Tables 4-25 through 4-27. Most of the water sample results for mercury were at or below the reporting limit of 0.1 µg/L. The highest number of 0.27 µg/L showed a result above the instrument detection limit (IDL) but below the contract-required detection limit (CRDL). This is at the low end of quantitation limits because this quantity is estimated; it is almost equivalent to non-detect.

The low mercury levels in the biota indicate that the mercury in the surface water and sediments is primarily inorganic mercury, since it would be organic mercury, as the dominant mercury species, that would permeate the skin of biota. In addition, of 12 surface water samples, all were non-detect with a detection limit of 0.1 µg/L. There were low level concentrations of volatile and semivolatile compounds in the surface water.

4.12 RI PHASE 2 SURFACE WATER RESULTS

Four surface-water samples were collected from the top of the water column from sediment sampling locations LTB-SD-119, LTB-SD-130, LTB-SD-132, and LTB-SD-141. Two of the locations, LTB-SD-132 and LTB-SD-141, also had bottom-water samples collected from them, for a total of six Little Bay water samples. Bottom-water samples are taken just above the sediment. The surface water and bottom water sample locations are shown on Figure 3-9. The water samples were collected in a Teflon bottle. All the samples were analyzed for mercury by USEPA Method 1631, a special low detection limit analysis. Two analyses were done on each sample: total mercury and dissolved (filtered) mercury. The results are given in Table 4-28.

The standard for mercury in marine surface water is 0.0007 µg/L for dissolved mercury (i.e., filtered water). During RI Phase 2, there were no detections of mercury in the dissolved surface water. However, there were low concentrations of mercury in the unfiltered samples analyzed for mercury. The presence of mercury in the unfiltered samples indicated that the mercury in the water column is likely attached to suspended particles.

4.13 RI PHASE 1 BIOTA RESULTS

The biota sample results for RI Phase 1 are presented in Tables 4-29 and 4-30. Five samples of mussel (20 January 1998) and oyster (22 January 1998) were taken in the first biota sampling. Fish were also collected in June 1998. The average detected mussel concentration was 0.094 mg/kg. The average detected oyster concentration was 0.086 mg/kg. The Risk-Based Concentration (RBC) for fish products for mercury is 0.14 mg/kg for methyl (organic) mercury and 0.41 mg/kg for inorganic (elemental mercury). The low mercury levels in the biota indicate that the mercury in the surface water and sediments is primarily inorganic mercury and is not bioconcentrating in the food chain.

4.14 RI PHASE 2 SEDIMENT TOXICITY RESULTS

The objective of the toxicity testing was to determine if the mercury present in Little Bay sediment is toxic to benthic organisms. Sediment for toxicity testing was collected from six locations (five in Little Bay and one reference). The five locations were LTB-SD-133, LTB-SD-137, LTB-SD-139, LTB-SD-142, and LTB-SD-144. The sediment sampling locations are shown in Figure 3-9 and the TAL metals concentrations are presented in Table 4-23. The reference sample of sediment, LTB-SD-130, was from a location on the southern side of the rock jetty, at the southern border of Fort Totten. The reference sample represents conditions within New York Harbor but not directly influenced by discharge from Building 615.

Samples were collected from the top 3 in. of sediment, as this depth has the most biological activity and the majority of the exposure are expected to occur there. At low tide, samples close to the shore were collected using a hand trowel. Samples from further out in the Bay were collected from a boat using a core-type apparatus with a split spoon. Each sample was immediately placed into a 2-L container.

The toxicity testing was accomplished by allowing the benthic organism, the polychaete *Leptocheirus plumulosus*, to live in the collected sediment for 28 days. A seventh, lab control colony of *L. plumulosus* was grown in clean sediment. The number and weight of the *L. plumulosus* was recorded before and after the 28-day period. *L. plumulosus* was chosen because it is ecologically important for energy flow and nutrient cycling in marine and estuarine systems and because it thrives in the low salinity levels (5 μg/L) ambient to Little Bay.

The sediment toxicity results are presented in Table 4-31. *L. plumulosus* survival, growth, and reproduction in all the samples were comparable to the laboratory control and reference control samples.

4.15 RI PHASE 2 BIOTA RESULTS

Biota sampling was conducted to determine whether mercury is bioconcentrating and/or bioaccumulating in the food chain. Tissue samples from mummichog, blue crab, oysters, and juvenile striped bass were collected and analyzed for mercury. (Several animals comprise each sample, in order to have sufficient sample.) Sampling was performed with nets, trowels, or crab traps (depending on the species) in mid-August 2000.

All biota were analyzed as whole-body samples. The results are presented in Tables 4-32 through 4-35. There were no measurements of mercury in biota above the reporting limit.

4.16 DEVIATIONS FROM WORK PLAN

RI Phase 1 sediment sub-samples were not always collected to the planned depth of 24 in. BGS, due to equipment problems. RI Phase 2 sediment sample LTB-SD-131-01 (0-3 in. BGS) was broken by the lab during processing before it could be analyzed for mercury. RI Phase 2 blue crab samples were to have been analyzed as liver, and whole-body minus liver samples. However, due to miscommunication with the lab the analysis was conducted for whole-body samples only.

4.17 SPRING 2002 GROUNDWATER RESULTS

Groundwater samples were taken from the existing Metcalf & Eddy monitoring wells 1 through 5 (Figure 3-1) using a low flow pump. Samples were collected in order of volatilization sensitivity. The samples were collected in the following order: VOCs, SVOCs, and unfiltered and filtered metals. The groundwater was analyzed for VOCs, SVOCs, pentachlorophenol (PCP), polycyclic aromatic hydrocarbon analysis (PAHs), and TAL metals. A sample was taken from MW04 on April 10, 2002, however, these data had quality control issues therefore a new sample was taken on April 25, 2002, which are shown in the appropriate tables, and used for the risk assessment. The sample results are presented in Tables 4-36 through 4-39.

There were scattered detections of the volatiles acetone, bromoform, chloroform, chloroethane, methyl tert-butyl ether, and dibromochloromethane among the monitoring wells, always at well below standards. Methylene chloride was detected in each of the five wells. Acetone, chloroform, and methylene chloride are common laboratory contaminants. There were scattered detections of the semivolatiles di(2-ethylhexyl)phthalate, di-n-butyl phthalate, chrysene, and diethyl phthalate among the monitoring wells, at low levels. The phthalates are common lab contaminants. The di(2-ethylhexyl)phthalate and chrysene exceeded TOGS 1.1.1 in MW-3 and MW-4, respectively. The polycyclic aromatic hydrocarbon analysis found 12 PAHs in MW-4. Nine (9) of the 12 exceeded the TOGs. There was no pentachlorophenol detected in any of the samples. The total metals values were generally higher than the dissolved metals values, indicating at least a slight amount of sediment in the groundwater samples since metals often cling to soil particles. Metals in groundwater at concentrations in excess of the NYSDEC screening levels included aluminum, chromium, iron, magnesium, and sodium. No mercury, total or dissolved, was found in any of the monitoring well samples.

4.18 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of the chemicals detected in the various media at the Fort Totten FUDS area are discussed here in light of the New York State TAGMs. The TAGMs were identified in Section 1.2 as items to be considered when investigating the site. Also, because of the lack of a background data set for the site, the chemicals, both organic and inorganic, detected in the various media at the site are discussed in light of concentrations found in urban areas. These urban area concentrations were obtained from the published literature, such as the peer-reviewed reports and government reports (e.g., ATSDR and USGS).

4.18.1 Soil Characterization

At least one PAH was above TAGM levels in every boring collected during the Phase II investigation. There was a cluster of PAHs exceeding TAGM values at FSS-12, FSS-13, FSS-14, and FSS-15. Many of the PAH results are estimates because the TAGM levels are near practical quantitation limits. Figure 4-10 shows concentrations of total PAHs (acenaphthylene, anthracene, benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]flouoranthene, benzo[g,h,i]perylene, chrysene, dibenz[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, naphthalene, phenanthrene, and pyrene) in soils in the Upland Areas. Similarly, Figure 4-11 shows concentrations of carcinogenic PAHs (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[k]flouoranthene, chrysene, dibenz[a,h]anthracene, and indeno[1,2,3-c,d]pyrene) in soils in the Upland Areas. Finally, Figure 4-12 shows benzo(a)pyrene toxicity equivalents for soil in the Upland Areas.

PAHs are introduced into the environment via natural and anthropogenic combustion processes (Van Metre et al. 2000). Volcanic eruptions and forest fires are among the major sources of naturally produced PAHs. Anthropogenic activities have dramatically increased the quantity of PAHs in the environment (Jones et al. 1989). The majority are emitted from fossil fuel combustion sources such as automobiles, coking plants, asphalt production, and manufacturing facilities that use fossil fuel (Menzie et al. 1992). PAHs are also present in industrial chemical wastes, such as coal tar, petroleum refinery sludges, waste oils and fuels, and wood-treating residues (Bradley et al. 1994). PAHs are ubiquitous in soil. PAH concentrations have increased over the last 100 to 150 years, especially in urban areas (Jones et al. 1989). Concentrations of benzo(a)pyrene in urban soils appear to be about two orders of magnitude higher than concentrations in rural soil (White and Vanderslice 1980). Saltiene et al. (2001) studied urban areas throughout the world in cities including Helsinki, Chicago, London, and other urban centers. The geometric mean and range of concentrations for selected PAHs reported in Saltiene et al. (2001) are presented in Table 4-3. The geometric mean concentration of benz(b)anthracene was 0.109 mg/kg with a range of 0.0028 to 5.499 mg/kg. The geometic mean concentration of benz(a)pyrene was 0.140 mg/kg with a range of 0.0047 to 7.051 mg/kg. The geometic mean concentration of dibenz(a,h)anthracene was 0.018 mg/kg with a range of 0.0008 to 0.608 mg/kg. Bradley et al. (1994) studied surface soils in three urban areas of New England. A total of 60 samples were collected and analyzed for PAHs. The results for selected PAHs are found in Table 4-3. The arithmetic mean concentration of benz(b)anthracene was 1.32 mg/kg with a range of 0.048 to 15.0 mg/kg. The arithmetic mean concentration of benz(a)pyrene was 1.323 mg/kg with a range of 0.04 to 13.0 mg/kg. The arithmetic mean concentration of dibenz(a,h)anthracene was 0.388mg/kg with a range of 0.02 to 2.9 mg/kg. ATSDR (1995) reports urban concentrations of benz(b)anthracene to range from 0.169 to 59.0 mg/kg and benzo(a)pyrene to range from 0.165 to 0.220 mg/kg. In addition, MADEP (2002) background values shown in Table 4-3 are similar to concentrations found at Fort Totten.

In the Phase 2 investigation surface soil sampling, three PAHs (benz(a)anthracene, benzo(a)pyrene, and dibenz(a,h)anthracene), often exceeded the TAGM value. However, as shown in Table 4-3, the PAH concentrations found in the upland area at Fort Totten, including benzo(a)pyrene, are similar to those found in the literature. Consequently, the PAHs found at Fort Totten are reflective of urban environments where vehicular exhaust and urban combustion sources are greatest. Site activities do not appear to have added significantly to PAH loadings in surface soils at the upland areas of Fort Totten.

Arsenic, cadmium, and mercury occasionally exceeded TAGM values (Table 4-4). Chromium was reported above the TAGM screening value of 10 mg/kg in all but one surface soil sample.

There were several detections of mercury above NYSDEC's TAGM value of 0.1 mg/kg. A cluster of such readings occurred at FSS-35, FSS-36, FSS-37, and FSS-38.

Arsenic is found in various types of minerals and ores. Natural background concentrations of arsenic in soil are usually less than 10 mg/kg (Sandberg and Allen 1975). Various anthropogenic uses of arsenic include pesticides (now banned); glass, alloy, and electronics manufacturing; catalysts; feed additives; and veterinary chemicals (Bodek et al. 1988a). In the Phase 2 surface soil sampling, arsenic was below the TAGM. Table 4-4 presents the range of concentrations present at Fort Totten versus literature values found for urban reference concentrations. The range of arsenic at Fort Totten was 0.125 to 19.2 mg/kg, within the range of concentrations found in urban soils reported by Shacklette and Boerngen (1984) and USEPA (2000b) (Table 4-4). Consequently, the concentrations typical in the Eastern United States are comparable to those found at the upland areas of the Fort Totten Coast Guard facility.

In the Phase 2 surface soil sampling, cadmium was measured above the TAGM value in several samples. Although cadmium occurs naturally in some carbonate and sulfide ores, its environmental occurrence and availability is largely due to its widespread industrial use and poor disposal practices. In addition to being a byproduct in the refining of other metals, cadmium is used in electroplating, batteries, pigments, plastic stabilizers, photovoltaic devices, and alloys (Bodek et al. 1988a). Table 4-4 presents the range of concentrations present at Fort Totten versus literature values found for urban reference concentrations. The range of cadmium at Fort Totten was 0.01 to 1.6 mg/kg within the range of concentrations found in urban soils reported by USEPA (2000b) and Bradley et al. (1994).

In the Phase 2 surface soil sampling, most chromium concentrations exceeded the TAGM value. In addition to being widely distributed in the earth's crust, chromium is widely used in manufacturing. Large quantities of chromite ore are used to produce ferroalloys. A variety of other uses include production of stainless steel, heat and chemical-resistant bricks, pigments, electroplating, and in the textile and chemical industries (Bodek et al. 1988a). However, as shown in Table 4-4, the range of concentrations present at Fort Totten (4.9 to 33.2 mg/kg) are within the range of concentrations found in urban soils reported by Shacklette and Boerngen (1984) and USEPA (2000b).

In the Phase 2 investigation, mercury concentrations in surface soil exceeded the TAGM in several samples. Figure 4-13 shows concentrations of mercury in Upland Area soil. Mercury occurs naturally in sulfide ores. It is extracted by man and produced primarily in its liquid elemental form and various metal amalgams. Nearly half of its anthropogenic use is in electrical apparatus. Another 25 percent is used to make chlorine and caustic. Other uses include paint manufacturing, industrial instruments, dental preparations, fungicides, and bacteriocides (Bodek et al. 1988a). Mercury is a volatile chemical, and is released to the atmosphere during the combustion of coal. Consequently, mercury is often found in higher concentrations in urban areas such as the Fort Totten Coast Guard Station relative to background areas. Table 4-4 presents the range of concentrations present at Fort Totten versus literature values found for urban background concentrations. The range of mercury at Fort Totten was 0.0016 to 5.0 mg/kg. Three samples (FSS-SS-38-01, FSS-SS-44-01, and FSS-SS-42-01) had mercury concentrations that exceeded 4.5 mg/kg. The maximum concentration exceeded the range of concentrations found in urban soils reported by reported by Shacklette and Boerngen (1984) and Bradley et al. (1994).

Lead did not exceed TAGM values; however, Figure 4-14 shows lead concentrations in Upland Areas soils.

The soil volatile, semivolatile, and metals concentrations are consistent with an urban environment where a low level of organics is always present. Metals concentrations are not above geographic norms. Based on the concentrations of SVOCs found in the upland soils, there is no indication of a release in the upland soils of Fort Totten because the concentrations are consistent with those expected in an urban environment.

4.18.2 Groundwater Characterization

The groundwater has a few scattered detections of volatile and semivolatile chemicals, with the exception of MW-4, which has several PAH detections. There is a low but consistent level of inorganic chemicals in the groundwater, either dissolved or in sediments that did not precipitate before collection. There are no drinking water sources downgradient of or on the site.

As shown in Tables 4-36 through 4-38, organic chemicals do not generally impact the groundwater, except for PAHs in MW-4. Drinking water analyses were used for the PAHs, and benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[ghi]perylene, benzo[k]fluoranthene, chrysene, fluoroanthene, and indeno[1,2,3-cd]pyrene exceeded NYSDEC guidance values. It should be pointed out that the standards for these chemicals are very stringent. The chemical properties of these semivolatile chemicals (e.g., very low water solubility) make it unlikely that they are dissolved in the groundwater. It is more likely, that the semivolatile chemicals in groundwater are attached to suspended particulate matter.

As shown in Table 4-11 and Table 4-39, the concentrations of a few metals (e.g., aluminum, chromium, iron, magnesium, and sodium) are greater than their respective guidance values. The concentrations of the more toxic metals (e.g., lead, mercury) are less than their respective guidance values. All of the metals found in the groundwater occur naturally in the environment; however, since there are no site-specific upgradient wells for comparison, a quantitative comparison of the metals concentration in groundwater cannot be made. The elevated concentration of sodium in the groundwater could be the result of saltwater influence from Little Bay or the result of impacts from road salt operations. High concentrations of chloride in the groundwater would also indicate impacts from road salt operations. High concentrations of iron in the groundwater, in excess of the guidance value, are common in the Queens/Brooklyn area and can assumed to be the result of natural processes.

4.18.3 Little Bay Characterization

There was a release of mercury to Little Bay from Building 615. Sediment sampling shows low levels of mercury throughout areas both in Little Bay and outside of it. Fort Totten's mercury data show a clear pattern of low concentrations approximately 100 ft from the sea wall, followed by slightly higher, ambient concentrations further out.

The concentration of mercury in Little Bay sediments collected from 0-12 in. BGS averaged 0.54 mg/kg mercury. The 90 percent Upper Confidence Limit on the Mean (UCLM) was 0.63 mg/kg. The 90 percent Upper Confidence Limit (UCL) is the upper bound estimate of the mean; i.e., with 90 percent confidence, the actual mean is less than 0.63 mg/kg.

To help put sediment contaminant levels in perspective, mercury and PAH concentrations will be compared between Fort Totten's Little Bay and various locations in the rest of the New York–New Jersey Harbor area.

There have been several studies by NOAA (1991), Adams et al. (1996), and by the states of New York and New Jersey (CARP 1997 – present) regarding sediment contamination in the New York Harbor area. The major study areas include six sub-basins: Newark Bay, Lower Harbor, Upper Harbor, Jamaica Bay, Western Long Island, and the Bight Apex. For locations, see Figure 2-1 in Appendix B.

Harbor sediments are variable in their tendency to capture and retain contaminants, a function basically of their grain size, mineralogy, and organic carbon content (Burton 1995). Just as biota bioconcentrate pollutants in varying degrees within their tissues from low concentrations in the water column, sediments effectively geo-concentrate them. An organic clay exposed to a source of cations or hydrophobic organics will always show higher concentrations of these than a quartz gravel exposed to the very same loading [non-aqueous phase liquid (NAPL) excepted].

Western Long Island Sound, which includes Willett's Point where Fort Totten is located, averaged 63.2 percent silt and clay, indicating a fine-grained substrate and largely depositional environment. Average TOC ranged from a low of 1.2 percent in the Bight Apex to a high of 2.5 percent in the Upper Harbor, with Western Long Island Sound close to the maximum at 2.3 percent.

Because a sediment's texture and organic carbon content are so influential in determining its pollutant capture efficiency, one can confidently expect elevated levels of contaminants in the Harbor's TOC enriched, fine-grained clastics regardless of the provenance of the chemicals. Based upon these parameters alone, it may be predicted that mercury and PAHs will be elevated in the fine-grained sediments of Western Long Island Sound as well as in the other sub-basins of the Harbor with the arguable exception of the Bight Apex.

The R-EMAP report shows the relative contamination at the various sub-basin stations in reference to common sediment toxicity measures (NYSDEC 1993; Long and Morgan 1990; Long et. al 1995). Thus, mercury (Figure 4-6 in Appendix B) is shown to be most elevated—consistently above the 0.71 mg/kg ER-M of Long et. al. (1995) in the westernmost extent of Western Long Island Sound close to the Fort Totten area. Moreover, one recent sediment sample under the Contaminant Assessment and Reduction Project (CARP) study from Long Island Sound Ambient Station 14 near the Throg's Neck Bridge (CARP database query results—Appendix B, Attachment 6), and thus close to Fort Totten, shows a mercury level of 1.47 mg/kg. Given the distribution of high mercury data in the western part of this sub-basin, the CARP value is probably fairly typical and may be low for more TOC-rich sediments.

Also, other studies (Stern et al. 1997; ITEX 1997; Bopp et. al. 1993, 1996) show that fine-grained sediments from industrialized areas in the Harbor, such as Newtown Creek and Port Jersey, can exceed 10 mg/kg and even 20 mg/kg mercury (Appendix B, Attachments 7 and 8). The R-EMAP data for Newark Bay sub-basin, as mentioned, shows it to have weighted mercury levels averaging 2.59 mg/kg (90 percent confidence interval of ±0.58 mg/kg; 90 percent UCL = 3.17 mg/kg). These elevated levels of mercury reflect the fine-grained, organic carbon rich nature of the sediments in the sub-basin and the density of industrial/commercial activity in the catchment area.

Finally, it should be pointed out that Harbor contamination depends not just on aerial and sedimentologic factors, but on stratigraphic variables (time of deposition, related to sample depth) as well. Bopp et. al. (1993) examined intact sediment profiles from Jamaica Bay and dated them using radionuclide markers. In core JB13, mercury levels varied (Appendix B, Attachment 9, Table 4) from 0.9 mg/kg of mercury in the top 2 centimeters (cm) of the core (the most recent deposition in the late 1980s, when the core was taken) to 2.4 mg/kg in the 28-32 cm horizon (representing deposition in about 1964-1970). These values show anthropogenic enrichment of mercury. Bopp et. al. (1993), citing Marowsky and Wedepohl (1971), estimate that pre-industrial age levels of mercury in the Harbor were about 0.18 mg/kg), which is above the NYSDEC TAGM limit.

The layering of mercury in the sediment is reflected in the Phase 2 sediment borings. The general trend of mercury concentrations in the Little Bay sediment borings shows that mercury concentrations are moderate at the surface, slightly more concentrated in the middle depths (3-8 ft BGS), and tapering off in the lowest depths. This is shown in Table 4-22. This anticipation that mercury and other contaminant values are higher in sediment cores from earlier in this century is supported by Bopp et. al. (1996). Mercury is shown to be higher historically (in about the 1960s to early 1970s) at all stations than it is now. A core from the Upper Harbor (mercury distribution, Appendix B, Attachment 10) shows a historical high of 4.3 mg/kg of mercury and a most recent concentration (bracketed in the illustration) of 1.8 mg/kg of mercury. One core from Raritan Bay gives a historical high of 2.9 mg/kg of mercury (0.5 mg/kg, most recent).

As a major industrial center and port for more than a century, subject to widespread discharges of petroleum products and wastes, one also finds elevated levels of PAHs in New York Harbor sediments, particularly those fractions containing fine-grained texture and high TOC. [PAHs are hydrophobic, with high organic-carbon partition coefficients, Koc; they have strong affinity for organic-rich media; NYSDEC (1993)].

USEPA's R-EMAP study sampled for 23 individual PAH compounds and reported these results as well as total PAHs (Appendix B; Attachment 11). The Harbor as a whole has an area-weighted average of total PAHs of 7.2 mg/kg (90 percent confidence interval of ±2.6 mg/kg; 90 percent UCL of 9.8 mg/kg). The Western Long Island Sound sub-basin, encompassing the Fort Totten area, has an area weighted average of 3.7 mg/kg (90 percent confidence interval = ±1.3 mg/kg) and a 90 percent UCL of 5.1 mg/kg. Moreover, the distribution of total PAHs by R-EMAP station (Appendix B, Attachment 12, Figure 4-8) shows that the highest PAH values, in excess of 44.8 mg/kg, are found in the western end of this sub-basin, including one station not far from the Willett's Point area.

In 1994, the National Oceanic and Atmospheric Administration (NOAA) conducted sampling throughout Long Island Sound (NOAA 1994). During NOAA's investigation, three samples were collected from Little Neck Bay and analyzed for PAHs. Little Neck Bay is southeast of Little Bay on the other side of the peninsula that contains Fort Totten. NOAA collected three samples from the sediment and analyzed for various PAHs. The list of PAHs that was analyzed for by NOAA is more expansive than the list of PAHs measured with USEPA's SW-846 methods. The results of the sediment sampling are shown in Table 4-40.

The results of the NOAA sediment analysis were compared qualitatively to the results from the USACE investigation of the Fort Totten FUDS area using the data described in Table 4-40. A statistical/quantitative comparison between the concentrations of PAHs in Little Bay and Little Neck Bay was not possible because of the low number of samples collected by NOAA (n=3). Figure 4-15 contains box and whisker plots for the PAHs that were detected in either the NOAA or USACE investigation. The summary plot is based on the median, quartiles, and extreme values. The box represents the interquartile range which contains the 50 percent of values. The whiskers are lines that extend from the box to the highest and lowest values, excluding outliers. A line across the box indicates the median PAH concentration.

A qualitative comparison shows that the median concentrations of most PAHs in Little Bay are less than the median concentrations of PAHs in Little Neck Bay. However, the interquartile range of the samples from Little Bay includes the median of the samples from Little Neck Bay, indicating that the two data sets may be from the same population. The pattern of PAH contamination is also similar indicating that the source(s) of contamination (likely urban deposition and runoff) and age of the PAHs are similar. The highest median concentrations of three PAHs (fluoranthene, pyrene, and benzo[b]fluoranthene) were the same in both locations. The absolute concentrations of the low and heavy molecular weight PAHs were lower than the medium weight PAHs. For example, the absolute concentration of fluorene (molecular weight 166.21 g/mole) is less than the absolute concentration of benzo[a]pyrene (molecular weight 152.32 g/mole). The concentrations and pattern of PAHs in both locations indicate that Little Bay is no more impacted (and may be less impacted) than Little Neck Bay.

TABLE 4-1 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
SURFACE SOIL SAMPLING FOR SEMIVOLATILES
AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-01-01	FSS-SS-02-01	FSS-SS-03-01	FSS-SS-04-01
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	<0.071 (U)	0.046 (J)	0.096 (J)	<0.071 (U)
ANTHRACENE	50.0	<0.40 (U)	<0.40 (U)	0.090 (J)	0.042 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	0.130 (J)	0.220 (J)	**0.560**	0.200 (J)
BENZO[A]PYRENE	0.061 or MDL	**0.190 (J)**	**0.310 (J)**	**0.700**	**0.250 (J)**
BENZO[B]FLUORANTHENE	1.1	0.270 (J)	0.460	1.100	0.380
BENZO[GHI]PERYLENE	50.0	0.120 (J)	0.180 (J)	0.390	0.150 (J)
BENZO[K]FLUORANTHENE	1.1	0.089 (J)	0.180 (J)	0.360 (J)	0.130 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.087 (J)	0.085 (J)	0.170 (J)	0.110 (J)
BUTYL BENZYL PHTHALATE	50.0	<0.056 (U)	<0.056 (U)	<0.056 (U)	<0.056 (U)
CHRYSENE	0.4	0.140 (J)	0.290 (J)	**0.670**	0.230 (J)
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	<0.072 (U)	<0.072 (U)	**0.041 (J)**	<0.072 (U)
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	0.068 (U)	0.068 (U)	0.068 (U)	0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	<0.046 (U)	<0.046 (U)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	0.250 (J)	0.480	1.100	0.440
FLUORENE	50.0	<0.067 (U)	<0.067 (U)	<0.067 (U)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.120 (J)	0.200 (J)	0.400	0.150 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	<0.063 (U)	<0.063 (U)	<0.063 (U)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	<0.069 (U)	<0.069 (U)	<0.069 (U)	<0.069 (U)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.110 (J)	0.210 (J)	0.570	0.280 (J)
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	0.270 (J)	0.500	1.300	0.480
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC**	FSS-SS-05-01	FSS-SS-12-01	FSS-SS-12-22	FSS-SS-12-33
	TAGM			QC Duplicate	QA Duplicate
	mg/kg			of SS-12-01	of SS-12-01
ACENAPHTHENE	50.0	<0.068 (U)	0.038 (J)	<0.068 (U)	0.020 (B)
ACENAPHTHYLENE	41.0	0.320 (J)	1.500	1.600	2.450
ANTHRACENE	50.0	0.130 (J)	0.390	0.480	0.840
BENZ[A]ANTHRACENE	0.224 or MDL	**0.970**	**4.100**	**4.600**	**7.100**
BENZO[A]PYRENE	0.061 or MDL	**1.300**	**6.400 (E)**	**6.600 (E)**	**9.000**
BENZO[B]FLUORANTHENE	1.1	**1.800**	**8.700 (E)**	**9.000 (E)**	**16.000**
BENZO[GHI]PERYLENE	50.0	0.660	4.500 (E)	4.900 (E)	6.740
BENZO[K]FLUORANTHENE	1.1	0.630	**2.700**	**2.700**	<0.052 (U)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.092 (J)	0.180 (J)	0.160 (J)	0.180 (B)
BUTYL BENZYL PHTHALATE	50.0	<0.056 (U)	<0.056 (U)	<0.056 (U)	0.030 (B)
CHRYSENE	0.4	**1.100**	**4.500 (E)**	**4.900 (E)**	**7.170**
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	0.110 (J)	0.110 (J)	0.140 (B)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	**0.063 (J)**	**1.000**	**1.200**	**1.270**
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	0.050 (J)	<0.046 (U)	<0.046 (U)	0.030 (B)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	1.400	4.700 (E)	4.800	11.000
FLUORENE	50.0	<0.067 (U)	0.092 (J)	0.097 (J)	0.090 (B)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.780	**4.60 (E)**	**5.000 (E)**	**7.340**
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	0.320 (J)	0.370 (J)	0.370
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	0.030 (B)
NAPHTHALENE	13.0	0.052 (J)	0.290 (J)	0.320 (J)	0.390
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.550	1.300	1.200	1.560
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	0.040 (B)
PYRENE	50.0	1.800	8.000 (E)	8.800 (E)	11.000
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-13-01	FSS-SS-14-01	FSS-SS-15-01	FSS-SS-16-01
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	0.400	0.490	1.200	0.120 (J)
ANTHRACENE	50.0	0.130 (J)	0.130 (J)	0.350 (J)	0.040 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	**0.890**	**1.200**	**3.500**	**0.300 (J)**
BENZO[A]PYRENE	0.061 or MDL	**1.500**	**1.900**	**5.100 (E)**	**0.460**
BENZO[B]FLUORANTHENE	1.1	**2.300**	**2.800**	**6.600 (E)**	0.690
BENZO[GHI]PERYLENE	50.0	1.200	1.500	4.100	0.360 (J)
BENZO[K]FLUORANTHENE	1.1	0.870	**1.100**	**2.400**	0.240 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.190 (J)	0.140 (J)	0.180 (J)	0.120 (J)
BUTYL BENZYL PHTHALATE	50.0	0.038 (J)	0.056 (J)	0.068 (J)	<0.056 (U)
CHRYSENE	0.4	**1.200**	**1.400**	**3.700**	0.380
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	0.054 (J)	0.047 (J)	0.074 (J)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	**0.083 (J)**	**0.30 (J)**	**0.940**	<0.072 (U)
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	0.044 (J)	<0.046 (U)	0.055 (J)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	1.500	1.400	3.600	0.460
FLUORENE	50.0	0.038 (J)	<0.067 (U)	0.068 (J)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	1.200	1.600	**4.100**	0.370 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	0.160 (J)	0.130 (J)	0.140 (J)	0.077 (J)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	0.150 (J)	0.130 (J)	0.190 (J)	0.061 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.490	0.400	0.820	0.170 (J)
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	2.300	2.500	6.900 (E)	0.680
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-17-01	FSS-SS-18-01	FSS-SS-18-22 QC Duplicate of SS-18-01	FSS-SS-19-01
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	0.049 (J)	<0.071 (U)	<0.071 (U)	<0.071 (U)
ANTHRACENE	50.0	<0.040 (U)	<0.040 (U)	<0.040 (U)	<0.040 (U)
BENZ[A]ANTHRACENE	0.224 or MDL	0.200 (J)	0.120 (J)	0.110 (J)	0.120 (J)
BENZO[A]PYRENE	0.061 or MDL	**0.210 (J)**	**0.140 (J)**	**0.160 (J)**	**0.130 (J)**
BENZO[B]FLUORANTHENE	1.1	0.370 (J)	0.230 (J)	0.210 (J)	0.220 (J)
BENZO[GHI]PERYLENE	50.0	0.160 (J)	0.110 (J)	<0.086 (U)	0.064 (J)
BENZO[K]FLUORANTHENE	1.1	0.140 (J)	0.072 (J)	0.100 (J)	0.080 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.093 (J)	0.130 (J)	0.130 (J)	0.100 (J)
BUTYL BENZYL PHTHALATE	50.0	<0.056 (U)	0.043 (J)	0.062 (J)	<0.056 (U)
CHRYSENE	0.4	0.310 (J)	0.150 (J)	0.150 (J)	0.160 (J)
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	0.100 (J)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	**0.043 (J)**	<0.072 (U)	<0.072 (U)	<0.072 (U)
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	<0.046 (U)	<0.046 (U)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	0.310 (J)	0.190 (J)	0.180 (J)	0.270 (J)
FLUORENE	50.0	0.041 (J)	<0.067 (U)	<0.067 (U)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.160 (J)	0.110 (J)	0.120 (J)	0.075 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	.330 (J)	<0.063 (U)	<0.063 (U)	<0.063 (U)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	0.140 (J)	<0.069 (U)	<0.069 (U)	<0.069 (U)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.440	0.120 (J)	0.100 (J)	0.160 (J)
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	0.460	0.290 (J)	0.300 (J)	0.270 (J)
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-20-01	FSS-SS-21-01	FSS-SS-22-01	FSS-SS-23-01
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	<0.071 (U)	<0.071 (U)	<0.071 (U)	<0.071 (U)
ANTHRACENE	50.0	<0.040 (U)	0.072 (J)	<0.040 (U)	0.071 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	0.120 (J)	**0.480**	0.160 (J)	**0.230 (J)**
BENZO[A]PYRENE	0.061 or MDL	**0.110 (J)**	**0.620**	**0.190 (J)**	**0.230 (J)**
BENZO[B]FLUORANTHENE	1.1	0.180 (J)	0.980	0.290 (J)	0.360
BENZO[GHI]PERYLENE	50.0	0.058 (J)	0.450	0.120 (J)	0.140 (J)
BENZO[K]FLUORANTHENE	1.1	0.079 (J)	0.340 (J)	0.100 (J)	0.150 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	17.000 (E)	0.130 (J)	0.200 (J)	0.049 (J)
BUTYL BENZYL PHTHALATE	50.0	0.088 (J)	<0.056 (U)	0.067 (J)	<0.056 (U)
CHRYSENE	0.4	<0.032 (U)	**0.540**	0.220 (J)	0.280 (J)
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	<0.072 (U)	**0.150 (J)**	<0.072 (U)	<0.072 (U)
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	0.040 (J)	<0.046 (U)	<0.046 (U)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	0.240 (J)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	0.200 (J)	0.750	0.320 (J)	0.460
FLUORENE	50.0	<0.067 (U)	<0.067 (U)	<0.067 (U)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.068 (J)	0.480	0.140 (J)	0.160 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	<0.063 (U)	<0.063 (U)	<0.063 (U)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.072 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.097 (J)	0.380	0.190 (J)	0.300 (J)
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	0.240 (J)	0.810	0.360 (J)	0.510
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC**	FSS-SS-24-01	FSS-SS-24-22	FSS-SS-25-01	FSS-SS-26-01
	TAGM		QC Duplicate		
	mg/kg		of SS-24-01		
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	<0.071 (U)	<0.071 (U)	<0.071 (U)	0.072 (J)
ANTHRACENE	50.0	<0.040 (U)	<0.040 (U)	0.088 (J)	0.086 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	0.160 (J)	0.140 (J)	**0.290 (J)**	**0.300 (J)**
BENZO[A]PYRENE	0.061 or MDL	**0.190 (J)**	**0.170 (J)**	**0.300 (J)**	**0.340 (J)**
BENZO[B]FLUORANTHENE	1.1	0.320 (J)	0.270 (J)	0.470	0.600
BENZO[GHI]PERYLENE	50.0	0.140 (J)	0.130 (J)	0.190 (J)	0.310 (J)
BENZO[K]FLUORANTHENE	1.1	0.094 (J)	0.096 (J)	0.170 (J)	0.210 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.230 (J)	0.210 (J)	0.200 (J)	0.180 (J)
BUTYL BENZYL PHTHALATE	50.0	0.110 (J)	0.054 (J)	0.069 (J)	0.051 (J)
CHRYSENE	0.4	0.230 (J)	0.220 (J)	0.380 (J)	**0.440**
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	**0.090 (J)**
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	<0.046 (U)	<0.046 (U)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	0.260 (J)	0.250 (J)	0.590	0.600
FLUORENE	50.0	<0.067 (U)	<0.067 (U)	<0.067 (U)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.140 (J)	0.140 (J)	0.230 (J)	0.350 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	<0.063 (U)	0.044 (J)	0.059 (J)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	<0.069 (U)	<0.069 (U)	<0.069 (U)	0.058 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.160 (J)	0.150 (J)	0.440	0.370 (J)
PHENOL	0.03 or MDL	<0.066 (U)	**0.069 (J)**	<0.066 (U)	<0.066 (U)
PYRENE	50.0	0.330 (J)	0.270 (J)	0.530	0.590
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and
Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	NYSDEC TAGM mg/kg	FSS-SS-27-01	FSS-SS-28-01	FSS-SS-29-01	FSS-SS-30-01
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	<0.071 (U)	0.059 (J)	0.410 (J)	0.055 (J)
ANTHRACENE	50.0	<0.040 (U)	0.082 (J)	0.190 (J)	0.056 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	0.099 (J)	**0.320 (J)**	**1.600**	**0.250 (J)**
BENZO[A]PYRENE	0.061 or MDL	**0.110 (J)**	**0.380 (J)**	**1.500**	**0.260 (J)**
BENZO[B]FLUORANTHENE	1.1	0.190 (J)	0.630	**2.200**	0.430
BENZO[GHI]PERYLENE	50.0	0.093 (J)	0.250 (J)	1.000	0.170 (J)
BENZO[K]FLUORANTHENE	1.1	0.082 (J)	0.220 (J)	0.680	0.160 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.150 (J)	0.300 (J)	9.800 (E)	0.210 (J)
BUTYL BENZYL PHTHALATE	50.0	0.044 (J)	0.069 (J)	0.300 (J)	0.099 (J)
CHRYSENE	0.4	0.160 (J)	**0.460**	**1.500**	0.360
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	<0.072 (U)	**0.072 (J)**	**0.280 (J)**	<0.072 (U)
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	0.064 (J)	0.066 (J)	0.039 (J)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	0.210 (J)	0.680	2.000	0.460
FLUORENE	50.0	<0.067 (U)	<0.067 (U)	<0.067 (U)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.087 (J)	0.280 (J)	1.200	0.220 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	0.050 (J)	0.058 (J)	0.045 (J)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	0.055 (J)	<0.160 (U)
NAPHTHALENE	13.0	<0.069 (U)	0.044 (J)	0.190 (J)	0.046 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PHENANTHRENE	50.0	0.110 (J)	0.320 (J)	0.620	0.250 (J)
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	0.190 (J)	0.690	2.700	0.450
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-31-01	FSS-SS-32-01	FSS-SS-33-01	FSS-SS-34-01
ACENAPHTHENE	50.0	0.140 (J)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	0.073 (J)	0.110 (J)	0.120 (J)	0.043 (J)
ANTHRACENE	50.0	0.390	0.081 (J)	0.071 (J)	0.064 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	**0.630**	**0.300 (J)**	**0.260 (J)**	0.120 (J)
BENZO[A]PYRENE	0.061 or MDL	**0.550**	**0.370**	**0.360 (J)**	**0.120 (J)**
BENZO[B]FLUORANTHENE	1.1	0.690	0.590	0.500	0.220 (J)
BENZO[GHI]PERYLENE	50.0	0.270 (J)	0.260 (J)	0.250 (J)	0.085 (J)
BENZO[K]FLUORANTHENE	1.1	0.260 (J)	0.170 (J)	0.190 (J)	0.064 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.200 (J)	0.190 (J)	0.130 (J)	0.059 (J)
BUTYL BENZYL PHTHALATE	50.0	0.081 (J)	0.076 (J)	0.150 (J)	<0.056 (U)
CHRYSENE	0.4	**0.660**	**0.420**	0.350 (J)	0.190 (J)
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	0.160 (J)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	**0.097 (J)**	**0.077 (J)**	<0.072 (U)	<0.072 (U)
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	<0.046 (U)	<0.046 (U)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	1.200	0.480	0.420	0.240 (J)
FLUORENE	50.0	0.210 (J)	<0.067 (U)	<0.067 (U)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.320 (J)	0.300 (J)	0.290 (J)	0.095 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	0.110 (J)	0.043 (J)	0.036 (J)	0.150 (J)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	0.110 (J)	0.054 (J)	0.050 (J)	0.110 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	1.400	0.240 (J)	0.230 (J)	0.180 (J)
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	1.300	0.490	0.440	0.250 (J)
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC**	FSS-SS-35-01	FSS-SS-35-22	FSS-SS-36-01	FSS-SS-37-01
	TAGM		QC Duplicate		
	mg/kg		of SS-35-01		
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	0.043 (J)	0.042 (J)	0.061 (J)	0.079 (J)
ANTHRACENE	50.0	0.053 (J)	0.045 (J)	0.100 (J)	0.069 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	**0.250 (J)**	**0.230 (J)**	**0.500**	**0.730**
BENZO[A]PYRENE	0.061 or MDL	**0.260 (J)**	**0.230 (J)**	**0.480**	**0.700**
BENZO[B]FLUORANTHENE	1.1	0.450	0.440	0.830	**1.100**
BENZO[GHI]PERYLENE	50.0	0.190 (J)	0.190 (J)	0.260 (J)	0.310 (J)
BENZO[K]FLUORANTHENE	1.1	0.160 (J)	0.150 (J)	0.320 (J)	0.420
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.110 (J)	0.140 (J)	0.770	0.210 (J)
BUTYL BENZYL PHTHALATE	50.0	<0.056 (U)	0.053 (J)	0.150 (J)	0.073 (J)
CHRYSENE	0.4	0.350 (J)	0.330 (J)	**0.670**	**0.840**
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	<0.072 (U)	<0.072 (U)	0.095 (J)	<0.072 (U)
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.638 (U)	<0.638 (U)	<0.638 (U)	<0.638 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	0.049 (J)	0.052 (J)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	0.490	0.450	1.000	1.100
FLUORENE	50.0	<0.067 (U)	<0.067 (U)	0.039 (J)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.240 (J)	0.240 (J)	0.340 (J)	0.400
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	<0.063 (U)	0.047 (J)	<0.067 (U)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	0.039 (J)	0.039 (J)	0.059 (J)	0.087 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.290 (J)	0.230 (J)	0.630	0.290 (J)
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	0.540	0.490	1.100	1.300
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and
Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-38-01	FSS-SS-39-01	FSS-SS-40-01	FSS-SS-45-01
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	<0.071 (U)	0.290 (J)	<0.071 (U)	<0.071 (U)
ANTHRACENE	50.0	<0.040 (U)	0.180 (J)	0.040 (J)	0.096 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	0.150 (J)	**0.860**	**0.260 (J)**	**0.420**
BENZO[A]PYRENE	0.061 or MDL	**0.160 (J)**	**0.910**	**0.260 (J)**	**0.480**
BENZO[B]FLUORANTHENE	1.1	0.270 (J)	**1.400**	0.460	0.760
BENZO[GHI]PERYLENE	50.0	0.078 (J)	0.500	0.150 (J)	0.310 (J)
BENZO[K]FLUORANTHENE	1.1	0.120 (J)	0.540	0.160 (J)	0.260 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.200 (J)	0.870	0.830	0.120 (J)
BUTYL BENZYL PHTHALATE	50.0	0.070 (J)	<0.056 (U)	0.056 (J)	<0.056 (U)
CHRYSENE	0.4	0.210 (J)	**1.100**	0.380 (J)	**0.570**
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	<0.072 (U)	**0.180 (J)**	<0.072 (U)	**0.080 (J)**
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	<0.046 (U)	<0.046 (U)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	0.330 (J)	1.600	0.600	1.100
FLUORENE	50.0	<0.067 (U)	0.065 (J)	<0.067 (U)	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.100 (J)	0.680	0.180 (J)	0.370 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	<0.063 (U)	0.041 (J)	<0.063 (U)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	<0.069 (U)	0.055 (J)	0.044 (J)	<0.069 (U)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.140 (J)	0.930	0.290 (J)	0.690
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	0.380	1.700	0.530	1.000
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FLA-SS-46-01	FLA-SS-47-01	FLA-SS-48-01	FSS-SS-48-22 QC Duplicate of SS-48-01
ACENAPHTHENE	50.0	<0.068 (U)	<0.068 (U)	0.130 (J)	0.081 (J)
ACENAPHTHYLENE	41.0	0.048 (J)	0.053 (J)	0.047 (J)	<0.071 (U)
ANTHRACENE	50.0	0.051 (J)	0.140 (J)	0.230 (J)	0.240 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	**0.270 (J)**	**0.440**	**0.770**	**0.790**
BENZO[A]PYRENE	0.061 or MDL	**0.330 (J)**	**0.480**	**0.870**	**0.830**
BENZO[B]FLUORANTHENE	1.1	0.390	0.670	**1.100**	1.000
BENZO[GHI]PERYLENE	50.0	0.200 (J)	0.340 (J)	0.630	0.530
BENZO[K]FLUORANTHENE	1.1	0.170 (J)	0.250 (J)	0.430	0.390 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.038 (J)	0.210 (J)	0.098 (J)	0.072 (J)
BUTYL BENZYL PHTHALATE	50.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
CHRYSENE	0.4	0.330 (J)	**0.530**	**0.810**	**0.880**
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	<0.073 (U)	0.049 (J)	0.047 (J)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	<0.072 (U)	<0.072 (U)	**0.180 (J)**	**0.170 (J)**
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	<0.046 (U)	0.043 (J)	0.053 (J)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	0.420	0.750	1.200	1.200
FLUORENE	50.0	<0.067 (U)	0.052 (J)	0.092 (J)	0.085 (J)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.210 (J)	0.400 (J)	0.700	0.590
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	<0.063 (U)	0.057 (J)	0.057 (J)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	<0.069 (U)	0.085 (J)	0.160 (J)	0.140 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	0.280 (J)	0.500	0.940	1.000
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	0.550	0.810	1.400	1.500
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC** **TAGM** mg/kg	FSS-SS-48-33 QA Duplicate of SS-48-01	FLA-SS-49-01	FLA-SS-50-01	FLA-SS-51-01
ACENAPHTHENE	50.0	0.490 (B)	<0.068 (U)	<0.068 (U)	<0.068 (U)
ACENAPHTHYLENE	41.0	<0.071 (U)	0.052 (J)	<0.071 (U)	0.047 (J)
ANTHRACENE	50.0	0.690 (B)	0.086 (J)	0.072 (J)	0.140 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	**1.480 (B)**	**0.320 (J)**	**0.310 (J)**	**0.540**
BENZO[A]PYRENE	0.061 or MDL	**1.280 (B)**	**0.390 (J)**	**0.360 (J)**	**0.550**
BENZO[B]FLUORANTHENE	1.1	**2.200 (B)**	0.540	0.400 (J)	0.830
BENZO[GHI]PERYLENE	50.0	0.840 (B)	0.260 (J)	0.310 (J)	0.430 (J)
BENZO[K]FLUORANTHENE	1.1	<0.052 (U)	0.190 (J)	0.190 (J)	0.270 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	<2 (U)	0.110 (J)	0.110 (J)	1.800
BUTYL BENZYL PHTHALATE	50.0	<0.056 (U)	<0.056 (U)	<0.056 (U)	0.073 (J)
CHRYSENE	0.4	**1.480 (B)**	0.380 (J)	0.350 (J)	**0.660**
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.070 (U)	<0.070 (U)	<0.070 (U)	<0.070 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)	<0.073 (U)	<0.073 (U)	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	**0.250 (B)**	<0.072 (U)	<0.072 (U)	**0.110 (J)**
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)	<0.630 (U)	<0.630 (U)	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)	<0.068 (U)	<0.068 (U)	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)	<0.047 (U)	<0.047 (U)	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)	<0.046 (U)	<0.046 (U)	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
FLUORANTHENE	50.0	3.260	0.460	0.410 (J)	1.100
FLUORENE	50.0	0.360 (B)	<0.067 (U)	<0.067 (U)	0.055 (J)
HEXACHLOROBENZENE	0.41	<0.059 (U)	<0.059 (U)	<0.059 (U)	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.940 (B)	0.300 (J)	0.260 (J)	0.420 (J)
ISOPHRONE	4.4	<0.081 (U)	<0.081 (U)	<0.081 (U)	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	<0.063 (U)	0.053 (J)	0.088 (J)	0.083 (J)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)	<0.077 (U)	<0.077 (U)	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)	<0.160 (U)	<0.160 (U)	<0.160 (U)
NAPHTHALENE	13.0	0.380 (B)	0.110 (J)	0.150 (J)	0.065 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)	<0.072 (U)	<0.072 (U)	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)	<0.064 (U)	<0.064 (U)	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)	<0.055 (U)	<0.055 (U)	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)	<0.052 (U)	<0.052 (U)	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)	<0.051 (U)	<0.051 (U)	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)	<0.310 (U)	<0.310 (U)	<0.310 (U)
PHENANTHRENE	50.0	2.660	0.280 (J)	0.260 (J)	0.700
PHENOL	0.03 or MDL	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)
PYRENE	50.0	2.660	0.550	0.580	1.100
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)	<0.066 (U)	<0.066 (U)	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-1 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FLA-SS-52-01
ACENAPHTHENE	50.0	<0.068 (U)
ACENAPHTHYLENE	41.0	<0.071 (U)
ANTHRACENE	50.0	0.068 (J)
BENZ[A]ANTHRACENE	0.224 or MDL	**0.260 (J)**
BENZO[A]PYRENE	0.061 or MDL	**0.290 (J)**
BENZO[B]FLUORANTHENE	1.1	0.460
BENZO[GHI]PERYLENE	50.0	0.240 (J)
BENZO[K]FLUORANTHENE	1.1	0.160 (J)
BIS(2-ETHYLHEXYL) PHTHALATE	50.0	0.450
BUTYL BENZYL PHTHALATE	50.0	0.061 (J)
CHRYSENE	0.4	0.360 (J)
4-CHLOROANILINE	0.220 or MDL	<0.068 (U)
4-CHLORO-3-METHYLPHENOL	0.240 or MDL	<0.072 (U)
2-CHLOROPHENOL	0.8	<0.064 (U)
DIBENZOFURAN	6.2	<0.073 (U)
DIBENZ[A,H]ANTHRACENE	0.014 or MDL	<0.072 (U)
3,3'-DICHLOROBENZIDINE	None	<0.047 (U)
2,4-DICHLOROPHENOL	0.4	<0.068 (U)
2,4-DINITROPHENOL	0.200 or MDL	<0.630 (U)
2,6-DINITROTOLUENE	1.0	<0.068 (U)
DIETHYLPHTHALATE	7.1	<0.047 (U)
DIMETHYLPHTHALATE	2.0	<0.055 (U)
DI-N-BUTYL PHTHALATE	8.1	<0.046 (U)
DI-N-OCTYL PHTHALATE	50.0	<0.064 (U)
FLUORANTHENE	50.0	0.450
FLUORENE	50.0	<0.067 (U)
HEXACHLOROBENZENE	0.41	<0.059 (U)
INDENO[1,2,3-CD]PYRENE	3.2	0.240 (J)
ISOPHRONE	4.4	<0.081 (U)
2-METHYLNAPHTHALENE	36.4	0.042 (J)
2-METHYLPHENOL	0.100 or MDL	<0.077 (U)
4-METHYLPHENOL	0.9	<0.160 (U)
NAPHTHALENE	13.0	0.044 (J)
NITROBENZENE	0.200 or MDL	<0.072 (U)
2-NITROANILINE	0.430 or MDL	<0.064 (U)
2-NITROPHENOL	0.330 or MDL	<0.055 (U)
4-NITROPHENOL	0.100 or MDL	<0.052 (U)
3-NITROANILINE	0.500 or MDL	<0.051 (U)
PENTACHLOROPHENOL	1.0 or MDL	<0.310 (U)
PHENANTHRENE	50.0	0.330 (J)
PHENOL	0.03 or MDL	<0.066 (U)
PYRENE	50.0	0.730
2,4,5-TRICHLOROPHENOL	0.1	<0.066 (U)

J = Between Method Detection Limit and Reporting Limit

E = Outside of calibration range

B = Found in Blank
Blank results means non-detect.

TABLE 4-2 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
SURFACE SOIL SAMPLING FOR TAL METALS
AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-01-01	FSS-SS-02-01	FSS-SS-03-01	FSS-SS-04-01	FSS-SS-05-01	FSS-SS-06-01	FSS-SS-07-01	FSS-SS-08-01
ALUMINUM	Site Bkgd	7650 (E)	7750 (E)	8400 (E)	9990 (E)	8790 (E)	7210 (E)	5020 (E)	5470 (E)
ANTIMONY	Site Bkgd	0.39 (BN)	0.42 (BN)	0.34 (BN)	0.36 (BN)	0.41 (BN)	0.62 (BN)	0.36 (BN)	0.25 (BN)
ARSENIC	7.5 or SB	2.9	3.4	4.9	4.0	7.2	4.5	3.8	3.8
BARIUM	300 or SB	121	80.9	106	65.9	95.7	87.7	57.8	43.8
BERYLLIUM	0.16 or SB	**0.29 (B)**	**0.29 (B)**	**0.30 (B)**	**0.40 (B)**	**0.39 (B)**	**0.26 (B)**	**0.20 (B)**	**0.20 (B)**
CADMIUM	1 or SB	0.21 (B)	0.16 (B)	0.41 (B)	0.14 (B)	0.35 (B)	0.24 (B)	0.21 (B)	0.18 (B)
CALCIUM	Site Bkgd	1250 (E)	1050 (E)	1450 (E)	1460 (E)	2060 (E)	2760 (E)	1300 (E)	1280 (E)
CHROMIUM	10 or SB	**19.5**	**19.9**	**21.5**	**22.1**	**21.6**	**18.3**	**14.9**	**15.4**
COBALT	30 or SB	6.0	5.1 (B)	6.0	6.7	6.3	5.5 (B)	4.2 (B)	4.5 (B)
COPPER	25 or SB	14.5 (E)	21.7 (E)	**50.9 (E)**	17.9 (E)	24.9 (E)	**25.9 (E)**	22.8 (E)	19.5 (E)
IRON	2000 or SB	**11800**	**12400**	**13300**	**15200**	**14800**	**16300**	**15300**	**13600**
LEAD	SB (500)	206	137	235	85.8	187	172	141	117
MAGNESIUM	Site Bkgd	1920 (E)	2000 (E)	2080 (E)	2370 (E)	2320 (E)	2230 (E)	1490 (E)	1730 (E)
MANGANESE	Site Bkgd	352	321	335	419	408	332	265	229
MERCURY	0.1	<0.05 (U)	0.080 (B)	**0.39**	0.080 (B)	**0.35**	**0.64**	**0.30**	**0.21**
NICKEL	13 or SB	**15.0**	**17.5**	**17.5**	**18.2**	**15.1**	**15.9**	**13.3**	**13.0**
POTASSIUM	Site Bkgd	739	1060	1020	1040	1140	1050	831	984
SELENIUM	2 or SB	0.63	0.47 (B)	0.60	0.59	0.64	0.55 (B)	0.48	0.39 (B)
SILVER	Site Bkgd	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)
SODIUM	Site Bkgd	118	197	200	147	155	161	97.2	97.1
THALLIUM	Site Bkgd	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)
VANADIUM	150 or SB	24.2	23.3	27.5	28.3	27.4	25.9	23.9	26.5
ZINC	20 or SB	**116**	**91.3**	**169**	**70.2**	**142**	**135**	**101**	**94.1**

B = Between Method Detection Limit and Reporting Limit

E = Estimated
N = Spike sample recovery outside of control limits

* = Duplicate analysis outside of control limits
Blank results means non-detect.

TABLE 4-2 (continued)

CHEMICAL	**NYSDEC**	FSS-SS-09-01	FSS-SS-10-01	FSS-SS-11-01	FSS-SS-12-01	FSS-SS-12-22	FSS-SS-12-33	FSS-SS-13-01	FSS-SS-14-01
	TAGM					QC Duplicate	QA Duplicate		
	mg/kg					of SS-12-01	of SS-12-01		
ALUMINUM	Site Bkgd	4900 (E)	6180 (E)	6180 (E)	5160 (E)	4880 (E)	7250	6290 (E)	6390 (E)
ANTIMONY	Site Bkgd	0.31 (BN)	0.77 (N)	0.23 (BN)	0.34 (BN)	0.46 (BN)	<1 (U)	0.49 (BN)	0.41 (BN)
ARSENIC	7.5 or SB	3.4	4.2	3.8	4.2	4.2	5.7	**19.2**	5.4
BARIUM	300 or SB	45.1	85.8	42.9	57.6	60.3	85.8	69.0	87.9
BERYLLIUM	0.16 or SB	0.14 (B)	**0.21 (B)**	**0.24 (B)**	**0.16 (B)**	**0.17 (B)**	**0.38 (B)**	**0.26 (B)**	**0.31 (B)**
CADMIUM	1 or SB	0.28 (B)	0.47 (B)	0.14 (B)	0.59	0.64	0.86	0.64	0.85
CALCIUM	Site Bkgd	2310 (E)	3070 (E)	1190 (E)	5160 (E)	4760 (E)	5340	4790 (E)	4710 (E)
CHROMIUM	10 or SB	**12.9**	**15.0**	**14.1**	**12.7**	**13.4**	**20.7**	**17.0**	**15.7**
COBALT	30 or SB	3.3 (B)	4.2 (B)	4.5 (B)	3.8 (B)	4.1 (B)	6.7	5.4	5.2
COPPER	25 or SB	19.0 (E)	**28.6 (E)**	16.4 (E)	**28.9 (E)**	**31.5 (E)**	**38.2**	**36.8 (E)**	**32.2 (E)**
IRON	2000 or SB	**10700**	**11300**	**12100**	**11800**	**11000**	**14200**	**13900**	**14000**
LEAD	SB (500)	93.8	229	95.4	152	164	191	169	198
MAGNESIUM	Site Bkgd	1460 (E)	1630 (E)	1600 (E)	2530 (E)	2560 (E)	2910	3100 (E)	2760 (E)
MANGANESE	Site Bkgd	207	306	317	246	249	312	297	298
MERCURY	0.1	**0.24**	**0.48**	**0.18**	**0.16**	**0.13**	**0.174**	**0.12**	**0.11**
NICKEL	13 or SB	11.4	12.9	11.6	**13.2**	12.9	19.9	**16.9**	**15.7**
POTASSIUM	Site Bkgd	851	1140	907	945	933	1110	1360	1450
SELENIUM	2 or SB	0.69	0.50 (B)	0.58	0.73	0.55	1.1 (B)	0.60	0.63
SILVER	Site Bkgd	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.28 (B)	<0.19 (U)	<0.19 (U)
SODIUM	Site Bkgd	112 (B)	164	108	174	129	200	153	175
THALLIUM	Site Bkgd	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<1 (U)	<0.14 (U)	<0.14 (U)
VANADIUM	150 or SB	19.2	20.7	24.3	22.7	23.2	34.5	30.0	29.1
ZINC	20 or SB	**121**	**155**	**59.4**	**129**	**133**	**160**	**144**	**164**

B = Between Method Detection Limit and Reporting Limit

E = Estimated
N = Spike sample recovery outside of control limits

* = Duplicate analysis outside of control limits
Blank results means non-detect.

TABLE 4-2 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-15-01	FSS-SS-16-01	FSS-SS-17-01	FSS-SS-18-01	FSS-SS-18-22 QC Duplicate of SS-18-01	FSS-SS-18-33 QA Duplicate of SS-18-01	FSS-SS-19-01	FSS-SS-20-01
ALUMINUM	Site Bkgd	5340 (E)	8100 (E)	7420 (E)	7080 (E)	6920 (E)	9550	8840	7740
ANTIMONY	Site Bkgd	0.23 (BN)	0.39 (BN)	0.37 (BN)	0.57 (BN)	0.47 (BN)	1.2 (B)	0.67 (BN)	1.0 (N)
ARSENIC	7.5 or SB	4.3	5.0	**9.6**	2.7	2.6	3.4	3.6	4.5
BARIUM	300 or SB	62.3	76.9	73.9	138	125	160	132	124
BERYLLIUM	0.16 or SB	**0.19 (B)**	**0.30 (B)**	**0.32 (B)**	**0.27 (B)**	**0.25 (B)**	**0.5**	**0.36 (B)**	**0.32 (B)**
CADMIUM	1 or SB	0.75	0.30 (B)	0.22 (B)	0.32 (B)	0.31 (B)	0.47 (B)	0.23 (B)	0.27 (B)
CALCIUM	Site Bkgd	5050 (E)	2630 (E)	983 (E)	2020 (E)	2220 (E)	2420	1990	2160
CHROMIUM	10 or SB	**13.5**	**18.6**	**17.4**	**25.3**	**28.1**	**29**	**22.8**	**19.0**
COBALT	30 or SB	4.3 (B)	5.7	4.9 (B)	4.6 (B)	4.8 (B)	6.7	6.1	6.6
COPPER	25 or SB	**32.4 (E)**	**25.7 (E)**	22.9 (E)	**43.2 (E)**	**38.0 (E)**	**43.9**	**50.9**	**46.2**
IRON	2000 or SB	**13000**	**16900**	**14000**	**13400**	**13200**	**15500**	**15600**	**16400**
LEAD	SB (500)	189	167	129	333	292	335	344	400
MAGNESIUM	Site Bkgd	2450 (E)	2220 (E)	1710 (E)	1980 (E)	2060 (E)	2430	2550 (E)	2300 (E)
MANGANESE	Site Bkgd	253	365	364	153	352	173	199 (N)	348 (N)
MERCURY	0.1	**0.10 (B)**	**0.21**	**0.37**	**0.77**	**0.66**	**0.619**	**0.85**	**0.83**
NICKEL	13 or SB	**14.3**	**14.7**	11.6	**15.8**	**17.4**	**20.8**	**16.7**	**16.2**
POTASSIUM	Site Bkgd	1000	1220	936	816	925	982	799	722
SELENIUM	2 or SB	0.71	0.82	0.64	0.65	0.55	0.85 (B)	0.47 (B)	0.52 (B)
SILVER	Site Bkgd	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.2 (U)	<0.19 (U)	<0.19 (U)
SODIUM	Site Bkgd	156	141	122	144	140	180	224	190
THALLIUM	Site Bkgd	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<1 (U)	<.14 (U)	<.14 (U)
VANADIUM	150 or SB	26.4	29.7	25.4	23.8	23.6	34.1	33.8	28.6
ZINC	20 or SB	**131**	**150**	**81.1**	**111**	**103**	**122**	**219 (N)**	**163 (N)**

B = Between Method Detection Limit and Reporting Limit

E = Estimated
N = Spike sample recovery outside of control limits

* = Duplicate analysis outside of control limits
Blank results means non-detect.

TABLE 4-2 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-21-01	FSS-SS-22-01	FSS-SS-23-01	FSS-SS-24-01	FSS-SS-24-22	FSS-SS-24-33	FSS-SS-25-01	FSS-SS-26-01
						QC Duplicate	QA Duplicate		
						of SS-24-01	of SS-24-01		
ALUMINUM	Site Bkgd	6850	6420	4800	5700	5890	7960	7050	6640
ANTIMONY	Site Bkgd	0.88 (N)	0.59 (BN)	1.7 (N)	0.55 (BN)	0.63 (BN)	1.0 (B)	0.74 (BN)	
ARSENIC	7.5 or SB	4.6	4.3	5.6	3.9	3.8	4.5	5.4	6.3
BARIUM	300 or SB	136	92.9	86.9	75.2	82.3	94.4	92.2	105
BERYLLIUM	0.16 or SB	**0.31 (B)**	**0.25 (B)**	**0.19 (B)**	**0.20 (B)**	**0.22 (B)**	**0.46**	**0.25 (B)**	**0.26 (B)**
CADMIUM	1 or SB	0.27 (B)	0.57 (B)	0.44 (B)	0.43 (B)	0.42 (B)	0.67	0.55 (B)	0.52 (B)
CALCIUM	Site Bkgd	1950	4420	1790	7660	8420	8690	9870	7990
CHROMIUM	10 or SB	**22.9**	**17.9**	**12.7**	**13.1**	**13.4**	**16**	**15.1**	**15.6**
COBALT	30 or SB	6.0	5.2 (B)	4.7 (B)	3.7 (B)	4.3 (B)	7.1	5.6 (B)	5.5 (B)
COPPER	25 or SB	**46.0**	**33.7**	**80.3**	**29.0**	**29.0**	**37.7**	**45.4**	**53.3**
IRON	2000 or SB	**15100**	**13100**	**19100**	**13100**	**12600**	**15400**	**17200**	**15600**
LEAD	SB (500)	400	148	471	156	163	170	191	373
MAGNESIUM	Site Bkgd	2100 (E)	2260 (E)	1530 (E)	3560 (E)	3920 (E)	4030	4800 (E)	4890 (E)
MANGANESE	Site Bkgd	220 (N)	304 (N)	229 (N)	296 (N)	295 (N)	356	327 (N)	308 (N)
MERCURY	0.1	**0.93**	**0.48**	**2.7**	**0.35**	**0.40**	**0.35**	**0.89**	**0.49**
NICKEL	13 or SB	**16.4**	**19.0**	12.9	**13.8**	**13.8**	**19.3**	**16.2**	**16.1**
POTASSIUM	Site Bkgd	769	1040	757	854	889	1020	1230	901
SELENIUM	2 or SB	0.46 (B)	0.48 (B)	0.48 (B)	0.40 (B)	0.38 (B)	1.0 (B)	0.23 (B)	0.44 (B)
SILVER	Site Bkgd	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.2 (B)	<0.19 (U)	<0.19 (U)
SODIUM	Site Bkgd	193	206	119	161	152	160	243	204
THALLIUM	Site Bkgd	<.14 (U)	<.14 (U)	<.14 (U)	<.14 (U)	<.14 (U)	<1 (U)	<0.14 (U)	<0.14 (U)
VANADIUM	150 or SB	30.5	31.2	21.9	18.5	19.0	26.3	23.7	21.6
ZINC	20 or SB	**133 (N)**	**123 (N)**	**207 (N)**	**111 (N)**	**116 (N)**	**127**	**166 (N)**	**208 (N)**

B = Between Method Detection Limit and Reporting Limit

E = Estimated
N = Spike sample recovery outside of control limits

* = Duplicate analysis outside of control limits
Blank results means non-detect.

TABLE 4-2 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-27-01	FSS-SS-28-01	FSS-SS-29-01	FSS-SS-30-01	FSS-SS-31-01	FSS-SS-32-01	FSS-SS-33-01	FSS-SS-34-01
ALUMINUM	Site Bkgd	5860	5290	6620	7800	7480	6710	6540	6070
ANTIMONY	Site Bkgd	0.34 (BN)	1.0 (N)	1.2 (N)	0.53 (BN)	0.49 (BN)	0.49 (BN)	0.49 (BN)	0.35 (BN)
ARSENIC	7.5 or SB	4.0	6.0	6.9	**11.0**	**8.5**	**9.4**	6.2	5.5
BARIUM	300 or SB	70.2	96.7	107	49.6	54.3	48.1	48.8	52.7
BERYLLIUM	0.16 or SB	**0.23 (B)**	**0.23 (B)**	**0.30 (B)**	**0.28 (B)**	**0.31 (B)**	**0.25 (B)**	**0.24 (B)**	**0.20 (B)**
CADMIUM	1 or SB	0.35 (B)	0.88	0.90	0.35 (B)	0.32 (B)	0.30 (B)	0.19 (B)	0.29 (B)
CALCIUM	Site Bkgd	6380	5280	9470	1840	2550	2430	1940	1730
CHROMIUM	10 or SB	**12.6**	**15.0**	**17.1**	**17.9**	**19.0**	**18.3**	**17.0**	**18.0**
COBALT	30 or SB	4.9 (B)	4.7 (B)	3.9 (B)	4.1 (B)	5.4	4.0 (B)	4.6 (B)	5.0 (B)
COPPER	25 or SB	**29.6**	**50.4**	**44.8**	**31.4**	**44.5**	**27.0**	21.7	**41.1**
IRON	2000 or SB	**13700**	**12700**	**12700**	**13800**	**15200**	**12600**	**12800**	**13100**
LEAD	SB (500)	152	469	251	139	122	120	89.6	118
MAGNESIUM	Site Bkgd	3680 (E)	1960 (E)	2170 (E)	1770 (E)	1990 (E)	1820 (E)	1860 (E)	2020 (E)
MANGANESE	Site Bkgd	332 (N)	295 (N)	445 (N)	211 (N)	225 (N)	244 (N)	251 (N)	255 (N)
MERCURY	0.1	**0.33**	**1.8**	**0.62**	**0.56**	**0.33**	**0.38**	**0.36**	**0.26**
NICKEL	13 or SB	12.5	**14.4**	**16.8**	**13.7**	**16.3**	**14.9**	**14.3**	**15.6**
POTASSIUM	Site Bkgd	740	830	953	546	658	721	821	1050
SELENIUM	2 or SB	0.48 (B)	0.88	0.98	0.60	0.46 (B)	0.45 (B)	0.37 (B)	0.18 (B)
SILVER	Site Bkgd	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)
SODIUM	Site Bkgd	160	153	207	155	153	134	138	132
THALLIUM	Site Bkgd	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)
VANADIUM	150 or SB	17.7	29.2	28.7	35.4	36.9	27.8	22.9	18.5
ZINC	20 or SB	**99.1 (N)**	**203 (N)**	**178 (N)**	**94.8 (N)**	**91.7 (N)**	**87.6 (N)**	**79.0 (N)**	**131 (N)**

B = Between Method Detection Limit and Reporting Limit

E = Estimated
N = Spike sample recovery outside of control limits

* = Duplicate analysis outside of control limits
Blank results means non-detect.

TABLE 4-2 (continued)

CHEMICAL	**NYSDEC**	FSS-SS-35-01	FSS-SS-35-22	FSS-SS-36-01	FSS-SS-37-01	FSS-SS-38-01	FSS-SS-39-01	FSS-SS-40-01	FSS-SS-41-01
	TAGM		QC Duplicate						
	mg/kg		of SS-35-01						
ALUMINUM	Site Bkgd	9770	9850	11000	7870	9370	9980	9900	2280
ANTIMONY	Site Bkgd	0.27 (BN)	0.28 (BN)	0.29 (BN)	0.38 (BN)	0.30 (BN)	0.24 (BN)	0.45 (BN)	0.39 (BN)
ARSENIC	7.5 or SB	**12.3**	**12.0**	**11.7**	6.9	6.1	5.2	7.2	4.4
BARIUM	300 or SB	38.3	39.8	51.5	36.1	46.5	48.6	44.4	79.0 (N)
BERYLLIUM	0.16 or SB	**0.34 (B)**	**0.32 (B)**	**0.53 (B)**	**0.37 (B)**	**0.42 (B)**	**0.52 (B)**	**0.47 (B)**	**0.19 (B)**
CADMIUM	1 or SB		0.42 (B)	0.17 (B)	0.040 (B)	0.080 (B)	0.060 (B)	0.020 (B)	0.31 (B)
CALCIUM	Site Bkgd	329	367	466	290	477	921	486	3250 (EN)
CHROMIUM	10 or SB	**18.6**	**18.8**	**21.1**	**16.8**	**17.1**	**19.6**	**22.2**	7.9 (E)
COBALT	30 or SB	3.1 (B)	3.2 (B)	4.3 (B)	3.9 (B)	4.3 (B)	6.4	6.5	10.0
COPPER	25 or SB	**83.8**	**78.4**	**36.9 (E)**	**36.5 (E)**	**36.2 (E)**	22.6 (E)	**36.3 (E)**	**310 (E)**
IRON	2000 or SB	**15200**	**14600**	**15900**	**12500**	**13400**	**15800**	**16300**	**5790**
LEAD	SB (500)	122	134	206 (N)	143 (N)	162 (N)	68.7 (N)	123 (N)	**536**
MAGNESIUM	Site Bkgd	1780 (E)	1770 (E)	1920	1650	1890	2340	2320	490
MANGANESE	Site Bkgd	151 (N)	155 (N)	191 (N)	165 (N)	222 (N)	313 (N)	256 (N)	80.3 (N)
MERCURY	0.1	**2.0**	**2.0**	**0.99**	**2.3**	**5.0**	**0.22**	**0.89**	**0.77 (*)**
NICKEL	13 or SB	11.0	11.2	**13.9**	11.3	**13.3**	**17.9**	**17.4**	9.5
POTASSIUM	Site Bkgd	368	363	450	340	457	734	736	376
SELENIUM	2 or SB	1.2	0.98	1.0	1.0	0.89	0.66	1.3	0.50
SILVER	Site Bkgd	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	2.4
SODIUM	Site Bkgd	114	125	121	104 (B)	126	125	121	154
THALLIUM	Site Bkgd	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)
VANADIUM	150 or SB	33.3	33.8	38.9	32.8	24.9	28.0	47.1	16.0 (N)
ZINC	20 or SB	**46.7 (N)**	**49.4 (N)**	**68.2**	**48.9**	**67.6**	**75.8**	**57.2**	**154 (N)**

B = Between Method Detection Limit and Reporting Limit

E = Estimated
N = Spike sample recovery outside of control limits

* = Duplicate analysis outside of control limits
Blank results means non-detect.

TABLE 4-2 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-42-01	FSS-SS-43-01	FSS-SS-44-01	FSS-SS-45-01	FLA-SS-46-01	FLA-SS-47-01	FLA-SS-48-01	FSS-SS-48-22 QC Duplicate of SS-48-01
ALUMINUM	Site Bkgd	6750	2540	5880	8810	8380	5210	5130	4490
ANTIMONY	Site Bkgd	0.21 (UN)	0.92 (N)	0.61 (N)	0.36 (BN)	0.48 (BN)	3.7 (N)	1.3 (N)	0.98 (N)
ARSENIC	7.5 or SB	5.5	5.2 (*)	3.5 (*)	5.7	4.4	5.7	9.5	7.4
BARIUM	300 or SB	80.2 (N)	84.8 (*)	62.8 (*)	43.2	69.4	133	232	186
BERYLLIUM	0.16 or SB	**0.41 (B)**	**0.24 (B)**	**0.22 (B)**	**0.43 (B)**	**0.40 (B)**	**0.30 (B)**	**0.42 (B)**	**0.33 (B)**
CADMIUM	1 or SB	0.86	0.34 (B)	0.97	0.11 (B)	0.16 (B)	**1.6**	**1.5**	**1.3**
CALCIUM	Site Bkgd	3970 (EN)	2910 (N*)	1210 (N*)	601	1800	22500	4530	22700
CHROMIUM	10 or SB	**17.5 (E)**	4.9	**17.0**	**20.2**	**17.8**	**17.0**	**26.7**	**22.8**
COBALT	30 or SB	**35.5**	5.8	6.4	5.2 (B)	6.2	5.3 (B)	7.5	5.2 (B)
COPPER	25 or SB	**83.7 (E)**	**29.9**	**91.0**	**28.8 (E)**	**49.9 (E)**	**157 (E)**	**156 (E)**	**122 (E)**
IRON	2000 or SB	**13400**	**6210 (*)**	**13400 (*)**	**14100**	**14000**	**18200**	**23500**	**20100**
LEAD	SB (500)	**793**	442 (*)	265 (*)	81.6 (N)	168 (N)	**649 (N)**	**595 (N)**	483 (N)
MAGNESIUM	Site Bkgd	2130	485 (*)	1970 (*)	2070	2440	4750	2460	13100
MANGANESE	Site Bkgd	245 (N)	46.6 (N)	205 (N)	247 (N)	212 (N)	454 (N)	300 (N)	216 (N)
MERCURY	0.1	**4.5 (*)**	**0.59 (N*)**	**4.8 (N*)**	**0.12**	**0.99**	**0.52**	**0.92**	**0.82**
NICKEL	13 or SB	**17.3**	7.0	**15.1**	**18.2**	**15.0**	**21.5**	**22.2**	**17.3**
POTASSIUM	Site Bkgd	1140	364	1080	806	1180	1580	885	795
SELENIUM	2 or SB	0.88	0.47 (B)	1.3	0.73	0.39 (B)	0.41 (B)	0.62	0.56 (B)
SILVER	Site Bkgd	1.2	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)	0.57 (B)	0.30 (B)
SODIUM	Site Bkgd	171	304	133	119	148	201	188	168
THALLIUM	Site Bkgd	0.012 (B)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)
VANADIUM	150 or SB	19.6 (N)	11.0	19.4	47.7	21.5	19.9	22.1	18.4
ZINC	20 or SB	**223 (N)**	**109 (N*)**	**179 (N*)**	**58.2**	**101**	**355**	**458**	**379**

B = Between Method Detection Limit and Reporting Limit

E = Estimated
N = Spike sample recovery outside of control limits

* = Duplicate analysis outside of control limits
Blank results means non-detect.

TABLE 4-2 (continued)

CHEMICAL	**NYSDEC TAGM** mg/kg	FSS-SS-48-33 QA Duplicate of SS-48-01	FLA-SS-49-01	FLA-SS-50-01	FLA-SS-51-01	FLA-SS-52-01
ALUMINUM	Site Bkgd	7530	5410	4780	4520	4800
ANTIMONY	Site Bkgd	1.9 (B)	0.96 (N)	0.96 (N)	0.71 (N)	0.35 (N)
ARSENIC	7.5 or SB	10.1	**7.8**	6.5	6.2	2.8
BARIUM	300 or SB	318	185	241	77.7	99.6
BERYLLIUM	0.16 or SB	**0.78**	**0.54 (B)**	**0.33 (B)**	**0.23 (B)**	**0.19 (B)**
CADMIUM	1 or SB	**2.08**	0.70	0.93	**1.0**	0.65
CALCIUM	Site Bkgd	5670	15300	5390	10800	7500
CHROMIUM	10 or SB	**31.8**	**17.9**	**20.8**	**14.6**	**11.7**
COBALT	30 or SB	8.6	4.8 (B)	5.5 (B)	3.7 (B)	4.2 (B)
COPPER	25 or SB	**174**	**72.9 (E)**	**87.9 (E)**	**38.3 (E)**	**34.0 (E)**
IRON	2000 or SB	**34800**	**31800**	**20500**	**10600**	**10800**
LEAD	SB (500)	**714**	448 (N)	**550 (N)**	236 (N)	252 (N)
MAGNESIUM	Site Bkgd	2950	3590	1970	3390	4050
MANGANESE	Site Bkgd	314	223 (N)	231 (N)	271 (N)	240 (N)
MERCURY	0.1	**0.729**	**0.63**	**0.74**	**0.69**	**0.25**
NICKEL	13 or SB	**27.1**	**19.0**	**20.3**	**16.0**	12.8
POTASSIUM	Site Bkgd	1180	1070	892	716	1170
SELENIUM	2 or SB	1.3 (B)	0.52 (B)	0.80	1.1	0.63
SILVER	Site Bkgd	1	<0.19 (U)	<0.19 (U)	<0.19 (U)	<0.19 (U)
SODIUM	Site Bkgd	230	137	165	143	120 (B)
THALLIUM	Site Bkgd		<0.14 (U)	<0.14 (U)	<0.14 (U)	<0.14 (U)
VANADIUM	150 or SB	33.8	28.3	20.0	24.6	18.5
ZINC	20 or SB	**535**	**295**	**369**	**230**	**340**

B = Between Method Detection Limit and Reporting Limit

E = Estimated
N = Spike sample recovery outside of control limits

* = Duplicate analysis outside of control limits
Blank results means non-detect.

TABLE 4-3 COMPARISON OF CONCENTRATIONS OF PAHs IN FORT TOTTEN SAMPLES VERSUS URBAN LOCATIONS

Compound	**Range of Concentrations at Fort Totten (mg/kg)**	**Saltiene et al. 2001 Geometric Mean Concentrations (mg/kg)**	**Saltiene et al. 2001 Range of Concentrations (mg/kg)**	**Bradley et al. 1994 Arithmetic Mean Concentrations (mg/kg)**	**Bradley et al. 1994 Range of Concentrations (mg/kg)**
Benz(a)anthracene	0.0465 – 4.1	0.109	0.0028 – 5.499	1.319	0.048 – 15.00
Benzo(a)pyrene	0.0465 – 6.3	0.140	0.0047 – 7.051	1.323	0.040 – 13.00
Dibenz(a,h)anthracene	0.041 –1.0	0.018	0.0008 – 0.608	0.388	0.020 – 2.90

Compound	**Range of Concentrations at Fort Totten (mg/kg)**	**MADEP 2002 Background Level natural soil (mg/kg)**	**MADEP 2002 Range of CA/T Concentrations (mg/kg)**	**ATSDR 1995 Urban Soil Range of Concentrations (mg/kg)**
Benz(a)anthracene	0.0465 – 4.1	2.0	0.045 – 250	0.169 – 59.0
Benzo(a)pyrene	0.0465 – 6.3	2.0	0.031 – 230	0.165 – 0.220
Dibenz(a,h)anthracene	0.041 –1.0	0.5	0.045 - 39	--

TABLE 4-4 COMPARISON OF CONCENTRATIONS OF METALS IN FORT TOTTEN SAMPLES VERSUS URBAN LOCATIONS

Compound	**Range of Concentrations at Fort Totten (mg/kg)**	**Shacklette and Boerngen 1984 Conterminous U.S. Mean Concentrations (mg/kg)**	**Shacklette and Boerngen 1984 Eastern U.S. Mean Concentrations (mg/kg)**	**Shacklette and Boerngen 1984 Eastern U.S. Observed Range of Concentrations (mg/kg)**	**U.S. EPA ECO-SSL Guidance 2000b CERCLIS Database Mean Concentrations (mg/kg)**	**U.S. EPA ECO-SSL Guidance 2000b CERCLIS Database Range of Concentrations (mg/kg)**	**Bradley et al. 1994 Range of Upper 95% Concentrations (mg/kg)**
Arsenic	0.125 – 19.2	5.2	4.8	<0.1 – 73	10.7	0 – 63.9	4.27-9.23
Cadmium	0.01 – 1.6	--	--	--	2.13	0 – 9.7	2.79
Chromium	4.9 – 33.2	37	33	1 – 1000	24.8	0 – 69	14.4-27.7
Mercury	0.0016 – 5.0	0.058	0.081	0.01 – 3.4	--	--	0.24-0.39

TABLE 4-5 RESULTS OF REMEDIAL INVESTIGATION PHASE 2 BUILDING 624 SURFACE SOIL SAMPLING FOR PESTICIDES AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC**	624-SS-53-01	624-SS-54-01	624-SS-54-33
	TAGM			QA Duplicate of
	mg/kg			624-SS-54-01
Aldrin	0.041	<0.00052 (U)	<0.00052 (U)	<0.0087 (U)
alpha-BHC	0.11	<0.00038 (U)	<0.00038 (U)	<0.00876 (U)
beta-BHC	0.2	<0.00049 (U)	<0.00049 (U)	<0.00973 (U)
delta-BHC	0.3	<0.00049 (U)	<0.00049 (U)	<0.0003 (U)
alpha-Chlordane	0.54	<0.00070 (U)	<0.00070 (U)	<0.0003 (U)
4,4'-DDD	2.9	0.071 (P)	0.020 (P)	<0.0113 (U)
4,4'-DDE	2.1	0.044 (P)	0.022 (P)	<0.0323 (U)
4,4'-DDT	2.1	0.470 (EP)	0.240 (EP)	0.7
Dieldrin	0.044	<0.00043 (U)	<0.00043 (U)	<0.0002 (U)
Endosulfan I	0.9	<0.00072 (U)	<0.00072 (U)	<0.0078 (U)
Endosulfan II	0.9	<0.00038 (U)	<0.00038 (U)	<0.0093 (U)
Endosulfan sulfate	1.0	<0.00084 (U)	<0.00084 (U)	<0.00898 (U)
Endrin	0.10	<0.0015(U)	<0.0015(U)	<0.0135 (U)
Endrin aldehyde	None	0.0082 (P)	<0.00094 (U)	<0.0005 (U)
Endrin ketone	None	0.032 (P)	0.013 (P)	Not Reported
gamma-BHC	0.06	0.0052 (P)	0.0032	<0.00823 (U)
gamma-Chlordane	0.54	0.0087 (P)	<0.00035(U)	<0.00139 (U)
Heptachlor	0.10	< 0.0006(U)	< 0.0006(U)	<0.008379 (U)
Heptachlor epoxide	0.02	**0.031**	0.016	<0.008045 (U)
Methoxychlor	Total Pesticides less than 10 ppm	< 0.0026(U)	< 0.0026(U)	<1
Toxaphene	None	< 0.014(U)	< 0.014(U)	<0.0485 (U)

E = Outside of calibration range
U= Not Detected
P = Greater than 25% difference between the two Gas Chromatograph columns

TABLE 4-6 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
BUILDING 609 AND 625 SURFACE SOIL SAMPLING FOR PCBs
AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC TAGM** mg/kg	625-SS-55-01	625-SS-56-01	609-SS-57-01	609-SS-57-33 QA Duplicate of 609-SS-57-01	609-SS-58-01
Aroclor 1016	Total Surface PCBs < 1.0 ppm	<0.0054	<0.0054	<0.0054	0.022	<0.0054
Aroclor 1221	Total Surface PCBs < 1.0 ppm	<0.0068	<0.0068	<0.0068	0.022	<0.0068
Aroclor 1232	Total Surface PCBs < 1.0 ppm	<0.0120	<0.0120	<0.0120	0.022	<0.0120
Aroclor 1242	Total Surface PCBs < 1.0 ppm	<0.0088	<0.0088	<0.0088	0.022	<0.0088
Aroclor 1248	Total Surface PCBs < 1.0 ppm	<0.0026	<0.0026	<0.0026	0.022	<0.0026
Aroclor 1254	Total Surface PCBs < 1.0 ppm	<0.0078	<0.0078	<0.0078	0.022	<0.0078
Aroclor 1260	Total Surface PCBs < 1.0 ppm	<0.0049	<0.0049	<0.0049	0.022	<0.0049

TABLE 4-7 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
GROUNDWATER SAMPLING FOR VOLATILES
AT FORT TOTTEN COAST GUARD STATION

		NYSDEC	**NYSDEC**	**NYSDEC**	0008080	0008205	0008079	MW4-GW-01-01	MW4-GW-01-22	MW4-GW-01-44
Analyte	Units	**TOGS**	**PART 5**	**703.5**	MW1-GW-01-01	MW2-GW-01-01	MW3-GW-01-01	0008202	0008203	0008206
		1.1.1				07/15/00		07/14/00	07/14/00	07/15/00
					Result	Result	Result	Result	Result	Result
1,1,1-Trichloroethane	ug/L	5	No Standard	5	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
1,1,2,2-Tetrachloroethane	ug/L	**0.2***	No Standard	5	<0.2 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
1,1,2-Trichloroethane	ug/L	1	No Standard	1	<0.4 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
1,1-Dichloroethane	ug/L	5	No Standard	5	<0.4 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
1,1-Dichloroethene	ug/L	**0.7***	No Standard	5	<0.4 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
1,2-Dichloroethane	ug/L	0.6	No Standard	0.6	<0.2 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
1,2-Dichloroethene, total	ug/L	5	No Standard	5	<0.5 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
1,2-Dichloropropane	ug/L	1	No Standard	1	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
2-Butanone	ug/L	**50***	No Standard	No Standard	<0.4 (U)	10 (U)	2 (U)	10 (U)	10 (U)	10 (U)
2-Hexanone	ug/L	50*	No Standard	No Standard	<0.6 (U)	10 (U)	2 (U)	10 (U)	10 (U)	10 (U)
4-Methyl-2-pentanone	ug/L	No Standard	No Standard	No Standard	<0.8 (U)	10 (U)	2 (U)	10 (U)	10 (U)	10 (U)
Acetone	ug/L	50*	No Standard	No Standard	<1.0 (U)	10 (U)	2 (U)	10 (U)	10 (U)	10 (U)
Benzene	ug/L	**190***	No Standard	1	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Bromodichloromethane	ug/L	50*	No Standard	No Standard	<0.08 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Bromoform	ug/L	50*	No Standard	No Standard	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Bromomethane	ug/L	5	No Standard	5	<0.2 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Carbon disulfide	ug/L	No Standard	No Standard	No Standard	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Carbon tetrachloride	ug/L	**0.4***	No Standard	5	<0.4 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Chlorobenzene	ug/L	5*	No Standard	5	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Chloroethane	ug/L	5**	No Standard	5	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Chloroform	ug/L	7	No Standard	7	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Chloromethane	ug/L	**5**	No Standard	No Standard	<0.4 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
cis-1,3-Dichloropropene	ug/L	0.4***	No Standard	0.4	<0.09 (U)	5 (U)	1 (U)	5 (U)	5 (U)	**5 (U)**
Dibromochloromethane	ug/L	50*	No Standard	No Standard	<0.2 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Ethylbenzene	ug/L	**4.5***	No Standard	5	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Methylene chloride	ug/L	**200**	2	5	<0.5 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Styrene	ug/L	**50**	No Standard	5	<0.1 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Tetrachloroethene	ug/L	**1***	No Standard	5	<0.3 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Toluene	ug/L	**92***	No Standard	5	<0.5 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
trans-1,3-Dichloropropene	ug/L	0.4***	No Standard	0.4	<0.2 (U)	5 (U)	1 (U)	5 (U)	5 (U)	**5 (U)**
Trichloroethene	ug/L	**40**	No Standard	5	<0.4 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)
Vinyl chloride	ug/L	**0.3***	No Standard	2	<0.6 (U)	5 (U)	1 (U)	5 (U)	5 (U)	**5 (U)**
Xylenes, total	ug/L	**19*****	No Standard	5	<0.6 (U)	5 (U)	1 (U)	5 (U)	5 (U)	5 (U)

U = Not detected   J = Estimated   B = Found in blank   D = Diluted   E = Outside of calibration range

TABLE 4-7 (continued)

		NYSDEC TOGS 1.1.1						07/17/00	
Analyte	Units				0008101	0008081	0008102	0008204	0008100
					MW4-GW-01-55	MW4-GW-01-66A	MW4-GW-01-66-B	MW4-GW-01-66-C	MW5-GW-01-01
					Result	Result	Result	Result	Result
1,1,1-Trichloroethane	ug/L	5	No Standard	5	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
1,1,2,2-Tetrachloroethane	ug/L	**0.2***	No Standard	5	<0.2 (U)	1 (U)	1 (U)	5 (U)	1 (U)
1,1,2-Trichloroethane	ug/L	1	No Standard	1	<0.4 (U)	1 (U)	1 (U)	5 (U)	1 (U)
1,1-Dichloroethane	ug/L	5	No Standard	5	<0.4 (U)	1 (U)	1 (U)	5 (U)	1 (U)
1,1-Dichloroethene	ug/L	**0.7***	No Standard	5	<0.4 (U)	1 (U)	1 (U)	5 (U)	1 (U)
1,2-Dichloroethane	ug/L	0.6	No Standard	0.6	<0.2 (U)	1 (U)	1 (U)	5 (U)	1 (U)
1,2-Dichloroethene, total	ug/L	5	No Standard	5	<0.5 (U)	1 (U)	1 (U)	5 (U)	1 (U)
1,2-Dichloropropane	ug/L	1	No Standard	1	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
2-Butanone	ug/L	**50***	No Standard	No Standard	<0.4 (U)	2 (U)	2 (U)	10 (U)	2 (U)
2-Hexanone	ug/L	50*	No Standard	No Standard	<0.6 (U)	2 (U)	2 (U)	10 (U)	2 (U)
4-Methyl-2-pentanone	ug/L	No Standard	No Standard	No Standard	<0.8 (U)	2 (U)	2 (U)	10 (U)	2 (U)
Acetone	ug/L	50*	No Standard	No Standard	<1.0 (U)	2 (U)	2 (U)	10 (U)	2 (U)
Benzene	ug/L	**190***	No Standard	1	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Bromodichloromethane	ug/L	50*	No Standard	No Standard	<0.08 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Bromoform	ug/L	50*	No Standard	No Standard	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Bromomethane	ug/L	5	No Standard	5	<0.2 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Carbon disulfide	ug/L	No Standard	No Standard	No Standard	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Carbon tetrachloride	ug/L	**0.4***	No Standard	5	<0.4 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Chlorobenzene	ug/L	5*	No Standard	5	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Chloroethane	ug/L	5**	No Standard	5	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Chloroform	ug/L	7	No Standard	7	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Chloromethane	ug/L	**5**	No Standard	No Standard	<0.4 (U)	1 (U)	1 (U)	5 (U)	1 (U)
cis-1,3-Dichloropropene	ug/L	0.4***	No Standard	0.4	<0.09 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Dibromochloromethane	ug/L	50*	No Standard	No Standard	<0.2 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Ethylbenzene	ug/L	**4.5***	No Standard	5	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Methylene chloride	ug/L	**200**	2	5	<0.5 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Styrene	ug/L	**50**	No Standard	5	<0.1 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Tetrachloroethene	ug/L	**1***	No Standard	5	<0.3 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Toluene	ug/L	**92***	No Standard	5	<0.5 (U)	1 (U)	1 (U)	5 (U)	1 (U)
trans-1,3-Dichloropropene	ug/L	0.4***	No Standard	0.4	<0.2 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Trichloroethene	ug/L	**40**	No Standard	5	<0.4 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Vinyl chloride	ug/L	**0.3***	No Standard	2	<0.6 (U)	1 (U)	1 (U)	5 (U)	1 (U)
Xylenes, total	ug/L	**19*****	No Standard	5	<0.6 (U)	1 (U)	1 (U)	5 (U)	1 (U)

* = guidance value

** = the substance did not receive a review beyond determining that it is a principal organic contaminant class and that it does not have a more stringent Specific MCL.

*** = a total value of the compound was usec

U = Not detected J = Estimated B = Found in blank D = Diluted E = Outside of calibration range

TABLE 4-8 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
GROUNDWATER SAMPLING FOR SEMIVOLATILES
AT FORT TOTTEN COAST GUARD STATION

					0008080	0008205	0008079	0008202	0008203	0008206	0008101	0008100
Analyte	Units	**NYSDEC**	**NYSDEC**	**NYSDEC**	MW1-GW-01-01	MW2-GW-01-01	MW3-GW-01-01	MW4-GW-01-01	MW4-GW-01-22	MW4-GW-01-44	MW4-GW-01-55	MW5-GW-01-01
		TOGS	**Part 5**	**703.5**	07/12/00	07/15/00	07/12/00	07/14/00	07/14/00	07/15/00	07/13/00	07/13/00
		1.1.1			Result	Result	Result	Result	Result	Result	Result	Result
1,2,4-Trichlorobenzene	ug/L	5***	No Standard	5	<0.4 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
1,2-Dichlorobenzene	ug/L	5***(g)	No Standard	No Standard	<0.2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
1,3-Dichlorobenzene	ug/L	**3**	No Standard	3	<0.3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
1,4-Dichlorobenzene	ug/L	**3**	No Standard	3	<0.3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2,2'-oxybis(1-Chloropropane)	ug/L	No Standard	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2,4,5-Trichlorophenol	ug/L	1***	No Standard	1	<3 (U)	48 (U)	50 (U)	48 (U)	48 (U)	48 (U)	48 (U)	48 (U)
2,4,6-Trichlorophenol	ug/L	1***	No Standard	1	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2,4-Dichlorophenol	ug/L	1***	No Standard	1	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2,4-Dimethylphenol	ug/L	**1**	No Standard	1	<4 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2,4-Dinitrophenol	ug/L	**1**	No Standard	1	<6 (U)	48 (U)	50 (U)	48 (U)	48 (U)	48 (U)	48 (U)	48 (U)
2,4-Dinitrotoluene	ug/L	5**(g)	No Standard	5	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2,6-Dinitrotoluene	ug/L	**5**	No Standard	5	<4 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2-Chloronaphthalene	ug/L	10	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2-Chlorophenol	ug/L	1***	No Standard	1	<1 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2-Methyl-4,6-dinitrophenol	ug/L	1***	No Standard	1	<5 (U)	48 (U)	50 (U)	48 (U)	48 (U)	48 (U)	48 (U)	48 (U)
2-Methylnaphthalene	ug/L	**No Standard**	No Standard	No Standard	<1 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2-Methylphenol	ug/L	1***	No Standard	1	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
2-Nitroaniline	ug/L	5**(g)	No Standard	5	<3 (U)	48 (U)	50 (U)	48 (U)	48 (U)	48 (U)	48 (U)	48 (U)
2-Nitrophenol	ug/L	1***	No Standard	1	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
3,3'-Dichlorobenzidine	ug/L	5**(g)	No Standard	5	<7 (U)	19 (U)	20 (U)	19 (U)	19 (U)	19 (U)	19 (U)	19 (U)
3-Nitroaniline	ug/L	5**(g)	No Standard	5	<2 (U)	48 (U)	50 (U)	48 (U)	48 (U)	48 (U)	48 (U)	48 (U)
4-Bromophenyl phenyl ether	ug/L	No Standard	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
4-Chloro-3-methylphenol	ug/L	1***	No Standard	1	<1 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
4-Chloroaniline	ug/L	5**(g)	No Standard	5	<8 (U)	19 (U)	20 (U)	19 (U)	19 (U)	19 (U)	19 (U)	19 (U)
4-Chlorophenyl phenyl ether	ug/L	No Standard	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
4-Methylphenol	ug/L	1***	No Standard	1	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
4-Nitroaniline	ug/L	5**(g)	No Standard	5	<1 (U)	48 (U)	50 (U)	48 (U)	48 (U)	48 (U)	48 (U)	48 (U)
4-Nitrophenol	ug/L	1***	No Standard	1	<4 (U)	48 (U)	50 (U)	48 (U)	48 (U)	48 (U)	48 (U)	48 (U)
Acenaphthene	ug/L	**20**	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Acenaphthylene	ug/L	No Standard	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Anthracene	ug/L	**50**	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Benzo[a]pyrene	ug/L	**No Standard**	0.2	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Benzo[b]fluoranthene	ug/L	0.002(g)	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	**1 (J)**	**1 (J)**	10 (U)	10 (U)	10 (U)
Benzo[ghi]perylene	ug/L	No Standard	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Benzo[k]fluoranthene	ug/L	0.002(g)	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Benz[a]anthracene	ug/L	**0.002**	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
bis(2-Chloroethoxy)methane	ug/L	5**(g)	No Standard	5	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
bis(2-Chloroethyl) ether	ug/L	**1**	No Standard	1	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
bis(2-Ethylhexyl) phthalate	ug/L	**5**	No Standard	5	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	**4 (J)**	10 (U)
Butylbenzylphthalate	ug/L	50(g)	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Carbazole	ug/L	No Standard	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Chrysene	ug/L	0.002(g)	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	**1 (J)**	**1 (J)**	10 (U)	10 (U)	10 (U)

U = Not detected J = Estimated B = Found in blank D = Diluted E = Outside of calibration range

TABLE 4-8 (continued)

					0008080	0008205	0008079	0008202	0008203	0008206	0008101	0008100
Analyte	Units	**NYSDEC**	**NYSDEC**	**NYSDEC**	MW1-GW-01-01	MW2-GW-01-01	MW3-GW-01-01	MW4-GW-01-01	MW4-GW-01-22	MW4-GW-01-44	MW4-GW-01-55	MW5-GW-01-01
		TOGS	**Part 5**	**703.5**	07/12/00	07/15/00	07/12/00	07/14/00	07/14/00	07/15/00	07/13/00	07/13/00
		1.1.1			Result	Result	Result	Result	Result	Result	Result	Result
Di-n-butyl phthalate	ug/L	50(g)	No Standard	50	<4 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Di-n-octyl phthalate	ug/L	50(g)	No Standard	No Standard	<4 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Dibenzofuran	ug/L	No Standard	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Dibenz[a,h]anthracene	ug/L	No Standard	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Diethyl phthalate	ug/L	50(g)	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Dimethyl phthalate	ug/L	50(g)	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Fluoranthene	ug/L	50(g)	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	3 (J)	10 (U)	10 (U)	10 (U)	10 (U)
Fluorene	ug/L	2.5(g)	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Hexachlorobenzene	ug/L	**0.04**	1	0.04	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Hexachlorobutadiene	ug/L	**0.5**	no Standard	0.5	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Hexachlorocyclopentadiene	ug/L	**5**	no Standard	5	<4 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Hexachloroethane	ug/L	**5**	no Standard	5	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Indeno[1,2,3-cd]pyrene	ug/L	**No Standard**	no Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Isophorone	ug/L	50(g)	no Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
N-Nitrosodi-n-propylamine	ug/L	No Standard	no Standard	No Standard	<4 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
N-Nitrosodiphenylamine	ug/L	50(g)	no Standard	No Standard	<4 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Naphthalene	ug/L	**10**	no Standard	No Standard	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Nitrobenzene	ug/L	0.4	no Standard	0.4	<3 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Pentachlorophenol	ug/L	1***	1	1	<2 (U)	48 (U)	50 (U)	48 (U)	48 (U)	48 (U)	48 (U)	48 (U)
Phenanthrene	ug/L	**50**	No Standard	No Standard	<2 (U)	10 (U)	10 (U)	1 (J)	1 (J)	10 (U)	10 (U)	10 (U)
Phenol	ug/L	1***	No Standard	1	<2 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)	10 (U)
Pyrene	ug/L	**50**	No Standard	No Standard	<3 (U)	10 (U)	10 (U)	2 (J)	2 (J)	10 (U)	10 (U)	10 (U)

(g) = guidance value

** = the substance did not receive a review beyond determining
that it is a principal organic contaminat class and that it
does not have a more stringent Specific MCL.

*** = a total value of the compound was used

U = Not detected J = Estimated B = Found in blank D = Diluted E = Outside of calibration range

TABLE 4-9 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
GROUNDWATER SAMPLING FOR PENTACHLOROPHENOL (PCP), METHOD 8151,
AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC**	**NYSDEC**	**NYSDEC**	MW1-GW-01-01	MW2-GW-01-01	MW3-GW-01-01	MW4-GW-01-01	MW4-GW-01-22	MW4-GW-01-33	MW5-GW-01-01
	TOGS 1.1.1	**Part 5**	**703.5**					QC Duplicate of	QA Duplicate of	
	ug/l							MW4-GW-01-01	MW4-GW-01-01	
PENTACHLOROPHENOL	Total Phenols < 1	1	1	<0.036 (U)	<0.036 (U)	<0.036 (U)	<0.036 (U)	<0.036 (U)	<0.1923 (U)	<0.036 (U)

J = Estimated

TABLE 4-10 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
GROUNDWATER SAMPLING FOR POLYCYCLIC AROMATIC HYDROCARBONS (PAHs), METHOD 8310,
AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC TOGS 1.1.1** ug/l	**NYSDEC Part 5**	**NYSDEC 703.5**	MW1-GW-01-01	MW2-GW-01-01	MW3-GW-01-01	MW4-GW-01-01	MW4-GW-01-22 QC Duplicate of MW4-GW-01-01	MW4-GW-01-33 QA Duplicate of MW4-GW-01-01	MW5-GW-01-01
ACENAPHTHENE	20, Guidance value	No Standard	No Standard	<0.44 (U)	<0.44 (U)	<0.44 (U)	11 (P)	1.6 (P)	<0.2993 (U)	<0.44 (U)
ACENAPHTHYLENE	None	No Standard	No Standard	<0.71 (U)	<0.71 (U)	<0.71 (U)	<0.722 (U)	<0.722 (U)	<0.3191 (U)	<0.71 (U)
ANTHRACENE	50	No Standard	No Standard	<0.039 (U)	<0.039 (U)	<0.039 (U)	1.1	0.14	<0.0167 (U)	<0.039 (U)
BENZ[A]ANTHRACENE	0.002	No Standard	No Standard	<0.053 (U)	<0.053 (U)	<0.053 (U)	**4.4 (D)**	**0.71**	<0.0166 (U)	<0.053 (U)
BENZO[A]PYRENE	Non-detect	0.2	No Standard	<0.036 (U)	<0.036 (U)	<0.036 (U)	**4.7(D)**	**0.77**	<0.0162 (U)	<0.036 (U)
BENZO[B]FLUORANTHENE	0.002	No Standard	No Standard	<0.08 (U)	<0.08 (U)	<0.08 (U)	**5.9 (P)**	**1.1**	<0.0324 (U)	<0.08 (U)
BENZO[GHI]PERYLENE	None	No Standard	No Standard	<0.086 (U)	<0.086 (U)	<0.086 (U)	3.5	0.56	<0.0574 (U)	<0.086 (U)
BENZO[K]FLUORANTHENE	0.002	No Standard	No Standard	<0.052 (U)	<0.052 (U)	<0.052 (U)	**2.6**	**0.47**	<0.0190 (U)	<0.052 (U)
CHRYSENE	0.002	No Standard	No Standard	<0.032 (U)	<0.032 (U)	<0.032 (U)	**5.4(D)**	**0.83**	<0.0175 (U)	<0.032 (U)
DIBENZ[A,H]ANTHRACENE	None	No Standard	No Standard	<0.077 (U)	<0.077 (U)	<0.077 (U)	0.52 (P)	0.75 (P)	<0.0482 (U)	<0.077 (U)
FLUORANTHENE	50	No Standard	No Standard	<0.098 (U)	<0.098 (U)	<0.098 (U)	13 (D)	2.5	<0.0372 (U)	<0.098 (U)
FLUORENE	50	No Standard	No Standard	<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.095 (U)	<0.0310 (U)	<0.095 (U)
INDENO[1,2,3-CD]PYRENE	0.002	No Standard	No Standard	<0.063 (U)	<0.063 (U)	<0.063 (U)	**3.7**	**0.62 (P)**	<0.0217 (U)	<0.063 (U)
1-METHYLNAPHTHALENE	None	No Standard	No Standard	<0.47 (U)	<0.47 (U)	<0.47 (U)	<0.47 (U)	<0.47 (U)	<0.50 (U)	<0.47 (U)
2-METHYLNAPHTHALENE	None	No Standard	No Standard	<0.39 (U)	<0.39 (U)	<0.39 (U)	6.7 (P)	1.1	<0.50 (U)	<0.39 (U)
NAPHTHALENE	10, Guidance value	No Standard	No Standard	<0.26 (U)	<0.26 (U)	<0.26 (U)	<0.26 (U)	<0.26 (U)	<0.154 (U)	<0.26 (U)
PHENANTHRENE	50	No Standard	No Standard	<0.054 (U)	<0.054 (U)	<0.054 (U)	4.6 (D)	0.91	<0.0173 (U)	<0.054 (U)
PYRENE	50	No Standard	No Standard	<0.079 (U)	<0.079 (U)	<0.079 (U)	9.5 (D)	1.7	<0.0196 (U)	<0.079 (U)

E = Outside of calibration range
U = Not Detected

P = Greater than 25% difference between the two Gas Chromatograph columns

TABLE 4-11 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
GROUNDWATER SAMPLING FOR TOTAL METALS
AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC**	**NYSDEC**	**NYSDEC**	MW1-GW-01-01	MW2-GW-01-01	MW3-GW-01-01	MW4-GW-01-01	MW4-GW-01-22	MW4-GW-01-33	MW5-GW-01
	TOGS 1.1.1	**Part 5**	**703.5**					QC Duplicate of	QA Duplicate of	
	ug/l							MW4-GW-01-01	MW4-GW-01-01	
ALUMINUM, TOTAL	**No Standard**	No Standard	No Standard	**235**	**351**	**185 (B)**	**270**	**345**	**240**	**683**
ANTIMONY, TOTAL	3	6	3	<1.0(U)	<1.0(U)	**3.5 (B)**	1.0 (B)	<1.0(U)	<1.0(U)	<1.0(U)
ARSENIC, TOTAL	25	50	25	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)
BARIUM, TOTAL	1,000	2,000	1000	102 (B)	<12.3(U)	53.8 (B)	57.9 (B)	55.6 (B)	68.0	23.7 (B)
BERYLLIUM, TOTAL	3	4	No Standard	<0.4(U)	<0.4(U)	<0.4(U)	<0.4(U)	<0.4(U)	<0.4(U)	<0.4(U)
CADMIUM, TOTAL	5	No Standard	No Standard	0.41 (B)	0.44 (B)	0.34 (B)	<0.2(U)	<0.2(U)	<0.2(U)	<0.2(U)
CALCIUM, TOTAL	None	No Standard	No Standard	50500 (E)	15100	53800 (E)	48700	47000	49500	15900 (E)
CHROMIUM, TOTAL	50	100	50	1.6 (B)	7.3 (B)	6.9 (B)	2.1 (B)	2.4 (B)	2.5 (J)	6.1 (B)
COBALT, TOTAL	**No Standard**	No Standard	No Standard	<7.5(U)	<7.5(U)	<7.5(U)	<7.5(U)	<7.5(U)	<7.5(U)	<7.5(U)
COPPER, TOTAL	200	No Standard	200	<2.1(U)	3.2 (B)	<2.1(U)	1.1 (B)	1.2 (B)	<2.1(U)	<2.1(U)
IRON, TOTAL	300	300	300	150	**600**	178	275	**427**	**390**	**1490**
LEAD, TOTAL	25	No Standard	25	1.7 (B)	3.7	2.3 (B)	10.5	10.3	9.7 (J)	2.9 (B)
MAGNESIUM, TOTAL	35000, Guidance value	No Standard	No Standard	27200 (E)	5760	24600	27200	26700	28600	11800 (E)
MANGANESE, TOTAL	300	300	300	20.7	<2.4(U)	<2.4(U)	<2.4(U)	<2.4(U)	7.5	4.7 (B)
MERCURY, TOTAL	0.7	2.0	0.7	<0.1(U)	<0.1(U)	<0.1(U)	<0.1(U)	<0.1(U)	<0.1(U)	<0.1(U)
NICKEL, TOTAL	100	No Standard	100	24.2 (B)	7.6 (B)	<13.1(U)	3.0 (B)	3.4 (B)	<13.1(U)	<13.1(U)
POTASSIUM, TOTAL	None	No Standard	No Standard	4260	1180	1750	2070	2080	2310	1080
SELENIUM, TOTAL	10	50	10	1.8(U)	2.3 (B)	3.2 (B)	4.0 (B)	3.1 (B)	1.8(U)	1.8(U)
SILVER, TOTAL	50	100	50	<2.2(U)	<2.2(U)	<2.2(U)	<2.2(U)	<2.2(U)	<2.2(U)	<2.2(U)
SODIUM, TOTAL	20,000	No Standard	20,000	**26700**	10300	8630	**73000**	**73300**	**72800**	18800
THALLIUM, TOTAL	0.5	No Standard	No Standard	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)
VANADIUM, TOTAL	**No Standard**	No Standard	No Standard	<5.6(U)	<5.6(U)	<5.6(U)	<5.6(U)	<5.6(U)	<5.6(U)	<5.6(U)
ZINC, TOTAL	2,000	5,000	No Standard	10.7 (B)	4.6 (B)	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)	<1.7(U)

B = Between Method Detection Limit and Reporting Limit

E = Estimated
U = Not Detected

J = Estimated concentration below the quantifiable detection limit

TABLE 4-12 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
SHORELINE SEDIMENT SAMPLING FOR VOLATILES
AT FORT TOTTEN COAST GUARD STATION

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE93A	FTSE 94A	FTSE 94B	FTSE 97A	FTSE 97B
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
VOLATILES	(ppb)	(ppb)	No standard	0 to 6"	0 to 6"	6 to 12"	0 to 6"	6 to 12"
Acetone	No standard	No standard	No standard	8 (JB)	13 (U)	12 (U)	12 (U)	12 (U)
Benzene	No standard	No standard	600 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Bromodichloromethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Bromoform	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Bromomethane	No standard	No standard	No standard	13 (U)	13 (U)	12 (U)	12 (U)	12 (U)
2-Butanone	No standard	No standard	No standard	13 (U)	13 (U)	12 (U)	12 (U)	12 (U)
Carbon Disulfide	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Carbon Tetrachloride	No standard	No standard	600 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Chlorobenzene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Chlorodibromomethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Chloroethane	No standard	No standard	No standard	13 (U)	13 (U)	12 (U)	12 (U)	12 (U)
Chloroform	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Chloromethane	No standard	No standard	No standard	13 (U)	13 (U)	12 (U)	12 (U)	12 (U)
1,1-Dichloroethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,2-Dichloroethane	No standard	No standard	700 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,1-Dichloroethene	No standard	No standard	20 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,2-Dichloroethene (Total)	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,2-Dichloropropane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Cis-1,3-Dichloropropene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Trans-1,3-Dichloropropene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Ethylbenzene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
2-Hexanone	No standard	No standard	No standard	13 (U)	13 (U)	12 (U)	12 (U)	12 (U)
4-Methyl-2-Pentanone	No standard	No standard	No standard	13 (U)	13 (U)	12 (U)	12 (U)	12 (U)
Methylene Chloride	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Styrene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,1,2,2-Tetrachloroethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Tetrachloroethene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Toluene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,1,1-Trichloroethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,1,2-Trichloroethane	No standard	No standard	600 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Trichloroethylene	No standard	No standard	70 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Vinyl Chloride	No standard	No standard	700 (1) FS	13 (U)	13 (U)	12 (U)	12 (U)	12 (U)
Xylenes (Total)	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-13 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SEDIMENT SAMPLING FOR VOLATILES 0 TO 50 FT FROM SEA WALL AT FORT TOTTEN COAST GUARD STATION

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE101A	FTSE102A	FTSE103A	FTSE105A	FTSE106A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
VOLATILES	(ppb)	(ppb)	No standard	0 to 6"	0 to 6"	0 to 6"	0 to 6"	0 to 6"
Acetone	No standard	No standard	No standard	13 (U)	16 (U)	13 (U)	14 (U)	6 (JB)
Benzene	No standard	No standard	600 (1) FS	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Bromodichloromethane	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Bromoform	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Bromomethane	No standard	No standard	No standard	13 (U)	16 (U)	13 (U)	14 (U)	16 (U)
2-Butanone	No standard	No standard	No standard	13 (U)	16 (U)	13 (U)	14 (U)	16 (U)
Carbon Disulfide	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Carbon Tetrachloride	No standard	No standard	600 (1) FS	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Chlorobenzene	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Chlorodibromomethane	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Chloroethane	No standard	No standard	No standard	13 (U)	16 (U)	13 (U)	14 (U)	16 (U)
Chloroform	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Chloromethane	No standard	No standard	No standard	13 (U)	16 (U)	13 (U)	14 (U)	16 (U)
1,1-Dichloroethane	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
1,2-Dichloroethane	No standard	No standard	700 (1) FS	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
1,1-Dichloroethene	No standard	No standard	20 (1) FS	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
1,2-Dichloroethene (Total)	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
1,2-Dichloropropane	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Cis-1,3-Dichloropropene	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Trans-1,3-Dichloropropene	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Ethylbenzene	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
2-Hexanone	No standard	No standard	No standard	13 (U)	16 (U)	13 (U)	14 (U)	16 (U)
4-Methyl-2-Pentanone	No standard	No standard	No standard	13 (U)	16 (U)	13 (U)	14 (U)	16 (U)
Methylene Chloride	No standard	No standard	No standard	6 (J)	8 (U)	9	5 (J)	6 (J)
Styrene	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
1,1,2,2-Tetrachloroethane	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Tetrachloroethene	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Toluene	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
1,1,1-Trichloroethane	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
1,1,2-Trichloroethane	No standard	No standard	600 (1) FS	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Trichloroethylene	No standard	No standard	70 (1) FS	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)
Vinyl Chloride	No standard	No standard	700 (1) FS	13 (U)	16 (U)	13 (U)	14 (U)	16 (U)
Xylenes (Total)	No standard	No standard	No standard	6 (U)	8 (U)	6 (U)	7 (U)	8 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-13 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE107A	FTSE107B	FTSE109A	FTSE114A	FTSE115A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
VOLATILES	(ppb)	(ppb)	No standard	0 to 6"	6 to 12"	0 to 6"	0 to 6"	0 to 6"
Acetone	No standard	No standard	No standard	12 (U)	12 (U)	13 (U)	13 (U)	18
Benzene	No standard	No standard	600 (1) FS	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Bromodichloromethane	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Bromoform	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Bromomethane	No standard	No standard	No standard	12 (U)	12 (U)	13 (U)	13 (U)	14 (U)
2-Butanone	No standard	No standard	No standard	12 (U)	12 (U)	13 (U)	13 (U)	14 (U)
Carbon Disulfide	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Carbon Tetrachloride	No standard	No standard	600 (1) FS	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Chlorobenzene	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Chlorodibromomethane	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Chloroethane	No standard	No standard	No standard	12 (U)	12 (U)	13 (U)	13 (U)	14 (U)
Chloroform	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Chloromethane	No standard	No standard	No standard	12 (U)	12 (U)	13 (U)	13 (U)	14 (U)
1,1-Dichloroethane	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
1,2-Dichloroethane	No standard	No standard	700 (1) FS	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
1,1-Dichloroethene	No standard	No standard	20 (1) FS	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
1,2-Dichloroethene (Total)	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
1,2-Dichloropropane	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Cis-1,3-Dichloropropene	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Trans-1,3-Dichloropropene	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Ethylbenzene	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
2-Hexanone	No standard	No standard	No standard	12 (U)	12 (U)	13 (U)	13 (U)	14 (U)
4-Methyl-2-Pentanone	No standard	No standard	No standard	12 (U)	12 (U)	13 (U)	13 (U)	14 (U)
Methylene Chloride	No standard	No standard	No standard	4 (J)	4 (J)	7 (U)	6 (U)	7 (U)
Styrene	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
1,1,2,2-Tetrachloroethane	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Tetrachloroethene	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Toluene	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
1,1,1-Trichloroethane	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
1,1,2-Trichloroethane	No standard	No standard	600 (1) FS	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Trichloroethylene	No standard	No standard	70 (1) FS	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)
Vinyl Chloride	No standard	No standard	700 (1) FS	12 (U)	12 (U)	13 (U)	13 (U)	14 (U)
Xylenes (Total)	No standard	No standard	No standard	6 (U)	6 (U)	7 (U)	6 (U)	7 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-13 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE116A	FTSE117A	FTSE118A	FTSE118B	FTSE119A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
VOLATILES	(ppb)	(ppb)	No standard	0 to 6"	0 to 6"	0 to 6"	6 to 12"	0 to 6"
Acetone	No standard	No standard	No standard	7 (J)	12 (U)	12 (U)	11 (U)	12 (U)
Benzene	No standard	No standard	600 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Bromodichloromethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Bromoform	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Bromomethane	No standard	No standard	No standard	12 (U)	12 (U)	12 (U)	11 (U)	12 (U)
2-Butanone	No standard	No standard	No standard	12 (U)	12 (U)	12 (U)	11 (U)	12 (U)
Carbon Disulfide	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Carbon Tetrachloride	No standard	No standard	600 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Chlorobenzene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Chlorodibromomethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Chloroethane	No standard	No standard	No standard	12 (U)	12 (U)	12 (U)	11 (U)	12 (U)
Chloroform	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Chloromethane	No standard	No standard	No standard	12 (U)	12 (U)	12 (U)	11 (U)	12 (U)
1,1-Dichloroethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,2-Dichloroethane	No standard	No standard	700 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,1-Dichloroethene	No standard	No standard	20 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,2-Dichloroethene (Total)	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,2-Dichloropropane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Cis-1,3-Dichloropropene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Trans-1,3-Dichloropropene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Ethylbenzene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
2-Hexanone	No standard	No standard	No standard	12 (U)	12 (U)	12 (U)	11 (U)	12 (U)
4-Methyl-2-Pentanone	No standard	No standard	No standard	12 (U)	12 (U)	12 (U)	11 (U)	12 (U)
Methylene Chloride	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Styrene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,1,2,2-Tetrachloroethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Tetrachloroethene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Toluene	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,1,1-Trichloroethane	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
1,1,2-Trichloroethane	No standard	No standard	600 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Trichloroethylene	No standard	No standard	70 (1) FS	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)
Vinyl Chloride	No standard	No standard	700 (1) FS	12 (U)	12 (U)	12 (U)	11 (U)	12 (U)
Xylenes (Total)	No standard	No standard	No standard	6 (U)	6 (U)	6 (U)	6 (U)	6 (U)

U=Undetected

B=Estimated in association with blanks

J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water

SW=Salt Water

(1) Human Health Bioaccumulation.

(3) Benthic aquatic life chronic toxicity

TABLE 4-13 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE119B	FTSE122A	FTSE122B	FTSE122C	FTSE123A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
VOLATILES	(ppb)	(ppb)	No standard	6 to 12"	0 to 6"	6 to 12"	12 to 18"	0 to 6"
Acetone	No standard	No standard	No standard	14 (U)	16	12 (U)	12 (U)	14 (U)
Benzene	No standard	No standard	600 (1) FS	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Bromodichloromethane	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Bromoform	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Bromomethane	No standard	No standard	No standard	14 (U)	14 (U)	12 (U)	12 (U)	14 (U)
2-Butanone	No standard	No standard	No standard	14 (U)	14 (U)	12 (U)	12 (U)	14 (U)
Carbon Disulfide	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Carbon Tetrachloride	No standard	No standard	600 (1) FS	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Chlorobenzene	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Chlorodibromomethane	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Chloroethane	No standard	No standard	No standard	14 (U)	14 (U)	12 (U)	12 (U)	14 (U)
Chloroform	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Chloromethane	No standard	No standard	No standard	14 (U)	14 (U)	12 (U)	12 (U)	14 (U)
1,1-Dichloroethane	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
1,2-Dichloroethane	No standard	No standard	700 (1) FS	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
1,1-Dichloroethene	No standard	No standard	20 (1) FS	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
1,2-Dichloroethene (Total)	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
1,2-Dichloropropane	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Cis-1,3-Dichloropropene	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Trans-1,3-Dichloropropene	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Ethylbenzene	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
2-Hexanone	No standard	No standard	No standard	14 (U)	14 (U)	12 (U)	12 (U)	14 (U)
4-Methyl-2-Pentanone	No standard	No standard	No standard	14 (U)	14 (U)	12 (U)	12 (U)	14 (U)
Methylene Chloride	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	5 (J)
Styrene	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
1,1,2,2-Tetrachloroethane	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Tetrachloroethene	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Toluene	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
1,1,1-Trichloroethane	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
1,1,2-Trichloroethane	No standard	No standard	600 (1) FS	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Trichloroethylene	No standard	No standard	70 (1) FS	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)
Vinyl Chloride	No standard	No standard	700 (1) FS	14 (U)	14 (U)	12 (U)	12 (U)	14 (U)
Xylenes (Total)	No standard	No standard	No standard	7 (U)	7 (U)	6 (U)	6 (U)	7 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-14 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SHORELINE SEDIMENT SAMPLING FOR SEMIVOLATILES AT FORT TOTTEN COAST GUARD STATION

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE93A	FTSE 94A	FTSE 94B	FTSE 97A	FTSE 97B
	Effects Range-Low	Effects Range-Med	(ug/kgOC)	**Sample Depth**				
SEMIVOLATILES	(ppb)	(ppb)		0 to 6"	0 to 6"	6 to 12"	0 to 6"	6 to 12"
Phenol	No standard	No standard	No standard	420 (U)	430 (U)	410 (U)	390 (U)	390 (U)
Bis(2-Chloroethyl)Ether	No standard	No standard	30 (1) FS	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2-Chlorophenol	No standard	No standard	No standard	420 (U)	430 (U)	410 (U)	390 (U)	390 (U)
1,3-Dichlorobenzene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
1,4-Dichlorobenzene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
1,2-Dichlorobenzene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2-Methylphenol	No standard	No standard	No standard	420 (U)	430 (U)	410 (U)	390 (U)	390 (U)
2,2'-Oxybis(1-Chloropropane)	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
4-Methylphenol	No standard	No standard	No standard	420 (U)	430 (U)	410 (U)	390 (U)	390 (U)
N-Nitrosodi-n-Propylamine	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Hexachloroethane	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Nitrobenzene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Isophorone	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2-Nitrophenol	No standard	No standard	No standard	420 (U)	430 (U)	410 (U)	390 (U)	390 (U)
2,4-Dimethylphenol	No standard	No standard	No standard	420 (U)	430 (U)	410 (U)	390 (U)	390 (U)
Bis(2-Chloroethoxy) Methane	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2,4-Dichlorophenol	No standard	No standard	No standard	420 (U)	430 (U)	410 (U)	390 (U)	390 (U)
1,2,4-Trichlorobenzene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Naphthalene	160	2100	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
4-Chloroaniline	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Hexachlorobutadiene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
4-Chloro-3-Methylphenol	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2-Methylnaphthalene	70	670	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Hexachlorocyclopentadiene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2,4,6-Trichlorophenol	No standard	No standard	No standard	420 (U)	430 (U)	410 (U)	390 (U)	390 (U)
2,4,5-Trichlorophenol	No standard	No standard	No standard	2200 (U)	2200 (U)	2100 (U)	2000 (U)	2000 (U)
2-Chloronaphthalene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2-Nitroaniline	No standard	No standard	No standard	2200 (U)	2200 (U)	2100 (U)	2000 (U)	2000 (U)
Dimethylphthalate	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Acenaphthylene	44	640	240,000 (3) SW	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2,6-Dinitrotoluene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
3-Nitroaniline	No standard	No standard	No standard	2200 (U)	2200 (U)	2100 (U)	2000 (U)	2000 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-14 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE93A	FTSE 94A	FTSE 94B	FTSE 97A	FTSE 97B
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
SEMIVOLATILES	(ppb)	(ppb)		0 to 6"	0 to 6"	6 to 12"	0 to 6"	6 to 12"
Acenaphthene	16	500	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2,4-Dinitrophenol	No standard	No standard	No standard	2200 (U)	2200 (U)	2100 (U)	2000 (U)	2000 (U)
4-Nitrophenol	No standard	No standard	No standard	2200 (U)	2200 (U)	2100 (U)	2000 (U)	2000 (U)
Dibenzofuran	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
2,4-Dinitrotoluene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Diethylphthalate	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
4-Chlorophenyl-Phenyl Ether	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Fluorene	19	540	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
4-Nitroaniline	No standard	No standard	No standard	2200 (U)	2200 (U)	2100 (U)	2000 (U)	2000 (U)
4,6-Dinitro-2-Methylphenol	No standard	No standard	No standard	2200 (U)	2200 (U)	2100 (U)	2000 (U)	2000 (U)
N-Nitrosodiphenylamine (1)	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Hexachlorobenzene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Pentachlorophenol	No standard	No standard	No standard	2200 (U)	2200 (U)	2100 (U)	2000 (U)	2000 (U)
Phenanthrene	240	1500	160,000 (3) SW	52 (J)	130 (U)	120 (U)	120 (U)	120 (U)
Anthracene	85.3	1100	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Carbazole	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Di-n-Butylphthalate	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Fluoranthene	600	5100	1,340,000 (3) S	100 (J)	130 (U)	62 (J)	64 (J)	79 (J)
Pyrene	665	2600	No standard	73 (J)	130 (U)	59 (J)	120 (U)	75 (J)
Butylbenzylphthalate	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
3,3'-Dichlorobenzidine	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Benzo(a)Anthracene	261	1600	700 (1) SW	42 (J)	130 (U)	120 (U)	120 (U)	120 (U)
Chrysene	384	2800	700 (1) SW	68 (J)	130 (U)	120 (U)	120 (U)	55 (J)
Bis(2-Ethylhexyl)Phthalate	No standard	No standard	199500 (3) FW	220	130 (U)	120 (U)	120 (U)	120 (U)
Di-n-Octylphthalate	No standard	No standard	No standard	160	130 (U)	120 (U)	120 (U)	120 (U)
Benzo(b)Fluoranthene	No standard	No standard	700 (1) SW	60 (J)	130 (U)	42 (J)	48 (J)	59 (J)
Benzo(k)Fluoranthene	No standard	No standard	700 (1) SW	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Benzo(a)Pyrene	430	1600	700 (1) SW	130 (U)	130 (U)	120 (U)	120 (U)	43 (J)
Indeno(1,2,3-cd)Pyrene	No standard	No standard	700 (1) SW	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Dibenz(a,h)Anthracene	63.4	260	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)
Benzo(g,h,i)Perylene	No standard	No standard	No standard	130 (U)	130 (U)	120 (U)	120 (U)	120 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-15 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
SEDIMENT SAMPLING FOR SEMIVOLATILES 0 TO 50 FT FROM SEA WALL
AT FORT TOTTEN COAST GUARD STATION

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE101A	FTSE102A	FTSE103A	FTSE105A	FTSE106A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
SEMIVOLATILES	(ppb)	(ppb)		0 to 6"	0 to 6"	0 to 6"	0 to 6"	0 to 6"
Phenol	No standard	No standard	No standard	420 (U)	540 (U)	420 (U)	460 (U)	520 (U)
Bis(2-Chloroethyl)Ether	No standard	No standard	30 (1) FS	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2-Chlorophenol	No standard	No standard	No standard	420 (U)	540 (U)	420 (U)	460 (U)	520 (U)
1,3-Dichlorobenzene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
1,4-Dichlorobenzene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
1,2-Dichlorobenzene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2-Methylphenol	No standard	No standard	No standard	420 (U)	540 (U)	420 (U)	460 (U)	520 (U)
2,2'-Oxybis(1-Chloropropane)	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
4-Methylphenol	No standard	No standard	No standard	420 (U)	540 (U)	420 (U)	460 (U)	520 (U)
N-Nitrosodi-n-Propylamine	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Hexachloroethane	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Nitrobenzene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Isophorone	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2-Nitrophenol	No standard	No standard	No standard	420 (U)	540 (U)	420 (U)	460 (U)	520 (U)
2,4-Dimethylphenol	No standard	No standard	No standard	420 (U)	540 (U)	420 (U)	460 (U)	520 (U)
Bis(2-Chloroethoxy) Methane	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2,4-Dichlorophenol	No standard	No standard	No standard	420 (U)	540 (U)	420 (U)	460 (U)	520 (U)
1,2,4-Trichlorobenzene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Naphthalene	160	2100	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
4-Chloroaniline	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Hexachlorobutadiene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
4-Chloro-3-Methylphenol	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2-Methylnaphthalene	70	670	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Hexachlorocyclopentadiene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2,4,6-Trichlorophenol	No standard	No standard	No standard	420 (U)	540 (U)	420 (U)	460 (U)	520 (U)
2,4,5-Trichlorophenol	No standard	No standard	No standard	2200 (U)	2800 (U)	2200 (U)	2400 (U)	2600 (U)
2-Chloronaphthalene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2-Nitroaniline	No standard	No standard	No standard	2200 (U)	2800 (U)	2200 (U)	2400 (U)	2600 (U)
Dimethylphthalate	No standard	No standard	No standard	130 (U)	100 (J)	130 (U)	140 (U)	160 (U)
Acenaphthylene	44	640	240,000 (3) SW	130 (U)	150 (J)	46 (J)	480	58 (J)
2,6-Dinitrotoluene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
3-Nitroaniline	No standard	No standard	No standard	2200 (U)	2800 (U)	2200 (U)	2400 (U)	2600 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-15 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE101A	FTSE102A	FTSE103A	FTSE105A	FTSE106A
	Effects Range-Low	Effects Range-Med	(ug/kgOC)	**Sample Depth**				
SEMIVOLATILES	(ppb)	(ppb)		0 to 6"	0 to 6"	0 to 6"	0 to 6"	0 to 6"
Acenaphthene	16	500	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2,4-Dinitrophenol	No standard	No standard	No standard	2200 (U)	2800 (U)	2200 (U)	2400 (U)	2600 (U)
4-Nitrophenol	No standard	No standard	No standard	2200 (U)	2800 (U)	2200 (U)	2400 (U)	2600 (U)
Dibenzofuran	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
2,4-Dinitrotoluene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Diethylphthalate	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
4-Chlorophenyl-Phenyl Ether	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Fluorene	19	540	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
4-Nitroaniline	No standard	No standard	No standard	2200 (U)	2800 (U)	2200 (U)	2400 (U)	2600 (U)
4,6-Dinitro-2-Methylphenol	No standard	No standard	No standard	2200 (U)	2800 (U)	2200 (U)	2400 (U)	2600 (U)
N-Nitrosodiphenylamine (1)	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
4-Bromophenyl-Phenylether	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Hexachlorobenzene	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Pentachlorophenol	No standard	No standard	No standard	2200 (U)	2800 (U)	2200 (U)	2400 (U)	2600 (U)
Phenanthrene	240	1500	160,000 (3) SW	51 (J)	490	290	620	170
Anthracene	85.3	1100	No standard	130 (U)	470	93 (J)	640	71 (J)
Carbazole	No standard	No standard	No standard	130 (U)	260	130 (U)	600	160 (U)
Di-n-Butylphthalate	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Fluoranthene	600	5100	1,340,000 (3) S	140	1900	790	3900	370
Pyrene	665	2600	No standard	120 (J)	1200	700	3200	300
Butylbenzylphthalate	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
3,3'-Dichlorobenzidine	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Benzo(a)Anthracene	261	1600	700 (1) SW	73 (J)	1000	480	2300	230
Chrysene	384	2800	700 (1) SW	93 (J)	1100	490	2600	230
Bis(2-Ethylhexyl)Phthalate	No standard	No standard	199500 (3) FW	130 (U)	160	130 (U)	93 (J)	84 (J)
Di-n-Octylphthalate	No standard	No standard	No standard	130 (U)	160 (U)	130 (U)	140 (U)	160 (U)
Benzo(b)Fluoranthene	No standard	No standard	700 (1) SW	140	1200	610	3400	350
Benzo(k)Fluoranthene	No standard	No standard	700 (1) SW	51 (J)	430	180	1200	59 (J)
Benzo(a)Pyrene	430	1600	700 (1) SW	87 (J)	660	420	1800	180
Indeno(1,2,3-cd)Pyrene	No standard	No standard	700 (1) SW	130 (U)	340	160	660	93 (J)
Dibenz(a,h)Anthracene	63.4	260	No standard	130 (U)	140 (J)	130 (U)	76 (J)	160 (U)
Benzo(g,h,i)Perylene	No standard	No standard	No standard	47 (J)	310	160	590	98 (J)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-15 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE107A	FTSE107B	FTSE109A	FTSE114A	FTSE115A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
SEMIVOLATILES	(ppb)	(ppb)		0 to 6"	6 to 12"	0 to 6"	0 to 6"	0 to 6"
Phenol	No standard	No standard	No standard	400 (U)	410 (U)	440 (U)	420 (U)	460 (U)
Bis(2-Chloroethyl)Ether	No standard	No standard	30 (1) FS	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2-Chlorophenol	No standard	No standard	No standard	400 (U)	410 (U)	440 (U)	420 (U)	460 (U)
1,3-Dichlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
1,4-Dichlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
1,2-Dichlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2-Methylphenol	No standard	No standard	No standard	400 (U)	410 (U)	440 (U)	420 (U)	460 (U)
2,2'-Oxybis(1-Chloropropane)	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
4-Methylphenol	No standard	No standard	No standard	400 (U)	410 (U)	440 (U)	420 (U)	460 (U)
N-Nitrosodi-n-Propylamine	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Hexachloroethane	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Nitrobenzene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Isophorone	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2-Nitrophenol	No standard	No standard	No standard	400 (U)	410 (U)	440 (U)	420 (U)	460 (U)
2,4-Dimethylphenol	No standard	No standard	No standard	400 (U)	410 (U)	440 (U)	420 (U)	460 (U)
Bis(2-Chloroethoxy) Methane	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2,4-Dichlorophenol	No standard	No standard	No standard	400 (U)	410 (U)	440 (U)	420 (U)	460 (U)
1,2,4-Trichlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Naphthalene	160	2100	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
4-Chloroaniline	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Hexachlorobutadiene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
4-Chloro-3-Methylphenol	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2-Methylnaphthalene	70	670	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Hexachlorocyclopentadiene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2,4,6-Trichlorophenol	No standard	No standard	No standard	400 (U)	410 (U)	440 (U)	420 (U)	460 (U)
2,4,5-Trichlorophenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2300 (U)	2200 (U)	2400 (U)
2-Chloronaphthalene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2-Nitroaniline	No standard	No standard	No standard	2000 (U)	2100 (U)	2300 (U)	2200 (U)	2400 (U)
Dimethylphthalate	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	640	1700
Acenaphthylene	44	640	240,000 (3) SW	120 (U)	120 (U)	50 (J)	220	61 (J)
2,6-Dinitrotoluene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
3-Nitroaniline	No standard	No standard	No standard	2000 (U)	2100 (U)	2300 (U)	2200 (U)	2400 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-15 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE107A	FTSE107B	FTSE109A	FTSE114A	FTSE115A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
SEMIVOLATILES	(ppb)	(ppb)		0 to 6"	6 to 12"	0 to 6"	0 to 6"	0 to 6"
Acenaphthene	16	500	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2,4-Dinitrophenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2300 (U)	2200 (U)	2400 (U)
4-Nitrophenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2300 (U)	2200 (U)	2400 (U)
Dibenzofuran	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
2,4-Dinitrotoluene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Diethylphthalate	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
4-Chlorophenyl-Phenyl Ether	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Fluorene	19	540	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
4-Nitroaniline	No standard	No standard	No standard	2000 (U)	2100 (U)	2300 (U)	2200 (U)	2400 (U)
4,6-Dinitro-2-Methylphenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2300 (U)	2200 (U)	2400 (U)
N-Nitrosodiphenylamine (1)	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
4-Bromophenyl-Phenylether	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Hexachlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Pentachlorophenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2300 (U)	2200 (U)	2400 (U)
Phenanthrene	240	1500	160,000 (3) SW	120 (J)	110 (J)	130 (J)	380	290
Anthracene	85.3	1100	No standard	44 (J)	120 (U)	80 (J)	260	100 (J)
Carbazole	No standard	No standard	No standard	120 (U)	120 (U)	52 (J)	290	140 (U)
Di-n-Butylphthalate	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Fluoranthene	600	5100	1,340,000 (3) S	210	220	590	2200	450
Pyrene	665	2600	No standard	170	200	410	1400 (U)	350
Butylbenzylphthalate	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
3,3'-Dichlorobenzidine	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Benzo(a)Anthracene	261	1600	700 (1) SW	78 (J)	100 (J)	290	1300	250
Chrysene	384	2800	700 (1) SW	98 (J)	100 (J)	380	1300	290
Bis(2-Ethylhexyl)Phthalate	No standard	No standard	199500 (3) FW	240	110 (J)	100 (J)	120 (J)	5700
Di-n-Octylphthalate	No standard	No standard	No standard	120 (U)	120 (U)	130 (U)	130 (U)	140 (U)
Benzo(b)Fluoranthene	No standard	No standard	700 (1) SW	110 (J)	140	400	1800	390
Benzo(k)Fluoranthene	No standard	No standard	700 (1) SW	58 (J)	42 (J)	150	680	100 (J)
Benzo(a)Pyrene	430	1600	700 (1) SW	76 (J)	86 (J)	220	950	240
Indeno(1,2,3-cd)Pyrene	No standard	No standard	700 (1) SW	120 (U)	120 (U)	91 (J)	370	78 (J)
Dibenz(a,h)Anthracene	63.4	260	No standard	120 (U)	120 (U)	130 (U)	110 (J)	140 (U)
Benzo(g,h,i)Perylene	No standard	No standard	No standard	120 (U)	120 (U)	81 (J)	310	70 (J)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-15 (continued)

CHEMICALS	**NYSDEC**	**NYS+C261DEC**	**NYSHHB**	FTSE116A	FTSE117A	FTSE118A	FTSE118B	FTSE119A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
SEMIVOLATILES	(ppb)	(ppb)		0 to 6"	0 to 6"	0 to 6"	6 to 12"	0 to 6"
Phenol	No standard	No standard	No standard	380 (U)	410 (U)	410 (U)	380 (U)	390 (U)
Bis(2-Chloroethyl)Ether	No standard	No standard	30 (1) FS	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2-Chlorophenol	No standard	No standard	No standard	380 (U)	410 (U)	410 (U)	380 (U)	390 (U)
1,3-Dichlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
1,4-Dichlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
1,2-Dichlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2-Methylphenol	No standard	No standard	No standard	380 (U)	410 (U)	410 (U)	380 (U)	390 (U)
2,2'-Oxybis(1-Chloropropane)	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
4-Methylphenol	No standard	No standard	No standard	380 (U)	410 (U)	410 (U)	380 (U)	390 (U)
N-Nitrosodi-n-Propylamine	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Hexachloroethane	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Nitrobenzene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Isophorone	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2-Nitrophenol	No standard	No standard	No standard	380 (U)	410 (U)	410 (U)	380 (U)	390 (U)
2,4-Dimethylphenol	No standard	No standard	No standard	380 (U)	410 (U)	410 (U)	380 (U)	390 (U)
Bis(2-Chloroethoxy) Methane	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2,4-Dichlorophenol	No standard	No standard	No standard	380 (U)	410 (U)	410 (U)	380 (U)	390 (U)
1,2,4-Trichlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Naphthalene	160	2100	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
4-Chloroaniline	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Hexachlorobutadiene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
4-Chloro-3-Methylphenol	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2-Methylnaphthalene	70	670	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Hexachlorocyclopentadiene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2,4,6-Trichlorophenol	No standard	No standard	No standard	380 (U)	410 (U)	410 (U)	380 (U)	390 (U)
2,4,5-Trichlorophenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2100 (U)	2000 (U)	2000 (U)
2-Chloronaphthalene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2-Nitroaniline	No standard	No standard	No standard	2000 (U)	2100 (U)	2100 (U)	2000 (U)	2000 (U)
Dimethylphthalate	No standard	No standard	No standard	40 (J)	120 (U)	120 (U)	110 (U)	120 (U)
Acenaphthylene	44	640	240,000 (3) SW	120 (U)	150	120 (U)	84 (J)	120 (U)
2,6-Dinitrotoluene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
3-Nitroaniline	No standard	No standard	No standard	2000 (U)	2100 (U)	2100 (U)	2000 (U)	2000 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-15 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE116A	FTSE117A	FTSE118A	FTSE118B	FTSE119A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**Sample Depth**				
SEMIVOLATILES	(ppb)	(ppb)		0 to 6"	0 to 6"	0 to 6"	6 to 12"	0 to 6"
Acenaphthene	16	500	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2,4-Dinitrophenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2100 (U)	2000 (U)	2000 (U)
4-Nitrophenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2100 (U)	2000 (U)	2000 (U)
Dibenzofuran	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
2,4-Dinitrotoluene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Diethylphthalate	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
4-Chlorophenyl-Phenyl Ether	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Fluorene	19	540	No standard	120 (U)	120 (U)	120 (U)	75 (J)	120 (U)
4-Nitroaniline	No standard	No standard	No standard	2000 (U)	2100 (U)	2100 (U)	2000 (U)	2000 (U)
4,6-Dinitro-2-Methylphenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2100 (U)	2000 (U)	2000 (U)
N-Nitrosodiphenylamine (1)	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
4-Bromophenyl-Phenylether	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Hexachlorobenzene	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Pentachlorophenol	No standard	No standard	No standard	2000 (U)	2100 (U)	2100 (U)	2000 (U)	2000 (U)
Phenanthrene	240	1500	160,000 (3) SW	100 (J)	240	120 (U)	820	120 (U)
Anthracene	85.3	1100	No standard	120 (U)	190	120 (U)	110 (U)	120 (U)
Carbazole	No standard	No standard	No standard	120 (U)	210	120 (U)	43 (J)	120 (U)
Di-n-Butylphthalate	No standard	No standard	No standard	120 (U)	180	120 (U)	110 (U)	120 (U)
Fluoranthene	600	5100	1,340,000 (3) S	200	1400	210	1000	150
Pyrene	665	2600	No standard	140	920	190	700	100 (J)
Butylbenzylphthalate	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
3,3'-Dichlorobenzidine	No standard	No standard	No standard	120 (U)	120 (U)	120 (U)	110 (U)	120 (U)
Benzo(a)Anthracene	261	1600	700 (1) SW	92 (J)	790	110 (J)	370	62 (J)
Chrysene	384	2800	700 (1) SW	100 (J)	830	160	510	71 (J)
Bis(2-Ethylhexyl)Phthalate	No standard	No standard	199500 (3) FW	68 (J)	220	1300	110 (U)	120 (U)
Di-n-Octylphthalate	No standard	No standard	No standard	120 (U)	120 (U)	64 (J)	110 (U)	120 (U)
Benzo(b)Fluoranthene	No standard	No standard	700 (1) SW	120 (U)	1400	170	560	81 (J)
Benzo(k)Fluoranthene	No standard	No standard	700 (1) SW	55 (J)	490	52 (J)	250	120 (U)
Benzo(a)Pyrene	430	1600	700 (1) SW	92 (J)	670	120 (U)	310	55 (J)
Indeno(1,2,3-cd)Pyrene	No standard	No standard	700 (1) SW	120 (U)	260	42 (J)	100 (J)	120 (U)
Dibenz(a,h)Anthracene	63.4	260	No standard	120 (U)	83 (J)	120 (U)	110 (U)	120 (U)
Benzo(g,h,i)Perylene	No standard	No standard	No standard	120 (U)	230	45 (J)	82 (J)	120 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-15 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE119B	FTSE122A	FTSE122B	FTSE123A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**ample Depth**			
SEMIVOLATILES	(ppb)	(ppb)		6 to 12"	0 to 6"	6 to 12"	0 to 6"
Phenol	No standard	No standard	No standard	450 (U)	480 (U)	410 (U)	470 (U)
Bis(2-Chloroethyl)Ether	No standard	No standard	30 (1) FS	140 (U)	140 (U)	120 (U)	140 (U)
2-Chlorophenol	No standard	No standard	No standard	450 (U)	480 (U)	410 (U)	470 (U)
1,3-Dichlorobenzene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
1,4-Dichlorobenzene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
1,2-Dichlorobenzene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
2-Methylphenol	No standard	No standard	No standard	450 (U)	480 (U)	410 (U)	470 (U)
2,2'-Oxybis(1-Chloropropane)	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
4-Methylphenol	No standard	No standard	No standard	450 (U)	480 (U)	410 (U)	470 (U)
N-Nitrosodi-n-Propylamine	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Hexachloroethane	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Nitrobenzene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Isophorone	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
2-Nitrophenol	No standard	No standard	No standard	450 (U)	480 (U)	410 (U)	470 (U)
2,4-Dimethylphenol	No standard	No standard	No standard	450 (U)	480 (U)	410 (U)	470 (U)
Bis(2-Chloroethoxy) Methane	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
2,4-Dichlorophenol	No standard	No standard	No standard	450 (U)	480 (U)	410 (U)	470 (U)
1,2,4-Trichlorobenzene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Naphthalene	160	2100	No standard	140 (U)	140 (U)	120 (U)	140 (U)
4-Chloroaniline	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Hexachlorobutadiene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
4-Chloro-3-Methylphenol	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
2-Methylnaphthalene	70	670	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Hexachlorocyclopentadiene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
2,4,6-Trichlorophenol	No standard	No standard	No standard	450 (U)	480 (U)	410 (U)	470 (U)
2,4,5-Trichlorophenol	No standard	No standard	No standard	2300 (U)	2500 (U)	2100 (U)	2400 (U)
2-Chloronaphthalene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
2-Nitroaniline	No standard	No standard	No standard	2300 (U)	2500 (U)	2100 (U)	2400 (U)
Dimethylphthalate	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Acenaphthylene	44	640	240,000 (3) SW	140 (U)	100 (J)	120 (U)	140 (U)
2,6-Dinitrotoluene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
3-Nitroaniline	No standard	No standard	No standard	2300 (U)	2500 (U)	2100 (U)	2400 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-15 (continued)

CHEMICALS	**NYSDEC**	**NYSDEC**	**NYSHHB**	FTSE119B	FTSE122A	FTSE122B	FTSE123A
	Effects Range-Low	Effects Range-Medium	(ug/kgOC)	**ample Depth**			
SEMIVOLATILES	(ppb)	(ppb)		6 to 12"	0 to 6"	6 to 12"	0 to 6"
Acenaphthene	16	500	No standard	140 (U)	140 (U)	73 (J)	140 (U)
2,4-Dinitrophenol	No standard	No standard	No standard	2300 (U)	2500 (U)	2100 (U)	2400 (U)
4-Nitrophenol	No standard	No standard	No standard	2300 (U)	2500 (U)	2100 (U)	2400 (U)
Dibenzofuran	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
2,4-Dinitrotoluene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Diethylphthalate	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
4-Chlorophenyl-Phenyl Ether	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Fluorene	19	540	No standard	140 (U)	140 (U)	52 (J)	140 (U)
4-Nitroaniline	No standard	No standard	No standard	2300 (U)	2500 (U)	2100 (U)	2400 (U)
4,6-Dinitro-2-Methylphenol	No standard	No standard	No standard	2300 (U)	2500 (U)	2100 (U)	2400 (U)
N-Nitrosodiphenylamine (1)	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
4-Bromophenyl-Phenylether	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Hexachlorobenzene	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Pentachlorophenol	No standard	No standard	No standard	2300 (U)	2500 (U)	2100 (U)	2400 (U)
Phenanthrene	240	1500	160,000 (3) SW	810	540	600	140 (U)
Anthracene	85.3	1100	No standard	160	170	110 (J)	140 (U)
Carbazole	No standard	No standard	No standard	110 (J)	94 (J)	59 (J)	140 (U)
Di-n-Butylphthalate	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Fluoranthene	600	5100	1,340,000 (3) S	1500	1000	710	150
Pyrene	665	2600	No standard	1200	760	520	110 (J)
Butylbenzylphthalate	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
3,3'-Dichlorobenzidine	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Benzo(a)Anthracene	261	1600	700 (1) SW	780	520	280	68 (J)
Chrysene	384	2800	700 (1) SW	930	660	320	92 (J)
Bis(2-Ethylhexyl)Phthalate	No standard	No standard	199500 (3) FW	140 (U)	120 (J)	120 (U)	100 (J)
Di-n-Octylphthalate	No standard	No standard	No standard	140 (U)	140 (U)	120 (U)	140 (U)
Benzo(b)Fluoranthene	No standard	No standard	700 (1) SW	1300	710	300	90 (J)
Benzo(k)Fluoranthene	No standard	No standard	700 (1) SW	380 (U)	210	140	140 (U)
Benzo(a)Pyrene	430	1600	700 (1) SW	830	470	260	62 (J)
Indeno(1,2,3-cd)Pyrene	No standard	No standard	700 (1) SW	270	230	120 (U)	140 (U)
Dibenz(a,h)Anthracene	63.4	260	No standard	88 (J)	140 (U)	120 (U)	140 (U)
Benzo(g,h,i)Perylene	No standard	No standard	No standard	260	230	140	140 (U)

U=Undetected
B=Estimated in association with blanks
J=Qualitatively estimated for limited purposes

FS=Fresh Salt Water
SW=Salt Water

(1) Human Health Bioaccumulation.
(3) Benthic aquatic life chronic toxicity

TABLE 4-16 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
SHORELINE SEDIMENT SAMPLING FOR TAL METALS
AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC** **Effects Range-Low** mg/kg	**NYSDEC** **Effects Range-Medium** mg/kg	FTSE 93A	FTSE 94A	FTSA 94B	FTSE 95A	FTSE 95B	FTSE 96A
			Sample Depth					
			0 to 6"	0 to 6"	6 to 12"	0 to 6"	6 to 12"	0 to 6"
ALUMINUM	No standard	No standard	1320	1720	1430			
ANTIMONY	2.0	25.0	0.260 (B)	0.515 (B)	3.57			
ARSENIC	8.2	70	4.64	2.34	1.95	0.687 (B)	3.13	1.17
BARIUM	No standard	No standard	10.5	5.39	6.82	1.93	10.5	10.2
BERYLLIUM	No standard	No standard	0.179 (B)	0.137 (B)	0.119 (B)			
CADMIUM	1.2	9.6	0.122 (B)	0.253 (B)	0.153 (B)	0.0707 (B)	0.286 (B)	0.143 (B)
CALCIUM	No standard	No standard	129000	12400	10900			
CHROMIUM	81	370	5.86	7.5	**13.1**	3.57 (B)	7.52	5.89
COBALT	No standard	No standard	1.35 (B)	1.88 (B)	1.54 (B)			
COPPER	34	270	15.1	25.9	25.1			
IRON	20000	40000	41.3	13300	7740			
LEAD	46.7	218	65.2	49.1	355	62.7	300	26.8
MAGNESIUM	No standard	No standard	15900	7210	6980			
MANGANESE	460	1100	160	67.1	81.1			
MERCURY	0.15	0.71	0.133	**0.484**	**0.804**	**0.261**	**0.596**	**0.103**
NICKEL	20.9	51.6	4.87	5.78	5.74			
POTASSIUM	No standard	No standard	576 (B)	403 (B)	401 (B)			
SELENIUM	No standard	No standard	0.364 (U)	0.374 (U)	0.360 (U)	0.485 (U)	0.356 (U)	0.307 (U)
SILVER	1.0	3.7	0.0593 (U)	0.0908 (B)	0.0925 (B)	0.0791 (U)	0.0941 (B)	0.0736 (B)
SODIUM	No standard	No standard	2080	1570	1250			
THALLIUM	No standard	No standard	0.452 (U)	0.464 (U)	0.534 (B)			
VANADIUM	No standard	No standard	5.49 (B)	9.59	8.95			
ZINC	150	410	35.4	36.8	24.7			

B = Undetected U = Estimated in association with a blank

TABLE 4-16 (continued)

CHEMICAL	**NYSDEC Effects Range-Low** mg/kg	**NYSDEC Effects Range-Medium** mg/kg	FTSE 96B	FTSE 97A	FTSA 97B	FTSE 98A	FTSE 98B	FTSE 99A	FTSE 99B
			Sample Depth						
			6 to 12"	0 to 6"	6 to 12"	0 to 6"	6 to 12"	0 to 6"	6 to 12"
ALUMINUM	No standard	No standard		3570	2790				
ANTIMONY	2.0	25.0		0.224 (U)	0.318 (B)				
ARSENIC	8.2	70	6.92	2.52	2.66	3.82	2.47	0.715 (B)	4.29
BARIUM	No standard	No standard	59.9	11.8	8.47	23.4	21.9	10.4	7.16
BERYLLIUM	No standard	No standard		0.178 (B)	0.131 (B)				
CADMIUM	1.2	9.6	0.533	0.287 (B)	0.438 (B)	0.254 (B)	0.169 (B)	0.123 (B)	0.336 (B)
CALCIUM	No standard	No standard		9460	5330				
CHROMIUM	81	370	**10.9**	**11.7**	**11.7**	15.7	10.5	5.06	10.6
COBALT	No standard	No standard		2.57 (B)	2.60 (B)				
COPPER	34	270		35	33.9				
IRON	20000	40000		11200	7380				
LEAD	46.7	218	371	263	120	179	**625**	52.6	35.8
MAGNESIUM	No standard	No standard		5110	3300				
MANGANESE	460	1100		99.4	47.2				
MERCURY	0.15	0.71	**0.248**	**0.251**	**0.236**	**0.297**	**0.555**	**0.192**	0.149
NICKEL	20.9	51.6		10.9	12.4				
POTASSIUM	No standard	No standard		690	516 (B)				
SELENIUM	No standard	No standard	0.961	0.341 (U)	0.339 (U)	0.435 (B)	0.372 (U)	0.313 (U)	0.331 (U)
SILVER	1.0	3.7	0.238 (B)	0.519 (B)	0.266 (B)	0.220 (B)	0.0606 (U)	0.0511 (U)	0.0540 (U)
SODIUM	No standard	No standard		1490	1430				
THALLIUM	No standard	No standard		0.904 (B)	0.542 (B)				
VANADIUM	No standard	No standard		13.7	12.8				
ZINC	150	410		92.2	81.5				

B = Undetected U = Estimated in association with a blank

TABLE 4-17 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
SEDIMENT SAMPLING FOR TAL METALS 0 TO 50 FT FROM SEA WALL
AT FORT TOTTEN COAST GUARD STATION

CHEMICAL	**NYSDEC**	**NYSDEC**	FTSE100A	FTSE100B	FTSA101A	FTSE102A	FTSE103A	FTSE104A	FTSE104B
	Effects Range-Low	**Effects Range-Medium**	**Sample Depth**						
	mg/kg	mg/kg	0 to 6"	6 to 12"	0 to 6"	0 to 6"	0 to 6"	0 to 6"	6 to 12"
ALUMINUM	No standard	No standard			2880	6030	5490		
ANTIMONY	2.0	25.0			0.417	0.664 (B)	0.492 (B)		
ARSENIC	8.2	70			16.1	9.98	15.6	6.71	5.97
BARIUM	No standard	No standard	1.29	1.94	24.1	45.7	39.4	14.3	16.0
BERYLLIUM	No standard	No standard	9.28	10.8	0.222 (B)	0.420 (B)	0.388 (B)		
CADMIUM	1.2	9.6			0.207 (B)	0.413 (B)	0.287 (B)	0.335 (B)	0.139 (B)
CALCIUM	No standard	No standard	0.124 (U)	0.0944 (B)	26100	173000	15300		
CHROMIUM	81	370			15.1	29.6	21.8	22.8	14.1
COBALT	No standard	No standard	5.42	7.41	5.04 (B)	6.90 (B)	7.90		
COPPER	34	270			126.	631.	368.		
IRON	20000	40000			22600	14200	24900		
LEAD	46.7	218			176.	350.	4190	86.3	258.
MAGNESIUM	No standard	No standard	14.9	27.5	8870	5820	4430		
MANGANESE	460	1100			144.	1090	895.		
MERCURY	0.15	0.71			1.87	0.421	0.455	0.0711	0.194
NICKEL	20.9	51.6	0.0899	0.0517	11.9	31.4	17.3		
POTASSIUM	No standard	No standard			951.	1260	1470		
SELENIUM	No standard	No standard			0.370 (U)	0.472 (U)	0.369 (U)	0.427 (U)	0.375 (U)
SILVER	1.0	3.7	0.365 (U)	0.349 (U)	0.119 (B)	0.416 (B)	0.0602 (U)	0.113 (B)	0.0885 (B)
SODIUM	No standard	No standard	0.0596 (U)	0.0569 (U)	2770	5880	3210		
THALLIUM	No standard	No standard			0.610 (B)	0.674 (B)	1.47		
VANADIUM	No standard	No standard			18.9	23.7	27.1		
ZINC	150	410			72.8	131.	136.		

B = Undetected U = Estimated in association with a blank

TABLE 4- 17 (continued)

CHEMICAL	**NYSDEC**	**NYSDEC**	FTSE105A	FTSE106A	FTSA107A	FTSE107B	FTSE108A	FTSE108B	FTSE109A
	Effects Range-Low	**Effects Range-Medium**	**Sample Depth**						
	mg/kg	mg/kg	0 to 6"	0 to 6"	0 to 6"	6 to 12"	0 to 6"	6 to 12"	0 to 6"
ALUMINUM	No standard	No standard	10100	4530	1430	3930			9380
ANTIMONY	2.0	25.0	0.989 (B)	2.59	0.228 (U)	0.577 (B)			0.409 (B)
ARSENIC	8.2	70	12.0	11.5	2.67	7.09	2.84	1.61	9.40
BARIUM	No standard	No standard	239.	56.3	14.4	24.2	14.1	8.44	53.2
BERYLLIUM	No standard	No standard	0.506 (B)	0.397 (B)	0.210 (B)	0.407 (B)			0.445 (B)
CADMIUM	1.2	9.6	1.83	0.604 (B)	0.118 (B)	0.176 (B)	0.324 (B)	0.300 (B)	0.473 (B)
CALCIUM	No standard	No standard	30398	112000	155000	15800			37900
CHROMIUM	81	370	34.1	79.9	6.83	22.4	21.2	9.52	26.5
COBALT	No standard	No standard	11.1	12.6	3.58 (B)	3.66 (B)			9.51
COPPER	34	270	2020	163.	22.3	48.5			329.
IRON	20000	40000	33900	14000	4710	19800			23200
LEAD	46.7	218	572.	251.	50.8	167.	66.5	72.4	302.
MAGNESIUM	No standard	No standard	8160	6270	10300	7320			7870
MANGANESE	460	1100	899.	1290	195.	126.			1240
MERCURY	0.15	0.71	0.975	0.777	0.0715	0.207	0.149	0.154	0.269
NICKEL	20.9	51.6	26.7	18.1	60.4	11.0			24.6
POTASSIUM	No standard	No standard	1030	1510	510 (B)	776.			1340
SELENIUM	No standard	No standard	0.401 (U)	0.563 (B)	0.347 (U)	0.360 (U)	0.364 (U)	0.405 (U)	0.384 (U)
SILVER	1.0	3.7	0.209 (B)	0.645 (B)	0.110 (B)	0.107 (B)	0.535 (B)	0.249 (B)	0.306 (B)
SODIUM	No standard	No standard	3140	5310	2040	2090			4490
THALLIUM	No standard	No standard	1.24 (B)	0.560 (U)	0.431 (U)	0.718 (B)			1.07 (B)
VANADIUM	No standard	No standard	30.4	36.7	5.39 (B)	23.7			24.9
ZINC	150	410	809.	180.	35.9	104.			155.

B = Undetected U = Estimated in association with a blank

TABLE 4- 17 (continued)

CHEMICAL	**NYSDEC**	**NYSDEC**	FTSE110A	FTSE111A	FTSA112A	FTSE112B	FTSE113A	FTSE113B	FTSE114A
	Effects Range-Low	**Effects Range-Medium**	**Sample Depth**						
	mg/kg	mg/kg	0 to 6"	0 to 6"	0 to 6"	6 to 12"	0 to 6"	6 to 12"	0 to 6"
ALUMINUM	No standard	No standard							10700
ANTIMONY	2.0	25.0							0.444 (B)
ARSENIC	8.2	70	9.34	1.71					8.01
BARIUM	No standard	No standard	29.1	12.4					147.
BERYLLIUM	No standard	No standard							0.449 (B)
CADMIUM	1.2	9.6	0.225 (B)	0.119					0.668
CALCIUM	No standard	No standard							55500
CHROMIUM	81	370	23.3	15.1					22.9
COBALT	No standard	No standard							10.9
COPPER	34	270							316.
IRON	20000	40000							25600
LEAD	46.7	218	332.	104.					323.
MAGNESIUM	No standard	No standard							8720
MANGANESE	460	1100							911.
MERCURY	0.15	0.71	0.450	0.242	1.93	2.12	2.18	1.80	0.206
NICKEL	20.9	51.6							27.2
POTASSIUM	No standard	No standard							1060
SELENIUM	No standard	No standard	0.368 (U)	0.402 (U)					0.776
SILVER	1.0	3.7	0.176 (B)	0.110 (B)					0.184 (B)
SODIUM	No standard	No standard							2520
THALLIUM	No standard	No standard							0.777 (B)
VANADIUM	No standard	No standard							23.5
ZINC	150	410							139.

B = Undetected U = Estimated in association with a blank

TABLE 4- 17 (continued)

CHEMICAL	**NYSDEC**	**NYSDEC**	FTSE115A	FTSE116A	FTSA117A	FTSE118A	FTSE118B	FTSE119A	FTSE119B
	Effects Range-Low	**Effects Range-Medium**	**Sample Depth**						
	mg/kg	mg/kg	0 to 6"	0 to 6"	0 to 6"	0 to 6"	6 to 12"	0 to 6"	6 to 12"
ALUMINUM	No standard	No standard	5430	2560	8970	6020	2780	2810	10100
ANTIMONY	2.0	25.0	0.710 (B)	0.219 (U)	0.302 (B)	0.867 (B)	0.377 (B)	0.225 (U)	0.728 (B)
ARSENIC	8.2	70	13.9	3.68	7.83	7.22	2.86	6.05	8.62
BARIUM	No standard	No standard	44.3	11.9	35.9	25.9	12.2	12.8	132.
BERYLLIUM	No standard	No standard	0.333 (B)	0.156 (B)	0.378 (B)	0.307 (B)	0.156 (B)	0.160 (B)	0.497 (B)
CADMIUM	1.2	9.6	0.626	0.174 (B)	0.823	0.189 (B)	0.172 (B)	0.180 (B)	0.253 (B)
CALCIUM	No standard	No standard	27000	16200	6770	1070	16100	15700	2010
CHROMIUM	81	370	26.2	12.3	22.5	18.0	12.1	11.9	24.1
COBALT	No standard	No standard	6.11 (B)	2.46 (B)	13.4	8.33	2.39 (B)	2.38 (B)	9.62
COPPER	34	270	1190	31.5	327.	148.	39.8	31.0	393.
IRON	20000	40000	30800	10400	25800	15400	8630	10700	19300
LEAD	46.7	218	259.	226.	245.	250.	81.0	74.2	1390
MAGNESIUM	No standard	No standard	4490	7630	6740	2500	8010	7450	3550
MANGANESE	460	1100	837.	114.	1520	596.	71.9	70.4	699.
MERCURY	0.15	0.71	0.410	0.158	0.149	0.470	0.137	0.266	5.25
NICKEL	20.9	51.6	17.3	7.83	29.5	11.2	6.77	8.15	24.0
POTASSIUM	No standard	No standard	1810	710.	1070	1320	874.	838.	1910
SELENIUM	No standard	No standard	0.761	0.502 (B)	1.32	0.601 (B)	0.432 (B)	0.343 (U)	1.33
SILVER	1.0	3.7	1.13 (B)	0.165 (B)	0.0590 (U)	0.0591 (U)	0.193 (B)	0.0583 (B)	0.0824 (B)
SODIUM	No standard	No standard	3620	1650	2650	2050	1460	1650	3160
THALLIUM	No standard	No standard	1.05 (B)	0.415 (U)	1.26	1.26 (B)	0.675 (B)	0.496 (B)	1.85
VANADIUM	No standard	No standard	30.6	15.2	23.0	23.1	13.4	13.5	29.3
ZINC	150	410	155.	51.5	201.	63.1	60.5	39.1	219.

B = Undetected U = Estimated in association with a blank

TABLE 4- 17 (continued)

CHEMICAL	**NYSDEC**	**NYSDEC**	FTSE120A	FTSE120B	FTSA121A	FTSE121B	FTSE121C	FTSE122A	FTSE122B
	Effects Range-Low	**Effects Range-Medium**	**Sample Depth**						
	mg/kg	mg/kg	0 to 6"	6 to 12"	0 to 6"	6 to 12"	12 to 18"	0 to 6"	6 to 12"
ALUMINUM	No standard	No standard						4950	7410
ANTIMONY	2.0	25.0						1.03 (B)	0.237 (U)
ARSENIC	8.2	70	3.57	3.14	9.93	3.35	5.19	11.9	5.36
BARIUM	No standard	No standard	12.0	56.2	46.2	23.0	27.4	65.8	19.2
BERYLLIUM	No standard	No standard						0.313 (B)	0.312 (B)
CADMIUM	1.2	9.6	0.254 (B)	0.419 (B)	0.921	0.241 (B)	0.249 (B)	0.448	0.0965 (B)
CALCIUM	No standard	No standard						19800	741.
CHROMIUM	81	370	11.1	14.5	26.2	17.8	20.0	22.4	17.0
COBALT	No standard	No standard						7.07 (B)	4.44 (B)
COPPER	34	270						321.	25.9
IRON	20000	40000						23600	11500
LEAD	46.7	218	125.	323.	647.	85.2	28.5	898.	60.5
MAGNESIUM	No standard	No standard						7670	2340
MANGANESE	460	1100						1570	95.3
MERCURY	0.15	0.71	0.142	0.171	2.85	0.632	0.504	1.08	0.959
NICKEL	20.9	51.6						24.4	10.6
POTASSIUM	No standard	No standard						1260	1220
SELENIUM	No standard	No standard	0.299 (U)	0.739	0.978	0.649	0.827	1.24	0.679
SILVER	1.0	3.7	0.194 (B)	0.330 (B)	0.223 (B)	0.0546 (U)	0.0558 (U)	0.141 (B)	0.119 (B)
SODIUM	No standard	No standard						4000	2180
THALLIUM	No standard	No standard						1.31 (B)	0.878 (B)
VANADIUM	No standard	No standard						29.2	20.4
ZINC	150	410						218.	86.0

B = Undetected U = Estimated in association with a blank

TABLE 4- 17 (continued)

CHEMICAL	**NYSDEC**	**NYSDEC**	FTSE123A	FTSA124A	FTSE124B	FTSE125A	FTSE125B	FTSE126A	FTSE126B
	Effects Range-Low	**Effects Range-Medium**	**Sample Depth**						
	mg/kg	mg/kg	0 to 6"	0 to 6"	6 to 12"	0 to 6"	6 to 12"	0 to 6"	6 to 12"
ALUMINUM	No standard	No standard	2200						
ANTIMONY	2.0	25.0	0.269 (U)						
ARSENIC	8.2	70	3.34	2.40	2.26	2.06	2.72	1.79	4.05
BARIUM	No standard	No standard	12.0	13.6	8.81	5.71	41.3	9.15	9.35
BERYLLIUM	No standard	No standard	0.201 (B)						
CADMIUM	1.2	9.6	0.128 (B)	0.338 (B)	0.617	0.234 (B)	0.367 (B)	0.315 (B)	0.592
CALCIUM	No standard	No standard	56400						
CHROMIUM	81	370	10.9	11.7	24.6	9.08	16.5	14.0	12.7
COBALT	No standard	No standard	1.76 (B)						
COPPER	34	270	24.0						
IRON	20000	40000	7990						
LEAD	46.7	218	70.0	41.0	57.9	116.	11.9	248.	80.6
MAGNESIUM	No standard	No standard	6770						
MANGANESE	460	1100	70.5						
MERCURY	0.15	0.71	0.158	0.187	0.352	0.234	0.0465 (U)	0.224	0.123
NICKEL	20.9	51.6	6.16						
POTASSIUM	No standard	No standard	645 (B)						
SELENIUM	No standard	No standard	0.410 (U)	0.362 (U)	0.409 (B)	0.381 (U)	0.402 (U)	0.396 (B)	0.615
SILVER	1.0	3.7	0.150 (B)	0.194 (B)	0.354 (B)	0.213 (B)	0.0656 (U)	0.161 (B)	0.337 (B)
SODIUM	No standard	No standard	3640						
THALLIUM	No standard	No standard	0.510 (U)						
VANADIUM	No standard	No standard	10.3						
ZINC	150	410	41.0						

B = Undetected U = Estimated in association with a blank

TABLE 4- 17 (continued)

CHEMICAL	**NYSDEC**	**NYSDEC**	FTSE127A	FTSA127B	FTSE128A	FTSE128B	FTSE129A	FTSE129B
	Effects Range-Low	**Effects Range-Medium**	**Sample Depth**					
	mg/kg	mg/kg	0 to 6"	6 to 12"	0 to 6"	6 to 12"	0 to 6"	6 to 12"
ALUMINUM	No standard	No standard						
ANTIMONY	2.0	25.0						
ARSENIC	8.2	70	1.65	80.3	2.31	2.28	1.20	5.80
BARIUM	No standard	No standard	11.4	8.30	11.1	11.1	6.16	20.4
BERYLLIUM	No standard	No standard						
CADMIUM	1.2	9.6	0.337 (B)	0.541	0.269 (B)	0.529 (B)	0.181 (B)	0.829
CALCIUM	No standard	No standard						
CHROMIUM	81	370	8.91	10.9	9.15	17.4	7.06	14.8
COBALT	No standard	No standard						
COPPER	34	270						
IRON	20000	40000						
LEAD	46.7	218	40.2	115.	1080	129.	41.1	106.
MAGNESIUM	No standard	No standard						
MANGANESE	460	1100						
MERCURY	0.15	0.71	0.203	0.0971	0.158	2.15	0.144	0.796
NICKEL	20.9	51.6						
POTASSIUM	No standard	No standard						
SELENIUM	No standard	No standard	0.374 (U)	4.20	0.361 (U)	0.551 (B)	0.344 (U)	0.578 (B)
SILVER	1.0	3.7	0.186 (B)	0.0870 (B)	0.257 (B)	0.0644 (U)	0.181 (B)	2.65
SODIUM	No standard	No standard						
THALLIUM	No standard	No standard						
VANADIUM	No standard	No standard						
ZINC	150	410						

B = Undetected U = Estimated in association with a blank

TABLE 4-18 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SHORELINE SEDIMENT SAMPLING FOR MERCURY AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

NYSDEC Effects Range-Medium (mg/kg)				**0.71**
NYSDEC Effects Range-Low (mg/kg)				**0.15**
Sample Date	**SampleID**	**Number**	**Value (A)**	**Value (B)**
01/13/98	FTSE	93	0.13	
01/15/98	FTSE	94	0.48	0.80
01/15/98	FTSE	95	0.26	0.60
01/15/98	FTSE	96	0.10	0.25
01/15/98	FTSE	97	0.25	0.24
01/15/98	FTSE	98	0.30	0.56
01/15/98	FTSE	99	0.19	0.15

Note:

Last letter in sample ID denotes depth interval of sample, e.g.,

Value A = 0-0.5 ft. bgs
Value B = 0.5-1 ft. bgs
Value C = 1-1.5 ft. bgs
Value D = 1.5-2 ft. bgs

ND indicates analytes was detected below the laboratory detection

TABLE 4-19 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SEDIMENT SAMPLING FOR MERCURY 0 TO 50 FT FROM SEA WALL AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

NYSDEC Effects Range-Medium (mg/kg)				0.71	
NYSDEC Effects Range-Low (mg/kg)				**0.15**	
Sample Date	**SampleID**	**Number**	**Value(A)**	**Value (B)**	**Value (C)**
01/13/98	FTSE	100	0.09	0.05	
01/13/98	FTSE	101	1.87		
01/13/98	FTSE	102	0.42		
01/13/98	FTSE	103	0.46		
01/13/98	FTSE	104	0.07	0.19	
01/13/98	FTSE	105	0.98		
01/13/98	FTSE	106	0.78		
01/13/98	FTSE	107	0.07	0.21	
01/15/98	FTSE	108	0.15	0.15	
01/13/98	FTSE	109	0.27		
01/13/98	FTSE	110	0.45		
01/13/98	FTSE	111	0.24		
01/15/98	FTSE	112	0.09	0.24	
01/15/98	FTSE	113	0.15	0.21	
01/14/98	FTSE	114	0.21		
01/14/98	FTSE	115	0.41		
01/14/98	FTSE	116	0.16		
01/14/98	FTSE	117	0.15		
01/14/98	FTSE	118	0.47	0.14	
01/14/98	FTSE	119	0.27	5.25	
01/15/98	FTSE	120	0.14	0.17	
01/14/98	FTSE	121	2.85	0.63	0.50
01/14/98	FTSE	122	1.08	0.96	
01/14/98	FTSE	123	0.16		
01/15/98	FTSE	124	0.19	0.35	
01/15/98	FTSE	125	0.23	0.05	
01/15/98	FTSE	126	0.22	0.12	
01/15/98	FTSE	127	0.20	0.10	
01/15/98	FTSE	128	0.16	2.15	
01/15/98	FTSE	129	0.14	0.80	

Note:

Last letter in sample ID denotes depth interval of sample, e.g.,

Value A = 0-0.5 ft. bgs
Value B = 0.5-1 ft. bgs
Value C = 1-1.5 ft. bgs
Value D = 1.5-2 ft. bgs

ND indicates analytes was detected below the laboratory detection limit.

TABLE 4-20 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 SEDIMENT SAMPLING FOR MERCURY 100 TO 400 FT FROM SEA WALL AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

NYSDEC Effects Range-Medium (mg/kg)				**0.71**		
NYSDEC Effects Range-Low (mg/kg)				**0.15**		
Sample Date	**SampleID**	**Number**	**Value(A)**	**Value (B)**	**Value (C)**	**Value(D)**
01/13/98	FTSE	67	1.99	2.19	2.25	
01/13/98	FTSE	68	1.80	2.18	1.51	2.46
01/13/98	FTSE	69	1.40	1.93	2.12	2.18
01/14/98	FTSE	70	1.42	1.20	2.17	2.19
01/14/98	FTSE	71	1.27	1.45	1.58	
01/14/98	FTSE	72	1.20	1.75	1.53	2.10
01/13/98	FTSE	73	1.60	1.98	1.78	2.22
01/13/98	FTSE	74	1.31	2.15	3.12	2.50
01/13/98	FTSE	75	1.28	1.34	1.60	2.70
01/14/98	FTSE	76	0.66	2.05		
01/14/98	FTSE	77	0.27			
01/14/98	FTSE	78	1.17	1.35	2.06	1.82
01/14/98	FTSE	79	1.30	1.42	1.03	1.43
01/13/98	FTSE	80	1.42	1.42		
01/13/98	FTSE	81	1.62	2.50	3.36	3.61
01/13/98	FTSE	82	1.06	ND	ND	ND
01/14/98	FTSE	83	0.30	ND		
01/14/98	FTSE	84	0.00			
01/14/98	FTSE	85	0.33	0.21	0.34	
01/14/98	FTSE	86	0.41			
01/13/98	FTSE	87	ND	ND		
01/14/98	FTSE	88	0.09			
01/14/98	FTSE	89	ND	ND	ND	
01/14/98	FTSE	90	ND	ND		
01/14/98	FTSE	91	0.12	ND		
01/14/98	FTSE	92	0.25			

Note:

Last letter in sample ID denotes depth interval of sample, e.g.,

Value A = 0-0.5 ft. bgs
Value B = 0.5-1 ft. bgs
Value C = 1-1.5 ft. bgs
Value D = 1.5-2 ft. bgs

ND indicates analytes was detected below the laboratory detection limit.

TABLE 4-21 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
BRAC SEDIMENT SAMPLING FOR MERCURY
AT FORT TOTTEN COAST GUARD STATION

NYSDEC Effects Range-Medium (mg/kg)					**0.71**			
NYSDEC Effects Range-Low (mg/kg)					**0.15**			
SAMPLE ID:		**FTSE 15A**	**FTSE 15B**	**FTSE 16A**	**FTSE 17A**	**FTSE 18A**	**FTSE 18B**	**FTSE 19A**
SAMPLING DATE:		12/16/97	12/16/97	12/12/97	12/17/97	12/12/97	12/12/97	12/17/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	0.0484	0.477	0.0915	0.120	0.100	ND	0.903
SAMPLE ID:		**FTSE 19B**	**FTSE 19C**	**FTSE 19D**	**FTSE 20A**	**FTSE 20B**	**FTSE 20C**	**FTSE 20D**
SAMPLING DATE:		12/17/97	12/17/97	12/17/97	12/12/97	12/12/97	12/12/97	12/12/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	1.61	1.64	1.42	1.11	1.21	2.01	1.72
SAMPLE ID:		**FTSE 21A**	**FTSE 21B**	**FTSE 21C**	**FTSE 21D**	**FTSE 22A**	**FTSE 22B**	**FTSE 22C**
SAMPLING DATE:		12/17/97	12/17/97	12/17/97	12/17/97	12/12/97	12/12/97	12/12/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	1.12	1.53	3.93	1.92	1.03	1.23	1.20
SAMPLE ID:		**FTSE 23A**	**FTSE 23B**	**FTSE 24A**	**FTSE 24B**	**FTSE 25A**	**FTSE 25B**	**FTSE 26A**
SAMPLING DATE:		12/16/97	12/16/97	12/16/97	12/16/97	12/16/97	12/16/97	12/16/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	0.0605	ND	0.130	ND	0.121	0.516	0.0981
SAMPLE ID:		**FTSE 26B**	**FTSE 27A**	**FTSE 27B**	**FTSE 28A**	**FTSE 28B**	**FTSE 29A**	**FTSE 29B**
SAMPLING DATE:		12/16/97	12/17/97	12/17/97	12/12/97	12/12/97	12/17/97	12/17/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	0.217	0.146	0.372	0.124	0.125	1.10	0.984
SAMPLE ID:		**FTSE 29C**	**FTSE 29D**	**FTSE 30A**	**FTSE 30B**	**FTSE 31A**	**FTSE 32A**	**FTSE 32B**
SAMPLING DATE:		12/17/97	12/17/97	12/12/97	12/12/97	12/16/97	12/16/97	12/16/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	1.17	1.21	0.397	0.196	0.0727	ND	ND
SAMPLE ID:		**FTSE 32C**	**FTSE 33A**	**FTSE 34A**	**FTSE 35A**	**FTSE 35B**	**FTSE 36A**	**FTSE 36B**
SAMPLING DATE:		12/16/97	12/16/97	12/16/97	12/16/97	12/16/97	12/16/97	12/16/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	ND	ND	ND	ND	ND	0.0416	ND
SAMPLE ID:		**FTSE 37A**	**FTSE 37B**	**FTSE 38A**	**FTSE 38B**	**FTSE 38C**	**FTSE 39A**	**FTSE 39B**
SAMPLING DATE:		12/16/97	12/16/97	12/16/97	12/16/97	12/16/97	12/15/97	12/15/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	0.149	ND	0.700	0.657	0.181	ND	ND

TABLE 4-21 (continued)

NYDEC Effects Range-Medium (mg/kg)				**0.71**				
NYDEC Effects Range-Low (mg/kg)				**0.15**				
SAMPLE ID:		**FTSE 40A**	**FTSE 40B**	**FTSE 41A**	**FTSE 42A**	**FTSE 43A**	**FTSE 44A**	**FTSE 45A**
SAMPLING DATE:		12/15/97	12/15/97	12/18/97	12/17/97	12/12/97	12/17/97	12/17/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	0.0423	ND	0.131	0.0650	0.0664	0.0581	0.108
SAMPLE ID:		**FTSE 45B**	**FTSE 46A**	**FTSE 46B**	**FTSE 47A**	**FTSE 47B**	**FTSE 48A**	**FTSE 48B**
SAMPLING DATE:		12/17/97	12/17/97	12/17/97	12/18/97	12/18/97	12/18/97	12/18/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	ND	0.428	0.116	ND	0.0506	ND	0.0513
SAMPLE ID:		**FTSE 48C**	**FTSE 49A**	**FTSE 49B**	**FTSE 49C**	**FTSE 50A**	**FTSE 50B**	**FTSE 51A**
SAMPLING DATE:		12/18/97	12/18/97	12/18/97	12/18/97	12/18/97	12/18/97	12/18/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	ND	ND	0.0412	0.0483	0.429	0.181	0.0549
SAMPLE ID:		**FTSE 51B**	**FTSE 52A**	**FTSE 52B**	**FTSE 53A**	**FTSE 53B**	**FTSE 54A**	**FTSE 55A**
SAMPLING DATE:		12/18/97	12/18/97	12/18/97	12/18/97	12/18/97	12/17/97	12/12/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	0.711	0.0593	0.327	0.0579	0.206	0.101	0.0831
SAMPLE ID:		**FTSE 56A**	**FTSE 57A**	**FTSE 58A**	**FTSE 58B**	**FTSE 58C**	**FTSE 58D**	**FTSE 59A**
SAMPLING DATE:		12/17/97	12/12/97	12/17/97	12/17/97	12/17/97	12/17/97	12/12/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	0.202	0.109	2.03	2.52	3.05	3.11	0.0621
SAMPLE ID:		**FTSE 60A**	**FTSE 61A**	**FTSE 62A**	**FTSE 63A**	**FTSE 64A**	**FTSE 65A**	**FTSE 66A**
SAMPLING DATE:		12/17/97	12/12/97	12/18/97	12/18/97	12/18/97	12/18/97	12/18/97
MATRIX:		Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
PARAMETE	**UNITS**							
Mercury	**MG/KG**	0.169	0.0379	0.382	0.0513	ND	ND	0.103

Note:

Last letter in sample ID denotes depth interval of sample, e.g.,

A = 0-0.5 ft. bgs
B = 0.5-1 ft. bgs
C = 1-1.5 ft. bgs
D = 1.5-2 ft. bgs

ND indicates analytes was detected below the laboratory detection limit.

TABLE 4-22 RESULTS OF REMEDIAL INVESTIGATION PHASE 2 SEDIMENT SAMPLING FOR MERCURY AT FORT TOTTEN COAST GUARD STATION

SAMPLE ID	DEPTH	MERCURY (mg/kg) NYSDEC Standard ER-L = 0.15; ER-M = 0.71
LTB-SD-130-01	0-3" BGS	0.36 (*)
LTB-SD-130-02	3-12" BGS	0.41
LTB-SD-130-22 (QC duplicate of 130-02)	3-12" BGS	0.26
LTB-SD-130-33 (QA duplicate of 130-02)	3-12" BGS	0.149
LTB-SD-130-03	1-2' BGS	0.25
LTB-SD-130-04	2-3' BGS	0.29
LTB-SD-130-42 (QC duplicate of 130-04)	2-3' BGS	0.27
LTB-SD-130-43 (QA duplicate of 130-04)	2-3' BGS	0.199
LTB-SD-130-05	3-4' BGS	0.40
LTB-SD-130-06	4-5' BGS	0.15
LTB-SD-130-07	5-6' BGS	0.42
LTB-SD-130-08	6-7' BGS	0.63
LTB-SD-130-09	7-8' BGS	0.05 (B)
LTB-SD-130-10	8-9' BGS	0.05(U)
LTB-SD-130-11	9-10' BGS	0.05(U)
LTB-SD-131-01	0-3" BGS	Spilled before analysis
LTB-SD-131-02	3-12" BGS	0.05(U)
LTB-SD-131-03	1-2' BGS	0.05(U)
LTB-SD-131-04	2-3' BGS	0.05(U)
LTB-SD-131-05	3-4' BGS	0.05(U)
LTB-SD-131-22 (QC duplicate of 131-05)	3-4' BGS	0.05(U)
LTB-SD-131-33 (QA duplicate of 131-05)	3-4' BGS	0.0055
LTB-SD-131-06	4-5' BGS	0.05(U)
LTB-SD-131-07	5-6' BGS	0.05(U)
LTB-SD-131-08	6-7' BGS	0.05(U)
LTB-SD-131-09	7-8' BGS	0.05(U)
LTB-SD-131-10	8-9' BGS	0.05(U)
LTB-SD-131-11	9-10' BGS	0.05(U)
LTB-SD-132-01	0-3" BGS	0.12
LTB-SD-132-02	3-12" BGS	0.05(U)
LTB-SD-132-03	1-2' BGS	0.05(U)
LTB-SD-132-04	2-3' BGS	0.05(U)
LTB-SD-132-05	3-4' BGS	0.05(U)
LTB-SD-132-06	4-5' BGS	0.05(U)
LTB-SD-132-22 (QC duplicate of 132-06)	4-5' BGS	0.05(U)
LTB-SD-132-33 (QA duplicate of 132-06)	4-5' BGS	0.0107
LTB-SD-132-07	5-6' BGS	0.06 (B)
LTB-SD-132-08	6-7' BGS	0.05(U)
LTB-SD-132-09	7-8' BGS	0.05(U)
LTB-SD-132-10	8-9' BGS	0.05(U)
LTB-SD-132-11	9-10' BGS	0.05(U)

TABLE 4-22 (continued)

SAMPLE ID	DEPTH	MERCURY (mg/kg)
		NYSDEC Standard
		ER-L = 0.15; ER-M = 0.71
LTB-SD-133-01	0-3" BGS	**1.5 (*)**
LTB-SD-133-02	3-12" BGS	**2.8**
LTB-SD-133-03	1-2' BGS	**2.8**
LTB-SD-133-04	2-3' BGS	**2.4**
LTB-SD-133-05	3-4' BGS	**2.5**
LTB-SD-133-06	4-5' BGS	**2.6**
LTB-SD-133-07	5-6' BGS	**2.8**
LTB-SD-133-22 (QC duplicate of 133-07)	5-6' BGS	**2.4**
LTB-SD-133-33 (QA duplicate of 133-07)	5-6' BGS	**3.2**
LTB-SD-133-08	6-7' BGS	**2.4**
LTB-SD-133-09	7-8' BGS	**2.9**
LTB-SD-133-10	8-9' BGS	**2.9**
LTB-SD-133-11	9-10' BGS	**1.5**
LTB-SD-134-01	0-3" BGS	**0.72**
LTB-SD-134-02	3-12" BGS	**2.6**
LTB-SD-134-03	1-2' BGS	**2.6**
LTB-SD-134-04	2-3' BGS	**2.4**
LTB-SD-134-22 (QC duplicate of 134-04)	2-3' BGS	**3.0**
LTB-SD-134-33 (QA duplicate of 134-04)	2-3' BGS	**3.14**
LTB-SD-134-05	3-4' BGS	**3.0**
LTB-SD-134-06	4-5' BGS	**3.1**
LTB-SD-134-07	5-6' BGS	**2.8**
LTB-SD-134-08	6-7' BGS	**2.5**
LTB-SD-134-09	7-8' BGS	**4.1**
LTB-SD-134-10	8-9' BGS	**2.9**
LTB-SD-134-11	9-10' BGS	**2.5**
LTB-SD-135-01	0-3" BGS	**1.2**
LTB-SD-135-02	3-12" BGS	**1.6**
LTB-SD-135-03	1-2' BGS	**1.5**
LTB-SD-135-04	2-3' BGS	**2.4**
LTB-SD-135-05	3-4' BGS	**2.2**
LTB-SD-135-06	4-5' BGS	**1.7**
LTB-SD-135-07	5-6' BGS	**1.7**
LTB-SD-135-08	6-7' BGS	**2.0**
LTB-SD-135-22 (QC duplicate of 135-08)	6-7' BGS	**2.2**
LTB-SD-135-33 (QA duplicate of 135-08)	6-7' BGS	**2.5**
LTB-SD-135-09	7-8' BGS	**2.0**
LTB-SD-135-10	8-9' BGS	**1.9**
LTB-SD-135-11	9-10' BGS	**1.7**

TABLE 4-22 (continued)

SAMPLE ID	**DEPTH**	**MERCURY (mg/kg)**
		NYSDEC Standard
		ER-L = 0.15; ER-M = 0.71
LTB-SD-136-01	0-3" BGS	**1.1**
LTB-SD-136-02	3-12" BGS	**1.3**
LTB-SD-136-03	1-2' BGS	**1.2**
LTB-SD-136-04	2-3' BGS	**1.6**
LTB-SD-136-05	3-4' BGS	**2.2**
LTB-SD-136-06	4-5' BGS	**1.0**
LTB-SD-136-07	5-6' BGS	**2.5**
LTB-SD-136-08	6-7' BGS	**2.5**
LTB-SD-136-09	7-8' BGS	**2.9**
LTB-SD-136-22 (QC duplicate of 136-09)	7-8' BGS	**2.8**
LTB-SD-136-33 (QA duplicate of 136-09)	7-8' BGS	**3.01**
LTB-SD-136-10	8-9' BGS	**3.0**
LTB-SD-136-11	9-10' BGS	**2.9**
LTB-SD-137-01	0-3" BGS	**1.3 (N)**
LTB-SD-137-02	3-12" BGS	**1.2 (N)**
LTB-SD-137-03	1-2' BGS	**2.0 (N)**
LTB-SD-137-22 (QC duplicate of 137-03)	1-2' BGS	**1.8 (N)**
LTB-SD-137-33 (QA duplicate of 137-03)	1-2' BGS	**2.33**
LTB-SD-137-04	2-3' BGS	**0.87 (N)**
LTB-SD-137-05	3-4' BGS	**1.2 (N)**
LTB-SD-137-06	4-5' BGS	**1.2 (N)**
LTB-SD-137-07	5-6' BGS	**1.9 (N)**
LTB-SD-137-08	6-7' BGS	**1.6 (N)**
LTB-SD-137-09	7-8' BGS	**2.6 (N)**
LTB-SD-137-10	8-9' BGS	**3.1 (N)**
LTB-SD-137-11	9-10' BGS	0.060 (BN)
LTB-SD-138-01	0-3" BGS	**0.97 (N)**
LTB-SD-138-02	3-12" BGS	**1.0 (N)**
LTB-SD-138-03	1-2' BGS	**1.0 (N)**
LTB-SD-138-04	2-3' BGS	**1.4 (N)**
LTB-SD-138-05	3-4' BGS	**1.7 (N)**
LTB-SD-138-06	4-5' BGS	**1.4 (N)**
LTB-SD-138-07	5-6' BGS	**2.0 (N)**
LTB-SD-138-08	6-7' BGS	**2.3 (N)**
LTB-SD-138-09	7-8' BGS	**2.1 (N)**
LTB-SD-138-10	8-9' BGS	**1.9 (N)**
LTB-SD-138-22 (QC duplicate of 138-10)	8-9' BGS	**1.7 (N)**
LTB-SD-138-33 (QA duplicate of 138-10)	8-9' BGS	**1.91**
LTB-SD-138-11	9-10' BGS	**1.7 (N)**

TABLE 4-22 (continued)

SAMPLE ID	**DEPTH**	**MERCURY (mg/kg)**
		NYSDEC Standard
		ER-L = 0.15; ER-M = 0.71
LTB-SD-139-01	0-3" BGS	**1.0 (N)**
LTB-SD-139-02	3-12" BGS	**1.7 (N)**
LTB-SD-139-03	1-2' BGS	**0.76 (N)**
LTB-SD-139-04	2-3' BGS	0.66 (N)
LTB-SD-139-05	3-4' BGS	**1.6 (N)**
LTB-SD-139-22 (QC duplicate of 139-05)	3-4' BGS	**1.0 (N)**
LTB-SD-139-33 (QA duplicate of 139-05)	3-4' BGS	**1.84**
LTB-SD-139-06	4-5' BGS	**2.0 (N)**
LTB-SD-139-07	5-6' BGS	**1.9 (N)**
LTB-SD-139-08	6-7' BGS	**2.2 (N)**
LTB-SD-139-09	7-8' BGS	**1.8 (N)**
LTB-SD-139-10	8-9' BGS	0.05 (U)
LTB-SD-139-11	9-10' BGS	0.05 (U)
LTB-SD-140-01	0-3" BGS	**1.0 (N)**
LTB-SD-140-02	3-12" BGS	**1.7 (N)**
LTB-SD-140-03	1-2' BGS	**1.3 (N)**
LTB-SD-140-04	2-3' BGS	0.67 (N)
LTB-SD-140-05	3-4' BGS	**2.6 (N)**
LTB-SD-140-06	4-5' BGS	0.64 (N)
LTB-SD-140-22 (QC duplicate of 140-06)	4-5' BGS	**0.76 (N)**
LTB-SD-140-33 (QA duplicate of 140-06)	4-5' BGS	**0.777**
LTB-SD-140-07	5-6' BGS	**1.8 (N)**
LTB-SD-140-08	6-7' BGS	**0.73 (N)**
LTB-SD-140-09	7-8' BGS	**0.71 (N)**
LTB-SD-140-10	8-9' BGS	0.05(U)
LTB-SD-140-11	9-10' BGS	0.05(U)
LTB-SD-141-01	0-3" BGS	**1.1**
LTB-SD-141-02	3-12" BGS	**1.7**
LTB-SD-141-03	1-2' BGS	**1.2**
LTB-SD-141-04	2-3' BGS	**1.7**
LTB-SD-141-05	3-4' BGS	**1.8**
LTB-SD-141-06	4-5' BGS	**1.5**
LTB-SD-141-07	5-6' BGS	**2.4**
LTB-SD-141-08	6-7' BGS	**2.2**
LTB-SD-141-09	7-8' BGS	**1.9**
LTB-SD-141-10	8-9' BGS	**1.9**
LTB-SD-141-11	9-10' BGS	0.2
LTB-SD-141-22 (QC duplicate of 141-11)	9-10' BGS	0.52
LTB-SD-141-33 (QA duplicate of 141-11)	9-10' BGS	0.271

TABLE 4-22 (continued)

SAMPLE ID	**DEPTH**	**MERCURY (mg/kg)**
		NYSDEC Standard
		ER-L = 0.15; ER-M = 0.71
LTB-SD-142-01	0-3" BGS	**1.1**
LTB-SD-142-02	3-12" BGS	**1.8**
LTB-SD-142-03	1-2' BGS	**0.97**
LTB-SD-142-04	2-3' BGS	**1.2**
LTB-SD-142-05	3-4' BGS	**1.6**
LTB-SD-142-06	4-5' BGS	**1.9**
LTB-SD-142-07	5-6' BGS	**2.5**
LTB-SD-142-22 (QC duplicate of 142-07)	5-6' BGS	**2.4**
LTB-SD-142-33 (QA duplicate of 142-07)	5-6' BGS	**2.92**
LTB-SD-142-08	6-7' BGS	**2.1**
LTB-SD-142-09	7-8' BGS	0.44
LTB-SD-142-10	8-9' BGS	**1.2**
LTB-SD-142-11	9-10' BGS	0.050 (B)
LTB-SD-143-01	0-3" BGS	**0.98**
LTB-SD-143-02	3-12" BGS	**0.81 (N)**
LTB-SD-143-03	1-2' BGS	**1.0 (N)**
LTB-SD-143-04	2-3' BGS	**1.4 (N)**
LTB-SD-143-05	3-4' BGS	**0.99 (N)**
LTB-SD-143-06	4-5' BGS	**1.4 (N)**
LTB-SD-143-07	5-6' BGS	**2.1 (N)**
LTB-SD-143-08	6-7' BGS	**2.0 (N)**
LTB-SD-143-22 (QC duplicate of 143-08)	6-7' BGS	**2.0 (N)**
LTB-SD-143-33 (QA duplicate of 143-08)	6-7' BGS	**2.49**
LTB-SD-143-09	7-8' BGS	**1.2 (N)**
LTB-SD-143-10	8-9' BGS	**2.3 (N)**
LTB-SD-143-11	9-10' BGS	**2.5 (N)**

TABLE 4-22 (continued)

SAMPLE ID	**DEPTH**	**MERCURY (mg/kg)**
		NYSDEC Standard
		ER-L = 0.15; ER-M = 0.71
LTB-SD-144-01	0-3" BGS	**0.92 (N)**
LTB-SD-144-02	3-12" BGS	**0.92 (N)**
LTB-SD-144-03	1-2' BGS	**2.9 (N)**
LTB-SD-144-22 (QC duplicate of 144-03)	1-2' BGS	**1.2 (N)**
LTB-SD-144-33 (QA duplicate of 144-03)	1-2' BGS	**1.42**
LTB-SD-144-04	2-3' BGS	**0.71 (N)**
LTB-SD-144-05	3-4' BGS	**2.1 (N)**
LTB-SD-144-06	4-5' BGS	0.53 (N)
LTB-SD-144-07	5-6' BGS	**2.1 (N)**
LTB-SD-144-08	6-7' BGS	**1.1 (N)**
LTB-SD-144-09	7-8' BGS	**1.3 (N)**
LTB-SD-144-10	8-9' BGS	0.36 (N)
LTB-SD-144-11	9-10' BGS	0.05(U)
LTB-SD-145-01	0-3" BGS	0.080 (B)
LTB-SD-145-02	3-12" BGS	**2.2**
LTB-SD-145-03	1-2' BGS	0.05(U)
LTB-SD-145-04	2-3' BGS	0.05(U)
LTB-SD-145-22 (QC duplicate of 145-04)	2-3' BGS	0.05(U)
LTB-SD-145-33 (QA duplicate of 145-04)	2-3' BGS	0.0293
LTB-SD-145-05	3-4' BGS	**1.5**
LTB-SD-145-06	4-5' BGS	**0.92**
LTB-SD-145-07	5-6' BGS	0.05(U)
LTB-SD-145-08	6-7' BGS	0.05(U)
LTB-SD-145-09	7-8' BGS	0.05(U)
LTB-SD-145-10	8-9' BGS	0.05(U)
LTB-SD-145-11	9-10' BGS	0.05(U)

NYSDEC Sediment Standards for Mercury:	Effects Range-Low: 0.15 mg/kg
	Effects Range-Medium: 0.71 mg/kg

TABLE 4-23 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
SEDIMENT SAMPLING FOR TAL METALS
AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

CHEMICAL	**NYSDEC Effects Range-Low** mg/kg	**NYSDEC Effects Range-Medium** mg/kg	LTB-SD-130-01	LTB-SD-133-01	LTB-SD-137-01	LTB-SD-139-01	LTB-SD-142-01	LTB-SD-144-01
ALUMINUM	No standard	No standard	7620	11800	13600	13800	13400 (E)	15100
ANTIMONY	2.0	25.0	1.0 (N)	0.68 (N)	1.4 (N)	1.1 (N)	1.1 (N)	0.94 (N)
ARSENIC	8.2	70	4.1	10.1	10.3 (E)	9.4 (E)	9.9 (E)	11.4 (E)
BARIUM	No standard	No standard	103 (N)	81.1 (N)	91.5	88.2	77.8 (E)	87.2
BERYLLIUM	No standard	No standard	0.23 (B)	0.59	0.63	0.65	0.67	0.68
CADMIUM	1.2	9.6	1.2	2.0	2.4	2.6	1.0	1.8
CALCIUM	No standard	No standard	4690 (EN)	6740 (EN)	6480	9480	7380 (E)	10400
CHROMIUM	81	370	42.5 (E)	96.2 (E)	113	96.3	90.4 (E)	93.0
COBALT	No standard	No standard	8.4	9.2	10.3	10.7	11.0	11.4
COPPER	34	270	79.8 (E)	182 (E)	220	197	165 (E)	183
IRON	20000	40000	17900	30700	31900	31400	34600	33300
LEAD	46.7	218	151	187	188 (N)	171 (N)	149 (E)	158 (N)
MAGNESIUM	No standard	No standard	5590	8050	8780	9210	9500 (E)	9450
MANGANESE	460	1100	181 (N)	408 (N)	460	495	538 (E)	517
MERCURY	0.15	0.71	0.36 (*)	**1.5 (*)**	**1.3 (N)**	**1.0 (N)**	**1.1**	**0.92 (N)**
NICKEL	20.9	51.6	19.5	28.8	32.9	30.6	29.2	31.4
POTASSIUM	No standard	No standard	4220	4400	4830	4620	4740	5010
SELENIUM	No standard	No standard	0.45 (B)	0.88	1.7 (N)	1.6 (N)	0.19 (B)	1.1 (N)
SILVER	1.0	3.7	0.16 (U)	**4.3**	**5.2**	**4.3**	3.4	**4.0**
SODIUM	No standard	No standard	3810	21200	21900	22900	26900	21200
THALLIUM	No standard	No standard	0.20 (B)	0.31 (BW)	0.37 (B)	0.37 (BE)	0.14 (BNW)	0.27 (B)
VANADIUM	No standard	No standard	27.5 (N)	35.9 (N)	40.0	39.4	39.3 (E)	41.8
ZINC	150	410	306 (N)	268 (N)	283	266	257 (E)	264

B = Between IDL and CRDL

E = Estimated

N = Matrix spike outside of control limits

W = AAS analysis is outside of control limits

* = Duplicate analysis is not within control limits

TABLE 4-24 RESULTS OF REMEDIAL INVESTIGATION PHASE 2 SEDIMENT SAMPLING FOR MERCURY - COMPARISON WITH NYSDEC SAMPLES - AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

USACE SAMPLE ID	**Depth for USACE Samples**	**USACE MERCURY (mg/kg)** NYSDEC Standard ER-L = 0.15; ER-M = 0.71	**NYSDEC SAMPLE ID at Similar Depth**	**NYSDEC MERCURY (mg/kg)** NYSDEC Standard ER-L = 0.15; ER-M = 0.71
LTB-SD-131-01	0-3" BGS	Spilled before analysis		
LTB-SD-131-02	3-12" BGS	0.10		
LTB-SD-131-03	1-2' BGS	0.10		
LTB-SD-131-04	2-3' BGS	0.10		
LTB-SD-131-05	3-4' BGS	0.10		
LTB-SD-131-22 (QC duplicate of 131-05)	3-4' BGS	0.10		
LTB-SD-131-33 (QA duplicate of 131-05)	3-4' BGS	0.0055		
LTB-SD-131-06	4-5' BGS	0.10		
LTB-SD-131-07	5-6' BGS	0.10		
LTB-SD-131-08	6-7' BGS	0.10	SD-1 (6 - 8' BGS)	0.10(U)
LTB-SD-131-09	7-8' BGS	0.10	SD-1 (6 - 8' BGS)	0.10(U)
LTB-SD-131-10	8-9' BGS	0.10	SD-2 (8 - 10' BGS)	0.10(U)
LTB-SD-131-11	9-10' BGS	0.10	SD-2 (8 - 10' BGS)	0.10(U)
LTB-SD-132-01	0-3" BGS	0.12	SD-3 (0 - 2" BGS)	0.10(U)
LTB-SD-132-02	3-12" BGS	0.10		
LTB-SD-132-03	1-2' BGS	0.10		
LTB-SD-132-04	2-3' BGS	0.10	SD-4 (2 - 4' BGS)	0.10(U)
LTB-SD-132-05	3-4' BGS	0.10	SD-4 (2 - 4' BGS)	0.10(U)
LTB-SD-132-06	4-5' BGS	0.10	SD-5 (4 - 6' BGS)	0.10(U)
LTB-SD-132-22 (QC duplicate of 132-06)	4-5' BGS	0.10	SD-5 (4 - 6' BGS)	0.10(U)
LTB-SD-132-33 (QA duplicate of 132-06)	4-5' BGS	0.0107	SD-5 (4 - 6' BGS)	0.10(U)
LTB-SD-132-07	5-6' BGS	0.06 (B)	SD-5 (4 - 6' BGS)	0.10(U)
LTB-SD-132-08	6-7' BGS	0.10	SD-6 (6 - 8' BGS)	0.10(U)
LTB-SD-132-09	7-8' BGS	0.10	SD-6 (6 - 8' BGS)	0.10(U)
LTB-SD-132-10	8-9' BGS	0.10	SD-7 (8 - 10' BGS)	0.10(U)
LTB-SD-132-11	9-10' BGS	0.10	SD-7 (8 - 10' BGS)	0.10(U)

NYSDEC Sediment Standards for Mercury:

Effects Range-Low: 0.15 mg/kg
Effects Range-Medium: 0.71 mg/kg

B = Between Method Detection Limit (0.05 mg/kg) and Reporting Limit (0.10 mg/kg)

TABLE 4-25 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
SURFACE WATER SAMPLING FOR VOLATILES
AT FORT TOTTEN COAST GUARD STATION

Analyte	**Sample ID**	**NYSDEC TOGS 1.1.1**	**9800169**			**9800170**			**9800175**			**9800176**			**9800177**			**9800178**		
			FTSW113A			**FTSW113B**			**FTSW106A**			**FTSW106B**			**FTSW118A**			**FTSW118B**		
	Units		Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit
1,1,1-Trichloroethane	ug/L	5	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
1,1,2,2-Tetrachloroethane	ug/L	0.2*	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
1,1,2-Trichloroethane	ug/L	1	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
1,1-Dichloroethane	ug/L	5	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
1,1-Dichloroethene	ug/L	0.7*	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
1,2-Dichloroethane	ug/L	0.6	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
1,2-Dichloroethene (Total)	ug/L	5	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
1,2-Dichloropropane	ug/L	1	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
2-Butanone	ug/L	50*	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2
2-Hexanone	ug/L	50*	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2
4-Methyl-2-Pentanone	ug/L	No Standard	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2
Acetone	ug/L	50*	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2
Benzene	ug/L	190*	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Bromodichloromethane	ug/L	50*	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Bromoform	ug/L	50*	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Bromomethane	ug/L	5	0.7	U	0.7	0.7	U	0.7	0.7	U	0.7	0.7	U	0.7	0.7	U	0.7	0.7	U	0.7
Carbon Disulfide	ug/L	No Standard	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
Carbon Tetrachloride	ug/L	0.4*	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
Chlorobenzene	ug/L	5*	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Chloroethane	ug/L	5**	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
Chloroform	ug/L	7	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Chloromethane	ug/L	5	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
Cis-1,3-Dichloropropene	ug/L	0.4***	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Chlorodibromomethane	ug/L	50*	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Ethylbenzene	ug/L	4.5*	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
m-Xylene and p-Xylene	ug/L	19***	0.7	U	0.7	0.7	U	0.7	0.7	U	0.7	0.7	U	0.7	1	U	0.7	1	U	0.7
Methylene Chloride	ug/L	200	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
o-Xylene	ug/L	19***	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
Styrene	ug/L	50	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Tetrachloroethene	ug/L	1*	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4
Toluene	ug/L	92*	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	0.4	U	0.4	1	U	0.4	1	U	0.4
Trans-1,3-Dichloropropene	ug/L	0.4***	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Trichloroethene	ug/L	40	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3	0.3	U	0.3
Vinyl Chloride	ug/L	0.3*	0.5	U	0.5	0.5	U	0.5	0.5	U	0.5	0.5	U	0.5	0.5	U	0.5	0.5	U	0.5

* = guidance value

** = the substance did not receive a review beyond determining that it is a principal organic contaminant class and that it does not have a more stringent Specific MCL.

*** = a total value of the compound was used

TABLE 4-26 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
SURFACE WATER SAMPLING FOR SEMIVOLATILES
AT FORT TOTTEN COAST GUARD STATION

	Sample ID	**NYSDEC TOGS 1.1.1**	**9800169**			**9800170**			**9800175**			**9800176**			**9800177**			**9800178**		
			FTSW113A			**FTSW113B**			**FTSW106A**			**FTSW106B**			**FTSW118A**			**FTSW118B**		
Analytes	Units		Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit
1,2,4-Trichlorobenzene	ug/L	5***	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
1,2-Dichlorobenzene	ug/L	5***(g)	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2
1,3-Dichlorobenzene	ug/L	5***(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
1,4-Dichlorobenzene	ug/L	5***(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
2,2'-Oxybis(1-Chloropropane)	ug/L	No Standard	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
2,4,5-Trichlorophenol	ug/L	1***	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
2,4,6-Trichlorophenol	ug/L	1***	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
2,4-Dichlorophenol	ug/L	1***	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
2,4-Dimethylphenol	ug/L	1000	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
2,4-Dinitrophenol	ug/L	400	6	U	6	6	U	6	6	U	6	6	U	6	6	U	6	6	U	6
2,4-Dinitrotoluene	ug/L	5**(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
2,6-Dinitrotoluene	ug/L	0.07	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
2-Chloronaphthalene	ug/L	10	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
2-Chlorophenol	ug/L	1***	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
2-Methyl-4,6-dinitrophenol	ug/L	1***	6	U	6	6	U	6	6	U	6	6	U	6	6	U	6	6	U	6
2-Methylnaphthalene	ug/L	4.2 (g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
2-Methylphenol	ug/L	1***	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
2-Nitroaniline	ug/L	5**(g)	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
2-Nitrophenol	ug/L	1***	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
3,3'-Dichlorobenzidine	ug/L	5**(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
3-Nitroaniline	ug/L	5**(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
4-Bromophenyl phenyl ether	ug/L	No Standard	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
4-Chloro-3-Methylphenol	ug/L	1***	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
4-Chloroaniline	ug/L	5**(g)	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
4-Chlorophenyl-Phenyl Ether	ug/L	No Standard	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
4-Methylphenol	ug/L	1***	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
4-Nitroaniline	ug/L	5**(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
4-Nitrophenol	ug/L	1***	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
Acenaphthene	ug/L	6.6(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
Acenaphthylene	ug/L	No Standard	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Anthracene	ug/L	3.8(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Benzo(a)Pyrene	ug/L	0.0006(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4

TABLE 4-26 (continued)

	Sample ID		**9800169**			**9800170**			**9800175**			**9800176**			**9800177**			**9800178**		
			FTSW113A			**FTSW113B**			**FTSW106A**			**FTSW106B**			**FTSW118A**			**FTSW118B**		
Analytes	Units		Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit
Benzo(b)Fluoranthene	ug/L	0.002(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Benzo(g,h,i)Perylene	ug/L	No Standard	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
Benzo(k)Fluoranthene	ug/L	0.002(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
Butylbenzylphthalate	ug/L	50(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Benzo(a)Anthracene	ug/L	0.03(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
Bis(2-Chloroethoxy) Methane	ug/L	5**(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Bis(2-Chloroethyl)Ether	ug/L	0.03(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Bis(2-Ethylhexyl)Phthalate	ug/L	0.6	7	U	7	7	U	7	7	U	7	7	U	7	7	U	7	7	U	7
Carbazole	ug/L	No Standard	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
Chrysene	ug/L	0.002(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
Di-n-Butylphthalate	ug/L	50(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Di-n-Octylphthalate	ug/L	50(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Dibenzofuran	ug/L	No Standard	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Dibenz(a,h)Anthracene	ug/L	No Standard	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Diethylphthalate	ug/L	50(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
Dimethylphthalate	ug/L	50(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
Fluoranthene	ug/L	50(g)	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
Fluorene	ug/L	2.5(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Hexachlorobenzene	ug/L	0.00003	6	U	6	6	U	6	6	U	6	6	U	6	6	U	6	6	U	6
Hexachlorobutadiene	ug/L	0.01	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Hexachlorocyclopentadiene	ug/L	0.07	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2	2	U	2
Hexachloroethane	ug/L	0.06	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
Indeno(1,2,3-cd)Pyrene	ug/L	0.002(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Isophorone	ug/L	50(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
N-Nitrosodi-n-Propylamine	ug/L	No Standard	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
N-Nitrosodiphenylamine	ug/L	50(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Naphthalene	ug/L	16(g)	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3	3	U	3
Nitrobenzene	ug/L	0.4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Pentachlorophenol	ug/L	1***	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
Phenanthrene	ug/L	1.5(g)	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5	5	U	5
Phenol	ug/L	1***	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4
Pyrene	ug/L	4.6(g)	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4	4	U	4

(g) = guidance value

** = the substance did not receive a review beyond determining that it is a principal organic contaminant class and that it does not have a more stringent Specific MCL.

*** = a total value of the compound was used

TABLE 4-27 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
SURFACE WATER SAMPLING FOR TAL METALS AND CYANIDE
AT FORT TOTTEN COAST GUARD STATION

Analyte	Sample ID	NYSDEC TOGS 1.1.1	9800167			9800168			9800169			9800170			9800171			9800172		
			FTSW100A			FTSW100B			FTSW113A			FTSW113B			FTSW126A			FTSW126B		
	Units		Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit
Aluminum	ug/L	100							333		56	381		56						
Antimony	ug/L	3							3.2	B	1	4.9	B	1						
Arsenic	ug/L	63	8.2	B	2	7.1	B	2	7.1	B	2	8.4	B	2	6.2	B	2	6.4	B	2
Barium	ug/L	1000	17.1	B	4	16.4	B	4	16.3	B	4	17.8	B	4	16.5	B	4	14	B	4
Beryllium	ug/L	3							0.2	UN	0.2	0.2	UN	0.2						
Cadmium	ug/L	7.7	0.6	U	0.6	0.6	U	0.6	0.6	U	0.6	0.6	U	0.6	0.6	U	0.6	0.6	U	0.6
Calcium	ug/L	No Standard							222000		22	214000		22						
Chromium	ug/L	50	4	UN	4	4	UN	4	4	UN	4	4	UN	4	4	UN	4	4	UN	4
Cobalt	ug/L	5							7	U	7	7	U	7						
Copper	ug/L	5.6							5	U	5	5	U	5						
Iron	ug/L	300							119		52	132		52						
Lead	ug/L	8	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1
Magnesium	ug/L	35000							775000		35	737000		35						
Manganese	ug/L	300							8	U	8	8	U	8						
Nickel	ug/L	8.2							5	UN	5	5	UN	5						
Potassium	ug/L	No Standard							245000		71	236000		71						
Selenium	ug/L	4.6	3.8	B	2	2	U	2	2.4	B	2	2	U	2	2.2	B	2	2	U	2
Silver	ug/L	2.3	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1
Sodium	ug/L	20000							66800		81	64600		81						
Vanadium	ug/L	14							3	U	3	3	U	3						
Zinc	ug/L	66							12	U	12	12	U	12						
Mercury	ug/L	0.0007	0.1	U	0.1	0.26	B	0.1	0.12	B	0.1	0.1	U	0.1	0.21	B	0.1	0.27	B	0.1
Thallium	ug/L	8							5	UWN	5	5	UWN	5						
Cyanide	ug/L	1							0.04		0.007	0.007	U	0.007						

U - Not Detected
B - Between IDL and CRDL
N - MS outside of control limits

TABLE 4-27 (continued)

Analyte	**Sample ID**	**NYSDEC TOGS 1.1.1**	**9800173**			**9800174**			**9800175**			**9800176**			**9800177**			**9800178**		
			FTSW128A			**FTSW128B**			**FTSW106A**			**FTSW106B**			**FTSW118A**			**FTSW118B**		
	Units		Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit
Aluminum	ug/L	100							329		56	339		56	346		56	315		56
Antimony	ug/L	3							3.3	B	1	4.5	B	1	2.7	B	1	4.6	B	1
Arsenic	ug/L	63	5.5	B	2	6.7	B	2	5.3	B	2	7.4	B	2	7.5	B	2	6.8	B	2
Barium	ug/L	1000	17.9	B	4	15	B	4	15.2	B	4	15.8	B	4	16.1	B	4	13.8	B	4
Beryllium	ug/L	3							0.2	UN	0.2	0.2	UN	0.2	0.2	UN	0.2	0.2	UN	0.2
Cadmium	ug/L	7.7	0.6	U	0.6	0.6	U	0.6	0.6	U	0.6	0.6	U	0.6	0.6	U	0.6	0.6	U	0.6
Calcium	ug/L	No Standard							212000		22	217000		22	216000		22	208000		22
Chromium	ug/L	50	4	UN	4	4	UN	4	4	UN	4	4	UN	4	4	UN	4	4	UN	4
Cobalt	ug/L	5							7	U	7	7	U	7	7	U	7	7	U	7
Copper	ug/L	5.6							5	U	5	5	U	5	5	U	5	5	U	5
Iron	ug/L	300							93.8	B	52	61.2	B	52	110		52	66.2	B	52
Lead	ug/L	8	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1
Magnesium	ug/L	35000							719000		35	752000		35	755000		35	702000		35
Manganese	ug/L	300							8	U	8	8	U	8	8	U	8	8	U	8
Nickel	ug/L	8.2							5	UN	5	5	UN	5	5	UN	5	5	UN	5
Potassium	ug/L	No Standard							229000		71	234000		71	238000		71	229000		71
Selenium	ug/L	4.6	2.2	B	2	2.2	B	2	2	U	2	2	U	2	2	U	2	2	U	2
Silver	ug/L	2.3	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1	1	U	1
Sodium	ug/L	20000							637		81	641000		81	64400	N	81	60700		81
Vanadium	ug/L	14							3	U	3	3	U	3	3	U	3	3	U	3
Zinc	ug/L	66							12	U	12	12	U	12	12	U	12	12	U	12
Mercury	ug/L	0.0007	0.1	B	0.1	0.1	U	0.1	0.1	U	0.1	0.1	U	0.1	0.1	U	0.1	0.1	U	0.1
Thallium	ug/L	8							5	UWN	5	5	UWN	5	10	UW	10	5	UWN	5
Cyanide	ug/L	1							0.007	U	0.007	0.007	U	0.007	0.007	U	0.007	0.007	U	0.007

U - Not Detected
B - Between IDL and CRDL
N - MS outside of control limits

TABLE 4-28 RESULTS OF REMEDIAL INVESTIGATION PHASE 2
SURFACE WATER SAMPLING FOR MERCURY
AT FORT TOTTEN COAST GUARD STATION/LITTLE BAY

CHEMICAL	**NYSDEC** **TOGS 1.1.1** ug/l	LTB-SW-119-01 Top Water	LTB-SW-130-01 Top Water	LTB-SW-132-01 Top Water	LTB-SW-132-02 Bottom Water	LTB-SW-141-01 Top Water	LTB-SW-141-02 Bottom Water
MERCURY, DISSOLVED	0.0007	0.0002(U)	0.0002(U)	0.0002(U)	0.0002(U)	0.0002(U)	0.0002(U)
MERCURY, TOTAL	No standard	0.00295	0.00266	0.00248	0.02970	0.00359	0.00432

TABLE 4-29 RESULTS OF REMEDIAL INVESTIGATION PHASE 1
MUSSEL AND OYSTER SAMPLING FOR MERCURY
AT FORT TOTTEN COAST GUARD STATION

		9800373			9800374			9800375			9800376			9800377		
Analyte	Units	Oyster#1			Oyster#2			Oyster#3			Oyster#4			Oyster#5		
		01/16/98			01/16/98			01/16/98			01/16/98			01/16/98		
		Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit
Mercury	mg/kg	0.080	U	0.080	0.080	U	0.080	0.090	U	0.090	0.10		0.090	0.080	U	0.080

		9800303			9800304			9800305			9800306			9800307		
Analyte	Units	Mussel #1			Mussel #2			Mussel #3			Mussel #4			Mussel #5		
		01/16/98			01/16/98			01/16/98			01/16/98			01/16/98		
		Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit	Result	Qual	Limit
Mercury	mg/kg	0.11	U	0.11	0.08	U	0.08	0.1	U	0.1	0.09	U	0.09	0.09	U	0.09

U = Not detected N = MS outside of control limits B = Between IDL and CRDL E = Serial dilution outside of control limits

TABLE 4-30 RESULTS OF REMEDIAL INVESTIGATION PHASE 1 FLOUNDER SAMPLING FOR MERCURY AT FORT TOTTEN COAST GUARD STATION

Windowpane Flounder		
Sample ID	**Whole Body**	**Fillet**
WP-1	0.05 (U)	
WP-2	0.06 (B)	
WP-3	0.07 (B)	
WP-4	0.2	
WP-5	0.13	
WP-6	0.2	0.27
WP-7	0.1	0.27
Average	0.112	0.245
White Flounder		
Sample ID	**Whole Body**	**Fillet**
WF-6	0.05 (B)	0.06 (B)
WF-7	0.05 (U)	0.07 (B)
WF-8	0.05 (B)	0.06 (B)
WF-9	0.05 (U)	0.05 (U)
WF-10	0.07 (B)	0.08
Average	0.044	0.059

TABLE 4-31 RESULTS OF REMEDIAL INVESTIGATION PHASE 2 SEDIMENT TOXICITY: SUMMARY OF SURVIVIAL, GROWTH, AND OFFSPRING OF *LEPTOCHEIRUS PLUMULOSIS* AT FORT TOTTEN COAST GUARD STATION

Sample	Replicate	Number of surviving amphipods	Number of suriviving females	Number of surviving males	Number of surviving immature	Average percent survival	Number of offspring	Number of offspring per female	Pooled dry weight (g)	Tin tare weight (g)	Average dry weight per amphipod (mg)
Lab Control	a	18	4	14	0	90	53	13.3	1.58992	1.56770	1.23
	b	17	7	10	0	85	66	9.4	1.60786	1.57740	1.79
	c	17	8	9	0	85	96	12.0	1.60688	1.57910	1.63
	d	19	9	9	1	95	98	10.9	1.61231	1.58460	1.46
	e	16	9	6	1	80	59	6.6	1.59534	1.56430	1.94
TOX-PO-130-01	a	19	10	9	0	95	76	7.6	1.61232	1.58350	1.52
	b	17	4	13	0	85	28	7.0	1.61553	1.58250	1.94
	c	19	7	12	0	95	43	6.1	1.61447	1.58590	1.50
	d	18	10	8	0	90	57	5.7	1.61734	1.58970	1.54
	e	17	10	7	0	85	112	11.2	1.59363	1.56430	1.73
TOX-PO-133-01	**a**	18	7	11	0	90	79	11.3	1.58716	1.55630	1.71
	b	19	13	6	0	95	126	9.7	1.59743	1.56830	1.53
	c	19	10	9	0	95	75	7.5	1.59661	1.56720	1.55
	d	18	8	10	0	90	41	5.1	1.60292	1.57350	1.63
	e	19	10	9	0	95	70	7.0	1.60205	1.57030	1.67
TOX-PO-137-01	**a**	19	7	12	0	95	54	7.7	1.68172	1.64950	1.70
	b	19	11	8	0	95	129	11.7	1.65014	1.61890	1.64
	c	20	9	11	0	100	47	5.2	1.64056	1.60700	1.68
	d	20	13	7	0	100	165	12.7	1.65837	1.62550	1.64
	e	19	8	11	0	95	45	5.6	1.64216	1.61190	1.59
TOX-PO-139-01	**a**	16	11	4	1	80	107	9.7	1.66037	1.63800	1.40
	b	17	11	6	0	85	87	7.9	1.59842	1.58010	1.08
	c	17	9	8	0	85	57	6.3	1.60919	1.58210	1.59
	d	16	10	6	0	80	100	10.0	1.69873	1.67150	1.70
	e	20	8	12	0	100	48	6.0	1.68144	1.65070	1.54
TOX-PO-142-01	**a**	20	12	8	0	100	114	9.5	1.70181	1.66890	1.65
	b	17	9	8	0	85	128	14.2	1.66215	1.62890	1.96
	c	20	13	7	0	100	110	8.5	1.67583	1.64430	1.58
	d	20	12	8	0	100	152	12.7	1.60301	1.57170	1.57
	e	17	8	9	0	85	109	13.6	1.60106	1.57190	1.72
TOX-PO-144-01	**a**	17	7	10	0	85	51	7.3	1.29281	1.26764	1.48
	b	15	8	7	0	75	37	4.6	1.61350	1.59333	1.34
	c	20	12	8	0	100	87	7.3	1.58329	1.55070	1.63
	d	15	6	9	0	75	50	8.3	1.59273	1.56620	1.77
	e	20	10	10	0	100	62	6.2	1.65756	1.62820	1.47

TABLE 4-32 RESULTS OF REMEDIAL INVESTIGATION PHASE 2 BIOTA SAMPLING FOR MERCURY IN OYSTERS AT FORT TOTTEN COAST GUARD STATION

SAMPLE I.D.	**MERCURY (mg/kg)**
LB-D21-SD	0.09(U)
LB-D22-SD	0.10(U)
LB-D23-SD	0.09(U)
LB-D24-SD	0.10(U)

TABLE 4-33 RESULTS OF REMEDIAL INVESTIGATION PHASE 2 BIOTA SAMPLING FOR MERCURY IN MUMMICHOGS AT FORT TOTTEN COAST GUARD STATION

SAMPLE I.D.	**MERCURY (mg/kg)**
LB-D01-SD	0.10(U)
LB-D02-SD	0.10(U)
LB-D03-SD	0.10(U)
LB-D04-SD	0.09(U)
LB-D05-SD	0.1 (B)
LB-D06-SD	0.10(U)
LB-D07-SD	0.10(U)
LB-D08-SD	0.10(U)
LB-D09-SD	0.10(U)
LB-D10-SD	0.10(U)
LB-D10-SDD (QC duplicate of LB-D10-SD)	0.10(U)
LB-D10-SDS (QC duplicate of LB-D10-SD)	0.16(U)
LB-D10-SDR (QC duplicate of LB-D10-SD)	0.10(U)

B = Between Instrument Detection Limit and Contract Required Detection Limit

TABLE 4-34 RESULTS OF REMEDIAL INVESTIGATION PHASE 2 BIOTA SAMPLING FOR MERCURY IN BLUE CRABS AT FORT TOTTEN COAST GUARD STATION

SAMPLE I.D.	MERCURY (mg/kg)
LB-D16-SD	0.10(U)
LB-D17-SD	0.10(U)
LB-D18-SD	0.10(U)
LB-D19-SD	0.10(U)
LB-D20-SD	0.10(U)
LB-D20-SDD (QC duplicate of LB-D20-SD)	0.10(U)
LB-D20-SDS (QC duplicate of LB-D20-SD)	0.09 (B)

B = Between Instrument Detection Limit and Contract Required Detection Limit

TABLE 4-35 RESULTS OF REMEDIAL INVESTIGATION PHASE 2 BIOTA SAMPLING FOR MERCURY IN JUVENILE STRIPED BASS AT FORT TOTTEN COAST GUARD STATION

SAMPLE I.D.	MERCURY (mg/kg)
LB-D11-SD	0.09(U)
LB-D12-SD	0.10(U)
LB-D13-SD	0.10(U)
LB-D14-SD	0.10(U)
LB-D15-SD	0.09(U)
LB-D15-SDD (QC duplicate of LB-D15-SD)	0.09(U)
LB-D15-SDS (QC duplicate of LB-D15-SD)	0.10(U)

TABLE 4-36 ANALYTICAL RESULTS OF VOCs IN THE FIVE MONITORING WELLS, FORT TOTTEN, NY (2002 SPRING GW)

				SITE	MWG-01	MWG-02	MWG-03	MWG-04	MWG-05
				SAMPLE ID	MW1-GW-0402-01	MW2-GW-0402-02	MW3-GW-0402-01	MW4-GW-0402-01	MW5-GW-0402-01
				DATE	04/10/2002	04/25/2002	04/10/2002	04/25/2002	04/10/2002
CONSTITUENT	TOGS Criteria/Stds	NYSDEC part 5	NYSDEC 703.5	Unit	Result	Result	Result	Result	Result
1,1,1-Trichloroethane	5	No Standard	5	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
1,1,2,2-Tetrachloroethane	0.2	No Standard	5	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
1,1,2-Trichloroethane	1	No Standard	1	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
1,1-Dichloroethane	5	No Standard	5	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
1,1-Dichloroethylene	0.7	No Standard	5	(ug/l)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
1,2-Dichloroethane	0.6	No Standard	0.6	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
1,2-Dichloropropane	1	No Standard	1	(ug/l)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
2-Hexanone	50	No Standard	No Standard	(ug/l)	<0.29 U	<0.29 U	<0.29 U	<0.29 U	<0.29 U
4-Methyl-2-pentanone	No Criteria/Stds	No Standard	No Standard	(ug/l)	<0.39 U	<0.39 U	<0.39 U	<0.39 U	<0.39 U
Acetone	50	No Standard	No Standard	(ug/l)	<1.39 U	<1.39 U	<1.39 U	8.9	<1.39 U
Benzene	**1**	No Standard	1	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
Bromodichloromethane	50	No Standard	No Standard	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
Bromoform	50	No Standard	No Standard	(ug/l)	<0.2 U	3	<0.2 U	1.7	<0.2 U
Bromomethane	5	No Standard	5	(ug/l)	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U
Carbon disulfide	No Criteria/Stds	No Standard	No Standard	(ug/l)	<0.13 U	<0.13 U	<0.13 U	<0.13 U	<0.13 U
Carbon tetrachloride	**5**	No Standard	5	(ug/l)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Chlorobenzene	5	No Standard	5	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
Chloroethane	5	No Standard	5	(ug/l)	<0.2 U	0.6	<0.2 U	0.3 J	<0.2 U
Chloroform	7	No Standard	7	(ug/l)	<0.1 U	5.7	<0.1 U	1.7	<0.1 U
Methyl chloride	5	No Standard	5	(ug/l)	1.4	4.2	0.9	2.8	1.1
cis-1,3-Dichloropropene	0.4	No Standard	0.4	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
Dibromochloromethane	50	No Standard	No Standard	(ug/l)	<0.2 U	0.5	<0.2 U	0.3 J	<0.2 U
Ethylbenzene	**5**	No Standard	5	(ug/l)	<0.09 U	<0.09 U	<0.09 U	<0.09 U	<0.09 U
Methylene chloride	**5**	No Standard	5	(ug/l)	<0.1 U	<0.1 U	<0.1 U	0.2 J	<0.1 U
Styrene	**5**	No Standard	5	(ug/l)	<0.09 U	<0.09 U	<0.09 U	<0.09 U	<0.09 U
Tetrachloroethene	**5**	No Standard	5	(ug/l)	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U
Toluene	**5**	No Standard	5	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
trans-1,3-Dichloropropene	0.4	No Standard	0.4	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
Trichloroethene	**5**	No Standard	5	(ug/l)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Vinyl chloride	**2**	2	2	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
Xylenes (total)	**5**	No Standard	5	(ug/l)	<0.2 U	0.3 J	<0.2 U	<0.2 U	<0.2 U
m- and p-Xylenes	**5**	No Standard	5	(ug/l)	<0.18 U	0.3 J	<0.18 U	<0.18 U	<0.18 U
o-Xylene	5	No Standard	5	(ug/l)	<0.08 U	<0.08 U	<0.08 U	<0.08 U	<0.08 U
Methyl tert-butyl ether	No Standard	No Standard	No Standard	(ug/l)	<0.08 U	0.1 J	0.1 J	1.4	0.7
n-Butylbenzene	5	No Standard	5	(ug/l)	0.09 J	0.1 J	0.07 J	0.1 J	<0.07 U
Reported at the MDL level				The following qualifiers exist: U, J		--- = Not analyzed			

TABLE 4-37 ANALYTICAL RESULTS OF SVOCs IN THE FIVE MONITORING WELLS, FORT TOTTEN NY (2002 SPRING GW)

				SITE	MWG-01	MWG-02	MWG-03	MWG-04	MWG-05
				SAMPLE ID	MW1-GW-0402-01	MW2-GW-0402-02	MW3-GW-0402-01	MW4-GW-0402-01	MW5-GW-0402-01
				DATE	04/10/2002	04/25/2002	04/10/2002	04/25/2002	04/10/2002
CONSTITUENT	TOGS Criteria/Stds	NYSDEC Part 5	NYSDEC 703.5	Unit	Result	Result	Result	Result	Result
1,2,4-Trichlorobenzene	5	No Standard	5	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
1,2-Dichlorobenzene	3	No Standard	3	(ug/l)	<0.1 U	<0.1 U	<0.1 U	<0.1 U	<0.1 U
1,3-Dichlorobenzene	3	No Standard	3	(ug/l)	<0.08 U	<0.08 U	<0.08 U	<0.08 U	<0.08 U
1,4-Dichlorobenzene	3	No Standard	3	(ug/l)	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
2,4,6-Trichlorophenol	1	No Standard	1	(ug/l)	<0.3 U	<0.3 U	<0.3 U	<3 U	<0.3 U
2,4-Dichlorophenol	1	No Standard	1	(ug/l)	<0.3 U	<0.3 U	<0.3 U	<3 U	<0.3 U
2,4-Dinitrophenol	**1**	No Standard	1	(ug/l)	<3 U	<3 U	<3 U	<30 U	<3 U
2,4-Dinitrotoluene	5	No Standard	5	(ug/l)	<0.3 U	<0.3 U	<0.3 U	<2 U	<0.3 U
2,6-Dinitrotoluene	**5**	No Standard	5	(ug/l)	<0.3 U	<0.3 U	<0.3 U	<3 U	<0.3 U
2-Methylnaphthalene	**No Standard**	No Standard	No Standard	(ug/l)	<0.03 U	<0.03 U	<0.03 U	<0.3 U	<0.03 U
2-Methylphenol	1	No Standard	1	(ug/l)	<0.3 U	<0.3 U	<0.3 U	<3 U	<0.3 U
Di(2-ethylhexyl)phthalate	0.6	No Standard	No Standard	(ug/l)	0.9	0.4 J	**14**	<2 U	0.7
Butylbenzylphthalate	50	No Standard	No Standard	(ug/l)	0.04 J	<0.02 U	0.1 J	0.5 J	0.05 J
Chrysene	0.002	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**14**	<0.02 U
Di-n-butyl phthalate	50	No Standard	50	(ug/l)	0.8	0.5	0.6	4 J	0.7
Dibenzofuran	No Criteria/Stds	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	0.9 J	<0.02 U
Diethyl phthalate	50	No Standard	No Standard	(ug/l)	0.4 J	2	2	0.8 J	3
Dimethyl phthalate	50	No Standard	No Standard	(ug/l)	0.08 J	0.1 J	0.1 J	<0.2 U	0.1 J
Hexachlorobenzene	0.04	1	0.04	(ug/l)	<0.02 U	<0.02 U	<0.02 U	<0.2 U	<0.02 U
Hexachlorobutadiene	0.5	No Standard	0.5	(ug/l)	<0.24 U	<0.24 U	<0.24 U	<0.24 U	<0.24 U
Hexachlorocyclopentadiene	5	No Standard	5	(ug/l)	<0.3 U	<0.3 U	<0.3 U	<3 U	<0.3 U
Hexachloroethane	5	No Standard	5	(ug/l)	<0.12 U	<0.12 U	<0.12 U	<0.12 U	<0.12 U
Nitrobenzene	0.4	No Standard	0.4	(ug/l)	<2.56 U	<2.56 U	<2.56 U	<2.56 U	<2.56 U
Bis(2-ethylhexyl) adipate	No Standard	No Standard	No Standard	(ug/l)	0.09 J	0.04 J	0.1 J	<0.3 U	0.04 J
Reported at the MDL level				The following qualifiers exist: U, J --- = Not analyzed					

TABLE 4-38 ANALYTICAL RESULTS OF PAHs IN THE FIVE MONITORING WELLS, FORT TOTTEN, NY (2002 SPRING GW)

				SITE	MWG-01	MWG-02	MWG-03	MWG-04	MWG-05
				SAMPLE ID	MW1-GW-0402-01	MW2-GW-0402-02	MW3-GW-0402-01	MW4-GW-0402-01	MW5-GW-0402-01
				DATE	04/10/2002	04/25/2002	04/10/2002	04/25/2002	04/10/2002
CONSTITUENT	TOGS Criteria/Stds	NYSDEC Part 5	NYSDEC 703.5	Unit	Result	Result	Result	Result	Result
Acenaphthene	20 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	0.8 J	<0.02 U
Acenaphthylene	No Criteria/Stds	No Standard	No Standard	(ug/l)	<0.03 U	<0.03 U	<0.03 U	<0.3 U	<0.03 U
Anthracene	50 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	2	<0.02 U
Benz(a)anthracene	0.002 (Guidance value)	No Standard	No Standard	(ug/l)	<0.03 U	<0.03 U	<0.03 U	**10**	<0.03 U
Benzo(a)pyrene	ND in Standard	0.2	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**10**	<0.02 U
Benzo(b)fluoranthene	0.002 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**20**	<0.02 U
Benzo(ghi)perylene	No Criteria/Stds	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**9**	<0.02 U
Benzo(k)fluoranthene	0.002 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**6**	<0.02 U
Chrysene	0.002 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**14**	<0.02 U
Dibenzo(a,h)anthracene	No Criteria/Stds	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**2**	<0.02 U
Fluoranthene	50 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**32**	<0.02 U
Fluorene	50 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	0.9 J	<0.02 U
Indeno(1,2,3-cd)pyrene	0.002 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	**10**	<0.02 U
2-Methylnaphthalene	**No Standard**	No Standard	No Standard	(ug/l)	<0.03 U	<0.03 U	<0.03 U	<0.3 U	<0.03 U
Naphthalene	10 (Guidance value)	No Standard	No Standard	(ug/l)	<0.14 U	<0.03 U	<0.14 U	0.9 J	<0.14 U
Phenanthrene	50 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	17	<0.02 U
Pyrene	50 (Guidance value)	No Standard	No Standard	(ug/l)	<0.02 U	<0.02 U	<0.02 U	23	<0.02 U
Reported at the MDL level				The following qualifiers exist: J, U --- = Not analyzed					

TABLE 4-39 ANALYTICAL RESULTS OF METALS IN THE FIVE MONITORING WELLS, FORT TOTTEN, NY (2002 SPRING GW)

				SITE	MWG-01	MWG-02	MWG-03	MWG-04	MWG-05
				SAMPLE ID	MW1-GW-0402-01	MW2-GW-0402-02	MW3-GW-0402-01	MW4-GW-0402-01	MW5-GW-0402-01
				DATE	04/10/2002	04/25/2002	04/10/2002	04/25/2002	04/10/2002
CONSTITUENT	TOGS Criteria/Stds	NYSDEC Part 5	NYSDEC 703.5	Unit	Result	Result	Result	Result	Result
Aluminum (Total)	**No Standard**	No Standard	No Standard	(mg/l)	0.62	0.09	0.1	<0.01 U	0.05
Aluminum (Dissolved)	No Standard	No Standard	No Standard	(mg/l)	0.2	<0.01 U	<0.01 U	<0.01 U	<0.01 U
Antimony (Total)	0.003	0.006	0.003	(mg/l)	<0.0002 U	<0.0002 U	<0.0002 U	<0.0002 U	<0.0002 U
Antimony (Dissolved)	0.003	0.006	0.003	(mg/l)	<0.00009 U	<0.00009 U	<0.00009 U	<0.00009 U	<0.00009 U
Arsenic (Total)	0.025	0.05	0.0025	(mg/l)	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U
Arsenic (Dissolved)	0.025	0.05	0.0025	(mg/l)	<0.002 U	<0.002 U	<0.002 U	<0.002 U	<0.002 U
Barium (Total)	1	2	1	(mg/l)	0.09	0.015	0.074	0.1	0.032
Barium (Dissolved)	1	2	1	(mg/l)	0.08	0.01	0.07	0.09	0.03
Beryllium (Total)	0.003	0.004	No Standard	(mg/l)	<0.00004 U	<0.00004 U	<0.00004 U	<0.00004 U	<0.00004 U
Beryllium (Dissolved)	0.003	0.004	No Standard	(mg/l)	<0.0001 U	<0.0001 U	<0.0001 U	<0.0001 U	<0.0001 U
Cadmium (Total)	0.005	No Standard	No Standard	(mg/l)	<0.0002 U	<0.0002 U	<0.0002 U	<0.0002 U	<0.0002 U
Cadmium (Dissolved)	0.005	No Standard	No Standard	(mg/l)	<0.0003 U	<0.0003 U	<0.0003 U	<0.0003 U	<0.0003 U
Calcium (Total)	None	No Standard	No Standard	(mg/l)	31.2	21.4	60.5	62.5	34.4
Calcium (Dissolved)	No Standard	No Standard	No Standard	(mg/l)	31.6	21.5	63	62.5	35.8
Chromium (Toatl)	0.05	0.1	0.05	(mg/l)	**0.051**	0.014	0.014	0.016	0.012
Chromium (Dissolved)	0.05	0.1	0.05	(mg/l)	0.006	<0.001 U	0.009	<0.001 U	0.008
Cobalt (Total)	**No Standard**	No Standard	No Standard	(mg/l)	<0.0004 U	0.003	<0.0004 U	<0.0004 U	<0.0004 U
Cobalt (Dissolved)	No Standard	No Standard	No Standard	(mg/l)	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U
Copper (Total)	0.2	No Standard	0.2	(mg/l)	0.011	<0.0006 U	<0.0006 U	0.014	<0.0006 U
Copper (Dissolved)	0.2	No Standard	0.2	(mg/l)	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U
Iron (Total)	0.3	0.3	0.3	(mg/l)	1.2	0.24	**0.88**	0.23	0.14
Iron (Dissolved)	0.3	0.3	0.3	(mg/l)	0.07	<0.01 U	<0.01 U	0.08	<0.01 U
Lead (Total)	0.025	No Standard	0.025	(mg/l)	<0.0009 U	<0.0009 U	<0.0009 U	0.013	<0.0009 U
Lead (Dissolved)	0.025	No Standard	0.025	(mg/l)	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U
Magnesium (Total)	35 (Guidance value)	No Standard	No Standard	(mg/l)	17.1	7.85	30.2	**37.8**	21.8
Magnesium (Dissolved)	35	No Standard	No Standard	(mg/l)	16.6	8.14	30.3	**38.8**	23
Manganese (Total)	0.3	0.3	0.3	(mg/l)	0.046	0.005	0.008	<0.0001 U	<0.0001 U
Manganese (Dissolved)	0.3	0.3	0.3	(mg/l)	0.007	<0.0003 U	<0.0003 U	<0.0003 U	<0.0003 U
Mercury (Total)	0.0007	0.002	0.0007	(mg/l)	<0.0001 U	<0.0001 U	<0.0001 U	<0.0001 U	<0.0001 U
Mercury (Dissolved)	0.0007	0.002	0.0007	(mg/l)	<0.0001 U	<0.0001 U	<0.0001 U	<0.0001 U	<0.0001 U
Nickel (Total)	0.1	No Standard	0.1	(mg/l)	0.05	0.02	<0.0004 U	0.02	0.01
Nickel (Dissolved)	0.1	No Standard	0.1	(mg/l)	0.02	<0.0008 U	<0.0008 U	<0.0008 U	<0.0008 U
Potassium (Total)	None	No Standard	No Standard	(mg/l)	3.33	1.46	2.13	2.63	1.88
Potassium (Dissolved)	No Standard	No Standard	No Standard	(mg/l)	3.25	0.0013	2.18	0.0024	2.07
Selenium (Total)	0.01	0.05	0.01	(mg/l)	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U
Selenium (Dissolved)	0.01	0.05	0.01	(mg/l)	<0.004 U	<0.004 U	<0.004 U	<0.004 U	<0.004 U
Silver (Total)	0.05	0.1	0.05	(mg/l)	<0.0007 U	<0.0007 U	<0.0007 U	<0.0007 U	<0.0007 U
Silver (Dissolved)	0.05	0.1	0.05	(mg/l)	<0.0007 U	<0.0007 U	<0.0007 U	<0.0007 U	<0.0007 U
Sodium (Total)	20	No Standard	20	(mg/l)	25.5	9.7	7.7	**110**	**25.4**

TABLE 4-39 ANALYTICAL RESULTS OF METALS IN THE FIVE MONITORING WELLS, FORT TOTTEN, NY (2002 SPRING GW)

				SITE	MWG-01	MWG-02	MWG-03	MWG-04	MWG-05
				SAMPLE ID	MW1-GW-0402-01	MW2-GW-0402-02	MW3-GW-0402-01	MW4-GW-0402-01	MW5-GW-0402-01
				DATE	04/10/2002	04/25/2002	04/10/2002	04/25/2002	04/10/2002
CONSTITUENT	TOGS Criteria/Stds	NYSDEC Part 5	NYSDEC 703.5	Unit	Result	Result	Result	Result	Result
Sodium (Dissolved)	20	No Standard	20	(mg/l)	24.2	9.72	7.89	**108**	**27.4**
Thallium (Total)	.0005 (Guidance value	No Standard	No Standard	(mg/l)	<0.00001 U	<0.00001 U	<0.00001 U	<0.00001 U	<0.00001 U
Thallium (Dissolved)	.0005 (Guidance value	No Standard	No Standard	(mg/l)	<0.00002 U	<0.00002 U	<0.00002 U	<0.00002 U	<0.00002 U
Vanadium (Total)	**No Standard**	No Standard	No Standard	(mg/l)	0.0009	<0.00004 U	<0.00004 U	<0.00004 U	<0.00004 U
Vanadium (Dissolved)	No Standard	No Standard	No Standard	(mg/l)	<0.00001 U	<0.00001 U	<0.00001 U	<0.00001 U	<0.00001 U
Zinc (Total)	2 (Guidance value)	5	2	(mg/l)	0.02	0.02	<0.0007 U	0.04	<0.0007 U
Zinc (Dissolved)	2	5	2	(mg/l)	0.02	<0.004 U	<0.004 U	0.02	<0.004 U
Reported at the MDL level				The following qualifier exists: U --- = Not analyzed					

TABLE 4-40 DESCRIPTIVE STATISTICS FOR PAHS, FORT TOTTEN FUDS INVESTIGATION (UG/KG)

Station Number		N	Minimum	Maximum	Mean	Std. Deviation
Little Neck Bay	naphthalene	3	252.74	387.67	300.2100	75.8349
	2-methylnaphthalene	3	215.94	327.97	254.1433	63.9488
	1-methylnaphthalene	3	111.29	172.32	131.6967	35.1810
	biphenyl	3	58.10	87.66	69.0733	16.1840
	2,6-dimethylnaphthalene	3	143.03	224.77	173.0133	45.0102
	acenaphthylene	3	437.69	739.79	557.0933	160.6880
	acenaphthene	3	90.39	143.77	109.5100	29.7367
	2,3,5-trimethylnaphthalene	3	38.29	62.50	47.4433	13.1403
	fluorene	3	95.24	134.96	111.7300	20.7000
	phenanthrene	3	603.3	835.1	711.733	116.610
	anthracene	3	415.69	691.28	519.3733	149.9276
	1-methylphenanthrene	3	160.95	254.21	198.6467	49.1301
	fluoranthene	3	1110.09	1493.30	1344.6333	205.5324
	pyrene	3	1394.16	1744.99	1537.3567	184.0774
	benz[a]anthracene	3	843.49	1350.01	1059.8067	261.2184
	chrysene	3	890.31	1184.41	992.7033	166.1516
	benzo[b]fluoranthene	3	1187.62	1709.48	1405.5600	271.3464
	benzo[k]fluoranthene	3	762.66	958.94	851.8167	99.3658
	benzo[e]pyrene	3	834.80	1140.31	948.9400	166.7556
	benzo[a]pyrene	3	1310.79	1794.83	1494.2433	262.4192
	perylene	3	288.43	394.72	329.2067	57.3002
	indeno[1,2,3-c,d]pyrene	3	1002.94	1359.83	1135.3067	195.4796
	dibenz[a,h]anthracene	3	170.19	274.02	213.4100	54.0553
	benzo[g,h,i]perylene	3	735.27	993.37	841.6833	134.8746

Station Number		N	Minimum	Maximum	Mean	Std. Deviation
Little Bay	naphthalene	0				
	2-methylnaphthalene	0				
	1-methylnaphthalene	0				
	biphenyl	0				
	2,6-dimethylnaphthalene	0				
	acenaphthylene	3	150.00	480.00	283.3333	173.8774
	acenaphthene	0				
	2,3,5-trimethylnaphthalene	0				
	fluorene	0				
	phenanthrene	11	170.0	820.0	477.273	223.163
	anthracene	7	110.00	640.00	285.7143	195.5213
	1-methylphenanthrene	0				
	fluoranthene	17	140.00	3900.00	948.8235	1000.9925
	pyrene	16	140.00	3200.00	772.5000	762.0805
	benz[a]anthracene	12	230.00	2300.00	715.8333	601.4446
	chrysene	13	160.00	2600.00	753.8462	656.4620
	benzo[b]fluoranthene	15	120.00	3400.00	846.0000	880.7935
	benzo[k]fluoranthene	10	140.00	1200.00	411.0000	327.2257
	benzo[e]pyrene	0				
	benzo[a]pyrene	13	120.00	1800.00	548.4615	458.1820
	perylene	0				
	indeno[1,2,3-c,d]pyrene	8	120.00	660.00	301.2500	167.1131
	dibenz[a,h]anthracene	0				
	benzo[g,h,i]perylene	8	140.00	590.00	278.7500	140.0446

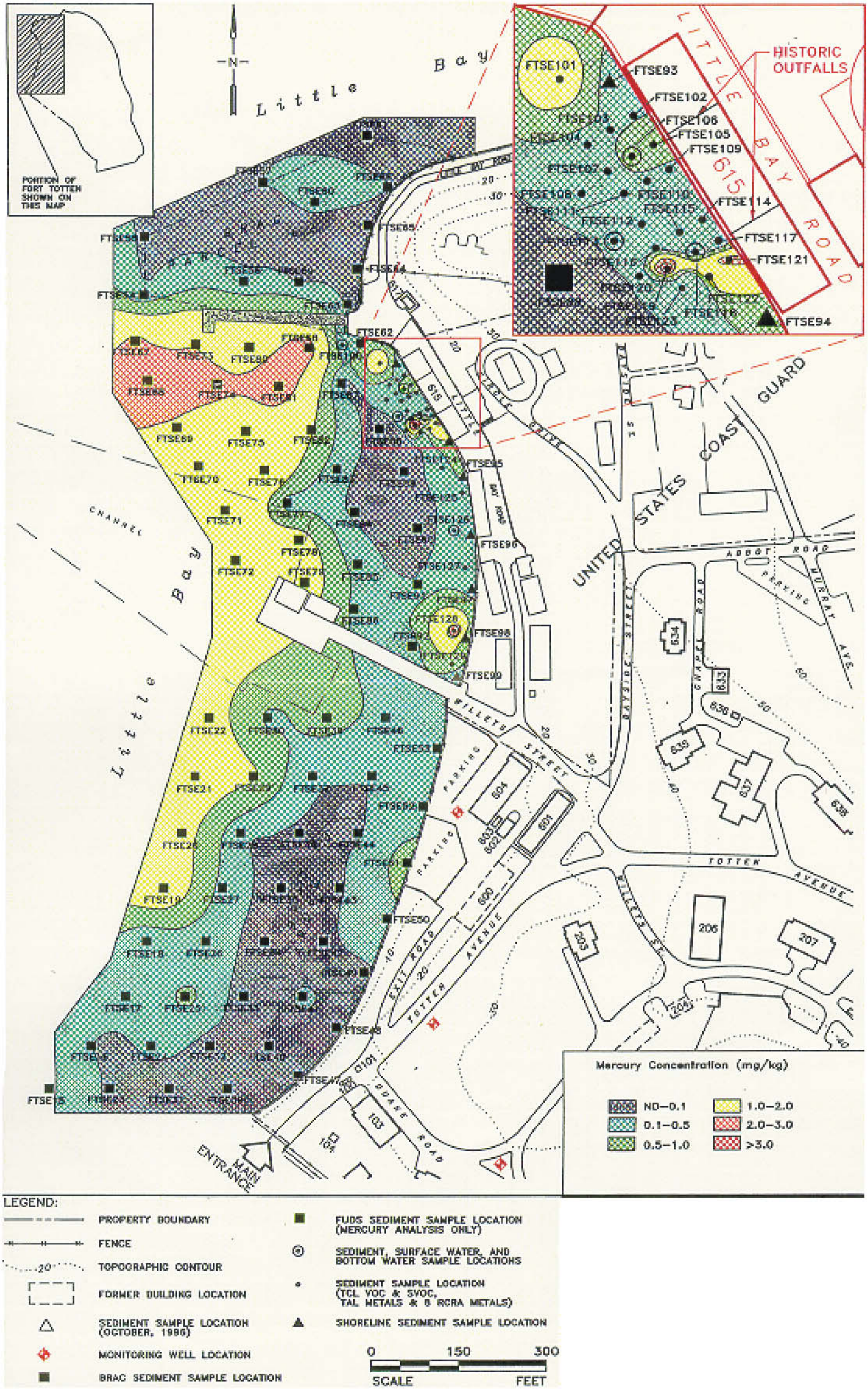

Figure 4-1. Shallow Mercury Sediment Concentrations (0-12") Along the Little Bay Shoreline.

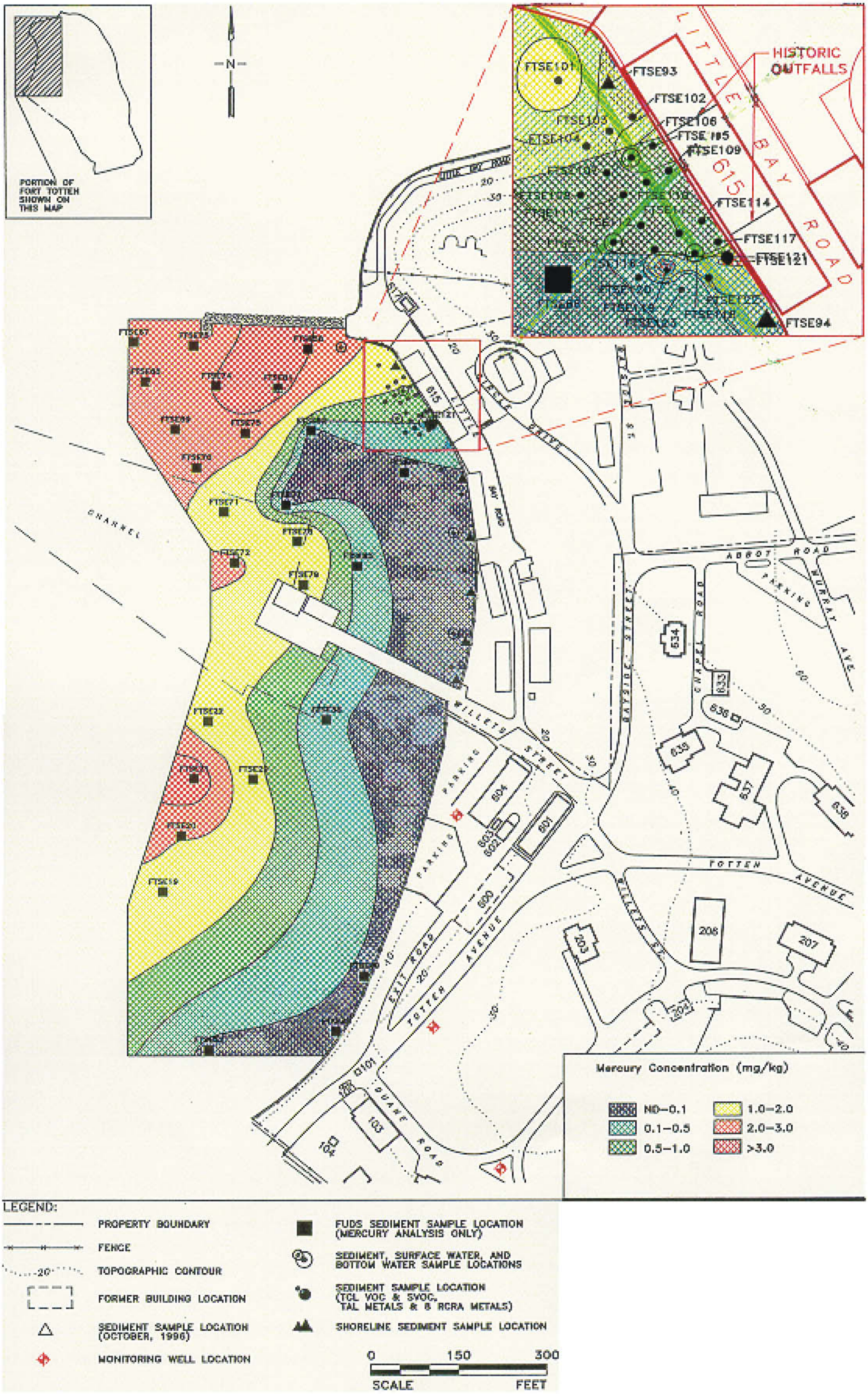

Figure 4-2. Deep Mercury Sediment Concentrations (12-24") Along the Little Bay Shoreline.

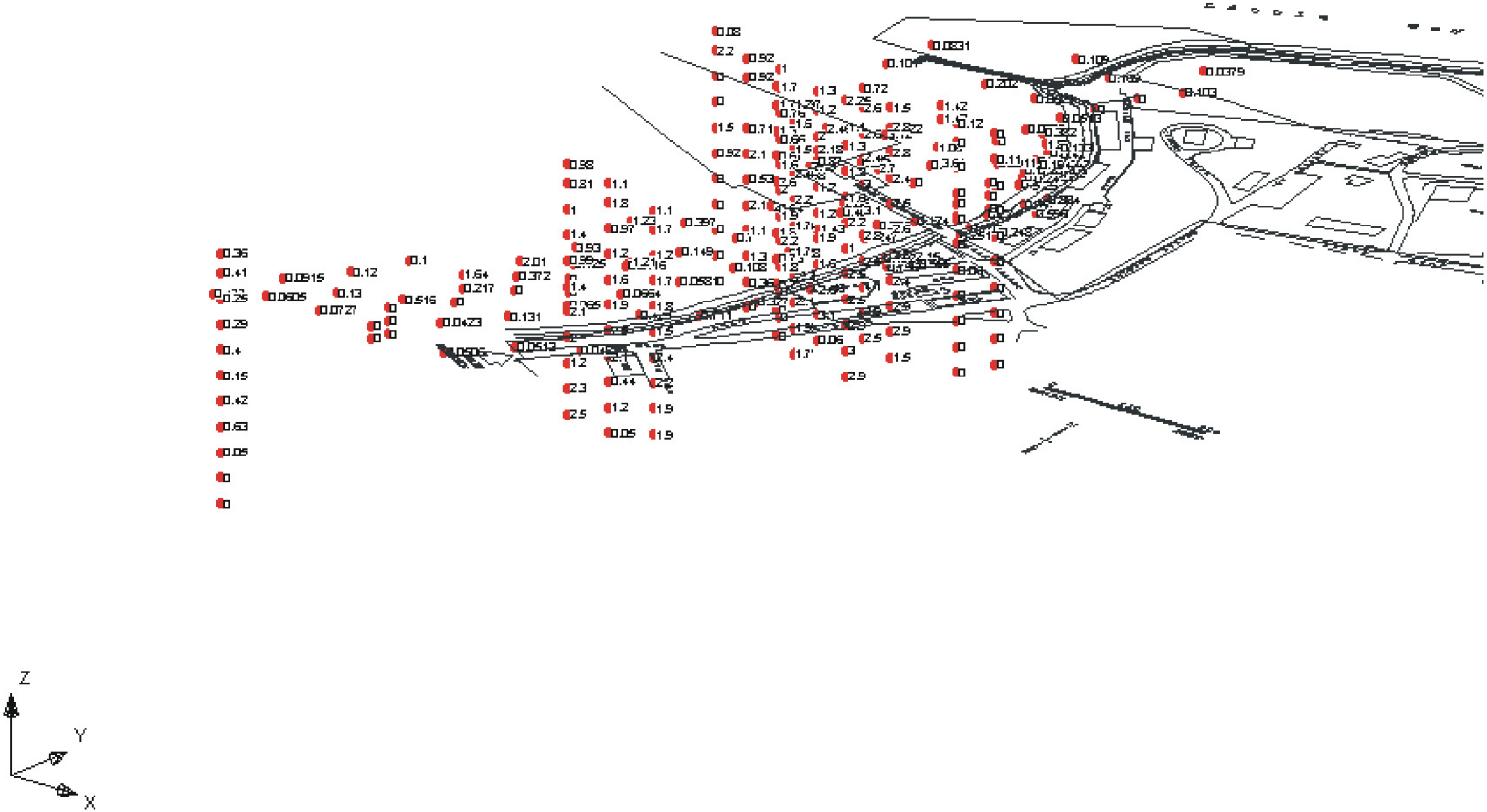

Figure 4-3. Oblique View of Sample Locations in Little Bay, Fort Totten, NY.

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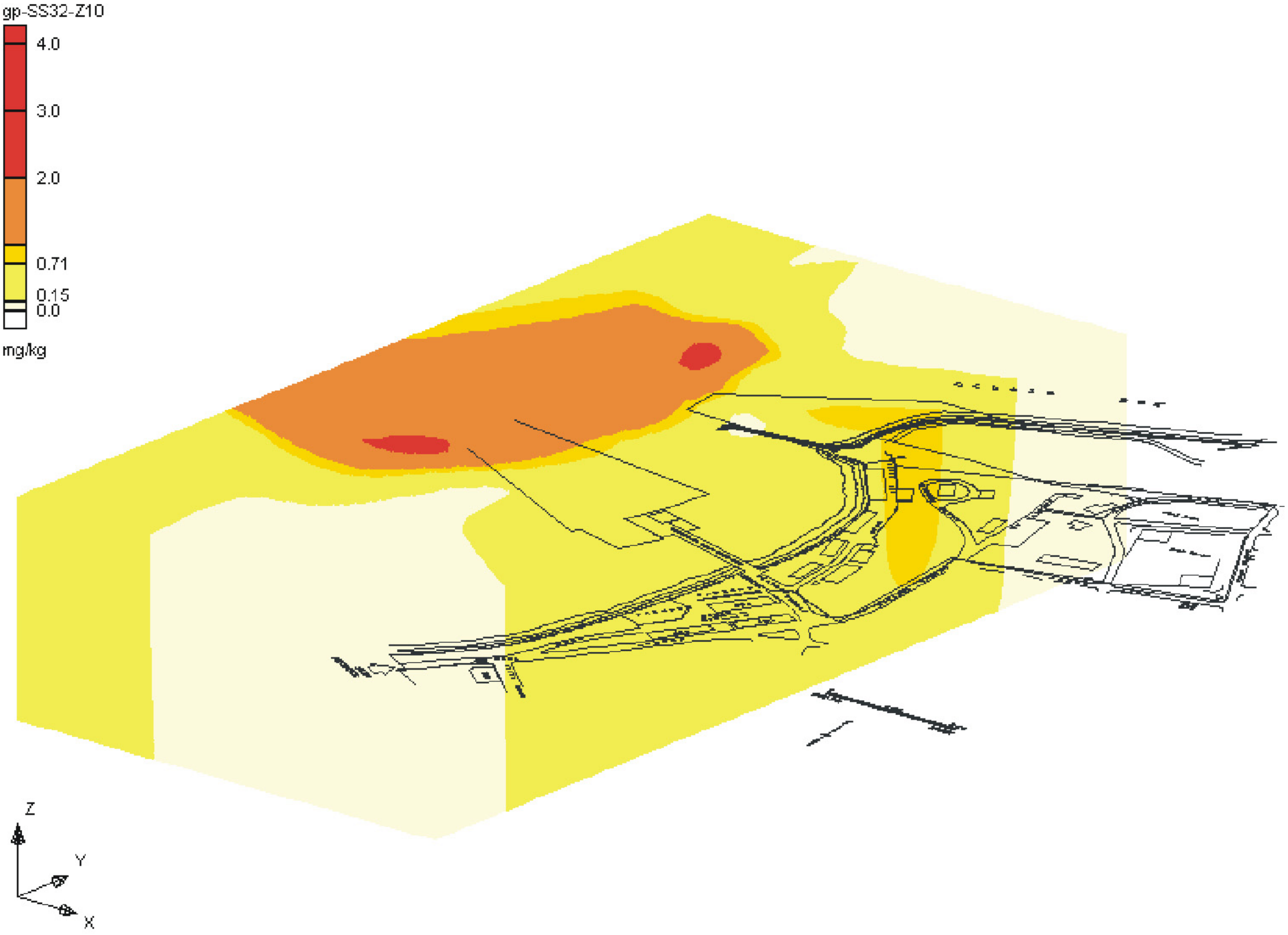

Figure 4-4. 3D Model of Mercury Contamination in Sediment, Little Bay, Fort Totten, NY.

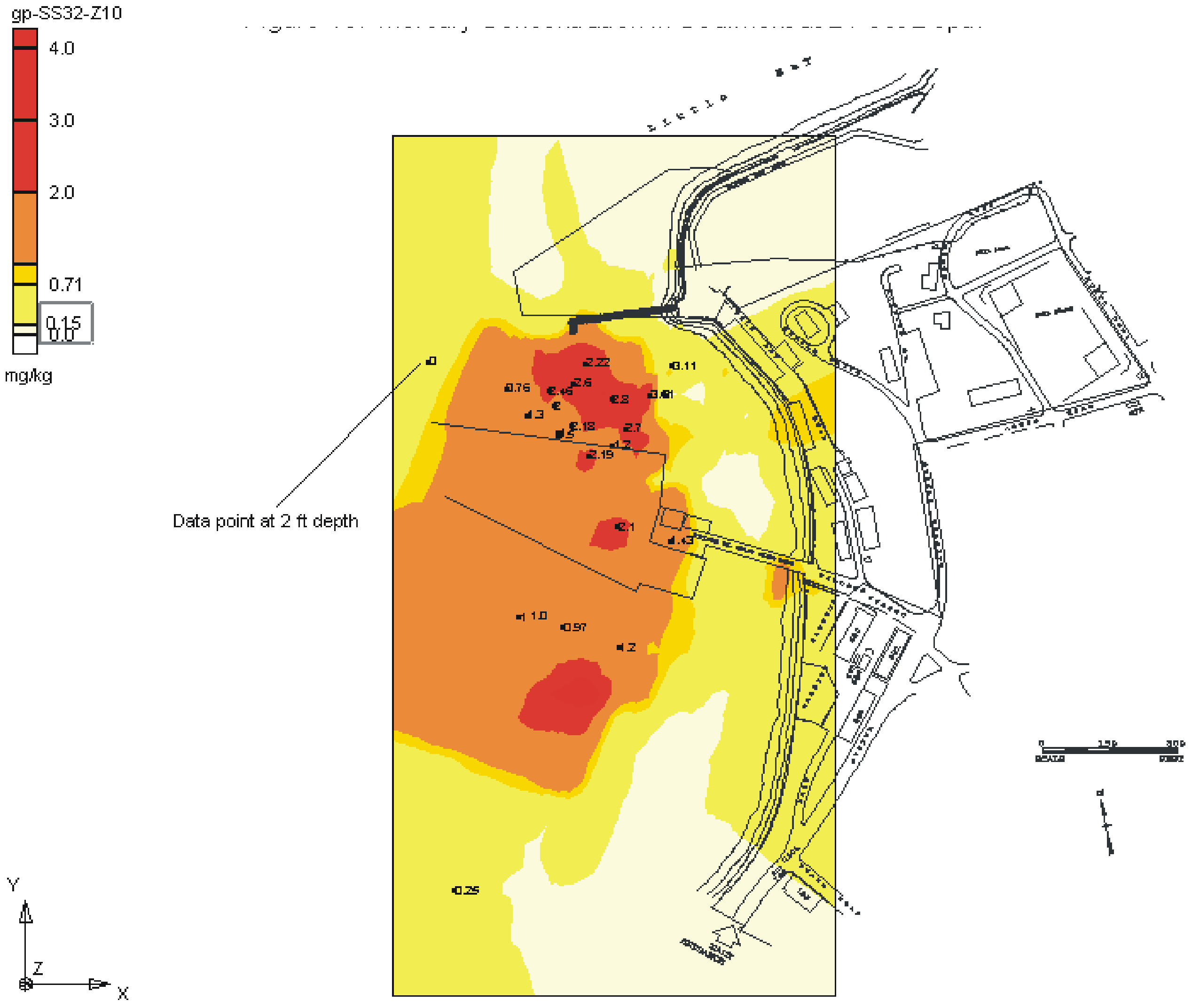

Figure 4-5. Mercury Concentration in Sediment at 2-Foot Depth.

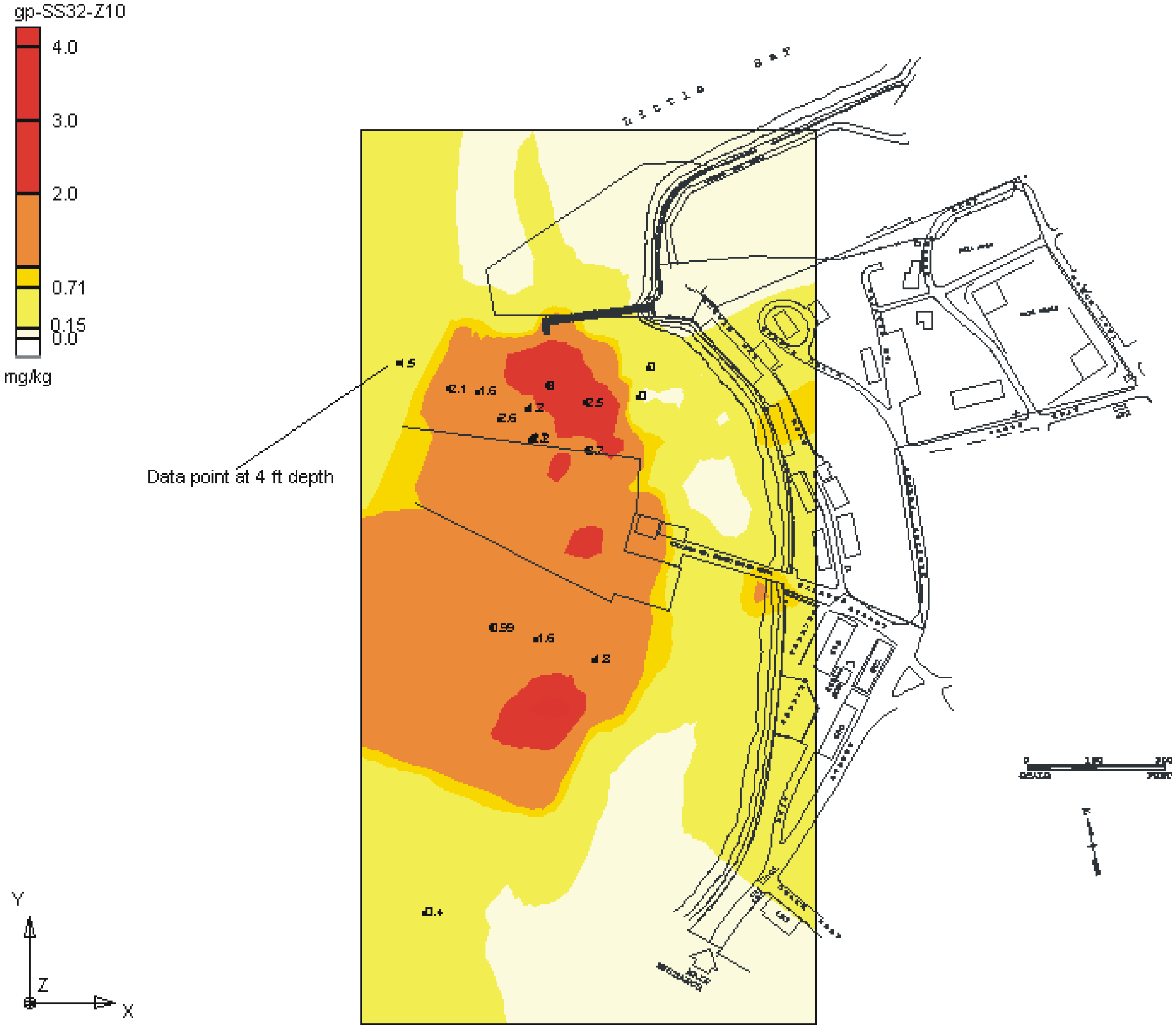

Figure 4-6. Mercury Concentration in Sediment at 4-Foot Depth.

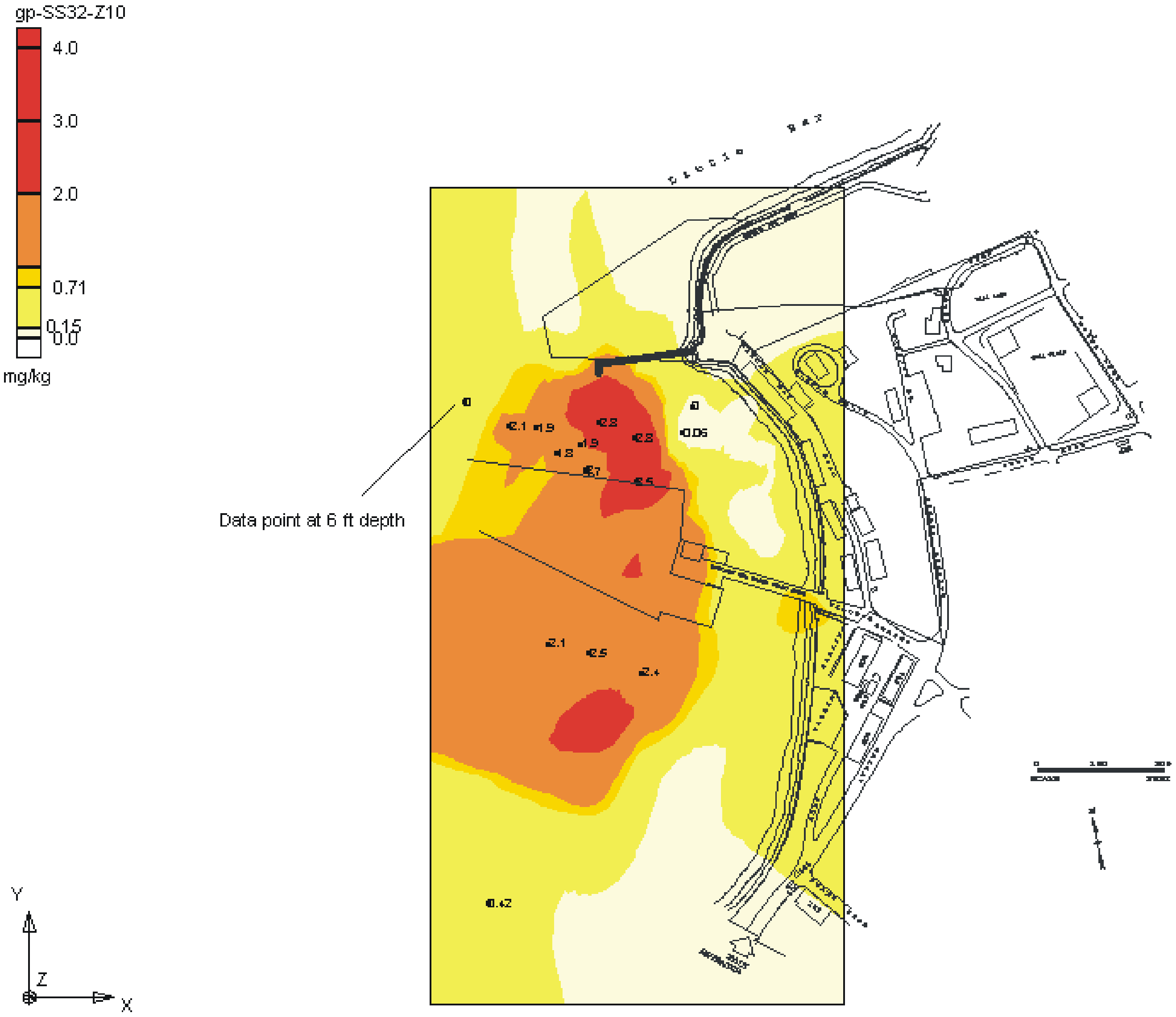

Figure 4-7. Mercury Concentration in Sediment at 6-Foot Depth.

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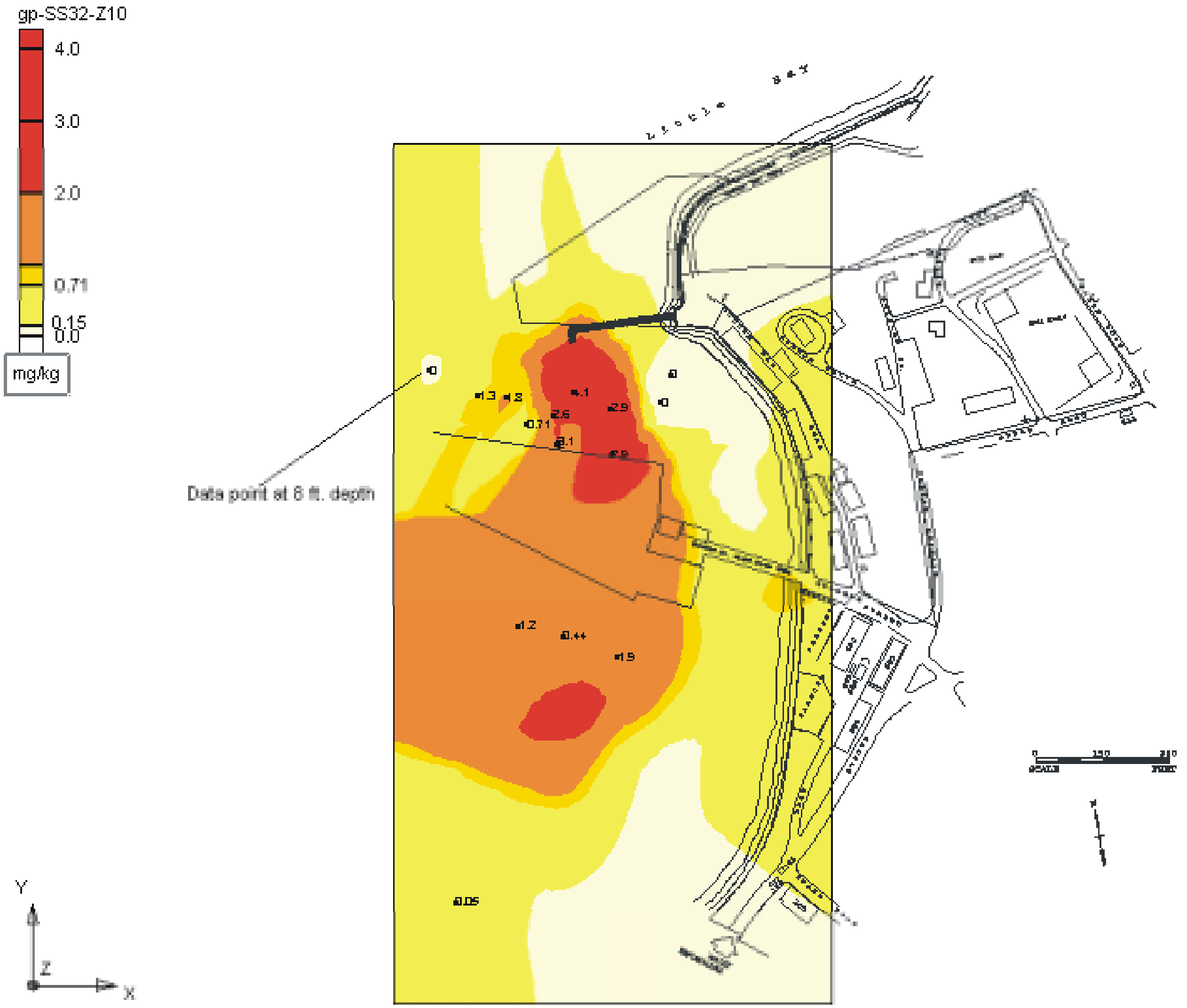

Figure 4-8. Mercury Concentration in Sediment at 6-Foot Depth.

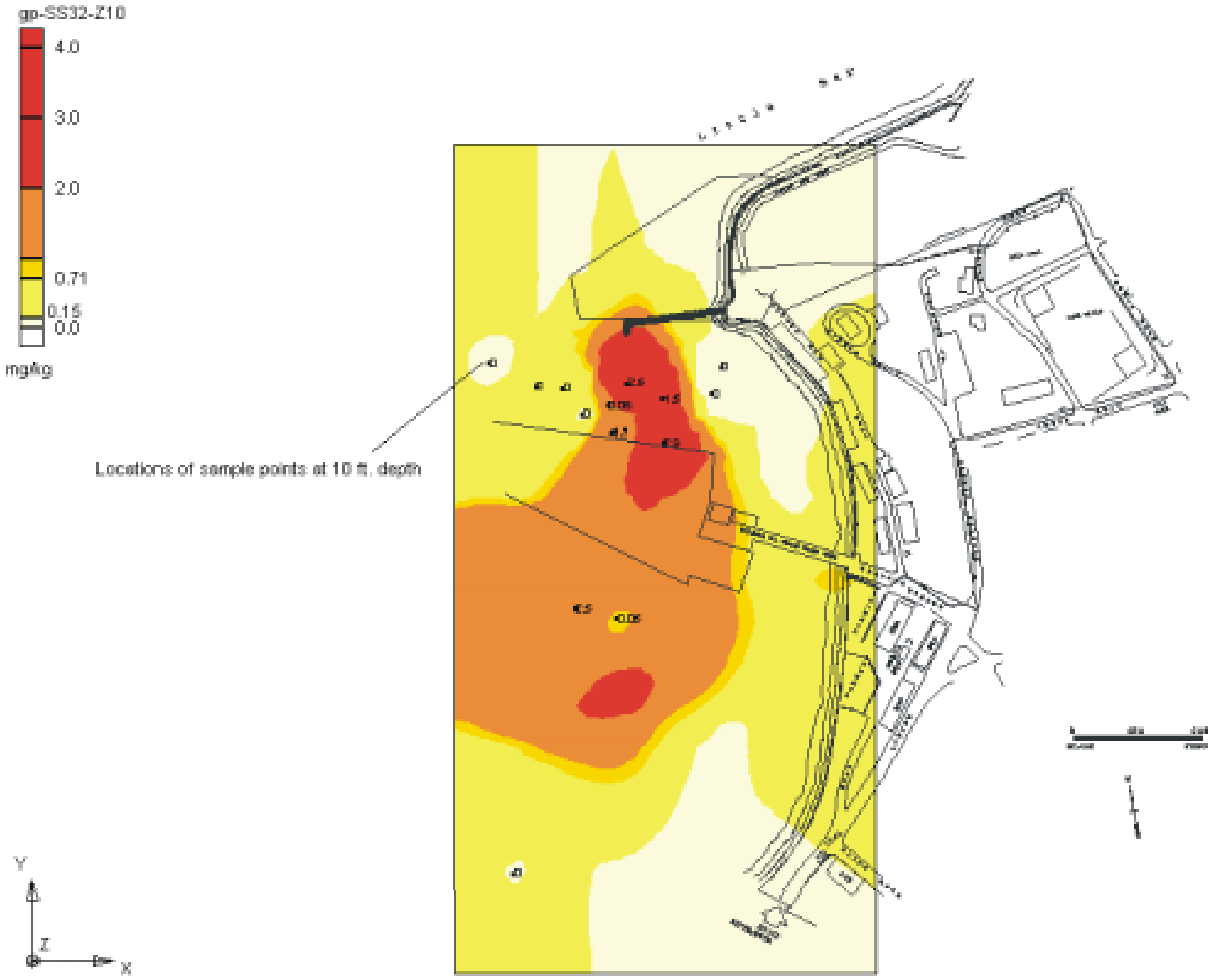

Figure 4-9. Mercury Concentration in Sediment at 10-Foot Depth.

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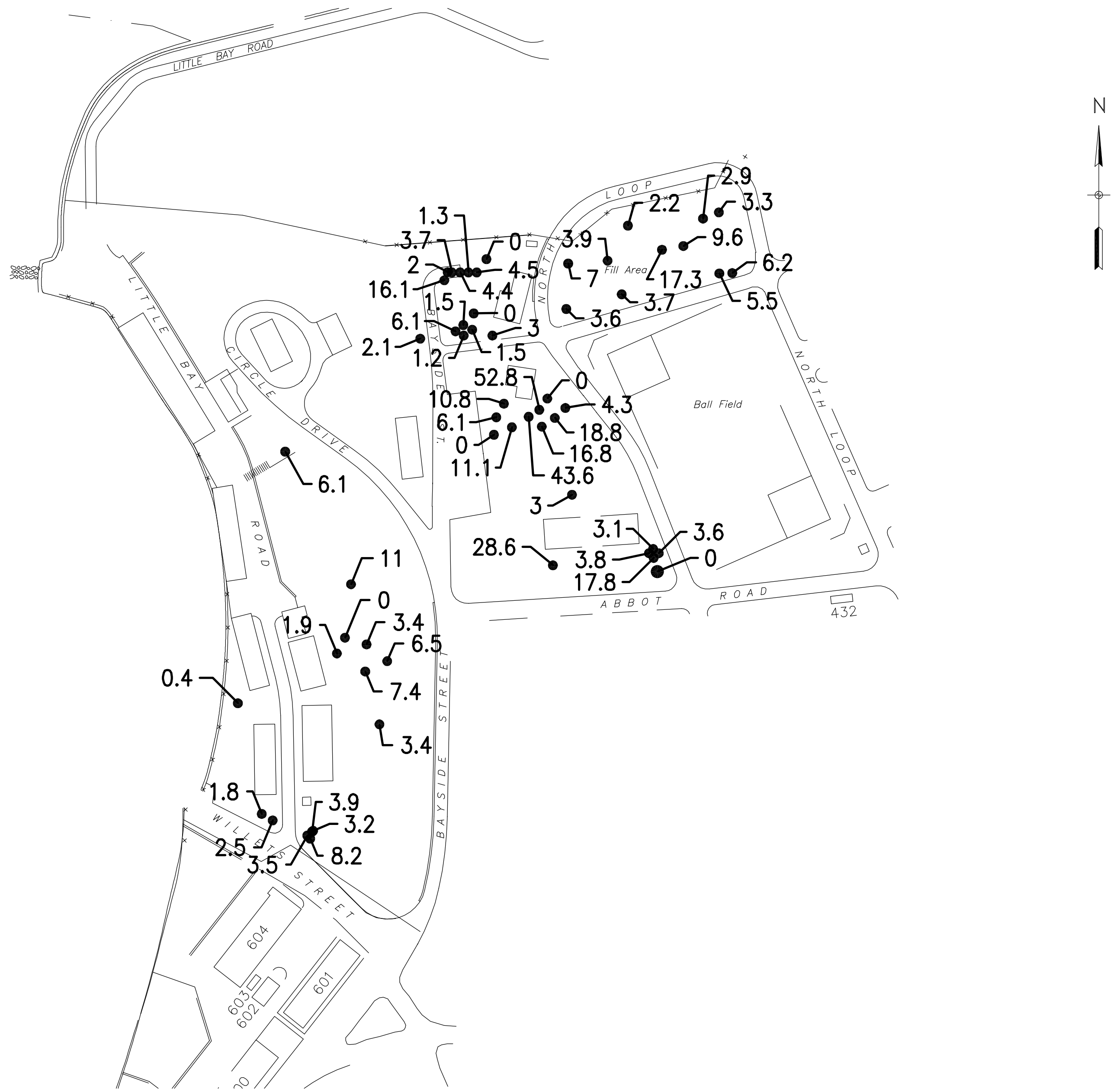

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Figure 4-10. TOTAL PAHs IN UPLAND AREAS, FT. TOTTEN, N.Y. (mg/kg)

Figure 4–11. CARCINOGENIC PAHs IN UPLAND AREAS FT. TOTTEN, N.Y. (mg/kg)

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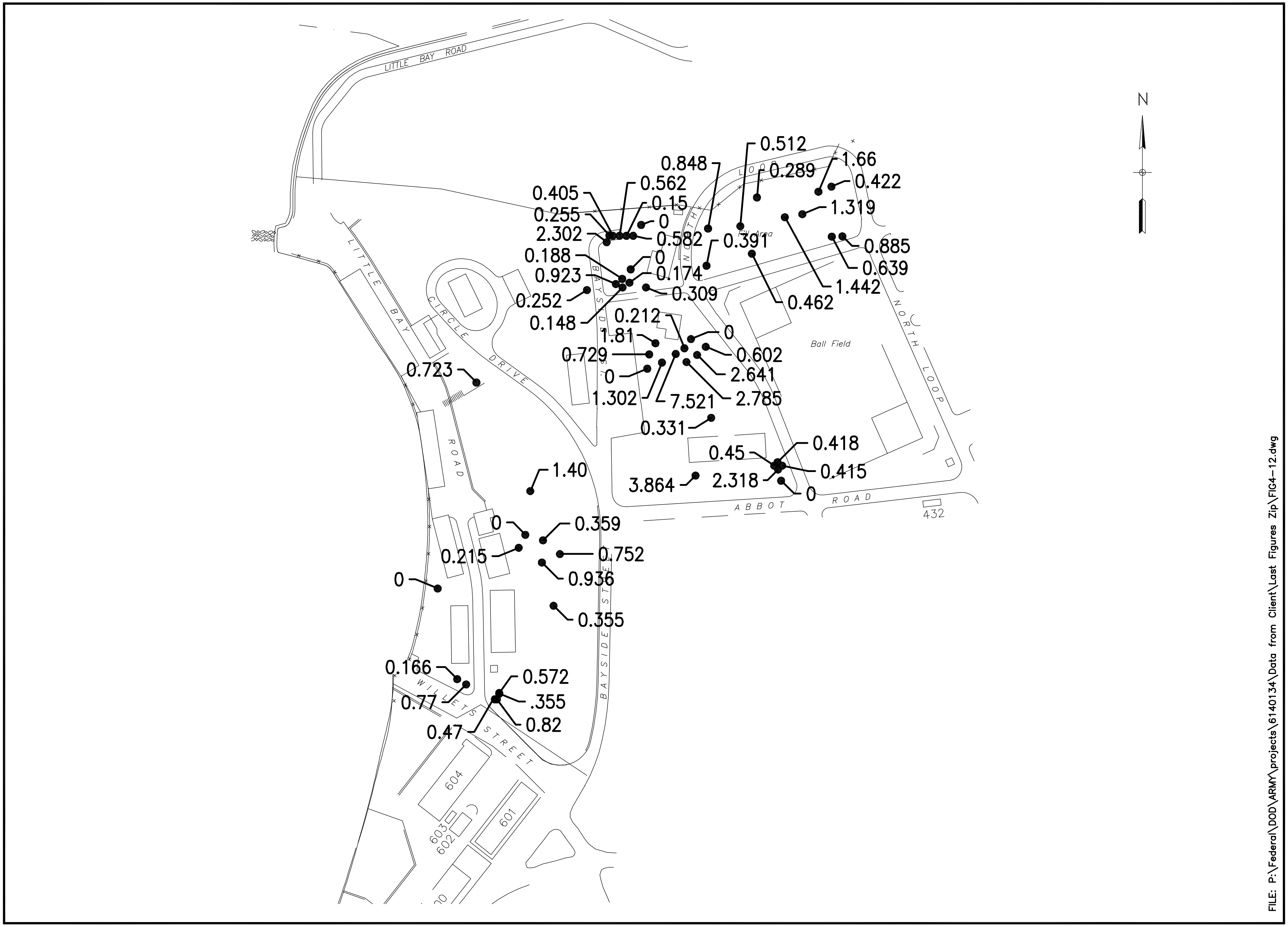

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Figure 4–12. BENZO(a)PYRENE EQUIVALENTS IN UPLAND AREAS FT. TOTTEN, N.Y. (mg/kg)

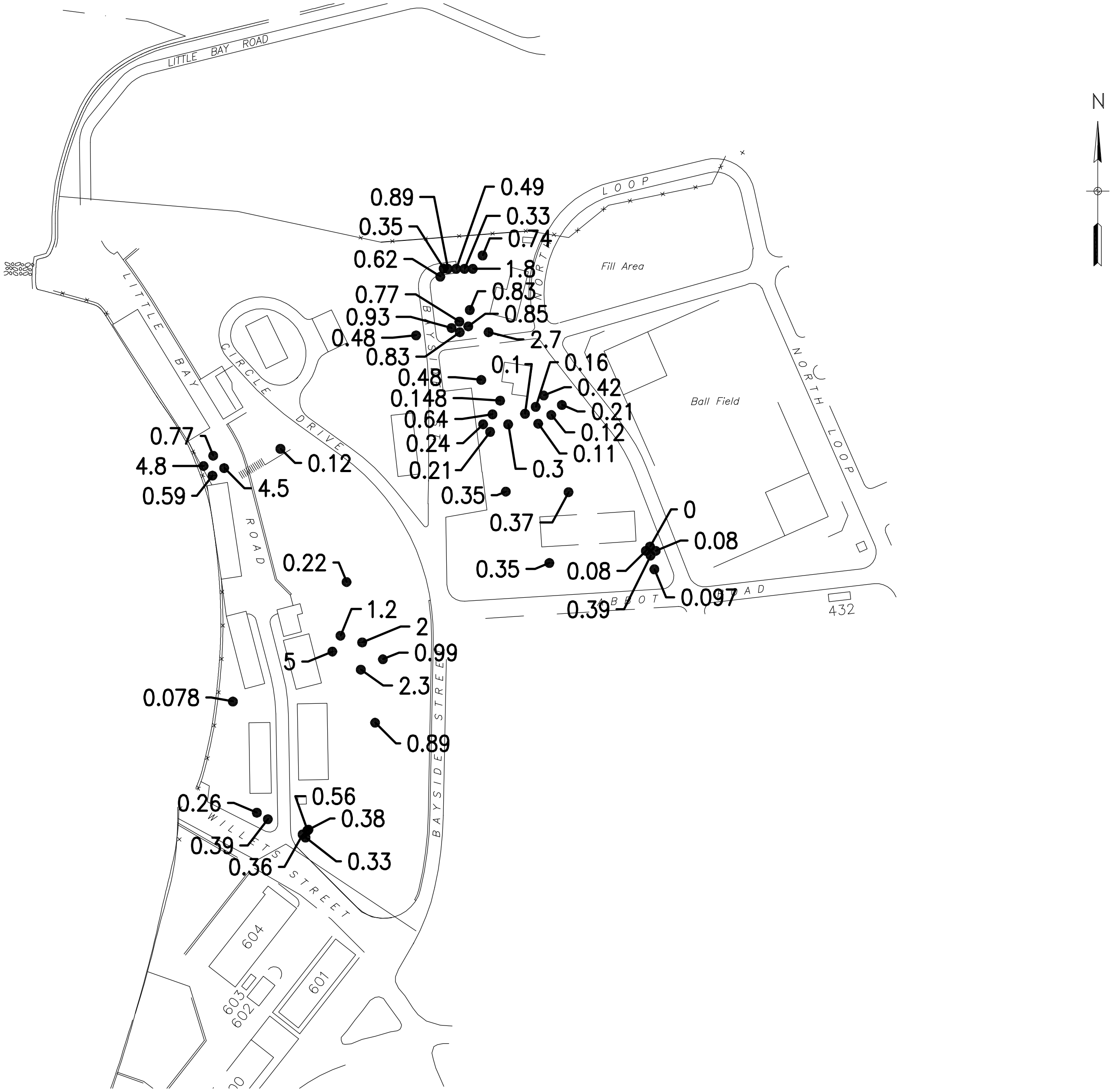

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Figure 4-13. MERCURY IN UPLAND AREAS FT. TOTTEN, N.Y. (mg/kg)

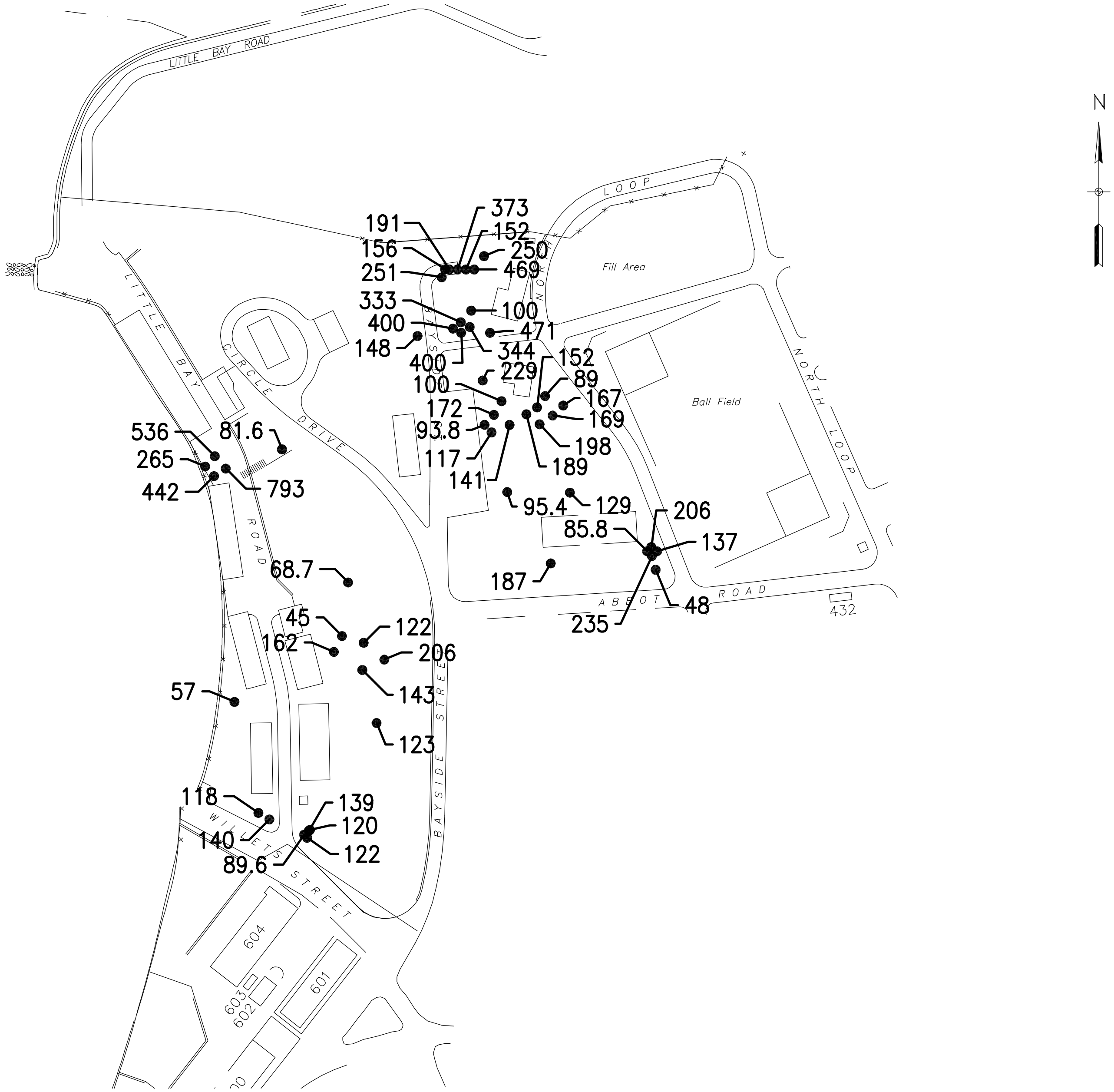

Figure 4–14. LEAD IN SOIL FROM UPLAND AREAS FT. TOTTEN, N.Y. (mg/kg)

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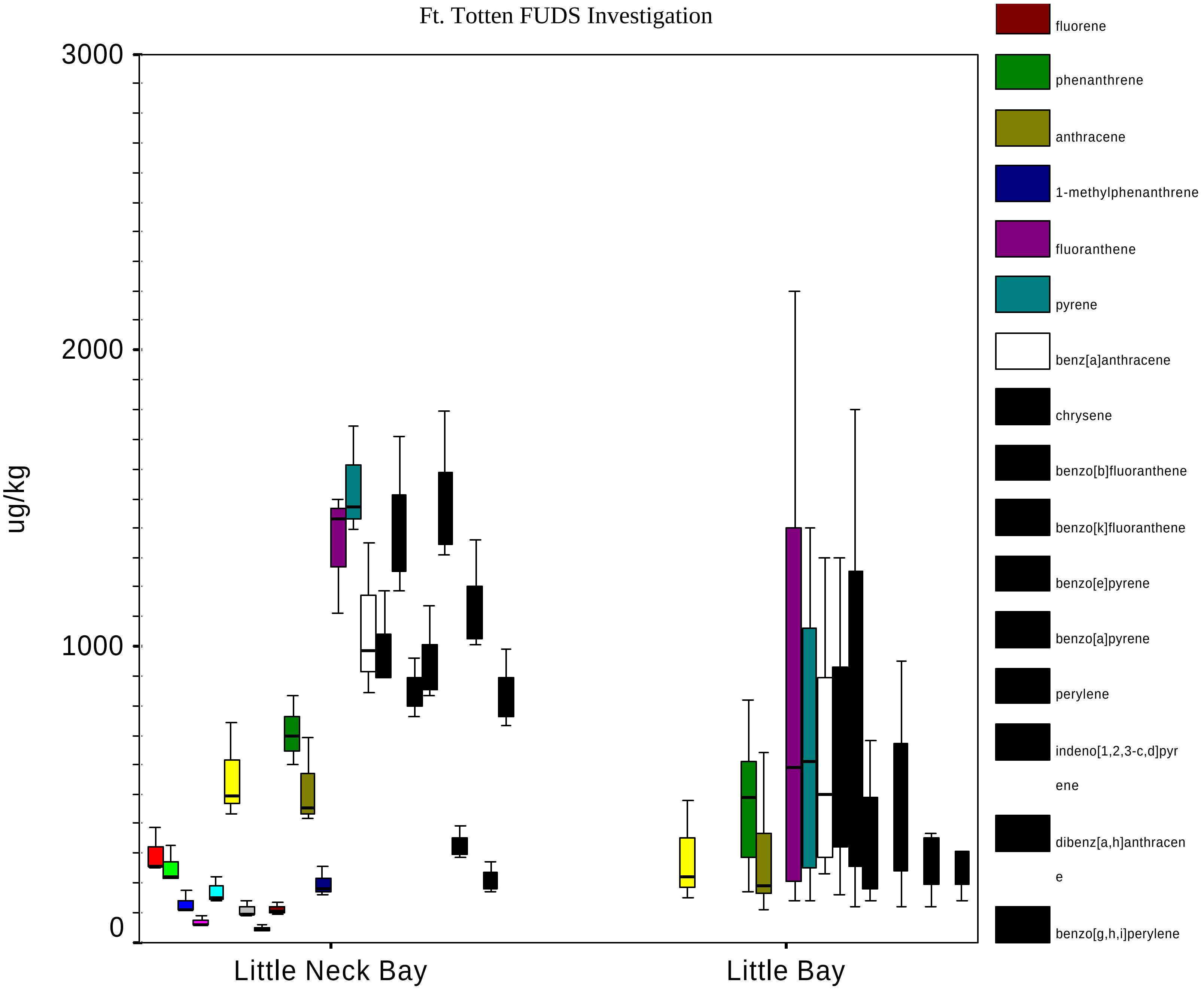
Figure 4-15. PAHs in Sediment
Ft. Totten FUDS Investigation



5.0 LITTLE BAY HUMAN HEALTH RISK ASSESSMENT

The objective of the human health risk assessment (HHRA) is to determine the health risk/hazard from exposure to the chemicals released into the sediment, water, and biota. The range of contaminants in various media was presented in Chapter 4. This section quantifies the human health risks/hazards from exposure to the chemicals released at the site under several different exposure scenarios. This section completes the following:

- Develops a conceptual site model including identification of the contaminant of concern, and its physical, chemical properties.
- Identifies exposure concentrations and potential receptors for both current and future use.
- Reviews the toxicological properties of mercury as it relates to the potential exposures.
- Combines the exposure and toxicity information and make a quantitative statement regarding the hazards posed by exposure including uncertainty.

5.1 CONCEPTUAL SITE MODEL

The conceptual site model (CSM) has three main elements: sources, pathways, and receptors. This CSM focuses on the current and potential sources, pathways, and receptors for the site. A CSM for the site is shown in Figure 5-1. The baseline for the risk assessment are the current conditions at the site. As discussed in Chapter 4, the concentrations of chemicals in the upland areas do not indicate that a release of CERCLA hazardous substance occurred. Therefore, the shoreline area is the primary focus of the risk assessment. For the area proximate to Building 615, the source was the release of mercury into floor drains that emptied into Little Bay. The potential migration pathways for movement of the material include downward movement into the groundwater, lateral movement into the surface water, and upward movement into the overlying material. The potential receptors include human recreators and/or trespassers that may visit the area. The relationships of these three elements are shown in Figure 5-1.

5.1.1 Source Areas

There are two suspect source areas for Little Bay, the upland sites and Building 615. As discussed in Chapter 4, concentrations of chemicals in the upland areas are not indicative of a source area that could impact Little Bay. Therefore, the shoreline area source is the primary focus of the risk assessment. The main source area is Building 615 and the contaminated sediment directly adjacent to the outfall pipes. As discussed elsewhere (USACE 1999), the outfall pipe was cleaned and grouted in place and there are no continuing sources of contamination from Building 615. The only continuing source of contamination is the sediment.

5.1.2 Pathways

The exposure pathways for mercury in the environment are varied. Its ultimate fate is largely governed by its physico-chemical properties. Mercury is a metal with atomic number 80, atomic weight 200.59, and density 13.5 grams/cubic centimeter. From the floor drain, mercury entered Little Bay and came in contact with the surface water and sediment. Based on its chemical properties most of the mercury would have initially partitioned into the sediment due to the elemental mercury’s low water solubility. Geochemical cycling caused by biotic and abiotic process would then cycle the mercury though several different chemical forms (e.g., elemental, organic and inorganic). USEPA (1997b) contains an overview of the mercury cycle from a global and regional perspective. After partitioning into the several different media, some degree of equilibrium would be achieved. The mercury continues to move through the different media and is influenced by physical disturbances and its chemical oxidation state.

At ambient conditions and in its elemental (inorganic) form, mercury is a liquid metal. Mercury may be present in the environment in three forms: elemental, organic, and inorganic. Mercury can exist in three oxidation states: Hg^0 (metallic), Hg^{1+} (mercurous), and Hg^{2+} (mercuric). The properties and chemical behavior of mercury strongly depend on the oxidation state. Mercurous and mercuric mercury can form numerous inorganic and organic chemical compounds; however, mercurous mercury is rarely stable under ordinary environmental conditions. Mercury is unusual among metals because it tends to form covalent rather than ionic bonds. Most of the mercury encountered in water/soil/sediments/biota (all environmental media except the atmosphere) is in the form of inorganic mercuric salts and organomercurics. Organomercurics are defined by the presence of a covalent carbon-Hg bond. The presence of a covalent carbon-Hg bond differentiates organomercurics from inorganic mercury compounds that merely associate with the organic material in the environment but do not have the carbon-Hg bond. The compounds most likely to be found under environmental conditions are these: the mercuric salts HgC_{l2} , $Hg(OH)_2$, and HgS; the methylmercury compounds, methylmercuric chloride (CH_3 HgCl) and methylmercuric hydroxide (CH_3 $HgOH_2$); and, in small fractions, other organomercurics (i.e., dimethylmercury and phenylmercury). Mercury compounds in the aqueous phase often remain as undisassociated molecules, and the reported solubility values reflect this. Solubility values for mercury compounds that do not disassociate are not based on the ionic product. Most organomercurics are not soluble and do not react with weak acids or bases due to the low affinity of the mercury for oxygen bonded to carbon. CH_3 HgOH, however, is highly soluble due to the strong hydrogen bonding capability of the hydroxide group. The mercuric salts vary widely in solubility. For example, $HgCl_2$ is readily soluble in water and HgS is as unreactive as the organomercurics due to the high affinity of mercury for sulfur. The dominant form in the atmosphere is vapor-phase elemental mercury.

5.1.3 Receptors

The receptors of primary interest in this assessment are future human receptors that would be associated with redevelopment of the property. Future redevelopment plans are associated with increasing the use of the waterfront/shoreline property.

5.2 EXPOSURE ASSESSMENT

The exposure assessment uses the CSM to quantify the relationship between the media containing the mercury and the receptor. An integral part of the chemical-receptor interaction is the planned reuse of the site. After establishing the site’s reuse plan, the first step is to qualitatively describe each receptor for the pathways identified in the CSM. The types of receptors will be based on the future and current land use at the site. The second step is to quantify the exposure point concentration of mercury in each medium of interest. The third step is to quantify the characteristics of the receptor that impact exposure. This last step is performed for each pathway individually.

In May 1997, a land use planning consultant team, headed by Hellmuth, Obata, & Kassabaum (HOK) was hired by the Fort Totten Reuse Authority (FTRA) to assist in the formal construction of the Permanent Proposal for Fort Totten to be submitted to the Army according to BRAC regulations. In 1998, HOK presented a Final Report (Fort Totten Redevelopment Authority 1998) outlining four potential land-use scenarios, incorporating possible uses by the Fire Department of New York, senior housing, non-profit organizations, parkland, university campus (presumably St. John’s University), and minor commercial development in the waterfront area. Preservation of all existing open space, use of an historic core of structures, including the Post Theater and the Officers Club, by a group of responsible non-profit organizations, and a public esplanade around the perimeter, was a basic component of all scenarios submitted for consideration.

The April 1998 final reuse plan, which was approved by the FTRA, established a fire-training academy at Fort Totten and provided more than 50 acres of publicly accessible park, waterfront esplanade, and open space. This draft reuse plan kept the property in public ownership, ensured that local residents will be able to continue to use the fort, created additional parkland, and prevented the private development of the historic site. The Fire Department was to use a number of historic buildings for administrative and educational uses. The fire training facility, which was designed to be compatible with existing historic structures, was to be located on the southern portion of Fort Totten, screened from public view by evergreen trees and berms. Subsequent to the release of the final reuse plan in 1998 the fire training facility was not approved, and in 2004 it was announced that most of the area of Fort Totten would be turned into a new park.

Relative to Building 615, the planned waterfront esplanade is the characteristic of interest. The esplanade is a proposed continuous multi-use path at the peninsula's edge. The right-of-way for the esplanade will be approximately 40 ft wide and will connect to the Old Fort Area to the planned area-wide multi-use trail system. The two major elements of the esplanade are the 3,200-ft Shore Road Esplanade overlooking Little Neck Bay and the 600-ft Little Bay Esplanade inside the gate. This esplanade is envisioned as a link within the NYC Greenway/Bikeway currently under design and construction. The esplanade will be accessible from the Fort's entry gate, site roadways, and a recommended connection along the Army Reserve Enclave to the Joe Michaels' Mile, with appropriate wetland protection. The esplanade is envisioned to be similar to the East River Esplanade in quality and character. The design palette is likely to include asphalt block pavers, lighting, benches, plantings, and sea railing. The esplanade will be developed at the water's edge where possible and will move inland to preserve existing vegetation or other site features.

The current investigation focuses on the FUDS portion of Fort Totten; however, it does not ignore the two BRAC parcels, parcels 62 and 79, as shown in Figure 3-8. Although the release occurred in the FUDS portion of the property, the proximity of the BRAC parcels necessitates that they be included.

5.2.1 Exposure Pathways

Currently, site use is restricted. There is no receptor for the portion of the site where the mercury is located. Building 615 and the proximate area are used currently by the City of New York Police Department for vehicle maintenance and modification. The U.S. Coast Guard also maintains offices and a boat pier in the area. While there may be occasional personnel in Building 615, no receptors are on the shoreline with a quantifiable frequency. The groundwater at the site and on Fort Totten is not used as a drinking water source; therefore, the exposure pathway is incomplete and there is no risk to human health from this environmental medium.

The future receptors evaluated include an adult and child recreational angler/beach comber. This scenario is consistent with the approved redevelopment plan. The future receptors are assumed to recreate along the shoreline including fishing, collecting shellfish, collecting shoreline items, and occasional wading. Swimming was not considered likely because of the rocky and uninviting nature of the shoreline in the area of Building 615.

There are three possible exposure pathways for the future receptors: inhalation, ingestion, and dermal contact. The latter of these pathways was evaluated for each of the two receptors. While inhalation is a complete pathway, it was not assessed quantitatively because:

- The sediments are underwater for approximately 12 hours a day

- Particle size and soil/sediment moisture content is such that fugitive dust emissions are unlikely

- Mercury vapor is not a significant exposure route at this site based on its chemical characteristics and duration since the release

- USEPA (1997b) concluded that while atmospheric mercury was important for global cycling, its impact at small/regional scales was insignificant

Hence, only ingestion and dermal contact are evaluated quantitatively. The pathways evaluated include incidental ingestion of water and sediment, ingestion of biota (e.g., fish and shellfish), and dermal contact with water and sediment. The potential future receptors are adults and children.

5.2.2 Exposure Point Concentration

The concentrations of mercury in the sediment, water, and biota were determined with a sampling and analysis effort. As with any sampling effort, statistics are used to determine how well the sample represents the population of interest. In this risk assessment, the data analysis focused on the concentration of mercury in each exposure medium. The numbers and types of samples collected are discussed in Chapter 3.

Data Analysis

The summary statistics for each exposure medium are presented below. The analytical measurements were reported by the laboratory with data quality indicators. These data quality "flags" provide information about the laboratory's ability to measure and identify the chemical(s) of interest. When calculating the statistics for each exposure the following rules were applied to data with applicable data qualifiers:

- J qualified data indicate that the chemical as positively identified but that the concentration is estimated; data with this qualifier were used as reported.

- R qualified data indicate that the measurements were not within the quality control parameters specified in the Quality Control Project Plan; data with this qualifier were rejected and not used.

- N qualified data indicate that the chemicals are tentatively identified; data with this qualifier were used as reported.

- B qualified data indicate that the data in the sample are also in the quality control blank; if the amount in the samples was more than 5 times the amount in the blank (10 times for common laboratory contaminants), the data were rejected; otherwise, the data were used as reported.

The exposure point concentration for each medium is highlighted and justification is provided for samples selected. To determine the exposure point concentration, the lower of the maximum detected concentration or the 95 percent Upper Confidence Limit on the Mean (95 UCLM) was used. For non-detected samples, a value of ½ the non-detected concentration was used. The 95 UCLM (either normal or lognormal) was calculated using the methods described in Gilbert (1987). The H-statistic, alpha = 0.05, was used when the shape of the distribution was lognormal.

The shape of the distribution was determined using the Shapiro-Wilk test, alpha = 0.05 when N < 50, and with the Kolmogorov-Smirnov statistic when N >50 using the SPSS statistical package. Probability plots as described in Gilbert (1987) and USEPA (1989) were also constructed. In the event that the shape of the distribution was undermined, the 95 UCL was calculated assuming that the shape was lognormal.

Sediment

To evaluate human receptor exposure to mercury in sediment, all of the samples collected within 50 ft of the shoreline were used. This includes samples collected from the BRAC79, BRAC69, and FUDS portion of the installation. Samples collected from 0-6 in. and 6-12 in. were combined into one dataset because the exposure unit depth of 0-12 in. was assumed. Samples in the borings located more than 50 ft from the shoreline were not included in the exposure assessment because recreational receptors are not anticipated to contact sediment beyond this distance. Based on the results of probability plots of the mercury concentrations and the Kolmogorov-Smirnov test (alpha > 0.05), it was determined that the concentration was not normally distributed. Therefore, the exposure point concentration was calculated using a lognormal assumption. The exposure point concentration for the shoreline sediment was 0.38 mg/kg.

Surface Water

Two types of surface water were collected: filtered and unfiltered samples. Unfiltered samples better represent the type of water to which the receptors of interest would be exposed, as recreational receptors are not anticipated to filter surface water prior to ingestion. Filtered surface water samples were not used in the human health risk assessment. The difference between the concentration of mercury in filtered samples and the unfiltered samples was evaluated visually with box plots, as the number of each sample was insufficient for statistical analysis. The fact that all of the filtered samples were non-detect for mercury indicates that the mercury is bound to particulate matter, and may indicate that it is less bioavailable to receptors.

Two types of analytical measurement were performed on the surface water. The first round of samples used method SW7471 with a detection limit of 0.1 μg/L, and method SW1631 with a detection limit of 0.002 μg/L. The initial round of sampling reported most analysis as non-detect, whereas 100 percent of the unfiltered samples had detectable concentration of mercury in the most recent round of sampling; filtered samples had no detectable concentration of mercury in the most recent sampling round.

Surface water samples were also collected at two different locations within the water column. Water was collected at the top of the water column and at the bottom of the water column. Although the samples were collected in the bay away from the shoreline, it is assumed that they represent the concentration of chemicals in the entire bay. There was no difference between the samples at the top and bottom of the water column; the number of samples at each location was insufficient for statistical analysis, so box plots were examined.

All of the unfiltered surface water samples collected during the field activities were used to determine the exposure point concentration. This included samples from the top of the water column and those collected near the sediment/water interface, also including SW7471 and SW1631 methods. The large number of non-detected values in the SW7471 data set (7 out of 12) skewed the results to the left. Therefore, the exposure point concentration was calculated assuming the data followed a lognormal distribution, although the distribution was normal (alpha > 0.05) when non-detects were included in the data set at ½ the detection limit. The exposure point concentration for the surface water was 0.27 μg/L; however, this value is likely an overestimate of the actual concentration in the water because of the large number of non-detects in the initial SW7471 data set.

Biota

Several different types of biota were collected during the two rounds of field activities: blue crabs (*Callinectes sapidus*), American oysters (*Crassostrea virginica*), blue mussels (*Mytilus edulis*), windowpane and winter flounder (*Lophopsetta maculata* and *Pseudopleuronectes americana*), and juvenile striped bass (*Morone saxatilis*). These species were collected to represent the range of shellfish and finfish that might be consumed by a local recreational fisher. Most of the biota data was reported as non-detect, suggesting that mercury is not present in the food chain of Little Bay. All of the biota samples collected during the field activities were used to calculate the concentration of mercury in finfish (fillet samples only) and shellfish. The data from the three different types of finfish samples were combined. Likewise, data from all of the shellfish samples were combined. There were too few samples and too many non-detects in each data subset to determine the distribution of each data set. Therefore, the maximum detected value from each type of biota was used. The exposure point concentration for the finfish was 0.27 mg/kg, and 0.10 mg/kg for the shellfish.

A summary of the exposure point concentrations for each medium of concern is shown below:

Media	Value	Units

Exposure Point Concentration (Sediment)	0.38	mg/kg
Exposure Point Concentration (Surface Water)	0.27	μg/L
Exposure Point Concentration (Fish)	0.27	mg/kg
Exposure Point Concentration (Shellfish)	0.10	mg/kg

5.2.3 Characteristics of Exposure

The relevant exposure characteristics for a beachcomber/fisher type receptor (both child and adult) are summarized in Tables 5-1 through 5-6. The beachcomber/fisher was determined to be the most realistic type of receptor based on the available information. These future receptors are assumed to recreate along the shoreline including fishing, collecting shellfish, collecting shoreline items, and occasional wading. These tables describe the exposure characteristic, estimated value with units, and data source. Exposure characteristics labeled as “Site-Specific” were estimated conservatively based on anticipated exposures and comparisons to data from other sources (e.g., USEPA 1997d; USEPA 1995a). The exposure characteristics are based on the exposure profile for the reasonable maximum exposure (RME). The RME scenario is an attempt to describe pathway-specific exposures at the upper percentiles (e.g., 90th – 95th) of the exposure profile. However, the RME comprises both average and upper bound estimates (USEPA 1989).

A few of the parameters are calculated based on other parameters or are site-specific. One site-specific parameter requiring additional explanation beyond that provided in the references is the amount of finfish and shellfish ingested. The finfish intake value used 18.9 g/day is from USEPA (1997d; see Table 10-52) and represents marine recreational anglers in the mid-Atlantic region. Because the reference cited in the USEPA report did not provide intake in terms of finfish and shellfish, the amount of shellfish ingested was selected from USEPA (1997d; see Table 10-7). The intake rate of 13.3 g/day is a national value and thus is less site-specific than the finfish ingestion value. The higher ingestion rate for finfish than shellfish is supported in part by analysis of the percentage of each type of fish shown in Table 10-5 of USEPA (1997d). Using the USEPA data in Table 10-5, 28 percent of the diet would be shellfish and 72 percent of the diet would be finfish (categories labeled “other” or “unknown” were assigned shellfish). The percentage of the diet in this model is 30 percent shellfish and 70 percent shellfish, with the total finfish and shellfish intake of 32.2 g/day.

The chronic daily intake for incidental ingestion of sediment is an event-based value rather than a daily rate. The daily rate, provided in USEPA (1997d) for residential receptors, is 100 mg/day for adults and 200 mg/day for children. An event-based rate was calculated to better reflect the event (i.e., episodic) nature of beach combing. As discussed in Chapter 1 of USEPA (1997d), it is important to define the duration estimate so that it is consistent with the intake rate. The objective is to define the terms so that when multiplied, they provide the appropriate estimate of mass of chemical contacted. Weighting the USEPA supplied values by an event duration of 2 hours for an adult and 4 hours for a child out of a possible 16 hours per day, the intake rate per event for adults is 12.5 mg/event, and for children it is 50 mg/event.

Body weight is one of the few exposure parameters that is not set at an upperbound (i.e., 95th percentile) estimate. This is because body weight should reflect the average body weight over the exposure period. In this case the exposure periods are 30 years for the adult and 6 years for the child. The use of a constant body weight over the period of exposure is by convention (USEPA 1989), but also because body weight is not always independent of other exposure variables (notable, intake). Maintaining a constant body weight in the exposure model minimizes this error. Furthermore, because all toxicity values are provided based on a 70 kg body weight, this value is used rather than the average (71.8 kg) recommended in USEPA (1997d). This change from the recommended value has no significant effect on the final risk/hazard estimates.

5.2.4 Estimated Exposure Profile

Using the characteristics of the exposed receptors in Tables 5-1 through 5-6 and the exposure point concentrations calculated in Section 5.2.2, the chronic daily intake for each receptor can be calculated. The generic equation for estimating intake from each exposure pathway is as follows:

$$CDI_{pot} = [C * IR * ED] / [BW * AT]$$

Where the potential Chronic Daily Intake (CDI_{pot}) is equal to the total potential dose (i.e., the product of the chemical concentration [C], intake rate [IR], and exposure duration [ED]) divided by the product of the body weight (BW) and the averaging time (AT). From this generic equation, several pathway-specific equations can be derived depending upon the boundary assumptions. This equation, which is specific for non-cancer effects, averages exposures (i.e., doses) over the period of time over which exposure occurred. The dose is expressed in milligrams of chemical per kilogram of body weight per day (mg/kg-day). The CDI_{pot} for each exposure pathway and exposure medium are as follows:

- Incidental surface water ingestion: 5.5E-8 for adults and 7.8E-7 for children
- Dermal absorption from surface water: 6.4E-9 for adults and 1.8E-8 for children
- Ingestion of finfish: 7.1E-5 for adults and 9.1E-6 for children
- Ingestion of shellfish: 1.9E-5 for adults and 4.5E-6 for children

- Incidental sediment ingestion: 9.4E-9 for adults and 1.4E-7 for children
- Dermal absorption from sediment: 2.0E-6 for adults and 3.2E-6 for children

These intakes are representative of the RME scenario, and the average or median exposure would be lower. The actual exposure for the average individual is likely to be substantially less than the estimated amounts. The compounding of several upper percentile exposure estimates results in total pathway exposure that may approach or exceed the 99.99th percentile exposure (Burmaster and Harris 1993).

As discussed in the subsequent section, the toxic effects of mercury are primarily non-cancerous. USEPA has determined that elemental mercury should be categorized as "D" – not classifiable with regards to carcinogenic potential. Inorganic and organic mercury are categorized as "C" – possible carcinogens. USEPA classified methylmercury as group "C" – possible human carcinogen – based on inadequate data in humans and increased incidence of kidney tumors in a single species and sex. However, there are no quantitative toxicity data for any form of mercury; therefore, there is no lifetime daily intake need in this risk assessment.

5.3 TOXICITY ASSESSMENT

There are at least three forms of mercury that may be preset at the site: elemental, inorganic, and methylated. Other forms of mercury may be present at the site but toxicity information is not generally available for other than these three types. The basic toxicity of each form is discussed below. Detailed reviews of the toxicity of mercury are contained in the recent Agency for Toxic Substances and Disease Registry's Toxicity Profile for Mercury (ATSDR 1999) and Volume 5 of USEPA (1997b).

Elemental Mercury

The absorption of elemental mercury vapor occurs rapidly through the lungs, but it is poorly absorbed from the gastrointestinal tract. Once absorbed, elemental mercury is readily distributed throughout the body; it crosses both placental and blood-brain barriers. Elemental mercury is oxidized to inorganic divalent mercury by the hydrogen peroxidase-catalase pathway, which is present in most tissues. The distribution of absorbed elemental mercury is limited primarily by the oxidation of elemental mercury to the mercuric ion as the mercuric ion has a limited ability to cross the placental and blood-brain barriers. Once elemental mercury crosses these barriers and is oxidized to the mercuric ion, return to the general circulation is impeded, and mercury can be retained in brain tissue. The elimination of elemental mercury occurs via urine, feces, exhaled air, sweat, and saliva. The pattern of excretion is dependent on the extent to which elemental mercury has been oxidized to mercuric mercury.

Inorganic Mercury

Absorption of inorganic mercury through the gastrointestinal tract varies with the particular mercuric salt involved. Absorption decreases with decreasing solubility. Estimates of the percentage of inorganic mercury that is absorbed vary; as much as 20 percent may be absorbed. Available data indicate that absorption of mercuric chloride from the gastrointestinal tract results from an electrostatic interaction with the brush border membrane and limited passive diffusion. Increases in intestinal pH, high doses of mercuric chloride causing a corrosive action, a milk diet (e.g., neonates) and increases in pinocytotic activity in the gastrointestinal tract (e.g., neonates) are associated with increased absorption of inorganic mercury. Inorganic mercury has a limited capacity for penetrating the blood-brain or placental barriers. There is some evidence indicating that mercuric mercury in the body following oral exposures can be reduced to elemental mercury and excreted via exhaled air. Because of the relatively poor absorption of orally administered inorganic mercury, the majority of the ingested dose in humans is excreted through the feces.

Methylmercury

Methylmercury is rapidly and extensively absorbed through the gastrointestinal tract. Absorption information following inhalation exposures is limited. This form of mercury is distributed throughout the body and easily penetrates the blood-brain and placental barriers in humans and animals. Methylmercury transport into tissues appears to be mediated by the formation of a methylmercury-cysteine complex. This complex is structurally similar to methionine and is transported into cells via a widely distributed neutral amino acid carrier protein. Methylmercury in the body is considered relatively stable and is slowly demethylated to form mercuric mercury in rats. It is hypothesized that methylmercury metabolism may be related to a latent or silent period observed in epidemiological studies observed as a delay in the onset of specific adverse effects. Methylmercury has a relatively long biological half-life in humans; estimates range from 44 to 80 days. Excretion occurs via the feces, breast milk, and urine.

5.3.1 Quantitative Cancer Endpoints

In general, it is not known whether exposure to the various forms of mercury can cause cancer. USEPA has determined that elemental mercury should be categorized as "D" – not classifiable with regards to carcinogenic potential. Inorganic and organic mercury are categorized as "C" – possible carcinogens. USEPA classified methylmercury as group "C" – possible human carcinogen – based on inadequate data in humans and increased incidence of kidney tumors in a single species and sex. Mice exposed to methylmercuric chloride in the diet had an increased incidence of kidney tumors. The tumors were observed at a single site and in a single test species and a single sex. The kidney epithelial cell tumors were observed only in the presence of profound nephrotoxicity and may be a consequence of repair changes in the cells. Several non-positive cancer bioassays were also reported. Although genotoxicity data suggest that methylmercury is capable of producing chromosomal and nuclear damage, there are also non-positive genotoxicity data. Cancer slope factors for all forms of mercury are not available; therefore, a quantitative statement of the risk of cancer cannot be made at this time.

5.3.2 Quantitative Non-Cancer Endpoints

Data in both humans and experimental animals show that all three forms of mercury (elemental, inorganic, and methylmercury) can produce adverse health effects at sufficiently high doses. Human exposure to elemental mercury occurs in some occupations, and exposure to inorganic mercury can arise from mercury amalgams used in dental restorative materials. Like all chemicals, mercury can produce a variety of adverse effects, depending on the dose and time of exposure. In general, mercury adversely affects the central nervous system. Health endpoints other than neurotoxicity were evaluated by USEPA using established values; however, data for other endpoints than developmental neurotoxicity are limited.

5.3.2.1 Oral Toxicity

USEPA has developed Reference Doses (RfDs) to determine safe levels of chemical exposure. The RfD is only applicable to those chemicals for which there is a threshold dose below which there is no adverse effects. An RfD is defined by USEPA as “an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime” (USEPA 1989). There are RfDs for methylmercury and mercuric chloride; however, there is no RfD for elemental mercury. The available RfDs are summarized below.

Chemical Form	RfD (mg/kg-day)	Total Uncertainty Factors	Critical Endpoint
Methylmercury	0.0001	10	Developmental neurologic abnormalities in human infants
Mercuric Chloride	0.001	1000	Autoimmune effects in subchronic rat feeding studies

Other federal agencies have also examined the health effects of exposure to mercury. The U.S. Food and Drug Administration (USFDA) uses an action level based on consideration of the tolerable daily intake (TDI) for methylmercury, as well as information on seafood consumption and associated exposure to methylmercury. The TDI is the amount of methylmercury that can be consumed daily over a long time with a reasonable certainty of no harm to adults. The neurological endpoint evaluated was paresthesia. USFDA in cooperation with the World Health Organization (WHO) established a TDI based on a weekly tolerance of 0.3 mg of total mercury per person, of which no more than 0.2 mg should be present as methylmercury. These amounts are equivalent to 5 and 3.3 µg, respectively, per kilogram of body weight. Using the values for methylmercury, this tolerable level would correspond to approximately 230 µg/week for a 70 kg person or 0.0004 mg/kg-day. Therefore, USFDA’s tolerable intake level is higher than that used by USEPA. The TDI was calculated using Swedish studies of Japanese individuals poisoned as a result of eating mercury-contaminated fish and shellfish and the consideration of other studies of fish-eating populations. In contrast, the USEPA reference dose was based on observations from a mercury poisoning event in Iraq. USFDA acknowledged that the Iraqi study may be more appropriate for determining the effects of mercury on the fetus [3990 *Federal Register* (FR) 44]. USFDA believes, however, that given existing patterns of fish consumption, few women (less than 1 percent) eating such high-mercury fish will experience slight reductions in the margin of safety. However, due to the uncertainties associated with the Iraqi study, USFDA has chosen not to use the Iraqi study as a basis for revising its action level. Instead, USFDA is waiting for findings of prospective studies of fish-eating populations in the Seychelles Islands and in the Faroes Islands.

In addition to the health benchmark developed by USEPA and USFDA, ATSDR developed a minimal risk level (MRL) for mercury. When calculated for exposure via ingestion, the MRL is conceptually equivalent to the RfD and the TDI. An MRL is calculated to ensure a substantial margin of safety. The MRL is not a definitive line indicating the boundary between no health risk and a definitive health risk. In 1994, ATSDR published a draft MRL for ingested methylmercury of 0.0001 mg/kg-day. After re-evaluation of the data, a long public comment period, and incorporation of additional toxicological studies, ATSDR revised the draft MRL for a final value of 0.0003 mg/kg-day. The final MRL for ingested methylmercury was based largely on preliminary data from studies of fish-eating populations in the Seychelles and Faroes Islands.

The available health-based benchmarks for mercury range from 0.0001 to 0.001 mg/kg-day. However, the health-based benchmarks for methylmercury fall within a narrow range of 0.0001 to 0.0004 mg/kg/day. When making quantitative estimates of the non-cancer hazards from exposure to mercury, the RfD for methylmercury developed by USEPA will be used. Specifically, the RfD for methyl mercury will be used because the sampling program was not designed to differentiate between elemental, organic, and inorganic mercury. This approach is consistent with observations that most (>95 percent) of the total mercury content of freshwater and saltwater fish is methylmercury (Bloom 1992 as cited in USEPA 1997b). This assessment uses toxicity values for methylmercury, although biota samples were analyzed only for total mercury. In addition, because mercury was not speciated in sediment or surface water samples, it was likewise assumed that all mercury present was methylmercury. This assumption regarding the form of mercury in sediment and/or surface water would tend to overestimate the toxicity of a dose of total mercury. By using the RfD for methylmercury, the toxicity assessment takes a conservative approach to estimating the potential health hazard from exposure.

5.3.2.2 Dermal Toxicity

Dermal toxicity is evaluated by adjusting the oral RfD for an absorbed rather than an administered dose (USEPA 1989). The dermal toxicity information was used to evaluate the toxicity of chemicals present in the sediment that might be absorbed through the skin during casual contact.

5.4 RISK CHARACTERIZATION

The purpose of the risk characterization is to combine the toxicity and exposure information and make a quantitative statement on the hazards and risks posed by the chemical of concern. The risk characterization summarizes the key issues and conclusions of each of the other components of the risk assessment, and also describes the likelihood of harm. Included in the summary is a description of the overall strengths and the limitations (including uncertainties) of the assessment and conclusions. The risk characterization includes, at least in a qualitative sense, a discussion of how a specific risk and its context compares with other similar risks. This is accomplished by comparisons with other situations in which the action was taken and with other situations with which the public may be familiar.

5.4.1 Risk/Hazard Profile

The chronic daily intake for each adult exposure pathway ranges from a low of 6.4E-9 mg/kg-day to a high of 7.1E-5 mg/kg-day. The chronic daily intake for each child exposure pathway ranges from a low of 1.8E-8 mg/kg-day to a high of 9.1E-6 mg/kg-day. In both the adult and child exposure scenarios, the pathway resulting in the highest chronic daily intake is the ingestion of fish. Therefore, limiting the daily intake of finfish and shellfish would greatly reduce the likelihood of adverse effects. The lowest intake rate for child and adult receptors was from dermal exposure to surface water.

Data in both humans and experimental animals show that all three forms of mercury (elemental, inorganic, and methylmercury) can produce adverse health effects at sufficiently high doses. Inorganic and organic mercury are classified as possible cancer causing agents. However, there is insufficient data to make a definitive statement as to the potential of elemental mercury to cause cancer. There is no quantitative data available for the derivation of a cancer slope factor; therefore, a quantitative statement about the risk of cancer cannot be made. With regards to non-cancer health effects, mercury is known to adversely affect the central nervous system. Data for endpoints other than developmental neurotoxicity are limited. Therefore, quantitative statements regarding the hazards from mercury exposure pertain only to neurotoxicity. The health-based benchmark used for non-cancer endpoints in this assessment is 0.0001 mg/kg-day, based on methlymercury toxicity.

Combining the toxicity data (i.e., the health benchmark of 0.0001 mg/kg-day) with the exposure data (e.g., the chronic daily intake values in mg/kg-day) is called a Hazard Quotient (HQ). The HQ is calculated for each exposure pathway using the general formula:

$$HQ = CDI_{pot} / RfD$$

The resulting HQ is a unitless number that represents the ratio of the estimated dose from exposure at the site to the dose assumed to be without adverse health impacts. The HQ is not a probability of harm. An HQ of 0.01 does not mean that there is a one in one hundred chance of the adverse effect occurring. An HQ of greater than 1.0 does not necessarily mean that adverse effects will occur or have occurred. An HQ of greater than 1.0 means that adverse effects would be expected based on the exposure scenario and toxicity data presented. Inherent in any HQ are several uncertainties that should be evaluated prior to making a definitive conclusion.

Because the HQ for each pathway is less than unity, no adverse health effects are expected to result from the exposures described in the assessment. Actual exposure from each pathway will probably be less than that described in the report, but may be more. The HQ for each exposure pathway and receptor are summarized below:

Hazard Quotient by Exposure Pathway		
Pathway	**Adult**	**Child**
Surface Water Ingestion	5.5E-04	7.81E-03
Surface Water Dermal Contact	9.11E-04	2.60E-03
Finfish Ingestion	7.29E-01	1.30E+00
Shellfish Ingestion	1.90E-01	3.38E-01
Sediment Ingestion	9.67E-05	1.37E-03
Sediment Dermal Contact	2.93E-01	4.57E-01
Hazard Index	1.21	2.10

By summing the individual pathways, a total exposure Hazard Index (HI) is calculated. The HI is a summation of the total aggregate hazard posed by all of the exposure pathways. That is, the HI represents the hazard posed by exposure to mercury from all route of exposure. The HI for the adult receptor is 1.21, and for the child receptor the HI is 2.10. There is a potential for adverse health effects for the adult and child receptors as evidenced by the HIs being greater than 1.0. Like the HQ, the HI is a unitless number that is not a probability of harm. The HI should not be interpreted as a bright line standard below which no effects will occur and above which will occur. The HI should be examined in light of the uncertainties and assumptions in the entire risk assessment.

5.4.2 Uncertainties in the Risk Assessment

Uncertainties are inherent in any risk assessment. The uncertainties in this risk assessment can be broken into three separate areas: data collection/analysis, exposure assessment, and toxicity assessment. Within each area, the uncertainties can be either site-specific or generic. The site-specific uncertainties are those that are influenced by the site conditions. For example, the amount of organic matter in sediment influences the amount of an organic chemical in the water column.

Generic uncertainties are those that are outside the influence of the site. For example, laboratory analysis of sediment samples is dependent on the calibration of the analytical instrument. Care is exercised in all areas to limit the uncertainties, but all uncertainties will never be eliminated. During data collection and analysis, samples were purposefully collected from areas of known chemical contamination. This action biases the results to reflect the areas of higher contamination rather than have equal representation across the entire exposure area. More sediment and mussel/oyster samples were taken near Building 615's outfall than anywhere else. The result of this action is a higher exposure point concentration than would be encountered if sampling were performed in a random pattern.

5.4.2.1 Exposure Assessment

The exposure assessment tends to be conservative and overestimate the actual exposure of any specific individual. The majority of this conservatism is the result of multiplying a series of upper percentile exposure estimates together to estimate the RME scenario. However, this approach is the result of a policy decision to be conservative and protective of human health. For example, the exposure assessment assumes that all of the mercury in the water column is present as methylmercury, while usually only 20 percent of the water in the water column is present as methylmercury (USEPA 1997b). Lacking data on the actual percentage of methymercury in the water column, it was assumed that 100 percent of the mercury was methylated. This assumption results in an overestimate of the dose from ingestion of surface water and dermal contact with surface water by 80 percent.

The exposure assessment includes wading while beach combing, but does not include swimming in Little Bay. If swimming did occur, the two main exposure pathways would be dermal contact and incidental surface-water ingestion. Given a reasonable exposure frequency for the summer months, the overall hazard from swimming would be low. For example, the current hazard quotient for dermal contact with surface water is 9.11×10^{-4} (see Section 5.4.1). Given that current assumption of 5,800 cm^2 of exposed skin and the assumption that a whole body exposure would be 20,000 cm^2, the dose would increase by less then a factor of 3. An increase in the dose by a factor of 3 would still provide a hazard quotient less than 1.0. An analogous change in the hazard quotient for incidental ingestion of surface water would occur. The hazard quotients for these two exposure pathways would not change significantly. Therefore, the change in the total hazard index, if swimming was included in the exposure assessment, would not be appreciable or result in an unacceptable hazard to human health.

In response to community concerns regarding the USEPA default assumption on the amount of fish ingested, variations on the amount of fish ingested were examined. Community concerns were raised in part because on January 12, 2001, USEPA and the U.S. Food and Drug Administration (USFDA) issued concurrent national fish consumption advisories recommending restricted consumption of freshwater, coastal, and marine species of fish due to methylmercury contamination. USEPA's advisory targeted women of child-bearing age and children who may be consuming noncommercial freshwater fish caught by family or friends. The advisory specifically recommends that women who are pregnant or could become pregnant, women who are nursing a baby, and their young children, should limit consumption of freshwater fish caught by family and friends to one meal per week. For adults, one meal is six ounces of cooked fish or 0.5 lb uncooked fish; for a young child, one meal is 2 oz of cooked fish or 3 oz uncooked fish. USFDA issued advice on mercury in fish bought from stores and restaurants, which includes ocean and coastal fish as well as other types of commercial fish. USFDA advises that women who are pregnant or could become pregnant, nursing mothers and young children not eat shark, swordfish, king mackerel, or tilefish. USFDA also advises that women who are pregnant or could become pregnant may eat an average of 12 oz of fish purchased in stores and restaurants each week. USEPA recommends that women who are or could become pregnant, nursing mothers and young children follow the USFDA advice for coastal and ocean fish caught by family and friends. New York State currently advises against consuming more then 0.2268 kg (approximately 0.5 lb) per week as a general fish advisory that is not specific to any area.

The site-specific fish consumption rate (0.0189 kg/d) for the adult receptor was based on data from USEPA 1997d for the mid-Atlantic U.S. Using the USEPA/USFDA advisory rate of 0.0324 kg/day, the CDI_{pot} of mercury for the adult receptor from finfish ingestion increases to 1.25E-4 mg/kg-day using the existing exposure parameter described in Section 5.2.3. Analogous changes for the child receptor using an intake rate of 0.0851 kg (approximately 3 oz) per week or 0.012 kg/day results in a revised dose of 1.64E-4 mg/kg-day. The resulting hazard quotients for this pathway are 1.25 for the adult and 1.64 for the child. Adjusting the revised HQs further to account for the percentage of methylmercury expected in finfish (95 percent) does not appreciably change these hazard estimates. When interpreting the revised HQ values it is important to note that, as described in Section 5.2.2, the concentration of mercury in finfish was based on the maximum concentration, because there were many non-detected values in the finfish dataset.

The exposure assessment used a mixture of maximum and upper-bound estimates to characterize the concentrations of mercury in various media. For example, the concentrations of mercury in finfish and shellfish were based on the maximum concentration, because there were many non-detected values in the biota dataset. Using the maximum measured concentration likely overestimates the long-term concentration to which a consumer might be exposed. Indeed, many of the fin and shell samples had no measurable concentration of mercury. If the average concentration in finfish (0.081 mg/kg) and shellfish (0.05 mg/kg) samples were used, the revised HQs would be as follows, assuming the same RME exposure factors used in Section 5.2.3. The HQs for the adult receptor would be 0.22 for finfish and 0.10 for shell fish. The HQs for the child receptor would be 0.39 for finfish and 0.17 for shellfish. These HQs, based on the average concentration of mercury in finfish and shellfish, are less than the target hazard quotient of 1.

5.4.2.2 Toxicity Assessment

The toxicity assessment is not site-specific mainly because it does not account for the type of mercury present in each exposure medium, with the exception that toxicity data were used for methylmercury and >95 percent of the mercury in shell/finfish is methylated. This uncertainty in the toxicity assessment is the direct result of how the sampling and analysis plan was executed. Because the chemical form of mercury was undetermined in the sediment and water column, the health benchmark for the most toxic form of mercury was used (i.e., methylmercury). While it is unlikely that all of the mercury present in all samples is methylated, faced with a lack of data the toxicity assessment uses a conservative, health protective approach. Unlike most risk assessments in which the toxicity data are based on laboratory animal studies, the toxicity data for methylmercury are based on human data that are generally supported by the animal studies.

The available health-based benchmarks for mercury range from 0.0001 to 0.001 mg/kg-day. However, the health-based benchmarks for methylmercury fall within a narrow range of 0.0001 to 0.0004 mg/kg/day. When making quantitative estimates of the non-cancer hazards from exposure to mercury, the USEPA’s RfD for methylmercury was used. Specifically, the RfD for methyl mercury was used because the sampling program was not designed to differentiate between elemental, organic, and inorganic mercury. If the USDA’s TDI value was used rather than the USEPA’s RfD, the hazard estimates under all scenarios would be lower by a factor of 4. Even when using an elevated finfish ingestion rate, as described above, the hazard quotients for all exposure pathways are less than 1 when using the higher toxicity benchmark.

5.4.2.3 Risk Characterization

A summary of additional site-specific and generic uncertainties is presented in Table 5-7. While not all inclusive, the table highlights some of the major uncertainties in the risk assessment. Also included in the table is the magnitude (high, medium, low) of the uncertainty and the direction (either over- or under-estimating the health hazard). Changes in magnitude were gauged by adjusting model parameters up or down 10 percent. Uncertainties that will tend to overestimate the hazard would result in an HQ (or HI) greater than unity, suggesting that adverse health effects may occur. Uncertainties that tend to underestimate the hazard would result in an HQ (or HI) of less than unity, thus indicating that adverse health effects are not anticipated.

Various changes in the exposure and toxicity factors were examined. As expected, intake rates and toxicity benchmarks had the greatest impact on the absolute value of the HQ. Increases in the finfish ingestion rate resulted in HQs for this exposure pathway increasing, whereas increases in the toxicity benchmark decreased the estimated hazard.

5.5 LITTLE BAY HUMAN HEALTH RISK ASSESSMENT SUMMARY

Previous defense-related activities at Building 615 resulted in the release of mercury to the environment. The contaminant of concern investigated in this risk assessment was mercury. Mercury can be available in the environment in three forms: organic, inorganic, and elemental. The toxicity of mercury is dependent on the form in which it is contacted. That is, exposure to the same amount of mercury in each of its different forms will have a different toxic effect. Exposure to mercury could occur along the shoreline below Building 615 when the property is transferred to public control. Current exposures are so sporadic that they are non-quantifiable. Future exposure scenarios include fishing, wading, and beach combing. Exposure to contaminated media might occur by incidental ingestion of sediment and/or surface water, dermal contact with sediments and/or surface water, and ingestion of contaminated finfish/shellfish. Ratios of high-end exposure and sensitive toxicity benchmarks indicated that adverse health effects may be expected for adult receptors (HI of 1.2 versus a benchmark HI of 1.0). The potential adverse health effects are primarily from the ingestion of mercury-contaminated fish. Adverse health effects to child receptors from exposure to the contaminated media proximate to Building 615 is not anticipated.

The hazards identified in the report are only for those hypothetical high-end receptors that were evaluated, the reasonable maximum exposure. It is likely that the risk assessment overestimates the hazard to the average person who may recreate, fish, or pursue other routine activities on the shoreline. The risk assessment uses assumptions that are designed to overestimate exposure during routine activities. This risk assessment also uses toxicity data from USEPA, which is stricter than equivalent toxicity data from USFDA or ATSDR. ATSDR and USFDA consider mercury three to four times less toxic than USEPA. If the toxicity data from USFDA and/or ATSDR were used in the assessment, the total HI would be less than 1.0 and the hazard would be within acceptable limits. The toxicity data from USEPA are for methylmercury – the most toxic form of mercury. Because mercury was not speciated, it is impossible to know exactly how much of the mercury in the sediment and tissue is methylated. However, it is unlikely that 100 percent of the mercury is methylated. Thus, the hazards from mercury exposure are likely overestimated.

TABLE 5-1 EXPOSURE CHARACTERISTICS FOR INCIDENTAL SURFACE WATER INGESTION BY POTENTIAL FUTURE BEACHCOMBER/FISHER RECEPTOR (CHILD AND ADULT)

Exposure Characteristic	Variable	Value	Units	Source
Chronic Daily Intake of Surface Water – Adult	SW_CDI_a	5.495E-08	mg/kg-d	Calculated
Chronic Daily Intake of Surface Water – Child	SW_CDI_c	7.81E-07	mg/kg-d	Calculated
Concentration in Surface Water	C_SW	0.00027	mg/L	Site-Specific
Intake Rate – Adult	SW_IR_a	0.05	L/hr	USEPA 1989
Intake Rate – Child	SW_IR_c	0.1	L/h	USEPA 1989
Exposure Frequency – Adult	SW_EF_a	52	Events/year	Site-Specific
Exposure Frequency – Child	SW_EF_c	52	Events/year	Site-Specific
Exposure Time – Adult	SW_ET_a	2	Hrs/event	Site-Specific
Exposure Time – Child	SW_ET_c	4	Hrs/event	Site-Specific
Exposure Duration – Adult	SW_ED_a	30	Years	USEPA 1989
Exposure Duration – Child	SW_ED_c	6	Years	USEPA 1989
Body Weight – Adult	SW_BW_a	70	Kg	USEPA 1997c
Body Weight – Child	SW_BW_c	19.7	Kg	USEPA 1997c
Averaging Time – Carcinogen	SW_AT_car		Days	
Averaging Time – Noncarcinogen - Adult	SW_AT_nc_a	10950	Days	USEPA 1997c
Averaging Time – Noncarcinogen - Child	SW_AT_nc_c	2190	Days	USEPA 1997c

TABLE 5-2 EXPOSURE CHARACTERISTICS FOR DERMAL ABSORPTION FROM SURFACE WATER BY POTENTIAL FUTURE BEACHCOMBER/FISHER RECEPTOR (CHILD AND ADULT)

Exposure Characteristic	Variable	Value	Units	Source
Chronic Absorbed Dose from Water – Adult	SWD_CDI_a	6.37E-09	mg/kg-d	Calculated
Chronic Absorbed Dose from Water – Child	SWD_CDI_c	1.82E-08	mg/kg-d	Calculated
Concentration in Surface Water	C_SW	0.00027	mg/L	Site-Specific
Surface Area available for Contact – Adult	SWD_SA_a	5800	cm sq/event	USEPA 1997c
Surface Area available for Contact – Child	SWD_SA_c	2327	cm sq/event	USEPA 1992
Skin Permeability Constant	SWD_PC_a	1.00E-03	cm/hr	USEPA 1992
Skin Permeability Constant	SWD_PC_c	1.00E-03	cm/hr	USEPA 1992
Exposure Time – Adult	SWD_ET_a	2	hours/day	Site-Specific
Exposure Time – Child	SWD_ET_c	4	hours/day	Site-Specific
Exposure Frequency – Adult	SWD_EF_a	52	days/year	Site-Specific
Exposure Frequency – Child	SWD_EF_c	52	days/year	Site-Specific
Exposure Duration – Adult	SWD_ED_a	30	years	USEPA 1989
Exposure Duration – Child	SWD_ED_c	6	years	USEPA 1989
Body Weight – Adult	SWD_BW_a	70	kg	USEPA 1997c
Body Weight – Child	SWD_BW_c	19.7	kg	USEPA 1997c
Averaging Time – Carcinogen	SWD_AT_car		days	USEPA 1989
Averaging Time – Noncarcinogen – Adult	SWD_AT_nc_a	10950	days	USEPA 1997c
Averaging Time – Noncarcinogen - Child	SWD_AT_nc_c	2190	days	USEPA 1997c

TABLE 5-3 EXPOSURE CHARACTERISTICS FOR INGESTION OF FINFISH BY POTENTIAL FUTURE BEACHCOMBER/FISHER RECEPTOR (CHILD AND ADULT)

Exposure Characteristic	Variable	Value	Units	Source
Chronic Daily Fish/Shellfish Intake – Adult	Fish_CDI_a	7.11E-05	mg/kg-d	calculated
Chronic Daily Fish/Shellfish Intake – Child	Fish_CDI_c	9.07E-06	mg/kg-d	calculated
Concentration in Finfish	C_Fish	0.27	mg/kg	site-specific
Intake Rate – Adult	Fish_IR_a	0.0189	kg/d	USEPA 1997c
Intake Rate – Child	Fish_IR_c	0.009	kg/d	Calculated[1]
Exposure Frequency – Adult	Fish_EF_a	365	Days	USEPA 1997c
Exposure Frequency – Child	Fish_EF_c	365	Days	USEPA 1997c
Exposure Duration – Adult	Fish_ED_a	30	Years	USEPA 1989
Exposure Duration – Child	Fish_ED_c	6	Years	USEPA 1989
Body Weight – Adult	Fish_BW_a	70	Kg	USEPA 1997c
Body Weight – Child	Fish_BW_c	19.7	kg	USEPA 1997c
Averaging Time – Carcinogen	Fish_AT_car		days	
Averaging Time – Noncarcinogen – Adult	Fish_AT_nc_a	10950	days	USEPA 1997c
Averaging Time – Noncarcinogen - Child	Fish_AT_nc_c	2190	days	USEPA 1997c

TABLE 5-4 EXPOSURE CHARACTERISTICS FOR INGESTION OF SHELLFISH BY POTENTIAL FUTURE BEACHCOMBER/FISHER RECEPTOR (CHILD AND ADULT)

Exposure Characteristic	Variable	Value	Units	Source
Chronic Daily Shellfish Intake - Adult	Shell_CDI_a	1.90E-05	mg/kg-d	calculated
Chronic Daily Shellfish Intake - Child	Shell_CDI_c	4.49E-06	mg/kg-d	calculated
Concentration in Shellfish	C_Shell	0.10	mg/kg	site-specific
Intake Rate – Adult	Shell_IR_a	0.013	kg/d	USEPA 1997c
Intake Rate – Child	Shell_IR_c	0.007	kg/d	Calculated
Exposure Frequency – Adult	Shell_EF_a	365	days	USEPA 1997c
Exposure Frequency – Child	Shell_EF_c	365	days	USEPA 1997c
Exposure Duration – Adult	Shell_ED_a	30	years	USEPA 1989
Exposure Duration – Child	Shell_ED_c	6	years	USEPA 1989
Body Weight – Adult	Shell_BW_a	70	kg	USEPA 1997c
Body Weight – Child	Shell_BW_c	19.7	kg	USEPA 1997c
Averaging Time – Carcinogen	Shell_AT_car		days	
Averaging Time – Noncarcinogen – Adult	Shell_AT_nc_a	10950	days	USEPA 1997c
Averaging Time – Noncarcinogen - Child	Shell_AT_nc_c	2190	days	USEPA 1997c

TABLE 5-5 EXPOSURE CHARACTERISTICS FOR INCIDENTAL SEDIMENT INGESTION BY POTENTIAL FUTURE BEACHCOMBER/FISHER RECEPTOR (CHILD AND ADULT)

Exposure Characteristic	Variable	Value	Units	Source
Chronic Daily Intake - Adult	Sed_CDI_a	9.42E-09	mg/kg-d	Calculated
Chronic Daily Intake - Child	Sed_CDI_c	1.37E-07	mg/kg-d	Calculated
Concentration in Sediment	C_Sed	0.38	mg/kg	Site-Specific
Intake Rate – Adult	Sed_IR_a	12.5	mg/event	Site-Specific
Intake Rate – Child	Sed_IR_c	50	mg/event	Site-Specific
Exposure Frequency – Adult	Sed_EF_a	52	Events/year	Site-Specific
Exposure Frequency – Child	Sed_EF_c	52	Events/year	Site-Specific
Exposure Duration – Adult	Sed_ED_a	30	Years	USEPA 1989
Exposure Duration – Child	Sed_ED_c	6	Years	USEPA 1989
Body Weight – Adult	Sed_BW_a	70	Kg	USEPA 1997c
Body Weight – Child	Sed_BW_c	19.7	Kg	USEPA 1997c
Averaging Time – Carcinogen	Sed_AT_car		Days	USEPA 1989
Averaging Time – Noncarcinogen – Adult	Sed_AT_nc_a	10950	Days	USEPA 1997c
Averaging Time – Noncarcinogen – Child	Sed_AT_nc_c	2190	Days	USEPA 1997c

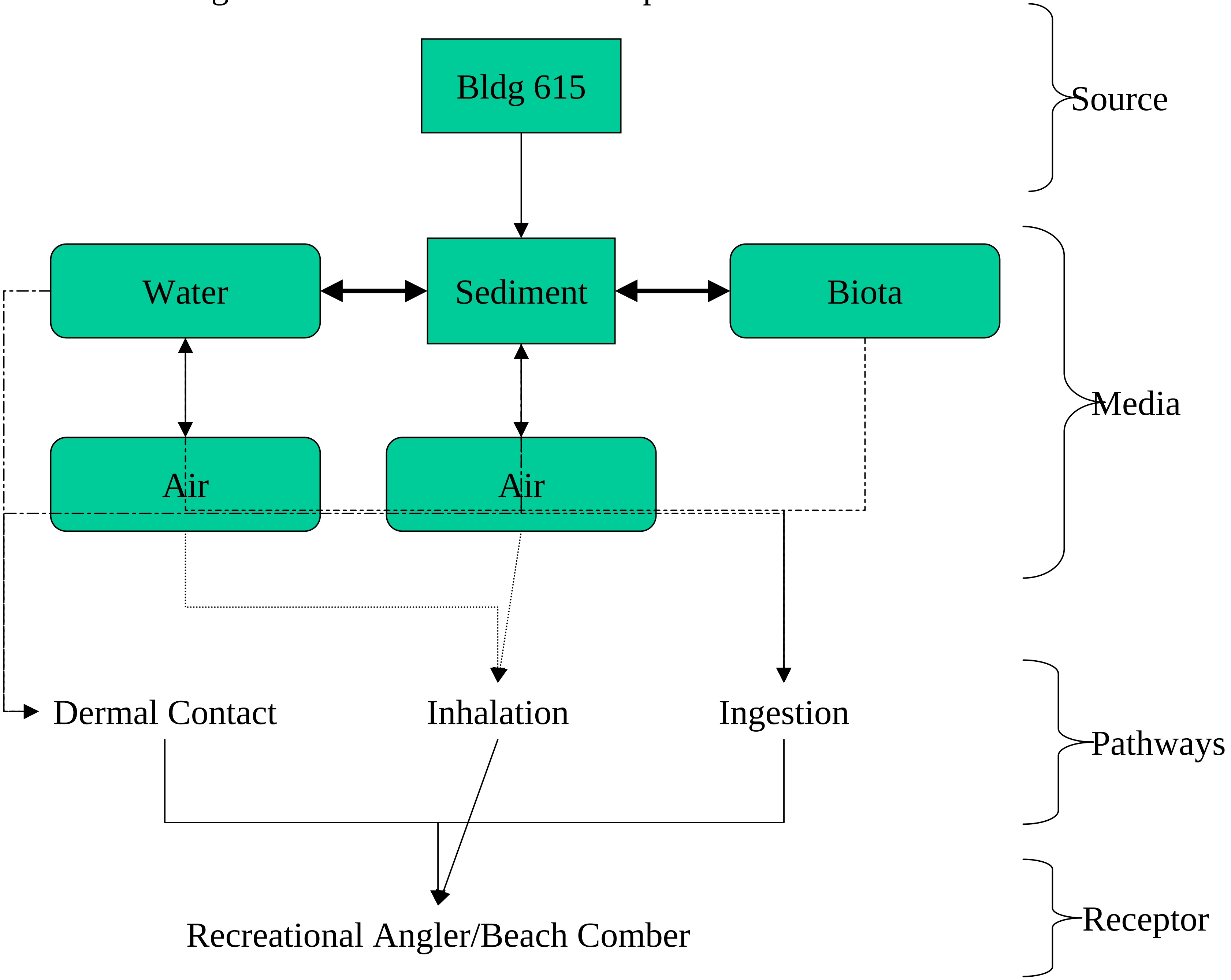
TABLE 5-6 EXPOSURE CHARACTERISTICS FOR DERMAL ABSORPTION FROM SEDIMENT BY POTENTIAL FUTURE BEACHCOMBER/FISHER RECEPTOR (CHILD AND ADULT)

Exposure Characteristic	Variable	Value	Units	Source
Chronic Daily Intake – Adult	Sed_D_CDI_a	2.00E-06	mg/kg-d	Calculated
Chronic Daily Intake – Child	Sed_D_CDI_c	3.20E-06	mg/kg-d	Calculated
Concentration in Sediment	C_Sed	0.38	mg/kg	Site-Specific
Surface Area available for Contact – Adult	Sed_D_SA_a	5300	cm sq/event	USEPA 1992
Surface Area available for Contact – Child	Sed_D_SA_c	2327	cm sq/event	USEPA 1992
Sediment/Skin Adherence Factor – Adult	Sed_D_AF_a	1.00	mg/cm^2	USEPA 1992
Sediment/Skin Adherence Factor – Child	Sed_D_AF_c	1.00	mg/cm^2	USEPA 1992
Skin Absorption Constant – Adult	Sed_D_ABS_a	0.1	unitless	USEPA 1995
Skin Absorption Constant – Child	Sed_D_ABS_c	0.1	unitless	USEPA 1995
Exposure Frequency – Adult	Sed_D_EF_a	26	events/year	Site-Specific
Exposure Frequency – Child	Sed_D_EF_c	26	events/year	Site-Specific
Exposure Duration – Adult	Sed_D_ED_a	30	years	USEPA 1989
Exposure Duration – Child	Sed_D_ED_c	6	years	USEPA 1989
Body Weight – Adult	Sed_D_BW_a	70	kg	USEPA 1997c
Body Weight – Child	Sed_D_BW_c	19.7	kg	USEPA 1997c
Averaging Time – Carcinogen	Sed_D_AT_car		days	USEPA 1989
Averaging Time – Noncarcinogen – Adult	Sed_D_AT_nc_a	10950	days	USEPA 1997c
Averaging Time – Noncarcinogen - Child	Sed_D_AT_nc_c	2190	days	USEPA 1989

TABLE 5-7 UNCERTAINTIES IN RISK ASSESSMENT FOR FORT TOTTEN COAST GUARD STATION, BUILDING 615

Item	**Uncertainty Description**	**Magnitude**	**Direction**
1.	Data Collection/Analysis – • Collection of more samples in areas of known contamination • Use of ½ sample quantitation limit for estimating concentrations below the detection limit	• Low • Unknown	• Over • Over
2.	Exposure Assessment – • Lack of data on recreational catch of shellfish • Lack of site-specific data on fishing and beach combing activity • Lack of data on chemical form of mercury	• Small • Small • Large	• Under • Unknown • Over
3.	Toxicity Assessment – • Use of health-based benchmark based on epidemiology study • Modeling of fetal exposure to mercury from contaminated grain • Assumed bioavailability of mercury at the site in sediment, surface water, and fish was similar to that used in the RfD studies by USEPA.	• Unknown, but estimated to be small based on low uncertainty factor (10) applied to RfD • Medium	• Over • Unknown
4.	Risk Characterization – • Summation of risks/hazard across all exposure pathways	• High	• Over

Figure 5-1 Human Health Conceptual Site Model



6.0 HUMAN HEALTH RISK ASSESSMENT FOR UPLAND AREAS

6.1 INTRODUCTION

The purpose of this human health risk assessment (HHRA) was to determine whether there are potential human health risks associated with constituents of potential concern (COPCs) in environmental media in upland areas of the Fort Totten Coast Guard Station. The HHRA for the Coast Guard Station was conducted in accordance with USEPA's *Risk Assessment Guidance for Superfund (RAGS) Part A* (USEPA 1989) and with the USACE guidance document *Risk Assessment Handbook Human Health Evaluation, Volume I: Human Health Evaluation* (USACE 1995).

Data for this evaluation were taken at different sampling periods. Data from the first Site Investigation (SI) by Metcalf & Eddy in 1988 have not been included in this risk assessment. The 1998 SI data were not used because the data were not validated in accordance with USEPA requirements. Data from samples taken in 1998 during Phase 1 and 2000 during Phase 2 were combined and used for this HHRA. Detailed discussions regarding the sampling events are provided in Chapter 3.

Data have been characterized according to the locations associated with these samples. Areas that have been assessed independently for total soil include:

- PCB Area (Buildings 609 and 625)
- Pesticide Area (Building 624)
- Fill Area
- Other Area (e.g., all other soil samples)

These areas are shown in Figure 6-1. Risks from groundwater were characterized as one exposure unit across the entire site.

The samples associated with each of these areas which were included in the risk assessment are shown in Table 6-1.

The risk assessment methodology used in this HHRA involves a four-step process: hazard identification, exposure assessment, toxicity assessment, and risk characterization. A brief description of each step is provided below:

- In the *hazard identification*, environmental data are evaluated, COPCs are selected for inclusion throughout the remainder of the risk assessment, and the rationale for their selection is documented.

- In the *exposure assessment*, the human population, or groups of individuals potentially exposed to COPCs (i.e., potential human receptors) are characterized. From the many potential pathways of exposure, pathways applicable to potential receptors at the site are identified. The concentrations of COPCs in relevant media (e.g., soil, groundwater) are converted into systemic doses, taking into account rates of contact (e.g., ingestion rates) and absorption rates of different COPCs. The magnitude, frequency, and duration of these exposures are then integrated to obtain estimates of daily doses over a specified period of time (e.g., lifetime, activity-specific duration).

- In the *toxicity assessment*, the relationship between extent of exposure and extent of toxic injury or disease is estimated for each COPC. Chemical-specific toxicity values, such as cancer slope factors (SFs) and reference doses (RfDs) or reference concentrations (RfCs) for non-carcinogens are presented along with a discussion of their scientific basis and derivation.

- *Risk characterization* integrates the results of the toxicity assessment and the exposure assessment to derive quantitative estimates of human health risk, including both the risks of cancer and hazards of non-carcinogenic effects. The major uncertainties and limitations associated with the estimates of risk and their potential ramifications are presented in this section.

6.2 HAZARD IDENTIFICATION

A hazard identification was conducted to determine which constituents are of potential concern at the site. Typically in the hazard identification, site-specific data are analyzed and compared to risk-based screening values; however, for this risk assessment no screening was performed, and with the exception of essential nutrients, all chemicals detected in each of the matrix/location areas were carried through the risk assessment.

6.2.1 Conceptual Site Model and Identification of Potential Exposure Pathways

A conceptual site model was developed for the upland areas of the Fort Totten Coast Guard Station to depict the potential pathways of concern at the site and is provided in Figure 6-2 for soil and Figure 6-3 for groundwater.

6.2.1.1 Media of Concern

Media of concern included total soil (combined surface and subsurface soil) and groundwater as environmental transport media for the release of chemicals present in the upland areas of the Fort Totten Coast Guard Station.

6.2.1.2 Exposure Pathways and Receptors of Concern

An exposure pathway describes a mechanism by which a population or individual may be exposed to chemicals present at a site. A completed exposure pathway requires the following four components:

- A source and mechanism of chemical release to the environment;
- An environmental transport medium for the released chemical;
- A point of potential human contact with the contaminated medium; and
- A human exposure route at the point of exposure.

All four components must exist for an exposure pathway to be complete and for exposure to occur. Incomplete exposure pathways do not result in actual human exposure and are not included in the exposure assessment and resulting risk characterization.

The April 1998 final reuse plan (Fort Totten Redevelopment Authority 1998) proposed that the area remain in public ownership with uses as a publicly accessible park. Consequently, one category of the current and future receptors includes recreational adults and children. Children are much more sensitive receptors than adults; therefore, soil risks will be quantified for recreational adolescents (ages 6-15) (Figure 6-2). Adult recreational risks will be qualitatively addressed. While the plan is that the site would remain in public ownership, there is the potential that in the future the site may be sold for commercial or residential development. Therefore, total soil risks for residential adults and children and commercial workers will be quantified (Figure 6-2). In addition, it is possible that residential adults and children may be exposed to contaminants through the ingestion of homegrown fruits and vegetables. These risks will be quantified, and included in the other exposure pathways shown in Figure 6-2. Because it would be necessary to do construction for either of these potential future uses, risks from exposure to total soil for construction workers will be quantified (Figure 6-2). Finally, to be consistent with New York State requirements, risks for groundwater consumption and bathing by residential adults and children will be quantified, even though the groundwater is not presently used (Figure 6-3). It is unlikely that new residences would use the groundwater; rather, they likely would be connected to the public water system. For these reasons, it is unlikely that groundwater will be used by potential future residential adults and children. Because carcinogenic risks are evaluated on a lifetime risk basis, the residential adult and child calculated risks are combined to account for potential lifetime residential exposure to the site.

As a conservative measure, current and future recreational adolescents were evaluated for potential risks associated with incidental ingestion of, dermal contact with, and inhalation of particulates entrained from total soil (surface and subsurface), even though exposure to subsurface soil is not expected for this receptor. The use of total soil as the exposure medium is due to construction activities that may mix existing subsurface soil with surface soil.

Future resident adults and children were evaluated for potential risks associated with incidental ingestion of, dermal contact with, and inhalation of particulates entrained from total soil. Future residential adults and children will also be quantitatively assessed for the consumption of homegrown fruits and vegetables. Assessing residential risks for total soil, which assumes contact with both surface and subsurface soil, is a conservative estimate to ensure that site soil is evaluated for any potential future use.

Future commercial workers were evaluated for incidental ingestion of, dermal contact with, and inhalation of particulates from total soil. Commercial workers typically are not involved in digging scenarios where exposure to subsurface soil would occur; however, assessment of total soil risks represents a conservative estimate of exposure. As with residents, total soil was used as the exposure medium as a conservative measure to account for potential mixing of subsurface with surface soil as a result of construction activities.

Future construction workers are evaluated for incidental ingestion of, dermal contact with, and inhalation of particulates from total soil during excavation activities. It was assumed that construction workers would contact both surface and subsurface soil; therefore, exposure to total soil is evaluated.

The aquifer under the Fort Totten Coast Guard Station is not currently used as a water source. The salinity of Little Bay is approximately 20 parts per thousand, and potential intrusion of Little Bay surface water into the groundwater may be sufficient to make the groundwater undrinkable. However, future residential use of groundwater at the site was evaluated as a conservative measure. Future residential adult and child exposures to groundwater via tap water through ingestion and dermal pathways were assessed. Inhalation is a probable pathway of concern for groundwater when there are VOCs of concern in groundwater. Because VOCs were detected in groundwater, inhalation of volatile constituents while showering were assessed for the adult resident via shower model by Foster and Chrostowski (1987). It was assumed that children (up to age 6) would be bathing, and volatile inhalation is not a significant pathway of volatiles for this receptor.

6.2.2 COPCs Selected

Under most circumstances, analytes detected in media of concern such as soil or groundwater are screened using risk-based toxicity values; however, for this HHRA, if metals or chemicals were detected in a medium, they were considered to be COPCs, and risks were quantified for them. The exception to this is that risks for essential nutrients (calcium, iron, magnesium, potassium, and sodium) have not been quantified due to their inherent importance for human health and their relatively low toxicity.

Analytes detected in total soil from the Fill Area are summarized in Table 6-2. Once the five essential nutrients were removed, 18 metals were detected and require quantitative risk assessment in this area. In addition, 17 PAHs, 5 SVOCs, and 7 VOCs were detected and will be quantitatively assessed. Similarly, 18 metals, 16 PAHs, 10 SVOCs, and 7 VOCs will require quantitative risk characterization in the Other Area (Table 6-3).

The only analyte type characterized in the Pesticide Area was pesticides, eight of which were detected at least once requiring quantitative risk characterization (Table 6-4). In the PCB Area, Aroclor was not detected in any sample (Table 4-6); consequently, quantitive risk assessment was not performed for the PCB area.

Finally 13 nonessential metals, 16 PAHs, one pesticide, 7 SVOCs, and 13 VOCs were detected at least once in groundwater (Table 6-5) and will be quantitatively assessed for risk to residential adults and children.

6.3 EXPOSURE ASSESSMENT

An exposure assessment is conducted to estimate the magnitude of potential human exposures to COPCs in site media. Typically in exposure assessment, average and reasonable maximum estimates (RME) of potential exposure are developed in accordance with USEPA guidance for both current and potential future land-use assumptions. However, average exposure estimates are rarely utilized for HHRA, and consequently only RME risks are presented in this risk assessment. Conducting an exposure assessment involves analyzing releases of COPCs; identifying all potential pathways of exposure; estimating RME exposure point concentrations for specific pathways, based both on environmental monitoring data and predictive chemical modeling results; and estimating potential chronic daily intakes for specific pathways. The results of this assessment are pathway-specific estimates of potential intakes for current and future exposures to individual chemicals of potential concern.

6.3.1 Quantification of Potential Exposures

The first step of the exposure assessment is to quantify potential exposure concentrations. This involves the evaluation of site data and the quantification of exposure concentrations for RME exposure scenarios.

6.3.1.1 Data Quality Evaluation

Inclusion or exclusion of data on the basis of analytical qualifiers was performed in accordance with USEPA guidance (USEPA 1989). Highlights related to the HHRA are presented here:

- Analytical results bearing the U qualifier (indicating that the analyte was not detected at the given sample quantitation level) were retained in the data set and considered non-detects. Where warranted for statistical purposes, each COPC was assigned a numerical value of one-half of the reported detection limit.

- Analytical results rejected were assigned an R qualifier (Appendix G), and were not included in the risk assessment.

- Analytical results bearing the J qualifier [indicating that the reported value was estimated because the analyte was detected at a concentration below the sample quantitation limit (SQL) or for other reasons] were retained at the reported concentration.

- Analytical results showing any other qualifiers (B, N, *, P, D, E-see Tables 6-2 through 6-5) were retained at the reported concentration.

- Concentrations from duplicate samples were averaged to determine the appropriate concentration for that specific sample.

Common laboratory contaminants, including acetone, 2-butanone, methylene chloride, chloroform, toluene, phthalate esters, and uncommon laboratory contaminants were considered to be COPCs unless it was evident that their presence was not related to site-specific activities but were due to laboratory contamination.

6.3.1.2 Estimation of RME Concentrations

To assess human health risks, a statistical analysis of the COPC concentrations in each medium was performed. The methods used to analyze the data for each of these media are described below.

Total soil and groundwater are potential site media of concern. For total soil and groundwater, reported concentrations were used to calculate the 95 upper confidence limit of the mean (95 UCLM) for COPCs in each medium (USEPA 1992b). Exposure point concentrations (EPCs) in site media were estimated as the 95 UCLM values for purposes of estimating the RME. In cases where the 95 UCLM values exceeded the maximum detected concentration, the maximum detected concentration was used.

The first step in estimation of EPC was to determine whether medium-specific environmental data for a COPC were normally or log-normally distributed. This was accomplished with the Shapiro-Wilks W-test for distribution (Gilbert 1987). The distribution was determined by comparison of the calculated W-statistic with critical W-statistic values. If the distribution fit neither normal or log-normal, a standard bootstrap method was used to estimate the 95 UCLM. Analysis using the standard bootstrap method is further discussed below.

If the statistical test supported the assumption that the data set for a COPC was normally distributed the following steps were undertaken to calculate 95 UCLM (USEPA 1992a): (1) calculate the arithmetic mean of the untransformed data; (2) calculate standard deviation of the untransformed data; (3) determine the one-tailed t-statistic (Gilbert 1987); and (4) calculate 95 UCLM using the equation given below:

$$95\,UCLM = (\bar{x} + t\ s\ /\ \sqrt{n})$$

where:

95UCLM = 95th percentile upper confidence limit on the mean

x = Mean of the untransformed data

s = Standard deviation of the untransformed data

t = Student-t statistic

n = Number of samples in the data set

For a log-normally distributed COPC, the following steps were performed to calculate 95 UCLM. Because transformation is a necessary step in calculating the UCLM for a log-normal distribution, the data were transformed by using the natural logarithm function (i.e., calculate ln(x), where x is the value from the data set). After transforming the data, 95 UCLM for the data set was found by calculating the arithmetic mean of the transformed data; calculating standard deviation of the transformed data; determining H-statistic (Gilbert 1987); and calculating 95 UCLM using the equation given below:

$$95\,UCLM = e^{(\bar{x} + 0.5\ s^2 + sH\ /\ \sqrt{n-1})}$$

where:

95UCLM = 95th percentile upper confidence limit on the mean

e = Constant (base of the natural logarithm; equal to 2.718)

x = Mean of the transformed data

s = Standard deviation of the transformed data

H = H-Statistic

n = Number of samples in the data set

For cases where the distribution of analyte concentrations deviated strongly from both normal and log-normal distributions, the 95 UCLM was determined using standard bootstrap estimation. The bootstrap approach (Efron 1981) gives a convenient way to estimate the standard error of a sample statistic, $\hat{\theta}$, without making any assumptions of how the original data are distributed. The following is a brief description of how the standard bootstrap procedure is used to estimate the upper confidence limit (UCL) of a sample statistic (Singh et al. 1997).

Step 1. From the original sample $\boldsymbol{X_n} = (X_1, X_2, \ldots, X_n)$; where the deviates X_i are independently and identically distributed, draw a sample of n observations with replacement such that each observation has the same probability of being drawn ($=\frac{1}{n}$). The new data set is called the bootstrap sample, and is typically denoted as $\boldsymbol{X}_{\boldsymbol{n}}^{*} = (X_1^*, X_2^*, \ldots, X_n^*)$.

Step 2. Compute the sample statistic, $\hat{\theta}^*$, of interest (in this case the sample mean $\overline{X}$) from $\boldsymbol{X}_{\boldsymbol{n}}^{*}$.

Step 3. The procedures in Steps 1 and 2 are repeated 2,000 times generating 2,000 bootstrap estimates of the sample statistic. The general bootstrap estimate is the arithmetic mean of the 2,000 estimates, $\overline{\theta}_B = \frac{1}{2000}\sum_{i=1}^{2000}\hat{\theta}_i^*$. The bootstrapped standard error of $\hat{\theta}$, denoted by $\hat{\sigma}_B$, is given by

$$\hat{\sigma}_B = \sqrt{\frac{1}{2000-1}\sum_{i=1}^{2000}\left(\hat{\theta}_i - \overline{\theta}_B\right)^2}\,.$$

Step 4. Finally, the (1-p)100% confidence limits of $\hat{\theta}$ are given by

$$\hat{\theta} \pm z_p \hat{\sigma}_B.$$

where z_p is the p^{th} quantile of the standard normal distribution.

Tables 6-6 through 6-8 shows the RME EPC for each COPC in total soil for the Fill Area, Other Area, and Pesticide Area respectively. Table 6-9 summarizes the RME EPC for groundwater COPCs. The RME EPC value was utilized as the chemical-specific, medium-specific EPC in the exposure assessment for the risk assessment.

6.3.2 Exposure Equations

The next step in the exposure assessment was to estimate COPC intakes for each of the pathways considered in the assessment. In this exposure assessment, two different measures of intake, depending on the nature of the effect being evaluated, are provided. When evaluating longer-term (i.e., subchronic and chronic) exposures to chemicals that produce adverse non-carcinogenic effects, intakes are averaged over the period of exposure (i.e., the averaging time [AT]) (USEPA 1989). This measure of intake is referred to as the non-carcinogenic average daily intake (ADI) and is a less than lifetime exposure. For chemicals that produce carcinogenic effects, intakes are averaged over an entire lifetime and are referred to as the lifetime average daily intake (LADI) (USEPA 1989).

The generic equation to calculate intakes is given below:

$$(L)ADI = \frac{C \text{ x } IF \text{ x } EF \text{ x } ED \text{ x } RAF}{BW \text{ x } AT} \text{ x CF}$$

where:

$(L)ADI$ = (Lifetime) Average daily intake (mg/kg-day)

C = Concentration in a specific medium (mg/L or mg/kg)

IF = Intake factor[1] (mg/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

RAF = Relative absorption factor (unitless)

BW = Body weight (kg)

AT = Averaging time (days)

CF = Conversion Factor (10^{-6} kg/mg)

The daily intake of COPC from ingested homegrown produce (I_{ag}) was calculated using the following equation (USEPA 1998c):

$$I_{ag} = [(\Pr_{ag} \times CR_{ag}) + (\Pr_{pp} \times CR_{pp}) + (\Pr_{bg} \times CR_{bg})] \times F_{ag}$$

where:

Pr_{ag}, Pr_{pp}, and Pr_{bg} = COPC concentrations in aboveground produce, aboveground protected produce, and belowground produce respectively (mg/kg DW),

Crag, CRpp, and CRbg = consumption rate of aboveground produce, protected aboveground produce, and belowground produce respectively (kg/kg-day DW), and

Fag = fraction of produce consumed from contaminated area (unitless).

The dose from homegrown produce was calculated using:

$$(L)ADI = \frac{I_{ag} \times EF \times ED}{AT}$$

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[1] The intake factor is the product of all intake variables that, when multiplied by the concentration of the chemical of potential concern in a specific medium, results in an estimate of the chemical intake in mg/kg-day for that population and exposure pathway. Intake factors may include ingestion rate, inhalation rate, body surface area exposed to soil or water, dermal permeability constants, and soil adherence factors.

where all terms are defined as above.

6.3.3 Selection of Exposure Factor Values

All exposure factor values used in estimating intakes are described and referenced in Tables 6-10 to 6-19. The following guidance documents were used in defining exposure factor values for estimating intakes for exposure pathways evaluated at upland areas of the Fort Totten Coast Guard Station:

- *Risk Assessment Guidance for Superfund (RAGS) Volume I Human Health Evaluation Manual Part A*, U.S. EPA December 1989 (USEPA 1989).

- Office of Solid Waste and Emergency Response (OSWER) Directive 9285.6-03; *Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"* (USEPA 1991).

- *Exposure Factors Handbook, Volume I, General Factors*, August 1997 (USEPA 1997d).

- *Dermal Exposure Assessment: Principles and Applications* (USEPA 1992a).

- *Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Interim Guidance* (USEPA 2000a).

- *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities*. (USEPA 1998c).

For all exposure pathways that have exposure factor values specified in RAGS Part A and in OSWER Directive 9285.6-03, those values were used in this risk assessment. Dermal Guidance documents from USEPA (1992a and 2000a) were also utilized. All exposure factor values utilized are presented in the following sections.

6.3.3.1 Future Residents

Future residential users may potentially be exposed to COPCs via total soil and groundwater. Both adults and children were assessed for the residential scenario. Cancer risks were assessed based on combined child/adult risks for a total exposure of 30 years. Non-cancer risks for residential adults were based on a 30-year exposure and for children on a 6-year exposure.

Residential Adults – Exposure parameters for residential adult exposure are presented in Table 6-10 for total soil and Table 6-11 for groundwater. Body weight for the adult resident was assumed to be 70 kg. Under RME conditions, future adult residents were assumed to have an exposure duration of 30 years for non-carcinogenic hazards and an exposure duration of 24 years for carcinogenic risks. Both carcinogenic and non-carcinogenic risks had an exposure frequency of 350 days/year. Surface area available for dermal exposure to soil was assumed to be 5,700 cm^2. An adherence factor of 0.07 mg/cm^2 for soil was assumed (USEPA 2000a). An inhalation rate of 0.83 m^3/hr for 24 hr/day for soil was conservatively assumed (Table 6-10). The residential adult RME groundwater ingestion rate was assumed to be 2 liters per day (Table 6-11). Other standard groundwater exposure parameters were used for ingestion and dermal contact, and are shown in Table 6-11. Surface area exposed to groundwater while bathing/showering was assumed to be 18,000 cm^2 for 0.58 hour (35 minutes) exposure time (Table 6-11). Exposure values used to assess volatilization and inhalation of volatile organic chemicals while showering are shown in Table 6-12. Consistent with the upper limit of exposure, a 15-minute shower for 350 days/year for 30 years was assumed for this risk assessment (Table 6-12). Exposure constants for the adult residential consumption of homegrown vegetables are shown in Table 6-13. Consistent with combustion guidance (USEPA 1998c), different consumption rates were used for aboveground produce, belowground produce (carrots or potatoes), and aboveground protected produce (vegetables with a skin that is removed such as cucumbers). Also consistent with the combustion guidance, it was assumed that 25 percent of consumed produce was contaminated. Finally, it was assumed that this exposure would occur for 2 months out of the year (60 days) (Table 6-13).

Residential Children – Exposure parameters for child resident exposure are presented in Table 6-14 for total soil and Table 6-15 for groundwater. Body weight for the future child resident was assumed to be 15 kg. Under RME conditions, future child residents were assumed to have a 6-year exposure duration with an exposure frequency of 350 days/year. RME surface area available for dermal exposure to soil was assumed to be 2,800 cm^2 with an adherence factor of 0.2 (USEPA 2000a). An inhalation rate of 0.417 m^3/hr for 24 hr/day was assumed (USEPA 1991). The residential child RME groundwater ingestion rate was assumed to be 1 liter per day (Table 6-14). RME surface area exposed to groundwater while bathing was assumed to be 6,600 cm^2 for 1.0 hour exposure time. As noted in the exposure pathway discussion, inhalation of volatiles by children during bathing was assumed to be *de minimus*, and therefore risks for this exposure scenario were not quantified. Exposure constants for the child residential consumption of homegrown vegetables are shown in Table 6-16. Consistent with combustion guidance (USEPA 1998c), different consumption rates were used for aboveground produce, belowground produce (carrots or potatoes), and aboveground protected produce (vegetables with a skin that is removed such as cucumbers). Also consistent with the combustion guidance, it was assumed that 25 percent of consumed produce was contaminated. Finally, it was assumed that this exposure would occur for 2 months out of the year (60 days) (Table 6-16).

6.3.3.2 Current and Future Adolescent Recreational User

Exposure parameters for adolescent recreational user exposure are presented in Table 6-17 for total soil. The age range of the adolescent recreational user was assumed to be 6 to 15 years, and the body weight for the adolescent recreational user was assumed to be 36 kg. Under RME conditions, adolescent recreational users were assumed to have an exposure duration of 9 years with an exposure frequency of 141 days/year. This exposure frequency is based on an average of the mean days of outdoor activity for a young child (130 days/year) and an older child (152 days/year) (USEPA 1997d). A surface soil ingestion rate of 200 mg/day was assumed. RME dermal exposure to soil was based on 2,900-cm^2 surface area. The dermal adherence factor was assumed to be 0.3 mg/cm^2 based on teenaged soccer players exposed to moist soil (USEPA 2000a). The RME inhalation rate was assumed to be 0.83 m^3/hr for particulates over an exposure time of 10 hr/day.

6.3.3.3 Construction Worker

Total soil exposure parameters for construction worker exposure are presented in Table 6-18. Body weight for the construction worker was assumed to be 70 kg. Under RME conditions, future construction workers were assumed to have an exposure duration of 1 year with an exposure frequency of 150 days/year. The exposure frequency was determined by assuming the construction worker would be at the site 5 days a week for 30 weeks. Skin surface area available for contact with total soil during construction activities was assumed to be 3,300 cm^2. Incidental ingestion of soil was assumed to be 480 mg/day (USEPA 1997d). The RME inhalation rate was assumed to be 0.83 m^3/hr for total soil particulate over an exposure time of 8 hr/day.

6.3.3.4 Commercial Worker

Exposure parameters for commercial worker exposure are presented in Table 6-19 for total soil. Body weight for the commercial worker was assumed to be 70 kg. Under RME conditions, commercial workers were assumed to have an exposure duration of 25 years with an exposure frequency of 250 days/year. A soil ingestion rate of 50 mg/day was assumed. Dermal exposure to soil was based on 5,700 cm^2 surface area based on a residential adult and 0.1 mg/cm^2 adherence factor based on groundskeepers (USEPA 2000a). The RME inhalation rate was assumed to be 0.83 m^3/hr for particulates over an exposure time of 8 hr/day.

6.3.3.5 Modeling Contaminant Concentrations in Homegrown Produce

Concentrations of COPCs in homegrown produce were estimated based on models found in the literature (USEPA 1998c, Baes et al. 1984, Bechtel Jacobs 1998, and Travis and Arms 1988). The order in which the different models were used was:

1. USEPA (1998c) is guidance provided by the Center for Combustion Science and Engineering. Equations presented in Appendix Tables B-2-9 and B-2-10 were used to estimate COPC concentrations in aboveground and belowground produce respectively. Chemical specific parameters used in these equations were taken from Appendix A-3 of this guidance.

2. In the absence of chemical-specific parameters in USEPA (1998c), the next reference used to estimate produce concentrations was Bechtel Jacobs (1998). This guidance from Oak Ridge lists regression equations to estimate vegetation concentrations relative to soil concentrations. This was only used to calculate copper produce concentrations.

3. In the absence of accumulation factors in the above two references, Baes et al. (1984) was used for metals (aluminum, cobalt, manganese, and vanadium) and Travis and Arms (1988) was used for organic chemicals (acenaphthylene, benzo(g,h,i)perylene, carbazole, and dibenzofuran).

The details of equations used for these various sources are discussed below, and chemical-specific parameters for each COPC are shown in Table 6-20.

The combustion guidance (USEPA 1998c) provides equations for the calculation of aboveground produce and belowground produce. Aboveground produce contaminant concentrations are calculated using the following equation:

$$\mathrm{Pr}_{ag} = Cs \times Br_{ag}$$

where:

Pr_{ag} = Concentration of COPC in aboveground produce due to root uptake (mg/kg DW),
Cs = Concentration of COPC in soil (mg/kg DW), and
Br_{ag} = Plant-soil bioconcentration factor for aboveground produce.

Belowground produce concentrations were calculated using the following equation:

$$\Pr_{bg} = Cs \times Br_{rootveg} \times VG_{rootveg}$$

where:

Pr_{bg} = Concentration of COPC in belowground produce due to root uptake (mg/kg DW),
$Br_{rootveg}$ = Plant-soil bioconcentration factor for belowground produce (unitless), and
$Vg_{rootveg}$ = Empirical correction factor for belowground produce (unitless).

For the uptake of copper into plants, Bechtel Jacobs (1998) used to estimate copper concentrations. This source derived a log-log regression equation directly relating expected concentrations in plants relative to concentrations in the soil:

$$\ln [X]_{plant} = B_0 + B_1 x \ln [X]_{soil}$$

where:

$\ln[X]_{plant}$ = the natural log of the concentration of chemical X in earthworm, plant or small mammal (mg/kg DW),
B_0 and B_1 are constants identified in Bechtel Jacobs (1998) for plants (0.669 and 0.394 for copper, respectively),
and $\ln [X]_{soil}$ = the natural log of the concentration of copper in soil (mg/kg DW).

The inverse of the natural log plant concentration was then taken, and used as the estimated copper concentration in plants.

For the metals that were not addressed in the Combustion Guidance (USEPA 1998c) Baes et al. (1984) was used to estimate concentrations of selected COPCs (aluminum, cobalt, manganese, and vanadium) in aboveground vegetation and protected aboveground vegetation (cucumbers, etc.). These authors examined the uptake of metals into these parts of vegetation, and derived bioconcentration factors.

For the quantification of metals in aboveground vegetation:

$$C_v = B_v \times C_s$$

where:

C_v = concentration of metal in aboveground produce (mg/kg dry),
B_v = soil to plant bioconcentration factor for vegetative portions of the plant (unitless), and

C_s = concentration of metal in soil (mg/kg dry).

For the quantification of metals in aboveground protected vegetation:

$$C_r = B_r \times C_s$$

where:

C_r = concentration of metal in aboveground protected produce (mg/kg dry), and
B_r = soil to plant bioconcentration factor for protected aboveground portions of the plant (unitless),

For organic chemicals not specifically addressed in the combustion guidance (USEPA 1998c), a regression equation derived by Travis and Arms (1988), based on the chemical's log K_{ow}, was used to estimate produce concentrations:

$$\log B_v = 1.588 - 0.578 \times \log K_{ow}$$

where log B_v = the base 10 log value of the bioconcentration factor, and log K_{ow} is the chemical's physical property.

If any specific type of produce concentration was not calculable (for example belowground produce from Baes equations or protected aboveground concentrations from combustion guidance calculations), concentrations from aboveground produce were utilized for exposure concentrations.

Constants used in the above equations are shown in Table 6-20 and predicted concentrations of aboveground, belowground, and protected produce are shown in Table 6-21.

6.4 TOXICITY ASSESSMENT

The toxicity assessment considers the types of potential adverse health affects associated with exposures to COPCs; the relationship between magnitude of exposure and potential adverse effects; and related uncertainties, such as the weight of evidence of a particular COPC's carcinogenicity in humans. The toxicity assessment for COPCs relies on existing toxicity information developed on specific organic compounds and inorganic constituents. USEPA Guidance (USEPA 1989) specifies that the assessment is accomplished in two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining whether studies claim that exposure to a COPC may cause the incidence of an adverse effect. USEPA specifies the dose-response assessment, which involves: (1) USEPA's quantitative evaluation of the existing toxicity information, and (2) USEPA's characterization of the relationship between the dose of the COPC administered or received, and the incidence of potentially adverse health effects in the exposed population. From this quantitative dose-response relationship, specific toxicity values are derived by USEPA that can be used to estimate the incidence of potentially adverse effects occurring in humans at different exposure levels (USEPA 1989). These USEPA-derived toxicity values are called Reference Doses (RfDs) for non-carcinogens and Slope Factors (SFs) for potential carcinogens. The toxicity values used for COPCs at the Fort Totten Coast Guard Station are presented in Tables 6-22 and 6-23 for non-carcinogens and in Tables 6-24 and 6-25 for carcinogens. Chemical-specific parameters including absorption factors (ABS) and permeability constants are shown in Table 6-26.

6.4.1 Toxicity Assessment for Non-Carcinogens

For most COPCs, toxicity values for non-carcinogens were taken, when available, from the Integrated Risk Information Systems (IRIS) database (USEPA 2001). IRIS chronic toxic potency concentrations are developed by USEPA and undergo an extensive process of scientific peer review. Therefore, IRIS values are judged to be adequately verified.

If toxic potency concentrations for COPCs were not available from IRIS (USEPA 2001), Health Effects Assessment Summary Tables (HEAST) (USEPA 1997e) were used as a secondary data source. As HEAST toxicity values are not scientifically peer-reviewed for quality or scientific acceptability, they may not be derived in strict accordance with USEPA-approved methodologies.

In the absence of toxicity data from IRIS or HEAST, toxicity data from the USEPA National Center for Environmental Assessment information (NCEA) was used for toxicity information.

If toxic potency concentrations were not available for one route of exposure, but existed for another route—for example, if an oral RfD existed but no inhalation RfD—the existing value was examined for technical applicability to the alternate route and subsequently utilized, if appropriate.

The methodology used by USEPA for deriving toxic potency concentrations for non-carcinogens, and site-specific considerations for modifying or using these concentrations are discussed in detail in Barnes and Dourson (1988) and USEPA guidance (USEPA 1989). Non-carcinogens are typically judged to have a threshold daily dose below which deleterious or harmful effects are unlikely to occur. This concentration is called the no-observed-adverse-effect-level (NOAEL) and may be derived from either animal laboratory experiments or human epidemiology investigations (usually workplace studies). In developing a toxicity value or human NOAEL for non-carcinogens (i.e., an RfD), the regulatory approach is first to (1) identify the critical toxic effect associated with chemical exposure (i.e., the most sensitive adverse effect); (2) identify the threshold dose in either an animal or human study; and (3) modify this dose to account for interspecies variability (where appropriate), differences in individual sensitivity (within-species variability), and other uncertainty and modifying factors. Uncertainty factors are intended to account for specific types of uncertainty inherent in extrapolation from the available data. Modifying factors account for the concentration of confidence in the scientific studies from which toxicity values are derived, according to such parameters as study quality and study reproducibility. The use of these factors is a conservative approach for protection of human health and is likely to overestimate the toxic potency associated with chemical exposure. The resulting RfD is expressed in units of milligrams of chemical per kilogram of body weight per day (mg/kg-bw/day).

Toxicity values used for exposures that involve dermal contact with chemicals typically require adjustment of the oral toxicity values (oral RfDs). This adjustment accounts for the difference between the daily intake dose through dermal contact as opposed to ingestion. Most toxicity values are based on the actual administered dose, and must be corrected for the percent of chemical-specific absorption that occurs across the gastrointestinal tract prior to their use in dermal contact risk assessment (USEPA 1989, 1992a and 2000a). USEPA (1998 and 2000a) recommend that dermal risks from PAHs not be addressed quantitatively, but rather that dermal risks from PAHs be discussed qualitatively. This is the approach taken for this HHRA. Dermal factors applied for this risk assessment are shown in Table 6-22 and 6-24 for non-cancer and cancer toxicity respectively.

6.4.2 Toxicity Assessment for Carcinogenicity

Unlike non-carcinogens, carcinogens are assumed to have no threshold. There is presumed to be no level of exposure below which carcinogenic effects will not manifest themselves. This "non-threshold" concept supports the idea that there are small, finite probabilities of inducing a carcinogenic response associated with every level of exposure to a potential carcinogen. The "no threshold" assumption is a science-policy decision, which is health protective, yet is not universally accepted within the scientific community. USEPA uses a two-part evaluation for carcinogenic effects. This evaluation includes the assignment of a weight-of-evidence classification and the quantification of a cancer toxic potency concentration. Quantification is expressed as a slope factor, which reflects the dose-response data for the carcinogenic endpoint(s) (USEPA 1989).

The weight-of-evidence classification system assigns a letter or alphanumeric (A through E) to each potential carcinogen that reflects an assessment of its potential to be a human carcinogen.[2] The

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[2] A = a known human carcinogen; B1 = a probable human carcinogen, based on sufficient animal data and limited human data; B2 = a probable human carcinogen based on sufficient animal data and inadequate or no human data; C = a possible

weight-of-evidence classification is based on a thorough scientific examination of the body of available data. Only compounds that have a weight-of-evidence classification of A, B, or C are considered to have carcinogenic potential in this risk assessment. In 1996 USEPA published a document titled *Proposed Guidelines for Carcinogenic Risk Assessment* (USEPA 1996b). This document discusses changes in the USEPA risk estimation method away from tumor findings in animals and humans towards a more expanded approach that allows the incorporation of recent more sophisticated methods of assessing the carcinogenicity of a chemical. For example, if a chemical is found to be carcinogenic from only one route of exposure and not others, the method allows modification of the cancer slope factors to allow this in risk assessments. An example of this is the recent change in the cancer risk potential for beryllium, now focussing on the inhalation exposure route only and finding the element to be non-carcinogenic from other exposure pathways such as oral ingestion.

The USEPA slope factor is the upper 95th percentile confidence limit of the probability of response per unit daily intake of a chemical over a lifetime. Typically, the slope factor is used to estimate the upper-bound lifetime probability of a person developing cancer from exposure to a given concentration of a carcinogen. Slope factors are generally based on experimental animal data, unless suitable epidemiological studies are available. Due to the difficulty in detecting and measuring carcinogenic endpoints at low exposure concentrations, slope factors are typically developed by using a model to fit the available high-dose, experimental animal data, and then extrapolating downward to the low-dose range to which humans are typically exposed. USEPA usually employs the linear multistage model to derive a slope factor. The model is conservative, and provides an upper bound estimate of excess lifetime cancer risk. Thus, the actual risk may be lower and could be zero (USEPA 1989). These methods and approaches are discussed in greater detail in USEPA (1989).

Carcinogenic slope factors used for exposures that involve dermal contact typically require adjustment of the oral slope factor. This accounts for the difference between the dermal dose and the ingested dose. Most toxicity values are based upon the actual administered dose. The values must be corrected for the percent of chemical-specific absorption that occurs across the gastrointestinal tract prior to use in dermal contact risk assessments (USEPA 1989). As discussed above, USEPA (1989) has recommended a qualitative assessment of toxicity for PAHs, which has been done in this risk assessment. For inhalation exposures, inhalation slope factors are developed if sufficient data are available.

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human carcinogen; D = not classifiable as to human carcinogenicity; and E = evidence of non-carcinogenicity for humans.

6.4.3 Toxicity of Constituents of Potential Concern

A review of relevant toxicity data for each COPC was performed using IRIS (USEPA 2001), a peer-reviewed toxicity database. If toxicity data were not found in IRIS toxicity data were taken from HEAST (USEPA 1997e), NCEA or ATSDR.

6.4.3.1 Summary of Toxicity Values for Non-Carcinogenic Effects

USEPA-derived toxicity values for evaluating potential chronic non-carcinogenic effects for COPCs are summarized in Tables 6-22 and 6-23. Toxicity information presented in these tables includes the following USEPA provided/derived information: chronic or subchronic RfD values for exposures via the oral and inhalation pathway, reported target organs, uncertainty and modifying factors specific to the USEPA-derived RfD, and the scientific source of the information.

6.4.3.2 Summary of Toxicity Values for Potential Carcinogenic Effects

USEPA-derived toxicity values for evaluating potential carcinogenic effects for COPCs are summarized in Tables 6-24 and 6-25. Toxicity information presented in these tables includes the following USEPA provided/derived information: a chemical-specific slope factor (cancer potency factor) for exposures via the oral and inhalation pathway, USEPA's weight-of-evidence cancer classification, and the scientific source of the information.

6.4.3.3 Lead Toxicity

According to USEPA, lead is classified as a B2-probable human carcinogen. However, there is no USEPA value for use as a slope factor in quantifying cancer risks. In the absence of any USEPA-published toxicity values for lead, it is currently not possible to perform a quantitative risk estimate for lead exposures using standard USEPA methodology. The current USEPA guidance sets forth an interim soil cleanup level for total lead at 400 ppm (USEPA 1998a) which is considered "protective for direct contact at residential settings." According to USEPA, this guidance adopts the recommendation in the 1985 Centers for Disease Control (CDC) statement on childhood lead poisoning and is to be followed when the current or future land use is residential. The recommendation states that, "...lead in soil and dust appears to be responsible for blood levels in children increasing above background levels when the concentration in soil or dust exceeds 500 to 1,000 ppm."

Infants and young children are the most vulnerable populations exposed to lead and were the focus of USEPA's risk assessment efforts. The relatively high vulnerability of infants and children results from a combination of factors: (1) an apparent intrinsic sensitivity of developing organs to lead; (2) behavioral characteristics that increase contact with lead from soil and dust (e.g., mouthing behavior); (3) various physiologic factors resulting in a greater deposition of airborne lead in the respiratory tract and greater adsorption efficiency from the gastrointestinal tract in children than in adults; and (4) transplacental transfer of lead that establishes a lead burden in the fetus, thus increasing the risk associated with additional exposure during infancy and childhood.

For resident children, the risks associated with lead were estimated using the USEPA Integrated Exposure Uptake Biokinetic (IEUBK) Model. The IEUBK Model is used to estimate blood lead concentrations resulting from exposure to environmental sources. The IEUBK Model is a three-stage method for estimating total blood lead levels. First, the intake of lead from each source is assessed. Second, the uptake of lead from each source is determined. Finally, the relationship between the uptake of lead and blood lead concentration is applied using the "Integrated Metabolic Model for Humans of All Ages" (USEPA 1997f). The IEUBK model incorporates total uptake of lead derived from all exposures and the distribution of lead to the four body compartments (blood, bone, liver, and kidney) in which 95 percent of the lead is found. The model was developed based on the distribution and equilibrium of stable lead and a naturally occurring radioactive lead isotope in the bodies of infant and child baboons, and in humans during continuous lead exposure. Model validation has been performed by using data collected from lead smelter sites, by using experimental data on blood lead concentrations in infants, and by studies of lead accumulation in bones under controlled conditions in adults (USEPA 1997f). The model predicts a linear increase in blood lead with increasing lead uptake. However, above a blood lead concentration of 30 µg/dL, the relationship is not linear (USEPA 1997f). Therefore, this model may only be applied for moderately low lead uptakes. USEPA has created a software program of the IEUBK Model, for predicting blood lead levels in children ages 0-84 months, for use on a personal computer. The most current software is LEAD version 0.99D (LEAD99D). LEAD99D was used in this assessment for estimating blood lead levels in children at this site. Standard default values used as input parameters for the model are described in USEPA Guidance (USEPA 1997f). The model output is a probability distribution function describing the percentage of children predicted to have blood levels exceeding 10 µg/dL.

In addition to estimating lead risks for children, the USEPA Technical Review Workgroup for Lead (TRW) has developed a model to predict blood-lead levels in adult workers (USEPA 1996). This model was run to assess potential workers under a commercial setting. Model default parameters were used to predict blood lead impacts for female workers and their potential children at the site.

The NYDOH does not reply on the lead models developed by USEPA that were used in the report, rather the NYSDOH uses the concentrations provided in USEPA's guidance on lead concentrations in soil (Federal Register, Vol. 66, No. 4, 5 January 2001). However, the concentrations used in the USEPA's guidance were developed using the models described in this report. Consequently, there is no difference between the results obtained by the model and the use of the guidance.

6.5 RISK CHARACTERIZATION

Risk characterization is the final step of the HHRA process. In this step, the toxicity values were combined with the estimated chemical intakes for the receptor populations to quantitatively estimate both carcinogenic and non-carcinogenic risks. Risks were estimated for the following receptor populations:

- Residents (Adult, Child)
- Adolescent Recreational User
- Construction Workers
- Commercial Workers

The methodologies used to estimate cancer risks and chronic and subchronic hazards for non-carcinogens are described further in the sections below.

6.5.1 Hazard Index for Non-Carcinogenic Effects

The potential human health hazard associated with exposures to non-carcinogenic COPCs at Fort Totten Coast Guard Station were estimated by comparing the ADI with the RfD, as per USEPA Guidance (USEPA 1989). A hazard quotient (HQ) was derived for each COPC, as shown in the equation below:

$$HQ = \frac{ADI}{RfD}$$

where:

HQ = Hazard Quotient; ratio of average daily intake level to acceptable daily intake level (unitless)

ADI = Estimated average daily dose (mg/kg-day)

RfD = Reference dose (mg/kg-day)

If the average daily dose exceeds the RfD, the HQ will exceed a ratio of one (1.0) and there may be concern that potential adverse systemic health effects will be observed in the exposed populations. If the ADI does not exceed the RfD, the HQ will not exceed 1.0 and there will be no concern that potential adverse systemic health effects will be observed in the exposed populations. However, if the sum of several HQs exceeds 1.0, and the COPCs affect the same target organ, there may be concern that potential adverse systemic health effects will be observed in the exposed populations. In general, the greater the value of the HQ above 1.0, the greater the level of concern. However, the HQ does not represent a statistical probability that an adverse health effect will occur.

For consideration of exposures to more than one chemical causing systemic toxicity via several different pathways, the individual HQs are summed to provide an overall hazard index (HI). If the HI is less than 1.0, then no adverse health effects are likely to be associated with exposures at the site. However, if the total HI is greater than 1.0, separate endpoint-specific HIs may be calculated based on toxic endpoint of concern or target organ (e.g., HQs for neurotoxins are summed separately from HQs for renal toxins). Only if an endpoint-specific HI is greater than 1.0 is there reason for concern about potential health effects for that endpoint.

6.5.2 Cancer Risks

Carcinogenic risk was estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a potential carcinogen at the site. The numerical estimate of excess lifetime cancer risk was calculated by multiplying the CADI by the risk per unit dose (the slope factor), as shown in the following equation:

$$Risk = CADI \times SF$$

where:

$Risk$ = The unitless probability of an exposed individual developing cancer
$CADI$ = Lifetime cancer average daily dose (mg/kg-day)
SF = Cancer slope factor $(\text{mg/kg-day})^{-1}$

Because the slope factor is the statistical 95th percent upper-bound confidence limit on the dose-response slope, this method provides a conservative, upper-bound estimate of risk.

It should be noted that the interpretation of the significance of the cancer risk estimate is based on the appropriate public policy. USEPA in the NCP (40 CFR Part 300) (USEPA 1990) states that:

> *"...For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between* 10^{-4} *and* 10^{-6}*."*

For the purposes of this risk assessment, the USEPA definition of acceptable carcinogenic risk, the 10^{-4} to 10^{-6} range, will be applied.

6.6 RISK RESULTS

The results of the risk assessment for each area are discussed below. Non-cancer hazards are summed across all pathways and all COPC to calculate the cumulative HI:

$$HI = \sum_{i=1}^{n} HQ$$

In the event that cumulative HIs exceed 1.0, individual HIs for target organs will be evaluated.

Risk discussion for cancer risks will focus on COPCs that result in cancer risks greater than 1×10^{-6}, which is the lower end of USEPA's acceptable risk range of 10^{-6} to 10^{-4}.

6.6.1 Total Soil, Fill Area

Risk calculations resulting from exposures to total soil in the Fill Area for all receptors and pathways are shown in Appendix K, Tables K-1 through K-17. Risks for receptors of concern exposed to soil are summarized below.

Residential Adults and Children

Non-cancer hazards to future residential adults and children in the Fill Area of the Fort Totten Coast Guard Station are summarized in Tables 6-27 and 6-28, respectively. Detailed calculations shown in Appendix K, Tables K-1 through K-6 for ingestion, dermal, and inhalation of soil particles, and the calculations from consumption of homegrown produce are shown in Tables K-16 and K-17. The total cumulative non-cancer HI for total soil exposure to residential adults is 0.3 (Table 6-27), which is below the hazard target of 1.0. Consequently, non-cancer hazards to adults from exposure to total soil are acceptable. The total cumulative non-cancer HI for residential children is 1.2 (Table 6-28), which is greater than the USEPA hazard target of 1.0. However, examination of Table 6-28 shows that arsenic (24 percent), manganese (21 percent), and mercury (9 percent) represent the greatest contribution to the overall non-cancer risk of 1.2. Table 6-29 shows a target organ assessment for these major contributors, revealing that all three are risk to different target organs. Consequently, once target organs are considered, non-cancer hazards for residential children exposed to total soil in the Fill Area of Fort Totten Coast Guard Station are acceptable.

Cancer risks from exposure to total soil for residential adults and children are shown in Table 6-30. Because cancer risks are averaged over the entire lifetime (assumed to be 70 years), cancer risks for both adults and children were summed together in Table 6-30. The total cancer risk was 3×10^{-5}, within USEPA's acceptable risk range of 10^{-6} to 10^{-4}.

Adolescent Recreational User

Risks for the current and future adolescent recreational user (age 6-15) were quantified as a conservative estimate of risks to all recreational users. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix K, Tables K-7, K-8, and K-9, respectively.

Table 6-31 is a summary of non-cancer hazards for the adolescent recreational user in the Fill Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is 0.16, which is below USEPA's hazard target of 1.0. Consequently, the adolescent recreational user has acceptable non-cancer hazard from total soil in the Fill Area. Cancer risks for the adolescent recreational user are shown in Table 6-31. The total cumulative cancer risk for this receptor is 4×10^{-6}, within USEPA's acceptable cancer risk range. Arsenic was the only COPC with risks exceeding 10^{-6} (2×10^{-6}). As discussed above, these risks are representative of those expected to be found in an urban location in New York, and do not appear related to site uses.

Risks for adult recreational users are also expected to be acceptable. Risks for the adolescent recreational users represent a conservative upper-limit of both adults and children due to the exposure assumptions inherent in the risk assessment. Because acceptable risks have been found for adolescent recreational users, the same is also true for adult recreational users.

Commercial Worker

Risks for the future adult commercial worker were quantified. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix K, Tables K-10, K-11, and K-12 respectively.

Table 6-33 is a summary of non-cancer hazards for the future commercial worker in the Fill Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is 0.04; consequently, the future commercial worker has acceptable non-cancer hazard from total soil in the Fill Area. Cancer risks for the commercial worker are shown in Table 6-34. The total cumulative cancer risk for this receptor is 3×10^{-6}, within USEPA's acceptable cancer risk range. Arsenic (2×10^{-6}) was the only COPC in Fill Area total soil showing cancer risks exceeding 1×10^{-6}. As discussed above with respect to residential adults and children, these risks are representative of those expected to be found in an urban location in New York (USEPA 2000b), and do not appear related to site uses. Additional discussion regarding arsenic in soil at Fort Totten relative to naturally occurring concentrations can be found in Chapter 4.

Construction Worker

Risks for the future adult construction workers were quantified. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix K, Tables K-13, K-14, and K-15, respectively.

Table 6-35 is a summary of non-cancer hazards for the future construction worker in the Fill Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is 0.2, which is below USEPA's target non-cancer hazard of 1.0. Consequently, the future construction worker has acceptable non-cancer hazard from total soil in the Fill Area. Cancer risks for the commercial worker are shown in Table 6-36. The total cumulative cancer risk for this receptor is 6×10^{-7}, below USEPA's acceptable cancer risk range. Consequently, cancer risks to construction workers from exposure to total soil at the Fill Area are acceptable.

Lead Risk Results

Appendix O contains the model output, both for the residential child IEUBK model (Table O-1) and the adult lead risks (Table O-2). The average lead concentration found in the Fill Area was 331 mg/kg (Table 6-6). Based on the IEUBK model outputs, 96 percent of residential children exposed to lead in total soil are expected to have blood lead levels below the cutoff of 95 percent. In addition, the predicted mean blood lead level is 4.5 μg/dL (Table O-1), below the 10 μg/dL level of concern for lead in blood. Consequently, future resident children are not at risk from lead in total soils in the Fill Area. Similarly, results of the adult model shows that the highest RME blood lead level for developing fetus of adults was found for the construction worker at 5.3 μg/dL, also below the cutoff of 10 μg/dL. Risks from exposure to lead in total soil at the Fill Area are acceptable for all receptors.

6.6.2 Total Soil, Other Area

Risk calculations for all receptors and pathways are shown in Appendix L, Tables L-1 through L-17. Risks for receptors of concern exposed to soil are summarized below.

Residential Adults and Children

Non-cancer hazards to future residential adults and children are summarized in Tables 6-37 and 6-38, respectively, and the detailed calculations shown in Appendix L, Tables L-1 through L-6, for ingestion, dermal, and inhalation of soil particles, and the calculations from consumption of homegrown produce are shown in Tables L-16 and L-17. The total cumulative non-cancer HI for total soil exposure to residential adults is 0.2 (Table 6-37), below USEPA's hazard target of 1.0. Consequently, non-cancer hazards to adults from exposure to total soil are acceptable. The total cumulative non-cancer HI for residential children is 1.2, greater than USEPA's hazard target of 1.0. As in the fill area, arsenic, manganese, and mercury account for the majority of non-cancer hazards (Table 6-38), and as shown in Table 6-39, target organs for each of these contributors are different. Therefore, with the consideration of target organs, non-cancer hazards for residential children exposed to total soil in the Other Area of Fort Totten Coast Guard Station are acceptable.

Cancer risks from exposure to total soil for residential adults and children are shown in Table 6-40. Because cancer risks are averaged over the entire lifetime (assumed to be 70 years), cancer risks for both adults and children were summed together in Table 6-40. The total cancer risk was 4×10^{-5}, within USEPA's acceptable risk range of 10^{-6} to 10^{-4}.

Adolescent Recreational User

Risks for the current and future adolescent recreational user (age 6-15) were quantified as a conservative estimate of risks to all recreational users. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix L, Tables L-7, L-8, and L-9, respectively.

Table 6-41 is a summary of non-cancer hazards for the adolescent recreational user in the Other Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is 0.15, which does not exceed USEPA's hazard target of 1.0. Consequently, the adolescent recreational user has acceptable non-cancer hazard from total soil in the Other Area. Cancer risks for the adolescent recreational user are shown in Table 6-42. The total cumulative cancer risk for this receptor is $5{\times}10^{-6}$, within USEPA's acceptable cancer risk range. Arsenic and benzo(a)pyrene were the only COPCs with risk exceeding 10^{-6}.

Commercial Worker

Risks for the future adult commercial worker were quantified. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix L, Tables L-10, L-11, and L-12, respectively.

Table 6-43 is a summary of non-cancer hazards for the future commercial worker in the Other Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is 0.04; consequently, the future commercial worker has acceptable non-cancer hazard from total soil in the Other Area. Cancer risks for the commercial worker are shown in Table 6-44. The total cumulative cancer risk for this receptor is $4{\times}10^{-6}$, within USEPA's acceptable cancer risk range. Arsenic and benzo(a)pyrene risks exceeded 10^{-6}.

Construction Worker

Risks for the future adult construction workers were quantified. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix L, Tables L-13, L-14, and L-15, respectively.

Table 6-45 is a summary of non-cancer hazards for the future construction worker in the Other Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is 0.2, which does not exceed USEPA's hazard target of 1.0. Consequently, the future construction worker has acceptable non-cancer hazard from total soil in the Other Area. Cancer risks for the commercial worker are shown in Table 6-46. The total cumulative cancer risk for this receptor is $8{\times}10^{-7}$, below USEPA's acceptable cancer risk range. Consequently, cancer risks to construction workers from exposure to total soil at the Other Area are acceptable.

Lead Risks

The lead models used to assess risk to receptors at the Fort Totten Coast Guard Station were described in Section 6.4.3.3. Using these same models, and the average lead concentration in the Other Area of 195 mg/kg, risks were calculated for children and adults and are shown in

Appendix O, Tables O-3 and O-4, respectively. The geometric mean blood lead level for children was 3.8 μg/dL, and the highest adult blood lead level was 4 μg/dL for the construction worker. Because these values are well below the risk cutoff of 10 μg/dL, lead risks to all receptors are acceptable at the Fort Totten Coast Guard Station.

6.6.3 Total Soil, Pesticide Area

Risk calculations for all receptors and pathways are shown in Appendix M, Tables M-1 through M-17. As discussed earlier, pesticides were the only chemical fraction analyzed in this area. Risks for receptors of concern exposed to soil are summarized below.

Residential Adults and Children

Non-cancer hazards to future residential adults and children are summarized in Tables 6-47 and 6-48, respectively, and the detailed calculations shown in Appendix M, Tables M-1 through M-6 for ingestion, dermal, and inhalation of soil particles and the calculations from consumption of homegrown produce are shown in Tables M-16 and M-17. The total cumulative non-cancer HI for total soil exposure to residential adults is 0.05 (Table 6-41), less than USEPA's target hazard of 1.0. Consequently, non-cancer hazards to adults from exposure to total soil are acceptable. The total cumulative non-cancer HI for residential children is 0.2, less than the target hazard level of 1.0. Therefore, non-cancer hazards to children in the Pesticide Area are acceptable.

Cancer risks from exposure to total soil for residential adults and children are shown in Table 6-49. Because cancer risks are averaged over the entire lifetime (assumed to be 70 years), cancer risks for both adults and children were summed together in Table 6-49. The total cancer risk was 6×10^{-6}, within USEPA's acceptable risk range of 10^{-6} to 10^{-4}, with heptachlor epoxide the only COPC exceeding 10^{-6}.

Adolescent Recreational User

Risks for the current and future adolescent recreational user (age 6-15) in the Pesticide Area were quantified as a conservative estimate of risks to all recreational users. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix M, Tables M-7, M-8, and M-9, respectively.

Table 6-50 is a summary of non-cancer hazards for the adolescent recreational user in the Pesticide Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is

0.02; consequently, the adolescent recreational user has acceptable non-cancer hazard from total soil in the Pesticide Area. Cancer risks for the adolescent recreational user are shown in Table 6-51. The total cumulative cancer risk for this receptor is 4×10^{-7}, below USEPA's acceptable cancer risk range. Consequently, cancer risks for the adolescent recreational user in the Pesticide Area are acceptable.

Commercial Worker

Risks for the future adult commercial worker were quantified. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix M, Tables M-10, M-11, and M-12, respectively.

Table 6-52 is a summary of non-cancer hazards for the future commercial worker in the Pesticide Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is 0.01; consequently, the future commercial worker has acceptable non-cancer hazard from total soil in the Pesticide Area. Cancer risks for the commercial worker are shown in Table 6-53. The total cumulative cancer risk for this receptor is 5×10^{-7}, below USEPA's acceptable cancer risk range. Therefore, cancer risks are acceptable for the commercial worker in the Pesticide Area.

Construction Worker

Risks for the future adult construction workers were quantified. Risk calculations for incidental soil ingestion, dermal contact with soil, and inhalation of soil particulate matter are shown in Appendix M, Tables M-13, M-14, and M-15, respectively.

Table 6-54 is a summary of non-cancer hazards for the future construction worker in the Pesticide Area of Fort Totten Coast Guard Station. The cumulative non-cancer hazard for this receptor is 0.03. Consequently, the future construction worker has acceptable non-cancer hazard from total soil in the Pesticide Area. Cancer risks for the commercial worker are shown in Table 6-55. The total cumulative cancer risk for this receptor is 5×10^{-13}, well below USEPA's acceptable cancer risk range. Consequently, cancer risks to construction workers from exposure to total soil at the Pesticide Area are acceptable.

6.6.4 Groundwater Risk Assessment for Residential Adults and Children

Risk calculations for residential adults and children for exposure to groundwater by ingestion and dermal contact (adults and children) and inhalation of volatiles (adults) while showering were calculated and are shown in Appendix N, Tables N-1 through N-5. Specific data input and showering model calculations are shown in Appendix P, Tables P-1 through P-3.

Non-cancer hazards from exposure to groundwater for future residential adults and children are summarized in Tables 6-56 and 6-57, respectively, and the detailed calculations shown in Appendix N, Tables N-1 through N-5 for each pathway (ingestion, dermal, and inhalation of volatiles). The total cumulative non-cancer HI for groundwater exposure to residential adults is 6.0 (Table 6-56). The only COPC with an HI exceeding 1.0 was chloroform (HI = 4.6). These hazards are nearly all from the showering scenario from a high concentration of chloroform found in MW2 GW-01-01 in 1998 (23 μg/L). When this same monitoring well was resampled in 2000, the concentration was below the detection limit of 5 μg/L chloroform, and in Spring 2002 a concentration of 5.7 μg/L was measured in this well. Resulting hazards from these later concentrations would be less than 1.0. Non-cancer hazards to adults from exposure to groundwater exceed the hazard target and may represent unacceptable hazards if future use includes residential use of groundwater. The total cumulative non-cancer HI for residential children is 3.6 (Table 6-57). Chromium had an HI of 1.4, as a result of chromium measured in MW1-GW01-01 in Spring 2002 at 51 μg/L. Nickel contributed 18 percent of the non-cancer HI. . Non-cancer hazards to children from exposure to groundwater exceed the hazard target and may represent unacceptable hazards if future use includes residential use of groundwater.

Cancer risks from exposure to groundwater for residential adults and children are shown in Table 6-58. Because cancer risks are averaged over the entire lifetime (assumed to be 70 years), cancer risks for both adults and children were summed together in Table 6-58. The total cancer risk was 2×10^{-3}, above USEPA's acceptable risk range of 10^{-6} to 10^{-4}. Benzo(a)pyrene, detected once in MW4-01-01 during Spring 2002 at 10 μg/L accounted for 70 percent of this cancer risk $(1.1\times10^{-3),}$ followed by dibenz(a,h)anthracene representing 14 percent of this risk with 2.2×10^{-4}. This level of risk is the result of an exposure concentration of 2 μg/L (Table 6-9), which was measured in the same well as that for benzo(a)pyrene in 2002. Similarly, this same well had the highest dieldrin concentration, which accounted for a cancer risk of 1×10^{-4}. It is not expected that future use of the site groundwater will include residential use.

6.7 UNCERTAINTY ASSESSMENT

There are numerous uncertainties involved in the human health risk assessment process. These are discussed briefly in the following sections.

6.7.1 Sampling and Analysis Uncertainties

The sampling plan can have a significant impact on the results obtained in calculating human health risks at a site. To the extent that samples are taken in areas that are expected to be contaminated (biased sampling), the EPC used in calculating risk exposures and risks is likely to overestimate the actual concentration encountered at the site from random exposure across the site. This sampling bias will generally result in an overestimate of exposures and risks at a site.

6.7.2 Uncertainties Analysis of Exposure Assessment

An analysis of uncertainties is an important aspect of the exposure assessment. It provides the risk assessor and reviewer with information relevant to the individual uncertainties associated with exposure factor assumptions and their potential impact on the final assessment.

A significant uncertainty exists with the basic approach used in arriving at EPCs for the COPCs in soil and groundwater. Uncertainty results from the use of one-half detection limit for all non-detects. An objective of the guidance is to include some quantitative value for COPCs when analytical data indicate that those COPCs were not detected, so that an estimated potential intake and resultant potential risk can be calculated (USEPA 1989). However, this approach generally overestimates the exposure value, and results in overestimates of intakes and subsequent risks, particularly for COPCs with low frequencies of detection.

USEPA has derived a specific process for the derivation of the exposure factors used in this risk assessment (USEPA 1997d). This process involves reviewing the scientific literature supporting these exposure factors, rating the appropriateness of the literature for the derivation, and the selection of upper-limits for their derivation and application. The derivation of residential children and adult incidental soil consumption of 200 and 100 mg/day serves as an example of the conservative nature of these exposure factors. Chapter 4 in USEPA (1997d) documents approximately a dozen scientific studies on the incidental ingestion of soil by children. Various uncertainties have been discussed by USEPA, such as incomplete sample collection (both input and output), the limited length of time that these studies were conducted, the uncertainty associated with the absorption of tracer elements used to derive these values, and the uncertainty associated with heterogeneous soil samples (USEPA 1997d). In particular, it should be noted that all but one of the studies used to derive the 200 mg/day child consumption rate were conducted in summer, when exposure is maximized. The studies are grouped, and typically the upper estimate of the mean chosen as the Reasonable Maximum Exposure (RME) exposure value. The consumption rate for adults (100 mg/day) was based on limited studies (only three), with limited support. Consequently, there is a high degree of uncertainty associated with 100 mg/day Other exposure values shown in Tables 6-10 through 6-19 were selected using similar conservative estimates. A consumption of homegrown produce exposure scenario has been incorporated into residential adults and child exposures. Estimation of the concentrations of chemicals in homegrown produce is problematic, and the plant chemical accumulation factors shown in Table 6-20 all have a high degree of uncertainty.

The use of conservative estimates for exposure including the use of the upper 95th UCLM for the EPC, and the upper limit estimates of each exposure parameter propagates throughout the entire exposure equation:

$$(L)ADI = \frac{C \ x \ IF \ x \ EF \ x \ ED \ x \ RAF}{BW \ x \ AT} \ \text{x CF}$$

where:

$(L)ADI$ = (Lifetime) Average daily intake (mg/kg-day)
C = Concentration in a specific medium (mg/L or mg/kg)
IF = Intake factor (mg/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
RAF = Relative absorption factor (unitless)
BW = Body weight (kg)
AT = Averaging time (days)
CF = Conversion Factor (10^{-6} kg/mg)

As an example of this propagation, assume that there is a 5 percent upper limit used for the concentration (C, upper 95th UCLM), and a 10 percent upper limit used for ingestion frequency (IF), exposure frequency (EF), and relative absorption frequency (RAF). The total error then propagates to:

$$Total \ Error = 0.05 \times 0.1 \times 0.1 \times 0.1 = 0.00005$$

Thus, while each parameter has selected for the upper 95th or 90th percentile, the resultant (lifetime) average daily intake [(L)ADI] has been calculated at the 99.995th percentile level.

Consequently, the selection of upper limit exposure assumptions for the estimate of RME exposure results in a conservative upper limit dose estimate, adding significantly to the conservative uncertainty of the HHRA.

6.7.3 Uncertainties of Toxicity Assessment

There are numerous uncertainties associated with the toxicity assessment. These are generally due to the unavailability of data to thoroughly calculate the toxicity of COPCs. Two chemicals detected during the Spring 2002 monitoring well samples (p-isopropyltoluene and tert-butyl alcohol) had no toxicity data available. For this reason, risks to these chemicals could not be quantified. It is not known to what degree risks have been underestimated by this data gap. Additional sources of uncertainty are described in more detail in the following sections.

6.7.3.1 Uncertainties Associated With Non-Carcinogenic Effects

- **Interspecies Extrapolation –** The majority of toxicological information comes from experiments with laboratory animals. Experimental animal data were relied on by regulatory agencies to assess the hazards of human chemical exposures. Interspecies differences in chemical absorption, metabolism, excretion, and toxic response are not well understood; therefore, conservative assumptions are applied to animal data when extrapolating to humans. These probably result in an overestimation of toxicity.

- **Intraspecies Extrapolation –** Differences in individual human susceptibilities to the effects of chemical exposures may be caused by such variables as genetic factors (e.g., glucose-6-phosphate dehydrogenase deficiency), lifestyle (e.g., cigarette smoking and alcohol consumption), age, hormonal status (e.g., pregnancy), and disease. To take into account the diversity of human populations and their differing susceptibilities to chemically induced injury or disease, a safety factor is used. USEPA uses a factor between 1 and 10. This uncertainty may lead to overestimates of human health effects at given doses.

- **Exposure Routes –** When experimental data available on one route of administration are different from the actual route of exposure that is of interest, route-to-route extrapolation must be performed before the risk can be assessed. Several criteria must be satisfied before route-to-route extrapolation can be undertaken. The most critical assumption is that a chemical injures the same organ(s) regardless of route, even though the injury can vary in degree. Another assumption is that the behavior of a substance in the body is similar by all routes of contact. This may not be the case when, for example, materials absorbed via the gastrointestinal tract pass through the liver prior to reaching the systemic circulation, whereas by inhalation the same chemical will reach other organs before the liver. However, when data are limited these extrapolations are made, and may result in overestimates of human toxicity.

The USEPA adds uncertainty factors to the RfD whenever there is a source of uncertainty. As shown in Tables 6-22 and 6-23, these uncertainty factors often reduce the RfD by three orders of magnitude, greatly increasing the conservativeness of resultant HHRA risks.

6.7.3.2 Uncertainties Associated With Carcinogenic Effects

- **Interspecies Extrapolation –** The majority of toxicological information for carcinogenic assessments comes from experiments with laboratory animals. There is uncertainty about whether animal carcinogens are also carcinogenic in humans. While many chemical substances are carcinogenic in one or more animal species, only a very small number of chemical substances are known to be human carcinogens. The fact that some chemicals are carcinogenic in some animal species but not in others raises the possibility that not all animal carcinogens are human carcinogens. Regulatory agencies assume that humans are as sensitive to carcinogens as the most sensitive animal species. This policy decision, designed to prevent underestimation of risk, introduces the potential to overestimate carcinogenic risk.

- **High-Dose to Low-Dose Extrapolation –** Typical cancer bioassays provide limited low-dose data on responses in experimental animals for chemicals being assessed for carcinogenic or chronic effects. The usual dose regime involves three dose groups per assay. The first dose group is given the highest dose that can be tolerated, the second is exposed to one-half that dose, and the third group is unexposed (control group). Because this dosing method does not reflect how animals would react to much lower doses of a chemical, a dose-response assessment normally requires extrapolation from high to low doses using mathematical modeling that incorporates to varying degrees information about physiologic processes in the body.

  The standard method for modeling high-dose to low-dose effects involves assumptions of extrapolation. Two models are utilized, the default no-threshold model that assumes that the response is linear to the origin (i.e., zero dose, zero response), and a threshold model that assumes that there is some dose above zero, below which there are no adverse effects. It has been found that toxicity data from animal bioassays often fit both no-threshold and threshold models equally well, and it is not possible to determine their validity based on goodness of fit (USEPA 1996b). The dose-response curves derived from these different models diverge substantially in the dose range of interest, with the default no-threshold model yielding much lower toxicity values. Consequently, the model extrapolation process can contribute conservative uncertainty to the chosen toxicity value.

- **Polycyclic Aromatic Hydrocarbon (PAH) Cancer Uncertainty –** Cancer slope factors (SF) have only been determined for the most carcinogenic of those chemical types, benzo(a)pyrene. Due to the absence of chemical-specific SFs for the other carcinogenic PAH, USEPA has utilized Toxic Equivalency Factors (TEFs) to extrapolate SFs for these PAH relative to the benzo(a)pyrene slope factor. There is a significant amount of uncertainty associated with the use of TEFs, which are fixed multiples of the benzo(a)pyrene SF (e.g., 1.0, 0.1, 0.01). There are few scientific justifications for the use of these TEFs, and the use of them is primarily convenience and ease of application.

6.7.4 Uncertainties in Risk Characterization

Uncertainties in the risk characterization can stem from the inherent uncertainties in the data evaluation; the exposure assessment process, including any modeling of exposure point concentrations in secondary media from primary media; and the toxicity assessment process. The individual uncertainties in these respective processes were addressed in previous sections.

6.8 RISK ASSESSMENT SUMMARY AND CONCLUSIONS

The upland HHRA for Fort Totten Coast Guard Station was conducted to assess potential non-carcinogenic effects and cancer risks from current and future site exposure. Risks to total soils were conducted for four areas, the Fill Area, all Other Areas of the station, the Pesticide Area, and the PCB Area. PCBs were never detected in the PCB area; therefore, quantitative risk calculations were not performed. For the other areas at the station, current and future adolescent recreational users, future residential adults and children, future commercial workers, and future construction workers were characterized for risk from ingestion, dermal contact, inhalation of dust, and ingestion of homegrown produce.

New York State Department of Health (NYSDOH) considers cancer risks of 1.0×10^{-6} or less insignificant and not a public health concern and cancer risks greater than 1.0×10^{-4} requiring actions to lower exposures. When cancer risk estimates are between 1.0×10^{-6} and 1.0×10^{-4}, it is NYSDOH's policy to make a risk management decision on a case-by-case basis whether or not to pursue risk reduction measures.

Potential risks from consumption of and dermal contact with groundwater was characterized for future residential adults and children. In addition, the risks of volatile chemical inhalation while showering by future residential adults were also quantified. As discussed in the exposure assumptions, it is assumed that inhalation of volatiles by children while bathing does not represent a significant route of exposure; therefore, this was not quantified.

Risks for each area where quantitative HHRA calculations were performed are summarized below.

Fill Area

Non-cancer hazards to future residential adults was less than 1.0, while non-cancer hazards to future residential children were 1.2. These risks were driven by arsenic, manganese, and mercury, which have different target organs. Consequently, future residential children have acceptable non-cancer risks once target organs are accounted. Cancer risks for residential adults and children exceeded 1×10^{-6} (3×10^{-5}) but were within USEPA's acceptable risk range of 10^{-6} to 10^{-4}.

Non-cancer hazards for the current/future adolescent recreational user were less than 1.0. Cancer risk was 4×10^{-6}, within the acceptable cancer risk range. As with residents, arsenic and benzo(a)pyrene accounted for most of this cancer risk. Non-cancer hazards for the future commercial worker were acceptable with a cumulative HI of 0.04. As with the recreational user, cancer risks were slightly above 1×10^{-6}, with arsenic responsible for the majority of this risk. Finally, both non-cancer and cancer risks for the future construction worker were acceptable, with cumulative HI and cancer risks of 0.2 and 6×10^{-7}.

Lead risks were addressed using USEPA's IEUBK lead model for children and Adult Lead Model for commercial and construction workers, and were found to be acceptable for both residential children and adults.

Other Area

Concentrations of chemicals and associated risks from these chemicals in the Other Area were very similar to those found in the Fill Area.

As at the Fill Area, the non-cancer hazard index for future residential adults in the Other Area were less than 1.0. The non-cancer hazard index for future residential children exceeded 1.0 at 1.2, with the same risk drivers as found in the Fill Area. Because the non-cancer risk drivers (arsenic, manganese, and mercury) impact different target organs, risks to future residential children from exposure to soil are acceptable. Cancer risks for residential adults and children exceeded 1×10^{-6} (4×10^{-5}) but were within USEPA's acceptable risk range of 10^{-6} to 10^{-4}.

Non-cancer hazards for the current/future adolescent recreational user were acceptable (cumulative HI of 0.15). Cancer risks were 5×10^{-6}, within the acceptable cancer risk range. Non-cancer hazards for the future commercial worker were acceptable with a cumulative HI of 0.04. As with the recreational user, cancer risks were 4×10^{-6}. Finally, both non-cancer and cancer risks for the future construction worker were acceptable with cumulative HI and cancer risks of 0.1 and 8×10^{-7}.

Lead risks were found acceptable for both residential children and adult workers.

Pesticide Area

The only chemicals analyzed in the pesticide area were pesticides. Residential adults and children were found to have acceptable non-cancer hazards from exposure to these chemicals. A residential cancer risk level of 6×10^{-6} was found, with the majority of risk from heptachlor epoxide. This cancer risk level is within the acceptable USEPA risk range.

Acceptable non-cancer and cancer risks were found for all other receptors (adolescent recreational user, commercial worker, and construction worker) for the Pesticide Area.

Groundwater

Risk calculations were performed for residential adults and children exposed to groundwater. Non-cancer hazards for adults exceeded 1.0 at 5.4. The majority of non-cancer hazard to the adult resident was the result of the inhalation of chloroform (HQ = 4.5). The exposure concentration (23 μg/L) was the maximum of this COPC; however, the exposure-point concentration is less than the MCL for total trihalomethanes of 100 μg/L. Because inhalation risks were not quantified for children, non-cancer hazard for residential children was smaller than that for adults, but still exceeded 1.0 (cumulative HI = 2.0). These risks were from a number of metals, each of which had separate target organs, and no specific target organ had a non-cancer hazard greater than 1.0.

Cancer risks from the consumption, dermal contact with, and inhalation of volatiles while showering were within the acceptable cancer risk range (8×10^{-5}). Risks from dibenz(a,h)anthracene contributed the majority of these risks at 6×10^{-5}.

The results of the groundwater future residential adult and child risk assessment indicate that groundwater may not be appropriate for use as a potable water source.

TABLE 6-1 SUMMARY OF SAMPLES ASSOCIATED WITH EACH HHRA RISK AREA

Sample ID	Sample Date	Sample ID	Sample Date
Total Soil, Fill Area		**Total Soil, Other Area (continued)**	
FLA-SB-09-01	8/18/1998	FSS-SB-04-02	8/22/1998
FLA-SB-09-02	8/18/1998	FSS-SB-04-03	8/24/1998
FLA-SB-09-05	8/18/1998	FSS-SB-05-01	8/22/1998
FLA-SB-09-07	8/18/1998	FSS-SB-05-02	8/22/1998
FLA-SB-10-01	8/18/1998	FSS-SB-05-03	8/22/1998
FLA-SB-10-02	8/19/1998	FSS-SB-06-01	8/25/1998
FLA-SB-10-03	8/19/1998	FSS-SB-06-02	8/25/1998
FLA-SB-11-01	8/19/1998	FSS-SB-06-03	8/25/1998
FLA-SB-11-02	8/19/1998	FSS-SB-07-01	8/24/1998
FLA-SB-11-03	8/19/1998	FSS-SB-07-02	8/24/1998
FLA-SB-11-05	8/19/1998	FSS-SB-07-04	8/24/1998
FLA-SB-12-01	8/19/1998	FSS-SB-07-05	8/24/1998
FLA-SB-12-02	8/19/1998	FSS-SB-07-07	8/24/1998
FLA-SB-12-03	8/20/1998	FSS-SB-08-01	8/25/1998
FLA-SB-13-03	8/20/1998	FSS-SB-08-02	8/25/1998
FLA-SS-46-01	7/22/2000	FSS-SB-08-03	8/25/1998
FLA-SS-47-01	7/22/2000	FSS-SS-01-01	7/21/2000
FLA-SS-48-01	7/22/2000	FSS-SS-02-01	7/21/2000
FLA-SS-49-01	7/22/2000	FSS-SS-03-01	7/21/2000
FLA-SS-50-01	7/22/2000	FSS-SS-04-01	7/21/2000
FLA-SS-51-01	7/22/2000	FSS-SS-05-01	7/21/2000
FLA-SS-52-01	7/22/2000	FSS-SS-06-01	7/21/2000
FSS-SB-13-01	8/20/1998	FSS-SS-07-01	7/21/2000
FSS-SB-13-03	8/20/1998	FSS-SS-08-01	7/21/2000
Total Soil, Other Area		FSS-SS-09-01	7/21/2000
FSS-SB-01-01	8/22/1998	FSS-SS-10-01	7/21/2000
FSS-SB-01-02	8/22/1998	FSS-SS-11-01	7/21/2000
FSS-SB-01-03	8/22/1998	FSS-SS-12-01	7/21/2000
FSS-SB-02-01	8/24/1998	FSS-SS-13-01	7/21/2000
FSS-SB-02-02	8/24/1998	FSS-SS-14-01	7/21/2000
FSS-SB-02-03	8/24/1998	FSS-SS-15-01	7/21/2000
FSS-SB-03-01	8/21/1998	FSS-SS-16-01	7/21/2000
FSS-SB-03-02	8/21/1998	FSS-SS-17-01	7/21/2000
FSS-SB-03-04	8/21/1998	FSS-SS-18-01	7/21/2000
FSS-SB-03-05	8/21/1998	FSS-SS-19-01	7/21/2000
FSS-SB-03-07	8/21/1998	FSS-SS-20-01	7/21/2000
FSS-SB-04-01	8/22/1998	FSS-SS-21-01	7/21/2000

TABLE 6-1 SUMMARY OF SAMPLES ASSOCIATED WITH EACH HHRA RISK AREA

Sample ID	Sample Date	Sample ID	Sample Date
Total Soil, Other Area (continued)		**Total Soil, Pesticide Area**	
FSS-SS-22-01	7/21/2000	624-SS-01-01	8/26/1998
FSS-SS-23-01	7/21/2000	624-SS-02-01	8/26/1998
FSS-SS-24-01	7/21/2000	624-SS-03-01	8/26/1998
FSS-SS-25-01	7/21/2000	624-SS-03-02	8/26/1998
FSS-SS-26-01	7/21/2000	624-SS-04-01	8/26/1998
FSS-SS-27-01	7/21/2000	624-SS-05-01	8/26/1998
FSS-SS-28-01	7/21/2000	624-SS-06-01	8/26/1998
FSS-SS-29-01	7/21/2000	624-SS-53-01	7/22/2000
FSS-SS-30-01	7/21/2000	624-SS-54-01	7/22/2000
FSS-SS-31-01	7/21/2000	**Groundwater**	
FSS-SS-32-01	7/21/2000	MW1-GW-01-01	8/20/1998
FSS-SS-33-01	7/21/2000	MW1-GW-01-01	7/12/2000
FSS-SS-34-01	7/21/2000	MW1-GW-01-01	4/10/2002
FSS-SS-35-01	7/22/2000	MW2-GW-01-01	8/20/1998
FSS-SS-36-01	7/22/2000	MW2-GW-01-01	7/15/2000
FSS-SS-37-01	7/22/2000	MW2-GW-01-01	4/25/2002
FSS-SS-38-01	7/22/2000	MW3-GW-01-01	8/20/1998
FSS-SS-39-01	7/22/2000	MW3-GW-01-01	7/12/2000
FSS-SS-40-01	7/22/2000	MW3-GW-01-01	4/10/2002
FSS-SS-41-01	8/20/1998	MW4-GW-01-01	8/20/1998
FSS-SS-42-01	8/20/1998	MW4-GW-01-01	7/14/2000
FSS-SS-43-01	7/8/2000	MW4-GW-01-01	4/25/2002
FSS-SS-44-01	8/20/1998	MW5-GW-01-01	8/20/1998
FSS-SS-45-01	7/22/2000	MW5-GW-01-01	7/13/2000
Total Soil, PCB Area		MW5-GW-01-01	4/10/2002
609-SS-57-01	7/22/2000		
609-SS-58-01	7/22/2000		
625-SS-55-01	7/22/2000		
625-SS-56-01	7/22/2000		

TABLE 6-2 SUMMARY OF TOTAL SOIL DATA, FILL AREA

CAS Number	Analyte	Minimum Concentration (mg/kg) [(a)]	Qualifier of Minimum	Maximum Concentration (mg/kg) [(a)]	Qualifier of Maximum	Maximum Location	Date Sampled	Sample Depth	Detection Frequency
INORGANICS									
7429-90-5	ALUMINUM	3950		9170		FLA-SB-09-07	8/18/1998	20' - 21'	17/17
7440-36-0	ANTIMONY	0.35	N	3.7	N	FLA-SS-47-01	7/22/2000	SS	17/17
7440-38-2	ARSENIC	0.125	U	9.5		FLA-SS-48-01	7/22/2000	SS	15/17
7440-39-3	BARIUM	30.9		316		FSS-SB-13-01	8/20/1998	0 - 0.5'	17/17
7440-41-7	BERYLLIUM	0.11	B	0.54	B	FLA-SS-49-01	7/22/2000	SS	17/17
7440-43-9	CADMIUM	0.035	U	1.6		FLA-SS-47-01	7/22/2000	SS	11/17
7440-70-2	CALCIUM	1460	*	22500		FLA-SS-47-01	7/22/2000	SS	17/17
7440-47-3	CHROMIUM	11.7	U	29.4	*	FLA-SB-09-07	8/18/1998	20' - 21'	17/17
7440-48-4	COBALT	3.7	B	10.1		FLA-SB-09-07	8/18/1998	20' - 21'	17/17
7440-50-8	COPPER	11.8		198		FLA-SB-10-01	8/18/1998	0 - 0.5'	17/17
7439-89-6	IRON	6780		34300		FLA-SB-11-01	8/19/1998	0 - 0.5'	17/17
7439-92-1	LEAD	2.8		743		FSS-SB-13-01	8/20/1998	0 - 0.5'	17/17
7439-95-4	MAGNESIUM	1780	N*	4990	N*	FLA-SB-09-07	8/20/1998	20' - 21'	17/17
7439-96-5	MANGANESE	87.3		454	N	FLA-SS-47-01	7/22/2000	SS	17/17
7439-97-6	MERCURY	0.01		1.3		FLA-SB-10-01	8/18/1998	0 - 0.5'	17/17
7440-02-0	NICKEL	12.8		31.5		FLA-SB-09-07	8/18/1998	20' - 21'	17/17
7440-09-7	POTASSIUM	716	B	3520	E	FLA-SB-09-07	8/18/1998	20' - 21'	17/17
7782-49-2	SELENIUM	0.125	U	1.1	B	FLA-SS-51-01	7/22/2000	SS	9/17
7440-22-4	SILVER	0.06	U	0.57	B	FLA-SS-48-01	7/22/2000	SS	5/17
7440-23-5	SODIUM	120	B	214		FLA-SB-11-01	8/19/1998	0 - 0.5'	17/17
7440-28-0	THALLIUM	0.06	U	0.23	B	FLA-SB-09-07	8/18/1998	20' - 21'	6/16
7440-62-2	VANADIUM	13.9		33		FLA-SB-12-01	8/19/1998	0 - 0.5'	17/17
7440-66-6	ZINC	19.2		850	B	FLA-SB-11-05	8/19/1998	16' - 18'	17/17
PAH									
83-32-9	ACENAPHTHENE	0.07	U	0.37	J	FLA-SB-11-05	8/19/1998	16' - 18'	7/16
208-96-8	ACENAPHTHYLENE	0.047	J	0.215	U	FLA-SS-50-01	7/22/2000	SS	5/16
120-12-7	ANTHRACENE	0.051	J	0.88		FLA-SB-11-05	8/19/1998	16' - 18'	11/16
56-55-3	BENZ[A]ANTHRACENE	0.0465	U	1.1		FLA-SB-11-05	8/19/1998	16' - 18'	13/16
50-32-8	BENZO[A]PYRENE	0.0465	U	0.87		FLA-SS-48-01	7/22/2000	SS	13/16
205-99-2	BENZO[B]FLUORANTHENE	0.046	U	1.1		FLA-SS-48-01	7/22/2000	SS	13/16
191-24-2	BENZO[G,H,I]PERYLENE	0.06	U	0.63		FLA-SS-48-01	7/22/2000	SS	13/16
207-08-9	BENZO[K]FLUORANTHENE	0.047	U	0.43		FLA-SS-48-01	7/22/2000	SS	13/16
218-01-9	CHRYSENE	0.055	U	1.2		FLA-SB-11-05	8/19/1998	16' - 18'	13/16
53-70-3	DIBENZ[A,H]ANTHRACENE	0.065	U	0.22	U	FLA-SS-47-01	7/22/2000	SS	6/16
206-44-0	FLUORANTHENE	0.075	U	1.9		FLA-SB-11-05	8/19/1998	16' - 18'	14/16
86-73-7	FLUORENE	0.052	J	0.58		FLA-SB-11-05	8/19/1998	16' - 18'	4/16

TABLE 6-2 SUMMARY OF TOTAL SOIL DATA, FILL AREA

CAS Number	Analyte	Minimum Concentration (mg/kg) [(a)]	Qualifier of Minimum	Maximum Concentration (mg/kg) [(a)]	Qualifier of Maximum	Maximum Location	Date Sampled	Sample Depth	Detection Frequency
193-39-5	INDENO[1,2,3-C,D]PYRENE	0.055	U	0.7		FLA-SS-48-01	7/22/2000	SS	13/16
91-20-3	NAPHTHALENE	0.044	J	0.175	U	FLA-SS-46-01	7/22/2000	SS	11/16
85-01-8	PHENANTHRENE	0.065	U	2.7		FLA-SB-11-05	8/19/1998	16' - 18'	13/16
129-00-0	PYRENE	0.038	U	2.7		FLA-SB-11-05	8/19/1998	16' - 18'	14/16
SEMIVOLATILES									
91-57-6	2-METHYLNAPHTHALENE	0.042	J	0.22	U	FLA-SS-47-01	7/22/2000	SS	7/16
117-81-7	BIS(2-ETHYLHEXYL)PHTHALATE	0.038	J	1.8		FLA-SS-51-01	7/22/2000	SS	12/16
85-68-7	BUTYLBENZYLPHTHALATE	0.061	J	0.22	U	FLA-SS-47-01	7/22/2000	SS	2/7
86-74-8	CARBAZOLE	0.042	J	0.215	U	FLA-SS-50-01	7/22/2000	SS	4/7
132-64-9	DIBENZOFURAN	0.049	J	0.28	J	FLA-SB-11-05	8/19/1998	16' - 18'	2/16
84-74-2	DIBUTYLPHTHALATE	0.043	J	0.22	U	FLA-SS-47-01	7/22/2000	SS	1/7
VOLATILES									
78-93-3	2-BUTANONE	0.0014	U	0.36	U	FLA-SB-11-03	8/19/1998	2' - 3'	1/9
67-64-1	ACETONE	0.0084	J	0.7	J	FLA-SB-11-03	8/19/1998	2' - 3'	9/9
71-43-2	BENZENE	0.0023	U	0.18	U	FLA-SB-11-03	8/19/1998	2' - 3'	2/9
75-15-0	CARBON DISULFIDE	0.0023	U	0.18	U	FLA-SB-11-03	8/19/1998	2' - 3'	1/9
108-88-3	TOLUENE	0.0022	J	0.18	U	FLA-SB-11-03	8/19/1998	2' - 3'	1/9
79-01-6	TRICHLOROETHENE	0.0023	U	0.18	U	FLA-SB-11-03	8/19/1998	2' - 3'	1/9
75-01-4	VINYL CHLORIDE	0.0023	U	0.18	U	FLA-SB-11-03	8/19/1998	2' - 3'	1/9

(a) Reported concentration represents 1/2 the detection limit when the qualifier is "U".

U = Compound was analyzed for but not detected.
N = Spiked sample recovery was not within normal limits.
B = Reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
* = Duplicate Analyses were not within normal limits.
J = Reported value is estimated.

TABLE 6-3 SUMMARY OF TOTAL SOIL DATA, OTHER AREA

CAS Number	Analyte	Minimum Concentration (mg/kg) (a)	Qualifier of Minimum	Maximum Concentration (mg/kg) (a)	Qualifier of Maximum	Maximum Location	Date Sampled	Sample Depth	Detection Frequency
INORGANICS									
7429-90-5	ALUMINUM	2280		11400		FSS-SB-01-01	8/22/1998	0 - 0.5'	62/62
7440-36-0	ANTIMONY	0.06	UN	1.8	N	FSS-SB-04-01	8/22/1998	0 - 0.5'	59/62
7440-38-2	ARSENIC	0.125	U	19.2		FSS-SS-13-01	7/21/2000	SS	60/62
7440-39-3	BARIUM	27.5		295		FSS-SB-04-01	8/22/1998	0 - 0.5'	62/62
7440-41-7	BERYLLIUM	0.1	B	0.53	B	FSS-SS-36-01	7/22/2000	SS	62/62
7440-43-9	CADMIUM	0.01	U	0.97		FSS-SS-44-01	8/20/1998	SS	47/62
7440-70-2	CALCIUM	290		13400	*	FSS-SB-05-01	8/22/1998	0 - 0.5'	62/62
7440-47-3	CHROMIUM	4.9		33.2	*	FSS-SB-05-03	8/22/1998	18' - 20'	62/62
7440-48-4	COBALT	1.8	B	35.5		FSS-SS-42-01	8/20/1998	SS	62/62
7440-50-8	COPPER	3.9		310	E	FSS-SS-41-01	8/20/1998	SS	62/62
7439-89-6	IRON	5790		23700		FSS-SB-05-03	8/22/1998	18' - 20'	62/62
7439-92-1	LEAD	2.9		793		FSS-SS-42-01	8/20/1998	SS	62/62
7439-95-4	MAGNESIUM	485	*	7000	N*	FSS-SB-05-01	8/22/1998	0 - 0.5'	62/62
7439-96-5	MANGANESE	46.6	N	493		FSS-SB-01-01	8/22/1998	0 - 0.5'	62/62
7439-97-6	MERCURY	0.0016	U	5		FSS-SS-38-01	7/22/2000	SS	60/62
7440-02-0	NICKEL	7		33.7		FSS-SB-05-03	8/22/1998	18' - 20'	62/62
7440-09-7	POTASSIUM	340		4020	E	FSS-SB-05-03	8/22/1998	18' - 20'	62/62
7782-49-2	SELENIUM	0.125	U	1.3	B	FSS-SS-44-01	8/20/1998	SS	49/62
7440-22-4	SILVER	0.06	U	2.4		FSS-SS-41-01	8/20/1998	SS	3/62
7440-23-5	SODIUM	97.1		304		FSS-SS-43-01	7/8/2000	SS	62/62
7440-28-0	THALLIUM	0.012	B	0.31	B	FSS-SB-03-07	8/21/1998	14' - 16'	13/62
7440-62-2	VANADIUM	11		47.7		FSS-SS-45-01	7/22/2000	SS	62/62
7440-66-6	ZINC	19.4		223	N	FSS-SS-42-01	8/20/1998	SS	62/62

TABLE 6-3 SUMMARY OF TOTAL SOIL DATA, OTHER AREA

CAS Number	Analyte	Minimum Concentration (mg/kg) [(a)]	Qualifier of Minimum	Maximum Concentration (mg/kg) [(a)]	Qualifier of Maximum	Maximum Location	Date Sampled	Sample Depth	Detection Frequency
PAH									
83-32-9	ACENAPHTHENE	0.038	J	0.26	U	FSS-SS-29-01	7/21/2000	SS	2/51
208-96-8	ACENAPHTHYLENE	0.043	J	1.5		FSS-SS-12-01	7/21/2000	SS	24/52
120-12-7	ANTHRACENE	0.04	J	0.39		FSS-SS-31-01	7/21/2000	SS	26/52
56-55-3	BENZ[A]ANTHRACENE	0.0465	U	4.1		FSS-SS-12-01	7/21/2000	SS	43/52
50-32-8	BENZO[A]PYRENE	0.0465	U	6.3	D	FSS-SS-12-01	7/21/2000	SS	43/52
205-99-2	BENZO[B]FLUORANTHENE	0.046	U	8.8	D	FSS-SS-12-01	7/21/2000	SS	44/52
191-24-2	BENZO[G,H,I]PERYLENE	0.058	J	4.1		FSS-SS-15-01	7/21/2000	SS	43/52
207-08-9	BENZO[K]FLUORANTHENE	0.047	U	2.7		FSS-SS-12-01	7/21/2000	SS	42/52
218-01-9	CHRYSENE	0.055	U	4.6	D	FSS-SS-12-01	7/21/2000	SS	44/52
53-70-3	DIBENZ[A,H]ANTHRACENE	0.041	J	1		FSS-SS-12-01	7/21/2000	SS	36/52
206-44-0	FLUORANTHENE	0.075	U	6.4	D	FSS-SS-12-01	7/21/2000	SS	44/52
86-73-7	FLUORENE	0.038	J	0.26	U	FSS-SS-29-01	7/21/2000	SS	7/52
193-39-5	INDENO[1,2,3-C,D]PYRENE	0.055	U	4.1		FSS-SS-15-01	7/21/2000	SS	43/52
91-20-3	NAPHTHALENE	0.039	J	0.29	J	FSS-SS-12-01	7/21/2000	SS	21/52
85-01-8	PHENANTHRENE	0.065	U	1.4		FSS-SS-31-01	7/21/2000	SS	44/52
129-00-0	PYRENE	0.038	U	7.7	D	FSS-SS-12-01	7/21/2000	SS	44/52
SEMIVOLATILES									
95-57-8	2-CHLOROPHENOL	0.17	U	0.39	J	FSS-SS-03-01	7/21/2000	SS	1/35
91-57-6	2-METHYLNAPHTHALENE	0.036	J	0.33	J	FSS-SS-17-01	7/21/2000	SS	18/52
7005-72-3	4-CHLOROPHENYL PHENYL ETHER	0.17	U	0.38	J	FSS-SS-04-01	7/21/2000	SS	1/35
106-44-5	4-METHYLPHENOL	0.055	J	0.23	U	FSS-SS-24-01	7/21/2000	SS	1/35
117-81-7	BIS(2-ETHYLHEXYL)PHTHAL	0.047	U	74	D	FSS-SS-20-01	7/21/2000	SS	45/52
85-68-7	BUTYLBENZYLPHTHALATE	0.038	J	0.3	J	FSS-SS-29-01	7/21/2000	SS	21/52
86-74-8	CARBAZOLE	0.034	J	0.23	U	FSS-SS-24-01	7/21/2000	SS	18/35
132-64-9	DIBENZOFURAN	0.047	J	0.26	U	FSS-SS-29-01	7/21/2000	SS	6/52
84-74-2	DIBUTYLPHTHALATE	0.039	J	0.23	U	FSS-SS-24-01	7/21/2000	SS	8/35
117-84-0	DIOCTYLPHTHALATE	0.17	U	0.26	U	FSS-SS-29-01	7/21/2000	SS	1/35

TABLE 6-3 SUMMARY OF TOTAL SOIL DATA, OTHER AREA

CAS Number	Analyte	Minimum Concentration (mg/kg) [a]	Qualifier of Minimum	Maximum Concentration (mg/kg) [a]	Qualifier of Maximum	Maximum Location	Date Sampled	Sample Depth	Detection Frequency
VOLATILES									
78-93-3	2-BUTANONE	0.0025	J	0.0065	U	FSS-SB-06-02	8/25/1998	2' - 3'	3/18
67-64-1	ACETONE	0.003	J	0.089		FSS-SB-03-04	8/21/1998	14' - 16'	15/18
71-43-2	BENZENE	0.0022	U	0.0048		FSS-SB-03-05	8/21/1998	14' - 16'	1/18
67-66-3	CHLOROFORM	0.0011	J	0.0032	U	FSS-SB-06-02	8/25/1998	2' - 3'	1/18
100-41-4	ETHYLBENZENE	0.0013	U	0.0031	J	FSS-SB-06-03	8/25/1998	6' - 7'	4/18
79-01-6	TRICHLOROETHENE	0.0007	U	0.0032	U	FSS-SB-06-02	8/25/1998	2' - 3'	2/18
75-01-4	VINYL CHLORIDE	0.0011	U	0.012		FSS-SB-08-02	8/25/1998	2' - 3'	3/18

(a) Reported concentration represents 1/2 the detection limit when the qualifier is "U".

U = Compound was analyzed for but not detected.
N = Spiked sample recovery was not within normal limits.
B = Reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
* = Duplicate analyses not within normal limits.
E = Reported value is estimated due to an interference.
J = Reported value is estimated.
D = The quantification for these samples are based on a diluted sample to bring the sample into calibration range.

TABLE 6-4 SUMMARY OF PESTICIDE AREA DATA

CAS Number	Analyte	Minimum Concentration (mg/kg) [(a)]	Qualifier of Minimum	Maximum Concentration (mg/kg) [(a)]	Qualifier of Maximum	Maximum Location	Date Sampled	Detection Frequency
72-54-8	4,4'-DDD	0.0021	U	0.071	P	624-SS-53-01	7/22/2000	2/8
72-55-9	4,4'-DDE	0.0021	U	0.044	P	624-SS-53-01	7/22/2000	2/8
50-29-3	4,4'-DDT	0.11		1.00		624-SS-02-01	8/26/1998	4/8
7421-93-4	ENDRIN ALDEHYDE	0.0022	U	0.0082	P	624-SS-53-01	7/22/2000	1/8
53494-70-5	ENDRIN KETONE	0.0021	U	0.032	P	624-SS-53-01	7/22/2000	2/8
5103-74-2	GAMMA-CHLORDANE	0.0011	U	0.0087	P	624-SS-53-01	7/22/2000	1/8
58-89-9	GAMMA-HCH (LINDANE)	0.0021	U	0.0052	P	624-SS-53-01	7/22/2000	2/8
1024-57-3	HEPTACHLOR EPOXIDE	0.016		0.12	P	624-SS-05-01	8/26/1998	3/8

(a) Reported concentration represents 1/2 the detection limit when the qualifier is "U".

U = Compound was analyzed for but not detected.
P = There was a greater than 25 % difference between the two GC columns, and the lower of the two values is reported.

TABLE 6-5 SUMMARY OF GROUNDWATER DATA

CAS Number	Analyte	Minimum Concentration (mg/L) [(a)]	Qualifier of Minimum	Maximum Concentration (mg/L) [(a)]	Qualifier of Maximum	Maximum Location	Date Sampled	Detection Frequency
INORGANICS								
7429-90-5	ALUMINUM	0.005	U	0.7965		MW4-GW-01-01	8/20/1998	13/15
7440-36-0	ANTIMONY	0.0001	U	0.0038	B	MW1-GW-01-01	8/20/1998	3/15
7440-39-3	BARIUM	0.0062	U	0.224		MW1-GW-01-01	8/20/1998	13/15
7440-43-9	CADMIUM	0.0001	U	0.0004	B	MW1-GW-01-01/ MW2-GW-01-01	7/12/2000	3/15
7440-70-2	CALCIUM	7.89		76.3		MW1-GW-01-01	8/20/1998	15/15
7440-47-3	CHROMIUM	0.0004	U	0.1025	U	MW1-GW-01-01	8/20/1998	10/15
7440-48-4	COBALT	0.0002	U	0.0038	U	MW1-GW-01-01/ MW5-GW-01-01	8/20/1998	1/15
7440-50-8	COPPER	0.0003	U	0.014		MW4-GW-01-01	4/25/2002	5/15
7439-89-6	IRON	0.0028	U	1.85		MW1-GW-01-01	8/20/1998	13/15
7439-92-1	LEAD	0.00045	U	0.013		MW4-GW-01-01	4/25/2002	7/15
7439-95-4	MAGNESIUM	2.88		41.9		MW1-GW-01-01	8/20/1998	15/15
7439-96-5	MANGANESE	0.00005	U	0.0605		MW1-GW-01-01	8/20/1998	7/15
7440-02-0	NICKEL	0.0002	U	0.204		MW1-GW-01-01	8/20/1998	8/15
7440-09-7	POTASSIUM	0.552	B	4.26		MW1-GW-01-01	7/12/2000	15/15
7782-49-2	SELENIUM	0.0005	U	0.004	B	MW4-GW-01-01	7/14/2000	4/15
7440-23-5	SODIUM	6.7		110		MW4-GW-01-01	4/25/2002	15/15
7440-62-2	VANADIUM	0.00002	U	0.0028	U	MW1-GW-01-01/ MW5-GW-01-01	8/20/1998	1/15
7440-66-6	ZINC	0.00035	U	0.04		MW4-GW-01-01	4/25/2002	6/15

TABLE 6-5 SUMMARY OF GROUNDWATER DATA

CAS Number	Analyte	Minimum Concentration (mg/L) (a)	Qualifier of Minimum	Maximum Concentration (mg/L) (a)	Qualifier of Maximum	Maximum Location	Date Sampled	Detection Frequency
PAH								
91-57-6	2-METHYLNAPHTHALENE	0.000015	U	0.0067	P	MW4-GW-01-01	7/14/2000	1/11
83-32-9	ACENAPHTHENE	0.00001	U	0.0008	J	MW4-GW-01-01	4/25/2002	1/9
120-12-7	ANTHRACENE	0.00001	U	0.005	U	MW2-GW-01-01	7/15/2000	2/11
56-55-3	BENZ[A]ANTHRACENE	0.000015	U	0.01		MW4-GW-01-01	4/25/2002	2/10
50-32-8	BENZO[A]PYRENE	0.00001	U	0.01		MW4-GW-01-01	4/25/2002	1/9
205-99-2	BENZO[B]FLUORANTHENE	0.00001	U	0.02		MW4-GW-01-01	4/25/2002	2/10
191-24-2	BENZO[G,H,I]PERYLENE	0.00001	U	0.009		MW4-GW-01-01	4/25/2002	2/10
207-08-9	BENZO[K]FLUORANTHENE	0.00001		0.006		MW4-GW-01-01	4/25/2002	2/10
218-01-9	CHRYSENE	0.00001		0.014		MW4-GW-01-01	4/25/2002	2/10
53-70-3	DIBENZ[A,H]ANTHRACENE	0.00001	U	0.002		MW4-GW-01-01	4/25/2002	2/10
206-44-0	FLUORANTHENE	0.00001	U	0.032		MW4-GW-01-01	4/25/2002	2/10
86-73-7	FLUORENE	0.00001	U	0.0009	J	MW4-GW-01-01	4/25/2002	1/10
193-39-5	INDENO[1,2,3-C,D]PYRENE	0.00001	U	0.01		MW4-GW-01-01	4/25/2002	2/10
91-20-3	NAPHTHALENE	0.000015	U	0.0009	J	MW4-GW-01-01	4/25/2002	1/13
85-01-8	PHENANTHRENE	0.00001	U	0.017		MW4-GW-01-01	4/25/2002	2/10
129-00-0	PYRENE	0.00001	U	0.023		MW4-GW-01-01	4/25/2002	2/10
PESTICIDES								
60-57-1	DIELDRIN	0.000015	U	0.0004	J	MW4-GW-01-01	4/25/2002	2/5
SEMIVOLATILES								
117-81-7	BIS(2-ETHYLHEXYL)PHTHAL	0.0004	J	0.014		MW3-GW-01-01	4/10/2002	5/11
85-68-7	BUTYLBENZYLPHTHALATE	0.00001	U	0.005	U	MW1-GW-01-01/ MW5-GW-01-01	7/12/2000	4/10
103-23-1	DI(2-ETHYLHEXYL)ADIPATE	0.00004	J	0.00015	U	MW4-GW-01-01	4/25/2002	4/5
132-64-9	DIBENZOFURAN	0.00001	U	0.005	U	MW1-GW-01-01/ MW5-GW-01-01	7/12/2000	1/10
84-74-2	DIBUTYLPHTHALATE	0.0005		0.005	U	MW1-GW-01-01/ MW5-GW-01-01	7/12/2000	5/10
84-66-2	DIETHYLPHTHALATE	0.0004	J	0.005	U	MW1-GW-01-01/	7/12/2000	5/10
131-11-3	DIMETHYLPHTHALATE	0.00008	J	0.005	U	MW1-GW-01-01/ MW5-GW-01-01	7/12/2000	4/10

TABLE 6-5 SUMMARY OF GROUNDWATER DATA

CAS Number	Analyte	Minimum Concentration (mg/L) (a)	Qualifier of Minimum	Maximum Concentration (mg/L) (a)	Qualifier of Maximum	Maximum Location	Date Sampled	Detection Frequency
VOLATILES								
67-64-1	ACETONE	0.000695	U	0.01		MW1-GW-01-01	8/20/1998	2/11
75-25-2	BROMOFORM	0.0001	U	0.003		MW2-GW-01-01	4/25/2002	2/10
75-00-3	CHLOROETHANE	0.0001	U	0.0025	U	MW2-GW-01-01/ MW4-GW-01-01	7/15/2000	2/10
67-66-3	CHLOROFORM	0.00005	U	0.023		MW2-GW-01-01	8/20/1998	4/12
74-87-3	CHLOROMETHANE	0.0005	U	0.0042		MW2-GW-01-01	4/25/2002	5/10
124-48-1	DIBROMOCHLOROMETHANE	0.0001	U	0.0025	U	MW2-GW-01-01/ MW4-GW-01-01	7/15/2000	2/10
GIS-130-312	M/P-XYLENES	0.00009	U	0.0003	J	MW2-GW-01-01	4/25/2002	1/5
1634-04-4	METHYL T-BUTYL ETHER	0.00004	U	0.0014		MW4-GW-01-01	4/25/2002	4/5
75-09-2	METHYLENE CHLORIDE	0.00005	U	0.0025	U	MW2-GW-01-01/ MW4-GW-01-01	7/15/2000	1/10
104-51-8	N-BUTYLBENZENE	0.000035	U	0.0001	J	MW2-GW-01-01/ MW4-GW-01-01	4/25/2002	4/5
99-87-6	P-ISOPROPYLTOLUENE	0.000045	U	0.0002	J	MW4-GW-01-01	4/25/2002	1/5
75-65-0	TERT-BUTYL ALCOHOL	0.00054	U	0.0051		MW4-GW-01-01	4/25/2002	1/5
1330-20-7	XYLENES	0.0001	U	0.0025	U	MW2-GW-01-01/ MW4-GW-01-01	7/15/2000	1/10

(a) Reported concentration represents 1/2 the detection limit when the qualifier is "U".

U = Compound was analyzed for but not detected.
B = Reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
P = There was a greater than 25 % difference between the two GC columns, and the lower of the two values is reported.
J = Estimated Value
D = The quantification for these samples are based on a diluted sample to bring the sample into calibration range.

TABLE 6-6 MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY (FORT TOTTEN COAST GUARD STATION-TOTAL SOIL-FILL AREA)

Scenario Timeframe: Current/Future
Medium: Total Soil
Exposure Medium: Total Soil
Exposure Point: Total Soil

Chemical of Potential Concern	Units	Arithmetic Mean	Distribution Tests					95% UCL of Mean	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
			W	Prob	W-Log	Prob	Distribution				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS													
ALUMINUM	mg/kg	5630	0.81	0.0031	0.88	0.0333	BOOTSTRAP	6260	9170		6260	95%UCLM	EPA 1989
ANTIMONY	mg/kg	1.26	0.85	0.0124	0.98	0.9510	LOGNORMAL	1.84	3.7	N	1.84	95%UCLM	EPA 1989
ARSENIC	mg/kg	4.63	0.92	0.1250	0.73	0.0002	NORMAL	5.88	9.5		5.88	95%UCLM	EPA 1989
BARIUM	mg/kg	150	0.94	0.3080	0.94	0.3694	NORMAL	188	316		188	95%UCLM	EPA 1989
BERYLLIUM	mg/kg	0.318	0.95	0.5084	0.90	0.0615	NORMAL	0.37	0.54	B	0.37	95%UCLM	EPA 1989
CADMIUM	mg/kg	0.587	0.88	0.0270	0.78	0.0010	BOOTSTRAP	0.805	1.6		0.805	95%UCLM	EPA 1989
CHROMIUM	mg/kg	19.8	0.95	0.4138	0.97	0.7565	NORMAL	22	29.4	*	22	95%UCLM	EPA 1989
COBALT	mg/kg	5.72	0.91	0.0987	0.97	0.7954	NORMAL	6.39	10.1		6.39	95%UCLM	EPA 1989
COPPER	mg/kg	73.5	0.90	0.0795	0.95	0.4627	NORMAL	97.3	198		97.3	95%UCLM	EPA 1989
LEAD	mg/kg	331	0.91	0.0865	0.77	0.0009	NORMAL	442	743		442	95%UCLM	EPA 1989
MANGANESE	mg/kg	251	0.89	0.0460	0.83	0.0061	BOOTSTRAP	283	454	N	283	95%UCLM	EPA 1989
MERCURY	mg/kg	0.601	0.91	0.0926	0.80	0.0024	NORMAL	0.791	1.3		0.791	95%UCLM	EPA 1989
NICKEL	mg/kg	19.3	0.90	0.0767	0.95	0.5247	NORMAL	21.1	31.5		21.1	95%UCLM	EPA 1989
SELENIUM	mg/kg	0.354	0.81	0.0024	0.83	0.0047	BOOTSTRAP	0.476	1.1		0.476	95%UCLM	EPA 1989
SILVER	mg/kg	0.174	0.66	0.0000	0.80	0.0023	BOOTSTRAP	0.25	0.57	B	0.25	95%UCLM	EPA 1989
THALLIUM	mg/kg	0.109	0.85	0.0126	0.93	0.2434	LOGNORMAL	0.131	0.23	B	0.131	95%UCLM	EPA 1989
VANADIUM	mg/kg	22	0.97	0.7376	0.98	0.9272	NORMAL	24.2	33		24.2	95%UCLM	EPA 1989
ZINC	mg/kg	289	0.92	0.1430	0.86	0.0135	NORMAL	382	850		382	95%UCLM	EPA 1989
PAH													
ACENAPHTHENE	mg/kg	0.143	0.79	0.0018	0.78	0.0017	BOOTSTRAP	0.169	0.37	J	0.169	95%UCLM	EPA 1989
ACENAPHTHYLENE	mg/kg	0.0683	0.43	0.0000	0.45	0.0000	BOOTSTRAP	0.0922	0.053	J	0.053	Maximum	EPA 1989
ANTHRACENE	mg/kg	0.147	0.47	0.0000	0.79	0.0020	BOOTSTRAP	0.237	0.88		0.237	95%UCLM	EPA 1989
BENZ[A]ANTHRACENE	mg/kg	0.375	0.90	0.0863	0.87	0.0288	NORMAL	0.497	1.1		0.497	95%UCLM	EPA 1989
BENZO[A]PYRENE	mg/kg	0.39	0.95	0.5331	0.81	0.0033	NORMAL	0.496	0.87		0.496	95%UCLM	EPA 1989
BENZO[B]FLUORANTHENE	mg/kg	0.519	0.95	0.4633	0.78	0.0013	NORMAL	0.663	1.1		0.663	95%UCLM	EPA 1989
BENZO[G,H,I]PERYLENE	mg/kg	0.275	0.95	0.4390	0.86	0.0221	NORMAL	0.343	0.63		0.343	95%UCLM	EPA 1989
BENZO[K]FLUORANTHENE	mg/kg	0.201	0.95	0.5072	0.88	0.0333	NORMAL	0.25	0.43		0.25	95%UCLM	EPA 1989
CHRYSENE	mg/kg	0.438	0.92	0.1772	0.84	0.0091	NORMAL	0.569	1.2		0.569	95%UCLM	EPA 1989
DIBENZ[A,H]ANTHRACENE	mg/kg	0.131	0.86	0.0213	0.86	0.0194	BOOTSTRAP	0.157	0.18	J	0.157	95%UCLM	EPA 1989
FLUORANTHENE	mg/kg	0.621	0.89	0.0514	0.91	0.1255	NORMAL	0.832	1.9		0.832	95%UCLM	EPA 1989
FLUORENE	mg/kg	0.136	0.60	0.0000	0.80	0.0024	BOOTSTRAP	0.194	0.58		0.194	95%UCLM	EPA 1989
INDENO[1,2,3-C,D]PYRENE	mg/kg	0.277	0.93	0.2080	0.86	0.0193	NORMAL	0.35	0.7		0.35	95%UCLM	EPA 1989
2-METHYLNAPHTHALENE	mg/kg	0.0834	0.69	0.0001	0.78	0.0016	BOOTSTRAP	0.105	0.15	J	0.105	95%UCLM	EPA 1989
NAPHTHALENE	mg/kg	0.104	0.88	0.0384	0.86	0.0206	BOOTSTRAP	0.123	0.16	J / J	0.123	95%UCLM	EPA 1989
PHENANTHRENE	mg/kg	0.512	0.63	0.0000	0.95	0.4294	LOGNORMAL	1.1	2.7		1.1	95%UCLM	EPA 1989
PYRENE	mg/kg	0.76	0.84	0.0096	0.85	0.0120	BOOTSTRAP	1.04	2.7		1.04	95%UCLM	EPA 1989

TABLE 6-6 (continued)

Chemical of Potential Concern	Units	Arithmetic Mean	Distribution Tests					95% UCL of Mean	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
			W	Prob	W-Log	Prob	Distribution				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
SEMIVOLATILES													
BIS(2-ETHYLHEXYL)PHTHALATE	mg/kg	0.258	0.52	0.0000	0.90	0.0744	LOGNORMAL	0.501	1.8		0.501	95%UCLM	EPA 1989
BUTYLBENZYLPHTHALATE	mg/kg	0.0981	0.67	0.0001	0.69	0.0001	BOOTSTRAP	0.12	0.073	J	0.073	Maximum	EPA 1989
CARBAZOLE	mg/kg	0.13	0.89	0.2783	0.87	0.1852	NORMAL	0.184	0.12	J	0.12	Maximum	EPA 1989
DIBENZOFURAN	mg/kg	0.13	0.77	0.0011	0.76	0.0009	BOOTSTRAP	0.165	0.28	J	0.165	95%UCLM	EPA 1989
DIBUTYLPHTHALATE	mg/kg	0.183	0.65	0.0009	0.56	0.0001	MAX	0.22	0.043	J	0.043	Maximum	EPA 1989
VOLATILES													
2-BUTANONE	mg/kg	0.0815	0.56	0.0000	0.76	0.0074	MAX	0.36	0.01	J	0.01	Maximum	EPA 1989
ACETONE	mg/kg	0.15	0.67	0.0007	0.91	0.2958	LOGNORMAL	0.7	0.7	J	0.7	95%UCLM	EPA 1989
BENZENE	mg/kg	0.0407	0.56	0.0000	0.63	0.0002	MAX	0.18	0.0043	J	0.0043	Maximum	EPA 1989
CARBON DISULFIDE	mg/kg	0.0414	0.57	0.0000	0.71	0.0020	MAX	0.18	0.01		0.01	Maximum	EPA 1989
TOLUENE	mg/kg	0.0404	0.55	0.0000	0.60	0.0001	MAX	0.18	0.0022	J	0.0022	Maximum	EPA 1989
TRICHLOROETHENE	mg/kg	0.0405	0.55	0.0000	0.60	0.0001	MAX	0.18	0.0033	J	0.0033	Maximum	EPA 1989
VINYL CHLORIDE	mg/kg	0.0413	0.57	0.0000	0.68	0.0009	MAX	0.18	0.01		0.01	Maximum	EPA 1989

N = Spiked sample recovery was not within normal limits.

B = Reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).

* = Duplicate Analyses were not within normal limits.

J = Reported value is estimated.

TABLE 6-7 MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY (FORT TOTTEN COAST GUARD STATION-TOTAL SOIL-OTHER AREA)

Scenario Timeframe: Current/Future
Medium: Total Soil
Exposure Medium: Total Soil
Exposure Point: Total soil

Chemical of Potential Concern	Units	Arithmetic Mean	Distribution Tests					95% UCL of Mean	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
			W	Prob	W-Log	Prob	Distribution				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS													
ALUMINUM	mg/kg	7160	0.97	0.1308	0.90	0.0001	NORMAL	7560	11400		7560	95%UCLM	EPA 1989
ANTIMONY	mg/kg	0.582	0.89	0.0000	0.97	0.0923	LOGNORMAL	0.695	1.8	N	0.695	95%UCLM	EPA 1989
ARSENIC	mg/kg	5.01	0.87	0.0000	0.80	0.0000	BOOTSTRAP	5.69	19.2		5.69	95%UCLM	EPA 1989
BARIUM	mg/kg	75.6	0.77	0.0000	0.97	0.1602	LOGNORMAL	83.5	295		83.5	95%UCLM	EPA 1989
BERYLLIUM	mg/kg	0.294	0.96	0.0352	0.98	0.5459	LOGNORMAL	0.318	0.53	B / B	0.318	95%UCLM	EPA 1989
CADMIUM	mg/kg	0.282	0.87	0.0000	0.91	0.0003	BOOTSTRAP	0.337	0.97		0.337	95%UCLM	EPA 1989
CHROMIUM	mg/kg	18.1	0.95	0.0111	0.88	0.0000	BOOTSTRAP	19.1	33.2	*	19.1	95%UCLM	EPA 1989
COBALT	mg/kg	5.91	0.42	0.0000	0.85	0.0000	BOOTSTRAP	6.78	35.5		6.78	95%UCLM	EPA 1989
COPPER	mg/kg	39	0.48	0.0000	0.94	0.0057	BOOTSTRAP	47.3	310	E	47.3	95%UCLM	EPA 1989
LEAD	mg/kg	195	0.87	0.0000	0.79	0.0000	BOOTSTRAP	228	793		228	95%UCLM	EPA 1989
MANGANESE	mg/kg	278	0.99	0.8668	0.87	0.0000	NORMAL	299	493		299	95%UCLM	EPA 1989
MERCURY	mg/kg	0.796	0.65	0.0000	0.92	0.0005	BOOTSTRAP	1.03	5		1.03	95%UCLM	EPA 1989
NICKEL	mg/kg	15.5	0.88	0.0000	0.96	0.0336	BOOTSTRAP	16.5	33.7		16.5	95%UCLM	EPA 1989
SELENIUM	mg/kg	0.523	0.93	0.0017	0.86	0.0000	BOOTSTRAP	0.585	1.3	/	0.585	95%UCLM	EPA 1989
SILVER	mg/kg	0.148	0.24	0.0000	0.62	0.0000	BOOTSTRAP	0.214	2.4		0.214	95%UCLM	EPA 1989
THALLIUM	mg/kg	0.0902	0.72	0.0000	0.83	0.0000	BOOTSTRAP	0.0993	0.31	B	0.0993	95%UCLM	EPA 1989
VANADIUM	mg/kg	26.3	0.97	0.1006	0.99	0.8188	NORMAL	27.9	47.7		27.9	95%UCLM	EPA 1989
ZINC	mg/kg	109	0.97	0.1157	0.94	0.0033	NORMAL	121	223	N	121	95%UCLM	EPA 1989
PAH													
ACENAPHTHENE	mg/kg	0.15	0.79	0.0000	0.74	0.0000	BOOTSTRAP	0.16	0.14	J	0.14	Maximum	EPA 1989
ACENAPHTHYLENE	mg/kg	0.181	0.51	0.0000	0.87	0.0000	BOOTSTRAP	0.242	1.5		0.242	95%UCLM	EPA 1989
ANTHRACENE	mg/kg	0.122	0.78	0.0000	0.89	0.0002	BOOTSTRAP	0.142	0.39	/	0.142	95%UCLM	EPA 1989
BENZ[A]ANTHRACENE	mg/kg	0.48	0.55	0.0000	0.96	0.0490	BOOTSTRAP	0.654	4.1		0.654	95%UCLM	EPA 1989
BENZO[A]PYRENE	mg/kg	0.617	0.47	0.0000	0.95	0.0327	BOOTSTRAP	0.877	6.3	D	0.877	95%UCLM	EPA 1989
BENZO[B]FLUORANTHENE	mg/kg	0.909	0.49	0.0000	0.95	0.0379	BOOTSTRAP	1.29	8.8	D	1.29	95%UCLM	EPA 1989
BENZO[G,H,I]PERYLENE	mg/kg	0.402	0.48	0.0000	0.91	0.0007	BOOTSTRAP	0.569	4.1		0.569	95%UCLM	EPA 1989
BENZO[K]FLUORANTHENE	mg/kg	0.317	0.53	0.0000	0.93	0.0036	BOOTSTRAP	0.43	2.7		0.43	95%UCLM	EPA 1989
CHRYSENE	mg/kg	0.576	0.58	0.0000	0.96	0.1076	LOGNORMAL	0.825	4.6	D	0.825	95%UCLM	EPA 1989
DIBENZ[A,H]ANTHRACENE	mg/kg	0.162	0.52	0.0000	0.86	0.0000	BOOTSTRAP	0.204	1		0.204	95%UCLM	EPA 1989
FLUORANTHENE	mg/kg	0.756	0.60	0.0000	0.96	0.1006	LOGNORMAL	1.11	6.4	D	1.11	95%UCLM	EPA 1989
FLUORENE	mg/kg	0.141	0.82	0.0000	0.81	0.0000	BOOTSTRAP	0.156	0.21	J	0.156	95%UCLM	EPA 1989
INDENO[1,2,3-C,D]PYRENE	mg/kg	0.439	0.50	0.0000	0.93	0.0053	BOOTSTRAP	0.613	4.1		0.613	95%UCLM	EPA 1989
2-METHYLNAPHTHALENE	mg/kg	0.121	0.83	0.0000	0.84	0.0000	BOOTSTRAP	0.139	0.33	J	0.139	95%UCLM	EPA 1989
NAPHTHALENE	mg/kg	0.11	0.80	0.0000	0.81	0.0000	BOOTSTRAP	0.126	0.29	J	0.126	95%UCLM	EPA 1989
PHENANTHRENE	mg/kg	0.34	0.81	0.0000	0.96	0.0739	LOGNORMAL	0.45	1.4		0.45	95%UCLM	EPA 1989
PYRENE	mg/kg	0.963	0.55	0.0000	0.94	0.0073	BOOTSTRAP	1.32	7.7	D	1.32	95%UCLM	EPA 1989

TABLE 6-7 (continued)

Chemical of Potential Concern	Units	Arithmetic Mean	Distribution Tests					95% UCL of Mean	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
			W	Prob	W-Log	Prob	Distribution				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
SEMIVOLATILES													
2-CHLOROPHENOL	mg/kg	0.2	0.51	0.0000	0.62	0.0000	BOOTSTRAP	0.211	0.39	J	0.211	95%UCLM	EPA 1989
4-CHLOROPHENYL PHENYL ETHI	mg/kg	0.2	0.52	0.0000	0.64	0.0000	BOOTSTRAP	0.209	0.38	J	0.209	95%UCLM	EPA 1989
4-METHYLPHENOL	mg/kg	0.188	0.58	0.0000	0.40	0.0000	BOOTSTRAP	0.196	0.055	J	0.055	Maximum	EPA 1989
BIS(2-ETHYLHEXYL)PHTHALATE	mg/kg	1.83	0.16	0.0000	0.75	0.0000	BOOTSTRAP	4.2	74	D	4.2	95%UCLM	EPA 1989
BUTYLBENZYLPHTHALATE	mg/kg	0.105	0.80	0.0000	0.83	0.0000	BOOTSTRAP	0.115	0.3	J	0.115	95%UCLM	EPA 1989
CARBAZOLE	mg/kg	0.14	0.85	0.0003	0.84	0.0001	BOOTSTRAP	0.158	0.17	J	0.158	95%UCLM	EPA 1989
DIBENZOFURAN	mg/kg	0.141	0.80	0.0000	0.77	0.0000	BOOTSTRAP	0.156	0.16	J	0.156	95%UCLM	EPA 1989
DIBUTYLPHTHALATE	mg/kg	0.16	0.70	0.0000	0.64	0.0000	BOOTSTRAP	0.178	0.066	J	0.066	Maximum	EPA 1989
DIOCTYLPHTHALATE	mg/kg	0.196	0.82	0.0001	0.86	0.0004	BOOTSTRAP	0.201	0.24	J	0.201	95%UCLM	EPA 1989
VOLATILES													
2-BUTANONE	mg/kg	0.00472	0.84	0.0065	0.77	0.0006	BOOTSTRAP	0.00495	0.004	J	0.004	Maximum	EPA 1989
ACETONE	mg/kg	0.0293	0.86	0.0133	0.91	0.0824	LOGNORMAL	0.0729	0.089		0.0729	95%UCLM	EPA 1989
BENZENE	mg/kg	0.00263	0.57	0.0000	0.67	0.0000	BOOTSTRAP	0.00286	0.0048		0.00286	95%UCLM	EPA 1989
CHLOROFORM	mg/kg	0.00243	0.75	0.0003	0.62	0.0000	BOOTSTRAP	0.0026	0.0011	J	0.0011	Maximum	EPA 1989
ETHYLBENZENE	mg/kg	0.00236	0.90	0.0544	0.82	0.0032	NORMAL	0.00253	0.0031	J	0.00253	95%UCLM	EPA 1989
TRICHLOROETHENE	mg/kg	0.00237	0.76	0.0004	0.57	0.0000	BOOTSTRAP	0.00257	0.0022	J	0.0022	Maximum	EPA 1989
VINYL CHLORIDE	mg/kg	0.00334	0.57	0.0000	0.74	0.0003	BOOTSTRAP	0.00437	0.012		0.00437	95%UCLM	EPA 1989

N = Spiked sample recovery was not within normal limits.

B = Reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).

* = Duplicate analyses not within normal limits.

E = Reported value is estimated due to an interference.

J = Reported value is estimated.

D = The quantification for these samples are based on a diluted sample to bring the sample into calibration range.

TABLE 6-8 MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY (FORT TOTTEN COAST GUARD STATION-TOTAL SOIL-PESTICIDE AREA)

Scenario Timeframe: Current/Future
Medium: Total Soil
Exposure Medium: Total Soil
Exposure Point: Total soil

Chemical of Potential Concern	Units	Arithmetic Mean	Distribution Tests					95% UCL of Mean	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
			W	Prob	W-Log	Prob	Distribution				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
DDD	mg/kg	0.0455	1.00	1.0000	1.00	1.0000	MAX	0.071	0.071	P	0.071	95%UCLM	EPA 1989
DDE	mg/kg	0.033	1.00	1.0000	1.00	1.0000	MAX	0.044	0.044	P	0.044	95%UCLM	EPA 1989
DDT	mg/kg	0.749	0.93	0.5353	0.83	0.0822	NORMAL	0.987	1.1		0.987	95%UCLM	EPA 1989
ENDRIN ALDEHYDE	mg/kg	0.0052	1.00	1.0000	1.00	1.0000	MAX	0.0082	0.0082	P	0.0082	95%UCLM	EPA 1989
ENDRIN KETONE	mg/kg	0.0225	1.00	1.0000	1.00	1.0000	MAX	0.032	0.032	P	0.032	95%UCLM	EPA 1989
GAMMA-CHLORDANE	mg/kg	0.0049	1.00	1.0000	1.00	1.0000	MAX	0.0087	0.0087	P	0.0087	95%UCLM	EPA 1989
GAMMA-HCH (LINDANE)	mg/kg	0.0042	1.00	1.0000	1.00	1.0000	MAX	0.0052	0.0052	P	0.0052	95%UCLM	EPA 1989
HEPTACHLOR EPOXIDE	mg/kg	0.0553	0.79	0.0206	0.84	0.0787	LOGNORMAL	0.0991	0.12	P	0.0991	95%UCLM	EPA 1989

P = There was a greater than 25 % difference between the two GC columns, and the lower of the two values is reported.

TABLE 6-9 MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY (FORT TOTTEN COAST GUARD STATION-GROUNDWATER)

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Groundwater

Chemical of Potential Concern	Units	Arithmetic Mean	Distribution Tests					95% UCL of Mean	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
			W	Prob	W-Log	Prob	Distribution				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
INORGANICS													
ALUMINUM	mg/L	0.268793333	0.87	0.0338	0.93	0.2834	LOGNORMAL	1.404552761	0.7965		0.7965	Maximum	EPA 1989
ANTIMONY	mg/L	0.00082	0.59	0.0000	0.83	0.0106	BOOTSTRAP	0.00134	0.0038	B	0.00134	95%UCLM	EPA 1989
BARIUM	mg/L	0.0609	0.82	0.0065	0.94	0.4102	LOGNORMAL	0.148319257	0.224		0.148319257	95%UCLM	EPA 1989
CADMIUM	mg/L	0.00016	0.59	0.0000	0.60	0.0000	BOOTSTRAP	0.000211	0.0004	B / B	0.000211	95%UCLM	EPA 1989
CHROMIUM	mg/L	0.015673333	0.59	0.0000	0.91	0.1409	LOGNORMAL	0.181389567	0.051		0.051	Maximum	EPA 1989
COBALT	mg/L	0.002786667	0.60	0.0000	0.58	0.0000	BOOTSTRAP	0.00345	0.003		0.003	Maximum	EPA 1989
COPPER	mg/L	0.002786667	0.63	0.0000	0.87	0.0364	BOOTSTRAP	0.00472	0.014		0.00472	95%UCLM	EPA 1989
LEAD	mg/L	0.002666667	0.63	0.0000	0.86	0.0241	BOOTSTRAP	0.0044	0.013		0.0044	95%UCLM	EPA 1989
MANGANESE	mg/L	0.011806667	0.68	0.0001	0.91	0.1241	LOGNORMAL	0.424132503	0.0605		0.0605	Maximum	EPA 1989
NICKEL	mg/L	0.02416	0.48	0.0000	0.97	0.9090	LOGNORMAL	0.191001993	0.204		0.191001993	95%UCLM	EPA 1989
SELENIUM	mg/L	0.001453333	0.78	0.0022	0.84	0.0122	BOOTSTRAP	0.00198	0.004	B	0.00198	95%UCLM	EPA 1989
VANADIUM	mg/L	0.001932	0.63	0.0000	0.60	0.0000	BOOTSTRAP	0.0025	0.0009		0.0009	Maximum	EPA 1989
ZINC	mg/L	0.008026667	0.70	0.0003	0.83	0.0087	BOOTSTRAP	0.0131	0.04		0.0131	95%UCLM	EPA 1989
PAH													
2-METHYLNAPHTHALENE	mg/L	0.001237273	0.58	0.0000	0.87	0.0748	LOGNORMAL	0.162526634	0.0067	P	0.0067	Maximum	EPA 1989
ACENAPHTHENE	mg/L	0.000282222	0.83	0.0401	0.75	0.0047	MAX	0.0008	0.0008	J	0.0008	Maximum	EPA 1989
ANTHRACENE	mg/L	0.000769091	0.58	0.0000	0.85	0.0397	BOOTSTRAP	0.0016	0.002		0.0016	95%UCLM	EPA 1989
BENZ[A]ANTHRACENE	mg/L	0.00104065	0.38	0.0000	0.69	0.0006	BOOTSTRAP	0.00284	0.01		0.00284	95%UCLM	EPA 1989
BENZO[A]PYRENE	mg/L	0.001150889	0.40	0.0000	0.74	0.0037	MAX	0.01	0.01		0.01	Maximum	EPA 1989
BENZO[B]FLUORANTHENE	mg/L	0.002041	0.37	0.0000	0.73	0.0019	BOOTSTRAP	0.00556	0.02		0.00556	95%UCLM	EPA 1989
BENZO[G,H,I]PERYLENE	mg/L	0.0012883	0.52	0.0000	0.81	0.0193	BOOTSTRAP	0.00294	0.009		0.00294	95%UCLM	EPA 1989
BENZO[K]FLUORANTHENE	mg/L	0.0006376	0.38	0.0000	0.73	0.0023	BOOTSTRAP	0.00172	0.006		0.00172	95%UCLM	EPA 1989
CHRYSENE	mg/L	0.0014366	0.37	0.0000	0.69	0.0007	BOOTSTRAP	0.00395	0.014		0.00395	95%UCLM	EPA 1989
DIBENZ[A,H]ANTHRACENE	mg/L	0.000288	0.52	0.0000	0.86	0.0858	LOGNORMAL	0.006859774	0.002		0.002	Maximum	EPA 1989
FLUORANTHENE	mg/L	0.0035389	0.41	0.0000	0.80	0.0162	BOOTSTRAP	0.00956	0.032		0.00956	95%UCLM	EPA 1989
FLUORENE	mg/L	0.0001335	0.49	0.0000	0.85	0.0588	LOGNORMAL	0.001025984	0.0009	J	0.0009	Maximum	EPA 1989
INDENO[1,2,3-C,D]PYRENE	mg/L	0.00104115	0.38	0.0000	0.76	0.0042	BOOTSTRAP	0.00284	0.01		0.00284	95%UCLM	EPA 1989
NAPHTHALENE	mg/L	0.000220769	0.73	0.0012	0.87	0.0526	LOGNORMAL	0.001432439	0.0009	J	0.0009	Maximum	EPA 1989
PHENANTHRENE	mg/L	0.0021967	0.49	0.0000	0.79	0.0123	BOOTSTRAP	0.00528	0.017		0.00528	95%UCLM	EPA 1989
PYRENE	mg/L	0.003288	0.52	0.0000	0.78	0.0081	BOOTSTRAP	0.00734	0.023		0.00734	95%UCLM	EPA 1989

Chemical of Potential Concern	Units	Arithmetic Mean	Distribution Tests					95% UCL of Mean	Maximum Detected Concentration	Maximum Qualifier	Reasonable Maximum Exposure		
			W	Prob	W-Log	Prob	Distribution				Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
PESTICIDES													
DIELDRIN	mg/L	0.000101	0.63	0.0014	0.76	0.0363	MAX	0.0004	0.0004	J	0.0004	Maximum	EPA 1989
SEMIVOLATILES													
BIS(2-ETHYLHEXYL)PHTHALATE	mg/L	0.004090909	0.77	0.0037	0.89	0.1267	LOGNORMAL	0.014701543	0.014		0.014	Maximum	EPA 1989
BUTYLBENZYLPHTHALATE	mg/L	0.00257	0.68	0.0005	0.81	0.0169	BOOTSTRAP	0.00392	0.0005	J	0.0005	Maximum	EPA 1989
DI(2-ETHYLHEXYL)ADIPATE	mg/L	0.000084	0.90	0.4127	0.87	0.2792	NORMAL	0.000128001	0.0001	J	0.0001	Maximum	EPA 1989
DIBENZOFURAN	mg/L	0.002594	0.69	0.0007	0.70	0.0008	BOOTSTRAP	0.00398	0.0009	J	0.0009	Maximum	EPA 1989
DIBUTYLPHTHALATE	mg/L	0.00316	0.71	0.0011	0.72	0.0015	BOOTSTRAP	0.00436	0.004	J	0.004	Maximum	EPA 1989
DIETHYLPHTHALATE	mg/L	0.00332	0.80	0.0155	0.79	0.0107	BOOTSTRAP	0.00442	0.003		0.003	Maximum	EPA 1989
DIMETHYLPHTHALATE	mg/L	0.002548	0.66	0.0003	0.67	0.0004	BOOTSTRAP	0.00399	0.0001	J / J / J	0.0001	Maximum	EPA 1989
VOLATILES													
ACETONE	mg/L	0.003152727	0.73	0.0010	0.77	0.0037	BOOTSTRAP	0.00505	0.01		0.00505	95%UCLM	EPA 1989
BROMOFORM	mg/L	0.00115	0.81	0.0205	0.85	0.0566	LOGNORMAL	0.009563125	0.003		0.003	Maximum	EPA 1989
CHLOROETHANE	mg/L	0.00077	0.68	0.0005	0.87	0.1090	LOGNORMAL	0.003429138	0.0006		0.0006	Maximum	EPA 1989
CHLOROFORM	mg/L	0.003254167	0.53	0.0000	0.92	0.2661	LOGNORMAL	0.100012896	0.023		0.023	Maximum	EPA 1989
CHLOROMETHANE	mg/L	0.00169	0.87	0.1113	0.90	0.2092	NORMAL	0.002416827	0.0042		0.002416827	95%UCLM	EPA 1989
DIBROMOCHLOROMETHANE	mg/L	0.00076	0.66	0.0003	0.86	0.0767	LOGNORMAL	0.003313512	0.0005		0.0005	Maximum	EPA 1989
M/P-XYLENES	mg/L	0.000132	0.55	0.0001	0.55	0.0001	MAX	0.0003	0.0003	J	0.0003	Maximum	EPA 1989
METHYL T-BUTYL ETHER	mg/L	0.000468	0.80	0.0795	0.90	0.4193	NORMAL	0.001027276	0.0014		0.001027276	95%UCLM	EPA 1989
METHYLENE CHLORIDE	mg/L	0.00069	0.66	0.0003	0.84	0.0447	BOOTSTRAP	0.00124	0.0002	J	0.0002	Maximum	EPA 1989
N-BUTYLBENZENE	mg/L	0.000079	0.84	0.1720	0.78	0.0601	NORMAL	0.000105197	0.0001	J / J	0.0001	Maximum	EPA 1989
P-ISOPROPYLTOLUENE	mg/L	0.000076	0.55	0.0001	0.55	0.0001	MAX	0.0002	0.0002	J	0.0002	Maximum	EPA 1989
TERT-BUTYL ALCOHOL	mg/L	0.001452	0.55	0.0001	0.55	0.0001	MAX	0.0051	0.0051		0.0051	Maximum	EPA 1989
XYLENES	mg/L	0.00072	0.65	0.0002	0.83	0.0383	BOOTSTRAP	0.00126	0.0003	J	0.0003	Maximum	EPA 1989

B = Reported value is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).

P = There was a greater than 25 % difference between the two GC columns, and the lower of the two values is reported.

J = Estimated Value

TABLE 6-10 VALUES USED FOR RESIDENT ADULT DAILY TOTAL SOIL INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Total Soil
Exposure Medium: Total Soil
Exposure Point: Fort Totten
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR	Ingestion Rate	mg/day	100	USEPA 1991
	EF	Exposure Frequency	day/yr	350	USEPA 1991
	ED-NC	Exposure Duration	yr	30	USEPA 1989
	ED-C	Exposure Duration	yr	24	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	10950	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Dermal	SA	Surface Area for Contact	cm2/event	5700	USEPA 2000
	AF	Adherence Factor	mg/cm2	0.07	USEPA 2000
	EF	Exposure Frequency	event/yr	350	USEPA 1991
	ED-NC	Exposure Duration	yr	30	USEPA 1989
	ED-C	Exposure Duration	yr	24	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	10950	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Inhalation	IR	Inhalation Rate	m3/hr	0.833	USEPA 1991
	ET	Exposure Time	hr/day	24	BPJ
	EF	Exposure Frequency	day/yr	350	USEPA 1991
	ED-NC	Exposure Duration	yr	30	USEPA 1989
	ED-C	Exposure Duration	yr	24	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	10950	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989

Note : BPJ = Best Professional Judgement

TABLE 6-11 VALUES USED FOR RESIDENT ADULT DAILY TOTAL GROUNDWATER INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Fort Totten
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR	Ingestion Rate	L/day	2	USEPA 1991
	EF	Exposure Frequency	day/yr	350	USEPA 1991
	ED-NC	Exposure Duration	yr	30	USEPA 1989
	ED-C	Exposure Duration	yr	24	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	10950	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
Dermal	SA	Surface Area for Contact	cm2	18000	USEPA 1992
	PC	Permeability Coefficient	cm/hr	chemical-specific	
	ET	Event Time	hr/day	0.58	USEPA 1997a
	EF	Exposure Frequency	day/yr	350	USEPA 1991
	ED-NC	Exposure Duration	yr	30	USEPA 1989
	ED-C	Exposure Duration	yr	24	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1991
	AT-NC	Averaging time - Noncancer	days	10950	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	L/cm3	0.001	USEPA 1989

TABLE 6-12 VALUES USED FOR RESIDENT ADULT DAILY TOTAL SHOWERING INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air
Exposure Point: Showering
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Inhalation	VR	Ventilation Rate	L/min	11	USEPA 1997a
	BW	Body Weight	kg	70	USEPA 1989
	EF	Exposure Frequency	event/yr	350	USEPA 1989
	ED	Exposure Duration	yr	30	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	10,950	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25,550	USEPA 1989
Parameters in the Shower Model					
		Liquid Phase t.c. CO_2	cm/h	20	Liss and Slater 1974
		Gas Phase t.c. H_2O	cm/h	3,000	Liss and Slater 1974
		Water Viscosity at 20C	cp	1.002	CRC 1979
		Water Viscosity at 45C	cp	0.596	CRC 1979
		Shower Temp	K	318	Foster and Chrostowski 1987
		Droplet Diameter	mm	1	Foster and Chrostowski 1987
		Drop Time	s	2	Foster and Chrostowski 1987
		Shower Flow Rate	L/min	10	Foster and Chrostowski 1987
		Shower Stall Volume	m^3	6	Foster and Chrostowski 1987
		Shower Duration	min	15	USEPA 1997a
		Air Exchange Rate	min^{-1}	0.0166667	Foster and Chrostowski 1987
		RT	atm-m^3/mol	0.024	
		Duration in Shower Room	min	20	BPJ

BPJ = Best Professional Judgement

TABLE 6-13 VALUES USED FOR RESIDENT ADULT HOMEGROWN VEGETABLE INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Total Soil
Exposure Medium: Vegetables
Exposure Point: Fort Totten
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR_{ag}	Consumption rate of exposed aboveground produce	kg/kg-day	0.0003	USEPA 1998c
	CR_{pp}	Consumption rate of protected aboveground produce	kg/kg-day	0.00057	USEPA 1998c
	CR_{bg}	Consumption rate of belowground produce in kg/kg-day.	kg/kg-day	0.00014	USEPA 1998c
	F_{ag}	Fraction of produce that is contaminated	unitless	0.25	USEPA 1998c
	EF	Exposure Frequency	day/yr	60	BPJ[1]
	ED-NC	Exposure Duration	yr	30	USEPA 1989
	ED-C	Exposure Duration	yr	24	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	8,760	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989

1. Assumed consumption of home grown vegetables for 2 months out of the year.

TABLE 6-14 VALUES USED FOR RESIDENT CHILD DAILY TOTAL SOIL INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Total Soil
Exposure Medium: Total Soil
Exposure Point: Fort Totten
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR	Ingestion Rate	mg/day	200	USEPA 1991
	EF	Exposure Frequency	day/yr	350	USEPA 1991
	ED	Exposure Duration	yr	6	USEPA 1991
	BW	Body Weight	kg	15	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	2190	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Dermal	SA	Surface Area for Contact	cm2/event	2800	USEPA 2000
	AF	Adherence Factor	mg/cm2	0.2	USEPA 2000
	EF	Exposure Frequency	event/yr	350	USEPA 1991
	ED	Exposure Duration	yr	6	USEPA 1991
	BW	Body Weight	kg	15	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	2190	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Inhalation	IR	Inhalation Rate	m3/hr	0.417	USEPA 1991
	ET	Exposure Time	hr/day	24	BPJ
	EF	Exposure Frequency	day/yr	350	USEPA 1991
	ED	Exposure Duration	yr	6	USEPA 1991
	BW	Body Weight	kg	15	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	2190	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989

Note : BPJ = Best Professional Judgement

TABLE 6-15 VALUES USED FOR RESIDENT CHILD DAILY TOTAL GROUNDWATER INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Fort Totten
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR	Ingestion Rate	L/day	1	USEPA 1991
	EF	Exposure Frequency	day/yr	350	USEPA 1991
	ED	Exposure Duration	yr	6	USEPA 1991
	BW	Body Weight	kg	15	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	2190	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
Dermal	SA	Surface Area for Contact	cm2	6600	USEPA 2000
	PC	Permeability Coefficient	cm/hr	chemical-specific	
	ET	Event Time	hr/day	1	USEPA 1992
	EF	Exposure Frequency	day/yr	350	USEPA 1991
	ED	Exposure Duration	yr	6	USEPA 1991
	BW	Body Weight	kg	15	USEPA 1991
	AT-NC	Averaging time - Noncancer	days	2190	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	L/cm3	0.001	USEPA 1989

TABLE 6-16 VALUES USED FOR RESIDENT CHILD HOMEGROWN VEGETABLE INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Total Soil
Exposure Medium: Vegetables
Exposure Point: Fort Totten
Receptor Population: Resident
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR_{ag}	Consumption rate of exposed aboveground produce	kg/kg-day	0.00042	USEPA 1998c
	CR_{pp}	Consumption rate of protected aboveground produce	kg/kg-day	0.00077	USEPA 1998c
	CR_{bg}	Consumption rate of belowground produce in kg/kg-day.	kg/kg-day	0.00022	USEPA 1998c
	F_{ag}	Fraction of produce that is contaminated	unitless	0.25	USEPA 1998c
	EF	Exposure Frequency	day/yr	60	BPJ[1]
	ED	Exposure Duration	yr	6	USEPA 1989
	BW	Body Weight	kg	15	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	2,190	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989

1. Assumed consumption of home grown vegetables for 2 months out of the year.

TABLE 6-17 VALUES USED FOR ADOLESCENT RECREATION USER DAILY TOTAL SOIL INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Current/Future
Medium: Total Soil
Exposure Medium: Total Soil
Exposure Point: Fort Totten
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR	Ingestion Rate	mg/day	200	BPJ
	EF	Exposure Frequency	day/yr	141	BPJ
	ED	Exposure Duration	yr	9	BPJ
	BW	Body Weight	kg	36	USEPA 1997a
	AT-NC	Averaging time - Noncancer	days	3285	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Dermal	SA	Surface Area for Contact	cm2/event	2900	USEPA 1992
	AF	Adherence Factor	mg/cm2	0.3	USEPA 2000
	EF	Exposure Frequency	event/yr	141	BPJ
	ED	Exposure Duration	yr	9	BPJ
	BW	Body Weight	kg	36	BPJ
	AT-NC	Averaging time - Noncancer	days	3285	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Inhalation	IR	Inhalation Rate	m3/hr	0.833	USEPA 1991
	ET	Exposure Time	hr/day	10	BPJ
	EF	Exposure Frequency	day/yr	141	BPJ
	ED	Exposure Duration	yr	9	BPJ
	BW	Body Weight	kg	36	USEPA 1997a
	AT-NC	Averaging time - Noncancer	days	2190	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989

Note : BPJ = Best Professional Judgement

TABLE 6-18 VALUES USED FOR CONSTRUCTION WORKER DAILY TOTAL SOIL INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Total Soil
Exposure Medium: Total Soil
Exposure Point: Fort Totten
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR	Ingestion Rate	mg/day	480	USEPA 1997a
	EF	Exposure Frequency	day/yr	150	BPJ
	ED	Exposure Duration	yr	1	BPJ
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	365	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Dermal	SA	Surface Area for Contact	cm2/event	3300	USEPA 2000
	AF	Adherence Factor	mg/cm2	0.3	USEPA 2000
	EF	Exposure Frequency	event/yr	150	BPJ
	ED	Exposure Duration	yr	1	BPJ
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	365	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Inhalation	IR	Inhalation Rate	m3/hr	0.833	USEPA 1991
	ET	Exposure Time	hr/day	8	BPJ
	EF	Exposure Frequency	day/yr	150	BPJ
	ED	Exposure Duration	yr	1	BPJ
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	365	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989

Note : BPJ = Best Professional Judgement

TABLE 6-19 VALUES USED FOR COMMERCIAL WORKER DAILY TOTAL SOIL INTAKE EQUATIONS, FORT TOTTEN

Scenario Timeframe: Future
Medium: Total Soil
Exposure Medium: Total Soil
Exposure Point: Fort Totten
Receptor Population: Commercial Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/Reference
Ingestion	CR	Ingestion Rate	mg/day	50	USEPA 1991
	EF	Exposure Frequency	day/yr	250	USEPA 1991
	ED	Exposure Duration	yr	25	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	9125	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Dermal	SA	Surface Area for Contact	cm2/event	5700	USEPA 2000
	AF	Adherence Factor	mg/cm2	0.1	USEPA 2000
	EF	Exposure Frequency	event/yr	250	USEPA 1991
	ED	Exposure Duration	yr	25	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	9125	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989
	CF	Conversion Factor	kg/mg	0.000001	USEPA 1989
Inhalation	IR	Inhalation Rate	m3/hr	0.833	USEPA 1991
	ET	Exposure Time	hr/day	8	BPJ
	EF	Exposure Frequency	day/yr	250	USEPA 1991
	ED	Exposure Duration	yr	25	USEPA 1991
	BW	Body Weight	kg	70	USEPA 1989
	AT-NC	Averaging time - Noncancer	days	9125	USEPA 1989
	AT-C	Averaging Time - Cancer	days	25550	USEPA 1989

Note : BPJ = Best Professional Judgement

TABLE 6-20 ACCUMULATION FACTORS USED TO CALCULATE COPC CONCENTRATIONS IN HOMEGROWN PRODUCE

COPC	Combustion Guidance (USEPA 1998c)			Baes et al. (1984)		Travis and Arms (1988)		Comments
	Br_{ag}	$Br_{rootveg}$	$VG_{rootveg}$	B_v	B_r	Log K_{ow}	B_r	
METALS								
Aluminum	NA	NA	NA	0.004	0.00065	NA	NA	
Antimony	0.0319	0.03	1.0	NA	NA	NA	NA	
Arsenic	0.00633	0.008	1.0	NA	NA	NA	NA	
Barium	0.0322	0.015	1.0	NA	NA	NA	NA	
Beryllium	0.00258	0.0015	1.0	NA	NA	NA	NA	
Cadmium	0.125	0.064	1.0	NA	NA	NA	NA	
Chromium	0.00488	0.0045	1.0	NA	NA	NA	NA	
Cobalt	NA	NA	NA	0.02	0.007	NA	NA	
Copper	NA	NA	NA	NA	NA	NA	NA	Use regression (see text)
Lead	0.0136	0.009	1.0	NA	NA	NA	NA	
Manganese	NA	NA	NA	0.25	0.05	NA	NA	
Mercury	0.0145	0.036	1.0	NA	NA	NA	NA	Based on mercuric chloride
Nickel	0.0093	0.008	1.0	NA	NA	NA	NA	
Selenium	0.016	0.0195	1.0	NA	NA	NA	NA	
Silver	0.138	0.10	1.0	NA	NA	NA	NA	
Thallium	0.00086	0.0004	1.0	NA	NA	NA	NA	
Vanadium	NA	NA	NA	0.0055	0.003	NA	NA	
Zinc	0.046	0.044	1.0	NA	NA	NA	NA	
Polycyclic Aromatic Hydrocarbons (PAH)								
Acenaphthene	0.196	5.48	1.0	NA	NA	NA	NA	
Acenaphthylene	NA	NA	NA	NA	NA	4.07	0.172	
Anthracene	0.101	2.76	0.01	NA	NA	NA	NA	
Benz(a)anthracene	0.0202	2.11	0.01	NA	NA	NA	NA	
Benzo(a)pyrene	0.0111	1.26	0.01	NA	NA	NA	NA	
Benzo(b)fluoranthene	0.01007	1.66	0.01	NA	NA	NA	NA	
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	6.58	0.0061	
Benzo(k)fluoranthene	0.0101	1.66	0.01	NA	NA	NA	NA	
Chrysene	0.0187	2.05	0.01	NA	NA	NA	NA	

TABLE 6-20 (continued)

COPC	Combustion Guidance (USEPA 1998c)			Baes et al. (1984)		Travis and Arms (1988)		Comments
	Br_{ag}	$Br_{rootveg}$	$VG_{rootveg}$	B_v	B_r	Log K_{ow}	B_r	
Dibenz(a,h)anthracene	0.0064	1.43	0.01	NA	NA	NA	NA	
Fluoranthene	0.0446	3.9	0.01	NA	NA	NA	NA	
Fluorene	0.151	4.96	0.01	NA	NA	NA	NA	
Indeno(1,2,3-c,d)pyrene	0.0039	1.19	0.01	NA	NA	NA	NA	
2-Methylnaphthalene	0.435	8.23	1.0	NA	NA	NA	NA	Used naphthalene as surrogate
Naphthalene	0.435	8.23	1.0	NA	NA	NA	NA	
Phenanthrene	0.0908	1.49	0.01	NA	NA	NA	NA	
Pyrene	0.0498	2.44	0.01	NA	NA	NA	NA	
Semivolatile Organic Chemicals								
2-Chlorophenol	2.18	4.4	1.0	NA	NA	NA	NA	
4-Chlorophenylphyenylether	0.068	1.48	0.01	NA	NA	NA	NA	Used 3-Chlorophenylphyenylether as surrogate
4-Methylphenol	2.93	29.4	1.0	NA	NA	NA	NA	
Bis(2-ethylhexyl)phthalate	0.038	2.13	0.01	NA	NA	NA	NA	
Butylbenzylphthalate	0.109	4.27	0.01	NA	NA	NA	NA	
Carbazole	NA	NA	NA	NA	NA	3.72	0.274	
Dibenzofuran	NA	NA	NA	NA	NA	4.12	0.161	
Dibutylphthalate	0.0724	64.3	0.01	NA	NA	NA	NA	
Dioctylphthalate	0.00016	0.393	0.01	NA	NA	NA	NA	
Volatile Organic Chemicals								
2-Butanone	26.7	286	1.0	NA	NA	NA	NA	
Acetone	52	680	1.0	NA	NA	NA	NA	
Benzene	2.25	26.7	1.0	NA	NA	NA	NA	
Carbon disulfide	2.7	27.9	1.0	NA	NA	NA	NA	
Chloroform	2.89	25.8	1.0	NA	NA	NA	NA	
Ethyl benzene	0.607	32	1.0	NA	NA	NA	NA	
Toluene	1.11	23.3	1.0	NA	NA	NA	NA	
Trichloroethene	1.52	21.2	1.0	NA	NA	NA	NA	
Vinyl chloride	8.42	72.9	1.0	NA	NA	NA	NA	

NA = Not Applicable

TABLE 6-21 SUMMARY OF MODELED PRODUCE CONCENTRATIONS (mg/kg dry)

COPC	Soil	Aboveground Produce	Protected Produce	Belowground Produce
Fill Area				
METALS				
ALUMINUM	6260	25.04	4.069	25.04
ANTIMONY	1.84	0.058696	0.058696	0.0552
ARSENIC	5.88	0.0372204	0.0372204	0.04704
BARIUM	188	6.0536	6.0536	2.82
BERYLLIUM	0.37	0.0009546	0.0009546	0.000555
CADMIUM	0.805	0.100625	0.100625	0.05152
CHROMIUM	22	0.10736	0.10736	0.099
COBALT	6.39	0.1278	0.04473	0.1278
COPPER	97.3	11.8538511	11.8538511	11.8538511
LEAD	442	6.0112	6.0112	3.978
MANGANESE	283	70.75	14.15	70.75
MERCURY	0.791	0.0114695	0.0114695	0.028476
NICKEL	21.1	0.196441	0.196441	0.1688
SELENIUM	0.476	0.007616	0.007616	0.009282
SILVER	0.25	0.0345	0.0345	0.025
THALLIUM	0.131	0.000112398	0.000112398	0.0000524
VANADIUM	24.2	0.1331	0.0726	0.1331
ZINC	382	17.572	17.572	16.808
PAH				
ACENAPHTHENE	0.169	0.033462	0.033462	0.92612
ACENAPHTHYLENE	0.053	0.009116243	0.009116243	0.009116243
ANTHRACENE	0.237	0.023937	0.023937	0.0065412
BENZ[A]ANTHRACENE	0.497	0.0100394	0.0100394	0.0104867
BENZO[A]PYRENE	0.496	0.0055056	0.0055056	0.0062496
BENZO[B]FLUORANTHENE	0.663	0.00667641	0.00667641	0.0110058
BENZO[G,H,I]PERYLENE	0.343	0.002089557	0.002089557	0.002089557
BENZO[K]FLUORANTHENE	0.25	0.002525	0.002525	0.00415
CHRYSENE	0.569	0.01061754	0.01061754	0.0116645
DIBENZ[A,H]ANTHRACENE	0.157	0.00099852	0.00099852	0.0022451
FLUORANTHENE	0.832	0.0371072	0.0371072	0.032448
FLUORENE	0.194	0.029294	0.029294	0.0096224
INDENO[1,2,3-C,D]PYRENE	0.35	0.001365	0.001365	0.004165
2-METHYLNAPHTHALENE	0.105	0.045675	0.045675	0.86415
NAPHTHALENE	0.123	0.053505	0.053505	1.01229
PHENANTHRENE	1.1	0.09988	0.09988	0.01639
PYRENE	1.04	0.051792	0.051792	0.025376
SEMIVOLATILES				
BIS(2-ETHYLHEXYL)PHTHALATE	0.501	0.019038	0.019038	0.0106713
BUTYLBENZYLPHTHALATE	0.073	0.007957	0.007957	0.0031171
CARBAZOLE	0.12	0.032886772	0.032886772	0.032886772
DIBENZOFURAN	0.165	0.026553633	0.026553633	0.026553633
DIBUTYLPHTHALATE	0.043	0.0031132	0.0031132	0.027649
VOLATILES				
2-BUTANONE	0.01	0.267	0.267	2.86
ACETONE	0.7	36.4	36.4	476

COPC	Soil	Aboveground Produce	Protected Produce	Belowground Produce
BENZENE	0.0043	0.009675	0.009675	0.11481
CARBON DISULFIDE	0.01	0.027	0.027	0.279
TOLUENE	0.0022	0.002442	0.002442	0.05126
TRICHLOROETHENE	0.0033	0.005016	0.005016	0.06996
VINYL CHLORIDE	0.01	0.0842	0.0842	0.729
Other Area				
METALS				
ALUMINUM	7560	30.24	4.914	30.24
ANTIMONY	0.695	0.0221705	0.0221705	0.02085
ARSENIC	5.69	0.0360177	0.0360177	0.04552
BARIUM	83.5	2.6887	2.6887	1.2525
BERYLLIUM	0.318	0.00082044	0.00082044	0.000477
CADMIUM	0.337	0.042125	0.042125	0.021568
CHROMIUM	19.1	0.093208	0.093208	0.08595
COBALT	6.78	0.1356	0.04746	0.1356
COPPER	47.3	8.921508587	8.921508587	8.921508587
LEAD	228	3.1008	3.1008	2.052
MANGANESE	299	74.75	14.95	74.75
MERCURY	1.03	0.014935	0.014935	0.03708
NICKEL	16.5	0.153615	0.153615	0.132
SELENIUM	0.585	0.00936	0.00936	0.0114075
SILVER	0.214	0.029532	0.029532	0.0214
THALLIUM	0.0993	8.51994E-05	8.51994E-05	0.00003972
VANADIUM	27.9	0.15345	0.0837	0.15345
ZINC	121	5.566	5.566	5.324
PAH				
ACENAPHTHENE	0.14	0.02772	0.02772	0.7672
ACENAPHTHYLENE	0.242	0.041625107	0.041625107	0.041625107
ANTHRACENE	0.142	0.014342	0.014342	0.0039192
BENZ[A]ANTHRACENE	0.654	0.0132108	0.0132108	0.0137994
BENZO[A]PYRENE	0.877	0.0097347	0.0097347	0.0110502
BENZO[B]FLUORANTHENE	1.29	0.0129903	0.0129903	0.021414
BENZO[G,H,I]PERYLENE	0.569	0.003466349	0.003466349	0.003466349
BENZO[K]FLUORANTHENE	0.43	0.004343	0.004343	0.007138
CHRYSENE	0.825	0.0153945	0.0153945	0.0169125
DIBENZ[A,H]ANTHRACENE	0.204	0.00129744	0.00129744	0.0029172
FLUORANTHENE	1.11	0.049506	0.049506	0.04329
FLUORENE	0.156	0.023556	0.023556	0.0077376
INDENO[1,2,3-C,D]PYRENE	0.613	0.0023907	0.0023907	0.0072947
2-METHYLNAPHTHALENE	0.139	0.060465	0.060465	1.14397
NAPHTHALENE	0.126	0.05481	0.05481	1.03698
PHENANTHRENE	0.45	0.04086	0.04086	0.006705
PYRENE	1.32	0.065736	0.065736	0.032208
SEMIVOLATILES				
2-CHLOROPHENOL	0.211	0.45998	0.45998	0.9284
4-CHLOROPHENYL PHENYL ETHE	0.209	0.014212	0.014212	0.0030932
4-METHYLPHENOL	0.055	0.16115	0.16115	1.617
BIS(2-ETHYLHEXYL)PHTHALATE	4.2	0.1596	0.1596	0.08946
BUTYLBENZYLPHTHALATE	0.115	0.012535	0.012535	0.0049105
CARBAZOLE	0.158	0.043300916	0.043300916	0.043300916
DIBENZOFURAN	0.156	0.025105253	0.025105253	0.025105253

COPC	Soil	Aboveground Produce	Protected Produce	Belowground Produce
DIBUTYLPHTHALATE	0.066	0.0047784	0.0047784	0.042438
DIOCTYLPHTHALATE	0.201	0.000031557	0.000031557	0.00078993
VOLATILES				
2-BUTANONE	0.004	0.1068	0.1068	1.144
ACETONE	0.0729	3.7908	3.7908	49.572
BENZENE	0.00286	0.006435	0.006435	0.076362
CHLOROFORM	0.0011	0.003179	0.003179	0.02838
ETHYLBENZENE	0.00253	0.00153571	0.00153571	0.08096
TRICHLOROETHENE	0.0022	0.003344	0.003344	0.04664
VINYL CHLORIDE	0.00437	0.0367954	0.0367954	0.318573
Pesticide Area				
DDD	0.071	0.0007952	0.0007952	0.018602
DDE	0.044	0.00041228	0.00041228	0.007788
DDT	0.987	0.0011844	0.0011844	0.0159894
ENDRIN ALDEHYDE (use Endrin)	0.0082	0.000047232	0.000047232	0.0010332
ENDRIN KETONE (use Endrin)	0.032	0.00018432	0.00018432	0.004032
GAMMA-CHLORDANE	0.0087	0.00012441	0.00012441	0.0014703
GAMMA-HCH (LINDANE) (use alpha	0.0052	0.0012844	0.0012844	0.0598
HEPTACHLOR EPOXIDE	0.0991	0.00689736	0.00689736	0.0146668

TABLE 6-22 NON-CANCER TOXICITY DATA - ORAL/DERMAL, FORT TOTTEN

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Oral to Dermal Adjustment Factor (GI ABS) (1)	Adjusted Dermal RfD (2) (mg/kg bw-day)	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (mm/dd/yy)
Inorganics								
ALUMINUM	Subchronic	1.00E+00	1	1.00E+00	Central Nervous System	100/3	EPA-NCEA	5/30/1997
ANTIMONY	Chronic	4.00E-04	0.15	6.00E-05	Blood glucose and cholesterol	1000/1	IRIS	7/26/2001
BARIUM	Chronic	7.00E-02	0.07	4.90E-03	Kidneys	3/1	IRIS	7/26/2001
CADMIUM	Chronic	5.00E-04	0.025	1.25E-05	Kidneys	10/1	IRIS	7/27/2001
CHROMIUM	Chronic	3.00E-03	0.025	7.50E-05	Central Nervous System	300/3	IRIS	7/27/2001
COBALT		6.00E-02	1	6.00E-02	provisional value		EPA-NCEA	
COPPER		3.70E-02	1	3.70E-02			IRIS	7/27/2001
LEAD		NA	1	NA				
MANGANESE	Chronic	2.40E-02	0.04	9.60E-04	Central Nervous System	1/1	IRIS	7/27/2001
NICKEL		2.00E-02	0.04	8.00E-04	None	300/1	IRIS	7/27/2001
SELENIUM		5.00E-03	1	5.00E-03	None	3/1	IRIS	7/27/2001
VANADIUM	Chronic	7.00E-03	0.026	1.82E-04	Hair	100/1	IRIS	7/27/2001
ZINC	Chronic	3.00E-01	1	3.00E-01		3/1	IRIS	7/27/2001
PAHs								
ACENAPHTHENE		6.00E-02	NA	NA	Liver	3000/1	IRIS	7/26/2001
ANTHRACENE		3.00E-01	NA	NA	None	3000/1	IRIS	7/26/2001
BENZ(A)ANTHRACENE		NA	NA	NA				
BENZO[A]PYRENE		NA	NA	NA				
BENZO(B)FLOURANTHENE		NA	NA	NA				
BENZO(G,H,I)PERYLENE		3.00E-02	NA	NA	Based on pyrene	3000/1	IRIS	7/26/2001
BENZO(K)FLOURANTHENE		NA	NA	NA				
CHRYSENE		NA	NA	NA				
DIBENZ[A, H]ANTHRACENE		NA	NA	NA				
FLUORANTHENE		4.00E-02	NA	NA	Liver	3000/1	IRIS	7/27/2001
FLUORENE		4.00E-02	NA	NA	Liver and blood	3000/1	IRIS	7/27/2001
INDENO(1,2,3-CD)PYRENE		NA	NA	NA				
2-METHYLNAPHTHALENE	Chronic	2.00E-02	1	2.00E-02	Based on napthalene	3000/1	IRIS	7/27/2001
NAPHTHALENE	Chronic	2.00E-02	NA	NA	None	3000/1	IRIS	7/27/2001
PHENANTHRENE	Chronic	2.00E-02	NA	NA	Based on napthalene	3000/1	IRIS	7/27/2001
PYRENE	Chronic	3.00E-02	NA	NA	Kidney	3000/1	IRIS	7/27/2001
Pesticides								
DIELDRIN	Chronic	5.00E-05	1	5.00E-05	Liver	100/1	IRIS	7/9/2002
HEPTACHLOR EPOXIDE	Chronic	1.30E-05	1	1.30E-05	Liver, Central Nervous System	1000/1	IRIS	7/27/2001
Semivolatiles								
BIS(2-ETHYLHEXYL)PHTHALATE		2.00E-02	1	2.00E-02	Liver	1000/1	IRIS	7/27/2001
BUTYLBENZYLPHTHALATE		2.00E-01	1	2.00E-01	None	1000/1	IRIS	7/26/2001
DI(2-ETHYLHEXYL)ADIPATE	Chronic	6.00E-01	1	6.00E-01	Liver	300/1	IRIS	7/9/2002
DIBENZOFURAN	Chronic	4.00E-03	1	4.00E-03	Liver, Kidney	300/1	EPA-NCEA	7/19/1999
DIBUTYLPHTHALATE		1.00E-01	1	1.00E-01	None	1000/1	IRIS	7/27/2001
DIETHYLPHTHALATE	Chronic	8.00E-01	1	8.00E-01	Decreased organ weight	1000/1	IRIS	7/9/2002
DIMETHYLPHTHALATE		1.00E+01	1	1.00E+01			EPA-NCEA	

Volatiles								
ACETONE		1.00E-01	1	1.00E-01	Liver	1000/1	IRIS	7/27/2001
BROMOFORM	Chronic	2.00E-02	1	2.00E-02	Liver	1000/1	IRIS	7/9/2002
CHLOROETHANE		4.00E-01	1	4.00E-01				
CHLOROFORM	Chronic	1.00E-02	1	1.00E-02	Liver, Kidneys, Central Nervous System	1000/1	IRIS	7/27/2001
CHLOROMETHANE		NA	1	NA				
DIBROMOCHLOROMETHANE	Chronic	2.00E-02	1	2.00E-02	Liver	1000/1	IRIS	7/9/2002
M&P XYLENES	Chronic	2.00E+00	1	2.00E+00	Respiratory, Body Weight	100/1	IRIS	5/27/2001
METHYL-T-BUTYL ETHER		NA	1	NA				
METHYLENE CHLORIDE	Chronic	6.00E-02	1	6.00E-02	Liver	100/1	IRIS	7/10/2002
N-BUTYLBENZENE		4.00E-02	1	4.00E-02			EPA-NCEA	
P-ISOPROPYLTOLUENE		NA	1	NA				
TERT-BUTYLALCOHOL		NA	1	NA				
XYLENES	Chronic	2.00E+00	1	2.00E+00		100/1	IRIS	7/9/2002

N/A= Not Applicable

(1) Taken from Region III Guidance.

(2) Dermal toxicological values adjusted from oral values using Region III recommended chemical-specific gastrointestinal absorption factors(GI ABS). RfDs are multiplied by the GI ABS.

(3) IRIS - Integrated Risk Information System. For IRIS values, the date IRIS was searched is provided.
HEAST - Health Affects Summary Tables. For HEAST values, the date of HEAST is provided.
EPA-NCEA - National Center for Environmental Assessment. For EPA-NCEA values, the date of the article provided by EPA-NCEA is provided.

TABLE 6-23 NON-CANCER TOXICITY DATA - INHALATION, FORT TOTTEN

Non-Cancer Toxicity Data - Inhalation

Fort Totten

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation (RfC) (mg/kg-day)	Adjusted Inhalation RfD (1)	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (mm/dd/yy)
Inorganics							
ALUMINUM	Chronic	1.40E-03	1	Respiratory System	NA	EPA-NCEA	5/30/1997
ANTIMONY		NA	0.15				
BARIUM	Chronic	1.40E-04	0.07	Kidneys	10/1	EPA-NCEA	10/7/1999
CADMIUM		NA	0.025				
CHROMIUM		NA	0.025				
COBALT		NA	1				
COPPER		NA	1				
LEAD		NA	1				
MANGANESE	Chronic	1.40E-05	0.04	Central Nervous System	1000/1	IRIS	7/27/2001
NICKEL		NA	0.04				
SELENIUM		NA	1				
VANADIUM		NA	0.026				
ZINC		NA	1				
PAHs							
ACENAPHTHENE		6.00E-02	NA	Liver	3000/1	IRIS	7/26/2001
ANTHRACENE		3.00E-01	NA	None	3000/1	IRIS	7/26/2001
BENZ(A)ANTHRACENE		NA	NA				
BENZO[A]PYRENE		NA	NA				
BENZO(B)FLOURANTHENE		NA	NA				
BENZO(G,H,I)PERYLENE		3.00E-02	NA	Based on pyrene	3000/1	IRIS	7/26/2001
BENZO(K)FLOURANTHENE		NA	NA				
CHRYSENE		NA	NA				
DIBENZ[A, H]ANTHRACENE		NA	NA				
FLUORANTHENE		4.00E-02	NA	Liver	3000/1	IRIS	7/27/2001
FLUORENE		4.00E-02	NA	Liver and blood	3000/1	IRIS	7/27/2001
INDENO(1,2,3-CD)PYRENE		NA	NA				
2-METHYLNAPHTHALENE		NA	1				
NAPHTHALENE	Chronic	8.60E-04	NA	Respiratory System	3000/1	IRIS	7/10/2002
PHENANTHRENE	Chronic	8.60E-04	NA	Based on napthalene	3000/1	IRIS	7/10/2002
PYRENE		3.00E-02	NA	Kidneys	3000/1	IRIS	7/27/2001
Pesticides							
DIELDRIN		NA	1				

Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE		2.20E-02	1				
BUTYLBENZYLPHTHALATE		2.00E-01	1	None	1000/1	IRIS	7/26/2001
DI(2-ETHYLHEXYL)ADIPATE		NA	1				
DIBENZOFURAN	Chronic	4.00E-03	1	None	NA	IRIS	7/27/2001
DIBUTYLPHTHALATE		1.00E-01	1	None	1000/1	IRIS	7/27/2001
DIETHYLPHTHALATE		NA	1				
DIMETHYLPHTHALATE		NA	1			EPA-NCEA	
Volatiles							
ACETONE		1.00E-01	1				
BROMOFORM		NA	1				
CHLOROETHANE	Chronic	2.90E+00	1		300/1	IRIS	7/10/2002
CHLOROFORM	Chronic	8.60E-05	1	None	1000/1	IRIS	7/27/2001
CHLOROMETHANE		2.60E-02	1			EPA-NCEA	
DIBROMOCHLOROMETHANE		NA	1				
M&P XYLENES	Chronic	2.00E-01	1	None	NA	IRIS	5/23/2001
METHYL-T-BUTYL ETHER	Chronic	8.57E-01	1	Liver, Kidney	100/1	IRIS	7/10/2002
METHYLENE CHLORIDE		8.60E-01	1				
N-BUTYLBENZENE		NA	1			EPA-NCEA	
P-ISOPROPYLTOLUENE		NA	1				
TERT-BUTYLALCOHOL		NA	1				
XYLENES		NA	1			IRIS	7/27/2001

N/A= Not Applicable

(1) Provide equation used for derivation

(2) For IRIS values, the date IRIS was searched is provided.
For HEAST values, the date of HEAST is provided.
For NCEA values, the date of the article provided by NCEA is provided.

TABLE 6-24 CANCER TOXICITY DATA - ORAL/DERMAL, FORT TOTTEN

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (GI ABS)(1)	Adjusted Cancer Slope Factor (2)	Units	Weight of Evidence/Cancer Guideline Description	Source	Date (3) (mm/dd/yy)
Inorganics							
ALUMINUM	NA	1	NA	per (mg/kg-day)	D	EPA-NCEA	5/30/1997
ANTIMONY	NA	0.15	NA	per (mg/kg-day)	D	IRIS	7/26/2001
BARIUM	NA	0.07	NA	per (mg/kg-day)	D	IRIS	7/26/2001
CADMIUM	NA	0.025	NA	per (mg/kg-day)	B1	IRIS	7/27/2001
CHROMIUM	NA	0.025	NA	per (mg/kg-day)	A	IRIS	7/27/2001
COBALT	NA	1	NA	per (mg/kg-day)	Not Classified	IRIS	7/27/2001
COPPER	NA	1	NA	per (mg/kg-day)	D	IRIS	7/27/2001
LEAD	NA	1	NA	per (mg/kg-day)			
MANGANESE	NA	0.04	NA	per (mg/kg-day)	D	IRIS	7/27/2001
NICKEL	NA	0.04	NA	per (mg/kg-day)	Not Classified		7/27/2001
SELENIUM	NA	1	NA	per (mg/kg-day)	D	IRIS	7/27/2001
VANADIUM	NA	0.026	NA	per (mg/kg-day)	Not Classified	IRIS	7/27/2001
ZINC	NA	1	NA	per (mg/kg-day)	D	IRIS	7/27/2001
PAHs							
ACENAPHTHENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
ANTHRACENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
BENZ(A)ANTHRACENE	0.73	NA	NA	per (mg/kg-day)	B2	IRIS	7/26/2001
BENZO[A]PYRENE	7.3	NA	NA	per (mg/kg-day)	B2	IRIS	7/26/2001
BENZO(B)FLOURANTHENE	0.73	NA	NA	per (mg/kg-day)	B2	IRIS	7/27/2001
BENZO(G,H,I)PERYLENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/26/2001
BENZO(K)FLOURANTHENE	0.073	NA	NA	per (mg/kg-day)	B2	IRIS	7/26/2001
CHRYSENE	0.0073	NA	NA	per (mg/kg-day)	B2	IRIS	7/27/2001
DIBENZ[A, H]ANTHRACENE	7.3	NA	NA	per (mg/kg-day)	B2	EPA-NCEA	7/27/2001
FLUORANTHENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
FLUORENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
INDENO(1,2,3-CD)PYRENE	0.73	NA	NA	per (mg/kg-day)	B2	IRIS	7/27/2001
2-METHYLNAPHTHALENE	NA	1	NA	per (mg/kg-day)	C	EPA-NCEA	5/23/2001
NAPHTHALENE	NA	NA	NA	per (mg/kg-day)	C	IRIS	7/27/2001
PHENANTHRENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
PYRENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
Pesticides							
DIELDRIN	16	1	1.60E+01	per (mg/kg-day)	B2	IRIS	7/10/2002
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	0.014	1	1.40E-02	per (mg/kg-day)	B2	IRIS	7/26/2001
BUTYLBENZYLPHTHALATE	NA	1	NA	per (mg/kg-day)	C	IRIS	7/26/2001
DI(2-ETHYLHEXYL)ADIPATE	0.0012	1	1.20E-03	per (mg/kg-day)	C	IRIS	7/10/2002
DIBENZOFURAN	NA	1	NA	per (mg/kg-day)	D	IRIS	7/27/2001
DIBUTYLPHTHALATE	NA	1	NA	per (mg/kg-day)	D	IRIS	7/27/2001
DIETHYLPHTHALATE	NA	1	NA	per (mg/kg-day)	D	IRIS	7/10/2002
DIMETHYLPHTHALATE	NA	1	NA	per (mg/kg-day)	D	IRIS	7/10/2002

Volatiles							
ACETONE	NA	1	NA	per (mg/kg-day)			
BROMOFORM	0.0079	1	7.90E-03	per (mg/kg-day)	B2	IRIS	7/10/2002
CHLOROETHANE	0.0029	1	2.90E-03	per (mg/kg-day)			
CHLOROFORM	0.0061	1	6.10E-03	per (mg/kg-day)	B2	IRIS	7/27/2001
CHLOROMETHANE	0.013	1	1.30E-02	per (mg/kg-day)			
DIBROMOCHLOROMETHANE	0.084	1	8.40E-02	per (mg/kg-day)	D	IRIS	7/10/2002
M&P XYLENES	NA	1	NA	per (mg/kg-day)	D	IRIS	5/23/2001
METHYL-T-BUTYL ETHER	0.004	1	4.00E-03	per (mg/kg-day)			
METHYLENE CHLORIDE	0.0075	1	7.50E-03	per (mg/kg-day)	B2	IRIS	7/10/2002
N-BUTYLBENZENE	NA	1	NA	per (mg/kg-day)			
P-ISOPROPYLTOLUENE	NA	1	NA	per (mg/kg-day)			
TERT-BUTYLALCOHOL	NA	1	NA	per (mg/kg-day)			
XYLENES	NA	1	NA	per (mg/kg-day)	D	IRIS	7/10/2002

N/A= Not Applicable
(1) Taken from Region III Guidance.
(2) Dermal Toxicological values adjusted from oral values using Region III recommended chemical-specific gastrointestinal absorption factors(GI ABS). CSFs are divided be the GI ABS.
(3) For IRIS values, the date IRIS was searched is provided.
For HEAST values, the date of HEAST is provided.
For NCEA values, the date of the article provided by NCEA is provided.

EPA Group: A - Human carcinogen
B1 - Probable human carcinogen - indicate that llimited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Posible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

Weight of Evidence: Known/Likely
Cannot be Determined
Not Likely

TABLE 6-25 CANCER TOXICITY DATA - INHALATION, FORT TOTTEN

Chemical of Potential Concern	Chronic/ Subchronic	Adjustment	Inhalation Cancer Slope Factor	Units	Weight of Evidence/Cancer Guideline Description	Source	Date (1)
Inorganics							
ALUMINUM	NA	NA	NA	per (mg/kg-day)	D	EPA-NCEA	5/30/1997
ANTIMONY	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/26/2001
BARIUM	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/26/2001
CADMIUM	NA	NA	6.30E+00	per (mg/kg-day)	A	IRIS	7/27/2001
CHROMIUM	NA	NA	2.90E+02	per (mg/kg-day)	D	IRIS	7/27/2001
COBALT	NA	NA	NA	per (mg/kg-day)	Not Classified	IRIS	7/27/2001
COPPER	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
LEAD	NA	NA	NA	per (mg/kg-day)			
MANGANESE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
NICKEL	NA	NA	NA	per (mg/kg-day)	Not Classified	IRIS	7/27/2001
SELENIUM	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
VANADIUM	NA	NA	NA	per (mg/kg-day)	Not Classified	IRIS	7/27/2001
ZINC	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
PAHs							
ACENAPHTHENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
ANTHRACENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
BENZ(A)ANTHRACENE	NA	NA	3.10E-01	per (mg/kg-day)	B2	IRIS	7/26/2001
BENZO[A]PYRENE	NA	NA	3.10E+00	per (mg/kg-day)	B2	IRIS	7/26/2001
BENZO(B)FLOURANTHENE	NA	NA	3.10E-01	per (mg/kg-day)	B2	IRIS	7/27/2001
BENZO(G,H,I)PERYLENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/26/2001
BENZO(K)FLOURANTHENE	NA	NA	3.10E-02	per (mg/kg-day)	B2	IRIS	7/26/2001
CHRYSENE	NA	NA	3.10E-03	per (mg/kg-day)	B2	IRIS	7/27/2001
DIBENZ[A, H]ANTHRACENE	NA	NA	3.10E+00	per (mg/kg-day)	B2	EPA-NCEA	7/27/2001
FLUORANTHENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
FLUORENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
INDENO(1,2,3-CD)PYRENE	NA	NA	3.10E-01	per (mg/kg-day)	B2	IRIS	7/27/2001
2-METHYLNAPHTHALENE	NA	NA	NA	per (mg/kg-day)	C	EPA-NCEA	5/23/2001
NAPHTHALENE	NA	NA	NA	per (mg/kg-day)	C	IRIS	7/27/2001
PHENANTHRENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
PYRENE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
Pesticides							
DIELDRIN	NA	NA	1.60E+01	per (mg/kg-day)	B2	IRIS	7/10/2002
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	NA	NA	NA	per (mg/kg-day)			
BUTYLBENZYLPHTHALATE	NA	NA	NA	per (mg/kg-day)			
DI(2-ETHYLHEXYL)ADIPATE	NA	NA	NA	per (mg/kg-day)	C	IRIS	7/10/2002
DIBENZOFURAN	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
DIBUTYLPHTHALATE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/27/2001
DIETHYLPHTHALATE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/10/2002
DIMETHYLPHTHALATE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/10/2002

Volatiles							
ACETONE	NA	NA	NA	per (mg/kg-day)	C	IRIS	7/26/2001
BROMOFORM	NA	NA	3.90E-03	per (mg/kg-day)	B2	IRIS	7/10/2002
CHLOROETHANE	NA	NA	NA	per (mg/kg-day)			
CHLOROFORM	NA	NA	8.05E-02	per (mg/kg-day)	B2	IRIS	7/27/2001
CHLOROMETHANE	NA	NA	3.50E-03	per (mg/kg-day)			
DIBROMOCHLOROMETHANE	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/10/2002
M&P XYLENES	NA	NA	NA	per (mg/kg-day)	D	IRIS	5/23/2001
METHYL-T-BUTYL ETHER	NA	NA	NA	per (mg/kg-day)			
METHYLENE CHLORIDE	NA	NA	1.65E-03	per (mg/kg-day)	B2	IRIS	7/10/2002
N-BUTYLBENZENE	NA	NA	NA	per (mg/kg-day)			
P-ISOPROPYLTOLUENE	NA	NA	NA	per (mg/kg-day)			
TERT-BUTYLALCOHOL	NA	NA	NA	per (mg/kg-day)			
XYLENES	NA	NA	NA	per (mg/kg-day)	D	IRIS	7/10/2002

N/A= Not Applicable

(1) For IRIS values, the date IRIS was searched is provided.
For HEAST values, the date of HEAST is provided.
For NCEA values, the date of the article provided by NCEA is provided.

EPA Group: A - Human carcinogen
B1 - Probable human carcinogen - indicate that llimited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Posible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

Weight of Evidence: Known/Likely
Cannot be Determined
Not Likely

TABLE 6-26 CHEMICAL-SPECIFIC PARAMETERS, FORT TOTTEN

Chemical of Potential Concern	Absorption Factor	Reference	Permeability Constant (cm/hr)	Reference (1)
Inorganics				
ALUMINUM	NA	USEPA 2000a	1.00E-03	On-line Database
ANTIMONY	NA	USEPA 2000a	1.00E-03	On-line Database
BARIUM	NA	USEPA 2000a	1.00E-03	On-line Database
CADMIUM	0.001	USEPA 2000a	1.10E-03	EPA 2000a Guidance
CHROMIUM	NA	USEPA 2000a	1.00E-03	EPA 2000a Guidance
COBALT	NA	USEPA 2000a	1.00E-03	On-line Database
COPPER	NA	USEPA 2000a	1.00E-03	On-line Database
LEAD	NA	USEPA 2000a	1.30E-04	EPA 2000a Guidance
MANGANESE	NA	USEPA 2000a	1.00E-03	On-line Database
NICKEL	NA	USEPA 2000a	2.70E-04	On-line Database
SELENIUM	NA	USEPA 2000a	1.00E-03	On-line Database
VANADIUM	NA	USEPA 2000a	1.00E-03	On-line Database
ZINC	NA	USEPA 2000a	1.00E-03	On-line Database
PAHs				
ACENAPHTHENE	0.13	USEPA 2000a	2.50E-01	On-line Database
ANTHRACENE	0.13	USEPA 2000a	2.20E-01	On-line Database
BENZ(A)ANTHRACENE	0.13	USEPA 2000a	5.20E-01	EPA 2000a Guidance
BENZO[A]PYRENE	0.13	USEPA 2000a	7.70E-01	EPA 2000a Guidance
BENZO(B)FLOURANTHENE	0.13	USEPA 2000a	7.80E-01	EPA 2000a Guidance
BENZO(G,H,I)PERYLENE	0.13	USEPA 2000a	1.80E+00	On-line Database
BENZO(K)FLOURANTHENE	0.13	USEPA 2000a	6.00E-01	On-line Database
CHRYSENE	0.13	USEPA 2000a	5.20E-01	EPA 2000a Guidance
DIBENZ[A, H]ANTHRACENE	0.13	USEPA 2000a	1.70E+00	On-line Database
FLUORANTHENE	0.13	USEPA 2000a	2.40E-01	EPA 2000a Guidance
FLUORENE	0.13	USEPA 2000a	2.50E-01	On-line Database
INDENO(1,2,3-CD)PYRENE	0.13	USEPA 2000a	1.20E+00	EPA 2000a Guidance
2-METHYLNAPHTHALENE	0.1	USEPA 2000a	1.50E-01	On-line Database
NAPHTHALENE	0.13	USEPA 2000a	4.90E-02	EPA 2000a Guidance
PHENANTHRENE	0.13	USEPA 2000a	1.50E-01	EPA 2000a Guidance
PYRENE	0.13	USEPA 2000a	3.20E-01	On-line Database
Pesticides				
DIELDRIN	0.1	USEPA 2000a	1.30E-02	EPA 2000a Guidance
Semivolatiles				
BIS(2-ETHYLHEXYL)PHTHALATE	0.1	USEPA 2000a	2.30E-02	On-line Database
BUTYLBENZYLPHTHALATE	0.1	USEPA 2000a	7.10E-02	On-line Database
DI(2-ETHYLHEXYL)ADIPATE	0.1	USEPA 2000a	3.60E+00	On-line Database
DIBENZOFURAN	0.1	USEPA 2000a	1.50E-01	On-line Database
DIBUTYLPHTHALATE	0.1	USEPA 2000a	2.60E-02	EPA 2000a Guidance
DIETHYLPHTHALATE	0.1	USEPA 2000a	4.10E-03	EPA 2000a Guidance
DIMETHYLPHTHALATE	0.1	USEPA 2000a	1.40E-03	EPA 2000a Guidance

Volatiles				
ACETONE	NA	USEPA 2000a	5.70E-04	On-line Database
BROMOFORM	NA	USEPA 2000a	2.40E-03	EPA 2000a Guidance
CHLOROETHANE	NA	USEPA 2000a	6.30E-03	EPA 2000a Guidance
CHLOROFORM	NA	USEPA 2000a	7.10E-03	EPA 2000a Guidance
CHLOROMETHANE	NA	USEPA 2000a	3.40E-03	EPA 2000a Guidance
DIBROMOCHLOROMETHANE	NA	USEPA 2000a	3.90E-03	On-line Database
M&P XYLENES	NA	USEPA 2000a	8.00E-02	On-line Database
METHYL-T-BUTYL ETHER	NA	USEPA 2000a	2.60E-03	On-line Database
METHYLENE CHLORIDE	NA	USEPA 2000a	3.60E-03	EPA 2000a Guidance
N-BUTYLBENZENE	NA	USEPA 2000a	NA	On-line Database
P-ISOPROPYLTOLUENE	NA	USEPA 2000a	NA	On-line Database
TERT-BUTYLALCOHOL	NA	USEPA 2000a	NA	On-line Database
XYLENES	NA	USEPA 2000a	9.50E-02	On-line Database

(1) Toxicity and Chemical-Specific Factors Database. Http://risk.lsd.ornl.gov/cgi-bin/tox. July 2001

TABLE 6-27 SUMMARY OF NONCANCER RISKS FOR RESIDENT ADULTS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: *Fill Area*

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total Soil	Ingestion of Vegetables	Total	Percent Contribution Of Each COC
	HQ	**HQ**	**HQ**		**HQ**	**HI**	
Inorganics							
ALUMINUM	8.58E-03	--	9.28E-04	9.50E-03	5.48E-04	1.01E-02	3.7%
ANTIMONY	6.30E-03	--	--	6.30E-03	6.04E-03	1.23E-02	4.6%
ARSENIC	2.68E-02	3.21E-03	--	3.01E-02	5.34E-03	3.54E-02	13.2%
BARIUM	3.68E-03	--	2.79E-04	3.96E-03	3.32E-03	7.28E-03	2.7%
BERYLLIUM	2.53E-04	--	1.35E-05	2.67E-04	1.87E-05	2.86E-04	0.1%
CADMIUM	2.21E-03	3.52E-04	--	2.56E-03	7.79E-03	1.03E-02	3.9%
CHROMIUM	1.00E-02	--	--	1.00E-02	1.47E-03	1.15E-02	4.3%
COBALT	1.46E-04	--	--	1.46E-04	5.60E-05	2.02E-04	0.1%
COPPER	3.60E-03	--	--	3.60E-03	1.33E-02	1.69E-02	6.3%
MANGANESE	1.62E-02	--	4.19E-03	2.03E-02	6.71E-02	8.75E-02	32.6%
MERCURY	1.08E-02	--	--	1.08E-02	5.74E-03	1.66E-02	6.2%
NICKEL	1.45E-03	--	--	1.45E-03	4.00E-04	1.84E-03	0.7%
SELENIUM	1.30E-04	--	--	1.30E-04	6.51E-05	1.96E-04	0.1%
SILVER	6.85E-05	--	--	6.85E-05	2.75E-04	3.44E-04	0.1%
THALLIUM	2.72E-03	--	--	2.72E-03	6.55E-05	2.78E-03	1.0%
VANADIUM	4.74E-03	--	--	4.74E-03	5.87E-04	5.32E-03	2.0%
ZINC	1.74E-03	--	--	1.74E-03	2.42E-03	4.16E-03	1.6%
PAHs							
ACENAPHTHENE	3.86E-06	--	5.84E-10	3.86E-06	1.09E-04	1.13E-04	0.0%
ACENAPHTHYLENE	3.63E-06	--	1.28E-08	3.64E-06	1.89E-05	2.26E-05	0.0%
ANTHRACENE	1.08E-06	--	1.64E-10	1.08E-06	2.98E-06	4.06E-06	0.0%
BENZ(A)ANTHRACENE	--	--	--	--	--	0.00E+00	0.0%
BENZO[A]PYRENE	--	--	--	--	--	0.00E+00	0.0%
BENZO(B)FLOURANTHENE	--	--	--	--	--	0.00E+00	0.0%
BENZO(G,H,I)PERYLENE	1.57E-05	--	2.37E-09	1.57E-05	2.89E-06	1.86E-05	0.0%
BENZO(K)FLOURANTHENE	--	--	--	--	--	0.00E+00	0.0%
CHRYSENE	--	--	--	--	--	0.00E+00	0.0%
DIBENZ[A, H]ANTHRACENE	--	--	--	--	--	0.00E+00	0.0%
FLUORANTHENE	2.85E-05	--	4.32E-09	2.85E-05	3.78E-05	6.63E-05	0.0%
FLUORENE	6.64E-06	--	1.01E-09	6.64E-06	2.76E-05	3.42E-05	0.0%
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	0.00E+00	0.0%
2-METHYLNAPHTHALENE	7.19E-06	--	--	7.19E-06	3.30E-04	3.37E-04	0.1%
NAPHTHALENE	8.42E-06	--	2.97E-08	8.45E-06	3.87E-04	3.95E-04	0.1%
PHENANTHRENE	7.53E-05	--	2.65E-07	7.56E-05	1.83E-04	2.59E-04	0.1%
PYRENE	4.75E-05	--	7.19E-09	4.75E-05	6.66E-05	1.14E-04	0.0%
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	3.43E-05	1.37E-05	4.72E-09	4.80E-05	3.71E-05	8.51E-05	0.0%
BUTYLBENZYLPHTHALATE	5.00E-07	2.00E-07	7.57E-11	7.00E-07	1.51E-06	2.21E-06	0.0%
CARBAZOLE	--	--	--	--	--	0.00E+00	0.0%
DIBENZOFURAN	5.65E-05	2.25E-05	8.56E-09	7.91E-05	2.76E-04	3.55E-04	0.1%
DIBUTYLPHTHALATE	5.89E-07	2.35E-07	8.92E-11	8.24E-07	2.70E-06	3.53E-06	0.0%
Volatiles							
2-BUTANONE	2.28E-08	--	7.15E-12	2.28E-08	4.33E-05	4.34E-05	0.0%
ACETONE	9.59E-06	--	1.45E-09	9.59E-06	4.04E-02	4.04E-02	15.1%
BENZENE	1.96E-06	--	5.25E-10	1.96E-06	3.35E-04	3.37E-04	0.1%
CARBON DISULFIDE	1.37E-07	--	1.04E-11	1.37E-07	2.57E-05	2.58E-05	0.0%
TOLUENE	1.51E-08	--	4.15E-12	1.51E-08	1.91E-06	1.93E-06	0.0%
TRICHLOROETHENE	7.53E-07	--	1.14E-10	7.54E-07	9.70E-05	9.77E-05	0.0%
VINYL CHLORIDE	4.57E-06	--	7.15E-11	4.57E-06	2.40E-03	2.41E-03	0.9%
Cumulative Risk	9.98E-02	3.60E-03	5.41E-03	1.09E-01	1.59E-01	2.68E-01	100%

TABLE 6-28 SUMMARY OF NONCANCER RISKS FOR RESIDENT CHILDREN AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: **Fill Area**

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total Soil	Ingestion of Vegetables	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ		HQ	HI	
Inorganics							
ALUMINUM	8.00E-02	--	2.17E-03	8.00E-02	7.87E-04	8.08E-02	7%
ANTIMONY	5.88E-02	--	--	5.88E-02	8.42E-03	6.72E-02	6%
ARSENIC	2.51E-01	2.10E-02	--	2.72E-01	7.49E-03	2.79E-01	24%
BARIUM	3.43E-02	--	6.51E-04	3.43E-02	4.59E-03	3.89E-02	3%
BERYLLIUM	2.37E-03	--	3.15E-05	2.37E-03	2.59E-05	2.39E-03	0%
CADMIUM	2.06E-02	2.31E-03	--	2.29E-02	1.08E-02	3.37E-02	3%
CHROMIUM	9.38E-02	--	--	9.38E-02	2.05E-03	9.58E-02	8%
COBALT	1.36E-03	--	--	1.36E-03	7.96E-05	1.44E-03	0%
COPPER	3.36E-02	--	--	3.36E-02	1.86E-02	5.22E-02	4%
MANGANESE	1.51E-01	--	9.80E-03	1.51E-01	9.62E-02	2.47E-01	21%
MERCURY	1.01E-01	--	--	1.01E-01	8.18E-03	1.09E-01	9%
NICKEL	1.35E-02	--	--	1.35E-02	5.57E-04	1.40E-02	1%
SELENIUM	1.22E-03	--	--	1.22E-03	9.13E-05	1.31E-03	0%
SILVER	6.39E-04	--	--	6.39E-04	3.83E-04	1.02E-03	0%
THALLIUM	2.54E-02	--	--	2.54E-02	9.05E-05	2.55E-02	2%
VANADIUM	4.42E-02	--	--	4.42E-02	8.28E-04	4.50E-02	4%
ZINC	1.63E-02	--	--	1.63E-02	3.37E-03	1.97E-02	2%
PAHs							
ACENAPHTHENE	3.60E-05	--	1.37E-09	3.60E-05	1.67E-04	2.03E-04	0%
ACENAPHTHYLENE	3.39E-05	--	2.99E-08	3.39E-05	2.64E-05	6.03E-05	0%
ANTHRACENE	1.01E-05	--	3.83E-10	1.01E-05	4.10E-06	1.42E-05	0%
BENZ(A)ANTHRACENE	--	--	--	--	--	0.00E+00	0%
BENZO[A]PYRENE	--	--	--	--	--	0.00E+00	0%
BENZO(B)FLOURANTHENE	--	--	--	--	--	0.00E+00	0%
BENZO(G,H,I)PERYLENE	1.46E-04	--	5.54E-09	1.46E-04	4.04E-06	1.50E-04	0%
BENZO(K)FLOURANTHENE	--	--	--	--	--	0.00E+00	0%
CHRYSENE	--	--	--	--	--	0.00E+00	0%
DIBENZ[A, H]ANTHRACENE	--	--	--	--	--	0.00E+00	0%
FLUORANTHENE	2.66E-04	--	1.01E-08	2.66E-04	5.27E-05	3.19E-04	0%
FLUORENE	6.20E-05	--	2.35E-09	6.20E-05	3.80E-05	1.00E-04	0%
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	0.00E+00	0%
2-METHYLNAPHTHALENE	6.71E-05	--	--	6.71E-05	5.02E-04	5.69E-04	0%
NAPHTHALENE	7.86E-05	--	6.93E-08	7.86E-05	5.88E-04	6.67E-04	0%
PHENANTHRENE	7.03E-04	--	6.20E-07	7.03E-04	2.52E-04	9.55E-04	0%
PYRENE	4.43E-04	--	1.68E-08	4.43E-04	9.21E-05	5.35E-04	0%
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	3.20E-04	8.97E-05	1.10E-08	4.10E-04	5.14E-05	4.61E-04	0%
BUTYLBENZYLPHTHALATE	4.67E-06	1.31E-06	1.77E-10	5.97E-06	2.09E-06	8.06E-06	0%
CARBAZOLE	--	--	--	--	--	0.00E+00	0%
DIBENZOFURAN	5.27E-04	1.48E-04	2.00E-08	6.75E-04	3.85E-04	1.06E-03	0%
DIBUTYLPHTHALATE	5.50E-06	1.54E-06	2.08E-10	7.04E-06	4.02E-06	1.11E-05	0%
Volatiles							
2-BUTANONE	2.13E-07	--	1.67E-11	2.13E-07	6.49E-05	6.51E-05	0%
ACETONE	8.95E-05	--	3.39E-09	8.95E-05	6.08E-02	6.09E-02	5%
BENZENE	1.83E-05	--	1.23E-09	1.83E-05	5.04E-04	5.22E-04	0%
CARBON DISULFIDE	1.28E-06	--	2.42E-11	1.28E-06	3.84E-05	3.97E-05	0%
TOLUENE	1.41E-07	--	9.69E-12	1.41E-07	2.91E-06	3.05E-06	0%
TRICHLOROETHENE	7.03E-06	--	2.67E-10	7.03E-06	1.46E-04	1.53E-04	0%
VINYL CHLORIDE	4.26E-05	--	1.67E-10	4.26E-05	3.57E-03	3.61E-03	0%
Cumulative Risk	9.31E-01	2.36E-02	1.26E-02	9.55E-01	2.30E-01	1.18E+00	100.0%

TABLE 6-29 BREAKDOWN OF NONCANCER RISK BY TARGET ORGAN, RESIDENT CHILDREN NONCANCER EFFECTS

Site Number: **Fill Area**

Chemical of Concern	Total Soil	Ingestion of Vegetables	Total	Target Organ
	HI	**HI**	**HI**	
Inorganics				
ARSENIC	2.72E-01	7.49E-03	2.79E-01	Skin
MANGANESE	1.51E-01	9.62E-02	2.47E-01	Central Nervous System
MERCURY	1.01E-01	8.18E-03	1.09E-01	Autoimmune
Cumulative Risk	5.24E-01	1.12E-01	6.35E-01	
			0.28	**Skin**
			0.25	**Central Nervous System**
			0.11	**Autoimmune**

TABLE 6-30 SUMMARY OF CANCER RISKS FOR RESIDENT ADULT AND CHILDREN AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: **Fill Area**

Chemical of Concern	Incidental Ingestion of Total soil	Dermal Contact With Total Soil	Inhalation of Particulates from Total Soil	Total Soil	Ingestion of Vegetables	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk		Risk	Risk	
Inorganics							
ALUMINUM	--	--	--	--	--	0.00E+00	0.0%
ANTIMONY	--	--	--	--	--	0.00E+00	0.0%
ARSENIC	1.38E-05	1.31E-06	9.94E-09	1.51E-05	1.11E-06	1.62E-05	49.8%
BARIUM	--	--	--	--	--	0.00E+00	0.0%
BERYLLIUM	--	--	3.50E-10	3.50E-10	--	3.50E-10	0.0%
CADMIUM	--	--	5.71E-10	5.71E-10	--	5.71E-10	0.0%
CHROMIUM	--	--	7.19E-07	7.19E-07	--	7.19E-07	2.2%
COBALT	--	--	--	--	--	0.00E+00	0.0%
COPPER	--	--	--	--	--	0.00E+00	0.0%
MANGANESE	--	--	--	--	--	0.00E+00	0.0%
MERCURY	--	--	--	--	--	0.00E+00	0.0%
NICKEL	--	--	--	--	--	0.00E+00	0.0%
SELENIUM	--	--	--	--	--	0.00E+00	0.0%
SILVER	--	--	--	--	--	0.00E+00	0.0%
THALLIUM	--	--	--	--	--	0.00E+00	0.0%
VANADIUM	--	--	--	--	--	0.00E+00	0.0%
ZINC	--	--	--	--	--	0.00E+00	0.0%
PAHs							
ACENAPHTHENE	--	--	--	--	--	0.00E+00	0.0%
ACENAPHTHYLENE	--	--	--	--	--	0.00E+00	0.0%
ANTHRACENE	--	--	--	--	--	0.00E+00	0.0%
BENZ(A)ANTHRACENE	5.68E-07	--	1.74E-11	5.68E-07	1.42E-07	7.10E-07	2.2%
BENZO[A]PYRENE	5.67E-06	--	1.73E-10	5.67E-06	7.86E-07	6.46E-06	19.8%
BENZO(B)FLOURANTHENE	7.58E-07	--	2.32E-11	7.58E-07	1.02E-07	8.60E-07	2.6%
BENZO(G,H,I)PERYLENE	--	--	--	--	--	0.00E+00	0.0%
BENZO(K)FLOURANTHENE	2.86E-08	--	8.73E-13	2.86E-08	3.86E-09	3.24E-08	0.1%
CHRYSENE	6.50E-09	--	1.99E-13	6.50E-09	1.51E-09	8.01E-09	0.0%
DIBENZ[A, H]ANTHRACENE	1.79E-06	--	5.48E-11	1.79E-06	1.65E-07	1.96E-06	6.0%
FLUORANTHENE	--	--	--	--	--	0.00E+00	0.0%
FLUORENE	--	--	--	--	--	0.00E+00	0.0%
INDENO(1,2,3-CD)PYRENE	4.00E-07	--	1.22E-11	4.00E-07	2.47E-08	4.25E-07	1.3%
2-METHYLNAPHTHALENE	--	--	--	--	--	0.00E+00	0.0%
NAPHTHALENE	--	--	--	--	--	0.00E+00	0.0%
PHENANTHRENE	--	--	--	--	--	0.00E+00	0.0%
PYRENE	--	--	--	--	--	0.00E+00	0.0%
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	1.10E-08	3.47E-09	--	1.44E-08	4.79E-09	1.92E-08	0.1%
BUTYLBENZYLPHTHALATE	--	--	--	--	--	0.00E+00	0.0%
CARBAZOLE	3.76E-09	1.19E-09	2.70E-13	4.94E-09	1.26E-08	1.76E-08	0.1%
DIBENZOFURAN	--	--	--	--	--	0.00E+00	0.0%
DIBUTYLPHTHALATE	--	--	--	--	--	0.00E+00	0.0%
Volatiles							
2-BUTANONE	--	--	--	--	--	0.00E+00	0.0%
ACETONE	--	--	--	--	--	0.00E+00	0.0%
BENZENE	3.70E-10	--	1.31E-14	3.70E-10	2.61E-08	2.65E-08	0.1%
CARBON DISULFIDE	--	--	--	--	--	0.00E+00	0.0%
TOLUENE	--	--	--	--	--	0.00E+00	0.0%
TRICHLOROETHENE	5.68E-11	--	2.23E-15	5.68E-11	3.02E-09	3.08E-09	0.0%
VINYL CHLORIDE	2.35E-08	--	3.49E-14	2.35E-08	5.08E-06	5.11E-06	15.7%
Cumulative Risk	2.31E-05	1.31E-06	7.30E-07	2.51E-05	7.47E-06	3.26E-05	100%

TABLE 6-31 SUMMARY OF NON-CANCER RISKS FOR RECREATIONAL USERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NON-CANCER RISKS

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	**HQ**	**HQ**	**HI**	
Inorganics					
ALUMINUM	1.34E-02	--	4.54E-04	1.39E-02	8.7%
ANTIMONY	9.87E-03	--	--	9.87E-03	6.2%
ARSENIC	4.21E-02	3.89E-05	--	4.21E-02	26.5%
BARIUM	5.76E-03	--	1.36E-04	5.90E-03	3.7%
BERYLLIUM	3.97E-04	--	6.59E-06	4.04E-04	0.3%
CADMIUM	3.46E-03	4.26E-06	--	3.46E-03	2.2%
CHROMIUM	1.57E-02	--	--	1.57E-02	9.9%
COBALT	2.29E-04	--	--	2.29E-04	0.1%
COPPER	5.64E-03	--	--	5.64E-03	3.5%
MANGANESE	2.53E-02	--	2.05E-03	2.74E-02	17.2%
MERCURY	1.70E-02	--	--	1.70E-02	10.7%
NICKEL	2.26E-03	--	--	2.26E-03	1.4%
SELENIUM	2.04E-04	--	--	2.04E-04	0.1%
SILVER	1.07E-04	--	--	1.07E-04	0.1%
THALLIUM	4.26E-03	--	--	4.26E-03	2.7%
VANADIUM	7.42E-03	--	--	7.42E-03	4.7%
ZINC	2.73E-03	--	--	2.73E-03	1.7%

TABLE 6-31 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
PAHs					
ACENAPHTHENE	6.04E-06	--	2.86E-10	6.05E-06	0.0%
ACENAPHTHYLENE	5.69E-06	--	6.26E-09	5.69E-06	0.0%
ANTHRACENE	1.70E-06	--	8.02E-11	1.70E-06	0.0%
BENZ(A)ANTHRACENE	--	--	--	0.00E+00	0.0%
BENZO[A]PYRENE	--	--	--	0.00E+00	0.0%
BENZO(B)FLUORANTHENE	--	--	--	0.00E+00	0.0%
BENZO(G,H,I)PERYLENE	2.45E-05	--	1.16E-09	2.45E-05	0.0%
BENZO(K)FLUORANTHENE	--	--	--	0.00E+00	0.0%
CHRYSENE	--	--	--	0.00E+00	0.0%
DIBENZ[A, H]ANTHRACENE	--	--	--	0.00E+00	0.0%
FLUORANTHENE	4.46E-05	--	2.11E-09	4.46E-05	0.0%
FLUORENE	1.04E-05	--	4.93E-10	1.04E-05	0.0%
INDENO(1,2,3-CD)PYRENE	--	--	--	0.00E+00	0.0%
2-METHYLNAPHTHALENE	1.13E-05	--	--	1.13E-05	0.0%
NAPHTHALENE	1.32E-05	--	1.45E-08	1.32E-05	0.0%
PHENANTHRENE	1.18E-04	--	1.30E-07	1.18E-04	0.1%
PYRENE	7.44E-05	--	3.52E-09	7.44E-05	0.0%

TABLE 6-31 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	5.38E-05	1.66E-07	2.31E-09	5.39E-05	0.0%
BUTYLBENZYLPHTHALATE	7.83E-07	2.42E-09	3.71E-11	7.86E-07	0.0%
CARBAZOLE	--	--	--	0.00E+00	0.0%
DIBENZOFURAN	8.85E-05	2.73E-07	4.19E-09	8.88E-05	0.1%
DIBUTYLPHTHALATE	9.23E-07	2.85E-09	4.37E-11	9.26E-07	0.0%
Volatiles					
2-BUTANONE	3.58E-08	--	3.50E-12	3.58E-08	0.0%
ACETONE	1.50E-05	--	7.11E-10	1.50E-05	0.0%
BENZENE	3.08E-06	--	2.57E-10	3.08E-06	0.0%
CARBON DISULFIDE	2.15E-07	--	5.08E-12	2.15E-07	0.0%
TOLUENE	2.36E-08	--	2.03E-12	2.36E-08	0.0%
TRICHLOROETHENE	1.18E-06	--	5.59E-11	1.18E-06	0.0%
VINYL CHLORIDE	7.15E-06	--	3.50E-11	7.15E-06	0.0%
Cumulative Risk	1.56E-01	4.36E-05	2.65E-03	1.59E-01	100%

TABLE 6-32 SUMMARY OF CANCER RISKS FOR RECREATIONAL USERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
Inorganics					
ALUMINUM	--	--	--	0.00E+00	0.0%
ANTIMONY	--	--	--	0.00E+00	0.0%
ARSENIC	2.43E-06	2.25E-09	7.68E-10	2.44E-06	59.1%
BARIUM	--	--	--	0.00E+00	0.0%
BERYLLIUM	--	--	2.71E-11	2.71E-11	0.0%
CADMIUM	--	--	4.42E-11	4.42E-11	0.0%
CHROMIUM	--	--	5.55E-08	5.55E-08	1.3%
COBALT	--	--	--	0.00E+00	0.0%
COPPER	--	--	--	0.00E+00	0.0%
MANGANESE	--	--	--	0.00E+00	0.0%
MERCURY	--	--	--	0.00E+00	0.0%
NICKEL	--	--	--	0.00E+00	0.0%
SELENIUM	--	--	--	0.00E+00	0.0%
SILVER	--	--	--	0.00E+00	0.0%
THALLIUM	--	--	--	0.00E+00	0.0%
VANADIUM	--	--	--	0.00E+00	0.0%
ZINC	--	--	--	0.00E+00	0.0%

TABLE 6-32 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
PAHs					
ACENAPHTHENE	--	--	--	0.00E+00	0.0%
ACENAPHTHYLENE	--	--	--	0.00E+00	0.0%
ANTHRACENE	--	--	--	0.00E+00	0.0%
BENZ(A)ANTHRACENE	1.00E-07	--	1.34E-12	1.00E-07	2.4%
BENZO[A]PYRENE	9.99E-07	--	1.34E-11	9.99E-07	24.2%
BENZO(B)FLUORANTHENE	1.34E-07	--	1.79E-12	1.34E-07	3.2%
BENZO(G,H,I)PERYLENE	--	--	--	0.00E+00	0.0%
BENZO(K)FLUORANTHENE	5.04E-09	--	6.75E-14	5.04E-09	0.1%
CHRYSENE	1.15E-09	--	1.54E-14	1.15E-09	0.0%
DIBENZ[A, H]ANTHRACENE	3.16E-07	--	4.24E-12	3.16E-07	7.7%
FLUORANTHENE	--	--	--	0.00E+00	0.0%
FLUORENE	--	--	--	0.00E+00	0.0%
INDENO(1,2,3-CD)PYRENE	7.05E-08	--	9.45E-13	7.05E-08	1.7%
2-METHYLNAPHTHALENE	--	--	--	0.00E+00	0.0%
NAPHTHALENE	--	--	--	0.00E+00	0.0%
PHENANTHRENE	--	--	--	0.00E+00	0.0%
PYRENE	--	--	--	0.00E+00	0.0%

TABLE 6-32 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
BIS(2-ETHYLHEXYL)PHTHALATE	1.94E-09	5.97E-12	--	1.94E-09	0.0%
BUTYLBENZYLPHTHALATE	--	--	--	0.00E+00	0.0%
CARBAZOLE	6.62E-10	2.04E-12	2.09E-14	6.64E-10	0.0%
DIBENZOFURAN	--	--	--	0.00E+00	0.0%
DIBUTYLPHTHALATE	--	--	--	0.00E+00	0.0%
Volatiles					
2-BUTANONE	--	--	--	0.00E+00	0.0%
ACETONE	--	--	--	0.00E+00	0.0%
BENZENE	6.53E-11	--	1.01E-15	6.53E-11	0.0%
CARBON DISULFIDE	--	--	--	0.00E+00	0.0%
TOLUENE	--	--	--	0.00E+00	0.0%
TRICHLOROETHENE	1.00E-11	--	1.72E-16	1.00E-11	0.0%
VINYL CHLORIDE	4.14E-09	--	2.70E-15	4.14E-09	0.1%
Cumulative Risk	4.07E-06	2.26E-09	5.64E-08	4.12E-06	100%

TABLE 6-33 SUMMARY OF NON-CANCER RISKS FOR COMMERCIAL WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NON-CANCER RISKS

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	**HQ**	**HQ**	**HI**	
Inorganics					
ALUMINUM	3.06E-03	--	2.21E-04	3.28E-03	8%
ANTIMONY	2.25E-03	--	--	2.25E-03	6%
ARSENIC	9.59E-03	3.28E-03	--	1.29E-02	32%
BARIUM	1.31E-03	--	6.63E-05	1.38E-03	3%
BERYLLIUM	9.05E-05	--	3.21E-06	9.37E-05	0%
CADMIUM	7.88E-04	3.59E-04	--	1.15E-03	3%
CHROMIUM	3.59E-03	--	--	3.59E-03	9%
COBALT	5.21E-05	--	--	5.21E-05	0%
COPPER	1.29E-03	--	--	1.29E-03	3%
MANGANESE	5.77E-03	--	9.99E-04	6.77E-03	17%
MERCURY	3.87E-03	--	--	3.87E-03	10%
NICKEL	5.16E-04	--	--	5.16E-04	1%
SELENIUM	4.66E-05	--	--	4.66E-05	0%
SILVER	2.45E-05	--	--	2.45E-05	0%
THALLIUM	9.71E-04	--	--	9.71E-04	2%
VANADIUM	1.69E-03	--	--	1.69E-03	4%
ZINC	6.23E-04	--	--	6.23E-04	2%

TABLE 6-33 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
PAHs					
ACENAPHTHENE	1.38E-06	--	1.39E-10	1.38E-06	0%
ACENAPHTHYLENE	1.30E-06	--	3.04E-09	1.30E-06	0%
ANTHRACENE	3.86E-07	--	3.90E-11	3.87E-07	0%
BENZ(A)ANTHRACENE	--	--	--	0.00E+00	0%
BENZO[A]PYRENE	--	--	--	0.00E+00	0%
BENZO(B)FLUORANTHENE	--	--	--	0.00E+00	0%
BENZO(G,H,I)PERYLENE	5.59E-06	--	5.65E-10	5.59E-06	0%
BENZO(K)FLUORANTHENE	--	--	--	0.00E+00	0%
CHRYSENE	--	--	--	0.00E+00	0%
DIBENZ[A, H]ANTHRACENE	--	--	--	0.00E+00	0%
FLUORANTHENE	1.02E-05	--	1.03E-09	1.02E-05	0%
FLUORENE	2.37E-06	--	2.40E-10	2.37E-06	0%
INDENO(1,2,3-CD)PYRENE	--	--	--	0.00E+00	0%
2-METHYLNAPHTHALENE	2.57E-06	--	--	2.57E-06	0%
NAPHTHALENE	3.01E-06	--	7.07E-09	3.02E-06	0%
PHENANTHRENE	2.69E-05	--	6.32E-08	2.70E-05	0%
PYRENE	1.70E-05	--	1.71E-09	1.70E-05	0%

TABLE 6-33 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	1.23E-05	1.40E-05	1.12E-09	2.62E-05	0%
BUTYLBENZYLPHTHALATE	1.79E-07	2.04E-07	1.80E-11	3.82E-07	0%
CARBAZOLE	--	--	--	0.00E+00	0%
DIBENZOFURAN	2.02E-05	2.30E-05	2.04E-09	4.32E-05	0%
DIBUTYLPHTHALATE	2.10E-07	2.40E-07	2.12E-11	4.50E-07	0%
Volatiles					
2-BUTANONE	8.15E-09	--	1.70E-12	8.16E-09	0%
ACETONE	3.42E-06	--	3.46E-10	3.43E-06	0%
BENZENE	7.01E-07	--	1.25E-10	7.01E-07	0%
CARBON DISULFIDE	4.89E-08	--	2.47E-12	4.89E-08	0%
TOLUENE	5.38E-09	--	9.88E-13	5.38E-09	0%
TRICHLOROETHENE	2.69E-07	--	2.72E-11	2.69E-07	0%
VINYL CHLORIDE	1.63E-06	--	1.70E-11	1.63E-06	0%
Cumulative Risk	3.56E-02	3.68E-03	1.29E-03	4.06E-02	100%

TABLE 6-34 SUMMARY OF CANCER RISKS FOR COMMERCIAL WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
Inorganics					
ALUMINUM	--	--	--	0.00E+00	0.0%
ANTIMONY	--	--	--	0.00E+00	0.0%
ARSENIC	1.54E-06	5.27E-07	1.56E-09	2.07E-06	64.3%
BARIUM	--	--	--	0.00E+00	0.0%
BERYLLIUM	--	--	5.48E-11	5.48E-11	0.0%
CADMIUM	--	--	8.95E-11	8.95E-11	0.0%
CHROMIUM	--	--	1.13E-07	1.13E-07	3.5%
COBALT	--	--	--	0.00E+00	0.0%
COPPER	--	--	--	0.00E+00	0.0%
MANGANESE	--	--	--	0.00E+00	0.0%
MERCURY	--	--	--	0.00E+00	0.0%
NICKEL	--	--	--	0.00E+00	0.0%
SELENIUM	--	--	--	0.00E+00	0.0%
SILVER	--	--	--	0.00E+00	0.0%
THALLIUM	--	--	--	0.00E+00	0.0%
VANADIUM	--	--	--	0.00E+00	0.0%
ZINC	--	--	--	0.00E+00	0.0%

TABLE 6-34 (continued)

Site Number: Fill Area

Chemical of Concern	**Incidental Ingestion of Total Soil**	**Dermal Contact with Total Soil**	**Inhalation of Particulates from Total Soil**	**Total**	**Percent Contribution Of Each COC**
	Risk	**Risk**	**Risk**	**Risk**	
PAHs					
ACENAPHTHENE	--	--	--	0.00E+00	0.0%
ACENAPHTHYLENE	--	--	--	0.00E+00	0.0%
ANTHRACENE	--	--	--	0.00E+00	0.0%
BENZ(A)ANTHRACENE	6.34E-08	--	2.72E-12	6.34E-08	2.0%
BENZO[A]PYRENE	6.33E-07	--	2.71E-11	6.33E-07	19.7%
BENZO(B)FLUORANTHENE	8.46E-08	--	3.63E-12	8.46E-08	2.6%
BENZO(G,H,I)PERYLENE	--	--	--	0.00E+00	0.0%
BENZO(K)FLUORANTHENE	3.19E-09	--	1.37E-13	3.19E-09	0.1%
CHRYSENE	7.26E-10	--	3.11E-14	7.26E-10	0.0%
DIBENZ[A, H]ANTHRACENE	2.00E-07	--	8.59E-12	2.00E-07	6.2%
FLUORANTHENE	--	--	--	0.00E+00	0.0%
FLUORENE	--	--	--	0.00E+00	0.0%
INDENO(1,2,3-CD)PYRENE	4.46E-08	--	1.91E-12	4.46E-08	1.4%
2-METHYLNAPHTHALENE	--	--	--	0.00E+00	0.0%
NAPHTHALENE	--	--	--	0.00E+00	0.0%
PHENANTHRENE	--	--	--	0.00E+00	0.0%
PYRENE	--	--	--	0.00E+00	0.0%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	1.23E-09	1.40E-09	--	2.62E-09	0.1%
BUTYLBENZYLPHTHALATE	--	--	--	0.00E+00	0.0%
CARBAZOLE	4.19E-10	4.78E-10	4.23E-14	8.97E-10	0.0%
DIBENZOFURAN	--	--	--	0.00E+00	0.0%
DIBUTYLPHTHALATE	--	--	--	0.00E+00	0.0%

TABLE 6-34 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
Volatiles					
2-BUTANONE	--	--	--	0.00E+00	0.0%
ACETONE	--	--	--	0.00E+00	0.0%
BENZENE	4.13E-11	--	2.05E-15	4.13E-11	0.0%
CARBON DISULFIDE	--	--	--	0.00E+00	0.0%
TOLUENE	--	--	--	0.00E+00	0.0%
TRICHLOROETHENE	6.34E-12	--	3.49E-16	6.34E-12	0.0%
VINYL CHLORIDE	2.62E-09	--	5.47E-15	2.62E-09	0.1%
Cumulative Risk	2.57E-06	5.29E-07	1.14E-07	3.22E-06	100%

TABLE 6-35 SUMMARY OF NON-CANCER RISKS FOR CONSTRUCTION WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NON-CANCER RISKS

Site Number: Fill Area

Chemical of Concern	**Incidental Ingestion of Total Soil**	**Dermal Contact with Total Soil**	**Inhalation of Particulates from Total Soil**	**Total**	**Percent Contribution Of Each COC**
	HQ	**HQ**	**HQ**	**HI**	
Inorganics					
ALUMINUM	1.76E-02	--	1.33E-04	1.78E-02	8%
ANTIMONY	1.30E-02	--	--	1.30E-02	6%
ARSENIC	5.52E-02	3.42E-03	--	5.87E-02	28%
BARIUM	7.57E-03	--	3.98E-05	7.61E-03	4%
BERYLLIUM	5.21E-04	--	1.92E-06	5.23E-04	0%
CADMIUM	4.54E-03	3.74E-04	--	4.91E-03	2%
CHROMIUM	2.07E-02	--	--	2.07E-02	10%
COBALT	3.00E-04	--	--	3.00E-04	0%
COPPER	7.41E-03	--	--	7.41E-03	4%
MANGANESE	3.32E-02	--	5.99E-04	3.38E-02	16%
MERCURY	2.23E-02	--	--	2.23E-02	11%
NICKEL	2.97E-03	--	--	2.97E-03	1%
SELENIUM	2.68E-04	--	--	2.68E-04	0%
SILVER	1.41E-04	--	--	1.41E-04	0%
THALLIUM	5.59E-03	--	--	5.59E-03	3%
VANADIUM	9.74E-03	--	--	9.74E-03	5%
ZINC	3.59E-03	--	--	3.59E-03	2%

TABLE 6-35 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
ACENAPHTHYLENE	7.47E-06	--	1.83E-09	7.47E-06	0%
ANTHRACENE	2.23E-06	--	2.34E-11	2.23E-06	0%
BENZ(A)ANTHRACENE	--	--	--	--	--
BENZO[A]PYRENE	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--
BENZO(G,H,I)PERYLENE	3.22E-05	--	3.39E-10	3.22E-05	0%
BENZO(K)FLUORANTHENE	--	--	--	--	--
CHRYSENE	--	--	--	--	--
DIBENZ[A, H]ANTHRACENE	--	--	--	--	--
FLUORANTHENE	5.86E-05	--	6.16E-10	5.86E-05	0%
FLUORENE	1.37E-05	--	1.44E-10	1.37E-05	0%
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--
2-METHYLNAPHTHALENE	1.48E-05	--	--	1.48E-05	0%
NAPHTHALENE	1.73E-05	--	4.24E-09	1.73E-05	0%
PHENANTHRENE	1.55E-04	--	3.79E-08	1.55E-04	0%
PYRENE	9.77E-05	--	1.03E-09	9.77E-05	0%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	7.06E-05	1.46E-05	6.75E-10	8.52E-05	0%
BUTYLBENZYLPHTHALATE	1.03E-06	2.12E-07	1.08E-11	1.24E-06	0%
CARBAZOLE	--	--	--	--	--
DIBENZOFURAN	1.16E-04	2.40E-05	1.22E-09	1.40E-04	0%
DIBUTYLPHTHALATE	1.21E-06	2.50E-07	1.27E-11	1.46E-06	0%

TABLE 6-35 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
2-BUTANONE	4.70E-08	--	1.02E-12	4.70E-08	0%
ACETONE	1.97E-05	--	2.07E-10	1.97E-05	0%
BENZENE	4.04E-06	--	7.50E-11	4.04E-06	0%
CARBON DISULFIDE	2.82E-07	--	1.48E-12	2.82E-07	0%
TOLUENE	3.10E-08	--	5.93E-13	3.10E-08	0%
TRICHLOROETHENE	1.55E-06	--	1.63E-11	1.55E-06	0%
VINYL CHLORIDE	9.39E-06	--	1.02E-11	9.39E-06	0%
Cumulative Risk	2.05E-01	3.83E-03	7.73E-04	2.10E-01	100%

TABLE 6-36 SUMMARY OF CANCER RISKS FOR CONSTRUCTION WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
Inorganics					
ALUMINUM	--	--	--	--	--
ANTIMONY	--	--	--	--	--
ARSENIC	3.55E-07	2.20E-08	3.73E-11	7.54E-07	122%
BARIUM	--	--	--	--	--
BERYLLIUM	--	--	1.32E-12	1.32E-12	0%
CADMIUM	--	--	2.15E-12	2.15E-12	0%
CHROMIUM	--	--	2.70E-09	2.70E-09	0%
COBALT	--	--	--	--	--
COPPER	--	--	--	--	--
MANGANESE	--	--	--	--	--
MERCURY	--	--	--	--	--
NICKEL	--	--	--	--	--
SELENIUM	--	--	--	--	--
SILVER	--	--	--	--	--
THALLIUM	--	--	--	--	--
VANADIUM	--	--	--	--	--
ZINC	--	--	--	--	--

TABLE 6-36 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
ACENAPHTHYLENE	--	--	--	--	--
ANTHRACENE	--	--	--	--	--
BENZ(A)ANTHRACENE	1.46E-08	--	6.52E-14	6.52E-14	0%
BENZO[A]PYRENE	1.46E-07	--	6.51E-13	6.51E-13	0%
BENZO(B)FLUORANTHENE	1.95E-08	--	8.70E-14	8.70E-14	0%
BENZO(G,H,I)PERYLENE	--	--	--	--	--
BENZO(K)FLUORANTHENE	7.35E-10	--	3.28E-15	3.28E-15	0%
CHRYSENE	1.67E-10	--	7.47E-16	7.47E-16	0%
DIBENZ[A, H]ANTHRACENE	4.61E-08	--	2.06E-13	2.06E-13	0%
FLUORANTHENE	--	--	--	--	--
FLUORENE	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	1.03E-08	--	4.59E-14	4.59E-14	0%
2-METHYLNAPHTHALENE	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--
PYRENE	--	--	--	--	--
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	2.82E-10	5.82E-11	--	0.00E+00	0%
BUTYLBENZYLPHTHALATE	--	--	--	--	--
CARBAZOLE	9.66E-11	1.99E-11	1.02E-15	1.02E-15	0%
DIBENZOFURAN	--	--	--	--	--
DIBUTYLPHTHALATE	--	--	--	--	--

TABLE 6-36 (continued)

Site Number: Fill Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
Volatiles					
2-BUTANONE	--	--	--	--	--
ACETONE	--	--	--	--	--
BENZENE	9.52E-12	--	4.92E-17	4.92E-17	0%
CARBON DISULFIDE	--	--	--	--	--
TOLUENE	--	--	--	--	--
TRICHLOROETHENE	1.46E-12	--	8.38E-18	8.38E-18	0%
VINYL CHLORIDE	6.04E-10	--	1.31E-16	1.31E-16	0%
Cumulative Risk	5.93E-07	2.20E-08	2.74E-09	6.18E-07	100%

TABLE 6-37 SUMMARY OF NONCANCER RISKS FOR RESIDIENT ADULTS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: ***Other Area***

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total Soil	Ingestion of Vegetables	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ		HQ	HI	
Inorganics							
ALUMINUM	1.04E-02	--	1.12E-03	1.15E-02	6.62E-04	1.21E-02	5.5%
ANTIMONY	2.38E-03	--	--	2.38E-03	2.28E-03	4.66E-03	2.1%
ARSENIC	2.60E-02	3.11E-03	--	2.91E-02	5.17E-03	3.43E-02	15.4%
BARIUM	1.63E-03	--	1.24E-04	1.76E-03	1.48E-03	3.23E-03	1.5%
BERYLLIUM	2.18E-04	--	1.16E-05	2.29E-04	1.60E-05	2.45E-04	0.1%
CADMIUM	9.23E-04	1.47E-04	--	1.07E-03	3.26E-03	4.33E-03	2.0%
CHROMIUM	8.72E-03	--	--	8.72E-03	1.28E-03	1.00E-02	4.5%
COBALT	1.55E-04	--	--	1.55E-04	5.94E-05	2.14E-04	0.1%
COPPER	1.75E-03	--	--	1.75E-03	1.00E-02	1.18E-02	5.3%
MANGANESE	1.71E-02	--	4.43E-03	2.15E-02	7.09E-02	9.24E-02	41.6%
MERCURY	1.41E-02	--	--	1.41E-02	7.47E-03	2.16E-02	9.7%
NICKEL	1.13E-03	--	--	1.13E-03	3.13E-04	1.44E-03	0.6%
SELENIUM	1.60E-04	--	--	1.60E-04	8.01E-05	2.40E-04	0.1%
SILVER	5.86E-05	--	--	5.86E-05	2.36E-04	2.94E-04	0.1%
THALLIUM	2.06E-03	--	--	2.06E-03	4.96E-05	2.11E-03	1.0%
VANADIUM	5.46E-03	--	--	5.46E-03	6.76E-04	6.14E-03	2.8%
ZINC	5.53E-04	--	--	5.53E-04	7.65E-04	1.32E-03	0.6%
PAHs							
ACENAPHTHENE	3.20E-06	--	4.84E-10	3.20E-06	9.01E-05	9.33E-05	0.0%
ACENAPHTHYLENE	1.66E-05	--	5.84E-08	1.66E-05	8.64E-05	1.03E-04	0.0%
ANTHRACENE	6.48E-07	--	9.82E-11	6.49E-07	1.78E-06	2.43E-06	0.0%
BENZ(A)ANTHRACENE	--	--	--	--	--	0.00E+00	0.0%
BENZO[A]PYRENE	--	--	--	--	--	0.00E+00	0.0%
BENZO(B)FLOURANTHENE	--	--	--	--	--	0.00E+00	0.0%
BENZO(G,H,I)PERYLENE	2.60E-05	--	3.94E-09	2.60E-05	4.80E-06	3.08E-05	0.0%
BENZO(K)FLOURANTHENE	--	--	--	--	--	0.00E+00	0.0%
CHRYSENE	--	--	--	--	--	0.00E+00	0.0%
DIBENZ[A, H]ANTHRACENE	--	--	--	--	--	0.00E+00	0.0%
FLUORANTHENE	3.80E-05	--	5.76E-09	3.80E-05	5.05E-05	8.85E-05	0.0%
FLUORENE	5.34E-06	--	8.09E-10	5.34E-06	2.22E-05	2.75E-05	0.0%
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	0.00E+00	0.0%
2-METHYLNAPHTHALENE	9.52E-06	--	--	9.52E-06	4.37E-04	4.47E-04	0.2%
NAPHTHALENE	8.63E-06	--	3.04E-08	8.66E-06	3.96E-04	4.05E-04	0.2%
PHENANTHRENE	3.08E-05	--	1.09E-07	3.09E-05	7.50E-05	1.06E-04	0.0%
PYRENE	6.03E-05	--	9.13E-09	6.03E-05	8.45E-05	1.45E-04	0.1%
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	2.88E-04	1.15E-04	3.96E-08	4.02E-04	3.11E-04	7.14E-04	0.3%
BUTYLBENZYLPHTHALATE	7.88E-07	3.14E-07	1.19E-10	1.10E-06	2.38E-06	3.48E-06	0.0%
CARBAZOLE	--	--	--	--	--	0.00E+00	0.0%
2-CHLOROPHENOL	5.78E-05	2.31E-05	8.76E-09	8.09E-05	4.36E-03	4.44E-03	2.0%
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	0.00E+00	0.0%
DIBENZOFURAN	5.34E-05	2.13E-05	8.09E-09	7.47E-05	2.61E-04	3.35E-04	0.2%
DIBUTYLPHTHALATE	9.04E-07	3.61E-07	1.37E-10	1.26E-06	4.15E-06	5.42E-06	0.0%
DIOCTYLPHTHALATE	1.38E-05	5.49E-06	2.09E-09	1.93E-05	2.84E-07	1.95E-05	0.0%
4-METHYLPHENOL	1.51E-05	6.01E-06	2.28E-09	2.11E-05	3.01E-03	3.03E-03	1.4%
Volatiles							
2-BUTANONE	9.13E-09	--	2.86E-12	9.14E-09	1.73E-05	1.73E-05	0.0%
ACETONE	9.99E-07	--	1.51E-10	9.99E-07	4.21E-03	4.21E-03	1.9%
BENZENE	1.31E-06	--	3.49E-10	1.31E-06	2.23E-04	2.24E-04	0.1%
CHLOROFORM	1.51E-07	--	2.65E-09	1.53E-07	2.77E-05	2.78E-05	0.0%
ETHYLBENZENE	3.47E-08	--	1.81E-12	3.47E-08	5.21E-06	5.24E-06	0.0%
TRICHLOROETHENE	5.02E-07	--	7.61E-11	5.02E-07	6.46E-05	6.52E-05	0.0%
VINYL CHLORIDE	2.00E-06	--	3.13E-11	2.00E-06	1.05E-03	1.05E-03	0.5%
Cumulative Risk	9.34E-02	3.43E-03	5.69E-03	1.02E-01	1.20E-01	2.22E-01	100%

TABLE 6-38 SUMMARY OF NONCANCER RISKS FOR RESIDIENT CHILDREN AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: **Other Area**

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total Soil	Ingestion of Vegetables	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ		HQ	HI	
Inorganics							
ALUMINUM	9.67E-02	--	2.62E-03	9.67E-02	1.91E-03	9.86E-02	8%
ANTIMONY	2.22E-02	--	--	2.22E-02	4.94E-03	2.72E-02	2%
ARSENIC	2.42E-01	2.04E-02	--	2.63E-01	1.10E-02	2.74E-01	23%
BARIUM	1.53E-02	--	2.89E-04	1.53E-02	3.26E-03	1.85E-02	2%
BERYLLIUM	2.03E-03	--	2.70E-05	2.03E-03	3.52E-05	2.07E-03	0%
CADMIUM	8.62E-03	9.65E-04	--	9.58E-03	7.18E-03	1.68E-02	1%
CHROMIUM	8.14E-02	--	--	8.14E-02	2.76E-03	8.42E-02	7%
COBALT	1.44E-03	--	--	1.44E-03	1.56E-04	1.60E-03	0%
COPPER	1.63E-02	--	--	1.63E-02	2.16E-02	3.79E-02	3%
MANGANESE	1.59E-01	--	1.04E-02	1.59E-01	2.00E-01	3.59E-01	30%
MERCURY	1.32E-01	--	--	1.32E-01	1.54E-02	1.47E-01	12%
NICKEL	1.05E-02	--	--	1.05E-02	6.78E-04	1.12E-02	1%
SELENIUM	1.50E-03	--	--	1.50E-03	1.71E-04	1.67E-03	0%
SILVER	5.47E-04	--	--	5.47E-04	5.14E-04	1.06E-03	0%
THALLIUM	1.92E-02	--	--	1.92E-02	1.09E-04	1.93E-02	2%
VANADIUM	5.10E-02	--	--	5.10E-02	1.65E-03	5.26E-02	4%
ZINC	5.16E-03	--	--	5.16E-03	1.65E-03	6.81E-03	1%
PAHs							
ACENAPHTHENE	2.98E-05	--	1.13E-09	2.98E-05	1.53E-04	1.83E-04	0%
ACENAPHTHYLENE	1.55E-04	--	1.36E-07	1.55E-04	1.86E-04	3.41E-04	0%
ANTHRACENE	6.05E-06	--	2.29E-10	6.05E-06	3.97E-06	1.00E-05	0%
BENZ(A)ANTHRACENE	--	--	--	--	--	0.00E+00	0%
BENZO[A]PYRENE	--	--	--	--	--	0.00E+00	0%
BENZO(B)FLOURANTHENE	--	--	--	--	--	0.00E+00	0%
BENZO(G,H,I)PERYLENE	2.42E-04	--	9.19E-09	2.42E-04	1.04E-05	2.53E-04	0%
BENZO(K)FLOURANTHENE	--	--	--	--	--	0.00E+00	0%
CHRYSENE	--	--	--	--	--	0.00E+00	0%
DIBENZ[A, H]ANTHRACENE	--	--	--	--	--	0.00E+00	0%
FLUORANTHENE	3.55E-04	--	1.34E-08	3.55E-04	1.09E-04	4.64E-04	0%
FLUORENE	4.99E-05	--	1.89E-09	4.99E-05	4.92E-05	9.90E-05	0%
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--	0.00E+00	0%
2-METHYLNAPHTHALENE	8.89E-05	--	--	8.89E-05	7.61E-04	8.50E-04	0%
NAPHTHALENE	8.05E-05	--	7.10E-08	8.05E-05	6.90E-04	7.70E-04	0%
PHENANTHRENE	2.88E-04	--	2.54E-07	2.88E-04	1.68E-04	4.55E-04	0%
PYRENE	5.63E-04	--	2.13E-08	5.63E-04	1.86E-04	7.49E-04	0%
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	2.68E-03	7.52E-04	9.25E-08	3.44E-03	6.83E-04	4.12E-03	0%
BUTYLBENZYLPHTHALATE	7.35E-06	2.06E-06	2.79E-10	9.41E-06	5.27E-06	1.47E-05	0%
CARBAZOLE	--	--	--	--	--	0.00E+00	0%
2-CHLOROPHENOL	5.40E-04	1.51E-04	2.05E-08	6.91E-04	9.09E-03	9.78E-03	1%
4-CHLOROPHENYL PHENYL ETHE	--	--	--	--	--	0.00E+00	0%
DIBENZOFURAN	4.99E-04	1.40E-04	1.89E-08	6.38E-04	5.62E-04	1.20E-03	0%
DIBUTYLPHTHALATE	8.44E-06	2.36E-06	3.20E-10	1.08E-05	7.69E-06	1.85E-05	0%
DIOCTYLPHTHALATE	1.28E-04	3.60E-05	4.87E-09	1.64E-04	4.84E-07	1.65E-04	0%
4-METHYLPHENOL	1.41E-04	3.94E-05	5.33E-09	1.80E-04	5.52E-03	5.70E-03	0%
Volatiles							
2-BUTANONE	8.52E-08	--	6.69E-12	8.52E-08	3.16E-05	3.17E-05	0%
ACETONE	9.32E-06	--	3.53E-10	9.32E-06	7.54E-03	7.54E-03	1%
BENZENE	1.22E-05	--	8.15E-10	1.22E-05	4.03E-04	4.15E-04	0%
CHLOROFORM	1.41E-06	--	6.20E-09	1.41E-06	5.13E-05	5.27E-05	0%
ETHYLBENZENE	3.23E-07	--	4.23E-12	3.23E-07	8.56E-06	8.88E-06	0%
TRICHLOROETHENE	4.69E-06	--	1.78E-10	4.69E-06	1.15E-04	1.20E-04	0%
VINYL CHLORIDE	1.86E-05	--	7.30E-11	1.86E-05	1.95E-03	1.97E-03	0%
Cumulative Risk	8.71E-01	2.25E-02	1.33E-02	8.94E-01	3.01E-01	1.20E+00	100.0%

TABLE 6-39 BREAKDOWN OF NONCANCER RISK BY TARGET ORGAN, RESIDENT CHILDREN NONCANCER EFFECTS

Site Number: **Other Area**

Chemical of Concern	Total Soil	Ingestion of Vegetables	Total	Target Organ
	HI	HI	HI	
Inorganics				
ARSENIC	2.63E-01	1.10E-02	2.74E-01	Skin
MANGANESE	1.59E-01	2.00E-01	3.59E-01	Central Nervous System
MERCURY	1.32E-01	1.54E-02	1.47E-01	Autoimmune
Cumulative HI per Target Organ	5.54E-01	2.27E-01	7.80E-01	
			0.27	**Skin**
			0.36	**Central Nervous System**
			0.15	**Autoimmune**

TABLE 6-40 SUMMARY OF CANCER RISKS FOR RESIDENT ADULT AND CHILDREN AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: **Other Area**

Chemical of Concern	Incidental Ingestion of Total soil	Dermal Contact With Total Soil	Inhalation of Particulates from Total Soil	Total Soil	Ingestion of Vegetables	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk		Risk	Risk	
Inorganics							
ALUMINUM	--	--	--	--	--	0.00E+00	0.0%
ANTIMONY	--	--	--	--	--	0.00E+00	0.0%
ARSENIC	1.34E-05	1.27E-06	9.62E-09	1.46E-05	2.50E-06	1.71E-05	40.1%
BARIUM	--	--	--	--	--	0.00E+00	0.0%
BERYLLIUM	--	--	3.01E-10	3.01E-10	--	3.01E-10	0.0%
CADMIUM	--	--	2.39E-10	2.39E-10	--	2.39E-10	0.0%
CHROMIUM	--	--	6.24E-07	6.24E-07	--	6.24E-07	1.5%
COBALT	--	--	--	--	--	0.00E+00	0.0%
COPPER	--	--	--	--	--	0.00E+00	0.0%
MANGANESE	--	--	--	--	--	0.00E+00	0.0%
MERCURY	--	--	--	--	--	0.00E+00	0.0%
NICKEL	--	--	--	--	--	0.00E+00	0.0%
SELENIUM	--	--	--	--	--	0.00E+00	0.0%
SILVER	--	--	--	--	--	0.00E+00	0.0%
THALLIUM	--	--	--	--	--	0.00E+00	0.0%
VANADIUM	--	--	--	--	--	0.00E+00	0.0%
ZINC	--	--	--	--	--	0.00E+00	0.0%
PAHs							
ACENAPHTHENE	--	--	--	--	--	0.00E+00	0.0%
ACENAPHTHYLENE	--	--	--	--	--	0.00E+00	0.0%
ANTHRACENE	--	--	--	--	--	0.00E+00	0.0%
BENZ(A)ANTHRACENE	7.47E-07	--	2.28E-11	7.47E-07	4.36E-07	1.18E-06	2.8%
BENZO[A]PYRENE	1.00E-05	--	3.06E-10	1.00E-05	3.24E-06	1.33E-05	31.0%
BENZO(B)FLOURANTHENE	1.47E-06	--	4.51E-11	1.47E-06	4.57E-07	1.93E-06	4.5%
BENZO(G,H,I)PERYLENE	--	--	--	--	--	0.00E+00	0.0%
BENZO(K)FLOURANTHENE	4.91E-08	--	1.50E-12	4.91E-08	1.53E-08	6.44E-08	0.2%
CHRYSENE	9.43E-09	--	2.88E-13	9.43E-09	5.11E-09	1.45E-08	0.0%
DIBENZ[A, H]ANTHRACENE	2.33E-06	--	7.13E-11	2.33E-06	4.86E-07	2.82E-06	6.6%
FLUORANTHENE	--	--	--	--	--	0.00E+00	0.0%
FLUORENE	--	--	--	--	--	0.00E+00	0.0%
INDENO(1,2,3-CD)PYRENE	7.01E-07	--	2.14E-11	7.01E-07	9.66E-08	7.97E-07	1.9%
2-METHYLNAPHTHALENE	--	--	--	--	--	0.00E+00	0.0%
NAPHTHALENE	--	--	--	--	--	0.00E+00	0.0%
PHENANTHRENE	--	--	--	--	--	0.00E+00	0.0%
PYRENE	--	--	--	--	--	0.00E+00	0.0%
Semivolatiles							
BIS(2-ETHYLHEXYL)PHTHALATE	9.21E-08	2.91E-08	--	1.21E-07	9.54E-08	2.17E-07	0.5%
BUTYLBENZYLPHTHALATE	--	--	--	--	--	0.00E+00	0.0%
CARBAZOLE	4.95E-09	1.56E-09	3.56E-13	6.51E-09	3.89E-08	4.54E-08	0.1%
2-CHLOROPHENOL	--	--	--	--	--	0.00E+00	0.0%
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--	0.00E+00	0.0%
DIBENZOFURAN	--	--	--	--	--	0.00E+00	0.0%
DIBUTYLPHTHALATE	--	--	--	--	--	0.00E+00	0.0%
DIOCTYLPHTHALATE	--	--	--	--	--	0.00E+00	0.0%
4-METHYLPHENOL	--	--	--	--	--	0.00E+00	0.0%
Volatiles							
2-BUTANONE	--	--	--	--	--	0.00E+00	0.0%
ACETONE	--	--	--	--	--	0.00E+00	0.0%
BENZENE	2.46E-10	--	8.70E-15	2.46E-10	3.54E-08	3.57E-08	0.1%
CHLOROFORM	1.05E-11	--	9.98E-15	1.05E-11	1.65E-09	1.66E-09	0.0%
ETHYLBENZENE	--	--	--	--	--	0.00E+00	0.0%
TRICHLOROETHENE	3.79E-11	--	1.49E-15	3.79E-11	4.07E-09	4.11E-09	0.0%
VINYL CHLORIDE	1.03E-08	--	1.53E-14	1.03E-08	4.62E-06	4.63E-06	10.8%
Cumulative Risk	2.88E-05	1.30E-06	6.35E-07	3.07E-05	1.20E-05	4.28E-05	100%

TABLE 6-41 SUMMARY OF NON-CANCER RISKS FOR RECREATIONAL USERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NON-CANCER RISKS

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Inorganics					
ALUMINUM	1.62E-02	--	5.49E-04	1.68E-02	11.3%
ANTIMONY	3.73E-03	--	--	3.73E-03	2.5%
ARSENIC	4.07E-02	3.77E-05	--	4.07E-02	27.3%
BARIUM	2.56E-03	--	6.06E-05	2.62E-03	1.8%
BERYLLIUM	3.41E-04	--	5.67E-06	3.47E-04	0.2%
CADMIUM	1.45E-03	1.79E-06	--	1.45E-03	1.0%
CHROMIUM	1.37E-02	--	--	1.37E-02	9.2%
COBALT	2.43E-04	--	--	2.43E-04	0.2%
COPPER	2.74E-03	--	--	2.74E-03	1.8%
MANGANESE	2.67E-02	--	2.17E-03	2.89E-02	19.4%
MERCURY	2.21E-02	--	--	2.21E-02	14.8%
NICKEL	1.77E-03	--	--	1.77E-03	1.2%
SELENIUM	2.51E-04	--	--	2.51E-04	0.2%
SILVER	9.19E-05	--	--	9.19E-05	0.1%
THALLIUM	3.23E-03	--	--	3.23E-03	2.2%
VANADIUM	8.55E-03	--	--	8.55E-03	5.7%
ZINC	8.66E-04	--	--	8.66E-04	0.6%

TABLE 6-41 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
PAHs					
ACENAPHTHENE	5.01E-06	--	2.37E-10	5.01E-06	0.0%
ACENAPHTHYLENE	2.60E-05	--	2.86E-08	2.60E-05	0.0%
ANTHRACENE	1.02E-06	--	4.81E-11	1.02E-06	0.0%
BENZ(A)ANTHRACENE	--	--	--	0.00E+00	0.0%
BENZO[A]PYRENE	--	--	--	0.00E+00	0.0%
BENZO(B)FLUORANTHENE	--	--	--	0.00E+00	0.0%
BENZO(G,H,I)PERYLENE	4.07E-05	--	1.93E-09	4.07E-05	0.0%
BENZO(K)FLUORANTHENE	--	--	--	0.00E+00	0.0%
CHRYSENE	--	--	--	0.00E+00	0.0%
DIBENZ[A, H]ANTHRACENE	--	--	--	0.00E+00	0.0%
FLUORANTHENE	5.96E-05	--	2.82E-09	5.96E-05	0.0%
FLUORENE	8.37E-06	--	3.96E-10	8.37E-06	0.0%
INDENO(1,2,3-CD)PYRENE	--	--	--	0.00E+00	0.0%
2-METHYLNAPHTHALENE	1.49E-05	--	--	1.49E-05	0.0%
NAPHTHALENE	1.35E-05	--	1.49E-08	1.35E-05	0.0%
PHENANTHRENE	4.83E-05	--	5.31E-08	4.83E-05	0.0%
PYRENE	9.44E-05	--	4.47E-09	9.44E-05	0.1%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	4.51E-04	1.39E-06	1.94E-08	4.52E-04	0.3%
BUTYLBENZYLPHTHALATE	1.23E-06	3.81E-09	5.84E-11	1.24E-06	0.0%
CARBAZOLE	--	--	--	0.00E+00	0.0%
2-CHLOROPHENOL	9.06E-05	2.79E-07	4.29E-09	9.08E-05	0.1%
4-CHLOROPHENYL PHENYL ETHER	--	--	--	0.00E+00	0.0%
DIBENZOFURAN	8.37E-05	2.58E-07	3.96E-09	8.40E-05	0.1%
DIBUTYLPHTHALATE	1.42E-06	4.37E-09	6.70E-11	1.42E-06	0.0%
DIOCTYLPHTHALATE	2.16E-05	6.65E-08	1.02E-09	2.16E-05	0.0%
4-METHYLPHENOL	2.36E-05	7.28E-08	1.12E-09	2.37E-05	0.0%

TABLE 6-41 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Volatiles					
2-BUTANONE	1.43E-08	--	1.40E-12	1.43E-08	0.0%
ACETONE	1.56E-06	--	7.40E-11	1.56E-06	0.0%
BENZENE	2.05E-06	--	1.71E-10	2.05E-06	0.0%
CHLOROFORM	2.36E-07	--	1.30E-09	2.37E-07	0.0%
ETHYLBENZENE	5.43E-08	--	8.86E-13	5.43E-08	0.0%
TRICHLOROETHENE	7.87E-07	--	3.72E-11	7.87E-07	0.0%
VINYL CHLORIDE	3.13E-06	--	1.53E-11	3.13E-06	0.0%
Cumulative Risk	1.46E-01	4.15E-05	2.78E-03	1.49E-01	100%

TABLE 6-42 SUMMARY OF CANCER RISKS FOR RECREATIONAL USERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
Inorganics					
ALUMINUM	--	--	--	0.00E+00	0.0%
ANTIMONY	--	--	--	0.00E+00	0.0%
ARSENIC	2.36E-06	2.18E-09	7.43E-10	2.36E-06	46.0%
BARIUM	--	--	--	0.00E+00	0.0%
BERYLLIUM	--	--	2.33E-11	2.33E-11	0.0%
CADMIUM	--	--	1.85E-11	1.85E-11	0.0%
CHROMIUM	--	--	4.82E-08	4.82E-08	0.9%
COBALT	--	--	--	0.00E+00	0.0%
COPPER	--	--	--	0.00E+00	0.0%
MANGANESE	--	--	--	0.00E+00	0.0%
MERCURY	--	--	--	0.00E+00	0.0%
NICKEL	--	--	--	0.00E+00	0.0%
SELENIUM	--	--	--	0.00E+00	0.0%
SILVER	--	--	--	0.00E+00	0.0%
THALLIUM	--	--	--	0.00E+00	0.0%
VANADIUM	--	--	--	0.00E+00	0.0%
ZINC	--	--	--	0.00E+00	0.0%

TABLE 6-42 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
PAHs					
ACENAPHTHENE	--	--	--	0.00E+00	0.0%
ACENAPHTHYLENE	--	--	--	0.00E+00	0.0%
ANTHRACENE	--	--	--	0.00E+00	0.0%
BENZ(A)ANTHRACENE	1.32E-07	--	1.77E-12	1.32E-07	2.6%
BENZO[A]PYRENE	1.77E-06	--	2.37E-11	1.77E-06	34.4%
BENZO(B)FLOURANTHENE	2.60E-07	--	3.48E-12	2.60E-07	5.1%
BENZO(G,H,I)PERYLENE	--	--	--	0.00E+00	0.0%
BENZO(K)FLOURANTHENE	8.66E-09	--	1.16E-13	8.66E-09	0.2%
CHRYSENE	1.66E-09	--	2.23E-14	1.66E-09	0.0%
DIBENZ[A, H]ANTHRACENE	4.11E-07	--	5.51E-12	4.11E-07	8.0%
FLUORANTHENE	--	--	--	0.00E+00	0.0%
FLUORENE	--	--	--	0.00E+00	0.0%
INDENO(1,2,3-CD)PYRENE	1.23E-07	--	1.65E-12	1.23E-07	2.4%
2-METHYLNAPHTHALENE	--	--	--	0.00E+00	0.0%
NAPHTHALENE	--	--	--	0.00E+00	0.0%
PHENANTHRENE	--	--	--	0.00E+00	0.0%
PYRENE	--	--	--	0.00E+00	0.0%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	1.62E-08	5.01E-11	--	1.63E-08	0.3%
BUTYLBENZYLPHTHALATE	--	--	--	0.00E+00	0.0%
CARBAZOLE	8.72E-10	2.69E-12	2.75E-14	8.75E-10	0.0%
2-CHLOROPHENOL	--	--	--	0.00E+00	0.0%
4-CHLOROPHENYL PHENYL ETHER	--	--	--	0.00E+00	0.0%
DIBENZOFURAN	--	--	--	0.00E+00	0.0%
DIBUTYLPHTHALATE	--	--	--	0.00E+00	0.0%
DIOCTYLPHTHALATE	--	--	--	0.00E+00	0.0%
4-METHYLPHENOL	--	--	--	0.00E+00	0.0%

TABLE 6-42 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
Volatiles					
2-BUTANONE	--	--	--	0.00E+00	0.0%
ACETONE	--	--	--	0.00E+00	0.0%
BENZENE	4.34E-11	--	6.72E-16	4.34E-11	0.0%
CHLOROFORM	1.85E-12	--	7.71E-16	1.85E-12	0.0%
ETHYLBENZENE	--	--	--	0.00E+00	0.0%
TRICHLOROETHENE	6.68E-12	--	1.15E-16	6.68E-12	0.0%
VINYL CHLORIDE	1.81E-09	--	1.18E-15	1.81E-09	0.0%
Cumulative Risk	5.08E-06	2.23E-09	4.90E-08	5.13E-06	100%

TABLE 6-43 SUMMARY OF NON-CANCER RISKS FOR COMMERCIAL WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NON-CANCER RISKS

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Inorganics					
ALUMINUM	3.70E-03	--	2.67E-04	3.97E-03	10%
ANTIMONY	8.50E-04	--	--	8.50E-04	2%
ARSENIC	9.28E-03	3.17E-03	--	1.25E-02	33%
BARIUM	5.84E-04	--	2.95E-05	6.13E-04	2%
BERYLLIUM	7.78E-05	--	2.76E-06	8.05E-05	0%
CADMIUM	3.30E-04	1.50E-04	--	4.80E-04	1%
CHROMIUM	3.11E-03	--	--	3.11E-03	8%
COBALT	5.53E-05	--	--	5.53E-05	0%
COPPER	6.25E-04	--	--	6.25E-04	2%
MANGANESE	6.10E-03	--	1.06E-03	7.15E-03	19%
MERCURY	5.04E-03	--	--	5.04E-03	13%
NICKEL	4.04E-04	--	--	4.04E-04	1%
SELENIUM	5.72E-05	--	--	5.72E-05	0%
SILVER	2.09E-05	--	--	2.09E-05	0%
THALLIUM	7.36E-04	--	--	7.36E-04	2%
VANADIUM	1.95E-03	--	--	1.95E-03	5%
ZINC	1.97E-04	--	--	1.97E-04	1%

TABLE 6-43 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
PAHs					
ACENAPHTHENE	1.14E-06	--	1.15E-10	1.14E-06	0%
ACENAPHTHYLENE	5.92E-06	--	1.39E-08	5.93E-06	0%
ANTHRACENE	2.32E-07	--	2.34E-11	2.32E-07	0%
BENZ(A)ANTHRACENE	--	--	--	0.00E+00	0%
BENZO[A]PYRENE	--	--	--	0.00E+00	0%
BENZO(B)FLUORANTHENE	--	--	--	0.00E+00	0%
BENZO(G,H,I)PERYLENE	9.28E-06	--	9.37E-10	9.28E-06	0%
BENZO(K)FLUORANTHENE	--	--	--	0.00E+00	0%
CHRYSENE	--	--	--	0.00E+00	0%
DIBENZ[A, H]ANTHRACENE	--	--	--	0.00E+00	0%
FLUORANTHENE	1.36E-05	--	1.37E-09	1.36E-05	0%
FLUORENE	1.91E-06	--	1.93E-10	1.91E-06	0%
INDENO(1,2,3-CD)PYRENE	--	--	--	0.00E+00	0%
2-METHYLNAPHTHALENE	3.40E-06	--	--	3.40E-06	0%
NAPHTHALENE	3.08E-06	--	7.24E-09	3.09E-06	0%
PHENANTHRENE	1.10E-05	--	2.58E-08	1.10E-05	0%
PYRENE	2.15E-05	--	2.17E-09	2.15E-05	0%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	1.03E-04	1.17E-04	9.43E-09	2.20E-04	1%
BUTYLBENZYLPHTHALATE	2.81E-07	3.21E-07	2.84E-11	6.02E-07	0%
CARBAZOLE	--	--	--	0.00E+00	0%
2-CHLOROPHENOL	2.06E-05	2.35E-05	2.08E-09	4.42E-05	0%
4-CHLOROPHENYL PHENYL ETHER	--	--	--	0.00E+00	0%
DIBENZOFURAN	1.91E-05	2.18E-05	1.93E-09	4.08E-05	0%
DIBUTYLPHTHALATE	3.23E-07	3.68E-07	3.26E-11	6.91E-07	0%
DIOCTYLPHTHALATE	4.92E-06	5.61E-06	4.96E-10	1.05E-05	0%
4-METHYLPHENOL	5.38E-06	6.14E-06	5.43E-10	1.15E-05	0%

TABLE 6-43 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Volatiles					
2-BUTANONE	3.26E-09	--	6.81E-13	3.26E-09	0%
ACETONE	3.57E-07	--	3.60E-11	3.57E-07	0%
BENZENE	4.66E-07	--	8.31E-11	4.66E-07	0%
CHLOROFORM	5.38E-08	--	6.32E-10	5.44E-08	0%
ETHYLBENZENE	1.24E-08	--	4.31E-13	1.24E-08	0%
TRICHLOROETHENE	1.79E-07	--	1.81E-11	1.79E-07	0%
VINYL CHLORIDE	7.13E-07	--	7.44E-12	7.13E-07	0%
Cumulative Risk	3.33E-02	3.50E-03	1.35E-03	3.82E-02	100%

TABLE 6-44 SUMMARY OF CANCER RISKS FOR COMMERCIAL WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
Inorganics					
ALUMINUM	--	--	--	0.00E+00	0.0%
ANTIMONY	--	--	--	0.00E+00	0.0%
ARSENIC	1.49E-06	5.10E-07	1.51E-09	2.00E-06	52.2%
BARIUM	--	--	--	0.00E+00	0.0%
BERYLLIUM	--	--	4.71E-11	4.71E-11	0.0%
CADMIUM	--	--	3.75E-11	3.75E-11	0.0%
CHROMIUM	--	--	9.77E-08	9.77E-08	2.5%
COBALT	--	--	--	0.00E+00	0.0%
COPPER	--	--	--	0.00E+00	0.0%
MANGANESE	--	--	--	0.00E+00	0.0%
MERCURY	--	--	--	0.00E+00	0.0%
NICKEL	--	--	--	0.00E+00	0.0%
SELENIUM	--	--	--	0.00E+00	0.0%
SILVER	--	--	--	0.00E+00	0.0%
THALLIUM	--	--	--	0.00E+00	0.0%
VANADIUM	--	--	--	0.00E+00	0.0%
ZINC	--	--	--	0.00E+00	0.0%

TABLE 6-44 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
PAHs					
ACENAPHTHENE	--	--	--	0.00E+00	0.0%
ACENAPHTHYLENE	--	--	--	0.00E+00	0.0%
ANTHRACENE	--	--	--	0.00E+00	0.0%
BENZ(A)ANTHRACENE	8.34E-08	--	3.58E-12	8.34E-08	2.2%
BENZO[A]PYRENE	1.12E-06	--	4.80E-11	1.12E-06	29.2%
BENZO(B)FLUORANTHENE	1.65E-07	--	7.06E-12	1.65E-07	4.3%
BENZO(G,H,I)PERYLENE	--	--	--	0.00E+00	0.0%
BENZO(K)FLUORANTHENE	5.48E-09	--	2.35E-13	5.48E-09	0.1%
CHRYSENE	1.05E-09	--	4.51E-14	1.05E-09	0.0%
DIBENZ[A, H]ANTHRACENE	2.60E-07	--	1.12E-11	2.60E-07	6.8%
FLUORANTHENE	--	--	--	0.00E+00	0.0%
FLUORENE	--	--	--	0.00E+00	0.0%
INDENO(1,2,3-CD)PYRENE	7.82E-08	--	3.35E-12	7.82E-08	2.0%
2-METHYLNAPHTHALENE	--	--	--	0.00E+00	0.0%
NAPHTHALENE	--	--	--	0.00E+00	0.0%
PHENANTHRENE	--	--	--	0.00E+00	0.0%
PYRENE	--	--	--	0.00E+00	0.0%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	1.03E-08	1.17E-08	--	2.20E-08	0.6%
BUTYLBENZYLPHTHALATE	--	--	--	0.00E+00	0.0%
CARBAZOLE	5.52E-10	6.29E-10	5.57E-14	1.18E-09	0.0%
2-CHLOROPHENOL	--	--	--	0.00E+00	0.0%
4-CHLOROPHENYL PHENYL ETHER	--	--	--	0.00E+00	0.0%
DIBENZOFURAN	--	--	--	0.00E+00	0.0%
DIBUTYLPHTHALATE	--	--	--	0.00E+00	0.0%
DIOCTYLPHTHALATE	--	--	--	0.00E+00	0.0%
4-METHYLPHENOL	--	--	--	0.00E+00	0.0%

TABLE 6-44 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
Volatiles					
2-BUTANONE	--	--	--	0.00E+00	0.0%
ACETONE	--	--	--	0.00E+00	0.0%
BENZENE	2.75E-11	--	1.36E-15	2.75E-11	0.0%
CHLOROFORM	1.17E-12	--	1.56E-15	1.17E-12	0.0%
ETHYLBENZENE	--	--	--	0.00E+00	0.0%
TRICHLOROETHENE	4.23E-12	--	2.33E-16	4.23E-12	0.0%
VINYL CHLORIDE	1.15E-09	--	2.39E-15	1.15E-09	0.0%
Cumulative Risk	3.21E-06	5.22E-07	9.94E-08	3.84E-06	100%

TABLE 6-45 SUMMARY OF NON-CANCER RISKS FOR CONSTRUCTION WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NON-CANCER RISKS

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Inorganics					
ALUMINUM	2.13E-02	--	1.60E-04	2.15E-02	11%
ANTIMONY	4.90E-03	--	--	4.90E-03	2%
ARSENIC	5.34E-02	3.31E-03	--	5.68E-02	29%
BARIUM	3.36E-03	--	1.77E-05	3.38E-03	2%
BERYLLIUM	4.48E-04	--	1.65E-06	4.50E-04	0%
CADMIUM	1.90E-03	1.57E-04	--	2.06E-03	1%
CHROMIUM	1.79E-02	--	--	1.79E-02	9%
COBALT	3.18E-04	--	--	3.18E-04	0%
COPPER	3.60E-03	--	--	3.60E-03	2%
MANGANESE	3.51E-02	--	6.33E-04	3.57E-02	18%
MERCURY	2.90E-02	--	--	2.90E-02	15%
NICKEL	2.32E-03	--	--	2.32E-03	1%
SELENIUM	3.30E-04	--	--	3.30E-04	0%
SILVER	1.21E-04	--	--	1.21E-04	0%
THALLIUM	4.24E-03	--	--	4.24E-03	2%
VANADIUM	1.12E-02	--	--	1.12E-02	6%
ZINC	1.14E-03	--	--	1.14E-03	1%

TABLE 6-45 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
PAHs					
ACENAPHTHENE	6.58E-06	--	6.92E-11	6.58E-06	0%
ACENAPHTHYLENE	3.41E-05	--	8.34E-09	3.41E-05	0%
ANTHRACENE	1.33E-06	--	1.40E-11	1.33E-06	0%
BENZ(A)ANTHRACENE	--	--	--	--	--
BENZO[A]PYRENE	--	--	--	--	--
BENZO(B)FLUORANTHENE	--	--	--	--	--
BENZO(G,H,I)PERYLENE	5.34E-05	--	5.62E-10	5.34E-05	0%
BENZO(K)FLUORANTHENE	--	--	--	--	--
CHRYSENE	--	--	--	--	--
DIBENZ[A, H]ANTHRACENE	--	--	--	--	--
FLUORANTHENE	7.82E-05	--	8.22E-10	7.82E-05	0%
FLUORENE	1.10E-05	--	1.16E-10	1.10E-05	0%
INDENO(1,2,3-CD)PYRENE	--	--	--	--	--
2-METHYLNAPHTHALENE	1.96E-05	--	--	1.96E-05	0%
NAPHTHALENE	1.78E-05	--	4.34E-09	1.78E-05	0%
PHENANTHRENE	6.34E-05	--	1.55E-08	6.34E-05	0%
PYRENE	1.24E-04	--	1.30E-09	1.24E-04	0%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	5.92E-04	1.22E-04	5.66E-09	7.14E-04	0%
BUTYLBENZYLPHTHALATE	1.62E-06	3.34E-07	1.70E-11	1.95E-06	0%
CARBAZOLE	--	--	--	--	--
2-CHLOROPHENOL	1.19E-04	2.45E-05	1.25E-09	1.43E-04	0%
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--
DIBENZOFURAN	1.10E-04	2.27E-05	1.16E-09	1.33E-04	0%
DIBUTYLPHTHALATE	1.86E-06	3.84E-07	1.96E-11	2.24E-06	0%
DIOCTYLPHTHALATE	2.83E-05	5.84E-06	2.98E-10	3.42E-05	0%
4-METHYLPHENOL	3.10E-05	6.39E-06	3.26E-10	3.74E-05	0%

TABLE 6-45 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Volatiles					
2-BUTANONE	1.88E-08	--	4.09E-13	1.88E-08	0%
ACETONE	2.05E-06	--	2.16E-11	2.05E-06	0%
BENZENE	2.69E-06	--	4.99E-11	2.69E-06	0%
CHLOROFORM	3.10E-07	--	3.79E-10	3.10E-07	0%
ETHYLBENZENE	7.13E-08	--	2.59E-13	7.13E-08	0%
TRICHLOROETHENE	1.03E-06	--	1.09E-11	1.03E-06	0%
VINYL CHLORIDE	4.10E-06	--	4.47E-12	4.10E-06	0%
Cumulative Risk	1.92E-01	3.65E-03	8.12E-04	1.96E-01	100%

TABLE 6-46 SUMMARY OF CANCER RISKS FOR CONSTRUCTION WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
Inorganics					
ALUMINUM	--	--	--	--	--
ANTIMONY	--	--	--	--	--
ARSENIC	3.44E-07	2.13E-08	3.61E-11	3.65E-07	48%
BARIUM	--	--	--	--	--
BERYLLIUM	--	--	1.13E-12	1.13E-12	0%
CADMIUM	--	--	8.99E-13	8.99E-13	0%
CHROMIUM	--	--	2.35E-09	2.35E-09	0%
COBALT	--	--	--	--	--
COPPER	--	--	--	--	--
MANGANESE	--	--	--	--	--
MERCURY	--	--	--	--	--
NICKEL	--	--	--	--	--
SELENIUM	--	--	--	--	--
SILVER	--	--	--	--	--
THALLIUM	--	--	--	--	--
VANADIUM	--	--	--	--	--
ZINC	--	--	--	--	--

TABLE 6-46 (continued)

Site Number: Other Area

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	Risk	Risk	Risk	
PAHs					
ACENAPHTHENE	--	--	--	--	--
ACENAPHTHYLENE	--	--	--	--	--
ANTHRACENE	--	--	--	--	--
BENZ(A)ANTHRACENE	1.92E-08	--	8.58E-14	1.92E-08	3%
BENZO[A]PYRENE	2.58E-07	--	1.15E-12	2.58E-07	34%
BENZO(B)FLUORANTHENE	3.79E-08	--	1.69E-13	3.79E-08	5%
BENZO(G,H,I)PERYLENE	--	--	--	--	--
BENZO(K)FLUORANTHENE	1.26E-09	--	5.64E-15	1.26E-09	0%
CHRYSENE	2.42E-10	--	1.08E-15	2.42E-10	0%
DIBENZ[A, H]ANTHRACENE	6.00E-08	--	2.68E-13	6.00E-08	8%
FLUORANTHENE	--	--	--	--	--
FLUORENE	--	--	--	--	--
INDENO(1,2,3-CD)PYRENE	1.80E-08	--	8.05E-14	1.80E-08	2%
2-METHYLNAPHTHALENE	--	--	--	--	--
NAPHTHALENE	--	--	--	--	--
PHENANTHRENE	--	--	--	--	--
PYRENE	--	--	--	--	--

TABLE 6-46 (continued)

Site Number: Other Area

Chemical of Concern	**Incidental Ingestion of Total Soil**	**Dermal Contact with Total Soil**	**Inhalation of Particulates from Total Soil**	**Total**	**Percent Contribution Of Each COC**
	Risk	**Risk**	**Risk**	**Risk**	
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	2.37E-09	4.88E-10	--	2.86E-09	0%
BUTYLBENZYLPHTHALATE	--	--	--	--	--
CARBAZOLE	1.27E-10	2.62E-11	1.34E-15	1.53E-10	0%
2-CHLOROPHENOL	--	--	--	--	--
4-CHLOROPHENYL PHENYL ETHER	--	--	--	--	--
DIBENZOFURAN	--	--	--	--	--
DIBUTYLPHTHALATE	--	--	--	--	--
DIOCTYLPHTHALATE	--	--	--	--	--
4-METHYLPHENOL	--	--	--	--	--
Volatiles					
2-BUTANONE	--	--	--	--	--
ACETONE	--	--	--	--	--
BENZENE	6.33E-12	--	3.27E-17	6.33E-12	0%
CHLOROFORM	2.70E-13	--	3.75E-17	2.70E-13	0%
ETHYLBENZENE	--	--	--	--	--
TRICHLOROETHENE	9.74E-13	--	5.59E-18	9.74E-13	0%
VINYL CHLORIDE	2.64E-10	--	5.74E-17	2.64E-10	0%
Cumulative Risk	7.41E-07	2.18E-08	2.39E-09	7.65E-07	100%

TABLE 6-47 SUMMARY OF NONCANCER RISKS FOR RESIDIENT ADULTS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: ***Pesticide Area***

Chemical of Concern	**Incidental Ingestion of Total Soil**	**Dermal Contact with Total Soil**	**Inhalation of Particulates from Total Soil**	**Total Soil**	**Ingestion of Vegetables**	**Total**	**Percent Contribution Of Each COC**
	HQ	**HQ**	**HQ**		**HI**	**HI**	
Pesticides/PCBs							
DDD	--	--	--	--	--	0.00E+00	0.0%
DDE	--	--	--	--	--	0.00E+00	0.0%
DDT	2.70E-03	1.08E-03	4.10E-07	3.78E-03	2.69E-04	4.05E-03	8.8%
ENDRIN ALDEHYDE	3.74E-05	1.49E-05	5.67E-09	5.24E-05	2.54E-05	7.78E-05	0.2%
ENDRIN KETONE	1.46E-04	5.83E-05	2.21E-08	2.04E-04	9.93E-05	3.04E-04	0.7%
GAMMA-CHLORDANE	2.38E-05	3.80E-06	3.61E-09	2.76E-05	--	2.76E-05	0.1%
GAMMA-BHC	2.37E-05	9.47E-06	3.60E-09	3.32E-05	1.30E-03	1.33E-03	2.9%
HEPTACHLOR EPOXIDE	1.04E-02	4.17E-03	1.58E-06	1.46E-02	2.55E-02	4.01E-02	87.3%
Cumulative Risk	1.34E-02	5.33E-03	2.03E-06	1.87E-02	2.72E-02	4.59E-02	100%

TABLE 6-48 SUMMARY OF NONCANCER RISKS FOR RESIDIENT CHILDREN AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: **Pesticide Area**

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total Soil	Ingestion of Vegetables	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ		HQ	HI	
Pesticides/PCBs							
DDD	--	--	--	--	--	0.00E+00	0%
DDE	--	--	--	--	--	0.00E+00	0%
DDT	2.52E-02	7.07E-03	9.57E-07	3.23E-02	4.05E-04	3.27E-02	16%
ENDRIN ALDEHYDE	3.49E-04	9.79E-05	1.32E-08	4.47E-04	3.88E-05	4.86E-04	0%
ENDRIN KETONE	1.36E-03	3.82E-04	5.17E-08	1.75E-03	1.52E-04	1.90E-03	1%
GAMMA-CHLORDANE	2.22E-04	2.49E-05	2.11E-08	2.47E-04	--	2.47E-04	0%
GAMMA-BHC	2.22E-04	6.21E-05	8.40E-09	2.84E-04	2.01E-03	2.30E-03	1%
HEPTACHLOR EPOXIDE	9.75E-02	2.73E-02	3.69E-06	1.25E-01	3.61E-02	1.61E-01	81%
Cumulative Risk	1.25E-01	3.49E-02	4.75E-06	1.60E-01	3.88E-02	1.99E-01	100.0%

TABLE 6-49 SUMMARY OF CANCER RISKS FOR RESIDENT ADULT AND CHILDREN AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: **Pesticide Area**

Chemical of Concern	Incidental Ingestion of Total soil	Dermal Contact With Total Soil	Inhalation of Particulates from Total Soil	Total Soil	Ingestion of Vegetables	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**		**Risk**	**Risk**	
Pesticides/PCBs							
DDD	2.67E-08	8.42E-09	1.92E-12	3.51E-08	2.82E-08	6.33E-08	1.1%
DDE	2.34E-08	7.39E-09	1.69E-12	3.08E-08	1.75E-08	4.83E-08	0.9%
DDT	5.25E-07	1.66E-07	3.78E-11	6.91E-07	3.93E-08	7.31E-07	12.9%
ENDRIN ALDEHYDE	--	--	--	--	--	0.00E+00	0.0%
ENDRIN KETONE	--	--	--	--	--	0.00E+00	0.0%
GAMMA-CHLORDANE	4.77E-09	6.02E-10	3.43E-13	5.37E-09	3.87E-09	9.24E-09	0.2%
GAMMA-BHC	1.06E-08	3.34E-09	7.62E-13	1.39E-08	4.43E-07	4.57E-07	8.1%
HEPTACHLOR EPOXIDE	1.41E-06	4.46E-07	1.02E-10	1.86E-06	2.50E-06	4.36E-06	76.9%
Cumulative Risk	2.00E-06	6.31E-07	1.44E-10	2.63E-06	3.03E-06	5.66E-06	100%

TABLE 6-50 SUMMARY OF NONCANCER RISKS FOR RECREATIONAL USERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: **Pesticide Area**

Chemical of Concern	Incidental Ingestion of Surface Soil	Dermal Contact with Surface Soil	Inhalation of Particulates from Surface Soil	Total	Percent Contribution Of Each COC
	HQ	**HQ**	**HQ**	**HI**	
Pesticides/PCBs					
DDD	--	--	--	0.00E+00	0.0%
DDE	--	--	--	0.00E+00	0.0%
DDT	4.24E-03	1.31E-05	2.01E-07	4.25E-03	20.2%
ENDRIN ALDEHYDE	5.87E-05	1.81E-07	2.78E-09	5.88E-05	0.3%
ENDRIN KETONE	2.29E-04	7.06E-07	1.08E-08	2.30E-04	1.1%
GAMMA-CHLORDANE	3.73E-05	4.61E-08	4.42E-09	3.74E-05	0.2%
GAMMA-BHC	3.72E-05	1.15E-07	1.76E-09	3.73E-05	0.2%
HEPTACHLOR EPOXIDE	1.64E-02	5.05E-05	7.74E-07	1.64E-02	78.1%
Cumulative Risk	2.10E-02	6.46E-05	9.95E-07	2.10E-02	100%

TABLE 6-51 SUMMARY OF CANCER RISKS FOR RECREATIONAL USERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: **Pesticide Area**

Chemical of Concern	Incidental Ingestion of Surface Soil	Dermal Contact with Surface Soil	Inhalation of Particulates from Surface Soil	Total Surface Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**		**Risk**	
Pesticides/PCBs						
DDD	4.70E-09	1.45E-11	1.48E-13	4.72E-09	4.72E-09	1.3%
DDE	4.13E-09	1.27E-11	1.30E-13	4.14E-09	4.14E-09	1.2%
DDT	9.26E-08	2.86E-10	2.92E-12	9.29E-08	9.29E-08	26.2%
ENDRIN ALDEHYDE	--	--	--	--	0.00E+00	0.0%
ENDRIN KETONE	--	--	--	--	0.00E+00	0.0%
GAMMA-CHLORDANE	8.40E-10	1.04E-12	2.65E-14	8.41E-10	8.41E-10	0.2%
GAMMA-BHC	1.87E-09	5.75E-12	5.89E-14	1.87E-09	1.87E-09	0.5%
HEPTACHLOR EPOXIDE	2.49E-07	7.68E-10	7.85E-12	2.50E-07	2.50E-07	70.5%
Cumulative Risk	3.53E-07	1.09E-09	1.11E-11	3.54E-07	3.54E-07	100%

TABLE 6-52 SUMMARY OF NONCANCER RISKS FOR COMMERCIAL WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: **Pesticide Area**

Chemical of Concern	Incidental Ingestion of Surface Soil	Dermal Contact with Surface Soil	Inhalation of Particulates from Surface Soil	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Pesticides/PCBs					
DDD	--	--	--	0.00E+00	0%
DDE	--	--	--	0.00E+00	0%
DDT	9.66E-04	1.10E-03	9.75E-08	2.07E-03	20%
ENDRIN ALDEHYDE	1.34E-05	1.52E-05	1.35E-09	2.86E-05	0%
ENDRIN KETONE	5.22E-05	5.95E-05	5.27E-09	1.12E-04	1%
GAMMA-CHLORDANE	8.51E-06	3.88E-06	2.15E-09	1.24E-05	0%
GAMMA-BHC	8.48E-06	9.67E-06	8.56E-10	1.81E-05	0%
HEPTACHLOR EPOXIDE	3.73E-03	4.25E-03	3.77E-07	7.98E-03	78%
Cumulative Risk	4.78E-03	5.44E-03	4.84E-07	1.02E-02	100%

TABLE 6-53 SUMMARY OF CANCER RISKS FOR COMMERCIAL WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: **Pesticide Area**

Chemical of Concern	Incidental Ingestion of Surface Soil	Dermal Contact with Surface Soil	Inhalation of Particulates from Surface Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
Pesticides/PCBs					
DDD	2.98E-09	3.39E-09	3.01E-13	6.37E-09	1.3%
DDE	2.61E-09	2.98E-09	2.64E-13	5.59E-09	1.2%
DDT	5.86E-08	6.68E-08	5.92E-12	1.25E-07	26.3%
ENDRIN ALDEHYDE	--	--	--	0.00E+00	0.0%
ENDRIN KETONE	--	--	--	0.00E+00	0.0%
GAMMA-CHLORDANE	5.32E-10	2.43E-10	5.37E-14	7.75E-10	0.2%
GAMMA-BHC	1.18E-09	1.35E-09	1.19E-13	2.53E-09	0.5%
HEPTACHLOR EPOXIDE	1.58E-07	1.80E-07	1.59E-11	3.37E-07	70.6%
Cumulative Risk	2.24E-07	2.54E-07	2.26E-11	4.78E-07	100%

TABLE 6-54 SUMMARY OF NONCANCER RISKS FOR CONSTRUCTION WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS

Site Number: **Pesticide Area**

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	HQ	**HQ**	**HQ**	**HI**	
Pesticides/PCBs					
DDD	--	--	--	--	--
DDE	--	--	--	--	--
DDT	5.56E-03	1.15E-03	5.85E-08	6.71E-03	20%
ENDRIN ALDEHYDE	7.70E-05	1.59E-05	8.10E-10	9.29E-05	0%
ENDRIN KETONE	3.01E-04	6.20E-05	3.16E-09	3.63E-04	1%
GAMMA-CHLORDANE	4.90E-05	4.05E-06	1.29E-09	5.31E-05	0%
GAMMA-BHC	4.88E-05	1.01E-05	5.14E-10	5.89E-05	0%
HEPTACHLOR EPOXIDE	2.15E-02	4.43E-03	2.26E-07	2.59E-02	78%
Cumulative Risk	2.75E-02	5.67E-03	2.90E-07	3.32E-02	100%

TABLE 6-55 SUMMARY OF CANCER RISKS FOR CONSTRUCTION WORKERS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS

Site Number: **Pesticide Area**

Chemical of Concern	Incidental Ingestion of Total Soil	Dermal Contact with Total Soil	Inhalation of Particulates from Total Soil	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
Pesticides/PCBs					
DDD	6.86E-10	1.41E-10	7.21E-15	7.21E-15	1%
DDE	6.02E-10	1.24E-10	6.33E-15	6.33E-15	1%
DDT	1.35E-08	2.79E-09	1.42E-13	1.42E-13	26%
ENDRIN ALDEHYDE	--	--	--	--	--
ENDRIN KETONE	--	--	--	--	--
GAMMA-CHLORDANE	1.23E-10	1.01E-11	1.29E-15	1.29E-15	0%
GAMMA-BHC	2.72E-10	5.61E-11	2.86E-15	2.86E-15	1%
HEPTACHLOR EPOXIDE	3.63E-08	7.49E-09	3.82E-13	3.82E-13	70%
Cumulative Risk	5.15E-08	1.06E-08	5.42E-13	5.42E-13	100%

TABLE 6-56 SUMMARY OF NONCANCER RISKS FOR RESIDENT ADULTS AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS ACROSS GROUNDWATER

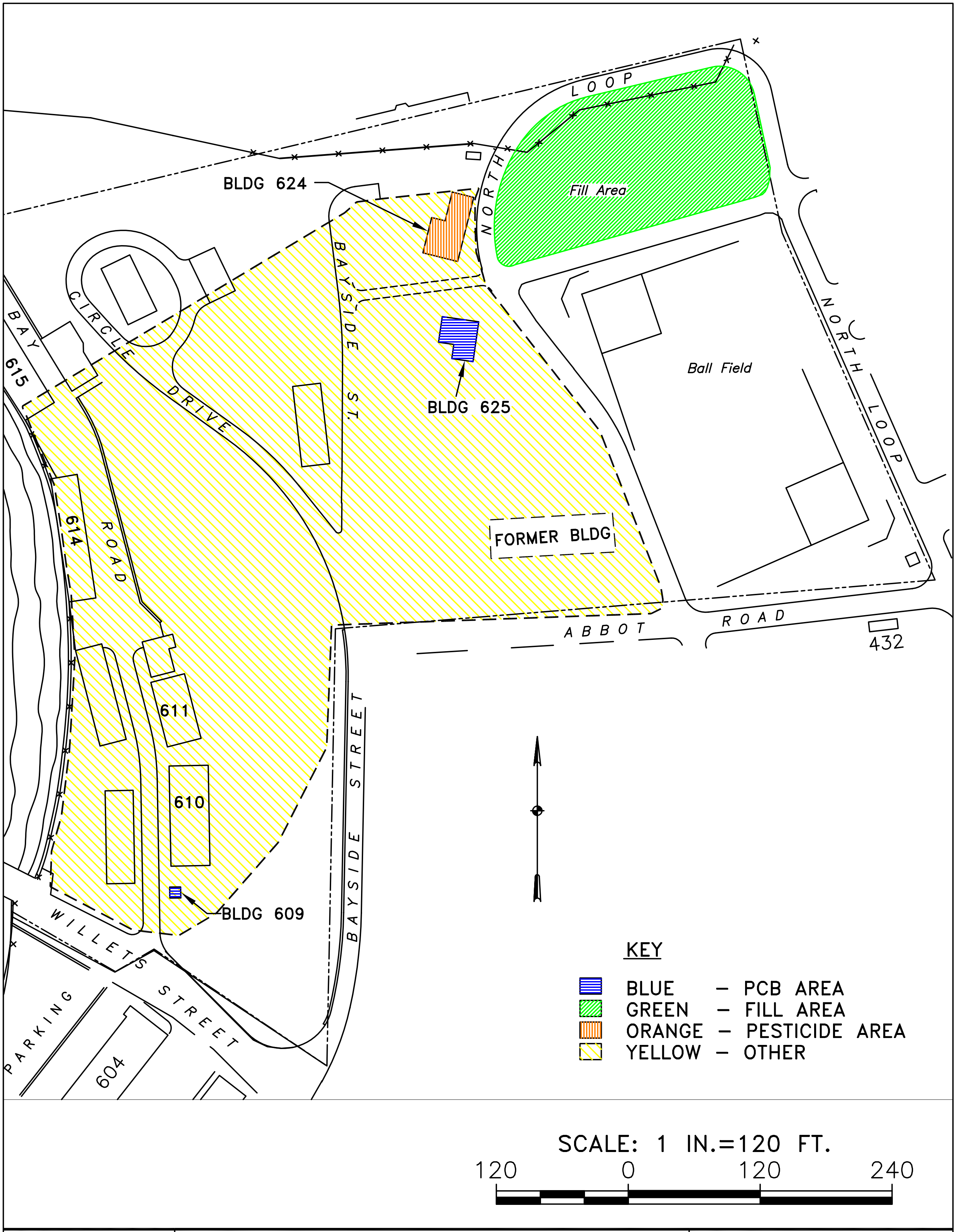
Chemical of Concern	Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Volatiles from Groundwater	Total	Percent Contribution Of Each COC
	HQ	HQ	HQ	HI	
Inorganics					
ALUMINUM	2.18E-02	1.14E-04	--	2.19E-02	0.4%
ANTIMONY	9.18E-02	3.19E-03	--	9.50E-02	1.6%
BARIUM	5.81E-02	4.33E-03	--	6.24E-02	1.0%
CADMIUM	1.16E-02	2.66E-03	--	1.42E-02	0.2%
CHROMIUM	4.66E-01	9.72E-02	--	5.63E-01	9.4%
COBALT	1.37E-03	7.15E-06	--	1.38E-03	0.0%
COPPER	3.50E-03	1.82E-05	--	3.51E-03	0.1%
MANGANESE	6.91E-02	9.01E-03	--	7.81E-02	1.3%
NICKEL	2.62E-01	9.22E-03	--	2.71E-01	4.5%
SELENIUM	1.08E-02	5.66E-05	--	1.09E-02	0.2%
VANADIUM	3.52E-03	7.07E-04	--	4.23E-03	0.1%
ZINC	1.20E-03	6.24E-06	--	1.20E-03	0.0%
PAHs					
ACENAPHTHENE	3.65E-04	--	--	3.65E-04	0.0%
ANTHRACENE	1.46E-04	--	--	1.46E-04	0.0%
BENZ(A)ANTHRACENE	--	--	--	--	0.0%
BENZO[A]PYRENE	--	--	--	--	0.0%
BENZO(B)FLOURANTHENE	--	--	--	--	0.0%
BENZO(G,H,I)PERYLENE	2.68E-03	--	--	2.68E-03	0.0%
BENZO(K)FLOURANTHENE	--	--	--	--	0.0%
CHRYSENE	--	--	--	--	0.0%
DIBENZ[A, H]ANTHRACENE	--	--	--	--	0.0%
FLUORANTHENE	6.55E-03	--	--	6.55E-03	0.1%
FLUORENE	6.16E-04	--	--	6.16E-04	0.0%
INDENO(1,2,3-CD)PYRENE	--	--	--	--	0.0%
2-METHYLNAPHTHALENE	9.18E-03	7.19E-03	--	1.64E-02	0.3%
NAPHTHALENE	1.23E-03	--	--	1.23E-03	0.0%
PHENANTHRENE	7.23E-03	--	--	7.23E-03	0.1%
PYRENE	6.70E-03	--	--	6.70E-03	0.1%
Pesticides/PCBs					
DIELDRIN	2.19E-01	1.49E-02	--	2.34E-01	3.9%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	1.92E-02	2.30E-03	--	2.15E-02	0.4%
BUTYLBENZYLPHTHALATE	6.85E-05	2.54E-05	--	9.39E-05	0.0%
DI(2-ETHYLHEXYL)ADIPATE	4.57E-06	8.58E-05	--	9.04E-05	0.0%
DIBENZOFURAN	6.16E-03	4.83E-03	--	1.10E-02	0.2%
DIBUTYLPHTHALATE	1.10E-03	1.49E-04	--	1.24E-03	0.0%
DIETHYLPHTHALATE	1.03E-04	2.20E-06	--	1.05E-04	0.0%
DIMETHYLPHTHALATE	2.74E-07	2.00E-09	--	2.76E-07	0.0%
Volatiles					
ACETONE	1.38E-03	4.12E-06	2.13E-04	1.60E-03	0.0%
BROMOFORM	4.11E-03	5.15E-05	--	4.16E-03	0.1%
CHLOROETHANE	4.11E-05	1.35E-06	4.48E-06	4.69E-05	0.0%
CHLOROFORM	6.30E-02	2.34E-03	4.51E+00	4.58E+00	76.0%
CHLOROMETHANE	--	--	2.20E-03	2.20E-03	0.0%
DIBROMOCHLOROMETHANE	6.85E-04	1.39E-05	--	6.99E-04	0.0%
M&P XYLENES	4.11E-06	1.72E-06	2.74E-05	3.32E-05	0.0%
METHYL-T-BUTYL ETHER	--	--	1.84E-05	1.84E-05	0.0%
METHYLENE CHLORIDE	9.13E-05	1.72E-06	4.31E-06	9.74E-05	0.0%
N-BUTYLBENZENE	6.85E-05	--	--	6.85E-05	0.0%
P-ISOPROPYLTOLUENE	--	--	--	--	0.0%
TERT-BUTYLALCOHOL	--	--	--	--	0.0%
XYLENES	4.11E-06	2.04E-06	--	6.15E-06	0.0%
Cumulative Risk	1.35E+00	1.58E-01	4.51E+00	6.02E+00	100%

TABLE 6-57 SUMMARY OF NONCANCER RISKS FOR RESIDIENT CHILDREN AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF NONCANCER RISKS GROUNDWATER

Chemical of Concern	Ingestion of Groundwater	Dermal Contact with Groundwater	Total	Percent Contribution Of Each COC
	HQ	HQ	HI	
Inorganics				
ALUMINUM	5.09E-02	3.36E-04	5.13E-02	1%
ANTIMONY	2.14E-01	9.42E-03	2.24E-01	6%
BARIUM	1.35E-01	1.28E-02	1.48E-01	4%
CADMIUM	2.70E-02	7.83E-03	3.48E-02	1%
CHROMIUM	1.09E+00	2.87E-01	1.37E+00	38%
COBALT	3.20E-03	2.11E-05	3.22E-03	0%
COPPER	8.16E-03	5.38E-05	8.21E-03	0%
MANGANESE	1.61E-01	2.66E-02	1.88E-01	5%
NICKEL	6.11E-01	2.72E-02	6.38E-01	18%
SELENIUM	2.53E-02	1.67E-04	2.55E-02	1%
VANADIUM	8.22E-03	2.09E-03	1.03E-02	0%
ZINC	2.79E-03	1.84E-05	2.81E-03	0%
PAHs				
ACENAPHTHENE	8.52E-04	--	8.52E-04	0%
ANTHRACENE	3.41E-04	--	3.41E-04	0%
BENZ(A)ANTHRACENE	--	--	--	0%
BENZO[A]PYRENE	--	--	--	0%
BENZO(B)FLOURANTHENE	--	--	--	0%
BENZO(G,H,I)PERYLENE	6.26E-03	--	6.26E-03	0%
BENZO(K)FLOURANTHENE	--	--	--	0%
CHRYSENE	--	--	--	0%
DIBENZ[A, H]ANTHRACENE	--	--	--	0%
FLUORANTHENE	1.53E-02	--	1.53E-02	0%
FLUORENE	1.44E-03	--	1.44E-03	0%
INDENO(1,2,3-CD)PYRENE	--	--	--	0%
2-METHYLNAPHTHALENE	2.14E-02	2.12E-02	4.26E-02	1%
NAPHTHALENE	2.88E-03	--	--	0%
PHENANTHRENE	1.69E-02	--	--	0%
PYRENE	1.56E-02	--	--	0%
Pesticides/PCBs				
DIELDRIN	5.11E-01	4.39E-02	5.55E-01	15%
Semivolatiles				
BIS(2-ETHYLHEXYL)PHTHALATE	4.47E-02	6.79E-03	5.15E-02	1%
BUTYLBENZYLPHTHALATE	1.60E-04	7.49E-05	2.35E-04	0%
DI(2-ETHYLHEXYL)ADIPATE	1.07E-05	2.53E-04	2.64E-04	0%
DIBENZOFURAN	1.44E-02	1.42E-02	2.86E-02	1%
DIBUTYLPHTHALATE	2.56E-03	4.39E-04	3.00E-03	0%
DIETHYLPHTHALATE	2.40E-04	6.49E-06	2.46E-04	0%
DIMETHYLPHTHALATE	6.39E-07	5.91E-09	6.45E-07	0%
Volatiles				
ACETONE	3.23E-03	1.21E-05	3.24E-03	0%
BROMOFORM	9.59E-03	1.52E-04	9.74E-03	0%
CHLOROETHANE	9.59E-05	3.99E-06	9.99E-05	0%
CHLOROFORM	1.47E-01	6.89E-03	1.54E-01	4%
CHLOROMETHANE	--	--	--	0%
DIBROMOCHLOROMETHANE	1.60E-03	4.11E-05	1.64E-03	0%
M&P XYLENES	9.59E-06	5.06E-06	1.47E-05	0%
METHYL-T-BUTYL ETHER	--	--	--	0%
METHYLENE CHLORIDE	2.13E-04	5.06E-06	2.18E-04	0%
N-BUTYLBENZENE	1.60E-04	--	--	0%
P-ISOPROPYLTOLUENE	--	--	--	0%
TERT-BUTYLALCOHOL	--	--	--	0%
XYLENES	9.59E-06	6.01E-06	1.56E-05	0%
Cumulative Risk	3.15E+00	4.67E-01	3.62E+00	100.0%

TABLE 6-58 SUMMARY OF CANCER RISKS FOR RESIDENT ADULT AND CHILDREN AT FORT TOTTEN -- REASONABLE MAXIMUM EXPOSURE (RME) SCENARIO, SUMMARY OF CANCER RISKS GROUNDWATER

Chemical of Concern	Ingestion of Groundwater	Dermal Contact with Groundwater	Inhalation of Groundwater	Total	Percent Contribution Of Each COC
	Risk	**Risk**	**Risk**	**Risk**	
Inorganics					
ALUMINUM	--	--	--	--	0.0%
ANTIMONY	--	--	--	--	0.0%
BARIUM	--	--	--	--	0.0%
CADMIUM	--	--	--	--	0.0%
CHROMIUM	--	--	--	--	0.0%
COBALT	--	--	--	--	0.0%
COPPER	--	--	--	--	0.0%
MANGANESE	--	--	--	--	0.0%
NICKEL	--	--	--	--	0.0%
SELENIUM	--	--	--	--	0.0%
VANADIUM	--	--	--	--	0.0%
ZINC	--	--	--	--	0.0%
PAHs					
ACENAPHTHENE	--	--	--	--	0.0%
ANTHRACENE	--	--	--	--	0.0%
BENZ(A)ANTHRACENE	3.08E-05	--	--	3.08E-05	2.0%
BENZO[A]PYRENE	1.09E-03	--	--	1.09E-03	70.0%
BENZO(B)FLOURANTHENE	6.04E-05	--	--	6.04E-05	3.9%
BENZO(G,H,I)PERYLENE	--	--	--	--	0.0%
BENZO(K)FLOURANTHENE	1.87E-06	--	--	1.87E-06	0.1%
CHRYSENE	4.29E-07	--	--	4.29E-07	0.0%
DIBENZ[A, H]ANTHRACENE	2.17E-04	--	--	2.17E-04	14.0%
FLUORANTHENE	--	--	--	--	0.0%
FLUORENE	--	--	--	--	0.0%
INDENO(1,2,3-CD)PYRENE	3.08E-05	--	--	3.08E-05	2.0%
2-METHYLNAPHTHALENE	--	--	--	--	0.0%
NAPHTHALENE	--	--	--	--	0.0%
PHENANTHRENE	--	--	--	--	0.0%
PYRENE	--	--	--	--	0.0%
Pesticides/PCBs					
DIELDRIN	9.52E-05	7.09E-06	--	1.02E-04	6.6%
Semivolatiles					
BIS(2-ETHYLHEXYL)PHTHALATE	2.92E-06	3.84E-07	--	3.30E-06	0.2%
BUTYLBENZYLPHTHALATE	--	--	--	--	0.0%
DI(2-ETHYLHEXYL)ADIPATE	1.78E-09	3.68E-08	--	3.86E-08	0.0%
DIBENZOFURAN	--	--	--	--	0.0%
DIBUTYLPHTHALATE	--	--	--	--	0.0%
DIETHYLPHTHALATE	--	--	--	--	0.0%
DIMETHYLPHTHALATE	--	--	--	--	0.0%
Volatiles					
ACETONE	--	--	--	--	0.0%
BROMOFORM	3.52E-07	4.85E-09	5.01E-08	4.07E-07	0.0%
CHLOROETHANE	2.59E-08	9.34E-10	0.00E+00	2.68E-08	0.0%
CHLOROFORM	2.09E-06	8.49E-08	1.34E-05	1.56E-05	1.0%
CHLOROMETHANE	4.67E-07	9.10E-09	8.58E-08	5.62E-07	0.0%
DIBROMOCHLOROMETHANE	6.25E-07	1.40E-08	0.00E+00	6.39E-07	0.0%
M&P XYLENES	--	--	--	--	0.0%
METHYL-T-BUTYL ETHER	6.11E-08	9.10E-10	0.00E+00	6.20E-08	0.0%
METHYLENE CHLORIDE	2.23E-08	4.60E-10	2.62E-09	2.54E-08	0.0%
N-BUTYLBENZENE	--	--	--	--	0.0%
P-ISOPROPYLTOLUENE	--	--	--	--	0.0%
TERT-BUTYLALCOHOL	--	--	--	--	0.0%
XYLENES	--	--	--	--	0.0%
Cumulative Risk	1.53E-03	7.62E-06	1.35E-05	1.55E-03	100%



US Army Corps
of Engineers
Baltimore District

RISK ASSESSMENT EXPOSURE AREAS
UPLAND AREAS
FORT TOTTEN – FUDS

DATE: APRIL 2002

SCALE: 1" = 120'

FIGURE 6–1

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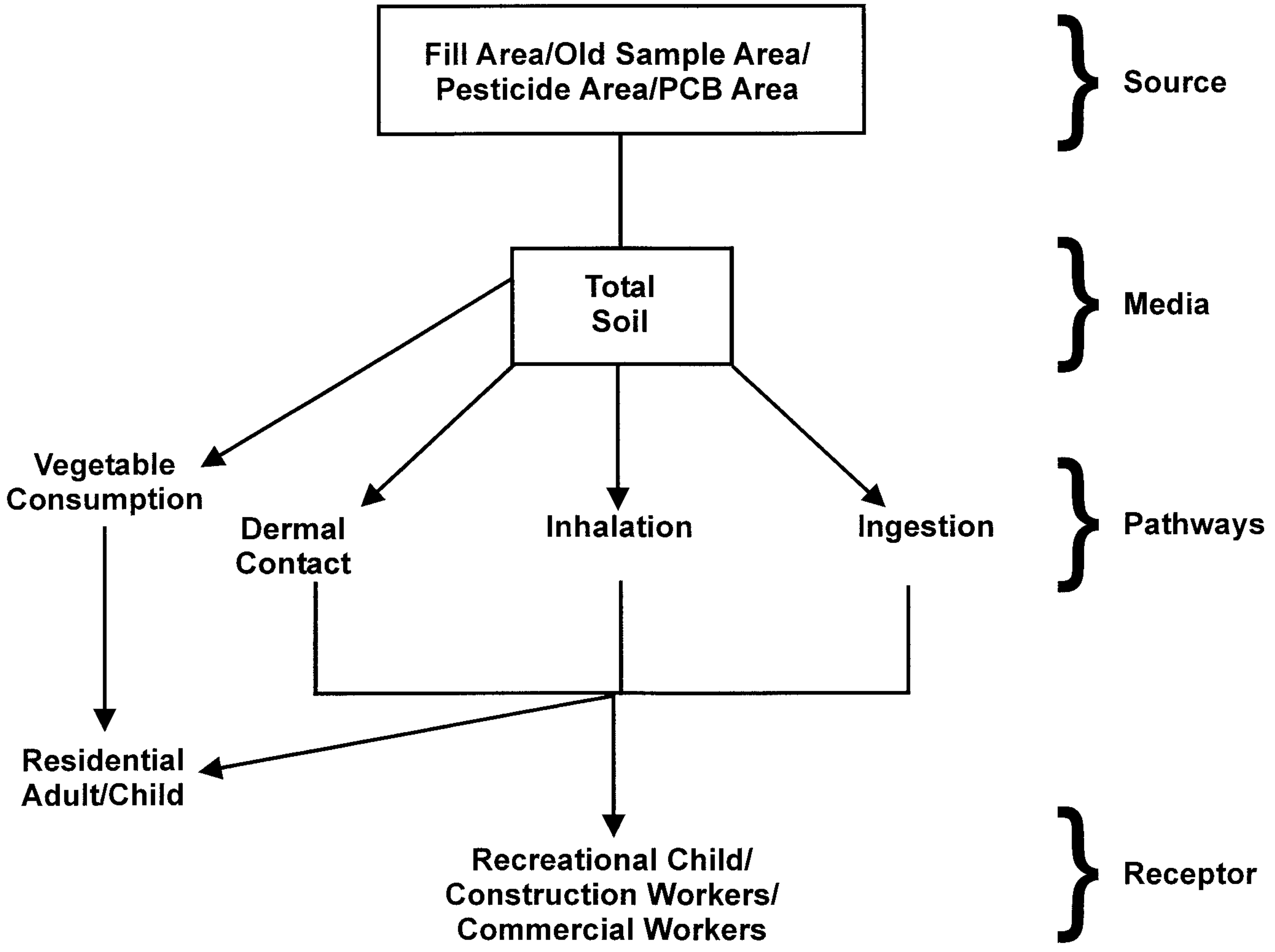

Figure 6-2. Human Health Total Soil Conceptual Site Model for Residential Adult and Child, Recreational Child, Construction Workers, and Commercial Workers.

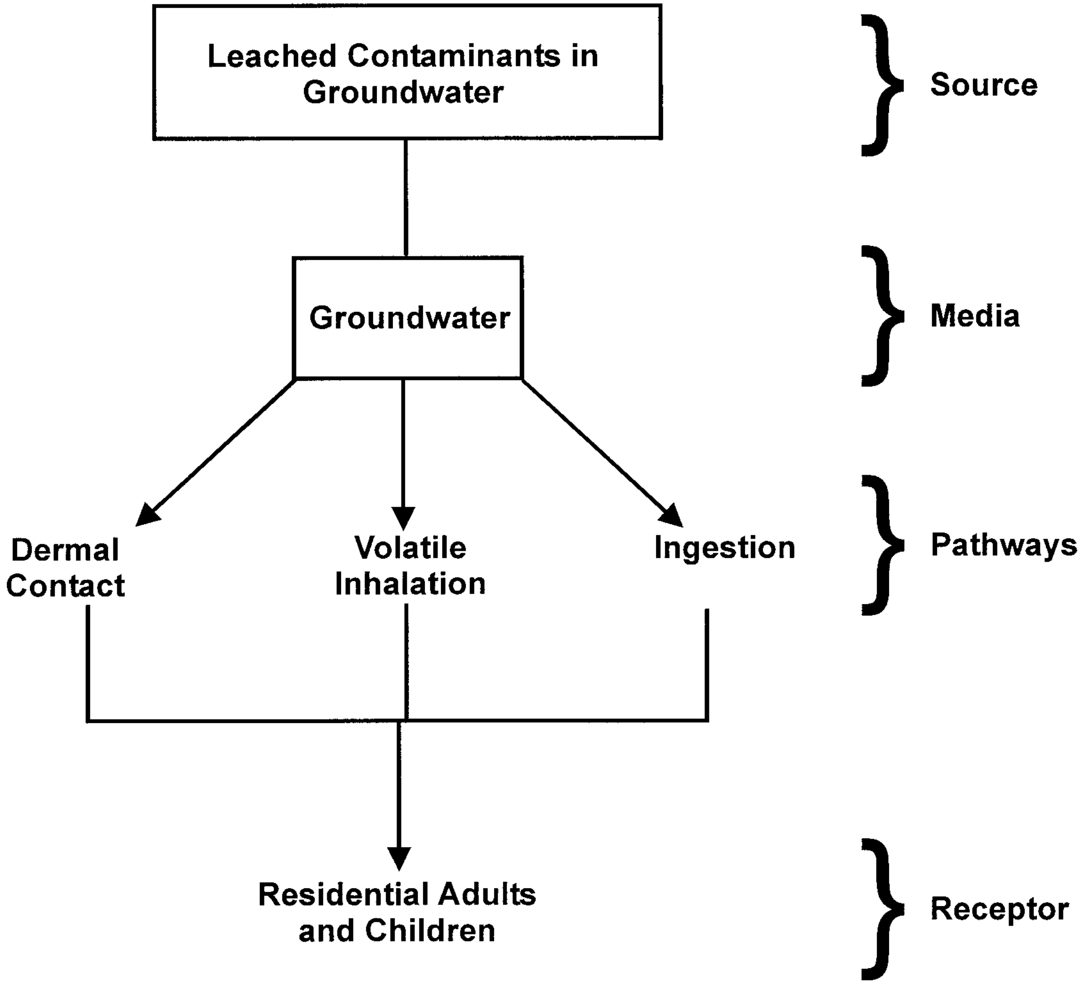

Figure 6-3. Human Health Groundwater Conceptual Site Model for Residential Adults and Children.

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7.0 LITTLE BAY ECOLOGICAL RISK ASSESSMENT

An ecological risk assessment (ERA), as used specifically for the Superfund Program, refers to a qualitative and/or quantitative appraisal of the actual or potential impacts of contaminants from a hazardous waste site on plants and animals other than humans and domesticated species. A risk does not exist unless: (1) the stressor has the ability to cause one or more adverse effects, and (2) it co-occurs with or contacts an ecological component long enough and at a sufficient intensity to elicit the identified adverse effect. This ERA follows guidance set forth in EPA's "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments" (USEPA 1997c), Steps 1 and 2. New York State guidance (e.g., sediment criteria) was used to supplement where appropriate.

7.1 SCREENING-LEVEL PROBLEM FORMULATION AND ECOLOGICAL EFFECTS EVALUATION

The screening-level problem formulation and ecological effects evaluation is part of the initial ecological risk screening assessment. This initial step uses the limited site-specific information collected to date to determine the nature and extent of contamination. The limited data are then used for characterizing ecological receptors at the site. This initial step includes all the functions of problem formulation and ecological effects analysis, but on a screening level. The results of this step will be used in conjunction with exposure estimates in the preliminary risk calculation in Section 7.3.

7.1.1 Screening-Level Problem Formulation

The screening-level problem formulation presents a rudimentary picture of the site, the mercury contamination, and the receptors of concern. The conceptual site model (CSM) developed here is similar to that development in the human health risk assessment. The fate and transport characteristics of mercury are important in the ERA, as they were in the human health assessment, for determining where the mercury will be located and the chemical form in which it exists.

7.1.2 Environmental Setting and Contaminants at the Site

Building 615, the source of the contamination, is adjacent to Little Bay, a small inlet on the greater New York City Harbor area. The site is located in the Willets Point section of Queens County, near the city of Bayside, New York (north shore of Long Island, New York). It is east of the southern reaches of the Throgs Neck Bridge, at the confluence of Long Island Sound and the eastern entrance to the East River. It is east of LaGuardia Airport and Shea Stadium, home to the New York Mets.

As described in the human health risk assessment, the future reuse of the site and shoreline perimeter includes a public esplanade along the entire length of Little Bay, connecting to another esplanade which will run along Little Neck Bay. More than 50 acres of Fort Totten will be reserved as open space/recreational property.

The contaminant of concern at the site is mercury that was released from Building 615 through a drainpipe into Little Bay. The mercury released was most likely elemental mercury used as switches in torpedoes and mines. These mercury switches worked on the same principle as those found in some older homes.

7.1.3 Contaminant Fate and Transport

Once released into the Bay from drainpipes at Building 615, the mercury was deposited in the sediment. The geochemical cycling of mercury in the Bay would include chemical transformation from elemental mercury to inorganic and organic mercury. Mercury can exist in three oxidation states: Hg0 (metallic), Hg22+ (mercurous), and Hg2+ (mercuric). The properties and behavior of mercury depend on the oxidation state. Most of the mercury in water, soil, sediments, or biota (i.e., all environmental media except the atmosphere) is in the form of inorganic mercury salts and organic forms of mercury.

The geochemical cycling in the Bay would be caused by biotic and abiotic processes. A detailed description of the geochemical cycling of mercury in the environment is found in Volume III of USEPA (1997c). Briefly, most of the mercury in water, soil, sediments, or plants and animals is in the form of inorganic mercury salts and organic forms of mercury (e.g., methylmercury). The inorganic form of mercury, when bound to airborne particles or in a gaseous form, is readily removed from the atmosphere by precipitation and is also dry deposited. Wet deposition is the primary mechanism for transporting mercury from the atmosphere to surface waters and land. Even after it deposits, mercury commonly is emitted back into the atmosphere as a gas or associated with particles, to be re-deposited elsewhere. As mercury cycles between the atmosphere, land, and water, mercury undergoes a series of complex chemical and physical transformations, many of which are not completely understood. Due to the type of release, the media most impacted are the sediment and surface water.

Sediments can serve as an important mercury reservoir, with sediment-bound mercury recycling back into the aquatic ecosystem for long periods of time. Biological processes affect this recycling process. For example, sulfate-reducing bacteria may mediate mercury methylation. Benthic invertebrates may take up mercury from sediments, making it available to other aquatic animals through the food chain and to vertebrates that consume emergent aquatic insects. Chemical factors, such as reduced pH, may stimulate methylmercury production at the sediment/water interface and thus may accelerate the rate of mercury methylation, resulting in increased accumulation by aquatic organisms. Attributes of the sediment, including organic carbon and sulfur content, can influence mercury bioavailability. Dissolved organic carbon appears to be important in the transport of mercury, but, at high concentrations, may limit bioavailability.

Mercury can enter surface water as Hg0 , Hg2+ , or methylmercury. Once in aquatic systems, mercury can exist in dissolved or particulate forms and can undergo the following transformations:

- Hg0 in surface waters can be oxidized to Hg2+ or volatilized to the atmosphere.
- Hg2+ can be methylated in sediments and the water column to form methylmercury.
- Methylmercury can be alkylated to form dimethylmercury.
- Hg2+ and methylmercury can form organic and inorganic complexes with sediment and suspended particulate matter.

Each of these reactions can also occur in the reverse direction. The net rate of production of each mercury species is determined by the balance between forward and reverse reactions. Estimates of the percent of total mercury in surface waters that exists as methylmercury vary. Generally, methylmercury makes up less than 20 percent of the total mercury in the water column.

7.1.4 Ecotoxicity and Potential Receptors

The toxicity of mercury to ecological receptors varies depending on the species of interest. Research on the toxicity of mercury varies widely, with the toxicity to species (e.g., fish) being more well document than others (e.g., reptiles). The next section describes the basic toxicity of mercury to five different categories of receptors. In discussing mercury toxicity, data for aquatic-related receptors were selected over data for strictly terrestrial species. Following the toxicity discussion, a series of potential receptors are described. The potential receptors are based on the type of habitat that is present now and the habitat that might be present after the redevelopment of the site with the esplanade.

7.1.4.1 Toxicity

The toxicity of mercury (in its various forms) to receptors in the environment is dependent on the route and amount of exposure. Additional factors influencing the toxicity of mercury include the age, sex, life stage, and physiological condition of the receptor. For example, young receptors may be more susceptible to injury because they are undergoing rapid development. The chemical form of mercury influences its distribution in the body, and the comparative toxicity data suggest that the organic species of the metal (e.g., ethyl- , methyl-, and phenyl-mercury) are far more toxic than inorganic mercury. In general, methyl-mercury as well as its metallic, mercurous, and mercuric form are nonessential and exert their toxicity at the biochemical level as inhibitors of enzyme-catalyzed reactions and protein synthesis.

Mercury is a known mutagen, teratogen, and carcinogen in selected receptors. Its toxicity and environmental effects vary with its form, dose, route of ingestion, and with the species, sex, age, and general condition of the organism (Eisler 1987; Fimreite 1979).

Biotransformation is an important fate process in the environmental partitioning of mercury. Under favorable conditions, microorganisms in soil and sediment can convert various forms of mercury to methyl-mercury. Methyl-mercury is more available for uptake by various organisms and for transport in the food chain, and is more mobile than inorganic forms (Peterle 1991).

Mercury, particularly in the methylated form, has a high potential for bioaccumulation and biomagnification (Eisler 1987). Biomagnification of methylmercury is documented for both aquatic and terrestrial food chains (Eisler 1987). The accumulation of mercury by aquatic organisms is enhanced at elevated water temperatures, reduced water salinity or hardness, reduced water pH, increased age of the organism, and reduced organic matter in the medium. Predatory organisms at the top of the food web generally have higher mercury concentrations. Nearly all of the mercury that accumulates in fish tissue is methylmercury (USEPA 1997b). Inorganic mercury, which is less efficiently absorbed and more readily eliminated from the body than methylmercury, does not tend to bioaccumulate.

Plants

Effects of mercury on aquatic plants include death and sublethal effects. Sublethal effects include plant senescence, growth inhibition, decreased chlorophyll content, decreased protein and RNA content, inhibited catalase and protease activities, inhibited and abnormal mitotic activity, increased free amino acid content, discoloration of floating leaves, and leaf and root necrosis. The level of mercury that results in toxic effects varies greatly among aquatic plants.

Fish and Other Aquatic Organisms

The toxicity of mercury to fish varies, depending on the fish's characteristics (e.g., species, life stage, age, and size), environmental factors (e.g., temperature, salinity, dissolved oxygen content, hardness, and the presence of other chemicals), and the form of mercury available. In particular, early life stages (especially of salmonids) exhibit greater sensitivity to elevated metal concentrations than later life stages. The toxicity of Hg2+ compounds to salmonids and catfish tends to increase with temperature (USEPA 1997b). Organomercury compounds, such as methylmercury, generally are much more acutely toxic than Hg2+ to aquatic organisms.

Levels of mercury that induce toxic effects in aquatic invertebrate species vary. For Hg2+ , acute values (LC50) for invertebrates range from 2.2 µg/L for the cladoceran *Daphnia pulex* to 2,000 µg/L for the larval forms of three insects (USEPA 1985). In certain types of flies methylmercury can alter chromosomes, causing abnormalities in offspring (NAS 1978 and Khera 1979, as cited in Eisler 1987). The reproduction of some marine invertebrates is inhibited by exposure to mercury (Eisler 1987). A plot of mercury toxicity to a variety of aquatic organisms is shown in Figure 7-2. This plot, from the Environmental Effects Residue Database (USACE 1999), includes data from marine and freshwater environments. It shows the highest, lowest, and average no observed effects levels for mercury on a variety of endpoints and a variety of species.

Birds

Methylmercury is more toxic to birds than inorganic mercury. Mercury poisoning in birds is characterized by muscular uncoordination, falling, slowness, fluffed feathers, calmness, withdrawal, hyperactivity, hypoactivity, and eyelid drooping (Eisler 1987). Sublethal effects of mercury on birds, administered by a variety of routes, include adverse effects on growth, development, reproduction, blood and tissue chemistry, metabolism, and behavior (Eisler 1987). Reproductive effects are noted at low doses long before the acute effects are noticeable in the exposed adult populations (Scheuhammer 1991). Significant reproductive effects of chronic dietary inorganic mercury exposure in birds include delayed testicular development, altered mating behavior, reduced fertility, reduced survivability and growth in young, and gonadal atresia. Mercury is also transferred to the egg in avian species, where it has adverse effects on the developing embryo (Peterle 1991).

Acute oral toxicity studies using methylmercury yielded LD50 values ranging from 2.2 to 23.5 µg/g for mallards (*Anas platyrhynchos*). Whole-body residues of mercury in acutely poisoned birds usually exceed 20 µg/g fresh weight and have been found up to 126 µg/g. Mercury levels observed in such cases are generally highest in the brain, followed by the liver, kidney, muscle, and carcass. Sublethal effects of mercury on birds include: liver damage, kidney damage, neurobehavioral effects, reduced food consumption, weight loss, spinal cord damage, effects on enzyme systems, reduced cardiovascular function, impaired immune response, reduced muscular coordination, impaired growth and development, altered blood and serum chemistry, and reproductive effects (Eisler 1987). Reproductive and behavioral effects are the primary concern, however, and can occur at dietary concentrations well below those that cause overt toxicity. It appears that mercury levels in feathers exceeding 20 µg/g should be interpreted as evidence for possible toxic effects. Eisler (1987) recommended that 5.0 µg/g fresh weight in feathers be used as a criterion for the protection of birds. Tissue mercury concentrations that are associated with toxicity in birds are remarkably similar despite differences in species, dietary exposure level and length of time necessary to produce the effect (USEPA 1997b). Frank neurological signs are generally associated with brain mercury concentrations of 15 µg/g (wet weight) or higher and 30 µg/g or more in liver and kidney. Liver mercury concentrations of 2-12 µg/g (wet weight) were associated with reproductive impairment in adult pheasants and mallard ducks.

Mammals

Mercury can cause adverse neurological, renal, behavioral, and reproductive effects in mammals. Nephrotoxicity is the most common effect mercury has on mammals. Acute toxicity responses to the organic form of the metal include ataxia, aphagia, tremors, and diminished capacities for coordinated movements. In chronic exposures, methyl-mercury intoxication is characterized by central nervous system and peripheral nervous system neuropathies (Lindström et. al. 1991, as cited in ATSDR 1999). Methyl-mercury also exhibits reproductive effects in both sexes as well as in the developing embryo and fetus (Cagiano et. al. 1990). Methyl-mercury can cause other reproductive effects, which include diminished neurological function and behavioral deficits in newborns (Khera and Tabacova 1973).

Levels of exposure that induce mercury poisoning in mammals vary among species. Death occurs in sensitive mammal species at 0.1-0.5 μg/g-day, or 1.0-5.0 μg/g in the diet. Smaller animals (e.g., minks) are generally more susceptible to mercury poisoning than are larger animals (e.g., mule deer and harp seals), perhaps because of differences in elimination rates. Also, smaller mammals eat more per unit body weight than larger mammals, and thus may be exposed to larger amounts of mercury on a body weight basis.

Amphibians and Reptiles

When compared to the toxicity information available on mammals, the toxicity information on the effects of mercury on reptile and amphibians is lacking. However, it is clear that mercury plays a critical role in the functioning of the central nervous system of reptiles and amphibians. It is a potent neurotoxicant that can cause a broad array of alteration ranging from discrete neurological dysfunction to a multitude of ethophysiological changes.

Toxicity endpoints in the mercury literature are dominated by survival estimators, usually LC50s, derived from static or static-renewal tests. For amphibians, a range of LC50s for embryo/larval tests occurs between 10 and 100 μg/L (Sparling et al. 2000). Inorganic and organic forms of mercury appear to have similar toxic effects.

In comparative toxicity studies, 21 amphibian species tested with mercury were more sensitive than were largemouth bass (*Micropterus salmoides*). LC50 values ranged from1.0 to 103 (Sparling et al. 2000). Although a seasonal measure, egg complement (total eggs produced per female) and fecundity (number of viable eggs produced per female) represents one of the most sensitive endpoints during the life history of organisms. Maternal exposure and accumulation of contaminants may alter the compliment, and subsequent deposition of contaminants into the eggs may reduce fecundity. Gonadal residues of 0.49 μg/g of mercury resulted in defective gametes and reduced survival of embryo-larval stages in the African clawed frog (*Xenopus laevis*) (Sparling et al. 2000).

7.1.4.2 Potential Receptors

Plants and animals can be exposed to mercury by direct contact with contaminated environmental media or ingestion of mercury-contaminated water and food. Mercury in the air can be taken up directly by terrestrial or aquatic emergent plants or inhaled by terrestrial animals. Mercury in water can be a source of direct exposure to aquatic plants (e.g., algae and seagrasses) and animals (e.g., zooplankton and fish) and can be ingested by terrestrial animals in drinking water. Finally, both aquatic and terrestrial animals can be exposed to mercury in contaminated food sources.

Based on the location of the site and the impacted media, the following broad classifications of receptors could be found at the site: fish, amphibians, marine invertebrates, and piscivorous birds and mammals.

Some of the species that are potentially present at or proximate to the site could include threatened and/or endangered species. Threatened and/or endangered species are protect by federal and state laws because they are of special concern due to loss of habitat, declining population, or rare occurrence. Additionally, there is a potential for species of special concern to be present. Special concern species are those native species which are not yet recognized as endangered or threatened, but for which documented evidence exists relating to their continued welfare in New York State.

7.1.5 Life Histories of Selected Species Found in the Fort Totten Ecosystem

The American oyster (*Crassostrea virginica*), blue mussel (*Mytilus edulis*), blue crab (*Callinectes sapidus*), striped bass (*Morone saxatilis*), winter flounder (*Plueronectes americanus*), summer flounder (*Paralichthys dentatus*), and mummichog (*Fundulus heteroclitus*) have been identified as species that are present in the Fort Totten ecosystem. Their life histories are included because they are important to the ecology of the site. These species share the following characteristics:

- Presence – they are known to occur onsite and were sampled during previous site investigations

- Availability – they were identified in the field sampling plan as species to be sampled because of their role in the food chain

- Susceptibility – exposure pathway is likely complete and of sufficient duration/magnitude

- Ecological Importance – abundant, present in a high biomass, important predator or prey species

- Commercial or Recreational Importance – the species represent species that the public views as important, which although ecologically irrelevant is important when defining endpoints (USEPA 1997c)

The life histories of these species focus on their roles in the food chain and their migratory patterns. A review of the life history demonstrates significance and role of these species in the Fort Totten, Little Bay area.

American Oyster (*Crassostrea virginica*)

The American oyster of the East Coast of North America has had a long history as an important species and is well adapted to an estuarine environment. It tolerates wide fluctuations in temperature, salinity, suspended sediments, and has a tremendous capacity to reproduce if habitat conditions and brood stock are adequate (Funderburk et al. 1991). Oysters filter water for food, improving water clarity conditions for submerged aquatic vegetation and other species.

Although oysters can tolerate full ocean salinity, their distribution is increasingly limited by parasites, predators, and competitors that live in higher salinity waters. Oysters require firm bottoms to prevent sinking and smothering, and they are normally found attached to shells, stones, hard objects, or other live oysters. Oysters are subtidal and most occur in water between 8 and 25 ft deep (Lippson 1973). Seasonal deficiencies in dissolved oxygen prevent their establishment in waters more than 35 ft deep.

Adult oysters are immobile but release eggs and sperm into the water where external fertilization occurs. Spawning occurs in the summer or fall and slows or stops under winter conditions. Spawning occurs at temperatures of 18 to 20°C and above. Where temperatures permit, females may spawn more than once in a season with up to 20 million eggs or more released at any one time by an individual female, depending upon her size and condition (Funderburk et al. 1991).

Fertilized eggs develop into ciliated veliger larvae in 24 hours or less, depending upon temperature. During the next 2 to 3 weeks, the free swimming larvae grows until ready to settle. Before settlement occurs at about 260-300 µm, a foot develops. The foot is used to crawl and explore substrate before settlement and metamorphosis occurs. When a suitable substrate is found, liquid cement is extruded from a pore in the foot and the left valve becomes fixed in place. The ciliated velum that allowed the larvae to swim is discarded. The foot is resorbed, and the gills and digestive tract become elaborated. The attached juvenile oyster is called a "spat" (Funderburk et al. 1991).

Metamorphosis will be delayed if suitable substrate is unavailable. Accumulations of oyster shells form oyster "bars," rocks, or reefs that support communities of filter-feeding live oysters. Survival of "spat" is dependent on oyster bars or shells for the expected attachment of spat.

The planktonic larval stage is the only mobile stage. Fastest relative growth occurs in the early months of an oyster's life. Annual growth rate is affected by temperature, food quality and quantity, salinity, and parasites. Larvae, spat, and adults ingest predominantly living plankton.

Blue Mussel (*Mytilus edulis*)

The blue mussel is widely distributed, occurring in the Arctic, North Pacific, and North Atlantic Oceans. On the East Coast it ranges from Labrador to Cape Hatteras, North Carolina. It is most common in the littoral to sublittoral zones of oceanic and polyhaline to mesohaline estuarine environments. It lives in habitats that range from flat intertidal shores that drain slowly, to vertical surfaces that are subject to a lot of wave splash. A primary requirement for the establishment of the blue mussel population is a surface for attachment of the byssus threads. The substrate may vary from large boulders to pebbles, or other mussel shells. The blue mussel is attached to shells, rocks, and other hard substrates, in the intertidal to subtidal zone. Adults range up to 4 in. in length (Lippson and Lippson 1984). Blue mussels prefer higher salinity environments; however, blue mussel larvae are occasionally carried by currents up into lower salinity waters and set on pilings or rocks in the winter. These populations rarely survive the summer season.

Mussels usually become sexually mature (i.e., are able to reproduce) in late spring or early summer. Following some spawning stimulus, most mussels release some or all of their eggs and sperm in what looks like whitish or orange clouds in the water. Fertilization is external, and in a very short time all the eggs are fertilized.

Once fertilized, it only takes 5 hours for the embryo to develop a small cilia and begin to swim. After 48 hours, it develops into a trochophore larva. It feeds on small phytoplankton cells and begins to develop the larval shell that has a distinct D-shape. The next stage is the veliger larvae. In 3 to 4 weeks, the mussel grows to a quarter millimeter in size. The larva develops a foot and gills and is ready to change into a juvenile mussel. It settles on a suitable hard substrate, such as a rock, wharf, or boat, extends the foot and withdraws the velum. Finally, it secretes byssus threads and anchors itself to the surface where it will grow into a mature mussel.

Mussels are suspension feeders—they feed by actively filtering particles from the water. Phytoplankton cells are the main source of food, and decomposed macrophytes or resuspended detritus may also supplement their diet.

Blue Crab (*Callinectes sapidus*)

The blue crab is found in marine and brackish waters from Nova Scotia southward to the northern part of Argentina. In the United States, it is abundant from Massachusetts to southern Texas, where it supports major commercial and recreational fisheries. Blue crabs mate from May through October in the relatively low-salinity waters of bays, estuaries, and lower reaches of rivers. After mating, females migrate to higher-salinity areas (20 to 32 ppt) of lower estuaries, sounds, and near-shore areas where they overwinter by burrowing into the mud. The following summer, females extrude their fertilized eggs into a cohesive mass or "sponge" attached to the abdominal appendages. A "sponge" may contain as many as 700,000 to 2,000,000 eggs. Females mate only once during their lives. Sperm from this single mating is stored and used two or more times during a 1- or 2-year period.

After a 7- to 14-day incubation period, the eggs hatch into a swimming larva called a zoea. In the lower Delaware Estuary, zoea abundance peaks in early August and again in early September (Epifanio et al. 1984). These larvae molt seven to eight times before reaching the next stage, the megalops (Epifanio et al. 1984). Blue crab zoea are unable to complete development to the megalops stage at salinities below 25 ppt. Peaks in megalops abundance occurs about 5 weeks after the peak zoea abundance.

The megalops stage typically lasts from 6 to 20 days, after which the larvae molt into the "first crab" stage and begin to move upriver. The juvenile first crab, while only approximately 2.5 mm (0.01 in.) wide (from tip to tip of the lateral spines of the carapace), has the proportions and appearance of an adult blue crab (Hill et al. 1989).

In the Hudson River area, juvenile crabs are most abundant in August through October, depending on location. Peak abundance occurs in August at downriver sites, while peak abundance occurs in September upstream. Where present, aquatic vegetation appears to be a favored habitat and may serve to reduce predation on juveniles. The highest concentrations of juvenile blue crabs [51 mm (<2 in.)] in the Hudson River area occur in sites heavily vegetated with *Valisneria* spp. and *Potamogeton* spp.

Growth and maturation occurs through a series of molts and intermolt phases. Molting and growth ceases during the winter but resumes as the water warms in spring. Blue crabs generally reach maturity during the spring or summer of the year following the year of hatching (Hill et al. 1989). Males continue to molt and grow after they reach sexual maturity, while females cease to grow after they mate. The average size at maturity is approximately 178 mm (7 in.) (Churchill 1919). Individual females at maturity may range from 51 to 203 mm (2 to 8 in.), while males may reach 203 mm (8 in.) (Williams 1984). The maximum age for most blue crabs in the mid-Atlantic region is 3 years.

Blue crabs perform a variety of roles in the ecosystem and can be a major factor in the transfer of energy within estuaries. During its life cycle, the blue crab may serve as prey and as consumer. Zoea consume phytoplankton, dinoflagellates, and copepod nauplii; megalops feed on fish larvae, small shellfish, and aquatic plants (Darnell 1959). As much of the early development occurs in offshore coastal waters, the megalops stage imports energy into the estuary. Post-larval blue crabs are considered general scavengers, bottom carnivores, detritivores, and omnivores. In turn, blue crabs are prey of a variety of animals. Larval blue crabs are consumed by fish, shellfish, jellyfish, combjellies, and a variety of other planktivores, while juveniles and adult blue crabs are preyed on by a wide variety of fish, birds, and mammals.

Striped Bass (*Morone saxatilis*)

Striped bass, one of the most important sport and commercial fishes of the United States, occur from the St. Lawrence River south to northern Florida and into the northern Gulf of Mexico (Scott and Crossman 1973).

Striped bass are anadromous, maturing offshore and returning to spawn in fresh water for the first time at 6 to 8 years of age. Adults generally move into the New York/New Jersey area in April, when water temperatures are 11 to 21°C, and remain until mid-June. Spawning takes place in fresh water near the salt front, where there is sufficient current to keep the eggs suspended. Depending on age and size, females produce from 150,000 to several million semibuoyant eggs, which drift back and forth with the tidal currents. The eggs are relatively large [averaging 34 mm (1.34 in.) in diameter after water hardening] but vary with the size of the female.

Principal East Coast spawning rivers and bays are the Hudson River; Delaware Bay, and Delaware River; Chesapeake Bay and tributaries; the Roanoke and Chowan Rivers and Abermarle Sound, North Carolina; the Santee River, South Carolina; and the St. Johns River, Florida. Striped bass do not reproduce in large populations north of the Hudson River in the eastern United States, but small spawning populations occur in several river systems in eastern Canada.

Striped bass eggs are found throughout most of the New York/New Jersey Estuary from late April through June. Peak egg abundance usually occurs in May. Striped bass eggs usually hatch into yolk sac larvae 20 to 37 mm (0.79 to 1.46 in.) long in 2 to 3 days, depending on water temperature. Currents move the yolk sac larvae downstream, and they transform into post yolk sac larvae at 7 to 8 mm (0.25 to 0.3 in) in length in 3 to 14 days. Yolk sac larvae are present from late April to mid-June, and post yolk sac larvae are present from mid-May to late July.

In the New York/New Jersey area, the post yolk sac larvae stage typically lasts less than 30 days, with transformation to the juvenile stage when the fish is 150 to 200 mm (5.91 to 7.87 in.) in length. Juveniles remain near shore until late fall, generally moving downriver to feed in nursery areas located in higher-salinity waters. As water temperature decreases in November and December, the juveniles move either to the lower estuary or into adjacent bays, including Newark Bay and Long Island Sound to overwinter. Juvenile striped bass (2-year-olds and younger) overwinter in portions of New York Harbor, with two peaks of abundance: fall and spring to early summer. They show a strong preference for deeper waters of channels and interpier areas during the winter months.

The striped bass is carnivorous, feeding on various organisms of suitable size. Of 250 striped bass collected from the Connecticut River from April and October, most common food items were silversides, menhaden, and shrimp (*Paleomonetes* sp.); less common food items were gunnels, herrings, mummichogs, striped killifish, squid, sandworms, and bloodworms (Merriman 1936). The contents of 48 stomachs taken from specimens caught in salt and brackish water of the Chesapeake Bay consisted of fish, crustaceans, annelid worms, and insects. The larger fish had fed principally on fish, whereas the smaller ones had eaten mainly crustaceans. Juveniles feed on mysid shrimp, amphipods, annelids, and insects (Hildebrand and Schroeder 1972). Juvenile striped bass are preyed upon by Atlantic tomcod, Atlantic cod, silver hake, bluefish, and larger striped bass. Adults, which commonly reach 13,636 g (30 lb), have few predators other than man (Cole 1978; Thomson et al. 1978).

Winter Flounder (*Plueronectes americanus*)

The winter flounder is a right-eyed flatfish (eyes and viscera on the right side) with a small, weakly toothed mouth. The scales are rough to the touch on the eyed side, but they are smooth on the blind (white) side. The color varies from reddish brown to a dark slate gray. It is a bottom dweller, as are the rest of the flatfishes. Adult winter flounder are generally 305 to 381 mm (12 to 15 in.) and 454 to 909 g (1 to 2 lb), sometimes reaching 508 mm (20 in.) and 2,272 kg (5 lb). The larger fish are sometimes called sea flounders to distinguish them from the smaller bay fish. In waters off Montauk Point, New York, and around Block Island, Rhode Island, there exist large flounders, locally known as snowshoes because of their shape and size. These larger individuals range in weight from 2,727 g (6 lb) to 3,636 g (8 lb) (McClane 1978).

The winter flounder occurs from Labrador to Georgia but is more commonly found from the Gulf of St. Lawrence to the Chesapeake Bay (Smith 1985). This is a shallow water flounder, found from well up into the high-tide mark to depths of about 122 m (400 ft). Generally, smaller fish are found in shallow water and large fish in deeper water, although large fish will enter water less than 0.3 m (1 ft) deep. They prefer muddy sand but may occur on sand, clay, or fine gravel. Offshore, they may be found on hard bottom as well as soft. They enter mouths of estuaries and occasionally are taken in water that is nearly fresh (Bigelow and Schroeder 1953).

The winter flounder is a resident of New York/New Jersey waters. It moves within the estuary system through its annual cycle, as reflected in trawl survey catches. Winter flounder spawn in mid-winter in the shallows, mainly in the Lower Bay and New York Bight, and catches in the Harbor are low. By March-April the flounder are feeding heavily, and catches of these foraging fish increase. During early summer, the larger flounders generally leave the estuary system and move offshore, where they support a commercial trawl fishery off estuary mouths along the coast. In contrast to the adults, many juvenile flounder remain within New York Harbor in summer. During the fall, the abundance of flounder increases as adult fish move back into the Harbor, and large numbers of young-of-the-year are recruited to the population in November-December.

Spawning typically occurs over sandy bottom from January to May, with a peak from March to April. The spawning depth is often 1.8 to 5.5 m (6 to 18 ft), and the eggs, unlike those of other flatfishes, sink to the bottom and stick together. Incubation takes 15 to 18 days at water temperatures of 2.8 to 3.3°C. The larvae are 3 to 3.5 mm (1.18 to 1.38 in.) at hatching. The rate of development of the larvae is governed by temperature; it generally takes 3 months for the larvae to become juveniles. Fish in the New York area are 20.3 to 25.4 mm (8 to 10 in.) at 2 to 3 years of age. Most spawning fish are greater than 8 in. long and 3 years of age (Scott and Crossman 1973).

Young winter flounder feed mainly on small crustaceans and worms. Adults feed on a wide variety of aquatic organisms, including amphipods, copepods, isopods, crabs, shrimp, worms, clams, snail eggs, and some seaweed. Bigelow and Schroeder (1953) report the adults are limited to a diet of small prey organisms because of their small mouths.

Summer Flounder (*Paralichthys dentatus*)

The summer flounder is a left-eyed flatfish with a large, strong toothed jaw. The summer flounder lies on the bottom on its right side, resembling the mirror image of the winter flounder in outline. The color is brownish but variable, some specimens being darker than others. Most individuals are marked with dark spots on the upper side, more prominent near the posterior.

Summer flounder occur along the Atlantic Coast from Maine to South Carolina (Bigelow and Schroeder 1953). They are fairly common in the New York area and up the Hudson River to the Tappan Zee Bridge (Smith 1985). They are found through late spring to late fall in shallow coastal areas, hence their name, summer flounder. They migrate to deeper waters during the winter, where they spawn in a variety of habitats (Hildebrand and Schroeder 1972). The larger fish usually remain offshore throughout the year (Bigelow and Schroeder 1953).

The summer flounder is a bottom dweller that feeds on a variety of organisms. Most common are fish, but invertebrates, including squid, shrimp, crabs, and smaller invertebrates, are eaten (Hildebrand and Schroeder 1972). They are also reported to feed on mollusks, worms, and even sand dollars.

Growth is rapid; by the first winter after hatching, yearlings are 120 to 180 mm (4.7 to 7.1 in.) in total length (Hildebrand and Schroeder 1972). Summer flounder can reach lengths near 100 cm (39 in.) and weigh nearly 7 kg (15 lb).

Mummichog (*Fundulus heteroclitus*)

The mummichog is found principally in saltwater marshes and in tidal creeks. It enters fresh water to a limited extent and is capable of withstanding abrupt salinity changes (Hardy 1978). Their range is from the Gulf of St. Lawrence to northeastern Florida (Robins and Ray 1986). Mummichog seem to prefer muddy bottoms and waters. They are migratory, moving to marshes and freshwater creeks in late March (water temperatures of 15°C), with peak migration occurring in mid-April (Hardy 1978). They run in and out with the tide until late August, cease running for 2 weeks, and then reappear from early September until the water temperature is down to 10°C (Hardy 1978). They are territorial, staying close to the shallow waters of the shoreline, rarely exceeding 90 meters out. This tendency for residency makes them a good species for biological monitoring in Little Bay because they will bioaccumulate contaminants if they are present and available for uptake.

Mummichog spawn in a variety of salinities, usually in shadowed areas, over gravelly or hard bottoms with vegetation. In the New York area, they breed from April to late August, with a peak in late May (Hardy 1978). Eggs are demersal and attached to plants, stones, rocks, or clumped to each other. Incubation varies with both temperature and oxygen concentration and tends be slower when eggs are crowded. Hatching time under natural conditions is 14 to 18 days at temperatures ranging from 12 to 30°C (Hardy 1978).

The average yolk-sac larvae length is 5.0 mm. They remain off the bottom and are attracted by light. The yolk is retained for 24 to 156 hours after hatching at which time they proceed to the larval stage. Larvae have a size range of 7.0 to 25.4 mm in length. Larvae commonly swim at the surface but will swim to the bottom if disturbed.

Young and immature juveniles are found in growths of eelgrass along sandy beaches, in warm shallow pools, and in ditches associated with saltmarshes. Their minimum size is 25.0 mm. Yearlings may spawn in late August but usually mature in their second year. Adults can range up to 125 mm (5 in.) in length.

The mummichog consumes a variety of plant and animal matter including diatoms, amphipods, mollusks, crustaceans, small fishes, fish eggs, and sea grass fragments.

7.1.6 Complete Exposure Pathways

Based on the types of potential receptors and the physical/chemicals properties of mercury in marine environments, the following exposure pathways will be considered complete:

- Direct contact of skin/gill surface with contaminated surface water
- Direct contact with sediment
- Ingestion of contaminated surface water and sediment
- Ingestion of contaminated prey items

The ecological conceptual site model for Fort Totten is presented in Figure 7-1.

7.1.7 Assessment and Measurement Endpoints

Assessment endpoints are "an explicit expression of the environmental value that is to be protected" (USEPA 1992). Ecological risk assessments involve multiple species that are likely to be exposed to differing degrees and to respond differently to the same contaminant. Nonetheless, it is not practical or possible to directly evaluate risks to all of the individual components of the ecosystem at a site. Instead, assessment endpoints are used to focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site.

For the screening-level ecological risk assessment, assessment endpoints are any adverse effects on ecological receptors, where receptors are plant and animal populations and communities, habitats, and sensitive environments (USEPA 1997c). Adverse effects on populations will be inferred from measures related to impaired reproduction, growth, and survival. Adverse effects on communities can be inferred from changes in community structure or function. Adverse effects on habitats can be inferred from changes in composition and characteristics that reduce the habitats' ability to support plant and animal populations and communities. Many of the screening ecotoxicity values now available (e.g., New York Sediment Guidelines) are based on generic assessment endpoints (e.g., protection of aquatic communities from changes in structure or function) and are assumed to be widely applicable.

Measurement endpoints are analogous to a testable hypothesis about how the chemical contamination affects the receptors. A measurement endpoint allows for an operational definition of the assessment endpoint that can be quantified and/or measured. The measurement endpoints for the contaminated media are the screening criteria provided by regulatory agencies. If contamination levels are above these levels, then further analysis may be required. If contamination concentrations are less than that these criteria, then no further action is usually warranted. The concentrations of mercury in the various media at the site are compared to the screening criteria provided by the regulatory agencies (or the toxicity information presented in Section 7.1.4.2 is used to generate screening levels). The measurement endpoints for receptors are selected based on relevance to the contaminated media, observed/potential presence at the site, susceptibility to mercury contamination, and availability of data for measurement. Based on these criteria, the herring gull and raccoon were selected as representative of other upper-trophic level feeders.

7.2 SCREENING-LEVEL ECOLOGICAL EFFECTS EVALUATION

The purpose of the screening level effects evaluation is to define conservative thresholds (i.e., benchmarks) for adverse effects to ecological receptors. All of the data evaluated were from reports published by federal and state regulatory agencies or from the open scientific literature. For each complete exposure pathway and route, a screening ecotoxicity value should be developed. In the case of sediment, a screening value is provided by the New York State Department of Environmental Conservation (NYSDEC 1999). The screening criterion for surface water was selected from the water quality criteria (63 FR 68354). A screening value for birds and mammals is developed in the next section following a method previously used by USEPA (1995b).

7.2.1 Toxicity Data

Based on the review of mercury toxicity, methyl mercury was selected as the most toxic form of mercury that could exist at the site. Therefore, a toxicity reference value (TRV) for mammals (small and large) and birds was developed. The TRV is a dose-based (mg/kg-day) concentration that should be without adverse health effects for the ecological receptors.

As part of the Great Lakes Water Quality Initiative (USEPA 1995b), USEPA developed wildlife criteria values for several chemicals, including mercury. The Great Lakes documents were peer-reviewed and are considered to be of high quality. The approach used in this ERA is modeled, in part, after the methods employed by USEPA. Mammalian and avian TRVs for mercury were based on studies identified by USEPA using organic mercury. Since the entire data set used to develop the Great Lakes wildlife TRVs was not presented in the Great Lakes documents, confidence ratings cannot be applied.

Mammals

The mammalian TRV for methylmercury was derived based on USEPA's wildlife criterion for mammals. In the Great Lakes documents, USEPA reviewed toxicological data on mercury from the primary literature on deer, seals, mink, cats, and rodents in order to derive a criterion for the mink and otter, which were the receptors of concern in the Great Lakes area. USEPA based its wildlife criterion on a mink study because the mink was a receptor of concern in the Great Lakes region. However, mink are not likely to be found at the site. In the data summarized by USEPA, rats appeared to be less sensitive than mink to the effects of mercury. In order to avoid choosing a TRV that was too conservative for small mammals, the studies on rats were used in place of the mink study selected by USEPA. Khera and Tabacova (1973) (as cited in USEPA 1995b) reported no adverse reproductive or developmental effects in rats exposed to 0.25 mg/kg-day of methylmercury for 122 days. This chronic NOAEL was selected as the TRV for small mammals. The TRV (0.25 mg/kg-day) was allometrically converted to account for differences in body size between the test organisms and the receptor species of concern:

$$\text{Dose}_{\text{receptor}} = \text{Dose}_{\text{test organism}} (\text{Body Weight}_{\text{test organism}}/\text{Body Weight}_{\text{receptor}})^{1/4}$$

$$\text{TRV: } \text{Dose}_{\text{receptor}} = 0.25 \text{ mg/kg-day } (0.1875 \text{ kg}/6.0 \text{ kg})^{1/4}$$

where:

$\text{Dose}_{\text{test organism}}$ = 0.25 mg/kg-day,
$\text{Body Weight}_{\text{test organism}}$ = 0.1875 kg, and
$\text{Body Weight}_{\text{receptor}}$ = 6.0 kg

Therefore, the final TRV for a raccoon is 0.11 mg/kg-day when using the body weight from USEPA (1993).

Avian

The avian TRV for mercury was derived based on USEPA's wildlife criterion for birds (USEPA 1995b). In the Great Lakes documents, USEPA reviewed toxicological data on mercury from the primary literature, including quail, ducks, pheasants, sparrows, chukars, doves, chickens, partridges, hawks, and finches. The data collected in the review were used to derive a criterion for the kingfisher, herring gull, and bald eagle, which were the receptors of concern. USEPA based its wildlife criterion on a Lowest Observed Adverse Effects Level (LOAEL) for reproductive effects in mallards exposed at 0.078 mg/kg-day (Heinz 1974, 1975, 1976, and 1979 as cited in USEPA 1995b). USEPA applied an uncertainty factor (UF) of 2 to convert from a LOAEL to a No Observed Adverse Effects Level (NOAEL). The adjusted dose (0.039 mg/kg-day) was used as the avian TRV. The body weight scaling adjustment was not used for birds, as it is inappropriate (Sample and Arenal 1999).

Benthic Organisms

NYSDEC published sediment-screening criteria for use in evaluating sediment (NYSDEC 1999). The sediment criteria for marine environments are based on data collected by the National Oceanic and Atmospheric Administration and published by Long et al. (1995). The screening criterion for mercury (irrespective of chemical form) is 0.15 mg/kg for a low effects range (ER-L) and 1.3 mg/kg for a medium effects range (ER-M). Concentrations of mercury in sediment less than ER-L are anticipated to have little or no impact on the benthic community, whereas concentration above the ER-M are anticipated to have a median impact. Mitigating factors such as dissolved organic matter, pH, and temperature also influence the toxicity of mercury in the sediment.

A 28-day static-renewal toxicity test was conducted using the estuarine amphipod *Leptocheirus plumulosus* to evaluate sediment samples from Fort Totten. The objective of the 28-day exposure toxicity test is to determine the chronic toxicity of the sediment to *L. plumulosus.* Amphipods are exposed to the sediment sample to assess survival, growth, number of young per surviving female, and percent gravid females on test day 28 (test termination). The neonate amphipods used to initiate the 28-day test are the same size and age and are held under the same conditions as testing. Details of the testing conditions are presented in Appendix J.

Water Column Organisms

USEPA has developed ambient water quality criteria (AWQC) for the protection of organisms in the water column. The AWQC are based solely on data and scientific judgments on the relationship between the chemical concentration and environmental health. The two parts of the aquatic life criteria of interest are the Criterion Maximum Concentration (CMC) and the Criterion Continuous Concentration (CCC). The CMC is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The CCC is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CCC for mercury is 0.94 µg/L and the CMC is 1.8 µg/L. The CCC and the CMC for mercury are based on the amount of dissolved mercury in the water column, not the total amount of mercury present, some of which may be attached to suspended particles. The AWQC for mercury reflects toxicity data primarily from inorganic mercury because data for other forms of mercury were not available.

NYSDEC does not have state water quality criteria for the protection of water column organisms in marine environments (NYSDEC 1999). The criteria for protection of freshwater fish are 0.77 µg/L for effects from chronic exposure and 1.4 µg/L for effects from acute exposure.

Media-Based Values

NYSDEC has a media-based standard of 0.0026 µg/L in surface waters for the protection of "wildlife" that consume fish (NYSDEC 1998). The criterion is applicable to dissolved mercury and is irrespective of chemical form.

7.2.2 Summary of Ecotoxicity

Mercury released from Building 615 through drainpipes entered Little Bay and can be detected in the surface water, sediment, and biota. The cycling of mercury in the marine environment is complex and not often well understood. Mercury cycling is dependent on the biotic and abiotic process at work in the sediment and surface water. The location of mercury is highly dependent on its chemical form (e.g., elemental, inorganic, or organic). Methylmercury is expected to represent most of the mercury found in fish and other aquatic organisms. Very little of the mercury in the water column is anticipated to be methylated. The majority of the mercury in the water column is expected to be inorganic.

The toxicity of mercury to ecological receptors varies depending on the species of interest. Research on the toxicity of mercury varies widely with the toxicity to some species (e.g., fish) being more well documented than others (e.g., reptiles). Exposure pathways are complete for several broad classes of organisms, including fish, benthic organisms, mollusks, and piscivorous birds and mammals. For each complete exposure pathway, route, and contaminant, a site-specific screening ecotoxicity value was developed or obtained from regulatory guidance. The toxicity assessment identified the following ecologically-based benchmarks for adverse effects:

- Birds – 0.039 mg/kg-day
- Mammals – 0.25 mg/kg-day for small mammals and 0.11 mg/kg-day for the raccoon
- Water Column Organisms – 0.94 and 1.8 µg/L
- Benthic Organisms – 0.15 and 1.3 mg/kg

In addition, NYSDEC has a promulgated standard for fresh water of 0.0026 µg/L for the protection of wildlife. This standard was developed for receptors in the Great Lakes and included bioaccumulation of mercury through the food chain. However, this standard may not be appropriate for the protection of a marine environment.

7.3 SCREENING-LEVEL EXPOSURE ESTIMATE AND HAZARD CALCULATION

The screening-level exposure estimate and hazard calculations comprise the second step in the ecological risk screening for a site. Risk/hazard is estimated by comparing maximum documented exposure concentrations with the ecological toxicity screening values.

7.3.1 Screening-Level Exposure Estimate

The screening-level exposure analysis is comprised of two parts. The first is an analysis of the exposure of receptors that are in direct contact with the contaminated media. The second is an analysis of receptors that receive the majority of their exposure to mercury via the food chain. The receptors in this second part may also receive some smaller percentage of their exposure via direct ingestion of contaminated media during foraging activities. For these receptors, a dose of chemical ingested must be calculated, whereas exposure for the first group is not based on dose.

The exposure area is the shoreline along Building 615. Samples from this area were used for estimating hazard to food chain exposures. In contrast, all samples collected were compared to state sediment and federal surface water screening criteria. The concentrations in the sediment, surface water, and biota sampled in the area of the site are discussed earlier. For this screening assessment, the maximum measured concentration was used as the exposure point concentration.

7.3.1.1 Media-Based Screening Values

For media-based criteria and for those organisms that live in direct contact with the contaminated media, exposure is assumed to be 100 percent. For example, benthic organisms are in direct contact with the media. In tidal areas, this assumption may overestimate the total exposure. For example, mollusks (e.g., mussels) may be submerged at high tide and exposed to the air at low tide. The exposed period would only include those times that the organism is submerged. Because these organisms are inherently exposed, the media concentration is equivalent to the exposure concentration.

7.3.1.2 Dose-Based Screening Values

Food-chain analysis and comparison of calculated daily doses to TRVs are one part of the overall risk assessment. They provide an assessment of risk to specific birds and mammals from contaminants ingested in the diet. Food-chain models allow one to calculate ingested doses for site receptors based on either site-collected prey tissue concentrations or estimated prey concentrations derived from literature trophic transfer factors. The dose is an estimate of exposure to contaminants in prey and incidentally ingested soil or sediment (mg/kg-day) that is then compared to the TRV, also in mg/kg per day, that is indicative of some level of effect.

The following model was used to estimate risk from site contaminants to higher level mammalian and avian receptors. Exposure models for birds and mammals are based on the assumption that exposure to contaminants is primarily through ingestion of contaminated soil and prey. Because the concentration of mercury in prey items (i.e., finfish and shellfish) was measured directly, bioaccumulation is inherent in the model. Therefore, assessment of food-chain effects with literature-based bioaccumulation factors is not required. Surface water ingestion, dermal contact, and inhalation are other possible routes of exposure that are not evaluated in these models, but could be added if sufficient data are available.

The following generic equation may be adapted for each measurement endpoint receptor:

$$\text{Dose}_{\text{total}} = \frac{[(\text{IR}_{\text{prey}} \text{ x } \text{C}_{\text{prey}}) + (\text{IR}_{\text{soil}} \text{ x } \text{C}_{\text{soil}})]}{\text{BW}}$$

where:

$\text{Dose}_{\text{total}}$ = Estimated dose from ingestion (mg/kg body weight-day)
IR_{prey} = Ingestion rate of prey (kg/day)
C_{prey} = Concentration of contaminant in prey (mg/kg)
IR_{soil} = Ingestion rate of soil (kg/day)
C_{soil} = Concentration of contaminant in sediment (mg/kg)
BW = Body weight (kg)

Several exposure parameters were held to conservative values that would tend to overestimate total exposure. These include site use factor, bioavailability, life stage, body weight/food ingestion ratio, and dietary composition. The exposure variables for the two surrogate species are listed in Table 7-1.

Using the generic exposure model and the exposure factors in Table 7-1, exposure estimates were calculated in Table 7-2.

7.3.2 Screening-Level Hazard Calculation

The hazard quotient (HQ) method is used to compare the calculated site-specific dose to the literature-based adverse effects level (e.g., the TRV). Hazard quotients, along with other tools in the weight of evidence approach, are then interpreted to characterize risk to the receptors of concern. Hazard quotients provide a *quantitative* tool for evaluating risk to specific avian and mammalian receptors; risk to other vertebrate receptors at the site may need to be evaluated in a more *qualitative* fashion.

The hazard quotient is expressed as the ratio of the exposure concentration (or dose) to the benchmark concentration (or dose). It is calculated using the following equation:

$$HQ = EEC/ESL$$

where the EEC is the estimated environmental exposure concentration (in mg/kg or mg/kg-day) and the ESL is the ecological screening level identified in the toxicity assessment. The ESL could be a lowest "no observed adverse effects level" (NOAEL) (in mg/kg or mg/kg-day) or another effects-based screening benchmark. The resulting HQ is a unitless number that represents the ratio of the estimated dose from exposure at the site to the dose assumed to be without adverse health impacts. The HQ is not a probability of harm. An HQ of 0.01 does not mean that there is a one in one hundred chance of the adverse effect occurring. Likewise, an HQ of greater than 1.0 does mean that adverse effects will or have occurred. An HQ of greater than one means that adverse effects would be expected based on the exposure scenario and toxicity data presented. Several uncertainties are inherent in any HQ estimate and each should be evaluated prior to making a definitive conclusion.

The HQ for each surrogate receptor and the HQ for the media-based screening are presented in Table 7-3.

An HQ less than 1.0 (unity) indicates that the contaminant alone is unlikely to cause adverse ecological effects. An HQ less than 1.0 does not indicate the absence of ecological risk; rather, it should be interpreted based on the severity of the effects reported and the magnitude of the calculated quotient. Conversely, an HQ of greater than 1.0 does not mean adverse effects have or will occur. The HQ provides an quantitative indication of what is expected if the assumptions in the exposure and toxicity assessment are met. As certainty in the exposure concentrations and the

NOAEL increase, there is greater confidence in the predictive value of the hazard quotient model, and unity (HQ = 1) becomes a more certain pass/fail decision point.

7.3.3 Toxicity Test Results

A summary of the *L. plumulosus* survival, growth and reproduction during the 28-day exposure periods is presented in Appendix J. The mean percent survival for organisms exposed to the laboratory control was 87 percent. The mean percent survival for organisms exposed to the reference control site was 87 percent. The mean percent survival of amphipods in the laboratory control (97 percent) and the reference control site met the minimum survival criteria for this study (≥80 percent survival).

The performance (survival, reproduction, and growth) of each of the test sites was statistically compared to the performance of the laboratory control organisms and the reference control site. The mean percent survival in all of the samples ranged from 86 to 97 percent and was comparable to the survival of the laboratory control organisms and the reference control organisms. The mean dry weights of the laboratory control and reference control organisms were 1.61 and 1.54 mg per amphipod, respectively. The mean dry weights in all of the samples ranged from1.46 to 1.69 mg per amphipod and were comparable to the mean dry weights of the laboratory control and reference control organisms. The mean number of offspring per female released by the laboratory control and reference control organisms, were 10.4 and 6.7 offspring per female, respectively. The mean number of offspring per female released in all of the samples ranged from 7.5 to 11.7 offspring per female and were comparable to the mean number of offspring per female released in the laboratory control organisms and the reference control organisms.

Based on the results of the statistical analysis, all of the samples tested were similar to the laboratory and reference control performance, indicating mercury in sediment samples had no adverse effects on the amphipod *L. plumulosus*. Since this amphipod was selected as the surrogate species in the measurement endpoint, it is strongly suggestive that the remainder of the benthic community would not be impacted adversely.

7.3.4 Tissue Residue Results

Concentrations of mercury in American oyster (*Crassostrea virginica*) tissue ranged from 0.04 to 0.10 mg/kg with a mean of 0.05 mg/kg. Concentrations of mercury in unfiltered water from Fort Totten ranged from 0.002 to 0.27 μg/L with a mean of 0.07 μg/L. In Cunningham and Tripp (1993) as reported in Jarvinen and Ankley (2000), oysters (*C. virginica)* exposed to water containing 10 μg/L of mercuric acetate in a 60-day flow-through lab bioassay showed no effect on survival with body residues of mercury equal to 28.00 mg/kg. The range of concentrations found in oyster tissue and surface water from Little Bay indicates there would be no adverse effect on survival.

Concentrations of mercury in blue crab (*Callinectes sapidus*) tissue ranged from 0.045 to 0.09 mg/kg with a mean of 0.05 mg/kg. Concentrations of mercury in unfiltered water from Fort Totten ranged from 0.002 to 0.27 μg/L with a mean of 0.07 μg/L. The range of concentrations found in crab tissue and surface water in Little Bay indicates there would be no adverse effect on survival.

Concentrations of mercury in winter flounder whole body tissue (*Plueronectes americanus*) ranged from 0.025 to 0.20 mg/kg with a mean of 0.08 mg/kg. Concentrations of mercury in juvenile striped bass whole body tissue (*Morone saxatilis*) were undetected. Concentrations of mercury in mummichog whole body tissue (*Fundulus heteroclitus*) ranged from 0.045 to 0.10 mg/kg with a mean of 0.05 mg/kg. Concentrations of mercury in unfiltered surface water of Little Bay ranged from 0.002 to 0.27 μg/L with a mean of 0.07 μg/L.

Salmonids exhibit greater sensitivity to mercury than many fish species. In Koeller and Wallace (1977) as reported in Jarvinen and Ankley (2000), fry-juvenile chum salmon (*Oncorhynchus keta*) were exposed to 1 μg/L of mercuric chloride in suspended enclosures in the field for 56 days. There was no effect on growth, and muscle tissue analysis revealed mercury concentrations of 0.5 mg/kg. The range of concentrations found in fish tissue and surface water of Little Bay indicates there would be no adverse effect on growth and survival.

Concentrations of mercury in blue mussel (*Mytilus edulis*) tissue ranged from 0.04 to 0.055 mg/kg with a mean of 0.05 mg/kg. Concentrations of mercury in unfiltered water from Fort Totten ranged from 0.002 to 0.27 μg/L with a mean of 0.07 μg/L. In Pagliarani et al. (1996) as reported in Jarvinen and Ankley (2000), the saltwater mussel *(Mytilus galloprovincialis)* was exposed to water containing 250 μg/L of mercuric chloride in a 5-day lab renewal bioassay which showed no effect on survival. Tissue residues of mercury in the gill equaled 212.6 mg/kg, and concentration of mercury in the mantle was detected at 23.2 mg/kg. The range of concentrations found in blue mussel tissue and water at Fort Totten indicate there would be no adverse effect on survival.

7.3.5 Uncertainty Assessment

There are several uncertainties contained in the risk assessment. According to USEPA guidance, the major uncertainties should be highlighted and the basis for the assumption should be provided (USEPA 1995b). The final estimation of the hazard/risk to the ecological community proximate to the drain pipe for Building 615 should be seen in context of the uncertainties.

The uncertainties in this risk assessment can be broken into three separate areas: data collection/analysis, exposure assessment, and toxicity assessment. Within each area, the uncertainties can be either site-specific or generic. The site-specific uncertainties are those that are influenced by the site conditions. For example, the amount of organic matter in sediment influences the amount of an organic chemical in the water column. Generic uncertainties are those that are outside the influence of the site. For example, laboratory analysis of sediment samples is dependent on the calibration of the analytical instrument. Care is exercised in all areas to limit the uncertainties; however, all uncertainties will never be eliminated.

During data collection and analysis samples were purposefully collected from areas of known chemical contamination. This action biases the results to reflect the areas of higher contamination rather than equal representation across the entire exposure area. More sediment and mussel/oyster samples were taken near the Building 615 outfall than anywhere else. The result of this action is a higher exposure point concentration than would be encountered if sampling were performed in a random pattern.

During the exposure assessment, two species were selected to represent others present at the site. All small mammals were represented by modeling exposures to raccoons, and avian exposure was represented by modeling exposures to herring gulls. There is obvious uncertainty in how well these two species represent the exposures of their entire categories. In the absence of resources necessary to model all of the receptors at the site, these two species were selected because they have characteristics that are common to the species of interest. In addition, the exposure parameters were selected to maximize the modeled exposure concentration (e.g., low body weight and higher than average intake values). In addition, several variables (e.g., site use factor, bioavailability, diet composition, body weight/food ingestion ratio) in the exposure model were held to conservative values that would tend to maximize exposure above that which would actually occur.

The toxicity assessment examined the toxicity of the different forms of mercury. However, most of the available data on mammals and birds seems to be on methylmercury. The toxicity data for water column organisms are based on data from inorganic mercury, which is the form of mercury that predominates in this media.

Table 7-4 lists some of the uncertainties in the ecological risk assessment. While not an inclusive listing, the table highlights some of the major uncertainties in the risk assessment. Also included in the table is the magnitude (high, medium, low) of the uncertainty and the direction (either over- or under-estimating the health hazard). Changes in magnitude were gauged by adjusting model parameters up or down 10 percent. Uncertainties that will tend to overestimate the hazard would result in an HQ greater than unity, suggesting that adverse ecological effects may occur. Uncertainties that tend to underestimate the hazard would result in an HQ of less then unity, thus indicating that adverse ecological effects are not anticipated.

Concentrations of mercury in near-shore sediments from Fort Totten ranged from 0.04120 to 5.25 mg/kg with a mean of 0.4071 mg/kg. Background concentrations from the Contaminant Assessment and Reduction Project (CARP) were detected at 1.47 mg/kg of mercury at Long Island Sound Ambient Station 14 near the Throgs Neck Bridge, close to Fort Totten. Given the distribution of high mercury concentrations in the western part of the Long Island Sound sub-basin, this value is probably fairly typical and may be low for more TOC-rich sediments. Therefore, a source of uncertainty arises concerning the sources of mercury contamination. The area near Fort Totten has potential sources of mercury input including municipal and industrial discharges, atmospheric inputs, non-point source runoff, other hazardous waste sites, landfills, combined sewer overflows, and accidental spills.

7.4 ECOLOGICAL RISK ASSESSMENT SUMMARY

At the conclusion of screening-level ERA, the risk manager(s) must decide that either the screening-level ecological risk assessment is adequate to determine that ecological threats are negligible, or the process should continue to a more detailed ecological risk assessment. If the process continues, the screening-level assessment serves to identify exposure pathways and preliminary contaminants of concern for the baseline risk assessment by eliminating those contaminants and exposure pathways that pose negligible risks.

The American oyster (*Crassostrea virginica*), blue mussel (*Mytilus edulis*), blue crab (*Callinectes sapidus*), striped bass (*Morone saxatilis*), winter flounder (*Plueronectes americanus*), summer flounder (*Paralichthys dentatus*), and mummichog (*Fundulus heteroclitus*) were identified and evaluated as species that are present and important in the Fort Totten ecosystem. The ERA examined risk to aquatic receptors (e.g., fish, benthic organisms) through media-based screening values and examined aquatic-dependent receptors (mammals/birds receiving a large portion of the diet from Little Bay) through food-chain modeling. Risk to the benthic community was also examined with toxicity testing with the estuarine amphipod *Leptocheirus plumulosus.*. The objective of the 28-day exposure toxicity test is to determine the chronic toxicity of the sediment.

In the benthic toxicity tests, all of the samples tested were similar to the laboratory and reference control performance, indicating mercury in sediment samples had no adverse effects on the amphipod *L. plumulosus*. Since this amphipod was selected as the surrogate species in the measurement endpoint, it is suggested that the remainder of the benthic community will also not be impacted adversely.

A comparison of mercury concentration in biota and sediment and surface water to benchmark concentrations indicates that there is little to no risk to the ecological receptors evaluated. The range of concentrations found in oyster tissue, crab tissue, mussel tissue, and surface water of Little Bay indicates there would be no adverse effect on survival. Concentrations of mercury in winter flounder whole body tissue (*P. americanus*) ranged from 0.025 mg/kg to 0.20 mg/kg with a mean of 0.08 mg/kg. Concentrations of mercury in juvenile striped bass whole body tissue (*M. saxatilis*) were less than the detection limit. Concentrations of mercury in mummichog whole body tissue (*F. heteroclitus*) ranged from 0.045 mg/kg to 0.10 mg/kg with a mean of 0.05 mg/kg. The range of concentrations found in fish tissue and surface water from Little Bay indicates there would be no adverse effect on growth and survival. The lack of an identified hazard to the identified ecological receptors strongly suggests that other similar ecological receptors would not be impacted adversely.

7.5 SCIENTIFIC/MANAGEMENT DECISION POINT

This section is pending comments from the regulatory and community members. Comments will be summarized in this section and a final scientific/management decision will be documented.

TABLE 7-1 EXPOSURE FACTORS FOR SURROGATE RECEPTORS

Variable	Value	Description	Source
Body Weight – Herring Gull	0.951 kg	Adult female	Norstrom et al. 1986 as cited in USEPA 1993
Body Weight – Raccoon	6 kg	Adult female (nulliparous)	Sanderson 1984 as cited in USEPA 1993
Ingestion Rate – Herring Gull	0.060 kg/day	based on allometric scaling: $IR=0.0582*BW^{0.651}$	Nagy 1987 as cited in USEPA 1993, Equation 3-3
Ingestion Rate – Raccoon	1.7 kg/day	based on allometric scaling: $IR=0.621*BW^{0.564}$	Nagy 1987 as cited in USEPA 1993, Equation 3-8
Concentration in Prey – Herring Gull Raccoon	0.2 mg/kg	Assumed that 100 percent of diet is mercury containing shellfish and finfish	Maximum concentration in shellfish and finfish
Ingestion Rate – (Sediment) Herring Gull	0.004 g/day	Incidental ingestion of sediment while foraging: 7.3% of diet (value for least sandpiper used as surrogate for herring gull)	Calculated from Table 4-4, USEPA 1993
Ingestion Rate – f(Sediment) Raccoon	0.16 kg/day	Incidental ingestion of sediment while foraging: 9.4% of diet	Beyer et al as cited in USEPA 1993
Concentration in Sediment	5250 mg/kg	Concentrations from 0-12 inch samples	Maximum concentration in sediment samples from 0-12 inches

TABLE 7-2 TOTAL DIETARY INTAKE FOR SURROGATE RECEPTORS

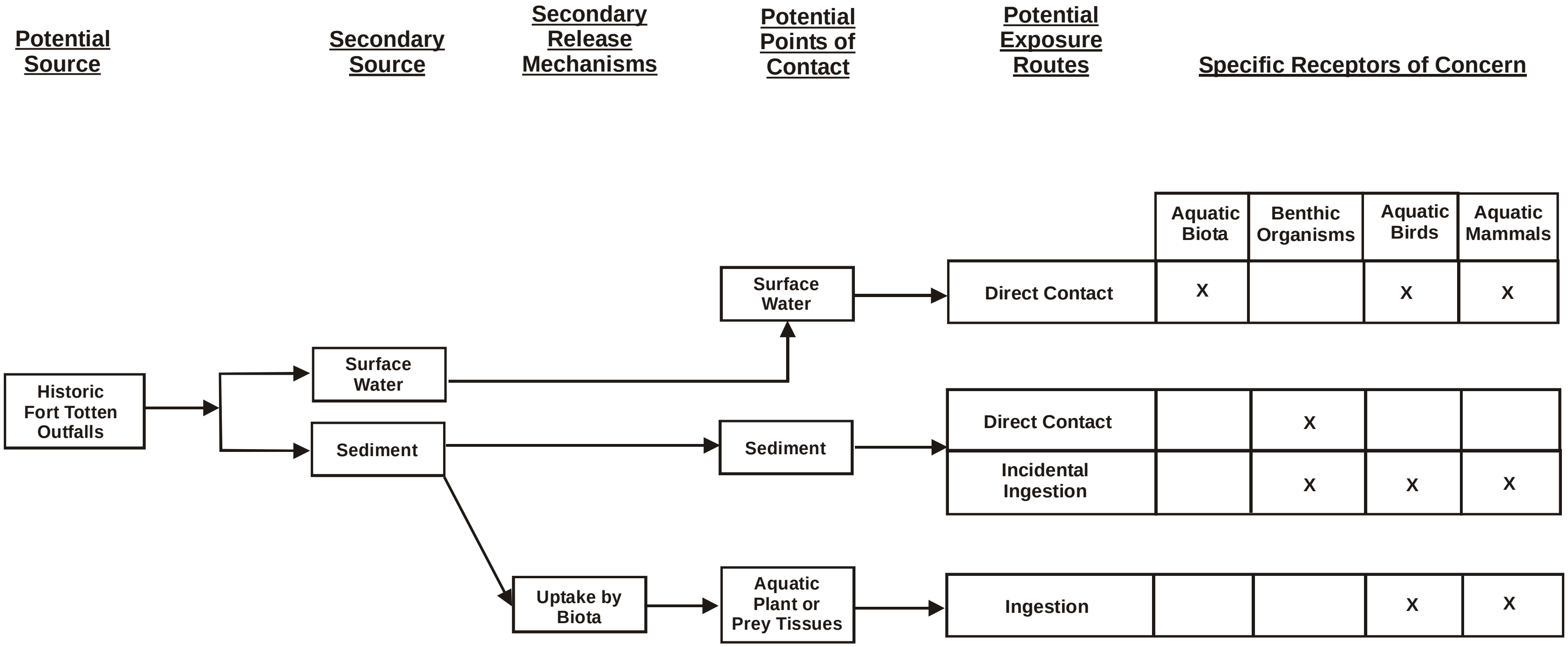
Surrogate Receptor	Dietary Intake	Units
Herring Gull	0.035	mg/kg-day
Raccoon	0.197	mg/kg-day

TABLE 7-3 SCREENING LEVEL HAZARD QUOTIENTS FOR SURROGATE RECEPTORS AND MEDIA

Receptor	EEC (units)	ESL (units)	Ecological HQ	Comment
Small mammals	0.197 mg/kg-day	0.11 mg/kg-day	1.79	HQ is based on the exposure data for the raccoon and toxicity data for rodents.
Birds	0.035 mg/kg-day	0.039 mg/kg-day	0.89	HQ is based on exposure for herring gull and toxicity data for the mallard.
Water Column Organisms	0.27 µg/L	0.94 µg/L	0.29	Based on maximum observed water concentration
Benthic Organisms (whole bay)	5250 µg/kg	150 µg/kg (ER-L) 1,300 µg/kg (ER-M)	35.00 4.03	Based on maximum concentration in sediment (0-12 inches)
Benthic Organisms (whole bay)	545 µg/kg	150 µg/kg (ER-L) 1,300 µg/kg (ER-M)	3.63 0.42	Based on exposure to the mean concentration (0-12 inches)

TABLE 7-4 UNCERTAINTIES IN ECOLOGICAL RISK ASSESSMENT FOR FORT TOTTEN COAST GUARD STATION, BUILDING 615

Item	Uncertainty Description	Magnitude	Direction
1	Data Collection/Analysis –		
	• More samples collected in area of discharge	• Low	• Over
	• Chemical form of mercury in sediment, surface water, and biota not known	• High/medium	• Over
2	Exposure Assessment –		
	• Used 2 species to represent all others at site	• Unknown	• Unknown
	• Used maximum observed concentration to estimate exposure	• High	• Over
3	Toxicity Assessment –		
	• Used data from a rat study to indicate toxicity of mercury to other small mammals	• Low	• Unknown
	• Used data on mallards to indicate toxicity of mercury to herring gulls	• Low	• Unknown
	• Assumed NOAELs are protective of community level effects	• Medium	• Over
4	Risk Characterization –		
	• HQ indicative of effects on individual receptors, not population	• High	• Over



Potential Points of Contact	Potential Exposure Routes	Aquatic Biota	Benthic Organisms	Aquatic Birds	Aquatic Mammals
Surface Water	Direct Contact	X		X	X
Sediment	Direct Contact		X		
	Incidental Ingestion		X	X	X
Aquatic Plant or Prey Tissues	Ingestion			X	X

Figure 7-1. Ecological Conceptual Site Model for Fort Totten, Queens, New York.

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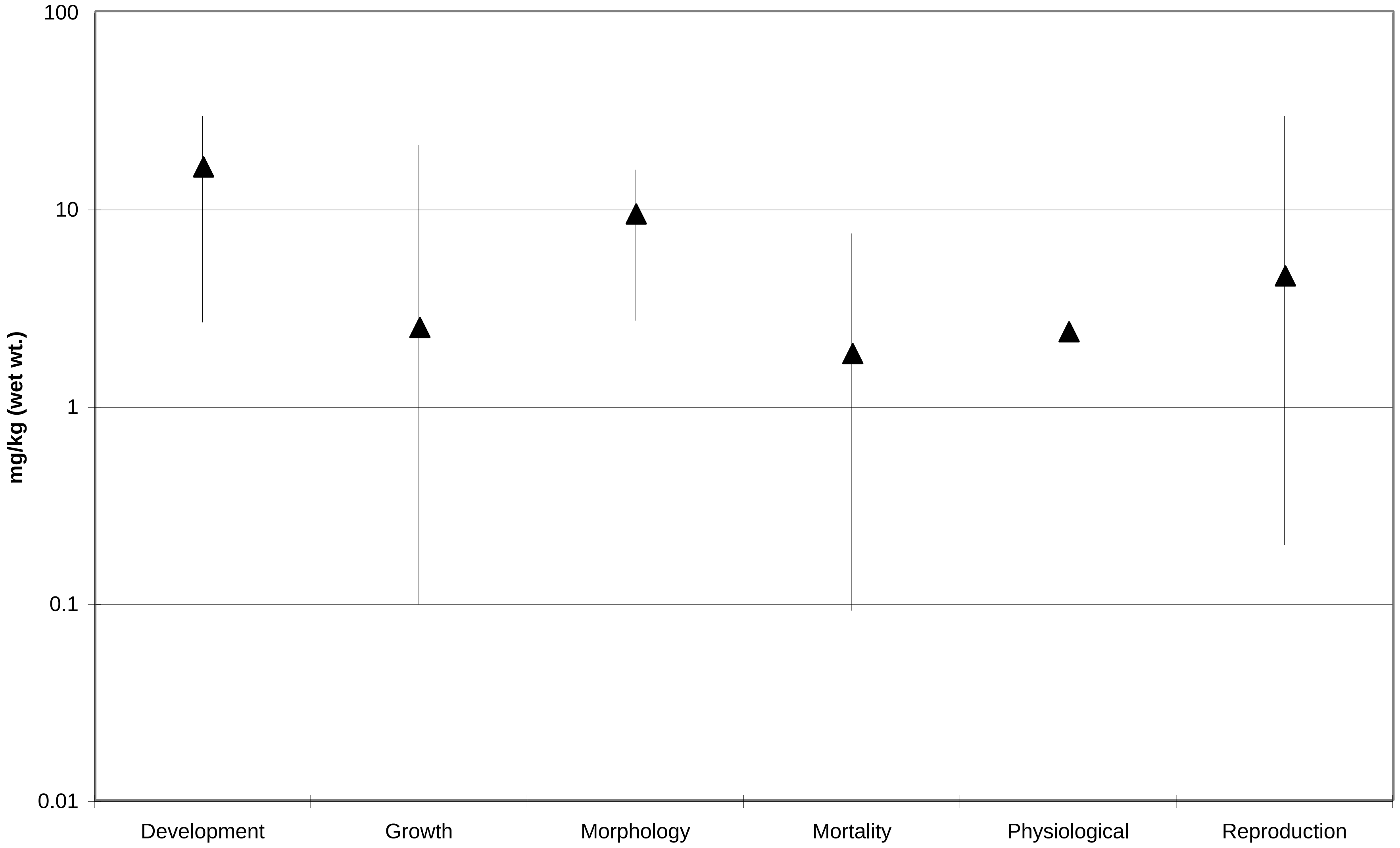
Figure 7-2. Summary Effects Plot for Mercury Residues in Aquatic Organisms



8.0 STEP 1 AND 2 ECOLOGICAL RISK SCREENING FOR UPLAND AREAS

This chapter presents the purpose, rationale, and methods used for the evaluation of a Step 1 and 2 ecological risk screening at the Fort Totten upland areas located in Queens, New York. A Step 1 and 2 Ecological Risk Assessment (ERA) is a preliminary, initial screening process designed to estimate the likelihood of ecological risk, and to provide a basis for the design of a more thorough Step 3 ERA if necessary (USEPA 1997c).

8.1 OBJECTIVES

The ecological risk assessment approach incorporates the latest available guidance and concepts on ecological risk assessment:

- *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA 1997c)
- *Guidelines for Ecological Risk Assessment* (USEPA 1998b)
- *Issuance of Final Guidance: Ecological Risk Assessment and Risk Management Principles for Superfund Sites* (USEPA 1999)

Although Fort Totten is not a Superfund site, the guidance provides an accepted framework for ecological risk assessment under any regulatory purview. The overall objectives of the ecological risk Step 1 and 2 screening approach are to characterize the ecological habitat, identify the ecological receptors of concern (ROCs) and constituents of potential concern (COPCs), and to assess the potential for risks to the environment.

The screening level assessment comprises the first two steps of an eight-step process of ecological risk assessment at Superfund sites, or sites otherwise required to follow the CERCLA process. The screening level process, as applied to the site, consists of two steps:

1. Problem Formulation and Ecological Effects Evaluation
2. Exposure Estimate and Risk Calculation

The screening level assessment approach corresponds to Steps 1 and 2 in Figure 8-1.

8.2 PROBLEM FORMULATION AND ECOLOGICAL EFFECTS EVALUATION

Problem formulation represents the scoping stage of the ecological risk assessment. Existing information is examined, the site visited and receptors of concern identified, a conceptual model for the site developed to identify potential exposure pathways, and preliminary assessment and measurement endpoints identified. Ultimately, the problem formulation generates one or more questions, speculations, or hypotheses regarding current or future man-induced changes to the environment. These questions are answered or hypotheses tested by collecting information during the analysis phase. The ecological significance of the results is evaluated during risk characterization.

Problem Formulation and Ecological Effects Evaluation consists of the following elements:

- Environmental Setting of the Site
- Identification of Receptors of Concern
- Development of a Conceptual Site Model
- Assignment of Assessment and Measurement Endpoints

Each of these elements are discussed below.

8.2.1 Environmental Setting of the Fort Totten Upland Site

The environmental characteristics of the site were described in Chapter 2. The upland land use was described as an urban campus. Wildlife habitat is limited and use is expected to be transitory and limited to wildlife moving between nearby wetlands and urban residential areas.

8.2.2 Selection of Receptors of Concern

Ecological ROCs are species or guilds of species that are important to the ecology of the study area and that may be susceptible to chemical constituents detected at the site. ROC examples could include an area of riparian wetland, a particular bird species, a benthic community, or a fish. Selection of ROCs is systematic, representative, and ecologically based to ensure that assessment endpoints (see Section 8.2.4) are adequately addressed. Criteria used to identify ecological ROCs include the following:

- Presence – known or expected to occur onsite

- Susceptibility – exposure pathway is likely complete and of sufficient duration/magnitude

- Representative – of the food web and/or guild

- Data Availability – sufficient and appropriate type of toxicity and exposure information

- Societal Importance – species merits public attention

In some instances, particularly during a Step 1 and 2 screening ERA, the selected ROCs represent an ecological guild (a group of species using similar resources such as food or location in a similar manner).

Ecological ROCs can be classified into three broad categories: (1) ecologically important, (2) recreationally or commercially important, and (3) threatened and endangered species. Ecologically important ROCs substantially contribute to the structure (numbers and biomass) and function (energy flow and nutrient cycling) of the site's ecosystem. This may include primary producers, and primary, secondary, and tertiary consumers, as well as their respective food base. Primary producers are represented by plants, which take energy from sunlight and nutrients from soil pore water. Primary consumers represent the first link of a food web and are represented by soil invertebrates and omnivores such as the white-footed mouse. Secondary consumers consume the primary consumers, and are eaten by tertiary consumers. A bird such as the American crow is an example of a secondary consumer.

For this screening level ERA, four ROCs were chosen for evaluation as described below.

Terrestrial Plants—Plant communities are important to the structure and function of terrestrial ecosystems and are directly exposed to soils on a site. Plants represent the base of food webs, and thus are critical receptors of concern.

Terrestrial Invertebrates (Earthworms)—Soil invertebrates are very important to the fertility of soils because of their role in the aeration and turnover of surface soils. Earthworms will serve as a guild representative for the other invertebrates (e.g., beetles, termites, grasshoppers, butterflies, spiders, moths, and wasps). Earthworms are in continuous contact with any soil-associated contaminants that may be present.

Terrestrial Avian Species—Birds are an important component of the terrestrial community, and several species have been observed at the Fort Totten site. One of these, the American robin, will represent the avian guild in the ERA. The robin is a thrush, and consumes relatively large amounts of invertebrates and fruit.

Terrestrial Mammalian Species—Small mammals would be expected to utilize the limited habitat available in the Fort Totten upland areas. The white-footed mouse will represent the guild of small mammals. The white-footed mouse, and similar species such as the deer mouse, is omnivorous and eats a variety of seeds and other plant material, as well as small arthropods such as insects.

8.2.3 Ecological Risk Conceptual Site Model (CSM)

The CSM is an end product of Problem Formulation (Figure 8-2). It contains a description of the physical and ecological characteristics of the site, potential exposure scenarios, ROCs, and assessment and measurement endpoints.

A major element in every CSM is a description of the exposure scenarios. This consists of four elements:

- Source of COPC and release mechanism(s)
- Transport medium and mechanism of transfer from primary to subsequent media
- Point (or area) of potential ROC contact with the COPC
- Route of uptake by the ROC (ingestion of soil, sediment, food, and bioconcentration)

Potential sources include past activities associated with the Fort Totten site. Because of different historical uses, and potential relative risks, upland source areas in the ERA were evaluated separately for the Pesticide Area, Fill Area, and Other Areas. Surface soil is an exposure medium for terrestrial receptors. There could be movement by constituent infiltration to the subsurface soils and to groundwater; however, there are no direct complete pathways for terrestrial ecological receptors to subsurface soil or groundwater. COPCs sequestered in secondary source material (surface soil) may move via several mechanisms, including incorporation into the food web. Terrestrial receptors may directly contact or ingest surface soil at the site. Through the process of trophic transfer, or trophic magnification in the case of bioaccumulative COPCs, biota can serve as vectors for COPC transport up the food chain and expose higher level animals through ingestion.

Exposure routes are based on simple direct contact with surface soil or surface water, or ingestion of soil and plant or prey tissue (Figure 8-2). Exposure pathways and routes include:

- Direct Contact With Surface Soil—This exposure route is important for uptake of COPCs for plants and for soil invertebrates.

- Ingestion of Food (i.e., plants and biota that have taken up constituents from soil)—Herbivores and predators that forage in the terrestrial habitats may ingest plants or animal prey that have bioaccumulated COPCs from surface soils. (In this screening level ERA, the wet weight concentration of COPC in food items is assumed identical to the dry weight concentration of COPC in surface soil.)

- Incidental Ingestion of Surface Soils—Herbivores and predators that forage in the terrestrial habitats may incidentally ingest some surface soil with their food or during other activities such as grooming. Soil invertebrates ingest surface soil and leaf litter during feeding, but it is difficult to distinguish between uptake as a result of direct contact with surface soils and uptake as a result of ingestion of surface soils because of their intimate association with surface soils. In this screening level ERA, incidental ingestion by invertebrates is inherently incorporated in the screening benchmarks. Incidental ingestion by vertebrates is incorporated in the very conservative food web models used in this screening level ERA, as described further below.

8.2.4 Assessment and Measurement Endpoints

USEPA (1998b) guidance stresses the importance of ecologically significant endpoints. The failure to select such an effect for evaluation brings little value to the decision-making process. Several criteria are applicable for assessment endpoint selection (Suter 1993; USEPA 1998b):

- Unambiguous Definition—Assessment endpoints should indicate a subject and a characteristic of the subject (such as American robin reproduction).

- Accessibility to Prediction and Measurement—Assessment endpoints should be reliably predictable from measurements.

- Susceptibility to the Hazardous Agent/Stressor—Susceptibility of an organism (plant or animal) results from the combination of potential for exposure and the sensitivity to the concentrations of contaminants or other stressors of concern.

- Biological Relevance—Biological relevance of impacts to an individual organism is determined by the importance of the impact to higher levels of biological organization such as populations or communities.

- Social Relevance and Policy Goals—Assessment endpoints should be of value to decision-makers and the public. The assessment endpoints should represent an effect that would warrant consideration of site remediation or alteration of project plans. Assessment endpoint selection should also include endpoints that may be mandated legally (e.g., protected species).

The extent to which these items are considered varies from site to site, and it depends on several factors including the level of public involvement, the ecological character of the site, and the lead regulatory agency involved in the assessment.

The selection of assessment endpoints must be based on the fundamental knowledge of the local ecology. Assessment endpoints typically relate to an effect on a population or community. Survival of a specific species of earthworm is an example of a population level assessment endpoint. Community level assessment endpoints could include survival of all soil invertebrates or the primary productivity of vegetation found at a site. Examples of endpoints representing guilds of species are useful in that they convey information beyond the indicator species identified in the endpoint itself.

Based on previous activities at the Fort Totten site, ecological ROCs may be exposed to COPCs through surface soil exposure. COPCs previously detected in the soil at this site may be ingested via soil and food (i.e., plants and biota that have taken up constituents from soil).

Based on the above observations, the following ecological assessment endpoints are defined:

1. Protection of plant communities to ensure that COPCs in soil do not have unacceptable adverse effects on survival, growth, and reproduction of key plant species, which may result in adverse effects to the community structure such as diversity or biomass.

2. Protection of soil-invertebrate communities to ensure that COPCs in soil do not have unacceptable adverse effects on survival, growth, and reproduction of key soil invertebrate species, which may result in adverse effects to the community structure such as diversity or biomass.

3. Protection of mammals, represented by the small terrestrial omnivorous white-footed mouse to ensure that ingestion of COPCs in food items and soil/sediment does not have unacceptable adverse impacts on survival, growth, and reproduction.

4. Protection of birds, represented by the omnivorous American robin, to ensure that ingestion of COPCs in food items and soil/sediment does not have unacceptable adverse impacts on survival, growth, and reproduction.

Measurement endpoints are measurable ecological characteristics that are related to the assessment endpoints (USEPA 1998b). Because it is difficult to "measure" assessment endpoints, measurement endpoints were chosen that permit inference regarding the above-described assessment endpoints. Measurement endpoints selected for this risk assessment include:

- Media Chemistry for Surface Soils—The measurement of chemical constituent concentrations in surface soil provides the means, when compared to appropriate background and ecotoxicological-based screening concentrations, for drawing inferences regarding the first measurement endpoint above. Because soil invertebrates and plants are in direct contact with the soil, direct measurement of soil concentrations is an appropriate endpoint.

- Calculated Dietary Doses—Measurement endpoints to address calculated chemical doses in the diet for birds and mammals. The knowledge of specific COPC concentrations in surface soil cannot be used to address this assessment endpoint directly. Rather, these measurements are used in conjunction with food ingestion rate and other factors to calculate the daily intake, or dietary dose of a constituent. These are then compared to toxicological thresholds to address the assessment endpoint, as described in Section 8.6 below. Because this is a Step 1 and 2 ecological screening, the assumption has been made that food concentrations are equivalent to those found in the surface soil. This assumption is conservative for the majority of compounds; however, for compounds known to bioaccumulate, such as some pesticides and PCBs, concentrations in food can be higher than concentrations found in soil.

8.3 COPC SCREEN

A risk assessment begins with a list of analytes that include compounds and/or elements known or suspected to have originated from site-related activities. Depending on the area in question at the Fort Totten site, these are metals, PAHs, other SVOCs, and pesticides. Analytes not detected or at non-hazardous concentrations may be candidates for elimination. Analytes known or suspected to have originated from site-related activities remaining after the screening process are COPCs.

The screening process that identifies COPCs must be environmentally conservative. That is, the process must not eliminate analytes that could pose potential ecological risk. In statistical terms, the screening process must minimize the potential for false negatives. This potential is minimized by using conservative assumptions and appropriate screening values during the COPC screening process. If possible, these screening values should be toxicologically based, as discussed below.

On a national basis, USEPA has not recommended any soil screening values. Screening values recommended for soil were taken from the draft USEPA Soil Screening Level documents (USEPA 2000b), Oak Ridge National Laboratory (ORNL) (Efroymson et al. 1997a and 1997b), RIVM (1994, 1995, 2000), and in this order. Some special references were found in the scientific literature for analytes not contained in these sources. Appropriate values from these sources are shown as ecological soil screening values.

The maximum site concentrations were compared to the corresponding screening values. The comparison was done by dividing the site maximum by the screening value to produce a Hazard Quotient (HQ). The HQ is a unitless ratio that reflects the relationship of the site concentration to the screening value. If the site maximum was less than the screening value ($HQ < 1.0$), that analyte was eliminated as a COPC. If the site maximum exceeded the screening value ($HQ > 1.0$), that analyte was retained as a COPC. In the latter case, the HQ reflects the magnitude of exceedance of the screening value by the site concentration. Calcium, iron, magnesium, potassium, and sodium were included in the screening tables, but were not considered as COPCs because of their importance as essential nutrients.

The identification of ecological COPCs in surface soil is summarized in Tables 8-1 through 8-3, and discussed below.

Pesticide Area

Soil samples from the Pesticide Area were analyzed only for pesticides. Only total DDT produced an HQ greater than 1.0; therefore it is retained as a COPC (Table 8-1). Screening values were not available for gamma-BHC (lindane) or heptachlor epoxide, so they were retained as COPC for evaluation in the Step 2 food web.

Fill Area

Eight metals—aluminum, chromium, copper, lead, mercury, selenium, vanadium, and zinc—produced HQs greater than 1.0 and were retained as COPCs (Table 8-2). Among organic constituents, only carbazole and dibenzofuran were retained as COPCs, because there were no available screening values.

Other Areas

Owing to HQs greater than 1.0, 10 metals—aluminum, chromium, cobalt, copper, lead, mercury, selenium, silver, vanadium, and zinc—and the organic constituents total PAH and total phthalates were retained as COPCs (Table 8-3). The organic compounds 4-chlorophenyl phenyl ether, carbazole, and dibenzofuran were retained as COPCs because of a lack of screening values.

8.4 STEP 1 AND 2 EXPOSURE ASSESSMENT

Exposure assessment is a key component of risk quantitation, linking contaminants to receptors through complete pathways. Exposure refers to the degree of contact between ecological receptors at a site and the COPCs.

Based on the CSM, terrestrial receptors at the Fort Totten site were assumed to be exposed to COPCs in surface soil either through direct contact, or via dietary food web. In either case, the starting point for the evaluation of terrestrial receptors is the concentration in the surface soil.

The relevant pathway for terrestrial plant and soil invertebrate communities is chronic exposure to surficial soil contaminants that may exhibit a detrimental effect on survival and growth. This exposure assessment was very conservative and was set up such that soil concentrations were compared to the lower of available vegetation or invertebrate screening values. It is assumed that the COPCs are 100 percent bioavailable for uptake by plants and invertebrates. Risk to terrestrial plants and soil invertebrates is based on calculation of an (HQ, as discussed in Section 8.3.

Hazard Quotient = Maximum Surface Soil Concentration / Plant/ Invertebrate Screening Value

The relevant pathway for terrestrial mammalian and avian ROCs is chronic exposure to surficial soil contaminants due to dietary uptake. The ROCs occupy different feeding guilds, but have diets that contain potential vectors for site-related soil contaminants.

Consistent with USEPA guidance (USEPA 1997c), COPC concentrations in food organisms were assumed to be at the same concentrations as the soil. This exposure is particularly conservative. It substitutes soil for vegetation, invertebrates, or mammals that organisms would typically ingest as their main food items. In addition, it assumes that all food is on a dry-weight basis, but this food is consumed at a much higher wet-weight basis; consequently, dietary doses (and risk) are overestimated.

Dietary exposures for ROCs have been estimated as body-weight-normalized daily doses for comparison to a body-weight-normalized daily dose toxicity reference value (TRV). The daily dose for a given receptor to a given COPC is given by summing the products of feeding rate and food items and multiplying the sum by the total feeding rate and a habitat usage factor (assumed to be 100 percent for this food web). Separate doses are presented for soil and food contributions, and these are summed to produce the total dose for each ROC.

$$Dose_{total} = Dose_{food} + Dose_{soil}$$

where:

$Dose_{total}$ = Total daily dose of COPC received by receptor; mg COPC/kg-bw/day

$Dose_{food}$ = Daily dose of COPC received by receptor; mg COPC/kg-bw/day from food items

$Dose_{soil}$ = Daily dose of COPC received by receptor; mg COPC/kg-bw/day from incidentally ingested soil

The total dose from food is given by:

$$Dose_{food} = F_f \, x \, U \, x \, C_f$$

where:

F_f = Total daily feeding rate in kg food/kg-body weight of ROC/day (wet basis)
U = Habitat usage factor (fraction of habitat range represented by site) for receptor; assumed to be 1.0 for this food web
C_f = Concentration of COPC in food; assumed to be the same concentration as soil (mg chemical/kg food)

The total dose from incidental soil is given by:

$$Dose_{soil} = F_s \; x \, U \; x \, C_s$$

where:

F_s = Total daily incidental soil feeding rate in kg soil/kg-body weight of ROC/day (wet basis)
U = Habitat usage factor (fraction of habitat range represented by site) for receptor; assumed to be 1.0 for this food web
C_s = Concentration of COPC in soil; mg chemical/kg soil (dry basis)

Lastly, the total daily soil feeding rate is given by:

$$F_s = F_f \; x \; F_{xsoil}$$

where:

F_s = Total daily incidental soil feeding rate in kg soil/day (wet basis)
F_f = Total daily feeding rate in kg food/day (wet basis)
F_{xsoil} = Fraction incidental soil ingestion as a proportion of food ingestion rate

Information necessary for calculation includes organism body weight (BW), food ingestion rate (F_f), fraction incidental soil ingestion as a proportion of food ingestion rate (F_{xsoil}), and analyte concentrations of ingested materials. As discussed earlier, vegetation and animal food items were represented by the same concentration as found in soil (dry weight). Information specifically relevant to the ecology of the ROCs (i.e., body weights, food ingestion rates, and incidental soil ingestion rates) was obtained from published sources. The primary source used for these exposure parameters was the Exposure Factors Handbook (USEPA 1993).

8.5 TOXICITY ASSESSMENT

This section summarizes the screening values and TRVs used in this ecological risk assessment. USEPA (1997c) guidance specifies that a screening ecotoxicity value should be "equivalent to a documented or best conservatively estimated chronic No Observed Adverse Effect Level (NOAEL)."

8.5.1 Soil Invertebrates and Terrestrial Plants

Risks to soil invertebrates and terrestrial plants are assessed relative to soil concentrations, using the screening values employed in the COPC screen (Section 2.3). As available, screening values were obtained in order from USEPA (2000b) (Eco-SSL values), Oak Ridge values (Efroymson et al. 1997a, 1997b), and the Dutch values (RIVM 1994, 1995, 2000). If both plant and invertebrate screening values were available for a given analyte, the lower of the two was chosen, consistent with the conservative approach of a Step 1 assessment.

8.5.2 TRVs for Terrestrial Food Web Risks

Terrestrial ROCs were selected in Section 8.2.2, and include both avian species (American robin) and mammalian species (white-footed mouse). Food web risks for avian and mammalian species are expressed relative to a dose of chemical (mg/kg body weight/day) taken up by the organism from food and soil. Literature-reported wildlife NOAEL TRVs (Sample et al. 1996) were primarily used as TRVs for the terrestrial food-web risks.

As noted in Sample et al. (1996), the current state of avian toxicology indicates that the use of allometric relationships, used to relate the body weight of the toxicity test organism to that of the receptor of concern, are not appropriate. Consequently, toxicity values for avian ROCs taken from Sample et al. (1996) are the same regardless of the receptor of concern, and are equivalent to that found in the test species (pheasant, chickens, and ducks). An allometric conversion was performed to modify the toxicity value from the test species to mammalian ROCs (Sample et al. 1996). This is due to the finding that smaller animals, such as rats and mice that are commonly used as test species in toxicity tests, have higher metabolic rates, and detoxify contaminants faster than larger animals.

Example Food-Web Calculation

An example HQ calculation provided below estimates the potential for risk for the case where the white-footed mouse is exposed to soil in the Fort Totten fill area containing the maximum concentration of lead.

The maximum concentration of lead reported in surface soil (dry-weight basis) in the fill area was determined to be 743 mg/kg (Table 8-2).

The following equation provides the dose to the receptor from food ingestion:

$$Dose_{food} = F_f \, x \, U \, x \, C_f$$

= (0.1989 kg/kg-bw/day x 1.0 x 743 mg/kg)

= 147.78 mg/kg-bw/day

where:

F_f = Total daily feeding rate in kg food/kg bw of ROC/day (wet basis)
U = Habitat usage factor (fraction of habitat range represented by site) for receptor; assumed to be 1.0 for this food web
C_f = Concentration of COPC in surface soil

The dose from incidental soil ingestion is calculated using:

$$Dose_{soil} = F_s \, x \, U \, x \, C_s$$

= (0.00398 kg/kg-bw-day x 1.0 x 743 mg/kg)

= 2.96 mg/kg-bw/day

where:

F_s = Total daily incidental soil feeding rate in kg soil/kg-bw of ROC/day (wet basis)
U = Habitat usage factor (fraction of habitat range represented by site) for receptor; assumed to be 1.0 for this food web
C_s = Concentration of COPC in soil; mg chemical/kg soil (dry basis)

The final dose is calculated as follows:

$$Dose_{total} = Dose_{soil} + Dose_{food}$$
$$Dose_{total} = 2.96 + 147.78$$
$$Dose_{total} = 150.74 \text{ mg/kg-bw/day}$$

The HQ is calculated from the dose and the TRV as follows:

$$HQ=Dose/TRV$$

$$HQ=150.74/15.98$$

$$HQ=9.43$$

The TRV and the final HQ can be found in Table 8-6.

8.6 STEP 2 RISK CHARACTERIZATION

8.6.1 Soil Invertebrates and Terrestrial Plants

In this screening level ERA, risks to lower trophic level organisms such as plants and invertebrates are established in the COPC-screening process (Section 8.3). As indicated, when both plant and invertebrate screening values were available for a given analyte, the lower of the two was used in the COPC screen. This afforded a conservative assessment of risks to lower trophic levels, as well as establishing COPCs for further evaluation in the Step 2 food-web assessment. The data from screening Tables 8-1 to 8-3 are summarized below to reflect the potential risk to lower trophic-level plants and invertebrates, based on screening HQs greater than 1.0.

	Fill Area	**Other Area**	**Pesticide Area**
Aluminum	X	X	not measured
Chromium	X	X	not measured
Cobalt		X	not measured
Copper	X	X	not measured
Lead	X	X	not measured
Mercury	X	X	not measured

	Fill Area	Other Area	Pesticide Area
Selenium	X	X	not measured
Silver		X	not measured
Vanadium	X	X	not measured
Zinc	X	X	not measured
Total PAH		X	not measured
Total phthalates		X	not measured
Total DDT	not measured	not measured	X

8.6.2 Food-Web Risks to Wildlife: Mammals and Birds

The Step 2 food-web risk characterizations include several conservative assumptions. It was assumed that prey items have the same dry-weight concentration as the maximum soil concentration of COPCs on the site. In addition, wet-weight consumption quantities were used with dry-weight soil concentrations. COPCs are assumed to be 100 percent bioavailable. That is, all of the COPCs are available for absorption and expression of toxic effects. These assumptions are conservative and contribute to the conservative nature of the risk characterization and to probable overestimation of risk at this stage in the USEPA process (Steps 1 and 2).

Risks to terrestrial receptors are based on the value of HQs, or the ratio of exposure to TRVs. Because of the very conservative assumptions built into a Step 1 and 2 ecological risk screening, risks are interpreted as follows:

- HQ less than 1.0 indicates acceptable risk levels for the receptor/analyte pair. Given the conservative assumptions used for this food web, the probability of false negatives (the potential of finding acceptable risk when there is unacceptable risk) is very small.

- HQ greater than or equal to 1.0, but less than 10 indicates minimal risk to the ecological receptor. Because of the exposure assumptions used in this food-web screen, correction of obvious inaccuracies such as ingestion of soil measured in dry weight on a wet-weight basis would be expected to easily decrease exposure by an order of magnitude.

- HQ greater than 10 but less than 100 indicates potential risk levels. Toxic effects are likely to occur with such an HQ level.

- HQ greater than 100 represents the highest level of risk to ecological receptors from exposure to the COPC.

For some COPCs, there are no available TRVs. These COPCs cannot be eliminated as of concern, although they cannot be quantified. Such a COPC must be considered as a potential risk through dietary exposure.

The results of the food-web risk calculations are shown in Tables 8-4 through 8-9. A number of HQs exceed 1.0 for both the mouse and robin in the fill and other areas, and the robin in the pesticide area. Based on the HQ-interpretive scheme presented above, the food-web results for each area and ROC are summarized as follows:

	Fill Area	**Other Area**	**Pesticide Area**
Mouse			
HQ 1-10	2	2	
HQ 10-100	1	2	
HQ > 100	1	1	
Robin			
HQ 1-10	4	3	
HQ 10-100	2	4	
HQ > 100	2	3	1

Greater than one-half of the ROC/analyte pair HQs are greater than 10, reflecting the potential for risk, and eight HQs exceed 100, reflecting the highest level of risk.

8.7 UNCERTAINTY

Ecological risk characterization includes analysis of uncertainty (USEPA 1997c). Uncertainty is distinguished from variability, and arises from lack of knowledge about factors associated with the study. In a screening-level assessment such as this one, uncertainty typically stems from two study facets: the sampling plan and the toxicological data. Sources of uncertainty can include the process of selecting COPCs, assumptions made in establishing the Conceptual Site Model, adequacy of ecological characterization of the site, estimates of toxicity to receptors, and selection of model parameters. There are a number of factors that contribute to uncertainty in the ecological risk characterization for the Fort Totten site, as described below.

- Environmental media are typically sampled in a non-random fashion. That is, sampling points are chosen to best characterize known or suspected areas of contamination. Peripheral and nearby areas are undersampled, if at all, and thus the average exposure of ecological receptors is biased high. A Step 1 and 2 ERA uses the maximum measured concentration to estimate risks consistent with guidance, which represents a high bias in exposure to ROCs.

- Toxicological data used in the risk characterization represent significant uncertainty. Because there may be no known data on the effects of chemical constituents on specific ROCs, toxicological data for surrogate species are sometimes used, and this adds uncertainty.

- Food-item concentrations were overestimated. Plant and animal food items had not been sampled at the site, and no bioaccumulation factors were used to estimate the chemical concentrations in food items. The extremely conservative assumption was made that all food (vegetation, soil invertebrates, etc.) was at the same concentration as the dry-weight soil or sediment maximum. Based on a review of published bioaccumulation factors for many of the COPCs identified in this assessment, these assumptions are conservative by factors of 10 to more than 100.

- Food item concentrations were expressed on a dry-weight basis. The food ingestion rates used from the *Wildlife Exposure Factors Handbook* (USEPA 1993) are ingested food on a wet-weight basis. Because dry-weight-basis soil was directly applied as food concentrations for food items, the exposure to receptors that consume plants and animals (robin, mouse) was overestimated. Percent moisture in food items is commonly 50 percent or greater, thus the use of dry-weight food results in an artificial increase of chemical ingestion of at least 100 percent.

- Incidentally ingested soil concentrations are expressed on a dry-weight basis. USEPA (1993) clearly notes that the fraction of incidental soil ingestion should be on a wet-weight basis, and recommends that the wet food ingestion rate be converted to a dry food ingestion rate prior to calculation of dose. In conformance with USEPA (1997c) this was not performed for this screening assessment. Therefore, this assessment overestimates ingestion at the Fort Totten site.

- COPCs were assumed to be 100 percent bioavailable. The assumption that COPCs are 100 percent bioavailable is highly unlikely based on soil chemistry. Elements such as lead, manganese, and zinc are common constituents of soil. In the solid soil matrix, most of these elements are not bioavailable, and are thus not taken up into organisms exposed to these soils. The environmental behavior (and thus the bioavailability) of metals in environmental soils is complex and not well understood. The solubility and availability of these metals is dependent on a number of factors including soil Eh (a measure of the oxidation/reduction potential), pH, and availability of ligands (chemical constituents capable of bonding with metal ions) (Bodek et al. 1988b).

- The toxicological data that underpin the screening values are inherently uncertain because laboratory data are extrapolated to specific field sites such as the Fort Totten site. This uncertainty is to some extent controlled by choosing the lowest available screening values, consistent with USEPA (1997c) guidance to "be consistently conservative in selecting literature values…" This also contributes to overestimation of risk.

Although the direction of bias of some uncertainties is unknown, the overriding influence of the non-random media sampling and assumptions of 100 percent bioavailability assures that risks are overestimated.

8.8 SUMMARY OF STEPS 1 AND 2 ECOLOGICAL RISK SCREENING

As reflected in HQs greater than the benchmark of 1.0, the Step 1 and 2 ERA screening process identified potential risk from a number of analytes for several receptors over several upland areas of the Fort Totten site. As identified in the Step 1 COPC-screening process, potential risk to lower trophic level organisms (i.e., plants and/or soil invertebrates) were identified for from 1 to 12 analytes, depending on the area of Fort Totten in question. A number of the HQs were less than 10, reflecting minimal risk. However, some were greater than 10, indicating potential risk to lower trophic levels (i.e., aluminum, lead, mercury, and vanadium at both the fill area and other area [Tables 8-2 and 8-3]). Similarly, food-web calculations projected at least potential risk, and in some cases high risk (HQ>100) for some receptor/analyte pairs.

Risk assessment guidance (USEPA 1997c) calls for a Scientific Management Decision Point (SMDP) following the Step 1 and 2 process. The purpose of the SMDP is to generate communication between risk assessor and risk manager to evaluate the results of the screening ERA and generate a decision regarding whether a site does or does not represent unacceptable ecological risk, or whether addition information is needed to support the decision.

The draft RI report was reviewed by the State of New York, Department of Environmental Conservation, Division of Fish and Wildlife, the public, and the USACE project manager (i.e., the risk managers for the site). In light of the potential risks, uncertainties, and conservative nature of the ecological risk assessment for the upland areas, the risk managers concluded, in the context of the SMDP process, that further efforts to define the risks to upland ecological receptors was not warranted. USEPA guidance for ecological risk assessment (1997c) recognizes that because of the very conservative exposure assumptions used in Steps 1 and 2, COPCs may be identified that in fact pose negligible risk. Refinement of the hazards identified in Steps 1 and 2 are not warranted because:

- Comparison of site concentrations to natural and anthropogenic background concentrations would likely show similar risks for ecological receptors;
- Overestimation of the exposure concentration through use of the maximum measured concentration;
- Overestimation of the food-web doses on a wet-weight basis rather than the natural moisture content of food items – a more realistic exposure scenario than the dry weight basis used in the Step 2 food web;
- The area use factor was assumed to be 1.0 resulting in the assumption that receptors forage at no other location except on the upland area all year long, even in the case of species that are not present all year long (e.g., robins).

TABLE 8-1 STEP 1 ECOLOGICAL RISK SCREEN, FORT TOTTEN PESTICIDE AREA

Analyte	**Minimum Conc. (ug/kg)**	**Maximum Conc. (ug/kg)**	**Maximum Location**	**Detection Frequency**	**Screening Value**	**Source**	**HQ**	**COPC**
4,4'-DDD	20	71	624-SS-53-01	2/2	NA	NA	NA	
4,4'-DDE	22	44	624-SS-53-01	2/2	NA	NA	NA	
4,4'-DDT	200	1100	624-SS-03-01	7/7	NA	NA	NA	
Total DDT products		1100	624-SS-03-01		731	a	1.5	**YES**
Endrin aldehyde	ND	8.2	624-SS-53-01	1/2	NA	NA	NA	
Endrin ketone	13	32	624-SS-53-01	2/2	NA	NA	NA	
Total drins	15.2	40.2	624-SS-53-01		730	a	0.1	
gamma-BHC	3.2	5.2	624-SS-53-01	2/2	NSV	NSV	NSV	**YES**
gamma-Chlordane	ND	8.7	624-SS-53-01	1/2	625	b	0.0	
Heptachlor epoxide	ND	120	624-SS-05-01	3/8	NSV	NSV	NSV	**YES**

NA=not applicable
NSV=no screening value
a=RIVM 1994, 1995, 2000
b=Cikutovic et al. 1993

TABLE 8-2 STEP 1 ECOLOGICAL RISK SCREEN, FORT TOTTEN FILL AREA

Analyte	Units	Minimum Conc.	Maximum Conc.	Maximum Location	Detection Frequency	Screening Value	Screening Source	HQ	COPC
Metals									
Aluminum	mg/kg	4400	8380	FLA-SS-46-01	12/12	600	c	14.0	**YES**
Antimony	mg/kg	0.35	3.7	FLA-SS-47-01	12/12	5	b	0.7	
Arsenic	mg/kg	2.8	9.5	FLA-SS-48-01	12/12	37	a	0.3	
Barium	mg/kg	69.4	316	FSS-SB-13-01	12/12	500	b	0.6	
Beryllium	mg/kg	0.19	0.54	FLA-SS-49-01	12/12	10	b	0.1	
Cadmium	mg/kg	ND	1.6	FLA-SS-47-01	11/12	29	a	0.1	
Calcium	mg/kg	1800	22500	FLA-SS-47-01	12/12	EN	EN	EN	
Chromium	mg/kg	11.7	27.8	FLA-SB-11-01	12/12	5	a	5.6	**YES**
Cobalt	mg/kg	3.7	7.5	FLA-SS-48-01	12/12	20	b	0.4	
Copper	mg/kg	30.1	198	FLA-SB-10-01	12/12	61	a	3.2	**YES**
Iron	mg/kg	10600	34300	FLA-SB-11-01	12/12	EN	EN	EN	
Lead	mg/kg	168	743	FSS-SB-13-01	12/12	50	b	14.9	**YES**
Magnesium	mg/kg	1970	4750	FLA-SS-47-01	12/12	EN	EN	EN	
Manganese	mg/kg	212	454	FLA-SS-47-01	12/12	500	b	0.9	
Mercury	mg/kg	0.25	1.3	FLA-SB-10-01	12/12	0.1	c	13.0	**YES**
Nickel	mg/kg	12.8	22.2	FLA-SS-48-01	12/12	30	b	0.7	
Potassium	mg/kg	716	1700	FLA-SB-12-01	12/12	EN	EN	EN	
Selenium	mg/kg	ND	1.1	FLA-SS-51-01	8/12	1	b	1.1	**YES**
Silver	mg/kg	ND	0.57	FLA-SS-48-01	5/12	2	b	0.3	
Sodium	mg/kg	120	214	FLA-SB-11-01	12/12	EN	EN	EN	
Thallium	mg/kg	ND	0.18	FLA-SB-12-01	4/12	1	b	0.2	
Vanadium	mg/kg	18.5	33	FLA-SB-12-01	12/12	2	b	16.5	**YES**
Zinc	mg/kg	101	494	FLA-SB-10-01	12/12	120	a	4.1	**YES**
PAH									
2-Methylnaphthalene	ug/kg	ND	88	FLA-SS-50-01	6/12	NA	NA	NA	
Acenaphthene	ug/kg	ND	130	FLA-SS-48-01	1/12	NA	NA	NA	
Acenaphthylene	ug/kg	ND	53	FLA-SS-47-01	5/12	NA	NA	NA	
Anthracene	ug/kg	51	230	FLA-SS-48-01	10/12	NA	NA	NA	
Benz[a]anthracene	ug/kg	180	770	FLA-SS-48-01	12/12	NA	NA	NA	

TABLE 8-2 (continued)

Analyte	Units	Minimum Conc.	Maximum Conc.	Maximum Location	Detection Frequency	Screening Value	Source	HQ	COPC
Benzo[a]pyrene	ug/kg	220	870	FLA-SS-48-01	12/12	NA	NA	NA	
Benzo[b]fluoranthene	ug/kg	320	1100	FLA-SS-48-01	12/12	NA	NA	NA	
Benzo[ghi]perylene	ug/kg	130	630	FLA-SS-48-01	12/12	NA	NA	NA	
Benzo[k]fluoranthene	ug/kg	120	430	FLA-SS-48-01	12/12	NA	NA	NA	
Chrysene	ug/kg	250	810	FLA-SS-48-01	12/12	NA	NA	NA	
Dibenz[a,h]anthracene	ug/kg	ND	180	FLA-SS-48-01	6/12	NA	NA	NA	
Fluoranthene	ug/kg	330	1200	FLA-SS-48-01	12/12	NA	NA	NA	
Fluorene	ug/kg	ND	92	FLA-SS-48-01	3/12	NA	NA	NA	
Indeno[1,2,3-cd]pyrene	ug/kg	150	700	FLA-SS-48-01	12/12	NA	NA	NA	
Napthalene	ug/kg	ND	1050	FLA-SB-09-01	10/12	NA	NA	NA	
Phenanthrene	ug/kg	150	940	FLA-SS-48-01	12/12	NA	NA	NA	
Pyrene	ug/kg	350	1400	FLA-SS-48-01	12/12	NA	NA	NA	
Total PAH	ug/kg	2624	9746	FLA-SS-48-01		20500	d	0.5	
Other SVOC									
bis(2-Ethylhexyl) phthalate	ug/kg	38	1800	FLA-SS-51-01	10/12	NA	NA	NA	
Butylbenzylphthalate	ug/kg	ND	73	FLA-SS-51-01	2/7	NA	NA	NA	
Di-n-butyl phthalate	ug/kg	ND	43	FLA-SS-48-01	1/7	NA	NA	NA	
Total Phthalates		47	2088	FLA-SS-51-01		30050	d	0.1	
Carbazole	ug/kg	ND	120	FLA-SS-48-01	4/7	NSV	NSV	NSV	**YES**
Dibenzofuran	ug/kg	ND	49	FLA-SS-48-01	1/12	NSV	NSV	NSV	**YES**

EN=essential nutrient
NA=not applicable
NSC=no screening value
a=U.S. EPA 2000b (Eco-SSL)
b=Efroymson et al. 1997a
c=Efroymson et al. 1997b
d=RIVM 1994, 1995, 2000

TABLE 8-3 STEP 1 ECOLOGICAL RISK SCREEN, FORT TOTTEN OTHER AREA

Analyte	Units	Minimum Conc.	Maximum Conc.	Maximum Location	Detection Frequency	Screening Value	Source	HQ	COPC
Metals									
Aluminum	mg/kg	2280	11400	FSS-SB-01-01	53/53	600	c	19.0	**YES**
Antimony	mg/kg	ND	1.8	FSS-SB-04-01	49/52	5	b	0.4	
Arsenic	mg/kg	2	19.2	FSS-SS-13-01	52/52	37	a	0.5	
Barium	mg/kg	35.7	295	FSS-SB-04-01	52/52	500	b	0.6	
Beryllium	mg/kg	0.14	0.53	FSS-SB-01-01	52/52	10	b	0.1	
Cadmium	mg/kg	ND	0.97	FSS-SS-44-01	46/53	29	a	0.0	
Calcium	mg/kg	290	13400	FSS-SB-05-01	53/53	EN	EN	EN	
Chromium	mg/kg	4.9	28.2	FSS-SB-01-01	53/53	5	a	5.6	**YES**
Cobalt	mg/kg	3.1	35.5	FSS-SS-42-01	53/53	20	b	1.8	**YES**
Copper	mg/kg	9.5	310	FSS-SS-41-01	53/53	61	a	5.1	**YES**
Iron	mg/kg	5790	23100	FSS-SB-01-01	53/53	EN	EN	EN	
Lead	mg/kg	13.6	793	FSS-SS-42-01	53/53	50	b	15.9	**YES**
Magnesium	mg/kg	485	7000	FSS-SB-05-01	53/53	EN	EN	EN	
Manganese	mg/kg	46.6	493	FSS-SB-01-01	53/53	500	b	1.0	
Mercury	mg/kg	ND	5	FSS-SS-38-01	52/53	0.1	c	50.0	**YES**
Nickel	mg/kg	7	23.7	FSS-SB-01-01	53/53	30	b	0.8	
Potassium	mg/kg	340	1450	FSS-SS-14-01	53/53	EN	EN	EN	
Selenium	mg/kg	0.18	1.3	FSS-SS-40-01	48/53	1	b	1.3	**YES**
				FSS-SS-44-01					
Silver	mg/kg	ND	2.4	FSS-SS-41-01	2/53	2	b	1.2	**YES**
Sodium	mg/kg	97.1	304	FSS-SS-43-01	53/53	EN	EN	EN	
Thallium	mg/kg	ND	0.15	FSS-SB-03-01	6/53	1	b	0.2	
				FSS-SB-06-01					
Vanadium	mg/kg	11	47.7	FSS-SS-45-01	53/53	2	b	23.9	**YES**
Zinc	mg/kg	37.6	223	FSS-SS-42-01	53/53	120	a	1.9	**YES**
PAH									
2-Methylnaphthalene	ug/kg	ND	330	FSS-SS-17-01	18/44	NA	NA	NA	
Acenaphthene	ug/kg	ND	140	FSS-SS-31-01	2/44	NA	NA	NA	
Acenaphthylene	ug/kg	ND	1500	FSS-SS-12-01	21/44	NA	NA	NA	

TABLE 8-3 (continued)

Analyte	Units	Minimum Conc.	Maximum Conc.	Maximum Location	Detection Frequency	Screening Value	Source	HQ	COPC
Anthracene	ug/kg	ND	390	FSS-SS-12-01	17/44	NA	NA	NA	
Benz[a]anthracene	ug/kg	ND	4100	FSS-SS-12-01	42/44	NA	NA	NA	
Benzo[a]pyrene	ug/kg	ND	6300	FSS-SS-12-01	42/44	NA	NA	NA	
Benzo[b]fluoranthene	ug/kg	ND	8800	FSS-SS-12-01	43/44	NA	NA	NA	
Benzo[ghi]perylene	ug/kg	ND	4100	FSS-SS-15-01	42/44	NA	NA	NA	
Benzo[k]fluoranthene	ug/kg	ND	2700	FSS-SS-12-01	40/44	NA	NA	NA	
Chrysene	ug/kg	ND	4600	FSS-SS-12-01	42/44	NA	NA	NA	
Dibenz[a,h]anthracene	ug/kg	ND	1000	FSS-SS-12-01	17/44	NA	NA	NA	
Fluoranthene	ug/kg	ND	6400	FSS-SS-12-01	43/44	NA	NA	NA	
Fluorene	ug/kg	ND	210	FSS-SS-31-01	7/44	NA	NA	NA	
Indeno[1,2,3-cd]pyrene	ug/kg	ND	4100	FSS-SS-15-01	42/44	NA	NA	NA	
Naphthalene	ug/kg	ND	290	FSS-SS-12-01	22/44	NA	NA	NA	
Phenanthrene	ug/kg	ND	1400	FSS-SS-31-01	43/44	NA	NA	NA	
Pyrene	ug/kg	ND	7700	FSS-SS-12-01	43/44	NA	NA	NA	
Total PAH	ug/kg	958	52230	FSS-SS-12-01		20500	d	2.5	**YES**
2-Chlorophenol	ug/kg	ND	390	FSS-SS-03-01	1/35	5000	d	0.1	
Benzyl butyl phthalate	ug/kg	ND	150	FSS-SB-05-01	1/9	NA	NA	NA	
bis(2-Ethylhexyl) phthalate	ug/kg	ND	74000	FSS-SS-20-01	43/44	NA	NA	NA	
Butylbenzylphthalate	ug/kg	ND	300	FSS-SS-29-01	15/35	NA	NA	NA	
Di-n-butyl phthalate	ug/kg	ND	66	FSS-SS-29-01	8/35	NA	NA	NA	
Di-n-octyl phthalate	ug/kg	ND	240	FSS-SS-20-01	1/35	NA	NA	NA	
Total Phthalates	ug/kg	135	74368	FSS-SS-20-01		30050	d	2.5	**YES**
4-Chlorophenyl phenyl ether	ug/kg	ND	380	FSS-SS-04-01	1/35	NSV	NSV	NSV	**YES**
4-Methylphenol	ug/kg	ND	55	FSS-SS-29-01	1/35	20025	d	0.0	
Carbazole	ug/kg	ND	170	FSS-SS-31-01	17/35	NSV	NSV	NSV	**YES**
Dibenzofuran	ug/kg	ND	160	FSS-SS-31-01	6/44	NSV	NSV	NSV	**YES**

EN=essential nutrient
NA=not applicable
NSC=no screening value
a=U.S. EPA 2000b (Eco-SSL)
b=Efroymson et al. 1997a
c=Efroymson et al. 1997b
d=RIVM 1994, 1995, 2000

TABLE 8-4 FOOD-WEB RISK CALCULATION FOR WHITE-FOOTED MOUSE IN THE PESTICIDE AREA

COPC	Soil Concentration (mg/kg)	Water Concentration (mg/L)	Food Concentration (mg/kg)	Dose (mg/kg/day)	TRV (mg/kg/day)	HQ	HQ>1?
Total DDT	1.1	0	1.1	0.223	1.6	0.1	
gamma-BHC	0.0052	0	0.0052	0.001	15.98	0.0	
Heptachlor epoxide	0.12	0	0.12	0.024	0.26	0.1	

Note: TRVs from Sample et al. (1996)

Body wt.=0.01936 kg; food ingestion rate=0.0038507 kg/day; incidental soil ingestion rate=0.000077 kg/day

TABLE 8-5 FOOD-WEB RISK CALCULATION FOR AMERICAN ROBIN IN THE PESTICIDE AREA

COPC	Soil Concentration (mg/kg)	Water Concentration (mg/L)	Food Concentration (mg/kg)	Dose (mg/kg/day)	TRV (mg/kg/day)	HQ	HQ>1?
Total DDT	1.1	0	1.1	1.904	0.003	634.7	**YES**
gamma-BHC	0.0052	0	0.0052	0.009	2	0.0	
Heptachlor epoxide	0.12	0	0.12	0.208	No TRV	No TRV	

Note: TRVs from Sample et al. (1996)

Body wt.=0.08102 kg; food ingestion rate=0.126919 kg/day; incidental soil ingestion rate=0.0133265 kg/day

TABLE 8-6 FOOD-WEB RISK CALCULATION FOR WHITE-FOOTED MOUSE IN THE FILL AREA

COPC	Soil Concentration (mg/kg)	Water Concentration (mg/L)	Food Concentration (mg/kg)	Dose (mg/kg/day)	TRV (mg/kg/day)	HQ	HQ>1?
Aluminum	8380	0	8380	1700.110	2.086	815.0	**YES**
Chromium	27.8	0	27.8	5.640	5466	0.0	
Copper	198	0	198	40.170	30.4	1.3	**YES**
Lead	743	0	743	150.738	15.98	9.4	**YES**
Mercury	1.3	0	1.3	0.264	14.26	0.0	
Selenium	1.1	0	1.1	0.223	0.399	0.6	
Vanadium	33	0	33	6.695	0.389	17.2	**YES**
Zinc	494	0	494	100.221	319.5	0.3	
Carbazole	0.17	0	0.17	0.034	No TRV	No TRV	
Dibenzofuran	0.16	0	0.16	0.032	No TRV	No TRV	

Note: TRVs from Sample et al. (1996)

Body wt.=0.01936 kg; food ingestion rate=0.0038507 kg/day; incidental soil ingestion rate=0.000077 kg/day

TABLE 8-7 FOOD-WEB RISK CALCULATION FOR AMERICAN ROBIN IN THE FILL AREA

COPC	Soil Concentration (mg/kg)	Water Concentration (mg/L)	Food Concentration (mg/kg)	Dose (mg/kg/day)	TRV (mg/kg/day)	HQ	HQ>1?
Aluminum	8380	0	8380	14505.767	109.7	132.2	**YES**
Chromium	27.8	0	27.8	48.122	1	48.1	**YES**
Copper	198	0	198	342.738	47	7.3	**YES**
Lead	743	0	743	1286.132	3.85	334.1	**YES**
Mercury	1.3	0	1.3	2.250	0.45	5.0	**YES**
Selenium	1.1	0	1.1	1.904	1.8	1.1	**YES**
Vanadium	33	0	33	57.123	11.4	5.0	**YES**
Zinc	494	0	494	855.113	14.5	59.0	**YES**
Carbazole	0.17	0	0.17	0.294	No TRV	No TRV	
Dibenzofuran	0.16	0	0.16	0.277	No TRV	No TRV	

Note: TRVs from Sample et al. (1996)

Body wt.=0.08102 kg; food ingestion rate=0.126919 kg/day; incidental soil ingestion rate=0.0133265 kg/day

TABLE 8-8 FOOD-WEB RISK CALCULATION FOR WHITE-FOOTED MOUSE IN THE OTHER AREA

COPC	Soil Concentration (mg/kg)	Water Concentration (mg/L)	Food Concentration (mg/kg)	Dose (mg/kg/day)	TRV (mg/kg/day)	HQ	HQ>1?
Aluminum	11400	0	11400	2312.799	2.086	1108.7	**YES**
Chromium	28.2	0	28.2	5.721	5466	0.0	
Cobalt	35.5	0	35.5	7.202	No TRV	No TRV	
Copper	310	0	310	62.892	30.4	2.1	**YES**
Lead	793	0	793	160.882	15.98	10.1	**YES**
Mercury	5	0	5	1.014	14.26	0.1	
Selenium	1.3	0	1.3	0.264	0.399	0.7	
Silver	2.4	0	2.4	0.487	No TRV	No TRV	
Vanadium	47.7	0	47.7	9.677	0.389	24.9	**YES**
Zinc	223	0	223	45.242	319.5	0.1	
bis(2-ethylhexyl)phthalate	74	0	74	15.013	19.8	0.8	
Di-n-butyl phthalate	0.066	0	0.066	0.013	594	0.0	
4-Chlorophenyl ether	0.38	0	0.38	0.077	No TRV	No TRV	
Carbazole	0.17	0	0.17	0.034	No TRV	No TRV	
Dibenzofuran	0.16	0	0.16	0.032	No TRV	No TRV	
Total PAH	52.23	0	52.23	10.596	1.08	9.8	**YES**

Note: TRVs from Sample et al. (1996)

Benzo(a)pyrene TRV used for Total PAH

Body wt.=0.01936 kg; food ingestion rate=0.0038507 kg/day; incidental soil ingestion rate=0.000077 kg/day

TABLE 8-9 FOOD-WEB RISK CALCULATION FOR AMERICAN ROBIN IN THE OTHER AREA

COPC	Soil Concentration (mg/kg)	Water Concentration (mg/L)	Food Concentration (mg/kg)	Dose (mg/kg/day)	TRV (mg/kg/day)	HQ	HQ>1?
Aluminum	11400	0	11400	19733.382	109.7	179.9	**YES**
Chromium	28.2	0	28.2	48.814	1	48.8	**YES**
Cobalt	35.5	0	35.5	61.450	No TRV	No TRV	
Copper	310	0	310	536.610	47	11.4	**YES**
Lead	793	0	793	1372.682	3.85	356.5	**YES**
Mercury	5	0	5	8.655	0.45	19.2	**YES**
Selenium	1.3	0	1.3	2.250	1.8	1.3	**YES**
Silver	2.4	0	2.4	4.154	No TRV	No TRV	
Vanadium	47.7	0	47.7	82.569	11.4	7.2	**YES**
Zinc	223	0	223	386.013	14.5	26.6	**YES**
bis(2-ethylhexyl)phthalate	74	0	74	128.094	1.1	116.4	**YES**
Di-n-butyl phthalate	0.066	0	0.066	0.114	0.11	1.04	**YES**
4-Chlorophenyl ether	0.38	0	0.38	0.658	No TRV	No TRV	
Carbazole	0.17	0	0.17	0.294	No TRV	No TRV	
Dibenzofuran	0.16	0	0.16	0.277	No TRV	No TRV	
Total PAH	52.23	0	52.23	90.410	No TRV	No TRV	

Note: TRVs from Sample et al. (1996)

Body wt.=0.08102 kg; food ingestion rate=0.126919 kg/day; incidental soil ingestion rate=0.0133265 kg/day

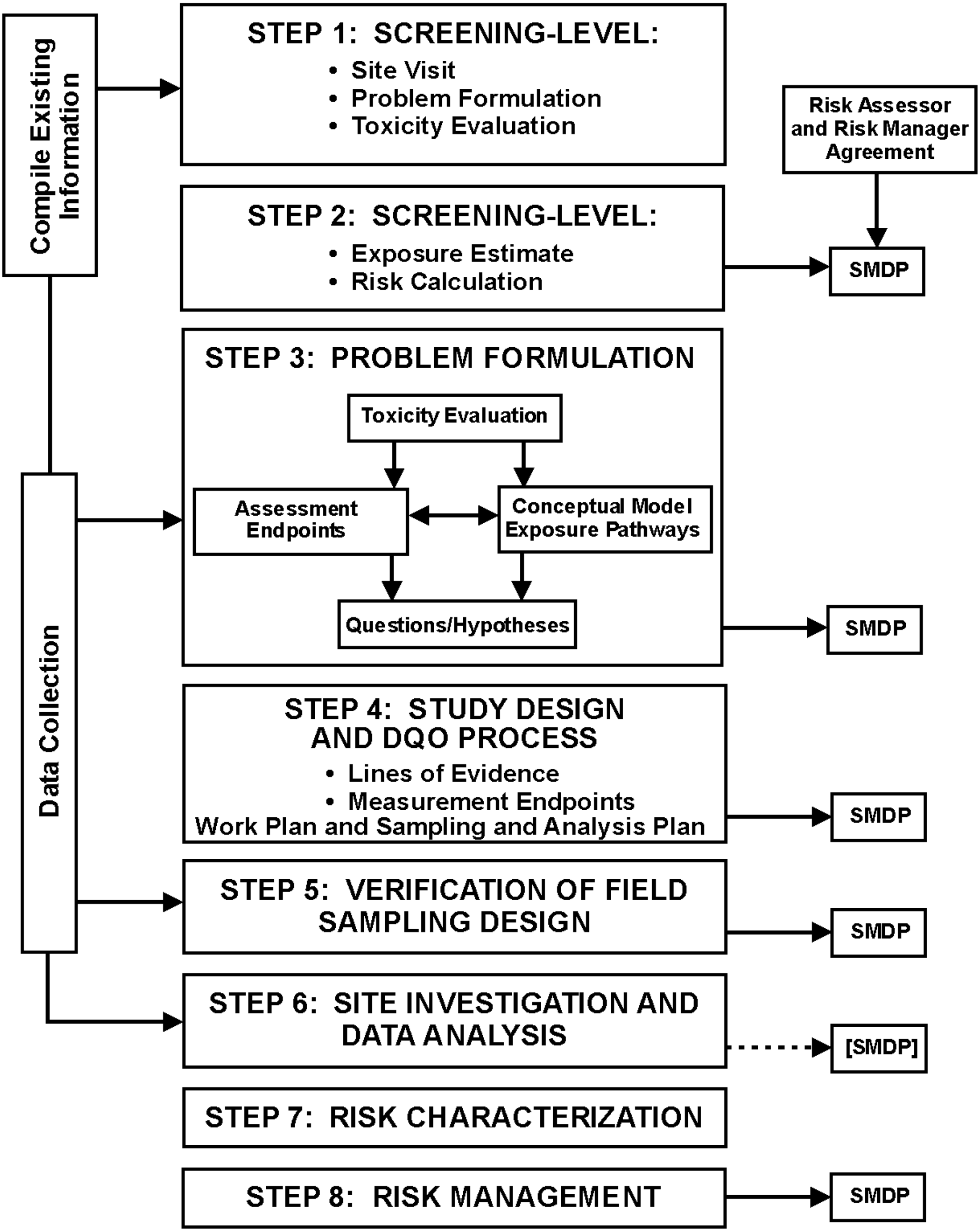


Figure 8-1. The EPA Eight-Step Ecological Risk Assessment Process for Superfund.

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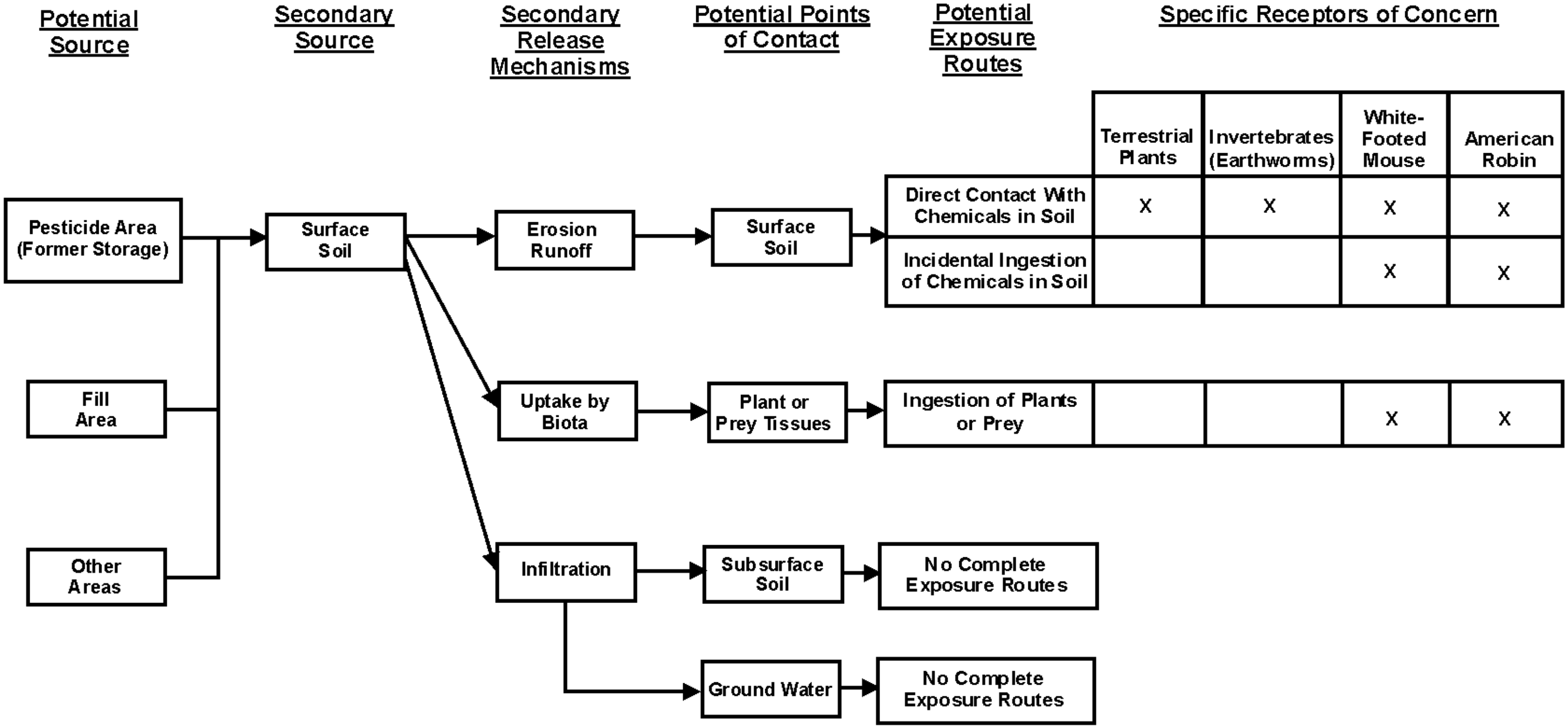

	Terrestrial Plants	Invertebrates (Earthworms)	White-Footed Mouse	American Robin
Direct Contact With Chemicals in Soil	X	X	X	X
Incidental Ingestion of Chemicals in Soil			X	X
Ingestion of Plants or Prey			X	X

Figure 8-2. Ecological Risk Screening Conceptual Site Model for Fort Totten Upland Areas.

9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 SUMMARY

The U.S. Army Corps of Engineers was tasked with performing a Remedial Investigation for the Fort Totten Coast Guard Station in Queens, New York. This action, taken under authority of the DERP-FUDS program, is derived primarily from CERCLA as amended by the Superfund Amendments and Reauthorization Act of 1986. The objective of DERP-FUDS is to give DOD the authority to clean up hazardous substances released from formerly used DOD properties, as long as the source was not disturbed or used by a subsequent occupant (non-DOD component) of the site. This DERP-FUDS project is limited to the excessed portion (9.60 acres) of Fort Totten presently owned by the U.S. Coast Guard. Several soil, sediment, and groundwater investigations have been conducted at the Fort Totten Coast Guard Station to determine the nature and extent of contamination. This report summarizes and evaluates the results, performs a quantitative risk assessment, and provides conclusions as to whether or not further HTRW remedial efforts are necessary.

Several previous environmental investigations examined potential source areas on the Fort Totten Formerly Used Defense Site. USACE commissioned the first Site Investigation of the Coast Guard Station in 1988. Section 1.2.3 reviews the activities of each past investigation. Building 624 surface soil shows little pesticide contamination; therefore, no further sampling is recommended for this area. In addition, surface soil samples from around Buildings 609 and 625 showed no PCB contamination, and no further sampling is planned there. There have been isolated and spotty detentions of VOC and SVOC contamination in monitoring wells, which cannot be duplicated. Monitoring Wells 2 and 3 are both downgradient of the Fill Area. In RI Phase 1, MW-2 showed some semivolatile contamination, yet MW-3 did not. In the RI Phase 2 investigation, MW-4 showed repeatable measurements of organics.

Historically there were discharges of mercury from Building 615 into Little Bay. The primary source of contamination was eliminated and potential secondary sources of mercury (the two Building 615 drain pipes) were removed. Sediment sampling shows low levels of mercury throughout Little Bay with gradient concentration increasing as the distance from the source areas increases. The increasing gradient indicates that ambient concentration of mercury in New York Harbor may be greater than concentrations in Little Bay. This conclusion is supported by various studies (see Appendix B) showing the average concentration in the Harbor is 2.59 mg/kg compared to the Little Bay average of 0.41 mg/kg and maximum of 5.25 mg/kg. The general trend of mercury concentrations in the Little Bay sediment borings shows that mercury concentrations are moderate at the surface, slightly more concentrated in the middle depths (3 to 8 ft BGS) and tapering off in the lowest depths. This is shown in Table 4-22.

There have been many studies done of mercury and other contaminants in the New York Harbor and Long Island Sound areas. It is acknowledged that there is contamination. As the R-EMAP study (Adams et. al. 1996; Section 1.1 Background) states:

> “The land uses surrounding the New York/New Jersey Estuary (both historic and modem), makes the Harbor particularly susceptible to toxic contamination. For more than a century, it has been the recipient of pollutants generated by the human activities that exist around it. The Harbor is surrounded by a population of over 20 million people and concentrated refining and manufacturing industries. It is also one of the most heavily utilized shipping ports on the East Coast. Sources of toxicants found in the Harbor include municipal and industrial discharges, atmospheric inputs, non-point source runoff, hazardous waste sites, landfills, combined sewer overflows and accidental spills.”

9.2 RISK ASSESSMENT SUMMARY

A human health and an ecological risk assessment were completed for Building 615 and Little Bay. The main source area for the shoreline and Little Bay is Building 615 and the contaminated sediment directly adjacent to the outfall pipes. As discussed elsewhere (Environmental Construction & Remediation’s Fort Totten, Flushing, New York, Closure Report), the outfall pipe was cleaned and grouted in place and there are no continuing sources of contamination from Building 615. The only continuing source of contamination is the sediment.

In addition, a human health and ecological risk assessment was completed to determine whether there are potential risks associated with constituents of potential concern (COPCs) in upland areas of the Fort Totten Coast Guard Station.

Risks for upland areas have been characterized according to the locations associated with these samples. Upland areas that have been assessed independently for total soil include:

- PCB Area (Buildings 609 and 625)
- Pesticide Area (Building 624)
- Fill Area
- Other Area (e.g., all other soil samples)

Finally, risks from groundwater were characterized as one exposure unit across the entire site.

9.2.1 Human Health Risk Assessment

9.2.1.1 Building 615 and Little Bay

The receptors of primary interest in this assessment are future human receptors that would be associated with redevelopment of the property. Future redevelopment plans are associated with increasing the use of the waterfront/shoreline property. Currently, site use is restricted. Building 615 and the proximate area are used currently by the City of New York Police Department for vehicle maintenance and modification. The U.S. Coast Guard also maintains offices and a boat pier in the area. While there may be occasional personnel in Building 615, no receptors are on the shoreline with a quantifiable frequency.

The future receptors evaluated include an adult and child recreational angler/beach comber. This scenario is consistent with the approved redevelopment plan. The future receptors are assumed to recreate along the shoreline, including fishing, collecting shellfish, collecting shoreline items, and occasional wading. Swimming was not considered likely because of the rocky and uninviting nature of the shoreline in the area of Building 615.

There are three possible exposure pathways for the future receptors: inhalation, ingestion, and dermal contact. The latter of these pathways was evaluated for each of the two receptors. While inhalation is a complete pathway, it was not assessed quantitatively because:

- The sediments are underwater for approximately 12 hours a day.
- Particle size and soil/sediment moisture content is such that fugitive dust emissions are unlikely.
- Mercury vapor is not a significant exposure route at this site based on its chemical characteristics and duration since the release.
- USEPA (1997b) concluded that while atmospheric mercury was important for global cycling, its impact at small/regional scales was insignificant.

Hence, only ingestion and dermal contact are evaluated quantitatively. The pathways evaluated include incidental ingestion of water and sediment, ingestion of biota (e.g., fish and shellfish), and dermal contact with water and sediment. The potential future receptors are adults and children.

The contaminant of concern for the Little Bay area is mercury. Mercury can be available in the environment in three forms: organic, inorganic, and elemental. The toxicity of mercury is dependent on the form in which it is contacted. That is, exposure to the same amount of mercury in each of its different forms will have a different toxic effect.

The hazards identified in the report are only for those hypothetical high-end receptors that were evaluated. It is likely that the Little Bay risk assessment overestimates the hazard to the average person who may recreate, fish, or pursue other routine activities on the shoreline. The risk assessment uses assumptions that are designed to overestimate exposure during routine activities. This risk assessment evaluates hazards using toxicity data from USEPA, which are stricter than equivalent toxicity data from USFDA or ATSDR. If the toxicity data of USFDA and/or ATSDR were used in the assessment, the total hazard index would be less than 1.0, and thus acceptable.

9.2.1.2 Upland Areas

The upland HHRA for Fort Totten Coast Guard Station was conducted to assess potential non-carcinogenic effects and cancer risks from current and future site exposure. Risks to total soils were conducted for four areas, the Fill Area, all Other Areas of the Station, the Pesticide Area, and the PCB Area. PCBs were never detected in the PCB area; therefore, quantitative risk calculations were not performed. For the other areas at the station, current and future adolescent recreational users, future residential adults and children, future commercial workers, and future construction workers were characterized for risk from ingestion, dermal contact, and inhalation of dust. Additionally, risks to future residential adults and children from consumption of homegrown produce were quantified.

Potential risks from consumption of and dermal contact with groundwater was characterized for future residential adults and children. In addition, the risks of volatile chemical inhalation while showering by future residential adults were also quantified.

Risks for each of the Upland Area locations are summarized below.

Fill Area

Non-cancer hazards for the current/future adolescent recreational user were less than 1.0. Cancer risk was 4×10^{-6}, within the acceptable cancer risk range. Arsenic and benzo(a)pyrene accounted for most of this cancer risk. Non-cancer hazards for the future commercial worker were acceptable with a cumulative hazard index (HI) of 0.04. As with the recreational user, cancer risks were slightly above 1×10^{-6}, with arsenic responsible for the majority of this risk. Finally, both non-cancer and cancer risks for the future construction workers were acceptable, with cumulative HI and cancer risks of 0.2 and 6×10^{-7}.

Non-cancer hazards to future residential adults were less than 1.0. Non-cancer risks to future residential children exceeded 1.0 (1.2), however when target organs are considered, no target organ had a HI greater than 1.0. Cancer risks for residential adults and children exceeded 1×10^{-6} (3×10^{-5}) but were within USEPA's acceptable risk range of 10^{-6} to 10^{-4}. The cancer risks were driven primarily by arsenic (2×10^{-5}) and benzo(a)pyrene (1×10^{-5}); however, concentrations of arsenic and benzo(a)pyrene found in the Fill Area are representative of urban locations, and are not associated with Coast Guard activities that may have taken place in the area (Section 4.18).

Lead risks were addressed using USEPA's IEUBK lead model for children and Adult Lead Model for commercial and construction workers, and were found to be acceptable for both residential children and adults.

Other Area

Non-cancer hazards for the current/future adolescent recreational user were acceptable (cumulative HI of 0.15). Cancer risks were 5×10^{-6}, within the acceptable cancer risk range. Arsenic and benzo(a)pyrene accounted for most of this cancer risk. Non-cancer hazards for the future commercial worker were acceptable with a cumulative HI of 0.04. As with the recreational user, cancer risks were 4×10^{-6}, with arsenic and benzo(a)pyrene responsible for the majority of this risk. Finally, both non-cancer and cancer risks for the future construction workers were acceptable with cumulative HI and cancer risks of 0.2 and 8×10^{-7}.

As at the Fill Area, the non-cancer hazard index for future residential adults in the Other Area were less than 1.0. A non-cancer hazard index of 1.2 was found for future residential children; however, once target organs have been taken into account, no target organ had a non-cancer hazard index greater than 1.0. Cancer risks for residential adults and children exceeded 1×10^{-6} (4×10^{-5}) but were within USEPA's acceptable risk range of 10^{-6} to 10^{-4}. Arsenic and benzo(a)pyrene were found to represent most of this cancer risk and are representative of urban locations, not associated with activities that may have taken place in the area (Section 4.18).

Lead risks were found acceptable for both residential children and adult workers.

Pesticide Area

The only chemicals analyzed in this area were pesticides. Acceptable non-cancer and cancer risks were found for the adolescent recreational user, commercial worker, and construction worker. Residential adults and children were found to have acceptable non-cancer hazards from exposure to these chemicals. A residential cancer risk level of 6×10^{-6} was found, with the majority of risk from heptachlor epoxide. This cancer risk level is within the acceptable USEPA risk range.

Groundwater

Risk calculations were performed for residential adults and children exposed to groundwater. Non-cancer hazards for adults exceeded 1.0 at 6.0. The majority of non-cancer hazard to the adult resident was the result of the inhalation of chloroform (HQ = 4.6). The exposure concentration (23 μg/L) was the maximum of this COPC; however, the exposure-point concentration is less than the MCL for total trihalomethanes of 100 μg/L. Because inhalation risks were not quantified for children, non-cancer hazard for residential children was smaller than that for adults, but still exceeded 1.0 (cumulative HI = 3.6). Cancer risks from the consumption and dermal contact with chemicals in groundwater, and inhalation of volatiles while showering were above the acceptable cancer risk range (2×10^{-3}). Risks from benzo(a)pyrene contributed the majority of these risks at 1×10^{-3}, the result of a single detection in MW4-01-01 in Spring 2002. The results of the groundwater future residential adult and child risk assessment indicate that groundwater may not be appropriate for use as a water source.

9.2.2 Ecological Risk Assessment

9.2.2.1 Building 615 and Little Bay

An ecological risk assessment (ERA) was completed for the aquatic and shoreline areas proximate to Building 615 and Little Bay. This ERA follows guidance set forth in USEPA's "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments" (USEPA 1997c). New York State guidance (e.g., sediment criteria) was used to supplement where appropriate.

The American oyster (*Crassostrea virginica*), blue mussel (*Mytilus edulis*), blue crab (*Callinectes sapidus*), striped bass (*Morone saxatilis*), winter flounder (*Plueronectes americanus*), summer flounder (*Paralichthys dentatus*), and mummichog (*Fundulus heteroclitus*) were identified and evaluated as species that are present and important in the Fort Totten ecosystem. The ERA examined risk to aquatic receptors (e.g., fish and benthic organisms) through media-based screening values and examined aquatic-dependent receptors (mammals/birds receiving a large portion of their diet from Little Bay) through food-chain modeling. Risk to the benthic community was also examined with toxicity testing using the estuarine amphipod *Leptocheirus plumulosus.* The objective of the 28-day exposure toxicity test is to determine the chronic toxicity of the sediment.

The exposure area for the aquatic-dependent receptors is the shoreline along Building 615. Samples from this area were used for estimating hazard to food-chain exposures. In contrast, all surface samples collected in Little Bay were compared to state sediment and federal surface water screening criteria. The concentrations in the sediment, surface water, and biota sampled in the area of the site are discussed in Section 7.3.1.1. For this screening assessment, the maximum measured concentration was used as the exposure point concentration.

In the benthic toxicity tests, all of the samples tested were similar to the laboratory and reference control performance, indicating mercury in sediment samples had no adverse effects on the amphipod *L. plumulosus*. Since this amphipod was selected as the surrogate species in the measurement endpoint, it is suggested that the remainder of the benthic community is not impacted adversely.

The comparison of mercury concentration in biota to sediment and surface water indicates that there is little to no risk to the ecological receptors evaluated. The range of concentrations found in oyster tissue and water at Fort Totten indicates there would be no adverse effect on survival. The range of concentrations found in crab tissue and water at Fort Totten indicates there would be no adverse effect on survival. The range of concentrations found in blue mussel tissue and water at Fort Totten indicates there would be no adverse effect on survival. Concentrations of mercury in winter flounder whole body tissue (*P. americanus*) ranged from 0.025 to 0.20 mg/kg with a mean of 0.08 mg/kg. Concentrations of mercury in juvenile striped bass whole-body tissue (*M. saxatilis*) were undetected. Concentrations of mercury in mummichog whole-body tissue (*F. heteroclitus*) ranged from 0.045 to 0.10 mg/kg with a mean of 0.05 mg/kg. The range of concentrations found in fish tissue and surface water from Little Bay indicates there would be no adverse effect on growth and survival. The lack of an identified hazard to the identified ecological receptors strongly suggests that other similar ecological receptors would not be impacted adversely.

9.2.2.2 Upland Areas

As reflected in ecological hazard quotients (HQs) greater than 1.0, the Step 1 and 2 process identified potential risk from a number of analytes for several receptors over several areas of the Fort Totten upland site. Terrestrial plants and/or soil invertebrates are at potential risk from several analytes, particularly aluminum, lead, mercury, and vanadium (i.e., HQs>10) in both the fill and other upland area. The food-web analysis projected risk from several analytes, particularly aluminum to the white-footed mouse in both the fill and other areas; aluminum, chromium, and lead to the robin in both areas; and DDT to the robin in the pesticide area.

9.3 RECOMMENDATIONS

The primary risk/hazard to human health is from the ingestion of locally caught finfish and shellfish. The risk posed by only this exposure pathway is less than the acceptable hazard range as defined in the National Contingency Plan, 40 CFR 315. However, the combined risk from fish ingestion and other exposure routes (e.g., dermal contact) is slightly above the acceptable hazard level. Given the uncertainties and conservative nature of the risk assessment, the risk/hazard to the average member of the population is well within the acceptable hazard level.

Building 624 surface soil data showed no appreciable pesticide contamination and human health risks in this area were within those defined in the National Contingency Plan (40 CFR 315) as acceptable; therefore, no further sampling is recommended for this area. In addition, surface soil samples from around Buildings 609 and 625 detected no PCB contamination; thus, no further sampling is recommended. Acceptable human health risks were found for total soil in both the Fill Area and Other Areas; therefore, no further action is required for soil in these areas.

Consumption and dermal contact with chemicals in groundwater and inhalation of volatiles while showering had greater than acceptable non-cancer risk from chloroform, measured in MW2. Cancer risks from consumption of and dermal contact with, as well as the inhalation of volatiles were greater than the acceptable cancer risk range of 10-6 to 10-4 at 2×10-3. These cancer risks were driven by the PAH benzo(a)pyrene and dibenz(a,h)anthracene in MW4.

The biota testing suggests that mercury in Little Bay is not bioavailable and thus not available for uptake by humans or animals. The sediment sampling of Little Bay indicates that mercury concentration generally increase in concentration with depth. Remedial actions that would disturb the sediments may release bound mercury into the Bay environment. Such action would potentially create a problem in elevated mercury in the surface water and surrounding biota, which is presently not a problem.

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