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WATERSHED CONTAMINATED SOURCE DOCUMENT APRIL 2003 SITE VISIT NS GREAT
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**WATERSHED CONTAMINATED SOURCE
DOCUMENT**

SITE VISIT 16/17 APR 2003

PETTIBONE CREEK



Art

INTRODUCTION

This Watershed Contaminated Source Document (WCSD) has been prepared in accordance with the Chief of Naval Operations (CNO) *Policy on Sediment Site Investigation and Response Action* (CNO, February 2002) and the WCSD Fact Sheet – N45 (CNO, March 2003). This policy and the fact sheet provide guidance on sediment investigations and response actions to be implemented at the Navy's Installation Restoration (IR) sites. Site 17, Pettibone Creek and Boat Basin, is the subject of this document and has been designated as an IR site by the Navy.

Site 17 is potentially affected by contamination from non-Navy sources. Illinois Environmental Protection Agency (EPA) and USEPA Region 5 have conducted several investigations and remedial actions at Comprehensive Environmental Response Compensation and Liability Act (CERCLA) listed sites upstream of Naval Training Center (NTC) Great Lakes and along Pettibone Creek since 1975. These sites are industrial facilities that have operated since the early 1900s.

The Navy has identified potential areas where hazardous materials may have been released to the environment at NTC Great Lakes and possibly Site 17. These sites consisted of landfills and disposal areas, transformer storage areas, training areas, service stations, shooting ranges, and storage areas. Other potential Navy sources include surficial runoff or engine exhausts from the roadways, historical pesticides usage, and volatile organic chemicals (VOCs) from storage in tanks and drums. The Navy has also conducted several investigations of Pettibone Creek and the Boat Basin.

The purpose of this WCSD is to be a brief summary report that documents the activities that may have had an impact on the Site 17 sediments. A recent Remedial Investigation/Risk Assessment (RI/RA) that was conducted for Site 17 provides additional details on the site, the contamination, and the sources of the contamination (TtNUS, May 2003).

GENERAL SETTING

NTC Great Lakes is located in Lake County, Illinois along the shore of Lake Michigan (see Figure 1). It is bounded on the north by the City of North Chicago, on the south by the Veterans Administration Hospital and Shore Acres Golf Course & Country Club, on the east by Lake Michigan, and on the west by U.S. Route 41 (Skokie Highway). NTC Great Lakes is used to support naval training, consisting of the Administrative Command, the Recruit Training Command, and the Service School Command.

NTC Great Lakes lies within both the North Branch Chicago River Drainage Basin and the Lake Michigan North Drainage Basin. The divide between the basins lies along Green Bay Road. Precipitation that does not infiltrate into the ground flows into the Skokie River or Pettibone Creek. The areas east of

Green Bay Road, which include NTC Great Lakes, drain into Lake Michigan through Pettibone Creek. Areas west of Green Bay Road drain into the Skokie River.

Pettibone Creek is located on the Mainside of NTC Great Lakes between Sheridan Road and the western shoreline of Lake Michigan. Pettibone Creek originates in North Chicago, enters the northwest corner of NTC Great Lakes, meanders through Mainside, and discharges into Lake Michigan. The South Branch of Pettibone Creek originates in a residential area southwest of NTC Great Lakes, meanders through the golf course and Mainside, and joins Pettibone Creek approximately 1,500 feet west of Lake Michigan.

Geography, Demographics, and Land Use

NTC Great Lakes covers 470 square miles of Lake County, Illinois. Lake County is located in northeastern Illinois, north of the City of Chicago, and encompasses 24 miles of Lake Michigan shoreline. Lake County extends from Lake Michigan north to the Wisconsin border and west to McHenry County. Lake County is divided into 18 townships, 52 incorporated cities and villages, and 18 unincorporated cities and villages. The most recent 2000 United States Census Bureau data estimate the County's population at 617,975. Current land use in Lake County includes agricultural, industrial, and residential. Farmland and resorts characterize the western portions of the County, and industrial, urban, and suburban areas follow the 24 miles of Lake Michigan shoreline to the east. There are also three state parks in Lake County.

Along the northern boundary of NTC Great Lakes are highly urbanized and industrial areas. Much of the area beyond the northwestern site boundary comprises unincorporated lands of Lake County and lays vacant except for scattered retail and residential properties. Adjacent to the western boundary are primarily industrial properties; while along the southern boundary is a mixture of public open space and residential land (TtNUS, July 2001).

Site 17 comprises two geographic areas, Pettibone Creek and the Boat Basin. Pettibone Creek includes the North and South Branches and covers approximately 8,542,500 square feet or 0.3 square mile. A path along the North Branch is used by naval recruits as a jogging path. The South Branch flows at the base of steep slopes behind buildings and consequently is not frequented by people.

The second geographic area is the Boat Basin portion of Site 17. The Boat Basin is approximately 113,256 square feet in area. The Boat Basin is nearly 850 feet long and measures approximately 100 feet wide near the discharge of Pettibone Creek, 225 feet in the center, and 60 feet as it empties into Lake Michigan. The water depth in the Boat Basin ranges from several inches to 5 feet. Boats are

docked at the opening of the Boat Basin near the Inner Harbor. Because of sedimentation, the Boat Basin is too shallow for vessels to dock. Recreational fishing occurs in the Boat Basin.

Regional Geology

The geologic units encountered at NTC Great Lakes include aeolian and lacustrine deposits, glacial till, and bedrock. The Silurian age bedrock consists of Niagran and Alexandrian dolomite that is the lowermost geologic unit encountered. A more detailed summary can be found in the Site 17 RI/RA (TtNUS, May 2003).

Regional Hydrology

Pettibone Creek is a small creek that flows through NTC Great Lakes and into Lake Michigan. The Pettibone Creek Watershed is one of five Lake Michigan watersheds in Lake County, Illinois. The Watershed drains an area of 5.4 square miles and consists of the North and South Branches with minor tributaries. Pettibone Creek flows through well-defined ravines within NTC Great Lakes and is characterized by moderately steep stream bed gradients and banks with 30 to 60 percent slopes. During precipitation events, runoff from overhead bridges and nearby streets adds to the volume of Pettibone Creek.

The North Branch of Pettibone Creek flows in the Boat Basin. The North Branch, which ranges between 15 to 30 feet wide and several inches to 2 feet deep, is a perennial stream that originates in North Chicago near Commonwealth Avenue from storm drains and flows southeastward from the North Chicago area and merges with the South Branch of Pettibone Creek. On NTC Great Lakes property the North Branch flows approximately 3,600 feet before it empties into the Boat Basin. An unnamed tributary originates from storm drains near the main entrance to NTC Great Lakes and flows into the North Branch approximately 2000 feet downstream from the origin of North Branch in North Chicago.

The South Branch ranges between 10 to 20 feet wide and several inches to 2 feet deep, and begins in a residential area southwest of NTC Great Lakes. The South Branch meanders through a golf course before entering the NTC Great Lakes property. There is runoff from Sheridan Road as well as several tributaries from the west and south that meets up with the South Branch of Pettibone Creek. The golf course also drains into the creek. On NTC Great Lakes property the South Branch flows approximately 2,600 feet before it merges with North Branch approximately 950 feet upstream of the Boat Basin. Four unnamed tributaries also flow into the South Branch.

There is little floodplain area along Pettibone Creek because of the steeply sloped creek banks. The North Branch of the creek has a short time of concentration (T_C), or time it takes for a unit of water to run the watercourse. The T_C is short because the water source is primarily from an urban area that has low infiltration rates (fast run-off rates) during storms. As a result, Pettibone Creek is susceptible to flash floods characterized by high channel velocities and increased erosive potential (TtNUS, July 2001).

Surface water in Pettibone Creek flows eastward and discharges in the Boat Basin. The Illinois State Water Survey calculated the average flow of Pettibone Creek as less than 10 cubic feet per second (cfs) or 4,488 gallons a minute (TtNUS, July 2001). This can greatly increase during periods of precipitation because of runoff from overhead bridges and nearby streets.

The Illinois EPA Bureau of Water has listed the two branches of Pettibone Creek as impaired waters under the federal Clean Water Act Section 303(d) and the Water Quality Planning and Management regulation at 40 CFR Part 130 for 2002 as a medium priority. A medium priority means Pettibone Creek is a watershed containing one or more water bodies in which potential causes of impairments pose a threat to aquatic life use, fishing use, or swimming use. According to the list, Pettibone Creek was included because of data collection for the chemical monitoring of sediments. According to the list, the causes for listing the North Branch of Pettibone Creek include habitat alteration, priority organics, polychlorinated biphenols (PCBs), and metals (arsenic, copper, lead, mercury, and zinc). The sources of contamination on the list include industrial point sources, urban runoff/storm sewers, hydrologic/habitat modification, channelization, contaminated sediments, and unknown salt storage sites. The causes for listing at the South Branch of Pettibone Creek include priority organics and PCBs. The sources listed are urban runoff/storm sewers, contaminated sediments, and unknown salt storage sites.

Surrounding Areas

Industries upstream of NTC Great Lakes include North Chicago Refiners and Smelters (NCRS, also known as R. Lavin & Sons), Vacant Lot, and Fansteel. These industries have contributed to elevated concentrations of contaminants in the Pettibone Creek sediment according to the Illinois EPA and US EPA Region 5 (USEPA, April 2002 and May 2002).

NCRS/R. Lavin & Sons. In 1941, R. Lavin & Sons (a division of NCRS) began operations including the smelting and refining of non-ferrous scrap metals and the manufacture of brass and bronze ingots. The NCRS/R. Lavin & Sons facility occupies approximately 18 acres in North Chicago, northwest of NTC Great Lakes. Much of the operational portion of the facility is paved. Prominent site features include a slag pile, a settling pond, two connected surface impoundments, a process building, warehouses, and an office building. This site was added to the list of CERCLA sites by Illinois EPA in August 1990 as a result of non-compliance with Resource Conservation and Recovery Act (RCRA) regulations.

The NCRS/R. Lavin & Sons facility has four National Pollution Discharge Elimination System (NPDES)-permitted discharge points (see Figure 1) into Pettibone Creek as follows:

- 001 - The reservoir tank overflow into the southeast impoundment. Operations include recycling and reusing water for direct ingot cooling, smoke spray towers, press heat exchangers, zinc die cast molds, cupola water jackets, and cupola slag granulation. Ideally, the water is recirculated through the cooling system; however, hydraulic overload caused by precipitation or process difficulties has led the reservoir to overflow into the 002 ditch that can then overflow to the storm sewer that discharges into Pettibone Creek.
- 002 - The southeast impoundment to the storm sewer tributary of Pettibone Creek. Outfall 002 is the overflow from the 001 receiving ditch that also receives storm water runoff via storm sewers on the property. Some of the drainage area includes Warehouses I and II, the concentrator building, the furnace building, and leachate and groundwater from filled wetlands.
- 003 and 004 - Outfalls 003 and 004 receive only storm water. Outfall 003 is located in the southeastern section of the property, just south of the 002 discharge, and collects runoff from the hazardous waste storage area. Outfall 004 is located in the northeastern section of the property near the parking lot entrance. Schematics show that this outfall receives the majority of area runoff, including runoff from the railroad receiving dock, both bag houses, and the parking lot.

According to Illinois EPA documents, R. Lavin & Sons, Inc. has violated its NPDES permit limits in the past. The violation may be caused by site runoff and/or contaminated groundwater, contaminated groundwater that may be infiltrating the on-site storm water ditch, and/or the ditch discharges to the storm water outfalls that discharge to Pettibone Creek. Sediment samples collected during the Illinois EPA Extended Site Investigation showed cadmium, chromium, copper, lead, nickel, and zinc in the sample downstream of its outfall into Pettibone Creek. Illinois EPA has also indicated that "R. Lavin is a major contributor to contaminated sediments to creek" (USEPA, April 2002).

Vacant Lot. Vulcan-Louisville Smelting owned a 6.4-acre parcel of land located at the corner of Commonwealth and Martin Luther King Jr. Drive, known as the Vacant Lot, as late as 1929. By 1936, the property was transferred to the Chicago, North Shore, and Milwaukee Railroad Co. Sometime between 1936 and 1954 the property was sold to an individual who made it into a parking lot. During this period, fill material of unknown composition was brought to the lot. Tailings/cinder-like material can be found in areas of the lot, but in some areas it exists only at the surface. In August 2000, EMCO Chemical Distributors completed the purchase of the Vacant Lot and uses the property for employee parking.

An Illinois EPA Emergency Response Unit incident log indicates that the "area was filled in years ago with what appears to be materials similar to fly ash, foundry sand." The Lake County Soil Survey classifies the entire site as "made land." In 1988, a fire broke out at the lot and firefighters determined that subsurface material had become hot enough to ignite nearby brush. CERCLA investigations included a 1991 Preliminary Assessment and a 1993 Integrated Assessment that revealed the presence of VOCs, semivolatile organic compounds (SVOCs), pesticides, PCBs, and various metals. Pettibone Creek runs through the Vacant Lot from north to south. Surface runoff from the Lot enters the Creek directly, or from Martin Luther King Jr. Drive.

Fansteel. Around 1941, the western portion of the remaining Vulcan-Louisville Smelting property (approximately a 9-acre site) was transferred to the Tantalum Defense Corp., a subsidiary of Fansteel. The Fansteel facility dates back to 1942 when the U.S. Government authorized and financed its construction as an expansion to the already-existing Fansteel facility located south of Martin Luther King Jr. Drive. The facility produced tantalum mill products and formed non-ferrous metals until November 1990. The facility remains as the company's headquarters. A CERCLA investigation was also conducted at this facility in the early 1990s. In the summer of 1990, two tanks were removed after sampling revealed soil contamination in the tank area. In early 1991, the facility became inactive, many areas were vacant, and others contained idle machinery. Drums of non-hazardous waste were found in the manufacturing building and warehouse. Sources of contamination were the waste oil storage area with contaminated soil and a drum storage area that contained several drums of hazardous and non-hazardous waste according to the USEPA briefing (USEPA, April 2002). Surface runoff from the Fansteel property flows south to Martin Luther King Jr. Drive where it enters a storm water outfall and discharges into Pettibone Creek (IEPA, December 1995).

Navy. NTC Great Lakes has been used to support naval training, consisting of the Administrative Command, the Recruit Training Command, and the Service School Command since 1911. Some commercial activities such as gas stations, underground storage tanks, drum storage, dry cleaners, printers, etc. are located at the facility, but the facility does not conduct industrial type activities. The Initial Assessment Study (Rogers, Golden, & Halpern and BCM Eastern Inc., March 1986) identified 14 potential areas where hazardous materials may have been released to the environment at NTC Great Lakes. These 14 sites consisted of landfills and disposal areas, transformer storage areas, training areas, service stations, shooting ranges, and storage areas. Of these 14 sites, seven sites were recommended for further investigation and one site was recommended to undergo a cleanup action. The sites that have sources of contamination that may be discharged into Site 17 through storm water runoff include two transformer storage areas (PCBs), silk screen shop (VOCs, metals), and the service station (VOCs, SVOCs, and metals).

RESULTS

Conceptual Site Model

Using the information provided above, a conceptual site model (CSM) was developed to better understand how contaminants may have been discharged into Pettibone Creek, and once discharged how the contaminants would likely interact with the surrounding environment (see Figures 2 and 3). The CSM integrates information regarding the physical characteristics of the site, exposed populations, sources of contamination, and contaminant mobility (fate and transport) to identify potential exposure routes and receptors. A well-developed CSM allows for a better understanding of the risks at a site and aids risk managers in the identification of the potential need for remediation. The site-specific CSM for Site 17 is presented in this section and illustrated in Figures 2 and 3. The CSM defines the nature of the environmental problem at the site, and depicts the relationships among the following elements:

- Sources of contamination
- Contaminant release mechanisms and transport/migration pathways
- Potential receptors
- Exposure routes

Sources of Contamination

Site 17 consists of Pettibone Creek and the Boat Basin. The following sections present a brief description of these water bodies, known sources of contamination, and a summary of the types of chemicals found in historical samples collected in Pettibone Creek and the Boat Basin.

Historical and more recent sampling and analyses have found various classes of contaminants in the sediments of Pettibone Creek and the Boat Basin. These include polynuclear aromatic hydrocarbons (PAHs), pesticides, PCBs, and metals. Sources of contamination include the upstream industrial point sources (NPDES-permitted discharge points), urban runoff and storm water from upstream outfalls as well as outfalls from NTC Great Lakes storm sewers, atmospheric deposition of pollutants, and the presence of contaminated sediments. Previous investigations have determined that concentrations of PAHs, PCBs, pesticides, and heavy metals including arsenic, copper, lead, mercury, and zinc concentrations were higher in sediment samples collected upstream of the NTC Great Lakes properties, and offsite sources are likely to have contributed to the contaminated sediments in Pettibone Creek and the Boat Basin.

However, the interpretation of the PAH contamination should consider the wide-spread use of petroleum products in our modern, industrialized society and the fact that PAHs are common, anthropogenic

contaminants frequently detected in sediments as a result of surface water run-off and storm water from roadways and areas that have been paved with asphalt. The pesticides that were detected in the sediment samples reflect concentrations that are indicative of widespread and historic use for pesticide control. Most of the pesticide concentrations reported from the sediment samples do not exceed human health screening levels criteria; however, the concentrations frequently exceed ecological screening criteria. PCBs were detected above human health screening criteria in sediment samples at-depths greater than 3 feet in the Boat Basin and many sediment samples in the North Branch of Pettibone and the Boat Basin exceeded ecological screening criteria. Several metals were detected in the sediments of the Boat Basin and the North Branch of Pettibone Creek at concentrations that exceeded background sediment and/or human health and ecological screening criteria. In contrast, most analytical results reported for the South Branch of Pettibone Creek are similar to background sediment concentrations.

The PAHs, pesticides, PCBs, and metals were detected in the off-site, upstream samples collected during previous environmental investigations. The concentrations of pesticides, PCBs, and metals in the deeper sediment samples of the Boat Basin were greater than the surface sediment samples. The difference in concentration with depth may reflect decreases in contaminant loading over time; sediments have built up, undisturbed in the Boat Basin over an extended period (approximately 30 years since last dredging). The concentrations of most pesticides, PCBs, and metals in the at-depth samples of the Boat Basin also exceed concentrations for surface or at-depth sediments collected along Pettibone Creek.

Pettibone Creek. Pettibone Creek is considered moderately impaired with respect to designated uses, support to aquatic life, and recreational swimming (Illinois EPA, August 1998). The causes of impairment include the presence of elevated concentrations of heavy metals and alterations in habitat. Pettibone Creek has received and may continue to receive a variety of wastes from upstream industries, road runoff, storm sewers (from a large section of the City of North Chicago and 30 NTC Great Lakes storm water outfalls), and runoff/discharges from local residential properties. Most of the contamination originates near the headwaters of the North Branch of Pettibone Creek. The upstream areas adjacent to industrial sites have been cleaned up, and it is thought that additional releases to the Creek should not be as significant as they were in the past. Nevertheless, there could be residual runoff into Pettibone Creek and the upstream outfalls are still permitted under the NPDES. Sediments are contaminated with various compounds and elements (TiNUS, May 2003).

Boat Basin. The original Harbor and Boat Basin were constructed in 1906 with the outer breakwater structures added by 1923. Extensive erosion of Pettibone Creek is contributing to the silting-in of the Boat Basin and Harbor. The most recent dredging operations of the Harbor were in the early 1950s and the early 1970s.

The Boat Basin, which is approximately 2.6 acres, is the most protected portion of the Harbor and extends from the west end of the bridge upstream of the Boat Basin to the Inner Harbor. It served as an area for boat slips when the water was deeper. Access to the boat repair building used to be through the eastern portion of the Boat Basin, but now, most vessels cannot access the boat repair building because of accumulated sediment. The Boat Basin was last dredged in 1972; therefore, sediments currently present in the basin have been accumulating over the past 30 years. A large depression was dredged at the end of Pettibone Creek near the Boat Basin spillway to serve as a sediment trap. Sediment was removed relatively easily from this trap on a periodic basis; however this has not been done since 1972. It has been estimated that 30,000 cubic yards of material would have to be dredged from the Boat Basin to reestablish a desired water depth of 8 feet. Evidence from aerial photographs indicates that the Boat Basin would require dredging about once every 5 to 7 years (United States Navy, May 1990).

Contaminant Release Mechanisms and Transport/Migration Pathways

Releases from upstream industries, storm sewers, local residences, and road runoff are thought to have impacted Pettibone Creek and, ultimately, the Boat Basin. The physical and chemical characteristics of contaminants affect their mobility, transport, and bioavailability in the environment. These characteristics include bioconcentration factors, organic carbon partition coefficients, and octanol/water partition coefficients. Potential receptors may be exposed either directly to contaminants in sediment by direct contact or incidental ingestion or indirectly by the ingestion of fish. Based on information regarding past chemical releases at the site, plausible contaminant release and migration mechanisms include the following:

- Discharges of inorganic constituents (i.e., non-ferrous metals) from the four NPDES discharge points from the NCRS facility into North Branch Pettibone Creek and the subsequent adherence of these metals to sediments in the Creek.
- Infiltration of contaminated groundwater (from the NCRS facility) to storm water ditches to outfalls eventually discharging into Pettibone Creek.
- Surface runoff containing VOCs, SVOCs, pesticides, PCBs, and various metals from the upstream industrial facilities and NTC Great Lakes into Pettibone Creek.
- Surface runoff from contaminated soil in a waste oil storage area or from drums in a hazardous waste storage area located on the Fansteel property into a storm water outfall and eventual discharge into Pettibone Creek.

- Discharges of organic pollutants, PCBs, and metals from urban runoff and storm sewers into South Branch Pettibone Creek.
- Drainage from the golf course area via runoff and creeks into the South Branch of Pettibone Creek.
- Deposition of chemicals in surface water and sediment on the banks of Pettibone Creek (e.g., via surface water runoff or storm sewers outfall discharges).
- Transport of chemicals in surface water and sediment in Pettibone Creek to the surface water and sediment of the Boat Basin.
- Bioaccumulation of chemicals from the surface water and sediment of Pettibone Creek and the Boat Basin in aquatic animals.

Potential Receptors

Potential receptors could be exposed to surface water, sediment, or fish tissue at Site 17 under current and future land uses. These receptors have been identified by analyzing current land use practices, potential future land use, and the identified areas of contamination to focus the risk assessment on potential site-related exposures. The general receptor classes are:

Potential Human Health Receptors. Potential human health receptors for Site 17 include adult and adolescent recreational users under both current and future land uses. These receptors might be exposed to contaminants in surface water and sediment in Pettibone Creek and Boat Basin by ingestion and dermal contact. Swimming is not known to occur and has not been observed in the Boat Basin. Therefore, the dermal exposure scenario assumes that receptors are exposed only while wading. Potential receptors could also be exposed by ingestion of fish caught in the Boat Basin.

Potential Ecological Receptors. Potential ecological receptors (e.g., benthic macroinvertebrates and fish) can be exposed to contaminants in the surface water and sediment of Pettibone Creek by direct contact and incidental ingestion of surface water and sediment. Also, mammals and birds can be exposed to contaminants in the surface water and sediment of Pettibone Creek by direct contact, ingestion of contaminated food items, and incidental ingestion of surface water and sediment. However, because Pettibone Creek and the Boat Basin do not support large fish populations, the piscivorous exposure route is not expected to be significant. Exposure of terrestrial wildlife to contaminants in the surface water and sediment via dermal contact is unlikely to represent a major exposure pathway because fur, feathers, and chitinous exoskeletons are expected to minimize transfer of contaminants across dermal tissue.

Exposure Routes

The manner in which a receptor comes into contact with contaminants is generally the result of interactions between a receptor's behavior or lifestyle and a contaminated medium. Potential receptors could come into contact with potentially contaminated surface water and sediment. Brief explanations of the potential routes of exposure by medium are provided in this section.

Potential human and ecological receptors may come into direct contact with surface water and sediment in Pettibone Creek or the Boat Basin. Individuals may be exposed primarily via dermal contact and incidental ingestion, but the frequency of exposure is expected to be less than typical residential or industrial exposures. Exposure via inhalation is expected to be minimal because VOCs are not expected to accumulate significantly in sediment and would volatilize rapidly from surface water.

Chemicals in surface water and sediment may bioaccumulate aquatic animals. Potential recreational receptors may ingest fish caught in the Boat Basin, where individuals have been observed fishing. Also, piscivorous birds and carnivorous mammals consume sediment invertebrates and fish potentially present in Pettibone Creek and the Boat Basin and may be exposed to contaminants through food items they consume.

CONCLUSIONS AND RECOMMENDATIONS

Upstream industrial sources are the primary sources of the environmental contaminants (PAHs, pesticides, PCBs, and metals) detected in the sediments of Site 17. Predominant inorganic contaminants in the Site 17 sediments (e.g., copper, lead, and zinc) were also identified as significant environmental contaminants in sediment samples collected upstream and off-site of Site 17 during past environmental investigations. Overland run-off and storm water discharges from NTC Great Lakes to Site 17 may contribute pollutants to the watershed, but analytical results do not suggest that a significant point source(s) is(are) impacting the sediment quality of Pettibone Creek or the Boat Basin. The analytical data (TtNUS, May 2003) suggest that the primary source of contamination is historical discharge and storm water discharge within the Pettibone Creek Watershed.

The PAH concentrations in the sediment samples have increased and this is believed to be caused by wide-spread use of petroleum products in our modern, industrialized society (more roads, more traffic). The pesticide, PCB, and metals concentrations in the sediment samples have decreased compared to the concentrations reported for historical samples. There is a general trend that the sediment at the surface is "cleaner" than the sediment at depth.

Many of the potential sources of contamination still remain; especially the storm water sewer systems and the surface water runoff from the industrial facilities into Pettibone Creek. However, a few of the industrial facilities (R. Lavin & Sons and Fansteel) that have contributed to the historical contamination in Pettibone Creek have filed petitions for bankruptcy and have ceased operations. Pettibone Creek may continue to receive a variety of wastes from the upstream industries, road runoff, storm sewers, and runoff/discharges from local residential properties. Many of the potential sources (industrial sites) have been cleaned up and it is thought that additional releases to the creek should not be as significant as they were in the past. Nevertheless, there could be residual runoff into Pettibone Creek and the upstream outfalls are still permitted under the NPDES. This WCSD recommends that no remedial actions be conducted for the sediments in Pettibone Creek and the Boat Basin. The Navy should maintain documentation of the spills resulting from both Navy and non-Navy (upstream) sources.

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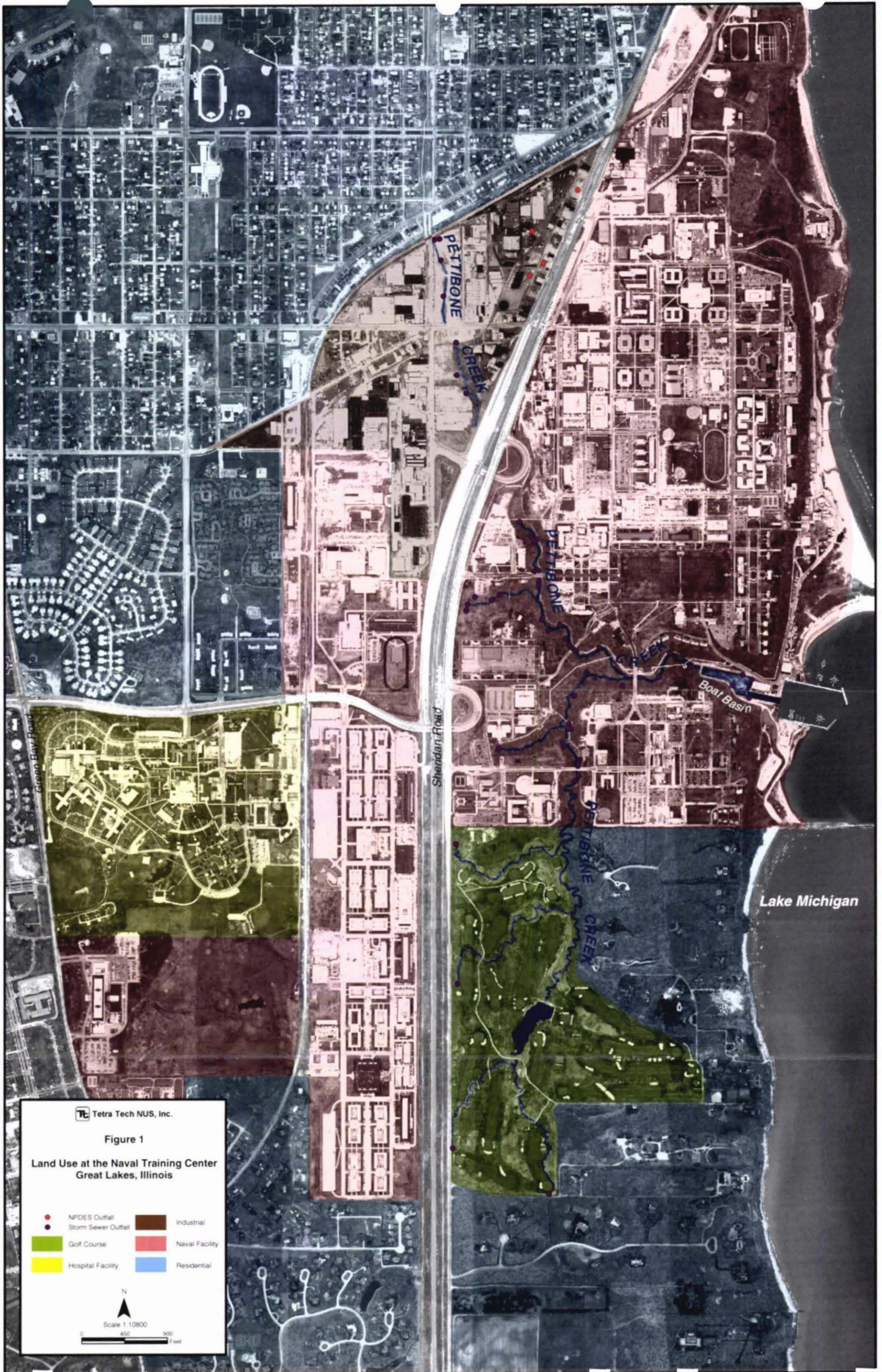


FIGURE 2

HUMAN HEALTH CONCEPTUAL SITE MODEL
 WATERSHED CONTAMINATED SOURCE DOCUMENT
 NAVAL TRAINING CENTER
 GREAT LAKES, ILLINOIS

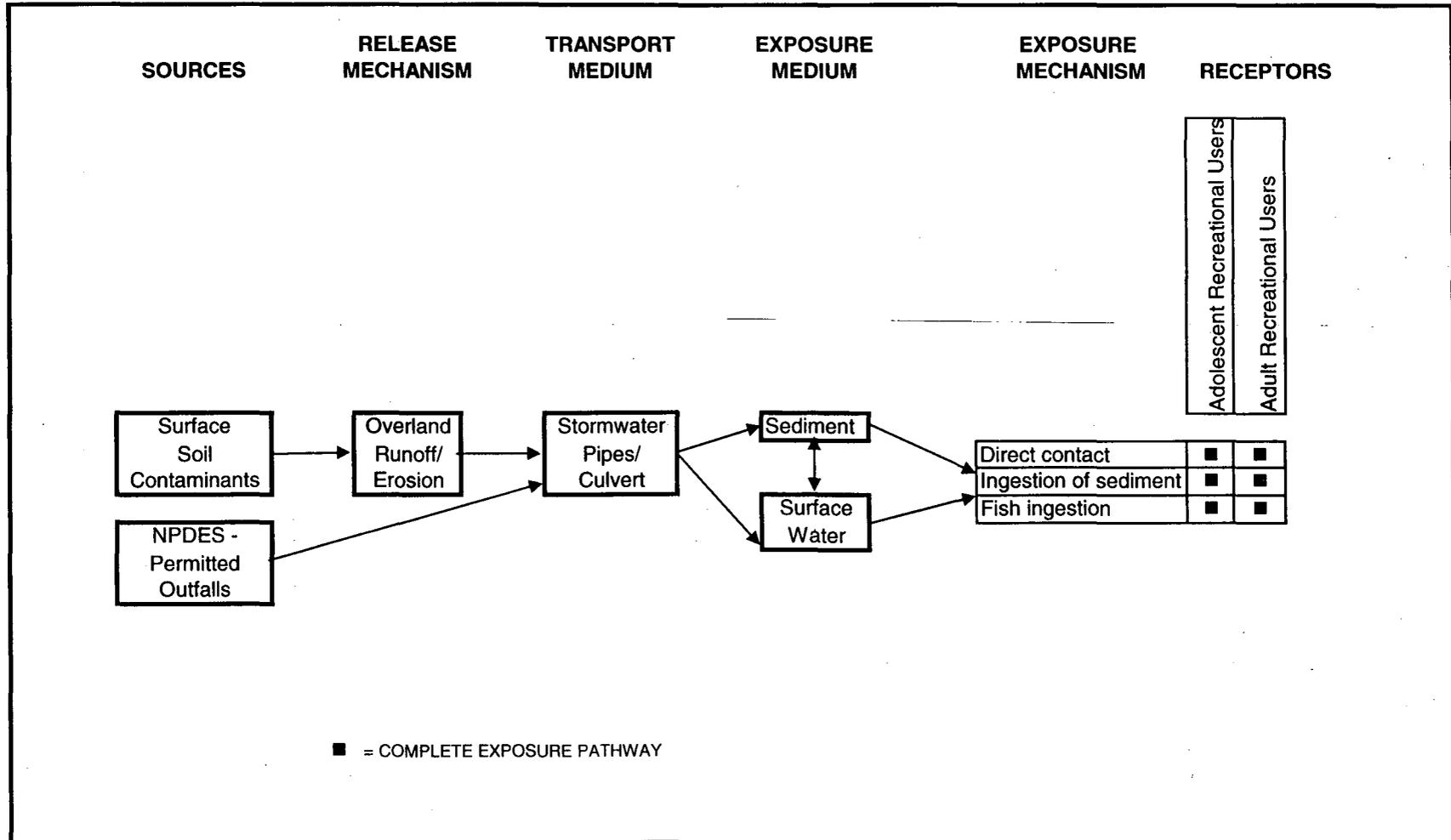


FIGURE 3

ECOLOGICAL CONCEPTUAL SITE MODEL
 WATERSHED CONTAMINATED SOURCE DOCUMENT
 NAVAL TRAINING CENTER
 GREAT LAKES, ILLINOIS

