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FINAL CONTAMINATION ASSESSMENT PLAN AND SITE-SPECIFIC HEALTH AND SAFETY
PLAN FOR CONTAMINATION ASSESSMENT INVESTIGATION NSA PANAMA CITY FL
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NAVFAC SOUTHERN



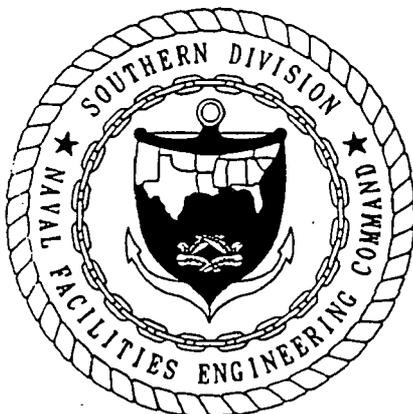
FINAL

**CONTAMINATION ASSESSMENT PLAN AND
SITE-SPECIFIC HEALTH AND SAFETY PLAN
FOR CONTAMINATION ASSESSMENT
INVESTIGATION**

**COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA**

**CTO NO.: 00011 AND 00052
NAVY CLEAN - DISTRICT I
CONTRACT NO. N62467-89-D-0317**

OCTOBER 1992



**SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA
29411-0068**

**SITE-SPECIFIC HEALTH AND SAFETY PLAN
FOR
CONTAMINATION ASSESSMENT INVESTIGATION
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA**

CTO NO.: 00011 and 00052

Contract Number N62467-89-D-0317

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October 1992

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Health and Safety Plan

REFERENCES

The following chapters of the Comprehensive Long-term Environmental Action Navy (CLEAN) Program District I Generic Health and Safety Plan (HASP) are applicable for the work anticipated at the site:

- 2.0 AUTHORITY AND RESPONSIBILITY OF HEALTH AND SAFETY PERSONNEL
- 3.0 TRAINING PROGRAM
- 4.0 MEDICAL SURVEILLANCE PROGRAM
- 5.0 ENGINEERING CONTROLS
- 6.0 PERSONAL PROTECTIVE LEVEL DETERMINATION
- 7.0 MONITORING EQUIPMENT
- 8.0 ZONATION
- 9.0 WORK PRACTICES
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- 11.0 EXCAVATION AND TRENCHING
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 - HEAT STRESS
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- 13.0 DECONTAMINATION
- 14.0 EMERGENCY PLANNING
- 15.0 HEALTH AND SAFETY FORMS AND DATA SHEETS
 - HEALTH AND SAFETY AUDIT FORM
 - ACCIDENT REPORT FORM
 - HEALTH AND SAFETY OFFICER (HSO) CHECKLIST FOR FIELD OPERATIONS
 - MATERIAL SAFETY DATA SHEETS
 - LIQUI-NOX
 - ETHYL ALCOHOL (denatured)
 - TRISODIUM PHOSPHATE
 - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) POSTER
 - DAILY HEALTH AND SAFETY AUDIT FORM

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Health and Safety Plan

REFERENCES (continued)

- ___ 16.0 RESPIRATORY PROTECTION PROGRAM
- ___ 17.0 OTHER
 - ___ ILLUMINATION
 - ___ SANITATION
 - ___ HEALTH AND SAFETY AUDIT PROCEDURES

1.0 GENERAL

1.1 SCOPE AND PURPOSE. This Health and Safety Plan (HASP) has been prepared in conformance with the Navy CLEAN Program District I (CLEAN) HASP and is intended to meet the requirements of 29 Code of Federal Regulations (CFR) 1910.120. As such, the HASP addresses those activities associated with field operations for this project. Compliance with this HASP is required for all ABB-ES personnel, contractor personnel, or third parties entering the site. This HASP is a revision of the HASP prepared under CTO 11, which dealt with work at Facilities 278 and 325. Under CTO 52, work at Facility 363 has been added.

1.2 PROJECT PERSONNEL.

1.2.1 Project Manager The project manager (PM) is the individual with overall project management responsibilities. Those responsibilities as they relate to health and safety include provision for the development of this site-specific HASP, the necessary resources to meet requirements of this HASP, the coordination of staff assignments to ensure that personnel assigned to the project meet medical and training requirements, and the means and materials necessary to resolve health and safety issues that are identified or develop on the project.

1.2.2 General Site Supervisor The General Site Supervisor is either the PM or the PM's designee who is on site and vested with the authority by the PM to carry out day-to-day site operations, including interfacing with the site Health and Safety Officer (HSO).

1.2.3 Health and Safety Officer The HSO for this project has been designated by the PM with concurrence of the Health and Safety Supervisor (HSS) or Health and Safety Manager (HSM). The HSO will have at least an indirect line of reporting to the HSM through the HSS for the duration of his/her assignment as project HSO. The HSO is responsible for developing and implementing this site-specific HASP in accordance with the CLEAN HASP. The HSO will investigate all accidents, illnesses, and incidents occurring on-site. The HSO will also conduct safety briefings and site-specific training for on site personnel. As necessary, the HSO will accompany all U.S. Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), or other governmental agency personnel visiting an ABB-ES site in response to health and safety issues. The HSO, in consultation with the HSS or HSM, is responsible for updating and modifying this HASP as site or environmental conditions change.

1.3 TRAINING. Training is defined under the CLEAN HASP, and all personnel entering potentially contaminated areas of this site must meet the requirements of 29 CFR 1910.120. Personnel without the required training will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Refer to Chapter 3.0 of the CLEAN HASP for further information.

1.4 MEDICAL SURVEILLANCE. All personnel entering potentially contaminated areas of this site will be medically qualified for site assignment through a medical surveillance program outlined in the CLEAN HASP. Personnel who have not received medical clearance will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Refer to Chapter 4.0 of the CLEAN HASP for further information.

2.0 SITE CHARACTERIZATION AND ANALYSIS

2.1 SITE NAME, LOCATION, AND SIZE. The Coastal Systems Station (CSS) in Panama City is a major Navy research and development facility located on St. Andrew Bay in Bay County, Florida (see Figure 1). It is situated approximately 103 miles east of Pensacola, 98 miles west of Tallahassee, and 7 miles west of Panama City. CSS is bounded by U.S. Highway 98 to the north, St. Andrew Bay to the east, State Route 392B (Magnolia Beach Road) to the south, and State Route 392 (Thomas Drive) to the west.

CSS Panama City consists of two operational areas that encompass 657 acres. The laboratory area, situated north of Alligator Bayou (an inlet to St. Andrew Bay), covers approximately 350 acres and houses research facilities and various support activities and tenants. The ordinance area, south of Alligator Bayou, is approximately 300 acres in extent and is used primarily for ordinance storage and limited research. The three sites being investigated are located on the laboratory side.

2.2 SITE HISTORY AND LAYOUT. The following is a background information on the three sites at CSS Panama City where contamination assessments will be performed.

Facility 325: Facility 325, located immediately south of the Heliport and consists of three 20,000-gallon fiberglass underground storage tanks (USTs) containing JP-5 jet fuel that were installed in 1976. The facility is used to fuel helicopters. A petroleum odor was detected in the soils during the installation of monitoring wells around the tanks for the Release Detection Project.

Facility 278: Facility 278 is located at the east dock alongside Alligator Bayou. The site at one time contained USTs. Contamination was discovered at the site during removal of the USTs. There were four 7,500-gallon USTs at the site that were constructed of fiberglass and installed in 1977. Each tank contained diesel fuel and had asphalt-coated steel piping. The tanks were removed and replaced with two 15,000-gallon, double walled steel tanks with a resin coating and interstitial leak detection equipment. During the removal of the old tanks, a wellpoint dewatering system was used. The discharged water was sampled for hydrocarbons but none were detected. There are no existing monitoring wells at this site.

Facility 363: Facility 363 is located along the eastern side of the CSS. The facility is an oil/water separator system. It has been reported that two releases have occurred at the site. The first release occurred in early February 1992. The second release occurred in early March 1992. The second release occurred when valves were closed to let storm water into a storm water retention pond located immediately south of the oil/water separator system. Improper valves were closed and the storm water was, instead, diverted into the 10,000-gallon fiberglass underground holding tank (a non-regulated flow through process tank). The manhole on the top of the tank was not fastened securely; therefore, bilge water leaked out of the top, into the ground, and flowed into the retention pond, and through a culvert into St. Andrew Bay. It was reported that an estimated 600 gallons of bilge water reached St. Andrew Bay as a result of the second release. Bilge water contains approximately 10 percent waste oil and 90

percent water. CSS has contracted Glenn Co. (a private contractor) to repair the tank system and remove some of the contaminated soil.

2.3 SCOPE OF WORK (WORK PLAN). ABB-ES will conduct contamination assessment investigations at Facility 325, Facility 278, and Facility 363. The assessments will include soil borings and the installation and sampling of monitoring wells. The work will be conducted in Level D protective wear. Soil samples and groundwater samples collected during the course of the investigations will be screened by an organic vapor analyzer (OVA) or a portable gas chromatograph (GC) for petroleum constituents.

3.0 TASK ANALYSIS

3.1 TASK ONE.

3.1.1 Hazardous Substances The contaminants of concern known or suspected to be present on site, along with any established exposure limits for those substances are listed in Table 3-1.

3.1.2 Site Risks. The following are the health hazards and safety hazards that are expected to be encountered at the site.

3.1.2.1 Health Hazards Contaminants to which personnel may be exposed are JP-4 and JP-5 jet fuels, diesel fuel, gasoline, waste oils, and their constituents. The primary constituents of the petroleum products that will be encountered that represent potential health hazards are described below and summarized in Table 3-1.

BENZENE is a colorless liquid with a pleasant aromatic odor. It is a moderate irritant in small amounts both as a gas and as a liquid. If inhaled in large amounts it attacks the central nervous system, possibly resulting in coma and/or respiratory arrest. Chronic poisoning causes leukemia.

ETHYL BENZENE is a colorless aromatic liquid. It is a moderate skin irritant in gaseous form. Inhalation of high concentrations of the gas may cause temporary irritation of the nose, dizziness, and depression. The liquid form can blister the skin if not washed off immediately.

TOLUENE is a colorless liquid with a pleasant aromatic odor. It is a mild skin irritant. Inhalation of high concentrations of the gas can cause temporary smarting of the eyes or irritation of the respiratory system. If the liquid form is allowed to remain on the skin for a long period of time, smarting and reddening of the skin may occur. Ingestion or aspiration of the liquid causes depressed respiration and pulmonary edema, and can result in kidney or liver damage.

XYLENE is a colorless, liquid with a sweet odor. It is a moderate skin irritant. When present as a gas in high concentrations, it can cause temporary slight smarting of the eyes or irritation of the respiratory system, headache, and dizziness. The liquid form may cause smarting or reddening of the skin if not washed off immediately. If the liquid is aspirated into the lungs it can result in severe coughing, distress, and rapidly developing pulmonary edema. If ingested, nausea, vomiting, cramps, headache, and coma can occur and may be fatal. Ingestion may also result in kidney and liver damage.

NAPHTHALENE is a volatile, white substance in its solid state with a "moth balls" or coal tar odor. Ingestion or inhalation of naphthalene causes eye irritation, headache, nausea, vomiting, sweating, and abdominal pain. Skin contact may cause redness and dermatitis. Both the vapor and the solid are irritating to the eye.

**Table 3-1
Contaminants of Concern**

Site-specific Health and Safety Plan
Naval Coastal Systems Center
Panama City, Florida

Chemical	Approximate Odor Threshold (ppm)	Permissible Exposure Limits (ppm)	Threshold Limit Value (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Benzene	4.7	1	1	Colorless liquid, pleasant aromatic odor.	Moderate skin irritant.	Inhalation of large amounts attacks central nervous system (CNS); chronic poisoning causes leukemia.
Ethyl benzene	140	100	100	Colorless liquid, aromatic odor.	Moderate skin irritant.	Liquid blisters skin, inhalation results in dizziness, depression.
Toluene	0.17	100	100	Colorless liquid, pleasant aromatic odor.	Mild skin irritant.	Ingestion or aspiration can cause pulmonary edema, depressed respiration, kidney and liver damage.
Xylene	0.05	100	100	Colorless liquid, aromatic odor.	Moderate skin irritant.	Inhalation causes headache and dizziness; vapors irritate eyes; can be fatal if ingested.
Naphthalene	—	10	10	Colorless to brown solid with an odor of mothballs.	Moderate skin irritant.	Inhalation causes headache and confusion; vapors irritate eyes.
Tetraethyl lead	No data	0.006 (skin)	0.007 (skin)	Colorless liquid with a pleasant, sweet odor.	Contact with the skin may cause itching, burning, and skin redness. The chemical can be absorbed through the skin into the body.	Symptoms of tetraethyl lead exposure include headache, anxiety, nausea, loss of appetite, and tremors.

Notes: ppm = parts per million.

TETRAETHYL LEAD is a colorless liquid with a sweet, pleasant odor. It is commonly used as an antiknock agent for aviation gasolines. The liquid can be absorbed into the body through contact with the skin, and as a moderate skin irritant, may cause itching, burning, and reddening of the skin. Ingestion or aspiration of the liquid causes headache, anxiety, nausea, loss of appetite, and tremors.

All activities at this site will be conducted in unconfined areas. This will minimize the chances of exposure of on site personnel to either high vapor concentrations or strong liquid concentrations of any of the substances described above.

3.1.2.2 Safety Hazards Safety hazards include those hazards to which personnel may be exposed that are unrelated to hazardous wastes. These include hazards such as heat stress, sunburn, snake bites, operation and presence around heavy equipment, lifting of objects, and vehicle traffic. Extreme caution should be practiced by all personnel while conducting work around drill rigs, backhoes, and other heavy equipment. During hot days, personnel should take time to drink fluids and cool off to avoid overheating and symptoms related to heat stress.

Lifting of heavy objects should be done with caution. Personnel should assist one another with moving heavy objects or use the appropriate equipment to accomplish these tasks. During all site activities, personnel should be aware of the possibility of an encounter with poisonous snakes, particularly rattlesnakes.

Power substations, power lines, underground utilities, and underground pipelines are to be avoided during drilling operations. Prior to performing soil borings and monitoring well installation, a survey will be conducted to locate subsurface utilities in the area of Facilities 278, 325, and 363. ABB-ES will coordinate the survey for gas and phone lines with the proper utility companies and the Navy will locate water, sewage, and electrical lines.

3.1.2.3 Conclusions and Risk Assessment Based on all of the available information (nature of the work, potential on site chemicals and their properties, exposure limits, etc.), hazards associated with conducting the described field work are considered to be low, assuming appropriate health and safety practices are maintained.

3.1.3 Protective Measures The following are the protective measures that will be used at the site.

3.1.3.1 Engineering Controls Whenever needed, engineering controls (i.e., fans to blow volatilized chemicals away from the work area) will be used.

3.1.3.2 Levels of Protection A level D work uniform will be used at the site when organic vapor concentrations of petroleum and gasoline constituents in the breathing zone are less than 25 ppm and benzene concentrations are less than 0.5 ppm during sustained drilling or sampling operations. Organic vapor concentrations will be monitored in the breathing zone using an OVA or FID. Benzene concentrations in the breathing zone will be monitored using a benzene 0.5/a Dräger tube. Level D Protection should only be used when the atmosphere contains no known hazard, all potential airborne contaminants can be monitored

for, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical.

Level C personal protective equipment will be used by all personnel working in the contaminated zone if FID monitoring of organic vapor concentrations in the breathing zone are greater than or equal to 25 ppm but less than 170 ppm and benzene concentrations in the breathing zone will be monitored using benzene Dräger tubes (0.5/a and 5/b).

Level B personal protective equipment will be used by all personnel working in the contaminated zone if FID monitoring in the breathing zone is greater than or equal to 170 ppm and Dräger tube (5/b) monitoring indicates greater than or equal to 50 ppm benzene.

Procedures using level B and level C personal protective equipment, heat and cold stress monitoring associated with upgrading levels of protection, and other relevant factors associated with the respiratory protection program are described in the CLEAN HASP.

3.1.4 Monitoring It is intended that real time monitoring instrumentation will be used to monitor the work environment in order to ensure the appropriate level of protection for the site team.

3.1.4.1 Air Sampling To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being used at the site, and may be used as the basis for upgrading or downgrading the levels of protection in conformance with action levels provided in this HASP and at the direction of the site HSO.

The following sampling equipment will be used at the site. Refer to Chapter 7.0 of the CLEAN HASP for information on the calibration and maintenance of the equipment.

1. Organic Vapor Analyzer (OVA)
2. Porta-FID™
3. Dräger Tubes:
 - Benzene 0.5/a
 - Benzene 5/b

3.1.4.2 Personal Monitoring Personal monitoring will be undertaken to characterize the personal exposure of high risk employees to the hazardous substances they may encounter on site. Personal monitoring will be conducted on a representative basis. Personnel who are represented by the sampling will be noted in field logs.

The following personal monitoring equipment will be used at the site. Refer to Chapter 7.0 of the CLEAN HASP for information on the maintenance and calibration of the equipment.

1. Thermoluminescent Dosimetry Body Badge

4.0 DATA SHEETS

BENZENE

BNZ

<p>Common Synonyms</p> <p>Benzol Benzene</p>		<p>Watery liquid</p> <p>Colorless</p> <p>Gasoline-like odor</p>
<p>Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.</p>		
<p>Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Put off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to knock down vapor. Soak and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>	
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access</p>		<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Competibility Class: Aromatic Hydrocarbon 3.2 Formula: C₆H₆ 3.3 IMO/IUN Designation: 3.2/1114 3.4 DOT ID No.: 1114 3.5 CAS Registry No.: 71-43-2</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic; rather pleasant aromatic odor; characteristic odor</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene. 5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death. 5.3 Treatment of Exposure: SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. If breathing is irregular or stopped, start resuscitation, administer oxygen. 5.4 Threshold Limit Value: 10 ppm 5.5 Short Term Inhalation Limits: 75 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Leukemia 5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: 4.68 ppm 5.11 IDLH Value: 2,000 ppm</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 12°F C.C. 6.2 Flammable Limits in Air: 1.3%-7.6% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back 6.7 Ignition Temperature: 1087°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 6.0 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p> <p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poison</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	1	Aesthetic Effect	3	Reactivity		Other Chemicals	2	Water	1	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 78.11 12.3 Boiling Point at 1 atm: 176°F = 80.1°C = 353.3°K 12.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K 12.5 Critical Temperature: 552.0°F = 288.9°C = 562.1°K 12.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m² 12.7 Specific Gravity: 0.879 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 2.7 12.11 Ratio of Specific Heats of Vapor (Gas): 1.061 12.12 Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 x 10⁴ J/kg 12.13 Heat of Combustion: -17,460 Btu/lb = -9698 cal/g = -406.0 x 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 30.45 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.22 psia</p>																																				
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 5 ppm/6 hr/minnow/lethal/distilled water 20 ppm/24 hr/sunfish/TL₅₀/tap water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days 8.4 Food Chain Concentration Potential: None</p>	<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Industrial pure99+ % Thiophene-free99+ % Nitration99+ % Industrial 90%85+ % Reagent99+ % 9.2 Storage Temperature: Open 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>																																				
<p>NOTES</p>																																					

TOLUENE

TOL

<p>Common Synonyms Toluol Methylbenzene Methylbenzol</p>		<p>Watery liquid</p>	<p>Colorless</p>	<p>Pleasant odor</p>
<p>Floats on water. Flammable, irritating vapor is produced.</p>				
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>				
<p>Fire</p>	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>			
<p>Exposure</p>	<p>CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>			
<p>Water Pollution</p>	<p>Dangerous to aquatic life in high concentrations. Fouling to shrimps. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>			
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>		
<p>3. CHEMICAL DESIGNATIONS 3.1 CO Competibility Class: Aromatic Hydrocarbon 3.2 Formula: C₇H₈ 3.3 IMO/UN Designation: 3.2/1294 3.4 DOT ID No.: 1294 3.5 CAS Registry No.: 108-88-3</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent; aromatic, benzene-like; distinct, pleasant</p>		
<p>5. HEALTH HAZARDS</p>				
<p>5.1 Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves. 5.2 Symptoms Following Exposure: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. 5.3 Treatment of Exposure: INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 600 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: Kidney and liver damage may follow ingestion. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eye or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.17 ppm 5.11 IDLH Value: 2,000 ppm</p>				

<p>6. FIRE HAZARDS</p>		<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																					
<p>6.1 Flash Point: 40°F C.C.; 55°F O.C. 6.2 Flammable Limits in Air: 1.27%-7% 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 967°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.7 mm/min. 6.10 Adiabatic Flame Temperature: Data not available</p>		<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 HAS Hazard Rating for Bulk Water Transportation</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>		<p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 92.14 12.3 Boiling Point at 1 atm: 231.1°F = 110.6°C = 383.8°K 12.4 Freezing Point: -139°F = -95.0°C = 178.2°K 12.5 Critical Temperature: 605.4°F = 318.6°C = 591.8°K 12.6 Critical Pressure: 596.1 psia = 40.55 atm = 4.108 MN/m² 12.7 Specific Gravity: 0.867 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.059 12.12 Latent Heat of Vaporization: 155 Btu/lb = 66.1 cal/g = 3.61 X 10⁴ J/kg 12.13 Heat of Combustion: -17,430 Btu/lb = -9666 cal/g = -405.5 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: 17.17 cal/g 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: 1.1 psia</p>																																					
<p>8. WATER POLLUTION</p>		<p>9. SHIPPING INFORMATION</p>																																					
<p>8.1 Aquatic Toxicity: 1180 mg/L/96 hr/sunfish/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0%, 5 days; 38% (theor), 6 days 8.4 Food Chain Concentration Potential: None</p>		<p>9.1 Grades of Purity: Research, reagent, nitrogen-free 99.8 + %; industrial, contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120; less pure than industrial. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																					
<p>6. FIRE HAZARDS (Continued)</p>																																							
<p>6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>																																							

m-XYLENE

XLM

<p>Common Synonyms 3-Dimethylbenzene Tolyl</p>		<p>Watery liquid Colorless Sweet odor</p>
<p>Floats on water. Flammable, irritating vapor is produced.</p>		
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: m-C₆H₄(CH₃)₂ 3.3 IMO/IUN Designators: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-38-3</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: INHALATION: remove to fresh air, administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm</p> <p>5.5 Short Term Inhalation Limit: 300 ppm for 30 min.</p> <p>5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 g/kg</p> <p>5.7 Late Toxicity: Kidney and liver damage.</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smearing of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin.</p> <p>5.10 Odor Threshold: 0.05 ppm</p> <p>5.11 IDLH Value: 10,000 ppm</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 64°F C.C.</p> <p>6.2 Flammable Limits in Air: 1.1%-6.4%</p> <p>6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.</p> <p>6.5 Special Hazards of Combustion Products: Not pertinent</p> <p>6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.</p> <p>6.7 Ignition Temperature: 966°F</p> <p>6.8 Electrical Hazard: Class I, Group D</p> <p>6.9 Burning Rate: 5.8 mm/min.</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 32</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 HAS Hazard Rating for Bulk Water Transportation</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classifications</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL₅₀/fresh water</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 6 days</p> <p>8.4 Food Chain Concentration Potential: Data not available</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 106.16</p> <p>12.3 Boiling Point at 1 atm: 209.4°F = 131.9°C = 405.1°K</p> <p>12.4 Freezing Point: -54.2°F = -47.9°C = 225.3°K</p> <p>12.5 Critical Temperature: 650.6°F = 343.6°C = 617.0°K</p> <p>12.6 Critical Pressure: 513.8 atm = 34.95 psia = 3.540 MN/m²</p> <p>12.7 Specific Gravity: 0.864 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 28.6 dynes/cm = 0.0286 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: 36.4 dynes/cm = 0.0364 N/m at 30°C</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.071</p> <p>12.12 Latent Heat of Vaporization: 147 Btu/lb = 61.9 cal/g = 3.43 X 10⁴ J/kg</p> <p>12.13 Heat of Combustion: -17,554 Btu/lb = -9752.4 cal/g = -406.31 X 10⁴ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: 26.01 cal/g</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: 0.34 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.2%</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p>NOTES</p>																																				

O-XYLENE

XLO

Common Synonyms 2-Dimethylbenzene Xylol		Watery liquid Colorless Sweet odor
Floats on water. Flammable, irritating vapor is produced.		
...DISCHARGE IF POSSIBLE. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Vapor self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water ... milk. DO NOT INDUCE VOMITING.	
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C_8H_{10} 3.3 IMO/IUN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 95-47-6		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Benzene-like; characteristic aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD ₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLM Value: 10,000 ppm		

6. FIRE HAZARDS 6.1 Flash Point: 63°F C.C.; 75°F O.C. 6.2 Flammable Limits in Air: 1.1%-7.0% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 868°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	
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7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32	
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8. WATER POLLUTION 8.1 Aquatic Toxicity: >100 mg/l/96 hr/D. magna/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb./lb. 5 days; 2.5% (theor.), 8 days 8.4 Food Chain Concentration Potential: Data not available	
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9. SHIPPING INFORMATION 9.1 Grades of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No reaction 9.4 Venting: Open (flame arrester) or pressure-vacuum	
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10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U
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11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Salt Reaction</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Salt Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 201.9°F = 144.4°C = 417.6°K 12.4 Freezing Point: -13.3°F = -25.2°C = 248.0°K 12.5 Critical Temperature: 674.8°F = 357.1°C = 630.3°K 12.6 Critical Pressure: 541.5 atm = 36.84 psia = 3.732 MN/m ² 12.7 Specific Gravity: 0.880 at 20°C (liquid) 12.8 Liquid Surface Tension: 30.53 dynes/cm = 0.0053 N/m at 15.5°C 12.9 Liquid Water Interfacial Tension: 36.06 dynes/cm = 0.03606 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.068 12.12 Latent Heat of Vaporization: 149 Btu/lb = 62.9 cal/g = 3.47 X 10 ⁴ J/kg 12.13 Heat of Combustion: -17,556 Btu/lb = -6784.7 cal/g = -406.41 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 30.64 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.26 psia	
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NOTES

p-XYLENE

XLP

Common Synonyms 1, 4-Dimethylbenzene Xylol		Watery liquid Colorless Sweet odor
Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.		
Avoid discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. DO NOT INDUCE VOMITING.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Floating to shorelines. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Aromatic Hydrocarbon 3.2 Formula: p-C ₆ H ₄ (CH ₃) ₂ 3.3 BQ/UN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-42-3		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD ₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLN Value: 10,000 ppm		

6. FIRE HAZARDS 6.1 Flash Point: 81°F C.C. 6.2 Flammable Limits in Air: 1.1%-6.6% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 870°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.6 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerizations: Not pertinent 7.6 Inhibitor of Polymerizations: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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Reactivity (Yellow)	0																																				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days 8.4 Food Chain Concentration Potential: Data not available	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 16°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 260.9°F = 128.3°C = 411.5°K 12.4 Freezing Point: 56.9°F = 13.3°C = 268.8°K 12.5 Critical Temperature: 648.4°F = 343.0°C = 616.2°K 12.6 Critical Pressure: 508.4 atm = 34.85 psia = 3.510 MN/m ² 12.7 Specific Gravity: 0.861 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.3 dynes/cm = 0.0283 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 37.8 dynes/cm = 0.0378 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 150 Btu/lb = 81 cal/g = 3.4 X 10 ⁴ J/kg 12.13 Heat of Combustion: -17,550 Btu/lb = -9764.7 cal/g = -408.41 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 37.83 cal/g 12.28 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.34 psia																																				
9. SHIPPING INFORMATION 9.1 Grades of Purity: Research: 99.99%; Pure: 99.8%; Technical: 99.0% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum	NOTES																																				

TETRAETHYL LEAD

TEL

Common Synonyms TEL Lead tetraethyl		Oily liquid Colorless, but generally dyed red Fruity odor
Sinks in water. Poisonous, flammable vapor is produced.		
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from behind barrier or protected location. Flood discharge area with water. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-poison, water contamination Restrict access Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: Poison 2.2 Class: 6
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: Pb(C ₂ H ₅) ₄ 3.3 IMO/IUN Designation: 6.1/1649 3.4 DOT ID No.: 1649 3.5 CAS Registry No.: 78-00-2		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dyed red or other distinctive color. 4.3 Odor: Sweet
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor type canister face mask for short periods; air line type for longer periods; neoprene-coated, liquid-proof gloves; protective goggles or face shield; white or light-colored clothing; rubber shoes or boots. 5.2 Symptoms Following Exposure: Increased urinary output of lead. If a large degree of absorption from inhalation or skin contact, may cause insomnia, excitability, delirium, coma and death. Do not confuse with inorganic lead. 5.3 Treatment of Exposure: Remove victim from contaminated area and consult physician immediately. INGESTION: induce vomiting. SKIN: wash immediately with kerosene or similar petroleum distillate followed by soap and water. 5.4 Threshold Limit Value: 0.1 mg/m ³ 5.5 Short Term Inhalation Limits: 0.15 mg Pb/m ³ for 30 min. 5.6 Toxicity by Ingestion: Oral rat LD ₅₀ = 17 mg/kg 5.7 Lethal Toxicity: Lead poisoning 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 40 mg/m ³		

6. FIRE HAZARDS 6.1 Flash Point: 200°F C.C.; 185°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic gases are generated in fires. 6.6 Behavior in Fire: May explode in fire. 6.7 Ignition Temperature: Decomposes above 230°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available (Continued)	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y								
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Rust and some metals cause decomposition. 7.3 Stability During Transport: Stable below 230°F. At higher temperatures, may detonate or explode when confined. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Poison, B 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classifications <table border="0"> <tr> <td>Category</td> <td>Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td>3</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>3</td> </tr> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	2	Reactivity (Yellow)	3
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Flammability (Red)	2								
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8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.20 mg/l/96 hr/bluegill/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 16°C and 1 atm: Liquid 12.2 Molecular Weight: 323.44 12.3 Boiling Point at 1 atm: Decomposes 12.4 Freezing Point: -215°F = -137°C = 136°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.633 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.5 dynes/cm = 0.0285 N/m at (est.) 25°C 12.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: (est.) -7,870 Btu/lb = -4,380 cal/g = -183 X 10 ³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.18 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available								
9. SHIPPING INFORMATION 9.1 Grades of Purity: Technical 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum									
6. FIRE HAZARDS (Continued) 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available									

5.0 SITE CONTROL

5.1 ZONATION. Due to the nature of the work (multiple soil borings and monitoring well sampling throughout the study area) and the properties of the potential chemicals found on site, typical exclusion, contamination reduction, and support zones are not necessary or practical at all locations. Therefore, where appropriate, a "floating" exclusion zone in the perimeter of the sampling site will be established to eliminate access to the area by the individuals not working on the project or involved in the assignment work. The perimeter will be at least 20 feet in radius and moved accordingly as the assessment points are moved.

5.2 COMMUNICATIONS. When radio communication is not used, the following air horn signals will be employed:

HELP	three short blasts	(. . .)
EVACUATION	three long blasts	(_ _ _)
ALL CLEAR	alternating long and short blasts	(_ . _ .)

5.3 WORK PRACTICES. General work practices to be used during ABB-ES projects are described in Chapter 9.0 of the CLEAN HASP. Work at the site will be conducted according to these established protocol and guidelines for the safety and health of all involved. Specific work practices necessary for this project or those that are of significant concern are described as follows.

- Work and sampling will be conducted in Level D clothing and equipment.

6.0 DECONTAMINATION AND DISPOSAL

All personnel and/or equipment leaving contaminated areas of the site will be subject to decontamination, which will take place in the contamination reduction zone. General decontamination practices used during ABB-ES projects are described in Chapter 13.0 of the CLEAN HASP.

6.1 PERSONNEL DECONTAMINATION. All personnel leaving the study area are subject to decontamination (as necessary). The decontamination procedure required will be determined by the nature and level of contamination found at the sites. At a minimum, site personnel will remove loose soils from boots and clothing before leaving the site. More thorough decontamination procedures will be observed as dictated by site conditions. These procedures are described in Chapter 13.0 of the CLEAN HASP.

6.1.1 Small Equipment Decontamination Small equipment will be protected from contamination as much as possible by keeping the equipment covered when at the site and placing the equipment on plastic sheeting, not the ground. Sampling equipment used at the site will be used only once or will be field cleaned between samples with soapy water (Alconox), rinsed with clean water, rinsed with an approved Quality Assurance/Quality Control solvent, and final rinsed with organic free water.

6.1.2 Heavy Equipment Decontamination Drilling equipment will be protected from contamination as much as possible by placing the equipment on plastic sheeting, not the ground. The drill rig and associated drilling equipment will be cleaned with high pressure water or high pressure steam followed by a soap and water wash and rinse. Loose material will be removed by brush. The person performing this activity will be at the level of protection used during the field investigation.

6.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS. All disposable protective gear, decontamination fluids (for both personnel and equipment), and other disposable materials will be disposed of at the site. Decontamination fluids (e.g., isopropanol from split spoons and groundwater sampling pumps) will be stored in amber glass bottles. Disposable materials (e.g., gloves and Tyveks™) will be bagged and disposed of properly.

7.0 EMERGENCY AND CONTINGENCY PLAN

This section identifies emergency and contingency planning that has been undertaken for operations at this site. Most sections of the HASP provide information that would be used under emergency conditions. General emergency planning information is addressed in Chapter 14.0 of the CLEAN HASP. The following subsections present site-specific emergency and contingency planning information.

7.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS. The site HSO or the Health and Safety designee is the primary authority for directing operations at the site under emergency conditions. All communications both on site and off site will be directed through the HSO or designee.

7.2 EVACUATION. Evacuation procedures at the site will follow those procedures discussed in Chapter 14.5 of the CLEAN HASP for upwind withdrawal, site evacuation, and evacuation of the surrounding area. Evacuation will be conducted by travelling out the north gate of the base and making a right turn on Highway 98 toward Panama City.

7.3 EMERGENCY MEDICAL TREATMENT AND FIRST AID. Any personnel injured on site will be rendered first aid as appropriate and transported to competent medical facilities for further examination and/or treatment. The preferred method of transport would be through professional emergency transportation means; however, when this is not readily available or would result in excessive delay, other transport will be authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

8.0 ADMINISTRATION

8.1 PERSONNEL AUTHORIZED DOWNRANGE. Personnel authorized to participate in downrange activities at this site have been reviewed and certified for site operations by the Project Manager and the HSS. Certification involves the completion of appropriate training, a medical examination, and a review of this site-specific HASP. All persons entering the site must use the buddy system, and check in with the Site Manager and/or HSO before going downrange.

CERTIFIED ABB ENVIRONMENTAL TEAM PERSONNEL:

<u>*+ Ken Busen</u>	<u>*+ Jack Pittman</u>
<u>*+ Peter Redfern</u>	<u>*+ Roger Durham</u>
<u>*+ Allan Stodghill</u>	<u>*+ Kelly Murray</u>
<u>*+ Celora Douse</u>	<u>*+ M. James Williams</u>
<u>*+ Pamela Wagner</u>	<u>*+ Brent Anderson</u>
<u>*+ Nicole Pagano</u>	<u>*+ Jay Koch</u>
<u> </u>	<u> </u>
<u> </u>	<u> </u>

OTHER CERTIFIED PERSONNEL:

<u> </u>	<u> </u>

- * FIRST-AID-TRAINED
- + CPR-TRAINED

8.2 HEALTH AND SAFETY PLAN (HASP) APPROVALS. By their signatures, the undersigned certify that this HASP will be used for the protection of the health and safety of all persons entering this site.

_____	_____
Health and Safety Officer	Date
_____	_____
Project Manager	Date
_____	_____
Health and Safety Manager/Supervisor	Date

8.3 FIELD TEAM REVIEW. I have read and reviewed the health and safety information in the HASP. I understand the information and will comply with the requirements of the HASP.

NAME: _____

DATE: _____

SITE/PROJECT: _____

8.4 MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all on-site personnel and kept in the Support Zone during site operations. It is not a substitute for the Medical Surveillance Program requirements consistent with the CLEAN HASP. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more space is required, use the back of this sheet.

Project: _____

Name: _____

Address: _____

Home Telephone: Area Code () _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code () _____

Do you wear contact lenses? Yes () No ()

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

Name of Personal Physician: _____

Telephone: Area Code () _____

8.4 MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all on-site personnel and kept in the Support Zone during site operations. It is not a substitute for the Medical Surveillance Program requirements consistent with the CLEAN HASP. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more space is required, use the back of this sheet.

Project: _____

Name: _____

Address: _____

Home Telephone: Area Code () _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code () _____

Do you wear contact lenses? Yes () No ()

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

Name of Personal Physician: _____

Telephone: Area Code () _____

8.4 MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all on-site personnel and kept in the Support Zone during site operations. It is not a substitute for the Medical Surveillance Program requirements consistent with the CLEAN HASP. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more space is required, use the back of this sheet.

Project: _____

Name: _____

Address: _____

Home Telephone: Area Code () _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code () _____

Do you wear contact lenses? Yes () No ()

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

Name of Personal Physician: _____

Telephone: Area Code () _____

8.5 EMERGENCY TELEPHONE NUMBERS.

Base Security	234-4373
Base Dispensary	234-4177
Base Fire Department	234-4333
Local Police Department	911
Local Rescue Service	911
Primary Hospital (Gulf Coast Hospital)	(904) 769-8341
Alternate Hospital (Bay Medical Center)	(904) 769-1511
Local Fire Department	911
Off site Emergency Services	911
Poison Control Center	(800) 492-2414
National Response Center	(800) 424-8802
Regional USEPA Emergency Response	(800) 414-8802
Site HSO: <u>Celora Douse</u>	(904) 656-1293
General Site Supervisor: <u>Michael Dunaway</u>	(904) 656-1293
Project Manager: <u>Jim Williams</u>	(904) 656-1293
ABB Environmental HSM: <u>C.E. Sundquist</u>	(207) 775-5401 x101

8.6 ROUTES TO EMERGENCY MEDICAL FACILITIES. The primary source of medical assistance for the site is:

Gulf Coast Hospital
449 W. 23rd Street
Panama City, Florida 32405
(904) 769-8341

DIRECTIONS TO PRIMARY HOSPITAL: Leave base by north gate and turn right onto Highway 98 (east bound). Cross the Hathaway Bridge and turn left onto 23rd Street (State Road 390) just past Gulf Coast Community College. Follow 23rd Street for approximately 4 miles. The hospital is on the right at the intersection of 23rd Street and Jenks Avenue (see Figure 8-1).

The alternate source of medical assistance for the site is:

Bay Medical Center
615 North Bonita Avenue
Panama City, Florida 32401
(904)769-1511

DIRECTIONS TO ALTERNATE HOSPITAL: Leave base by north gate and turn right onto Highway 98 (east bound). Cross the Hathaway Bridge and continue on Highway 98 (not Business Highway 98) for approximately 4½ miles. Turn right (south) onto State Road 77 (Cove Boulevard). Follow State Road 77 for about 1 mile. The hospital is on the left (see Figure 8-1).

DIRECTIONS TO BASE DISPENSARY: The Base Dispensary is located in Building 148, which is on the corner of Vernon Avenue and Sky Lark Drive.

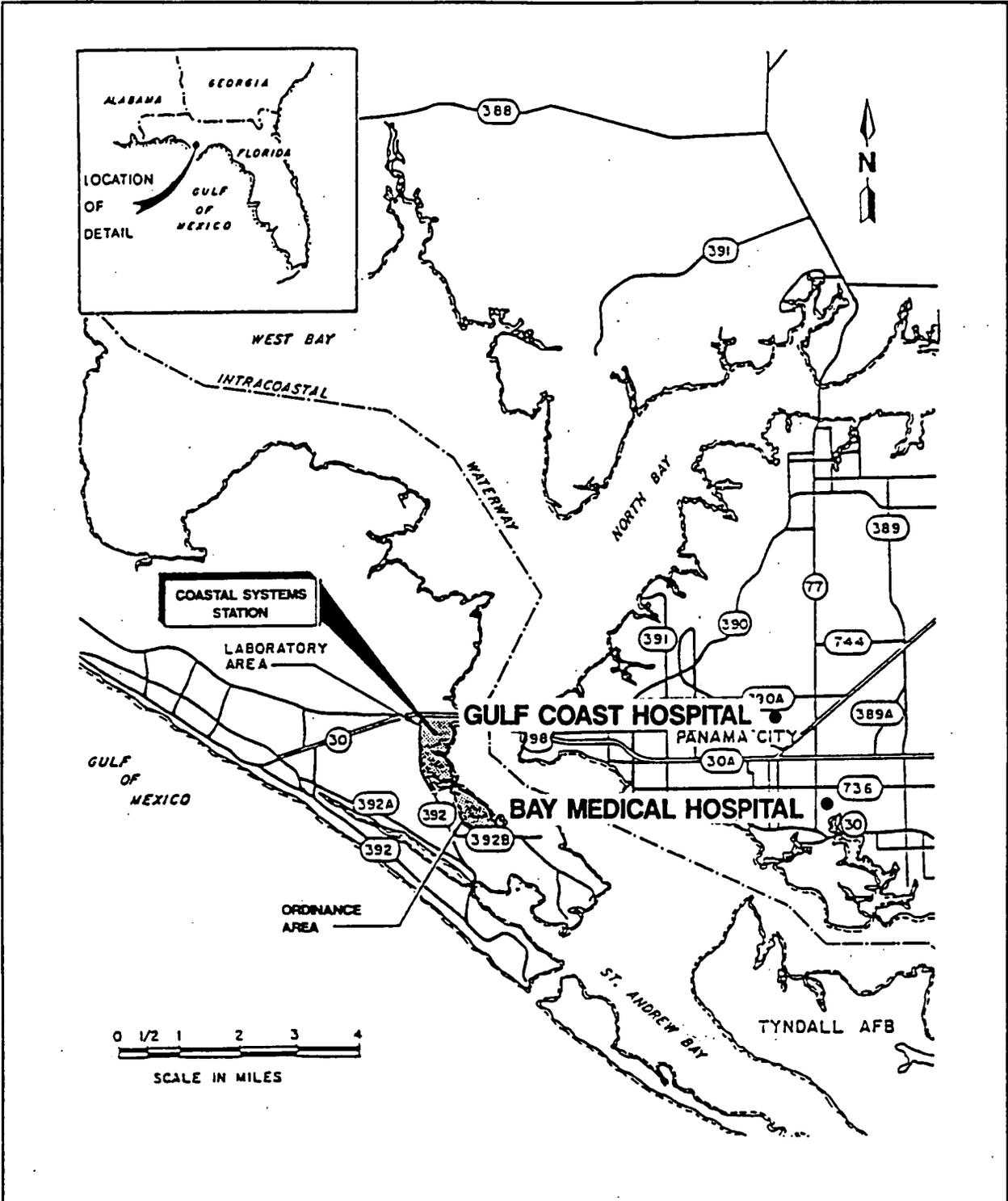


FIGURE 8-1
HOSPITAL LOCATIONS



HEALTH AND SAFETY PLAN

**COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA**

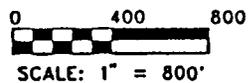
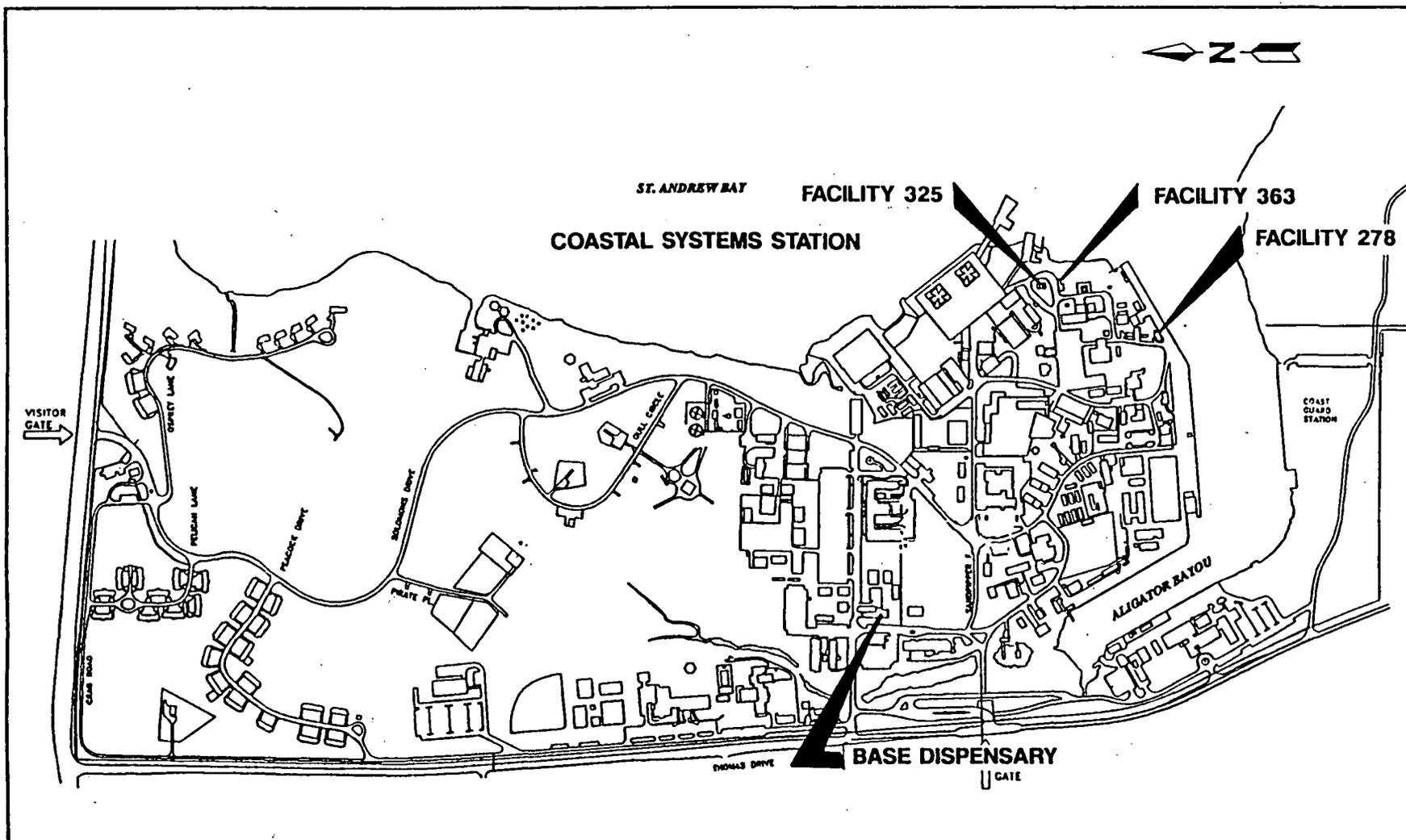


FIGURE 8-2
BASE DISPENSARY LOCATION



HEALTH AND SAFETY PLAN
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

CONTAMINATION ASSESSMENT PLAN
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

CTO NO.: 00011 and 00052

Contract Number N62467-89-D-0317

Prepared by:

**ABB Environmental Services, Inc.
2590 Executive Center Circle East
Berkeley Building
Tallahassee, Florida 32301**

Prepared for:

**Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
Charleston, South Carolina 29411-0068**

Luis Vazquez, Engineer-in-Charge

October, 1992

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1.0 INTRODUCTION

ABB Environmental Services (ABB-ES), Inc., was contracted by the Naval Facilities Engineering Command, Southern Division (SOUTHNAVFACENGCOM) to prepare a Contamination Assessment Plan (CAP) for three sites at the Coastal Systems Station (CSS) Panama City, Florida. The purpose of the CAP is to outline field investigations and sampling programs for the sites that will assess the extent of petroleum contamination. The following report presents the site location, the site history and conditions, and presents the rationale for the proposed investigation to be implemented during the Contamination Assessment (CA).

2.0 BACKGROUND

2.1 SITE DESCRIPTION. CSS Panama City is a major Navy research and development facility located on St. Andrew Bay in Bay County, Florida (see Figure 1). It is situated approximately 103 miles east of Pensacola, 98 miles west of Tallahassee, and 7 miles west of Panama City. CSS is bounded by U.S. Highway 98 to the north, St. Andrew Bay to the east, State Route 392B (Magnolia Beach Road) to the south, and State Route 392 (Thomas Drive) to the west.

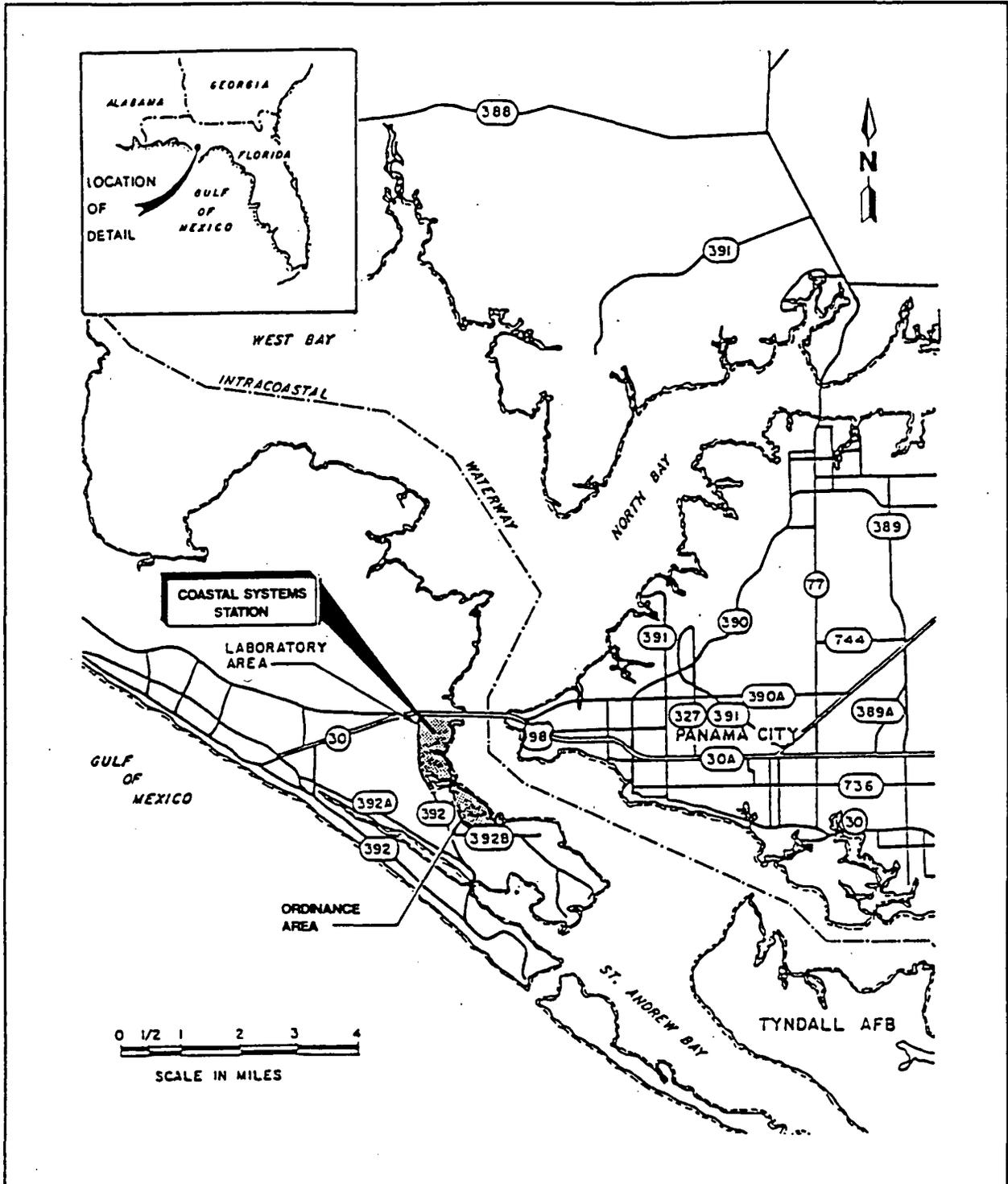
CSS consists of two operational areas that encompass 657 acres. The laboratory area, situated north of Alligator Bayou (an inlet to St. Andrew Bay), covers approximately 350 acres and houses research facilities and various support activities and tenants. The ordinance area, south of Alligator Bayou, is approximately 300 acres and is used primarily for ordinance storage and limited research. Both sites covered in this CAP are located in the laboratory area.

2.2 SITE HISTORY. The following is background information on the three sites at CSS Panama City where contamination assessments will be performed. See Figure 2 for locations of these sites within the base.

Facility 325: Facility 325, located immediately south of the Heliport, consists of three 20,000-gallon fiberglass underground storage tanks (USTs) containing JP-5 jet fuel that were installed in 1976. The facility is used to fuel helicopters. A petroleum odor was detected in the soils during the installation of monitoring wells around the tanks for the Navy Release Detection Program in 1989. Currently, there are seven existing monitoring wells.

Facility 278: Facility 278 is located at the east dock alongside Alligator Bayou. The site at one time contained USTs. Contamination was discovered at the site during removal of the USTs. There were four 7,500-gallon USTs at the site that were constructed of fiberglass and installed in 1977. Each tank contained diesel fuel and had asphalt-coated steel piping. The tanks were removed and replaced with two 15,000-gallon, double walled steel tanks with a resin coating and interstitial leak detection equipment. During the removal of the old tanks, a wellpoint dewatering system was used. The discharged water was sampled for hydrocarbons but none were detected. There are no existing monitoring wells at this site.

Facility 363: Facility 363 is located along the eastern side of the CSS station. The facility is an oil/water separator system. It has been reported that two releases have occurred at the site. The first release occurred in early February 1992. The second release occurred in early March 1992. The second release occurred when valves were closed to let storm water into a storm water retention pond located immediately south of the oil/water separator system. Improper valves were closed and the storm water was, instead, diverted into the 10,000-gallon fiberglass UST holding tank (a non-regulated flow through process tank). The manhole on the top of the tank was not fastened securely; therefore, bilge water leaked out of the top, into the ground, and flowed into the retention pond, and through a culvert into St. Andrews Bay. It was reported that an estimated 600 gallons of bilge water reached St. Andrews Bay as a result of the second release. Bilge water contains approximately 10 percent waste oil and 90



SOURCES: SOUTHNAVFACENCOM, 1983; JOHNSON AND ASSOC., 1986.

FIGURE 1
FACILITY LOCATION



CONTAMINATION ASSESSMENT PLAN

**COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA**

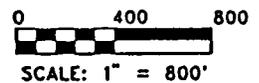
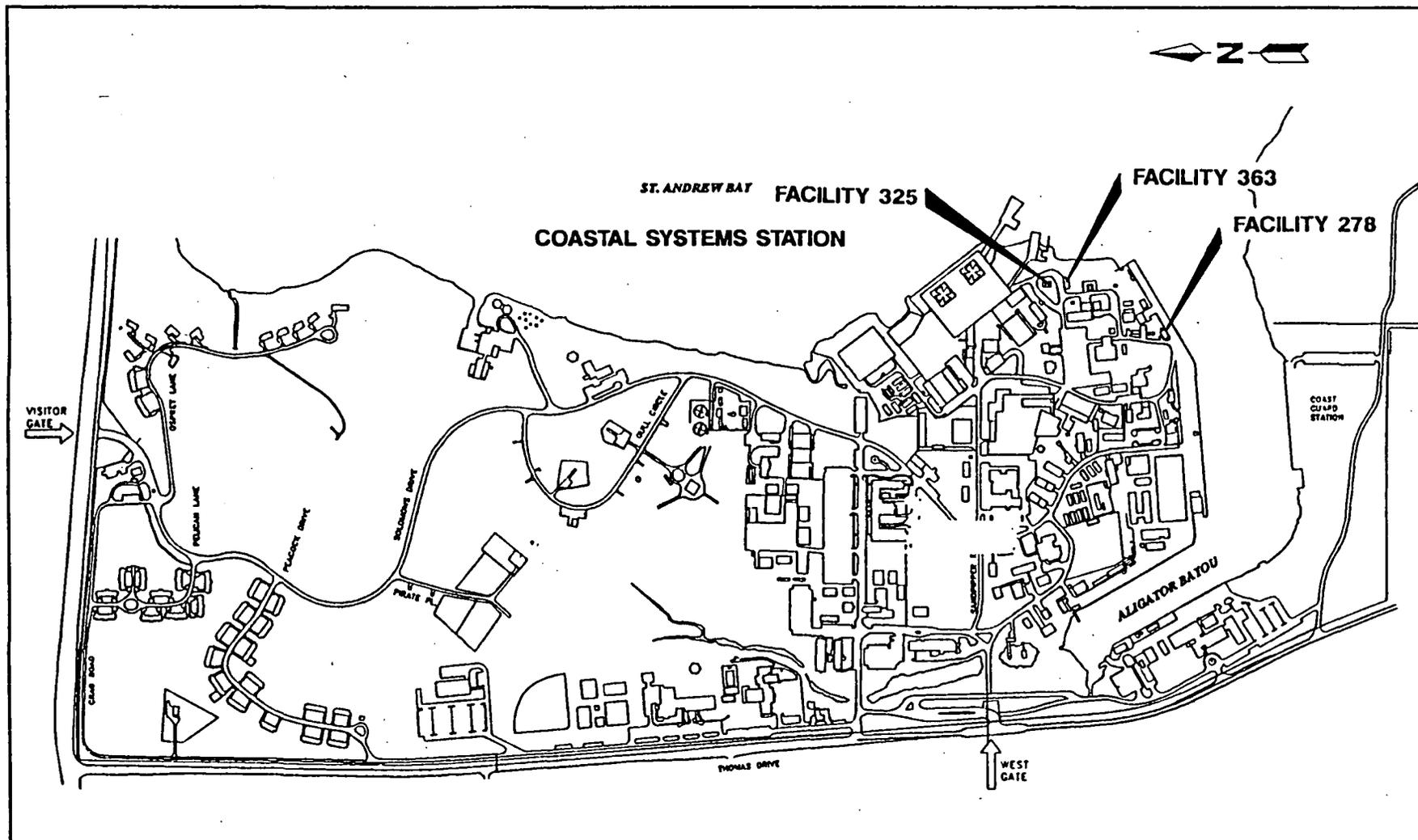


FIGURE 2
SITE LOCATIONS



CONTAMINATION ASSESSMENT PLAN
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

percent water. CSS has contracted Glenn Co. (a private contractor) to repair the tank system and remove some of the contaminated soil.

2.3 GEOLOGY. Surficial deposits at CSS are Pleistocene to Recent coastal plain sediments of marine and estuarine origin. They are predominantly comprised of quartz sands. They vary in thickness from 70 to 100 feet in Bay County and are approximately 100 feet thick at CSS.

The upper 50 feet of sediments at CSS consist of fine sands. Dominant surface soils that have developed from these surficial deposits include the Mandarin, Rutledge, Osier, Arents, and Leon soil series (Naval Facilities Engineering Command, 1982). These soil series range from very poorly drained sands, sandy clay loams, and organic soils in the low lying areas, to well drained sands on high ridges of the Coastal Plain.

The Intracoastal Formation underlies the Pleistocene to Recent sediments at CSS. This formation is late Middle Miocene to late Pliocene in Bay County. It consists of olive green sand and poorly consolidated limestone, is highly fossiliferous, and contains phosphorite. This formation is approximately 150 feet thick at NCSC.

The Bruce Creek Formation underlies the Intracoastal formation in Bay County. It consists of white to light yellow-gray, moderately indurated granular to calcarenitic limestone. It may possess up to 20 percent quartz sands, is fossiliferous, and contains minor amounts of phosphorite, glauconite, and pyrite. This formation is absent in the northeastern corner of Bay County and increases in thickness, up to about 300 feet, near the coast. It is Miocene or younger in age and is approximately 300 feet thick under NCSC.

The Suwannee Limestone and limestones of the Ocala Group probably underlie the Bruce Creek Formation. Wells have not been drilled to sufficient depths at NCSC to confirm their presence. However, it is inferred from boring logs for deep wells from surrounding areas that they are present (Schmidt and Clark, 1980). The Suwannee Limestone consists of light-gray to yellow-gray limestone, is fossiliferous, and is locally dolomitized. It is Oligocene in age and has a thickness of 70 to 100 feet in the vicinity of CSS.

Limestones of the Ocala Group underlie the Suwannee Limestone. The limestone is divided into an upper and a lower facies. The lower facies is a light orange to white limestone with high porosity, calcite cement, some glauconite and sand, and is high fossiliferous. The upper facies is similar but glauconite is rare and chert is more common. The Ocala Limestone is of Eocene age, thickens toward the coast, and lies about 650 to 700 feet below the surface. It is approximately 400 feet thick below CSS.

Older Cenozoic (i.e., Paleocene) and Mesozoic sedimentary rocks probably underlie the site, but an exact description is not possible because they have not been encountered during previous drilling episodes in the CSS area. Although such rocks are known to exist at depths throughout the Panhandle, the formations vary in composition and lateral extent.

Cambrian quartzite/meta-arkos, and Precambrian granite (basement) underlie the younger sedimentary deposits. These occur at depths greater than 11,000 feet below the surface.

Bay County is located at the western flank of the Apalachicola Embayment, which is the main structural feature influencing the deposition of sediments found in the subsurface. The axis of this shallow basin is generally northeast to southwest; it is narrowest in the northeast and widens to the south and southwest. The areal extent of the basin increases with depth indicating a long, continued development. Correspondingly, the older rocks (Paleogene and Mesozoic) are thicker than the younger deposits (Quaternary and Neogene) because they have had deposition for a longer time period.

2.4 HYDROGEOLOGY.

2.4.1 Regional Groundwater occurs in three aquifers in the region surrounding CSS: the surficial aquifer, the secondary artesian aquifer, and the Floridan aquifer system.

The surficial aquifer is composed of highly-permeable quartz sands with scattered lenses of clayey sands and sandy clays within the coastal plain sediments and upper Intracoastal Formation. It ranges in thickness from 65 to 140 feet.

The secondary artesian aquifer underlies the water table aquifer and is composed of isolated sand and shell beds and discontinuous limestone lenses that range from 10 to 25 feet in thickness within the Intracoastal Formation. Clay and low permeability limestone bound these more permeable lenses, confining the water in them and producing artesian conditions.

The Floridan aquifer system is separated from the overlying aquifers by semi-confining beds within the Intracoastal Formation. It is hydraulically connected with overlying strata in this area. At CSS, the aquifer consists of the lower permeable beds of the Intracoastal Formation, the Bruce Creek Formation, the Suwannee Limestone, and the limestones of the Ocala Group. It is composed of limestones and dolomites, and it is approximately 1,100 feet thick (Foster 1965; 1972). Groundwater flow within the aquifer is southwesterly toward the Gulf of Mexico.

Recharge is predominantly a result of local rainwater infiltration. Some recharge to the Floridan aquifer system occurs from north of Bay County. Water entering surface outcrops of limestone in Washington, Holmes, and Jackson Counties and in southern Alabama travels down-dip, providing regional recharge. However, the majority of recharge to the Floridan aquifer system in this area is probably a result of seepage from overlying formations.

2.4.2 Site Specific The two major aquifer systems of concern at CSS are the surficial aquifer and the Floridan aquifer system.

The shallow water-table (surficial) aquifer at CSS, where most of the contaminant migration would be expected to take place, is primarily composed of quartz sand and gravel with few clay sand, sandy clay loams, and organic soils. The quartz sands are only very slightly soluble; therefore, the mineral content of the

water-table aquifer is low with the exception of iron. The surficial aquifer contains high levels of iron, making the groundwater slightly acidic.

The depth to the water table ranges from 0 to 9 feet below land surface (bls), and varies 3 to 5 feet periodically due to changes in rainfall. Groundwater flow direction within this aquifer at CSS generally follows local topography. Onsite flow is primarily towards the discharge areas of St. Andrew Bay and Alligator Bayou, to the east and south.

The groundwater quality in the surficial aquifer exhibits a high iron content (unsuitable for domestic use) and is acidic and corrosive (pH of 5.5 to 6.5). Laboratory analysis of the groundwater at CSS shows dissolved solids ranging from 200 to 300 milligrams per liter (mg/l), hardness ranging from 150 to 200 mg/l, a chloride concentration less than 50 mg/l, and fluoride ranging from 0.5 to 1.5 mg/l (Johnson and Associates, 1985).

The Floridan aquifer system, which lies about 250 feet below sea level at CSS, yields up to 500 gallons per minute in wells. However, the water is generally hard and has a high pH. Groundwater hardness, pH, calcium, magnesium, sulfate, chloride, nitrate, and dissolved solids increase in the down-dip direction toward the coast. Analysis of the quality of water in the Floridan aquifer system at CSS shows dissolved solids greater than 500 parts per million (ppm), hardness greater than 180 ppm, chloride greater than 100 ppm, and a fluoride concentration ranging from 0.5 to 1.5 ppm (Johnson and Associates, 1985).

3.0 INVENTORY OF NEARBY POTABLE WELLS

CSS changed its primary source of potable water from surficial aquifer and Floridan aquifer system to municipal surface water in October 1970. This was done to avoid saltwater intrusion into the aquifer due to excessive pumping. Water is now supplied by the Bay County Water System, which obtains water from Deer Point Lake (located 9 miles northeast of CSS).

There are still wells onsite that are used for potable and nonpotable water supply. Two low-capacity surficial aquifer wells, approximately 100 feet deep, are located 150 to 250 feet south of the southern shore of Alligator Bayou and are used for drinking water supply. There are four operative Floridan aquifer system wells located at Buildings 10, 101, 281, and 394. The well at Building 10 has not been used for 13 years. The well at Building 101 is actively maintained for emergencies. It can be used, if required, to maintain water pressure in the water tower, for fire fighting, and as a potable water supply (with the use of a temporary chlorinator at the discharge point). The well is flushed every 2 months and periodically sampled for coliform bacteria. The well at Building 281 is capable of delivering emergency water, but is not flushed or sampled. The well near the housing area at Building 394 is used to provide water for air conditioning and heating pumps and discharges into the residential area through heat pump sprinkler systems.

There are other Floridan aquifer system wells located in the vicinity of CSS. There are two large capacity wells for public use located at Long Beach Resort (3 miles west of CSS), three at West Panama Beach (10 miles northwest of CSS), and two at Lynn Haven (7.5 miles northeast of CSS). There are two smaller wells located at a campground and trailer park 2 miles north of CSS that are used for potable water and a swimming pool.

4.0 PROPOSED ASSESSMENT PLAN

4.1 PRELIMINARY INVESTIGATION. Prior to performing soil borings and monitoring well installation, a survey will be conducted to locate subsurface utilities in the area of Facilities 325, 278, and 363. ABB-ES will coordinate the survey for gas and phone lines with the proper utility companies and the Navy will locate water, sewage, and electrical lines.

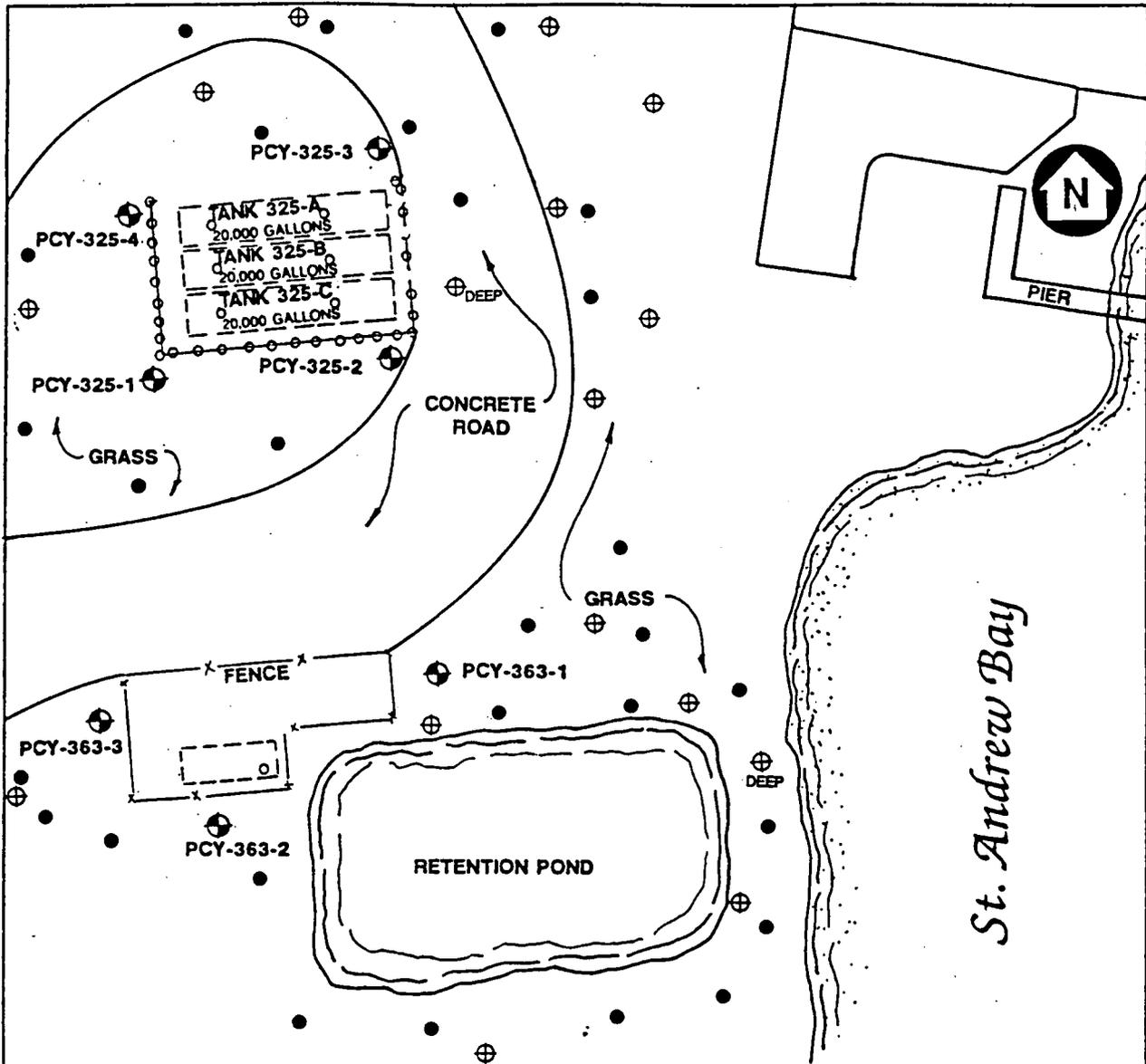
4.2 FIELD INVESTIGATION. The field investigation for this site has been divided into two phases. Phase I will consist of soil borings, while Phase II will consist of installing monitoring wells. During both segments of the project, samples of soil or groundwater will be taken and analyzed to assess the extent of contamination. The results from Phase I will be used to determine the location of monitoring wells in Phase II.

Startup Meeting: Prior to the beginning of the field investigation, a startup meeting will be held onsite at CSS Panama City. All personnel associated with the investigation will review the scope of work in the CAP and Health and Safety Plan (HAS). Scheduling, logistics, and special precautions will be discussed.

Phase I Field Investigation: Soil borings will be drilled using a hand auger at each of the sites at CSS Panama City to collect soil samples for Organic Vapor Analyzer (OVA) screening following Florida Department of Environmental Regulation (FDER) Chapter 17-770.200 (2), Florida Administrative Code (FAC) guidelines. Soil samples will be collected from each boring at 1 foot bls and 3-foot intervals until the top of the water table is reached. The screening of soil samples from borings will help in understanding the extent of the contamination and provide information for placement of monitoring wells at each of the sites.

The level of effort for completing the Phase I field investigation will consist of the drilling of up to 12 soil borings taken just above the water table at Facility 325, 12 soil borings at Facility 278, and 16 soil borings at Facility 363. Figures 3 and 4 show tentative locations of proposed soil borings. Actual locations of soil borings will be determined by the field team as more information is obtained about the contaminant plume.

Phase II Field Investigation: Phase II will include the installation of monitoring wells at the sites and collection of groundwater samples for analysis. The purpose of the CA is to assess the vertical and horizontal extent and to quantitatively characterize the petroleum contamination at each of the sites. Information from the soil borings conducted during Phase I investigation will help in understanding the extent of the contamination and provide information for the placement of monitoring wells at each of the sites. Monitoring wells will be installed to characterize the contaminant plume and to assess its horizontal extent. Placement of the wells will also be aided by a field gas chromatograph for measuring levels of benzene, ethyl benzene, toluene, and xylene (BETX). Figures 3 and 4 show a tentative placement of monitoring wells. The number of wells at each site is as follows: Facility 325, 8 shallow wells (up to 15 feet in depth) and 1 deep well (up to 65 feet in depth); Facility 278, 10 shallow wells and 1 deep well; and Facility 363, 6 shallow wells and 1 deep well.



LEGEND

- ⊕ EXISTING MONITORING WELL LOCATION
- ⊕ PROPOSED MONITORING WELL LOCATION
- PROPOSED SOIL BORING LOCATION

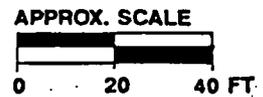


FIGURE 3
PROPOSED SOIL BORINGS AND
MONITORING WELL LOCATIONS
FACILITY 325 AND FACILITY 363



CONTAMINATION
ASSESSMENT PLAN
COASTAL SYSTEMS STATION
PANAMA CITY, FLORIDA

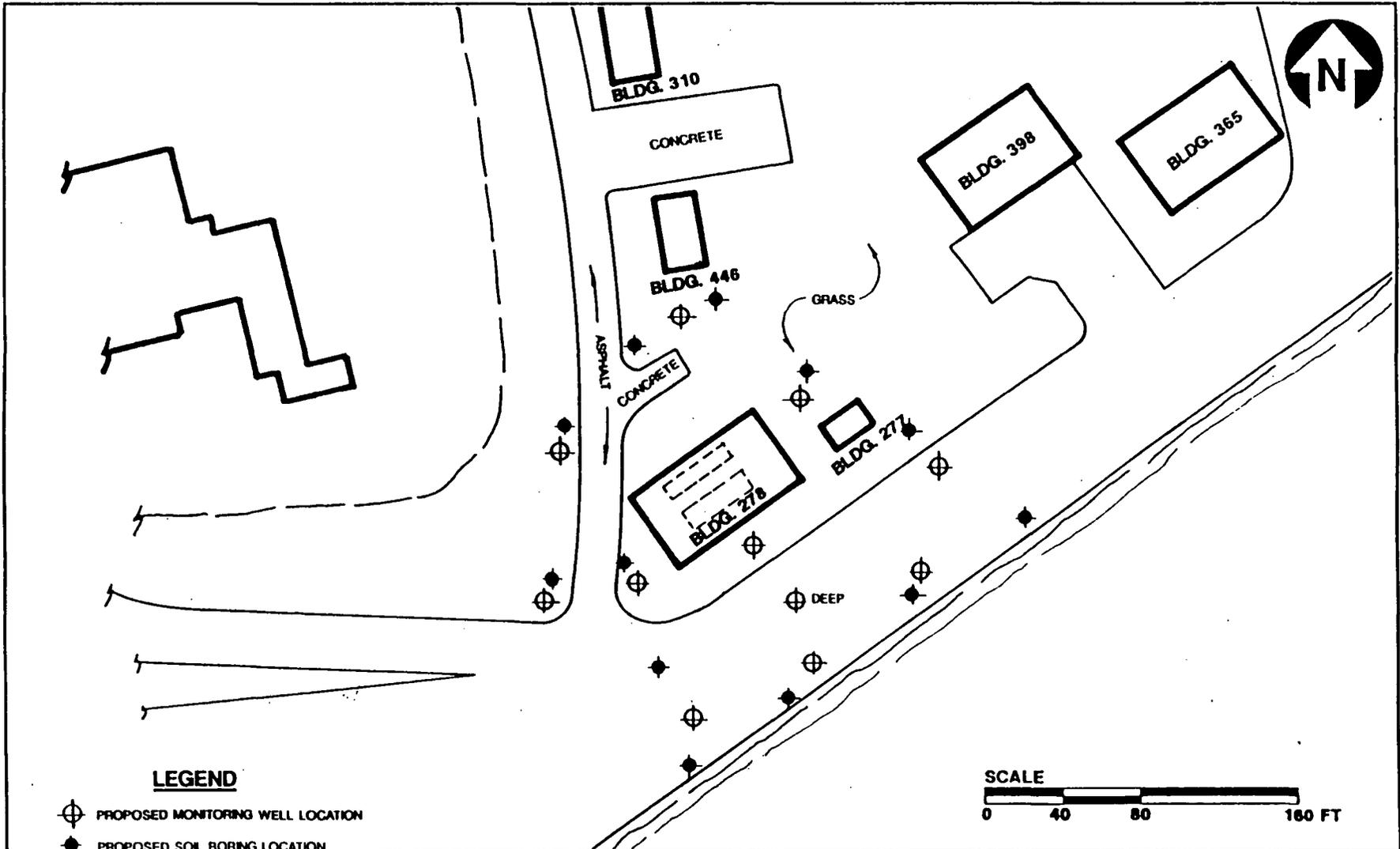


FIGURE 4
PROPOSED SOIL BORINGS AND
MONITORING WELL LOCATIONS
FACILITY 278



CONTAMINATION
ASSESSMENT PLAN

COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

For those wells that will be installed to characterize the plume, soil samples will be collected at 1 foot bls and at 3-foot intervals until the top of the water table is reached. These samples will be analyzed using an OVA with an FID, following procedures described in the Phase I Field Investigation section.

The monitoring wells will be constructed of 2-inch (inside diameter), schedule 40, flush-threaded, polyvinyl chloride (PVC) screen and casing. Screen length will be 10 feet with a slotted screen opening of 0.010 inch. At least 2 feet of screen will be placed about the water table to accommodate seasonal fluctuations of the water table. The screen will be surrounded with a quartz sand filter pack of 6/20 size (or of an acceptable equivalent) to at least 1 foot above the top of the screen. A 1-foot bentonite seal will be placed about the filter pack. The remaining annulus will be grouted with neat cement. A locking, watertight cap will be installed on each well. The monitoring wells will be finished below grade in a subsurface vault and protected with a metal manhole assembly. A diagram of a typical monitoring well, finished below grade, is illustrated in Figure 5.

Detailed information of monitoring well construction, lithologic descriptions, split-spoon samples, and other pertinent data will be graphically displayed in boring logs. These data will be included in the Contamination Assessment Report (CAR). Soils will be classified in accordance with the Unified Soil Classification System.

Upon completion, all newly-installed monitoring wells will be developed by pumping or bailing until the purged water is clear and relatively free of sediment to assure a good hydraulic connection with the surrounding aquifer. Aquifer tests will be conducted to estimate the hydraulic properties of the water table aquifer at the site. Rising-head slug tests will be performed on a minimum of two wells at each site to collect data for calculating the hydraulic conductivities. Hydraulic conductivities will be calculated by using ABB-ES' in-house program AQTESOLV™ (Geraghty & Miller, Inc., 1989). A measuring point for groundwater elevation will be established at the top-of-casing of each well. A Florida-licensed professional surveyor will survey the horizontal and vertical coordinates for each of the monitoring wells into either the U.S. Geological Survey (USGS) North America Datum (NAD) '27 or the base coordinate grid system.

Groundwater samples will be collected from the new monitoring wells (providing that they do not contain free-floating petroleum product). The following is a listing of samples that will be collected at each of the sites.

Facility 325: 9 monitoring well samples, 7 existing well samples, 2 duplicate samples, 1 field blank, 1 equipment blank, and 4 trip blanks for kerosene parameters.

Facility 278: 11 monitoring well samples, 2 duplicate samples, 1 field blank, 1 equipment blank, and 3 trip blanks for kerosene parameters.

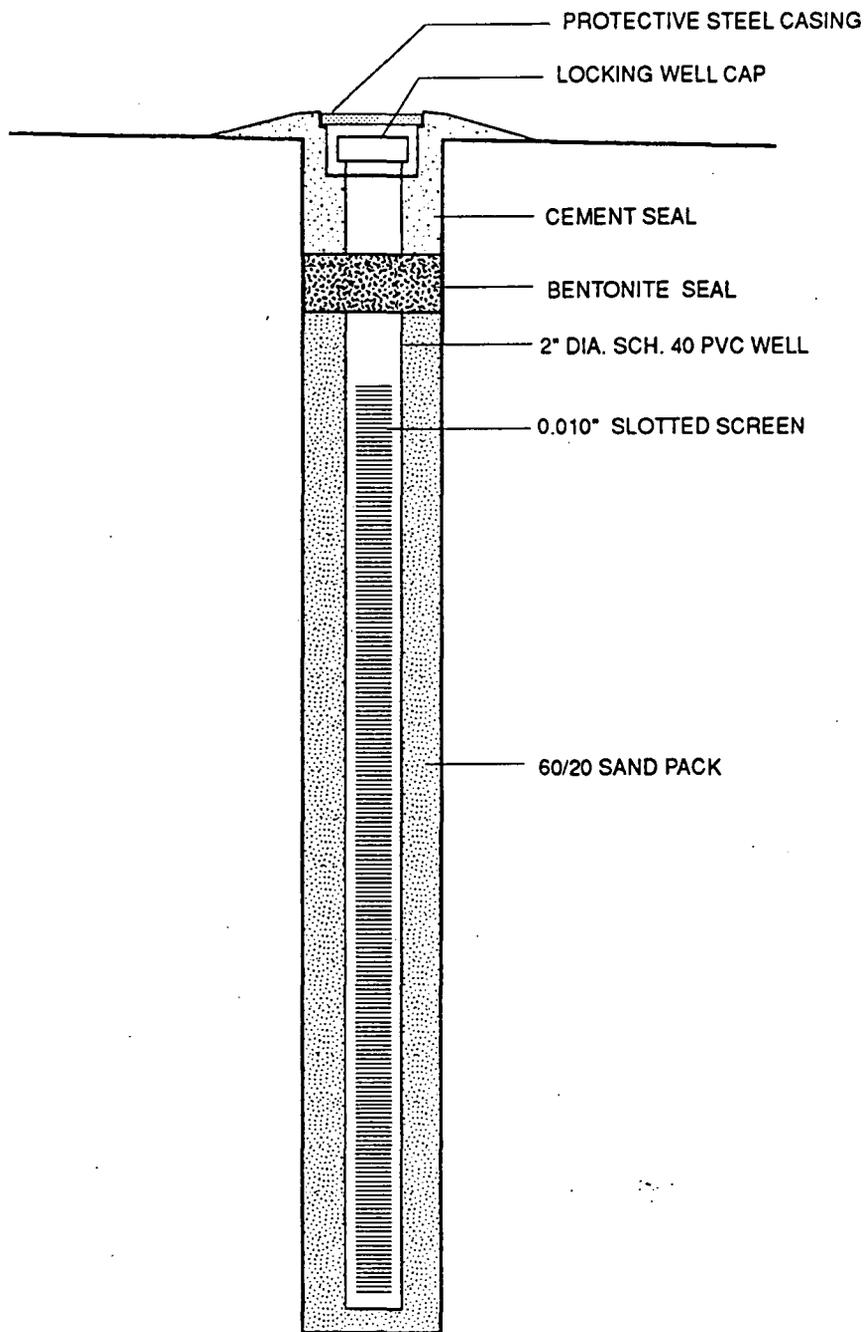


FIGURE 5
TYPICAL MONITORING WELL
INSTALLATION DETAIL



CONTAMINATION
ASSESSMENT PLAN

COASTAL SYSTEMS CENTER
PANAMA CITY, FLORIDA

Facility 363: 7 monitoring well samples, 3 existing well samples 1 duplicate sample, 1 equipment blank, 1 field blank, and 1 trip blank for mixed gasoline, kerosene, and waste oil constituents as described in FDER Chapter 17-770, FAC. In addition to the groundwater samples collected from the monitoring wells at Facility 363, 3 soil samples, 1 equipment blank, and 1 trip blank for mixed gasoline, kerosene, and waste oil constituents as described in FDER Chapter 17-770, FAC, will be collected.

Groundwater samples will be collected with Teflon™ bailers and shipped via overnight carrier to an approved analytical laboratory. Sampling and the subsequent analytical program will comply with ABB-ES' FDER-approved Comprehensive Quality Assurance Plan (CompQAP). All groundwater samples will be analyzed for the parameters previously discussed by facility and found in the FDER Chapter 17-770.

During this field investigation, ABB-ES personnel and their subcontractors will coordinate efforts with site personnel to dispose of contaminated fluids and soils onsite. No drums will be supplied by ABB-ES or the subcontractors. It will be the Navy's responsibility to dispose of any hazardous waste.

4.3 PREPARATION OF REPORTS. Upon completion of the field investigations and receipt of the laboratory analytical results of the groundwater samples, draft, final draft, and final CARs will be prepared and submitted to SOUTHNAVFACENCOM and the Naval activity for review and approval. The reports will discuss site background information, site conditions, findings, and recommendations for the two sites at CSS Panama City. Recommendations will also be made as to the need for any follow-up reports. Site location maps, locations of monitoring wells, groundwater contour maps, and contamination delineation maps will be included with the reports.

Based on findings, conclusions, and recommendations of the final CARs, draft (90 percent), final draft (100 percent), and final follow-up reports will be prepared for the two sites at CSS Panama City. The reports shall be either No Further Action Proposals (NFAPs), Monitoring Only Proposals (MOPs), or Remedial Action Plans (RAPs).

For the purpose of costing the project, it will be assumed that a RAP will be developed for the three sites. The RAP will include the following items.

- summary sheet of the CAR;
- general discussion of the technical and economic feasibility of remediation alternatives and more detailed information on the most feasible remedial system;
- general discussion of the rationale for the selected system;
- comparison of contaminant levels found with existing State and U.S. Environmental Protection Agency (USEPA) cleanup criteria in tabular format;
- disposition and expected contamination concentrations in any effluent from the proposed cleanup method;

- cost estimates and schedules for the design, construction startup, and operation phases;
- designation of monitoring wells and proposed methodology for verifying accomplishment of RAP goals (cleanup levels);
- details of any proposed treatment of contaminated soils;
- design and construction details;
- schedule for completion of the remedial action; and
- recommendations for conducting pilot studies and obtaining additional information.

Additional site information that may be needed to develop the performance specifications but not included in this scope is as follows.

- existing conditions site survey plans,
- locations of existing utilities, and
- location and availability of electric power.

5.0 SCHEDULE

A projected schedule to complete the CA field investigation program at CSS Panama City is approximately 4 weeks. This includes mobilization, drilling, sampling, surveying, aquifer testing, and demobilization. The field investigation work is scheduled to begin the week of October 19, 1992. Upon completion of the field investigation, approximately 3 weeks will be required before receipt of the laboratory analyses of the groundwater samples that were collected during the investigation. A draft CAR for the site will be prepared and submitted to SOUTHNAVFACENGCOM by November 9, 1992. If time schedules for report review are followed, draft follow-up reports have been scheduled to be delivered to SOUTHNAVFACENGCOM by February 8, 1993.

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