568 First Avenue South, Suite 600 Seattle, WA 98104 voice +1.206.254.0203 fax +1.206.254.0204
Innovating renewables for the future www.imperiumrenewables.com

February 22, 2013

Attn: Sally Toteff, Regional Director Southwest Regional Office and
Diane Butorac, Regional Planner Southwest Region
State of Washington Department of Ecology
Southwest Regional Office
300 Desmond Drive, Lacey
PO Box 47775
Olympia, WA 98504-7775

RE: Imperium Terminal Services, LLC. Imperium Bulk Liquid Terminal Facility Project Proposal Environmental Checklist Resubmittal

Dear Ms. Toteff and Ms. Butorac:

Imperium Renewables is resubmitting the attached The State Environmental Policy Act (SEPA) checklist for the construction of new storage tanks, rail infrastructure and office space. The expansion permits will provide Imperium the opportunity to develop an additional 10.7 acres that are within the Port of Grays Harbor and are adjacent to the existing Imperium biodiesel plant and the Port's T-1 marine terminal. The expansion permits would enable Imperium to store and transport a variety of liquid products in order to meet increasing customer demand for biofuels and petroleum products that are sourced from US energy supplies.

Imperium's growth and expansion opportunities are made possible by the unique transportation infrastructure of the Port of Grays Harbor. Access to rail, road and marine vessel transportation options were key factors in Imperium's decision to build our existing operations here, and we now have new growth opportunities that are focused on expanding our current capabilities. Expanding the terminal to store and transport additional products will allow Imperium to meet growing market demand for domestic energy supplies and transportation fuels on the West Coast of the United States.

The expansion design and permits will require all tanks and infrastructure to be designed and constructed to store both renewable and conventional fuel products. We anticipate that the products stored onsite will vary over the life of the facility, and may include biodiesel, ethanol, US crude oil, jet fuel, gasoline, diesel, vegetable oils and other biofuel feedstocks.

Imperium currently operates a Class 1 Terminal. Our existing and expanded operations are required to

follow very stringent Federal and State guidelines that have been established over the last four decades. Since we began operations in Grays Harbor, Imperium has been loading and/or unloading vessels since 2007 without incident by following all applicable regulations and has shipped/received railcars continuously, all without incident. We have accomplished this by following Imperium's established policies and applicable government regulations. We will continue to operate responsibly and every effort will be made to continue our safety record in the future for any and all products.

This project will create new jobs, provide significant additional tax and Port revenues, and help Imperium deliver on its mission of producing and distributing renewable fuels. We anticipate approximately 60 jobs will be created during the construction phase and up to an additional 20 full time Imperium employees will be hired upon completion of the new facility.

As described in the attached SEPA checklist, Imperium will be following all Federal and State laws for the expanded operations. We will also build on our current best practices for newly permitted products in order to protect the environment and the community. The permitting process will help ensure that we continue to comply with all Federal, State and local requirements related to all products passing through the community and our facility, and to continue our history of being a responsible employer and community partner as we have since 2007.

This resubmittal addresses greenhouse gas emission estimates per the *Guidance for Ecology Including Greeenhouse Gas Emissions in SEPA Reviews*, June 3, 2011 and revises the maximum expected number of ships and barges.

Please contact me or Steve Drennan, Vice President of Engineering at 206-254-0203 with any questions.

Sincerely,

John Plaza
President and CEO, Imperium Terminal Services, LLC

State Environmental Policy Act (SEPA) Checklist

Imperium Bulk Liquid Terminal Facility Project
Imperium Terminal Services, LLC

February 22, 2013

TABLE OF CONTENTS

I. Cover Letter

II. SEPA Checklist

III. Figure 1 – Vicinity Map

IV. Figure 2 – General Arrangement

V. Figure 3 – Section View

VI. Appendix A – Legal Description

VII. Appendix B – Geotech Report

VIII. Appendix C – Wetlands Technical Report

IX. Appendix D – MSDSs

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), Chapter 43.21C Regional Code of Washington (RCW), requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

A. BACKGROUND

1. Name of proposed project, if applicable:

Imperium Bulk Liquid Terminal Facility

2. Name of applicant:

Imperium Terminal Services, LLC

3. Address and phone number of applicant and contact person:

Steve Drennan, Vice President of Engineering

Imperium Terminal Services, LLC

568 1st Ave S

Suite 600

Seattle, Washington 98104

(206) 254-0203

4. Date checklist prepared:

January 31, 2013

5. Agency requesting checklist:

Pursuant to WAC 197-11-938, the Department of Ecology (Ecology) is a co-Lead Agency because the proposal involves construction on a single site of a facility designed for storing a total of one million or more gallons of any liquid fuel not under the jurisdiction of the Energy Facility Site Evaluation Council (EFSEC). The greatest portion of the project area is within the jurisdiction of the City of Hoquiam and the City of Hoquiam is therefore the other co-Lead agency.

Other agencies with jurisdiction include:

- City of Aberdeen (southeast corner of site)
- Olympic Region Clean Air Agency (ORCAA), Air Quality Permits

6. Proposed timing or schedule (including phasing, if applicable):

Project Element	Begin Construction	Complete Construction
Additional Storage Tanks	June 2013	December 2014
Additional Rail Spurs	June 2013	December 2014
Pipelines to Terminal 1	June 2013	December 2014
Marine Vapor Combustion Unit	June 2013	December 2014

The storage tank construction will occur in phases. The first phase is expected to include five tanks. The construction schedule for the remaining four tanks may extend the construction completion date for the project.

7. Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.

The project will take place on a partial lease of the 22.9-acre Terminal 1 facility from the Port of Grays Harbor. The project is proposed on 10.907 acres of Terminal 1. Imperium Grays Harbor occupies the remainder of the site. Imperium may elect to build the additions in phases which may extend the construction completion date for the entire proposed project.

8. List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.

- Shoreline Substantial Development Permit (includes Joint Aquatic Resources Permit Application [JARPA])
- Industrial Stormwater Pollution Prevention Plan (SWPPP)
- Olympic Region Clean Air Agency (ORCAA) Approval Order, State of Washington
- Phase I and II Environmental Site Assessment (ESA)
- Spill Prevention Control and Countermeasures (SPCC) Plan
- Construction SWPPP
- Temporary Erosion and Sediment Control (TESC) Plan
- Geotechnical Report
- Critical Areas Report
- Wetland Technical Report
- Integrated Contingency Plan (ICP)
- Oil/Hazardous Materials Transfer Operations Manual for Class 1 Terminals

9. Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.

There will be a pending air permit modification request with the Olympic Region Clean Air Agency for the existing Imperium Grays Harbor biodiesel production facility. There are no known pending applications or approvals for other proposals affecting this project.

10. List any government approvals or permits that will be needed for your proposal, if known.

- Shoreline Substantial Development Permit (SSDP), City of Hoquiam and City of Aberdeen
- Conditional Use Permit (CUP) and Variance, City of Hoquiam
- Olympic Region Clean Air Agency (ORCAA) Approval Order, State of Washington
- Grading and Building Permits, City of Hoquiam and Aberdeen
- Construction Stormwater General Permit, Ecology
- Industrial Stormwater General Permit, Ecology
- Local Fire Department Permit (including above ground storage tank permit), City of Hoquiam Fire Department
- Certificate of Industrial Insurance Coverage, Washington Department of Labor and Industry
- Fuel Registration, Environmental Protection Agency
- Hazardous Substance Use Reporting, Ecology
- Spill Prevention and Response Plan, Ecology (ICP)
- Fuel Tax License, Department of Licensing
- Letter of Intent, U.S. Coast Guard
- Facility Response Plan / Oil Spill Response Plan, U.S. Environmental Protection Agency and U.S. Coast Guard (ICP)
- Facility Security Plan and Facility Security Assessment, U.S. Coast Guard
- EPA ID number, if required

No in-water work or work within wetlands will take place, therefore no federal or state aquatic permits are required.

11. Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)

The proposed project is to construct a bulk liquid storage facility on a 10.907 acre site located at the Port of Grays Harbor (PGH) (see Figure 1 Vicinity Map). This project will result in construction of a tank farm that includes storage tanks, pipelines to Terminal 1 from the tank farm, rail spurs in connection with the existing Schneider's loop rail line, and construction of new office / laboratory / maintenance / warehouse building(s). The facility will be served by three

functionally independent modes of transportation: water, rail, and truck. Each will provide pathways for inbound raw materials or outbound products (see Figure 2 Plan View and Figure 3 Section View).

The project will include construction of a tank farm that includes storage tanks, rail spurs, and pipelines. The tank farm will be permitted to allow for operational flexibility to store biofuels such as ethanol and additional feedstocks for biofuel production such as used cooking oil/waste vegetable oil and animal fat; petroleum products including naphtha, gasoline, vacuum gas oil, jet fuel, no. 2 fuel oil, no. 6 fuel and kerosene; crude oil; and renewable fuels such as renewable diesel and renewable jet fuel. These will be in addition to the existing permitted vegetable oil, biodiesel, methanol, diesel, and petroleum products. The liquids will be stored in up to nine tanks totaling up to 720,000 barrels. The tank farm will be encompassed by a berm designed in compliance with NFPA 30 requirements and will contain 100 percent of the total volume of the largest tank on site plus an additional allowance of 6 inches for a storm event.

The existing rail system will also be expanded. Approximately 6,100 feet of track in multiple new rail spurs will be constructed on site in connection with the existing rail line and the existing rail yard will be expanded. Rail car loading and unloading will be conducted in bermed, walled, or sloped areas capable of containing the maximum volume of any single compartment of a tank car. The existing road crossing at Port Industrial Road will be utilized to connect to the rail line. Connecting to the rail line will require little or no track to be constructed off site. The connection from the site to the existing railroad will be across improved areas and maintained by the Port of Grays Harbor. Inbound bulk liquid is traditionally shipped in unit trains of approximately 105 rail cars. Significant capacity is required to receive these trains and the system has been designed to handle rail car unit trains.

Pipelines will be installed connecting the PGH Terminal 1 with the tank farm. One 24-inch-diameter pipe and one 16-inch-diameter pipe will be connected from the tank farm (above grade, on pipe racks) and routed across an existing pipe bridge over the existing rail line. The two pipes will be routed (at grade, on concrete block pipe supports) to Terminal 1 following a similar route as the existing Imperium Grays Harbor piping. All pipes will be carbon steel, insulated, and heat traced. A Marine Vapor Combustion Unit (MVCU) will be installed to incinerate displaced vapors during vessel loading.

A new building or buildings will be constructed on the Imperium property to replace the existing mobile trailers. These facilities will provide offices and laboratory, maintenance, and warehouse facilities.

12. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.

The site is located adjacent to the Chehalis River in the City of Hoquiam in Section 7, Range 9 West, Township 17 North of the Willamette Meridian. The project is located at the Port of Grays Harbor Terminal 1 (see Figure 1 Vicinity Map and Appendix A Legal Description).

B. ENVIRONMENTAL ELEMENTS

1. Earth

a. General description of the site (circle one): Flat, rolling, hilly, steep slopes, mountainous, other_____.

b. What is the steepest slope on the site (approximate percent slope)?

The maximum slope on the site is approximately 1 percent.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.

Originally the site was an open water slip berth used for log transfer operations. In 1983, the Port of Grays Harbor received permits to fill the site for use as a marine cargo facility, utilizing material from the Port of Grays Harbor channel widening project. Per National Resources Conservation Service mapping, soils in the project area consist of udorthents. The parent material of udorthents is sandy and loamy river dredging.

In 2011, The Port of Grays Harbor received permits to grade the site and add approximately 13,500 cubic yards of fill.

Soils on the site are non-native fill, typical of the industrial types of lands in the area. There are no agricultural soils on the site. In June of 2006, an analysis of the site was performed by a geotechnical engineer, GeoEngineers of Tacoma, WA, on soil suitability for the project in general accordance with the 2003 International Building Code (IBC) and American Society of Civil Engineers (ASCE) 7-02. GeoEngineers will perform an additional analysis to confirm soil suitability for the project. This report will be furnished when it becomes available. Civil design and construction of the production facility will comply with the recommendations of the geotechnical engineering report and will be approved by a Washington Registered Professional Engineer.

A Phase Two Environmental Assessment identified petrochemicals within the site which may be at concentrations warranting cleanup under the Model Toxics Control Act Chapter (MTCA) RCW 70.105D and MTCA Cleanup Regulation

WAC 173-340. Further site assessment will be performed to further detail the type and concentration of contaminants and the extent of area covered. As part of development of the site a cleanup plan will be developed and implemented in accordance with WAC 173-340-745.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.

Per Washington State Department of Natural Resources' 2004 Liquefaction Susceptibility Map of Grays Harbor County, Washington, the proposed project falls in an area with moderate to high liquefaction susceptibility. Also see the attached geotechnical engineering report from June 2006 attached as Appendix B.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.

Earthwork will be necessary to construct the proposed tank farm and rail yard to ensure proper grade, slope, and foundation. Where cuts are made, this material will be used as fill. Other fill will be necessary for equipment foundations and for bedding the rail grade. The tank farm and rail bed will be composed of cleaned crushed rock (approximately 12,500 cubic yards) of railroad standard aggregate hauled from a commercial quarry.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.

The site is level, so the chances of erosion are minimal. However, slight erosion during construction is possible, and will be mitigated by applying Best Management Practices (BMPs) consistent with state and local guidelines.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

Approximately 80 percent of the site will be covered with impervious surfaces after project construction. Stormwater management of runoff from impervious surfaces is discussed in Section B.3(c) of this SEPA document

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:

A general NPDES permit will be issued by Ecology for construction. This permit will require the preparation of a TESC Plan, a Construction SWPPP, and BMPs to control the risk of erosion. To control the risk of potential liquefaction susceptibility during seismic events, the storage tanks will be supported with piles.

2. Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.

During construction, potential emissions from construction activities will consist of dust and exhaust from construction equipment. Following construction, emissions are likely to consist of exhaust from vessel and rail engines, emissions from the MVCU and fugitive emissions of volatile organic compounds from storage tanks, valves, and fittings. Air emissions sources within the facility are managed under appropriate approvals and required permits of ORCAA. The facility as proposed will not be a "major source" under either the Prevention of Significant Deterioration (PSD), or the National Emission Standards for Hazardous Air Pollutants (NESHAP) programs. The production facility will utilize best available control technology to ensure meeting applicable ORCAA requirements.

An air permit modification application for the existing storage tanks at the Imperium Grays Harbor facility will also be prepared for ORCAA. The modification application will include the list of liquids identified in the above project description Section 11 of this SEPA document.

The Washington State Department of Ecology has published a guidance document for calculating greenhouse gas (GH) emissions for SEPA (*Guidance for Ecology Including Greeenhouse Gas Emissions in SEPA Reviews*, June 3, 2011). Under this guidance, for projects that are expected to produce an average estimate of 25,000 metric tons (tonnes) or more of CO_2e[1] per year, the proponents should include a quantitative disclosure of the GHG emissions expected to be caused by the project.

[1] "Carbon dioxide equivalents" or "CO_2e" means a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential. For example, one cubic foot of methane is equivalent to 21 cubic feet of carbon dioxide, and one cubic foot of nitrous oxide is equivalent to 310 cubic feet of carbon dioxide.

Potential greenhouse gas emissions from the Imperial Terminal Services Project, CO_2e, metric tons

Activity	CO2e
Scope 1	
Direct stationary combustion of fossil fuels once the project is complete	21,564
Vehicle fleet emissions once the project is complete	98
Loss of carbon storage from permanent conversion of forested lands	-
Methane emissions from new landfills, wastewater treatment plants, or manure management systems	-
Scope 2	
Purchased electricity or steam consumed by the project	4,200
Scope 3	
Heavy machinery emissions during site preparation, construction, or cleanup activities	103
New on-going product transportation emissions that occur within Washington State and its three mile nautical boundary	19,098
Vehicle trips generated during construction and operation, including those of employees, customers, vendors, or residents	147
Total	45,211

The Washington Department of Ecology has also promulgated Chapter 173-441 WAC which establishes mandatory GHG reporting requirements for owners and operators of certain facilities that directly emit GHG more than 10,000 tonnes CO_2e. It should be noted that the only item described in **Error! Reference source not found.** that is required for reporting under Chapter 173-441 WAC is the direct stationary combustion of fossil fuels once that project is complete, which is 21,564 metric tons, which is the result of the combustion of natural gas in the marine vapor control unit. This unit is required to combust emissions of volatile organic compounds that are collected during the loading of ships and barges.

The vehicle fleet will drive an estimated 110,000 miles per year, which will result in the emissions of 98 metric tons CO_2e per year.

This project will not cause emissions of greenhouse gases due to loss of carbon storage and there will be no methane emissions from new landfills, wastewater treatment plants, or manure management systems.

The facility will consume approximately 10,000 mega-Watt hours of electricity, which will result in the emission of 4,200 metric tons of CO_2e per year.

Heavy machinery emissions during site preparation, construction, and cleanup activities will consume an estimated 10,000 gallons of diesel fuel, which will result in the emission of 103 metric tons of CO_2e per year.

All of the bulk liquid received at the facility are expected to be delivered by train. Assumptions for this calculation were 400 miles round trip within Washington State, 105 cars per train, and 743 barrels per tank car. This will result 18,579 metric tons of CO_2e due to rail transport. Bulk fuel will be sent out of the facility by ship or barge. Assuming that the typical ship or barge will have a capacity of 300,000 barrels, and the round trip from the loading dock to the three-mile limit is 40 miles, the fuel consumed by ships or tugs will result in 520 metric tons of CO_2e. Total potential to emit CO_2e due to product transportation will be 19,098 metric tons of CO_2e per year.

Employee, customer, or vendor vehicle use during construction will result in emission of approximately 49 metric tons of CO_2e, and approximately 98 tons of CO_2e during plant operation. Total estimated greenhouse gas emissions from employee, customer and vendor vehicular use will be approximately 147 metric tons per year.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None expected.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:

Standard construction dust control measures will be used during construction. Rail and vessel emissions will be designed to minimize emissions and optimize loading and unloading efficiencies. The rail yard is designed to minimize rail engine idling and resulting emissions: rail cars are unloaded in place thereby reducing the railcar movements to one initial rail car position for unload and one final connection prior to departure. Rail car emissions will be controlled via the use of vacuum relief devices on each rail car. Tank emissions will be reduced by the installation of internal floating roofs. Vessel loading emissions will be reduced by routing through the MVCU. Air emissions from the facility will be identified and managed under appropriate approvals and required permits of ORCAA.

3. Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.

Fry Creek is present on the north and west boundaries of the site. The southwest side of the site is bordered by the Chehalis River (see attached Appendix C Wetland Technical Report).

There are two existing Port of Grays Harbor outfalls to the Chehalis River in the project vicinity: one to the northwest and one to the southeast. These two outfalls are approximately 0.15 miles apart. Stormwater runoff from the project area currently discharges through the northwest outfall via Fry Creek and runoff from the existing Imperium facility discharges through the southeast outfall.

The rail line between Centralia and Grays Harbor crosses numerous streams and wetlands on fill, bridges and trestles. Bridges and trestles are addressed by a management programs under the Rail Safety Improvement Act of 2008 that includes inspection and maintenance programs.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

Tanks, rail spurs, pipelines to Terminal 1, and MVCU will be installed within 200 feet of adjacent creek and river (see Figure 2). The pipelines to Terminal 1 will be routed on top of the existing dock structure and an existing catwalk will be removed to allow for construction of the new pipelines. This project will incorporate spill prevention equipment, operating procedures, and personnel training prior to a liquid transfer operation. There will be no in–water work, no shading over adjacent shore areas, and no work below the ordinary high water mark.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

No fill or dredge material will be placed in or removed from surface waters or wetlands.

4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No surface water will be withdrawn or diverted, other than stormwater runoff, as indicated in Section B3(c).

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.

No, the project site does not lie within a 100-year floodplain, per FEMA Flood Insurance Rates Maps. The project area is mapped as being in Flood Zone C, which is classified as "Areas outside the 1 percent annual chance floodplain, areas of 1 percent annual chance sheet flow flooding where average depths are less than 1 foot, areas of 1 percent annual chance stream flooding where the contributing drainage areas is less than 1 square mile, or areas protected from the 1 percent annual chance flood by levees" (FEMA 1997). The FEMA Flood Insurance Rate Map is for the Cities of Aberdeen, and Hoquiam, WA (map panel #5300580003B).

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No discharge of waste materials to surface waters is expected. No discharge will be generated at the facility other than stormwater runoff, as indicated in Section B3(c).

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

No groundwater will be withdrawn and no water will be discharged to groundwater.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals: ___; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

The project will not require any discharges into the ground. Sewer services for the new offices and laboratory buildings will be served by City of Aberdeen wastewater treatment plant.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.

Runoff outside the tank farm and rail areas will continue to flow to the Port of Grays Harbor stormwater system. Runoff sources will be stormwater only.

There are two existing Port of Grays Harbor outfalls to the Chehalis River in the project vicinity: one to the northwest and one to the southeast. These two outfalls are approximately 0.15 miles apart. Stormwater runoff from the project area currently discharges through the northwest outfall via Fry Creek and runoff from the existing Imperium facility discharges through the southeast outfall.

Stormwater runoff that accumulates in the proposed tank farm and rail area will be assumed to be non-contact, will be contained in bermed areas, verified prior to discharge, and treated through an oil/water separator. This stormwater will then be routed to the southeast outfall under an NPDES discharge permit. In the event that the water is contaminated and does not meet discharge criteria, it will be treated as required under the permit or sent offsite to a facility permitted to accept it.

In the unlikely event that the waters have enough contamination to make them a dangerous waste, they will be manifested and sent to a permitted facility.

2) Could waste materials enter ground or surface waters? If so, generally describe.

Waste materials are not expected to enter the ground or surface waters. Containment will be installed in all tank farm and rail areas with capacity to contain the largest tank or rail car, respectively, plus a 6-inch allowance for a storm event in compliance with NFPA 30 requirements. The tank farm will have concrete or covered bentonite membrane system containment. The tank farm storage tanks will be on grade level or elevated foundations (no below grade tanks or piping), within bermed areas constructed of an impervious material.

An impervious liner will be constructed to contain the entire tank farm. The liner will consist of a concrete or covered bentonite clay membrane liner designed and approved by a registered State of Washington Geotechnical Engineer. All tanks will be monitored for leaks using electronic leak detection devices. The collection sump will also be monitored continuously by conductivity meters or other devices to determine if product is being collected in the sump.

Rail car loading and unloading will be conducted in bermed, walled, or sloped areas capable of containing the maximum volume of any single compartment of a tank car. In the event of a rail spill, the collection sump(s) for the rail containment area(s) will be pumped to the tank farm oil/water separator or emptied by tank truck for off-site disposal at an approved facility.

3) Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:

The project will be designed to comply with all federal, state, and local regulations, controlling potential risks to water resources through project planning, design, and the application of required BMPs. With these risks controlled, no operational or construction-related adverse impacts on water resources are expected.

During construction, risks will be controlled through stormwater management BMPs that will be applied for following the requirements of the construction SWPPP. These BMPs may include the use of silt fences, temporary stormwater ponds, or other appropriate methods.

During operation, the facility will control risks by following the Industrial SWPPP and SPCC to prevent liquid products from the leaving the containment areas. Spill kits will be placed in strategic and easily accessible locations for use if small spills occur. If an uncontained spill should occur, the operator will notify Ecology of the situation as required by law.

Existing potential water contamination resulting from petrochemicals within soils on the site will be addressed by a cleanup plan will be developed and implemented in accordance with WAC 173-340-745.

4. Plants

a. Check or circle types of vegetation found on the site:

___ **deciduous tree:** alder, maple, aspen, other
___ **evergreen tree:** fir, cedar, pine, other
_X_ **shrubs:** Himalayan blackberry, Scot's broom
_X_ **grass:** various pasture grasses
___ **pasture**
___ **crop or grain**
_X__ **wet soil plants:** reed canarygrass, common rush, other
___ **water plants:** water lily, eelgrass, milfoil, other
___ **other types of vegetation**

b. What kind and amount of vegetation will be removed or altered?

Existing non-native grasses and shrubs will be removed during construction activities.

c. List threatened or endangered species known to be on or near the site.

The Washington Natural Heritage Program GIS dataset (Washington DNR 2012) was reviewed on December 5, 2012. No ESA-listed or State-listed threatened or endangered plant species have been documented within a 1-mile radius of the project area.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

The City of Hoquiam Landscaping and Screening ordinance (HMC 10.05.065) requires that 18 inches total caliper of new deciduous trees (min. 2 in. caliper DPH at 4.5 ft. above ground) and 18 ft. total height of new evergreen trees (min. 3 ft. height) be planted per gross acre of construction. For the 10.907 acre site, this dictates 194.4 total caliper inches of deciduous trees (129 trees at 1.5 caliper each) and 194.4 ft. total height of evergreen trees (65 trees at a minimum 3 foot height). Imperium will submit a Landscape Plan for approval in compliance with HMC 10.05.065 Table 4 "Minimum Planting Standards for New Development" which will detail Imperium's plan to plant trees near the entrance of the facility near Port Industrial Road in the northeast corner of the site adjacent to Fry Creek.

5. Animals

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

Birds: hawk, heron, eagle, songbirds, other: loon, Peregrine falcon

(The area is within the City of Hoquiam Peregrine Falcon Management Area.)

According to data from the WDFW Priority Habitats and Species system (WDFW 2012a), the project site falls within a peregrine falcon wintering area that encompasses much of Grays Harbor. WDFW (2005) provides the following management recommendations for peregrine falcon wintering areas:

- Peregrine falcons can tolerate human presence at wintering sites if they are not harassed and if abundant prey remains.
- Maintain all large trees and snags in areas where peregrine falcons are known to feed in winter.
- Retain snags and debris located on mud flats for winter perching and roosting.
- Strictly protect wetlands (especially intertidal mudflats, estuaries, and coastal marshes) used regularly at any time of the year by peregrine falcons from filling, development, or other excessive disturbances that could alter prey abundance.
- Do not apply pesticides where winter prey species congregate (especially intertidal mudflats, estuaries, and coastal marshes).

The proposed project does not entail any large tree or snag removal, wetland disturbance, or pesticide application and is, therefore, expected to comply with the management recommendations for peregrine falcon wintering areas.

No other priority bird species have been documented at the project site, and no other priority areas occur within 0.5 mile. At a more regional scale, Grays Harbor includes priority areas for numerous species. Data from the WDFW Priority Habitats and Species system (WDFW 2012a) identify priority areas for the following bird species in Grays Harbor: bald eagle (breeding territories), Caspian tern (breeding colonies), great blue heron (breeding areas), peregrine falcon (nest site and wintering areas), purple martin (breeding areas), shorebirds (regular concentrations), snowy plover (breeding areas), streaked horned lark (breeding areas), various species of gull (breeding colonies), and waterfowl (regular concentrations).

Habitat includes the Bowerman Basin National Wildlife Refuge, Washington Department of Fish and Wildlife Wildlife Recreation Areas, state parks and a variety of public and private land in Grays Harbor and the Pacific coast.

The most commonly occurring bird species within Grays Harbor are listed below, in descending order of occurrence, as observed during Christmas bird counts between 1974 and 2008 (Audubon Society 2008):

- European starling
- Mallard
- Gulls and terns
- Canada goose
- Northern pintail
- Western sandpiper
- Song sparrow
- Killdeer
- Red-tailed hawk

Mammals: deer, bear, elk, beaver, other:

No priority mammal species have been documented at the project site, and no priority areas occur within 0.5 mile. At a more regional scale, Grays Harbor includes priority areas for two mammal species. Data from the WDFW Priority Habitats and Species system (WDFW 2012a) identify priority areas for the following mammal species in Grays Harbor: California sea lion (haulouts) and harbor seal (breeding area and haulouts). A variety of mammals use waters of the Pacific and may use marine habitats in Grays Harbor, but only rarely. These include the gray whale, humpback whale, blue whale, fin whale, sei whale, sperm whale, and Steller sea lion.

Fish: bass, salmon, trout, herring, shellfish, other:

The lower reaches of Fry Creek adjacent to the project site support coho salmon and cutthroat trout (WDFW 2012a, b). Both species use the stream for migration, and coho salmon rear in that portion of the stream (WDFW 2012a,b).

Pacific herring spawning has been documented in many nearshore areas in Grays Harbor, particularly in the southern portion of the bay (WDFW 2012a). No Pacific herring spawning areas have been identified within 0.5 mile of the project site. In addition to coho salmon and cutthroat trout, the following anadromous salmonids have been documented in the Chehalis River and are likely to use nearshore habitats near project site: bull trout, Chinook salmon (spring, summer, and fall runs), steelhead (summer and winter runs), and chum salmon (fall run) (WDFW 2012b).

Shellfish growing areas are located in a variety of areas in Grays Harbor and on the Pacific coast and supports commercial aquaculture, recreational gathering and tribal resource areas.

b. List any threatened or endangered species known to be on or near the site.

Data from the Washington Department of Fish and Wildlife Priority Habitats and Species (PHS) system were reviewed in December 2012. No ESA-listed or State-

listed threatened or endangered species have been documented at the project site (WDFW 2012a). Several listed species, however, may use habitats in nearby areas of Grays Harbor.

The marbled murrelet, an ESA-listed and State-listed threatened species, nests in forests south and north of Grays Harbor and periodically forages for small fish in Grays Harbor. Speich and Wahl (1995) reported that, over a 23-year period, marbled murrelets were recorded in Grays Harbor Channel in every month of the year. The general pattern of occurrence was one of high average densities during the spring, fall, and winter months, with higher densities in habitats closer to shore. No murrelet use has been documented within 1 mile of the project site.

The brown pelican is a State-listed endangered species. The U.S. Fish and Wildlife Service removed the brown pelican from the ESA list of endangered and threatened species in November 2009 (74 Federal Register 59443-59472). Pelicans occur in Grays Harbor primarily during the summer months, with peak abundance typically occurring in August (Jaques and O'Casey 2006) after pelicans have left their breeding grounds in California and Mexico. Pelicans forage in Grays Harbor and use sandbars and sand islands as roost sites. They also roost on manmade features such as breakwaters.

The western snowy plover is an ESA-listed threatened species and a State-listed endangered species. The Pacific coast population breeds primarily above the high tide line on coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries (NatureServe 2012). WDFW (2012a) identifies breeding sites near the mouth of Grays Harbor, more than 10 miles from the project site.

The streaked horned lark is a State-listed endangered species and is a candidate for listing under the ESA. The streaked horned lark nests on grasslands and sparsely vegetated areas at airports, sandy islands, and coastal spits, including sites near the mouth of Grays Harbor (WDFW 2012a), more than 10 miles from the project site.

The southern resident killer whale is an ESA-listed and State-listed endangered species. Southern resident killer whales were once thought to range southward along the Washington Coast only to about Grays Harbor (Bigg et al. 1990); however, recent sightings have suggested that the southern extent of their range is considerably farther south (NMFS 2008a). Observations of southern resident killer whales offshore of Grays Harbor and in the Westport vicinity are infrequent (NMFS 2008a).

Several other species of ESA-listed and State-listed marine mammals use waters of the Pacific and may use marine habitats in Grays Harbor, but only rarely. These include the gray whale, humpback whale, blue whale, fin whale, sei whale, sperm whale, and Steller sea lion. The nearest documented haulout sites

for Steller sea lions are the South Jetty at the entrance to the Columbia River, approximately 50 miles to the south, or in the vicinity of Split Rock approximately 40 miles to the north of the entrance to Grays Harbor (Jeffries et al. 2000). Gray whales, known as the Pacific Coast Feeding Group, migrate along the Washington coast line with the southbound migration peaking in December, and the northbound migration peaking first in late March and in early June when mostly females with calves pass by (Calambokidis et al.1994).

Fish from the southern distinct population segment of green sturgeon, which is ESA-listed as threatened, regularly appear in the waters of Grays Harbor and the mouth of the Chehalis River. This population spawns primarily in the Klamath/Sacramento River system but individuals from the population travel extensively. Grays Harbor is considered to provide important over-summering habitat for fish from both the northern and southern populations (Dumbauld et al. 2008; NMFS 2008b).

The southern distinct population of eulachon is ESA-listed as threatened. Adult eulachon are described as "common" in Grays Harbor (Monaco et al. 1990; Emmett et al. 1991). Historically, the Columbia River has supported the largest returns of any spawning population throughout the species' range; spawning also occurs in some of the rivers that feed into Grays Harbor (Gustafson et al. 2010).

Of the salmonid fish species identified in the preceding section, only the Coastal-Puget Sound distinct population segment of bull trout has ESA or State listing status (as threatened) in Grays Harbor. Bull trout are only rarely observed in Grays Harbor (Jeanes et al. 2006). Although no local spawning population of bull trout is believed to inhabit the Grays Harbor system, the system provides foraging, migration, and overwintering habitat for coastal populations including the Quinault River population (USFWS 2004).

c. Is the site part of a migration route? If so, explain.

The project site is in the Pacific Flyway, which is a flight corridor for migrating waterfowl and other avian species. The Pacific Flyway extends from Alaska to South America. Grays Harbor National Wildlife Refuge is approximately 3 miles from the project site. As many as 24 species of shorebirds use Grays Harbor Refuge, with the most abundant species being western sandpiper and dunlin. Semi-palmated plover, least sandpiper, red knot, and black-bellied plover are also common during migration. The refuge is also used by peregrine falcon, bald eagle, northern harrier, Caspian tern, great blue heron, songbirds, and a variety of waterfowl (USFWS 2012).

Also, as described above, fish use Grays Harbor and Fry Creek for migration. The proposed project does not involve any in-water work in Fry Creek and is not anticipated to affect the migratory route of any species in that stream.

d. Proposed measures to preserve or enhance wildlife, if any:

The tank farm which includes storage tanks, piping, and adjacent rail area will be contained and controlled.

The potential for adverse effects on fish and wildlife due to increased shipping traffic in Grays Harbor is minimal. The biological assessment for the State Route 520 pontoon construction project in Grays Harbor (WSDOT 2010) determined that operation of vessels associated with pontoon construction, maintenance, and transport had the potential to affect fish, birds, and marine mammals, but the potential for adverse interactions would be reduced or eliminated by the slow speeds of the vessels.

The potential for adverse effects due to an increased risk of oil spills in Grays Harbor will be addressed through implementation of the provisions of the federal Oil Pollution Act (OPA) and State of Washington contingency planning requirements (WAC). These regulations require oil storage facilities and vessels to develop plans detailing how they will respond to large discharges. The U.S. Environmental Protection Agency has published regulations for aboveground storage facilities and the Coast Guard has done so for oil tankers. The OPA and WAC also require the development of contingency plans to prepare and plan for oil spill response on a regional scale. Imperium Renewables currently complies with the above federal OPA, U.S. Environmental Protection Agency, and Coast Guard regulations for their existing operations in Grays Harbor and will expand their compliance to include the new operations.

Measures required through the City of Hoquiam and City of Aberdeen shoreline substantial development permitting processes would further reduce the risk of adverse effects resulting from the proposed project. Under the rules implementing the Shoreline Management Act, local shoreline management programs are required to provide a level of protection for wetlands, vegetation, and other shoreline resources that ensures "no net loss of shoreline ecological functions necessary to sustain shoreline natural resources" (WAC 173-26-221(2)(a), WAC 173-26-221(5)). Management standards imposed through these programs for the protection of sediment transport processes, water quality, aquatic vegetation, and shoreline vegetation would minimize the potential for adverse effects on species that use habitats in shoreline and nearshore areas.

6. Energy and natural resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

The facility will receive electricity through the Grays Harbor PUD to provide power for lighting and for rail and vessel loading and unloading pumps. Peak power consumption will occur during vessel loading and will be less than 1 megawatt.

The tank farm will include a MVCU utilizing natural gas from Cascade Natural Gas. The MVCU will only consume natural gas during vessel loading activities. Natural gas may also be used intermittently to generate steam to heat the contents of the tanks and to preheat rail cars to facilitate off-loading of viscous product. The steam will be provided via the neighboring Imperium Grays Harbor biodiesel production facility.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

No, this project will not shade adjacent parcels or affect the potential use of solar energy on adjacent properties.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

All pumps, motors, electrical equipment and process technology equipment will include the most energy efficient systems for proficient operations.

Heated storage tanks will be insulated for energy conservation.

7. Environmental health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.

Risk of exposure to potentially toxic chemicals present in some of the bulk liquids will require compliance with current health, safety, and operational requirements which will limit potential impacts and provide for adequate analysis and mitigation of potential adverse impacts in accordance with RCW 43.21C.240.

The risk of fire and explosion will be addressed by compliance with standards of the International Fire Code (IFC) which will limit impacts and provide for adequate analysis and mitigation of potential adverse impacts in accordance with RCW 43.21C.240. Some of the bulk liquids are flammable. If these substances are involved in a spill, there is a potential to ignite. Fire would most likely be restrained to the site. Imperium will continue its partnership with the local fire department to maintain an Emergency Preparedness Plan incorporating the use of the City of Hoquiam Foam Tender truck and the Imperium Grays Harbor on-site foam trailer that is appropriate for the materials stored and handled. The site will be designed for emergency vehicle access.

Spill prevention plans for all materials will be implemented.

Marine and rail shipping will require oversight by trained personnel during product transfer. All Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) health and safety

requirements will be followed. On-site equipment-specific training will be required for applicable employees.

All storage tanks and land product transfer areas will be contained. If a spill occurs, the product will be contained on site.

Specific railroad safety requirements related to the carriage of hazardous materials are outlined in the Transportation Title of the Code of Federal Regulations, 49 CFR, Parts 171-174 and 178-180. These regulations address specific actions, including emergency response, and regulations regarding the design of railroad tank cars, which must be taken by railroads. They also include incident reporting requirements, as well as preventative measures, such as the manner in which hazardous materials are contained, the manner in which employees are trained, and the way in which railcars must be handled.

In addition, 49 CFR Parts 200-299 regulate the operation of trains, identify minimum safety standards for track and equipment (and set higher minimum standards for tracks over which hazardous materials are transported), and reporting requirements (in addition to the reporting requirements in 49 CFR Parts 171-180). The potential for rupture of railroad tank cars is dependent on both the design/construction of the cars and the speed at which they operate. The speeds on the Puget Sound and Pacific Railroad between Centralia and Grays Harbor are within the range in which head and shell impacts from derailment are less likely to result in rupture (Tyrell 2007). If a spill occurs during rail transit, the railroads must notify the National Response Center, the State Emergency Management Division, and the appropriate regional office of Ecology. In the event of a release, the railroad that provides rail services between Centralia and Grays Harbor (Puget Sound and Pacific Railroad) also contacts their dispatching center and local supervisory personnel to notify them of the release. The local supervisor (Train Master) refers to the Emergency Response Guidebook (carried by all Train Masters) to define the appropriate response procedures specific to the material released. The Dispatch Center contacts first responders to notify them of the release and mobilize them to the site and the Dispatch Center contacts the local Environmental Response contractor to begin spill response.

According to the Association of American Railroads (AAR 2008), 99.998% of rail shipments involving hazardous materials are completed without a release caused by train accident. Per the American Petroleum Institute (API 2009) only 0.73% of the annual US oil spillage between 1998 and 2007 is attributed to railroads. Overall, the risk of spill of oil or other materials during rail transit that could occur as a result of this proposal is relatively low.

The rail line between Centralia and Grays Harbor crosses numerous streams and wetlands on fill, bridges and trestles. Bridges and trestles are addressed by a management programs under the Rail Safety Improvement Act of 2008 that

includes inspection and maintenance programs. Spills at locations where water resources may be impacted are subject to higher inspection and maintenance requirements and may be considered somewhat less likely than on other portions of the rail line.

If a spill occurs during over-water transfers of product, the Integrated Contingency Plan will be followed, which will limit impacts and provide for adequate analysis and mitigation of potential adverse impacts in accordance with RCW 43.21C.240. Ecology and the U.S. Coast Guard will be notified to oversee and assist with containment.

See Appendix D for Material Safety Data Sheets (MSDSs) for ethanol, vegetable oil, animal fat, naphtha, gasoline, vacuum gas oil, jet fuel, kerosene, crude oil, biodiesel, methanol, diesel, and sodium methylate.

Additional vessel and barge trips through Grays Harbor can increase the risk of spills of oil cargo and fuels used to propel vessels and tow boats.

Strategies to control risk include a collection of established physical elements and procedural elements. Physical elements include engineered safety features, such as vessel construction with various physical barriers and containments, (particularly double hulls for tankers) as well as automatic controls, redundancy, and warning systems. Procedural elements include personnel training, rules and procedures, training, drills, administrative controls and, oversight and enforcement (Michel and Winslow 1999). Spills investigated by the Washington Department of Ecology indicate that human factors such as inattention and judgment and organizational factors relating to procedures and training are the primary "root causes" of spills (Ecology 2012a).

The probability of damage resulting from an incident is largely related to the design, age and maintenance of the vessel. In general, newer double hull vessels are less likely to be damaged to the extent that oil outflow occurs. Environmental factors such as substrate (particularly whether rocks are present that may penetrate hulls) as well as environmental factors such as wind and waves affect the structural integrity and the releases of materials. Groundings on sandy substrate (such as is present is Grays Harbor and adjacent areas of the Pacific) is generally less of an immediate structural hazard than penetration by rocks (Daidola1995).

Control of spills from vessel operation is largely controlled by the U.S. Coast Guard. Response to spills in Washington State is coordinated by the Ecology Spill Prevention, Preparedness and Response Program funded by a 5-cent-per-barrel tax on imported oil and general revenues. The Ecology program includes a number of elements including (Ecology 2012b):

- Review and approval of spill contingency plans maintained by operators to assurance that plan holders and spill response contractors maintain their readiness through scheduled and unannounced drills.
- Partnerships with other agencies to maintain a regional contingency plan that guides how spills are managed in the Northwest.
- Development and update of Geographic Response Plans (GRPs) in consultation with other natural resource experts and communities.
- Inspecting facilities, vessels, and oil-handling facility transfers
- Rapidly responding to and cleaning up of oil and hazardous material spills.
- Restoring public natural resources damaged by oil spills

A GRP has been developed for Grays Harbor. The GRP is intended to help the first responders to a spill and serves as the federal and state on-scene coordinators "orders" during a spill.

All response strategies fall into one of three major techniques that may be utilized either individually or in combination.

- Dispersants. Washington State Policy currently does not allow use of dispersants in this area.
- In Situ Burning. It is unlikely that this technique will be employed in this area due to the proximity of population to a potential burn site.
- Mechanical Recovery and Protection Strategies. When in situ burning or dispersants are not appropriate, key strategies are skimming and use of collection, diversion, or exclusion booming to contain and recover the oil. These measures prevent oil from entering areas with sensitive wildlife and fisheries resources. Specific skimming strategies are not listed in the maps and matrices, but skimming should be used whenever possible and is often the primary means of recovering oil and protecting resources, especially when booming is not possible or feasible.

The GRP identifies 15 geographic areas where spills are likely to occur; identifies sensitive resources that would likely be impacted within the initial hours of the spill; and identifies booming strategies for each of the "Potential Spill Origins" based on the sensitivity of resources, feasibility, etc. Control and containment at the source is the number one priority of any response (Ecology 2003).

Overall, the risk of spill of oil or other materials that could occur as a result of this proposal is relatively low and within the parameters for risk management developed for the marine transport industry. Compliance with the programs for spill avoidance administered by the U.S. Coast Guard, U.S. Environmental Protection Agency and Ecology will limit impacts and provide for adequate

analysis and mitigation of potential adverse impacts in accordance with RCW 43.21C.240. Through the implementation of a Spill Prevention and Response Plan, Ecology will address the greatest risks of potential spills during the loading and unloading process.

Imperium has loaded/unloaded 57 vessels since 2006 without incident and currently maintains an Integrated Contingency Plan (ICP). This ICP incorporates, and is intended to meet requirements contained in:

- U.S. Coast Guard (USCG) Facility Response Plan requirements, 33 CFR 154
- U.S. Environmental Protection Agency's (EPA's) Oil Pollution Prevention, 40 CFR 112.7(d) and 112.20-.21.
- OSHA's Emergency Action Plan Regulations - 29 CFR 1910.38
- EPA's Resource Conservation and Recovery Act (RCRA) Contingency Planning Requirements – 40 CFR Part 265, Part D
- WDOE Oil Spill Prevention and Contingency Planning requirements – WAC 173-182
- WDOE Dangerous Waste Regulation, Chapter 173-303-145.

This plan will be updated to reflect the largest tank storage proposed in this project (from 47,620 bbls to 80,000 bbls) and the resultant on water storage required (approximately 8,000 bbls for the 6 and 12 hour timeframe). In addition, Imperium will contract with local and national Spill Response Companies to provide the required 18,500 bbls and 25,000 bbls (24 and 48 hour timeframe respectively) on water storage. It is important to note that all inbound and outbound vessels will be covered by the WA State Maritime Cooperative Oil Spill Contingency Plan (WSMC).

In addition, Imperium will continue to follow the Facility Transfer Operations Manual and/or Best Management Practices – (BMP) before, during and after the transfer of material by:

- Notifying Washington State Maritime Cooperative (WSMC) and Ecology of any vessels arriving, etc. as soon as the vessel is confirmed. Vessels calling on the Port of Grays Harbor must be enrolled with WSMC or have a State approved contingency plan.
- Identifying worst case discharge volume of the vessel and communicate to WSMC, NRCES and Ecology.
- Arranging for escort tug(s) to meet the vessel and escort it to the Chehalis River and during mooring procedures.
- Arranging for third party to provide a skimmer vessel (OSRV) positioned at Imperium's Terminal during transfer.

- Pre booming if it is safe and effective or arranging for third party to provide a boom boat positioned at the terminal during transfer.
- During the entire transfer operation, an Imperium Terminal Person In Charge (TPIC) will be in attendance at the dock as will required long shore men and Vessel Person In Charge (VPIC).

Given that Grays Harbor does not have a Vessel Traffic Service to coordinate vessel traffic and is not subject to RCW 88.16.190, Imperium works directly with the Port of Grays Harbor, pilots and vessel agents to coordinate the ship arrival and departure as per suitable tidal windows. In addition, all vessel traffic on the coast of Washington State and in the Port of Grays Harbor are monitored by the Marine Exchange of Puget Sound (Marex). Marex is an industry funded Vessel Traffic Service (VTS). They have 'real time' monitoring via the Automated Information System (AIS). Marex is an additional resource for the maritime industry to ensure safe transits.

If the entrance to the Port of Grays Harbor is closed due to conditions, the US Coast Guard and Grays Harbor Licensed Pilots will coordinate ship logistics until the entrance to the port is opened. Vessel traffic meeting and overtaking situations are coordinated via VHF radio. A safe anchorage is located inside the harbor at buoys 13 and 14 and can be utilized for vessel staging if required. The Grays Harbor Licensed Pilots will assume responsibility to determine when travel across the bar is safe once the closure of the port entrance is lifted. Bar monitoring is part of the Columbia River Bar system. The tugboats located in Grays Harbor are capable of providing assistance offshore. All three tugboats have tow winches that are equipped with a steel tow wire. Tug and Barge companies operating in the Port have additional tugboats that can be positioned in Grays Harbor if warranted. Besides Neah Bay, there are additional tugs stationed in Astoria, Oregon that can be utilized in response situations.

Per Imperium's Best Management Practice (BMP) the vessel will be met at the entrance to the Port of Grays Harbor by an escort tug for travel down the Chehalis River. Once the vessel is ready to dock, a second tug will be employed to assist. Imperium is a member of the Grays Harbor Safety Committee and will continue to contribute and participate in developing appropriate guidelines and Standards of Care for marine operations for the Port of Grays Harbor.

The largest vessel expected to be loaded at Terminal 1 is a Panamax class vessel (60,000 to 80,000 DWT) and 300,000 to 350,000 bbls of cargo capacity. Ocean going barges will also be loaded with capacities of up to 150,000 bbls. These ships and barges are subject to US Coast Guard, State and Federal design, construction and operation regulations. Oil Tankers are required to be Double Hulled at ports /

terminals. General tankage layouts tend to be 1-6 Port & Starboard cargo tanks with also Slops Port & Starboard being used in some cases to hold cargo as well. General engineering, cargo handling, and navigation systems are regulated by USCG, Class Society (ABS and DNV), Ship Owners Policy, Flag State Requirements, and various State and Governmental agencies that have regulations set forth for entering and trading within the United States Waterways.

1) Describe special emergency services that might be required.

Imperium Terminal Services, LLC, will work with all regulating agencies to ensure all bulk materials on site will be properly stored, handled, and used in accordance with all emergency services providers. The facility will maintain a list of emergency services that may be required including fire, ambulance, Ecology and U.S. Coast Guard contacts for spill control, etc. An emergency preparedness plan will be filed with the local fire department which will include chemical storage data and locations.

2) Proposed measures to reduce or control environmental health hazards, if any:

Imperium Terminal Services will have significant procedures and engineering controls in place to prevent releases of raw materials and products that will be loaded and unloaded. The bulk tank farm will be constructed to American Petroleum Institute (API) 650 standards with impervious containment to capture the largest tank and accumulated precipitation. Tanks will be equipped with over-pressure protection, high-level alarms, floating roofs, foam blanketing fire protection, and emergency overflows into the containment area. Tanks will be inspected and repaired in accordance with the most recent revision of API 653. Rail car loading and unloading will be conducted only in contained areas.

The pipelines to the terminal will be of welded steel, constructed per ASME B31 Code for Pressure Piping, and tested per applicable regulations. Unloading operations will be continuously staffed during all transfer operations. The load/unload operations will be in compliance with the U.S. Oil Pollution Control Act and in conformance with an approved SPCC Plan approved by a Registered Professional Engineer.

Imperium Terminal Services, LLC has discussed the project with the City of Hoquiam Fire Department and designed the project to meet building setbacks for fuel storage, collection vents and flame arrestors on tanks, and will not allow open flames on site.

Specific containment for on-site chemicals includes:

- Flammable Liquid Storage. Risks will be mitigated with full tank containment, foam blanketing fire suppression, and suppression (floating roofs) of vent gasses.

- Vessel Loading Vapor Emissions. Risks will be mitigated with vent collection, and incineration through a Marine Vapor Emission Control System in compliance with U.S. Coast Guard regulations published in 33 CFR 154 and NVIC 1-96.

These measures will limit impacts and provide for adequate analysis and mitigation of potential adverse impacts in accordance with RCW 43.21C.240.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

This project will occur in an active industrial and shipping area. Noises from the project are expected to be similar to Imperium's current operation and are typical for the area.

2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.

Both in the short-term and long-term, noise increases will be associated with operation of rail in the area and motor noise associated with the off-loading equipment (electric motors), which will normally operate 24 hours per day, 7 days per week.

During construction, noise generated will be limited to typical working hours and will include truck traffic and typical construction noise. Pile driving for tank foundations will be the only likely source of off-site comment.

3) Proposed measures to reduce or control noise impacts, if any:

The construction and use of the proposal will meet noise standards of the Cities of Hoquiam and Aberdeen and the standards of WAC 173 60 which will limit impacts and provide for adequate analysis and mitigation of potential adverse impacts in accordance with RCW 43.21C.240.

8. Land and shoreline use

a. What is the current use of the site and adjacent properties?

The existing site is vacant industrial. The site is bordered by Fry Creek on the north and west sides, the Chehalis River on the southwest side, additional port properties west of the creek, to the east by industrial facilities including Imperium Grays Harbor's biodiesel production facility and Westway's methanol storage terminal, and to the north by the railroad and Port Industrial Road.

b. Has the site been used for agriculture? If so, describe.

No.

c. Describe any structures on the site.

A dock and pipe bridge with piping are adjacent to the site.

Industrial facilities including Imperium Grays Harbor's storage tanks and biodiesel production facility and Westway's methanol storage terminal are located to the east.

d. Will any structures be demolished? If so, what?

As part of the construction at Terminal 1, an existing catwalk on the dock facilities will be removed. The catwalk is located over the existing pipe racks and its removal is necessary to allow for construction of the new pipelines. This catwalk will not be replaced following construction because it is no longer utilized.

e. What is the current zoning classification of the site?

Current land use designation is Heavy Industrial (for both the City of Hoquiam and City of Aberdeen).

f. What is the current comprehensive plan designation of the site?

Per Grays Harbor County's Generalized Land Use Plan Map (May 1989) the project area is designated as industrial. The Land Use Map was prepared as part of the Industrial Lands Study for Grays Harbor County, the City of Hoquiam, the City of McCleary, and Grays Harbor Regional Planning Commission in May 1989 (Map 1, page 22).

g. If applicable, what is the current shoreline master program designation of the site?

The shoreline master plan designation for the site is "urban" in both Hoquiam and Aberdeen.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

Fry Creek and the Chehalis River are adjacent to the site and have been classified as environmentally sensitive.

The proposed expansion falls within the Geologically Hazardous Areas designation of the Cities of Hoquiam and Aberdeen Critical Areas Ordinance, specifically Liquefaction, Seismic and Tsunami. It is not anticipated that the proposed project will have an adverse effect on these environmentally sensitive areas. Compliance with the Critical Area Ordinances will limit impacts and provide for adequate analysis and mitigation of potential adverse impacts in accordance with RCW 43.21C.240

i. Approximately how many people would reside or work in the completed project?

Approximately 60 jobs will be created during construction. Approximately 15 to 20 employees will work in the completed project. No employees will reside in the completed project.

j. Approximately how many people would the completed project displace?

No people will be displaced by the project.

k. Proposed measures to avoid or reduce displacement impacts, if any:

None required.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The proposal will take place in both the City of Hoquiam and the City of Aberdeen. Since the majority of the project is within the City of Hoquiam, the City of Hoquiam is the lead agency for the Shoreline Substantial Development Permit. This project is allowed under the Conditional Use Permit and is consistent with land use and comprehensive plans for both the City of Hoquiam and the City of Aberdeen. Since there will be greater than 1 million gallons of liquid fuels stored on site, Ecology will be a co-lead agency on SEPA.

9. Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

N/A

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

N/A

c. Proposed measures to reduce or control housing impacts, if any:

N/A

10. Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

The maximum height of any structure will be the liquid storage tanks, which will be made of steel. The maximum height of the tanks in the tank farm will be 60 to 70 feet.

b. What views in the immediate vicinity would be altered or obstructed?

Adjacent parcels are currently under industrial use; therefore, the proposal will be consistent with other aesthetics in the vicinity. Some structures will be visible in the surrounding area and will be similar in character to existing tanks on the Imperium and Westway sites and are considerably shorter than the existing grain elevator to the east. The proposed tanks will not obstruct any views because the generally flat topography does not allow views of the water due to blockage by existing buildings and vegetation. The areas further to the north with sloping topography have existing distant views of the water areas of Grays Harbor. The new tanks will not block distant views.

c. Proposed measures to reduce or control aesthetic impacts, if any:

None.

11. Light and glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Lighting of the tank farm, rail area, and parking lot will be required between the hours of dusk and dawn that will slightly raise ambient light levels in the area. The lights will be directed downward and shielded to illuminate employee work areas and will not be directed towards the community.

No features of the proposal will produce reflective glare.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

The facility is in an existing industrial area and is consistent with other activities in the area. Therefore, light from the facility is not expected to be a safety hazard or interfere with views. Distant views of the site from the north currently feature a variety of lighting sources from port and industrial uses in the vicinity of the proposal.

c. What existing off-site sources of light or glare may affect your proposal?

There are no known off-site sources of light or glare that will affect the proposal.

d. Proposed measures to reduce or control light and glare impacts, if any:

No measures are proposed at this time.

12. Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

The Chehalis River and Grays Harbor provide informal recreational opportunities for boaters using the water. The 28th Street boat ramp and viewing tower, owned by the Port of Grays Harbor, are adjacent to the parcel and provide opportunities to view the shoreline and includes a fishing pier.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No, the proposed project will not restrict access to the boat ramp or viewing tower.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

No measures are proposed at this time.

13. Historic and cultural preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

Research of the Washington State Department of Archaeology and Historic Preservation's (DAHP) database was conducted February 9, 2010 to determine the presence of places or objects in the project vicinity. A cultural resources

survey was recently conducted by Historical Research Associates for improvements to Port Industrial Road, from 28th Street to the east of E. Terminal Way. No cultural resources were found within the Area of Potential Effect of that project.

No places or objects were indicated on or near the project site that occur on national, state or local registers. The nearest property indicated on a register is Union Pacific Railroad Depot, which is approximately 2 miles east of the project site, and has since been removed from the register listing.

Native American cultural resources in the maritime Pacific Northwest are generally associated with the shorelines of water bodies because those locations would have been used seasonally (particularly in spring-summer) for fishing and gathering. Winter villages typically also were located near water bodies, particularly near the mouths of streams. Midden deposits are typically the most readily identified. Detailed site surveys and excavation are generally required to identify resources related to houses, camps or other uses. In Grays Harbor, many of the sites utilized by Native Americans also were utilized by Euro American settlers because they also valued access to shorelines for the natural resources present and for trade. Where intact cultural resources are present, liquids spilled into the water could be carried to and deposited on these sites. It is unlikely that crude oil or other materials would have adverse physical or chemical impacts on cultural resources. During clean-up operations, the surface of these resources would be affected. The displacement of surface materials from clean-up operations, however, are likely to be limited. The depth of disturbance is likely to be less than the effects of storm driven waves that such areas experience.

Vessel traffic will be restricted to the ship channel and increased traffic will have no greater effect on the Tribal Fishing areas and Shellfish Growing areas.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

DAHP's databases, searched February 9, 2010, did not indicate any landmarks or evidence of historic, archaeological, scientific, or cultural importance within one mile of the project site.

c. Proposed measures to reduce or control impacts, if any:

No measures are proposed at this time.

14. Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

This project site is accessed by Port Industrial Road, E. Terminal Way, and 28th Street (see Figures 1 and 2).

Regional highway connections are provided by State Routes 8 and 108 which connect with Interstate 5 (I-5) in Olympia about 50 miles to the east. Seattle is about 110 miles. U.S. Highway 12 connects with I-5 near Rochester. U.S. Highway 101 connects to Port Angeles about 160 miles to the north and to Astoria, Oregon 81 miles to the south.

b. Is the site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Grays Harbor transit has regularly scheduled buses along Port Industrial Road. The nearest Grays Harbor Transit stop is within a mile of the project site.

c. How many parking spaces would the completed project have? How many would the project eliminate?

The City of Hoquiam Off-Street Parking ordinance (HMC 10.05.100) requires that Imperium provide off-street parking for the additional employees needed for the project. This project includes additional space for 15 parking places. This will allow for 5 operators, 10 at shift change, plus additional spots for office staff and several visitor spots including one designated as a Handicapped Parking space. No existing parking spaces will be eliminated. A bike rack with four spaces will also be added. Imperium will submit a Parking Plan for approval in compliance with HMC 10.05.100 which will detail Imperium's plan to provide off-street parking near the entrance of the facility near Port Industrial Road adjacent to the new office / laboratory / maintenance / warehouse building.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

No increases in capacity of local arterials or the state highway system will be required by the project. The Grays Harbor Council of Governments (GHCOG) - 2018 Regional Transportation Improvement Plan, adopted by the GHCOG board September 20, 2012 provides for an integrated program of transportation improvements to serve future growth in the area. The transportation demands of the project are consistent with growth projections for economic growth in the plan.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

The project will require utilization of rail and water transportation.

Bulk liquids would be delivered from the east (Intermountain and Central United States) by rail. Rail connections are to Grays Harbor are provided by Rail America / Puget Sound & Pacific Railroad (PSAP) and connect to either the Burlington Northern Santa Fe (BNSF) Railway or the Union Pacific (UP) Railroad at Centralia, WA. From Centralia, BNSF and UP provide access to the rest of the US rail network via multiple routes.

Bulk liquids arriving by vessel could be transshipped by truck to the Pacific Northwest and by truck or rail to the east.

Rail delivery is projected to be up to one unit train per day consisting on average of 105 tank cars, though if demand warrants only smaller quantities, those railcars may be incorporated into other trains. The proposed on-site rail expansion will increase on-site capacity to be able to store 146 to 161 rail cars which is designed to provide appropriate storage. Off-site storage is provided by Rail America / Puget Sound & Pacific Railroad and is adequate for serving the expansion.

Maintenance of viability of rail service to Grays Harbor is included in the Washington State 2010-2030 Freight Rail Plan completed December 31, 2009. (WSDOT 2009). The GHCOG 2018 Regional Transportation Improvement Plan includes the Pacific Northwest Coastal Export Rail Corridor which proves for rehabilitation of the short line freight rail lines connecting the export terminal in the Port of Grays Harbor to the BNSF and Union Pacific railroads at Centralia, WA (GHCOG 2012).

Delivery of rail cars to the site will be designed to minimize disruptions to Port Industrial Road traffic by targeting rail crossings at off peak hours. Port Industrial Road is already equipped with flashing lights and bells to provide warning to motorists of approaching trains. Port Industrial Road is not the main road through Aberdeen. All local businesses can be accessed via alternate routes if rail deliveries temporarily block the road as trains move into or out of the Imperium facility.

Projections for transshipment include up to two outbound vessels per week and two outbound barges per week. Up to 200 outbound vessels and barges per year are projected. The largest vessels will be Panamax class vessels with capacity up to 350,000 barrels. The Terminal 1 depth of 41 feet MLLW and the berth length of 480 feet long define maximum vessel size. Outbound barge capacity will be in the range of 25,000 to 150,000 barrel capacity.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Rail delivery is projected to be up to one unit train per day consisting on average of 105 tank cars. Projections for transshipment include up to two outbound vessels per week and two outbound barges per week.

Employee trips from 15-20 employees regularly employed on site are projected to be 20 to 30 per day.

g. Proposed measures to reduce or control transportation impacts, if any:

No measures are proposed at this time. Demands for rail service will be met by the local short line and regional rail systems. Marine transportation infrastructure is in place to serve additional vessels accessing Grays Harbor.

Compliance with the programs of the GHCOG 2018 Regional Transportation Improvement Plan and Washington State 2010-2030 Freight Rail Plan will limit impacts and provide for adequate analysis and mitigation of potential adverse impacts in accordance with RCW 43.21C.240.

15. Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

Imperium Terminal Services, LLC has met with the City of Hoquiam Fire Department to discuss any special requirements the terminal facility may need. It was determined that the project will not result in an increased need for public services.

b. Proposed measures to reduce or control direct impacts on public services, if any.

No measures are proposed at this time. Affected utilities are in place and no major changes or costs are involved in serving the proposal.

16. Utilities

a. Circle utilities currently available at the site: electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other: potable water

Imperium Terminal Services will share utilities with the Imperium Grays Harbor facility. Some utility upgrades will be necessary for this project. Electricity upgrades to the facility will be required to provide power to the rail and vessel unloading and loading pumps. Natural gas will need to be extended to the Marine Vapor Emissions Control System. Potable water, electricity, sanitary sewer, natural gas, telephone and refuse service will be provided for the new building(s).

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

The utilities proposed for this project require working with existing service companies. Electricity required for the project will come from the Grays Harbor PUD and will required modification and expansion of facilities for delivery to the site. Natural gas will come from Cascade Natural Gas and will not require modification of the existing pipeline serving the site. Other utilities will be shared with the Imperium Grays Harbor facility.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Title: President and CEO, Imperium Terminal Services, LLC

Date Submitted: February 22, 2013

Reviewed by: _____

Title: _____ Division_____

Date: _____

References:

AAR (Association of American Railroads). 2008. Hazmat Transportation by Rail: An Unfair Liability. March 2011 newsletter referencing 2008 study.

API. 2009. Analysis of U.S. Oil Spillage. API Publication 356. August 2009. http://www.api.org/environment-health-and-safety/clean-water/oil-spill-prevention-and-response/~/media/93371edfb94c4b4d9c6bbc766f0c4a40.ashx
Audubon Society. 2008. Christmas bird counts. http://audubon2.org/cbchist/count_table.html . Accessed April 2, 2009.

Bigg, M.A., P.F. Olesiuk, G.M. Ellis, J.K.B. Ford, and K.C. Balcomb III. 1990. Social organization and genealogy of resident killer whales (*Orcinus orca*) in the coastal waters of British Columbia and Washington State. *Report of the International Whaling Commission* (Special Issue) 12: 383–405.

Calambokidis, J., J. R. Evenson, G. H. Steiger, and S. J. Jeffries. 1994. Gray whales of Washington state: natural history and photographic catalog. Cascadia Research Collective, Olympia, Washington.

Daidola, J.C. 1995. Tanker structure behavior during collision and grounding. *Marine Technology*, Vol. 32, No. 1, pp. 20-32. http://www.docstoc.com/docs/41249027/Structural-Design-and-Response-in-Collision-and-Grounding

Dumbauld, B.R., D.L. Holden, and O.P. Langness. 2008. Do sturgeon limit burrowing shrimp populations in Pacific Northwest estuaries? Environmental Biology of Fishes. DOI 10.1007/s 10641-008-9333-y. 14 pp.

Ecology (Washington State Department of Ecology). 2003. Grays Harbor geographic response plan. Ecology Publication 03-08-10 http://www.ecy.wa.gov/programs/spills/preparedness/GRP/Introduction/introduction.htm

Ecology. 2007. Causal analysis of vessel-related incidents and oil spills in the State of Washington occurring between November 1993 – December 2006. Washington Oil Spill Advisory Council. http://www.psp.wa.gov/downloads/OSAC/osac_archive_20090701/assets/pdf/2007causal_analysis.pdf

Ecology. 2012a Investigated vessel incidents in Washington State: Pacific States/British Columbia data (A Pareto view). http://www.ecy.wa.gov/programs/spills/prevention/measures/States_BC%20Data%20for%20Washington%20State/InvestigatedVesselIncidents_Summary.html

Ecology. 2012b. Spills program overview. http://www.ecy.wa.gov/programs/spills/other/about_us.htm

Emmett, R.L., S.A. Hinton, S.L. Stone, and M E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in West Coast estuaries. Volume II: Species life history summaries. ELMR Report Number 8, Strategic Assessment Branch, NOS/NOAA. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service.

GHCOG (Grays Harbor Council of Governments). 2012. 2013-2018 Regional Transportation Improvement Plan http://www.ghcog.org/Transportation/2013TIP_projects/GraysHarbor_RegionalTIP_Adopted_Sept20_2012.pdf

Gustafson, R.G., M.J. Ford, D. Teel, and J.S. Drake. 2010. Status review of eulachon (*Thaleichthys pacificus*) in Washington, Oregon, and California. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-105, 360 p.

Jaques, D.L. and C. O'Casey. 2006. Brown pelican roost site use in Grays Harbor and Willapa Bay, Washington, 2003-2005. Final report prepared for the Washington State Department of Transportation. Crescent Coast Research, Crescent City, California.

Jeanes, E.D., C.M. Morello, and M.H. Appy. 2006. Native char utilization Lower Chehalis River and Grays Harbor Estuary, Aberdeen, Washington. Prepared by R2 Resource Consultants, Inc., Redmond, WA for U.S. Army Corps of Engineers, Seattle District Office.

Jeffries, S.J., P.J. Gearin, H.R. Huber, D.L. Saul, and D.A. Pruett. 2000. Atlas of seal and sea lion haulout sites in Washington. Washington Department of Fish and Wildlife, Wildlife Science Division, Olympia WA. 150 pp.

Michel, K. and T. Winslow. 1999. Cargo ship bunker tanks: designing to mitigate oil spillage. Proceedings, SNAME Joint California Sections Meeting, May 1999.

Monaco, M.E., R.L. Emmett, S.A. Hinton, and D.M. Nelson. 1990. Distribution and abundance of fishes and invertebrates in west coast estuaries. Volume I: Data summaries. ELMR Rep. No. 4, Strategic Assessment Branch, NOS/NOAA. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service.

NatureServe. 2012. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at http://www.natureserve.org/explorer . Accessed December 6, 2012 .

NMFS (National Marine Fisheries Service). 2008a. Recovery plan for southern resident killer whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Seattle, WA.

NMFS. 2008b. Proposed designation of critical habitat for the southern distinct population segment of North American green sturgeon. Draft biological report. September 2008. National Marine Fisheries Service, Southwest Region Protected

Resources Division, Long Beach CA. http://swr.nmfs.noaa.gov/gs/Final_Draft_GS_BioRpt.pdf.

NRC (National Research Council). 1994 Minding the helm: Marine navigation and piloting. Washington, DC. National Academy Press.

Speich, S.M. and T.R. Wahl. 1995. Marbled murrelet populations of Washington -- marine habitat preferences and variability of occurrence. *In:* Ecology and conservation of the marbled murrelet. Eds. C.J. Ralph, G.L. Hunt, M.G. Raphael, and J.F. Piatt. General Technical Report PSW-152. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture, Albany, CA.

Tyrell, David, David Jeong, Karina Jacobsen. 2007. Improved Tank Car Safety Research. Proceedings of the 2007 ASME Rail Transportation Division Fall Technical Conference, RTDF2007. September 11-12, 2007, Chicago, Illinois, http://www.volpe.dot.gov/coi/pis/docs/2007/asme_rtdf2007-46013.pdf

USACE (U.S. Army Corps of Engineers). 2006. Fiscal Years 2007–2011 maintenance dredging and disposal Grays Harbor and Chehalis River Navigation Project. Grays Harbor County, WA. August 2006.

USFWS (U.S. Fish and Wildlife Service). 2004. Draft recovery plan for the Coastal-Puget Sound distinct population segment of bull trout (*Salvelinus confluentus*). Region 1, U.S. Fish and Wildlife Service, Portland, Oregon.

USFWS (U.S. Fish and Wildlife Service). 2012. Grays Harbor National Wildlife Refuge. Available at http://www.fws.gov/refuges/profiles/index.cfm?id=13534. Accessed December 7, 2012.

Washington DNR (Department of Natural Resources). 2012. Washington Natural Heritage Program GIS dataset: locational records of rare species and high-quality ecosystems of special concern. Updated January 2012.

WDFW (Washington Department of Fish and Wildlife). 2005. Management recommendations for Washington's priority species: peregrine falcon (*Falco peregrinus*). January 2005.

WDFW. 2012a. PHS on the Web: An interactive map of WDFW priority habitats and species information for project review. Available online at http://wdfw.wa.gov/mapping/phs/.

WDFW. 2012b. Salmonscape fish database and mapping application. Available online at http://wdfw.wa.gov/mapping/salmonscape/index.html.

WSDOT (Washington State Department of Transportation) 2009 Washington State 2010-2030 freight rail plan. Prepared by Washington State Department of Transportation State Rail and Marine Office December 2009 http://www.wsdot.wa.gov/NR/rdonlyres/AFF740F6-20F2-4C85-8569-F107E5B649D8/0/StateFreightRailPlan.pdf

WSDOT. 2010. Biological assessment for the State Route 520 pontoon construction project. July 2010.

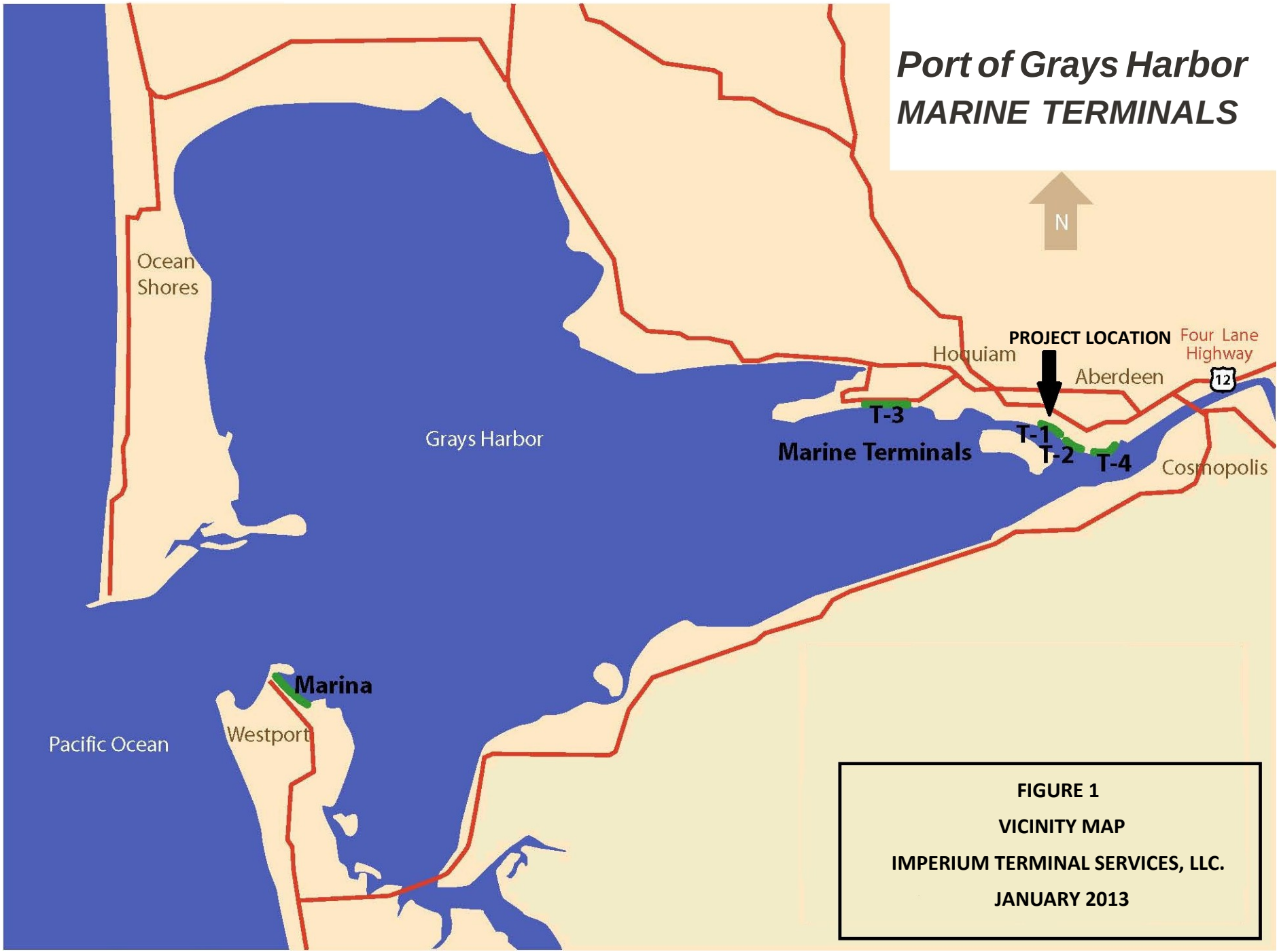
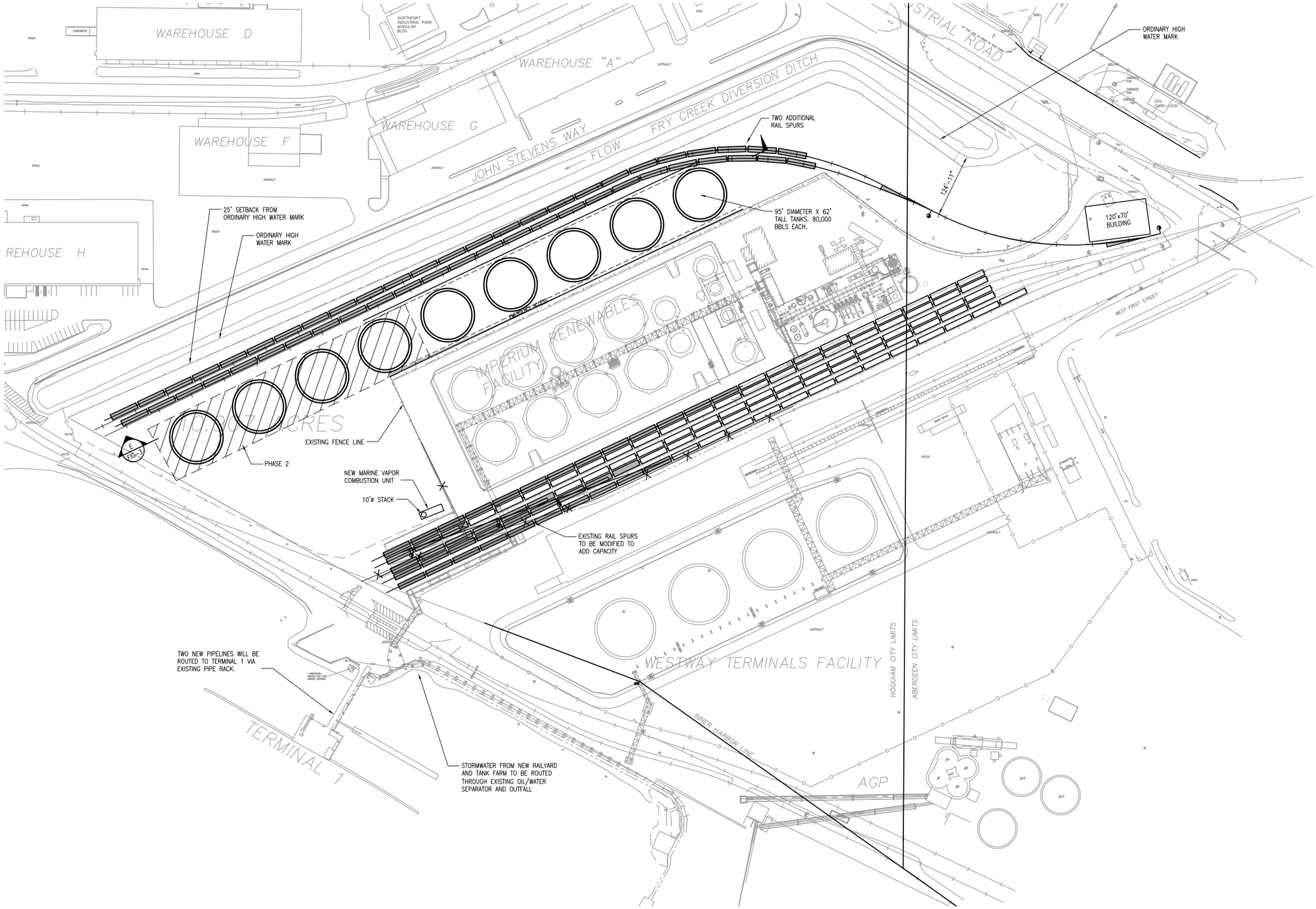


FIGURE 1
VICINITY MAP
IMPERIUM TERMINAL SERVICES, LLC.
JANUARY 2013



PRELIMINARY - NOT FOR CONSTRUCTION

Reference Drawings		Revisions				Revisions			
Drawing No	Title	Rev	Date	By	Description	Rev	Date	By	Description
		A	–	–	–				

Rev	Date	App'd	Client Approval Milestone

Imperium

Harris Group Inc.
Engineering Solutions for a Better World®
www.harrisgroup.com

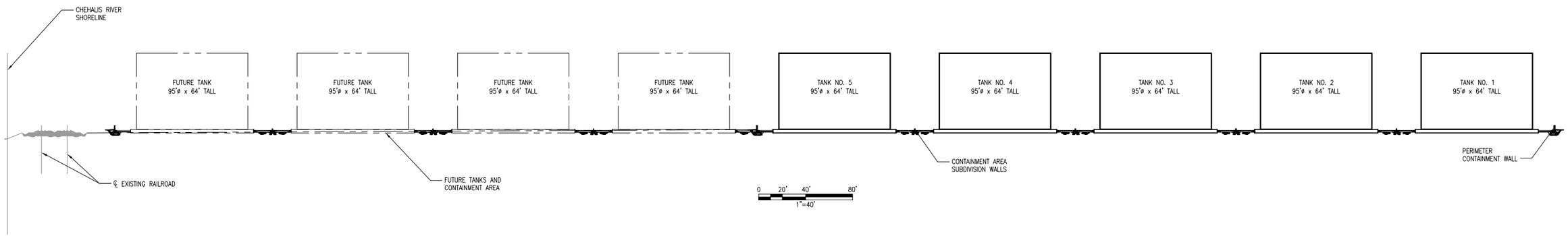
Drawn: SKK Check:
Engr: Check:
Appr: PMgr:

PORT OF GRAYS HARBOR PLANT EXPANSION
GENERAL ARRANGEMENT

IMPERIUM GRAYS HARBOR BIODIESEL FACILITY

Project No: 30359.00
Drawing: FIGURE 2
Rev: A

File Location: U:\30359.00\Drawings\Gen\Sketches\FIG-2.dwg
By: Kyle, Dennis
Save Date: 1/4/13



SECTION E
SCALE: 1"=40' SK-01

File Location: U:\30359.00\Drawings\Gen\Sketches\FIG-3.dwg

By: Kyle, Dennis

Save Date: 1/4/13

PRELIMINARY - NOT FOR CONSTRUCTION

Reference Drawings		Revisions				Revisions			
Drawing No	Title	Rev	Date	By	Description	Rev	Date	By	Description
		A	–	–	–				

Rev	Date	App'd	Client Approval Milestone

Imperium

Harris Group Inc.
Engineering Solutions for a Better World®
www.harrisgroup.com

Drawn: DAK Check:
Engr: Check:
Appr: PMgr:

PORT OF GRAYS HARBOR PLANT EXPANSION SECTION VIEW

IMPERIUM GRAYS HARBOR BIODIESEL FACILITY

Project No: 30359.00
Drawing: **FIGURE 3**
Rev: A

Appendix A – Legal Description

BERGLUND, SCHMIDT
& ASSOCIATES, INC.
PROFESSIONAL ENGINEERS & LAND SURVEYORS

2323 Bay Avenue
Hoquiam, WA 98550
(360) 532-7630 · FAX (877) 419-9683
www.berglundschmidt.com

January 4, 2013

LEGAL DESCRIPTION FOR:

Port of Grays Harbor
PO Box 660
Aberdeen, WA 98520

IMPERIUM RENEWABLES LEASE NO. 1120

That portion of Tracts 23 and 24 of Hoquiam Tidelands lying in front of Section 7, Township 17 North, Range 9 West of the Willamette Meridian, and that portion of Lots 6, 7, 8 and Vacated Fry Creek Waterway of Aberdeen tide and Shorelands lying in front of Sections 7 and 8, Township 17 North, Range 9 West of the Willamette Meridian and that portion of West First Street right-of-way as per plat of Hoquiam Addition to Aberdeen recorded in Volume 2 of Plats Page 108, records of Grays Harbor County, Washington, more particularly described as follows:

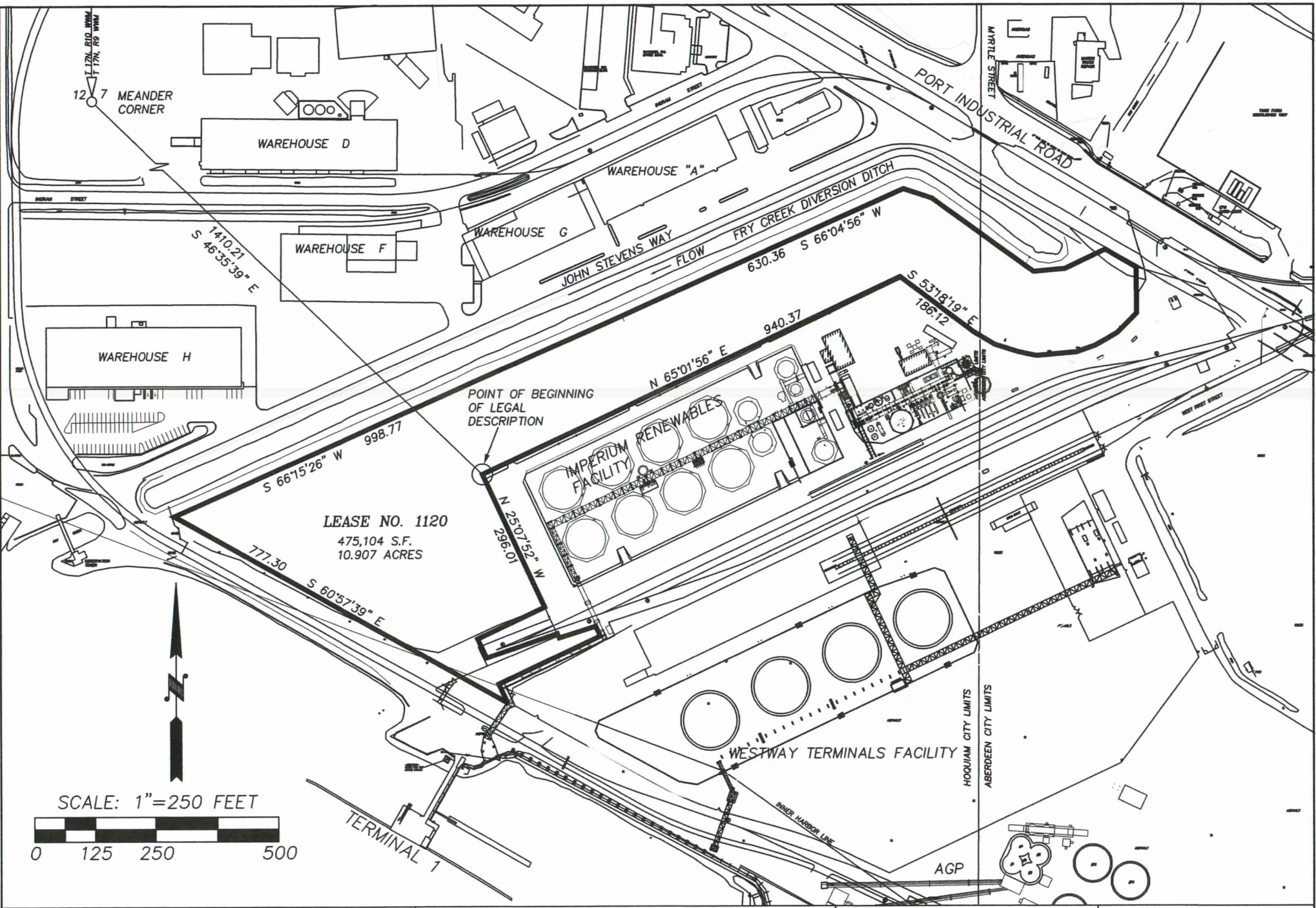
Commencing at the Meander Corner common to Section 7, Township 17 North, Range 9 West of the Willamette Meridian and Section 12, Township 17 North, Range 10 West of the Willamette Meridian;
Thence South 46° 35' 39" East on a Tideland Bearing a distance of 1,410.21 feet to the True Point of Beginning;
Thence North 65° 01' 56" East a distance of 940.37 feet;
Thence South 53° 18' 19" East a distance of 186.12 feet;
Thence South 59° 36' 13" East a distance of 50.63 feet;
Thence South 72° 12' 48" East a distance of 50.41 feet;
Thence South 78° 56' 33" East a distance of 37.75 feet;
Thence North 84° 49' 12" East a distance of 80.43 feet;
Thence North 70° 42' 15" East a distance of 39.92 feet;
Thence North 60° 10' 17" East a distance of 50.67 feet;
Thence North 44° 56' 52" East a distance of 56.19 feet;
Thence North 0° 27' 59" East a distance of 92.87 feet;
Thence North 59° 57' 29" West a distance of 72.35 feet;
Thence South 64° 18' 15" West a distance of 90.07 feet;
Thence South 84° 52' 52" West a distance of 63.08 feet;
Thence North 54° 24' 28" West a distance of 254.77 feet;
Thence North 71° 53' 40" West a distance of 60.85 feet;
Thence South 66° 04' 56" West a distance of 630.36 feet;
Thence South 66° 15' 26" West a distance of 998.77 feet;
Thence South 60° 57' 39" East a distance of 777.30 feet;
Thence North 25° 15' 44' West a distance of 39.74 feet;
Thence North 64° 44' 16" East a distance of 226.99 feet;
Thence North 25° 16' 30" West a distance of 22.07 feet;
Thence South 72° 12' 31" West a distance of 76.96 feet;
Thence North 24° 02' 19" West a distance of 9.62 feet;
Thence South 71° 05' 05" West a distance of 151.82 feet;
Thence North 25° 12' 34" West a distance of 42.74 feet;
Thence North 64° 52' 07" East a distance of 150.83 feet;
Thence North 25° 07' 52" West a distance of 296.01 feet to the True Point of Beginning.

Situate in County of Grays Harbor, State of Washington.

This parcel contains 475,104 Square Feet or 10.907 acres.

MICHAEL L. SCHMIDT
STATE OF WASHINGTON
22967
REGISTERED
PROFESSIONAL LAND SURVEYOR
1-4-13

Michael L. Schmidt, PLS



PREPARED BY:
BERGLUND, SCHMIDT & ASSOC., INC.
PROFESSIONAL ENGINEERS AND LAND SURVEYORS
2323 BAY AVENUE HOQUIAM, WA. 98550
PH. 360-532-7630 FAX 877-419-9683

PORT OF GRAYS HARBOR

IMPERIUM RENEWABLES LEASE NO. 1120
LEASE EXHIBIT

SCALE: 1"=250'	DWG. NO. 12.128
LOC'N: P.I.A.	NO.
DRAWN BY: M.L.S.	
DATE: 1-4-2013	

Appendix B – Geotech Report

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GEOENGINEERS

EMAIL TRANSMITTAL

1101 Fawcett Avenue, Suite 200, Tacoma, WA 98402 TELEPHONE: (253) 383-4940, FAX: (253) 383-4923 www.geoengineers.com

To: Steve Drennan
Seattle Biofuels, Inc.
1418 - 3rd Avenue, suite 300
Seattle, Washington 98101

Date: 6/13/2006

File: 15342-001-00

Email Address: steve@imperiumrenewables.com

Regarding: Proposed Storage Tanks, Hoquiam, Washington

Date	Description
6/13/2006	Report - Geotechnical Engineering Services

Remarks: Please call if you have questions.

Signed: Amanda Heller for

Eric Heller
eheller@geoengineers.com

DISCLAIMER: This document and any attachments are confidential and intended solely for the use of the individual or entity to whom they are addressed. Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

REPORT
GEOTECHNICAL ENGINEERING SERVICES
PROPOSED STORAGE TANKS
PORT OF GRAYS HARBOR, WASHINGTON

JUNE 13, 2006

FOR
SEATTLE BIOFUELS, INC.

GEOENGINEERS

File No. 15342-001-00

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Geotechnical Engineering Services
File No. 15342-001-00

June 13, 2006

Prepared for:

Seattle Biofuels, Inc.
1418 3rd Avenue, Suite 300
Seattle, Washington 98101

Attention: Steve Drennan

Prepared by:

GeoEngineers, Inc.
1101 South Fawcett Avenue, Suite 200
Tacoma, Washington 98402
(253) 383-4940

GeoEngineers, Inc.

Eric W. Heller
Geotechnical Engineer

Gary W. Henderson, PE
Senior Principal

GARY W. HENDERSON
STATE OF WASHINGTON
12970
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 3/20/06

6/13/06

EWH:GWH:tt
TACO:\15\15342001\00\Finals\1534200100R.doc

Copyright© 2006 by GeoEngineers, Inc. All rights reserved.

Disclaimer: Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

TABLE OF CONTENTS

Page No.

INTRODUCTION 1
PROJECT UNDERSTANDING 1
PURPOSE AND SCOPE 2
SITE CONDITIONS 3
- PROJECT LOCATION 3
- SURFACE CONDITIONS 3
- SUBSURFACE EXPLORATIONS 3
- SUBSURFACE CONDITIONS 3

CONCLUSIONS AND RECOMMENDATIONS 3
- GENERAL 3
- SITE DEVELOPMENT AND EARTHWORK 4
  - General 4
  - Stripping and Clearing 4
  - Subgrade Preparation 4
- FILL MATERIALS 5
  - General 5
  - Pipe Bedding 5
  - Trench Backfill 5
  - On-Site Soils 5
- FILL PLACEMENT AND COMPACTION 5
  - General 5
  - Area Fills and Bases 6
  - Trench Backfill 6
  - Temporary Excavation Support and Groundwater Handling 6
  - Permanent Cut and Fill Slopes 7
  - Surface Drainage 7
  - Erosion Control 7
- SITE RESPONSE ANALYSES 8
  - General 8
  - Seismic Hazard Analysis 8
  - Site Response Analysis 8
  - Liquefaction 10
  - Tsunami Hazard 11
- FOUNDATION SUPPORT 11
  - General 11
  - Tanks 11
- PILE FOUNDATION OPTIONS 12
  - Building Support 12
- FLOOR SLABS 12
- RAILROAD SUPPORT 13

LIMITATIONS 13

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

TABLE OF CONTENTS

Page No.

List of Tables

Table 1. Tank Statistics 1
Table 2. Ground Motions 9
Table 3. Soil Profile Model 10

List of Figures

Figure 1. Vicinity Map
Figure 2. Site Plan
Figure 3. 5% Damped Acceleration Spectra
Figure 4. 5% Damped MCE Spectra
Figure 5. 5% Damped Design Spectra
Figure 6. Design 5% Damped Acceleration Spectra

APPENDICES

APPENDIX A – SUPPLEMENTAL SUBURFACE EXPLORATIONS A-1

Appendix A Figures

Figure A-1. Key to Exploration Logs
Figure A-2. Log of Boring
Figures A-3 through A-7. CPT Results

APPENDIX B – LABORATORY TESTING B-1

Appendix B Figures

Figure B-1. Sieve Analysis Results
Figure B-2. Atterberg Limits Test Results
Figures B-3 and B-4. Consolidation Test Results

APPENDIX C – SITE RESPONSE ANALYSES
APPENDIX D – GEOENGINEERS REPORT, DECEMBER 10, 1996
APPENDIX E – REPORT LIMITATIONS AND GUIDELINES FOR USE ..... E-1...E-4

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

REPORT
GEOTECHNICAL ENGINEERING SERVICES
PROPOSED STORAGE TANKS
PORT OF GRAYS HARBOR, WASHINGTON
FOR
SEATTLE BIOFUELS, INC.

INTRODUCTION

GeoEngineers is pleased to present the results of our geotechnical engineering services associated with the proposed storage tanks on the Port of Grays Harbor property in Hoquiam, Washington. The site is shown relative to surrounding physical features on the Vicinity Map, Figure 1 and the Site Plan, Figure 2.

PROJECT UNDERSTANDING

Our understanding of the project is based on conversations with you and Craig Houghton, who is with Parner, Messana and Associates, review of site plans provided by you and review of our in-house files. Prior to this investigation, we completed the following report for this site:

- Geotechnical Engineering Services, Fill Conditions, Slip 1, Port of Grays Harbor, December 10, 1995.

It is our understanding that you are planning to construct storage tanks and associated improvements for bio-diesel production. The proposed tanks range from 20 to 80 feet in diameter as shown on a proposed layout you have provided. A railroad spur with four tracks is indicated between the proposed tracks and the existing building, which occupied the old finger pier (Pier 1). Miscellaneous support facilities would be located in a new building. We understand that the tank heights and weight of contents are as follows (this will be used in our settlement analysis):

Table 1. Tank Statistics

Diameter (feet)	Height (feet)	Contents (s.g.)
80	60	0.9
40	56	0.9
20	44	0.9
30	40	1.2
20	44	1.2

At the present time, four of the 80-foot-diameter tanks are shown as "future tanks." We understand that these tanks may be included, or possibly substituted for other tanks. The tanks are proposed within the old Slip 1 area, which had been developed in stages between the early 1980s to about 1996. A dike was constructed across the entrance slip to form an enclosed area in the mid 1980s. This enclosed area was filled hydraulically by pumping a mixture of soil and water into the slip. The hydraulic fill was discharged near the south corner of the slip. The characteristics of a hydraulic fill are controlled by the dredge material and the manner in which it is deposited. Hydraulic fills tend to segregate by particle size with the largest and heaviest particles, in this case gravel, dropping out of the soil-water mixture rapidly and accumulating near the discharge point. A fan of material forms around the discharge point; at greater distances the gravel will grade to sand followed by finer material. The gravel material also contains a

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

mixture of fine sand and silt. Some mixing of the material will occur and local variations are the rule rather than the exception.

The hydraulic fill was capped in 1994 by placing a variable thickness of fill excavated from a roadway construction project in the Grays Harbor area. The fill material generally comprises weathered sandstone and siltstone and was placed in a generally uncontrolled manner using dump trucks and a dozer. Fill placement induced localized bearing failures in the underlying dredge fill material, which resulted in heaving of the dredge fill surface in some areas. This created a variable thickness of the capping material.

In 1995 and 1996, we explored the fill in Slip 1 by drilling and sampling to 80 feet and advancing three cone penetrometer tests (CPTs) to depths of 60, 70 and 117 feet. The boring and two of the CPTs are located within or adjacent to the proposed tank area. The logs of our boring and CPT soundings are presented in our December 10, 1996 report, which is attached in Appendix C of this report. Also, in 1974 we drilled two deep borings between the rail spur and building that were located close to the building. Other borings were drilled on the other side of the building, but are too far away to be relevant.

The site is located approximately 100 miles from a potentially large subduction earthquake. The magnitude is estimated at 9.5 and the shaking would likely last two minutes. The estimated return period is 300 to 700 years. Based on previous nearby work, an earthquake of this magnitude would cause substantial liquefaction settlement and lateral spreading. If the tanks have to be designed for this, then pile support of the tank and tank floor load is likely to be required. If the useful life of the tanks is short, then a much smaller design level earthquake is reasonable. For this case, shallow support of the tanks may be feasible.

PURPOSE AND SCOPE

Based on the existing information, present layout, your preference for shallow support and our discussions our scope includes:

1. Drilling one additional boring to 80 feet and obtaining samples for laboratory testing. The testing consisted of two consolidation tests, two Atterberg limits and moisture/density determinations.
2. Advancing four CPTs to depths ranging between 80 and 143 feet below ground surface (bgs).
3. Advancing one seismic CPT to a depth of 105 feet bgs.
4. Exploring the railroad spur alignment using a hand auger or by digging shallow holes.
5. Providing recommendations for design of shallow support of the tanks, including allowable bearing estimates of settlement and preparation of the tank subgrade.
6. Providing design recommendations for support of the railroad spur, including subgrade preparation, base or ballast thickness and compaction requirements.
7. Providing recommendations for design of pile foundations, including vertical (up and down) and lateral capacities.
8. Providing installation criteria for piling.
9. Providing site specific response spectrum for structural design of tanks.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

SITE CONDITIONS

PROJECT LOCATION

The site is located on Port of Grays Harbor property in Grays Harbor County, Washington, in Township 17N, Range 9W and Section 18. The western portion of the site is located in Hoquiam and the eastern portion is in Aberdeen. The site is shown relative to surrounding physical features on the Vicinity Map, Figure 1 and the Site Plan, Figure 2.

SURFACE CONDITIONS

We observed surface conditions at the site on April 25, 2006. The site occupies an undeveloped field between "Warehouse E" to the south and Fry Creek Ditch to the north at the Port of Grays Harbor. The site is relatively flat, and is vegetated with grass and Scotch broom. We observed several small areas of ponded surface water at the site at the time of our visit.

SUBSURFACE EXPLORATIONS

Subsurface conditions at the site were further evaluated by drilling one boring (B-2) to a depth of 79 feet below existing grade, advancing four CPT soundings (CPT-4 through CPT-7) to depths ranging between 80 and 130 feet below existing grade and advancing one seismic CPT sounding (CPT-8) to a depth of 105 feet bgs. Explorations were located within the proposed bermed area for the tanks. The locations of the explorations are shown on the Site Plan, Figure 2. Logs of the explorations and a detailed description of the field exploration program are presented in Appendix A.

SUBSURFACE CONDITIONS

Boring B-2 was advanced on an existing gravel road at the site. The gravel road is approximately 2 feet above the typical grade of the site. In general, we observed silty sand or gravel in a loose to medium dense condition to a depth of approximately 15 feet bgs at the location of the boring. We interpret this material to be "Upper Fill" from the Highway 12 project located at the eastern end of Aberdeen. Groundwater was encountered at less than 10 feet bgs.

Beneath the Upper Fill, we observed silt, sandy silt or silty sand, with varying amounts of organics to a depth of approximately 74 feet bgs. The material was in a very soft to stiff or loose condition. We interpret this material to be "Dredge Fill" from Grays Harbor, or sediment that collected in the slip during its existence.

Beneath the Dredge Fill, we observed silty sand and sandy silt to the full depth explored. The material was in a stiff or loose condition. We interpret this to be native material beneath the Dredge Fill. The CPTs as well as nearby explorations show that these native soils are underlain by a medium dense to dense sandy gravel to gravelly sand at a depth of 130 to 140 feet.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

It is our opinion that the site improvements can be constructed generally as envisioned. The foundation design recommendations presented, both shallow and deep, are not intended to withstand a major subduction zone earthquake, which may be technically impossible. The existing soil contains a

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

significant percentage of fines (silt and clay-sized particles passing the U.S. Standard No. 200 sieve). Material with a significant amount of fines is very sensitive to small changes in moisture content and may be difficult, if not impossible, to work and compact when wet. This soil is also susceptible to disturbance from construction traffic when wet or if earthwork is performed during wet weather. Staged construction, subgrade protection measures, import of granular fill and delays during wet weather construction should be expected. We recommend a contingency be included in the project budget for import, removal and export of material if construction is conducted during periods of wet weather.

SITE DEVELOPMENT AND EARTHWORK

General

We anticipate that site development work will include clearing and stripping, placing fill to establish design grades, excavating for utility trenches, and placing and compacting excavated or backfill materials. We expect that the majority of site grading can be accomplished with conventional earthmoving equipment. The following sections provide recommendations for earthwork, site development and fill materials.

Stripping and Clearing

The existing brush, sod and organic-rich soil should be stripped and removed from proposed pavement and structural areas. Stripped material should be transported off site for disposal or processed and used in landscaping areas. The primary root systems for shrubs should be removed.

Required stripping depths should be evaluated based on observations during the stripping operation. We estimate stripping depths could be on the order of 6 inches to remove the surficial organic material and plant root zone. Greater stripping depths may be required to remove localized zones of loose or organic soil. Perched groundwater seepage may be encountered where more permeable soil overlies less permeable soil. The extent of the seepage and depth at which it might be encountered often depends on the time of year of construction. Groundwater seepage can soften soil and could create construction difficulties. Additional stripping may be required if subgrades become disturbed during stripping operations.

Subgrade Preparation

Due to the loose and highly variable surficial soil conditions, we recommend overexcavating the existing soil and compacting the exposed soil to a uniformly firm and unyielding condition prior to placement of fill. Overexcavation should extend approximately four feet below proposed subgrades. We recommend that prepared subgrades be observed by a member of our firm, prior to placement of fill. Our representative will evaluate the suitability of the subgrade and identify areas of yielding, which are indicative of soft or loose soil. The exposed subgrade soil should be proof-rolled with heavy rubber-tired equipment and/or probed with a 1/2-inch-steel rod, as necessary. If soft or otherwise unsuitable areas are revealed during proof-rolling or probing that cannot be compacted to a stable and uniformly firm condition, we recommend that: 1) the subgrade soils be scarified (e.g., with a ripper or farmer's disc), aerated and recompacted; or 2) the unsuitable soils be removed and replaced with structural fill limited to a maximum deposit 5 feet below foundation grade.

Soils encountered in the explorations contain a significant percentage of fines. This material may be sensitive to small changes in moisture content. Site soil may be difficult, if not impossible, to work and compact when wet or if construction occurs during wet weather conditions. Soil with high fines content

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

is susceptible to disturbance from construction traffic when wet or if earthwork is performed during wet weather.

FILL MATERIALS

General

Material used for fill should be free of debris, organic contaminants and rock fragments larger than 6 inches. The workability of material for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines (material passing the U.S. Standard No. 200 sieve) increases, soil becomes increasingly more sensitive to small changes in moisture content and adequate compaction becomes more difficult or impossible to achieve. If construction is performed during wet weather conditions, we recommend using fill consisting of well-graded sand and gravel containing less than 5 percent fines by weight based on the minus 3/4-inch fraction. If prolonged dry weather prevails during the earthwork phase of construction, a somewhat higher fines content would be acceptable, and the on-sit soil that is without organic material should be suitable.

Pipe Bedding

Trench backfill for the bedding and pipe zone should be as recommended by the pipe manufacturer. The material should be free of roots, debris, organic matter and other deleterious material.

Trench Backfill

For wet weather construction, we recommend that all trench backfill consist of material of approximately the same quality as “gravel borrow” described in Section 9-03.14(1) of the Standard Specifications. On-site soil that can be conditioned to the proper moisture content and compacted to the required density is suitable for trench backfill. All fills should be constructed in horizontal lifts at the appropriate thickness for compaction. For compaction recommendations refer to the “Fill Placement and Compaction” section of this report.

On-Site Soils

On-site materials used as structural fill should be free of roots, organic matter and other deleterious materials and particles larger than 6 inches in diameter. During extended periods of dry weather construction, non-organic on-site granular soil may be considered for use as fill provided it meets the criteria described above and can be compacted as recommended. Based on our explorations, portions of the excavated material could be over optimum moisture content for compaction. It will likely be necessary to aerate and/or dry the soil prior to placement and compaction.

The site soil may not be suitable for use as fill under wet weather conditions. Compaction of these soils will be difficult, if not impossible, to achieve during wet weather conditions. Even when properly compacted, this material can be easily disturbed and will soften when exposed to moisture.

FILL PLACEMENT AND COMPACTION

General

Structural fill should be compacted at a moisture content near optimum. The optimum moisture content varies with the soil gradation and should be evaluated during construction. Silty soil and other fine

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

granular soil such as silt, sandy silt, silty sand, and sand with silt may be difficult or impossible to compact during persistent wet conditions.

Fill and backfill material should be placed in uniform, horizontal lifts, and uniformly densified with vibratory compaction equipment. The maximum lift thickness will vary depending on the material and compaction equipment used, but should generally not exceed 10 to 12 inches in loose thickness.

Area Fills and Bases

Structural fill placed to raise site grades and aggregate base materials under foundations, slabs and pavements should be placed on a prepared subgrade that consists of uniformly firm and unyielding inorganic native soils or compacted fill. Structural fill (including the preload) should be compacted to at least 95 percent of the maximum dry density (MDD) determined by ASTM Test Method D 1557 (modified Proctor). Surcharge fill will not remain below proposed structures and so it does not need to be compacted as structural fill. However, the surcharge may need to be compacted in order to meet the unit weight requirement described in the "Foundation Support" section of this report.

Trench Backfill

For utility excavations, we recommend that the initial lift of fill over the pipe be thick enough to reduce the potential for damage during compaction but generally should not be greater than about 18 inches. In addition, rock fragments greater than about 1 inch in maximum dimension should be excluded from this lift.

In the building area, trench backfill should be uniformly compacted in horizontal lifts to at least 95 percent of the MDD (ASTM D 1557). Fill placed below a depth of 2 feet in pavement areas should be compacted to at least 90 percent of the MDD (ASTM D 1557). In nonstructural areas, trench backfill should be compacted to a firm condition to allow mobilization of construction equipment.

Temporary Excavation Support and Groundwater Handling

Excavations deeper than 4 feet should be shored or laid back at a stable slope if workers are required to enter. Shoring and temporary slope inclinations must conform to the provisions of Title 296 Washington Administrative Code (WAC), Part N, "Excavation, Trenching and Shoring." Regardless of the soil type encountered in the excavation, shoring, trench boxes or sloped sidewalls will be required under Washington Industrial Safety and Health Act (WISHA). The contract documents should specify that the contractor is responsible for selecting excavation and dewatering methods, monitoring the excavations for safety and providing shoring, as required, to protect personnel and structures.

In general, temporary cut slopes should be inclined no steeper than about 1-1/2H:1V (horizontal:vertical). This guideline assumes that all surface loads are kept at a minimum distance of at least one half the depth of the cut away from the top of the slope and that significant seepage is not present on the slope face. Flatter cut slopes will be necessary where significant seepage occurs or if large voids are created during excavation. Some sloughing and raveling of the cut slopes should be expected. Temporary covering with heavy plastic sheeting should be used to protect slopes during periods of wet weather.

In general, we recommend that temporary fill slopes be constructed at a maximum inclination of 1-1/2H:1V. Where 1-1/2H:1V temporary slopes are not feasible, retaining structures should be considered, such as near the existing building. Temporary protection should be used while slopes are in use.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Groundwater was not encountered in the supplemental boring completed for this study. During our previous investigations groundwater was encountered below anticipated excavation depths. We anticipate that the groundwater handling needs will generally be lower during the late summer and early fall months. We anticipate that perched groundwater encountered in shallow footing or trench excavations can be handled adequately with sumps, pumps, and/or diversion ditches, as necessary. Ultimately, we recommend that the contractor performing the work be made responsible for controlling groundwater encountered.

Permanent Cut and Fill Slopes

In general, we recommend that permanent cut and fill slopes be constructed at a maximum inclination of 2H:1V. Where 2H:1V permanent slopes are not feasible, retaining structures should be considered. Cut areas should be re-vegetated as soon as practical to reduce the surface erosion and sloughing. We recommend that fill slopes be overbuilt slightly and subsequently cut back to expose well compacted fill in order to achieve uniform compaction. Temporary erosion protection should be used until permanent protection is established.

Surface Drainage

Surface water from roofs, driveways and landscape areas should be collected and controlled. Curbs or other appropriate measures such as sloping pavements, sidewalks and landscape areas should be used to direct surface flow away from the buildings and erosion sensitive areas. Roof and catchment drains should discharge to an appropriate collection system.

It is our understanding that a berm will eventually be constructed around the proposed tanks for spill control. This will in effect trap rain water within the tank area. We recommend measures be taken to allow rainwater to exit while maintaining the integrity if the system to contain any potential spills.

Erosion Control

Based on existing site grades and the proposed development, we anticipate that erosion control measures such as silt fences, straw bales and sand bags will generally be adequate for the proposed development. However, if construction and grading is staged, slopes may be created and additional erosion control measures may have to be implemented.

Temporary erosion control should be provided during construction activities and until permanent erosion control measures are functional. Surface water runoff should be properly contained and channeled using drainage ditches, berms, swales, and tightlines and should not discharge onto sloped areas. Any disturbed sloped areas should be protected with a temporary covering until new vegetation can take effect. Jute or coconut fiber matting, excelsior matting or clear plastic sheeting is suitable for this purpose. Graded or disturbed slopes should be tracked in-place with the equipment running perpendicular to the slope contours so that the track grouser marks provide a texture to help resist erosion.

Permanent measures for erosion control should include reseeding or replanting the disturbed areas as soon as possible and protecting those areas until new vegetation has been established. Permanent site grading should be accomplished in such a manner that stormwater runoff is not concentrated and surface water is not directed to sloped portions or into excavated areas of the site. This can be accomplished by grading to direct the flow to appropriate collection points away from the slopes or excavations.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

SITE RESPONSE ANALYSES

General

Site response analyses were completed to develop site specific spectral response accelerations at the project site for ground motions consistent with a risk level of 2 percent probability of exceedance (PE) in 50 years (2,500-year event). The site response analyses were completed in general accordance with the 2003 International Building Code (IBC) and American Society of Civil Engineers (ASCE) 7-02.

In general, the development of the response spectra includes the following steps:

- Estimation of probabilistic ground motions on bedrock for the design risk level using the seismic hazard model developed by the United States Geological Survey (USGS).
- Developing a target bedrock response spectrum using the probabilistic ground motion parameters determined from the USGS model.
- Selecting representative earthquake time histories with source zones, magnitudes, and site to source distance that are consistent with the regional tectonics.
- Scaling the selected time histories so that the average of their response spectra on bedrock are a good match to the target bedrock response spectrum.
- Propagating the scaled time histories through a model of the soil conditions to assess the amplification and damping effect of the site soils and developing response spectra at the ground surface (top of the soil profile).
- Establishing a site-specific design spectrum using the average of the response spectra at the ground surface per the procedures outlined in the 2003 IBC and ASCE 7-02.

Seismic Hazard Analysis

The USGS 2002 probabilistic seismic hazard deaggregation was completed and used to evaluate the seismic hazard at the site. Using the spectral acceleration values estimated by the USGS for periods between 0 and 2 seconds, a maximum considered earthquake (MCE) response spectrum for rock was constructed and was used as the target spectrum in scaling our selected input motions used in our site response analysis, as described below.

The USGS model includes regional seismic source zones, recurrence relationships for seismic events associated with these source zones, and local attenuation relationships to estimate probabilistic ground motions at a specific site.

Site Response Analysis

Input Ground Motions

In order to provide representative earthquake acceleration time histories for the site response analysis, we reviewed the percent contribution of the regional source zones to the estimated seismic hazard at the site using the USGS 2002 probabilistic seismic hazard deaggregation for ground motions with a 2 percent PE in 50 years. From the USGS deaggregation, we observed that the earthquakes associated with subduction zone events off the coast of Washington contributed approximately 90 percent of the seismic hazard at the site. Crustal and Benioff zone earthquakes contributed the remaining 10 percent of the seismic hazard at the site. Based on this evaluation, we selected two shallow crustal events, two Benioff events, and three

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

subduction zone events to be used as input ground motions for the site response analysis. There are few recordings of subduction zone earthquakes to use for modeling, so we supplemented subduction zone time histories with Crustal and Benioff zone earthquakes that exhibits long-period energy content similar to what would be expected from a subduction zone event. The ground motions selected using the criteria described above are presented in the following table.

Table 2. Ground Motions

Earthquake, Year	Recording Station	Magnitude	Distance (km)	Peak Horizontal Acceleration (g), (orientation of orthogonal component)	Fault Mechanism
Taiwan, 1999	Nantou - Yuchi	7.6	12	0.23 (180)	Crustal/Reverse Thrust
				0.35 (90)	
Bhuj-Kachchh, 2001	Ahmedabad	7.6	239	0.08 (180)	Crustal/Reverse Thrust
				0.11 (90)	
El Salvador, 2001	San Miguel	7.6	92	0.12 (360)	Benioff
				0.14 (270)	
Nisqually, 2001	Alki	6.8	73	0.02 (00)	Benioff
				0.04 (90)	
Mexico 1985	La Union Mexico	8.1	80	0.17 (00)	Subduction Zone, Interplate
				0.15 (90)	
Chile-Valparaiso, 1985	Llolleo	7.8	Unknown	698.3 (10)	Subduction Zone, Interplate
				436.9 (100)	
Chile-Valparaiso, 1985	Melipilla	7.8	Unknown	673 (00)	Subduction Zone, Interplate
				518 (90)	

Scaling Procedure

The selected input motion time histories were scaled prior to completing site response analysis. Each selected time history was scaled so that its response spectrum is, on average, approximately at the level of the target bedrock spectrum as defined above over the period range of 0 to 2 seconds. Figure 3 shows the response spectra for each orthogonal pair of input motion time histories. The resulting average response spectrum and the target rock spectrum are also shown on Figure 3 for comparison purposes.

Soil Profile

A site response model based on low-strain shear wave velocities was developed for this project. The explorations completed at the site extend to an approximate maximum depth of 140 feet and were terminated in medium stiff to medium dense alluvium. Based on our review of the regional geology at the site, dense gravel typically exists below the alluvium and transition quickly into bedrock. For this project, the contact between the alluvium and dense gravel was assumed at depth of about 150 feet and the bedrock was modeled at depth of 200 feet.

The shear wave velocities of the soil located within the exploration depth were estimated based on shear wave velocity measurement completed in CPT-8 to depth of about 100 feet and correlation with the converted blow counts obtained in the CPT-6 that was probed to a depth of about 140 feet. Shear wave velocity below the exploration depth is assumed to increase linearly to a shear wave velocity of 2,500 feet per second at depth of 200 feet. The following table summarizes the soil type, unit weights, shear wave

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

velocity and shear modulus and damping reduction curves used in the ProShake model for the soil profile model used in our analysis.

Table 3. Soil Profile Model

Depth (feet)	Soil Type	Unit Weight (pcf)	Small Strain Shear Wave Velocity (ft/s)	Shear Modulus and Damping Reduction Curves
0 to 20	Fill (granular)	125	500	Clay (shear modulus), Clay Average (damping) (Seed and Sun, 1988)
20 to 50	Alluvium (cohesive)	115	350	Clay (shear modulus), Clay Average (damping) (Seed and Sun, 1988)
50 to 65	Alluvium (cohesive)	120	500	Clay (shear modulus), Clay Average (damping) (Seed and Sun, 1988)
65 to 100	Alluvium (cohesive)	120	650	Clay (shear modulus), Clay Average (damping) (Seed and Sun, 1988)
100 to 120	Alluvium (cohesive)	120	700	Clay (shear modulus), Clay Average (damping) (Seed and Sun, 1988)
120 to 140	Alluvium (cohesive)	120	850	Clay (shear modulus), Clay Average (damping) (Seed and Sun, 1988)
140 to 150	Alluvium (cohesive)	120	950	Clay (shear modulus), Clay Average (damping) (Seed and Sun, 1988)
150 to 200	Dense sand (granular)	135	1,500 – 2,100	Sand, 121-250 feet (EPRI 1993)
200+	Bedrock (rock)	140	2,500	Rock, (Idriss, 1991)

Site Response Analysis and Computed Results

The site response analysis was completed using the computer program ProShake Version 1.1 (EduPro Civil Systems, Inc., 1998). ProShake is a computer program for equivalent linear, one-dimensional ground response analysis.

Response spectra for 5 percent structural damping were developed for the site by propagating the scaled input motions through the soil profile using ProShake. Figure 4 shows the MCE response spectra at the ground surface calculated for the site. The average response spectrum at the ground surface will be used to construct the site-specific design spectra for the project, as described below.

Site-Specific Design Spectrum. The site-specific design spectrum for the site was determined in accordance with the procedures outlined in the 2003 IBC and ASCE 7-02 publications. Figure 5 shows the average design response spectrum calculated at the ground surface and 80 percent of the site class E generalized design response spectrum per the 2003 IBC. A recommended site-specific design response spectrum that envelops the two response spectra shown in Figure 5 was then constructed and is shown in Figure 6. Also shown in Figure 6 is the recommended site-specific MCE response spectrum, which is 1.5 times the site specific design response spectrum.

Liquefaction

The DNR *Preliminary Liquefaction Susceptibility Map of Grays Harbor County Washington* (Palmer et al. 2004) shows the project site located in an area of high liquefaction susceptibility. Liquefaction is a phenomenon where vibration or shaking of the ground, usually from earthquake forces, results in development of excess pore pressures in loose, saturated soils and subsequent loss of strength in the deposit of soil so affected. Based in the encountered conditions, we estimate liquefaction during a moderate to severe earthquake could result in settlement at ground surface on the order of 12 inches. The

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

structure should be designed to withstand some differential settlement on the order of 6 inches without catastrophic collapse.

Tsunami Hazard

Large subduction zone earthquakes are commonly followed by a tsunami. A tsunami is a large ocean wave typically caused by rapid vertical seafloor movements associated with earthquakes. The December 26, 2005 earthquake and tsunami that struck Banda Ache, Indonesia are an example of the relationship between subduction zone earthquakes and tsunamis. Predicting the size of a tsunami is complicated and relies on several factors, including size of the earthquake, seafloor topography and tides. A review of the *Tsunami Hazard Map of the Southern Washington Coast: Modeled Tsunami Inundation from a Cascadia Subduction Zone Earthquake* (Walsh, et al, 2000) indicates that the site is located within the tsunami inundation area.

FOUNDATION SUPPORT

General

The proposed structures may be supported on either shallow foundations or deep foundations; we have provided recommendations for both options.

Tanks

Mat Foundation

It is our understanding that the 80-foot-diameter tanks will be supported on 90-foot-diameter octagonal mat foundations. This provides an average bearing at approximately 3,400 psf. Based on the loose condition of the upper fill material, we recommend that the upper 4 feet of material be overexcavated and recompacted. Compaction of the material should be performed as described in the "Fill Placement and Compaction" section of this report. For bearing surfaces prepared as described we recommend using a modulus of subgrade reaction of 200 pounds per cubic inch (pci). For overturning, we recommend an allowable edge bearing of 5,000 psf. The overexcavated and compacted area should extend a minimum of 6 feet beyond the edge of the footing.

We recommend that a member of our firm be present to observe prepared subgrades prior to fill placement. We also recommend observation during fill placement to asses the quality of the excavated material for use as fill. If material over optimum is observed that cannot be compacted to a stable and uniformly firm condition, we recommend that: 1) the subgrade soils be scarified (e.g., with a ripper or farmer's disc), aerated and prior to placement; or 2) the unsuitable soils be removed and replaced with structural fill, as needed.

We estimate that settlements of the mat foundation designed and constructed as recommended should be on the order of 6 to 10 inches, for the anticipated loading conditions. Differential settlement may vary according to an individual tanks location but in general, for a single tank, could be on the order of 1 inch across the width of the mat foundation, 90 feet. We have assumed that all tanks will be loaded approximately equally. If some tank are initially left unloaded (empty) the differential settlement of the empty tank could be as much as the total settlement, 6 to 10 inches. Ninety percent of the estimated settlement will occur in 8 to 10 months.

If future tanks are to be added the settlement induced by the new tanks on the pre-existing tanks should be considered. Without any special consideration or preparation, new tanks placed in sequence with existing

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

tanks may induce up to 4 inches of settlement in the existing tanks. We provide two recommendations to compensate for the additional settlement, surcharge and or spacing. Because spacing is likely not an option, we recommend surcharging the future tank areas with at least 22 feet of fill. We can provide specific recommendations at your request.

PILE FOUNDATION OPTIONS

Piling for support of the tanks can consist of steel or concrete piles extending to the sandy gravel or shorter timber or concrete piles. Typically, 6-inch top timber piles penetrating 30 feet have an allowable static capacity of 10 tons. When they extend to 40 feet, the allowable capacity is 15 tons. These piles depend on skin friction and will have significant loss of capacity during a significant seismic event. However, they avoid the need to overexcavate and recompact the surface layer of soil.

Piles extending into the underlying dense soil have capacity approaching the structural strength of the piling. Because of the required length, splicing is usually necessary. Mechanical splices for 12-inch–square concrete piles have been used in the Aberdeen area. The piling supporting Terminal 2 consist of 16-1/2-inch octagonal concrete piles driving to practical refusal into the underlying dense soil. The design allowable capacity is 100 tons, limited somewhat by the free length above the mudline.

Recommendations for design of driven pile foundations can be provided if you want to pursue this option further.

Building Support

It is our opinion that the proposed buildings can be adequately supported by shallow spread footings. Some portions of the foundations inside the building will require special consideration, i.e., the turbine generator. It is our understanding that the design of the turbine generator foundation will be an iterative process during the design of the structure. Based on the loose condition of the upper fill material, we recommend that the upper 2 feet of material be overexcavated and recompacted under building foundations. Compaction of the material should be performed as described in the “Fill Placement and Compaction” section of this report. For bearing surfaces prepared as described, we recommend using a maximum allowable soil bearing pressure of 2,000 psf with a minimum embedment of 12 inches and a maximum width of 18 inches.

FLOOR SLABS

A modulus of subgrade reaction of 200 pci can be used for designing the building floor slab provided that the subgrade consists of structural fill and has been prepared in accordance with the “Site Development and Earthwork” section of this report with 4 feet of compacted fill with 2 feet of overexcavation and replacement with compacted fill a modulus of 100 pci is recommended. Settlements for the floor slab designed and constructed as recommended are estimated to be less than 1 inch where floor loads are less than 300 psf or overloaded areas are less than about 10 square feet. We estimate that differential settlement of the floor slabs will be 1/2 inch or less over a span of 50 feet providing that the fill below the slab is compacted as specified, and the preload/surcharge is completed as discussed above.

We recommend that on-grade slabs be underlain by a minimum 6-inch-thick capillary break layer to reduce the potential for moisture migration into the slab. The capillary break material should consist of a well-graded sand and gravel or crushed rock with a maximum particle size of 3/4-inch and less than 5 percent fines. The material should be placed as recommended in the “Fill Placement and Compaction” section of this report. If dry slabs are required (e.g., where adhesives are used to anchor carpet or tile to

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

the slab), a waterproof liner may be placed as a vapor barrier below the slab. A 2-inch thickness of clean sand can be placed over the vapor barrier to protect the liner and serve as a leveling course.

RAILROAD SUPPORT

Based on the loose condition of the upper fill material, we recommend that the upper material be overexcavated and recompacted such that there is a minimum of 2 feet of compacted fill. Compaction of the material should be performed as described in the "Fill Placement and Compaction" section of this report. For bearing surfaces prepared as described, we recommend using a minimum of 12 inches of ballast under the cross ties. When loaded cars set on the tracks for extended periods of time, settlement will occur. We are assuming that it is more economical to relevel the tracks if settlement does occur. Otherwise, the area should be preloaded with approximately 8 feet of soil.

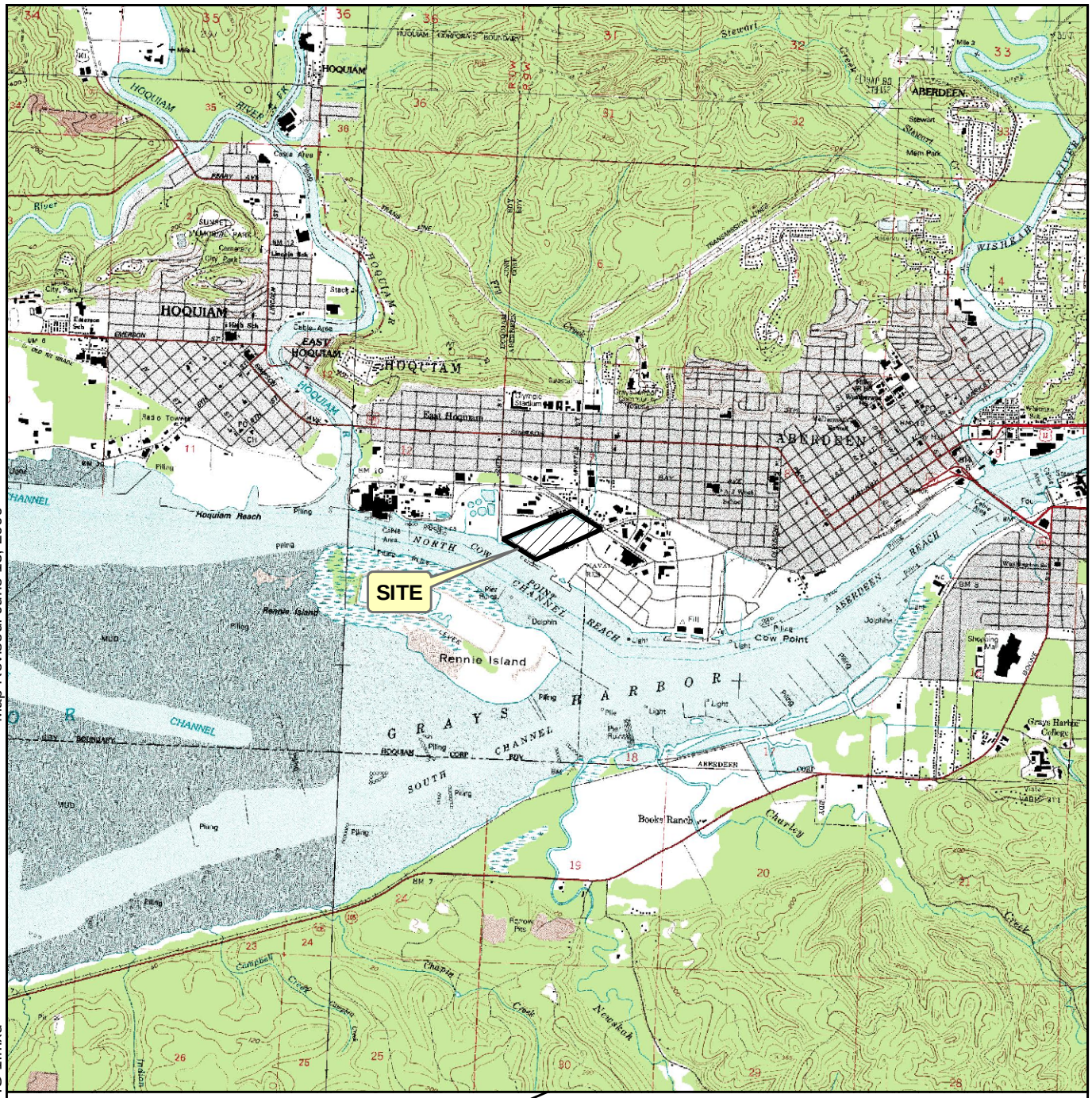
LIMITATIONS

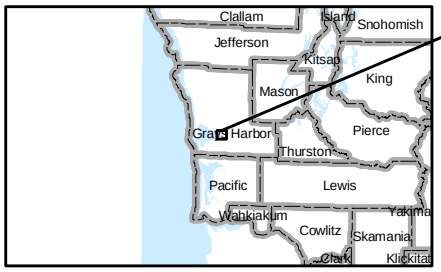
We have prepared this report for the exclusive use by Seattle Biofuels, Inc., for the Proposed Storage Tank Facility located in Hoquiam, Washington.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix E titled "Report Limitations and Guidelines for Use" for additional information pertaining to use of this report.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.





N
W E
S

4,000 0 4,000
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: Interstates, state routes, and roads from TIGER 2000. County boundaries, cities, and waterbodies from Department of Ecology.

Lambert Conformal Conic, Washington State Plane North, North American Datum 1983

Vicinity Map

Proposed Storage Tanks
Port of Grays Harbor, Washington

GEOENGINEERS

Figure 1

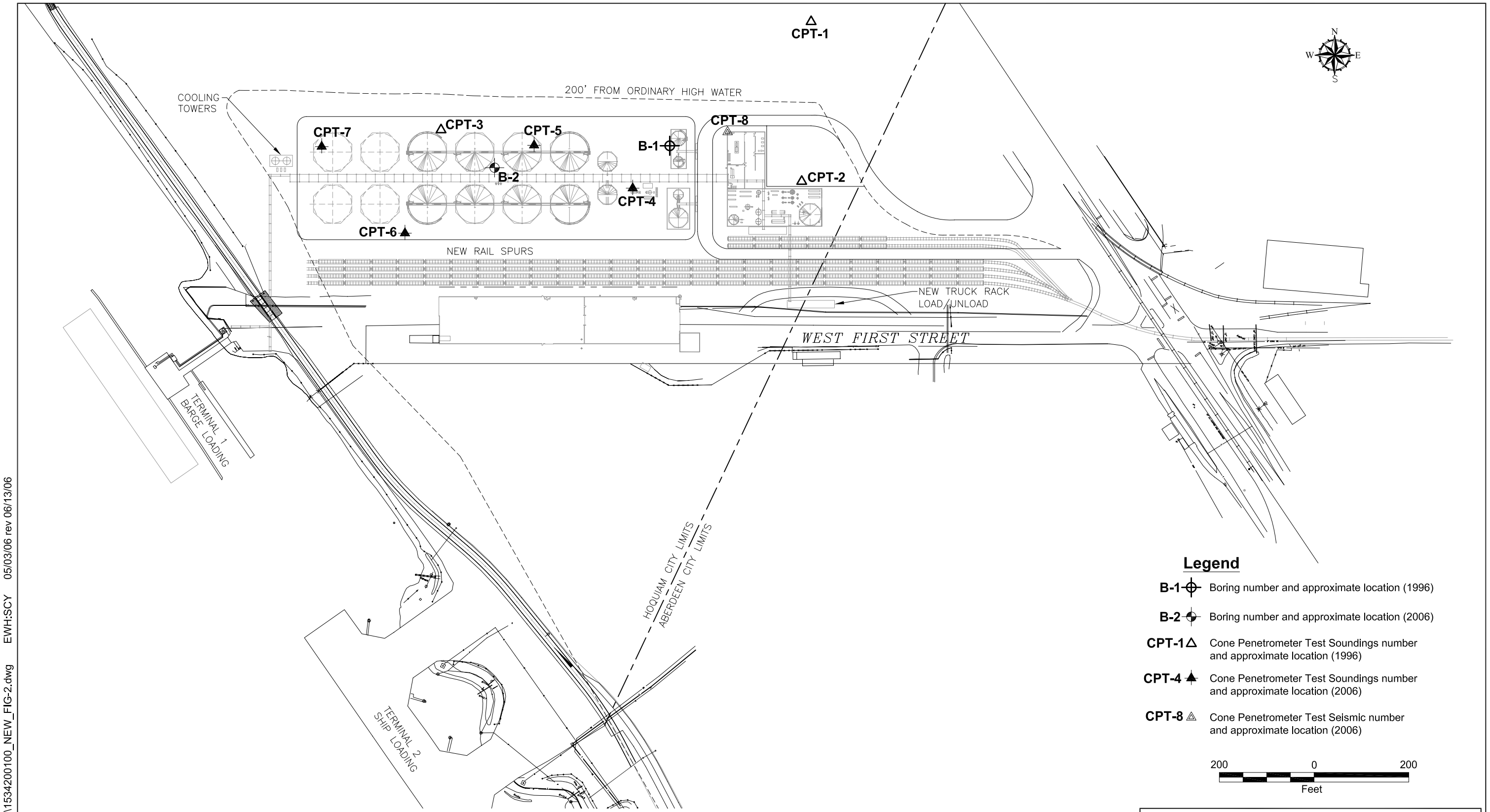
Map Revised: June 13, 2006

Path: 15\1534200100\GIS\1534200100_FIG-1.mxd

Office: TAC

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

TACO\15\1534200\100\CAD\1534200100_NEW_FIG-2.dwg EWH:SCY 05/03/06 rev 06/13/06



Legend

B-1	Boring number and approximate location (1996)
B-2	Boring number and approximate location (2006)
CPT-1	Cone Penetrometer Test Soundings number and approximate location (1996)
CPT-4	Cone Penetrometer Test Soundings number and approximate location (2006)
CPT-8	Cone Penetrometer Test Seismic number and approximate location (2006)

200 0 200
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: CAD drawing file provided by Parker, Messana & Associates, Inc. Consulting Engineers.

Site Plan

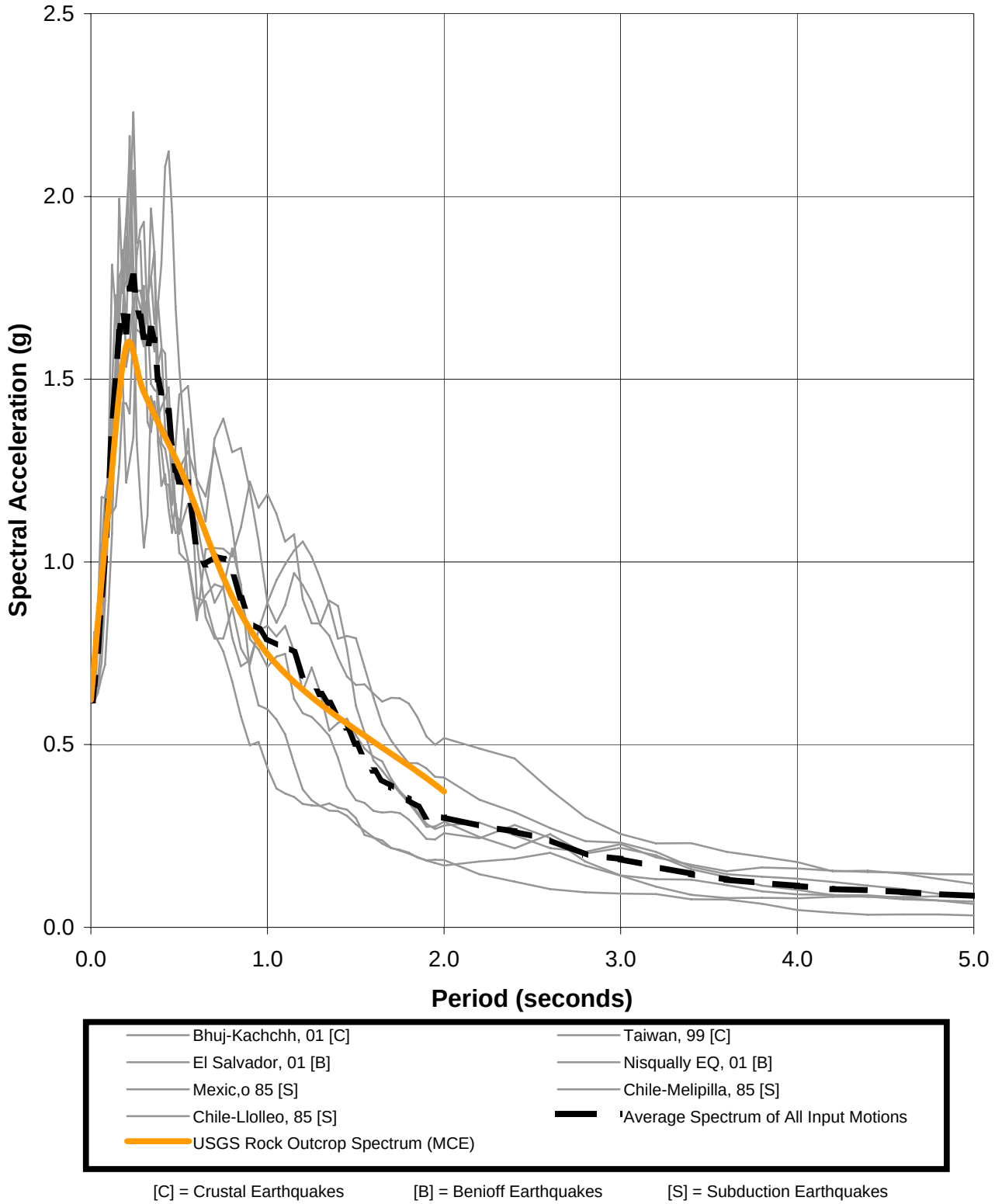
Proposed Storage Tanks
Port of Grays Harbor, Washington

GEOENGINEERS

Figure 2

This page contains proprietary information that Imperium requests not to be released to persons
outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Bio Diesel Facility - Port of Grays Harbor
Scaled Response Spectra of Input Ground Motions



[C] = Crustal Earthquakes [B] = Benioff Earthquakes [S] = Subduction Earthquakes

GeoEngineers
Earth Science + Technology

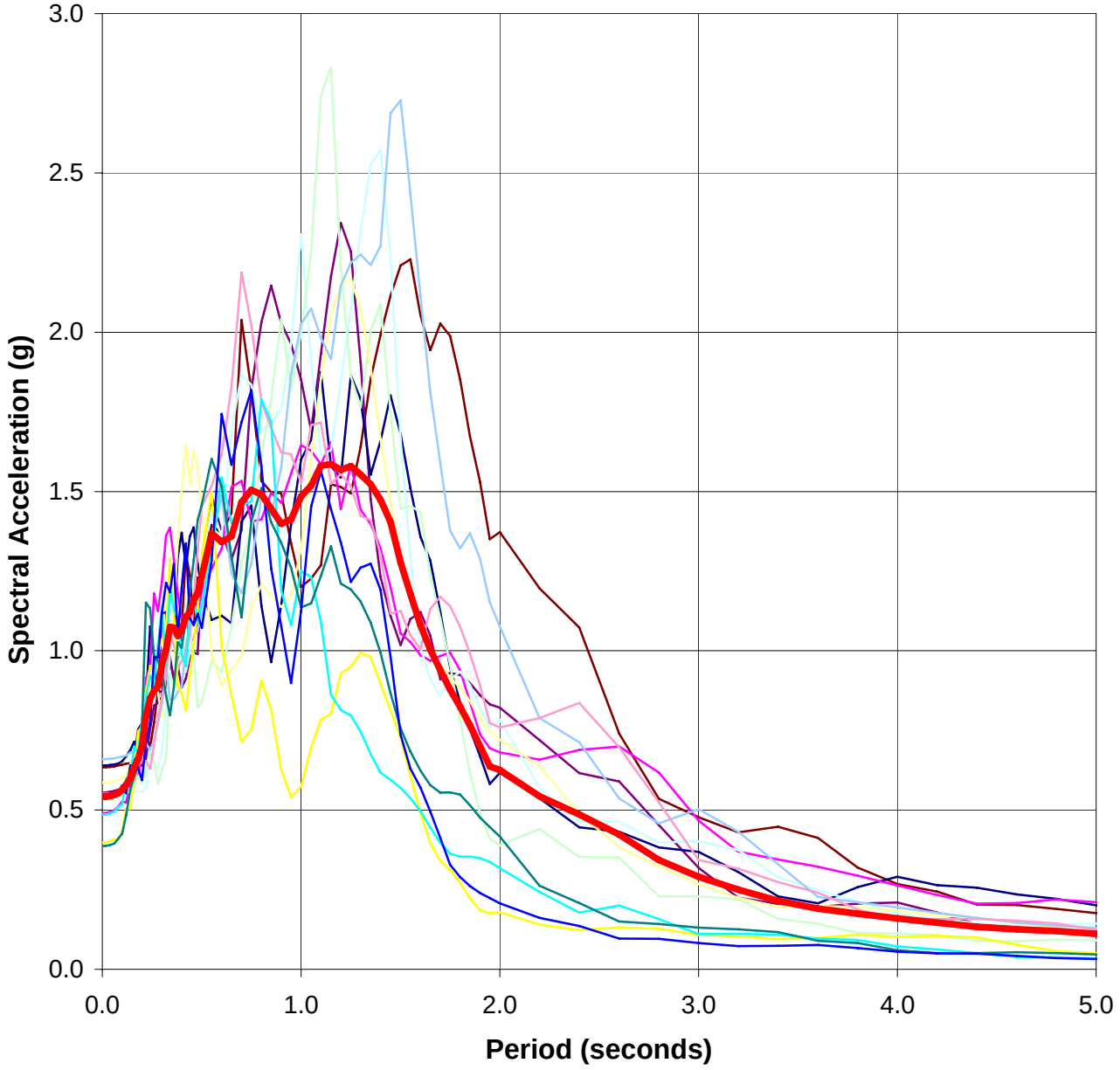
5% Damped Acceleration Spectra

Figure 3

TACO:\15\15342001\00\153420010 0Figure3.xls SCS:KHC:tt 061206

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Bio Diesel Facility - Port of Grays Harbor
MCE Spectra at Ground Surface



Bhuj-Kachchh 01, NS [C]	Bhuj-Kachchh 0, EW [C]	Taiwan 99, NS [C]
Taiwan 99, EW [C]	El Salvador 2001, NS [B]	El Salvador 2001, EW [B]
Nisqually 01, NS [B]	Nisqually 01, EW [B]	Mexico 85, NS [S]
Mexico 85, EW [S]	Chile 85 - Melipilla, NS [S]	Chile 85 - Melipilla, EW [S]
Chile 85 - Llolleo, NS [S]	Chile 85 - Llolleo, EW [S]	Average MCE Spectrum

[C] = Crustal Earthquakes [B] = Benioff Earthquakes [S] = Subduction Earthquakes

GEOENGINEERS
Earth Science + Technology

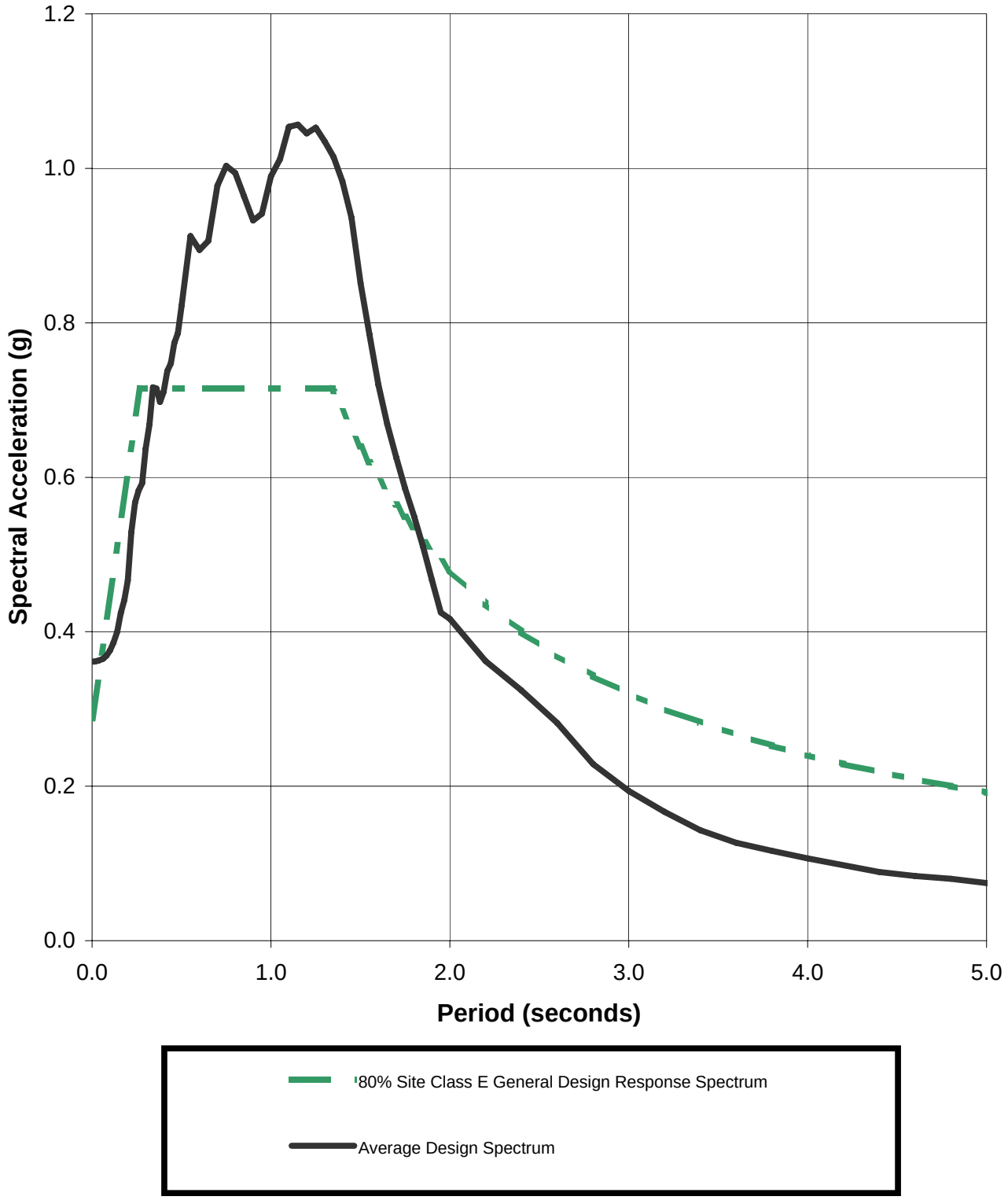
5% Damped MCE Spectra

Figure 4

TACO:\15\1534200100\Finals\1534200100Figure4.xls SCS:KHC:tt 061206

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Bio Diesel Facility - Port of Grays Harbor
Site Specific Design Spectra at Ground Surface



GEOENGINEERS
Earth Science + Technology

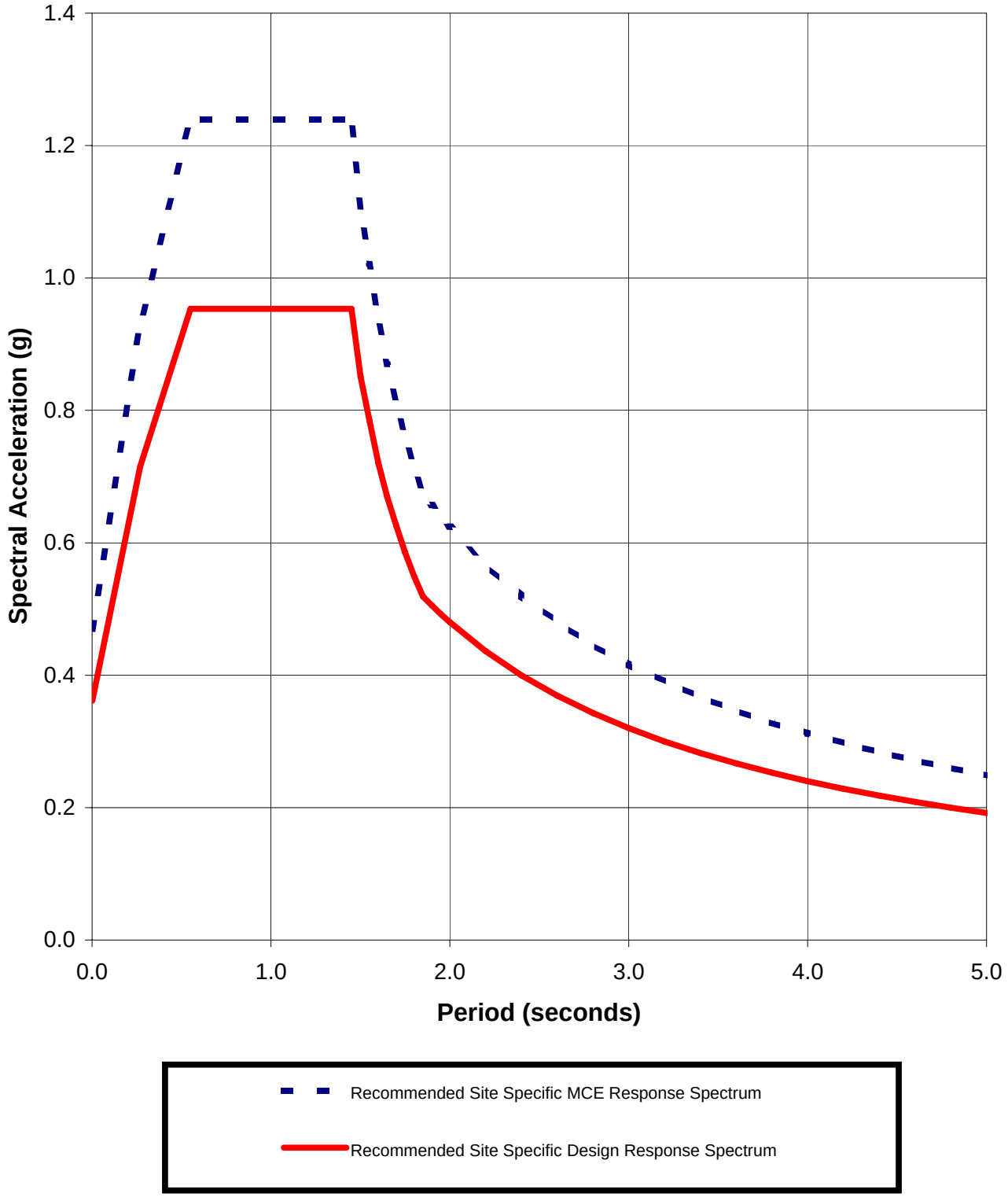
5% Damped Design Spectra

Figure 5

TACO:\15\1534200100\Finals\1534200100Figure5.xls SCS:KHC:tt 061206

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Bio Diesel Facility - Port of Grays Harbor
Recommended Site Specific Spectra at Ground Surface



GEOENGINEERS
Earth Science + Technology

Design 5% Damped Acceleration Spectra

Figure 6

TACO:\15\15342001\00\Finals\1534200100Figure6.xls SCS:KHC:tt 061206

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GeoEngineers

APPENDIX A
SUPPLEMENTAL SUBSURFACE EXPLORATIONS

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

APPENDIX A
SUPPLEMENTAL SUBURFACE EXPLORATIONS

SUBSURFACE EXPLORATIONS

We explored subsurface conditions at the site by advancing one boring and four cone penetration tests (CPTs) on April 25, 2006 and advancing one seismic CPT on May 18, 2006. Our representative located the explorations in the field by hand-taping and pacing from existing site features such as buildings and roadways. Exploration locations should be considered approximate and are indicated on the Site Plan, Figure 2. A key to the symbols used on the boring logs is included as Figure A-1. The boring log is included as Figure A-2. The CPT logs are included as Figures A-3 through A-8.

SOIL BORING

The test boring was advanced by Boart Longyear (formerly Holt) Drilling using a truck-mounted hollow-stem auger drill rig under subcontract to GeoEngineers. The soil boring was advanced to a depth of 80 feet below existing site grade. Soil samples were obtained from the boring using a 2.4-inch-inside-diameter split-barrel ring sampler driven into the soil using a 300-pound hammer free-falling a distance of 30 inches. The number of blows required to drive the sampler the last 12 inches or other indicated distance is recorded on the logs as the blow count.

Our representative continuously monitored the boring, maintained a log of the subsurface conditions, and made sample attempts at 5-foot depth intervals. The soils encountered were visually classified in accordance with the system described in Figure A-1, American Society for Testing and Materials (ASTM) D 2488.

CPT SOUNDINGS

The CPT soundings were advanced by Northwest Cone Explorations Inc. under subcontract to GeoEngineers, Inc. The CPT soundings were each advanced to depths of 80 to 143 feet below existing site grade. The electric CPT sounding involves pushing an instrumented steel probe into the ground and continuously recording soil frictions, tip resistance, dynamic pore pressure and an equivalent standard penetrations (SPT) “N” value using electronic methods. No soil samples are obtained during CPT soundings. Soil types are interpreted based on empirical relationships between measured CPT parameters described above. The CPT method generally provides more detailed information on soil layering than conventional drilling and sampling methods.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS
				SP	POORLY-GRADED SANDS, GRAVELLY SAND
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS, ROCK FLOUR, CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS AND SILTS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Multiple symbols are used to indicate borderline or dual soil classifications

ADDITIONAL MATERIAL SYMBOLS

SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
	CC	Cement Concrete
	AC	Asphalt Concrete
	CR	Crushed Rock/ Quarry Spalls
	TS	Topsoil/ Forest Duff/Sod

Measured groundwater level in exploration, well, or piezometer

Groundwater observed at time of exploration

Perched water observed at time of exploration

Measured free product in well or piezometer

Stratigraphic Contact

Distinct contact between soil strata or geologic units

Gradual change between soil strata or geologic units

Approximate location of soil strata change within a geologic soil unit

Sampler Symbol Descriptions

2.4-inch I.D. split barrel

Standard Penetration Test (SPT)

Shelby tube

Piston

Direct-Push

Bulk or grab

Blowcount is recorded for driven samplers as the number of blows required to advance sampler 12 inches (or distance noted). See exploration log for hammer weight and drop.

A "P" indicates sampler pushed using the weight of the drill rig.

Laboratory / Field Tests

%F	Percent fines
AL	Atterberg limits
CA	Chemical analysis
CP	Laboratory compaction test
CS	Consolidation test
DS	Direct shear
HA	Hydrometer analysis
MC	Moisture content
MD	Moisture content and dry density
OC	Organic content
PM	Permeability or hydraulic conductivity
PP	Pocket penetrometer
SA	Sieve analysis
TX	Triaxial compression
UC	Unconfined compression
VS	Vane shear

Sheen Classification

NS	No Visible Sheen
SS	Slight Sheen
MS	Moderate Sheen
HS	Heavy Sheen
NT	Not Tested

NOTE: The reader must refer to the discussion in the report text and the logs of explorations for a proper understanding of subsurface conditions. Descriptions on the logs apply only at the specific exploration locations and at the time the explorations were made; they are not warranted to be representative of subsurface conditions at other locations or times.

KEY TO EXPLORATION LOGS

GEOENGINEERS

FIGURE A-1

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Date(s) Drilled	04/25/06	Logged By	GRL	Checked By	EWH
Drilling Contractor	Holt Drilling	Drilling Method	Mud Rotary	Sampling Methods	2.4-inch ID Split Barrel Ring Sampler
Auger Data	4-1/2 inch ID HSA	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	Mobile B-59 Truck Rig
Total Depth (ft)	80	Surface Elevation (ft)		Groundwater Level (ft. bgs)	Not Encountered
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
0						SM	Brown silty fine to coarse sand with gravel (medium dense, moist)			
						GP-GM	Brown fine gravel with sand and silt (medium dense, moist)			
	18	18	1							
5						SM	Brown silty fine to coarse sand with gravel (loose, moist)			
						SM	Gray silty fine to coarse sand, occasional gravel (loose, moist)			
	7	4	2					29	100	
10										
	6	6	3					27		SA
15						ML	Gray sandy silt (soft to medium stiff, moist)			Upper Fill 0 to 15 feet
	18	4	4					46	73	
20							Grades soft			
	18	9	5					35	89	
25						SM	Gray silty fine sand (loose, moist to wet)			
	10	6	6					31	96	
30							Grades very loose			
						MH	Dark gray sandy silt, trace wood debris (soft, moist to wet)			Upper Dredge Fill 15 to 32 feet
	16	4	7					37	80	CS
35										
	16	3	8					46	71	
40							Grades very soft			

Note: See Figure A-1 for explanation of symbols.

LOG OF BORING 2

GEOENGINEERS

Project: Proposed Storage Tanks
Project Location: Port of Grays Harbor, Washington
Project Number: 15342-001-00

Figure A-2
Sheet 1 of 2

V6_GTBORING P:\15\15342001\00\FINALS\153420010 0.GPJ GEIV6_1.GDT 6/13/06

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Depth feet	SAMPLES Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
45	18	12	9				Dark brown silt, trace sand with organics (medium stiff, moist to wet)	42	73	
50	18	9	10					65		AL
55	17	9	11					63	59	
60	18	9	12				Grades to with wood splinters	63	58	
65	18	18	13				Dark brown silt with organics and wood splinters (stiff, moist)	64		AL
70	18	18	14				Dark gray sandy silt with organics, trace shell fragments (stiff, moist to wet)	36	86	CS
75	18	25	15			SM	Dark gray silty fine sand (loose, wet)	43	80	Lower Dredge Fill 32 to 74 feet
80	2	13	16			ML	Dark gray sandy silt (stiff, moist)	51		Native
85										
90										

LOG OF BORING 2 (continued)

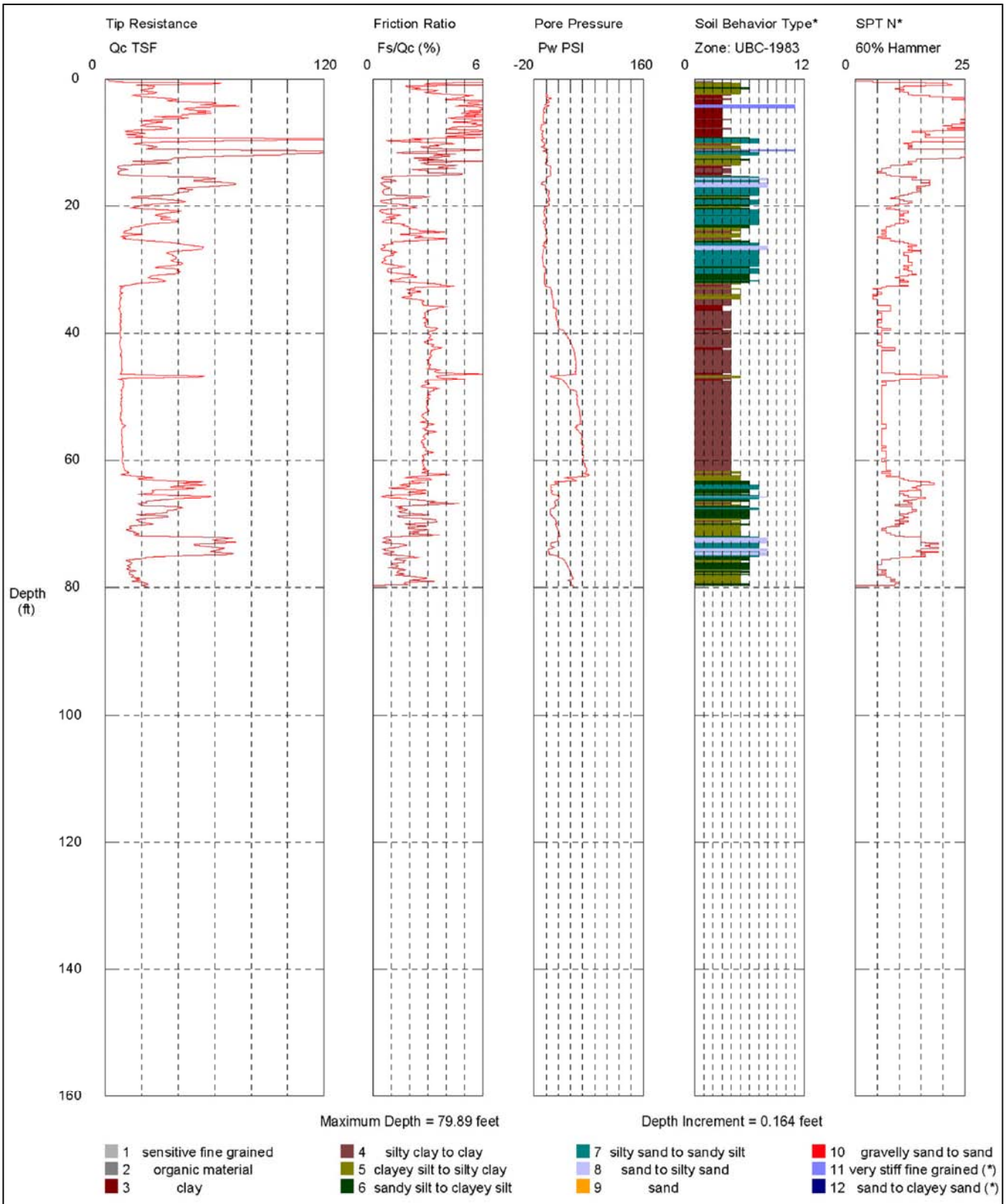
GEOENGINEERS

Project: Proposed Storage Tanks
Project Location: Port of Grays Harbor, Washington
Project Number: 15342-001-00

Figure A-2
Sheet 2 of 2

V6_GTBORING P:\15\15342001\00\FINALS\153420010 0.GPJ GEIV6_1.GDT 6/13/06

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



Not to Scale

CPT-4

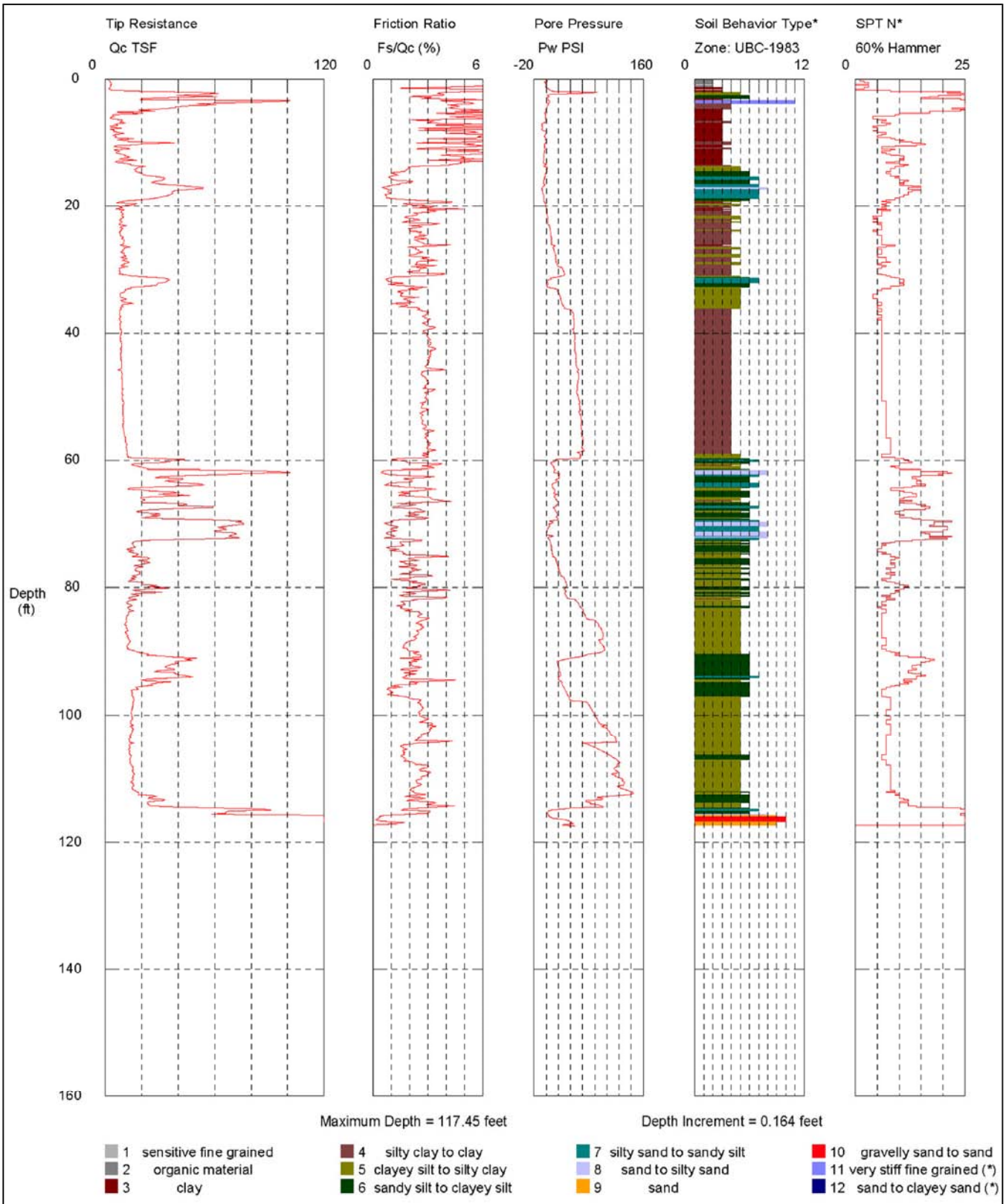
Proposed Storage Tanks
Port of Grays Harbor, Washington

GeoEngineers

Figure A-3

TACO\15\1534200\100\CAD\1534200100_FIG-A3 TO A7.dwg EWH:SCY 06/13/06 rev 06/13/06

This page contains proprietary information that Imperium requests not to be released to persons
outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



Not to Scale

CPT-5

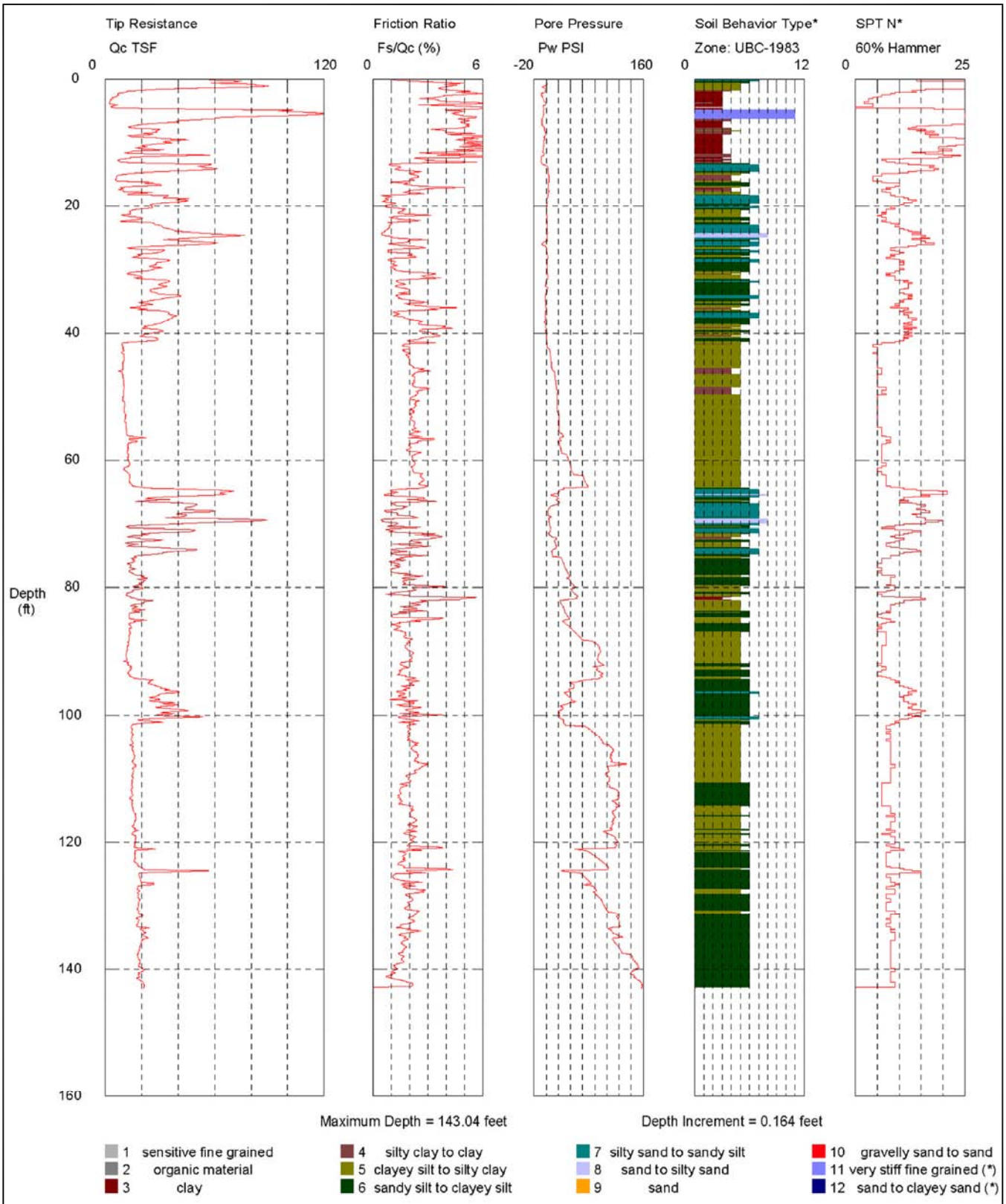
Proposed Storage Tanks
Port of Grays Harbor, Washington

GEOENGINEERS

Figure A-4

TACO\15\1534200\100\CAD\1534200100_FIG-A3 TO A7.dwg EWH:SCY 06/13/06 rev 06/13/06

This page contains proprietary information that Imperium requests not to be released to persons
outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



Not to Scale

CPT-6

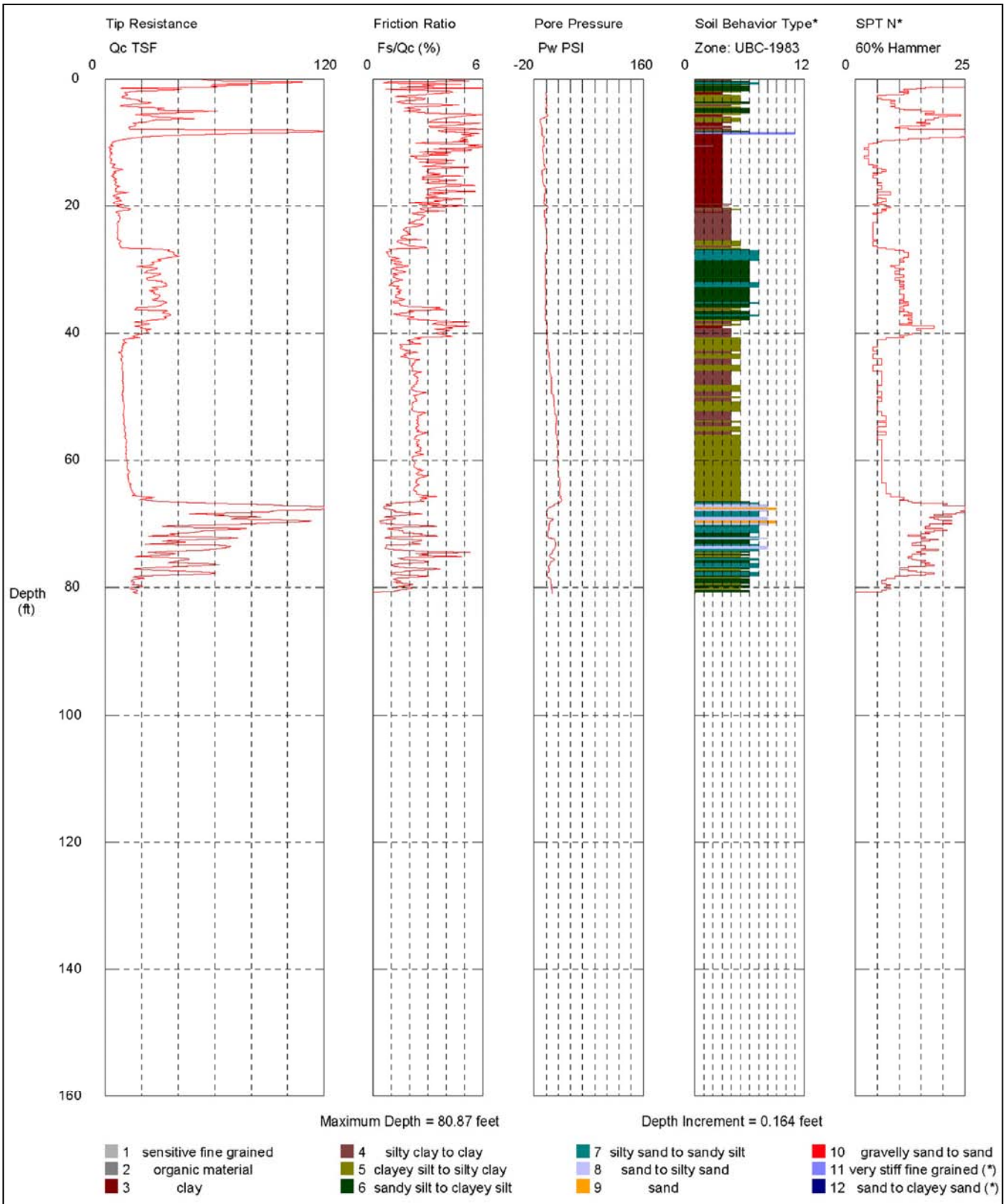
Proposed Storage Tanks
Port of Grays Harbor, Washington

GeoEngineers

Figure A-5

TACO\15\1534200\100\CAD\1534200100_FIG-A3 TO A7.dwg EWH:SCY 06/13/06 rev 06/13/06

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



Not to Scale

CPT-7

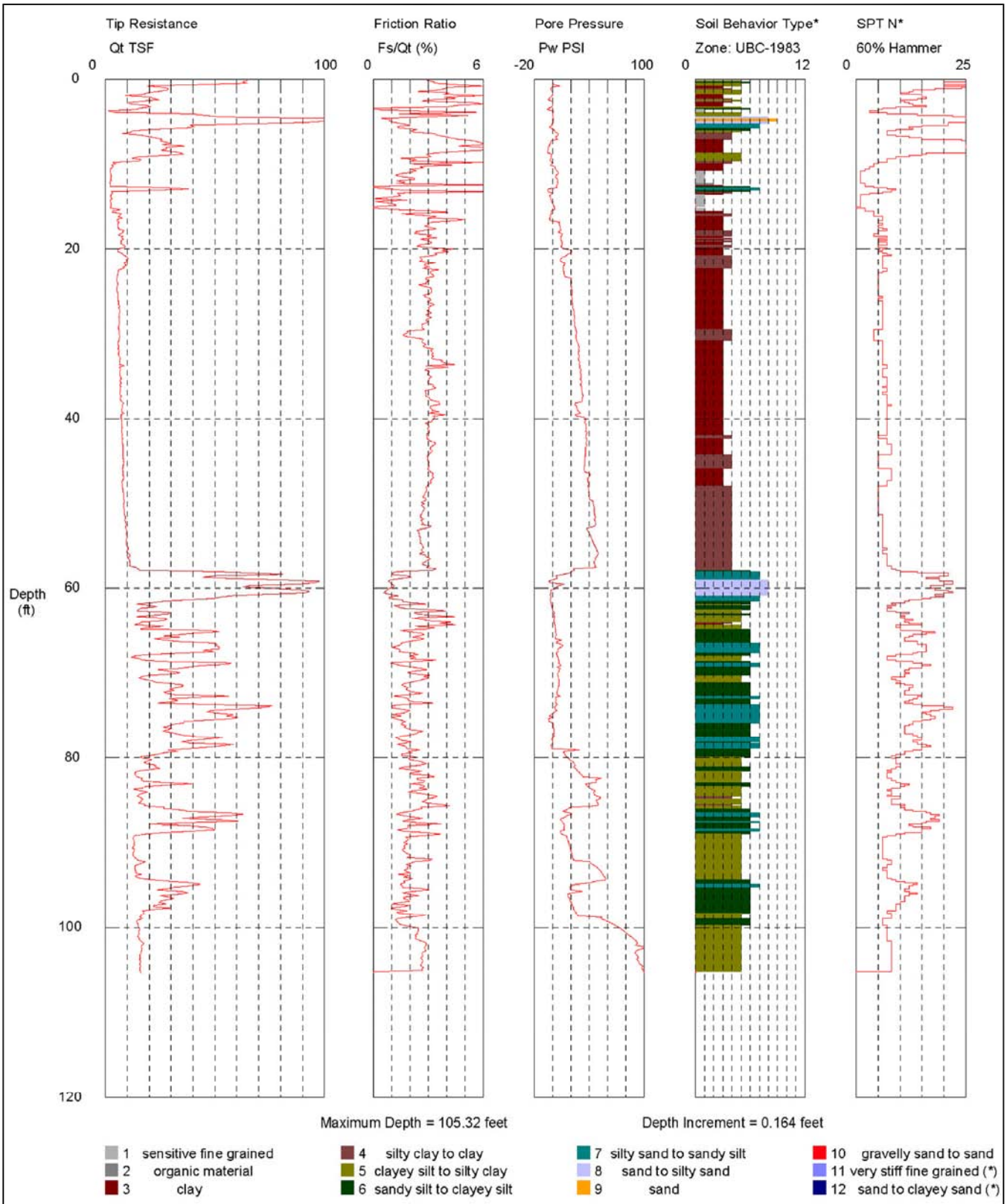
Proposed Storage Tanks
Port of Grays Harbor, Washington

GeoEngineers

Figure A-6

TACO\15\1534200\100\CAD\1534200100_FIG-A3 TO A7.dwg EWH:SCY 06/13/06 rev 06/13/06

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



Not to Scale

CPT-8

Proposed Storage Tanks
Port of Grays Harbor, Washington

GEOENGINEERS

Figure A-7

TACO\15\1534200\100\CAD\1534200100_FIG-A3 TO A7.dwg EWH:SCY 06/13/06 rev 06/13/06

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GeoEngineers

APPENDIX B
LABORATORY TESTING

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

APPENDIX B
LABORATORY TESTING

LABORATORY TEST RESULTS

Soil samples obtained from the borings were transported to GeoEngineers laboratory. Representative soil samples were selected for laboratory tests to evaluate the pertinent geotechnical engineering characteristics of the site soils and to confirm our field classification. The following paragraphs provide a description of the tests performed.

Moisture Content and Density

The moisture content and/or density of selected samples were determined in general accordance with ASTM Test Methods D 2216 and D 2937, respectively. The test results are used to aid in soil classification and correlation with other pertinent engineering soil properties. The test results are presented on the boring logs in Appendix A.

Particle Size Analysis

Particle size analyses were performed on selected samples in general accordance with ASTM Test Method D 422. This test method covers the quantitative determination of the distribution of particle sizes in soils. Typically the distribution of particle sizes larger than 75 micrometers (μm) is determined by sieving. The results of the tests were used to verify field soil classifications. Figure B-1 presents the results of the sieve analysis.

Atterberg Limit Testing

Atterberg Limit Tests were performed on selected samples in general accordance with ASTM Test Method D 4318 (includes organic determination). This test method determines the liquid limit, plastic limit and plasticity index of soil particles passing the No. 40 sieve. The results of the tests are used to assist in soil classification. In addition, the potential for volume change can often be detected from the liquid- and plastic-limit test. Figure B-2 presents the results of this test.

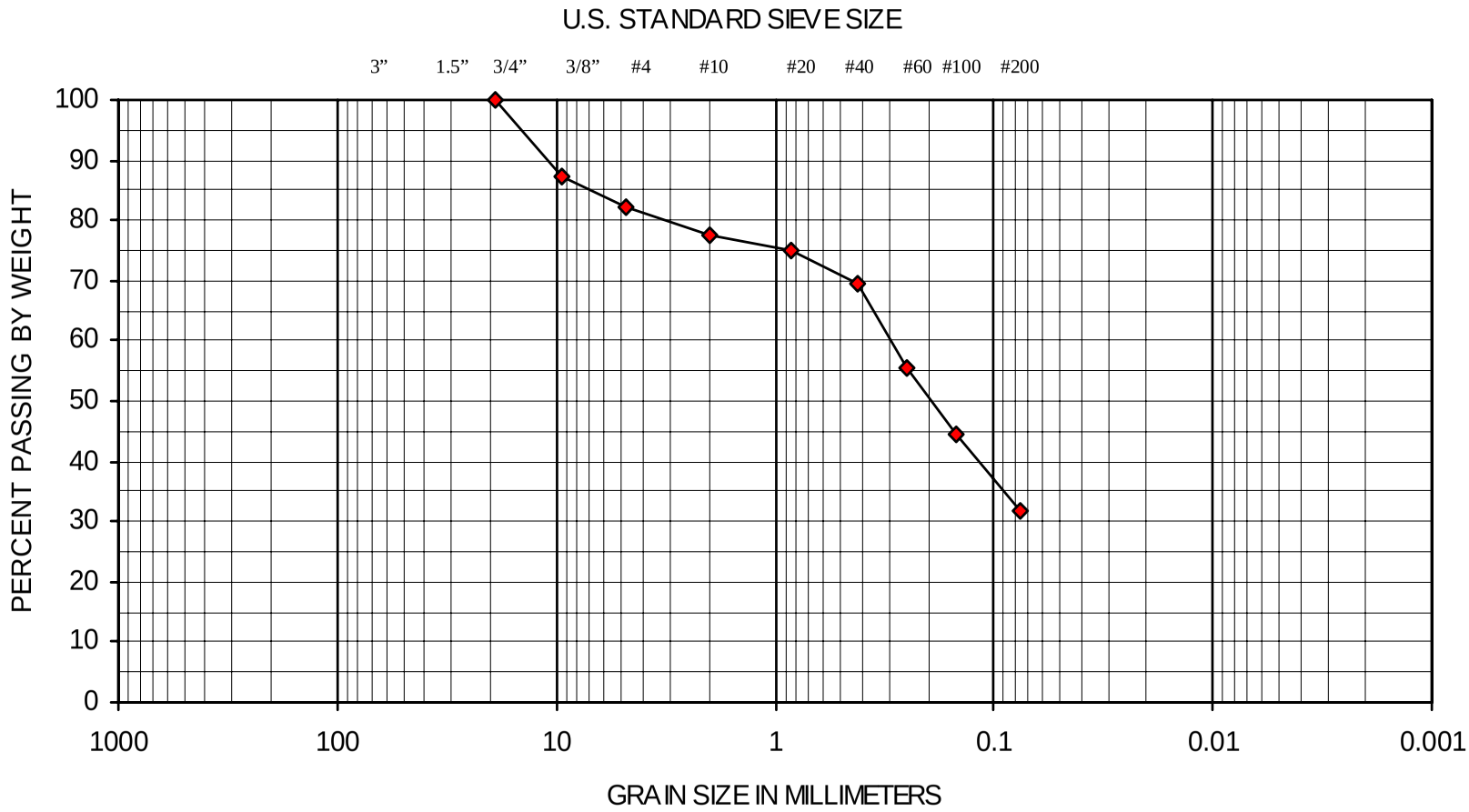
Consolidation

Consolidation testing was performed to determine the settlement potential of selected samples in accordance with ASTM D 2435. The consolidation test determines the magnitude and rate of consolidation of soil restrained laterally and drained axially while subjected to incrementally applied controlled-stress loading. Test results are shown on Figures B-3 and B-4.

TACO:\15\15342001\00\1534200100FigureB1.ppt EWH:MES:tt 061206

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GEOENGINEERS



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

SYMBOL	EXPLORATION NUMBER	DEPTH (ft)	SOIL CLASSIFICATION
◆	B-2	15	Silty fine to coarse sand with gravel (SM)

SIEVE ANALYSIS RESULTS

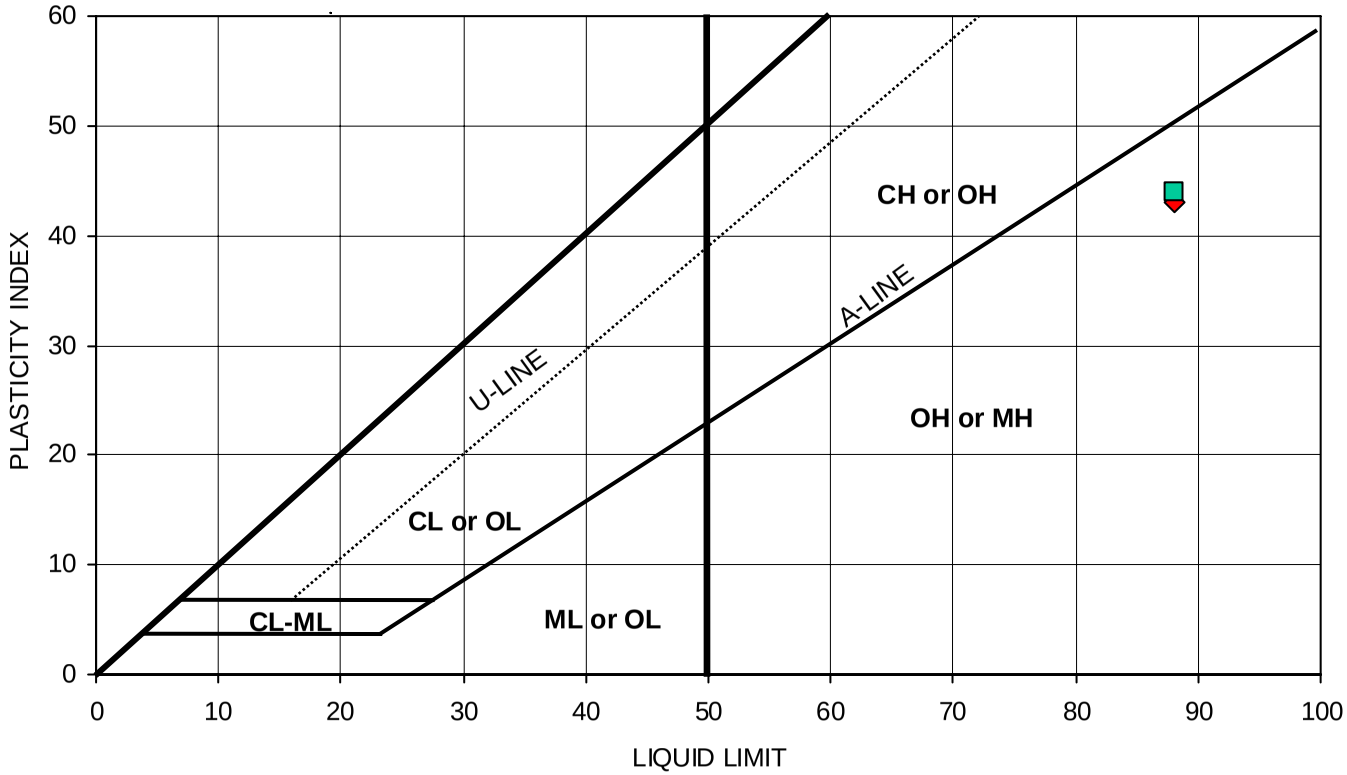
FIGURE B-1

TACO:\15\15342001\00\Finals\1534200100FigureB2.ppt EWH:MES:tt 061206

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GEOENGINEERS

PLASTICITY CHART

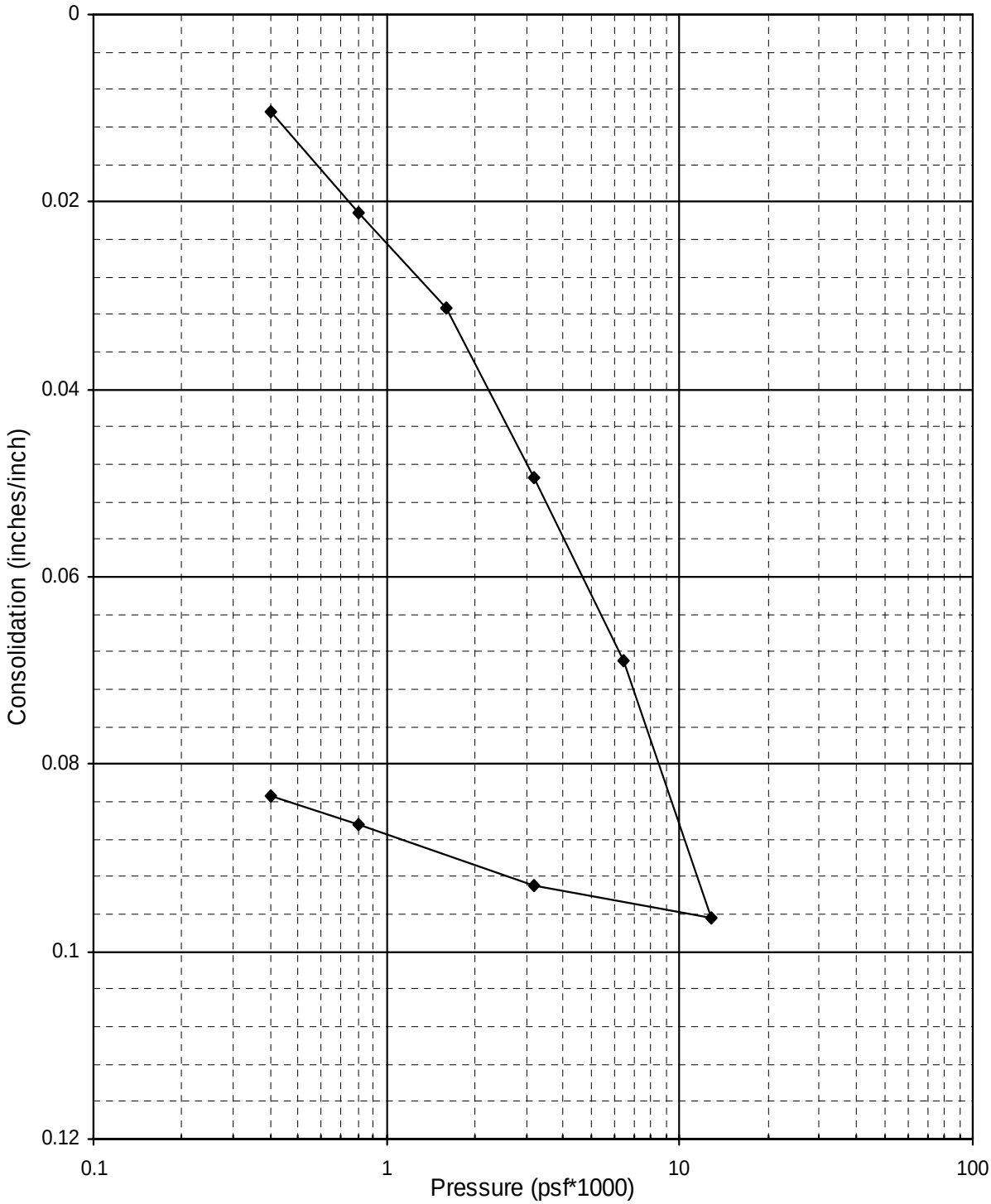


SYMBOL	EXPLORATION NUMBER	SAMPLE DEPTH	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	SOIL DESCRIPTION
◆	B-2	50’	64.7	88	43	Elastic silt with sand (MH)
■	B-2	65’	63.9	88	44	Elastic silt with sand (MH)

ATTERBERG LIMITS TEST RESULTS

FIGURE B-2

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



BORING NUMBER	SAMPLE DEPTH (FEET)	SOIL CLASSIFICATION	INITIAL MOISTURE CONTENT	INITIAL DRY DENSITY (LBS/FT³)
B-2	35	Silt with fine sand (ML)	37.3	80.3

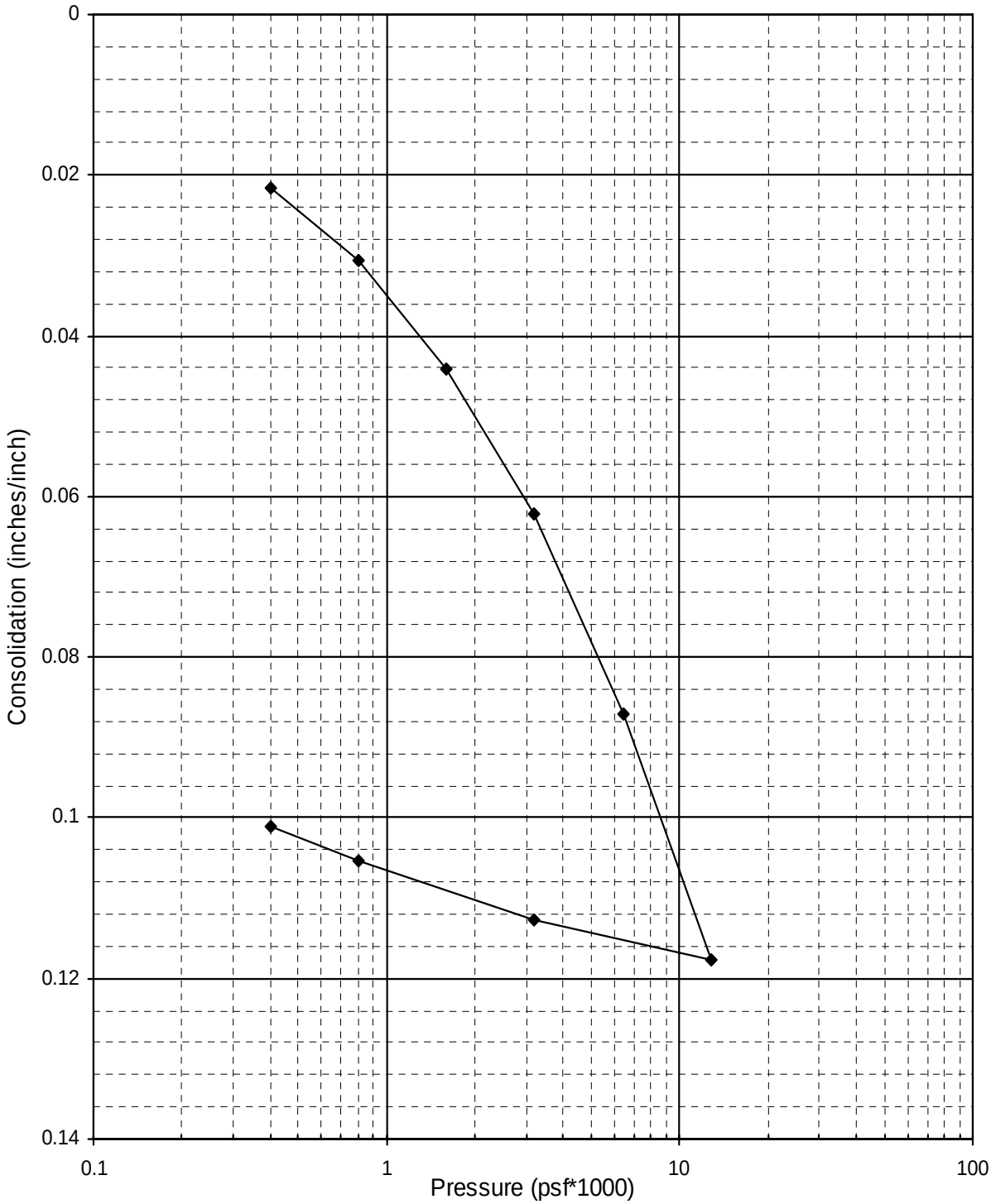
GEOENGINEERS

CONSOLIDATION TEST RESULTS

FIGURE B-3

TACO:\15\1534200100\Finals\1534200100FigureB3.ppt GWH:: jvj:tt 061206

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



BORING NUMBER	SAMPLE DEPTH (FEET)	SOIL CLASSIFICATION	INITIAL MOISTURE CONTENT	INITIAL DRY DENSITY (LBS/FT³)
B-2	70	Silt with fine sand (ML)	35.9	85.5

GEOENGINEERS

CONSOLIDATION TEST RESULTS

FIGURE B-4

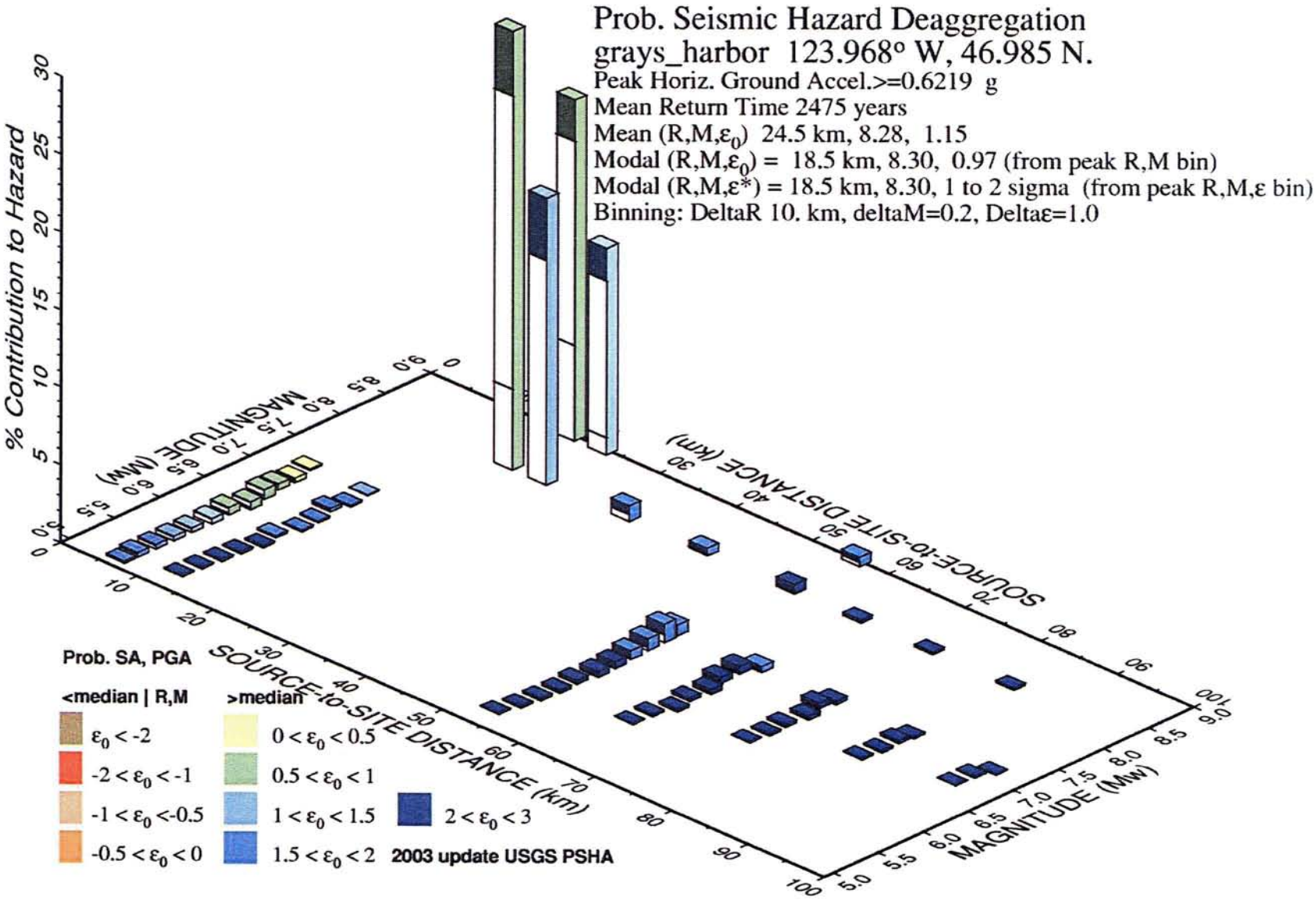
TACO:\15\1534200100\Finals\154320010 0FigureB4.ppt GWH:jvj"tt 061206

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GeoEngineers

APPENDIX C
SITE RESPONSE ANALYSES

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



GMT May 30 18:25 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on ROCK avg Vs=760 m/s top 30 m USGS CGHT PSHA2002v3 UPDATE Bins with lt 0.05% contrib. omitted

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Prob. Seismic Hazard Deaggregation

111 123.968° W, 46.985 N.

SA period 0.10 sec. Accel.>=1.1507 g

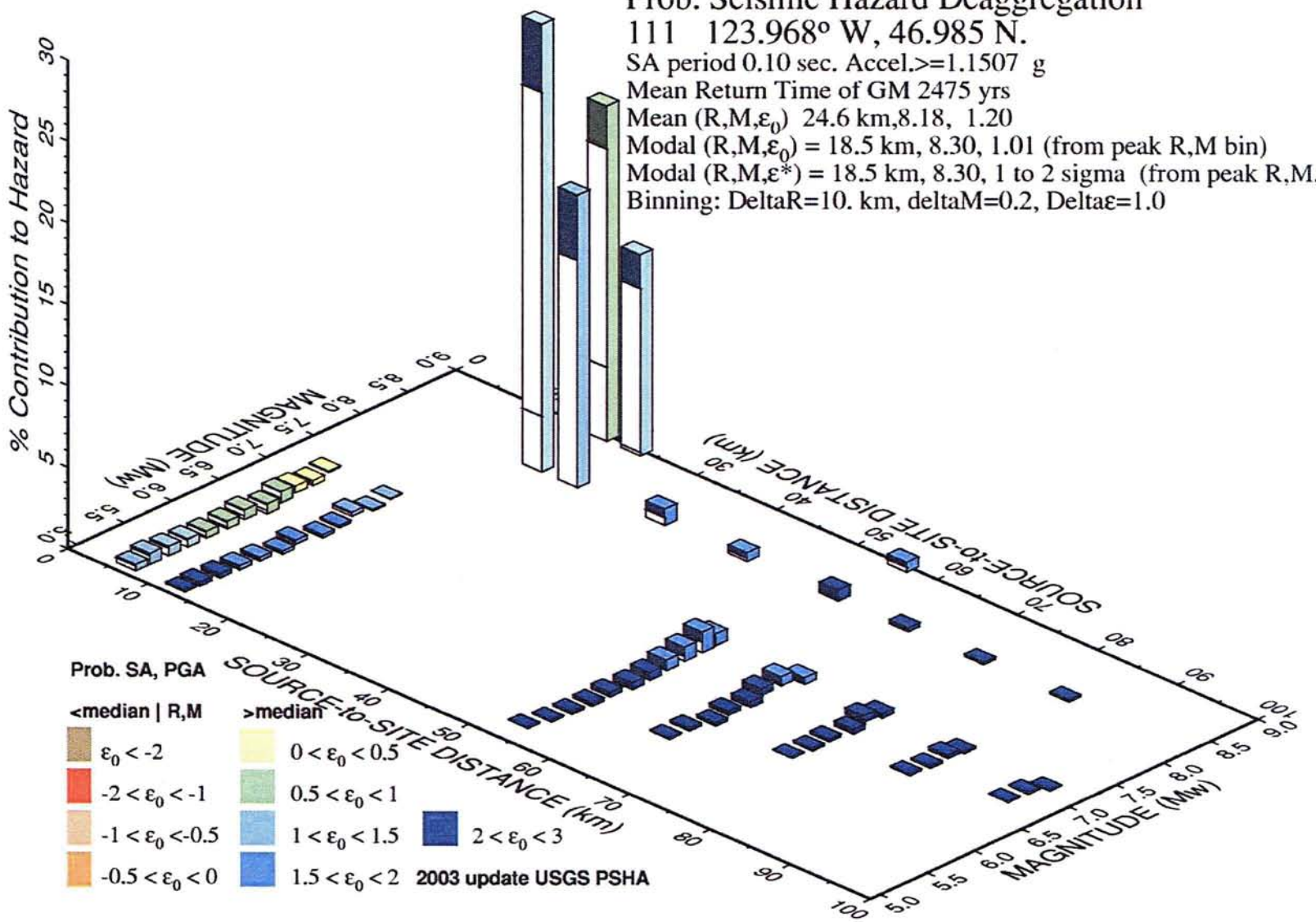
Mean Return Time of GM 2475 yrs

Mean (R,M,ε_0) 24.6 km,8.18, 1.20

Modal (R,M,ε_0) = 18.5 km, 8.30, 1.01 (from peak R,M bin)

Modal (R,M,ε^*) = 18.5 km, 8.30, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT May 30 18:38 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on ROCK avg Vs=760 m/s top 30 m USGS CGHT PSHA2002v3 UPDATE Bins with lt 0.05% contrib. omitted

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Prob. Seismic Hazard Deaggregation

111 123.968° W, 46.985 N.

SA period 0.20 sec. Accel.>=1.4897 g

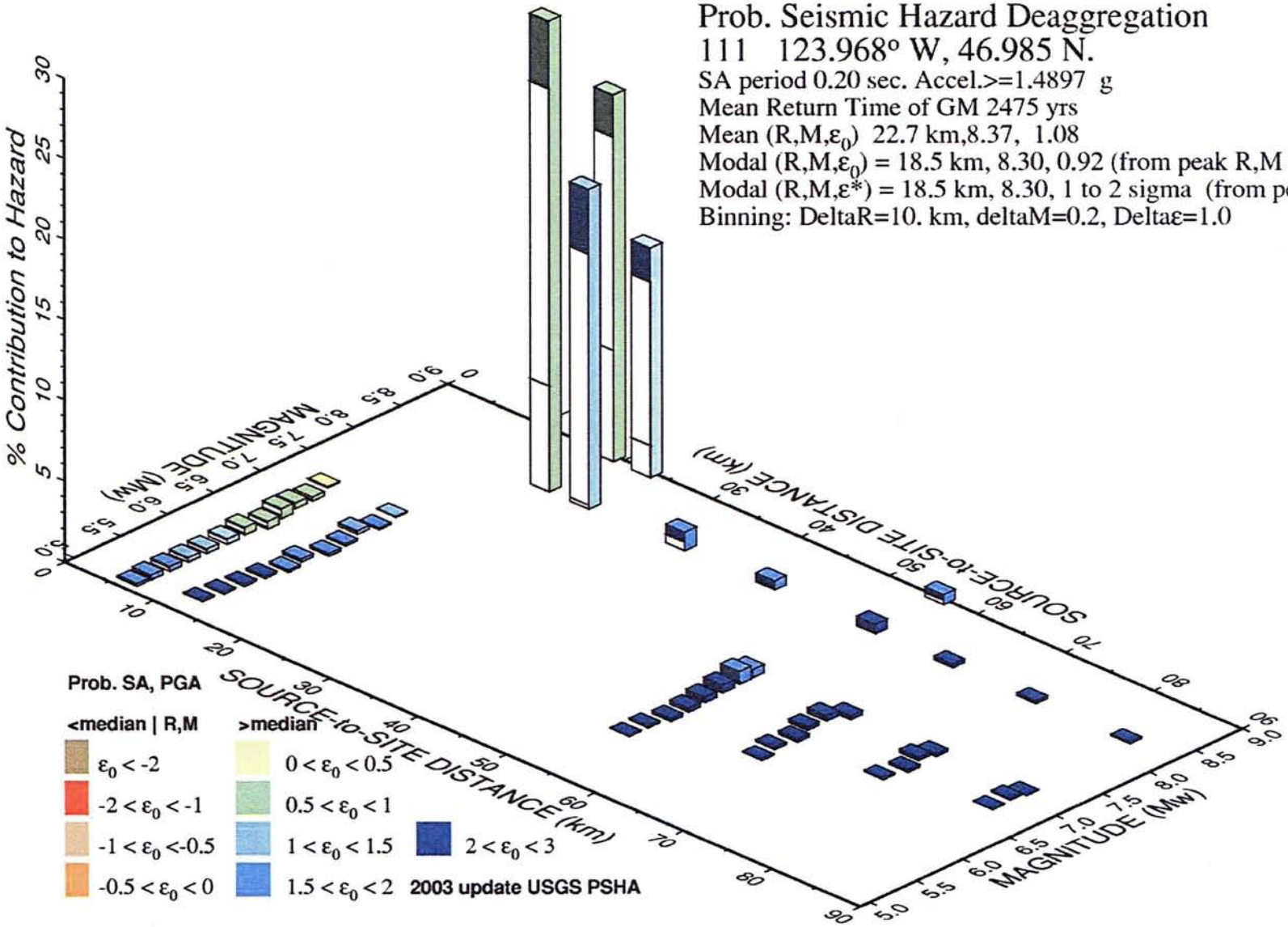
Mean Return Time of GM 2475 yrs

Mean (R,M,ε_0) 22.7 km,8.37, 1.08

Modal (R,M,ε_0) = 18.5 km, 8.30, 0.92 (from peak R,M bin)

Modal (R,M,ε*) = 18.5 km, 8.30, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT May 30 18:38 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on ROCK avg Vs=760 m/s top 30 m USGS CGHT PSHA2002v3 UPDATE Bins with lt 0.05% contrib. omitted

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Prob. Seismic Hazard Deaggregation

111 123.968° W, 46.985 N.

SA period 0.30 sec. Accel.>=1.4653 g

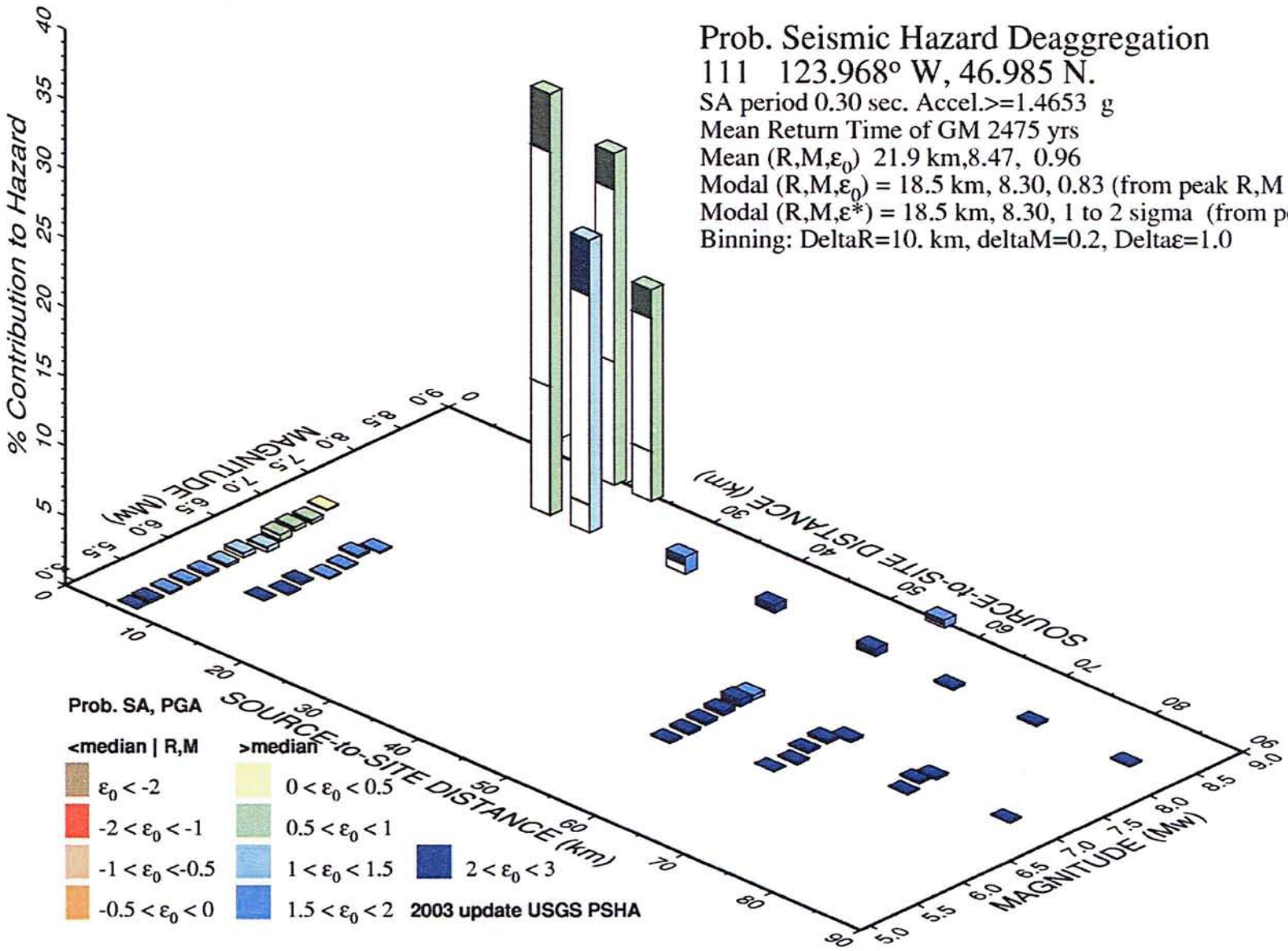
Mean Return Time of GM 2475 yrs

Mean (R,M,ε_0) 21.9 km,8.47, 0.96

Modal (R,M,ε_0) = 18.5 km, 8.30, 0.83 (from peak R,M bin)

Modal (R,M,ε*) = 18.5 km, 8.30, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT May 30 18:37 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on ROCK avg Vs=760 m/s top 30 m USGS CGHT PSHA2002v3 UPDATE Bins with lt 0.05% contrib. omitted

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Prob. Seismic Hazard Deaggregation

111 123.968° W, 46.985 N.

SA period 0.50 sec. Accel.>=1.2614 g

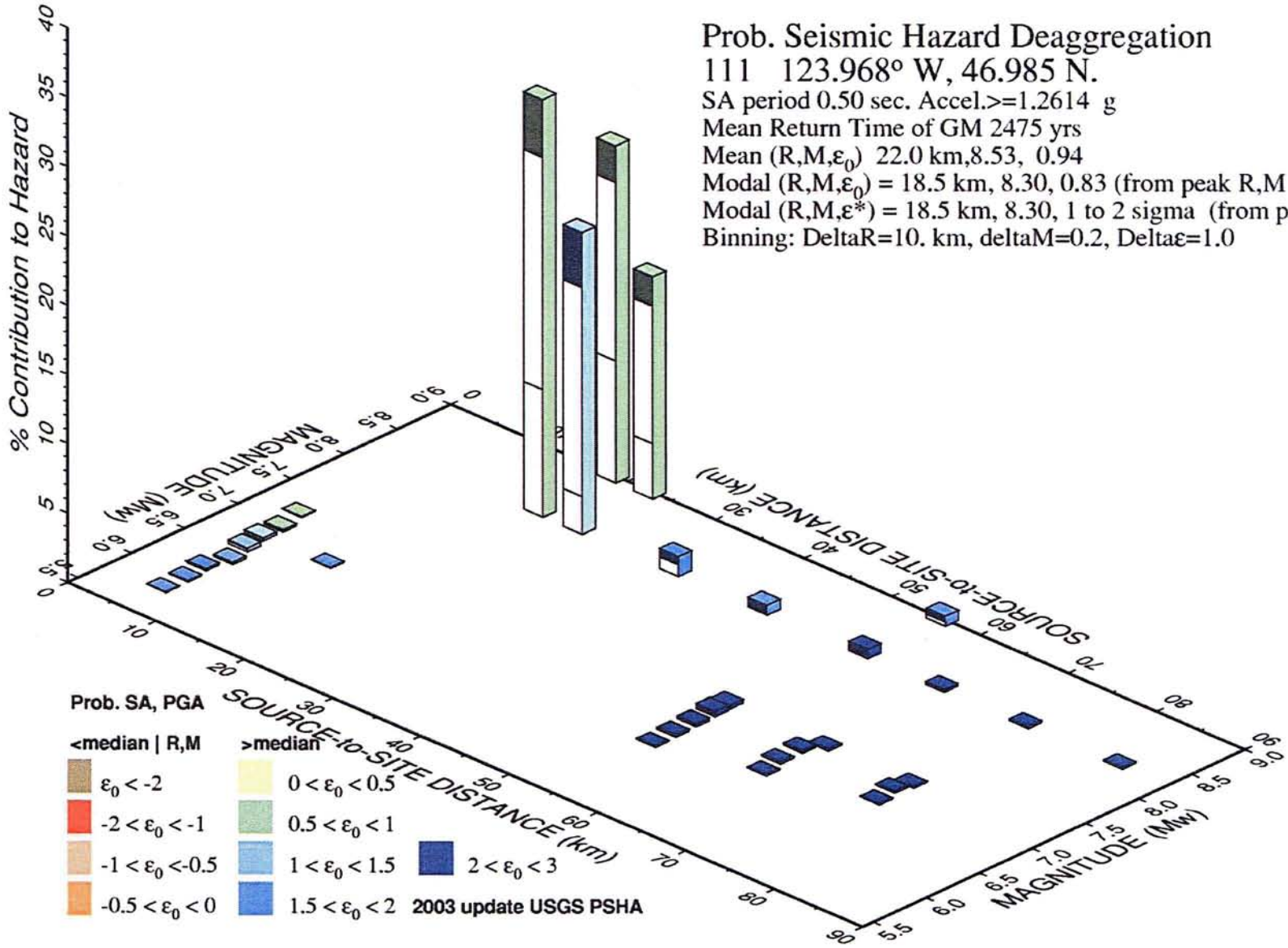
Mean Return Time of GM 2475 yrs

Mean (R,M,ε_0) 22.0 km,8.53, 0.94

Modal (R,M,ε_0) = 18.5 km, 8.30, 0.83 (from peak R,M bin)

Modal (R,M,ε*) = 18.5 km, 8.30, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT May 30 18:36 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on ROCK avg Vs=760 m/s top 30 m USGS CGHT PSHA2002v3 UPDATE Bins with lt 0.05% contrib. omitted

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Prob. Seismic Hazard Deaggregation

111 123.968° W, 46.985 N.

SA period 1.00 sec. Accel.>=0.7479 g

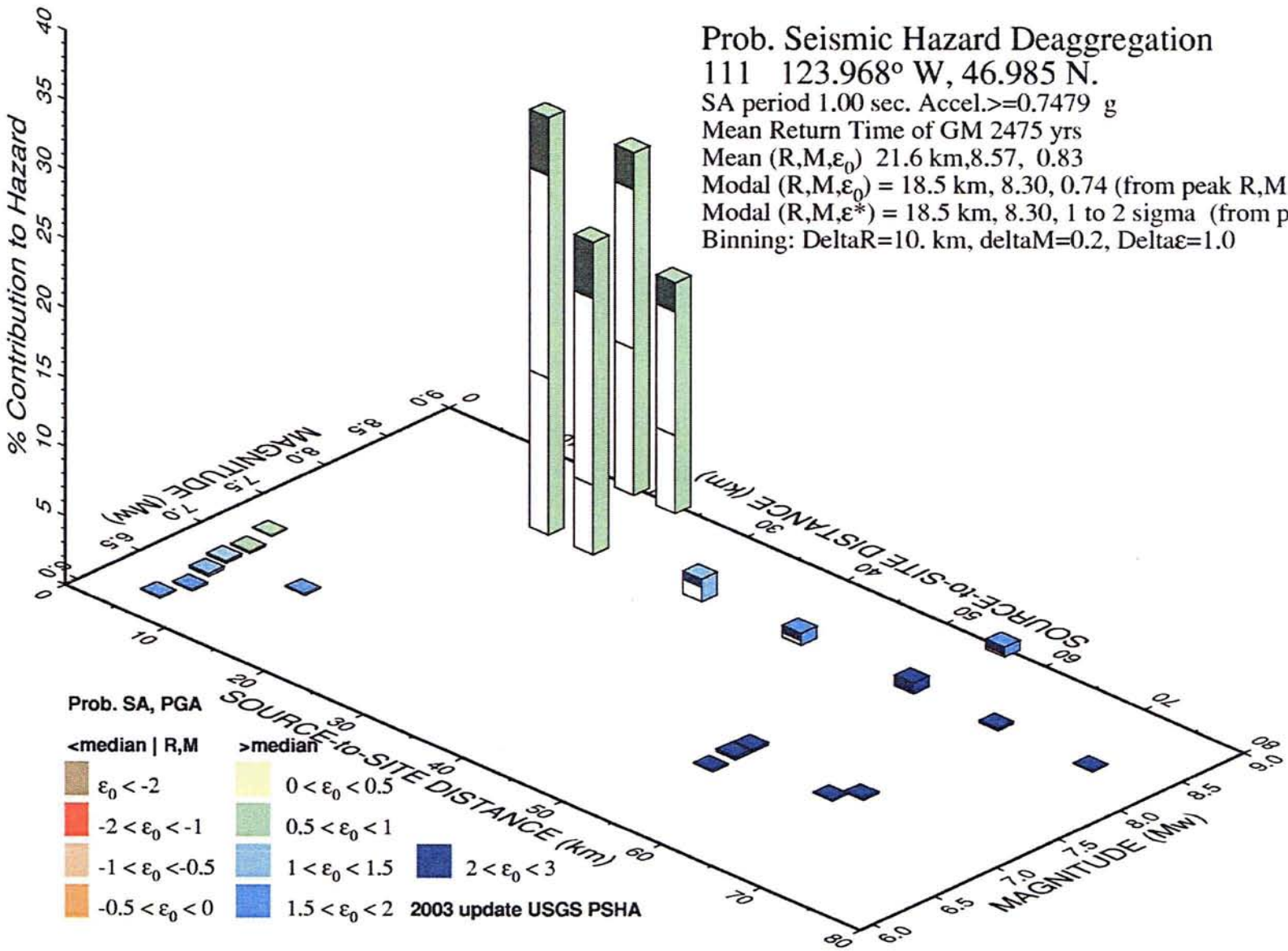
Mean Return Time of GM 2475 yrs

Mean (R,M,ε_0) 21.6 km,8.57, 0.83

Modal (R,M,ε_0) = 18.5 km, 8.30, 0.74 (from peak R,M bin)

Modal (R,M,ε*) = 18.5 km, 8.30, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT May 30 18:35 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on ROCK avg Vs=760 m/s top 30 m USGS CGHT PSHA2002v3 UPDATE Bins with lt 0.05% contrib. omitted

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Prob. Seismic Hazard Deaggregation

111 123.968° W, 46.985 N.

SA period 2.00 sec. Accel.>=0.3721 g

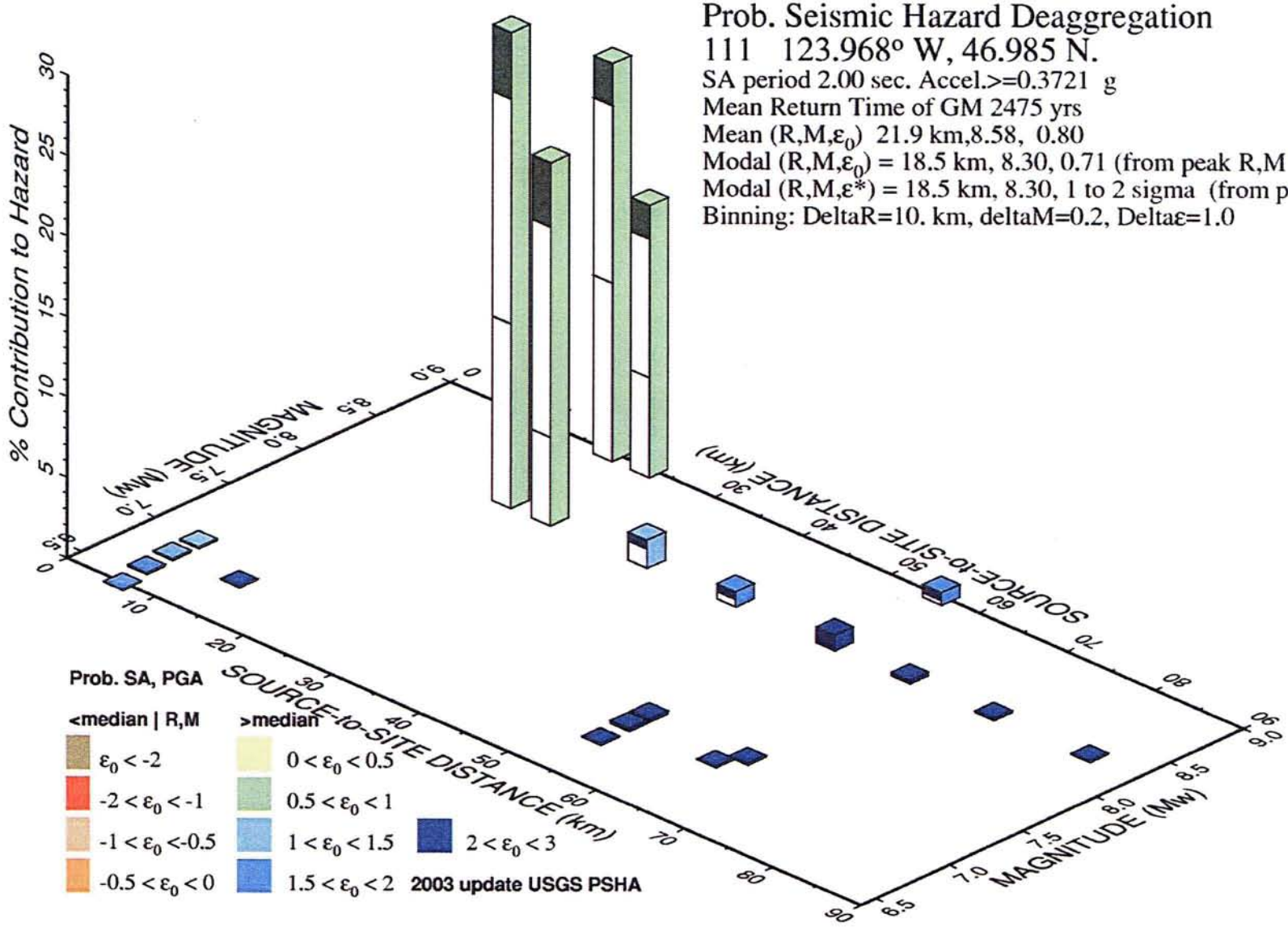
Mean Return Time of GM 2475 yrs

Mean (R,M,ε_0) 21.9 km,8.58, 0.80

Modal (R,M,ε_0) = 18.5 km, 8.30, 0.71 (from peak R,M bin)

Modal (R,M,ε*) = 18.5 km, 8.30, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT May 30 18:32 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on ROCK avg Vs=760 m/s top 30 m USGS CGHT PSHA2002v3 UPDATE Bins with lt 0.05% contrib. omitted

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GeoEngineers

APPENDIX D
GEOENGINEERS REPORT, DECEMBER 10, 1996

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Report
Geotechnical Engineering Services
Fill Conditions - Slip 1
Port of Grays Harbor

December 10, 1996

For

Port of Grays Harbor

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GeoEngineers

15 YEARS

Consulting Engineers and Geoscientists
Offices in Washington, Oregon, and Alaska

December 10, 1996

Port of Grays Harbor
P.O. Box 660
Aberdeen, Washington 98520

Attention: Mr. Tom Evans

Report
Geotechnical Engineering Services
Fill Conditions - Slip 1
Port of Grays Harbor
File No. 0102-046-T03

INTRODUCTION

This report presents the results of our geotechnical engineering services for Slip 1 at the Port of Grays Harbor near Aberdeen, Washington. The project site is shown on the Vicinity Map, Figure 1. We previously prepared a report on the condition of the fill within Slip 1 dated September 5, 1995, and a report for the construction of the dike at the mouth of Slip 1 dated February 2, 1981. We have also completed several reports for warehouse sites located in the vicinity of Slip 1, The Frye Creek diversion, and reports relating to the Slip 1 fill process.

BACKGROUND

Slip 1 was developed in stages between the early 1980s to present with material dredged from Grays Harbor and material from various upland projects in the site vicinity. A dike was constructed across the entrance of the slip to form an enclosed area in the mid 1980's. This enclosed area was filled hydraulically by pumping a mixture of soil and water into the slip. The hydraulic fill was discharged near the south corner of the slip. The characteristics of a hydraulic fill are controlled by the dredge material and the manner in which it is deposited. Hydraulic fills tend to segregate by particle size with the largest and heaviest particles, in this case gravel, dropping out of the soil water mixture rapidly and accumulating near the discharge point. A fan of material forms around the discharge point; at greater distances the gravel will grade to sand

GeoEngineers, Inc.
1101 Fawcett Ave., Suite 200
Tacoma, WA 98402
Telephone (206) 383-4940
Fax (206) 383-4923

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

followed by finer material. The coarse material also contains a mixture of fine sand and silt. Some mixing of material will occur and local variations should be expected.

The hydraulic fill was capped in 1994 by placing a variable thickness of fill excavated from a roadway construction project in the Grays Harbor area. The fill material generally comprises weathered sandstone and siltstone and was placed in a generally uncontrolled manner. Fill placement induced localized bearing failures in the underlying dredge fill material which resulted in heaving of the fill surface in some areas.

SCOPE

The purpose of our services was to explore the subsurface soil and ground water conditions as a basis for evaluating the feasibility for commercial/industrial site development of Slip 1. Specifically, our scope of services includes the following:

1. Explore the subsurface soil and ground water conditions by advancing three cone penetrometer test (CPT) soundings to depths of up to 117 feet.
2. Evaluate the feasibility of developing the site at this time or at some time in the future.
3. Prepare a written report containing our observations, conclusions and recommendations along with the supporting data.

SITE CONDITIONS

SURFACE CONDITIONS

The site comprises a relatively level area bounded to the southwest by the waters of Grays Harbor as shown on the Site Plan, Figure 2. Vegetation consists of scattered brush and grass. Portions of the area have been developed for use as storage.

SUBSURFACE EXPLORATIONS

Subsurface conditions were evaluated by advancing 3 cone penetrometer soundings to depths of 60 to 117 feet below the existing ground surface on June 6, 1996. A boring was advanced to a depth of about 80 feet below the existing ground surface on July 25, 1995. We also reviewed logs of other explorations in the project area. The approximate location of the CPT soundings and the prior boring were determined by tape measurement from existing site features and are indicated on the site plan.

Soil samples were obtained from the test boring using a 3-inch-outside-diameter split-barrel sampler driven into the soil with a 300-pound hammer free-falling a distance of 30 inches. The number of blows required to drive the sampler the last 12 inches, or other indicated distance, is recorded on the boring logs.

The boring was continuously monitored by one of our representatives who examined and classified the soils encountered, obtained representative soil samples, observed ground water conditions, and prepared a log of the exploration. Soils encountered were visually classified in

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

general accordance with the system described in Figure 3. An explanation of the boring log symbols is included as Figure 4. The log of the boring is presented as Figure 5.

Results of the laboratory moisture and in-place density tests are noted on the boring log adjacent to the corresponding soil sample.

The CPT involves pushing a calibrated probe consisting of a conical tip and friction sleeve into the soil. The force required to push the cone and friction sleeve is measured. Established correlations between cone and sleeve resistance values are used to identify the soil type. The cone is advanced in 5 cm increments, with measurements taken electronically from load cells located within the cone. Measurements of the pore water pressure also are obtained using a pressure transducer located just behind the cone tip. Logs of the CPT soundings are presented on Figures 6 through 8.

SUBSURFACE CONDITIONS

Based on the conditions encountered in CPT soundings 1 and 2 and the test boring, the northeastern end of Slip 1 is underlain by approximately 48 feet of fill. The fill generally consists of very loose to loose silty fine sand to a depth of about 16 and very soft to soft organic silt to a depth of about 48 feet. The upper 16 feet of the fill appears to be material mechanically placed over the hydraulic fill. The fill is underlain by very soft organic silt, which in turn is underlain by very loose silty sand and soft fine sandy silt, and dense sand.

CPT 1 was terminated at a depth of 60 feet below ground surface in native deposits comprised of interlayered silty sand and silt. CPT 2 was advanced to the underlying dense sand encountered at a depth of about 117 feet below the ground surface. Based on review of logs of borings which we previously advanced in the vicinity of the south end of Slip 1, soft to medium stiff silt and loose to medium dense sand deposits extend to approximately Elevation -115 to -125.

CPT 3 was advanced near the point of discharge of the dredge material. The upper approximately 18 feet of material encountered appears to be a silty sand in a loose condition with layers of very loose and medium dense material. This material is underlain by a sandy silt which extends to a depth of about 38 feet and is very soft to soft. The sandy silt overlies a very soft organic silt which extends to a depth of about 65 feet. Medium dense sand was encountered beneath the organic silt and extends to the depth explored. Borings previously advanced near the southwestern end of Slip 1 indicate that the original mudline (prior to hydraulic fill placement) was at a depth of about 60 feet below the current ground surface.

Ground water levels are anticipated to remain at or slightly above mean high water level in Grays Harbor. Seasonal variations in ground water levels will likely occur. Ground water was observed to flow up out of the CPT soundings after the rods were withdrawn from the hole indicating that there is excess hydrostatic pressure at depth.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

Based on our explorations and analyses, it is our opinion that consolidation of the fill and underlying soft soils can be expected to continue at a relatively high rate for four to six years and at lesser rates thereafter. These and other geotechnical aspects are discussed in more detail in the following sections. Our primary conclusions are summarized below.

- To date we estimate that approximately 70 percent of the primary consolidation has occurred with an additional 1 to 2 feet of consolidation settlement likely to occur over the next 2 to 3 years.
- Secondary consolidation is anticipated to result in an additional 4 to 6 inches of settlement over a period of about 30 to 50 years.
- Increased settlement can be expected if the site grades are raised or additional loads placed on the ground surface.
- The mechanically placed fill overlying the hydraulic fill is in a loose condition and will require reworking to support shallow footings regardless of other consolidation issues.
- The site is vulnerable to liquefaction and amplification of ground motion through soft soils during seismic events.

SETTLEMENT

The magnitude and rate of settlement resulting from consolidation of compressible soils can vary substantially across a site due to minor variations in soil conditions. The settlement magnitudes and rates presented above are based on our judgement and experience, and should be considered as representative of average conditions. Substantial variation in magnitude and rate of settlement across the site should be expected. The consolidation characteristics of the compressible soils can be evaluated in more detail by obtaining relatively undisturbed samples and performing consolidation tests. As an alternative, we recommend that a survey program be implemented to monitor actual settlements occurring in the slip. After sufficient monitoring of the time-rate of settlement behavior, future settlement magnitudes and rates can be empirically estimated.

INITIAL SITE PREPARATION AND MONITORING

We recommend a topographic survey be performed on the site to establish existing site contours. We also recommend that survey monuments be established within the filled area of Slip 1 to monitor the ongoing settlement and for use in evaluating future settlements. Survey monuments should be embedded at least 3 feet below ground surface, and should be protected from disturbance. Monument elevation should be surveyed every 3 to 4 months. We recommend a minimum of six monuments spaced evenly over the filled area. The settlement data may be

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

used as the basis for evaluating when restrictions on initial development options may be removed and in developing appropriate mitigating measures for design of future development.

We further recommend a grading and drainage plan be developed for the site. Low areas identified from the topographic survey should be filled so that standing water does not accumulate on the site and create potential wetland areas.

INITIAL DEVELOPMENT

The ongoing settlement due to consolidation of the hydraulic fill and soft native soils, and additional settlement resulting from application of new loads in our opinion presents practical limitations an options for initial site development. Temporary and light weight structures or yard storage are in our opinion appropriate land uses until most of the anticipated settlement has occurred. In general, we anticipate the northern portion of the slip, furthest from the point of discharge of the hydraulic fill will likely experience the greatest settlement over the longest period of time. Therefore initial development constraints will likely be appropriate in this portion of the site for several years. We anticipate the southern portion of the site will be subject to initial development limitations for a lesser period.

FUTURE DEVELOPMENT

General

Because the site is underlain by a substantial thickness of compressible soil, additional settlement can be expected if surcharges resulting from heavily loaded structures are applied, or if site grades are raised. We judge lightly loaded structures may be supported on shallow foundations such as spread or strip footings. Heavily loaded or settlement sensitive structures should be supported on deep foundations. Alternatively, building footprints may be preloaded. Experience on nearby sites indicates that preload periods on the order of 1 year may be required. Vertical (sand or wick) drains may be used to reduce the time required for preloading.

Once specific site development plans have been established an appropriate geotechnical investigation should be conducted to evaluate site specific soil conditions and develop appropriate design and construction recommendations. These and other aspects for future development are discussed in more detail below.

Shallow Foundations

The mechanically placed fill overlying the hydraulic fill is generally in a loose condition and will likely consolidate under new loads. To control this settlement it will be necessary to partially remove the loose fill material and replace it with properly compacted structural fill beneath building foundations and floor slabs. The depth to which over excavation will be required will depend on the footing load, and the shape and size of the footing.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Mat foundations are structurally stiffened slabs which distribute loads more uniformly which can reduce differential settlements. Raft foundations are similar to mat foundations, but are typically set at a depth below grade such that the weight of soil removed approximately compensates for the additional weight of the structure. This reduces or eliminates increases in vertical pressure on the underlying soil mass from the structure thereby reducing post-construction consolidation related settlement

Deep Foundations

Heavily loaded structures considered for future site development may have to be pile-supported so that structural loads are not applied to the mechanically placed fill or the upper portions of the hydraulic fill. Potential for downdrag forces to develop on pile foundations and development of appropriate mitigating measures will be important design considerations.

Utility lines and the utility connections to pile-supported structures will require special design provisions to accommodate anticipated total and long-term differential settlements.

Preloading and Surcharging

Preloading and surcharging by placing temporary fill over a proposed building footprint can be performed to preinduce settlements, thereby reducing the potential for post-construction settlements. Preloading and surcharging may be expedited by using sand or wick drains discussed in the following section

Wick Drains

Consolidation settlement of the hydraulic fill and native soils can be accelerated by reducing the length of the drainage path within the soil mass. This may be accomplished by installing vertical sand or wick drains.

Sand or wick drain spacings typically range from about 3 to 10 feet on centers depending on the soil properties and the increase in consolidation rate desired.

Seismic Considerations

Based on the 1994 UBC, the site is located in seismic zone 3 with a site coefficient of S4. Zones of very loose to loose silty sand occur in the fill and the underlying native soil. This material may experience liquefaction in a seismic event. The risk of liquefaction will be greater in areas with sands and silty sands such as were encountered in the southern portion of the slip. Substantial total and differential settlement, and lateral spreading could occur if these soils liquefy. Amplification of ground motion also may occur in the soft soils which underlie the site.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

LIMITATIONS

We have prepared this report for the Port of Grays Harbor and their agents for use on evaluating a portion of this project. Our report, conclusions and interpretations are based on widely-spaced explorations and should not be construed as a warranty of the subsurface conditions. Variations in subsurface conditions are possible between explorations and are occurring over time.

Once a specific development plan has been selected a detailed geotechnical investigation should be undertaken.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in this area at the time this report was prepared. No warranty, express or implied, should be understood.

We appreciate the opportunity to be of service on this project and look forward to working with you again. Please call if you have any questions.

Yours very truly,

GeoEngineers, Inc.

Garry H. Squires by [illegible]

Garry H. Squires, P.E.
Senior Engineer

GARY W. HENDERSON
STATE OF WASHINGTON
12979
REGISTERED
PROFESSIONAL ENGINEER
11/20/96
EXPIRES 3/20/98

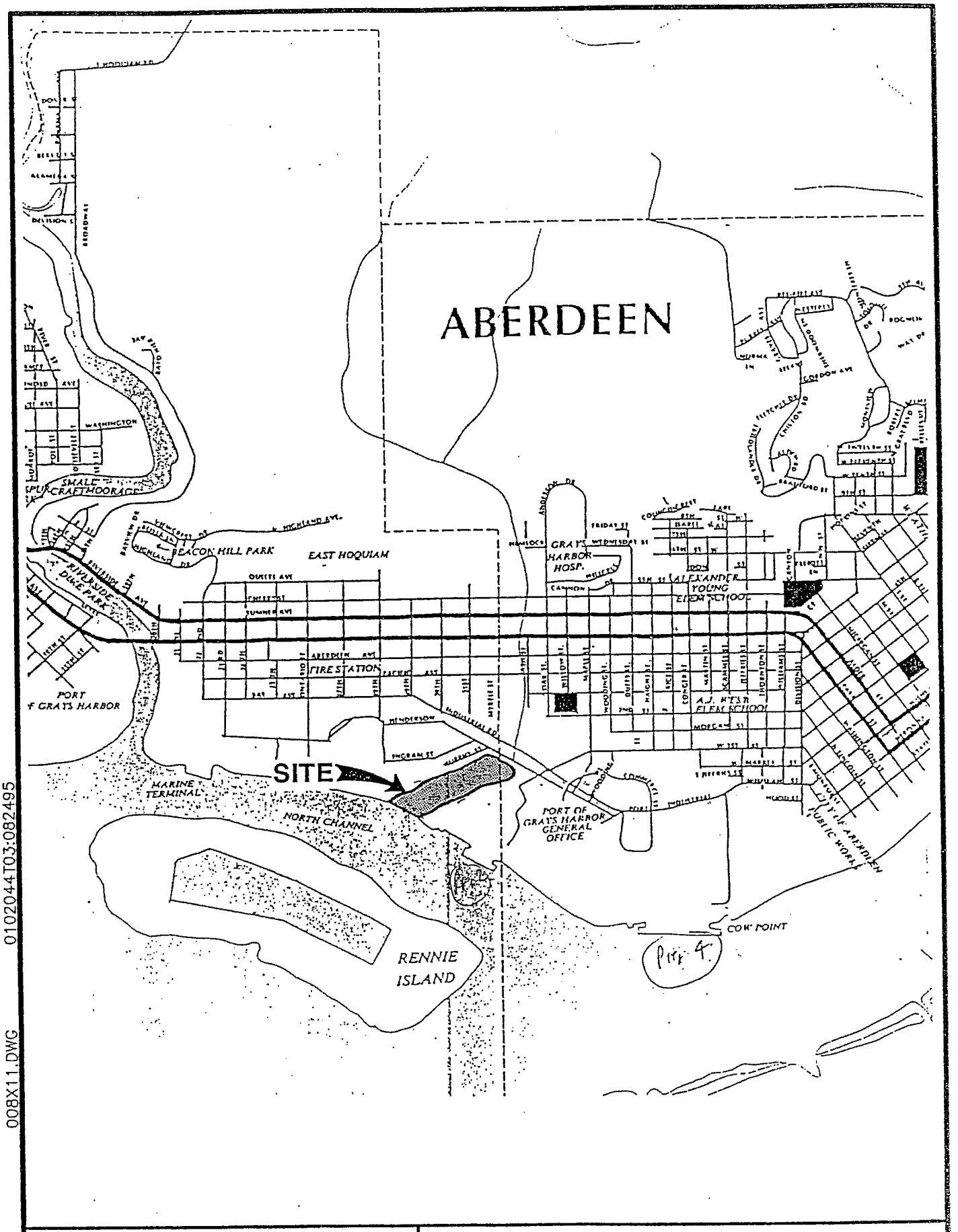
Gary W. Henderson
Principal

GHS:GWH:cdl
Document I.D. 0102046R.R

Attachments

Two copies submitted

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



Geo Engineers

VICINITY MAP

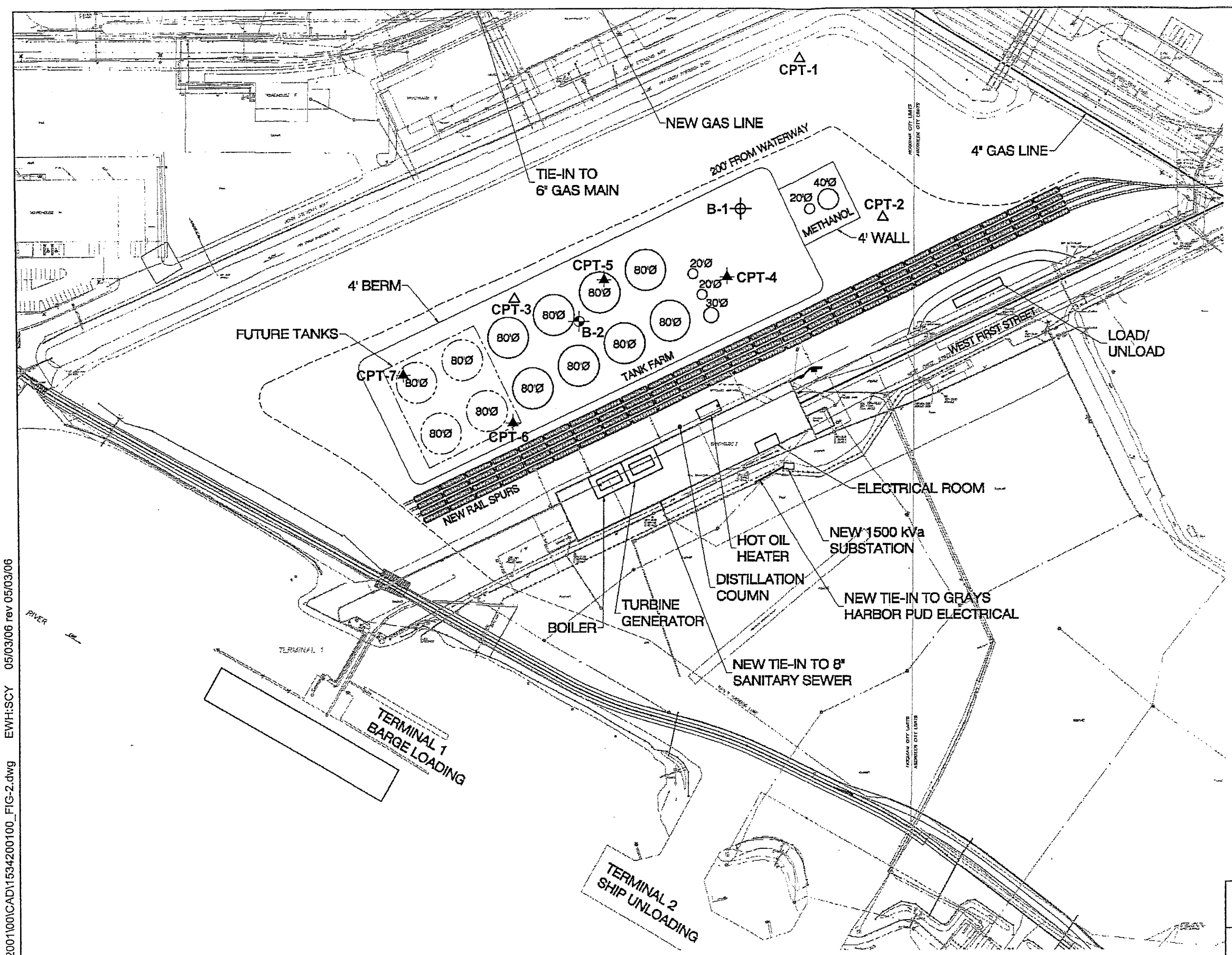
FIGURE 1

01020441T03:082495

008X11.DWG

SMA:SPS

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.



Legend

- B-1 — Boring number and approximate location (1996)
- B-2 — Boring number and approximate location (2006)
- CPT-1 — Cone Penetrometer Test Soundings number and approximate location (1996)
- CPT-4 — Cone Penetrometer Test Soundings number and approximate location (2006)

200 0 200
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Drawing PDF file provided by Parker, Messana & Associates, Inc. Consulting Engineers.

Site Plan

Proposed Storage Tanks
Hoquiam, Washington

GEOENGINEERS

Figure 2

TACO\15\1534200\100\CAD\1534200100_FIG-2.dwg EWH:SCY 05/03/06 rev 05/03/06

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More Than 50% Retained on No. 200 Sieve	GRAVEL More Than 50% of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More Than 50% of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More Than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less Than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or More	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Descriptions of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and/or test data.

SOIL MOISTURE MODIFIERS:

Dry - Absence of moisture, dusty, dry to the touch

Moist - Damp, but no visible water

Wet - Visible free water or saturated, usually soil is obtained from below water table

GeoEngineers

SOIL CLASSIFICATION SYSTEM

FIGURE 3

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

LABORATORY TESTS:

- AL Atterberg limits
- CP Compaction
- CS Consolidation
- DS Direct shear
- GS Grain - size
- %F Percent fines
- HA Hydrometer analysis
- SK Permeability
- SM Moisture content
- MD Moisture and density
- SP Swelling pressure
- TX Triaxial compression
- UC Unconfined compression
- CA Chemical analysis

SOIL GRAPH:

SM Soil Group Symbol (See Note 2)

Distinct Contact Between Soil Strata

Gradual or Approximate Location of Change Between Soil Strata

Water Level

Bottom of Boring

BLOW-COUNT/SAMPLE DATA:

Blows required to drive a 2.4-inch I.D. split-barrel sampler 12 inches or other indicated distances using a 300-pound hammer falling 30 inches.

- 22 ■ Location of relatively undisturbed sample
- 12 ⊠ Location of disturbed sample
- 17 □ Location of sampling attempt with no recovery

Blows required to drive a 1.5-inch I.D. (SPT) split-barrel sampler 12 inches or other indicated distances using a 140-pound hammer falling 30 inches.

- 10 ◧ Location of sample obtained in general accordance with Standard Penetration Test (ASTM D-1586) procedures
- 26 ◫ Location of SPT sampling attempt with no recovery

Location of grab sample

"P" indicates sampler pushed with weight of hammer or against weight of drill rig.

NOTES:

1. The reader must refer to the discussion in the report text, the Key to Boring Log Symbols and the exploration logs for a proper understanding of subsurface conditions.

2. Soil classification system is included.

GEOTECH

KBLS2221.CDR

Geo Engineers

KEY TO BORING LOG SYMBOLS

FIGURE 4

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

TEST DATA

BORING B-1

Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	DESCRIPTION Surface Elevation (ft.):
					SM	Gray to brown silty fine to medium sand with occasional gravel and organic material (loose, moist) (fill)
	23	97	6	■		
			2	⊠		Grades to very loose
			2	⊠		Grades to gray (fill)
	53	67	3	■	ML	Dark gray sandy silt with occasional organic material (soft, moist) (fill)
					OH	Dark gray organic silt with occasional sand (very soft, wet) (fill)
	59	66	1	⊠		
	88	53	1	■		Grades to black (fill)
	85	47	2	■		Black silt with organic material (very soft, wet)
	84	45	0	■		
	87	45	2	■		Black silt with occasional sand and organic material (very soft, moist) (wood fibers)

DEPTH IN FEET: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45

Note: See Figure for explanation of symbols

Geo Engineers

LOG OF BORING

FIGURE 5

SMA:GWH:va: 7/11/98

0102-044-T03

NB40

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

TEST DATA

BORING B-1
(Continued)

DESCRIPTION

Lab Tests	Moisture Content (%)	Dry Density (pcf)	Blow Count	Samples	Group Symbol	Description
	79	51	1	■	OL	Grades to dark gray, no wood fibers
	63	64	2	■	SP-SM	Gray fine to medium sand with silt (very loose, wet)
					SM	
	37	82	1	■		Gray silty fine to medium sand with occasional shell fragments (very loose, wet)
	53	68	1	■		Gray silty fine to medium sand with occasional shell fragments (very loose, wet)
					ML	Dark gray fine sandy silt (soft, wet)
	50	71	4	■		
	53	68	5	■		
	42	75	4	■		

DEPTH IN FEET: 45, 50, 55, 60, 65, 70, 75, 80, 85, 90

Boring completed at a depth of 79.0 on 07/25/95
Ground water encountered at an approximate depth of 54.0 feet during drilling

Note: See Figure for explanation of symbols

GeoEngineers

LOG OF BORING

FIGURE 5

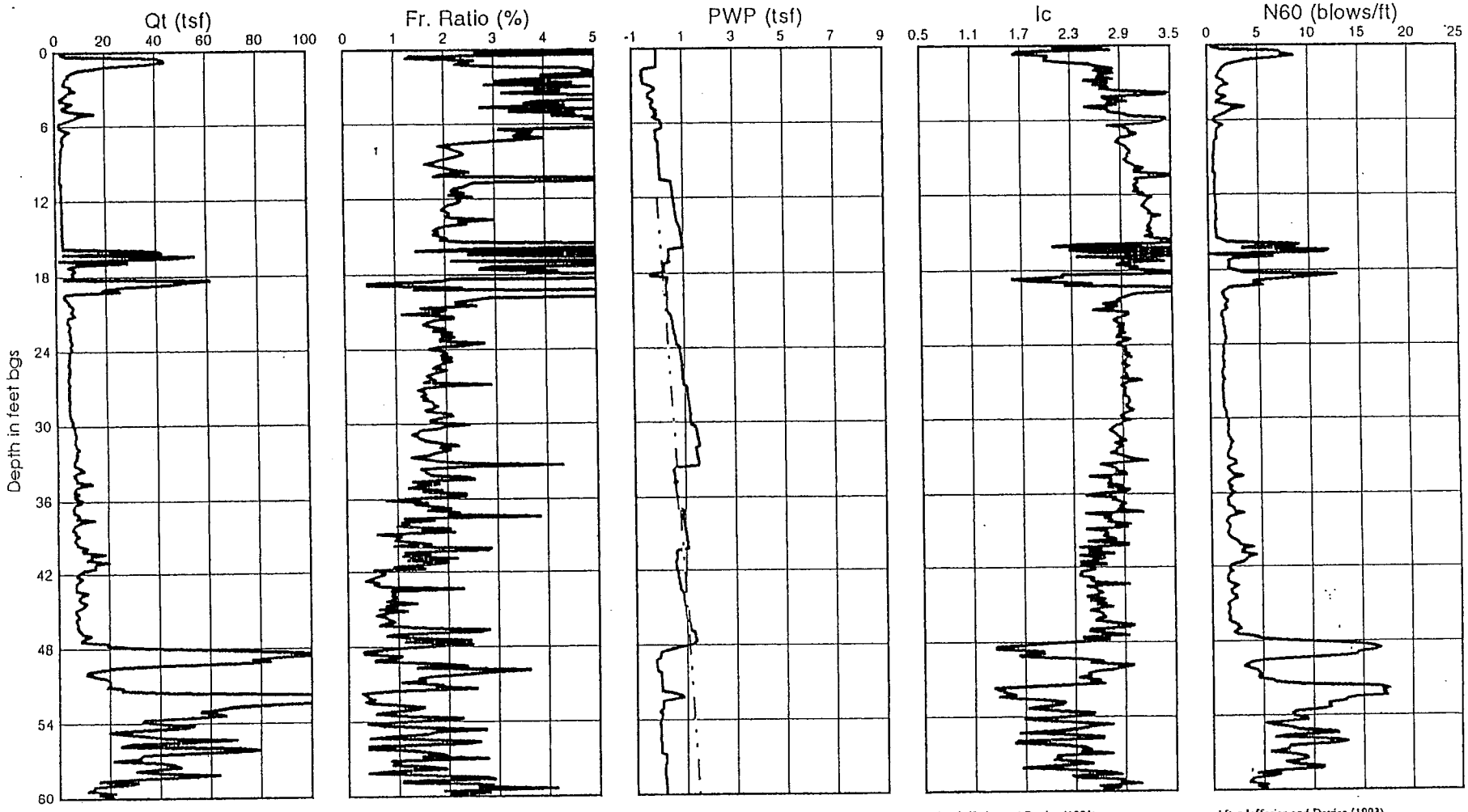
This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Cone Penetration Test - CPT-1

Test Date : Jun 06, 1996
Location : Port of Grays Harbor, Slip 1

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 12.00



Qt normalized for unequal end area effects

Fr Ratio = 100*Fr/(Qt-Sigmav)
Gamma = 100 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. 0102-04 DATE: June 8, 1996 DRAWN BY: Keith Brown

GeoEngineers, Inc.

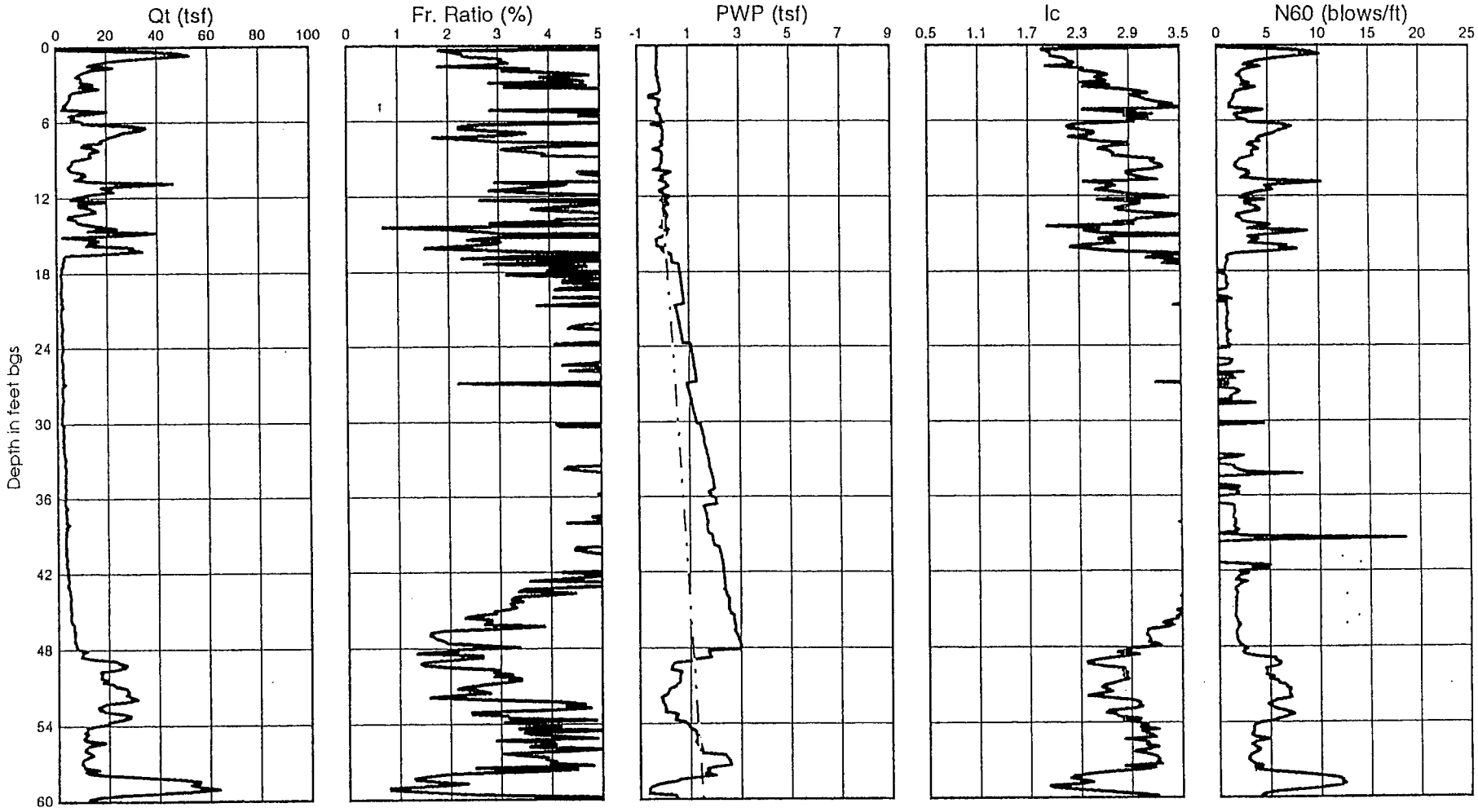
FIGURE 6

Cone Penetration Test - CPT-2

Test Date : Jun 06, 1996
Location : Port of Grays Harbor, Slip 1

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 12.00



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 100 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. 0102-04 DATE: June 6, 1996 DRAWN BY: Keith Brown

GeoEngineers, Inc.

FIGURE 7

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

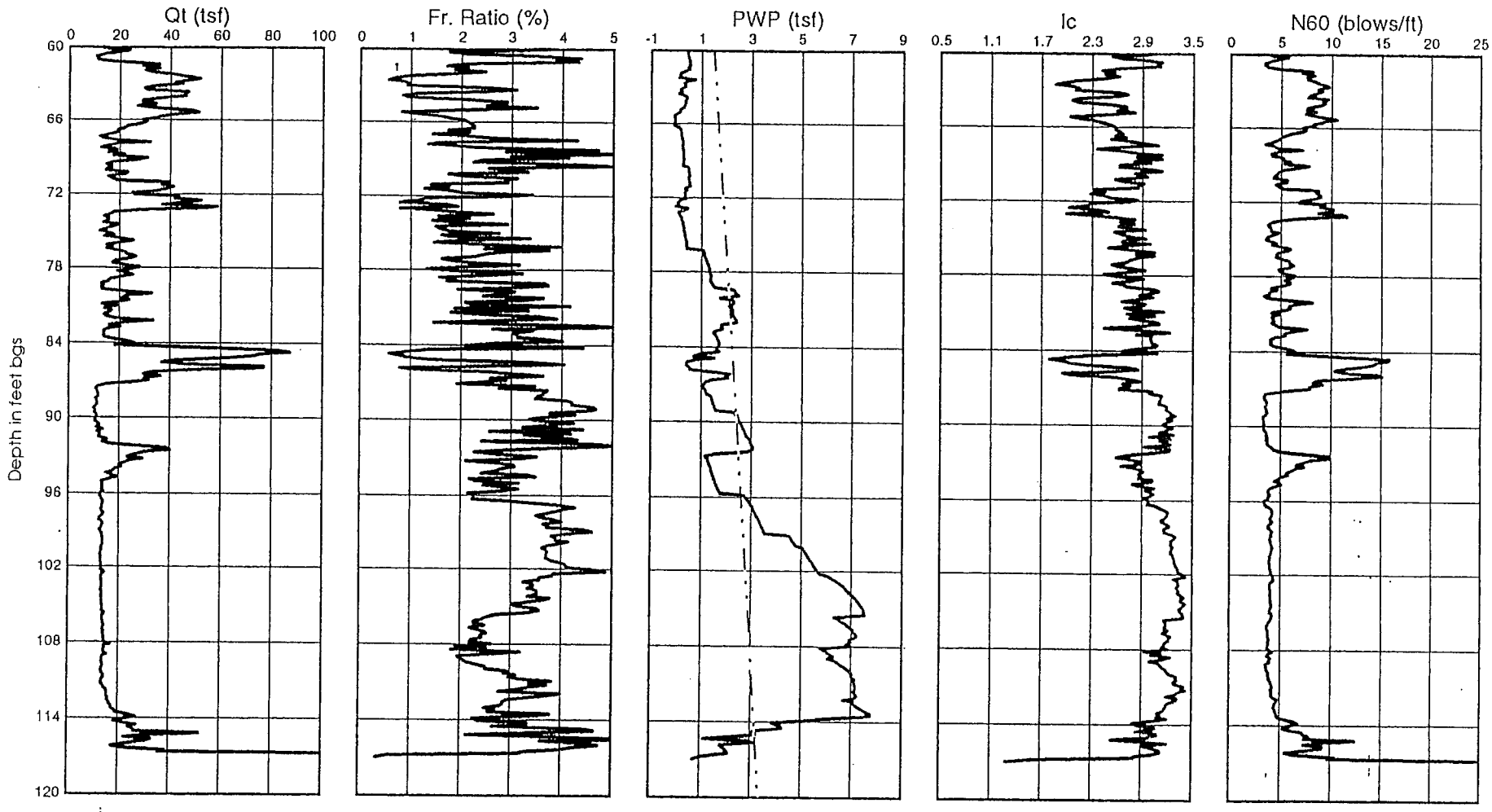
This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Cone Penetration Test - CPT-2

Test Date : Jun 06, 1996
Location : Port of Grays Harbor, Slip 1

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 12.00



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 100 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. 0102-04 DATE: June 6, 1996 DRAWN BY: Keith Brown

GeoEngineers, Inc.

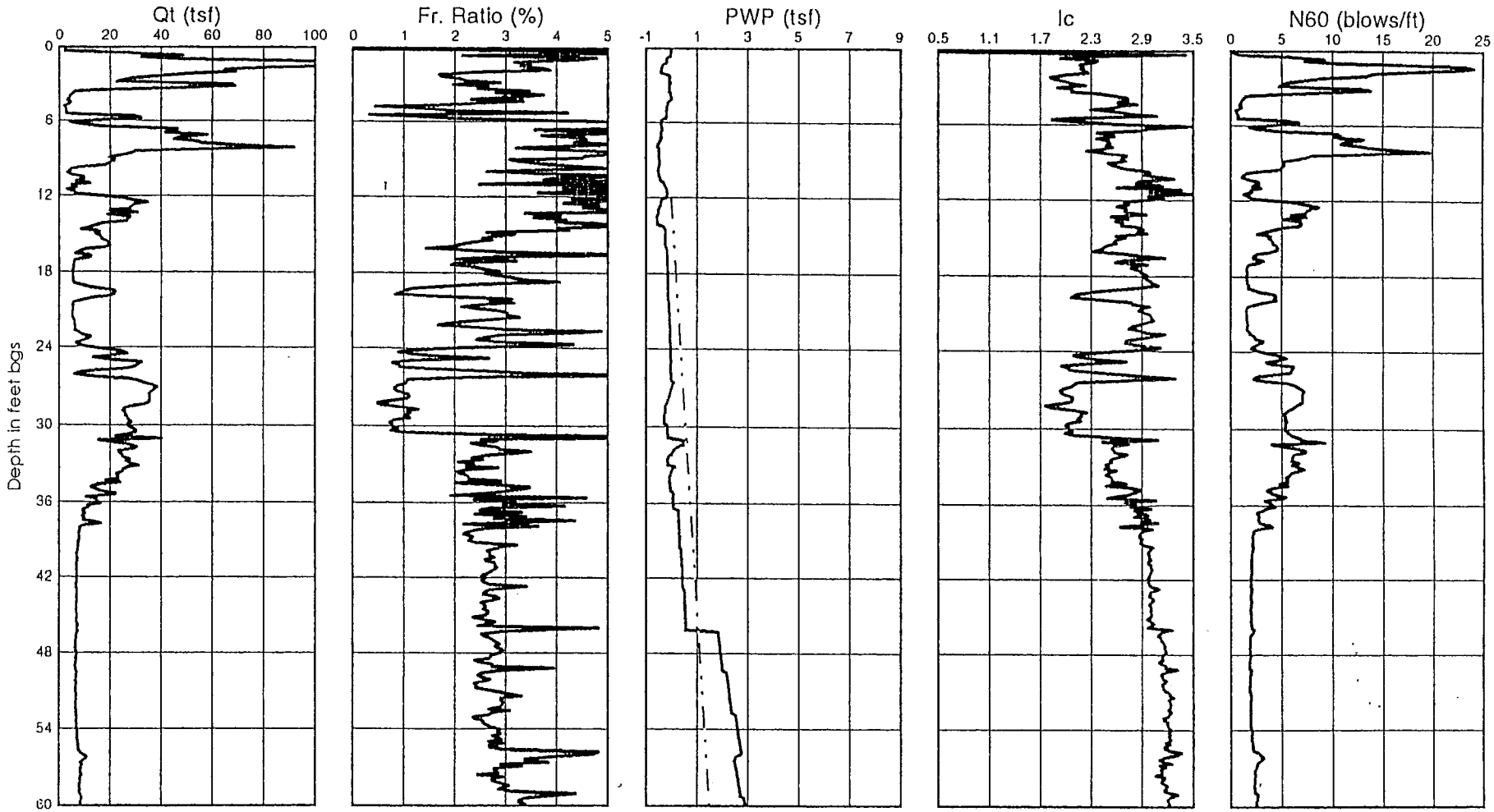
FIGURE 7

Cone Penetration Test - CPT-3

Test Date : Jun 06, 1996
Location : Port of Grays Harbor, Slip 1

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 12.00



Qt normalized for
unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 100 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. 0102-04 DATE: June 8, 1996 DRAWN BY: Keith Brown

GeoEngineers, Inc.

FIGURE 8

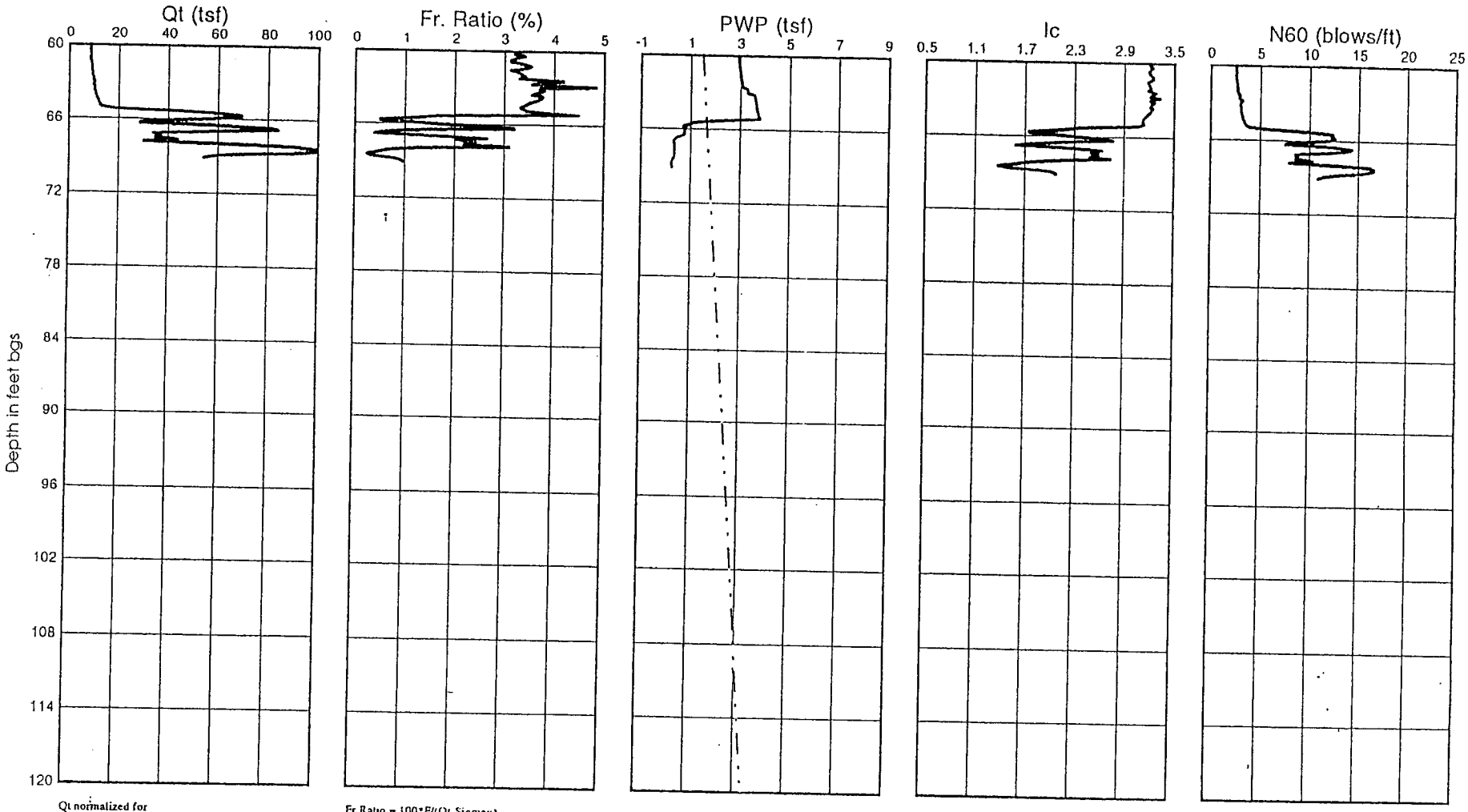
This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

Cone Penetration Test - CPT-3

Test Date : Jun 06, 1996
Location : Port of Grays Harbor, Slip 1

Operator : Northwest Cone Exploration

Ground Surf. Elev. : 0.00
Water Table Depth : 12.00



Qt normalized for unequal end area effects

Fr Ratio = 100*F/(Qt-Sigmav)
Gamma = 100 pcf

After Jefferies and Davies (1991)
Ic < 1.25 - Gravelly sands
1.25 <Ic < 1.90 - Clean to silty sand
1.90 <Ic < 2.54 - Silty sand to sandy silt
2.54 <Ic < 2.82 - Clayey silt to silty clay
2.82 <Ic < 3.22 - Clays

After Jefferies and Davies (1993)

PROJECT NO. 0102-04 DATE: June 8, 1996 DRAWN BY: Keith Brown

GeoEngineers, Inc.

FIGURE 8

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GeoEngineers

APPENDIX E
REPORT LIMITATIONS AND GUIDELINES FOR USE

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

APPENDIX E
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES, PERSONS AND PROJECTS

This report has been prepared for the exclusive use of Seattle Biofuels, Inc., and their authorized agents. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, a geotechnical or geologic study conducted for a civil engineer or architect may not fulfill the needs of a construction contractor or even another civil engineer or architect that are involved in the same project. Because each geotechnical or geologic study is unique, each geotechnical engineering or geologic report is unique, prepared solely for the specific client and project site. Our report is prepared for the exclusive use of our Client. No other party may rely on the product of our services unless we agree in advance to such reliance in writing. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions. Within the limitations of scope, schedule and budget, our services have been executed in accordance with our Agreement with the Client and generally accepted geotechnical practices in this area at the time this report was prepared. This report should not be applied for any purpose or project except the one originally contemplated.

A GEOTECHNICAL ENGINEERING OR GEOLOGIC REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

This report has been prepared for the Proposed Bio-diesel Facility Project located at the Port of Grays Harbor, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

For example, changes that can affect the applicability of this report include those that affect:

- the function of the proposed structure;
- elevation, configuration, location, orientation or weight of the proposed structure;
- composition of the design team; or
- project ownership.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences; www.asfe.org.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

SUBSURFACE CONDITIONS CAN CHANGE

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, or by natural events such as floods, earthquakes, slope instability or ground water fluctuations. Always contact GeoEngineers before applying a report to determine if it remains applicable.

TOPSOIL

For the purposes of this report, we consider topsoil to consist of generally fine-grained soil with an appreciable amount of organic matter based on visual examination, and to be unsuitable for direct support of the proposed improvements. However, the organic content and other mineralogical and gradational characteristics used to evaluate the suitability of soil for use in landscaping and agricultural purposes was not determined, nor considered in our analyses. Therefore, the information and recommendations in this report, and our logs and descriptions should not be used as a basis for estimating the volume of topsoil available for such purposes.

MOST GEOTECHNICAL AND GEOLOGIC FINDINGS ARE PROFESSIONAL OPINIONS

Our interpretations of subsurface conditions are based on field observations from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

GEOTECHNICAL ENGINEERING REPORT RECOMMENDATIONS ARE NOT FINAL

Do not over-rely on the preliminary construction recommendations included in this report. These recommendations are not final, because they were developed principally from GeoEngineers' professional judgment and opinion. GeoEngineers' recommendations can be finalized only by observing actual subsurface conditions revealed during construction. GeoEngineers cannot assume responsibility or liability for this report's recommendations if we do not perform construction observation.

Sufficient monitoring, testing and consultation by GeoEngineers should be provided during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether or not earthwork activities are completed in accordance with our recommendations. Retaining GeoEngineers for construction observation for this project is the most effective method of managing the risks associated with unanticipated conditions.

This page contains proprietary information that Imperium requests not to be released to persons outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

A Geotechnical Engineering or Geologic Report Could be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. You could lower that risk by having GeoEngineers confer with appropriate members of the design team after submitting the report. Also retain GeoEngineers to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering or geologic report. Reduce that risk by having GeoEngineers participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Exploration Logs

Geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering or geologic report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering or geologic report, but preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with GeoEngineers and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might an owner be in a position to give contractors the best information available, while requiring them to at least share the financial responsibilities stemming from unanticipated conditions. Further, a contingency for unanticipated conditions should be included in your project budget and schedule.

Contractors are Responsible for Site Safety on their Own Construction Projects

Our geotechnical recommendations are not intended to direct the contractor's procedures, methods, schedule or management of the work site. The contractor is solely responsible for job site safety and for managing construction operations to minimize risks to on-site personnel and to adjacent properties.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering or geology) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

This page contains proprietary information that Imperium requests not to be released to persons
outside the Government, except for purposes for review and evaluation, under obligation of confidentiality.

GEOTECHNICAL, GEOLOGIC AND ENVIRONMENTAL REPORTS SHOULD NOT BE INTERCHANGED

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

BIOLOGICAL POLLUTANTS

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention, or assessment of the presence of Biological Pollutants in or around any structure. Accordingly, this report includes no interpretations, recommendations, findings, or conclusions for the purpose of detecting, preventing, assessing, or abating Biological Pollutants. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

Appendix C – Wetlands Memo

Parametrix ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

411 108th AVENUE NE, SUITE 1800
BELLEVUE, WA 98004-5571
T. 425.458.6200 F. 425.458.6363
www.parametrix.com

TECHNICAL MEMORANDUM

Date:	January 1, 2013
To:	Steve Drennan
From:	Matthew Maynard
Subject:	Wetland and Stream Site Investigation
cc:	David Sherrard
Project Number:	553-5503-009 (02/21)
Project Name:	Imperium Bulk Liquid Terminal Facility

The purpose of this Technical Memorandum is to document the results of a wetland and stream investigation on the Imperium Renewables property in Aberdeen, Washington. The site investigation occurred December 6, 2012.

SITE DESCRIPTION

The site is bordered to the southwest by the Chehalis River, to the west by Fry Creek, to the northwest and southeast by industrial facilities including the Imperium Grays Harbor biodiesel production facility and the Westway methanol storage terminal, and to the northeast by the Puget Sound and Pacific railroad and Port Industrial Rd. The site is composed primarily of rocks and gravel that is sparsely vegetated, primarily with weedy species.

The proposed project is to construct a bulk liquid storage facility on 10.907 acres, located at the Port of Grays Harbor (PGH) (See Figure 1). The purpose of project is to construct a tank farm, a pipeline to Terminal 1 from the tank farm, rail spurs in connection with the existing Schneider's loop rail line, and new office/laboratory/maintenance/warehouse building(s).

RESULTS

Originally the site was an open water slip berth used for log transfer operations. In 1983, the Port of Grays Harbor received permits (Corps Permit #071-OYB-2-008671) to fill the site for use as a marine cargo facility, utilizing material from the Port of Grays Harbor channel widening project. Per National Resources Conservation Service mapping, soils in the project area consist of udorthents. The parent material of udorthents is sandy and loamy river dredging. In 2011, The Port of Grays Harbor received permits to grade the site and add approximately 13,500 cubic yards of fill. Soils on the site are non-native fill, typical of the industrial types of lands in the area. Soils were inconsistent in color and texture throughout the site, but were generally composed of clay, sand, and gravels and did not meet wetland hydric soils criteria. There are no agricultural soils on the site.

Grays County defines wetlands as "…areas that are inundated or saturated by ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland

sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas created to mitigate conversion of wetlands.

The site investigation occurred during a rain event and surface water was observed in several locations. The permitted fill added to the site in 2011has been compacted and some areas that had water sheetflowing over the surface had dry soils below the surface. Surface water observed elsewhere on the site was confined in stormwater features. Some small portions of these areas were dominated by hydric vegetation, including reed canarygrass (*Phalaris arundinacea*), common rush (*Juncus effusus*), saltgrass (*Distichlis spicata*), and common brassbuttons (*Cotula coronopifolia*). However, these areas did not contain soils that meet wetland hydric soil conditions. Therefore, it was determined that no wetlands are located in the project site area.

Appendix D - MSDSs

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT LABEL NAME: B100 Biodiesel **CAS #: Mixture**

MANUFACTURER: Imperium Grays Harbor, LLC
ADDRESS: 3122 Port Industrial Road, Hoquiam, WA 98550
PHONE: 360.532.3752
FAX: 360.532.3753
EMERGENCY - CHEMTREC PHONE: (800) 424.9300

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

GENERAL PRODUCT NAME: B100 Biodiesel

SYNONYMS: Methyl Soyate, Canola Methyl Ester (RME), Biodiesel

PRODUCT DESCRIPTION: Contains >96.5% methyl esters from lipid sources.

INGREDIENT:	CAS NO.	OSHA PEL	ACGIH TWA
Methyl Soyate	67784-80-9	Not Listed	Not Listed
and/or			
Canola Methyl Esters	73891-99-3	Not Listed	Not Listed

California Prop 65: This product does NOT contain an ingredient(s), above the safe harbor limits, which are known to the state of California to cause cancer, birth defects, or other reproductive harm.

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product contains no hazardous materials.

NFPA Rating: Health – 0, Flammability – 1, Reactivity – 0
NFPA Definitions: 0= Least, 1=Slight, 2=Moderate, 3=High, 4=Extreme

ROUTES OF ENTRY: Eyes, Skin, Ingestion, Inhalation.

POTENTIAL HEALTH EFFECTS:

EYES: May cause irritation. Irrigate eye with water for at least 15 to 20 minutes. Seek medical attention if symptoms persist.

SKIN: Prolonged or repeated contact is not likely to cause significant skin irritation. Material is sometimes encountered at elevated temperatures. Thermal burns are possible.

INGESTION: No hazards anticipated from ingestion incidental to industrial exposure.

INHALATION: Negligible unless heated to produce vapors. Vapors or finely misted materials may irritate the mucous membranes and cause irritation, dizziness, and nausea. Remove to fresh air.

CARCINOGENIC EFFECTS: None of the components of this product are listed as probably, possible or confirmed human carcinogen by IARC, ACGIH, NTP or OSHA.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Persons with pre-existing skin disorders or impaired respiratory function may be more susceptible to the effects of the substance.

SECTION 4: FIRST AID MEASURES

EYES: If contact with eyes, immediately flush eyes with plenty of water for at least 15 minutes lifting upper and lower eyelids occasionally. Get medical attention if irritation persists or vision is blurred.

SKIN: Flush skin with plenty of soap and water.

INGESTION: Never give anything by mouth to an unconscious person. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cups of milk or water. Get medical attention if irritation or symptoms occur.

INHALATION: Remove to fresh air. Get medical attention if cough or other symptoms appear.

NOTES TO PHYSICIANS OR FIRST AID PROVIDERS: Treat symptomatically and supportively

SECTION 5: FIRE-FIGHTING MEASURES

FLAMMABLE LIMITS IN AIR, % BY VOL:
Lel: N.E.%
Uel: N.E.%

FLASH POINT:
F: >200
C: >93
METHOD USED: ASTM D93

EXTINGUISHING MEDIA: Dry chemical, alcohol foam, carbon dioxide, or water spray (fog). Water stream may splash the burning liquid and spread the fire.

SPECIAL FIRE FIGHTING PROCEDURES: Use water spray to cool containers exposed to fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Oil soaked rags can cause spontaneous combustion if not handled properly. Before disposal, wash rags with soap and water and dry in well ventilated area. Firefighters should use self-contained breathing apparatus to avoid exposure to smoke and vapor.

SECTION 6: ACCIDENTAL RELEASE MEASURES

ACCIDENTAL RELEASE MEASURES: Remove sources of ignition, contain spill to smallest area possible. Stop leak if possible. Pick up small spills with absorbent materials such as paper towels, "Oil Dry", sand or dirt. Recover large spills for salvage or disposal. Wash hard surfaces with safety solvent or detergent to remove remaining oil film. Greasy nature will result in a slippery surface.

SECTION 7: HANDLING AND STORAGE

RECOMMENDED STORAGE CONDITIONS: Do not ingest. Do not breathe vapor/spray. Wear suitable protective clothing. Avoid contact with skin and eyes. Keep away from incompatible materials such as strong oxidizers. Keep container tightly closed and sealed until ready for use. Protect from physical damage.

HANDLING (PERSONNEL): Handle in accordance with good industrial hygiene and safety practices. Avoid contact with eyes, skin and clothing. Use with adequate ventilation. Avoid breathing vapors. Do not eat, drink or smoke in work area. Wash thoroughly after handling.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

AIRBORNE EXPOSURE LIMITS: None established.

VENTILATION SYSTEM: A system of local and/or general exhaust is recommended to in areas where mists and vapors are generated. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.

RESPIRATORY PROTECTION: If vapors or mists are generated, wear a NIOSH approved organic vapor/mist respirator.

PROTECTIVE CLOTHING: Safety glasses, goggles, or face shield is recommended to protect eyes from mists or splashing. PVC coated gloves recommended to prevent skin contact.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Employees must practice good personal hygiene, washing exposed areas of skin several times daily and laundering contaminated clothing before re-use.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear to pale yellow liquid.
ODOR: Mild odor.
PHYSICAL STATE: Liquid.
BOILING POINT @ 760 mmHg:
F: >392
C: >200
FLASH POINT:
F: >200
C: >93
SPECIFIC GRAVITY: 0.88 (g/ml)
SOLUBILITY IN WATER: Immiscible
VOLATILES % BY VOLUME: <2
EVAPORATION RATE, BUTYL ACETATE = 1: <1
VAPOR PRESSURE (mm Hg): <2 @ 20C

SECTION 10: STABILITY AND REACTIVITY

STABILITY: Stable under ordinary conditions of use and storage. Heat will contribute to instability. Slowly decomposed by moisture.

INCOMPATIBILITY (MATERIAL TO AVOID): Avoid heat and strong oxidizers. Will attack some forms of plastic rubber, and coatings.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS: Combustion produces carbon monoxide, carbon dioxide along with thick smoke.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Refer to SECTION 7: HANDLING AND STORAGE

SECTION 11: TOXICOLOGICAL INFORMATION

METHYL SOYATE: No LD50/LC50 information found relating to normal routes of occupational exposure.

CANOLA METHYL ESTERS: No LD50/LC50 information found relating to normal routes of occupational exposure.

SECTION 12: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD: Waste may be disposed of by a licensed waste disposal company. Contaminated absorbent material may be disposed of in an n approved landfill. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Follow local, state and federal disposal regulations.

SECTION 13: TRANSPORT INFORMATION

UN HAZARD CLASS: N/A
PROPER SHIPPING NAME: Fatty acid ester
NMFC (Nation Motor Freight Classification):
IDENTIFICATION NUMBER: 144920
SHIPPING CLASSIFICATION: 65

SECTION 15: REGULATORY INFORMATION

OSHA STATUS: This product is not hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200. Thermal processing and decomposition fumes from this product may be hazardous.

CERCLA (Comprehensive Response Compensation and Liability Act): NOT reportable.

SARA TITLE III (Superfund Amendments and Reauthorization Act):
SECTION 312 - Extremely Hazardous Substances: None

SECTION 311/312 – Hazard Categories: Non-hazardous under Section 311/312
SECTION 313 – Toxic Chemicals: None

RCRA STATUS: If discarded in its purchased form, this product would not be a hazardous waste either by listing or by characteristic. However, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste, (40 CFR 261.20-24)

CALIFORNIA PROPOSITION 65: This following g statement is made in order to comply with the California Safe Drinking Water and Toxic Enforcement Act of 1986. This product contains no chemicals known to the state of California to cause cancer.

Chemical Inventory Listing: This material or all of its components are listed on the Inventory of Existing Chemical Substances under the Toxic Substance Control Act (TSCA). This material or all of its components are listed on the Canadian Domestic Substances List (DSL). This material or all of its components are listed (or considered as having been notified) on the European Inventory of Existing Chemical Substances (EINECS).

SECTION 16: OTHER INFORMATION

This information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any other process. Such information is to the best of the company's knowledge and believed accurate and reliable as of the date indicated. However, no representation, warranty or guarantee of any kind, express or implied, is made as to its accuracy, reliability or completeness and the company assumes no responsibility for any loss, damage or expenses, direct or consequential, arising out of use. It is the user's responsibility to satisfy himself/herself as to the suitableness and completeness of such information for his/her own particular use.

Vegetable Oil

MSDS # 786.00

Section 1: Product and Company Identification

Vegetable Oil

Synonyms/General Names: Soybean Oil
Product Use: For educational use only
Manufacturer: Columbus Chemical Industries, Inc., Columbus, WI 53925.

24 Hour Emergency Information Telephone Numbers

CHEMTREC (USA): 800-424-9300 **CANUTEC (Canada): 613-424-6666**

ScholAR Chemistry; 5100 W. Henrietta Rd, Rochester, NY 14586; (866) 260-0501; www.Scholarchemistry.com

Section 2: Hazards Identification

Clear, light yellow, oily liquid; faint odor.

HMIS (0 to 4)

Health	0
Fire Hazard	1
Reactivity	0

CAUTION! Combustible liquid.
Target organs: None known.

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Section 3: Composition / Information on Ingredients

Vegetable Oil (8001-22-7), 100%

Section 4: First Aid Measures

Always seek professional medical attention after first aid measures are provided.

Eyes: Immediately flush eyes with excess water for 15 minutes, lifting lower and upper eyelids occasionally.
Skin: Immediately flush skin with excess water for 15 minutes while removing contaminated clothing.
Ingestion: Call Poison Control immediately. Rinse mouth with cold water. Give victim 1-2 cups of water or milk to drink. Induce vomiting immediately.
Inhalation: Remove to fresh air. If not breathing, give artificial respiration.

Section 5: Fire Fighting Measures

When heated to decomposition, emits acrid fumes.
Protective equipment and precautions for firefighters: Use foam or dry chemical to extinguish fire. Firefighters should wear full fire fighting turn-out gear and respiratory protection (SCBA). Cool container with water spray. Material is not sensitive to mechanical impact or static discharge.

Section 6: Accidental Release Measures

Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Contain spill with sand or absorbent material and place in sealed bag or container for disposal. Ventilate and wash spill area after pickup is complete. See Section 13 for disposal information.

Section 7: Handling and Storage Green

Handling: Use with adequate ventilation and do not breathe dust or vapor. Avoid contact with skin, eyes, or clothing. Wash hands thoroughly after handling.
Storage: Store in General Storage Area [Green Storage] with other items with no specific storage hazards. Store in a cool, dry, well-ventilated, locked store room away from incompatible materials.

Section 8: Exposure Controls / Personal Protection

Use ventilation to keep airborne concentrations below exposure limits. Have approved eyewash facility, safety shower, and fire extinguishers readily available. Wear chemical splash goggles and chemical resistant clothing such as gloves and aprons. Wash hands thoroughly after handling material and before eating or drinking. Exposure guidelines: Vegetable Oil : OSHA PEL: N/A, ACGIH: TLV: N/A, STEL: N/A.

© 2008, Scholar Chemistry. All Rights Reserved.

Section 9: Physical and Chemical Properties

Molecular formula	Natural Product.	**Appearance**	Clear, light yellow, oily liquid.
Molecular weight	N/A.	**Odor**	Faint odor.
Specific Gravity	~0.9 g/mL @ 60°C.	**Odor Threshold**	N/A.
Vapor Density (air=1)	N/A.	**Solubility**	Insoluble.
Melting Point	22-31°C.	**Evaporation rate**	N/A. *(Butyl acetate = 1).*
Boiling Point/Range	N/A.	**Partition Coefficient**	N/A. *(log P_{OW}).*
Vapor Pressure (20°C)	N/A.	**pH**	N/A.
Flash Point:	255°C (491°F).	**LEL**	N/A.
Autoignition Temp.:	N/A.	**UEL**	N/A.

N/A = Not available or applicable

Section 10: Stability and Reactivity

Avoid heat and moisture.
Stability: Stable under normal conditions of use and storage.
Incompatibility: Oxidizing materials.
Shelf life: Indefinite if stored properly.

Section 11: Toxicology Information

Acute Symptoms/Signs of exposure: ***Eyes***: Redness, tearing, itching, burning, conjunctivitis. ***Skin***: Redness, itching. ***Ingestion***: Irritation and burning sensations of mouth and throat, nausea, vomiting and abdominal pain. ***Inhalation***: Irritation of mucous membranes, coughing, wheezing, shortness of breath,
Chronic Effects: No information found.
Sensitization: none expected
Vegetable Oil: LD50 [oral, rat]; N/A; LC50 [rat]; N/A; LD50 Dermal [rabbit]; N/A
Material has not been found to be a carcinogen nor produce genetic, reproductive, or developmental effects.

Section 12: Ecological Information

Ecotoxicity (aquatic and terrestrial): Not considered an environmental hazard.

Section 13: Disposal Considerations

Check with all applicable local, regional, and national laws and regulations. Local regulations may be more stringent than regional or national regulations. Small amounts of this material may be suitable for sanitary sewer or trash disposal.

Section 14: Transport Information

DOT Shipping Name:	Not regulated by DOT.	**Canada TDG:**	Not regulated by TDG.
DOT Hazard Class:		**Hazard Class:**	
Identification Number:		**UN Number:**	

Section 15: Regulatory Information

EINECS: Listed (232-274-4).
TSCA: All components are listed or are exempt.
WHMIS Canada: Not WHMIS Controlled.
California Proposition 65: Not listed.

The product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

Section 16: Other Information

Current Issue Date: September 22, 2012
Disclaimer: Scholar Chemistry and Columbus Chemical Industries, Inc., ("S&C") believes that the information herein is factual but is not intended to be all inclusive. The information relates only to the specific material designated and does not relate to its use in combination with other materials or its use as to any particular process. Because safety standards and regulations are subject to change and because S&C has no continuing control over the material, those handling, storing or using the material should satisfy themselves that they have current information regarding the particular way the material is handled, stored or used and that the same is done in accordance with federal, state and local law. ***S&C makes no warranty, expressed or implied, including (without limitation) warranties with respect to the completeness or continuing accuracy of the information contained herein or with respect to fitness for any particular use.***

© 2008, Scholar Chemistry. All Rights Reserved.

Backyard Biodiesel, L.L.C.
3125 South Burnside Ave.
Gonzales, LA 70737

Material Safety Data Sheet: Used Cooking Oil & Grease from Kitchens

Section I General Information

Manufacturer's Name:
Backyard Biodiesel, L.L.C.
3125 S. Burnside Ave.
Gonzales, LA 70737
Date Prepared: 7/1/2011
Signature of Preparer: Brandon Iglesias

Section II Hazardous Ingredients/Identity Information

Hazardous Components :	Non-Hazardous Components per Hazard Communication Standard
Substance:	Used Cooking Oils & Greases from Kitchens - CAS Number N/A
Trade Names:	Yellow Grease, Waste Vegetable Oil, Crude Vegetable Oil, Used Cooking Oil, Waste Cooking Oil
Chemical Family:	Triglyceride; Triglycerol & Fatty-A Chains
Molecular Formula:	N/A Molecular Weight: N/A
HMIS Rating:	Health = 0 Fire = 1 Reactivity = 0
Components and Contaminants	
Components:	Triglyceride Percent: 100%
Other Contaminants:	None - Exposure Limits: N/A

Section III Physical/Chemical Characteristics

Boiling Point	Decomposition Specific Gravity (H20 = 1): 0.90 at 75 degrees F & atmospheric pressure
Vapor Pressure (mm Hg):	N/A Melting Point: 86° F
Vapor Density (Air = 1):	N/A
Evaporation Rate:	0
Viscosity:	29-33 centipoises @120F.
Solubility in Water:	Not soluble
Appearance and Odor:	light brown to gold liquid – brown solid – musky odor

Section IV Fire and Explosion Hazard Data

Flash Point (Method Used):	405°+ F, Cup
Flammable Limits:	N/A LEL: N/A UEL: N/A
Extinguishing Media:	Type B (Flammable Liquids)
Special Fire Fighting Procedures:	None
Unusual Fire and Explosion Hazards:	None

Backyard Biodiesel, L.L.C.
3125 South Burnside Ave.
Gonzales, LA 70737

Material Safety Data Sheet: Used Cooking Oil & Grease from Kitchens

Section V Reactivity Data

Reactivity:	Stable
Conditions to Avoid:	None
Incompatibility (Materials to Avoid):	None
Hazardous Decomposition or Byproducts:	None
Hazardous Polymerization:	Not Known to Occur

Identity: Waste Cooking Oil

Emergency Telephone Number:	1 (855) 692-2269
Location for Additional Information:	http://www.backyardbiodiesel.com

Section VI Health Hazard Data

Inhalation:	N/A
Skin Contact:	N/A
Eye Contact:	N/A
Ingestion:	N/A
Emergency and First Aid Procedures:	Wash thoroughly, treat for potential burns from heat
OSHA Regulated:	No

Section VII Precautions for Safe Handling and Use

Steps to be taken in case material is released or spilled: Contain and use absorbent pads or vacuum or contact Backyard Biodiesel, L.L.C. to recycle into esters. Do not flush into sewer.
Precautions To Be Taken in Handling and Storing – Keep out of direct sunlight
Other Precautions – Keep in clean ventilated storage area away from direct sunlight and house.

Section VIII Control Measures

Respiratory Protection:	None
Ventilation:	Ventilate tanks before pumping.
Protective Gloves:	Standard
Eye Protection:	Standard
Other Protective Clothing or Equipment:	Standard
Work/Hygienic Practices:	Standard

We make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. However, the information provided is believed to be accurate and represents the best information currently available to us. You are responsible for making your own investigations to determine the suitability of the information for your particular purposes.

GRIFFIN INDUSTRIES
A Tradition in Agri-Business Since 1943

Material Safety Data Sheet
Identity: Extra Fancy tallow

Section I - General Information

Manufacturer's Name:
Griffin Industries, Inc.
4221 Alexandria Pike
Cold Spring, KY 41076

Emergency Telephone Number: (859) 472-7363
Telephone Number for Information: (859) 472-7363

Date Prepared: 3/19/07
Signature of Preparer: Thomas L. Dobbs

Section II - Hazardous Ingredients/Identity Information

Hazardous Components - Contains no Hazardous Components as described in the Hazard Communication Standard
Substance - Rendered Animal Fat CAS Number 61789-97-7
Trade Names - Bleachable Fancy Tallow, Inedible Tallow, Animal Fat, Special Tallow, Extra Fancy Tallow
Chemical Family: Triglyceride; Triacylglycerol
Molecular Formula: N/A Molecular Weight: N/A

Components and Contaminants

Components: Triglycerides Percent: 100%
Other Contaminants: None Exposure Limits: N/A

Section III - Physical/Chemical Characteristics

Boiling Point: Decomposes Specific Gravity (H20 = 1): 0.84 avg.
Vapor Pressure (mm Hg): N/A Melting Point: 35° C
Vapor Density (Air = 1): N/A Evaporation Rate: 0 (Butyl Acetate = 1)
Solubility in Water: Insoluble
Appearance and Odor: Light brown liquid to pale brown solid, bland odor

---

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used): 525° F, Open Cup
Flammable Limits: N/A LEL: N/A UEL: N/A
Extinguishing Media: Type B (Flammable Liquids)
Special Fire Fighting Procedures: None
Unusual Fire and Explosion Hazards: None

Section V - Reactivity Data

Reactivity: Stable
Conditions to Avoid: None
Incompatibility (Materials to Avoid): None
Hazardous Decomposition or Byproducts: None
Hazardous Polymerization: Will Not Occur

Section VI - Health Hazard Data

Inhalation: N/A
Skin Contact: N/A
Eye Contact: N/A
Ingestion: N/A
Emergency and First Aid Procedures: Wash well, treat for possible heat burns
OSHA Regulated: No

Section VII - Precautions for Safe Handling and Use

Steps to be taken in case material is released or spilled -
Contain and contact Griffin Industries, Inc. concerning reprocessing.
Waste Disposal Method - Rendering (reprocessing), not to be landfilled. Do not flush to sewer.
Precautions To Be Taken in Handling and Storing - None
Other Precautions - None

Section VIII - Control Measures

Respiratory Protection - None
Ventilation - Ventilate tanks before entering.
Protective Gloves - Standard
Eye Protection - Standard
Other Protective Clothing or Equipment - Standard
Work/Hygienic Practices - Standard

The information provided is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

Material Safety Data Sheet

Ethanol

Section 1. Chemical product and company identification

Product name : Ethanol

Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Synonym : Ethyl alcohol; Alcohol; Alcohol anhydrous; Algrain; Anhydrol; Denatured ethanol; Ethyl hydrate; Ethyl hydroxide; Jaysol; Jaysol S; Methylcarbinol; SD Alchol 23-hydrogen; Tecsol; C2H5OH; Absolute ethanol; Cologne spirit; Fermentation alcohol; Grain alcohol; Molasses alcohol; Potato alcohol; Aethanol; Aethylalkohol; Alcohol, dehydrated; Alcohol, diluted; Alcool ethylique; Alcool etilico; Alkohol; Cologne spirits; Denatured alcohol CD-10; Denatured alcohol CD-5; Denatured alcohol CD-5a; Denatured alcohol SD-1; Denatured alcohol SD-13a; Denatured alcohol SD-17; Denatured alcohol SD-23a; Denatured alcohol SD-28; Denatured alcohol SD-3a; Denatured alcohol SD-30; Denatured alcohol SD-39b; Denatured alcohol SD-39c; Denatured alcohol SD-40m; Etanolo; Ethanol 200 proof; Ethyl alc; Etylowy alkohol; EtOH; NCI-C03134; Spirits of wine; Spirt; Thanol; Alkoholu etylowego; Ethanol, solution; Ethyl alcohol anhydrous; SD alcohol 23-hydrogen; UN 1170; Tecsol C; Alcare Hand Degermer; Absolute alcohol; Cologne spirits (alcohol); Denatured alcohol; Ethanol, silent spirit; Ethylol; Punctilious ethyl alcohol; Pyro; Spirit; Synasol; USI in oval; Ethanol standard

Material uses : Other non-specified industry: MANUFACTURE OF ACETALDEHYDE AND OTHER CHEMICALS; SOLVENTS; ANTIFREEZE AND BRAKE FLUIDS; FUEL.

MSDS # : 001114

Date of Preparation/Revision : **4/28/2010.**

In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Liquid. [CLEAR, COLORLESS LIQUID WITH A WEAK, ETHEREAL, VINOUS ODOR]

Emergency overview : WARNING!

FLAMMABLE LIQUID AND VAPOR. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CAN CAUSE CANCER.

Flammable liquid. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapor or mist. Avoid contact with skin and clothing. May cause target organ damage, based on animal data. Can cause cancer. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use.

Target organs : May cause damage to the following organs: blood, the reproductive system, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Potential acute health effects

Eyes : Irritating to eyes.

Skin : Irritating to skin.

Inhalation : Irritating to respiratory system.

Ingestion : No known significant effects or critical hazards.

Potential chronic health effects : **CARCINOGENIC EFFECTS**: Classified 1 (Proven for humans.) by IARC. Classified A3 (Proven for animals.) by ACGIH.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

United States

			Exposure limits
ethanol	64-17-5	100	**ACGIH TLV (United States, 1/2009).** STEL: 1000 ppm 15 minute(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 1000 ppm 8 hour(s). TWA: 1900 mg/m³ 8 hour(s). **NIOSH REL (United States, 6/2009).** TWA: 1000 ppm 10 hour(s). TWA: 1900 mg/m³ 10 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 1000 ppm 8 hour(s). TWA: 1900 mg/m³ 8 hour(s).

Section 4. First aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Section 5. Fire-fighting measures

Flammability of the product : Flammable.

Auto-ignition temperature : 398.85°C (749.9°F)

Flash point : Closed cup: 12.85°C (55.1°F).

Flammable limits : Lower: 3.3% Upper: 19%

Products of combustion : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Flammable liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Ethanol

Eyes	:	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.
Skin	:	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
Respiratory	:	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Hands	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Personal protection in case of a large spill	:	Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name	Exposure limits
United States	
ethanol	**ACGIH TLV (United States, 1/2009).** STEL: 1000 ppm 15 minute(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 1000 ppm 8 hour(s). TWA: 1900 mg/m³ 8 hour(s). **NIOSH REL (United States, 6/2009).** TWA: 1000 ppm 10 hour(s). TWA: 1900 mg/m³ 10 hour(s). **OSHA PEL (United States, 11/2006).** TWA: 1000 ppm 8 hour(s). TWA: 1900 mg/m³ 8 hour(s).

Section 9. Physical and chemical properties

Physical state	:	Liquid. [CLEAR, COLORLESS LIQUID WITH A WEAK, ETHEREAL, VINOUS ODOR]
Molecular weight	:	46.08 g/mole
Molecular formula	:	C2-H6-O
Boiling/condensation point	:	78.4°C (173.1°F)
Melting/freezing point	:	-113.9°C (-173°F)
Specific gravity	:	0.79 (Water = 1)
Vapor pressure	:	5.9 kPa (44 mm Hg) (at 20°C)
Vapor density	:	1.6 (Air = 1)
Evaporation rate	:	1.7 compared with butyl acetate
VOC	:	100 % (w/w)

Section 10. Stability and reactivity

Stability and reactivity	:	The product is stable.
Incompatibility with various substances	:	Highly reactive or incompatible with the following materials: oxidizing materials and alkalis.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure

Ethanol				
ethanol	LD50 Intra-arterial	Rat	11 mg/kg	-
	LD50 Intraperitoneal	Rat	3600 ug/kg	-
	LD50 Intravenous	Rat	1440 mg/kg	-
	LD50 Oral	Rat	15010 mg/kg	-
	LD50 Oral	Rat	7 g/kg	-
	LD50 Oral	Rat	7060 mg/kg	-
	LDLo Dermal	Rabbit	20000 mg/kg	-
	LDLo Oral	Rat	7000 mg/kg	-
	TDLo Intraperitoneal	Rat	3500 mg/kg	-
	TDLo Intracerebral	Rat	106 ug/kg	-
	TDLo Intraperitoneal	Rat - Male	3000 mg/kg	-
	TDLo Intraperitoneal	Rat	2700 mg/kg	-
	TDLo Intraperitoneal	Rat	2500 mg/kg	-
	TDLo Intraperitoneal	Rat	2000 mg/kg	-
	TDLo Intraperitoneal	Rat - Male	1.25 mg/kg	-
	TDLo Intraperitoneal	Rat - Female	1000 mg/kg	-
	TDLo Intracerebral	Rat	363.6 ug/kg	-
	TDLo Intraperitoneal	Rat	500 mg/kg	-
	TDLo Intravenous	Rat - Male	0.5 g/kg	-
	TDLo Oral	Rat - Male	5 mL/kg	-
	TDLo Oral	Rat	4.44 mL/kg	-
	TDLo Oral	Rat	4 mL/kg	-
	TDLo Oral	Rat - Male	0.5 g/kg	-
	TDLo Oral	Rat - Female	10 mL/kg	-
	TDLo Oral	Rat - Female	6000 mg/kg	-
	TDLo Oral	Rat	12800 mg/kg	-
	TDLo Intraperitoneal	Rat	2.45 g/kg	-
	TDLo Intraperitoneal	Rat - Male	1.5 g/kg	-
	TDLo Oral	Rat - Male	5250 mg/kg	-
	TDLo Oral	Rat	5000 mg/kg	-
	TDLo Oral	Rat - Female	4800 mg/kg	-
	TDLo Oral	Rat	4300 mg/kg	-
	TDLo Oral	Rat	2 g/kg	-
	TDLo Oral	Rat	5 g/kg	-
	TDLo Intraperitoneal	Rat	1.2 g/kg	-
	TDLo Oral	Rat	6 g/kg	-
	TDLo Intraperitoneal	Rat - Male	1 g/kg	-
	TDLo Oral	Rat	5.25 g/kg	-
	TDLo Oral	Rat - Male	1600 mg/kg	-
	TDLo Oral	Rat	1500 mg/kg	-
	TDLo Oral	Rat	8000 mg/kg	-
	TDLo Oral	Rat	3 g/kg	-
	TDLo Oral	Rat	0.4 g/kg	-
	TDLo Oral	Rat	2.5 g/kg	-
	TDLo Oral	Rat	6.4 g/kg	-
	TDLo Oral	Rat	0.72 g/kg	-
	TDLo Intraperitoneal	Rat - Male	0.5 g/kg	-
	TDLo Subcutaneous	Rat	7900 mg/kg	-
	TDLo Intraperitoneal	Rat - Male	2 g/kg	-
	TDLo Intraperitoneal	Rat	0.25 g/kg	-
	TDLo Unreported	Rat	3 g/kg	-
	TDLo Intraperitoneal	Rat - Male	2.4 mg/kg	-
	LC50 Inhalation Vapor	Rat	124700 mg/m3	4 hours
	LC50 Inhalation Vapor	Rat	5900 mg/m3	6 hours
	LC50 Inhalation Gas.	Rat	20000 ppm	10 hours

IDLH : 3300 ppm

Chronic effects on humans : **CARCINOGENIC EFFECTS**: Classified 1 (Proven for humans.) by IARC. Classified A3 (Proven for animals.) by ACGIH.
May cause damage to the following organs: blood, the reproductive system, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Ethanol

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : Can cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

ethanol	-	Acute EC50 >100 ppm Fresh water	Daphnia - Water flea - Daphnia magna - <24 hours	48 hours
	-	Acute EC50 2000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	-	Acute LC50 13 to 16 ml/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss - 0.8 g	96 hours
	-	Acute LC50 6772000 to 7710000 ug/L Fresh water	Daphnia - Water flea - Ceriodaphnia dubia - Neonate	48 hours
	-	Acute LC50 6386000 to 7461000 ug/L Fresh water	Daphnia - Water flea - Ceriodaphnia dubia - Neonate	48 hours
	-	Acute LC50 6325000 to 7413000 ug/L Fresh water	Daphnia - Water flea - Ceriodaphnia dubia - Neonate	48 hours
	-	Acute LC50 6076000 to 7115000 ug/L Fresh water	Daphnia - Water flea - Ceriodaphnia dubia - Neonate	48 hours
	-	Acute LC50 5577000 to 6557000 ug/L Fresh water	Daphnia - Water flea - Ceriodaphnia dubia - Neonate	48 hours
	-	Acute LC50 3715000 to 4432000 ug/L Fresh water	Daphnia - Water flea - Ceriodaphnia dubia - Neonate	48 hours
	-	Acute LC50 >100000 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas - Juvenile (Fledgling, Hatchling, Weanling) - 0.2 to 0.5 g	96 hours
	-	Acute LC50 42000 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	4 days
	-	Acute LC50 25500 ug/L Marine water	Crustaceans - Brine shrimp - Artemia franchiscana -	48 hours

Ethanol				
	-	Acute LC50 13480000 ug/L Fresh water	LARVAE Fish - Fathead minnow - Pimephales promelas - Juvenile (Fledgling, Hatchling, Weanling) - 4 to 8 weeks - 1.1 to 3.1 cm	96 hours
	-	Acute LC50 5680 to 7392 mg/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <24 hours	48 hours
	-	Acute LC50 10000000 to 11500000 ug/L Marine water	Fish - Bleak - Alburnus alburnus - 8 cm	96 hours
	-	Acute LC50 11000000 ug/L Marine water	Fish - Bleak - Alburnus alburnus - 8 to 10 cm	96 hours
	-	Acute LC50 14200000 to 15100000 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas - 30 days - 19.4 mm - 0.099 g	96 hours
	-	Chronic NOEC <6.3 g/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours

Products of degradation : Products of degradation: carbon oxides (CO, CO_2) and water.

Section 13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1170	ETHANOL OR ETHYL ALCOHOL OR ETHANOL SOLUTIONS OR ETHYL ALCOHOL SOLUTIONS	3	II		**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 5 L **Cargo aircraft** Quantity

						limitation: 60 L **Special provisions** 24, IB2, T4, TP1
TDG Classification	UN1170	ETHANOL MORE THAN 24 PER CENT ETHANOL, BY VOLUME; ETHANOL SOLUTION MORE THAN 24 PER CENT ETHANOL, BY VOLUME; ETHYL ALCOHOL MORE THAN 24 PER CENT ETHANOL, BY VOLUME; OR ETHYL ALCOHOL SOLUTION MORE THAN 24 PER CENT ETHANOL, BY VOLUME	3	II		**Explosive Limit and Limited Quantity Index** 5 **Passenger Carrying Road or Rail Index** 60
Mexico Classification	UN1170	ETHANOL OR ETHYL ALCOHOL OR ETHANOL SOLUTIONS OR ETHYL ALCOHOL SOLUTIONS	3	II		**Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 5 L **Cargo aircraft** Quantity limitation: 60 L **Special provisions** 24, IB2, T4, TP1

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

HCS Classification : Flammable liquid
Carcinogen
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b):** This material is listed or exempted.

Ethanol

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: ethanol
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: ethanol: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

State regulations : **Connecticut Carcinogen Reporting:** This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is not listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

Canada

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2B: Material causing other toxic effects (Toxic).

CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Label requirements : FLAMMABLE LIQUID AND VAPOR. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CAN CAUSE CANCER.

Hazardous Material Information System (U.S.A.) :

Health	*	2
Flammability		3
Physical hazards		0

National Fire Protection Association (U.S.A.) :

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Terra Nitrogen Corporation
Terra Centre – 600 Fourth Street
Sioux City, Iowa 51101

Material Safety Data Sheet

Methanol

MSDS Number 2016 (Revised April 1, 2001) 8 Pages

1. CHEMICAL PRODUCT and EMERGENCY TELEPHONE CONTACT

Product Name:.....Methanol
Chemical Family: .....Aliphatic Alcohol
Synonyms:.....Carbinol, Columbian Spirits, Methyl Alcohol, Pyroligneous Spirits, Wood Alcohol, Methylol, Wood Naphtha, Wood Spirits, Manhattan Spirits, Pyroxylic Spirits, Colonial Spirits, Methyl Hydroxide, Monohydroxymethane
Formula:.....CH_3OH

EMERGENCY TELEPHONE NUMBER
CHEMTREC:.....800-424-9300

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient Name/CAS Number	Concentration	Exposure Limits
Methanol #67-56-1	99-100%	200 ppm TWA 250 ppm STEL 6000 ppm IDLH (1 ppm = 1.33 mg/m^3)

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Methanol is a colorless volatile liquid with a faintly sweet pungent odor similar to ethyl alcohol. The substance is fully soluble in water. Vapors of methanol are slightly heavier than air and may travel some distance to a source of ignition and flash back. Accumulations of vapors in confined spaces such as buildings or sewers may explode if ignited. There is potential for containers of liquid to rupture violently if exposed to fire or excessive heat for sufficient time duration. Methanol is listed as a “Poison-Class B”. It is harmful if swallowed or absorbed through the skin. Ingestion of as little as one ounce can cause irreversible injury to the nervous system, blindness, or death. It cannot be made non-poisonous. Causes eye and respiratory system irritation and may cause skin irritation. Avoid liquid, mist, or vapor contact. Vapor inhalation or liquid penetration of the skin can cause central nervous system depression.

POTENTIAL HEALTH EFFECTS

Primary Routes of Entry: Inhalation, skin contact/absorption, eye contact, and ingestion.
General Acute Exposure: Liquid, mist, or vapors can cause eye, skin, and respiratory tract irritation and Central Nervous System (CNS) depression.

Inhalation:
Acute Exposure: Short-term exposure to high concentrations of methanol may cause CNS depression. Symptoms may include headache, weakness, drowsiness, lightheadedness, nausea, difficult breathing, drunkenness, eye irritation, blurred vision, blindness, loss of consciousness, vertigo, fatigue, convulsions, and possibly death, depending on exposure. Victims may improve and then get worse again up to 30 hours later.

Skin:
Acute Contact: Upon prolonged or repeated contact, absorption through the skin may occur and produce toxic effects similar to those resulting from inhalation exposure. Repeated or prolonged skin contact may cause drying, cracking, and inflammation of the skin due to the defatting action of the product.

Eye:
Acute Contact: Eye irritation may occur upon short-term exposure, including a burning sensation, tearing, redness, or swelling. Upon direct contact with liquid, conjunctivitis and corneal burns may occur. The primary toxic effect of methanol is exerted upon the nervous system, particularly the optic nerves and possibly the retina. The condition can progress to permanent blindness.

Ingestion:
Ingestion may cause serious poisoning with effects similar to those of inhalation and absorption through the skin. Toxic effects are more common after ingestion. Death from as little as one ounce has been reported.

Neurologic:
Acute Exposure: Central Nervous System (CNS) depression may occur upon exposure.

Summary of Chronic Exposure:
Methanol is slowly eliminated from the body; hence repeated exposures may result in toxic levels in the blood and tissues. Due to its slow elimination, methanol should be regarded as a cumulative poison. Though single exposures to fumes may cause no harmful effect, daily exposure may result in the accumulation of sufficient methanol in the body to cause illness.

Note to the Physician: Coma resulting from massive exposures may last as long as 2-4 days. In the body, products formed by its oxidation are formaldehyde and formic acid.

Carcinogenicity:
NTP:.....Not Listed
IARC:.....Not Listed
OSHA.....Not Regulated

Medical Conditions Aggravated by Exposure: Personnel with pre-existing CNS disease, skin disorders, impaired liver or kidney function, GI tract disorders or chronic respiratory diseases should avoid exposure.

4. FIRST AID MEASURES

First Aid for Eyes: Immediately flush eyes with copious amounts of tepid water for at least 15 minutes. The patient should be seen in a health care facility and referral to an ophthalmologist considered.

First Aid for Skin: Immediately flush exposed area with copious amounts of tepid water for at least 15 minutes while removing contaminated clothing and shoes, followed by washing area thoroughly with soap and water. The patient should be seen in a health care facility if irritation or pain persists or if symptoms of toxicity develop. Wash contaminated clothing and shoes before reuse.

First Aid for Inhalation: Move patient to fresh air and keep warm and at rest. Monitor for respiratory distress. If difficulty in breathing develops or if breathing has stopped, administer artificial respiration and seek medical attention. If trained to do so administer supplemental oxygen with assisted ventilation as required. *Caution*: Administration of mouth-to-mouth resuscitation may expose the first aid provider to chemical within the victim's lungs or vomit.

First Aid for Ingestion: If patient is conscious, immediately give two glasses of water and induce vomiting. Do not make an unconscious person vomit. Get medical attention immediately. **NOTE**: NIOSH suggests that vomiting be induced only if immediate medical attention in not available.

Note to Physician: Provide standard methanol ingestion treatment. To prepare the antidote, make a solution using 100 ml of 100-proof ethyl alcohol (grain alcohol) in 2000 ml of water and give 1.5 ml per kg of body weight, or 100 ml for an average adult. Following this, at 2-hour intervals for 4 days, give the antidote (0.5-1.0 ml per kg of body weight, orally or intravenously to reduce the metabolism of the methanol and to allow time for its excretion). Blood ethanol levels should be 1.0-1.5 mg/L.

5. FIRE FIGHTING MEASURES

Flash Point: .....52° F, closed cup
Lower Flammable Limit: .....6.0 % Volume in Air
Upper Flammable Limit:.....36.5 % Volume in Air
Autoignition Temperature:.....725° F, 385° C

General Information: Methanol is extremely flammable! This material releases vapors at or below ambient temperatures. When mixed with air this substance can burn in the open or explode in confined space conditions. Methanol vapors are heavier than air and may travel long distances along the ground before reaching a point of ignition and flashing back. Methanol-water mixtures containing as little as 21% methanol by volume (25% by weight) are also flammable liquids. Methanol fires may not be visible to the naked eye during daylight.

Extinguishing Media:
Water may be ineffective but may be used to dilute spills to nonflammable mixtures.

Small Fire:.....Dry chemical, CO_2, water spray or alcohol-resistant foam
Large Fire:.....Water spray, fog or alcohol-resistant foam

Special Fire Fighting Procedures:

a. Move container from fire area if you can do it without risk.
b. Apply cooling water to sides of containers that are exposed to flames until well after fire is out. Stay away from ends of tanks due to exploding potential when tanks are involved in a fire.
c. Dike fire control water for later disposal, do not scatter the material.
d. Do not use straight streams due to spreading of methanol.
e. Positive pressure self-contained breathing apparatus (SCBA) should be used when there is a potential for inhalation of vapors and/or fumes.
f. Structural fire fighter's protective clothing is recommended for fire situations ONLY; it is not effective in spill situations.

Fire involving Tanks or Rail Car/Trailer Loads

a. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
b. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
c. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
d. Isolate area for 1/2 mile in all directions.

6. ACCIDENTAL RELEASE MEASURES

Spill or Leak Measures: Stop leak if you can do it without risk. Keep unnecessary people away and deny entry. Isolate spill or leak area immediately for at least 330 to 660 feet in all directions. Stay upwind, out of low areas, and ventilate closed spaces before entering. Eliminate all ignition sources. Do not touch or walk through spilled material. Prevent entry of product into waterways, sewers, basements, or confined spaces. A vapor suppressing foam may be used to reduce vapors. All equipment used when handling the product must be grounded and/or spark resistant. Water spray may reduce vapors but may not prevent ignition in closed spaces. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.

Determining Spill Size: Generally, a small spill is one that involves a single, small package (i.e. up to a 55 gallon drum), small cylinder, or a small (non-continuing) leak from a large container.

Small Spill:

a. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.
b. Use clean non-sparking tools to collect absorbed material.

Large Spill:

a. Dike far ahead of liquid spill for later disposal.
b. Follow local emergency protocol for handling.
c. Water spray may reduce vapor; but may not prevent ignition in closed spaces.

7. HANDLING AND STORAGE

Handling and storage for methanol should follow the standards listed below. Other standards or regulations may apply which are not listed.

a. National Electrical Code; Hazard Classification for Methanol is Class I, Div. 1 or 2, Group D.
b. NFPA No. 30, "Flammable and Combustible Liquids Code".

Handling Precautions: Use proper personal protective equipment when working with or around methanol. See Section 8.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

Respiratory Protection Requirements:

<200 ppm:	No protection required.
200 to 250 ppm:	Protection required if the daily TWA is exceeded, a fresh air supplied system must be used if protection is needed.
>250 ppm:	A fresh air supply system must be used (i.e. positive pressure self contained breathing apparatus)

Skin Protection Requirements: Equipment should prevent repeated or prolonged skin contact with the product. This may include rubber boots, resistant gloves, and other impervious and resistant clothing. Compatible materials may include butyl rubber, natural rubber, neoprene, nitrile rubber, viton and others. Review the equipment manufacture's compatibility data.

Eye Protection Requirements: Use chemical (indirectly vented) goggles when there is a potential for contact with product, including vapor. A full-face shield may be worn over goggles for additional protection, but not as a substitute for goggles.

Other Protective Equipment: Safety shower and eyewash fountain should be provided in the methanol handling area. Proper fire extinguishment equipment must be kept in the handling area.

Engineering Controls: Adequate ventilation to keep methanol concentrations below applicable standards when possible.

NOTE: See Section 2 for regulatory exposure guidelines.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form: .....Liquid
Color: .....Colorless
Odor: .....Faintly sweet pungent odor like ethyl alcohol
Boiling Point:.....148° F at atmospheric pressure
Melting point:.....-144° F
pH:.....7.2
Solubility:.....100%
Specific Gravity: .....0.792 (@ 68° F)
Vapor Density:.....1.11 (@ 60° F)
Vapor Pressure:.....1.86 psia (@ 68° F)
% Volatile by Volume: 100
Molecular Weight:.....32.04
Density:.....6.63 lb. per gallon (@ 60° F)
Critical Temperature:.....464° F
Critical Pressure:.....1142 psia

10. REACTIVITY

Stability:.....This is a stable material.
Hazardous Polymerization:.....Will not occur.

Decomposition:
Excessive heating and/or incomplete combustion will generate carbon monoxide, formaldehyde, and possibly unburned methanol.

Incompatibilities:

a. Methanol has an explosive reaction with chloroform + sodium methoxide and diethyl zinc (see note following).

b. Methanol has a violent reaction with alkyl aluminum salts, acetyl bromide, chloroform + sodium hydroxide, cyanuric chloride, nitric acid, etc. (See note following)

c. Incompatible with beryllium dihydride, metals (potassium, magnesium, etc.), oxidants (barium, perchorate, bromine, chlorine, etc.), etc. (see note following)

d. Dangerous; can react vigorously with oxidizing materials. (See note following)

NOTE: The incompatibilities above is a partial list taken from two books by Sax & Lewis: “Dangerous Properties of Industrial Materials”, 9th. ed., 1995 and “Hawley’s Condensed Chemical Dictionary”, 11th. ed. 1987, both published by Van Nostrand Reinhold Company, New York. It is recommend that if additional information is needed, refer to these and other published information.

11. TOXICOLOGICAL INFORMATION

LDLo Human:.....143 mg/kg; Eye, Pul, GIT
LD_{50} Mouse:.....7300 mg/kg
LC_{50} Rat:.....64,000 ppm / 4 hours
LC_{50} Goldfish:.....250 ppm / 11hours

12. ECOLOGICAL INFORMATION

a. Methanol is harmful to aquatic life in low concentrations and may be hazardous if it enters water intakes.
b. Local health and wildlife authorities, as well as operators of water intakes in the vicinity, should be notified of water releases.
c. Biological Oxygen Demand: 0.6 to 1.12 lb./lb. in 5 days

13. DISPOSAL CONSIDERATIONS

Waste must be disposed of in accordance with federal, state, and local environmental control regulations. Waste methanol in concentrations equal to or greater than 24 % by weight meets the definition of an ignitable hazardous waste. Product grade methanol, when disposed, is a listed hazardous waste.

For large spills, maximize product recovery for reuse or recycling. Free liquid may be collected using explosion-proof pumps. For small spills, take up with sand or other non-combustible absorbent. Use registered transporters to move contaminated product/soil/water in D.O.T. approved containers. Dispose of materials at a licensed facility permitted to handle RCRA "Hazardous Wastes". Incineration is the recommended disposal method. Burn concentrated liquid in systems compatible with water-soluble waste. Biodegradation may be used on dilute aqueous waste. Assure emissions and effluents comply with applicable laws.

14. TRANSPORTATION INFORMATION

D.O.T. Shipping Name:.....Methanol
D.O.T. Hazard Class:.....Flammable Liquid, Class 3
U.N. / N.A. Number:.....1230
D.O.T. Placard:.....Flammable Liquid, Class 3, color: red
OSHA Label Required:.....Yes
RQ (Reportable Quantity):.....5000 pounds or approx. 755 gallons
STCC Number: 4909230

15. REGULATORY INFORMATION

OSHA: This product is considered a hazardous material under criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200.

SARA TITLE III:

a. EHS (Extremely Hazardous Substances) List: Not Listed
   Note: Chemicals on the original list that do not meet the toxicity criteria but because of their high production volume and recognized toxicity are considered chemicals of concern ("other chemicals").
b. RQ (Reportable Quantity): Not Listed
c. TPQ (Threshold Planning Quantity): Not Listed
d. Section 313: "Specific Toxic Chemical Listings" - 40 CFR Part 372 Methanol is subject to the reporting requirements of Section 313 and 40 CFR Part 372. Terra Nitrogen is required by 40 CFR 372.45 to notify certain customers as to which of its mixture or trade name products contain those chemicals. The purpose of that notification is to ensure that facilities that may be subject to reporting requirements of Section 313 and that use products of unknown formulation will have knowledge that they are receiving products that contain chemicals subject to those reporting requirements.

CERCLA Hazardous Substances List:

a. RQ (Reportable Quantity): 5000 pounds or approx. 755 gallons
b. Regulation: "Designation, Reportable Quantities, Notification" - 40 CFR 302

TSCA Inventory:

Listed (RTECS)

16. OTHER INFORMATION

Nov. 5, 1996: The MSDS was rewritten to comply with ANSI Standard Z400.1-1993.

Feb. 16, 1999: Revised to make minor typographical and editorial changes.

April 1, 2001: Revised to change the mailing address of Terra Nitrogen Corporation and to make minor editorial changes.

The information and recommendations herein are taken from data contained in independent, industry-recognized references including but not limited to NIOSH, OSHA, NFPA, D.O.T. ERG, MEDITEXT, HAZARDTEXT, CHRIS, and SAX's Dangerous Properties of Industrial Materials - ninth edition. Thus, Terra Nitrogen Corporation makes no guarantee, warranty or other representation concerning this substance, since conditions of its use are beyond the control of the company. Terra Nitrogen Corporation disclaims any liability for loss or damage incurred in connection with the use of this substance.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: LIGHT CRUDE OIL
Synonyms: Bakken Oil, Bakken Crude
Chemical Description: A naturally occurring mixture of aromatic hydrocarbons and small amounts of sulfur and nitrogen compounds
Product Use: Process stream, fuels and lubricants production
Manufacturer/Supplier: CENOVUS ENERGY INC.
500 Centre Street SE, PO Box 766
Calgary, AB T2P 0M5
Prepared By: Cenovus Energy Inc. Health and Safety
Phone Number: 1-403-766-2000
Emergency Telephone: 1-877-458-8080, CANUTEC 1-613-996-6666 (Canada)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredients	CAS Number	Approximate Concentration (%)
Petroleum Crude Oil	8002-05-9	100 v/v
Benzene	71-43-2	0.1 – 1.0 v/v

Hydrogen Sulfide in liquid is <0.1% v/v, vapour phase may contain higher concentrations.

3. HAZARDS IDENTIFICATION

Routes of Entry: Skin contact, skin absorption, eye contact, inhalation, ingestion
Emergency Overview: Warning. Flammable liquid and vapour. Liquid and vapour may cause irritation or burns to eyes, nose and throat. Inhalation of vapour may cause dizziness and drowsiness. Possible cancer hazard (benzene). Possible asphyxiation hazard (hydrogen sulfide). Wear personal protective equipment appropriate for the task.

WHMIS B2, D2-A, D2-B
NFPA F4, R0, H3

Potential Health Effects: Contains material which may cause cancer after long-term, repeated skin contact.

4. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with large amounts of lukewarm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.

Skin Contact: Remove contaminated clothing. Flush skin with water. Get medical attention if irritation persists or large area of contact. Decontaminate clothing before re-use.

Inhalation: Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek medical attention immediately.

Ingestion: Give 2-3 glasses of milk or water to drink unless patient is unconscious or has a decreased level of alertness. DO NOT INDUCE VOMITING. Keep patient warm and at rest. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

Flammable: Material will ignite at normal temperatures.
Means of Extinction: Foam, carbon dioxide (CO_2), dry chemical. Explosive accumulations can build up in areas of poor ventilation.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. Cut off fuel and allow flame to burn out.
TDG Classification: 3
Flash Point (°C) & Method: <-35 (PMCC) **Auto-Ignition Temp. (°C)**: 250 (estimated)
Upper Explosive Limit (% v/v): 8 (estimated) **Lower Explosive Limit (% v/v)**: 0.8 (estimated)
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes, at normal temperatures
Hazardous Combustion Products: Carbon monoxide, sulfur oxides, nitrogen oxides, smoke particles
NFPA 704 Rating: Flammability:4, Instability/Reactivity:0, Health:3

6. ACIDENTAL RELEASE MEASURES

Personnel precautions: Appropriately trained personnel should respond to uncontrolled releases. Avoid direct contact with material; use the personal protective equipment specified in Section 8. Stay upwind of release; isolate the immediate hazard area; and keep unnecessary and unprotected people away. Use water spray to cool containers. Eliminate all sources of ignition. Provide explosion-proof clearing ventilation, if possible.
Environmental precautions: Prevent material from entering soil, waterways, drains, sewers, or confined areas.
Cleanup measures: Stop leak if safe to do so. Dyke and pump material into containers for recycling or disposal. Contact appropriate regulatory authorities for disposal requirements (see Section 13). Notify the appropriate regulatory authorities of reportable releases (see Section 15).

7. HANDLING AND STORAGE

Handling: Wear appropriate personal protective equipment. Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions. Wash hands and face after handling and before eating, drinking or smoking.
Storage: Store material in a cool, dry, well-ventilated area away from heat, strong sunlight, hot metal surfaces and ignition sources. Use approved containers only. Separate from incompatible material (see Section 10).

Caution: Hydrogen sulfide may accumulate in headspaces of tanks and other equipment, even when concentrations in the liquid product are low. Factors increasing this hazard potential include heating, agitation and contact of the liquid with acid or acid salts. Assess the exposure risk by gas monitoring. Wear air supplying breathing apparatus if necessary. Overexposure to hydrogen sulfide may cause dizziness, headache, nausea and possibly unconsciousness and death.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

Occupational Exposure Limits

Hazardous Ingredients	Alberta OEL	Saskatchewan	OSHA PEL	ACGIH TLV
Petroleum Crude Oil	300 ppm; 500 ppm (15min)	300 ppm	--	--
Benzene	0.5 ppm; 2.5 ppm (15min), Skin	--	1 ppm; 5 STEL; Petroleum Industry: 10 ppm; 25 ppm (C)	0.5 ppm; 2.5 STEL, Skin
Hydrogen Sulfide	10 ppm; 15 ppm (C)	--	20 ppm (C)	1 ppm

Engineering Controls: Use only in well-ventilated areas. Local exhaust ventilation required in confined areas. Equipment must be explosion proof.
Hygiene Measures: Wash hands and face after handling and before eating, drinking or smoking. Take off contaminated clothing and wash before re-use.
Personal Protection
Respirator: Where concentrations may exceed exposure limits, use full-face, positive pressure self-contained breathing apparatus; full-face, positive pressure supplied-air breathing apparatus; or cartridge air-purifying respirator approved for organic vapours (note: cartridge respirator not suitable for hydrogen sulfide, oxygen deficient or IDLH situations).
Gloves: Chemical-resistant gloves: Viton (Nitrile adequate for short exposure to liquid.)
Eyewear: Chemical splash goggles. A face shield may also be necessary, depending on handling conditions.
Footwear: As per safety policy.
Clothing: As per fire protection policy.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid
Odour Threshold (ppm): Not Available
Vapour Density (air=1): 2.5 -5.0 (estimated)
Evaporation Rate: Not Available
Freezing Pt. (°C): <-60
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: Dark Brown, hydrocarbon-like
Specific Gravity: 0.7 – 0.8
Vapour Pressure (mmHg): 280-360 @ 20ºC
Boiling Pt. (°C): -40 to 530
pH: Not Available
Percent Volatiles, (v/v): 15 - 30 (estimated)

10. STABILITY AND REACTIVITY

Chemical Stability: Stable under normal, ambient conditions.
Incompatibility: Incompatible with strong oxidizing agents (e.g. chlorine, peroxide).
Reactivity: Reactive to heat, strong sunlight and ignition sources.
Hazardous Decomposition Products: Carbon monoxide, sulfur oxides, nitrogen oxides, smoke particles
Hazardous Polymerization: Not known to occur.

11. TOXICOLOGICAL INFORMATION

Acute Exposure
Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and possibly dermatitis. Contact of liquid with eyes may cause severe irritation or burns.

Hazardous Ingredients	Result	Species	Dose	Exposure
Petroleum Crude Oil	LD50 Oral LD50 Dermal LC50 Inhalation	Rat	>5 g/kg >2 g/kg >4300 ppm	-
Benzene	LD50 Oral LC50 Inhalation	Rat	0.9 g/kg 13200 ppm	- 4 hours
Hydrogen Sulfide	LC50 Inhalation	Rat	444 ppm	4 hours

Chronic Exposure
Due to presence of benzene, long term exposure may increase the risk of anemia and leukemia. Repeated skin contact may increase the risk of skin cancer.

Irritant: Yes
Skin Sensitization: Yes
Respiratory Sensitization: No
Carcinogenicity: Yes
Reproductive Toxicity: Possibly
Teratogenicity: Possibly
Mutagenicity: Possibly
Synergistic Materials/Products: None reported

Crude Oil
IARC – Crude oil is not classifiable as to its carcinogenicity to humans (Group 3).
ACGIH, OSHA, US NTP – not listed as a carcinogen.
Benzene
ACGIH A1-Confirmed Human Carcinogen
IARC, OSHA, US NTP – There is sufficient evidence that benzene is carcinogenic to man.
Hydrogen Sulfide
Hydrogen sulfide is not considered to be mutagenic or a reproductive or developmental toxicant.
ACGIH, IARC, OSHA, US NTP – Hydrogen sulfide is not listed as a carcinogen.

12. ECOLOGICAL INFORMATION

Aquatic Toxicity: Not available
Biodegradability: Not available

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Contact appropriate regulatory authorities for disposal requirements. Empty containers or liners may retain a product residue. This material and its container and rinseates must be disposed of safely and in compliance with the requirements of environmental protection and waste disposal legislation and regional local authority requirements. Avoid dispersal of spilled material and runoff contact with soil, waterways, drains and sewers.
Use which results in chemical or physical change of this material could subject it to regulation as a hazardous product. Container residues and rinseates could be considered hazardous waste.

US EPA Waste Numbers
D001 – Ignitability characteristic
D018 – Toxicity characteristic (Benzene) (Regulatory Level = 0.5 mg/L)

14. TRANSPORT INFORMATION

Regulatory Information	UN Number	Proper Shipping Name	Class	PG	Label	Additional Information
TDG	UN1267	Petroleum Crude Oil	3	I	Flammable Liquids	
DOT	UN1267	Petroleum Crude Oil	3	I	Flammable Liquid	49 CFR 173.150; 173.202; 173.242
IMDG	UN1267	Petroleum Crude Oil	3	I	Flammable Liquid	12°C, P001 EmS:F-E, S-E MARPOL Annex I
ICAO/IATA	UN1267	Petroleum Crude Oil	3	I	Flammable Liquid	ERG Code: 3L

North American Emergency Response Guide Number: 128

15. REGULATORY INFORMATION

Canadian Classification

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

WHMIS Classification: B2 – Flammable and combustible material – Flammable liquid
D2A – Poisonous and infectious material – Other effects – Very toxic
D2B – Poisonous and infectious material – Other effects – Toxic

WHMIS Ingredient Disclosure List:

Meets criteria for disclosure at 0.1% or greater of benzene.

CEPA Domestic Substance List: All components are either listed or exempt.

US Federal and State Regulations

The contents of this MSDS comply with the OSHA Hazard Communication Standard 29 CFR 1910.1200.

CERCLA/SARA – Section 302 Extremely Hazardous Substances: Exempt.

CERCLA/SARA 311-312 (Title III Hazard Categories):

Hydrogen Sulfide – Fire, Immediate (Acute),

Produced Hydrocarbons – Fire, Sudden Release of Pressure, Immediate (Acute), Delayed (Chronic).

CERCLA/SARA 313, Reportable Quantity: Benzene: 10 lbs; RCRA Code U019.

Clean Air Act Section 112(b) Hazardous Air Pollutants: Exempt.

United States National Chemical Inventory: All components are listed or exempted.

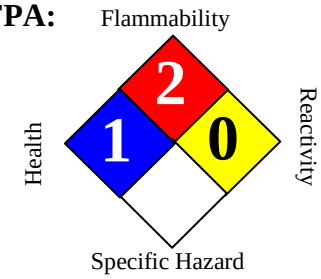
California 65: This product contains benzene a chemical known to the State of California to cause cancer and developmental harm.

16. OTHER INFORMATION

Guide to Abbreviations: ACGIH = American Conference of Governmental Hygienists; C = Ceiling; CAS = Chemical Abstracts Service Registry; Cenovus = Supplier recommendation based on composition; CEPA = Canadian Environmental Protection Act; DOT = Department of Transport; EmS = Environmental Management System; ERG = Emergency Response Guide
IARC = International Agency for Research on Cancer; ICAO/IATA = International Civil Aviation Organization/International Air Transport Association; IMDG = International Marine Dangerous Goods; MARPOL = The International Convention for the Prevention of Pollution from Ships; OEL = Occupational Exposure Limit; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit; PG = Packing Group; Skin = Danger of skin absorption; SARA STEL = Short Term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; US NTP = United States National Toxicology Program; v/v = volume per volume; WHMIS = Workplace Hazardous Materials Information System

Safety Data Sheet
Jet Fuel

NFPA:



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Jet Fuel			
Synonyms	:	Jet Fuel - A, B, A-I, A-50, High Sulfur, Military, Jet A & B Aviation Turbine Fuel, Jet A-I, Jet A; Avjet For Blending; Jet Q Turbine Fuel, Aviation Fuel; Turbine Fuel; JP-4; JP-5; JP-8, Av-Jet, 888100004452			
SDS Number	:	888100004452	**Version**	:	2.15
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications : Flammable Liquid – Category 3
Aspiration Hazard – Category 1
Skin Irritation – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Chronic Aquatic Toxicity – Category 2

Pictograms

Signal Word : **Danger**

Hazard Statements : Flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon by mouth.
Causes skin irritation. Repeated or prolonged skin contact can cause skin irritation and dermatitis.
May cause drowsiness or dizziness by inhalation.
May cause irritation of respiratory system.
Toxic to aquatic life with long lasting effects.

Precautionary statements

Prevention

Keep away from heat, sparks, open flames, welding and hot surfaces.
No smoking.
Keep container tightly closed.
Ground and/or bond container and receiving equipment.
Use explosion-proof electrical equipment.
Use only non-sparking tools if tools are used in flammable atmosphere.
Take precautionary measures against static discharge.
Wear gloves, eye protection and face protection as needed to prevent skin and eye contact with liquid.
Wash hands or liquid-contacted skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Do not breathe vapors or mists.
Use only outdoors or in a well-ventilated area.

Response

In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish.
If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth.
If skin irritation persists, get medical attention.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Get medical attention if you feel unwell.

Storage

Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers.

Disposal

Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Kerosene (petroleum)	8008-20-6	100%
Naphthalene	91-20-3	0 to 3%
Ethyl Benzene	100-41-4	0 to 1%
Trimethy Benzene	95-63-6	0 to 1%
Ethyl Benzene	100-41-4	0 to 1%

SECTION 4. FIRST AID MEASURES

Inhalation : If inhaled, remove to fresh air. If not breathing, give artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

Skin contact : Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention.

Eye contact : In case of eye contact, remove contact lens and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical attention

immediately.

Ingestion : Do NOT induce vomiting. Do not give liquids. Seek medical attention immediately. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

Notes to physician : Symptoms: Aspiration may cause pulmonary edema and pneumonitis. Treatment: Do not induce vomiting, use gastric lavage only. Remove from further exposure and treat symptomatically.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray., Do not use a solid water stream as it may scatter and spread fire., Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Specific hazards during fire fighting : Fire Hazard. Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray. Sealed containers may rupture when heated. Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back.

Special protective equipment for fire-fighters : Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Further information : Exposure to decomposition products may be a hazard to health. Standard procedure for chemical fires.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN if applicable. Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Environmental precautions : Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Methods for cleaning up : Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling : Keep away from fire, sparks and heated surfaces. No smoking near areas where

material is stored or handled. The product should only be stored and handled in areas with intrinsically safe electrical classification.

: Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).
(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

: Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

: Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA Z1	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Ethyl Benzene	100-41-4	PEL	100 ppm 435 mg/m3
ACGIH	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm
	Kerosene (petroleum)	8008-20-6	TWA	200 mg/m3
	Ethyl Benzene	100-41-4	TWA	100 ppm 434 mg/m3
			STEL	125 ppm 543 mg/m3

Protective measures : Keep out of reach of children.

Engineering measures : Use only intrinsically safe electrical equipment approved for use in classified areas. Emergency eye wash capability should be available in the vicinity of any potential

		splash exposure.
Eye protection	:	Goggles and face shield as needed to prevent eye and face contact.
Hand protection	:	Gloves constructed of nitrile, neoprene, or PVC are recommended.
Skin and body protection	:	Chemical protective clothing such as DuPont TyChem ®, Barricade or equivalent, recommended based on degree of exposure. Consult manufacturer specifications for further information.
Respiratory protection	:	NIOSH/MSHA approved positive-pressure self-contained breathing apparatus (SCBA) or Type C positive-pressure supplied air with escape bottle must be used for gas concentrations above occupational exposure limits, for potential of uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere.
Work / Hygiene practices	:	Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Clear to straw colored liquid
Odor		Characteristic petroleum or kerosene-like odor
Odor threshold		0.1 - 1 ppm typically reported
pH		Not applicable
Melting point/freezing point		Gel point can be about -15°F; freezing requires laboratory conditions
Initial boiling point & range		154 - 372 °C (310° - 702 °F)
Flash point		38°C (100°F) Minimum
Evaporation rate		Higher initially and declining as lighter components evaporate
Flammability (solid, gas)		Flammable vapor released by liquid
Upper explosive limit		5.0 %(V)
Lower explosive limit		0.7 %(V)
Vapor pressure		< 2 mm Hg at 20 °C
Vapor density (air = 1)		> 4.5
Relative density (water = 1)		0.8 g/mL
Solubility (in water)		0.0005 g/100 mL
		3.3 to 6 as log Pow

Partition coefficient (n-octanol/water)	
Auto-ignition temperature	210 °C (410°F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	1.6 mm²/s at 40°C
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature	Diesel Fuel Oils at terminal load rack: At least 25 pS/m Ultra Low Sulfur Diesel (ULSD) without conductivity additive: 0 pS/m to 5 pS/m ULSD at terminal load rack with conductivity additive: At least 50 pS/m JP-8 at terminal load rack: 150 pS/m to 600 pS/m

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions		Can react with strong oxidizing agents, peroxides, acids and alkalies.
Conditions to avoid	:	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	:	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and, depending on formulation, trace amounts of sulfur dioxide. Diesel exhaust particals may be a lung hazard (see Section 11).

SECTION 11. TOXICOLOGICAL INFORMATION

Skin irritation	:	Irritating to skin. Repeated or prolonged contact can cause dryness, cracking and dermatitis. Liquid may be absorbed through skin in toxic amounts if large areas of the skin are repeatedly exposed.
Eye irritation	:	May cause eye irritation.
Inhalation		Inhalation of vapors or mist may result in respiratory tract irritation and central nervous system effects including headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure and death.
Chronic Exposure		Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposure has not been determined.
Further information	:	Kerosene does not have a measurable effect on human reproduction or development. Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen. Some petroleum distillates have been found to cause adverse reproductive effects in laboratory animals. Acute and chronic exposure to kerosene may result in CNS effects including irritability, restlessness, ataxia, drowsiness, convulsions, coma and death. The most common health effect associated with chronic kerosene exposure is dermatitis.

Component:

Kerosene (petroleum)	8008-20-6	Acute oral toxicity: LD50 rat 4 hour Dose: >5,000 mg/kg Acute dermal toxicity: LD50 rabbit Dose: >2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: >5,000 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130

Carcinogenicity

NTP	Naphthalene (CAS-No.: 91-20-3)
IARC	Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen. naphthalene (CAS-No.: 91-20-3) Kerosene (petroleum) (CAS-No.: 8008-20-6)
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause cancer. Naphthalene (CAS-No.: 91-20-3)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Release of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802. Naphthalene (91-20-3) one of the ingredients in this mixture is classified as a Marine Pollutant.

Component:

Naphthalene	91-20-3	Toxicity to algae: EC50 Species: Dose: 33 mg/l Exposure time: 24 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility.
Processing, use or contamination of this product may change the waste management options.
State and local disposal regulations may differ from federal disposal regulations.
Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	:	Fuel, aviation, turbine engine
UN-No.	:	1863
Class	:	3
Packing group	:	III

TDG

Proper shipping name	:	Fuel, aviation, turbine engine
UN-No.	:	UN1863
Class	:	3
Packing group	:	III

IATA Cargo Transport

UN UN-No.	:	UN1863
Description of the goods	:	Fuel, aviation, turbine engine
Class	:	3
Packaging group	:	III
ICAO-Labels	:	3
Packing instruction (cargo aircraft)	:	366
Packing instruction (cargo aircraft)	:	Y344

IATA Passenger Transport

UN UN-No.	:	UN1863
Description of the goods	:	Fuel, aviation, turbine engine
Class	:	3
Packaging group	:	III
ICAO-Labels	:	3
Packing instruction (passenger aircraft)	:	355
Packing instruction (passenger aircraft)	:	Y344

IMDG-Code

UN-No.	:	UN 1863
Description of the goods	:	Fuel, aviation, turbine engine
Class	:	3
Packaging group	:	III
IMDG-Labels	:	3
EmS Number	:	F-E S-E
Marine pollutant	:	Yes

SECTION 15. REGULATORY INFORMATION

TSCA Status	:	On TSCA Inventory
DSL Status	:	All components of this product are on the Canadian DSL list.
SARA 311/312 Hazards	:	Acute Health Hazard Chronic Health Hazard Fire Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply.

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Naphthalene 91-20-3

SECTION 16. OTHER INFORMATION

Further information

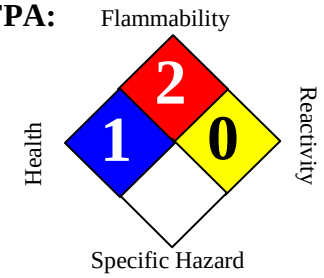
The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 11/17/2012

40, 41, 42, 43, 139, 141, 263, 1117, 1333, 1450, 1640

Safety Data Sheet
Kerosene

NFPA:



SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Kerosene			
Synonyms	:	Dual Purpose, K1, Dyed K1, Kerosine, Low Aromatic Feedstock, SRK Solvent, Arctic Grade Fuel Oil (DFA), Heater Oil, Range Oil, Coal Oil, K2, Gas Oil, 888100004861			
SDS Number	:	888100004861	**Version**	:	2.16
Product Use Description	:	Fuel			
Company	:	For: Tesoro Refining & Marketing Co. 19100 Ridgewood Parkway, San Antonio, TX 78259			
Tesoro Call Center	:	(877) 783-7676	**Chemtrec (Emergency Contact)**	:	(800) 424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classifications : Flammable Liquid – Category 3
Aspiration Hazard – Category 1
Skin Irritation – Category 2
Specific Target Organ Toxicity (Single Exposure) – Category 3
Chronic Aquatic Toxicity – Category 2

Pictograms

Signal Word : **Danger**

Hazard Statements : Flammable liquid and vapor.
May be fatal if swallowed and enters airways – do not siphon by mouth.
Causes skin irritation. Repeated or prolonged skin contact can cause skin irritation and dermatitis.
May cause drowsiness or dizziness by inhalation.
May cause irritation of respiratory system.
Toxic to aquatic life with long lasting effects.

Precautionary statements:

Prevention : Keep away from heat, sparks, open flames, welding and hot surfaces.

	No smoking. Keep container tightly closed. Ground and/or bond container and receiving equipment. Use explosion-proof electrical equipment. Use only non-sparking tools if tools are used in flammable atmosphere. Take precautionary measures against static discharge. Wear gloves, eye protection and face protection as needed to prevent skin and eye contact with liquid. Wash hands or liquid-contacted skin thoroughly after handling. Do not eat, drink or smoke when using this product. Do not breathe vapors or mists. Use only outdoors or in a well-ventilated area.
Response	In case of fire: Use dry chemical, CO2, water spray or fire fighting foam to extinguish. If swallowed: Immediately call a poison center, doctor, hospital emergency room, medical clinic or 911. Do NOT induce vomiting. Rinse mouth. If skin irritation persists, get medical attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. Get medical attention if you feel unwell.
Storage	Store in a well ventilated place. Keep cool. Store locked up. Keep container tightly closed . Use only approved containers.
Disposal	Dispose of contents/containers to approved disposal site in accordance with local, regional, national, and/or international regulations.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Weight %
Kerosene (petroleum)	8008-20-6	100%
Naphthalene	91-20-3	0 to 3%
Ethyl Benzene	100-41-4	0 to 1%

SECTION 4. FIRST AID MEASURES

Inhalation	:	Move to fresh air. If not breathing, give artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.
Skin contact	:	Take off all contaminated clothing immediately. Wash off immediately with soap and plenty of water. Wash contaminated clothing before re-use. If skin irritation persists, seek medical attention.
Eye contact	:	Remove contact lenses. In case of eye contact, immediately flush with low pressure, cool water for at least 15 minutes, opening eyelids to ensure flushing. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting does occur naturally, keep head below the hips to reduce the risks of aspiration. Obtain medical attention. Do not give liquids. Small amounts of material which enter the mouth should be rinsed out until the

taste is dissipated.

Notes to physician : Symptoms: Aspiration may cause pulmonary edema and pneumonitis. Treatment: Do not induce vomiting, use gastric lavage only. Remove from further exposure and treat symptomatically.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media : Carbon dioxide (CO2), Water spray, Dry chemical, Foam, Keep containers and surroundings cool with water spray., Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Specific hazards during fire fighting : Fire Hazard Do not use a solid water stream as it may scatter and spread fire. Cool closed containers exposed to fire with water spray. Sealed containers may rupture when heated. Above the flash point, explosive vapor-air mixtures may be formed. Vapors can flow along surfaces to distant ignition source and flash back.

Special protective equipment for fire-fighters : Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

Further information : Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions : ACTIVATE FACILITY'S SPILL CONTINGENCY OR EMERGENCY RESPONSE PLAN if applicable. Consider wind direction; stay upwind and uphill, if possible. Evacuate nonessential personnel and remove or secure all ignition sources. Evaluate the direction of product travel, diking, sewers, etc. to contain spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Environmental precautions : Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Methods for cleaning up : Take up with sand or oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal - caution, flammable vapors may accumulate in closed containers. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

SECTION 7. HANDLING AND STORAGE

Precautions for safe handling : Keep away from fire, sparks and heated surfaces. No smoking near areas where material is stored or handled. The product should only be stored and handled in

areas with intrinsically safe electrical classification.

: Hydrocarbon liquids including this product can act as a non-conductive flammable liquid (or static accumulators), and may form ignitable vapor-air mixtures in storage tanks or other containers. Precautions to prevent static-initated fire or explosion during transfer, storage or handling, include but are not limited to these examples:

(1) Ground and bond containers during product transfers. Grounding and bonding may not be adequate protection to prevent ignition or explosion of hydrocarbon liquids and vapors that are static accumulators.
(2) Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil or diesel) is loaded into tanks previously containing low flash point products (such gasoline or naphtha).
(3) Storage tank level floats must be effectively bonded.

For more information on precautions to prevent static-initated fire or explosion, see NFPA 77, Recommended Practice on Static Electricity (2007), and API Recommended Practice 2003, Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents (2008).

Conditions for safe storage, including incompatibilities : Keep away from flame, sparks, excessive temperatures and open flame. Use approved containers. Keep containers closed and clearly labeled. Empty or partially full product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose containers to sources of ignition. Store in a well-ventilated area. The storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

: Keep away from food, drink and animal feed. Incompatible with oxidizing agents. Incompatible with acids.

: Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

List	Components	CAS-No.	Type:	Value
OSHA Z1	Naphthalene	91-20-3	PEL	10 ppm 50 mg/m3
	Ethylbenzene	100-41-4	PEL	100ppm 435 mg/m3
ACGIH	Kerosene (petroleum)	8008-20-6	TWA	200 mg/m3
	Ethylbenzene	100-41-4	TWA STEL	100ppm 434 mg/m3 125ppm 543 mg/m3
	Naphthalene	91-20-3	TWA	10 ppm
		91-20-3	STEL	15 ppm

Engineering measures : Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use only intrinsically safe electrical equipment approved for use in classified areas. Emergency eye wash capability should be available in the vicinity of any potential splash exposure.

Eye protection	:	Goggles and face shield as needed to prevent eye and face contact.
Hand protection	:	Gloves constructed of nitrile, neoprene, or PVC are recommended.
Skin and body protection	:	Chemical protective clothing such as DuPont TyChem ®, Barricade or equivalent, recommended based on degree of exposure. Consult manufacturer specifications for further information.
Respiratory protection	:	A NIOSH/ MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection. Use a NIOSH/ MSHA-approved positive-pressure supplied-air respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.
Work / Hygiene practices	:	Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Clear to straw colored liquid
Odor		Characteristic petroleum or kerosene-like odor
Odor threshold		0.1 - 1 ppm typically reported
pH		Not applicable
Melting point/freezing point		Gel point can be about -15°F; freezing requires laboratory conditions
Initial boiling point & range		154 - 372 °C (310° - 702 °F)
Flash point		38°C (100°F) Minimum
Evaporation rate		Higher initially and declining as lighter components evaporate
Flammability (solid, gas)		Flammable vapor released by liquid
Upper explosive limit		5.0 %(V)
Lower explosive limit		0.7 %(V)
Vapor pressure		< 2 mm Hg at 20 °C
Vapor density (air = 1)		> 4.5 0.8 g/mL

Relative density (water = 1)	
Solubility (in water)	0.0005 g/100 mL
Partition coefficient (n-octanol/water)	3.3 to 6 as log Pow
Auto-ignition temperature	210 °C (410°F)
Decomposition temperature	Will evaporate or boil and possibly ignite before decomposition occurs.
Kinematic viscosity	1.6 mm²/s at 40°C
Conductivity (conductivity can be reduced by environmental factors such as a decrease in temperature	Diesel Fuel Oils at terminal load rack: At least 25 pS/m Ultra Low Sulfur Diesel (ULSD) without conductivity additive: 0 pS/m to 5 pS/m ULSD at terminal load rack with conductivity additive: At least 50 pS/m JP-8 at terminal load rack: 150 pS/m to 600 pS/m

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Vapors may form explosive mixture with air. Hazardous polymerization does not occur.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions		Can react with strong oxidizing agents, peroxides, acids and alkalies
Conditions to avoid	:	Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources. Avoid static charge accumulation and discharge (see Section 7).
Hazardous decomposition products	:	Ignition and burning can release carbon monoxide, carbon dioxide, non-combusted hydrocarbons (smoke) and, depending on formulation, trace amounts of sulfur dioxide. Diesel exhaust particals may be a lung hazard (see Section 11).

SECTION 11. TOXICOLOGICAL INFORMATION

Skin irritation	:	Irritating to skin. Repeated or prolonged contact can cause dryness, cracking and dermatitis. Liquid may be absorbed through skin in toxic amounts if large areas of the skin are repeatedly exposed.
Eye irritation	:	May cause eye irritation.
Inhalation		Inhalation of vapors or mist may result in respiratory tract irritation and central nervous system effects including headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure and death.
Chronic Exposure		Similar products produced skin cancer and systemic toxicity in laboratory animals following repeated applications. The significance of these results to human exposure has not been determined.
Further information	:	Kerosene does not have a measurable effect on human reproduction or development. Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen. Some petroleum distillates have been found to cause adverse reproductive effects

in laboratory animals.
Acute and chronic exposure to kerosene may result in CNS effects including irritability, restlessness, ataxia, drowsiness, convulsions, coma and death. The most common health effect associated with chronic kerosene exposure is dermatitis.

Component:

Kerosene (petroleum)	8008-20-6	Acute oral toxicity: LD50 rat 4 hour Dose: >5,000 mg/kg Acute dermal toxicity: LD50 rabbit Dose: >2,001 mg/kg Acute inhalation toxicity: LC50 rat Dose: >5,000 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Skin irritation
Naphthalene	91-20-3	Acute oral toxicity: LD50 rat Dose: 2,001 mg/kg Acute dermal toxicity: LD50 rat Dose: 2,501 mg/kg Acute inhalation toxicity: LC50 rat Dose: 101 mg/l Exposure time: 4 h Skin irritation: Classification: Irritating to skin. Result: Mild skin irritation Eye irritation: Classification: Irritating to eyes. Result: Mild eye irritation Carcinogenicity: N11.00422130

Carcinogenicity

NTP	Naphthalene (CAS-No.: 91-20-3)
IARC	Kerosene is not listed as carcinogenic by NTP, OSHA, and ACGIH. IARC has listed kerosene as a probable human carcinogen. naphthalene (CAS-No.: 91-20-3) Kerosene (petroleum) (CAS-No.: 8008-20-6)
CA Prop 65	WARNING! This product contains a chemical known to the State of California to cause cancer. Naphthalene (CAS-No.: 91-20-3)

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information : Release of this product should be prevented from contaminating soil and water and from entering drainage and sewer systems. U.S.A. regulations require reporting spills of this material that could reach any surface waters. The toll free number for the U.S. Coast Guard National Response Center is (800) 424-8802. Naphthalene (91-20-3) one of the ingredients in this mixture is classified as a Marine Pollutant.

Component:

Naphthalene	91-20-3	Toxicity to algae: EC50 Species: Dose: 33 mg/l Exposure time: 24 h

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal : Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility.
Processing, use or contamination of this product may change the waste management options.
State and local disposal regulations may differ from federal disposal regulations.
Dispose of container and unused contents in accordance with federal, state and local requirements.

SECTION 14. TRANSPORT INFORMATION

CFR

Proper shipping name	: Kerosene
UN-No.	: 1223
Class	: 3
Packing group	: III

TDG

Proper shipping name	: Kerosene
UN-No.	: UN1223
Class	: 3
Packing group	: III

IATA Cargo Transport

UN UN-No.	: UN1223
Description of the goods	: Kerosene
Class	: 3
Packaging group	: III
ICAO-Labels	: 3
Packing instruction (cargo aircraft)	: 366
Packing instruction (cargo aircraft)	: Y344

IATA Passenger Transport

UN UN-No.	: UN1223
Description of the goods	: Kerosene
Class	: 3
Packaging group	: III
ICAO-Labels	: 3
Packing instruction (passenger aircraft)	: 355
Packing instruction (passenger aircraft)	: Y344

IMDG-Code

UN-No.	:	UN 1223
Description of the goods	:	Kerosene
Class	:	3
Packaging group	:	III
IMDG-Labels	:	3
EmS Number	:	F-E S-E
Marine pollutant	:	Yes

SECTION 15. REGULATORY INFORMATION

TSCA Status : On TSCA Inventory

DSL Status : All components of this product are on the Canadian DSL list.

SARA 311/312 Hazards : Acute Health Hazard
Chronic Health Hazard
Fire Hazard

CERCLA SECTION 103 and SARA SECTION 304 (RELEASE TO THE ENVIROMENT)
The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts crude oil. Fractions of crude oil, and products (both finished and intermediate) from the crude oil refining process and any indigenous components of such from the CERCLA Section 103 reporting requirements. However, other federal reporting requirements, including SARA Section 304, as well as the Clean Water Act may still apply**.**

California Prop. 65 : WARNING! This product contains a chemical known to the State of California to cause cancer.

Naphthalene 91-20-3

SECTION 16. OTHER INFORMATION

Further information

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Revision Date : 11/17/2012

MRC
MONTANA REFINING COMPANY

1900 10th Street NE | Great Falls, MT | 59404 - 1955
MONTANAREFINING.COM
(406) 761-4100 (24 hours)

MATERIAL SAFETY DATA SHEET

PETROLEUM NAPHTHA

EMERGENCY PHONE NUMBERS:
CHEMTREC: 1-800-424-9300 (for fire, spill and emergency response information)
CHEMTREC CUSTOMER NUMBER: CCN14937
GREAT FALLS POISON CONTROL CENTER: 1-800-525-5042 (for poisoning)
SPOKANE POISON CONTROL CENTER: 1-800-732-6985 (for poisoning)

SECTION 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: PETROLEUM NAPHTHA
CAS NUMBER: 8030-30-6
FORMULA: C_6H_{14} to $C_{12}H_{26}$
CHEMICAL FAMILY: Petroleum hydrocarbon

NFPA 704 SYMBOL

SYNONYMS: Crude Diluents, Petroleum Distillates, NAPHTHA

SECTION 2 - HAZARDOUS INGREDIENTS

HAZARDOUS COMPONENTS	CAS NO.	RETEC#	VOL%	TLV(8 Hr TWA)	PEL(8 Hr TWA)	STEL	IDLH
Petroleum Naphtha	8030-30-6	SE7449000	>99	400 ppm	100 ppm (1)	1800 ppm (2)	1100 ppm
Benzene	71-43-2	CY1400000	<1	0.5 ppm (s)	1 ppm	2.5 ppm (2	500 ppm (3)
Ethyl benzene	100-41-4	DA0700000	<2	100 ppm	100 ppm	125 ppm (2)	800 ppm (3)
Cyclohexane	110-82-7	GU6300000	<0.5	100 ppm	300 ppm	--	1300 ppm (3)
N-hexane	110-54-3	MN9275000	<4	50 ppm (s)	500 ppm	--	1100 ppm (3)
Toluene	108-88-3	XS5250000	1 - 5	50 ppm (s)	200 ppm	125 ppm (3)	500 ppm (3)
Xylenes	1330-20-7	ZE2450000	2 - 4	100 ppm	100 ppm	150 ppm (3)	900 ppm (3)
1,2,4-Trimethyl benzene	95-63-6	DC3325000	<0.5	25 ppm	--	--	--
Naphthalene	91-20-3	QJ0525000	<0.1	10 ppm (2)	10 ppm	15 ppm (2)	250 ppm (3)

(1)= OSHA (2)= ACGIH (3)= NIOSH (s)= skin notation

SECTION 3 - PHYSICAL DATA

BOILING RANGE:	86-350°F
VAPOR PRESSURE:	<4 RVP
VAPOR DENSITY (AIR=1):	3-4
SOLUBILITY IN WATER:	<0.1%
ODOR THRESHOLD:	0.25 ppm
APPEARANCE:	Clear to straw liquid
ODOR:	Light Hydrocarbon, gasoline
SPECIFIC GRAVITY (WATER=1):	0.6 - 0.8
AUTOIGNITION TEMP:	550 °F
Physical Hazard:	Extremely Flammable

SECTION 4 - FIRE AND EXPLOSION HAZARD DATA

CLASSIFICATION: FLAMMABLE LIQUID
FLASH POINT: -20°F (C.C.)
FLAMMABLE LIMITS: LEL = 1.1% UEL = 5.9%
EXTINGUISHING MEDIA: Foam, dry chemical, carbon dioxide
SPECIAL FIRE FIGHTING PROCEDURES: This material is **extremely flammable** and can be easily ignited be heat, sparks, flames, static electricity, and electronic devices that are not intrinsically safe. Move containers from fire area if possible. Use water to keep fire exposed containers or equipment cool. Avoid spreading burning liquid with water used for cooling purposes. Use foam for spill control.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Evacuate a radius of 1000 feet for uncontrolled fires. Vapors are heavier than air and may travel great distances and flash back. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Extinguish only if flow can be stopped.

NFPA FIRE = 4 (extreme)

SECTION 5 - REACTIVITY DATA

STABILITY: Stable
HAZARDOUS POLYMERIZATION: Will not occur
CONDITIONS TO AVOID/INCOMPATABILITY: Strong oxidizers such as peroxides and nitric acid
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide

NFPA REACTIVITY = 0 (minimal)

SECTION 6 - HEALTH HAZARD DATA

ROUTES OF ENTRY: Inhalation, ingestion, contact, absorption
TARGET ORGANS: Eyes, skin, respiratory system, central nervous system, liver, kidneys
HEALTH HAZARDS: Chronic toxicity, possible cancer, irritation to eyes, skin and mucous membranes, pulmonary edema, bronchial pneumonia, asphyxiation, liver and kidney damage, anemia or myocardial damage. Individuals with liver disease may be more susceptible to toxic effects of exposure to benzene. Benzene can cause anemia and other blood diseases, including leukemia after repeated or prolonged exposures at high concentrations--benzene can be toxic to the blood and blood-forming tissues. N-hexane represents a hazard of producing peripheral polyneuropathy after exposure to high vapor concentrations (1000-1500 ppm) over several months. Individuals with neurological diseases should avoid exposure to hexane. Exposure to petroleum solvents/petroleum hydrocarbons by skin contact may aggravate an existing dermatitis. Prolonged and repeated exposure of pregnant animals to high levels of toluene (levels greater than 1500 ppm) has been reported to cause adverse fetal developmental effects. This product is judged to have an acute oral LD50 (rat) greater than 5 g/kg of body weight and an acute dermal LD50 (rabbit) greater than 5.14 g/kg of body weight.
CARCINOGENICITY: Naphtha is not listed by IARC, NTP or OSHA as a possible carcinogen. Benzene is listed by NTP and IARC and is regulated by OSHA as a carcinogen. Ethylbenzene is listed by the IARC as a possible carcinogen (Group 2b).
SIGNS AND SYMPTOMS OF EXPOSURE: Irritation of eyes, skin and mucous membranes, dizziness, headaches, respiratory arrest, coughing, irregular heartbeat, mental confusion, vomiting, blurred vision, flushing of face, slurred speech, difficulty in swallowing, weakness, pain in limbs, coma and convulsions. Also gingival line, insomnia, toxicity, psychosis, tremors, exaggerated tendon reflexes. Repeated or prolonged skin exposure can cause dermatitis and or blistering of skin due to defatting properties. Exposure to eyes can cause hypermia of the conjunctiva. Aspiration after ingestion can cause chemical pneumonia.

SECTION 6 – HEALTH HAZARD DATA (cont.)

EMERGENCY AND FIRST AID PROCEDURES:

INGESTION: DO NOT induce vomiting (Aspiration hazard). Immediately seek medical attention. Do not leave victim unattended and observe closely for adequacy of breathing.

INHALATION: Move victim into fresh air, maintain respirations, assist with artificial respiration if needed, and give oxygen if available and trained to do so. Seek medical attention. If liquid is in lungs (aspirated) seek immediate medical attention.

EYES: Flush eyes with water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persists seek medical attention.

SKIN: Remove contaminated clothing. Wash skin with soap and water. If irritation persists seek medical attention.

NFPA HEALTH = 1 (slight)

SECTION 7 – PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Extremely Flammable eliminate all sources of ignition, isolate immediate hazard area, contain spill. Use water fog to suppress vapor cloud. Use SCBA to avoid breathing vapors. Absorb liquid with dry earth, sand, clay or other noncombustible material. Do not touch or walk through spilled material.

WASTE DISPOSAL: Waste should be fully characterized and dispose in accordance with RCRA regulations. Do not put in sewers or any water course.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: All equipment and storage containers should be bonded or grounded when transferring liquid from one vessel to another to minimize accumulated static charge. This material is subject to OSHA and DOT regulations. Store only in approved containers, in a cool, dry, well-ventilated area. Place portable containers on the ground before filling.

OTHER PRECAUTIONS: **Extremely flammable** Avoid breathing vapors. Minimize skin contact. Do not weld on containers unless properly cleaned and purged using safe work procedures.

SECTION 8 – ENVIRONMENTAL AND SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Use NIOSH\MSHA approved respiratory protection in areas exceeding exposure limits, the type to be determined by the degree of exposure.

VENTILATION: Use in well ventilated area or provide ventilation to limit exposure to acceptable levels.

EYE/SKIN PROTECTION: Rubber gloves, face shields, goggles or safety glasses with side shields, coveralls.

WORK/HYGIENIC PRACTICES: Remove contaminated clothing as soon as possible. Always wash after handling hazardous chemicals.

NOTICE: This product contains a toxic chemical or chemicals subject to the reporting Requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372, as listed below:

CAS-NUMBER	CHEMICAL	WEIGHT %
71-43-2	Benzene	<1
100-41-4	Ethyl benzene	<2
110-82-7	Cyclohexane	<0.5
110-54-3	N-hexane	<4
108-88-3	Toluene	1 – 5
1330-20-7	Xylenes	2 – 4
95-63-6	1,2,4-Trimethyl benzene	<0.5
91-20-3	Naphthalene	<0.1

This notice should be included in all copies or redistribution of this Material Safety Data Sheet.

SECTION 8 - ENVIRONMENTAL AND SPECIAL PROTECTION INFORMATION(cont.)

This product contains the following components which are considered hazardous if spilled in navigable waters.

Component	Reportable Quantity
Petroleum Hydrocarbon	Film or sheen upon the water surface or discoloration of the water or adjoining shoreline

REFER TO DEPARTMENT OF TRANSPORTATION (DOT) EMERGENCY RESPONSE GUIDEBOOK GUIDE 128 FOR ADDITIONAL EMERGENCY INFORMATION.

SECTION 9 - SHIPPING DATA

DOT

Identification #: UN 1268
Shipping name: Petroleum Distillates, n.o.s.
Hazard class/division: 3
Packing group: II
Label: FLAMMABLE
Placard required: FLAMMABLE/1268
STCC No: 49-102-42

Labels are required for non- bulk packages (≤119 gal)
Placards are required for bulk packages (>119 gal)

IATA

Identification #: UN 1268
Shipping name: Petroleum Distillates, n.o.s.
Hazard class/division: 3
Packing group: II
Non-bulk package Marking: UN 1268, Petroleum Distillates, n.o.s.
Label: FLAMMABLE LIQUID

This information is believed to be accurate and as reliable as information available to us. We make no warranty or guarantee as to its accuracy and assume no liability from its use. Users should determine the suitability of the information for their particular purposes.

UNLEADED GASOLINE (ALL GRADES)
MATERIAL SAFETY DATA SHEET

Petrocom Energy Group, LLC
1330 Post Oak Blvd., Suite 2350
Houston, Texas 77056
Phone: 713-418-3000
Fax: 713-418-3001

Revision Date: 03/05/2008

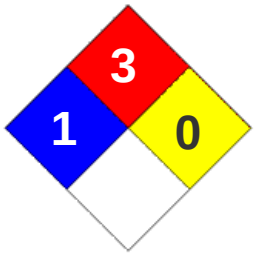
Section 1: Product Identification

Name: Unleaded Gasoline
Synonyms: Regular/Midgrade/Premium Gasoline, Motor Fuel, Reformulated Gasoline, RFG, Conventional Gasoline.
CAS No.: 86290-81-5
MSDS No.: PEG-UNL
Use: Motor fuel

Section 2: Product Composition

Component	CAS Number	Amount (%)
Gasoline	86290-81-5	0 – 100
Benzene	71-43-2	0 – 5
Toluene	108-88-3	0 – 30
Xylene (all isomers)	1330-20-7	0 – 25
Hexane (other isomers)	Mixture	5 – 25
n-Hexane	110-54-3	0 – 3
Cyclohexane	110-82-7	0 – 3
Octanes (all isomers)	Mixture	0 – 20
Heptane (all isomers)	142-82-5	0 – 15
Ethanol	64-17-5	0 – 10
Pentanes (all isomers)	Mixture	0 – 20
Trimethylbenzenes (all isomers)	95-63-6	0 – 5
Ethylbenzene	100-41-4	0 – 5
Cumene	98-82-8	0 – 5
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 – 16
Tertiary Amyl Methyl Ether (TAME)	994-05-8	0 – 6

Section 3: Hazards Identification

Emergency Overview	Hazard Rankings
DANGER! Extremely Flammable liquid and vapor Harmful if swallowed Skin Irritant May cause eye and respiratory irritation Cancer Hazard – Contains material which can cause cancer	**NFPA** 

Physical form: Liquid
Appearance: Clear to amber
Odor: Strong, Gasoline

Potential Health Effects

Eyes: Contact with eyes may cause irritation, redness, tearing, stinging, watering and blurred vision.

Skin: Contact with skin may cause irritation, itching, redness and skin damage. Prolonged or repeated contact may cause drying and cracking of the skin, and may also cause dermatitis and inflammation. (See also section 11).

Inhalation: Breathing high concentration can be harmful. Throat and lung irritation may occur. Central nervous system effects including nausea, euphoria, dizziness, headache, fatigue, drowsiness or unconsciousness may occur due to long term or high concentration exposure to vapors.

Ingestion: Toxic if swallowed. This product may cause nausea, vomiting, dizziness, drowsiness, diarrhea if swallowed. Central nervous system effects may be caused. Swallowing this product can result in severe lung damage and/or death.

Signs / Symptoms: When overexposed to this product effects such as nausea, vomiting, blurred vision, respiratory failure, central nervous system depression, unconsciousness, tremor, death may occur.

See toxicological Information (section 11)

Section 4: First Aid Measures

Eye contact: Flush eyes immediately with fresh, cool water for at least 15 minutes. If irritation or redness or any symptoms persist, seek medical attention.

Skin contact: Remove contaminated clothes and shoes. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, wash affected area thoroughly with soap and water. If irritation or redness develops, seek medical attention.

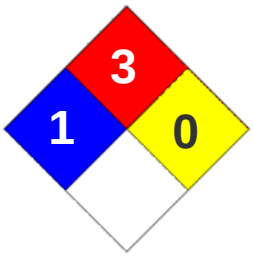
Inhalation (Breathing): If inhaled, immediately move person to fresh air. If there is difficulty breathing, give oxygen. If not breathing, immediately give artificial respiration. Seek medical attention.

Ingestion (Swallowing): This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. Do not induce vomiting. Do not give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is unconscious or drowsy, place on the left side with the head down. Seek immediate medical attention.

Notes to Physician: This material sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material.
Inhalation overexposure can produce toxic effects. Monitor respiratory distress. If difficulty in breathing evaluate upper respiratory tract inflammation, bronchitis and pneumonitis. Administer supplemental oxygen as required.
If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Cinsuder activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubtion or by placement of the body in a Trendelenburg and left lateral decubitus position.

Section 5: Fire Fighting Measures

NFPA Hazard Class: Health = 1 ; Flammability = 3 ; Instability = 0
(0 – Minimal ; 1 – Slight ; 2 – Moderate ; 3 – Serious ; 4 – Severe)



Auto – ignition temperature : >260 ˚C (500 ˚F)

Flash point **:** Closed cup: **-**43 ˚C (-45 ˚F)

Flammable limits **:** Lower: approximately 1.4%
Upper: approximately 7.6%

Products of combustion **:** Carbon monoxide, carbon dioxide, nitrogen and sulfur oxides, smoke, fumes, unburned hydrocarbons and other products of incomplete combustion.

Special properties **:** Flammable liquid! This material can be ignited by heat, sparks, flames or other sources of ignition. Vapors may travel long distances to a source where they can ignite and flash back, or explode. A mixture of vapor and air can create an explosion hazard in confined spaces. If container is not properly cooled, it can rupture n the heat of a fire.

Extinguishing media **:** Use of dry chemical, carbon dioxide, or foam is recommended to extinguish fire. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may not extinguish the fire, unless it is used by experienced fire fighters and under favorable conditions.

Protective Equipment for Fire Fighters **:** Fire fighters should wear appropriate protective equipment and self contained breathing apparatus (SCBA) with a full face piece operated in positive pressure mode.

Section 6: Accidental Release Measures

Personal precautions: This material is extremely flammable. Eliminate all ignition sources. Keep all hot metal surfaces away from spill/release. All equipment used when handling this material must be grounded.

Spill precautions: Stay upwind and away from spill. Notify persons down wind of the spill, isolate spill area and keep unauthorized personnel out. If it can be done with minimal risk, try to stop spill. Always wear protective equipment, including respiratory protection. Contact emergency personnel.

Environmental precautions: Prevent spilled material from entering sewers, drains, soil, and natural waterways. Use foam or spills to minimize vapors (section 5). Spilled material may be absorbed into an appropriate absorbent material.

Methods for cleaning up: Notify fire authorities and appropriate federal, state and local agencies. Immediate cleanup is recommended.

Section 7: Handling and Storage

Handling: Flammable liquid and vapor. To be used only as a motor fuel. Avoid inhalation of vapors and contact with skin. Wash hands thoroughly after handling this material. Use in a well ventilated area away from all ignition sources. Use product with caution around heat, sparks, static electricity and open flames. Static electricity may ignite vapors and cause fire.

Empty containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks or other ignition sources. The may explode and cause injury and/or death. Empty drums should be completely drained, properly bunged, and returned promptly to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Storage: Store in approved containers only. Keep in tightly closed containers in cool, dry, well ventilated areas. Keep isolated away from heat, sources of ignition and hot metal surfaces.

Section 8: Exposure Controls / Personal Protection

Engineering controls: Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below their occupational exposure limits. Eyewash stations and safety showers should be located near the work-station.

Personal Protection

Eye Protection: Keep away from eyes. Safety glasses complying with approved standards should be worn. Chemical type goggles should be worn.

Skin Protection: Keep away from skin. Skin protection should be worn. Chemical resistant, impervious gloves should be worn. Always follow good personal hygiene practices after handling the material.

Respiratory Protection: Approved respiratory equipment must be used if a risk assessment indicates it is necessary. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn.

General Protection: Use this material in well ventilated areas. Ventilation equipment should be explosion proof also.

Component	Applicable Workplace Exposure Limits
Gasoline	ACGIH – TWA: 300 ppm (8 hours) STEL: 500 ppm (15 minutes)
Benzene	ACGIH – TWA: 0.5 ppm (8 hours) STEL: 2.5 ppm (15 minutes) OSHA – TWA: 1 ppm (8 hours) STEL: 5 ppm (15 minutes)
Toluene	ACGIH – TWA: 20 ppm (8 hours) OSHA – TWA: 200 ppm (8 hours) CEIL: 300 ppm PEAK: 500 ppm (10 minutes)
Xylene (all isomers)	ACGIH – TWA: 100 ppm (8 hours) STEL: 150 ppm (15 minutes) OSHA – TWA: 100 ppm (8 hours)
Hexane (other isomers)	ACGIH – TWA: 500 ppm (8 hours) STEL: 1000 ppm (15 minutes)
n-Hexane	ACGIH – TWA: 50 ppm (8 hours) OSHA – TWA: 500 ppm (8 hours)
Cyclohexane	ACGIH – TWA: 100 ppm (8 hours) OSHA – TWA: 300 ppm (8 hours)
Octanes (all isomers)	ACGIH – TWA: 300 ppm (8 hours) OSHA – TWA: 500 ppm (8 hours)
Heptane (all isomers)	ACGIH – TWA: 400 ppm (8 hours) STEL: 5000 ppm (15 minutes) OSHA – TWA: 500 ppm (8 hours)
Ethanol	ACGIH – TWA: 1000 ppm (8 hours) OSHA – TWA: 1000 ppm (8 hours)
Pentanes (all isomers)	ACGIH – TWA: 600 ppm (8 hours) OSHA – TWA: 1000 ppm (8 hours)
Trimethylbenzenes (all isomers)	ACGIH – TWA: 25 ppm (8 hours)
Ethylbenzene	ACGIH – TWA: 100 ppm (8 hours) STEL: 125 ppm (15 minutes) OSHA – TWA: 100 ppm (8 hours)
Cumene	ACGIH – TWA: 50 ppm (8 hours) OSHA – TWA: 50 ppm (8 hours)
Methyl Tertiary Butyl Ether (MTBE)	ACGIH – TWA: 50 ppm (8 hours)
Tertiary Amyl Methyl Ether (TAME)	ACGIH – TWA: 20 ppm (8 hours)

Section 9: Physical and Chemical Properties

Physical State:	Liquid.
Color:	Transparent, clear to amber liquid.
Odor:	Strong. Characteristic gasoline odor.
pH:	Not applicable
Boiling Point:	>26 ˚C (>78 ˚F)
Melting Point:	Not applicable.
Specific gravity:	0.66 to 0.75 (Water = 1)
Vapor density:	3 to 4 (Air = 1)
Vapor pressure:	220-450 mm Hg at 20˚C (68˚F) / 6-15 Reid-psia at 37.8˚C (100˚F)
Volatility:	720 – 770 g/l VOC (w/v)
Viscosity (at 40 ˚C):	< 1
Flash Point:	< -45 ˚F / < 43˚C
Bulk Density:	6.0 – 6.4 lbs/gal
Solubility in water:	Negligible

Section 10: Stability and Reactivity

Stability:	Stable. Extremely flammable liquid and vapor. Vapor can cause fire.
Conditions to avoid:	Keep away from heat, flame and all other possible sources of ignition.
Materials to avoid:	Keep away from strong oxidizing agents such as acids, chlorine, hydrogen peroxide and oxygen.
Hazardous decomposition products:	Please refer to the combustion products identified in Section 5 of this MSDS.
Hazardous Polymerization:	Not expected to occur.

Section 11: Toxicological Information

Toxicology Information

Oral toxicity: Almost non-toxic. LD 50: > 2000 mg/kg (species: rats)
Dermal toxicity: Almost non-toxic. LD 50: > 2000 mg/kg (species: rabbits)
Inhalation toxicity: Almost non-toxic. LD 50: > 5 mg/l (species: rats)
Eye irritation: Almost non-irritating. Draize score: > 6 and < 15 (species: rabbits)
Skin irritation: Irritant. Primary irritation index: > 3 and < 5 (species: rabbits)

Other data: Inhalation of high concentrations of vapors or mists may cause respiratory system irritation and damage. It may also result in the damage and depression of the central nervous system and may cause death. Prolonged contact with the material may cause severe skin irritation.

Subchronic toxicity: Dermal studies resulted in significant irritation but not systematic toxicity (species: rabbits). Inhalation exposures (90 day, approximately 1500 ppm vapor) produced light hydrocarbon nephropathy but no significant systemic toxicity (species: rats).

Neurotoxicity: Repeated and prolonged exposures to high concentrations of vapor has been reported to result in central nervous system damage and eventually, death. In a study in which ten human volunteers were exposed for 30 minutes to approximately 200, 500 or 1000 ppm concentrations of gasoline vapor, irritation of the eyes was the only significant effect observed, based on both subjective and objective assessments.
However, no persistent neurotoxic effects were observed in subchronic inhalation studies of gasoline.

Reproductive toxicity: An inhalation study with rats exposed to 0, 400 and 1600 ppm of wholly vaporized unleaded gasoline, 6 hours per day on day 6 through 16 of gestation, showed no teratogenic effects nor indication of toxicity to either the mother or the fetus. Another inhalation study in rats exposed to 3000, 6000, or 9000 ppm of gasoline vapor, 6 hours per day on day 6 through 20 of gestation, also showed no teratogenic effects nor indications of toxicity to either the mother or the fetus.

Chronic toxicity: A lifetime mouse skin painting study of unleaded gasoline applied at 50 microliters, three time weekly, resulted in some severe skin irritation and changes, but no statistically significant increase in skin cancer or cancer to any other organ. Lifetime inhalation of wholly vaporized unleaded gasoline over 2000 ppm has caused increased liver tumors in female mice and increased kidney tumors in male rats. The EPA has concluded that mechanism by which wholly vaporzied unleaded gasoline causes kidney damage is unque to the male rat. The effects in that species (kidney damage and cancer) should not be used in human risk assessment.

Other toxic effects on humans

Extremely hazardous in case of ingestion.
Very hazardous in case of eye contact.
Hazardous in case of skin contact.
Slightly hazardous in case of inhalation.

Carcinogenic effects:

Contains material that may cause cancer depending on the level and duration of exposure.

Target organs:

Contains material that may cause damage to humans organs such as (but not limited to) blood, kidneys, lungs, liver, eye, skin, nervous system and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity:

This material may be toxic to aquatic organisms such as algae and daphnia. It has also shown to be toxic to fish.

Environmental fate:

The material is expected to be readily biodegradable. When released into the environment, some of the constituents of gasoline will volatilize and be photo degraded in the atmosphere. Following spillage, the more volatile components of gasoline will be rapidly lost, with concurrent dissolution of these and other constituents into the water. Factors such as local environmental conditions, photo-oxidation, biodegradation and adsorption onto suspended sediments, can contribute to the weathering of spilled gasoline.

Section 13: Disposal Considerations

Waste disposal:

Avoid disposal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product and any of its by products should always comply with the requirements of environmental protection and waste disposal legislation and any local authority requirements.
This material would likely be identified as a federally regulated RCRA hazardous waste. See sections 7 and 8 for further information on handling, storage and personal protection. See section 9 for the material's physical and chemical properties.

Section 14: Transportation Information

This material is U.S Department of Transportation (DOT) regulated material.

Shipping name: Gasoline, 3, UN 1203, PG II
Gasohol, 3, NA 1203, PG II (for gasoline blended with less than 20% ethanol).

Hazard class: 3 DOT Class: Flammable liquid

Packing Group: II

UN / NA Number: UN1203 / NA1203

Emergency Response Code: 128

Label:

Section 15: Regulatory Information

TSCA Inventory: This product and/or its components are listed on the Toxic Substances Control Act (TSCA)

SARA 302 / 304: Emergency planning and notification The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for “Extremely Hazardous Substances” listed in 40 CFR 302.4 and CFR 355. No components were identified.

SARA 311 / 312: Hazard identification SARA Title III requires facilities subject to this subpart to submit aggregate information on chemicals by “Hazard Category” as defined in 40 CFR 370.2. This material would be classified under: Fire, Acute (immediate) Health Hazard, Chronic (Delayed) Health Hazard.

CERCLA / SARA 313: Toxic and chemical notification and release reporting

This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372

Component	CAS Number	Amount (%)
Benzene	71-43-2	0 – 5
Toluene	108-88-3	0 – 30
Xylene (o, m, p isomers)	1330-20-7	0 – 25
n-Hexane	110-54-3	0 – 3
Cyclohexane	110-82-7	0 – 3
1, 2, 4 Trimethylbenzenes	95-63-6	0 – 5
Ethylbenzene	100-41-4	0 – 5
Cumene	98-82-8	0 – 5
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 – 16

California Proposition 65: This material may contain detectable quantities of the following chemicals known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):
Benzene (CAS NO. 71-43-3)
Toluene (CAS No. 108-88-3)
Ethylbenzene (CAS No. 100-41-4)
Naphthalene (CAS No. 91-20-3)

Canadian Regulations: WHMIS Hazard Class: B2 – Flammable Liquids
D2A – Very Toxic Material

Section 16: Other Information

Issue date: March 5, 2008
Previous issue date: No previous date
Version: 1
MSDS Code: PEG-UNL

Legend:
ACGIH = American Conference of Governmental Industrial Hygienists
CAS = Chemical Abstracts Service Registry
CEIL = Ceiling Limit
CERCLA = The Comprehensive Environmental Response, Compensation and Liability Act
EPA = Environmental Protection Agency
NFPA = National Fire Protection Association
OSHA = Occupational Safety and Health Administration
SARA = Superfund Amendments and Reauthorization Act
STEL = Short Term Exposure Limit (15 minutes)
TWA = Time Weighted Average (8 hours)
WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer:
The information presented in this Material Safety Data Sheet (MSDS) d on data believed to be accurate as of the issuance date of this MSDS. No warranty is expressed or implied for the accuracy or completeness of the above provided information. Petrocom Energy Group, LLC does not assume any liability for any damage or injury arising out of product use by others. The end user of the product has the responsibility for evaluating the accuracy of the data, and determining the safety, toxicity and suitability of the product under any conditions.

No. 2 Diesel Fuel

Material Safety Data Sheet

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name: No. 2 Diesel Fuel

MSDS Code: 001847

Synonyms:
CARB Diesel TF3; CARB Diesel; CARB Diesel 10%
CARB Diesel Ultra Low Sulfur - Dyed and Undyed
EPA Low Sulfur Diesel Fuel - Dyed and Undyed
EPA Off Road High Sulfur Diesel - Dyed
High Sulfur Diesel Fuel; Low Sulfur Diesel Fuel
No. 2 Diesel Fuel Oil
No. 2 High Sulfur Diesel - Dyed
No. 2 Low Sulfur Diesel - Dyed; No. 2 Low Sulfur Diesel - Undyed
No. 2 Low Sulfur Distillate
No. 2 Ultra Low Sulfur Diesel - Dyed; No. 2 Ultra Low Sulfur Diesel - Undyed
Super Diesel Fuel; Super Diesel Fuel II-LS
Virgin Diesel Fuel; No. 2 Distillate
ULSD
Super Diesel Fuel; Super Diesel Fuel II-LS
Virgin Diesel Fuel

Intended Use: Fuel

Responsible Party:
ConocoPhillips
600 N. Dairy Ashford
Houston, Texas 77079-1175

MSDS Information:
Phone: 800-762-0942
Email: MSDS@conocophillips.com
Internet: http://w3.conocophillips.com/NetMSDS/

Emergency Telephone Numbers:
Chemtrec: 800-424-9300 (24 Hours)
California Poison Control System: 800-356-3219

2. HAZARDS IDENTIFICATION

Emergency Overview

WARNING!
Flammable Liquid and Vapor
Skin Irritant
Aspiration Hazard

NFPA

Appearance: Straw colored to dyed red
Physical Form: Liquid
Odor: Diesel fuel

Potential Health Effects
Eye: Contact may cause mild eye irritation including stinging, watering, and redness.

Skin: Mild to moderate skin irritant. Contact may cause redness, itching, a burning sensation, and skin damage. Prolonged or repeated contact may cause drying and cracking of the skin, dermatitis (inflammation), burns, and severe skin damage. No harmful effects from skin absorption have been reported.

Inhalation (Breathing): No information available on acute toxicity. See signs and symptoms.

Ingestion (Swallowing): Low degree of toxicity by ingestion. ASPIRATION HAZARD - This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage.

Signs and Symptoms: Effects of overexposure may include irritation of the respiratory tract, irritation of the digestive tract, nausea, diarrhea, signs of nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue).

Pre-Existing Medical Conditions: Conditions aggravated by exposure may include skin disorders.

See Section 11 for additional Toxicity Information.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS	Concentration (wt %)
Diesel Fuel No. 2	68476-34-6	100
Naphthalene	91-20-3	<1

4. FIRST AID MEASURES

Eye: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention.

Inhalation (Breathing): Immediately move victim away from exposure and into fresh air. If respiratory symptoms or other symptoms of exposure develop, seek immediate medical attention. If victim is not breathing, clear airway and immediately begin artificial respiration. If breathing difficulties develop, oxygen should be administered by qualified personnel. Seek immediate medical attention.

Ingestion (Swallowing): Aspiration hazard: Do not induce vomiting or give anything by mouth because this material can enter the lungs and cause severe lung damage. If victim is drowsy or unconscious and vomiting, place on the left side with the head down. If possible, do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

5. FIRE-FIGHTING MEASURES

NFPA 704 Hazard Class

Health: 1 **Flammability:** 2 **Instability:** 0 (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

Unusual Fire & Explosion Hazards: This material is flammable and can be ignited by heat, sparks, flames, or other sources of ignition (e.g., static electricity, pilot lights, or mechanical/electrical equipment, and electronic devices such as cell phones, computers, calculators, and pagers which have not been certified as intrinsically safe). Vapors may travel considerable distances to a source of ignition where they can ignite, flash back, or explode. May create vapor/air explosion hazard indoors, in confined spaces, outdoors, or in sewers. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media: Dry chemical, carbon dioxide, or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

Fire Fighting Instructions: For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by DOT, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area, keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Move undamaged containers from immediate hazard area if it can be done with minimal risk.

Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done with minimal risk. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: Flammable. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof electrical equipment is recommended.

Spill precautions: Stay upwind and away from spill/release. Notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done with minimal risk. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8).

Environmental precautions: Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Use foam on spills to minimize vapors (see Section 5). Spilled material may be absorbed into an appropriate absorbent material.

Methods for cleaning up: Notify fire authorities and appropriate federal, state, and local agencies. Immediate cleanup of any spill is recommended. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, notify the National Response Center (phone number 800-424-8802).

7. HANDLING AND STORAGE

Handling: Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. The use of explosion-proof electrical equipment is recommended and may be required (see appropriate fire codes). Refer to NFPA-704 and/or API RP 2003 for specific bonding/grounding requirements. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits (see Section 8).

Do not wear contaminated clothing or shoes. Keep contaminated clothing away from sources of ignition such as sparks or open flames. Use good personal hygiene practices.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

Storage: Keep container(s) tightly closed. Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces, and all sources of ignition. Post area "No Smoking or Open Flame." Store only in approved containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Component	ACGIH	OSHA	Other:
Diesel Fuel No. 2	TWA: 100 mg/m^3 Skin	---	---

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits additional engineering controls may be required. Where explosive mixtures may be present, electrical systems safe for such locations must be used (see appropriate electrical codes).

Personal Protective Equipment (PPE):

Eye/Face: Approved eye protection to safeguard against potential eye contact, irritation, or injury is recommended. Depending on conditions of use, a face shield may be necessary.

Skin: The use of nitrile gloves impervious to the specific material handled is advised to prevent skin contact, possible irritation, and skin damage (see glove manufacturer literature for information on permeability). Depending on conditions of use, nitrile apron and/or arm covers may be necessary.

Respiratory: A NIOSH certified air purifying respirator with an organic vapor cartridge may be used under conditions where airborne concentrations are expected to exceed exposure limits.

Protection provided by air purifying respirators is limited (see manufacturer's respirator selection guide). Use a NIOSH approved self-contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode If there is potential for an oxygen-deficient atmosphere, uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection.

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse. It is recommended that impervious clothing be worn when skin contact is possible.

Suggestions for the use of specific protective materials are based on readily available published data. Users should check with specific manufacturers to confirm the performance of their products.

9. PHYSICAL AND CHEMICAL PROPERTIES

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm).

Appearance:	Straw colored to dyed red
Physical Form:	Liquid
Odor:	Diesel fuel
Odor Threshold:	No data
pH:	Not applicable
Vapor Pressure:	0.40 mm Hg
Vapor Density (air=1):	> 3
Boiling Point/Range:	300-690°F / 149-366°C
Melting/Freezing Point:	No data
Solubility in Water:	Negligible
Partition Coefficient (n-octanol/water) (Kow):	No data
Specific Gravity:	0.81-0.88 @ 60°F (15.6°C)
Bulk Density:	7.08 lbs/gal
Percent Volatile:	Negligible @ ambient conditions
Evaporation Rate (nBuAc=1):	<1
Flash Point:	125-180°F / 52-82°C
Test Method:	Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
LEL (vol % in air):	0.3
UEL (vol % in air):	10.0
Autoignition Temperature:	500°F / 260°C

10. STABILITY AND REACTIVITY

Stability: Stable under normal ambient and anticipated storage and handling conditions of temperature and pressure. Flammable liquid and vapor. Vapor can cause flash fire.

Conditions to Avoid: Avoid all possible sources of ignition (see Sections 5 and 7).

Materials to Avoid (Incompatible Materials): strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc..

Hazardous Decomposition Products: Combustion can yield carbon, nitrogen and sulfur oxides. The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels. Diesel engine exhaust contains hazardous combustion products and has been classified as a probable cancer hazard in humans.

Hazardous Polymerization: Will not occur.

11. TOXICOLOGICAL INFORMATION

Chronic Data:

Diesel Fuel No. 2

Carcinogenicity: Petroleum middle distillates have been shown to cause skin tumors in mice following repeated and prolonged skin contact. Follow-up studies have shown that these tumors are produced through a non-genotoxic mechanism associated with frequent cell damage and repair, and that they are not likely to cause tumors in the absence of prolonged skin irritation. Animal studies have also shown that washing the skin with soap and water can reduce the tumor response. Middle distillates with low polynuclear aromatic hydrocarbon content have not been identified as a carcinogen by NTP, IARC or OSHA. Diesel exhaust has been identified as a probable cancer hazard by IARC

Target Organs: Limited evidence of renal impairment has been noted from a few older case reports involving excessive exposure to diesel fuel No. 2. However, renal toxicity has not been demonstrated to be a consistent finding of diesel fuel exposure.

Naphthalene

Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Acute Data:

Component	Oral LD50	Dermal LD50	Inhalation LC50
Diesel Fuel No. 2	9 ml/kg (Rat)	>5ml/kg (Rabbit)	No data available

12. ECOLOGICAL INFORMATION

When middle distillate hydrocarbons escape into the environment due to leaks or spills, most of their constituent hydrocarbons will evaporate and be photodegraded by reaction with hydroxyl radicals in the atmosphere. The half-lives in air for many of the individual hydrocarbons is less than one day. Less volatile hydrocarbons can persist in the aqueous environment for longer periods. They remain floating on the surface of the water; those that reach soil or sediment biodegrade relatively slowly. Soil contaminated with middle distillates can develop adapted microbial species able to use the fuel as a carbon source; soil aeration and nutrient supplementation can enhance this biodegradation.

Reported LC50/EC50 values for water-soluble fractions of middle distillates are usually in the range of 10 to 100 mg/liter. Adverse effects on the gills, pseudobranch, kidney and nasal mucosa have been reported in fish involved in spills of middle distillates. Juvenile clams may be particularly sensitive to marine sediments contaminated as a result of spilled material. Direct toxicity and fouling of sea birds can occur if birds dive through floating layers of spilled material.

Phytotoxic effects of middle distillate hydrocarbons have been reported following exposure of plants to sprays or vapors. Lack of seed germination and inhibition of seedling growth may also occur. There is evidence for moderate bioaccumulation of the water-soluble hydrocarbons present in middle distillates.

13. DISPOSAL CONSIDERATIONS

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations.

This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste. However, it would likely be identified as a federally regulated RCRA hazardous waste for the following characteristic(s) shown below. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the MSDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste.

Container contents should be completely used and containers should be emptied prior to discard. Container residues and rinseates could be considered to be hazardous wastes.

EPA Waste Number(s)

- D001 - Ignitability characteristic

14. TRANSPORTATION INFORMATION

U.S. Department of Transportation (DOT)

14. TRANSPORTATION INFORMATION

Shipping Description: Diesel fuel, Combustible liquid, NA1993, III
Non-Bulk Package Marking: Not Regulated ***[49 CFR 173.150(f)(2)]***
Non-Bulk Package Labeling: Not Regulated ***[49 CFR 173.150(f)(2)]***
Bulk Package/Placard Marking: Combustible/1993
Packaging - References: None; none; 49 CFR 173.241
(Exceptions; Non-bulk; Bulk)
Emergency Response Guide: 128
Note: ***May also be shipped as:*** Diesel fuel, Combustible liquid, UN1202, III
Bulk Pakcage/Placard Marking would also be changed to: 1202

International Maritime Dangerous Goods (IMDG)

Shipping Description: ***Not regulated if flashpoint is >60° C closed-cup***
UN1202, Diesel fuel, 3, III , (FP° C), *where FP is the material's flash point in degrees C.*
Non-Bulk Package Marking: Diesel fuel, UN1202
Labels: Flammable liquid
Placards/Marking (Bulk): Flammable/1202
Packaging - Non-Bulk: P001, LP01
EMS: F-E, S-E
Note: ***May also replace*** Diesel fuel ***with*** Gas Oil ***or*** Heating Oil, light ***as the Shipping Name***

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)

UN/ID #: ***Not regulated if flashpoint is >60° C cc***
UN1202
Proper Shipping Name: Diesel fuel
Hazard Class/Division: 3
Packing Group: III
Non-Bulk Package Marking: Diesel fuel, UN1202
Labels: Flammable liquid
ERG Code: 3L

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	Y309	309	310
Max. Net Qty. Per Package:	10 L	60 L	220 L

15. REGULATORY INFORMATION

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

CERCLA/SARA - Section 311/312 (Title III Hazard Categories)

Acute Health: Yes
Chronic Health: Yes
Fire Hazard: Yes
Pressure Hazard: No
Reactive Hazard: No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Component	Concentration (wt %)	de minimis
Naphthalene	<1	0.1%

EPA (CERCLA) Reportable Quantity (in pounds):
EPA's Petroleum Exclusion applies to this material - (CERCLA 101(14)).

California Proposition 65:
Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5):

Component	Type of Toxicity
Toluene	Developmental Toxicant
Benzene	Cancer Developmental Toxicant Male Reproductive Toxicant
Naphthalene	Cancer

Diesel engine exhaust, while not a component of this material, is on the Proposition 65 list of chemicals known to the State of California to cause cancer.

Canadian Regulations:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
B3 - Combustible Liquids
D2A - Very Toxic Material
D2B - Toxic Material

National Chemical Inventories:

Component	AICS	DSL	NDSL	CHINA	ELINCS	EINECS	ENCS	KOREA	PICCS	TSCA
Diesel Fuel No. 2 68476-34-6	X	X		X		X		X	X	X

U.S. Export Control Classification Number: EAR99

16. OTHER INFORMATION

Issue Date: 12-Mar-2007
Status: Final
Product Code: Multiple
Revised Sections or Basis for Revision: Fire Fighting information (Section 5)
MSDS Code: 001847

MSDS Legend:
ACGIH = American Conference of Governmental Industrial Hygienists; CAS = Chemical Abstracts Service Registry; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; IARC = International Agency for Research on Cancer; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.

MATERIAL SAFETY DATA SHEET

1. Product and Company Identification

Material name	**No. 6 Fuel Oil**
Revision date	01-06-2012
Version #	02
MSDS Number	203
Product use	Refinery feedstock.
Synonym(s)	Residual Fuel Oil, Resid, Residue, Heavy Fuel Oil See section 16 for complete information.
Manufacturer/Supplier	Valero Marketing & Supply Company and Affiliates P.O. Box 696000 San Antonio, TX 78269-6000
General Assistance	210-345-4593
Emergency	24 Hour Emergency 866-565-5220 1-800-424-9300 (CHEMTREC USA)

2. Hazards Identification

Physical state	Liquid.
Appearance	Thick, black, oily liquid.
Emergency overview	WARNING! Combustible liquid and vapor. Will be easily ignited by heat, spark or flames. Heat may cause the containers to explode. Harmful if inhaled, absorbed through skin, or swallowed. Aspiration may cause lung damage. Irritating to eyes, respiratory system and skin. In high concentrations, vapors and spray mists are narcotic and may cause headache, fatigue, dizziness and nausea. Cancer hazard. Mutagen. May cause heritable genetic damage. May cause adverse reproductive effects - such as birth defects, miscarriages, or infertility. Contains polycyclic aromatic compounds which have been shown to cause anemia, disorders of the liver, bone marrow and lymphoid tissues in rats following dermal application. Exhaust Fumes have been reported to be an occupational hazard due to NIOSH-reported potential carcinogenic properties. Hydrogen sulfide, a highly toxic gas, may be present or released. Signs and symptoms of overexposure to hydrogen sulfide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odor does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. Prolonged exposure may cause chronic effects. Toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment. Static accumulating flammable materials can become electrostatically charged even in bonded and grounded equipment. Sparks may ignite material and vapor may cause flash fire (or explosion).
OSHA regulatory status	This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).
Potential health effects	
Routes of exposure	Inhalation. Ingestion. Skin contact. Eye contact.
Eyes	Contact may irritate or burn eyes. Eye contact may result in corneal injury.
Skin	Harmful if absorbed through skin. Irritating to skin. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.
Inhalation	Harmful if inhaled. Irritating to respiratory system. In high concentrations, vapors and spray mists are narcotic and may cause headache, fatigue, dizziness and nausea. May cause breathing disorders and lung damage. May cause cancer by inhalation. Prolonged inhalation may be harmful.
Ingestion	Harmful if swallowed. Ingestion may result in vomiting; aspiration (breathing) of vomitus into lungs must be avoided as even small quantities may result in aspiration pneumonitis. Irritating to mouth, throat, and stomach.
Target organs	Blood. Eyes. Liver. Respiratory system. Skin. Kidneys. Central nervous system.

Chronic effects Cancer hazard. Contains material which may have reproductive toxicity, teratogenetic or mutagenic effects. Liver injury may occur. Kidney injury may occur. Contains polycyclic aromatic compounds which have been shown to cause anemia, disorders of the liver, bone marrow and lymphoid tissues in rats following dermal application. May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage. Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis.

Signs and symptoms Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Cyanosis (blue tissue condition, nails, lips, and/or skin). Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash.

Potential environmental effects Toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

3. Composition / Information on Ingredients

Components	CAS #	Percent
Clarified oils (Petroleum), catalytic cracked	64741-62-4	0-100
Clarified oils (petroleum), hydrodesulfurized catalytic cracked	68333-26-6	0-100
Distillates (petroleum), heavy catalytic cracked	64741-61-3	0-100
Distillates, petroleum residues vacuum	68955-27-1	0-100
Fuel Oil No. 6	68553-00-4	0-100
Residues (petroleum), light vacuum	68512-62-9	0-100
Polycyclic Aromatic Hydrocarbons	130498-29-2	0-10
Asphaltenes (petroleum)	91995-23-2	0-5
Naphthalene	91-20-3	0-3
Hydrogen sulfide	7783-06-4	0-1
Sulfur	7704-34-9	0-1

Composition comments Small amount of hydrogen sulfide, a highly toxic gas, may be present, especially in the headspace of containers.

4. First Aid Measures

First aid procedures

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.

Skin contact Remove contaminated clothing and shoes. Wash off immediately with soap and plenty of water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes. If high pressure injection under the skin occurs, always seek medical attention.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

Ingestion Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Do not give mouth-to-mouth resuscitation. If vomiting occurs, keep head low so that stomach content does not get into the lungs. Get medical attention immediately.

Notes to physician In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.

General advice If exposed or concerned: get medical attention/advice. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

5. Fire Fighting Measures

Flammable properties Combustible by OSHA criteria. Containers may explode when heated.

Extinguishing media

Suitable extinguishing media Water spray. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO_2).

Unsuitable extinguishing media Do not use a solid water stream as it may scatter and spread fire.

Protection of firefighters

Specific hazards arising from the chemical	Vapor may cause flash fire. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.
Protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire fighting equipment/instructions	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of tanks due to fire. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Cool containers exposed to flames with water until well after the fire is out. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Vapors may form explosive air mixtures even at room temperature. Prevent buildup of vapors or gases to explosive concentrations. Some of these materials, if spilled, may evaporate leaving a flammable residue. Water runoff can cause environmental damage. Use compatible foam to minimize vapor generation as needed.
Specific methods	In the event of fire and/or explosion do not breathe fumes. Use water spray to cool unopened containers.
Hazardous combustion products	Carbon monoxide. Carbon Dioxide. Sulfur oxides. Hydrocarbons.

6. Accidental Release Measures

Personal precautions	Keep unnecessary personnel away. Local authorities should be advised if significant spills cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 of the MSDS for Personal Protective Equipment.
Environmental precautions	If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Flammable. Review Firefighting Measures, Section 5, before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g. by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Use compatible foam to minimize vapor generation as needed. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 1-800-424-8802. For highway or railways spills, contact Chemtrec at 1-800-424-9300.
Methods for containment	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if you can do so without risk. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up	Use non-sparking tools and explosion-proof equipment. Small Spills: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste. Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system. Should not be released into the environment.
Other information	Clean up in accordance with all applicable regulations.

7. Handling and Storage

Handling

Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity.
Wear personal protective equipment. Do not breathe dust/fume/gas/mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Avoid prolonged exposure. Use only with adequate ventilation. Wash thoroughly after handling. The product is extremely flammable, and explosive vapor/air mixtures may be formed even at normal room temperatures. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. When using, do not eat, drink or smoke. Avoid release to the environment.

Storage

Flammable liquid storage. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. The pressure in sealed containers can increase under the influence of heat. Keep container tightly closed in a cool, well-ventilated place. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. Exposure Controls / Personal Protection

Occupational exposure limits

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Clarified oils (Petroleum), catalytic cracked (64741-62-4)	TWA	5 mg/m3	Inhalable fraction.
Distillates (petroleum), heavy catalytic cracked (64741-61-3)	TWA	5 mg/m3	Inhalable fraction.
Fuel Oil No. 6 (68553-00-4)	TWA	5 mg/m3	Inhalable fraction.
Hydrogen sulfide (7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
Naphthalene (91-20-3)	STEL	15 ppm	
	TWA	10 ppm	

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value	Form
Clarified oils (Petroleum), catalytic cracked (64741-62-4)	PEL	5 mg/m3	Mist.
Fuel Oil No. 6 (68553-00-4)	PEL	5 mg/m3	Mist.
Naphthalene (91-20-3)	PEL	50 mg/m3	
		10 ppm	

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value
Hydrogen sulfide (7783-06-4)	Ceiling	20 ppm

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value	Form
Clarified oils (Petroleum), catalytic cracked (64741-62-4)	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Fuel Oil No. 6 (68553-00-4)	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Hydrogen sulfide (7783-06-4)	Ceiling	21 mg/m3	
		15 ppm	
	TWA	14 mg/m3	
		10 ppm	
Naphthalene (91-20-3)	STEL	79 mg/m3	
		15 ppm	
	TWA	52 mg/m3	
		10 ppm	

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value	Form
Sulfur (7704-34-9)	TWA	10 mg/m3	

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Components	Type	Value	Form
Clarified oils (Petroleum), catalytic cracked (64741-62-4)	TWA	1 mg/m3	Mist.
Distillates (petroleum), heavy catalytic cracked (64741-61-3)	TWA	1 mg/m3	Mist.
Fuel Oil No. 6 (68553-00-4)	TWA	1 mg/m3	Mist.
Hydrogen sulfide (7783-06-4)	Ceiling	10 ppm	
Naphthalene (91-20-3)	STEL	15 ppm	
	TWA	10 ppm	

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
Hydrogen sulfide (7783-06-4)	STEL	15 ppm
	TWA	10 ppm
Naphthalene (91-20-3)	STEL	15 ppm
	TWA	10 ppm

Canada. Quebec OELS. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value	Form
Clarified oils (Petroleum), catalytic cracked (64741-62-4)	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Distillates (petroleum), heavy catalytic cracked (64741-61-3)	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Hydrogen sulfide (7783-06-4)	STEL	21 mg/m3	
		15 ppm	
	TWA	14 mg/m3	
		10 ppm	
Naphthalene (91-20-3)	STEL	79 mg/m3	
		15 ppm	
	TWA	52 mg/m3	
		10 ppm	

Mexico. Occupational Exposure Limit Values

Components	Type	Value	Form
Clarified oils (Petroleum), catalytic cracked (64741-62-4)	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Fuel Oil No. 6 (68553-00-4)	STEL	10 mg/m3	Mist.
	TWA	5 mg/m3	Mist.
Hydrogen sulfide (7783-06-4)	STEL	21 mg/m3	
		15 ppm	
	TWA	14 mg/m3	
		10 ppm	
Naphthalene (91-20-3)	STEL	75 mg/m3	
		15 ppm	
	TWA	50 mg/m3	
		10 ppm	

Engineering controls

Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment.

Personal protective equipment

Eye / face protection	Wear safety glasses. If splash potential exists, wear full face shield or chemical goggles.
Skin protection	Wear chemical-resistant, impervious gloves. Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn. Proper respirator selection should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. This equipment should be available for nonroutine and emergency use.
General hygiene considerations	Consult supervisor for special handling instructions. Avoid contact with eyes. Avoid contact with skin. Keep away from food and drink. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance	Thick, black, oily liquid.
Color	Black.
Odor	Petroleum.
Odor threshold	Not available.
Physical state	Liquid.
Form	Oily liquid.
pH	Not applicable.
Melting point	Not available.
Freezing point	Not available.
Boiling point	350 - 1200 °F (176.69 - 648.89 °C)
Flash point	> 141.8 °F (> 61 °C) Pensky-Martens Closed Cup
Evaporation rate	Not available.
Flammability	Combustible.
Flammability limits in air, upper, % by volume	7
Flammability limits in air, lower, % by volume	0.9
Vapor pressure	< 0.7 kPa (20°C)
Vapor density	> 5 (Air = 1)
Specific gravity	0.88 - 1.02 (water=1)
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	> 600.1 °F (> 315.59 °C)
Decomposition temperature	Not available.

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal temperature conditions and recommended use.
Conditions to avoid	Heat, flames and sparks. Ignition sources. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Strong oxidizing agents. Acids. Alkalis.
Hazardous decomposition products	Carbon oxides. Nitrogen oxides. Sulfur oxides. Hydrocarbons.
Possibility of hazardous reactions	Hazardous polymerization does not occur.

11. Toxicological Information

Toxicological data

Components	Test Results
Hydrogen sulfide (7783-06-4)	Acute Inhalation LC50 Mouse: > 0.024 mg/l 960 Minutes
Naphthalene (91-20-3)	Acute Inhalation LC50 Rat: > 0.38 mg/l 960 Minutes Acute Dermal LD50 Rabbit: > 2 g/kg Acute Oral LD50 Rat: 490 mg/kg

Acute effects Harmful if inhaled, absorbed through skin, or swallowed. Harmful: may cause lung damage if swallowed. Irritating to eyes, respiratory system and skin. In high concentrations, vapors and spray mists are narcotic and may cause headache, fatigue, dizziness and nausea.

Local effects

US ACGIH Threshold Limit Values: Skin designation

Naphthalene (CAS 91-20-3)	Can be absorbed through the skin.

Sensitization This product is not expected to cause skin sensitization.

Chronic effects Contains organic solvents which in case of overexposure may depress the central nervous system causing dizziness and intoxication. Contains polycyclic aromatic compounds which have been shown to cause anemia, disorders of the liver, bone marrow and lymphoid tissues in rats following dermal application. Danger of serious damage to health by prolonged exposure. Prolonged or repeated overexposure may cause central nervous system, kidney, liver, and lung damage.

Subchronic effects Blood disorders may occur after prolonged inhalation, prolonged skin contact and/or ingestion. Liver and kidney damage may occur after prolonged and repeated exposure.

Carcinogenicity Diesel exhaust has been reported to be an occupational hazard due to NIOSH-reported potential carcinogenic properties.

ACGIH Carcinogens

Clarified oils (Petroleum), catalytic cracked (CAS 64741-62-4)	A4 Not classifiable as a human carcinogen.
Distillates (petroleum), heavy catalytic cracked (CAS 64741-61-3)	A4 Not classifiable as a human carcinogen.
Fuel Oil No. 6 (CAS 68553-00-4)	A4 Not classifiable as a human carcinogen.
Naphthalene (CAS 91-20-3)	A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

Clarified oils (Petroleum), catalytic cracked (CAS 64741-62-4)	2B Possibly carcinogenic to humans.
Distillates (petroleum), heavy catalytic cracked (CAS 64741-61-3)	2B Possibly carcinogenic to humans.
Fuel Oil No. 6 (CAS 68553-00-4)	2B Possibly carcinogenic to humans.
Naphthalene (CAS 91-20-3)	2B Possibly carcinogenic to humans.

US NTP Report on Carcinogens: Anticipated carcinogen

Naphthalene (CAS 91-20-3)	Reasonably Anticipated to be a Human Carcinogen.

Epidemiology Contains polycyclic aromatic compounds which have been shown to cause anemia, disorders of the liver, bone marrow and lymphoid tissues in rats following dermal application. Studies have shown a risk of spontaneous abortions in women exposed to high concentrations of organic solvents during pregnancy.

Mutagenicity In in-vitro experiments benzene did not change the number of sister-chromatid exchanges (SCEs) or the number of chromosomal aberrations in human lymphocytes.

Neurological effects Chronic exposure to high concentrations of various hydrocarbon blends may lead to polyneuropathy (peripheral nerve damage), characterized by progressive weakness and numbness in the extremities, loss of deep tendon reflexes and reduction of motor nerve conduction velocity. May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue) and/or damage.

Reproductive effects May damage fertility or the unborn child. Can cause adverse reproductive effects - such as birth defects, miscarriages, or infertility. Avoid contact during pregnancy/while nursing.

Further information Symptoms may be delayed.

12. Ecological Information

Ecotoxicological data

Components	Test Results
Residues (petroleum), light vacuum (68512-62-9)	LC50 Fish: 48 mg/l 48 Hours
Hydrogen sulfide (7783-06-4)	LC50 Lake whitefish (Coregonus clupeaformis): 0.002 mg/l 96 hours
Naphthalene (91-20-3)	EC50 Water flea (Daphnia magna): 1.09 - 3.4 mg/l 48 hours
	LC50 Rainbow trout,donaldson trout (Oncorhynchus mykiss): 0.91 - 2.82 mg/l 96 hours

Ecotoxicity Contains a substance which causes risk of hazardous effects to the environment.

Environmental effects The product contains a substance which is toxic to aquatic organisms and which may cause long-term adverse effects in the aquatic environment.

Aquatic toxicity Toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

Persistence and degradability Not available.

Bioaccumulation / Accumulation No data available.

Partition coefficient (n-octanol/water) Not available.

Mobility in environmental media No data available.

13. Disposal Considerations

Disposal instructions Dispose in accordance with all applicable regulations. Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

14. Transport Information

DOT

Basic shipping requirements:

UN number	UN3256
Proper shipping name	Elevated temperature liquid, flammable, n.o.s.
Hazard class	3
Packing group	III
Labels required	3

Additional information:

Special provisions	IB1, T3, TP3, TP29
Packaging exceptions	None
Packaging non bulk	None
Packaging bulk	247
ERG number	128

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

TDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification(40 CFR 707, Subpt. D)

Not regulated.

US CAA Section 112 Hazardous Air Pollutants (HAPs) List

NAPHTHALENE (CAS 91-20-3)
POLYCYCLIC ORGANIC MATTER (CAS 130498-29-2)

US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Spill: Reportable quantity

Hydrogen sulfide (CAS 7783-06-4)	100 LBS

US EPCRA (SARA Title III) Section 302 - Extremely Hazardous Substance: Threshold Planning Quantity

Hydrogen sulfide (CAS 7783-06-4)	500 LBS

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

Naphthalene (CAS 91-20-3)	0.1 %
Polycyclic Aromatic Hydrocarbons (CAS 130498-29-2)	0.1 % N590 Substance is not eligible for the de minimis exemption except for the purposes of supplier notification requirements.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Reportable threshold

Polycyclic Aromatic Hydrocarbons (CAS 130498-29-2)	100 LBS N590

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance

Naphthalene (CAS 91-20-3)	Listed.
Polycyclic Aromatic Hydrocarbons (CAS 130498-29-2)	N590 Listed.

CERCLA (Superfund) reportable quantity (lbs) (40 CFR 302.4)

Naphthalene: 100
Hydrogen sulfide: 100

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - Yes Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance (40 CRF 355, Appendix A)	No
Section 311/312 (40 CFR 370)	No

Drug Enforcement Administration (DEA) (21 CFR 1308.11-15)	Not controlled
Canadian regulations	This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.
WHMIS status	Controlled
WHMIS classification	B3 - Flammable/Combustible D1B - Immediate/Serious-TOXIC D2A - Other Toxic Effects-VERY TOXIC D2B - Other Toxic Effects-TOXIC

WHMIS labeling

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes

Country(s) or region	Inventory name	On inventory (yes/no)*
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

US - California Hazardous Substances (Director's): Listed substance

Clarified oils (Petroleum), catalytic cracked (CAS 64741-62-4)	Listed.
Distillates (petroleum), heavy catalytic cracked (CAS 64741-61-3)	Listed.
Hydrogen sulfide (CAS 7783-06-4)	Listed.
Naphthalene (CAS 91-20-3)	Listed.
Polycyclic Aromatic Hydrocarbons (CAS 130498-29-2)	Listed.
Sulfur (CAS 7704-34-9)	Listed.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Clarified oils (Petroleum), catalytic cracked (CAS 64741-62-4)	Listed.
Distillates (petroleum), heavy catalytic cracked (CAS 64741-61-3)	Listed.
Fuel Oil No. 6 (CAS 68553-00-4)	Listed.
Fuel oil, residual (CAS 68476-33-5)	Listed.
Naphthalene (CAS 91-20-3)	Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

Clarified oils (Petroleum), catalytic cracked (CAS 64741-62-4)	Listed: October 1, 1990 Carcinogenic.
Distillates (petroleum), heavy catalytic cracked (CAS 64741-61-3)	Listed: October 1, 1990 Carcinogenic.
Fuel Oil No. 6 (CAS 68553-00-4)	Listed: October 1, 1990 Carcinogenic.
Fuel oil, residual (CAS 68476-33-5)	Listed: October 1, 1990 Carcinogenic.
Naphthalene (CAS 91-20-3)	Listed: April 19, 2002 Carcinogenic.

US - Massachusetts RTK - Substance: Listed substance

Clarified oils (Petroleum), catalytic cracked (CAS 64741-62-4)	Listed.
Fuel Oil No. 6 (CAS 68553-00-4)	Listed.
Hydrogen sulfide (CAS 7783-06-4)	Listed.
Naphthalene (CAS 91-20-3)	Listed.
Sulfur (CAS 7704-34-9)	Listed.

US - New Jersey Community RTK (EHS Survey): Reportable threshold

Hydrogen sulfide (CAS 7783-06-4)	500 LBS
Naphthalene (CAS 91-20-3)	500 LBS
Polycyclic Aromatic Hydrocarbons (CAS 130498-29-2)	500 LBS

US - New Jersey RTK - Substances: Listed substance

Clarified oils (Petroleum), catalytic cracked (CAS 64741-62-4)	Listed.
Distillates (petroleum), heavy catalytic cracked (CAS 64741-61-3)	Listed.
Hydrogen sulfide (CAS 7783-06-4)	Listed.
Naphthalene (CAS 91-20-3)	Listed.
Polycyclic Aromatic Hydrocarbons (CAS 130498-29-2)	Listed.
Sulfur (CAS 7704-34-9)	Listed.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

Clarified oils (Petroleum), catalytic cracked (CAS 64741-62-4)	Listed.
Distillates (petroleum), heavy catalytic cracked (CAS 64741-61-3)	Listed.
Hydrogen sulfide (CAS 7783-06-4)	Listed.
Naphthalene (CAS 91-20-3)	Listed.
Polycyclic Aromatic Hydrocarbons (CAS 130498-29-2)	Listed.
Sulfur (CAS 7704-34-9)	Listed.

16. Other Information

Further information	HMIS® is a registered trade and service mark of the NPCA.
Other information	Note: This Material Safety Data Sheet applies to the listed products and synonym descriptions for Hazard Communication purposes only. Technical Specifications vary greatly depending on the products and are not reflected in this document. Consult specification sheets for technical information.
HMIS® ratings	Health: 1* Flammability: 2 Physical hazard: 0
NFPA ratings	Health: 1 Flammability: 2 Instability: 0
Disclaimer	This Material Safety Data Sheet (MSDS) was prepared in accordance with 29 CFR 1910.1200 by Valero Marketing & Supply Co., ("VALERO"). VALERO does not assume any liability arising out of product use by others. The information, recommendations, and suggestions presented in this MSDS are based upon test results and data believed to be reliable. The end user of the product has the responsibility for evaluating the adequacy of the data under the conditions of use, determining the safety, toxicity and suitability of the product under these conditions, and obtaining additional or clarifying information where uncertainty exists. No guarantee expressed or implied is made as to the effects of such use , the results to be obtained, or the safety and toxicity of the product in any specific application. Furthermore, the information herein is not represented as absolutely complete, since it is not practicable to provide all the scientific and study information in the format of this document, plus additional information may be necessary under exceptional conditions of use, or because of applicable laws or government regulations.
Issue date	12-04-2010

NOVA Chemicals®

Material Safety Data Sheet

Material Name: **VGO (Vacuum Gas Oil)** MSDS ID: NOVA-0009

Section 1 - Product and Company Identification

Synonyms: Vacuum Gas oil; V.G.O.; Heavy petroleum distillates (vacuum); heavy vacuum distillate
Chemical Name: Gas Oils (petroleum), heavy vacuum
Chemical Family: Hydrocarbon
Material Use: Industrial feedstock
Chemical Formula: Not available; complex mixture

NOVA Chemicals
P.O. Box 2518, Station M
Calgary, Alberta, Canada T2P 5C6

Product Information: 1-412-490-4063
MSDS Information Email:
msdsemail@novachem.com

EMERGENCY Telephone Numbers:
North America (Canada and US):
1-800-561-6682, 1-403-314-8767 (NOVA Chemicals)(24 hours)
1-800-424-9300 (CHEMTREC-USA)(24 hours)
1-613-996-6666 (Canutec-Canada)(24 hours)
Mexico and South America: +44 (0) 1235 239 670 (NCEC) (24 hours)

Section 2 - Hazards Identification

HMIS Ratings: Health: 1* **Fire:** 2 **Physical Hazard:** 0 **Personal Protection:** chemical goggles, gloves, respirator, coveralls

*Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard*

NFPA Ratings: Health: 1 **Fire:** 2 **Reactivity:** 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Emergency Overview

WARNING! This product is flammable when heated to high temperatures. Product is a dark orange to brown thick waxy liquid with a heavy fuel oil odour. Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury. This product may be irritating to the eyes, skin, and respiratory system. Ingestion or inhalation of heated vapours or mists may result in central nervous system effects including headache, sleepiness, dizziness, slurred speech and blurred vision. May cause skin cancer. Avoid contact. Prevent entry into drains, ditches, sewers, and waterways.

Potential Health Effects: Eye

This product may cause irritation to the eyes on contact with heated vapours or liquid.

Potential Health Effects: Skin

Skin contact with this product may cause irritation/dermatitis. Prolonged and/or repeated contact may cause severe irritation/dermatitis and possible skin cancer.

Potential Health Effects: Ingestion

Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Ingestion of this product may result in central nervous system effects including headache, sleepiness, dizziness, slurred speech and blurred vision. Swallowing or vomiting of liquid may cause aspiration into the lungs. Aspiration of liquid into the lungs can cause mild to severe pulmonary injury.

Potential Health Effects: Inhalation

Excessive inhalation of this material causes headache, dizziness, nausea and loss of coordination. Inhalation of heated vapours or mists may cause headache, dizziness, nausea and loss of coordination. Aspiration of liquid into the lungs can cause mild to severe pulmonary injury.

Section 3 - Composition/Information on Ingredients

CAS #	Component	Percent by Wt.
64741-57-7	Gas oils, petroleum, heavy vacuum	100

Additional Information

Product contains <1% sulphur compounds by weight.

This product is hazardous under 29 CFR 1910.1200 (Hazard Communication).
This material is a controlled product under Canadian WHMIS regulations.
This product is not regulated as dangerous goods for transportation.

See Section 8 for applicable exposure limits. See Section 11 for applicable toxicity data.

Section 4 - First Aid Measures

First Aid: Eyes

Remove contact lenses, if it can be done safely. Immediately flush eyes with water for at least 15 minutes, while holding eyelids open. Seek medical attention if symptoms develop or persist.

First Aid: Skin

Remove contaminated clothing and shoes. For skin contact, wash immediately with soap and water. Seek medical attention if symptoms develop or persist. Completely decontaminate clothing, shoes and other protective equipment before reuse or discard.

First Aid: Inhalation

Move affected individual to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

First Aid: Ingestion

Material is not expected to be absorbed from the gastrointestinal tract. DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. Seek immediate medical attention.

First Aid: Notes to Physician

For more detailed medical emergency support information call 1-800-561-6682 or 1-403-314-8767 (24 hours, NOVA Chemicals Emergency Response). Ensure thorough eye and skin decontamination. Treat unconsciousness, nausea, hypotension, seizures and cardiac arrhythmias in the conventional manner. Aspiration of this product during induced emesis can result in lung injury. If evacuation of stomach contents is considered necessary, use the method least likely to cause aspiration, such as gastric lavage after protecting the airway. Observe hospitalized patients for delayed chemical pneumonia, acute tubular necrosis, encephalopathy and dysrhythmias. Monitor for urinary phenol within 72 hours of acute exposure.

Section 5 - Fire Fighting Measures

See Section 9: Physical Properties for flammability limits, flash point and auto-ignition information.

General Fire Hazards

This product is flammable when heated to high temperatures. Fire and container explosion hazards are extremely high when this product is exposed to heat or flame. Empty containers when heated may pose a fire risk. Vapours may travel to some distant source of ignition and flash back. Consider need for immediate emergency isolation and evacuation. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 metres (1/2) mile) in all directions; also, consider initial evacuation for 800 metres (1/2 mile) in all directions.

Explosion Hazards

Vapours may form explosive mixture with air. Keep containers away from source of heat or fire.

Hazardous Combustion Products

Upon combustion, this product emits carbon monoxide, carbon dioxide, sulphur oxides and/or low molecular weight hydrocarbons and toxic (acidic) gases.

Extinguishing Media

Dry chemical, foam, carbon dioxide, water spray or fog. Use water to cool fire-exposed containers and to protect personnel. Water may be an ineffective extinguishing medium.

Fire Fighting Equipment/Instructions

Position upwind. Keep unnecessary personnel away. Move containers from fire area if you can do so without risk. Fight fire from maximum distance or use unmanned holders or monitor nozzles. Immediately withdraw in case of fire and tank venting or heat discolouration of a tank. Fire fighters should wear full-face, self-contained breathing apparatus and thermal protective clothing. Avoid inhaling any smoke and combustion products. Remove and clean or destroy any contaminated clothing. Cool containers with flooding quantities of water until well after the fire is out. Control runoff waters to prevent entry into sewers, drains, ditches, underground or confined spaces and waterways.

Section 6 - Accidental Release Measures

Evacuation Procedures

Isolate area. Keep unnecessary personnel away. Alert stand-by emergency and fire fighting personnel.

Small Spills

Stop discharge if it is safe to do so. Absorb spill with inert material. Shovel material into appropriate container for disposal.

Large Spills

Eliminate ignition sources. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain discharge by booming on water or diking on ground. Remove material with approved non-sparking pumps, skimmers or vacuum equipment. Absorb/adsorb residual materials with DRY earth, sand or other non-combustible materials. Soil remediation may be required. Prevent entry into drains, ditches, sewers and waterways.

Special Procedures

Contact local police/emergency services and appropriate emergency telephone numbers provided in Section 1. Ensure that statutory and regulatory reporting requirements in the applicable jurisdiction are met. Wear appropriate protective equipment and clothing during cleanup. Individuals without appropriate protective equipment should be excluded from area of spill until cleanup has been completed.

See Section 8 for recommended Personal Protective Equipment and see Section 13 for waste disposal considerations.

Section 7 - Handling and Storage

Handling Procedures

Keep locked up or secured. Handle in fully grounded, properly designed and approved equipment systems that are suitable for flammable liquids. Use with adequate ventilation. Do not ingest or inhale. Keep away from heat and ignition sources. No smoking or open flames permitted in storage, use or handling areas. Take special precautions when cold cutting or breaking into lines, or when cleaning and disposing of empty containers. Do not breathe gas, fumes, vapour or spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Keep away from incompatible materials such as oxidizing agents and strong acids. After handling, always wash hands thoroughly with soap and water.

Storage Procedures

Storage area should be clearly identified, well-illuminated, clear of obstruction and accessible only to trained and authorized personnel. Adequate security must be provided so that unauthorized personnel do not have access to product. Store in grounded, properly designed and approved vessels and away from incompatible materials. Store and use away from heat, sparks, open flame, or any other ignition source. Store according to applicable regulations. Have appropriate extinguishing capability in storage area (e.g. sprinkler system, portable fire extinguishers) and flammable gas detectors. Prevent soil contamination. Keep absorbents for leaks and spills readily available. Storage tanks should be above ground and diked to hold entire contents.

See Section 8: Exposure Controls/Personal Protection for appropriate Personal Protective Equipment. See Section 10 for information on Incompatibilities.

Section 8 - Exposure Controls / Personal Protection

Exposure Guidelines

A: General Product Information

Refer to published exposure limits - use effective control measures and PPE to maintain worker exposure to concentrations that are below these limits. Ensure that eyewash stations and safety showers are in close proximity to work locations.

B: Component Exposure Limits

ACGIH, OSHA, NIOSH, EPA, Alberta, and Ontario exposure limit lists have been checked for major components listed with CAS registry numbers. Other exposure limits may apply, check with proper authorities.

*NOTE: The Vacated OSHA Permissible Exposure Limits (PELs) are those provided in the 1989 update to OSHA's Air Contaminants Standard 29 CFR 1910.1000. These limits were vacated by the U.S. Court of Appeals, Eleventh Circuit buy may be enforceable in some states.

Gas oils, petroleum, heavy vacuum (64741-57-7)

ACGIH:	5 mg/m3 TWA (inhalable fraction) (related to Mineral oil, pure, highly and severely refined)
	-- TWA (exposure by all routes should be carefully controlled to levels as low as possible) (related to Mineral oil, poorly and mildly refined)
OSHA (Vacated)*:	5 mg/m3 TWA (related to Oil mist, mineral)
OSHA Final:	5 mg/m3 TWA (related to Oil mist, mineral)
NIOSH:	5 mg/m3 TWA; 10 mg/m3 STEL (related to Oil mist, mineral)
	2500 mg/m3 IDLH (related to Oil mist, mineral)
Alberta:	5 mg/m3 TWA; 10 mg/m3 STEL (related to Oil mist, mineral)
Ontario:	5 mg/m3 TWAEV; 10 mg/m3 STEV (related to Oil mist, mineral)

ENGINEERING CONTROLS

Engineering methods to reduce hazardous exposure are preferred controls. Methods include mechanical ventilation (dilution and local exhaust) process or personal enclosure, remote and automated operation, control of process conditions, leak detection and repair systems, and other process modifications. Ensure all exhaust ventilation systems are discharged to outdoors, away from air intakes and ignition sources. Supply sufficient replacement air to make up for air removed by exhaust systems. Administrative (procedure) controls and use of personal protective equipment may also be required.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

Wear safety glasses; chemical goggles are recommended if splashing is possible, or to prevent eye irritation from vapours.

Personal Protective Equipment: Skin/Hands/Feet

Use impervious gloves when handling product. Wear chemical-resistant safety footwear with good traction to prevent slipping. Work clothing that sufficiently prevents skin contact should be worn, such as coveralls and/or long sleeves and pants. Fire resistant (i.e., Nomex) or natural fibre clothing (i.e., cotton or wool) is recommended. Synthetic clothing can generate static electricity and is not recommended where a flammable vapour release may occur.

Personal Protective Equipment: Respiratory

If engineering controls and ventilation are not sufficient to prevent buildup of aerosols or vapours, appropriate NIOSH approved air-purifying respirators or self-contained breathing apparatus (SCBA) appropriate for exposure potential should be used. Air supplied breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.

Personal Protective Equipment: General

Personal protective equipment (PPE) should not be considered a long-term solution to exposure control. Employer programs to properly select, fit, maintain, and train employees to use equipment must accompany PPE. Consult a competent industrial hygiene resource, the PPE manufacturer's recommendation, and/or applicable regulations to determine hazard potential and ensure adequate protection.

Section 9 - Physical & Chemical Properties

Physical State and Appearance:	Thick, waxy liquid	**Colour:**	Dark, orange to brown
Odour:	Fuel oil, heavy	**Odour Threshold:**	Not available
pH:	Not applicable	**Vapour Pressure:**	6 mm Hg at 20°C (68°F)
Vapour Density @ 0°C (Air=1):	Estimate: 1	**Boiling Point:**	Range: 315°C to 610°C (599°F to 1130°F)
Melting Point:	Range: 12°C to 40°C (53.6°F to 104°F)	**Solubility (H2O):**	Negligible
Specific Gravity (Water=1):	0.91 at 15°C (60°F)	**Evaporation Rate (n-Butyl Acetate=1):**	slow; only partially volatile
Viscosity:	Range: 40 to 65 cSt at 50°C (122°F)	**Octanol/H2O Coeff.:**	Not available
Auto Ignition:	>260°C (>500°F) (estimated)	**Flash Point:**	>130°C (>266°F)
Flash Point Method:	Pensky-Martens, closed cup	**Upper Flammable Limit (UFL):**	5% (estimated)
Lower Flammable Limit (LFL):	1% (estimated)	**Flammability Classification:**	Flammable when heated

Section 10 - Stability & Reactivity Information

Chemical Stability

This product is stable under normal use conditions for shock, vibration, pressure, or temperature.

Chemical Stability: Conditions to Avoid

Keep away from uncontrolled heat, sparks, or open flame.

Incompatibility

May react with oxidizing agents or strong acids. Heated vapours or mists may form explosive mixtures in air.

Possibility of Hazardous Reactions or Hazardous Polymerization

Hazardous polymerization not likely to occur.

Corrosivity

Not corrosive to the common metals.

Hazardous Decomposition

Upon decomposition, this product emits carbon monoxide, carbon dioxide, sulphur oxides and/or low molecular weight hydrocarbons and toxic (acidic) gases.

Special Remarks

This product is flammable when heated to high temperatures. Empty containers when heated may pose a fire risk.

Section 11 - Toxicological Information

A: Acute Toxicity - General Product Information

Similar materials have been tested under the EPA's High Production Volume (HPV) Chemical Challenge Program for Heavy Fuel Oils Category submitted by the American Petroleum Institute (API). Product is an eye, skin, and respiratory tract irritant. Eye irritation testing in animals indicates a mild irritation that clears in 48 hours. Skin Irritation: 4.3 (unrefined) to 5.4 (highly refined) Draize Tests in rabbits. Product is a central nervous system (CNS) depressant. Exposure can cause headache, nausea, weakness, dizziness, sleepiness, loss of coordination and even loss of consciousness. It is a pulmonary aspiration hazard. Unrefined lube base oils are not skin sensitizers when tested in animals.

B: Acute Toxicity - LD50/LC50

Gas oils, petroleum, heavy vacuum (64741-57-7)

Oral LD50 Rat 4320 mg/kg; Dermal LD50 Rat >2000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg
Oral LD50 Mouse: 22 g/kg (related to Oil mist, mineral)

C: Chronic Toxicity - General Material Information

Similar materials have been tested under the EPA's High Production Volume (HPV) Chemical Challenge Program for Heavy Fuel Oils Category submitted by the American Petroleum Institute (API). Petroleum distillates of this type have been shown to cause skin cancer in laboratory animals following prolonged and frequent skin contact. mg/kg/day. Material is likely to contain polycyclic aromatic hydrocarbons, some of which are known to be carcinogenic. A similar VGO was tested in the Modified Pre-incubation Mutagenesis assay (Ames TA98 & S9) and demonstrated a Mutagenicity Index of 3.8. Therefore, VGO is predicted to produce tumours in standard mouse skin painting bioassay.

D. Chronic Toxicity - Carcinogenic Effects

ACGIH, EPA, IARC, OSHA, and NTP carcinogen lists have been checked for selected similar materials or those components with CAS registry numbers.

Gas oils, petroleum, heavy vacuum (64741-57-7)

IARC: Supplement 7 [1987], Monograph 33 [1984] (related to Mineral oils, untreated and mildly treated) (Group 1 (carcinogenic to humans))

Section 12 - Ecological Information

Ecotoxicity

A: General Product Information

Similar materials have been tested under the EPA's High Production Volume (HPV) Chemical Challenge Program for Heavy Fuel Oils Category submitted by the American Petroleum Institute (API). Material is considered environmentally toxic and damaging on contact with plants, birds and water mammals.
Testing of various base oil samples:
Fish (rainbow trout) 96-h LC50: 1000 mg/L (measured); algae 96-h NOEC: 50% WAF (water-accommodated fraction) (measured); daphnid 48-h LC-50: 10mg/l (measured); daphnid 21-d LL0: 1000mg/l WAF (measured).

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Gas oils, petroleum, heavy vacuum (64741-57-7)

96 Hr LC50 Brachydanio rerio: 48 mg/L [semi-static]

Environmental Fate/Mobility

This product has not been tested. In ambient conditions, the product has minimal to no volatility into air. Any volatile component degrades by reaction with hydroxyl radicals, in the troposphere, under the influence of sunlight, with half-lives less than one day. These waxy hydrocarbon mixtures are not subject to hydrolysis reactions with water. This complex petroleum mixture is expected to partition primarily to soil and/or sediment. This material is very waxy and sets up at normal room temperature. Mobility in the aquatic and atmospheric environment of these hydrocarbon mixtures is low due to low water solubility and low vapour pressure. These components will partition rapidly to the terrestrial compartment, where the main fate process is expected to be slow biodegradation of base oil components in soil and sediment.

Persistence/Degradability

Similar products have been measured and shown to biodegrade in the environment under both aerobic (20-26% in 28 days) and anaerobic (86% in 28 days) with rates dependent on soil moisture, bacteria, and other conditions. Possible hazardous short-term degradation products are not likely. Product is sticky, will solidify, and strongly adheres to soils and sediment. Recovery time for land and waters following a major spill is estimated to extend into months, possibly years.

Bioaccumulation/Accumulation

This product has not been tested, but is not expected to bioaccumulate in either terrestrial or aquatic systems. Spilled product will accumulate on the surface of plants, waterfowls and mammals, resulting in serious injury and possible death.

Section 13 - Disposal Considerations

U.S./Canadian Waste Information

A: General Product Information

This product may be a hazardous waste according to US RCRA and Canadian regulations. The use, mixing or processing of this product may alter this product. Contact federal, provincial/state and local authorities in order to generate or ship a waste material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste. DO NOT ATTEMPT TO DISPOSE OF BY UNCONTROLLED IGNITION. Since emptied containers retain product residue, follow safe handling/label warnings even after container is emptied.

See Section 7: Handling and Storage and Section 8: Exposure Controls/Personal Protection for additional handling information that may be applicable for safe handling and the protection of employees.

Waste generator is advised to carefully consider hazardous properties and control measures needed for other materials that may be found in the waste.

B: Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

Section 14 - Transportation Information

US DOT Information

Shipping Name: Not regulated as a hazardous material for transportation.
Additional Info.: This material is regulated under 49 CFR 130 (Regulations applicable to oil spill prevention and response plans) when transported by highway or rail.

Canadian TDG Information

Shipping Name: Not regulated as dangerous goods for transportation.

International Air Transport Association (IATA) and International Civil Aviation Organization (ICAO) Information

Shipping Name: Not regulated as dangerous goods for transportation.

International Maritime Dangerous Goods (IMDG) Code

Shipping Name: Not regulated as dangerous goods for transportation.

Section 15 - Regulatory Information

A: International Regulations

Component Analysis – International Inventory Status

Component	CAS #	US -TSCA	CANADA - DSL	EU - EINECS
Gas oils, petroleum, heavy vacuum	64741-57-7	Yes	Yes	Yes

B: USA Federal & State Regulations

Ongoing occupational hygiene, medical surveillance programs, or site emission or spill reporting may be required by Federal or State regulations. Check for applicable regulations.

USA OSHA Hazard Communication Class

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication). HCS Classes:
HCS CLASS: MAY CAUSE CANCER
HCS CLASS: Irritating substance.

USA Right-to-Know - Federal

None of this product's components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

USA Right-to-Know - State

The following components appear on one or more of the following state hazardous substances lists. Some components (including those present only in trace quantities, and therefore not listed in this document) may be included on the Right-To-Know lists of other U.S. states. The reader is therefore cautioned to contact his or her NOVA Chemicals' representative or NOVA Chemicals' Product Integrity group for further U.S. State Right-To-Know information.

Component	CAS #	NJ	PA
Gas oils, petroleum, heavy vacuum ([1]related to Oil mist, mineral) ([2]related to Mineral Oil)	64741-57-7	Yes[1]	Yes[2]

C: Canadian Regulations - Federal and Provincial

Canadian Environmental Protection Act (CEPA): All components of this material are on the Domestic Substances List (DSL) or are exempt and are acceptable for use under the provisions of CEPA.

WHMIS Ingredient Disclosure List (IDL)

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List (IDL):

Component	CAS #	Minimum Concentration
Gas oils, petroleum, heavy vacuum	64741-57-7	1 % (related to Oil, mineral)

WHMIS Classification

Workplace Hazardous Materials Information System (WHMIS): This product has been classified in accordance with the hazard criteria of the CPR (Controlled Products Regulations) and the MSDS contains all the information required by the CPR.

WHMIS Class D2A: Very Toxic (Carcinogen)

WHMIS Class D2B: Toxic (Skin/eye irritant)

Other Regulations

Ongoing occupational hygiene, medical surveillance programs, or site emission or spill reporting may be required by Federal or Provincial regulations. Check for applicable regulations.

Section 16 - Other Information

Label Information

WARNING! This product is flammable when heated to high temperatures. Product is a dark orange to brown, thick, waxy liquid with a heavy fuel oil odour. Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury. This product may be irritating to the eyes, skin and respiratory system. Ingestion or inhalation of heated vapours or mists may result in central nervous system effects including headache, sleepiness, dizziness, slurred speech and blurred vision. May cause skin cancer. Avoid contact. Prevent entry into drains, ditches, sewers and waterways.

FIRST AID:

SKIN: Remove contaminated clothing and shoes. For skin contact, wash immediately with soap and water. Seek medical attention if symptoms develop or persist. Completely decontaminate clothing, shoes and other protective equipment before reuse or discard.

EYES: Remove contact lenses, if it can be done safely. Immediately flush eyes with water for at least 15 minutes, while holding eyelids open. Seek medical attention if symptoms develop or persist.

INHALATION: Move affected individual to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

INGESTION: DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. Seek immediate medical attention.

IN CASE OF A LARGE SPILL: Eliminate ignition sources. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain discharge by booming on water or diking on ground. Remove material with approved non-sparking, approved pumps, skimmers or vacuum equipment. Absorb/adsorb residual materials with DRY earth, sand or other non-combustible materials. Soil remediation may be required. Prevent entry into drains, ditches, sewers and waterways.

References

Available on request.

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; BLEVE = Boiling Liquid Expanding Vapour Explosion; BOD = Biochemical Oxygen Demand; CAS = Chemical Abstracts Service; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CPR = Controlled Products Regulations; DOT = Department of Transportation; DSL = Domestic Substances List; EINECS = European Inventory of Existing Commercial Substances; EPA = Environmental Protection Agency; EU = European Union; FDA = Food and Drug Administration; IARC = International Agency for Research on Cancer; IDL = Ingredient Disclosure List; Kow = Octanol/water partition coefficient; LEL = Lower Explosive Limit; NIOSH = National Institute for Occupational Safety and Health; NJTSR = New Jersey Trade Secret Registry; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; RCRA = Resource Conservation and Recovery Act; SARA = Superfund Amendments and Reauthorization Act; TDG = Transportation of Dangerous Goods; TSCA = Toxic Substances Control Act.

MSDS Prepared by: NOVA Chemicals

MSDS Information Phone Number: 1-412-490-4063

Other Information

Notice to Reader:

ALTHOUGH THE INFORMATION CONTAINED IN THIS DOCUMENT IS PRESENTED IN GOOD FAITH, BASED ON AVAILABLE INFORMATION BELIEVED TO BE RELIABLE AT THE TIME OF PREPARATION OF THIS DOCUMENT, **NOVA CHEMICALS MAKES NO WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION OR THE PRODUCT/MATERIALS DESCRIBED HEREIN, AND EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES AND CONDITIONS (INCLUDING ALL WARRANTIES AND CONDITIONS OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE). NO FREEDOM FROM INFRINGEMENT OF ANY PATENT OWNED BY NOVA CHEMICALS OR OTHERS IS TO BE INFERRED. THIS INFORMATION IS SUBJECT TO CHANGE WITHOUT NOTICE. PLEASE CONTACT NOVA CHEMICALS FOR THE MOST CURRENT VERSION OF THIS MSDS. NOVA CHEMICALS DOES NOT ASSUME RESPONSIBILITY FOR MSDS OBTAINED FROM THIRD PARTY SOURCES.**

UNLESS SPECIFICALLY AGREED OTHERWISE, NOVA CHEMICALS DOES NOT TAKE RESPONSIBILITY FOR USE, TRANSPORTATION, STORAGE, HANDLING OR DISPOSAL OF THE PRODUCTS DESCRIBED HEREIN.

NOVA Chemicals® **is a registered trademark of NOVA Brands Ltd.; authorized use/ utilisation autorisée.**

This is the end of MSDS # NOVA-0009.