

Surface Washing Agents

Application Observer's Guidance Document



Project Research Conducted by:

National Spill Control School
Texas A&M University Corpus Christi

Project Funded by:

Texas General Land Office
Contract Number: 18-128-000-A668

December 2019

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Table of Contents

Title

Acknowledgments

| | |
|---|----|
| 1.0 Introduction | 1 |
| 1.1 Report Description | 1 |
| 1.2 Study Objectives | 1 |
| 1.3 Research Methodology..... | 2 |
| 1.3.1 SWA Market Assessment | 2 |
| 1.3.2 Laboratory-Scale Procedures..... | 3 |
| 1.3.3 Meso-Scale Procedures | 5 |
| 2.0 SWA Market, Laboratory-Scale, and Meso-Scale Overview | 8 |
| 2.1 Research Findings | 8 |
| 2.1.1 SWA Market Evaluations | 8 |
| 2.1.2 Chemistry Effectiveness on Dispersion in Water Column | 10 |
| 2.1.3 Physical Effectiveness on Chemical Cleaning Capabilities | 12 |
| 2.2 Laboratory Assessments..... | 13 |
| 2.2.1 SWA Laboratory Testing Results | 14 |
| 2.2.2 Observed and Calculated Oil Dispersion | 22 |
| 2.2.3 SWA Lift and Float Identification | 23 |
| 2.3 Meso-Scale Assessments..... | 25 |
| 2.3.1 SWA Meso-Scale Testing Results | 25 |
| 2.3.2 Observed and Calculated Cleaning Capabilities | 25 |
| 3.0 Best Management Practices for SWA Application and Guidance | 28 |
| 3.1 Response Priorities | 28 |
| 3.2 PPE Requirements and Recommendations | 29 |
| 3.3 Pre-Deployment Considerations | 32 |
| 3.4 SWA Deployment | 37 |
| 3.5 Waste Management | 40 |
| 3.6 Supporting Forms and Links | 40 |
| 4.0 References | 42 |
| 5.0 Attachments | |
| A. SDS Information Chart | |

- B. SWA Company Profiles
- C. Laboratory-Scale Observations
- D. Meso-Scale Observations
- E. First Response Assessment and Observation Form
- F. First Responder Shoreline and Sensitive Habitats Observation Form
- G. Pre-Approved SWA Operations Activation Evaluation Checklist
- H. SWA Deployment and Observation Form
- I. SWA Storage, Handling, Containment & Disposal Plan Checklist
- J. SWA Equipment and PPE Checklist
- K. SWA Applicators Request for Approval
- L. USCG Strike Team SMART Guidance Form

(Safety Data Sheets for all NCP Listed SWAs are provided under separate cover)

List of Tables

| | |
|---|----|
| 2-1 NCP SWA Calculated Dispersion | 15 |
| 2-2 Lift and Float SWA..... | 23 |
| 3-1 Calculated Dispersion of LF SWAs..... | 36 |

List of Figures

| | |
|--|----|
| 2-1 Gulf Coastal States Storage and Marketed Agents | 9 |
| 2-2 Storage/Shipping Container Sizes..... | 9 |
| 2-3 Shelf Life of SWA Agents..... | 10 |
| 2-4 Surface Washing Agent Interaction on Impermeable Substrates..... | 11 |
| 2-5 Timescale Dispersion of Major Surface Washing Agents..... | 12 |
| 2-6 Post Application Cleaning Assessments..... | 13 |
| 2-7 SWAs Calculated Dispersion vs. Control Conc. | 16 |
| 2-8 Hanby TPH Testing and Colorimetric Comparison..... | 22 |
| 2-9 SWA Application and Dispersion..... | 23 |
| 2-10 SWA Application and Observation of LF Characteristics..... | 24 |
| 2-11 SWA 1 st Application Timeline..... | 26 |
| 3-1 PPE and Health Hazard Indications..... | 31 |
| 3-2 Recommended Minimum PPE..... | 32 |
| 3-3 Containment Booming Strategies after SWA Application | 33 |
| 3-4 Skimmer Selection | 35 |

Acknowledgments

This Surface Washing Agent research project was developed to provide decision makers and responders the detailed information on SWA availability, use, application, and performance. The data collected and empirical observations by researchers is intended to aid in the safe, proper, efficient, and environmentally appropriate decisions by field applicators and agency observers.

This Guidance Document provides general checklists and guidelines for SWA application. Another aspiration of this report is to provide the TGLO relevant information which may be used to justify an expansion of the pre-approved areas for SWA use along the Texas coast.

Principal Investigator, H.A. "Tony" Wood, and Graduate Researcher, Andrew Dittmar, were supported by various TAMU-CC undergraduate interns: Elise Rother, Valeria Ortiz, McKenzie Ward, Kelsey McCreless, and Mitchell Clemens. Their meticulous support was invaluable in completing the hundreds of lab and meso-scale tests of SWAs.

The following TGLO personnel were instrumental in the funding, management, and oversight of this project from its inception. Their help and advice was greatly appreciated.

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Brent Koza, Project POC

Wesley McDaniel, Project POC

Subject matter experts that have advised on this project included Dr. Jacqueline Michel, President of Research Planning, Inc., and numerous SWA product manufacturers and OSRO's.

Research on this project was also made possible by the donations of test equipment and supplies, SWA chemical products, decom solutions, and petroleum products. Contributors included Hanby Environmental, OMG Solutions, Valero Petroleum Laboratory, SWA Manufacturers, and the TAMU-CC Physical and Environmental Sciences Department

1. Introduction

1.1 Report Description

This comprehensive guidance document was developed by the National Spill Control School at Texas A&M University Corpus Christi as the last phase of a four-phased project funded by the Texas General Land Office (TGLO under Contract Number 18-128-000-A668).

- Phase 1 - SWA Market Study
- Phase 2 - Laboratory Evaluation of SWA Performance
- Phase 3 - Meso-Scale Testing of SWAs
- Phase 4 - SWA Guidance Manual for Field Investigators

The overall project was developed to assess and compare the Surface Washing Agents (SWA) listed on the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). It provides valuable information about SWA product availability, performance, and safety. This Guidance Manual is intended to serve as a resource and guidance tool for those regulatory agencies involved in the conditional approval and monitoring of SWA use in certain areas.

This guidance document allows quick and easy access to information for safe and effective SWA application. The response strategies formulated in this paper are intended to guide in the efficacy of decision makers in oil spill response. It will not serve as a proxy for any required training in spill response. Consultation of the Area Committee, Regional Response Team, and Federal On-Scene Coordinator is recommended/required for SWA use in pre-approved areas. At the time of publication (December, 2019), this guidance document has been updated to current SWA manufacturer application criteria and safety standard practices.

1.2 Study Objectives

Study objectives and goals for this guidance document were determined during initial stages of proposed research development. Identified goals and objectives included:

- Determining physical and chemical behavior, effectiveness, and product recoverability during full scale operations.
- To identify, categorize, and evaluate SWA use in Texas waters and coastal zones.
- To aid in the evaluation of SWA use by oil spill response agency decision makers.

Additional research goals align with NSCS market assessment, laboratory-scale, and meso-scale work.

1.3 Research Methodology

Surface washing agents are determined by distinctive formulations (Fingas, 2013):

- Non-ionic or anionic surfactants with HLBs of more than 11 in a low-aromatic hydrocarbon solvent
- d-Limonene in various solvents
- Surfactants mixed with various solvents
- Surfactants in glycol-type solvents similar to dispersants
- Detergents with little or no solvent
- Solvent mixtures

These formulations are further described into two general categories: Lift-and-Float (LF) and Lift-and-Disperse (LD). This describes the physical characteristics of the SWA and oil interaction. In Texas only SWA with LF characteristics can be used in pre-approved waterways and should not be allowed to enter into any connected drainage system.

The NCP List includes SWA's that are LF, LD, or dependent upon their dilution ratio may fall into either category. During the market assessment and laboratory evaluation researchers endeavored to determine whether each of the 56 SWAs were LF, LD, or dilution dependent. Further testing to determine the type, chemical/physical interactions, and pertinent information was conducted to allow decision makers resources for effective in SWA application.

The following data supports the preparation of this guidance document, checklists, and identifies appropriate procedures for safe and efficient SWA decisions upon deployment.

1.3.1 SWA Market Assessment

This market assessment was developed to determine which SWAs were available, where, in what quantities, and how manufacturers recommend the application of their specific product. The market study and associated SDS booklet also serves to guide field investigators in the safe and proper application of these products.

Determinations regarding the current market valuations, uses, storage, shelf-life, and pertinent information were established in this phase of the project. Researchers created two 10-page E-Survey questionnaires to electronically distribute. They were also used as a template to conduct in-person or telephone interviews. One survey was used for manufacturers, and the other survey was used for OSROs and response contractors. Contact lists for manufacturers were created with information gathered from the NCP Product Schedule. Following the survey, manufacturers were asked to send 1-gallon samples of their SWA for evaluation testing and adequately characterizing their types. Safety Data Sheets (SDSs) were obtained for each available SWA and compiled into a booklet under separate copy.

A total of 52 SWA manufacturers produce 56 SWA products on the NCP Product list. One additional miscellaneous agent listed in the NCP Product Schedule that is primarily used in

response was included in SWA research. The NCP Product Schedule's September 2017 update did not have current contact records for each of the SWA manufacturers. Some product lines have been acquired by new companies. Phone and website investigations by NSCS researchers led to a nearly complete contact list for the 56 SWA products. EPA updated their NCP Product Schedule in March 2018 to indicate their concurrence with this NSCS research. A total of 81 contacts received the SWA questionnaire for manufacturers.

A list of Gulf state's OSRO's contacts was created from Cleanupoil.com, *The Little Black Book of Oil Spill Contractors 7th Edition (2016)*, attendees at Clean Gulf conferences, and other sources.

Researchers initially targeted 279 OSROs and other response contractors and all 52 SWA manufacturers. After extensive research, it was determined an NCP List update was required for contact changes and removal of decommissioned manufacturers. This information was communicated to the U.S. EPA Office of Emergency Management. Researchers made contact with 78 OSROs, and conducted an extensive interview process with 24 manufacturing companies.

1.3.2 Laboratory Scale Procedures

The laboratory scale testing procedures were established to evaluate the LF and LD characteristics of each SWA in various temperature conditions for each applied oil.

Researchers collected 20 samples of NCP listed SWAs along with application criteria derived from the manufacturer's recommendations. The supporting equipment for SWA application and methods for dispersion testing were established in discussions with TGLO. Texas A&M University- Corpus Christi (TAMU-CC) provided laboratory space and safety equipment and Personal Protective Equipment (PPE). The laboratory was equipped with fume hoods.

Five-gallon petroleum samples of marine diesel, crude oil, 6-oil, and asphaltic oil were obtained for testing.

Substrates frequently found along the Texas coastline and waterways were selected for use in simulating the SWA application process. Small representative samples of concrete, wood, and steel were used in the laboratory tests. Test procedures were designed to assure consistent water salinity at the same concentration as the Gulf of Mexico. This was achieved through the use of Instant Ocean aquarium saltwater mix. Industrial pressure washing was simulated in the laboratory using a handheld adjustable micro-pressure washer. The washer was equipped with a 1-liter liquid storage chamber allowing researchers to accurately dilute SWA to the manufacturer's recommended concentration. The micro-pressure washer could also be adjusted to assure consistent and recommended pressure settings.

SWAs were applied in direct instruction as described by the SWA manufacturer either through given directions or on SDS information. For each test, the 10-gallon aquariums were set in the fume hood for vapor and chemical containment. Roughly 595-grams of Instant-Ocean mix was

added to 20L of deionized water to achieve a salinity of 35-36ppt. Consistency between all tests were achieved using a refractometer to measure salinity, and the 595-grams of I-O were measured using a digital portion scientific scale. Substrates were then dipped in the water and had roughly 5mL of one petroleum substance applied and allowed 1 minute to sit. Substrates were then hung vertically with 1/3 of the substrate underneath the water line. For 10° and 30° tests, at this point researchers would add the aquarium heater and allow time for the water to warm up or add the ice sheet to cool down. This process was replicated 12 times for each SWA for each of the 4 petroleum oils at 3 different temperatures.

For application involving a non-diluted SWA, the agent is directly applied through a brush or micro-pressure washer. For application involving a diluted SWA, the agent is measured in a 100mL or 250mL beaker and diluted with deionized water to recommended level, then applied through application instruction means. SWA that require special additional instructions were completed each test, such as: retention time of SWA on petroleum product, post-application rinse, additional application, and change in dilution application. All results were written and visually captured using Canon and GoPro cameras.

Laboratory-scale tests were designed to assist in the determination of whether a SWA has predominantly LF or LD characteristics and if there was any difference at various temperatures. It was not possible to determine how SWAs would be affected by currents or wave energy. To efficiently determine the floating and/or dispersing differences, a 1-hour post application observation was conducted for each of the 12 product tests. Cameras were positioned with a view of the 3 substrates and the depth of the water column. Time-lapse photography was set to record the application of SWA, retention time if applicable, and take a picture every minute for 1-hour afterwards. The Canon camera was set to video record for the entire application, retention time if applicable, and 1-hour post application period. Observation forms were completed at post-application time increments of: 1-minute, 5-minute, 15-minute, 30-minute, 45-minute, and 1-hour. These written and visual observations aided researchers in determining when or if the physical characteristics (dispersion) of the SWA and petroleum products visibly changed in the water column.

Trials were conducted to find the most efficient and accurate testing method to calculate whether the agents act as LF or LD. Initial efforts to assess dispersion in the water column with spectrophotometry resulted in higher-than-anticipated calculated dispersion. This was due to the process of SWA application where particles of wood, concrete, and rust from the steel plates would cloud the water column and would provide high false-positive results. A reliable testing method to determine TPH concentration in water was found to be the Hanby TPH Water Kits. This colorimetric test was unaffected by the substrate particles in the water. This testing methodology was demonstrated to TGLO representatives and was found to be an ideal time and cost-effective method for evaluating dispersion.

To calculate the dispersion of oil in the water column, researchers gathered samples in the benthic section of the water column slightly above the bottom surface. It was determined that this area would represent the ideal area you would see settling of oils with dispersants in ocean application settings. This was achieved using a 10mL scientific pipette, primed with air, so once

reached to the ideal benthic location in the water column, air was pushed out to release any agent or petroleum product build up from the surface. Water samples were collected after waiting a short period to allow settling. Samples were placed in a 250mL separatory funnel and the ampoules extraction reagent was added. The extraction reagent binds to hydrocarbon molecules present in the water sample and separates them into 2 liquids of different densities. The funnel was gently shaken for a minimum of 1 minute to allow the reagent time and access to the entire sample. Using a test tube, the reagent and petroleum mix is separated from the water sample.

One test tube vial of the color development reagent was added and mixed for 1 minute. This reaction with the hydrocarbon molecules in the test tube will alter the samples color along a gradient that represents the dispersion concentration. As the gradient darkens, the concentration increases. The Hanby kit comes with a color gradient book used to compare and calculate concentration for many petroleum products, including the products involved in this study.

Considerations to reduce calculation errors and control consistency between all researchers and interns running tests occurred. Hanby Environmental has a mobile application that has a database of all color gradients for petroleum products, which will remove the error of visual calculations between all researchers and interns. Each test tube has been photographed with a white background and analyzed for an exact concentration measurement with an error of +/- 0.02ppm. Hanby Environmental's mobile application allows researchers to export all data into tables for further analysis.

Reagents and glassware generated as waste from these tests were disposed of in accordance with TAMU-CC policies for managing laboratory waste under supervision of the university's hazardous waste supervisor.

For consistency of each test, all testing equipment was fully cleaned of all chemicals, petroleum products, and wastewater before the next test was initiated. OMG Solutions have created a remediation product, ELMN8, for equipment remediation, and ELMN8+, for liquid remediation. Application of these products break down the hydrocarbon bonds in the petroleum products and allow them to be eliminated. Equipment was soaked and rinsed clean prior to each test. After each application of ELMN8+, a Hanby TPH Water test was conducted to ensure that hydrocarbon compounds were eliminated.

Dispersion results were categorized and compared to laboratory testing controls. SWA considered to be LF were determined based upon a relative scale. This approach was discussed with and approved by TGLO POC. Descriptions of processes in this section may be found in greater detail (under separate cover) in the Laboratory-Scale Testing report (2019) by Wood and Dittmar.

1.3.3 Meso-Scale Procedures

The NSCS obtained industrial scale pressure washing and steam cleaning equipment for use in the meso-scale testing. The purpose of this phase of evaluation was to observe the performance characteristics of SWAs that have met the LF criteria in laboratory tests.

Testing was conducted outdoors in an area adjacent to the TAMUCC campus boat and equipment storage barn and close to the university oil-water separator.

Large representative pieces of concrete, wood, and steel (4-8 sq. ft) were used during this phase of testing. Seawater collect from Corpus Christi Bay was collected and used during the meso-scale testing. A 1000-gallon polypropylene containment tank with open top and drainage ports was used to hold the seawater and substrates with oily coatings. This configuration proved to be ideal for testing the effectiveness of the SWAs that had been shown (in laboratory tests) to have LF characteristics with a full-scale industrial pressure washer.

This phase of research showed in a larger scale setting the observations and calculated cleaning capabilities on weathered oil in outdoor conditions. A 1-hour post application observation was conducted for each SWA for 3 petroleum products: crude oil, 6-oil, and asphaltic oil. Because marine diesel has such a high evaporation rate it was not included in the meso-scale testing.

The GoPro camera was used to record pressure washing of the 3 substrates. The GoPro was set to take a picture every minute for the application, retention time if applicable, and 1-hour post application period.

Researchers filled out written observation forms that describe the date/time of oil application on the substrates, date/time of SWA application after the 24-hr weathering period, weather conditions at the time of the test, and weather conditions over the 24-hr weathering period. For the written observation testing table, researchers fill out descriptive rows on the measured differences outside the oil application line due to weathering, 1st application and 5 passes back and forth, 2nd application and 25 passes back and forth, and 3rd application and 50 passes back and forth. In addition to the measured differences for comparison, the total number of passes required to clean the oil to lose its tacky touch as well as remove it completely from the substrate was determined. Speaking with TGLO POC, interpretations of when an oil spill is considered “clean” may vary for different groups and agencies. Because of this, the number of passes required for the oil to be cleaned to a tacky touch and completely removed was determined. The “tacky touch” description describes weathered oils that are unable to be completely removed, but their ability to attach to objects.

Each substrate was applied with the 3 petroleum oils 24 hours before the application in direct view of the sun and elements to simulate natural weathering processes. This time period was put in place to further simulate SWA application in real world instances where the oil has experienced weather elements for a period of time. Each oil is applied in vertical strips using plastic guidelines that are 1in wide by 12in long, spaced 2in evenly. The petroleum applied substrates are placed horizontally in large plastic lined containers to ensure in the event of a rain or drippage of oils, all petroleum is contained for disposal. Researchers began after the weathering period with each test by setting up the staging area with a 1000gal open topped tank. All application equipment, PPE, and emergency response containment pads, rolls, and powders are thoroughly checked and placed for quick response in the event of a spill. The 325gal transport tank was lifted and secured in the transport truck bed along with 2 Honda water pumps

and intake/discharge hoses. Researchers collected testing saltwater at the Corpus Christi Bay decommissioned loading dock located south of the University.

Upon returning to the testing location, 162.5gal of bay water was pumped into the 1000gal open topped container for each test. Weathered substrates were positioned in the tank to ensure consistent applications of the various SWAs.

During the application process oil is removed at high application pressure, so to ensure safety of all researchers, each test was conducted at a minimum of level C PPE safety wear with TYVEK cover-all's with hoods, half-face respirators, gloves, and a splash shield. All PPE used during application processes was contained and disposed of properly.

Researchers applied the SWA in precise accordance with specific SWA manufacturer's recommendations. For example, applications involving non-diluted SWAs were applied with a brush or pressure washer in accordance with manufacturer's recommendations. For applications involving diluted SWAs, the agents were diluted with freshwater to the recommended level and applied. SWAs that required additional steps like retention time on petroleum products, post-application rinses, and other special instructions were followed in accordance with manufacturer's recommendations. All results were written and visually captured during this time.

To determine the degree of cleanliness, measurements were collected of weathered oil removal and drippage before and after each application (and rinse/retention time if required). The degree of cleanliness was also evaluated visually and by touch. Substrates were inspected for visual staining and whether it had a "tacky touch".

Waste and equipment neutralization was conducted using an undiluted ELMN8+ solution. Wastewaters were processed through the university's oil/water separator.

The meso-scale assessment was designed to assure consistency between researchers. Oil application stencils and the thickness of coatings assured consistency between all tests. Decontamination was assured with visual and touch tests. Uncoated substrates were used as a visual comparison for adequate stain removal.

The results of SWA cleaning capabilities were analyzed and can be found in greater detail (under separate cover) in the Meso-Scale Testing report (2019) by Wood and Dittmar.

2.0 Application and Response Guidance

2.1 Research Findings

Full market, lab-scale, and meso-scale research reports were produced for the TGLO. Additional data, information on procedures, and research findings may be found in those reports.

2.1.1 SWA Market Evaluations

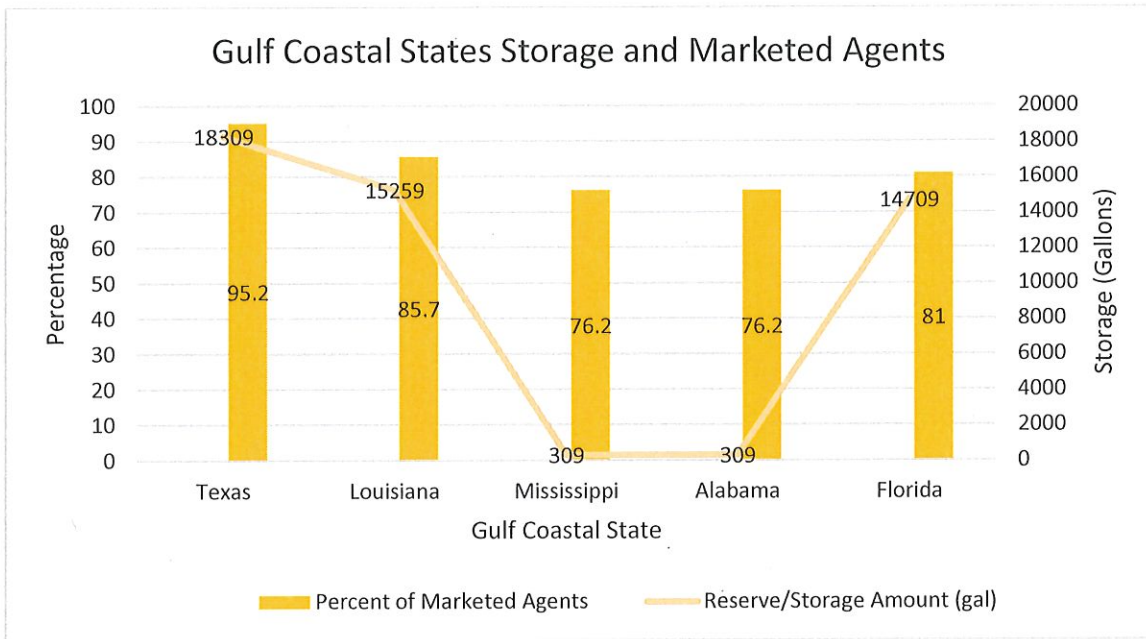
There are 56 NCP listed SWA products and 1 miscellaneous product that can be used as a SWA. Of these 24 manufacturers appeared to have some marking presence in Gulf coast states. The NSCS was able to obtain marking information from all 24 SWA manufacturers.

Market data was categorized and assessed restraints as well as driving forces for SWA use. The rise in SWA research and use derives for the standards of efficient and effective remediation of coastal and waterline environments, while having the ability to recover a majority of polluted oil. However, researchers observed a lack of OSRO knowledge about the variety of SWAs on the NCP List. OSROs appeared to express significant loyalty to only 3 SWA products that are consistently used in Texas and Gulf states, and one of these is listed as a miscellaneous product rather than a SWA.

At the time of this project (2017-2018), researchers identified various SWA market conditions in the Gulf coast. These included: availability, stored volumes, distributor/manufacturer marketed agents, container sizes, and the shelf life of SWAs. The SDS were obtained from manufacturers to aid in the evaluation of safety and environmental protocols for SWA use.

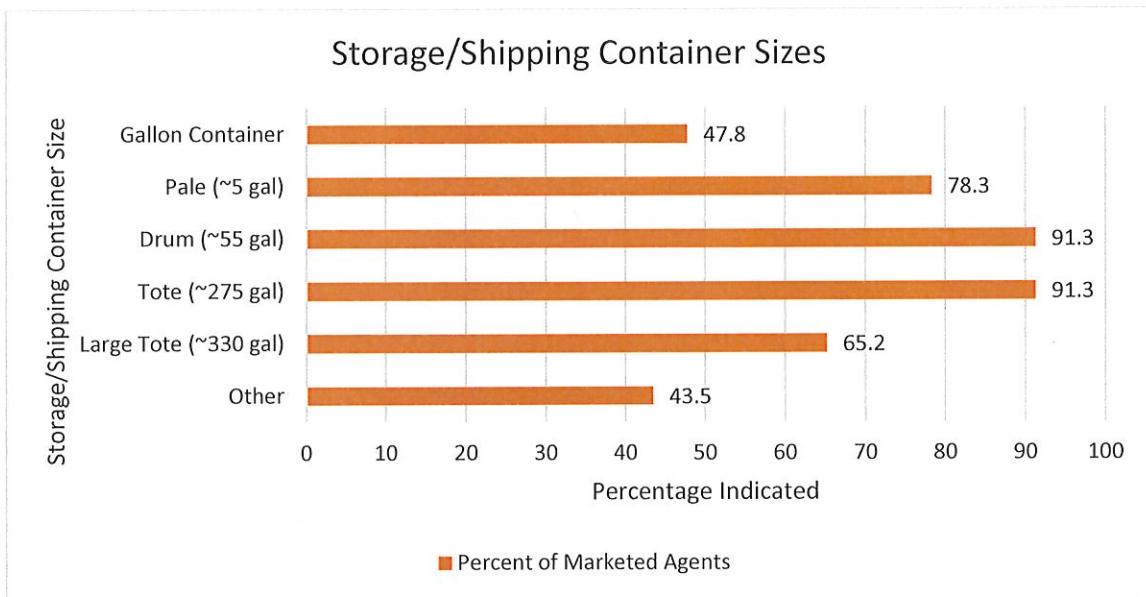
The majority of the 24 SWAs are available in each of the Gulf coast states, but they are not necessarily available in every state. See Figure 2-1 for a comparison of relative availability and current storage. Distributors and manufacturers in Texas have access to provide 95.2% of listed SWAs, followed closely by Louisiana and Florida at around 83%. Texas has the largest current storage of SWA at 18,309gal.

FIGURE 2-1



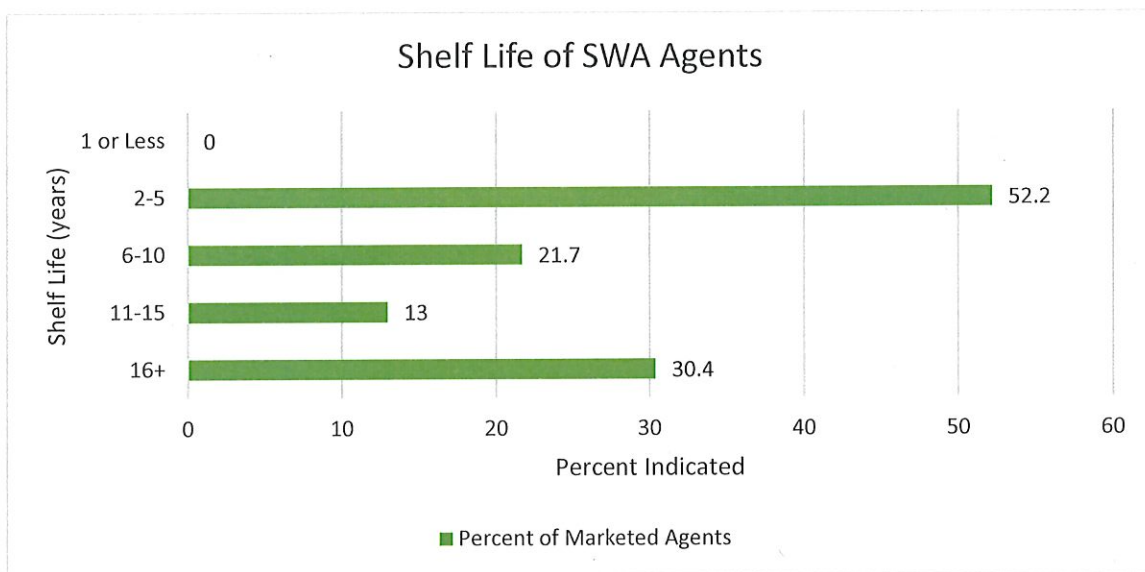
SWA are available in a variety of container sizes. Figure 2-2 shows the sizes typically available for distribution. Most manufacturers produce drums and totes (91.3%). Some manufacturers produce smaller or larger containers. Manufacturers indicated in the “other” category produce custom batches of SWA ranging from tank-trucks to railcars and other purchaser requests.

FIGURE 2-2



OSROs and response groups usually purchase and store small quantities of SWA and typically purchase large orders upon request. A few OSROs indicated that they prefer to purchase in bulk quantities and store their SWA on-site. Those OSROs that store large quantities on-site must consider the manufacturer’s published shelf life. The results displayed in Figure 2-3 show that the shelf life of more than half of the SWA on the market is less than 5 years.

FIGURE 2-3



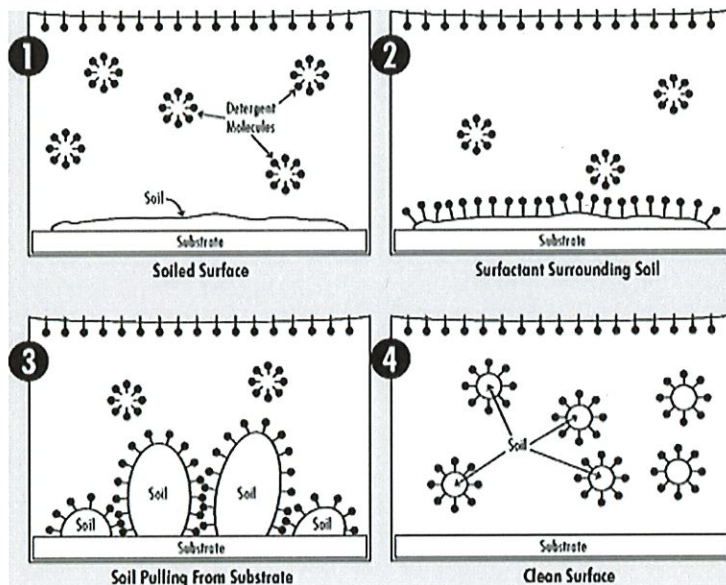
2.1.2 Chemistry Effectiveness on Dispersion in the Water Column

There are two primary categories for surface washing agents. Generally, these are described as “lift-and-float” (LF) and “lift-and-disperse” (LD) agents. The categories describe the post-application processes and how the surfactant/petroleum mixture interacts in the water column. These categories also give an indication of the recoverability of oil from the surface of the water.

The process by which LF agents can be applied to the petroleum covered substrates, bind to the oily material, and are washed off via pressure washing at various temperatures and pressures, or removed by steam cleaning, are shown in Figure 2-4. If the applied SWA washes off and accumulates on the water’s surface, either immediately or after a delayed amount of time, the product would be considered LF. However, describing a SWA behavior as specifically LF may be situationally inaccurate. The observation of delayed effects may be considerably affected by wave action, currents, temperature, etc. Certain LF agents may initially disperse the oily mixture into the water column and then re-float after a period of time. In addition, the term LF does not insinuate that the product will remain floating indefinitely.

FIGURE 2-4

Surface Washing Agent Interaction on Impermeable Substrates



Source: "Chemistry of Cleaning", Essential Industries Inc.

This diagram illustrates how surfactants clean soil from a smooth substrate. SWA use the same process when removing petroleum from impermeable surfaces in the LF process.

The other category of surface washing agents are LD agents. These products perform like dispersants. They emulsify oils and disperse them into the water column. LDs are not allowed to be used as SWAs in Texas waters due to the inability to recover the petroleum and chemical mixture. Dispersion may also lead to environmental concerns about aquatic toxicity. There is evidence to suggest that the petroleum products dispersed in the water column by LD agents may separate and result in the accumulation of the heavier petroleum fractions in the benthic areas of the water column.

Some agents may be considered either LF or LD, depending upon the dilution ratio of the SWA that is used during application. For example, some SWAs portray the physical and chemical characteristics of a dispersant at higher concentrations and behave like a LF SWA at lower concentrations. This dual role of a given SWA, based upon the dilution ratio, may lead to questions about delayed effects. An SWA could float the petroleum off of a substrate and then, after a period of time, begin to disperse it into the water column. Additional factors that might affect dispersion of the petroleum can include: temperature, substrate type, salinity, biological coverage and other factors. These factors represent just a few reasons that SWA users should follow manufacturer's instructions very closely and why regulatory agencies may want to monitor applications.

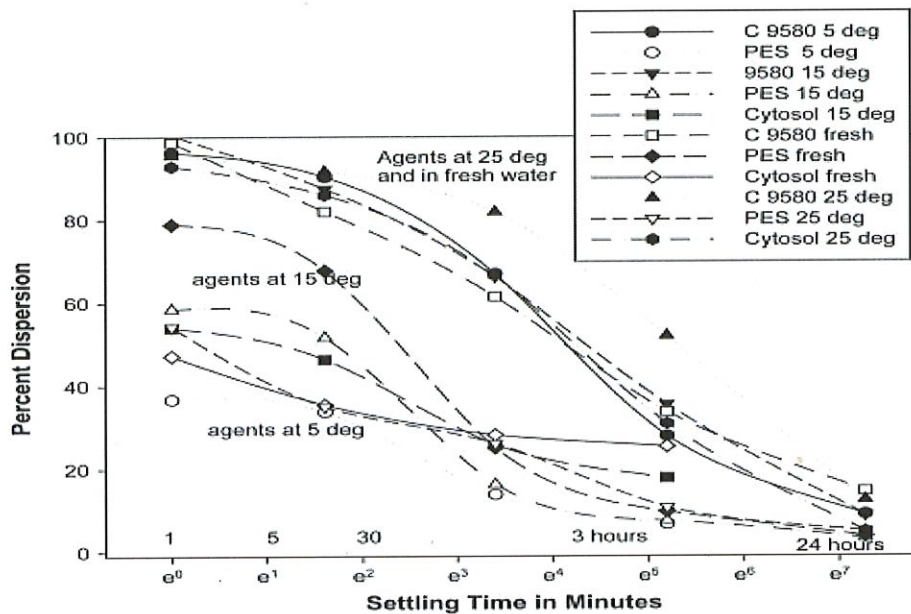
In a study done by Fingas and Fieldhouse (2011), dispersion trials were conducted for 3 of the surface washing agents: Corexit 9580, PES 51, and Cytosol. In these laboratory tests dispersion percentages were based on the use of high-application energy, various dilution ratios, salinity,

and temperature differences. They determined that salinity had minor effects on dispersion. All 3 of the tested SWA product's dispersion became unstable after a longer period of time. Figure 2-5 shows the dispersion percentage change to an unstable, lower dispersion percentage after time elapses. This insinuates that higher-pressure washing will lead to greater dispersion of surface washing agents into the water column, and that the pressure washing energy used will determine the amount of time for reformulation of the agent/petroleum mixture to rise to the surface.

Products with LD properties or products that are considered LF only in stable energy conditions are not generally recommend for use on shorelines with high wave energy. Such conditions will result in higher dispersion in tidal zones and make recoverability unlikely.

FIGURE 2-5

Timescale Dispersion of Major Surface Washing Agents



Source: "Chapter 21- Surface Washing Agents or Beach Cleaners", Oil Spill Science and Technology.

2.1.3 Physical Effectiveness on Chemical Cleaning Capabilities

SWA effectiveness is highly dependent on the chemical and physical characteristics of the petroleum contaminants on which it is used. Instances where the contaminants were either heavily weathered or coagulated reduced the effectiveness of the SWA products. In general laboratory and meso-scale testing that simulated response efforts showed that crude oil and marine diesel (lab tests only) could be removed and recovered. This finding is significant because Texas' largest petroleum export is crude oil.

The physical effectiveness and chemical cleaning capabilities of SWA were observed and described by noting the degree of removal, tackiness, and other general observations during and after application. SWA are formulated to lift hydrocarbon molecules off the surface of a substrate and allow gravitational forces to drip the liquid down to the water-substrate interface. Petroleum removal and drippage was measured after each of the 3 applications for each SWA product comparative cleaning results.

The visual effectiveness of SWA cleaning capabilities were noted during and after each test. Researchers were able to note physical removal or changes that the SWA had accomplished on the oiled substrates. For example, Figure 2-6 shows concrete and wood substrates post-application during meso-scale testing. The concrete substrate shows evidence of the removal and drippage that occurred with all 3 petroleum oils. Note that in the photograph (left) stains were not completely removed after the 3rd application of this SWA. The wood substrate photograph (right) depicted significantly greater removal of all 3 applied petroleum strips but there was still significant stain removal of the crude and 6-oils.

FIGURE 2-6

Post Application Cleaning Assessments



2.2 Laboratory Assessments

Lab tests were designed to simulate natural conditions of Gulf salinity and seasonal temperature variations as well as petroleum product and substrate characteristics. The primary purpose of the laboratory evaluations was to gather data on the dispersion rates of SWAs that are marketed as

LF agents. SWAs were applied in accordance with the specific instructions of the manufacturers. Lab test results and analyses were reviewed by the TGLO POC prior to publication.

2.2.1 SWA Laboratory Testing Results

SWAs were tested at 3 different temperatures, on 3 different substrates, with 4 different applied oils. Since all 3 substrates were included in each test run there were a total of 12 runs with each SWA. The results of this testing are displayed in Table 2-1. The calculated dispersion ratios for each of the 12 tests on each SWA are shown on that table.

DI water alone was used in the micro-pressure washer as a control to determine LF or LD characteristics in relation to the tested SWAs. The results displayed in Table 2-1 are discussed in detail in section 2.2.3. This table serves to establish an empirical approach for describing a SWA as either LF or LD. Only those described as LF would be moved to the meso-scale testing phase of this project.

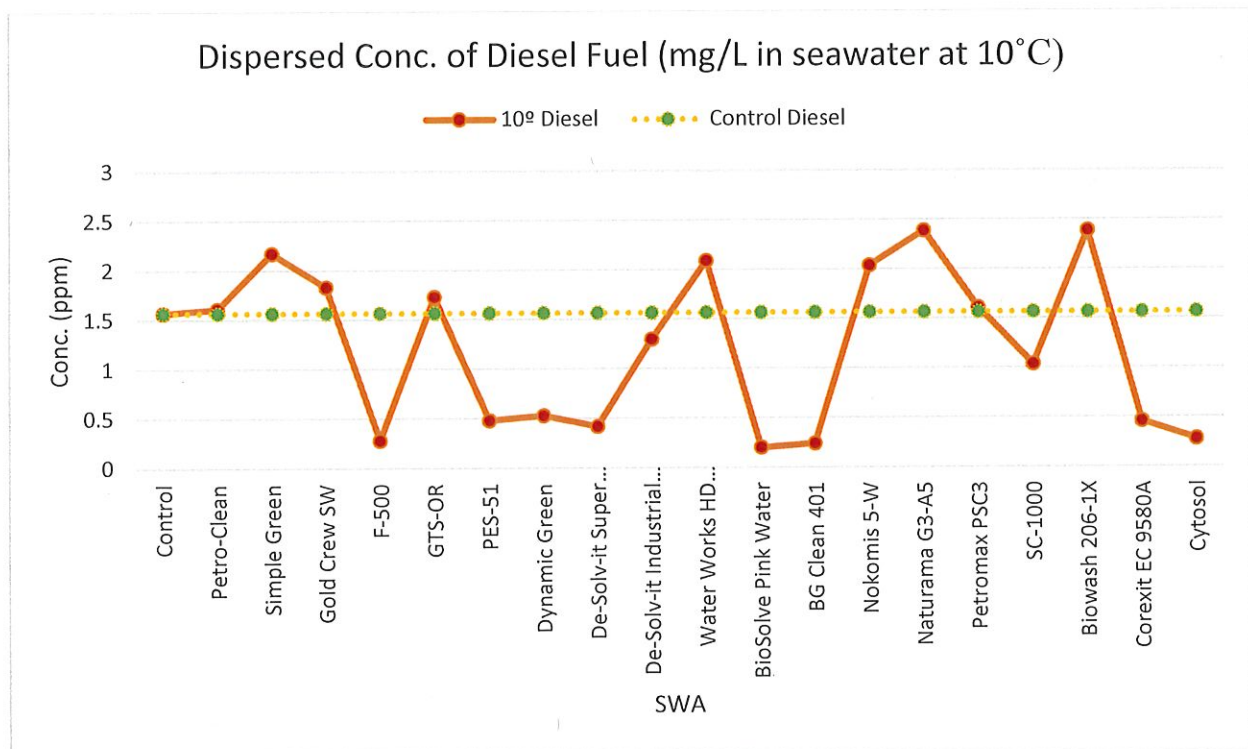
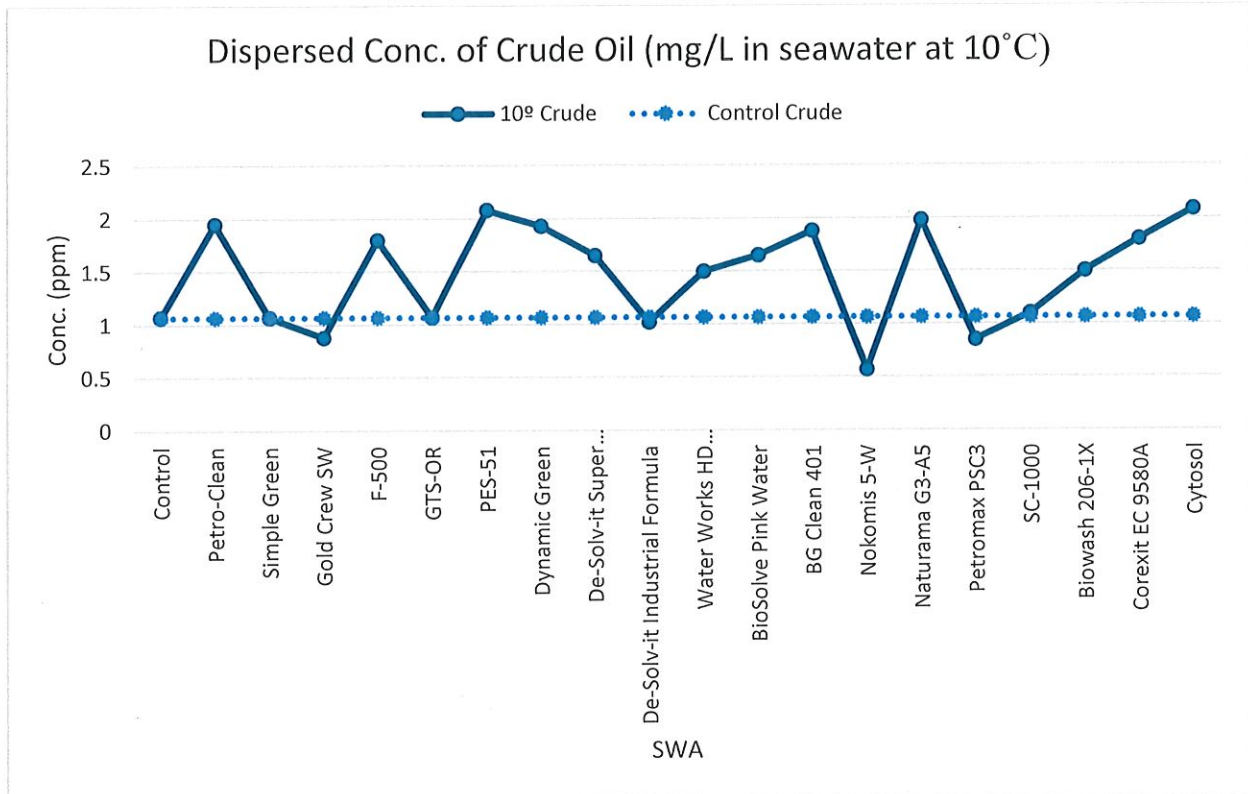
There are 12 line-graphs that follow Table 2-1. These graphs (Figure 2-7) depict the comparison of using the various SWA products against the control tests using DI water. When assessing the appropriate SWAs to use on a given oil at 10^o- 30^o C these graphs will assist in determining which products will result in the lowest dispersion rates after 1-hour.

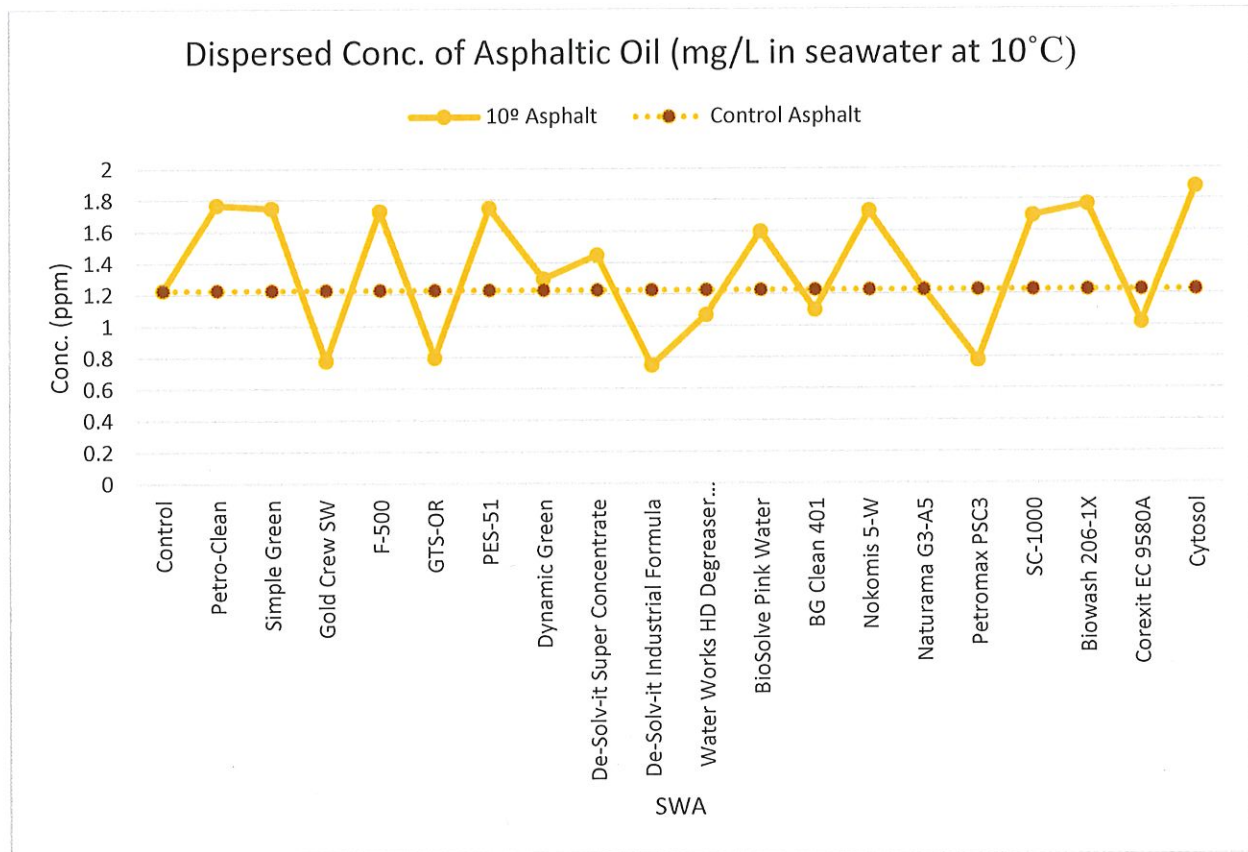
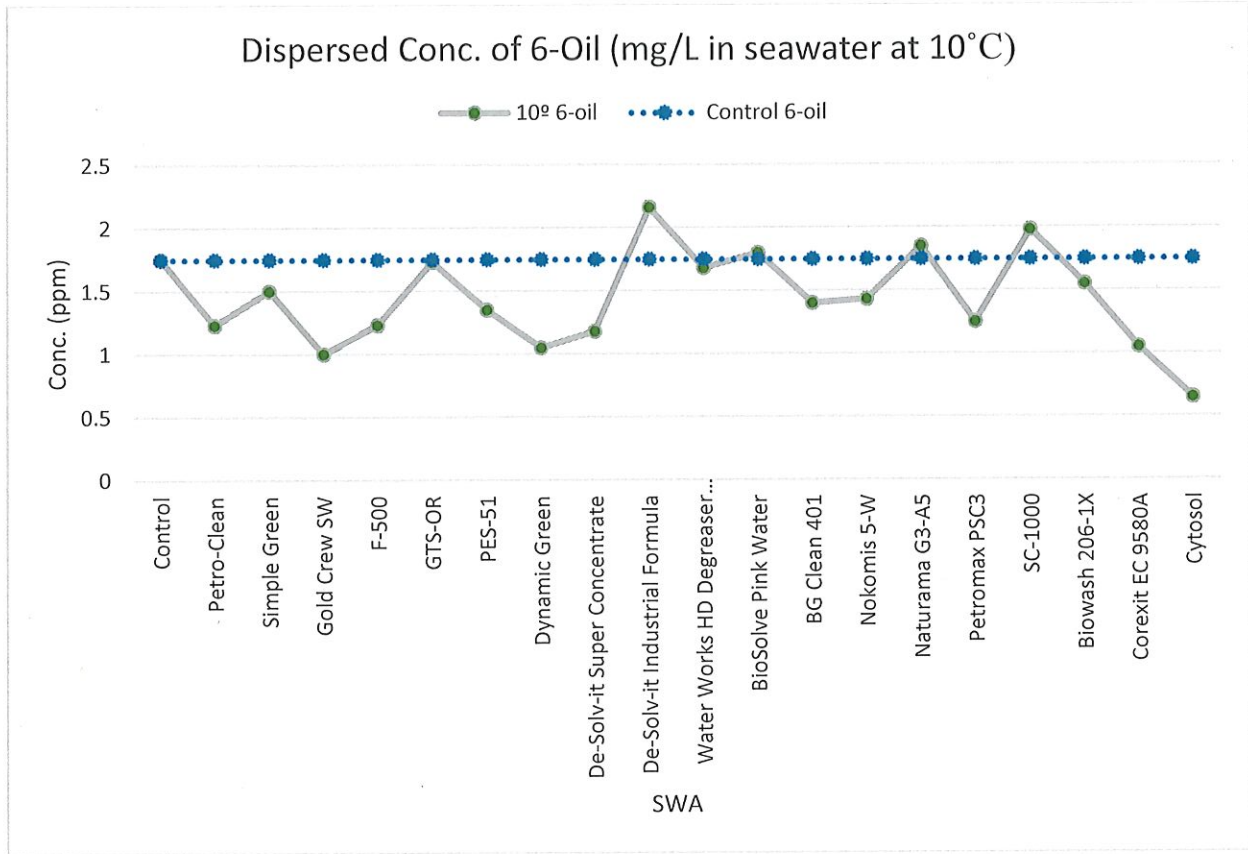
The observed dispersion concentrations were shown on the graphs. Concentrations below the threshold line of the control were used to determine the designation of LF. The TGLO POC concurred that this approach for comparing LF, LD, and control was the most appropriate method.

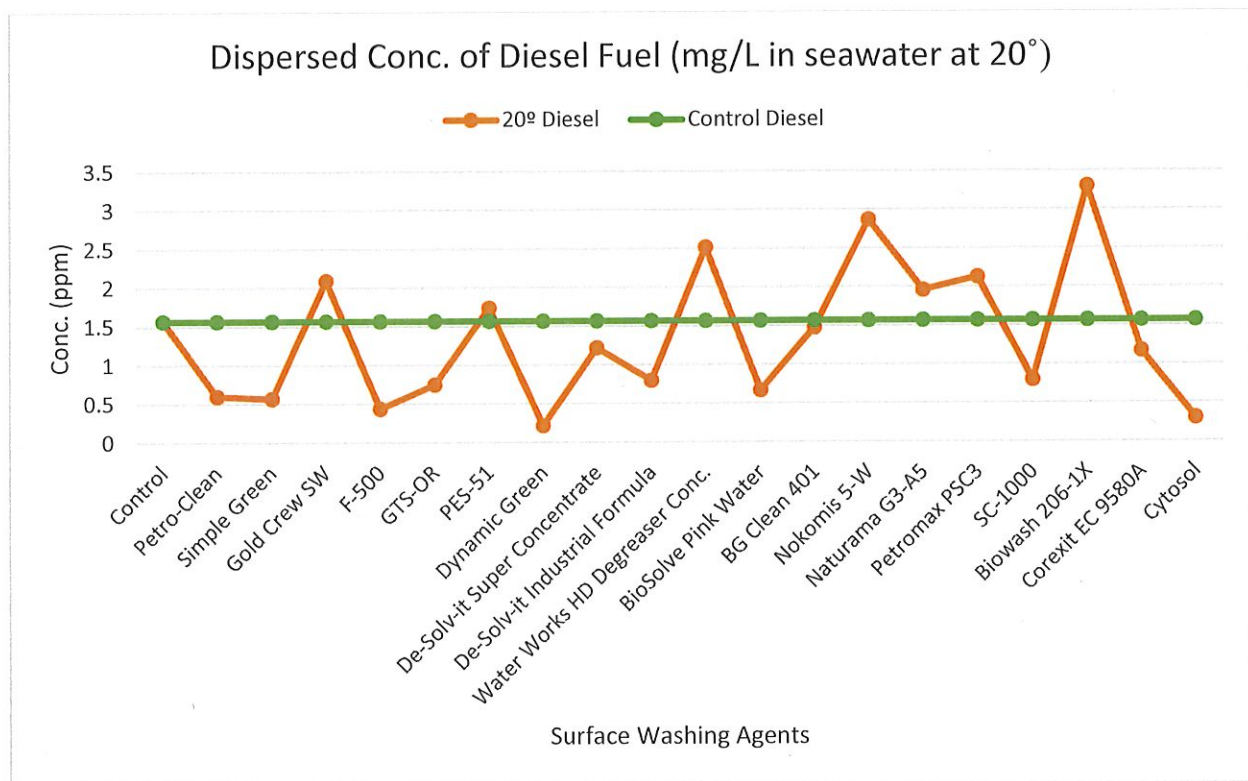
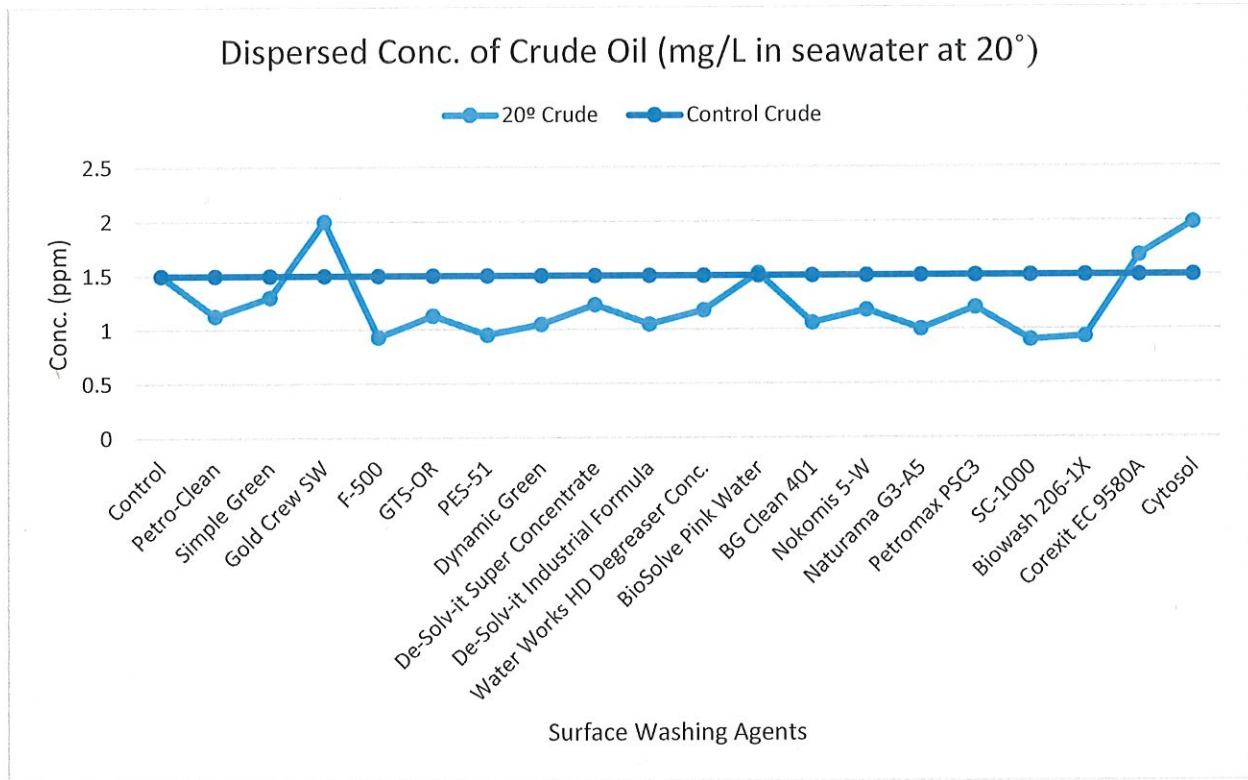
Table 2-1
NCP SWA Calculated Dispersion (mg/L TPH in seawater)
 (Temperatures are shown in ° Celsius)

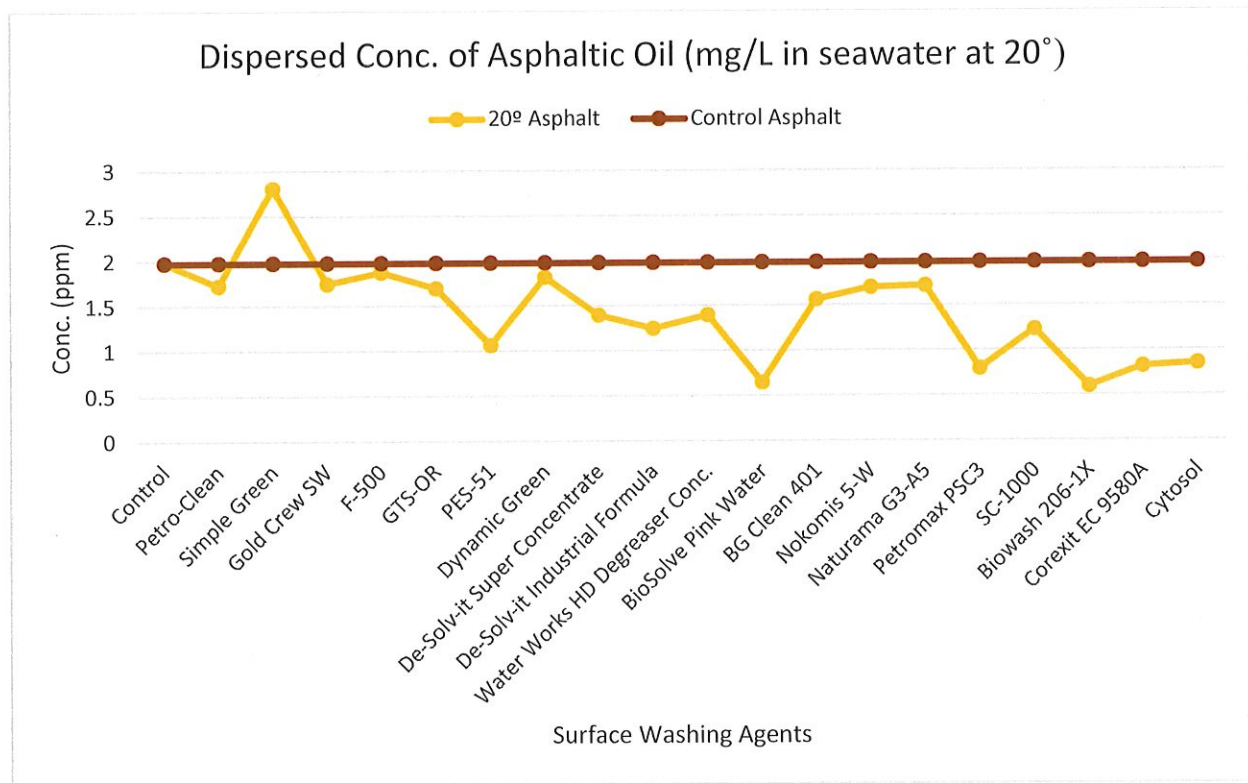
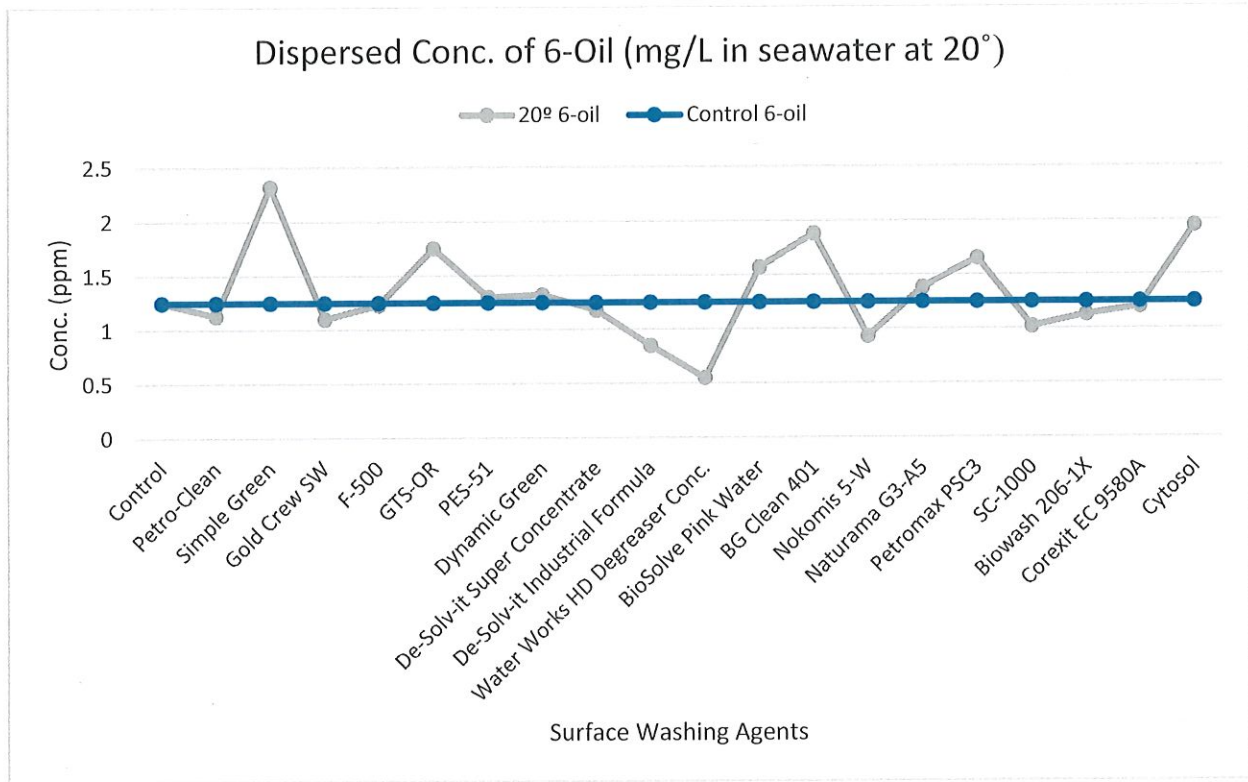
| | 10° Crude | 20° Crude | 30° Crude | 10° Diesel | 20° Diesel | 30° Diesel | 10° 6-oil | 20° 6-oil | 30° 6-oil | 10° Asphalt | 20° Asphalt | 30° Asphalt |
|--------------------------------|-----------|-----------|-----------|------------|------------|------------|-----------|-----------|-----------|-------------|-------------|-------------|
| Control | 1.07 | 1.5 | 0.95 | 1.57 | 1.57 | 0.5 | 1.75 | 1.25 | 1.15 | 1.23 | 1.98 | 1.88 |
| Petro-Clean | 1.95 | 1.13 | 1.45 | 1.61 | 0.6 | 2.09 | 1.23 | 1.13 | 1.8 | 1.77 | 1.73 | 0.72 |
| Simple Green | 1.07 | 1.3 | 0.7 | 2.17 | 0.57 | 1.61 | 1.5 | 2.32 | 1.18 | 1.75 | 2.81 | 0.6 |
| Gold Crew SW | 0.88 | 2 | 1.8 | 1.83 | 2.09 | 0.42 | 1 | 1.1 | 2.32 | 0.78 | 1.75 | 2.81 |
| F-500 | 1.8 | 0.93 | 0.93 | 0.28 | 0.44 | 1.7 | 1.23 | 1.23 | 0.78 | 1.73 | 1.88 | 2.32 |
| GTS-OR | 1.07 | 1.13 | 1.1 | 1.73 | 0.75 | 0.44 | 1.73 | 1.75 | 1.27 | 0.8 | 1.7 | 1.45 |
| PES-51 | 2.08 | 0.95 | 2.16 | 0.48 | 1.74 | 0.2 | 1.35 | 1.3 | 1.18 | 1.75 | 1.07 | 1.5 |
| Dynamic Green | 1.93 | 1.05 | 1.93 | 0.53 | 0.22 | 0.34 | 1.05 | 1.32 | 0.72 | 1.3 | 1.82 | 1.23 |
| De-Solv-it Super Concentrate | 1.65 | 1.23 | 1.9 | 0.42 | 1.22 | 1.61 | 1.18 | 1.18 | 1.07 | 1.45 | 1.4 | 1.38 |
| De-Solv-it Industrial Formula | 1.02 | 1.05 | 2.73 | 1.3 | 0.8 | 0.87 | 2.16 | 0.85 | 1.75 | 0.75 | 1.25 | 1.02 |
| Water Works HD Degreaser Conc. | 1.5 | 1.18 | 1.1 | 2.09 | 2.52 | 0.43 | 1.68 | 0.55 | 1.2 | 1.07 | 1.4 | 0.8 |
| BioSolve Pink Water | 1.65 | 1.52 | 1.4 | 0.2 | 0.67 | 1.7 | 1.8 | 1.57 | 0.88 | 1.6 | 0.65 | 2.97 |
| BG Clean 401 | 1.88 | 1.06 | 1.68 | 0.24 | 1.48 | 2.09 | 1.4 | 1.88 | 0.78 | 1.1 | 1.57 | 1.4 |
| Nokomis 5-W | 0.57 | 1.18 | 0.57 | 2.04 | 2.87 | 0.28 | 1.43 | 0.93 | 0.6 | 1.73 | 1.7 | 0.97 |
| Naturama G3-A5 | 1.98 | 1 | 2 | 2.39 | 1.96 | 0.2 | 1.85 | 1.38 | 1.98 | 1.23 | 1.72 | 1.82 |
| Petromax PSC3 | 0.85 | 1.2 | 1.15 | 1.61 | 2.13 | 1.51 | 1.25 | 1.65 | 1.93 | 0.78 | 0.8 | 1.35 |
| SC-1000 | 1.1 | 0.9 | 1.23 | 1.04 | 0.8 | 0.3 | 1.98 | 1.02 | 1.75 | 1.7 | 1.23 | 3.29 |
| Biowash 206-1X | 1.5 | 0.93 | 1.15 | 2.39 | 3.3 | 2.61 | 1.55 | 1.13 | 1.48 | 1.77 | 0.6 | 0.53 |
| Corexit EC 9580A | 1.8 | 1.68 | 0.97 | 0.46 | 1.17 | 1.39 | 1.05 | 1.2 | 0.57 | 1.02 | 0.82 | 0.95 |
| Cytosol | 2.08 | 1.98 | 1.57 | 0.28 | 0.3 | 0.73 | 0.65 | 1.95 | 1.07 | 1.88 | 0.85 | 1.35 |

Figure 2-7
SWAs Calculated Dispersion vs. Control Conc.
 (Concentrations are shown in ppm or mg/L in seawater)

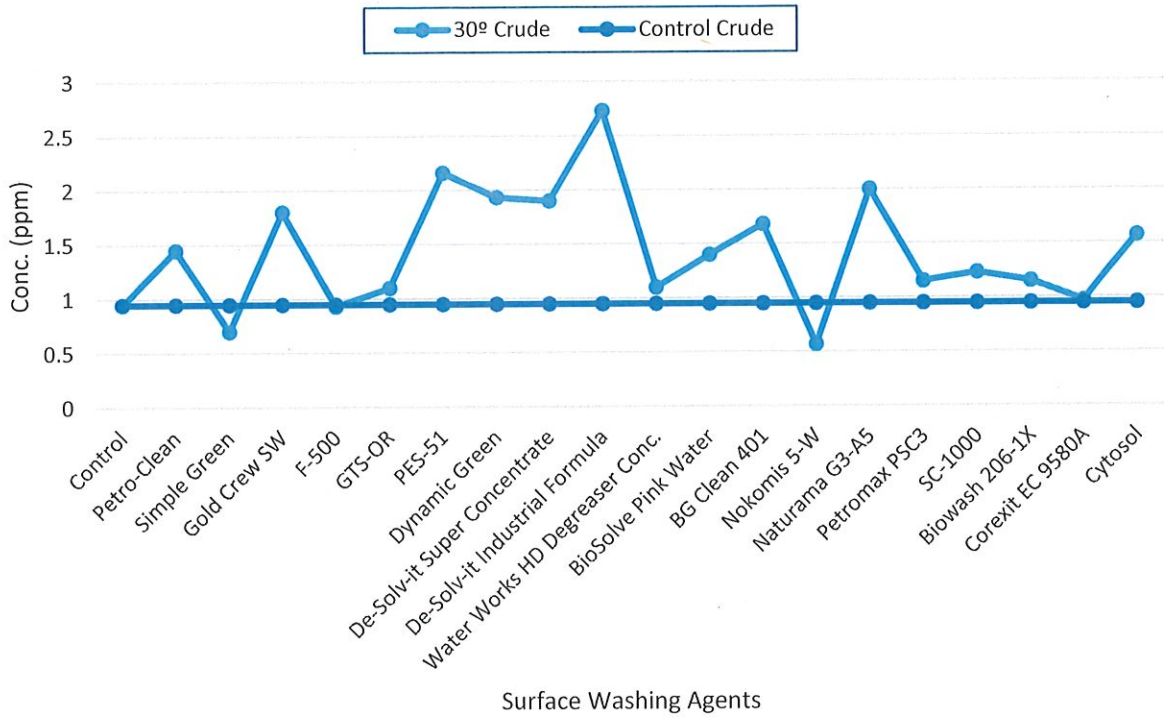




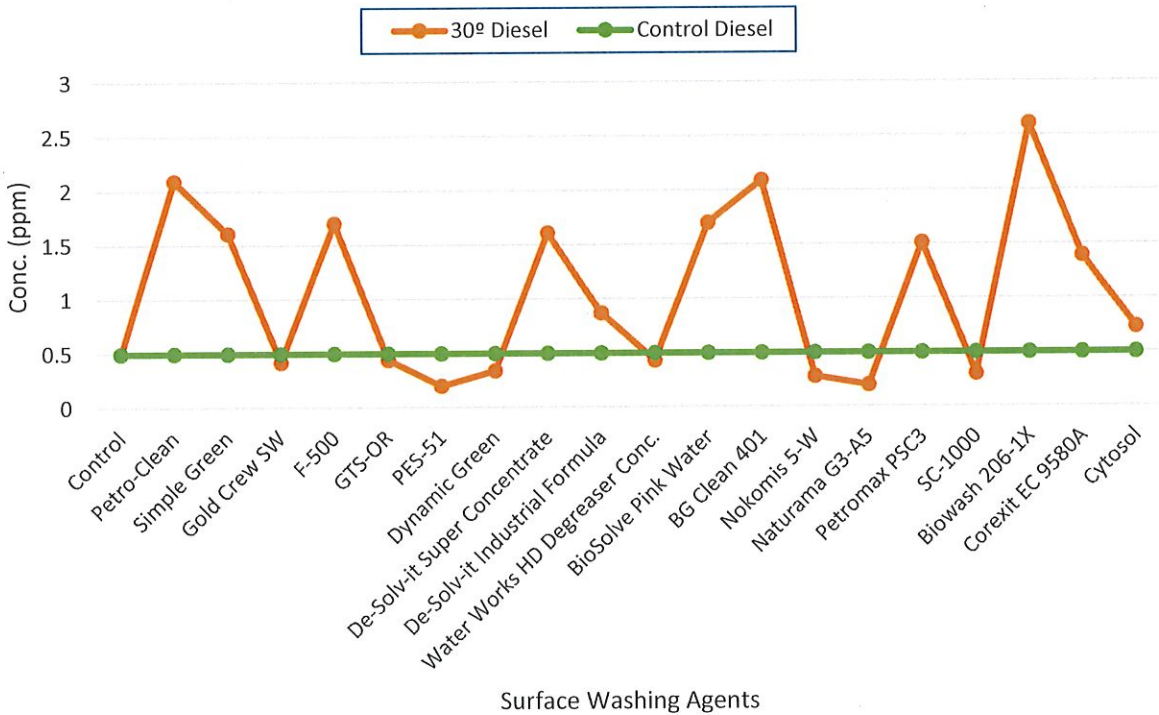


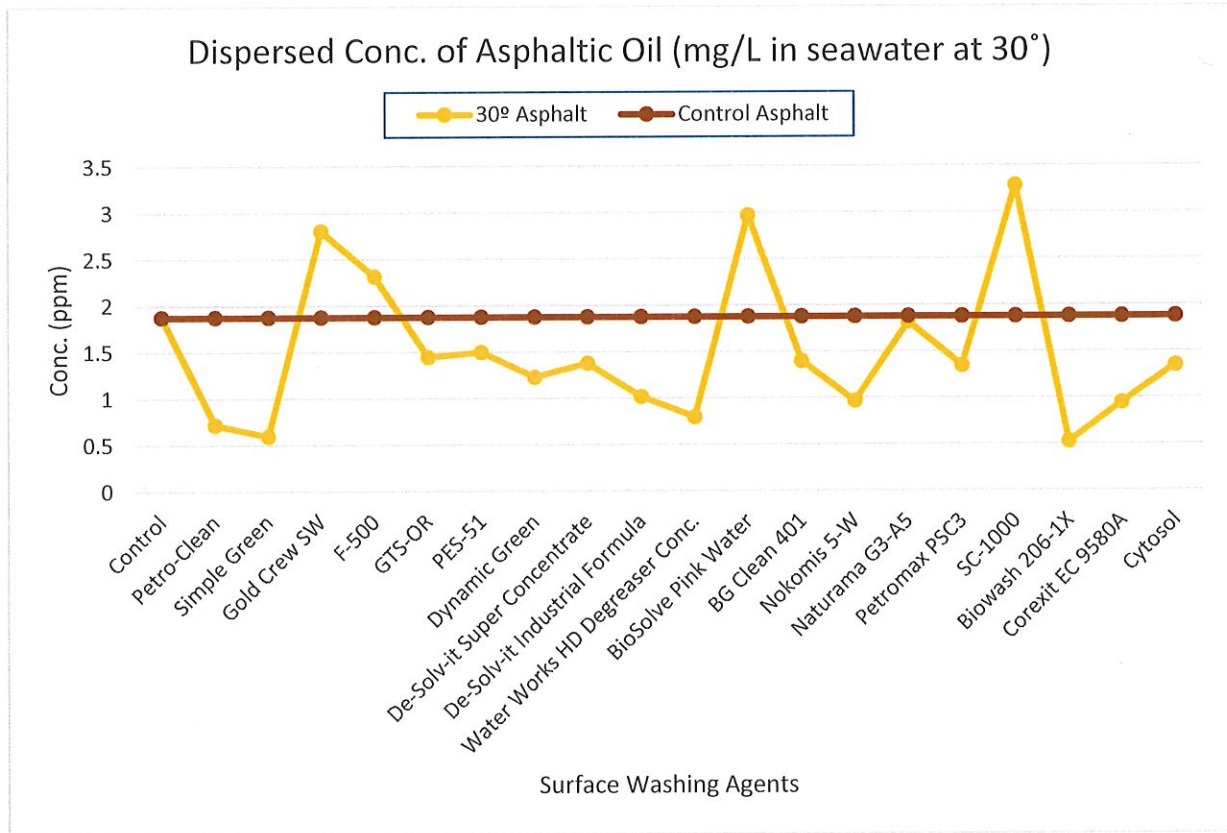
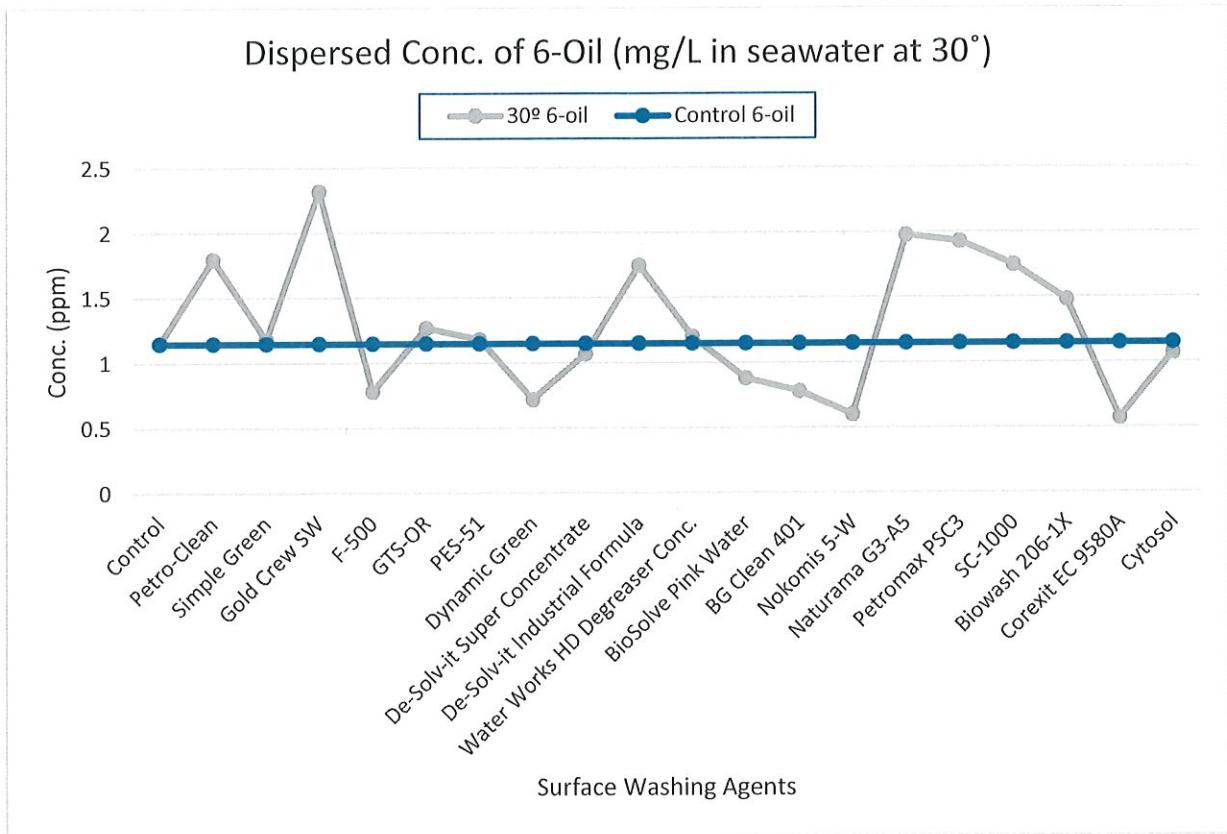


Dispersed Conc. of Crude Oil (mg/L in seawater at 30°)



Dispersed Conc. of Diesel Fuel (mg/L in seawater at 30°)



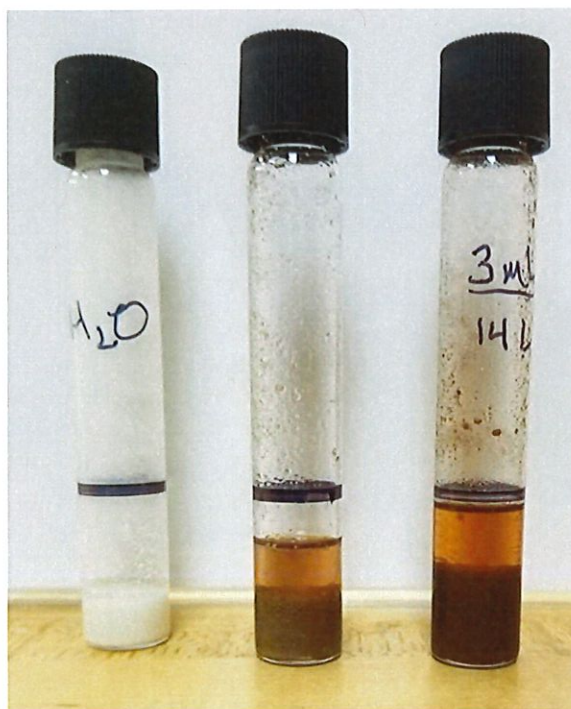


2.2.2 Observed and Calculated Oil Dispersion

Hanby Environmental TPH Water Kits were used to determine accurate and consistent evaluation of SWA dispersion into the water column. Substrate particles that broke off into the water did not interfere with dispersion calculations using this method because the tests use colorimetric reactions to quantify TPH. Figure 2-8 depicts the Hanby test method in use (left) and the resulting color change with various concentrations of TPH in the water (right). The process of calculating dispersion using this Hanby TPH analysis method is described in section 1.2.2.

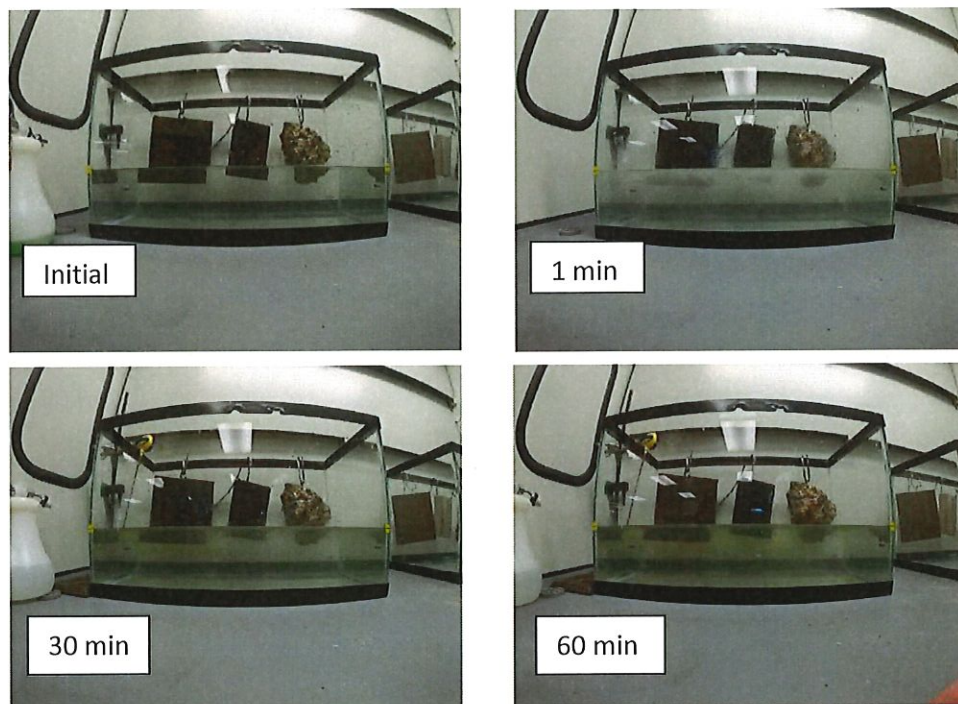
FIGURE 2-8

Hanby TPH Testing and Colorimetric Comparison



Records were maintained of all laboratory tests of the 20 SWAs provided by the manufacturers. These include written records of visual observations and stop motion photography or videography. These records are maintained on an external hard-drive at the NSCS. Figure 2-9 shows the comparative timeline of a SWA from initial application to the 60-minute post-application time. These photo and video files show how the SWA performs comparatively at different temperatures. They show dispersion and refloating over the test period.

**FIGURE 2-9
SWA Application and Dispersion**



2.2.3 SWA Lift and Float Identification

NSCS researchers tested the 20 NCP listed SWAs that were available on the Gulf coast and were provided by manufacturers. The dispersion ratios shown in Table 2.2 identify the SWAs that were determined to be LF products. This method of determining LF agents was discussed with TGLO personnel and other leading SWA researchers.

**Table 2-2
Lift and Float SWA**

| Surface Washing Agent | Occurrences of Dispersion Below Control |
|--------------------------------|---|
| F-500 | 8 |
| GTS-OR | 8 |
| PES-51 | 6 |
| Dynamic Green | 8 |
| De-Solv-it Super Concentrate | 8 |
| De-Solv-it Industrial Formula | 8 |
| Water Works HD Degreaser Conc. | 7 |
| BG Clean 401 | 8 |
| Nokomis 5-W | 9 |
| Corexit EC 9580A | 8 |
| Cytosol | 7 |

To determine LF capabilities the NSCS researchers compared results of dispersed oil concentrations in water to the concentrations found in control tests using only DI water in the micro-pressure washer. In tests where the majority of the results showed concentrations of TPH in seawater below the levels observed with pressurized DI water only, the SWA was considered to be LF. The SWAs in Table 2-2 show the agents which were tested in the meso-scale pressure washing phase.

The laboratory scale testing provided researchers a way to evaluate the dispersion characteristics of each SWA application and determine LF characteristics. The meso-scale testing provided an assessment of the removal and cleaning capabilities of proven LF SWAs on weathered oils.

Figure 2-10

SWA Application and Observation of LF Characteristics

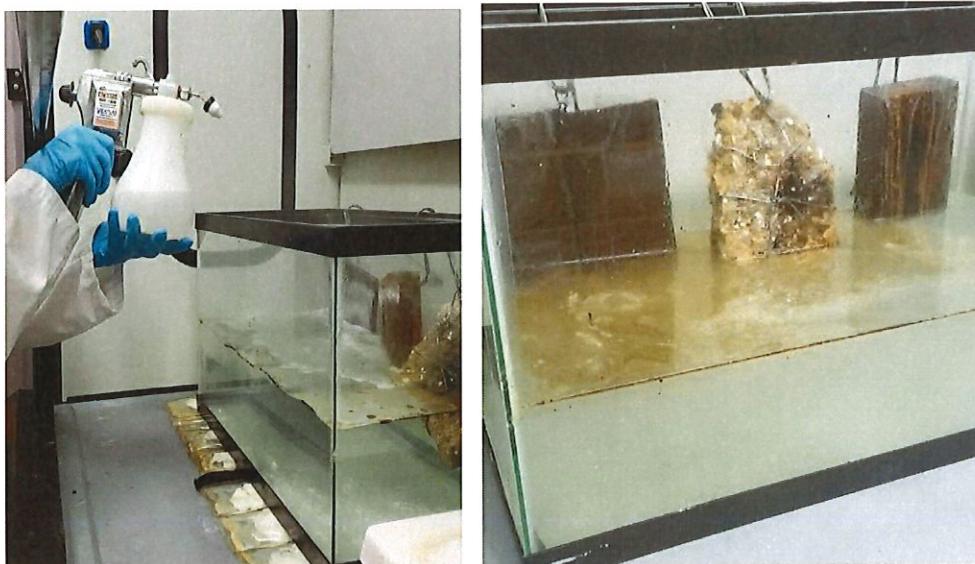


Figure 2-10 depicts researchers applying a SWA during a 10°C test (left). Post application dispersion characteristics typically show a cloudy water column. In this photo both LF and LD characteristics can be observed (right).

Laboratory-scale testing results, observation, and calculation tables are located in the attachments to this guidance document.

Some currently listed NCP products are no longer produced and some are not produced by the original manufacturer. The list of NCP Product Schedule manufacturers was updated in 2018. A current NCP Product Schedule should be consulted for updated contact or status information in future years.

2.3 Meso-Scale Assessments

Meso-scale tests were designed to simulate the manufacturer's full-scale application recommendations on various substrates and with oils. The primary purpose of the meso-scale assessments was to test the effectiveness and cleaning capabilities of the SWAs. These various oils had been weathered outdoors, at ambient temperatures and solar incidence, on the respective substrates for 24-hours.

2.3.1 SWA Meso-Scale Testing Results

All tests were conducted at ambient outdoor temperatures ranging from 29°-35°C. Meso-scale testing results represent ambient conditions at the time of these tests. Actual field results will be subject to the actual environmental conditions at the time of a spill response. Conditions such as precipitation, wind, heat, and wave action may vary with each spill and it was not possible to evaluate all such variables for this project.

Meso-scale test results, observations, and calculations are located in the attachment section of this report.

2.3.2 Observed and Calculated Cleaning Capabilities

Researchers compiled all testing visual observations and records maintained on an external hard-drive at the NSCS. Visual observations were documented with stop motion photography or videography. Figure 2-11 shows the progress of meso-scale testing of an SWA on various substrates from initial application to the conclusion of the first application. A total of 3 applications were required to adequately remove the surface oiling from the substrates. This visual database shows viewers how the SWA performs at different temperatures and how adequately it cleans the substrates.

FIGURE 2-11

SWA 1st Application Timeline



Pre-Application



Initial Application



Post 1st Application

Cleaning capability results for SWA meso-scale testing shows that many agents provide significant removal of weathered crude oil by the first and second applications. Of the remaining SWAs, those that did not remove weathered crude oil by the second application, removed it after

the third application. Most of the 11 SWAs that were tested were able to efficiently remove staining and surface tackiness of crude oil by the third application.

Most tested products removed weathered 6-oil by the second application. The 6-oil used had characteristics of high viscosity at low temperatures. However, this oil had a higher removal rate and lower viscosity when the temperatures reached around 31°C. When SWAs were applied onto coatings of 6-oil, most SWAs were able to efficiently remove staining and surface tackiness by the third application.

Asphaltic oil was the most persistent of any of the weathered petroleum tested. This asphalt was a solid at ambient temperatures below 35° C. It was necessary to heat it prior to applying it to substrates. During the weathering process in the sun, the asphaltic oil bubbled at the surface when temperatures were above 32°C. During the first and second applications asphalt was typically degraded into patches and was, in certain instances, fully removed by the third SWA application. However, multiple SWA applications were observed to remove layers of the asphaltic oils, but not the underlying stains. In certain cases, enough layers were removed from the asphaltic coating for it to lose its tackiness.

The most difficult aspect of cleaning of the substrates with any of the agents was the removal of the residual stains. It appeared that high pressure was more effective for removing stains than SWA treatment alone. Observations in the laboratory and meso-scale tests indicated that staining was especially difficult to remove from wood substrates. This is likely due to the porosity of the wood fibers which allowed oils to soak into the substrate over the period of weathering.

3.0 Best Management Practices for SWA Application and Guidance

3.1 Response Priorities

All appropriate decision-making parties should be notified immediately after the need for SWA use has been identified. Typically, the decision to use SWAs must be approved by the FOSC. Decision making on chemical response is determined by the FOSC, USCG, and Unified Command of the incident. In response cases for dispersant use, the USCG Strike Team should be notified for observation.

One of the first priorities in a response situation is to notify the appropriate regulatory agencies of the intent or need to use SWAs. Decision makers will expect pertinent information about the environment, weather conditions, type of oil, and proposed SWA products.

First responders should assess the substrate types and determine if SWA application could be a potential cleaning method in each situation. Prior to applying SWAs responders should be familiar with all aspects of the surrounding environments. Then, prior to SWA application, responders should boom off the contaminated areas to ensure that the lifted-and-floated oily product will not become mobile in the marine environment. Areas of sensitive aquatic habitat and vegetated shorelines should be identified and considered during the selection of response methods and SWA products. The “First Responder Shoreline and Sensitive Habitats Observation Form” will help guide sight evaluators in this process.

Initial observers should assess the situation from a safe distance upwind, uphill, or upstream of the target area. Initial observations should consider environmental effects, markings or signs of exposure or release sites, weather, and nearby dwellings. Wave energy should be considered while selecting an appropriate cleaning methodology as it may affect the dispersion rate of SWAs.

First responders should determine the type(s) of oil(s) coating coastal shorelines and collect pertinent information on that petroleum product(s). The selection of an SWA should be based upon the greatest potential for cleaning, recoverability, and minimal dispersion of the oil into the water column.

Prior to an actual response management should develop a quality control program to ensure that all response equipment is in proper working order. Forms or checklists may be used to assure readiness. Generalized SWA and response checklists may be found in the attachment section. SWAs and pressure washer fuels should be ready for transport in secure containers. SDSs should be on hand for SWAs and any other chemical products. The shelf life of SWAs should be checked to assure reliable product performance.

U.S. Federal agency observers of SWA applications may include: USCG Strike Team, USFW Observers, and other pertinent groups. Texas state agencies may be represented by observers from TGLO, TCEQ, TPWD, TDH, and others. The primary purpose of this document is to aid such observers responsible for agency oversight on response activities involving the application of SWAs.

During the response process, personnel safety is the most important priority. Ensuring safe work practices including the proper application of SWAs and the appropriate use of PPE will aid in assuring the safety of all involved. Any additional spills, accidents, or recoverability problems should be promptly reported to the appropriate party. Containment of all chemical and oily products must occur. Waste transport and disposal must meet all state and federal laws and regulations.

Once initial determinations are made for the application of SWA, applicators and responders should reference the “SWA Applicators Request for Approval” form. This form should be submitted as the cover document to the FOSC, Federal and State SSC, and RRT-VI representative, along with all additional supporting forms and checklists. These attachments will aid the decision makers in their approval process for SWA use.

Upon initial arrival at the site, regulatory agency observers should reference the attachments to this document including:

- First Response Assessment and Observation Form
- First Response Shoreline and Sensitive Habitats Observation Form

3.2 PPE Requirements and Recommendations

PPE may be required for SWA operations. This includes the use of safety glasses, goggles, face-shields, gloves, chemically-resistant clothing, respiratory protection equipment, and etc. Specific recommendations and checklists can be found in the attachment “SWA Equipment and PPE Checklist”. Prior to response operations all equipment, PPE, and chemicals should be properly stored and inspected for safe function.

OSHA’s Hazard Communication Standard (HCS), located in 29 CFR 1910.1200(g), requires that chemical manufacturers and distributors provide a Safety Data Sheet (SDS). SDSs should be made available to any person who works with or around SWAs. A quick reference table of the safety information contained in the SDSs for all NCP listed SWAs is provided in the Attachment section. This table includes SDS information for health hazards, first aid, PPE, fire hazards, and ecological damages.

SWA SDS sheets contain all pertinent information of the chemical and should be referenced before purchase or application. SDSs contain safety information in the following 16 sections:

- Chemical Product and Company Identification: Product name, sur-names, uses, manufacturing company contact information, and emergency contact information.

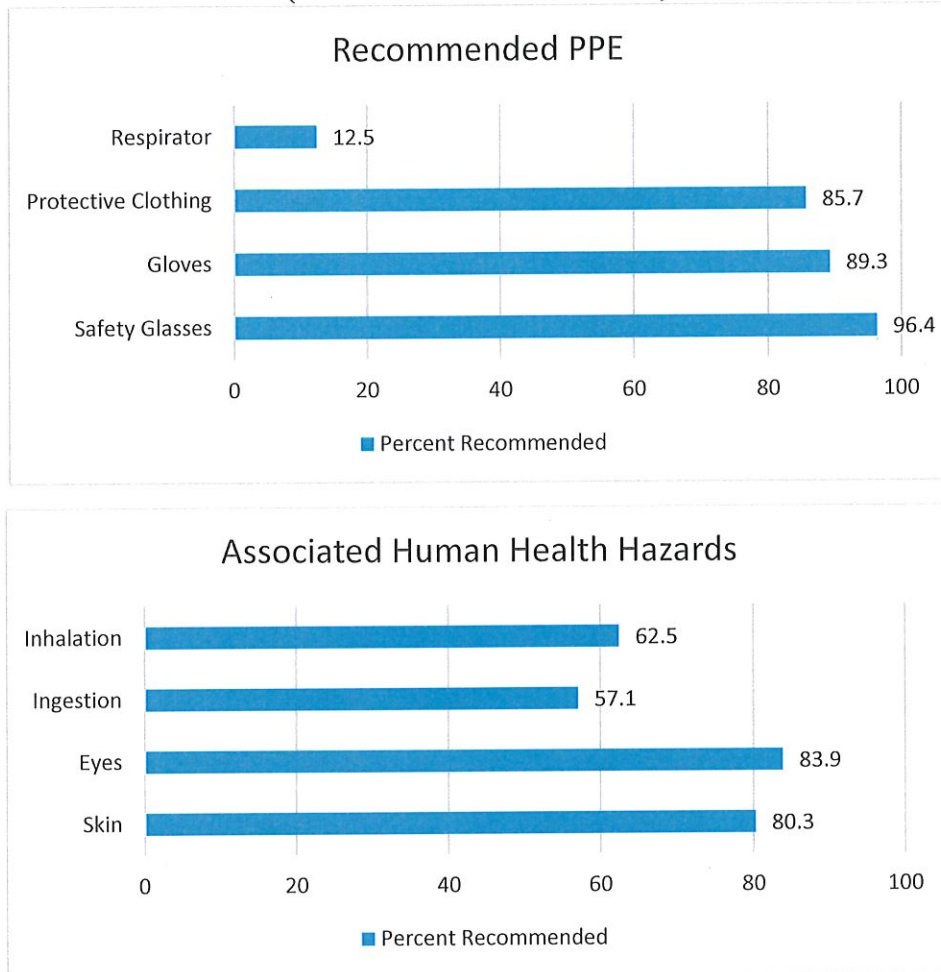
- Hazards Information: General health and physical hazards, and warnings.
- Composition Information: Non-proprietary chemical composition percentages.
- First Aid Measures: All safety instructions for eye and skin contact, inhalation, ingestion, and aspiration hazards.
- Fire Fighting Measures: Extinguishing media, hazard decomposition, explosion hazards, and any additional information for SWA fire containment.
- Accidental Release Measures: Containment required equipment, procedures, and precautions.
- Handling and Storage: Container storage limitations and handling/transport requirements.
- Exposure Control/Personal Protection: PPE requirements and exposure limits of the chemical.
- Physical and Chemical Properties: Flash points, physical state, appearance, odors, solubility, volatiles, pH, specific gravity, weight, viscosity, boiling/freezing point, evaporation rate, and any chemical characteristics listed.
- Stability and Reactivity: Hazards associated with polymerization, chemical stability, reactivity, conditions to avoid, incompatible materials and chemicals, and thermal decomposition.
- Toxicological Information: Listed routes of exposure, symptoms of exposure, calculated acute toxicity and category, targeted organs, medical conditions affected, physician notes, carcinogenic properties, and mutagenic and reproductive effects.
- Ecological Information: Calculated LC50 results at exposure limits, persistence and degradability, bio-accumulative potential, and soil mobility.
- Disposal Considerations: Environmental fate as well as State/Federal agency guidelines and regulations.
- Transport Information: D.O.T. classification numbers, labels, packing groups, and general transport requirements.
- Regulatory Information: Reportable quantities associated with EPCRA TPG and RQ, CERCLA, TRI, RCRA, RMP, and SARA, chemical inventories for TSCA, California additions, Clean Air/Water Acts, and Canadian WHMIS Classifications.
- Other Information: Standard Risk and Safety Phrases, Manufacturer statements, and any additional information the manufacturer wishes to include.

Most of the SWA reviewed under this project indicate hazards associated with human health and require some types of PPE and proper ventilation. Shown in Figure 3-1 the percentage of SWA manufacturers that have indicated which specific PPE is required. The figure also shows human health hazards that are frequently encountered when applying SWAs.

Reference the attachments section of this report for additional guidance and checklists regarding appropriate PPE, chemical, and equipment selection when applying specific SWAs.

FIGURE 3-1

PPE and Health Hazard Indications
(Percent of all NCP Listed SWAs)



Response operations that occur outdoors should be well ventilated, however changes in wind direction must be constantly monitored and relayed to SWA applicators. During and after response all polluted PPE will be treated as hazardous and contained prior to cleaning or disposal.

All response personal and equipment operators should be trained prior to response operations. The following PPE as shown in Figure 3-2 is considered a minimum safety standard for SWA applications.

FIGURE 3-2

Recommended Minimum PPE

- Liquid Chemical protective clothing
- Hard hat and/or facial splash shield
- Half-face or full-face respirator
- Steel-toe water-resistant boots



Prior to acquiring SWAs it is important to reference the SDS information to determine the appropriate PPE. Some foreign manufactured SWAs recommend the use of higher level PPE such as SCBA's and/or specific chemical protective clothing or gloves. Both the "Pre-Approved SWA Operations Activation Evaluation" and the "SWA Deployment and Observation Form" guide sight evaluators in the PPE selection process.

3.3 Pre-Deployment Considerations

The main goal of surface washing is to remove oily pollutants from substrates and to recover that oil from the water surface. Prior to SWA application, decision makers should make an initial assessment on whether the oil can be effectively removed and recovered after application. SWA may be preferred over other response methods if recovery can be assured. SWA application may not be preferred if it is determined that high energy or other factors would contribute to a loss of product or dispersion that would be detrimental to water quality or aquatic organisms.

The "First Response Assessment and Observations Form" in the attachments section will assist in making decisions prior to the deployment of SWA teams. The required information and checklists incorporated into this form are required for reporting to the Regional Response Team (RRT-VI Inland-Area Contingency Plan Report, 2016).

Before SWA use, notification and application forms must be submitted to RRT-VI which has jurisdiction over Texas coastal waters. This process allows RRT VI to notify and discuss the situation with TGLO personnel and send a Federal On-Scene Coordinator to oversee the

response process. Applications of SWA are only allowed with FOSC approval. There are certain pre-approved areas designated by the TGLO for which the FOSC approval can be expedited.

Upon SWA application some oily products will be lifted off of the substrate surface and drip to the ground or waterline below. Prior to application initial responders should determine the transport mechanisms that will occur after oil is released from the substrate. Currents and waves must be considered. In every situation of SWA application into or adjacent to waterways, a boom collection system should be deployed down-current. Figure 3-3 depicts containment booming strategies that have been successful in calm but open waterways.

FIGURE 3-3
Containment Booming Strategies after SWA Application



Regulatory agency observers should review the manufacturer's application criteria and ensure that response contractors have done the same, and are prepared to follow those instructions. SWAs should only be applied in accordance with the manufacturer's instructions to receive the intended cleaning results and assure reliable LF characteristics.

Prior to application recovery equipment should be selected. Sorbents, vacuums, or skimmers may be used for oil recovery. Recovery equipment should be chosen with the lifted-and-floated petroleum products in mind. Oil viscosity, debris, waves, and other factors must be considered. The selection matrix of skimming equipment may be found in Table 3-4 (Exxon Oil Spill Response Field Manual, 2008).

The documentation of observations made before, during, and after SWA application and response are highly recommended.

Prior to SWA deployment observers and applicators should refer to the attachments section for forms and checklists. These forms and checklists provide a template for gathering and recording information on PPE, chemical & response equipment, dilution and application rates, shoreline and sensitive habitat characteristics, containment, and observations.

Responders may want to review this document's attachments prior to requesting approval for SWA use from the FOSC. Responders may find the "Pre-Approved SWA Operations Activation Evaluation" and "SWA Equipment and PPE Checklist" most useful in preparing a request.

Laboratory tests have shown that only certain SWAs show the general physical characteristics of LF agents. Table 3-1 shows the degree of LF characteristics for various oil and at various temperatures. Because the RRT-VI and TGLO require that LF characteristics predominate for SWA use in pre-approved areas of Texas, this table may be used as a guide prior to making decisions for a specific spill event.

**FIGURE 3-4
Skimmer Selection**

| | | Skimmer Type | | | | | | | | | | | | | | | | |
|--|--|---------------|--------------------|---------------------------------|----------------|-----------|---------------------|------|-------------------|-------------------------|----------|----------------------------------|----------------------|------------------------|-----------|-----------------------|---------------|-------------|
| | | Weir Skimmers | | | | | Oleophilic Skimmers | | | | | | | Hydro-dynamic Skimmers | | | * | |
| | | Simple Weir | Self-Leveling Weir | Weir with Integral Screen/Auger | Advancing Weir | Weir Boom | Drum | Disc | Grooved Drum/Disc | Fabric-Coated Drum/Disc | Rope Mop | Zero Rotate w/ Velocity Rope Mop | Sorbent Lifting Belt | Brush | Water Jet | Submersion Plane/Belt | Rotating Vane | Paddle Belt |
| Operating Environment | Open Water | ● | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Protected Water | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Calm Water | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | High Current >1 knot (> 0.5 m/s) | ● | ● | ○ | ○ | ○ | ● | ● | ● | ● | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ |
| | Shallow Water <1 foot (<0.3 m) | ○ | ○ | ● | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Debris (Including ice) | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Oil Viscosity | High Viscosity | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Medium Viscosity | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Low Viscosity | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Skimmer Characteristics | Oil/Water Pickup % <small>see</small> | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Recovery Rate | ○ | ● | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| | Ease of Deployment | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| Available as VOSS (Vessel of Opportunity Skimming System) | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | |
| Available as Advancing Skimmer | | | | | ✓ | ✓ | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| Available with Storage | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |

Legend ○ Good ◐ Fair ● Poor ✓ = Yes

Copied with permission from ExxonMobil "Oil Spill Response Field Manual" (2014).

**Table 3-1
Calculated Dispersion of LF SWAs**

| | 10 ^o Crude | 20 ^o Crude | 30 ^o Crude | 10 ^o Diesel | 20 ^o Diesel | 30 ^o Diesel | 10 ^o 6-oil | 20 ^o 6-oil | 30 ^o 6-oil | 10 ^o Asphalt | 20 ^o Asphalt | 30 ^o Asphalt |
|--------------------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|-----------------------|-----------------------|-----------------------|-------------------------|-------------------------|-------------------------|
| Control | 1.07 | 1.5 | 0.95 | 1.57 | 1.57 | 0.5 | 1.75 | 1.25 | 1.15 | 1.23 | 1.98 | 1.88 |
| F-500 | 1.8 | 0.93 | 0.93 | 0.28 | 0.44 | 1.7 | 1.23 | 1.23 | 0.78 | 1.73 | 1.88 | 2.32 |
| GTS-OR | 1.07 | 1.13 | 1.1 | 1.73 | 0.75 | 0.44 | 1.73 | 1.75 | 1.27 | 0.8 | 1.7 | 1.45 |
| PES-51 | 2.08 | 0.95 | 2.16 | 0.48 | 1.74 | 0.2 | 1.35 | 1.3 | 1.18 | 1.75 | 1.07 | 1.5 |
| Dynamic Green | 1.93 | 1.05 | 1.93 | 0.53 | 0.22 | 0.34 | 1.05 | 1.32 | 0.72 | 1.3 | 1.82 | 1.23 |
| De-Solv-it Super Concentrate | 1.65 | 1.23 | 1.9 | 0.42 | 1.22 | 1.61 | 1.18 | 1.18 | 1.07 | 1.45 | 1.4 | 1.38 |
| De-Solv-it Industrial Formula | 1.02 | 1.05 | 2.73 | 1.3 | 0.8 | 0.87 | 2.16 | 0.85 | 1.75 | 0.75 | 1.25 | 1.02 |
| Water Works HD Degreaser Conc. | 1.5 | 1.18 | 1.1 | 2.09 | 2.52 | 0.43 | 1.68 | 0.55 | 1.2 | 1.07 | 1.4 | 0.8 |
| BG Clean 401 | 1.88 | 1.06 | 1.68 | 0.24 | 1.48 | 2.09 | 1.4 | 1.88 | 0.78 | 1.1 | 1.57 | 1.4 |
| Nokomis 5-W | 0.57 | 1.18 | 0.57 | 2.04 | 2.87 | 0.28 | 1.43 | 0.93 | 0.6 | 1.73 | 1.7 | 0.97 |
| Corexit EC 9580A | 1.8 | 1.68 | 0.97 | 0.46 | 1.17 | 1.39 | 1.05 | 1.2 | 0.57 | 1.02 | 0.82 | 0.95 |
| Cytosol | 2.08 | 1.98 | 1.57 | 0.28 | 0.3 | 0.73 | 0.65 | 1.95 | 1.07 | 1.88 | 0.85 | 1.35 |

3.4 SWA Deployment

SWAs may be purchased on an as-need basis or purchased and stored by responders depending upon their requirements. Shelf life, pricing, storage, storage capacity, and container sizes should be considered by the OSROs before purchase. Some SWA manufacturers do not produce commercial quantities of product until an order is placed. Contact information for the 11 SWA manufacturers that currently (December 2019) produce LF SWAs in the U.S. are displayed below:

SW-10 Corexit EC9580A
Nalco Environmental Solutions LLC
Mrs. Debby Theriot
7705 Highway 90-A
Sugar Land, TX 77478
Office Phone: 281-263-7709
Mobile Phone: 832-851-5164
Website: nalcoenvironmentalsolutionsllc.com

SW-11 De-Solv-It Industrial Formula
Orange-Sol Blending and Packaging
Mr. Tim Farnsworth
1400 N Fiesta Boulevard
Gilbert, AZ 85233
Phone: 800-877-7771
Fax: 480-497-0444
Website: orange-sol.com

SW-19 Cytosol
CytoCulture International Inc.
Dr. Randall von Wedel
249 Tewksbury Avenue
Point Richmond, CA 94801
Phone: 510-233-0102
Fax: 510-233-3777
Website: cytoculture.com

SW-30 F-500
Hazard Control Technologies, Inc.
Mr. Michael Greiner
150 Walter Way
Fayetteville, GA 30214
Phone: 770-719-5112
Fax: 770-719-5117
Website: hct-world.com

SW-32 BG-Clean 401
Amiran BioChemicals LLC
Mr. Jason Wilde
7221 South 10th Street
Oak Creek, WI 53154
Phone: 414-571-6230
Fax: 414-571-6231
Website: biochemicals.amiran-technologies.com

SW-38 Nokomis 5-W
Mar-Len Supply Inc.
Mr. Frank Winter
23159 Kidder Street
Hayward, CA 94545
Phone: 510-782-3555
Fax: 510-782-2032
Website: marlensupply.com

SW-49 De-Solve-It Clean Away APC Super Concentrate
Orange-Sol Blending and Packaging
Mr. Tim Farnsworth
1400 N Fiesta Boulevard
Gilbert, AZ 85233
Phone: 800-877-7771
Fax: 480-497-0444
Website: orange-sol.com

W-51 Dynamic Green
Wechem Inc.
Mr. Michael Wisecarver
5734 Susitna Drive
Harahan, LA 70123
Phone: 800-426-0512
Phone: 504-733-1152
Fax: 504-733-2218
Website: wechem.com

SW-63 Green Technologies Solutions-Oil Recovery (GTS-OR)
International Technologies and Services Inc.
Mrs. Pilar Ortega
302 W. 5th Street, Suite 100 B
San Pedro, CA 90731
Phone: 310-791-4487
Fax: 877-744-9975
Website: itsenvironmental.com

SW-69 Water Works Heavy Duty Degreaser Concentrate
Keteca USA Inc.
Ms. Kathy Parks
4280 W. Opportunity Way
Phoenix, AZ 85086
Phone: 602-278-7789
Website: ketecawaterworks.com

M-12 PES-51
Practical Environmental Solutions.
Mr. Bill Sims
P.O. Box 12563
San Antonio, TX 78212
Phone: 210-493-7172
Fax: 210-493-7172
Website: pes51.com

The SWA Deployment and Observation Form as well as other forms and checklists, located in the attachment section of this document, should be utilized by OSROs before and during SWA application. These documents will assist the OSROs and regulatory agency observers in assuring that the dilution ratios and other manufacturer's application recommendations are followed.

SWA cleaning and oil removal can be observed anywhere from immediate to 1-hour post application. Observers should focus on the drip movement of SWA and oil products, the initial oiled location, as well as a 50ft radius of application site. The radius ensures that SWA and oil products are not relocated to other sensitive areas in the case of high energy removal through pressure washing means.

SWA users should review laboratory and meso-scale testing results to determine SWA applicability on selected substrates (wood, concrete, steel) and in specific conditions (weathering, temperature, wave action, etc.).

3.5 Waste Management

In most cases the recovered oil can be recycled or disposed of in a solid waste management facility. Because SWAs represent an added component, the mixture must be evaluated to determine if there are any hazardous constituents and how the mixture can be managed. If the mixture does not contain hazardous constituents, it may be recycled or disposed in other approved methods. This is usually the case. If there are any listed or characteristic hazardous waste constituents in the SWAs, the mixture could be considered hazardous waste and would have to be transported and disposed by facilities with an U.S. EPA ID number. All local, regional, state, and federal laws and regulations must be followed.

OSROs may choose to dispose of oily waste in approved facilities with permitted disposal processes. Whenever possible, responders should have a pre-approved disposal site established prior to the collection of the oily waste. Occasionally there may be a need to develop in-situ disposal capabilities such as land treatment.

Additional regulations and permitting may be required by state or federal agencies in certain circumstances. Responders should contact appropriate state and/or federal agencies and be familiar with the approved waste management practices. All appropriate documentation should be submitted and accepted by all parties before waste may be handled for transportation and disposal.

OSROs and regulatory agency decision makers should reference the attachment section for the following form: “SWA Storage, Handling, Containment and Disposal Plan Checklist”.

3.6 Supporting Forms and Links

FOSC guidebooks and forms:

<https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/fosc-guide.html>

Coastal Habitat and Biological Resources Manual:

<https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/coastal-habitats-biological-resources-job-aid.html>

NCP Product Schedule and Manual:

<https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/ncp-product-schedule-and-notebook.html>

Oil/Fuel Spill Trajectory and Movement Analysis Handbook:

<https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/trajectory-analysis-handbook.html>

EPA Oil/Fuel Spill Prevention and Regulations Form and Guidebook:

<https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations/forms/contact-us-about-oil-spill-prevention-and>

RRT-VI Contact and Documentation:

https://response.epa.gov/site/site_profile.aspx?site_id=5083

DOT Forms and Regulations Guidebooks:

<https://mancomm.com/dot-forms-department-of-transportation/forms.htm>

DOI Response Descriptions and Reporting Links:

<https://www.doi.gov/oepc/preparedness-and-response-oil-spills-and-hazardous-substance-releases>

USCG Strike Team Contact and Form Links:

<https://www.dco.uscg.mil/Our-Organization/National-Strike-Force/>

TPWD Oil Spill and Hazardous Response Reporting Links:

https://tpwd.texas.gov/landwater/water/environconcerns/damage_assessment/response.html

TGLO Toolkit and Contact Link:

<http://www.glo.texas.gov/coast/oil-spill/toolkit/index.html>

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- EPA, 2015. *National Oil and Hazardous Substances Pollution Contingency Plan*. Federal Register, Vol. 80, No. 14, pp. 3380-3446.
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- Fingas, M., Fieldhouse, B. 2011. *Ch. 21 Surface Washing Agents or Beach Cleaners*. Oil Spill Science and Technology 1st Edition, Gulf Professional Publishing, pp 683-711.
- Fingas, M.F., Stoodley, R., Laroche, N., 1990. *Effectiveness testing of spill-treating agents*. Oil and Chemical Pollution, Vol. 7, pp. 337-348.
- Koran, K.M., Venosa, A.D., Luedeker, C.C., Dunnigan, K., Sorial, G.A., 2009. *Development and testing of a new protocol for evaluating the effectiveness of oil spill surface washing agents*. Marine Pollution Bulletin, Vol. 58, Elsevier Ltd, pp 1903-1908.
- Michel, J., Scholz, D., Walker, A.H., Boyd, J. 2001. *Surface-washing agents: Product evaluations, Case histories and guidelines for use in marine and freshwater habitats*. International Oil Spill Conference, Vol. 2001, No. 1.
- Robertson, D.R., Maddox, J.H. 2003. *Shoreline Surface Washing Agent Test and Evaluation Protocol for Freshwater Use in the Great Lakes Region*. International Oil Spill Conference, Vol. 2003, No. 1.
- RRT-VI. 2001. *FOSC Dispersant Pre-Approval Guidelines and Checklists*. Version 4.0

RRT-VI. 2016. *Inland Area Contingency Plan*. Vol. 2

Wood, H.A., Dittmar, A. 2018. *Surface Washing Agents: A Market Study of NCP Listed Products in the Gulf Coast*.

Wood, H.A., Dittmar, A. 2019. *Surface Washing Agents: A Laboratory Scale Testing of NCP Listed Products in the Gulf Coast*.

Wood, H.A., Dittmar, A. 2018. *Surface Washing Agents: A Market Study of NCP Listed Products in the Gulf Coast*.

Zdrazil, T. 2019. *How Does an Oil Containment Boom Work?* AbsorbantsOnline, eleven40.

5.0 Attachments

Attachment A
SDS Information Chart

SDS Information Chart

| Product ID | | Hazards | | | | | | | First Aid | | | | | PPE | | | |
|-------------------------|----|---------|------|------|-----------|------------|--------------|-----------|-----------------|-----------|--------------|---------|--------|---------------------|------------|--|--|
| | | SWA # | Skin | Eyes | Ingestion | Inhalation | Carcinogenic | Flush Eye | Wash Skin/Mouth | Fresh Air | Induce Vomit | Glasses | Gloves | Protective Clothing | Respirator | | |
| Superall | 2 | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | |
| CN-110 | 9 | ● | ● | * | * | * | * | ● | ● | ○ | * | ● | ● | ● | ○ | | |
| Corexit EC9580A | 10 | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ∅ | ● | ● | ● | ● | | |
| De-solv-it Ind. Formula | 11 | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | |
| Premier 99 | 12 | ● | ● | ● | ● | ● | * | ● | ● | ● | ∅ | ● | ● | ● | * | | |
| Simple Green | 15 | ● | ● | ● | * | * | * | ● | ● | ○ | * | ● | ● | ● | * | | |
| Aquaclean | 16 | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ● | ● | ● | ● | ○ | | |
| Nature's Way HS | 18 | ● | ● | ● | * | ● | * | ● | ● | ● | * | ● | ● | ● | * | | |
| Cytosol | 19 | ● | ● | ● | * | ● | * | ● | ● | ● | * | ● | ● | ● | * | | |
| Biosolve/Pinkwater | 20 | ● | ● | ● | ● | ● | ○ | ● | ● | ● | * | ● | ● | ● | ○ | | |
| Petrotech 25 | 21 | ● | ● | ● | * | * | * | * | * | * | * | ● | ● | ● | ○ | | |
| Petro-Clean | 23 | ○ | ○ | ○ | ● | ○ | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | |
| Do-All | 24 | ● | ● | ● | * | * | * | ● | ● | * | * | ● | ● | ● | * | | |
| SC-1000 | 25 | ○ | ○ | ○ | ○ | ○ | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | |
| Gold Crew SW | 26 | ● | ● | ● | ● | ○ | ○ | ● | ● | ○ | * | ● | ● | ● | ○ | | |
| Nale-it | 28 | ● | ● | ● | * | ● | * | * | * | * | * | ● | ● | ● | ● | | |
| F-500 | 30 | ● | ● | ● | ● | ● | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | |

| Legend | | | |
|--------|-----|---|-----------------------------|
| ● | Yes | ∅ | No, under any circumstances |
| ○ | No | * | No Information available |

| Product ID | | Hazards | | | | | | First Aid | | | | PPE | | | |
|---|-------|---------|------|-----------|------------|--------------|-----------|-----------------|-----------|--------------|---------|--------|---------------------|------------|--|
| Name | SWA # | Skin | Eyes | Ingestion | Inhalation | Carcinogenic | Flush Eye | Wash Skin/Mouth | Fresh Air | Induce Vomit | Glasses | Gloves | Protective Clothing | Respirator | |
| Enviroclean | 31 | ● | ● | ● | ● | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | |
| BG-Clean 401 | 32 | ● | ● | ● | ● | ○ | ● | ● | ● | * | ● | ● | ● | ○ | |
| E-Safe | 33 | ○ | ○ | ● | ○ | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | |
| Sheer-magic | 34 | ○ | ○ | ● | ○ | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | |
| Procleans | 35 | ● | ● | ● | ● | * | ● | ● | ● | ∅ | ● | ● | ● | ● | |
| Spilclean | 36 | ● | ● | ● | * | * | ● | ● | * | ∅ | ● | ● | ● | * | |
| TXChem HE-1000 | 37 | ● | ● | * | ● | * | ● | ● | * | * | ● | ● | ● | ● | |
| Nokomis 5-W | 38 | ● | ● | ● | ● | * | ● | ● | ● | ∅ | ● | ● | ● | ○ | |
| G-Clean OSC- 1809 | 39 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | |
| Green Beast Oil Spill & Odor Remediator | 40 | ● | ● | * | ● | * | ● | ● | * | * | ● | ○ | ○ | * | |
| Tulxa | 41 | ● | ● | ● | ● | * | ● | ● | * | ∅ | ● | ● | ● | ● | |
| Marine Green Clean | 42 | ● | ● | ● | ● | ○ | ● | ● | ● | * | ● | ● | ● | ○ | |
| Marine Green Clean Plus | 43 | ● | ● | * | ● | * | ● | ● | * | * | ● | ● | ● | ○ | |
| Green Clean | 44 | ● | ● | * | ○ | * | ● | ● | * | * | ● | ● | ○ | ○ | |
| SOC 10 | 45 | ● | ● | ● | ○ | * | ● | ● | * | ● | ● | ● | ● | ○ | |
| Biograss Extra | 46 | ○ | ● | ○ | ○ | * | ● | * | * | * | ● | ○ | ○ | ○ | |

| Legend | | | |
|--------|-----|---|-----------------------------|
| ● | Yes | ∅ | No, under any circumstances |
| ○ | No | * | No Information available |

| Product ID | | Hazards | | | | | | | First Aid | | | | | PPE | | | |
|--------------------------------|-------|---------|------|-----------|------------|--------------|-----------|-----------------|-----------|--------------|---------|--------|---------------------|------------|--|--|--|
| Name | SWA # | Skin | Eyes | Ingestion | Inhalation | Carcinogenic | Flush Eye | Wash Skin/Mouth | Fresh Air | Induce Vomit | Glasses | Gloves | Protective Clothing | Respirator | | | |
| Env. 1 Crude Oil Cleaner | 47 | ○ | ● | ○ | ○ | * | ● | * | * | * | ● | ○ | ○ | ○ | | | |
| SandKlene 950 De-solv-it Clean | 48 | ● | ● | ○ | ○ | * | ● | ● | * | * | ● | ● | ○ | ○ | | | |
| Away APC Super Concentrate | 49 | ● | ● | ● | ● | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | | |
| EO All Purpose Soap Lavender | 50 | ● | ● | ● | ● | * | ● | ● | * | * | ● | ● | ● | ○ | | | |
| Dynamic Green | 51 | ● | ● | ● | ● | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | | |
| Veru-Solve Marine 200 HP | 52 | ● | ● | ● | ● | * | ● | ● | * | ∅ | ● | ● | ● | ● | | | |
| Naturama G3 A-5 | 53 | ● | ● | ● | ● | ○ | ● | ● | ● | * | ● | ● | ● | ○ | | | |
| Safe Kleen | 54 | ● | ● | * | ● | * | ● | ● | * | * | ● | ● | ● | * | | | |
| Coriba 700 SR | 55 | ● | ● | * | ● | * | ● | ● | * | * | ● | ● | ● | * | | | |
| Coriba 713 SR | 56 | ● | ● | * | ● | * | ● | ● | * | * | ● | ● | ● | * | | | |
| JEP-Marine Clean | 57 | ● | ● | * | * | * | * | * | * | * | ● | ● | ● | ○ | | | |
| Ethos Clean | 58 | ● | ● | * | ● | * | ● | ● | ● | * | ● | ● | ● | * | | | |
| OSR-10 | 59 | ● | ● | * | ● | * | ● | ● | ● | * | ● | ● | ● | * | | | |
| Accell Clean SWA | 60 | ● | ● | * | ● | * | ● | ● | * | * | ● | ● | ● | * | | | |

| Legend | | |
|-----------------------------|-----|---|
| ● | Yes | ∅ |
| ○ | No | * |
| No, under any circumstances | | |
| No Information available | | |

| Product ID | | Hazards | | | | | | First Aid | | | | | | PPE | | | |
|---------------------------------|-------|---------|------|-----------|------------|--------------|-----------|-----------------|-----------|--------------|---------|--------|---------------------|------------|--|--|--|
| Name | SWA # | Skin | Eyes | Ingestion | Inhalation | Carcinogenic | Flush Eye | Wash Skin/Mouth | Fresh Air | Induce Vomit | Glasses | Gloves | Protective Clothing | Respirator | | | |
| EPA Oil Field Solution | 61 | ○ | ● | * | ○ | * | ● | ● | * | * | ● | ○ | ○ | ○ | | | |
| Petromax PSC 3 | 62 | ● | ● | ● | ● | * | ● | ● | ● | ∅ | ● | ● | ● | ○ | | | |
| Solution-Oil Recovery | 63 | ● | ● | ● | ● | ○ | ● | ● | ● | * | ● | ● | ● | ○ | | | |
| Nontox Surface Washing Agent | 64 | ● | ● | ● | ● | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | | |
| Simple Green 2013 Reformulation | 65 | ○ | ○ | ● | ○ | ○ | ● | ● | ● | * | ● | ● | ● | ○ | | | |
| Formula 206-1X Biowash | 66 | ○ | ○ | ● | ○ | ○ | ● | ● | ● | * | ○ | ○ | ○ | ○ | | | |
| Rhamnawash 10 | 67 | ● | ● | ● | ● | * | ● | ● | ● | ∅ | ● | ● | ● | ● | | | |
| ADP-7 | 68 | ● | ● | ● | ● | ● | ● | ● | ● | ∅ | ● | ● | ● | ● | | | |
| Water Works HD Degreaser Conc. | 69 | ○ | ● | ● | ○ | ○ | ● | ● | ● | ∅ | ● | ● | ● | ○ | | | |

| Product ID | | Hazards | | | | | | First Aid | | | | | | PPE | | | |
|------------|---------|---------|------|-----------|------------|--------------|-----------|-----------------|-----------|--------------|---------|--------|---------------------|------------|--|--|--|
| Name | MOSCA # | Skin | Eyes | Ingestion | Inhalation | Carcinogenic | Flush Eye | Wash Skin/Mouth | Fresh Air | Induce Vomit | Glasses | Gloves | Protective Clothing | Respirator | | | |
| PES-51 | 12 | ● | ● | ● | ● | * | ● | ● | ● | ∅ | ● | ● | ● | ● | | | |

| Legend | | |
|--------|--------------------------|---|
| ● | Yes | ∅ |
| ○ | No | * |
| | No Information available | |

| Product ID | | Fire Hazard | | | | | | | Ecological | | | |
|-------------------------|-------|-------------|------------|---------------|-------------------|------------|---------------|----------------|----------------|--------------|--|--|
| Name | SWA # | Flamability | Reactivity | Extinguishing | Decomposition Gas | Combustion | Biodegradable | Bioaccumulates | Mobile in Soil | Marine Toxic | | |
| Supercell | 2 | ○ | ○ | ○ | ● | ○ | ● | ○ | ● | ○ | | |
| CN-110 | 9 | ○ | * | ○ | * | ○ | * | * | * | * | | |
| Corexit EC9580A | 10 | ● | ● | ● | ● | ● | * | * | * | * | | |
| De-solv-it Ind. Formula | 11 | ● | ● | ○ | ● | ● | ● | * | * | ○ | | |
| Premier 99 | 12 | ○ | * | ○ | * | ○ | * | * | * | * | | |
| Simple Green | 15 | ○ | * | ○ | * | ○ | * | * | * | * | | |
| Aquaclean | 16 | ○ | ● | ○ | ● | ○ | * | * | * | ○ | | |
| Nature's Way HS | 18 | ○ | * | ○ | * | ○ | * | * | * | * | | |
| Cytosol | 19 | ○ | * | * | * | ○ | * | * | * | * | | |
| Biosolve/Pinkwater | 20 | ○ | ● | ○ | ○ | ○ | ○ | ● | * | ● | | |
| Petrotech 25 | 21 | ○ | * | * | * | * | * | * | * | * | | |
| Petro-Clean | 23 | ○ | ○ | ○ | ● | ○ | ● | * | ● | ○ | | |
| Do-All | 24 | ○ | * | * | * | * | * | * | * | * | | |
| SC-1000 | 25 | ○ | ○ | ○ | ○ | ○ | ● | ○ | ● | ○ | | |
| Gold Crew SW | 26 | ○ | ○ | ○ | ○ | ○ | ● | * | * | ● | | |
| Nale-it | 28 | ○ | * | * | * | * | * | * | * | * | | |
| F-500 | 30 | ○ | ○ | ○ | ○ | ○ | * | * | * | ○ | | |
| Enviroclean | 31 | ○ | ● | ○ | ○ | ○ | * | * | * | * | | |
| BG-Clean 401 | 32 | ○ | ● | ○ | ● | ○ | * | ○ | * | ○ | | |

| Legend | | |
|--------|-----|-----------------------------|
| ● | Yes | ○ |
| ○ | No | * |
| | | ∅ |
| | | No, under any circumstances |
| | | No Information available |

| Product ID | | Fire Hazard | | | | | | Ecological | | | | |
|---|-------|-------------|------------|---------------|-------------------|------------|---------------|----------------|----------------|--------------|--|--|
| Name | SWA # | Flamability | Reactivity | Extinguishing | Decomposition Gas | Combustion | Biodegradable | Bioaccumulates | Mobile in Soil | Marine Toxic | | |
| E-Safe | 33 | ○ | ○ | ○ | ○ | ○ | * | * | * | * | | |
| Sheen-magic | 34 | ○ | ○ | ○ | ○ | ○ | * | * | * | * | | |
| Procleans | 35 | ○ | ○ | ○ | * | ○ | * | * | * | ○ | | |
| Spillclean | 36 | ● | * | * | * | * | * | * | * | * | | |
| TXChem HE-1000 | 37 | ○ | * | * | * | * | * | * | * | * | | |
| Nokomis 5-W | 38 | ○ | ● | ○ | ● | ○ | * | * | * | ● | | |
| G-Clean OSC- 1809 | 39 | ○ | ○ | ○ | ○ | ○ | ● | * | * | ○ | | |
| Green Beast Oil Spill & Odor Remediator | 40 | ○ | * | * | * | * | * | * | * | * | | |
| Tuhka | 41 | ○ | * | * | * | * | * | * | * | * | | |
| Marine Green Clean | 42 | ○ | ○ | ○ | ○ | ○ | ● | ○ | ● | ○ | | |
| Marine Green Clean Plus | 43 | ○ | * | * | * | * | * | * | * | * | | |
| Green Clean | 44 | ○ | * | * | * | * | * | * | * | * | | |
| SOC 10 | 45 | ○ | * | * | * | * | * | * | * | * | | |
| Bioglass Extra | 46 | ○ | * | * | * | * | * | * | * | * | | |
| Env. 1 Crude Oil Cleaner | 47 | ○ | * | * | * | * | * | * | * | * | | |
| SandKlene 950 | 48 | ○ | * | * | * | * | * | * | * | * | | |
| De-solv-it Clean Away APC Super Concentrate | 49 | ○ | ○ | ○ | ○ | ○ | ● | * | * | ○ | | |

| Legend | | |
|--------|-----|-----------------------------|
| ● | Yes | No, under any circumstances |
| ○ | No | No Information available |
| ∅ | | |
| * | | |

| Product ID | | Fire Hazard | | | | | | | Ecological | | | |
|--|-------|-------------|------------|---------------|-------------------|------------|---------------|----------------|----------------|--------------|--|--|
| Name | SWA # | Flamability | Reactivity | Extinguishing | Decomposition Gas | Combustion | Biodegradable | Bioaccumulates | Mobile in Soil | Marine Toxic | | |
| EO All Purpose Soap Lavender | 50 | O | * | * | * | * | * | * | * | * | | |
| Dynamic Green | 51 | O | ● | O | ● | O | ● | * | * | ● | | |
| Veru-Solve Marine 200 HP | 52 | O | * | * | * | * | * | * | * | * | | |
| Naturama G3 A-5 | 53 | O | * | O | O | O | * | * | * | * | | |
| Safe Kleen | 54 | O | * | * | * | O | * | * | * | * | | |
| Coriba 700 SR | 55 | O | * | * | * | * | * | * | * | * | | |
| Coriba 713 SR | 56 | O | * | * | * | * | * | * | * | * | | |
| JEP-Marine Clean | 57 | O | * | * | * | * | * | * | * | * | | |
| Ethos Clean | 58 | O | * | * | * | * | * | * | * | * | | |
| OSR-10 | 59 | O | * | * | * | * | * | * | * | * | | |
| Accell Clean SWA | 60 | O | * | * | * | * | * | * | * | * | | |
| EPA Oil Field Solution | 61 | O | * | * | * | * | * | * | * | * | | |
| Petromax PSC 3 | 62 | O | ● | O | * | O | * | * | * | ● | | |
| Green Technologies Solution-Oil Recovery | 63 | O | O | O | O | O | ● | * | * | O | | |
| Nontox Surface Washing Agent | 64 | O | * | O | ● | O | ● | * | O | O | | |
| Simple Green 2013 Reformulation | 65 | O | * | O | O | O | ● | * | * | O | | |

| Legend | | |
|--------|-----|-----------------------------|
| ● | Yes | No, under any circumstances |
| O | No | No Information available |
| ∅ | | |
| * | | |

| Product ID | | Fire Hazard | | | | | | | Ecological | | | |
|--------------------------------|-------|-------------|------------|---------------|-------------------|------------|---------------|----------------|----------------|--------------|--|--|
| Name | SWA # | Flamability | Reactivity | Extinguishing | Decomposition Gas | Combustion | Biodegradable | Bioaccumulates | Mobile in Soil | Marine Toxic | | |
| Formula 206-1X Biowash | 66 | ○ | ○ | ○ | ○ | ○ | * | * | * | * | | |
| Rharnowash 10 | 67 | ○ | * | ○ | * | ○ | * | * | * | * | | |
| ADP-7 | 68 | ○ | * | ○ | ○ | ○ | * | * | * | ● | | |
| Water Works HD Degreaser Conc. | 69 | * | ○ | ○ | ○ | * | ● | * | * | ● | | |

| Product ID | | Fire Hazard | | | | | Ecological | | | |
|------------|---------|-------------|------------|---------------|-------------------|------------|---------------|----------------|----------------|--------------|
| Name | MOSCA # | Flamability | Reactivity | Extinguishing | Decomposition Gas | Combustion | Biodegradable | Bioaccumulates | Mobile in Soil | Marine Toxic |
| PES-51 | 12 | ● | ○ | ○ | ● | ● | ● | * | ● | ○ |

| Legend | | |
|--------|-----|--------------------------|
| ● | Yes | ○ |
| ○ | No | * |
| | | No Information available |

Attachment B
SWA Company Profiles

- SW-2 Topsall #30 (aka, Superall #38)

Superall Products LLP

Mr. Sammy Roberts II

P.O. Box 2954

Spring, TX 77383

Phone: 281-351-4800

Fax: 281-351-4855

Website: superall.com

SAP produces 4 separate formulations of hydrocarbon cleaning solutions, in addition to producing and selling cleaning systems. SAP sell fully customizable pressure washing mobile units and additional equipment.

SuperAll has participated in the questionnaire and is committed to providing a sample.

- SW-9 CN-110

Chemex Inc.

Mr. Gale Campbell

107-B Balboa Dr.

Broussard, LA 70518

*no valid phone number available

Website: chemexinc.net

Chemex Inc. was founded in 1989 as a wholesale manufacturer of specialty drilling, production and refinery chemical additives. They produce 6 different chemicals involved in paraffin inhibition, lubricity fluid enhancers, oil recovery enhancers, and drag reducing products.

Chemex has not participated in the NSCS questionnaire after many efforts for contact.

- SW-10 Corexit EC9580A

Nalco Environmental Solutions LLC

Mrs. Debby Theriot

7705 Highway 90-A

Sugar Land, TX 77478

Office Phone: 281-263-7709

Mobile Phone: 832-851-5164

Website: nalcoenvironmentalsolutionsllc.com

NES LLC was established in 2010 for oil and gas industry response and has developed spill dispersants and shoreline cleaning products. NES LLC produces 3 different formulations of dispersants and 1 formulation of SWA.

NES LLC has participated in the questionnaire and is providing the NSCS a sample.

- SW-11 De-Solv-It Industrial Formula

Orange-Sol Blending and Packaging

Mr. Tim Farnsworth

1400 N Fiesta Boulevard

Gilbert, AZ 85233

Phone: 800-877-7771

Fax: 480-497-0444

Website: orange-sol.com

Orange-Sol was formally established in 1976, focusing on citrus based cleaning products.

Orange-Sol produces 15 different brands of cleaners and degreasers. They produce 2 SWA listed on the NCP Product Schedule.

Orange-Sol Blending and Packaging has participated in the questionnaire and has provided the NSCS a sample.

- SW-12 Premier 99

Gold Coast Chemical Products

Mr. Eli Finkelberg and Ms. Maria Morris

2357 Stirling Road

Dania Beach, FL 33312

Phone: 954-893-0044

Fax: 954-893-8884

Website: goldcoastchemical.com

GCC is a manufacturer and distributor for agricultural, industrial, janitorial and specialty chemical, established in 1989. GCC produces 110 chemical products. GCC have 1 SWA listed on the NCP Product Schedule.

GCC Products was contacted via phone. GCC indicated that they do not want to participate in the NSCS research project.

- SW-15 Simple Green

Sunshine Makers Inc.

Ms. Carol Chapin

15922 Pacific Coast Highway

Huntington Beach, CA 92649

Office Phone: 800-228-0709

Mobile Phone: 592-795-6000

Fax: 562-592-3830

Website: simplegreen.com

The Simple Green product was produced 30+ years ago to remove tannic acid and by-products of coffee roasting machinery as well as automotive and industrial companies. There are 31 different formulations of Simple Green, 2 which are listed as SWA on the NCP Product Schedule.

Sunshine Makers Inc. has participated in the questionnaire and has provided the NSCS a sample.

- SW-16 AquaClean

Madison Chemical Company Inc.

Ms. Cara Cyrus

3141 Clifty Dr.

Madison, IN 47250

Phone: 812-273-6000

Fax: 812-273-6002

Website: madchem.com

MCC was established in 1947 and has chemical products pertaining to 6 different categories: metal and composite fabricators, paper mill, transportation, industrial maintenance, food industry, and wastewater treatment. MCC has 1 chemical product listed on the NCP Product Schedule.

MCC has not participated in the NSCS questionnaire after many efforts for contact.

- SW-18 Nature's Way HS

Integra Environmental Ltd.

Ms. Cathy Kaiser

5825 Centralcrest

Houston, TX 77092

*no valid phone number available

*no valid website is available

Integra Environmental produced SWA Nature's Way in 1993 with the intended use of a combination of surfactants and microbes for petroleum cleanup. Integra Environmental has 1 SWA listed on the NCP Product Schedule.

Integra Environmental has not participated in the NSCS questionnaire after many efforts for contact.

- SW-19 Cytosol

CytoCulture International Inc.

Dr. Randall von Wedel

249 Tewksbury Avenue

Point Richmond, CA 94801

Phone: 510-233-0102

Fax: 510-233-3777

Website: cytoculture.com

Founded in 1986, CytoCulture's services include application protocols and production of oil cleaning agents as well as microbiological bioremediation products. CytoCulture has 1 SWA product listed on the NCP Product Schedule.

CytoCulture has completed a phone interview/questionnaire and is providing the NSCS a sample.

- SW-20 Pinkwater (aka Biosolve)

BioSolve Company

Mr. James Edgerly

329 Massachusetts Avenue

Lexington, MA 02420

Phone: 781-482-7900

Fax: 781-482-7909

Website: biosolve.com

BioSolve/Pinkwater product was founded in 1975 which was a surfactant chemical that was intended to replace volatile vapor and fire hazard suppressing foams. BioSolve currently produces 4 formulations of their product. Only 1 SWA formulation is listed on the NCP Product Schedule.

BioSolve has completed the questionnaire and has provided the NSCS a sample.

- SW-21 Petrotech 25

Petrotech America Corporation

Mr. Lawrence Gallo

130 William St., Suite 802

New York, NY 10038

Phone: 212-933-9071

Fax: 877-226-4028

Website: petrotechamerica-na.com

Founded in 1992, Petrotech America Corporation produced a water based, natural product that contains no solvents. They have now expanded to 5 separate products involved in deodorizing, degreasing, sanitizing and spot removal. They have 1 SWA listed on the NCP Product Schedule. PAC has not participated in the NSCS questionnaire after many efforts for contact.

- SW-23 Petro-Clean

B.R.A.T. Microbial Products Inc. / Alabaster Corp.

Mr. John Sheffield

P.O. Box 7089

Pasadena, TX 77508

Phone: 713-724-9226

Website: alabastercorp.com

Alabaster Corporation produces products used for bioremediation, emergency response, oil spill clean-up, and additional environmental services. Alabaster manufactures 1 SWA listed on the NCP Product Schedule.

Alabaster/B.R.A.T. Microbial has completed the questionnaire and has provided the NSCS a sample.

- SW-24 Do-All #18

Radcob Solutions Inc.

Mr. Adam Goldberg

4800 North State Road 7

Suite #105

Lauderdale Lakes, FL 33319

Phone: 954-249-2178

Fax: 954-640-7080

*no valid website is available

Radcob Solutions Inc. has only 1 SWA listed on the NCP Product Schedule
Radcob Solutions has not participated in the NSCS questionnaire after many efforts for contact.

- SW-25 SC-1000

Gemtek Products
Mrs. Sarah Kristoff
3808 N. 28th Avenue
Phoenix, AZ 85017
Phone: 602-265-8586
Fax: 602-265-7241
Website: gemtek.com

Gemtek has been a manufacturer of plant-based cleaners, degreasers, solvents, lubricants, and specialty chemicals since 1992. They have 3 major products marketed one being Safe Care, with 15 formulations of the initial SC product. Gemtek has 1 SWA listed on the NCP Product Schedule.

Gemtek Products has completed the questionnaire and has provided the NSCS a sample.

- SW-26 Gold Crew SW
Gold Crew Products & Services LLC.

Mr. Jim Figueira
P.O. Box 12032
Orange, CA 92859
Phone: 714-288-8781
Fax: 714-288-8730
Website: goldcrew.net

Gold Crew was developed in 1966 of the U.S. Navy's oil spill response and now markets product involved in petroleum oils and lubricants, fats and greases, and volatile organic compounds. GC produces 6 different products. GC has 1 SWA listed on the NCP Product Schedule.

Gold Crew has completed the questionnaire and has provided the NSCS a sample.

- SW-28 Nale-It
SPL Control LLC
Mr. Tom Lester
P.O. Box 627
Elemore City, OK 73433
Phone: 580-788-2187
Website: nale-it.com

SPL Control LLC has 1 SWA listed on the NCP Product Schedule. Their product Nale-It is non-hazardous, biodegradable, and is used in bioremediation processes in contaminated soils, refinery and crude waste, and drilling projects.

SPL Control LLC has not participated in the NSCS questionnaire after many efforts for contact.

- SW-30 F-500

Hazard Control Technologies, Inc.

Mr. Michael Greiner

150 Walter Way

Fayetteville, GA 30214

Phone: 770-719-5112

Fax: 770-719-5117

Website: hct-world.com

HCT provides products involved in fire suppression and environmental impact protection chemicals, as well as provides training and consulting services. They have 1 SWA listed on the NCP Product Schedule for surface washing agents that serves as a SWA as well as fire suppressant agent.

HCT has completed the questionnaire and has provided the NSCS a sample.

- SW-31 Enviroclean
Enviro Clean Services LLC.

Mr. Jonathan Behymer

P.O. Box 721090

Oklahoma City, OK 73172

Phone: 405-373-4545

Fax: 405-373-4549

Website: eccgrp.com

ECS has 1 SWA listed on the NCP Product Schedule but provides 9 products involving in oil spill cleanup, saltwater remediation, odor control, vapor suppression, and paraffin and asphaltene removal. They also provide spill response kits and trailers with equipment.

Enviro Clean Services has not participated in the NSCS questionnaire after many efforts for contact.

- SW-32 BG-Clean 401
Amiran BioChemicals LLC

Mr. Jason Wilde

7221 South 10th Street

Oak Creek, WI 53154

Phone: 414-571-6230

Fax: 414-571-6231

Website: biochemicals.amiran-technologies.com

ABC LLC. produces and markets products involved in industrial degreasers, concrete cleaners, odor removal, surface cleaners, bioremediation aids, and many more. ABC has 1 SWA listed on the NCP Product Schedule.

Amiran BioChemicals has completed the questionnaire and has provided the NSCS a sample.

- SW-33 E-Safe
Plutus Environmental Technologies Inc.
Mr. James Hatcher

300 John L. Marshall Drive
Sevierville, TN 37862
Phone: 865-214-0350

*no valid website is available

PET Inc. has 2 listed products on the NCP Product Schedule. Their E-Safe product is built for hydrocarbon remediation removal on all types of land spills.

Plutus ET has completed the questionnaire and has provided the NSCS a sample and has agreed to provide a sample before lab testing begins.

- SW-34 Sheen-Magic
Plutus Environmental Technologies Inc.

Mr. James Hatcher
300 John L. Marshall Drive
Sevierville, TN 37862
Phone: 865-214-0350

*no valid website is available

PET Inc. has 2 listed products on the NCP Product Schedule. Their Sheen-Magic product is built for hydrocarbon remediation in water sources.

Plutus ET has completed the questionnaire and has provided the NSCS a sample and has agreed to provide a sample before lab testing begins.

- SW-35 Procleans
Eximco International Inc.

Mr. Nat Brown
5250 Gulfton, #2-B
Houston, TX 77081
Phone: 713-432-7899

Website: eximco.net

Eximco was founded in 1992 and markets industrial umbilical, floating and long length hoses and reels. In addition, they provide 6 different types of transfer pumps as well as Haz-Mat and oil spill chemicals and equipment. Eximco has 1 SWA listed on the NCP Product Schedule.

Eximco International Inc. has completed the questionnaire and agreed to provide a sample before lab testing begins.

- SW-36 Spillclean
Super Sat Ventures Inc.
Mr. Daniel Klein
S96 W34577 Jericho Drive
Eagle, WI 53119
Phone: 414-840-9223
Website: ssvinc.com

SSV was established in 1997 and markets products used for vehicle and road spill cleanup detergents. SSV also provides application tanks and pumps calibrated for their products. SSV has 1 SWA listed on the NCP Product Schedule.

Super Sat Ventures Inc. has not participated in the NSCS questionnaire after many efforts for contact.

- SW-37 TXChem HE-1000

Texas EnviroChem Inc.

Mr. Pete Franks

11410 Dumas Street

Houston, TX 77034

Phone: 713-806-4099

*no valid website is available

After many phone and web research attempts for contact, researchers found information regarding TEC from archived records at corporationwiki.com. It states that TEC is no longer an active corporation in the state of Texas. As of July 2018, TXChem HE-1000 remains listed on the NCP Product Schedule.

- SW-38 Nokomis 5-W

Mar-Len Supply Inc.

Mr. Frank Winter

23159 Kidder Street

Hayward, CA 94545

Phone: 510-782-3555

Fax: 510-782-2032

Website: marlensupply.com

MLS was founded in 1958 and markets products for industrial cleaning equipment and cleaning chemicals. MLS has 5 formulations of Nokomis chemical, and has 1 SWA listed on the NCP Product Schedule.

Mar-Len Supply has completed the questionnaire and has provided the NSCS a sample.

- SW-39 G-Clean OSC-1809

Green Earth Technologies

Mr. Michael Lukco

1136 Celebration Boulevard

Celebration, FL 34347

Phone: 330-540-4220

Fax: 815-331-0931

Website: getg.com

GET markets environmentally friendly lubricant and cleaning products for industrial and household uses. GET has 1 SWA listed on the NCP Product Schedule.

GET has not participated in the NSCS questionnaire after many efforts for contact.

- SW-40 Green Beast Oil Spill & Odor Remediator

BioFusion Corporation

Mr. David Gubb

310 Godwin Avenue

Ridgewood, NJ 07450

Phone: 201-447-6241

Fax: 201-444-2307

Website: biofusion.co

BioFusion established their products line for wastewater as well as grease and hydrocarbon remediation treatment in 2006. BioFusion has 3 products marketed for hydrocarbon remediation and has 1 SWA listed on the NCP Product Schedule.

BioFusion has not participated in the NSCS questionnaire after many efforts for contact.

- SW-41 Tulxa

Grupo Arthuriana S.A. de C.V.

Cuernavaca No. 43

Colonia Condesa

Delegación Cuauhtémoc

Mexico, Distrito Federal C.P. 06140

Phone: 011 52 (55) 52 41 11 90

Fax: 011 52 (55) 53 61 13 54

Website: grupoarthuriana.com.mx

GA has not participated in the NSCS questionnaire after many efforts for contact. No valid emails are given off NCP Product Schedule

- SW-42 Marine Green Clean

AGS Solutions Inc.

Mrs. Linda Whiteley

5647 Nunn Street

Houston, TX 77087

Phone: 713-645-4933

Fax: 713-645-4903

Website: agstx.org

AGS Solutions has marketed products in cleaning chemicals, equipment, and systems for the past 24 years. In addition to their marketed products, they provide equipment and chemical training services as well as unmanned aerial drone site surveying services. AGS has 2 SWA listed on the NCP Product Schedule.

AGS Solutions has completed the questionnaire and agreed to provide a sample before lab testing begins.

- SW-43 Marine Green Clean Plus

AGS Solutions Inc.

Mrs. Linda Whiteley

5647 Nunn Street
Houston, TX 77087
Phone: 713-645-4933
Fax: 713-645-4903
Website: agstx.org

AGS Solutions has marketed products in cleaning chemicals, equipment, and systems for the past 24 years. In addition to their marketed products, they provide equipment and chemical training services as well as unmanned aerial drone site surveying services. AGS has 2 SWA listed on the NCP Product Schedule.

AGS Solutions has completed the questionnaire and agreed to provide a sample before lab testing begins.

- SW-44 Clean Green (aka, CleanGreen Planet Wash)

U.S. AG LLC.

Mr. Carl Schneider

P.O. Box 368

Luthersville, GA 30251

Phone: 770-927-3206

Fax: 770-927-3968

Website: unitedstatesag.com

U.S. AG is a liquid fertilizer manufacturer that markets fertility and surfactant products. U.S. AG has 1 SWA listed on the NCP Product Schedule

U.S. AG has not participated in the NSCS questionnaire after many efforts for contact.

- SW-45 SOC 10

Oil Treatment International AG

Mr. Paul Schuler

Seestrasse 5

CH-6300 Zug

Switzerland

Phone: 01141-41-727-21000

Fax: 01141-41-727-2109

Website: oti.ag/en/

OTI AG is a surfactant based manufacturer with product application involved in industrial cleaning in marine and land remediation. OTI AG has 1 SWA listed on the NCP Product Schedule.

OTI AG has not participated in the NSCS questionnaire after many efforts for contact.

- SW-46 Biograss Extra

Química del Desierto, S. De R.L. de C.V.

Ing. Erich Wolf

Trasviña y Retes 6103-2

Col. Panamericana

Chihuahua, Chihuahua, Mexico

C.P. 31210

Phone: +52-1-614-110-2650

Website: biograssextra.com/en_us/

Q.D. has not participated in the NSCS questionnaire after many efforts for contact.

- SW-47 Environmental 1 Crude Oil Cleaner

Environmental 1 LLC

Ms. Mary Blankenship

P.O. Box 9

Jackson, TN 38302

Phone: 615-269-0506

Fax: 615-269-0025

Website: environmental-one.com

Environmental 1 markets 9 different products involved in household and industrial cleaners.

Environmental 1 has 1 SWA listed on the NCP Product Schedule.

Environmental 1 was contacted via phone and has asked to not participate in the research project.

- SW-48 Sandklene 950

MDEChem Inc.

Mr. Paul Sack

923 10th Street PMB 101

Floresville, TX 78114

Phone: 830-393-5293

Website: mdechem.com

MDEChem was established in 1996 and produces three products involved in fuel additives, corrosion removal, and hydrocarbon remediation products. MDEChem has 1 SWA listed on the NCP Product Schedule that is built for oil recovery on tar/oil contaminated sands.

MDEChem has not participated in the NSCS questionnaire after many efforts for contact.

- SW-49 De-Solve-It Clean Away APC Super Concentrate

Orange-Sol Blending and Packaging

Mr. Tim Farnsworth

1400 N Fiesta Boulevard

Gilbert, AZ 85233

Phone: 800-877-7771

Fax: 480-497-0444

Website: orange-sol.com

Orange-Sol was formally established in 1976, focusing on citrus based cleaning products.

Orange-Sol produces 15 different brands of cleaners and degreasers. They produce 2 SWA listed on the NCP Product Schedule.

Orange-Sol Blending and Packaging has participated in the questionnaire and is committed to providing a sample.

- SW-50 EO All Purpose Soap-Lavender

EO Products/Small World Trading

Mr. Sam Borri and Ms. Joyce Tsang

90 Windward Way

San Rafael, CA 94901

Phone: 415-945-1900

Fax: 415-945-7117

Website: eoproducts.com

EO Products was established in 2004 and manufactures products in essential oils and human hygiene cleaning soaps and sanitizers. EO Products produce 1 SWA listed on the NCP Product Schedule.

EO Products has not participated in the NSCS questionnaire after many efforts for contact.

- SW-51 Dynamic Green

Wechem Inc.

Mr. Michael Wisecarver

5734 Susitna Drive

Harahan, LA 70123

Phone: 800-426-0512

Phone: 504-733-1152

Fax: 504-733-2218

Website: wechem.com

Wechem markets products for pesticides, lubricants, disinfectants, herbicides, solvents, adhesives, and cleaners. In addition to their chemical products, Wechem also distributes dispensers, pumps, sprayers, and additional cleaning equipment. Wechem produces 1 SWA listed on the NCP Product Schedule.

Wechem has completed the questionnaire and has provided the NSCS a sample.

- SW-52 Veru-Solve Marine 200HP

VeruTEK Technologies

Ms. Bethany McAvoy

65 West Dudley Town Road, Suite 100

Bloomfield, CT 06002

*no valid phone

Website: verutek.com

Website has indicated that VeruTEK has been acquired by EthicalChem LLC

EthicalChem LLC

Ms. Geeta Dahal

177 Governors Highway

South Windsor, CT 06074

Phone: 860-640-0074

Phone: 701-212-8087

Website: ethicalchem.com

EthicalChem manufactures chemical solvents, dissolvent, surfactants, and oil remediation products. EthicalChem now manufactures surfactant S-ISCO which is formerly known as the VeruSOL agent. The NCP Product schedule has the Veru-Solve agent listed, but the new S-ISCO agent is not listed.

- SW-53 Naturama G3 A-5

Green Life Development Inc.

Mr. David Levy

5112 W. Charleston Boulevard, Suite C

Las Vegas, NC 89146

Phone: 702-966-1284

Phone: 702-355-5102

Fax: 702-448-6977

Website: greenlifedevelopment.com

GLD is a chemical manufacturer that focusses on environmentally safe products used in odor elimination, dissolvants, soil remediation, oil recovery, and food and automotive processes. GLD produces 1 SWA listed on the NCP Product Schedule

GLD has completed the questionnaire and has indicated that they will not provide a sample after many attempts for additional contact.

- SW-54 Safe Kleen

Anti Slip Solutions Ltd.

Mr. Dan Bayliss

Bridge House

Severn House

Riverside North, Bewdley, Worcestershire,

DY12 1AB, UK

Phone: 44(0)1299-406-011

Fax: 44(0)1299-406-023

Website: safe-grip.co.uk

Anti Slip Solutions is a chemical manufacturer for anti-slip and protective coating solutions as well as multi-purpose cleaning agents. Anti Slip Solutions produces 1 SWA listed on the NCP Product Schedule.

Researchers have come in contact with U.S. distributor Mr. Todd Vitek, who has stated he no longer sells the product, and the contact information he gave to NSCS researchers was no longer valid.

Anti Slip Solutions has not participated in the NSCS questionnaire after many efforts for contact.

- SW-55 Coriba 700 SR

Coriba Technologies LLC

Mr. Harvey Cobb

5708 Cadron Creek

North Little Rock, AR 72116

*no valid phone number available

*no valid website is available

After many phone and web research attempts for contact, researchers concluded that there is no valid contact information available for Coriba Technologies. Coriba has over 20 patents and was in litigation until 2014. However, it appears that the company may not be in business anymore. Coriba Technologies has not participated in the NSCS questionnaire after many efforts to establish contact.

- SW-56 Coriba 713 SR

Coriba Technologies LLC

Mr. Harvey Cobb

5708 Cadron Creek

North Little Rock, AR 72116

*no valid phone number available

*no valid website is available

After many phone and web research attempts for contact, researchers concluded that there is no valid contact information available for Coriba Technologies. Coriba has over 20 patents and was in litigation until 2014. However, it appears that the company may not be in business anymore. Coriba Technologies has not participated in the NSCS questionnaire after many efforts to establish contact.

- SW-57 JEP-Marine Clean

Nuance Solutions

Mr. Neil Houtsma

900 E. 103rd Street, Suite D

Chicago, IL 60628

Phone: 800-621-8553

Fax: 800-621-1276

Website: nuancesolutions.com

Nuance Solutions manufactures products involved in industrial cleaning, microfiber and sanitation, as well as agricultural and food services. Nuance Solutions produces 1 SWA listed on the NCP Product Schedule.

Nuance Solutions has not participated in the NSCS questionnaire after many efforts for contact.

- SW-58 Ethos Clean

MAG7 Venture Group LLC

Mr. Greg Goodell and Mr. Trevor Quig

1 Lepage Place, Suite 100

Syracuse, NY 13206

*no valid phone number available

*no valid website is available

After many phone and web research attempts for contact, researchers concluded that there is no valid contact information available for MAG7 Venture Group.

MAG7 Venture Group has not participated in the NSCS questionnaire after many efforts to establish contact.

- SW-59 OSR-10

MAG7 Venture Group LLC

Mr. Greg Goodell and Mr. Trevor Quig

1 Lepage Place, Suite 100

Syracuse, NY 13206

*no valid phone number available

*no valid website is available

After many phone and web research attempts for contact, researchers concluded that there is no valid contact information available for MAG7 Venture Group.

MAG7 Venture Group has not participated in the NSCS questionnaire after many efforts to establish contact.

- SW-60 Accell Clean SWA

Advanced BioCatalytics Corporation

Mr. Carl Podella

18010 Skypark Circle, #130

Irvine, CA 92614

Phone: 949-442-0880

Website: abiocat.com

ABC manufactures products involved in industrial and marine cleaners, wastewater treatment, agricultural growth stimulation proteins, and oil and gas cleaners. ABC produces 1 SWA listed on the NCP Product Schedule.

ABC has not participated in the NSCS questionnaire after many efforts for contact.

- SW-61 EPA Oil Field Solution (aka, Hydro-Clean)

Environmental Protections Associates Inc.

Mr. Nathan Hall

2578 Enterprise Rd., Suite 141

Orange City, FL 32763

Phone: 407-687-6742

No valid Website

As of 2015, EPA Inc. was acquired by World Oil Group Inc.

World Oil Group Inc.

2578 Enterprise Rd., Suite 141

Orange City, FL 32763

Phone: 407-777-9228

Website: WorldOilGroup.com

WOG is an oil exploration operating company that produces products designed for oil and gas industry pipeline cleaners, and oil spill cleaners. WOG now manufactures surfactant Hydro-Clean which is formerly known as the EPA Inc. agent. The NCP Product schedule has the EPA Inc. agent listed, but the new Hydro-Clean agent is not listed.

- SW-62 Petromax PSC 3

Saxon Petrotechnologies S.A.

Mr. Scot von Bergen

Ancona 14-Bis

Carrasco, Montevideo

Uruguay

Phone: 598-2-604-1006

U.S. Phone: (305) 600-4927

Fax: (508) 256-8318

Website: alfaluz.net

SP is a Switzerland based manufacturer that produces products in oil cleaning and remediation. SP has 11 formulations of the Petromax product. SP produces 1 SWA listed on the NCP Product Schedule.

SP has participated the questionnaire and has provided the NSCS a sample.

- SW-63 Green Technologies Solutions-Oil Recovery (GTS-OR)

International Technologies and Services Inc.

Mrs. Pilar Ortega

302 W. 5th Street, Suite 100 B

San Pedro, CA 90731

Phone: 310-791-4487

Fax: 877-744-9975

Website: itsenvironmental.com

ITS manufactures environmentally friendly bioremediation products, industrial cleaning and operating chemicals, emulsifying agents, surfactants, and suppressants agents. ITS produces 1 SWA listed on the NCP Product Schedule.

ITS has completed the questionnaire and has provided the NSCS a sample

- SW-64 Nontox Surface Washing Agent

Bio-Organic Catalyst Inc.

Mr. Jay Johnston

711 West 17th Street, Suite E-6

Costa Mesa, CA 92627

Phone: 949-515-1301

Phone: 800-92-8676

Fax: 949-515-1314

Website: bio-organic.com

BOC manufactures products involved in aquaculture, agriculture, biological film growth, mineralization, and hydrocarbon remediation. BOC produces 9 different products. BOC produces 1 SWA listed on the NCP Product Schedule.

BOC has participated in the questionnaire and is committed to providing a sample.

- SW-65 Simple Green 2013 Reformulation

Sunshine Makers Inc.

Ms. Carol Chapin

15922 Pacific Coast Highway

Huntington Beach, CA 92649

Office Phone: 800-228-0709

Mobile Phone: 592-795-6000

Fax: 562-592-3830

Website: simplegreen.com

The Simple Green product was produced 30+ years ago to remove tannic acid and by products of coffee roasting machinery as well as automotive and industrial companies. There are 31 different formulations of Simple Green, 2 which are listed as SWA on the NCP Product Schedule.

Sunshine Makers Inc. has participated in the questionnaire and has provided the NSCS a sample.

- SW-66 Formula 206-1x Biowash (aka, Castoff)

Natural Soap Formulas Inc.

Ms. Kaylin D'Aire

3200 S Andrews Avenue, Suite 113

Fort Lauderdale, FL 33316

Phone: 888-759-7256

Phone: 954-789-5656

Website: naturalsoapformulas.com

NSF manufactures non-ionic soap-based surfactants and cleaning compounds. They produce products involved in agricultural, aerospace, maritime, commercial, and industrial services. NSF produces 1 SWA listed on the NCP Product Schedule.

NSF has participated in the questionnaire and is committed to providing a sample.

- SW-67 Rhamnowash 10

Rhamnolipid Inc.

Mr. Samuel Grecco

511 West Bay Street, Suite 350

Tampa, FL 33606

Phone: 917-576-7381

Phone: 704-564-6445

Website: rhamnolipid.com

Rhamnolipid produces bacterial surfactants used in pest control, agricultural practices, and hydrocarbon removal washing. Rhamnolipid produces 1 SWA listed on the NCP Product Schedule.

NSCS Researchers spoke on the phone with Rhamnolipid, who stated that they are currently conducting research with another group and would not like to participate in our project at this time.

- SW-68 ADP-7

Petro-Green Inc.

Mr. Michael Paddock

P.O. Box 814665

Dallas, TX 75381

Phone: 214-484-7336

Website: petro-green.com

Petro-Green manufactures 1 product, the ADP-7, which is a water-soluble, surfactant blend used to wash a variety of crude oil from structures.

Petro-Green has not participated in the NSCS questionnaire after many efforts for contact.

- SW-69 Water Works Heavy Duty Degreaser Concentrate

Keteca USA Inc.

Ms. Kathy Parks

4280 W. Opportunity Way

Phoenix, AZ 85086

Phone: 602-278-7789

Website: ketecawaterworks.com

Keteca produces aqueous cleaning solution for automotive, industrial, printing, aerospace, and oil/gas industries. Keteca manufactures 8 products. Keteca produces 1 SWA listed on the NCP Product Schedule.

Keteca USA has participated in the questionnaire and has provided the NSCS a sample.

2.2.2 Miscellaneous Oil Spill Control Agent Manufacturer's

NSCS determined in addition to the NCP approved SWA a majority of OSRO's use a Miscellaneous Oil Spill Control Agent (MOSCA), also located on National Contingency Plan Subpart J.

The MOSCA manufacturers are listed in the following format:

Miscellaneous Oil Spill Control Agent

Manufacturer name

Company contact name

Contact Information

Brief company history and the products that they produce

Statement of their participation in the project questionnaire and providing samples.

All products listed are derived from September 2017 NCP Product Schedule, and all contact information is derived from March 2018 Update NCP Product Schedule.

- M-12 PES-51

Practical Environmental Solutions.

Mr. Bill Sims

P.O. Box 12563

San Antonio, TX 78212

Phone: 210-493-7172

Fax: 210-493-7172

Website: pes51.com

PES produces 5 formulations of the PES product used in washing/cleaning, decontamination, and remediation of petroleum covered substrates. PES produces 1 SWA listed on the NCP Product Schedule.

PES has participated in the questionnaire and has provided the NSCS a sample.

Attachment C
Laboratory-Scale Observations

SW-10 Corexit EC9580A

Nalco Environmental Solutions LLC

Mrs. Debby Theriot

7705 Highway 90-A

Sugar Land, TX 77478

Office Phone: 281-263-7709

Mobile Phone: 832-851-5164

Website: nalcoenvironmentalsolutionsllc.com

| Application Criteria: | | Straight | | | | | | | | | | Apply directly to oiled surfaces and allow a max of 30 minutes to soak, rinse clean. | | | | | | | | | |
|-----------------------|---------------|-------------|----------------|----------------|-----------|-------------------------|-------|--------|--------|--------|-------------|--|------|--|--|--|--|--|--|--|--|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | Conc. (ppm) | | | | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | | 1 hr | | | | | | | | | |
| 11/27/2018 | 4:14 - 5:36 | 21.6 - 20.9 | 36 | 810 | Crude | Oil on Steel: | N | N | N | N | N | N | 1.68 | | | | | | | | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | | | | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | N | N | N | N | | | | | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | | | | | | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | | | |
| 6/6/2019 | 11:05 - 12:35 | 9.8 - 10.9 | 33 | CAM 10 | crude | Oil on Steel: | Y | Y | N | N | N | N | 1.8 | | | | | | | | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | | | | | | | | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | | | | | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | | | | | | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | | | |
| 6/5/2019 | 3:11 - 4:41 | 31.1 - 30.0 | 37 | CAM 9 | Crude | Oil on Steel: | Y | N | N | N | N | N | 0.97 | | | | | | | | |
| | | | | | | Oil on Concrete: | Y | N | N | N | N | N | | | | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | N | N | N | N | | | | | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | | | | | | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | | | |

| Application Criteria: | | Straight | | | Apply directly to oiled surfaces and allow a max of 30 minutes to soak, rinse clean. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|----------------|--|-------------------------|-------|--------|--------|--------|-------------|------------------|------------------|---|---|-------|---|--------------|--------------|---|---|---|---|---|-----------------------|---|---|-----------------------|---|---|------|------|---|---|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Observation | | | | | Conc. | | | | | | | | | | | | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | | | | | | | | | | | | | | | | | |
| 5/30/2019 | 12:47 - 2:17 | 23.0 - 23.0 | 38 | CAM 1 | Diesel | Oil on Steel: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | Oil on water surface: | Y | Y | Y | Y | Y | Y | 1.17 | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Observation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Oil on Steel: | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | N | N | N | N | Oil on water surface: | Y | Y | Y | | Y | Y |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | | | | | | | | | | | | | | | | | | | | |
| 6/5/2019 | 3:11 - 4:41 | 30.9 - 29.8 | 36 | 353 | Diesel | Oil on Steel: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | Oil on water surface: | Y | Y | Y | Y | Y | 1.39 | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Observation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Oil on Steel: | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | N | N | N | N | Oil on water surface: | Y | Y | | Y | Y | Y |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | | | | | | | | | | | | | | | | | | | | |
| 6/6/2019 | 11:05 - 12:35 | 10.0 - 11.3 | 33 | 446 | Diesel | Oil on Steel: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | Oil on water surface: | Y | Y | Y | Y | Y | 0.46 | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Observation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Oil on Steel: | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | N | N | N | N | Oil on water surface: | Y | Y | | Y | Y | Y |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | | | | | | | | | | | | | | | | | | | | |

| Application Criteria: | | Straight | | | Apply directly to oiled surfaces and allow a max of 30 minutes to soak, rinse clean. | | | | | | | | | | | | |
|-----------------------|-------------|-------------|----------|----------------|--|-------------------------|-------|--------|--------|--------|-------|---|------|--|--|--|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | |
| 8/7/19 | 5:01 - 6:40 | 9.5 - 12.5 | 37 | 1987 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.02 | | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | | | | | |
| 7/30/19 | 1:57-3:27 | 25.2-24.3 | 35 | 1145 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 0.82 | | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | | | | | |
| 7/30/19 | 1:57 - 3:27 | 30.9 - 28.1 | 35 | VID 1 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 0.95 | | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | | | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | | | | | |

| Application Criteria: | | Straigh or up to 1:9 | | Apply straight or diluted mixture to contaminated surface, use pressure or steam cleaning equipment at high heat. | | | | | | | | | | | | | |
|-----------------------|---------------|----------------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|-------|------------------------------|---|---|---|---|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | |
| 11/15/2018 | 1:50 - 2:50 | 21.0 - 20.7 | 37 | 494 | Diesel | Oil on Steel: Oil on | N | N | N | N | N | Oil on Wood: Oil on water | N | N | N | N | 0.8 |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | Y | Y | Y | Y | |
| 7/18/2019 | 10:23 - 11:25 | 31.7 - 31.0 | 35 | VID 11 | Diesel | Oil on Steel: Oil on | N | N | N | N | N | Oil on Wood: Oil on water | N | N | N | N | 0.87 |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | Y | Y | Y | Y | |
| 5/30/2019 | 10:50 - 11:50 | 8.7 - 12.5 | 33 | CAM 10 | Diesel | Oil on Steel: Oil on | Y | Y | Y | Y | Y | Oil on Wood: Oil on water | Y | Y | Y | Y | 1.3 |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | Y | Y | Y | Y | |

| Application Criteria: | | Straigh or up to 1:9 | | Apply straight or diluted mixture to contaminated surface, use pressure or steam cleaning equipment at high heat. | | | | | | | | | | | | |
|-----------------------|--------------|----------------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|-------|---|--|--|--|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | |
| 4/17/2019 | 12:16 - 1:17 | 30.5 - 31.2 | 40 | 2858 | 6-oil | Oil on Steel: | N | N | N | N | N | N | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on water: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | |
| 4/18/2019 | 3:32 - 4:33 | 24.1 - 24.0 | 37 | 2920 | 6-oil | Oil on Steel: | N | N | N | N | N | N | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on water: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | |
| 4/26/2019 | 12:19 - 1:23 | 10.7 - 12.2 | 28 | CAM 3 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on water: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | |

| Application Criteria: | | Straigh or up to 1:9 | | Apply straight or diluted mixture to contaminated surface, use pressure or steam cleaning equipment at high heat. | | | | | | | | | | | | | | | | | | |
|-----------------------|-------------|----------------------|----------|---|-------------------------|---------------|-------|--------|--------|--------|-------|--|--|--|--|--|--|--|--|--|--|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | | | | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | | | | | |
| 7/22/19 | 3:56 - 4:56 | 31.2 - 30.3 | 34 | 66 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on water | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | | | | | |
| 7/31/19 | 4:49-5:49 | 23.7-23.1 | 35 | vid 5 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on water | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | | | | | |
| 8/7/19 | 3:15 - 4:15 | 10.8 - 12.3 | 35 | VID 1 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | | Oil on water | Y | Y | Y | Y | Y | | | | | | | | | | | |
| | | | | | Dispersed oil in water: | N | N | N | N | N | N | | | | | | | | | | | |

SW-15 Simple Green
 Sunshine Makers Inc.
 Ms. Carol Chapin
 15922 Pacific Coast Highway
 Huntington Beach, CA 92649
 Office Phone: 800-228-0709
 Mobile Phone: 592-795-6000
 Fax: 562-592-3830
 Website: simplegreen.com

| Application Criteria: | | 1:10 | Dilute in hot or cold water and apply to contaminated surface. Allow 1 - 2 minutes of sitting time. Scrub surface if heavily oiled or greased surface. Rinse off surface and blot dry, apply again if necessary. | | | | | | | | | | |
|-----------------------|---------------|-------------|--|----------------|-----------|-------------------------|-------|--------|--------|--------|------|-------------|--------|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | | Conc. (ppm) | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 10/10/2018 | 3:24 / 4:24 | 23.4 - 23.0 | 38 | 751 | Crude | Oil on Steel: | N | N | N | N | N | N | 1.3ppm |
| | | | | | | Oil on | N | N | N | N | N | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| 6/13/2019 | 12:05 - 1:13 | 9.1 - 11.8 | 33 | CAM 5 | Crude | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.07 |
| | | | | | | Oil on | N | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | |
| 7/12/19 | 10:52 - 11:56 | 30.2 - 30.2 | 36 | vid 6 | Crude | Oil on Steel: | N | N | N | N | N | N | 0.7 |
| | | | | | | Oil on | N | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | |

| Application Criteria: | | 1:10 | | Dilute in hot or cold water and apply to contaminated surface. Allow 1 - 2 minutes of sitting time. Scrub surface if heavily oiled or greased surface. Rinse off surface and blot dry, apply again if necessary. | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|--|-----------|-------------------------|-------|--------|--------|--------|------|-------|------|--|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Conc. | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | |
| 7/22/19 | 5:23 - 6:24 | 23.4 - 23.5 | 36 | 127 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 2.81 | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | |
| 8/1/19 | 11:02 - 12:04 | 8.6 - 13.7 | 35 | 1592 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.75 | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | | | | |
| 7/31/19 | 2:47-3:52 | 30.1-28.3 | 35 | vid 4 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 0.6 | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | | | | |

| Application Criteria: | | Straight | | Apply through brush application and allow a minimum of 1 hour retention time. | | | | | | | | | | | | | | |
|-----------------------|--------------|-------------|----------|---|-----------|--------------------|-------------|----------------|-------------------|-------------------|-----------------------|--------------------|-------------|----------------|-------------------|-------------------|-----------------------|-------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Observation | | | | | | Conc. |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | |
| 6/11/2019 | 11:32 - 1:32 | 24.1 - 23.2 | 37 | CAM 2 | Diesel | Oil on Steel: Y | Oil on N | Concrete: N | Oil on Wood: N | Oil on water Y | Dispersed oil in Y | Oil on Steel: N | Oil on N | Concrete: N | Oil on Wood: Y | Oil on water Y | Dispersed oil in Y | 0.3 |
| 6/11/2019 | 2:24 - 4:24 | 30.8 - 28.2 | 39 | CAM3 | Diesel | Oil on Steel: N | Oil on N | Concrete: N | Oil on Wood: Y | Oil on water Y | Dispersed oil in N | Oil on Steel: N | Oil on N | Concrete: N | Oil on Wood: Y | Oil on water Y | Dispersed oil in N | 0.73 |
| 6/12/2019 | 12:49 - 2:50 | 5.5 - 11.2 | 29 | CAM 4 | Diesel | Oil on Steel: N | Oil on N | Concrete: N | Oil on Wood: N | Oil on water Y | Dispersed oil in N | Oil on Steel: N | Oil on N | Concrete: N | Oil on Wood: N | Oil on water Y | Dispersed oil in N | 0.28 |

| Application Criteria: | | Straight | | Apply through brush application and allow a minimum of 1 hour retention time. | | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|------|---------------|-------------------------|--------|--------|--------|------|-------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/25/19 | 2:57-4:56 | 20.8-21.1 | 34 | 806 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | 0.85 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | Oil on water surface: | N | N | N | N | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | Dispersed oil in water: | N | N | N | N | | |
| 7/25/19 | 2:58 - 4:58 | 30.3 - 26.5 | 35 | VID 7 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.35 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | Dispersed oil in water: | N | N | N | N | | |
| 8/9/19 | 10:50 - 12:50 | 9.4 - 13.0 | 35 | 2295 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.88 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | Dispersed oil in water: | N | N | N | N | | |

| Application Criteria: | | 12% or 3:25 | | Apply solution by spray, followed by course stream of water. | | | | | | | | | |
|-----------------------|---------------|-------------|----------|--|-----------|-------------------------|-------|--------|--------|--------|------|---|-------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/24/19 | 3:47 - 4:47 | 32.1 - 28.5 | 36 | vid 4 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | N |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | 2.97 |
| 7/31/19 | 2:50-3:52 | 22.8-23.1 | 37 | 1463 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | N |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | 0.65 |
| 8/8/19 | 11:23 - 12:24 | 7.5 - 10.5 | 35 | 2082 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | 1.6 |

SW-23 Petro-Clean
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 Pasadena, TX 77508
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 Website: alabastercorp.com

| Application Criteria: | | Apply solution to surface via brush or through pressure 100 PSI or more | | | | | | | | | | |
|-----------------------|--------------|---|----------------|----------------|-------------------------|---------------|-------|--------|--------|--------|-------------|---------|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | Conc. (ppm) | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | | 1 hr |
| 9/26/2018 | 9:38-10:40 | 25.0 - 24.4 | 37 | 945 | Crude | Oil on Steel: | Y | Y | Y | Y | Y | 1.13ppm |
| | | | | | | Oil on | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water: | Y | Y | Y | Y | Y | |
| | | | | | Dispersed oil in water: | N | N | N | Y | Y | Y | |
| | | | | | Petroleum | Observation | | | | | Conc. | |
| 5/21/2019 | 12:28 - 1:30 | 31.5 - 28.2 | 38 | CAM 5 | Crude | Oil on Steel: | Y | Y | Y | Y | Y | 1.45 |
| | | | | | | Oil on | Y | N | N | N | N | |
| | | | | | | Oil on Wood: | Y | N | N | N | N | |
| | | | | | | Oil on water: | Y | Y | Y | Y | Y | |
| | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | |
| | | | | | Petroleum | Observation | | | | | Conc. | |
| 6/5/2019 | 12:16 - 1:16 | 10.3 - 12.9 | 35 | CAM 26 | Crude | Oil on Steel: | N | N | N | N | N | 1.95 |
| | | | | | | Oil on | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | |
| | | | | | | Oil on water: | Y | Y | Y | Y | Y | |
| | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | |
| | | | | | Petroleum | Observation | | | | | Conc. | |

| Application Criteria: | | 1:10 | | Apply solution to surface via brush or through pressure 100 PSI or more | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|--------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Observation | | | | | | Conc. |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | |
| 11/27/2018 | 12:24 / 1:24 | 20.9 - 20.4 | 39 | 745 | Diesel | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | 0.6ppm |
| | | | | | | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | |
| | | | | | | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | | | | | | | |
| 6/5/2019 | 1:33 - 2:33 | 32.2 - 30.1 | 36 | CAM 27 | Diesel | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | 2.09 |
| | | | | | | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | |
| | | | | | | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | | | | | | | |
| 6/5/2019 | 10:38 - 11:38 | 8.9 - 12.1 | 30 | CAM 25 | Diesel | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | 1.61 |
| | | | | | | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | |
| | | | | | | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | | | | | | | |

| Application Criteria: | | 1:10 | | Apply solution to surface via brush or through pressure 100 PSI or more | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|------|---|-------|------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | |
| 7/22/19 | 3:20 - 4:21 | 23.6 - 23.1 | 37 | vid 1 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y | Y | 1.73 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | N | N | N | N | N | N | | |
| 7/22/19 | 5:25 - 6:25 | 32.8 - 28.3 | 38 | vid 2 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y | 0.72 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | |
| 8/7/19 | 11:30 - 12:30 | 8.1 - 11.8 | 35 | 1797 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y | 1.77 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | N | | |

SW-25 SC-1000
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| Application Criteria: | | 20% to 100% | | Pre-soak surface, apply mixture at 160°F in circular motion working towards center. | | | | | | | | | | | | | | |
|-----------------------|-------------|-------------|----------------|---|-----------|---------------------------|-------|--------|--------|--------|------|---------------------------|-------|--------|--------|--------|------|-------------|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | | Observation | | | | | | Conc. (ppm) |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | |
| 11/12/2018 | 3:40 - 5:00 | 22.0 - 22.1 | 36 | 344 | Crude | Oil on Steel: N | N | N | N | N | N | Oil on Steel: N | N | N | N | N | N | 0.9 |
| | | | | | | Oil on Wood: N | N | N | N | N | N | Oil on Wood: N | N | N | N | N | N | |
| | | | | | | Oil on water: Y | Y | Y | Y | Y | Y | Oil on water: Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: N | N | N | Y | Y | Y | Dispersed oil in water: N | N | N | Y | Y | Y | |
| | | | | | | Observation | | | | | | | | | | | | Conc. |
| 7/3/2019 | 1:35 - 2:35 | 9.9 - 12.4 | 31 | 2516 | Crude | Oil on Steel: N | N | N | N | N | N | Oil on Steel: N | N | N | N | N | N | 1.1 |
| | | | | | | Oil on Wood: N | N | N | N | N | N | Oil on Wood: N | N | N | N | N | N | |
| | | | | | | Oil on water: Y | Y | Y | Y | Y | Y | Oil on water: Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: Y | Y | Y | Y | Y | Y | Dispersed oil in water: Y | Y | Y | Y | Y | Y | |
| | | | | | | Observation | | | | | | | | | | | | Conc. |
| 7/11/19 | 3:36 - 4:36 | 30.8 - 30.8 | 38 | 772 | Crude | Oil on Steel: N | N | N | N | N | N | Oil on Steel: N | N | N | N | N | N | 1.23 |
| | | | | | | Oil on Wood: N | N | N | N | N | N | Oil on Wood: N | N | N | N | N | N | |
| | | | | | | Oil on water: Y | Y | Y | Y | Y | Y | Oil on water: Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: Y | Y | Y | Y | Y | Y | Dispersed oil in water: Y | Y | Y | Y | Y | Y | |

| Application Criteria: | | 20% to 100% | | Pre-soak surface, apply mixture at 160°F in circular motion working towards center. | | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|-------------|---------------|-------------------------|--------|--------|--------|------|---|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Observation | | | | | Conc. | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/3/19 | 3:18 - 4:19 | 22.3 - 22.8 | 36 | 2578 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | 1.02 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |
| 7/16/19 | 2:10 - 3:11 | 31.1 - 29.8 | 35 | 1450 | 6-oil | Oil on Steel: | N | N | N | N | N | Oil on Steel: | N | N | N | N | N | N | 1.75 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | Oil on Wood: | N | N | N | N | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | | |
| 7/17/19 | 11:02 - 12:02 | 9.7 - 13.7 | 31 | VID 7 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.98 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | Oil on Wood: | N | N | N | N | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | | |

| Application Criteria: | | 20% to 100% | | Pre-soak surface, apply mixture at 160°F in circular motion working towards center. | | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|-------------|---------------|-------------------------|--------|--------|--------|------|------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Observation | | | | | Conc. | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/23/19 | 9:22 - 10:22 | 22.6 - 22.4 | 35 | vid 3 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | 1.23 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |
| 7/23/19 | 11:06 - 12:06 | 32.6 - 28.8 | 35 | vid 4 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | 3.29 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | | |
| 8/8/19 | 3:22 - 4:35 | 10.4 - 13.4 | 33 | 2217 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | 1.7 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | | |

SW-26 Gold Crew SW
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| Application Criteria: | | 1% to 10% | | Pre-soak surface, apply mixture at 160°F in circular motion working towards center. | | | | | | | | | | | | | | | | |
|-----------------------|--------------|-------------|----------------|---|-----------|-------------------------|-------|-------|--------|--------|--------|-------------|-------------------------|-------|-------|--------|--------|-------------|------|--------|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | | Observation | | | | | | Conc. (ppm) | | |
| | | | | | | Oil on Steel: | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | Oil on Steel: | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | |
| 10/15/2018 | 3:20 | 23.4 - 23.0 | 36 | 216 | Crude | Oil on | N | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | N | 2.0ppm |
| | | | | | | Oil on water | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| 6/24/2019 | 12:27 - 1:27 | 32.2 - 30.1 | 39 | 1073 | Crude | Oil on Steel: | Y | N | N | N | N | N | Oil on | Y | N | N | N | N | N | 1.8 |
| | | | | | | Oil on Wood: | Y | N | N | N | N | N | Oil on water | N | N | N | N | N | N | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | | N | N | N | N | N | N | |
| 6/26/2019 | 1:43 - 2:43 | 7.9 - 10.9 | 33 | 1564 | Crude | Oil on Steel: | N | N | N | N | N | N | Oil on | N | N | N | N | N | N | 0.88 |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | Oil on water | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | Y | Y | Y | Y | Y | Y | |

| Application Criteria: | | 1% to 10% | | Pre-soak surface, apply mixture at 160°F in circular motion working towards center. | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|-------|------|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 6/24/2019 | 2:09 - 3:12 | 30.7 - 29.7 | 36 | 1136 | 6-oil | Y | Y | Y | Y | Y | Y | 2.32 | |
| | | | | | | Oil on Steel: | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | Y | | |
| | | | | | | Observation | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 6/24/2019 | 2:09 - 3:12 | 23 - 23.5 | 38 | VID 7 | 6-oil | Y | N | N | Y | Y | Y | 1.1 | |
| | | | | | | Oil on Steel: | N | N | N | N | N | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | | |
| | | | | | | Observation | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/17/19 | 11:05 - 12:05 | 9.5 - 13.4 | 31 | 1634 | 6-oil | Y | Y | Y | Y | Y | Y | 1 | |
| | | | | | | Oil on Steel: | N | N | N | N | N | | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | N | N | | |

| Application Criteria: | | 2.5% to 3% | | Apply at 70-200°F at 2500 - 3600 PSI or standard fire equipment delivery 80 - 150 PSI. Steam Cleaning is not suggested. | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|------|---|-------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 6/26/19 | 3:25 - 4:25 | 23.8 - 23.1 | 36 | vid 4 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | N | N | N | Y | Y | Y | |
| 7/15/19 | 6:40 - 7:40 | 31.8 - 31.8 | 37 | 1319 | 6-oil | Oil on Steel: | N | N | N | N | N | N | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| 7/19/19 | 10:15 - 11:15 | 9.3 - 12.1 | 36 | vid 9 | 6-oil | Oil on Steel: | Y | N | N | N | N | N | |
| | | | | | | Oil on Concrete: | Y | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |

| Application Criteria: | | 2.5% to 3% | | Apply at 70-200°F at 2500 - 3600 PSI or standard fire equipment delivery 80 - 150 PSI. Steam Cleaning is not suggested. | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|-------|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/24/19 | 11:38 - 12:38 | 23.0 - 22.5 | 36 | 441 | Asphalt | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | 1.88 | |
| | | | | | | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | | |
| | | | | | | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | | |
| | | | | | | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | | |
| | | | | | | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | | |
| | | | | | | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/24/19 | 11:39 - 12:39 | 30.5 - 27.6 | 34 | VID 2 | Asphalt | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | 2.32 | |
| | | | | | | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | | |
| | | | | | | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | | |
| | | | | | | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | | |
| | | | | | | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | | |
| | | | | | | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 8/7/19 | 11:31 - 12:31 | 9.9 - 13.3 | 35 | vid 11 | Asphalt | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | 1.73 | |
| | | | | | | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | | |
| | | | | | | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | | |
| | | | | | | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | | |
| | | | | | | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | | |

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| Application Criteria: | | 1:5 to 1:100 | | Begin with dilution (2-10%) at low pressure (20gpm) at 100-180°F, allow 15 to 30 minute soak. Second application with dilution (1-5%) at high pressure (70gpm). | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---------------|--------------|----------------|---|-----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------|-------------------|-------------------|-------------------|----------------------------|----------------------------|----------------------------|----------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | | Conc. (ppm) | | | | | | | | | | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | | | | | | | | | | | |
| 11/6/2018 | 4:10 - 5:25 | 22.4 - 22.6 | 36 | 62 | Crude | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: N | 1.06 |
| 7/1/2019 | 10:50-12:20 | 9.7-13.5 | 32 | 1856 | Crude | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | 1.88 |
| 7/8/19 | 10:50 - 12:22 | 30.5 - 27.2 | 36 | 0 | Crude | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | 1.68 |

| Application Criteria: | | 1:5 to 1:100 | | Begin with dilution (2-10%) at low pressure (20gpm) at 100-180°F, allow 15 to 30 minute soak. Second application with dilution (1-5%) at high pressure (70gpm). | | | | | | | | | | | | | | | |
|-----------------------|---------------|--------------|----------|---|-----------|-------------------------|-------|--------|--------|--------|------|-------------|-------------------------|--------|--------|--------|------|-------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 2/1/2018 | 11:38 - 1:09 | 21.8 - 20.4 | 40 | 1126 | Diesel | Oil on Steel: | N | N | N | N | N | N | Oil on Steel: | N | N | N | N | N | 1.48 |
| | | | | | | Oil on Concrete: | Y | Y | N | N | N | N | Oil on Concrete: | N | N | N | N | N | |
| | | | | | | Oil on Wood: | Y | Y | N | N | N | N | Oil on Wood: | Y | Y | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |
| 7/1/2019 | 10:50-12:20 | 9.6-12.8 | 33 | vid 8 | Diesel | Oil on Steel: | N | N | N | N | N | N | Oil on Steel: | N | N | N | N | N | 0.24 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |
| 7/8/19 | 10:50 - 12:22 | 30.1 - 27.7 | 36 | vid 7 | Diesel | Oil on Steel: | N | N | N | N | N | N | Oil on Steel: | N | N | N | N | N | 2.09 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |

| Application Criteria: | | 1: 10 to 1:600 | | Apply by brush or spray and agitate surface. Spray at ambient to 125°F and allow 1-10 minute soak, then rinse clean. | | | | | | | | | | | | |
|-----------------------|---------------|----------------|----------|--|-----------|-------------------------|-------|--------|--------|--------|------|---|-------|------|--|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | |
| 8/8/19 | 1:21 - 2:31 | 11.0 - 13.8 | 36 | 2144 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y | 1.73 | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | |
| 7/30/19 | 10:15-11:30 | 23.2-22.4 | 35 | 1067 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.7 | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | | | | | |
| 7/30/19 | 10:16 - 11:31 | 30.1 - 26.3 | 35 | VID 10 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 0.97 | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | | | | |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | | | | | |

| Application Criteria: | | 1:1 to 1:4 | | Apply straight or diluted mixture to contaminated surface, use pressure or steam cleaning equipment at high heat. | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|-------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Observation | | | | | | Conc. |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | |
| 2/27/2019 | 11:35 - 12:39 | 22.5 - 21.9 | 39 | 1342 | Diesel | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: Y | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | 1.22 |
| | | | | | | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | |
| | | | | | | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | | | | | | | |
| 6/25/2019 | 3:30 - 4:30 | 30.1 - 28.1 | 35 | vid 4 | Diesel | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | 1.61 |
| | | | | | | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | |
| | | | | | | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | | | | | | | |
| 7/2/19 | 12:08 - 1:10 | 8.5 - 10.4 | 31 | VID 4 | Diesel | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | 0.42 |
| | | | | | | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | Oil on water surface: Y | |
| | | | | | | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | | | | | | | |

| Application Criteria: | | 1:1 to 1:4 | | Apply straight or diluted mixture to contaminated surface, use pressure or steam cleaning equipment at high heat. | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-----------|------------------------------|-------|--------|--------|--------|-------|----------------------------|---|---|---|---|---|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | |
| 6/26/19 | 3:25 - 4:25 | 23.4 - 22.8 | 36 | 1627 | 6-oil | Oil on Steel: N | Y | Y | Y | Y | Y | Oil on Concrete: N | Y | Y | Y | Y | Y | 1.18 |
| | | | | | | Oil on Wood: N | Y | Y | Y | Y | Y | Oil on water surface: N | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: N | Y | Y | Y | Y | Y | | | | | | | |
| | | | | | | Observation | | | | | Conc. | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | |
| 7/15/19 | 6:40 - 7:40 | 31.6 - 31.6 | 38 | VID 2 | 6-oil | Oil on Steel: N | N | N | N | N | N | Oil on Concrete: N | N | N | N | N | N | 1.07 |
| | | | | | | Oil on Wood: N | N | N | N | N | N | Oil on water surface: N | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: N | Y | Y | Y | Y | Y | | | | | | | |
| | | | | | | Observation | | | | | Conc. | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | |
| 5/29/19 | 11:45 - 12:45 | 8.9 - 11.4 | 38 | 962 | 6-oil | Oil on Steel: Y | Y | Y | Y | Y | Y | Oil on Concrete: N | Y | Y | Y | Y | Y | 1.18 |
| | | | | | | Oil on Wood: N | Y | Y | Y | Y | Y | Oil on water surface: N | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: N | Y | Y | Y | Y | Y | | | | | | | |

| Application Criteria: | | 1:1 to 1:4 | | Apply straight or diluted mixture to contaminated surface, use pressure or steam cleaning equipment at high heat. | | | | | | | | | |
|-----------------------|---------------|-------------|----------|---|-------------------------|-----------------------|-------|--------|--------|--------|------|-------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/22/19 | 1:48 - 2:48 | 23.4 - 22.5 | 36 | 0 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | |
| 8/7/19 | 3:13 - 4:15 | 10.7 - 13.3 | 36 | 1924 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.45 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | Dispersed oil in water: | N | N | N | N | N | N | | |
| 7/31/19 | 11:08 - 12:08 | 30.4 - 28.5 | 26 | VID 2 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.38 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | |
| | | | | | Dispersed oil in water: | N | N | N | N | N | N | | |

| Application Criteria: | | 1 : 1 | | Apply solution by spray, brush, or mop. Allow time for penetration, and rinse thoroughly with water. | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|--|-----------|-------------------------|-------|--------|--------|--------|------|---|-------|---|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | |
| 7/12/2019 | 12:42 - 2:00 | 25.4 - 23.1 | 38 | 899 | Diesel | Oil on Steel: | N | N | N | N | N | N | N | N | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | |
| 7/3/2019 | 9:52 - 11:07 | 7.4 - 12.3 | 33 | vid 3 | Diesel | Oil on Steel: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | |
| 7/11/19 | 11:59 - 12:04 | 30.3 | 35 | VID 3 | Diesel | Oil on Steel: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | |

| Application Criteria: | | 1:1 | | Apply solution by spray, brush, or mop. Allow time for penetration, and rinse thoroughly with water. | | | | | | | | | |
|-------------------------|---------------|-------------|----------|--|-----------|-----------------------|-------|--------|--------|--------|------|-------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/23/19 | 2:05 - 3:22 | 22.7 - 22.9 | 35 | 362 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.82 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | | | | | |
| 7/23/19 | 2:05 - 3:22 | 30.0 - 28.3 | 35 | vid 6 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.23 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | | | | | |
| 8/1/19 | 11:03 - 12:05 | 9.9 - 12.2 | 35 | VID 6 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.3 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | N | N | N | N | N | N | |
| Dispersed oil in water: | N | N | N | N | N | N | N | | | | | | |

| Application Criteria: | | 1:6 for light oiling 25% for heavy/thicker oiling | | May be applied by drum pump, pressurization, brush, or wash tank. For light application, apply diluted mixture and allow 2-3 minute soak., for heavy/thicker apply diluted mixture and allow 10-15 minutes soak. Rinse with pressure or steam at ambient temperatures. | | | | | | | | | |
|-----------------------|---------------|---|----------|--|-----------|-------------------------|-------|--------|--------|--------|------|-------|---|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 6/6/2019 | 2:32 - 3:35 | 21.2 - 22.8 | 36 | CAM 1 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Oil on Concrete: | Y | Y | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| 7/15/19 | 11:18 - 12:28 | 9.5 - 14.1 | 32 | 1135 | 6-oil | Oil on Steel: | N | N | N | N | N | N | N |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| 7/15/19 | 11:18 - 12:38 | 30.6 - 28.6 | 36 | VID 9 | 6-oil | Oil on Steel: | N | N | N | N | N | N | N |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |

SW-62 Petromax PSC 3
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| Application Criteria: | | 1% | | Apply at ambient temperatures through physical, hydro-blasting/ pressure washing, application. | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------------|--|-----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-----------------------|-----------------------|-----------------------|-------------------|-------------------|-------------------|----------------------------|----------------------------|----------------------------|------------------------------|------------------------------|------------------------------|------|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | | Conc. (ppm) | | | | | | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | | | | | | | |
| 11/12/2018 | 2:00 - 3:20 | 21.9 - 21.3 | 37 | 281 | Crude | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Steel: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Concrete: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Wood: Y | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Dispersed oil in water: N | Dispersed oil in water: N | Dispersed oil in water: N | 1.2 |
| 7/9/2019 | 11:25 - 12:28 | 9.7 - 11.5 | 32 | 240 | Crude | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | 0.85 |
| 7/11/19 | 1:53 - 2:53 | 30.3 - 28.6 | 35 | 709 | Crude | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Steel: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Concrete: N | Oil on Wood: N | Oil on Wood: N | Oil on Wood: N | Oil on Water surface: Y | Oil on Water surface: Y | Oil on Water surface: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | Dispersed oil in water: Y | 1.15 |

| Application Criteria: | | 1% | | Apply at ambient temperatures through physical, hydro-blasting/ pressure washing, application. | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|--|-----------|-------------------------|-------|--------|--------|--------|-------------|-------------------------|-------|--------|--------|--------|------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Observation | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | |
| 5/28/2019 | 11:50 - 12:50 | 23.7 - 22.1 | 36 | CAM 17 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | 1.65 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |
| 7/16/19 | 12:15 - 1:15 | 32.5 - 30.2 | 36 | 1382 | 6-oil | Oil on Steel: | N | N | N | N | N | Oil on Steel: | Y | Y | Y | Y | Y | 1.93 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |
| 7/17/19 | 3:22 - 4:23 | 11.0 - 16.8 | 36 | VID 8 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | N | N | N | N | N | 1.25 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |

| Application Criteria: | | 1% | | Apply at ambient temperatures through physical, hydro-blasting/ pressure washing, application. | | | | | | | | | | | | | | |
|-----------------------|--------------|-------------|----------|--|-----------|-------------------------|-------|--------|--------|--------|-------------|-------------------------|-------|--------|--------|--------|------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Observation | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | |
| 7/23/19 | 12:37 - 1:37 | 30.1 - 27.2 | 38 | vid 5 | Asphalt | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 1.35 |
| | | | | | | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | |
| 8/1/19 | 1:09 - 2:11 | 8.7 - 13.1 | 35 | VID 9 | Asphalt | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 0.78 |
| | | | | | | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | Dispersed oil in water: | N | N | N | N | N | |
| 7/31/19 | 4:44-5:44 | 23.5-23.1 | 35 | 1528 | Asphalt | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | 0.8 |
| | | | | | | Oil on Steel: | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | N | N | N | N | N | Oil on water surface: | N | N | N | N | N | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | Dispersed oil in water: | N | N | N | N | N | |

| Application Criteria: | | 1:10 for heavy weathered on rock 1:1 fr heavy weathered on sand 1:20 for light/ moderated oiling | | | May be applied by spraying, dispensing, pouring, or manual/automatic scrubbing machine. Preferred application is to apply at mid-pressure (100 PSI) or direct application and allow 30 minute soaking time. | | | | | | | | | | |
|-----------------------|--------------|--|----------|----------------|---|-------------------------|-------|--------|--------|--------|------|---|-------|------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | |
| 1/9/2019 | 2:11 - 3:41 | 21.2 - 20.7 | 36 | 957 | Diesel | Oil on Steel: | Y | Y | N | N | N | N | N | N | 0.75 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | N | N | N | N | | |
| 1/4/2019 | 2:45 - 4:15 | 30.1 - 29.8 | 40 | 1050 | Diesel | Oil on Steel: | N | Y | N | N | N | N | N | 0.44 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | N | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | |
| 4/10/2019 | 12:19 - 1:52 | 10.8 - 13.0 | 32 | 2592 | Diesel | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y | 1.73 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | N | N | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | N | | |

| Application Criteria: | | 1:10 for heavy weathered on rock 1:1 fr heavy weathered on sand 1:20 for light/ moderated oiling | | | May be applied by spraying, dispensing, pouring, or manual/automatic scrubbing machine. Preferred application is to apply at mid-pressure (100 PSI) or direct application and allow 30 minute soaking time. | | | | | | | | | | |
|-----------------------|---------------|--|----------|----------------|---|-------------------------|-------|--------|--------|--------|------|---|-------|------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | |
| 4/3/2019 | 11:27 - 12:59 | 22.2 - 21.4 | 40 | 2274 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y | Y | 1.75 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | |
| 4/29/2019 | 6:04 - 7:37 | 32.7 - 30.6 | 36 | 2180 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y | 1.27 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | | |
| 4/5/2019 | 12:46 - 2:20 | 11.3 - 13.2 | 35 | 2496 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | Y | 1.73 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | N | Y | Y | Y | Y | Y | Y | | |

| Application Criteria: | | 1:10 for heavy weathered on rock 1:1 fr heavy weathered on sand 1:20 for light/ moderated oiling | | May be applied by spraying, dispensing, pouring, or manual/automatic scrubbing machine. Preferred application is to apply at mid-pressure (100 PSI) or direct application and allow 30 minute soaking time. | | | | | | | | | |
|-----------------------|-------------|--|----------|---|-----------|-------------------------|-------|--------|--------|--------|------|-------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/24/19 | 1:29 - 2:59 | 23.4 - 22.5 | 36 | 504 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.7 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| 7/24/19 | 1:29 - 2:59 | 31.7 - 27.9 | 36 | vid 3 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.45 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| 8/7/19 | 5:03 - 6:40 | 10.5 - 13.5 | 34 | VID 2 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 0.8 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | N | |

SW-66 Formula 206-1x Biowash (aka, Castoff)
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 Phone: 954-789-5656
 Website: naturalsoapformulas.com

| Application Criteria: | | 1:5 to 1:200 first application is 1:10 | | May be applied by spraying, pressure washing, mopping, scrubbing, cloth, or sponge. Apply diluted mixture at ambient temperatures and allow 5-30 minutes to soak, then rinse. During soak, physical agitation may be required. | | | | | | | | | | | | | |
|-----------------------|-------------|--|----------------|--|-----------|-------------|-------|--------|--------|--------|-------------|--------------------|--------------------------|-------------------|-------------------------------|---------------------------------|------|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | Conc. (ppm) | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | |
| 11/12/2018 | 5:50 - 7:15 | 22.4 - 22.0 | 36 | 409 | Crude | N | N | N | N | N | N | Oil on Steel: N | Oil on Concrete: N | Oil on Wood: N | Oil on water surface: Y | Dispersed oil in water: Y | 0.93 |
| 3/8/2019 | 1:01 - 2:14 | 33.2 - 29.7 | 31 | 1756 | Crude | N | N | N | N | N | N | Oil on Steel: N | Oil on Concrete: Y | Oil on Wood: N | Oil on water surface: Y | Dispersed oil in water: Y | 1.15 |
| 4/12/2019 | 2:07 - 3:24 | 9.1 - 12.6 | 32 | CAM 2 | Crude | N | N | N | N | N | N | Oil on Steel: N | Oil on Concrete: Y | Oil on Wood: N | Oil on water surface: Y | Dispersed oil in water: N | 1.5 |

| Application Criteria: | | 1:5 to 1:200 first application is 1:10 | | May be applied by spraying, pressure washing, mopping, scrubbing, cloth, or sponge. Apply diluted mixture at ambient temperatures and allow 5-30 minutes to soak, then rinse. During soak, physical agitation may be required. | | | | | | | | | |
|-----------------------|---------------|--|----------|--|-----------|-------------------------|-------|--------|--------|--------|------|-------|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Conc. | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 4/3/2019 | 2:14 - 3:47 | 22.8 - 22.1 | 35 | 2367 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| Conc. | | | | | | | | | | | | 1.13 | |
| 4/12/2019 | 11:05 - 12:36 | 30.9 - 29.1 | 37 | 2685 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| Conc. | | | | | | | | | | | | 1.48 | |
| 4/26/2019 | 11:57 - 1:23 | 10.9 | 34 | 3108 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| Conc. | | | | | | | | | | | | 1.55 | |

| Application Criteria: | | 1:5 to 1:200 first application is 1:10 | | | May be applied by spraying, pressure washing, mopping, scrubbing, cloth, or sponge. Apply diluted mixture at ambient temperatures and allow 5-30 minutes to soak, then rinse. During soak, physical agitation may be required. | | | | | | | | | | | |
|-----------------------|-------------|--|----------|----------------|--|--------------------|--------------------------|-------------------|-------------------------------|---------------------------------|------|---|-------|---|---|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | |
| 7/30/19 | 4:24 - 5:54 | 30.2 - 28.4 | 37 | VID 1 | Asphalt | Oil on Steel: Y | Oil on Concrete: Y | Oil on Wood: Y | Oil on water surface: N | Dispersed oil in water: N | Y | Y | Y | Y | Y | 0.53 |
| 7-30-19 | 4:24-5:34 | 23.7-24.0 | 37 | 1238 | Asphalt | Oil on Steel: Y | Oil on Concrete: Y | Oil on Wood: Y | Oil on water surface: N | Dispersed oil in water: N | Y | Y | Y | Y | Y | 0.6 |
| 8/8/19 | 3:19 - 4:35 | 9.8 - 13.0 | 37 | vid 6 | Asphalt | Oil on Steel: Y | Oil on Concrete: Y | Oil on Wood: Y | Oil on water surface: Y | Dispersed oil in water: Y | Y | Y | Y | Y | Y | 1.77 |

| Application Criteria: | | 1:3 to 1:7 | | Apply at 100-1259F through pressure washing. Do not use steam. | | | | | | | | | | | |
|-----------------------|--------------|-------------|----------|--|-----------|-------------------------|-------|--------|--------|--------|------|------|-------|--|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | |
| 3/1/2019 | 12:51 - 1:45 | 22.1 - 21.5 | 30 | 1542 | Diesel | Oil on Steel: | Y | N | N | N | N | N | 2.52 | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | N | N | | | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | |
| 4/24/2019 | 2:44 - 3:44 | 30.0 - 29.4 | 37 | 3046 | Diesel | Oil on Steel: | Y | Y | N | N | N | 0.43 | | | |
| | | | | | | Oil on Concrete: | Y | Y | N | N | N | | | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | | | |
| | | | | | | Dispersed oil in water: | Y | N | N | N | N | | | | |
| 5/22/2019 | 12:30 - 1:30 | 8.6 - 12.1 | 33 | CAM 6 | Diesel | Oil on Steel: | N | N | N | N | N | 2.09 | | | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | | | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | |

| Application Criteria: | | 1:3 to 1:7 | | Apply at 100-1259F through pressure washing. Do not use steam. | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|--|-----------|-------------------------|-------|--------|--------|--------|------|-------------|-------------------------|--------|--------|--------|------|-------|------|---|--|--|--|--|--|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Observation | | | | | | Conc. | | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | | | |
| 7/10/2019 | 11:50 - 12:53 | 23.5 - 23.4 | 37 | 434 | 6-oil | Oil on Steel: | N | N | N | N | N | N | Oil on Steel: | N | N | N | N | N | 0.55 | | | | | | | |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | | N | | | | | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | | N | | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | | Y | | | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | | Y | | | | | | |
| 5/1/2019 | 10:44 - 11:45 | 31.2 - 30.8 | 37 | 3264 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | Y | Oil on Steel: | Y | Y | Y | Y | Y | 1.2 | | | | | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | Oil on Concrete: | Y | Y | Y | Y | Y | | | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | Oil on Wood: | Y | Y | Y | Y | Y | | | | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | | | | | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | | | | | |
| 5/23/2019 | 11:49 - 12:49 | 9.3 - 11.4 | 33 | 3581 | 6-oil | Oil on Steel: | Y | Y | N | N | N | Y | Oil on Steel: | Y | Y | N | N | N | 1.68 | | | | | | | |
| | | | | | | Oil on Concrete: | Y | Y | N | N | N | Y | Oil on Concrete: | Y | Y | N | N | N | | | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | N | N | N | Y | Oil on Wood: | Y | Y | N | N | N | | | | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | Oil on water surface: | Y | Y | Y | Y | Y | | | | | | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Dispersed oil in water: | Y | Y | Y | Y | Y | | | | | | | | |

| Application Criteria: | | 1:3 to 1:7 | | | Apply at 100-1259F through pressure washing. Do not use steam. | | | | | | | | | | | | |
|-----------------------|--------------|-------------|----------|----------------|--|-------------------------|-------|--------|--------|--------|------|-------|------|--|--|--|--|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | Conc. | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | |
| 8/7/19 | 1:36 - 2:36 | 13.3 - 14.5 | 36 | vid 1 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.07 | | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | | | | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | | | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | | | | | | |
| 7/31/19 | 12:51 - 1:51 | 23.3 - 22.2 | 35 | 1395 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | 1.4 | | | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | | | | | |
| | | | | | | Oil on water surface: | N | N | N | N | N | | | | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | | | | | | |
| 7/31/19 | 12:51 - 1:51 | 30.1 - 26.9 | 35 | VID 3 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | 0.8 | | | | | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | | | | | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | | | | | |
| | | | | | | Oil on water surface: | N | N | N | N | N | | | | | | |
| | | | | | | Dispersed oil in water: | N | N | N | N | N | | | | | | |

M-12 PES-51
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| Application Criteria: | | 1:10 to 1:25 | | Apply mixture at ambient temperatures and allow sitting time of 3-5 minutes, scrub if necessary, and rinse area clean. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---------------|--------------|----------------|--|-----------|-------------------------|-------|--------|--------|--------|------|-------------|------------------|---|---|---|---|---|--------------|---|---|---|---|-----------------------|-----------------------|---|---|---|---|---|------|------|---|---|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | | Conc. (ppm) | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | | | | | | | | | | | | | | | | | | |
| 10/22/2018 | 4:52 - 5:52 | 24.9 - 23.3 | 37 | 452 | Crude | Oil on Steel: | Y | N | N | N | N | N | Oil on Concrete: | Y | N | N | N | N | Oil on Wood: | Y | N | N | N | Oil on water surface: | Y | Y | Y | Y | Y | Y | 0.95 | | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Observation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Conc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7/2/2019 | 10:36 - 11:40 | 8.2 - 11.1 | 34 | 2119 | Crude | Oil on Steel: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | Oil on water surface: | Y | Y | Y | Y | Y | Y | 2.08 | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Observation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Conc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7/11/19 | 10:02 - 11:07 | 31.0 - 29.7 | 36 | 573 | Crude | Oil on Steel: | N | N | N | N | N | N | Oil on Concrete: | N | N | N | N | N | Oil on Wood: | N | N | N | N | N | Oil on water surface: | Y | Y | Y | Y | Y | Y | 2.16 | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| | | | | | | Observation | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | Conc. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Application Criteria: | | 1:10 to 1:25 | | Apply mixture at ambient temperatures and allow sitting time of 3-5 minutes, scrub if necessary, and rinse area clean. | | | | | | | | | | | | | |
|-----------------------|-------------|--------------|----------|--|-----------|-------------|-------|--------|--------|--------|-------|--------------------|--------------------------|-------------------|-------------------------------|---------------------------------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | | |
| 5/23/2019 | 2:05 - 3:10 | 22.3 - 23.0 | 36 | 3644 | 6-oil | Y | Y | Y | N | N | N | Oil on Steel: Y | Oil on Concrete: Y | Oil on Wood: N | Oil on water surface: Y | Dispersed oil in water: Y | 1.3 |
| 7/16/19 | 2:05 - 3:11 | 30.7 - 30.1 | 34 | VID 5 | 6-oil | N | N | N | N | N | N | Oil on Steel: N | Oil on Concrete: N | Oil on Wood: N | Oil on water surface: Y | Dispersed oil in water: Y | 1.18 |
| 7/17/19 | 5:17 - 6:45 | 10.0 - 14.1 | 35 | 1833 | 6-oil | N | N | N | N | N | N | Oil on Steel: N | Oil on Concrete: N | Oil on Wood: N | Oil on water surface: Y | Dispersed oil in water: Y | 1.35 |

| Application Criteria: | | 1:10 to 1:25 | | | Apply mixture at ambient temperatures and allow sitting time of 3-5 minutes, scrub if necessary, and rinse area clean. | | | | | | | | |
|-------------------------|--------------|--------------|----------|----------------|--|-----------------------|-------|--------|--------|--------|------|------|-------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | | | Conc. |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 8/1/19 | 1:06 - 2:11 | 9.7 - 13.7 | 35 | 1666 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | Y | 1.75 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | |
| 7/25/19 | 12:59-2:00 | 23.1-22.6 | 35 | 743 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | 1.07 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | | Y |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | Y |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | Y |
| Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | |
| 7/25/19 | 12:59 - 2:00 | 30.6 - 28.3 | 35 | VID 6 | Asphalt | Oil on Steel: | Y | Y | Y | Y | Y | 1.5 | |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | | Y |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | Y |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | Y |
| Dispersed oil in water: | Y | Y | Y | Y | Y | Y | | | | | | | |

● Control Tests

| Application Criteria: | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------------|----------------|-----------|-------------------------|-------|--------|--------|--------|------|---|-------------|
| Date | Time | Temp (°C) | Salinity (ppt) | Visual Test ID | Petroleum | Observation | | | | | | | Conc. (ppm) |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/9/2019 | 3:39 - 4:39 | 23.5 - 23.1 | 37 | 372 | Crude | Oil on Steel: | Y | Y | N | N | N | N | 1.5 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Observation | | | | | | | Conc. |
| 7/13/2019 | 3:34 - 4:34 | 32.0 - 29.4 | 38 | 1073 | Crude | Oil on Steel: | Y | Y | Y | Y | Y | Y | 0.95 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Observation | | | | | | | Conc. |
| 7/18/19 | 11:59 - 12:59 | 10.9 - 14.4 | 35 | 1988 | Crude | Oil on Steel: | N | N | N | N | N | N | 1.07 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | N | |
| | | | | | | Oil on Wood: | N | N | N | N | N | N | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | Y | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | Y | |

| Application Criteria: | | | | | | | | | | | | | |
|-----------------------|--------------|-------------|----------|----------------|-----------|-------------------------|-------|--------|--------|--------|-------|--|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | |
| 7/3/19 | 3:18 - 4:19 | 21.7 - 22.3 | 37 | VID 6 | 6-oil | Oil on Steel: | N | N | N | N | N | | 1.25 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | N | Y | Y | Y | Y | | |
| 7/9/19 | 1:47 - 2:49 | 8.8 - 14.9 | 36 | VID 11 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | | 1.75 |
| | | | | | | Oil on Concrete: | N | N | N | N | N | | |
| | | | | | | Oil on Wood: | N | N | N | N | N | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | |
| 7/16/19 | 12:15 - 1:15 | 32.1 - 30.1 | 35 | VID 3 | 6-oil | Oil on Steel: | Y | Y | Y | Y | Y | | 1.15 |
| | | | | | | Oil on Concrete: | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on Wood: | Y | Y | Y | Y | Y | | |
| | | | | | | Oil on water surface: | Y | Y | Y | Y | Y | | |
| | | | | | | Dispersed oil in water: | Y | Y | Y | Y | Y | | |

| Application Criteria: | | | | | | | | | | | | | | | | |
|-----------------------|---------------|-------------|----------|----------------|-----------|--------------------|--------------------------|-------------------|-------------------------------|---------------------------------|-------|---|---|---|------|------|
| Date | Time | Temp | Salinity | Visual Test ID | Petroleum | Observation | | | | | Conc. | | | | | |
| | | | | | | 1 min | 5 min | 15 min | 30 min | 45 min | 1 hr | | | | | |
| 7/29/19 | 4:23-5:23 | 30.7 - 27.5 | 35 | 1004 | Asphalt | Oil on Steel: Y | Oil on Concrete: Y | Oil on Wood: Y | Oil on water surface: N | Dispersed oil in water: N | Y | Y | Y | Y | 1.98 | |
| 7/29/19 | 4:24 - 5:24 | 23.2 - 22.7 | 36 | VID 9 | Asphalt | Oil on Steel: Y | Oil on Concrete: Y | Oil on Wood: Y | Oil on water surface: N | Dispersed oil in water: N | Y | Y | Y | Y | Y | 1.88 |
| 8/9/19 | 10:47 - 11:47 | 10.5 - 13.0 | 35 | vid 7 | Asphalt | Oil on Steel: Y | Oil on Concrete: Y | Oil on Wood: Y | Oil on water surface: N | Dispersed oil in water: N | Y | Y | Y | Y | Y | 1.23 |

Attachment D
Meso-Scale Observations

SW-10 Corexit EC9580A

Nalco Environmental Solutions LLC

Mrs. Debby Theriot

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Sugar Land, TX 77478

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| | Concrete | | | Wood | | | Steel | | |
|----------------------------|---|-----------------------------------|-------------------|--------------------------|-----------------------------|--------------------------|-----------------------|----------------------------------|---|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Bubbling, drip of 6.5in | Partial evaporation, Drip of 14in | Drip of 10in | Drip of 4.5in | Evaporated/Soaked into wood | Drip of 18in | Bubbling, drip of 8in | Heavily Evaporated, drip of 12in | Drip of 15in |
| Observations at 5 passes | Drip of 12in | Drip of 25in (waterline) | Drip of 18in | Drip to 17.5in | Removed | Drip of 20in | Drip of 12in | Removed | Drip of 21in |
| Observations at 25 passes | Drip of 25in (waterline) | Removed | Partially removed | Drip of 25in (waterline) | - | Drip of 25in (waterline) | Drip of 22in | - | Partial Removal, Drip of 25in (waterline) |
| Pass Number to Tacky Touch | 40 | 0 | 30 | 40 | 40 | 0 | 45 | 45 | 25 |
| Pass Number for Clean | Maximum (50) | 25 | Maximum (50) | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | 45 |
| Notes | Corexit EC9580A was extremely effective at removing crude oil and stains by the first application. Portions of removal of 6-oil was observed by the second application, and fully removed by the third application at max 50 passes. Asphalt was observed to be tacky to the touch with a majority removal around 40 passes during the third application. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|-----------------|-------------------------|-------------------------|-------------|----------------|----------------|
| Corexit EC9580A | 8/19/2019 - 10am | 8/20/19 - 12:03pm | 94 F | Vid 2/ pic 2 | 30 min |

SW-11 De-Solv-It Industrial Formula
 Orange-Sol Blending and Packaging
 Mr. Tim Farnsworth
 1400 N Fiesta Boulevard
 Gilbert, AZ 85233
 Phone: 800-877-7771
 Fax: 480-497-0444
 Website: orange-sol.com

| | Concrete | | | Wood | | | Steel | | |
|-----------------------------------|---|-------------|--------------------------|---|--------------------------|--------------------------|--------------------------|--------------|--------------------------|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Drip of 1in | Drip of 8in | Drip of 1in | Soaked into Wood/Evaporated, Drip of 10in | Drip of 3in | Drip of 10in | Drip of 5in | Drip of 10in | Drip of 1in |
| Observations at 5 passes | Drip of 25in (waterline) | Removed | Drip of 25in (waterline) | Heavily removed | Drip of 25in (waterline) | Drip of 25in (waterline) | Drip of 25in (waterline) | Removed | Drip of 25in (waterline) |
| Observations at 25 passes | No Change | - | Partial removed | Removed | Partial removed | No Change | - | - | Partial removed |
| Pass Number to Tacky Touch | Maximum (50) | 1 | 25 | Maximum (50) | 5 | 25 | Maximum (50) | 1 | 25 |
| Pass Number for Clean | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 10 | Maximum (50) | Maximum (50) | 5 | Maximum (50) |
| Notes | **It was observed 10 minutes post meso-scale test additional asphalt and 6-oil was dripping and coming off. Possibility of the use of a retention time in the future may positively correlate on oil removal.** Observations show that all oil applied on substrates were immediately effected and began to drip after the first application pass. However little change were observed to asphaltic oils after the intial pass. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|-----------------------|-------------------------|-------------------------|-------------|----------------|----------------|
| Desolvit- Ind Formula | 8/26/19 - 9am | 8/27/19 - 10:30am | 85 F | Vid 7-10 | 0 min |

SW-19 Cytosol
 CytoCulture International Inc.
 Dr. Randall von Wedel
 249 Tewksbury Avenue
 Point Richmond, CA 94801
 Phone: 510-233-0102
 Fax: 510-233-3777
 Website: cytoculture.com

| | Concrete | | | Wood | | | Steel | | |
|-------------------------------|--|-----------------------------------|---|--------------------------|-----------------------------|---|--------------------------|----------------------------------|---|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Drip of 10in | Heavily evaporation, Drip of 20in | Drip of 17in | Drip of 2in | Evaporated/Soaked into wood | Drip of 12in | Drip of 2in | Heavily Evaporated, drip of 21in | Drip of 19in |
| Observations at 1 Application | Drip of 25in (waterline) | Removed | Heavily removed, drip of 25in (waterline) | Drip of 25in (waterline) | Removed | Heavily removed, drip of 25in (waterline) | Drip of 25in (waterline) | Removed | Heavily removed, drip of 25in (waterline) |
| Observations at 5 passes | | | | | N/A | | | | |
| Observations at 25 passes | | | | | N/A | | | | |
| Pass Number to Tacky Touch | | | | | N/A | | | | |
| Pass Number for Clean | | | | | N/A | | | | |
| Notes | Cytosol is physically brushed on and allowed 1hr time of retention before being washed off substrates. Cytosol was shown to be effective on crude and 6-oil. Observations of asphalt show only surface layer of petroleum application was removed. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Retention time |
|---------|-------------------------|-------------------------|-------------|----------------|
| Cytosol | 8/18/19 - 10am | 8/19/19 - 11:15am | 87 F | 195 60min |

SW-30 F-500
 Hazard Control Technologies, Inc.
 Mr. Michael Greiner
 150 Walter Way
 Fayetteville, GA 30214
 Phone: 770-719-5112
 Fax: 770-719-5117
 Website: hct-world.com

| | Concrete | | | Wood | | | Steel | | |
|----------------------------|--|-----------------|--------------------------|---------------|-----------------|-------------------|--------------|-----------------|--------------------------|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Bubbling, drip of 4in | Drip of 6in | Drip of 2in | Drip of 4in | Drip of 8in | Drip of 3in | Drip of 5in | Drip of 8in | Drip of 8in |
| Observations at 5 passes | No change | Heavily removed | Drip of 25in (waterline) | Drip to 8.5in | Heavily removed | Partially removed | Drip of 12in | Heavily removed | Drip of 25in (waterline) |
| Observations at 25 passes | Drip of 4in | Removed | Partially removed | Drip of 11in | Removed | Heavily removed | Drip of 15in | Removed | Partially removed |
| Pass Number to Tacky Touch | Maximum (50) | 5 | 15 | Maximum (50) | 5 | 10 | Maximum (50) | 5 | 15 |
| Pass Number for Clean | Maximum (50) | 20 | Maximum (50) | Maximum (50) | 15 | 45 | Maximum (50) | 20 | Maximum (50) |
| Notes | Observations showed little to no change on asphaltic application. Majority of crude application and stain was removed at a low number of passes. 6-oil application was shown to be heavily removed by maximum number of passes (50), but not completely removed. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|-------|-------------------------|-------------------------|-------------|----------------|----------------|
| F-500 | 8/22/19 - 10am | 8/23/19 - 10:35am | 92 F | Vid 6 | 0 min |

SW-32 BG-Clean 401
 Amiran BioChemicals LLC
 Mr. Jason Wilde
 7221 South 10th Street
 Oak Creek, WI 53154
 Phone: 414-571-6230
 Fax: 414-571-6231
 Website: biochemicals.amiran-technologies.com

| | Concrete | | | Wood | | | Steel | | |
|----------------------------|---|-------------|---|--------------------------|---|--------------------------|--------------------------|--------------|---|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Drip of 1in | Drip of 8in | Drip of 2in | Drip of 0in | Drip of 7in | Drip of 4in | Drip of 1.5in | Drip of 12in | Drip of 2in |
| Observations at 5 passes | Drip of 12in | Removed | Drip of 25in (waterline) | Drip of 7in | Heavy removed, Drip of 25in (waterline) | Drip of 25in (waterline) | Drip of 21in | Removed | Partial removed, Drip of 25in (waterline) |
| Observations at 25 passes | Drip of 25in (waterline) | - | Heavy removed, Drip of 25in (waterline) | Drip of 25in (waterline) | Removed | Drip of 25in (waterline) | Drip of 25in (waterline) | - | Removed |
| Pass Number to Tacky Touch | Maximum (50) | 1 | 25 | Maximum (50) | 5 | 30 | Maximum (50) | 1 | 5 |
| Pass Number for Clean | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 25 | Maximum (50) | Maximum (50) | 5 | Maximum (50) |
| Notes | ***SWA requires application at 2 dilutions, first at lower pressure and high heat, 30min retention, and second at high pressure. This was done at each pass interval (5, 25, and 50). ** SWA cleaning showed most effective on steel substrate, followed closely with concrete substrate. Observations show a higher application pass number on wood substrates but still effective. Observations showed crude oil to be effectively cleaned and stain free from application, but stains remained with asphaltic and #6 oils. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|--------------|-------------------------|-------------------------|-------------|----------------|----------------|
| BG Clean 401 | 8/20/19 - 1:15pm | 8/21/19 - 2:15pm | 93F | 97 | 30 min |

SW-38 Nokomis 5-W
 Mar-Len Supply Inc.
 Mr. Frank Winter
 23159 Kidder Street
 Hayward, CA 94545
 Phone: 510-782-3555
 Fax: 510-782-2032
 Website: marlensupply.com

| | Concrete | | | Wood | | | Steel | | |
|--|--------------|-----------------|--------------------------|---------------|-----------------|-----------------|--------------|-----------------|--------------------------|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering Observations at 5 passes | Drip of 8in | Heavily removed | Drip of 17in | Drip of 7in | Heavily removed | Drip of 16in | Drip of 10in | Heavily removed | Drip of 20in |
| Observations at 25 passes | No change | Removed | Drip of 25in (waterline) | Drip to 8.5in | Removed | Drip of 24in | Drip of 12in | Removed | Drip of 25in (waterline) |
| Pass Number to Tacky Touch | Drip of 4in | - | Partially removed | Drip of 11in | - | Heavily removed | Drip of 15in | - | Partial Removal |
| Pass Number for Clean | Maximum (50) | 0 | 35 | 40 | 0 | 25 | 45 | 0 | 30 |
| Notes | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | Maximum (50) |
| Slight rain of 0.5in during weathering period before testing. Nearly complete removal of crude and stain was observed. Partial removal and tacky touch was observed around an average of 30 passes, however stain removal was not observed. Little change to asphalt during application process. | | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|-------------|-------------------------|-------------------------|-------------|----------------|----------------|
| Nokomis 5-W | 8/21/2019 - 9:30am | 8/22/19 - 10:49am | 91 F | 65 | 10 min |

SW-49 De-Solve-It Clean Away APC Super Concentrate
 Orange-Sol Blending and Packaging
 Mr. Tim Farnsworth
 1400 N Fiesta Boulevard
 Gilbert, AZ 85233
 Phone: 800-877-7771
 Fax: 480-497-0444
 Website: orange-sol.com

| | Concrete | | | Wood | | | Steel | | |
|-------------------------------------|---|---------------------------------------|--|--|--|--|---|---------------------------------------|--|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering Observations at 5 passes | Bubbling Drip of 25in (waterline) | Slight evaporation, Drip of 4in | Drip of 2in Drip of 25in (waterline) | No Change Drip of 25in (waterline) | Soaked into Wood/Evaporated, Drip of 5in | Drip of 1in Drip of 25in (waterline) | Bubbling Drip of 25in (waterline) | Slight evaporation, Drip of 5in | Drip of 2in Drip of 25in (waterline) |
| Observations at 25 passes | No Change | - | No Change | No Change | - | No Change | No Change | - | No Change |
| Pass Number to Tacky Touch | Maximum (50) | 1 | 40 | Maximum (50) | 1 | 40 | Maximum (50) | 1 | 35 |
| Pass Number for Clean | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | Maximum (50) |
| Notes | Observations show that all oil applied on substrates were immediately effected and began to drip after the first application pass. However little change were observed to asphaltic oils after the intial pass. 6-oil was observed to be tacky to the touch at around 40 passes, and not fully cleaned of stains off the surface. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|-----------------------|-------------------------|-------------------------|-------------|----------------|----------------|
| Desolvit- All Purpose | 8/27/19 - 10am | 8/28/19 - 11:30am | 91 F | Vid 10 | 0 min |

W-51 Dynamic Green
 Wechem Inc.
 Mr. Michael Wisecarver
 5734 Susitna Drive
 Harahan, LA 70123
 Phone: 800-426-0512
 Phone: 504-733-1152
 Fax: 504-733-2218
 Website: wechem.com

| | Concrete | | | Wood | | | Steel | | |
|----------------------------|---|--------------------------|--------------------------|----------------------------|--------------------------|--------------------------|----------------------------|--------------------------|--------------------------|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Drip of 3in | Drip of 25in (waterline) | Drip of 18in | Drip of 6in | Drip of 25in (waterline) | Drip of 3in | Drip of 5in | Drip of 25in (waterline) | Drip of 21in |
| Observations at 5 passes | Drip of 12in | Heavily removed | Drip of 25in (waterline) | Drip of 12in | Heavily removed | Drip of 25in (waterline) | Drip of 13in | Heavily removed | Drip of 25in (waterline) |
| Observations at 25 passes | Drip of 19in, Spot removal | Removed | Heavily removed | Drip to 21in, Spot removal | Removed | Heavily removed | Drip of 23in, Spot removal | Removed | Heavily removed |
| Pass Number to Tacky Touch | Maximum (50) | 5 | 15 | Maximum (50) | 5 | 10 | Maximum (50) | 5 | 10 |
| Pass Number for Clean | Maximum (50) | Maximum (50) | Maximum (50) | Maximum (50) | Maximum (50) | Maximum (50) | Maximum (50) | Maximum (50) | Maximum (50) |
| Notes | Slight rain of 1in during weathering period before testing. Observations on crude and #6 oil show removal to be within 15 passes. It was observed for the asphaltic application that only 3-5 quarter sized chunks were removed during application. No oil strip was shown to be cleaned stain free during application process. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|---------------|-------------------------|-------------------------|-------------|----------------|----------------|
| Dynamic Green | 8/25/19 - 10am | 8/26/19 - 10:30am | 87 F | Vid 6 | 0 min |

SW-63 Green Technologies Solutions-Oil Recovery (GTS-OR)
International Technologies and Services Inc.

Mrs. Pilar Ortega
302 W. 5th Street, Suite 100 B
San Pedro, CA 90731
Phone: 310-791-4487
Fax: 877-744-9975
Website: itsenvironmental.com

| | Concrete | | | Wood | | | Steel | | |
|-----------------------------------|---|-------------|--------------------------|--|-------------|--------------------------|--|-------------|--------------------------|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Bubbling, Drip of 2in | Drip of 6in | Drip of 3in | Bubbling, Drip of 1in | Drip of 5in | Drip of 2in | Bubbling, Drip of 3in | Drip of 9in | Drip of 3in |
| Observations at 5 passes | Drip of 25in (waterline) | Removed | Drip of 25in (waterline) | Drip of 25in (waterline) | Removed | Drip of 25in (waterline) | Drip of 25in (waterline) | Removed | Drip of 25in (waterline) |
| Observations at 25 passes | Spot removal, Drip of 25in (waterline) | - | Partial Removal | Spot Removal, Drip of 25in (waterline) | - | Heavy Removal | Spot Removal, Drip of 25in (waterline) | - | Partial Removal |
| Pass Number to Tacky Touch | Maximum (50) | 5 | 25 | Maximum (50) | 5 | 25 | Maximum (50) | 5 | 25 |
| Pass Number for Clean | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | Maximum (50) |
| Notes | SWA application on crude oil had a drip of 25in (waterline), and was completely removed after 30 minute retention time and rinse. Application on 6-oil showed begin removing a majority of oil around the second application/retention at 20-25 passes, and cleaning without stain was observed after third application/rinse at 50 passes. Application on asphaltic oil showed top layer removal after first application passes. Additional layer and quarter sized spots showed to be removed after the second application/rinse and 25 passes. Asphaltic oil was heavily removed by maximum 50 passes. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|--------|-------------------------|-------------------------|-------------|----------------|----------------|
| GTS-OR | 8/29/19 - 11am | 8/30/19 - 1:30pm | 95 F | Pic 0 | 30 min |

SW-69 Water Works Heavy Duty Degreaser Concentrate
 Keteca USA Inc.
 Ms. Kathy Parks
 4280 W. Opportunity Way
 Phoenix, AZ 85086
 Phone: 602-278-7789
 Website: ketecawaterworks.com

| | Concrete | | | Wood | | | Steel | | |
|----------------------------|---|---|---|--------------|---|---|--------------|---|--------------------------|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Drip of 2in | Drip of 18in | Drip of 8in | Drip of 2in | Drip of 12in | Drip of 7in | Drip of 1in | Drip of 15in | Drip of 12in |
| Observations at 5 passes | Drip of 3in | Partial removed, Drip of 25in (waterline) | Drip of 14in | Drip of 5in | Partial removed, Drip of 25in (waterline) | Drip of 12in | Drip of 3in | Partial removed, Drip of 25in (waterline) | Drip of 19in |
| Observations at 25 passes | Drip of 17in | Removed | Partial removed, Drip of 25in (waterline) | Drip of 17in | Removed | Heavy removed, Drip of 25in (waterline) | Drip of 24in | Removed | Drip of 25in (waterline) |
| Pass Number to Tacky Touch | Maximum (50) | 5 | 35 | Maximum (50) | 5 | 30 | Maximum (50) | 5 | 40 |
| Pass Number for Clean | Maximum (50) | 30 | Maximum (50) | Maximum (50) | 30 | Maximum (50) | Maximum (50) | 30 | Maximum (50) |
| Notes | Slight rain of 1in during weathering period before testing. Effective removal of crude oil was shown to be after 5 application passes, and removal of 6-oil was shown to average around 35 application passes. Application effectiveness on asphaltic oils showed to be effective with increasing applications but was not removed by maximum pass limit of 50. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|-------------|-------------------------|-------------------------|-------------|----------------|----------------|
| Water Works | 8/29/19 - 9am | 8/30/19 - 11am | 90 F | Vid 1 | 0 min |

M-12 PES-51
 Practical Environmental Solutions.
 Mr. Bill Sims
 P.O. Box 12563
 San Antonio, TX 78212
 Phone: 210-493-7172
 Fax: 210-493-7172
 Website: pes51.com

| | Concrete | | | Wood | | | Steel | | |
|----------------------------|--|-------------|---|--------------|--------------|---|---|-------------|--------------------------|
| | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil | Asphalt | Crude | 6-oil |
| Weathering | Drip of 4in | Drip of 8in | Drip of 10in | Drip of 14in | Drip of 10in | Drip of 15in | Drip of 2in | Drip of 7in | Drip of 4in |
| Observations at 5 passes | | Removed | Partial removed, Drip of 25in (waterline) | Drip of 18in | Removed | Partial removed, Drip of 25in (waterline) | Drip of 6in | Removed | Drip of 25in (waterline) |
| Observations at 25 passes | | - | Heavily removed | Drip of 24in | - | Heavy removed | Partial removed, Drip of 25in (waterline) | - | Partial removed |
| Pass Number to Tacky Touch | 40 | 40 | 25 | 40 | 40 | 25 | 35 | 35 | 1 |
| Pass Number for Clean | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | Maximum (50) | Maximum (50) | 5 | Maximum (50) |
| Notes | Effective removal of crude oil was shown to be after 5 application passes. Removal of 6-oil was shown to average around 30 application passes with removal on concrete and wood surfaces quicker. Application effectiveness on asphaltic oils showed to be effective with increasing applications and removed by 40 passes. It was observed that small chunks of substrates were being broken off during application process due to the required psi pressure. | | | | | | | | |

| SWA | Date of Oil Application | Date of SWA Application | Temperature | Visual Test ID | Retention time |
|--------|-------------------------|-------------------------|-------------|----------------|----------------|
| PES-51 | 8/15/19 - 12:30pm | 8/16/19 - 2:45pm | 95 F | Vid 0 | 5 min |

Attachment E
First Response Assessment and Observation Form

FIRST RESPONSE ASSESSMENT AND OBSERVATIONS FORM

All information categories and checks are required for reporting in accordance with the RRT-VI Inland-Area Contingency Plan Report (2016)

| | |
|---|--|
| Date and Time of Call: | |
| Caller Name, Address & Phone Number: | |
| Name of Reporter: | |

Potentially Responsible Party:

Name: _____

Telephone #: (____) ____ - _____

Alternative Telephone #: (____) ____ - _____

Address:

Street: _____

City: _____

State: _____ *Zip Code:* _____

Associated ID Information:

Vessel [] Facility [] Railcar [] Vehicle []

Type: _____ Size: _____

Identification markings: _____

Nationality (Vessel): _____

Vessel/Facility agent(s) Contact:

Name: _____

Telephone #: (____) ____ - _____

Alternative Telephone #: (____) ____ - _____

Address:

Street: _____

City: _____

State: _____ *Zip Code:* _____

Insurance Carrier Contact:

Name: _____

Telephone #: (____) ____ - _____

Alternative Telephone #: (____) ____ - _____

Address:

Street: _____

City: _____

State: _____ *Zip Code:* _____

Spill Descriptions:

| | | |
|---------------------------------|---------------------------------------|------------------|
| Initial Time of Spill: | | |
| Location of Spill: | Latitude: _____ | Longitude: _____ |
| Type of Release: | Instantaneous () Continuous () | |
| Quantity of Fuel/Oil on board: | _____ | |
| Estimated Release Amount: | _____ | |
| Total Potential Release Amount: | _____ | |
| Type of Spill/Incident: | _____ | |
| Released Materials: | _____ | |
| API: _____ | Pour Point (°C or °F): _____ | |
| General Spill Description: | _____ | |
| | _____ | |
| | _____ | |

On-Scene Weather:

Wind Direction from: _____ Wind Speed: _____ Knots
 Visibility: _____
 Wave Height: _____
 Surface Current Direction: _____ Speed: _____ Knots

Potential or Impacted Environmental Media: _____

Injured Number: _____ Type of Injury: _____
 Fatality Number: _____ Type of Fatality: _____

Time of Evacuation (if applicable): _____
 Method of Evacuation Communication(s): _____

Response Activities currently/previously conducted: _____

List of Current On-Scene Personnel:

Agencies Notified:

Attachment F
First Responder Shoreline and Sensitive Habitats
Observation Form

**FIRST RESPONDER SHORELINE AND SENSITIVE HABITATS
OBSERVATION FORM**

(This form should be submitted to the FOSC and accompany any request for SWA application)

| | |
|--------------------------|--|
| Date and Time: | |
| Name of Reporter: | |

Spill Location: Lat: _____ Long: _____
 Spill Coverage Area: _____ sq. feet () sq. miles () acres ()
 Potential Mobility of Spill Materials: Yes () No ()

| |
|---|
| Estimated Release Amount: _____ |
| Total Potential Release Amount: _____ |
| Type of Spill/Incident: _____ |
| Released Materials: _____ |
| API: _____ Pour Point (°C or °F): _____ |
| General Spill Description: _____ |
| _____ |
| _____ |

On-Scene Weather:

Wind Direction from: _____ Wind Speed: _____ Knots
 Visibility: _____
 Wave Height: _____
 Surface Current Direction: _____ Speed: _____ Knots

Potentially Affected Environments:

Check all that have/potentially have, oil/fuel coverage in the following table.

| | Yes | No | N/A |
|--------------------|-----|----|-----|
| Concrete Structure | | | |
| Wood Structure | | | |
| Steel Structure | | | |
| Bedrock | | | |
| Cobble | | | |
| Gravel | | | |
| Sand | | | |
| Mud | | | |
| Rock | | | |
| Vessel(s) | | | |
| Fiberglass | | | |
| Plastics | | | |
| Foams | | | |
| Artificial | | | |
| Other | | | |

Physical and Environmental Conditions:

1. Give a general description of the site's climate: _____

2. General soil types found on the site location: _____

3. Surface indications of unstable soils or sediments: Yes () No ()
If yes, explain: _____
4. Considering soil type, is there potential for leaching during or after application?
Yes () No ()
5. Considering soil type, is there potential for erosion during or after application?
Yes () No ()
6. Are there areas at the site covered with impervious surfaces? Yes () No ()
7. Is there possibility of hazardous air emissions during/after application? Yes () No ()
8. If yes, are there proposed measures to control or reduce emissions? Yes () No ()
Explain: _____

9. List all water bodies in vicinity of the spill that may have the potential to be affected:
 - a. _____
 - b. _____
 - c. _____
 - d. _____
10. Are there any National Parks/Shorelines, known sensitive habitats, or wetlands at or within 3-miles of the spill location? Yes () No ()
If yes, list all below:
 - a. _____
 - b. _____
 - c. _____
 - d. _____
11. Check each vegetation type present at the site:
Trees () Succulent () Vines () Grasses () Shrubs () Mangroves ()
Seagrasses () Wildflowers () Other: _____
12. Will any or all vegetation at the site be removed or altered prior/during SWA application?
Yes () No ()
If yes, explain: _____

13. List any and all threatened or endangered species known to be or present at the site:
 - a. _____
 - b. _____
 - c. _____
14. Propose measures to preserve or enhance wildlife, vegetation, and coastal substrates:

15. Have bird species that may be present/potentially present at the site been identified using a current Environmental Sensitivity Index: Yes () No ()

If yes, list each bird species that is potentially present on a separate sheet.

Indicate for each bird if it is present, migrating, mating, nesting, or fledging.

16. Are there any environmental health hazards that could result from application of SWA? Yes () No ()

If yes, explain: _____

17. Are there wildlife response plans designated for this area? Yes () No ()

18. Are there a geographic response plan (GRP) for this site? Yes () No ()

19. Are there any historical and/or cultural sites known near this area? Yes () No ()

20. Does the observer completing this form recommend the use of SWAs at or near this site? Yes () No ()

| Name of the SWA product being recommended: | | | |
|--|-----------|--------------|------|
| | Signature | Name (Print) | Date |
| Technical Observer | | | |
| Company Representative | | | |

Decision makers should review this form and the accompanying SDS prior to approving “lift and float” SWAs. All involved parties may want to be involved with any decisions regarding which agent, if any, would be the most efficient in mitigating the site. This form will help to evaluate the environmental situation at the site. After the completion of this form, if there is any indication of vegetation, marine animal, or habitat destruction, then authorization to use SWAs may be rescinded.

Attach the SWA product SDS to this form.

Attachment G
Pre-Approved SWA Operations Activation
Evaluation Checklist

PRE-APPROVED SWA OPERATIONS ACTIVATION EVALUATION

1. Do you expect the use of SWA in this case to provide an environmental benefit?
The NOAA SSC should be contacted for trajectory and environmental fate analysis.

YES () GO TO SECTION 2 BELOW
NO () GO TO SECTION 12 BELOW

2. Plot the position of the spill on the appropriate nautical and/or shoreline chart, draw a circle about the spill source with a 5-mile shoreline radius as a worst-case scenario for surface movement. Outline the TGLO listed Pre-Approval areas on the chart. Is the SWA operational area located within the Pre-Approval areas?

YES () GO TO SECTION 3 BELOW
NO () GO TO SECTION 12 BELOW

3. Was a contractual relationship with a SWA spray contractor established prior to the spill?

YES () GO TO SECTION 4 BELOW
NO () GO TO SECTION 10 BELOW

4. Considering the amount of oil spilled, the location of the operational area, volume of available SWA to be used, and the timeframe in which the required equipment can be on-scene, what is the most effective SWA application platform? More than one type may be considered.

| | |
|------------------------------------|-----------------------|
| If pressure washing | GO TO SECTION 5 BELOW |
| If steam cleaning with SWA | GO TO SECTION 6 BELOW |
| If direct (low energy) application | GO TO SECTION 7 BELOW |
| If Other | GO TO SECTION 8 BELOW |

5. Pressure Washing Application Operational Conditions

Refer to the on-scene weather, wind, and wave characteristics for decision making.
All SWA operations are carried out during daylight hours only. For the following:

[A] Winds less than 10 knots, and

Visibility at least 1 mile, and

Pressure equipment accessibility to shoreline or near-shore, and

Adequate containment area for residual high energy dispersion?

YES () GO TO SECTION 9 BELOW
NO () GO TO [B] IN THIS SECTION BELOW

[B] Notify the spiller's representative that SWA use has been delayed until the weather improves, and that SWA pressure washing operation will be placed on a standby status.

[C] Consult with RRT-VI members. Contact the USCG, EPA, DOI, DOC, and Texas RRT representatives to notify them that SWA are being considered but delayed due to weather. As the weather begins to improve:

RESTART SECTION 2 ABOVE

6. Steam Cleaning with SWA Application Operational Conditions

Refer to the on-scene weather, wind, and wave characteristics for decision making.

All SWA operations are carried out during daylight hours only. For the following:

- [A] Winds less than 10 knots, and
- Visibility at least 1 mile, and
- Steam equipment accessibility to shoreline or near-shore, and
- Adequate containment area for residual high energy dispersion?

YES () GO TO SECTION 9 BELOW
NO () GO TO [B] IN THIS SECTION BELOW

[B] Notify the spiller's representative that SWA use has been delayed until the weather improves, and that SWA pressure washing operation will be placed on a standby status.

[C] Consult with RRT-VI members. Contact the USCG, EPA, DOI, DOC, and Texas RRT representatives to notify them that SWA are being considered but delayed due to weather. When the weather begins to improve:

RESTART SECTION 2 ABOVE

7. Direct (Low Energy) Application Operational Conditions

Refer to the on-scene weather, wind, and wave characteristics for decision making.

All SWA operations are carried out during daylight hours only. For the following:

- [A] Winds less than 10 knots, and
- Visibility at least 1 mile, and
- Personnel have accessibility to shoreline with handheld application equipment, and
- Adequate containment area for residual low energy dispersion?

YES () GO TO SECTION 9 BELOW
NO () GO TO [B] IN THIS SECTION BELOW

[B] Notify the spiller's representative that SWA use has been delayed until the weather improves, and that SWA direct (low energy) washing operation will be placed on a standby status.

[C] Consult with RRT-VI members. Contact the USCG, EPA, DOI, DOC, and Texas RRT representatives to notify them that SWA are being considered but delayed due to weather. When the weather is beginning to improve:

RESTART SECTION 2 ABOVE

8. Consult with the State and Federal Scientific Support Coordinator (SSC) or their designated representatives to evaluate alternatives to pressure, steam, or direct application platforms.

[A] After a briefing on the spill response situation from the FOSC, does the SSC recommend pressure washing application of SWA?

| |
|---|
| YES () GO TO SECTION 5 ABOVE NO () GO TO [B] IN THIS SECTION BELOW |
|---|

[B] After a briefing on the spill response situation from the FOSC, does the SSC recommend steam cleaning application of SWA?

| |
|---|
| YES () GO TO SECTION 6 ABOVE NO () GO TO [C] IN THIS SECTION BELOW |
|---|

[C] After a briefing on the spill response situation from the FOSC, does the SSC recommend direct (low energy) application of SWA?

| |
|---|
| YES () GO TO SECTION 7 ABOVE NO () GO TO [D] IN THIS SECTION BELOW |
|---|

[D] After a briefing on the spill response situation from the FOSC, does the SSC recommend an alternative application of SWA?

| |
|---|
| YES () DEVELOP A PLAN AND GO TO SECTION 9 BELOW NO () GO TO SECTION 11 BELOW |
|---|

9. Is the SWA to be used listed on the NCP Product Schedule and considered appropriate for existing environmental, weather, and physical conditions?

| |
|---|
| YES () GO TO SECTION 11 NO () GO TO SECTION 10 |
|---|

10. DISCONTINUE THE USE OF THIS SWA CHECKLIST. The request for SWA use does not qualify under the guidelines for pre-approval use of SWA in Region 6. Contact your SSC and begin the SWA use approval process as specified in the RRT-VI Regional Contingency Plan.

11. Refer to the SWA Pre-Approval Guidelines in the TGLO and RRT-VI Contingency Plan. Does the available technical information suggest that dispersion is likely given the spilled oil, anticipated oil weathering, and selected SWA?

| |
|---|
| YES () GO TO 12 BELOW NO () GO TO 13 BELOW |
|---|

12. DISCONTINUE THE USE OF THIS SWA CHECKLIST. In this case SWA use is either inappropriate or outside the pre-approval area for this response and could result in the excessive dispersion of oily product into the water column.

13. INITIATE APPLICATION OF SWA WITHIN RRT GUIDELINES.

◆ The Special Monitoring of Applied Response Technologies (SMART) controller/observer should be over the spray site before the start of the operation. A DOI/USFW approved marine mammal/turtle, migratory birds, and/or shoreline environmental survey specialists might accompany the SMART observer, but the operation will not be delayed for that individual.

Note: The purpose of SMART monitoring is to confirm best professional advice related to the potential success of SWA use. Given the uncertainty involved relating to physical and environmental condition, oil weathering, and SWA and oil interaction, we must rely on positive feedback from the monitors to continue SWA application.

◆ Personal protective equipment for personnel on-site will conform to the appropriate SWA's SDS

◆ For application of SWA, refer and follow all ASTM standards that apply.

◆ If an alternative SWA platform is used, the Operation Plan should include SWA application guidelines.

◆ The FOOSC should notify the RP and the RRT as soon as practicable after the approval is granted.

GO TO SECTION 14 BELOW

14. The RRT (EPA, DOI, and the TGLO) must be kept informed on the status of the SWA application throughout the operation. Additional applications of the same SWA in the same operational area do not require additional RRT approvals if the initial applications are successful and operational results are positive.

GO TO SECTION 15 BELOW

15. At the completion of the SWA operation, send the following to the RRT representatives:

1. This completed Checklist
2. A SWA Pre-Approval Initial Call Checklist
3. The SWA Deployment and Observations Form
4. Other information as necessary

Provide the RRT post-application information/results within 24 hours of the SWA application. Follow-up operation by ensuring that SMART team logs and all equipment logs are secured should RRT members request additional documentation.

Attachment H
SWA Deployment and Observation Form

SWA DEPLOYMENT AND OBSERVATIONS FORM

Certain information derived in this form was based off previously described checklists for dispersants in the RRT-VI Dispersant Pre-Approval Paper (2001).

| | |
|---|--|
| Date and Time of FOSC Approval: | |
| FOSC Name, Address & Phone Number: | |
| Responding Company: | |

Response Company Profile:

Name: _____
Telephone #: (____) ____ - _____
Alternative Telephone #: (____) ____ - _____
Address:
Street: _____
City: _____
State: _____ *Zip Code:* _____

SWA Information:

Agent Deployed: _____
Application Type: _____
Date of Application: __/__/____ Application Start Time: __: __ pm or am
Application End Time: __: __ pm or am
Method: Direct Contact () Pressure Washing () Steam Washing () Other ()
If other, state method: _____
Number of Responding Personnel: _____ Dilution (if applicable): _____
SWA Application Amount: _____ Estimated Recovered SWA amount: _____
Estimated Fuel/Oil Recovered Amount: _____
Explain the Application Process: _____

FOSC present at application: Yes () No ()
SMART Controller/Observer present at application: Yes () No ()
Other Agencies or Parties present at application: _____

Containment Method: _____

Post-Application Residual Presence: No "tacky" touch () Stain Removed ()
Fuel/Oil Present () Other: _____

Safety and PPE:

Check all that apply

| | On-site | Required | Used | N/A | Additional Notes |
|-----------------------------|---------|----------|------|-----|------------------|
| Physical Hazards | | | | | |
| Health Hazards | | | | | |
| First Aid Measures | | | | | |
| Fire Fighting Measures | | | | | |
| Accidental Release Measures | | | | | |
| Safety Goggles | | | | | |
| Gloves | | | | | |
| Half-Face Respirator | | | | | |
| Full-Face Respirator | | | | | |
| Level C Protective Clothing | | | | | |
| Level B Protective Clothing | | | | | |
| Level A Protective Clothing | | | | | |

Were there any reportable injuries, exposures, and/or fatalities during application: Yes () No ()
 If yes, explain. Use additional sheets if necessary.

If "Yes" above, identify all agencies, companies, and responders notified: _____

****Attach all additional documentation and forms associated with the above incident(s)****

Will the SWA applicator and/or OSRO transport the collected materials: Yes () No ()
 If yes, attach additional documentation and forms associated with D.O.T transportation and classification, shipping methods, transport manifests, disposal manifests, etc.

If the OSRO is not the transporter, provide the following information for each involved transporter and attach additional documentation as described above.

Waste Transport Company Profile:

Name: _____

Telephone #: (____) ____ - _____

Alternative Telephone #: (____) ____ - _____

Address:

Street: _____

City: _____

State: _____ Zip Code: _____

Waste Disposal Company Profile: (if different from transport company)

Name: _____

Telephone #: (____) ____ - _____

Alternative Telephone #: (____) ____ - _____

Address:

Street: _____

City: _____

State: _____ Zip Code: _____

Date of Transportation: __/__/____ Time transport left the site: __: __ pm or am

Observations:

Observer: _____ Date: __/__/____

Observation Start Time: __: __ pm or am

Observation End Time: __: __ pm or am

If observation end time is on a different date than above: __/__/____

Case # (if applicable): _____

| | Signature | Name (Print) | Date |
|------|-----------|--------------|------|
| FOSC | | | |
| SOSC | | | |
| LOSC | | | |

A blank SWA Observation Log sheet is attached on the following page. Attach completed observation log sheets to this form for the review and approval of the FOSC, SSC, and other appropriate parties. Additional observations should be made and recorded at each observation interval. Recorded observations should be numbered sequentially.

OBSERVATION LOG

| | | |
|------------------------|------------|-----------------------|
| Observation #: | Date/Time: | Observation Lat/Long: |
| Observation Photo ID#: | | Photo Archive Name: |
| Additional Comments: | | |

| | Yes | No | N/A |
|--------------------------|-----|----|-----|
| Oil/Fuel Removal | | | |
| Partial Oil/Fuel Removal | | | |
| Heavy Oil/Fuel Removal | | | |
| All Oil/Fuel Removal | | | |
| Tackyness to Touch | | | |
| Stain Removal | | | |
| Other Observations | | | |

| | | |
|------------------------|------------|-----------------------|
| Observation #: | Date/Time: | Observation Lat/Long: |
| Observation Photo ID#: | | Photo Archive Name: |
| Additional Comments: | | |

| | Yes | No | N/A |
|--------------------------|-----|----|-----|
| Oil/Fuel Removal | | | |
| Partial Oil/Fuel Removal | | | |
| Heavy Oil/Fuel Removal | | | |
| All Oil/Fuel Removal | | | |
| Tackyness to Touch | | | |
| Stain Removal | | | |
| Other Observations | | | |

Attachment I
SWA Storage, Handling, Containment & Disposal
Plan Checklist

SWA STORAGE, HANDLING, CONTAINMENT & DISPOSAL PLAN CHECK LIST

This document is to serve as a guidance document only. It is a checklist intended to ensure that the items below regarding SWA handling and storage are addressed. The spill response plan, supporting documents, and logs for the activities/practices/procedures in the checklist below should be made available for inspections. The requirements are as follows:

SPILL PREVENTION

Regulated Substance Management: All Regulated Substances, including chemical wastes, are to be managed in a way that prevents release, and is consistent with the protocol established by Federal, State and Local regulatory agencies.

- For each “Yes” response, describe how each requirement is currently addressed.
- For each “No” response, describe how each requirement is proposed to be addressed.
- For each “Not Applicable” response, the owner and/or operator should provide justification why this requirement is not applicable to the location.

The above referenced descriptions should be printed or typed and attached to this checklist.

Storage:

1. Are all regulated SWA substance containers are in good condition, compatible with the materials stored within, and residual spills on the exterior of the containers are cleaned immediately.
Yes ___ No ___ Not Applicable ___
2. Are all regulated SWA substance containers accessible and spaced between containers, providing sufficient access to perform periodic inspections and respond to releases.
Yes ___ No ___ Not Applicable ___
3. Are all regulated SWA substances are stored inside buildings or if outside; under a cover, on an impermeable surface, with secondary containment.
Yes ___ No ___ Not Applicable ___
4. Are regulated SWA substances that are not used on a daily basis stored in cabinets, or in designated, secure, and weather-resistant areas.
Yes ___ No ___ Not Applicable ___
5. Are regulated SWA substances stored in proper cabinets and only with compatible materials. (i.e. flammability cabinets)
Yes ___ No ___ Not Applicable ___
6. Are incompatible substances are stored a safe distance apart or in a manner which precludes mixing to prevent potential explosion or fire.
Yes ___ No ___ Not Applicable ___
7. Do all waste drums allow at least 4 inches of headspace to allow for expansion.
Yes ___ No ___ Not Applicable ___
8. Are small spills or leaks easily contained, and immediately cleaned up and properly disposed.
Yes ___ No ___ Not Applicable ___
9. Is signage used to designate hazardous and nonhazardous storage or waste collection areas.
Yes ___ No ___ Not Applicable ___

10. Is there a log documenting that the storage areas for equipment and regulated SWAs are inspected monthly for leaks or spills.
Yes ___ No ___ Not Applicable ___
11. Are work areas and regulated SWA storage areas kept clean and in good general condition.
Yes ___ No ___ Not Applicable ___
12. Are flammable materials in drums or totes grounded during material transfer to prevent static spark.
Yes ___ No ___ Not Applicable ___

Handling:

13. Are regulated SWAs, including chemical wastes, properly marked and labeled in accordance with federal, state and local regulations.
Yes ___ No ___ Not Applicable ___
14. Are regulated SWAs transferred to secondary containers marked with the chemical's name in accordance with the Hazcom standard (29 CFR 1910.1200).
Yes ___ No ___ Not Applicable ___
15. Are all regulated SWA substances transferred from larger to smaller containers by use of a funnel or spigot.
Yes ___ No ___ Not Applicable ___
16. When not in use, are regulated SWA substance containers kept closed.
Yes ___ No ___ Not Applicable ___
17. Are drip pans or other collection devices used to contain drips or leaks from dispensing containers or equipment.
Yes ___ No ___ Not Applicable ___
18. Is a Disposal Practices log documenting substance, dates removed, quantities removed, and vendor used and maintained.
Yes ___ No ___ Not Applicable ___
19. Are the spill clean-up supplies compatible with the regulated substances stored on site.
Yes ___ No ___ Not Applicable ___
20. Are the spill supplies stored in areas where spills are likely to occur (loading docks, chemical storage areas, locations where regulated SWAs are being transferred).
Yes ___ No ___ Not Applicable ___
21. Are spill kits sufficient enough to contain the amount of regulated SWAs that may be spilled or released.
Yes ___ No ___ Not Applicable ___
22. Is a log documenting spill supplies inspected monthly to ensure they are complete and maintained.
Yes ___ No ___ Not Applicable ___

Secondary Containment:

23. Are containerized SWAs (in any container size) stored over appropriate secondary containment.
Yes ___ No ___ Not Applicable ___

24. Is there a log documenting that secondary containment is checked monthly and is up to date.
 Yes ___ No ___ Not Applicable ___
25. Is there a log documenting the removal of any storm water contained in any outside secondary containment system maintained.
 Yes ___ No ___ Not Applicable ___

Engineering Controls:

26. Is there an operations and maintenance log documenting that engineering controls have been inspected and are in good operating condition. Is it updated on a monthly basis.
 Yes ___ No ___ Not Applicable ___
27. Is an inventory of all machines (including oil and/or coolant reservoirs) that is updated whenever any changes in the inventory are made.
 Yes ___ No ___ Not Applicable ___
28. Have preventative maintenance activities to reduce the potential for release from equipment been implemented.
 Yes ___ No ___ Not Applicable ___
29. Is employee training on the proper handling of regulated SWAs documented and maintained.
 Yes ___ No ___ Not Applicable ___
30. Are all employees trained on the location and use of the spill response supplies.
 Yes ___ No ___ Not Applicable ___
31. Is a log documenting employee trainings on spill response procedures maintained.
 Yes ___ No ___ Not Applicable ___
32. Do all employees receive periodic reviews of the Spill Prevention & Response Plan.
 Yes ___ No ___ Not Applicable ___
33. Are there written spill response procedures that include appropriate training, notification, response, and cleanup/disposal methods? Is it available to employees?
 Yes ___ No ___ Not Applicable ___
34. Have all employees received HAZCOM (29 CFR 1910.1200) training?
 Yes ___ No ___ Not Applicable ___
35. Are current SDS accessible to all employees? Is there a location known to employees?
 Yes ___ No ___ Not Applicable ___

SWA Storage Area Site Plans (land [] and/or vessel []):

36. Is there a site plan available showing the SWA storage area and associated safety features (such as fire extinguishers)?
 Yes ___ No ___ Not Applicable ___
37. Has the business implemented other site-specific practices that reduce the risk to storm water systems? Note: Storm water runoff may flow directly to surface waters untreated.
 Yes ___ No ___ Not Applicable ___
38. Has the business implemented other site-specific practices that reduce the risk to the groundwater?
 Yes ___ No ___ Not Applicable ___

Notification/Reporting of an SWA release to the environment:

39. Are required notifications posted and available in case of an accidental release?
Yes ___ No ___ Not Applicable ___
40. Are required notifications updated whenever a change has occurred? And are employees notified of the changes?
Yes ___ No ___ Not Applicable ___
41. Do employees know what information is needed and are they prepared to provide the required information when reporting a release?
Yes ___ No ___ Not Applicable ___

Spill Response Actions:

42. If the spill is small and its chemical properties are known, are proper supplies available to stop and contain it?
Yes ___ No ___ Not Applicable ___
43. If the spill is small and its chemical properties are known are adsorbent, booms, drain covers, etc. available to protect drains?
Yes ___ No ___ Not Applicable ___
44. If a spill cannot be contained/controlled, have employees been trained in proper procedures for evacuation and reporting the spill?
Yes ___ No ___ Not Applicable ___
45. Is a log maintained noting who has replaced/restocked the materials/supplies used?
Yes ___ No ___ Not Applicable ___

Recovered SWA Spill Materials Disposal:

46. Are procedures in place to characterize the waste prior to disposal?
Yes ___ No ___ Not Applicable ___
47. Is there a Disposal Practices log that documents spilled substances, dates and quantities recovered and removed, and the disposal sites used?
Yes ___ No ___ Not Applicable ___
48. Is there a designated employee to prepare the report of an incident?
Yes ___ No ___ Not Applicable ___
49. Is there an established procedure for reporting to the appropriate agencies or companies within 30-days of the incident?
Yes ___ No ___ Not Applicable ___

All procedures in the above sections should be reviewed and amended whenever:

- The procedures fail in a spill event
 - The facility changes in design, construction, equipment, operation, maintenance, use.
 - The list of emergency contacts change
50. Has someone been designated to maintain and update logs, forms, plans when any of the above occur:
Yes ___ No ___ Not Applicable ___

Attachment J
SWA Equipment and PPE Checklist

SWA Equipment and PPE Checklist

(This form should be submitted to the FOSC and accompany any request for SWA application)

The SWA equipment, PPE, and product selections presented on this checklist are available in the Gulf coast (2020). Any changes or additions to any SWA product formulations, manufacturer's application recommendations, or their SDS may warrant reconsideration of existing approvals.

Equipment:

All equipment associated with SWA application must be quality control checked before use in any incident. Check and fill in responses as applicable:

| | Yes | No | Quantity | Brand(s) | Quality Control Check Date |
|-----------------------------|-----|----|----------|----------|----------------------------|
| Pressure Washer | | | | | |
| Steam Washer | | | | | |
| Sprayer | | | | | |
| Mop | | | | | |
| Rag | | | | | |
| Brush | | | | | |
| Skimmer | | | | | |
| Vaccum System | | | | | |
| Boom | | | | | |
| Generator | | | | | |
| Containment Tank | | | | | |
| Vehicle | | | | | |
| Vessel | | | | | |
| Utility Vehicle | | | | | |
| Water Pump | | | | | |
| Hoses | | | | | |
| Air / Gas Monitor | | | | | |
| Communication Device | | | | | |
| Other | | | | | |

PPE:

All PPE associated with SWA application must be quality control checked before use in any incident. Equipment must meet OSHA and/or NIOSH requirements. Use the following checklist:

| CATEGORY | ITEM | YES | NO | QUANTITY | BRAND(s) |
|--------------------------------|--------------------------------|-----|----|----------|----------|
| Eye and Face Protection | Safety Glasses | | | | |
| | Goggle | | | | |
| | Face Shield | | | | |
| Head Protection | Safety Helmet/Hard Hat Level A | | | | |
| | Safety Helmet/Hard Hat Level B | | | | |
| | Safety Helmet/Hard Hat Level C | | | | |
| Ear Protection | Ear Plug | | | | |
| | Earmuffs | | | | |
| Skin/Feet Protection | Protective Clothing | | | | |
| | Level C Chemical Suit | | | | |
| | Level B Chemical Suit | | | | |
| | Level A Chemical Suit | | | | |
| | Steel-toe Boot | | | | |
| | Foot/Shin Guard | | | | |
| | Foundry Shoes | | | | |
| Inhalation Protection | Gloves (show type) | | | | |
| | Half-face Respirator | | | | |
| | Full-face Respirator | | | | |
| | Cartridge type | | | | |
| Other | SCBA | | | | |
| | | | | | |

Attach all additional quality control and supporting documentation associated with this checklist.

| | | | |
|--|-----------|--------------|------|
| Name of the SWA product being recommended: | | | |
| | Signature | Name (Print) | Date |
| Technical Observer | | | |
| Company Representative | | | |

Attachment K
SWA Applicators Request for Approval

SWA APPLICATORS REQUEST FOR APPROVAL

This form should be submitted to the FOSC along with the indicated attached forms

Spill Name: _____

County: _____

Adjoining Waterways: _____

SWA product being recommended: _____

| | Company | Contact |
|-------------------------|----------------|----------------|
| Name | | |
| Address | | |
| City, State, ZIP | | |
| Phone | | |
| Email | | |

| Form / Checklist | Date | |
|--|---------------------------------|----------------------------|
| | Submitted by Company | Agency Reviewer |
| First Response Assessment and Observation | | |
| First Responder Shoreline and Sensitive Habitats Observation | | |
| Pre-Approved SWA Operations Activation Evaluation | | |
| SWA Equipment and PPE | | |

| Approvals | Signature | Name (Print) | Date |
|--------------------------|------------------|---------------------|-------------|
| RRT-VI Representative | | | |
| Federal SSC | | | |
| State SSC | | | |
| FOSC | | | |

Attachment L
USCG Strike Team SMART Guidance Form

NATIONAL STRIKE FORCE SPECIALIZED RESPONSE EQUIPMENT

Each Strike Team is equipped to respond to most chemical and WMD incidents

GENERAL RESPONSE EQUIPMENT

- Mobile Incident Command Post
- Hazardous Substance Response Trailers
- Level A, B, and C protective suits
- Confined space entry and egress gear
- Decontamination suites
- Portable weather stations
- Drum handling equipment
- Chlorine Insuffite Kits
- Generators (3.0 to 10.0 KW)
- GPS units
- Photo/Video equipment

VEHICLES/BOATS/COMMAND POSTS

- Tractor/trailer units
- All terrain vehicles
- Mobile Incident Command Posts
- 32' & 24' Munson boats
- 15' Inflatable boats
- 18' John boats

Monitoring/Detecting Equipment

- Organic vapors detection instruments
- Multi-gas meters for toxic and explosive atmospheres APD 2000
- Networked remote atmospheric monitors
- Aerosol particulate meters
- Hazard categorization kits
- Multi-media (air, soil, water) sampling gear/Hand-Held Assays (Bio)(DoD item)
- PhD Ultra (or MultiRae)
- CDS Dräger Combo-Seis
- Anthrax Kit
- WMD HazCat Kit
- WMD Sampling Kit
- SKC pumps (or Personal DataRams)
- 256 Kit (DoD)
- M-8 / M-9 paper (DoD)
- Radiation Pagers (AN-JDR-13B)
- Gamma/Neutron
- Thermo IDENTIFINDER U (isotope identifier)
- TVA-1000

CHEMICAL, BIOLOGICAL & RADIOLOGICAL RESPONSE EQUIPMENT

- Field presumptive detection for biological agents
- Field presumptive detection: chemical warfare agents
- Radiation detection instruments for alpha, beta, neutron and gamma (include isotopic identification)

OIL SPILL RESPONSE EQUIPMENT

- Vessel of Opportunity Skimming System (VOSS)
- Inflatable 45-inch boom (6,000 ft)
- Temporary Storage Devices 26,000 gal. inflatable barges and 10,000 gal. dracones

DAMAGE CONTROL EQUIPMENT

- Oil/Water interface meter
- Plugging and patching equipment

NSF Contacts & AOR's



ATLANTIC STRIKE TEAM

PH: (609) 724-0008 FAX: (609) 724-0232
 Commanding Officer
 USCG Atlantic Strike Team
 5614 Doughboy Loop
 Fort Dix, NJ 08640-0068

GULF STRIKE TEAM

PH: (251) 441-6601 FAX: (251) 441-6610
 Commanding Officer
 USCG Gulf Strike Team
 8501 Tanner Williams Rd.
 Mobile, AL 36608-9690

PACIFIC STRIKE TEAM

PH: (415) 883-3311 FAX: (415) 883-7814
 Commanding Officer
 USCG Pacific Strike Team
 Hangar 2, Hamilton Field
 Novato, CA 94949-5082

NSFCC

PH: (252) 331-6000 FAX: (252) 331-6012
 Commanding Officer: USCG National Strike Force Coordination Center
 1461 North Road St.
 Elizabeth City, NC 27909



Phone Numbers Addresses Areas of Responsibility Response Capabilities Resources Available

The National Strike Force (NSF) is a vital national asset comprised of a unique, highly trained cadre of Coast Guard professionals who maintain and rapidly deploy with specialized equipment and incident management skills. The NSF is recognized worldwide as experts in preparedness and response to mitigate the effects of weapons of mass destruction events, hazardous substance releases, oil discharges and other emergencies on behalf of the American public. Our mandate is to assist and support Lead Agency/Incident Commanders and Federal On-Scene Coordinators in their response and preparedness activities for both crisis and consequence management. In this way, the NSF supports the National Response System and Homeland Security by minimizing the adverse impact to the public and reducing environmental damage from weapons of mass destruction events, hazardous substance releases and oil discharges.

POCKET GUIDE

NSF Capabilities & Support

GENERAL RESPONSE SERVICES

Site Safety

- Site assessment and characterization
- Site Safety Plan development and enforcement
- Safety protocol development and implementation
- Supervise/monitor contractors
- Hazard identification (secondary and primary: physical, chemical, environmental, radiological)
- Air monitoring for primary & secondary hazards
 - Multi-media sampling (air, water, soil)
 - Weather monitoring

Emergency Medical Technician Support/medical monitoring/medical countermeasures for responders

Isolate contaminated areas & support efforts to deny entry to unauthorized personnel

Hazard mitigation/source control

- Level A, B, & C capabilities (full hazmat team capable)
- Entry, Backup and Decon (for responder and responder equipment)
- Pre-stage equipment for threats of release
 - Salvage contractor monitoring
 - Safe salvage & transfer operations practices
- Vessel damage assessment and salvage and consultation
- Damage control assessment/assistance (Railcars, containers, IMO tanks, tank trucks)
- Plugging/patching w/government owned/contracted (equipment and/or monitor contractors)
- Lightering/pumping w/government-owned/contracted equipment or monitor contractors
- Waste characterization and disposal advice and coordination

Incident Command System Support

- Provide/support mobile command post for communications and response management operations
- CO to serve as Incident Specific FOSC
- Serve as FOSC representative
- Incident Command/response management support
- Logistical support, management, and coordination
 - Evidence collection support
 - Resource/cost documentation
- Modeling/trajectory - provide and use for decision making

NSF RESPONSE POLICY
All Strike Teams stand ready to deploy; 2 members immediately, 4 members within 2 hours, 12 members and equipment within 6 hours
Strike Team equipment is palletized, loaded, and ready for immediate deployment by truck or aircraft.

REQUESTING STRIKE TEAM ASSISTANCE

Contact the Strike Team in your area, ask for the Response Officer, Operations Officer or Command Duty Officer
Atlantic Strike Team: (609) 724-0008 Gulf Strike Team: (251) 441-6601 Pacific Strike Team: (415) 883-3311
For PIAT support contact NSFCC: (252) 331-6000

Assistance may also be requested through the National Response Center at (800) 424-8802

BIOLOGICAL RESPONSE SERVICES

- Personal Protective Equipment to safely assess, mitigate, control, and remove hazards
- Site assessment and characterization
- Multi-media sampling (air, water, soil) for laboratory analysis and conduct presumptive on-site field testing for initial response actions

CHEMICAL RESPONSE SERVICES

- Personal Protective Equipment to safely assess, mitigate, control, and remove hazards
- Containment
- Vessel Damage Assessment and salvage consultation
- Knowledge of alternative response technologies and procedures
- Remote Sensing (handheld IR)

OIL SPILL RESPONSE SERVICES

- Dispersant use oversight/effectiveness monitoring (SMART)
- In-situ burn use oversight/effectiveness monitoring (SMART)
- Dewatering/de-ballasting w/government owned and contracted equipment
- Containment (open-water, near coastal, riverine, shoreline, tidal zone)
- Temporary storage of recovered oil/oiled wastes
- Knowledge of alternative response technologies and NCP approved products, and procedures
- Remote sensing (e.g. infrared camera)
- Shoreline assessment with response and recovery recommendations
- Skimming operations w/government owned and contracted equipment
- Offshore containment w/government owned and contracted equipment

PUBLIC AFFAIRS SUPPORT

- Public Information Assist Team (PIAT): Four-person mobile crisis communications team offering:
 - Crisis media relations
- Risk Communication based message development
- Public affairs policy guidance
- Speaker preparation
- Media coverage analysis
- Liaison with media and federal, state, local officials

Community relations

- Open house/town hall meeting support
- Stakeholder identification
- Pamphlets (design, production, distribution)
- Joint Information Center (JIC) setup and support
- Qualified ICS Information Officers
- JIC staffing
- Photo and video documentation

RADIOLOGICAL RESPONSE SERVICES

- Detection of alpha, beta, gamma and neutron radiation
- Specific substance/nucleide identification via direct survey instruments, reach-back capabilities with appropriate resources
- Direct personnel monitoring, real-time dosimetry
- Dose rate monitoring
- Support to lead agencies for radiological monitoring
- Personal Protective Equipment to safely assess hazard, ID safe zones
- Site assessment from safe zone location or within TDS parameters
- Site Safety Plan development and enforcement with DOE or health physicists
- Response action management including time, distance, shielding protocols