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Welcome

Welcome to the second edition of the API (American Petroleum Institute) Joint Industry Task Force (JITF) Oil Spill Emergency Preparedness and Response (OSEPR) newsletter. The purpose of this update is to inform stakeholders within and around the energy and spill response community on the latest developments within the JITF Program.

Through the JITF Program, API and its members continue their commitment to advancing the prevention of oil spills and developing improved tools for spill preparedness, incident response and environmental restoration. Invaluable to these ends is cooperation and collaboration with key stakeholders in the oil spill community, especially federal and state agencies, scientists, academia, and non-governmental organizations (NGO's), with whom API and its membership convene frequently.

The oil and natural gas industry's relationship with policy makers and key stakeholders is vital to successfully preventing incidents and effectively responding to them. It ensures that when an incident requires a response, that response will be executed in a manner that is timely, measured and effective, weighing properly the shared values of the stakeholder community. Lead by API and its member companies, the JITF's development of targeted research, sound science, and critical communication methods plays a central role in preventing future incidents from occurring and enhancing the effectiveness of the response if they do.

This year has seen several R&D projects completed, while others progress towards completion and a few new projects are poised to begin. This newsletter provides details and updates on the status of JITF project activity, as well as information on relevant issues and developments. More details regarding all of the JITF projects, as well as background information, goals and final reports, are available in the R&D Center of [API's Oil Spill Prevention + Response website](#).

UPCOMING EVENTS OF INTEREST

Gulf of Mexico Oil Spill and Ecosystem Science Conference
Houston, TX
February 16-19, 2015

Interspill
Amsterdam, Netherlands
March 24-26, 2015

Spillcon
Perth, Australia
May 2-6, 2016

International Oil Spill Conference (IOSC)
Long Beach, CA
May 15-18, 2017

Planning

Guidelines for Offshore Oil Spill Response Plans (OSRPs)

A guidance document on preparing more functional and effective Oil Spill Response Plans (OSRPs) for offshore areas, which incorporated the Bureau of Safety and Environmental Enforcement's (BSEE) Notice to Lessees (NLT) for oil spill response plans ([NLT 2012-N06](#)), was prepared in 2013. The document, – [Guidance for Offshore Oil and Gas Exploration, Production and Pipeline Facility Operators](#) (API Technical Report 1145 – September 2013), was later published in September of that same year and is available on [API's Oil Spill Prevention + Response website](#). This guidance document is currently in the process of being developed into an API Recommended Practice (RP) for the oil and natural gas industry to ensure increased safety for operators in the offshore environment as well as improved alignment among policymakers, regulators, industry and emergency responders. While a guidance document can be very effective in providing direction in particular areas of operation, a Recommended Practice carries more weight and specificity in terms of guidance, largely because its development often involves stakeholders outside of the industry, including scientific experts, academia, third-party service providers and federal and state regulators.

Improvements to Oil Spill Response Training and Exercises (T&E)

The [API report Guidelines for Oil Spill Response Training and Exercise Programs](#) (API Technical Report 1159 – July 2014) was published in July 2014, and is available on the [API and Oil Spill Prevention + Response website](#). The final report presented several practices for

[Learn more at API.org](#)



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consideration in the development of training and exercise (T&E) programs, including recommendations on how to develop multi-year T&E classes that support scientific and technical response positions and team development. Great effort was taken to ensure that the recommendations of the report align with existing training and exercise guides, including the [National Preparedness for Response Exercise Program \(PREP\)](#), [Homeland Security Exercise and Evaluation Program \(HSEEP\)](#) and the USCG's [Spill Planning, Exercise, and Response System \(SPEARS\)](#). The industry anticipates the government's release of a revised set of PREP Guidelines in early 2015. After its release, the API T&E Workgroup will conduct a comprehensive review of this latest version.

For further information on API's Planning projects, please contact Ray Bradley at bradleyr@api.org

Dispersants

Subsea Dispersant Injection Program

The multi-year, large-scale Subsea Dispersant Injection Program has been steadily progressing, with activity occurring in five main areas: Effectiveness, Fate and Effects, Modeling, Monitoring, and Communications.

Effectiveness Team

The Effectiveness Team continues with six phases of research planned to study the effectiveness of subsea dispersants on oil. Phase I and II of this research effort were concluded in 2014 using [SINTEF's](#) 6-meter Tower Basin test tank. The Phase I report, [Subsurface oil releases – Experimental Study of Droplet Distributions and Different Dispersant Injection Techniques - version 2 - A scaled experimental approach using the SINTEF Tower basin](#), was published in July 2014 and can be accessed on the API Oil Spill Prevention + Response website. The Phase II report is in final review and is projected to be published by the 1st quarter of 2015. Findings from the Phase I and II reports include:

- Dispersants could reduce droplet sizes for a range of oils even at low dispersant-to-oil ratios – up to five times less dispersants needed compared to a surface application.
- For injections within six pipe diameters above the discharge point, injection wands were as effective as more sophisticated and complex injection systems.
- Corexit 9500 was only slightly better than Finasol OSR 52 and Dasic Slickgone NS. Therefore any of these products could be considered for subsea dispersant injection.
- Oil temperatures above 50°C reduce the effectiveness of dispersants at 1% dispersant treatment but not at 2% treatment.
- Droplet sizes produced immediately after the turbulent jet may not be representative of droplets that rise slowly up the water column as additional break up from tip streaming may occur.

In addition to the Phase I and II work efforts, the Effectiveness Team is studying the effects of high-pressure on dispersed oil (Phase III) through a joint effort with SINTEF and Southwest Research Institute. The Team is also working with SINTEF and the University of Hawaii to investigate the effect of dispersant latency (tip streaming) on droplet size formation (Phase IV). Testing for both of these phases were completed in this year and the Team will issue technical reports for both phases by the end of the 2nd quarter of 2015.

The final two phases of this work effort will be conducted in 2015. Phase V will study pressure effects on "live oil" and is expected to commence in the 1st quarter of 2014. Phase VI will conduct effectiveness testing at higher flow rates and is designed to quantify the upward scaling on the droplet sub-model. This work is expected to commence in the 2nd quarter of 2015. The Team plans to publish results from these two final phases by the end of 2015.

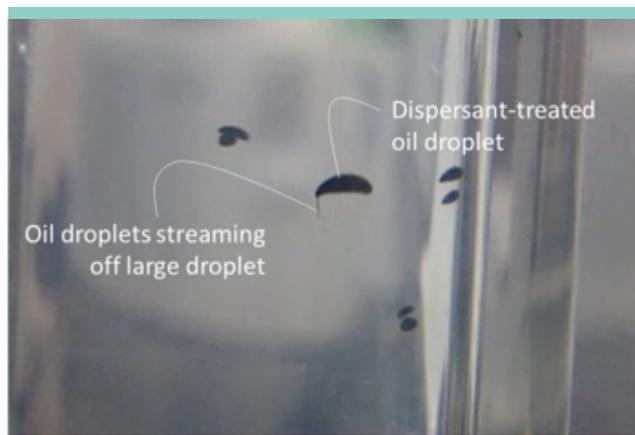


Figure 1. Photo from the University of Hawaii's water tunnel that shows a large (~4 mm) droplet of oil undergoing tip streaming. The droplet was treated with 1 part dispersant to 100 parts oil prior to placement in the water tunnel. Droplets treated with adequate dispersant do not form spheres. Instead they take the shape of an umbrella. Tip streaming occurs as the larger droplet "shed" smaller droplets off of the umbrella's edge, or tip.



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Fate and Effects Team

The Fate and Effects Team has been continuing their work on biodegradation and toxicity research. The findings from the 2012 Fate & Effects workshop were presented at the 2014 IOSOC in Savannah, GA, in May in a paper titled [Consensus on the State of the Knowledge and Research Recommendations on the Fate and Effects of Deep Water Releases of Oil, Dispersants and Dispersed Oil](#). Professor Terry Hazen of the University of Tennessee is finalizing a biodegradation State of the Science report and it should be published in the 1st quarter of 2015. In addition to the State of the Science Report, Dr. Hazen will also publish a biodegradation Research Recommendations report.

In addition to the biodegradation efforts, Phase I toxicity research is also underway. This research consists of a literature and model review on aquatic toxicity of gas molecules, a literature and model review on the role of pressure on hydrocarbon aquatic toxicity, and a study to understand exposure of oil components at depth. Phase I efforts are expected to be complete by the 1st Quarter of 2015. Toxicity Phase II tests will include species sensitivity distribution (SSD) checks for deep sea species and toxicity of continuous and spiked exposures to crude oil at 1 atmosphere for deep sea species. It will begin in December 2014.

Modeling Team

The API Dispersant Modeling Team held a Model Intercomparison Workshop in January 2014 in Houston, TX. This effort allowed modelers the opportunity to evaluate the predictions of integrated oil spill models for simulated, accidental oil well blowouts with and without the subsea application of dispersants. A number of test cases were prepared by the team to support this effort and covered a wide range of potential scenarios.

The modeling results were collated, presented, and discussed at the workshop and provided the model developers with the opportunity to discuss model development needs. A paper that both outlines the results from the workshop and provides an analysis of the current models' performances in predicting the fate and transport of a subsea plume is undergoing final author review and publication is expected in the 2nd quarter of 2015. The Team also plans to submit the paper for publication in a peer-reviewed journal.

Monitoring Team

In 2014, the Monitoring Team held several meetings with Federal, state, and industry stakeholders to develop operational decision making tools to support subsea dispersant injection. Work to develop these tools is underway with the goal of presenting initial drafts of the tools to Regional Response Teams (RRT) IV and VI in the 1st Quarter of 2015.

Communications Team

Because of the extensive and technical nature of this activity, a Communications Team was established at the formation of the program in order to provide updates to the broader oil spill response and research communities. As part of this effort, a series of newsletters has been created to communicate about these efforts. The [fourth edition of the newsletter](#) was published in September 2014 and a fifth edition is anticipated for release in the second quarter of 2015.



Figure 2. An open house was held at the Ohmsett Facility in July 2014 where attendees observed the effect of dispersants on an oil slick as illustrated by the change in color from black to brown due to the formation of tiny dispersed oil droplets entrained in the water column. (Left) API's Subsea Dispersants Injection Program Chair Tim Nedwed (back center) and Robyn Conmy (front center) of the EPA discuss dispersants chemical behavior while watching on-water demonstrations of dispersants on oil. (Right)



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In addition to the subsea dispersants newsletters, Subsea Dispersants team members have attended and presented at a variety of conferences in 2013 and 2014 to promote the Team's research activities. This past summer, the API hosted its second annual oil spill dispersant workshop at the Bureau of Safety and Environmental Enforcement's (BSEE) oil spill response and research facility (Ohmsett). The workshop included a research forum focused on the subsea dispersant program and related dispersant research projects and was attended by a diverse contingent of dispersants experts from academia, industry, non-governmental organizations (NGOs), federal agencies, and state/regional based oil spill response organizations. The API Subsea Dispersants Team members were an integral part of this workshop.

Surface Dispersant Application Preparedness and Operations Plan

As part of the JITF effort, a project team was formed to evaluate best practices developed during the Deepwater Horizon (DWH) response for safely and successfully applying dispersants to surface oil slicks. The project team developed a guidance document to assist companies in pre-planning for large scale aerial and/or vessel dispersant application programs, as well as the preparation of a dispersant operations guide at the time of an incident. The final draft document was completed in the Spring of 2014 and shared with several agency response experts for review and comment. Following feedback from these experts, the document was finalized in November 2014.



A plane releasing dispersants on a surface oil slick. Photo: Courtesy of the National Commission on the Deepwater Horizon Oil Spill and Offshore Drilling.

API Technical Publication 1148 Aerial and Vessel Dispersant Preparedness and Operations Plan is now publicly available in the R&D Center at OilSpillPrevention.org.

Improved Communication Tools

In addition to the ongoing scientific research being carried out, there is a critical need to develop materials that effectively provide clarity around the complex science of dispersants and their application. As such, the API JITF OSEPR Subcommittee coordinated with the OGP/PIECA Oil Spill Response Joint Industry Program to develop a suite of tools tailored to the various stakeholders, most especially the uninformed and often misinformed public. Since the last API JITF OSEPR Newsletter, the final three dispersant fact sheets were completed. The dispersants fact sheets are quick reference guides available to anyone seeking out more information on the chemical contents, toxicity, and the need for dispersants, as well as their critical role in protecting human health and the environment. The ten factsheets are as follows:

- Introduction to Dispersants (Factsheet 1)
Dispersants - Human Health and Safety (Factsheet 2)
Fate of Oil and Weathering (Factsheet 3)
Toxicity and Dispersants (Factsheet 4)
Dispersant Use Approvals in the United States (Factsheet 5)
Assessing Dispersant Use Trade-offs (Factsheet 6)
Aerial and Vessel Dispersant Operations (Factsheet 7)
Subsea and Point Source Dispersant Operations (Factsheet 8)
Dispersant Use & Regulation Time (Factsheet 9)
Dispersant Use in the Environment (Factsheet 10)

Infographic titled 'SUBSEA AND POINT SOURCE DISPERSANT OPERATIONS' with sections for 'Things You Should Know', 'Overview', 'Fact Sheet Series', and 'Act Sheet Series'.

In addition to the development of fact sheets, "scan and glance" dispersant-related materials were created and are being used to succinctly and effectively communicate the benefits of dispersants to the entire stakeholder community and general public at large. The products have been reviewed by representatives from government agencies and industry and are posted on the Oil Spill Prevention + Response website.

API representatives have presented both the factsheets and the "scan and glance" materials at conferences around the world and received positive feedback. A presentation was given at the 2014 International Oil Spill Conference (IOSC) describing these communication activities and can be found on the IOSC website.

Other Stakeholder Education & Outreach Efforts

A Stakeholder Education/Outreach Project Team was formed to evaluate dispersant related emerging studies from the Deepwater Horizon (DWH) release and to suggest additional research where appropriate. Two distinct research and development (R&D) needs and assessment activities were identified: 1) interaction with research entities and 2) evaluation of published research.



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Following the Deepwater Horizon (DWH) event, the team recognized the need to network and engage with R&D consortia and other oil spill response-related research groups. In 2012 and 2013, the API JITF funded forums convened for industry, government and academia to assess and confer on the latest dispersant-related research and activities. In 2014, the team continued to collect and review current publications, and is looking to broaden their contact with the wider R&D community, including the [National Academy of Sciences Gulf Research Program](#).

In addition to direct interaction between researchers and the resultant exchange of ideas, both the API JITF and the OGP/ IPIECA Joint Industry Program believe that there is a need to review, evaluate, and address published research results in a timely manner. To that end, they have sponsored the formation of an independent panel of international technical experts from academia, government, and industry to review new scientific publications on dispersants. Through this review, panelists will a) identify the contributions of each to operating practices, knowledge of dispersants and understanding of the fate and effects of dispersant and dispersed oil during spills; b) highlight novel avenues of research suggested by results; and c) where appropriate, provide constructive input regarding study approaches and methods, as well as the study's interpretation of results. This year, the panel conducted a literature review on new research issued in 2013 forward focusing on the environmental fate of oil and dispersed oil, the effects of oil and dispersed oil, human health, and new dispersant products. A final report summarizing this literature review will be issued in the fall of 2015.

For further information on API's work on dispersants, please contact Emily Kennedy Hague at kennedye@api.org.

Shoreline Protection and Cleanup

Recommended Practice for Personal Protective Equipment (PPE)

A team was formed in early 2011 to frame the scope of a Recommended Practice (RP) on the use of Personal Protective Equipment (PPE) for shoreline cleanup after a spill response. In coordination with representatives from the federal government and industry, API completed the development of Recommended Practice (RP) 98 this year. Participating with members of the oil & gas industry were members of the Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health (NIOSH), and the U.S. Coast Guard (USCG). The value of this comprehensive document lies in its iterative development with multiple industry representatives as well as key federal regulators. The RP, [Personal Protective Equipment Selection for Oil Spill Responders](#), is available through the API Standards Department.

Assess Shoreline Protection Technologies

A Technical Working Group (TWG) was formed to evaluate a suite of methods and technologies to be considered and employed for preventing or mitigating shoreline impacts and cleaning oiled shoreline areas. This multi-year program involves eight separate projects to evaluate effective technologies and includes participation from members of federal and state governments, industry and the scientific and academic community. During 2014, the team completed work in the following areas:

- [Biodegradation and Bioremediation of Oiled Beaches – A Primer for Planners and Managers \(API Technical report 1147\)](#)
– published January 2014
- [Tidal Inlet Protection Strategies \(TIPS\) Phase 1 – Final Report \(API Technical Report 1153-1\)](#)
– published January 2014
- [Subsurface Oil Detection and Delineation in Shoreline Sediments Phase 2 – Final Report \(API Technical Report 1149-2A\)](#) – published October 2014



Worker Safety: Protective equipment. (Photo: [Deepwater Horizon Response/Flickr](#))

The following studies are ongoing and planned for completion in late 2014 and 2015:

- Beach Sand Cleaning Phases 2 & 3 (provides a review and guidance on mechanical beach cleaning)
- Submerged Oil Mats (will look at all submerged oil recovery)
- Tidal Inlet Protection Strategies Phase 2 Field Guide (a guide on protecting tidal inlets)
- Buried Oil Detection Phase 3 (focus is on use of service dogs and analytical instruments)
- Bioremediation Phase 2 (analyzing the effects of nutrients)

For further information on API's Shoreline Protection projects, please contact Ray Bradley at bradleyr@api.org.



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In-Situ Burning

The In-Situ Burn (ISB) Program continues to address the 2010 OSPR JITF recommendations made regarding ISB application and execution. The program objective is to provide information and tools to industry, responders, regulators, and other stakeholders that demonstrate the value of ISB as a viable response tool. This multi-year program includes team members from state and federal governments, the oil response community, industry, fire experts and scientific advisors. Program projects include:

API ISB Factsheets

Similar to the dispersant fact sheets, five in-situ burning fact sheets are being created for the API web site to convey information about inland and marine burning of spilled oil. The ISB team is currently reviewing drafts of the factsheets and plans to finalize them in the 2nd quarter of 2015. The working titles for the factsheets are:

- An Introduction to In-situ Burning (Factsheet 1)
- Fate of Burned Oil and Health & Environmental Effects (Factsheet 2)
- ISB Approval in the U.S. (Factsheet 3)
- Assessing ISB Use and Tradeoffs (Factsheet 4)
- ISB Operations (Factsheet 5)



In-situ burn on Gulf of Mexico; Photo Courtesy of NOAA

Revision of two API Publications: *In-Situ Burning: A Decision Maker's Guide to In-Situ Burning (#4740)* and *In-Situ Burning: The Fate of Burned Oil (#4735)*

Extensive practical and operational experience was gained from the ISB efforts to the Deepwater Horizon oil spill response in 2010 and continues with the ongoing research and development efforts for responding in the Arctic. The ISB team has combined and updated two older API documents on ISB to incorporate the lessons learned from recent activities and to provide a comprehensive, concise, and clear summary of the requirements and limitations for ISB. The revised API publication is under final review by the team and will be publicly available in the early summer of 2015.

Soil Heating from Inland/Upland Burns

Soil heating that results from wildfires and in-situ burning of oil can affect soil productivity. An incomplete understanding of soil heating and its biological effects are factors that have limited the use of in-situ burning as an oil spill response treatment. Research at the Rocky Mountain Research Fire Science Laboratory is underway to measure soil heating with a variety of soils, moisture conditions, and petroleum products to better understand the impacts of ISB on soil. A report on this research was presented at the 2014 Clean Gulf Conference. This project is projected to be completed in the 2nd quarter of 2015.

Aerial Ignition Enhancement Evaluation

The objective of this project is to evaluate ignition devices and aircraft to improve their safety, burn reliability, targeting precision and accuracy. Two advisory groups were established and include burn experts as well as aviation experts from both industry and U.S. Fire Services. A formal liaison has been established with the OGP Aviation Subcommittee (ASC), which is the international group for the industry's aviation guidance and expertise. Ignition devices will be evaluated for their performance with a variety of oils in small and lab-scale tests in advance of meso-scale tests with different launching platform options. The second phase of this effort, which will focus on comprehensive heat flux testing, is expected to be completed by fall of 2015.

Operations Manuals

To aid responders as they plan for, train for, and execute safe burns, the ISB team has developed two operational manuals (inland and offshore) for use in the field. These manuals provide basic operational information and checklists for responders and focus on slick suitability, equipment needs, ignition, burn team organization, habitats / site conditions (including snow and ice), health and safety, logistics and air support, and monitoring and smoke management. The manuals have been finalized and are being formatted for field use. They are expected by January 2015.

Guideline Development for Safety Officers and Industrial Hygienists

Many safety officers and industrial hygienists have not been involved with ISB operations and may find supporting such operations challenging without better understanding as to how it is performed and what potential hazards and risks may be associated with it. The ISB team is developing guidance to support the incident safety officer and/or industrial hygienist(s) during oil spill responses where ISB may be used. This guide will provide the safety officer with introductory information such as what ISB is, where and how it is performed, and how and when the decision to burn is made. A draft guide is currently under review by the ISB Team and will be finalized and publicly available in the summer of 2015.



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Develop Guidelines for Selection and Training of Workers for In-Situ Burning of Spilled Oil

The ISB team is developing guidance to assist ISB users to establish a standardized curriculum or a qualification program for ISB responders. Existing training guidance and curricula regarding wildfire control and prescribed burning for firefighters was reviewed to determine its application to oil spill responders conducting ISB operations. This guidance will be modeled after National Fire Protection Association (NFPA) standards and will be grouped into three sections (open water, inland, and oil on ice). It will cover specific job positions their suggested capabilities and job performance requirements. This selection and training guide is in final development and will be produced in the summer of 2015 along with a public-outreach flyer, and a presentation that can be used for outreach.

For further information on API's work on in-situ burning projects, please contact Emily Kennedy Hague at kennedye@api.org.

Forthcoming Projects

In-Situ Treatment Of Oil In Shoreline Areas

Research on **in-situ treatment of oil in shoreline areas** will be a particular focus for new work in 2015. A User Guide for in-situ treatment, Operational Manual and In-Situ Document Library will begin being developed in the first quarter of the coming year. A revision and updating of the 1994 NOAA/API Guide on Options for Minimizing Environmental Impacts of Freshwater Spill Response will also be underway in 2015. Research on the applicability and use of detection dogs in locating subsurface oil will be carried out in 2015. This stems from the Phase II Report of Subsurface Oil Detection and Delineation in Shoreline Sediments. A range of small-scale field tests will be conducted to better understand the capabilities and limitations of detection dogs. Determination of the types of subsurface deposits that dog teams can locate and how the teams can utilize search patterns to delineate oil will be a primary focus of this study.

Conclusion

As the API JITF Program enters 2015, we look back on the numerous R&D projects that have been completed in order to increase the level of safe, incident-free operations, and look ahead to 2015 as a year to finish well the work that the oil and natural gas industry has undertaken. The JITF has been one of the key drivers of safety improvements and scientific advancement for the industry post-Macondo, as it has significantly increased development and learning from real-world data and experience. The enhancement of sound scientific insights and best practices remains at the center of the industry's focus as it continues to take part in America's emerging Energy Renaissance. As we continue to collaborate closely with our regulating partners, and direct further focus and resources toward inland prevention and response, we are confident that this bright future for American energy will be supported by industry's continued commitment to human and environmental safety and sound, innovative operational practices.

For further information API's Joint Industry Task Force Program, or any questions on oil spills and emergency response, please contact Ray Bradley at bradleyr@api.org.

Available on the API Oil Spill Prevention + Response Website:

Spill Response Planning

[API Training and Exercise Guidelines for Oil Spill Response](#)

API TECHNICAL REPORT 1159
JULY 2014

[Guidelines for Offshore Oil Spill Response Plans: Guidance for Offshore Oil and Gas Exploration, Production and Pipeline Facility Operators](#)

API TECHNICAL REPORT 1145
SEPTEMBER 2013

[Personal Protective Equipment for Oil Spill Responders](#)

API RECOMMENDED PRACTICE 98
AUGUST 2013



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[Net Environmental Benefit Analysis \(NEBA\) for Effective Oil Spill Preparedness and Response](#)

API RECOMMENDED PRACTICE 98
AUGUST 2013

Oil Sensing and Tracking

[Remote Sensing in Support of Oil Spill Response](#)

API TECHNICAL REPORT 1144
SEPTEMBER 2013

Dispersants

[Industry Recommended Subsea Dispersant Monitoring Plan Version 1.0](#)

API TECHNICAL REPORT 1152
SEPTEMBER 2013

[Aerial and Vessel Dispersant Preparedness and Operations and Management Plan](#)

API TECHNICAL REPORT 1148
NOVEMBER 2014

[The Role of Dispersants in Oil Spill Response](#)

[SINTEF Dispersants Effectiveness Report - Phase I](#)

MAY 2014

[Shoreline Protection on Sand Beaches \(aka Berms and Barriers\) Phase I Report](#)

API TECHNICAL REPORT 1150-1
SEPTEMBER 2013

[Shoreline Protection on Sand Beaches \(aka Berms and Barriers\) Phase II- Field Guide](#)

API TECHNICAL REPORT 1150-2
SEPTEMBER 2013

[Improvements for the Mechanized Cleanup of Oiled Sand Beaches - Phase I Report](#)

API TECHNICAL REPORT 1151-1
SEPTEMBER 2013

[Tidal Inlet Protection Strategies \(TIPS\) - Phase I Report](#)

API TECHNICAL REPORT 1153-1
JANUARY 2014

[Biodegradation and Bioremediation on Sand Beaches](#)

API TECHNICAL REPORT 1147
JANUARY 2014

Mechanical Recovery

[Deepwater Horizon Mechanical Recovery System Evaluation - Interim Report](#)

API TECHNICAL REPORT 1143
SEPTEMBER 2013

Shoreline Protection

[Oil Spills in Marshes Planning and Response Considerations](#)

API TECHNICAL REPORT 1146
SEPTEMBER 2013

[Subsurface Oil Detection and Delineation in Shoreline Sediments Phase I - Final Report](#)

API TECHNICAL REPORT 1149-1
SEPTEMBER 2013

[Subsurface Oil Detection and Delineation in Shoreline Sediments - Phase II Field Guide](#)

API TECHNICAL REPORT 1149-2
SEPTEMBER 2013

[Subsurface Oil Detection and Delineation in Shoreline Sediments Phase II - Final Report](#)

API TECHNICAL REPORT 1149-2A
OCTOBER 2014

Alternative Response Technologies

[Evaluation of the Alternative Response Technology Evaluation System \(ARTES\)](#)

API TECHNICAL REPORT 1142
JULY 2013