Appendix A

Deepwater Horizon

On April 20, 2010, while working on an exploratory well in Mississippi Canyon Block 252, approximately 50 mi (80 km) offshore Louisiana, the semisubmersible drilling rig *Deepwater Horizon* experienced an explosion and fire, resulting in an uncontrolled release of oil and natural gas from the Macondo reservoir (now known as the *Deepwater Horizon* spill). The *Deepwater Horizon* spill required that the operator cap and attempt well control efforts at the seabed in very deep water depths (approximately 5,000 ft; 1,524 m) and, although not simultaneously, the operator was also required to handle fire-fighting efforts at the surface when the incident first occurred. On July 15, 2010, the leaking well was capped, and a relief well encountered and plugged the Macondo wellbore on September 19, 2010. Prior to capping/plugging the well, approximately 53,000-62,000 barrels (bbl) of oil per day (2.23-2.60 million gallons) were released from the well, with an approximate total release of 4.9 million bbl of oil (206,000,000 gallons) over an 87-day period. The subsea blowout also resulted in the loss of large quantities of gas (to date this volume is undetermined) (DHUC, 2010).

With respect to spill remediation the following information was made available by the *Deepwater Horizon* Unified Command (DHUC) (2010) and Lubchenco et al. (2010):

- More than 6,050 response vessels and approximately 47,849 personnel responded to protect the shoreline and wildlife and to cleanup vital coastlines;
- At the surface, approximately 34.7 million gallons (827,251 bbl) of oily water were recovered and an estimated 11.14 million gallons (265,450 bbl) of oil burned;
- Approximately 1.84 million gallons (43,809 bbl) of dispersant were applied (1.07 million gallons [25,476 bbl] on the surface and 771,000 gallons [18,357 bbl] subsea);
- More than 3.33 million feet (1,003 km) of containment boom and 9.7 million feet (2,469 km) of sorbent boom were deployed;
- Approximately 641 mi (1,032 km) of Gulf Coast shoreline was oiled, including approximately 368 mi (592 km) in Louisiana, 112 mi (180 km) in Mississippi, 73 mi (117 km) in Alabama, and 88 mi (142 km) in Florida.

According to the National Marine Fisheries Service (NMFS), approximately 88,522 square miles (mi^2) (229,270 square kilometers [km^2]) of Federal waters were closed to commercial and recreational fishing, approximately 33 percent of the Gulf of Mexico (GOM) Federal waters (USDOC, NMFS, 2010).

Hydrocarbon Spill Transport

When oil is released in seawater, a combination of physicochemical and biological processes immediately begin to transform the oil into substances with characteristics that differ from the original material, while physical transport processes begin to dissipate it. Physicochemical processes include evaporation, emulsification, dissolution, and photo-oxidation, which are collectively referred to as weathering. Biological processes include microbial oxidation. Microbes consume the oil, and wave action, sun, currents, and continued evaporation and dissolution continue to break down the residual oil in the water and on shorelines. Transport processes include spreading, dispersion and entrainment, sinking and sedimentation, and stranding, which can lead to tar ball formation. These processes are described by the National Research Council (NRC, 2003).

Natural gas from the release dissolved into the water column or vented into the atmosphere. Oil from the *Deepwater Horizon* spill, a medium weight oil, was dispersed into the water column. Ryerson et al. (2012) reported that ~36 percent of the hydrocarbon mass flow from the MC 252 wellhead remained subsurface and ~41 percent rose to the surface, with the caveat that ~23 percent of the flow was unaccounted for. It was estimated by the MC 252 National Incident Command's technical group that approximately 36 percent of the oil spilled from the *Deepwater Horizon* was lost once it reached the water surface due to dissolution, evaporation, and natural dispersion (Federal Interagency Solutions Group, Oil Budget Calculator Science and Engineering Team., 2010). The majority of this oil that was lost due to evaporation and dissolution (23%). Additional oil was lost due to these same processes as it weathered, although at a much smaller percentage.

During the *Deepwater Horizon* spill, due to the high speed of oil release and application of chemical dispersants, some of the oil was dispersed as oil droplets in the water column as it rose to the surface from a water depth of approximately 5,000 ft (1,524 m). These oil droplets are neutrally buoyant and remain in the water column until they weather.

The NOAA, USEPA, and the White House Office of Science and Technology Policy's summary report about subsurface oil monitoring in the GOM after the MC 252 blowout indicated that average fluorescence in the depths of interest – 3,300 and 4,300 ft (1,005 and 1,311 m) – at sampled locations ranged from 4 to 7 parts per million oil. This estimated value is slightly higher than the laboratory-confirmed values previously reported, which at their highest, near the wellhead, were approximately 1-2 parts per million oil. The fluorometric signal to detect the presence of oil was strongest near the wellhead and decreased with distance, which was consistent with previous sampling (USDOC, NOAA, 2010a).

It is anticipated that some of the oil would remain subsurface, while the rest would surface (Federal Interagency Solutions Group, Oil Budget Calculator Science and Engineering Team, 2010). Based upon the DeepSpill research and experience gained during the MC 252 spill incident, it would be expected that any oil contained within the water column would be transported at that same depth by ocean currents.

Research is ongoing related to how much of the *Deepwater Horizon* spill oil was dispersed throughout the water column due to the use of subsurface dispersants at the wellhead; however, during the response it was estimated that 10-29% of the oil volume discharge could be dispersed by the application of chemical dispersants both on and below the surface (Federal Interagency Solutions Group, Oil Budget Calculator Science and Engineering Team., 2010 (see Fig. 13)). The chemically dispersed oil ended up deep in the water column and just below the surface because both surface and subsurface application was used. Dispersion, whether natural or chemical, increases the likelihood that the oil will be biodegraded, both in the water column and at the surface. However, until it is biodegraded, naturally or chemically dispersed oil, even in dilute amounts, can be toxic to vulnerable species (Lubchenco et al., 2010). Studies are presently ongoing to assess the short and long-term effects of dispersant usage during the *Deepwater Horizon* spill.

The *Deepwater Horizon* oil was relatively high in alkanes. Because alkanes are made up of single-bonded carbon chains that microorganisms can readily use as a food source, *Deepwater Horizon* spill oil was considered likely to biodegrade more readily than other crude oils and was also generally considered to be less toxic than some crude oils because it was relatively much lower in polyaromatic hydrocarbons (PAHs). The PAHs are highly toxic chemicals that tend to persist in the environment for long periods of time, especially if the spilled oil penetrated into the substrate on beaches or shorelines. The *Deepwater Horizon* spill oil was also low in sulphur. Like all crude oils, *Deepwater Horizon* spill oil contained volatile organic compounds (VOC's) such as benzene, toluene, and xylene. Some VOCs are acutely toxic but because they evaporate readily, they are generally a concern only when oil is fresh (USDOC, NOAA, 2010b).

Once surfaced, the *Deepwater Horizon* spill oil appeared as black or dark brown oil, sheens, and water-in-oil emulsion, or mousse. The oil also formed tar balls. As the oil reached the surface and spread out across the water, its lighter components, including VOCs, soon evaporated, leaving heavier components behind. Fresh oil appears as a black or dark brown, thick, sticky liquid with petroleum odor. On open water, this oil will spread quickly. In the intertidal zone, this oil could pick up silt and sediment and sink. On the beach, this form of oil could release sheen when washed by tides or waves and could also penetrate beach substrate. Some of the remaining *Deepwater Horizon* spill oil became sheen, a very thin layer of floating oil (less than 0.0002 inches or 0.005 mm) that can be transparent, grey, silver, or rainbow-colored. Light sheens will degrade quickly while heavier sheens may concentrate on shorelines. The *Deepwater Horizon* spill oil also mixed with water to form a sticky, pudding-like water-in-oil emulsion, or mousse, normally brown, reddish, or orange in color. Typically, crude oil emulsifies on the sea surface as winds and waves mix it with water, but *Deepwater Horizon* spill oil also appeared to be incorporating water as it rose to the surface through 5,000 ft (1,524 m) of water. Water content reduces ignitability and biodegradability. Winds and waves tear oil and mousse patches into smaller pieces, eventually producing tar balls. The *Deepwater Horizon* spill tar balls typically were in the form of small, hard, black pellets. Tar balls can range in size from 5mm to 5 cm (0.20 to 2 inches). Tar balls can be very persistent in the marine environment and travel long distances. On the beach, tar balls may soften in hot sun. In intertidal waters, tar balls can pick up sediment or silt and sink. Occasionally, some burn residue can be mistaken for tar balls. Burn residue is brittle, hard, asphalt-like, and typically mixed with unburned fresh oil. Some of the *Deepwater Horizon* spill oil gathered offshore just below the water surface in thick mats or patches of emulsified oil (USDOC, NOAA, 2010a).

Dispersion increases the likelihood that the oil will be biodegraded, both in the water column and at the surface. Oil that is chemically dispersed at the surface will move into the top 20 ft (6 m) of the water column where it will mix with surrounding waters and begin to biodegrade. While there is more analysis to be done to quantify the rate of biodegradation in the GOM after the *Deepwater Horizon* spill, early observations and preliminary research results showed that some of the oil biodegraded fairly quickly. Bacteria that break down the dispersed and weathered surface oil are abundant in the GOM in large part because of the warm water, the favorable nutrient and oxygen levels, and the fact that oil enters the GOM through natural seeps regularly (Lubchenco et al., 2010).

Using the information obtained as a result of the response to the *Deepwater Horizon* spill, it is evident that large amounts of oil could remain on the water surface and within the water column for some period of time during a spill event if it is not successfully contained by some other subsea source control measure. Approximately 17 percent of the oil was captured through the subsea containment effort during the *Deepwater Horizon* spill (Federal Interagency Solutions Group, Oil Budget Calculator Science and Engineering Team., 2010).

The National Oceanic and Atmospheric Administration (NOAA), the U.S. Environmental Protection Agency (USEPA), and the White House Office of Science and Technology Policy released peer-reviewed, analytical summary reports about subsurface oil monitoring in the GOM during the *Deepwater Horizon* spill response. Their second report contains preliminary data collected at 227 sampling stations extending from 1 to 52 km (0.6 to 32.3 mi) from the Macondo wellhead. This data indicated that the movement of subsurface oil is consistent with ocean currents and that concentrations continue to be more diffuse as one moves away from the source of the leak. These results confirmed the findings of their previous report. The fluorometric sampling confirmed that the subsurface oil moved consistent with the observed ocean currents. During the *Deepwater Horizon* spill response, many techniques were tested to better understand the extent of this unprecedented oil spill, and it was discovered that fluorometric sampling was useful to help identify the location and concentration of subsurface oil. Fluorometers use light waves to detect anomalies in the water column. Fluorometry measurements show repeated signals between approximately 3,300 and 4,300 ft (1,000-1,400 m) deep that were consistent with diffused oil in the water. For the areas sampled, the fluorescence data indicated movement primarily west-southwest until June 2, 2010. In mid-June, fluorescence indicated movement toward the northeast within the GOM. As previously indicated, these movements were generally consistent with observed ocean currents in the area at that time (USDOC, NOAA, 2010a).

DeepSpill Experiment

The DeepSpill experiment was conducted in the Norwegian Sea at the Helland Hansen site in June 2000 and included four controlled discharges of oil and gas from a water depth of 844 m (2,769 ft). This experiment was part of the DeepSpill project, organized as a Joint Industry Project (JIP), involving 23 oil companies and BOEM (then MMS). Analysis of water samples taken during this experiment with a rosette sampler (guided by images from the echo sounder) revealed how the composition of the crude oil and diesel released as part of this experiment changed on its way to the sea surface due to dissolution of the water soluble components into the ambient water. The echo sounder images indicated that the methane gas did not reach the sea surface, with the signal from the rising cloud of gas bubbles vanishing from the images at about a water depth of 150 m (492 ft). The crude oil and the diesel oil did reach the sea surface in a relatively shorter period of time than expected. The crude oil release did form water-in-oil emulsion, which was also evident during the *Deepwater Horizon* spill. This research also indicated that slicks from a submerged oil release were thinner than those resulting from surface spills, allowing them to weather more rapidly (Johansen et al., 2001). However, the oil released subsea that reached the water surface as a result of the *Deepwater Horizon* spill did not seem to behave any differently than would a surface spill of the same oil.

The conclusions of the DeepSpill field experiment, two other follow-up laboratory studies, and three model comparisons were summarized in a 2005 report entitled *Review of DeepSpill Modeling Activity Supported by the DeepSpill JIP and Offshore Operators Committee* (Adams and Socolofsky, 2005). The aforementioned six activities resulted in several conclusions about the fate of oil spilled subsurface within deep water. This 2005 report indicated that jets of oil and gas (if present) will break up into droplets and bubbles. The buoyancy of the oil droplets and gas bubbles will form a buoyant plume, with the gas providing the dominant source of buoyancy (if present). Near the point of release, this plume will behave like a single phase plume. Although slight leakage of entrained seawater and fine oil droplets can be expected in the lee of the plume, basic plume features in this near source can be easily described with conventional integral plume models. Above a certain height, ambient stratification and ambient currents will separate the dispersed phases from the entrained water. Above a current speed of 2.5 cm/sec, the current is the major factor, and separation can be expected at elevations of 180 m (591 ft) or less. It was determined that plume dynamics were relatively unimportant when determining the fate of oil released at depths of 800-1,000 m (2,625-3,281 ft) because the plume stage is short when compared with the water depth (Adams and Socolofsky, 2005).

The DeepSpill work indicated that, above the point of separation, gas bubbles and large oil droplets rise toward the surface while small oil droplets continue with the entrained seawater as a buoyant jet. Some of the modeling work indicated that the oil would rise to surface closer to the release point. However, since the field experiment resulted in only a small fraction of the diesel oil being recovered at the surface, it was determined that much of the oil could have been contained in the form of much finer droplets that were much more widely dispersed. Although earlier studies such as the 1997 S.L. Ross study indicated that the gas would be expected to convert very quickly to hydrates during a deepwater release, observations are lacking from the *Deepwater Horizon* spill of released gas converting to hydrates, which reinforces the 2005 report's modeling work conclusions (S.L. Ross Environmental Research Ltd., 1997; Adams and Socolofsky, 2005).

The experiments indicated that oil is water-extracted after its subsea release on its way up to the sea surface. The rate of this extraction depends upon the solubility of the compounds in the water. For example, close to the surface, the naphthalenes are almost completely extracted from the oil. This is important because the water-soluble compounds are the most toxic ones when exposed to marine biota. The results from the experiments showed that the rising of the oil through the water column represents a kind of "stripping" process of some of the most toxic compounds in the oil. Therefore, a portion of the most toxic compounds are left in the water column. The largest concentration of hydrocarbons in the water column will be basically inside the "cloud" of rising oil droplets while the peak concentration may be deeper due to a larger exposure of oil droplets that has passed by. In a surface-generated slick, the most toxic compounds typically evaporate rather than dissolve into the sea (Johansen, et al., 2001).

Spill Response

Potential impacts from an accidental release of oil from a high-volume blowout are a serious concern; however, the historical database indicates that it is rare for such a pollution event to occur. An operator is responsible for ensuring that the response to an oil spill would be in full accordance with the applicable Federal and State laws and regulations. BSEE has spill preparedness, planning, and response requirements identified at 30 C.F.R. Part 254 and 30 C.F.R. 250 Subpart C.

The ability to effectively respond to a spill that might occur in the deepwater areas of the outer continental shelf (OCS) will vary depending upon a number of factors. Among these factors are the chemical and physical characteristics of an oil, the volume of oil spilled, the rate of spillage, the weather conditions at the time of the spill, the source of the spill, and the amount of time necessary for response equipment or chemical countermeasures to reach a spill site. The distance from shore for a deepwater drilling and/or production project would generally allow more time for cleanup efforts and natural weathering of the oil to take place before oil could reach shore.

Oil-Spill-Response Plan

BSEE and BOEM both have regulatory requirements addressing oil spill response plans and spill response information. As required by BOEM at 30 C.F.R. 550.219 and 30 C.F.R. 550.250, operators are required to provide BOEM an oil-spill-response plan (OSRP) that is prepared in accordance with 30 C.F.R. 254, subpart B with their proposed exploration, development, or production plan for the facilities that they will use to conduct their activities; or to alternatively reference their approved regional OSRP by providing the following information:

- A discussion of the approved OSRP;
- the location of the primary oil spill equipment base and staging area;
- the name of the oil spill equipment removal organization(s) for both equipment and personnel;

- the calculated volume of your worst case discharge scenario in accordance with 30 C.F.R. 254.26)a) and a comparison of the worst case discharge scenario in the approved regional OSRP with the worst case discharge calculated for these proposed activities;
- a description of the worst case discharge to include the trajectory information, potentially impacted resources, and a detailed discussion of the spill response proposed to the worst case discharge in accordance with 30 C.F.R. 254.(b),(c), and (d).

All OSRPs are reviewed and approved by BSEE, whether submitted with a BOEM associated plan or directly to BSEE in accordance with 30 C.F.R. 254. Although site specific OSRPs are required to be submitted to BOEM with a proposed exploration, development, or production plan, in contrast, BSEE regulations at 30 C.F.R. 254.2 state that an OSRP must be submitted to BSEE for approval before a facility may be used. BSEE regulations; therefore, link the approval of OSRPs to the application for permit to drill submitted to BSEE as opposed to the exploratory, development, or production plans submitted to BOEM.

An OSRP is required to demonstrate that an operator can respond quickly and effectively whenever oil is discharged from a facility. An operator is required by BSEE to immediately carry out the provisions of the plan whenever there is a release of oil from a covered facility. The OSRP is also required to be consistent with the National Contingency Plan and the appropriate Area Contingency Plan(s). The proposed operations would be required to be conducted under the applicable provisions of OCS regulations and notices and in the interest of safety and pollution control.

As clarification to the 30 C.F.R. 254 regulations, BSEE issued NTL 2012-N06 which provides guidance to owners and operators of offshore facilities seaward of the coastline concerning regional oil spill response plans. A regional OSRP is defined as a spill response plan covering multiple facilities or leases of an owner, or operator, or their affiliates which are located in the same BSEE region. The information included in the tables below is included in a regional OSRP prepared in accordance with NTL 2012-N06. Site specific OSRPs submitted with BOEM exploration, development, or production plans can either be prepared using the 30 C.F.R.254 regulations or the guidance outlined in NTL 2012-N06.

Sections Included in a Regional OSRP (NTL No. 2012-N06)			
(1)	OSRP quick guide	(12)	resource identification and prioritization for protection
(2)	preface	(13)	resource protection methods
(3)	introduction	(14)	mobilization and deployment methods
(4)	organization	(15,16)	oil/debris removal/disposal procedures
(5)	spill response operations/communications	(17)	wildlife rehabilitation procedures
(6)	spill detection and source identification and control	(18)	dispersant use plan
(7,8)	internal and external notifications	(19)	in-situ burn plan
(9)	available technical expertise	(20)	other response strategies
(10)	strategic response planning	(21)	documentation
(11)	spill assessment	(22)	prevention measures for facilities located in state waters

Appendices included in a Regional OSRP (NTL No. 2012-N06)			
(A)	facility information	(G)	ICS compliant notification and reporting
(B)	training information	(H)	Worst case discharge scenarios
(C)	drill information	(I)	subsea containment information
(D)	contractual agreements	(J)	oceanographic and meteorology information
(E)	response equipment	(K)	bibliography
(F)	support services and supplies		

Some of the clarifications and encouraged practices identified in NTL No. 2012-N06 are based upon lessons learned from the *Deepwater Horizon* spill response. This NTL indicates that BSEE's review of OSRPs is also based, in part, upon information obtained during the *Deepwater Horizon* spill response. For example, during the *Deepwater Horizon* spill response it was discovered that the total estimated de-rated recovery capacity for all equipment listed in the OSRP overestimated the amount of oil that could be removed from the water. NTL No. 2012-N06; therefore, states that the OSRP should be developed considering 1) a fully developed response strategy that includes the identification of the available dedicated recovery equipment as well as the actual operating characteristics of the systems associated with each skimmer and 2) the use of new technology and response systems that will increase the effectiveness of mechanical recovery tactics. The NTL is designed to encourage owners and operators of offshore facilities to include innovative offshore oil spill response techniques, particularly for a continuous high-rate spill. NTL No. 2012-N06 included requirements for the submittal of information regarding subsea containment equipment and subsea dispersant application among other provisions. This NTL also encouraged the inclusion of options that will improve spill response capabilities such as:

- using remote sensing techniques as a tool for safe night operations, to increase oil spill detection, and to improve thickness determinations for ascertaining the effectiveness of response strategies;
- increasing spill response operational time by reducing transit times to disposal locations and decontamination equipment;
- identifying sources for supplies and materials, such as fire boom and dispersants, that can support a response to an uncontrolled spill lasting longer than 30 days or for the duration of the spill response; and
- the use and specification of primary and secondary communications technology and software for coordinating and directing spill-response operations systems and/or providing a common operating picture to all spill management and response personnel, including the Federal On-Scene coordinator and participating Federal and State government officials.

Once BSEE approves an OSRP, it must be reviewed at least every two years and modifications must be submitted in accordance with 30 C.F.R. 254.30(a). If no modifications are deemed necessary, the owner or operator must inform BSEE in writing that there are no changes. A separate revision to an OSRP must be submitted to BSEE within 15 days when the following conditions are met:

- there is a change which significantly reduces operator response capabilities;
- a significant change occurs in the worst case discharge or in the type of oil being handled, stored or transported at a facility;
- there is a change in the names or capabilities of the oil spill removal organizations cited in the plan; or
- there is significant change to the area contingency plan.

BSEE has issued NTL No. 2013-N02 to clarify what BSEE considers a significant change in a worst case discharge scenario, which requires that a revision to an OSRP be submitted. The guidance issued by this NTL states that a significant change in worst case discharge may occur when calculating a new worst case discharge based upon the following:

- the addition of a new facility installation or well;
- a modification to an existing facility; or
- a change in any assumptions and calculations used to determine the prior estimated worst case discharge.

NTL No. 2013-N02 identifies the process in which an owner or operator of a facility would determine whether the new worst case discharge represents a significant change. BSEE considers a change in worst case discharge as significant and thus requiring revision when the process identifies the need for additional onshore or offshore response equipment beyond what is included in an approved OSRP. Although information to make this determination is submitted to BOEM and forwarded to BSEE with a proposed exploration, development or production plan, pursuant to NTL No. 2013-N02, the 15 day timeframe for notification of a significant change will be enforced by BSEE as beginning no later than the date that the operator submitted an Application for Permit to Drill to BSEE.

BSEE Oil Spill-Response Division (OSRD) Program

The BSEE Oil-Spill Program oversees the review of oil-spill response plans, coordinates inspection of oil-spill response equipment, and conducts unannounced oil-spill drills. This program also supports continuing research to foster improvements in spill prevention and response. Studies funded by BSEE address issues such as spill prevention and response, in-situ burning, and dispersant use. In addition, BSEE works with the U.S. Coast Guard (USCG) and other members of the multiagency National Response System to further improve spill-response capability in the GOM.

As indicated above, BSEE is now responsible for review and approval of OSRPs. BOEM's regulations require that an operator must have an approved OSRP prior to BOEM's approval of an operator-submitted exploration, development, or production plan. BOEM relies heavily upon BSEE's expertise to ensure that the OSRP complies with all pertinent laws and regulations and demonstrates the ability of an operator to respond to a worst-case discharge.

BSEE issued NTL No. 2012-N07 to address the oil discharge reports that are required by 30 C.F.R. 254. 46(b)(2) for spills greater than 1 bbl within 15 days after a spill has been stopped or ceased. The responsible party is encouraged to report cause, location, volume, remedial action taken, sea state, meteorological conditions, and the size and appearance of the slick. Additional information about BSEE's oil spill response responsibilities is included within Section 3.2.1.9 of the 2012-2017 WPA/CPA Mulitsale EIS, the WPA 233/CPA 231 Supplemental EIS (USDOI, BOEM, 2013), and the WPA 238 Supplemental EIS (USDOI, BOEM, 2014).

Spill Response Techniques

In the event of a spill, particularly a blowout, there is no single method of containing and removing the oil that would be 100 percent effective. Removal and containment efforts to respond to an ongoing spill would likely require multiple technologies, including mechanical cleanup, burning of the slick, and chemical dispersants. Even with the deployment of all of these technologies, it is likely that, with the operating limitations of today's present commercially available spill response technology, not all of the oil could be contained and removed offshore. It is likely that larger spills in deep waters, under the right conditions, would require the simultaneous use of all available cleanup methods (mechanical cleanup, dispersant application, and in-situ burning).

Chapter 3.2.1.9 of the 2012-2017 WPA/CPA Multisale EIS describes in detail offshore spill response. Issues discussed related to spill response include offshore response, containment and cleanup technology and onshore response and cleanup. Additional information and updates to the 2012-2017 WPA/CPA Multisale EIS have been included within respective sections of the WPA and the 233/CPA 231 Supplemental EIS (USDOI, BOEM, 2013). The WPA 238 Supplemental EIS (USDOI, BOEM, 2014) identifies the following updates:

- There have been some changes to the spill-response equipment staging locations previously reported in the 2012-2017 WPA/CPA Multisale EIS. Due to these changes, it is expected that the oil-spill response equipment needed to respond to an offshore spill could be called out from one or more of the following oil-spill equipment base locations: New Iberia, Belle Chase, Sulphur, Houma, Port Fourchon, Fort Jackson, Venice, Grand Isle, or Lake Charles, Louisiana; La Porte, Port Arthur, Aransas Pass, Ingleside, Galveston, or Houston, Texas; Pascagoula, Mississippi; Mobile, Alabama; or Pensacola, Panama City, Tampa, or Miami, Florida.

- In addition, the USCG has worked diligently to improve coastal oil-spill response since the *Deepwater Horizon* oil spill by replacing the One Gulf Plan with separate Area Contingency Plans (ACP) for each coastal USCG sector. The ACPs cover subregional geographic areas and represent the third tier of the National Response Planning System mandated by the Oil Pollution Act of 1990. The ACPs are a focal point of response planning. The GOM OCS Region's ACP's also include separate Geographic Response Plans, which are developed jointly with local, State, and other Federal entities to better focus spill response tactics and priorities. These Geographic Response Plans contain the resources initially identified for protection during a spill, response priorities, procedures, and appropriate spill-response countermeasures.

- During the *Deepwater Horizon* shoreline response, oiling conditions generally included surface and buried oil layers, surface and buried oil/sand balls, stained sand, and sunken oil in the adjacent subtidal waters. Since waste minimization was a core principle considered when cleaning sand beaches, efforts were made to remove as little sediment as practical from the shore zone during cleaning operations. Treatment methods for sand beaches consisted of manual and mechanical removal, an on-site treatment plant, and sediment relocation. Mechanical removal involved a range of commercial self-propelled or towed machines designed primarily to sieve debris and litter on recreational beaches. Field trials were conducted to evaluate which specific mechanisms were more appropriate for the different oiling conditions. The beach cleaners were used as scrapers on the more heavily oiled beaches in Louisiana, whereas the sieving function was more appropriate to recover oil particles on the beaches of Mississippi, Alabama, and Florida. Oiled wetlands included *Spartina* salt marshes and *Phragmites* ("roseau cane") brackish-freshwater wetlands in the Mississippi Delta. Because previous spills in this region provided an understanding of the recovery potential for the oiled wetlands, natural recovery was the preferred strategy in most cases based on the generally light oiling conditions. Natural attenuation was relatively rapid if an area was only lightly oiled, as the Macondo well oil type had an API gravity of 35. A guiding principle for wetland treatment was to minimize physical intrusion and work from floating platforms, skiffs, or shallow-draft barges, whenever possible. Floating mechanical flushing machines, using concrete pump arms, were used on a limited scale to reach into oiled fringe wetlands to wash and recover mobile oil. Oiled rip rap, breakwaters, and groins and jetties were treated through manual removal of bulk oil and were washed using a range of temperatures and pressure depending on the character of the oil.

Source Control and Containment

After the *Deepwater Horizon* event occurred, BSEE (then BOEMRE) issued NTL No. 2010-N10 which became effective on November 8, 2010. This NTL applies only to operators conducting operations using subsea blowout preventers (BOPs) or surface BOPs on floating facilities. The NTL also informs lessees that BSEE will be evaluating whether each operator has submitted adequate information demonstrating that it has access to and can deploy surface and subsea containment resources that would be adequate to promptly respond to a blowout or other loss of well control. The type of information that BSEE will review for, pursuant to this NTL includes, but is not limited to:

- Subsea containment and capture equipment, including containment domes and capping stacks.
- Subsea utility equipment, including hydraulic power, hydrate control, and dispersant injection equipment.
- Riser systems.
- Remotely operated vehicles.
- Capture vessels.
- Support vessels.
- Storage facilities.

To address the new improved containment systems expectations to rapidly contain a spill as a result of a loss of well control from a subsea well addressed in NTL No. 2010-N10, new, rapid response systems were developed for use in the GOM by Marine Well Containment Company (MWCC) and Helix Energy Solutions Group, Inc (Helix). These systems are designed to fully contain oil flow in the event of a potential future underwater blowout and to address a variety of scenarios. Details of these systems can be found in the 2012-2017 WPA/CPA Mulitsale EIS, and the WPA 233/CPA 231 Supplemental EIS (USDOI, BOEM, 2013).

BOEM and BSEE will not allow an operator to begin drilling operations until adequate subsea containment and collection equipment, as well as subsea dispersant capability, is determined by the agency to be available to the operator and sufficient for use in response to a potential incident from the proposed well(s). However, it would be impossible to predict with any degree of certainty the percentage of oil that could be contained subsea in the event of a spill or when, or if, complete containment would even be possible. There are some situations where this equipment might not be able to be used to control the well; for example, if the drilling structure were to fall directly on top of the well as debris during a loss of well control event. If a loss of well control event occurred in the future, it is possible that it could be contained in a best case scenario within weeks with the utilization of the rapid subsea containment packages thereby greatly limiting the amount of oil potentially lost to the environment.

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