National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling

THE USE OF SURFACE AND SUBSEA DISPERSANTS DURING THE BP DEEPWATER HORIZON OIL SPILL

---Draft---

Staff Working Paper No. 4

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This Working Paper examines the issues raised by the use of dispersants in the Deepwater Horizon spill. Dispersants change the distribution, not the amount, of oil within a marine environment. They are chemicals typically applied directly to oil on the water surface in order to break the oil into small droplets that can then mix with water below the surface. The dispersed oil is rapidly diluted, mixing both vertically and horizontally in the water column.[1] While this alleviates high concentrations at the surface, it may expose organisms to lower, but more widespread, concentrations of oil.

The use of dispersants in the aftermath of the Macondo deepwater well explosion was controversial for three reasons.[2] First, the total amount of dispersants used was unprecedented: 1.84 million gallons. Second, 771,000 of those gallons were applied at the wellhead, located 5,067 feet below the surface. Little or no prior testing had been done on the effectiveness and potential adverse environmental consequences of subsea dispersant use, let alone at those volumes.[3] Third, the existing federal regulatory system pre-authorized dispersant use in the Gulf

[1] Press Conference with Lisa P. Jackson, EPA Administrator (May 24, 2010), *available at* http://www.epa.gov/bpspill/dispersants/statement-dispersant-use-may24.pdf [hereinafter Jackson Press Conference]. For further information about dispersants, see Committee on Understanding Oil Spill Dispersants: Efficacy and Effects, National Research Council of the National Academies, UNDERSTANDING OIL SPILL DISPERSANTS: EFFICACY AND EFFECTS 9 (2005), *available at* http://www.nap.edu/catalog/11283.html [hereinafter NRC Report].

[2] The day after the Macondo well was capped and the amount of daily dispersant use dropped precipitously, a group of marine scientists opposed to the high volume use of dispersants issued a statement calling for an immediate end to their use. *See* Susan D. Shaw et al., *Consensus Statement: Scientists Oppose the Use of Dispersant Chemicals in the Gulf of Mexico* (July 16, 2010), *available at* http://www.meriresearch.org/Portals/0/Documents/CONSENSUS%20STATEMENT%20ON%20DISPERSANTS%20IN%20THE%20GULF%20updated%20July%2017.pdf.

[3] BP's "Lessons Learned" report refers to "limited trials" and "some discussion in technical papers of applying dispersant to the source." BP, DEEPWATER HORIZON CONTAINMENT AND RESPONSE: HARNESSING CAPABILITIES AND LESSONS LEARNED 26 (2010), *available at* http://www.boemre.gov/ooc/PDFs/NarrativeFinal.pdf. BP also claims that "EPA has permitted use of dispersants subsea to remediate oil spills since the 1990s." *Id.* None of the experts (whether from EPA, BP, or independent) with whom Commission staff spoke in researching this paper was

of Mexico without any limits or guidelines as to amounts or duration. Faced with an emergency, the government had to make decisions about high-volume and subsea dispersant use within time frames that denied officials the opportunity to gather necessary information. The resulting uncertainty even fueled unfounded suspicions that BP was using dispersants without authorization from the government in an effort to mask the oil and to limit its ultimate liability.

This paper considers two issues. The first is how well the government handled the dispersant issues it faced in the absence of necessary scientific information and pursuant to a regulatory regime that had failed to anticipate this kind of problem. The second is how, in light of lessons learned from this recent experience, government procedures and existing laws might be improved to allow for sounder decisions regarding the use of dispersants in the future.

The paper is divided into three parts. Part I provides background information on dispersants and their potential authorization for use in responses to oil spills. It then recaps the chronology of the use of dispersants following the Macondo well explosion. This chronology includes the volume of dispersants used, where they were used, the types of dispersants used, and the role of various government agencies in making relevant decisions regarding dispersant use. Part I also describes some of the contemporaneous public controversy concerning the use of dispersants, including the debate, still ongoing, regarding their potentially adverse impacts. Part II considers the distinct questions of whether the government's decisions were reasonable at the time; and whether, regardless of their reasonableness or unreasonableness when made, preliminary scientific research since undertaken suggests those decisions may, in fact, have been sensible. Finally, Part III describes some possible implications for changes in agency procedures and regulations arising out of the use of dispersants in the Deepwater Horizon spill response that Commissioners may wish to consider.

I. Background on Dispersants

A. The Trade-offs of Dispersant Use

When an oil spill occurs, responders have several tools to manage potential environmental impacts. Mechanical means are generally preferred, but they cannot always be used and do not recover all of the spilled oil.[4] Non-mechanical methods such as *in-situ* burning and chemical dispersants can contribute to the elimination of the oil. In response to the

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aware of prior subsea use of dispersants, which suggests that any such use or approval was not well-known. On September 7, 2010, we requested information from BP's counsel regarding the trials, papers, and EPA actions to which BP refers. On September 27, 2010, BP's counsel confirmed in an email to Commission staff that "the reference on page 26 of the report to EPA's approval of subsea dispersant use in the 1990s is an error. Although dispersants have been on the Product Schedule since the 1970s, we understand that only surface uses were contemplated in the 1990s." BP's counsel also provided the Commission staff with references to two technical papers discussing the application of subsea dispersants. *See, e.g.*, NRC Report at 138.

[4] *See* NRC Report at 9 ("The effectiveness of mechanical response techniques is variable and highly influenced by the size, nature, and location of the spill as well the environmental conditions under which the response is carried out. Essentially, mechanical response works satisfactorily under a finite subset of all possible spill scenarios.").

Deepwater Horizon oil spill, BP used large amounts of the dispersant Corexit 9500 and some Corexit 9527.[5]

Dispersants function like detergents to break up oil into small droplets that mix easily with water. They contain a combination of surfactants and solvents. Surfactants are compounds that have lipophilic groups, which mix with non-polar substances like oil, and hydrophilic groups, which mix with polar substances like water. By combining lipophilic and hydrophilic groups, surfactants can lower surface tension to allow water and oil to mix more easily.[6] The solvents help the surfactants pass through the oil to reach the oil-water boundary where the surfactants operate.[7]

The resulting oil/water mixture takes the form of small droplets of dispersant-covered oil, which, because of their small size, can remain suspended in water rather than rising to the surface.[8] These droplets can move into and through the water column from the water's surface.[9] This process depends on outside forces to disperse the oil droplets through the top of the water column. For that reason, dispersants applied to surface oil slicks are more effective in areas with high wave energy.[10]

The toxicity of available dispersants has diminished substantially over the past several decades.[11] Generally, dispersants are less toxic than oil or chemically dispersed oil. However, dispersants and dispersed oil are typically more toxic than oil alone to embryos and larvae.[12]

Using dispersants to remove oil from the water surface has several potential benefits. First, less oil will float ashore to adversely affect shorelines and fragile estuarine environments. Second, animals and birds that float on or wade through the water surface may be less exposed to oil.[13] Third, dispersants may accelerate the rate at which oil biodegrades. Smaller droplets have a larger surface-area-to-volume ratio, which in theory should allow microorganisms greater access to the oil, and speed their rate of consumption. The expected acceleration of this biodegradation is often cited as a major reason to use dispersants.

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[5] *See* David Biello, *Is Using Dispersants on the BP Gulf Oil Spill Fighting Pollution with Pollution?*, SCI. AM. (June 18, 2010), *available at* http://www.scientificamerican.com/article.cfm?id=is-using-dispersants-fighting-pollution-with-pollution. Toxicity information on these dispersants can be found in Anita George-Ares & James R. Clark, *Aquatic Toxicity of Two Corexit Dispersants*, 40 CHEMOSPHERE 897 (2000).

[6] *See* Coastal Response Research Center, RESEARCH & DEVELOPMENT NEEDS FOR MAKING DECISIONS REGARDING DISPERSING OIL 1 (Apr. 2006), http://www.crrc.unh.edu/dwg/dispersant_workshop_report-final.pdf [hereinafter CRRC Report].

[7] *See* International Tanker Owners Pollution Federation Ltd, *Dispersants*, http://www.itopf.com/spill-response/clean-up-and-response/dispersants/.

[8] *See* CRRC Report at 7.

[9] *See* NRC Report at 10.

[10] *See* Merv Fingas, A REVIEW OF LITERATURE RELATED TO OIL SPILL DISPERSANTS 1997-2008 5 (Sept. 2008), *available at* http://www.pwsrcac.org/docs/d0053000.pdf.

[11] NRC Report at 207.

[12] *Id.*

[13] The NRC Report, however, suggests that the effect of dispersants on the fur and feathers of animals and birds—*e.g.*, potential negative effects on waterproofing—requires further study. *See* NRC Report at 196, 274.

There are uncertainties regarding both the actual realization of some of these benefits, especially in the subsea, and potential offsetting costs. For instance, less oil on the surface means more in the water column, increasing exposure for subsurface marine life. And, while the smaller droplets may accelerate biodegradation, their smaller size increases the dissolution of potentially toxic compounds and exposure to aquatic organisms. Moreover, according to at least some scientific literature, the assumption of increased biodegradation may not always be accurate. Some studies have found that dispersants have no effect on the biodegradation rate or may even inhibit biodegradation.[14] It is also only largely in the aftermath of the Macondo well explosion that scientists have begun to research the extent to which oil-eating bacteria are present at the low temperatures of deepwater.[15] Finally, there is no reason to suppose that all dispersants act in the same manner. They may, depending upon their chemical makeup, have strikingly dissimilar impacts. For example, some evidence indicates that the ionic surfactant in Corexit 9527 and 9500 inhibits biodegradation while their non-ionic surfactants increase biodegradation.[16]

B. Regulation of the Use of Dispersants in Oil Spill Response

The Clean Water Act expressly contemplates the use of dispersants in response to oil spills. Section 311(d)(2)(G) of the Act requires that the federal National Contingency Plan for oil spill response contain a schedule identifying:

> (i) dispersants . . . , if any, that may be used in carrying out the Plan,
>
> (ii) the waters in which such dispersants . . . may be used, and
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> (iii) the quantities of such dispersant . . . which can be used safely in such waters . . . .[17]

In addition, subsection (G) requires each schedule to provide for use of other, non-listed dispersants: "[T]he President, or his delegate, may, on a case-by-case basis, identify the dispersants, other chemicals, and other spill mitigating devices and substances which may be used, the waters in which they may be used, and the quantities which can be used safely in such waters."[18]

The National Contingency Plan under the Clean Water Act and Oil Pollution Act of 1990 further provides for the establishment of regional and area-wide contingency plans, which may expressly pre-authorize the use of dispersants:

> In meeting the provisions of this paragraph, preauthorization plans may address factors such as the potential sources and types of oil that might be spilled, the existence and location of environmentally sensitive resources that might be impacted by spilled oil, available product and storage locations, available equipment and adequately trained operators, and the available means to monitor product application and effectiveness . . . .

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[14] *See* Fingas at 22.
[15] *See, e.g.*, Richard Camilli et al., *Tracking Hydrocarbon Plume Transport and Biodegradation at Deepwater Horizon*, SCIENCE (Aug. 19, 2010) , http://www.sciencemag.org/cgi/content/abstract/science.1195223); Terry C. Hazen, et al., *Deep-Sea Plume Enriches Indigenous Oil-Degrading Bacteria*, SCIENCE (Aug. 24, 2010), http://www.sciencemag.org/cgi/content/abstract/science.1195979.
[16] *See* Fingas at 22.
[17] 33 U.S.C. § 311(d)(2)(G).
[18] *Id.*

> Approved preauthorization plans shall be included in the appropriate RCPs and ACPs [regional and area contingency plans].[19]

When dispersants have *not* been pre-authorized in an oil spill response contingency plan, they can still be approved after a spill has occurred. Federal regulations require the Federal On-Scene Coordinator to obtain "concurrence" in this circumstance from EPA and applicable state authorities, but require only "consultation" with the Department of Commerce (through the National Oceanic and Atmospheric Administration [NOAA]) and the Department of the Interior:

> [T]he OSC [On-Scene Coordinator], with the concurrence of the EPA representative to the RRT [Regional Response Team] and, as appropriate, the concurrence of the RRT representatives from the states with jurisdiction over the navigable waters threatened by the release or discharge, and in consultation with the DOC [Department of Commerce, *i.e.*, NOAA] and DOI [Department of the Interior] natural resource trustees, when practicable, may authorize the use of dispersants, surface washing agents, surface collecting agents, bioremediation agents, or miscellaneous oil spill control agents on the oil discharge, provided that the products are listed on the NCP [National Contingency Plan] Product Schedule.[20]

The effect of pre-approval, accordingly, is to eliminate the need for approvals and consultations during the response and to allow the Federal On-Scene Coordinator to act unilaterally.

The National Contingency Plan also establishes "Area Committees"[21] under the direction of a Federal On-Scene Coordinator[22] that are charged with "work[ing] with State and local officials to expedite decisions for the use of dispersants and other mitigating substances and devices."[23]

The decision whether to approve the use of dispersants can be difficult, whether it occurs through the pre-approval process in developing a contingency plan or, in the absence of pre-approval, once a spill has occurred. As described by the National Research Council of the National Academies of Sciences, "[g]iven the potential impacts that dispersed oil may have on water-column and seafloor biota and habitats, thoughtful analysis is required prior to the spill

[19] 40 C.F.R. § 300.910(a).
[20] 40 C.F.R. § 300.910(b).
[21] "There is established for each area designated by the President an Area Committee comprised of members appointed by the President from qualified personnel of Federal, State, and local agencies." Clean Water Act § 311(j)(4)(A); 40 C.F.R. § 300.5. In the spill-affected area there are two "areas" (and thus Area Committees) for Louisiana, three for Texas, two for Northwest/West Florida, and one for Mississippi/Alabama.
[22] "On-scene coordinator (OSC) means the federal official pre-designated by EPA or the USCG [U.S. Coast Guard] to coordinate and direct responses under subpart D, or the government official designated by the lead agency to coordinate and direct removal actions under subpart E of the NCP." 40 C.F.R. § 300.5. Rear Admiral Mary Landry was the Federal On-Scene Coordinator until June 1, 2010, when Rear Admiral James Watson assumed that role. On July 12, 2010, Rear Admiral Paul Zukunft replaced Admiral Watson as the Federal On-Scene Coordinator.
[23] Clean Water Act § 311(j)(4)(B); *see also* 40 C.F.R. § 300.910(a) ("RRTs Area Committees shall address, as part of their planning activities, the desirability of using appropriate dispersants, surface washing agents, surface collecting agents, bioremediation agents, or miscellaneous oil spill control agents listed on the NCP Product Schedule, and the desirability of using appropriate burning agents.").

event so that decision makers understand the potential impacts with and without dispersant application."[24] The trade-offs are complex:

> Decisions to use dispersants . . . involve trade-offs between decreasing the risk to water surface and shoreline habitats while increasing the potential risk to organisms in the water column and on the seafloor. This trade-off reflects the complex interplay of many variables, including the type of oil spilled, the volume of the oil, sea state and weather, water depth, degree of turbulence (thus mixing and dilution of the oil), and relative abundance and life stages of resident organisms.[25]

Under the National Contingency Plan, EPA is responsible for obtaining dispersant toxicity data from industry before placing a dispersant on the product schedule, which then serves as the basis for listing particular dispersants for pre-approved use in oil spill response contingency plans. The accuracy and consistency of pre-listing testing by manufacturers has been questioned, with toxicologists suggesting that the results of industry testing vary more widely than they should.[26]

Moreover, the required pre-authorization testing is limited to acute toxicity studies (48 and 96 hours) on two species: a fish species and a mysid shrimp species, *Menidia beryllina* and *Mysidopsis bahia*, respectively. EPA commonly uses these species in laboratory tests, and they are useful in providing comparative acute toxicity information, but the tests are not designed as proxies for all possible adverse ecosystem impacts. The pre-testing of dispersants did not include other important matters such as environmental persistence, effectiveness with multiple varieties of oil and at multiple temperatures, byproducts, and endocrine effects.

C. The Use of Dispersants in Response to the Deepwater Horizon Spill

The federal government's response to the oil spill began immediately after the Macondo well explosion on the night of April 20, 2010. In addition to the emergency search-and-rescue mission, efforts to address the released oil were soon underway. Pursuant to the National Contingency Plan, the Coast Guard Captain of the nearest port, Morgan City, Louisiana, served as the Federal On-Scene Coordinator, in charge of the government's response action, until a few days later when the District (Eight) Commander, Rear Admiral Mary Landry, took over the Coordinator role.

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[24] *See* NRC Report at 3.

[25] *Id.* at 2.

[26] *See* Biello, *Fighting Pollution with Pollution.* Discrepancies between the pre-approval tests and EPA's post-spill toxicity testing results suggest that there were potential flaws in the earlier testing, although it may not be possible to resolve that question definitively at this late date. The pre-approval tests found differences in toxicity between dispersants that did not appear in the EPA test. *Gulf Coast Oil Spill: Small Business and the Cleanup Effort Before the S. Subcomm. On Small Business and Entrepreneurship*, 111th Cong. (June 18, 2010) (statement of Carys Mitchelmore) ("Noteworthy is that the reference toxicant LC50s for the different dispersants listed on the NCPPS differ by orders of magnitude, up to nearly 300-fold. For example, in Table 2 reference toxicant data for the mysid shrimp tests range from an LC50 (ppm, 96-hr) from 0.98 (for Sea Brat #4) to 267.7 (for Nokomis 3-F4). One product (Nokomis 3-AA) used copper sulfate as a reference toxicant instead of the EPA-required SDS reference toxicant. These issues are of concern if you are trying to compare the relative toxicity of the dispersants. Indeed, this currently, cannot be accurately assessed given the data presented on the NCPPS. These toxicity tests should be repeated.").

The oil spill response contingency plans applicable to the Gulf (Regions 4 and 6 within the National Response Plan framework) pre-authorized the use of a list of specific dispersants. Neither of the plans limited the overall volume or duration of such pre-authorized use.[27] With the permission of the Federal On-Scene Coordinator, BP applied 14,654 gallons of the dispersant Corexit, which was on the approved list, on the surface during the week of April 20-26, 2010.[28] On April 29, 2010, the Coast Guard formally designated the Gulf spill a "Spill of National Significance" pursuant to the Oil Pollution Act.[29] Based on that designation, the Commandant of the Coast Guard, Admiral Thad Allen, became the "National Incident Commander" in charge of the federal government's response actions.

During May, dispersants were applied both to the surface and subsea, and the volume used increased rapidly. During the week of April 27 to May 3, 2010, responders applied 141,358 gallons to the surface, and that amount grew to 168,988 by the following week.[30] The week of May 11 to May 17, 2010, the amount of surface dispersants used reached 255,000 gallons.[31]

On May 1, 2010, Admiral Thad Allen reported that response crews had begun testing the subsurface application of dispersants to oil escaping from the broker riser.[32] Nearly 3,000 gallons of subsea dispersants were applied.[33] At the time, it was unclear whether the National Contingency Plan's pre-approval of the use of dispersants in the Gulf applied to subsea use in addition to surface use, and therefore whether additional EPA approval and NOAA consultation were required.[34] Notwithstanding those uncertainties regarding governing law, on May 7, 2010, "having deployed test applications of subsea dispersants, EPA halted subsea dispersant operations, awaiting additional test results."[35]

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[27] The Region 6 dispersant guidelines pre-authorize use of any dispersant on the National Product Schedule in water at least ten meters deep and at least three miles from shore. Region 4's dispersant guidelines give the same general pre-authorization, but exclude certain geographic areas. Both sets of guidelines also provide the Federal On-Scene Coordinator with a checklist of factors to consider—not including overall volume or duration —in determining whether to permit dispersant use. RRT-6, FOSC DISPERSANT PRE-APPROVAL GUIDELINES AND CHECKLIST (2001), *available at* http://www.losco.state.la.us/pdf_docs/RRT6_Dispersant_Preapproval_2001.pdf; REGION IV REGIONAL RESPONSE TEAM RESPONSE AND TECHNOLOGY COMMITTEE DISPERSANT WORKGROUP, USE OF DISPERSANTS IN REGION IV (1996), *available at* http://ocean.floridamarine.org/acp/mobacp/PDF/ANNEXES/RRT%20IV%20Dispersant%20Policy.pdf.

[28] Figures on the volume of dispersant use are either taken directly from, or calculated based on data in, the *Operations and Ongoing Response* daily reports for the Deepwater Horizon Response, available at www.restorethegulf.gov [hereinafter Restore the Gulf Estimates].

[29] Campbell Robertson, *White House Takes a Bigger Role in the Oil Spill Cleanup*, N.Y. TIMES (Apr. 29, 2009).

[30] Restore the Gulf Estimates.

[31] *Id.*

[32] *See* Transcript from Press Briefing, Coast Guard Commandant Thad Allen and Assistant to the President for Homeland Security John Brennan (May 1, 2010), *available at* http://coastguardnews.com/gulf-oil-spill-press-conference-transcript/2010/05/01/; Deepwater Horizon Response, *The Ongoing Administration-Wide Response to the Deepwater Horizon Oil Spill* (May 3, 2010), *available* at http://www.restorethegulf.gov/release/2010/05/03/ongoing-administration-wide-response-deepwater-horizon-oil-spill [hereinafter May 3, 2010 Release].

[33] May 3, 2010 Release.

[34] Interview with Coast Guard official.

[35] *See* H.R. Committee on Energy and Commerce, 111th Cong., CHRONOLOGY OF DEEPWATER HORIZON EVENTS, *available at* http://energycommerce.house.gov/documents/20100615/EE.Attachment.A.2010.6.12.pdf.

Testing and monitoring, however, presented substantial logistical and organizational problems. BP itself performed three tests, based on protocols established by EPA and the Coast Guard.[36] On May 15, 2010, the testing for effectiveness and toxicity that had been completed prompted EPA and the Coast Guard to announce their joint approval of subsea dispersant use with the condition that BP conduct further monitoring.[37] The EPA Administrator, Lisa Jackson, made the approval decision on behalf of EPA herself and has since publicly acknowledged the difficulty of making this decision with the limited amount of scientific information then available. Considerations related to response worker health and ease of application—subsea application would minimize the necessary human contact with dispersants, and could occur at night and in foul weather—reportedly played a role in the decision to approve the method.[38] By May 17, 2010, BP had made extensive use of dispersants. The cumulative totals by this time were 580,000 gallons on the surface and 45,000 gallons subsea.

On May 20, 2010, in the wake of continuing media reports relating public concern about the potential toxicity of the high volumes of dispersants being used,[39] the Coast Guard and EPA issued a joint directive requiring BP to identify and use a less toxic and more effective dispersant than Corexit 9500 from the list of dispersants authorized by the National Contingency Plan.[40] According to the data in the National Contingency Plan Product Schedule, some of the pre-approved dispersants were both less toxic and more effective on South Louisiana crude oil than Corexit 9500.[41] Based on the Plan, the federal directive required BP to identify a less toxic alternative to be used both on the surface and subsea at the source of the oil leak within 24 hours, and to begin using the less toxic dispersant within 72 hours of submitting the alternative. Specifically, the directive called for toxicity levels LD_{50} "at or below" 23 parts per million (ppm)

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[36] *See* Conference Call with Lisa P. Jackson, EPA Administrator (May 12, 2010), *available at* http://www.epa.gov/bpspill/dispersants/may12transcript-final.pdf; *see also* Joel Achenbach & Steven Mufson, *Engineers draw battle lines in effort to plug gulf oil well: 'Top hat,' 'hot tap' among tactics pursued; uncertainties still loom*, WASH. POST (May 11, 2010).

[37] *See* EPA, DISPERSANT MONITORING AND ASSESSMENT DIRECTIVE FOR SUBSURFACE DISPERSANT APPLICATION (May 10, 2010); *available at* http://www.epa.gov/bpspill/dispersants/subsurface-dispersant-directive-final.pdf ; EPA, DISPERSANT MONITORING AND ASSESSMENT DIRECTIVE FOR SUBSURFACE DISPERSANT APPLICATION–ADDENDUM 1 (May 14, 2010), *available at* http://www.epa.gov/bpspill/dispersants/subsurface-dispersant-addendum-final.pdf; Press Release, Deepwater Horizon Incident Joint Information Center, *Coast Guard and EPA Approve Use of Dispersant Subsea in Further Effort to Prevent Oil From Reaching U.S. Shoreline* (May 15, 2010), *available at* http://www.restorethegulf.gov/release/2010/05/15/coast-guard-and-eps-approve-use-dispersant-subsea-further-effort-prevent-oil-reac.

[38] Jeff Goodell, *The Poisoning*, ROLLING STONE (July 21, 2010). Administrator Jackson gave a wide-ranging and candid interview to *Rolling Stone*, in which she stated that she had told her aides that the approval decision was among the hardest she had ever made. She also reportedly said that BP argued for subsea application as a method that would reduce the overall volume of chemicals discharged into the marine ecosystem. *Id.*

[39] *See, e.g.*, Elizabeth Rosenthal, *In Gulf of Mexico, A Huge Experiment with Chemical Dispersants*, N.Y. TIMES (May 6, 2010) (characterizing "BP and federal officials [as] engaging in one of the largest and most aggressive experiments with chemical dispersants in the history of the country, and perhaps the world.").

[40] *See* EPA, DISPERSANT MONITORING AND ASSESSMENT DIRECTIVE FOR SUBSURFACE DISPERSANT APPLICATION–ADDENDUM 2 (May 20, 2010), *available at* http://www.epa.gov/bpspill/dispersants/directive-addendum2.pdf [hereinafter EPA ADDENDUM 2]. BP had used Corexit 9500 and 9527, though it discontinued use of the latter early on during the spill because Corexit 9527 contained 2-butoxyethanol, which had allegedly created health problems for *Exxon Valdez* workers. *See* Elana Schor, *Ingredients of Controversial Dispersants Used on Gulf Spill Are Secret No More*, N.Y. TIMES (June 9, 2010).

[41] *See* EPA, NATIONAL CONTINGENCY PLAN PRODUCT SCHEDULE TOXICITY AND EFFECTIVENESS SUMMARIES, *available at* http://www.epa.gov/emergencies/content/ncp/tox_tables.htm#dispersants.

for *Menidia* or 18 ppm for *Mysidopsis*.[42] If BP was unable to identify acceptable alternative dispersant products, BP had to provide the Coast Guard and EPA with a detailed description of the alternative dispersants investigated, and the reasons it believed those products did not meet the required standards.[43]

BP responded to the directive the day it was issued.[44] BP contended that only five products on the National Contingency Plan Product Schedule (which lists acceptable dispersants) met the criteria in the directive and that Corexit 9500A was the "best alternative."[45] BP noted that one of these five acceptable dispersants "contains a small amount of a chemical that may degrade to a nonylphenol," a class of chemicals that have been identified as potential endocrine disruptors and may persist in the environment for a period of years.[46] Unfortunately, BP said, neither the manufacturer nor BP had had the opportunity to test the product for these potential effects.[47]

BP said that it would be prudent to obtain the chemical formulas for the other dispersants to evaluate their potential to degrade to a nonylphenol, but indicated that it had not been able to do so.[48] BP noted that "there may be only limited information on the constituents of the dispersants, since the dispersants typically contain proprietary substances whose identities are not publicly available."[49] In contrast, BP explained, the manufacturer of Corexit had said that it reached "maximum biodegradability" within one month and was not persistent in the environment.[50] In short, BP concluded, Corexit "appears to have fewer long term effects than the other dispersants evaluated."[51] BP also made clear that the company did not, in any event, then have a sufficient stockpile of any dispersants other than Corexit and Sea Brat #4, and that the Sea Brat #4 supply might not be sufficient for both surface and subsea use.[52] Corexit 9500 was the only dispersant used during the remainder of the spill.

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[42] *See* EPA ADDENDUM 2. LD_{50} is the dose that is lethal to 50% of the test population. *Menidia* is a genus of silverside fish found in the Gulf of Mexico. *Mysodopsis* are a type of shrimp used for toxicity testing. The reference to toxicity levels "at or below" designated LD_{50} levels was confusing, because a higher LD_{50} actually means a safer substance.

[43] *See id*.

[44] *See* Letter from Douglas J. Suttles of BP to Rear Admiral Mary Landry, Commander, Eighth Coast Guard District, and Samuel Coleman, Director, Superfund Division EPA Region 6 (May 20, 2010), *available at* http://www.epa.gov/bpspill/dispersants/5-21bp-response.pdf [hereinafter Suttles Letter]. This letter refers to the directive (EPA Addendum 2) as having a May 19, 2010 date.

[45] Corexit is a product of the Nalco Company, headquartered in Napier, Illinois. Corexit 9500A contains petroleum distillates, propylene glycol, and a proprietary organic sulfonate (a type of detergent). *See* Safety Data Sheet, Nalco Company, Corexit EC 9527A (May 11, 2010), *available at* http://www.deepwaterhorizonresponse.com/posted/2931/Corexit_EC9527A_MSDS.539295.pdf (last visited Sept. 14, 2010).

[46] *See* Suttles Letter.

[47] *See id.* The manufacturer tests were also conducted by different laboratories and on dispersants mixed with No. 2 fuel oil, not Louisiana sweet crude. *See* EPA, DISPERSANTS TOXICITY TESTING–PHASE II QUESTIONS AND ANSWERS (Aug. 2, 2010), *available at* http://www.epa.gov/BPSpill/dispersants/qanda-phase2.pdf [hereinafter DISPERSANTS TOXICITY Q&A] (explaining in answer to question seven that No. 2 fuel oil is not the oil in the Gulf).

[48] *See* Suttles Letter.

[49] *Id.*

[50] *Id*.

[51] *Id.*

[52] *See id*.

In a May 24, 2010 press conference, EPA Administrator Jackson stressed three points, while generally acknowledging that federal regulators remained "deeply concerned about the things we don't know" such as the "long-term effect on aquatic life."[53] First, she said, the government was instructing BP to "take immediate steps to significantly scale back the overall use of dispersants" and expressed EPA's belief that "we can reduce the amount of dispersant applied by as much as half, and I think probably 75%, maybe more."[54] Second, she expressed dissatisfaction with BP's efforts to analyze other dispersant options.[55] Third, she announced, EPA would perform its own tests to verify BP's data and to "determine the least toxic, most effective dispersant available in the volumes necessary for a crisis of this magnitude."[56]

Two days later, Administrator Jackson sent a letter to David Rainey of BP criticizing BP's inadequate compliance with the May 20, 2010 directive, which had instructed BP "to analyze alternative dispersants for toxicity and effectiveness and report back within 24 hours."[57] "Because we believe your analysis of potential alternative dispersants was insufficient," she wrote, "the EPA is performing its own scientific verification of the data BP presented."[58] EPA said it would make laboratory comparisons with Gulf of Mexico species, including a silverside fish and a mysid shrimp.[59] EPA would also identify a test for endocrine disrupters.[60] Administrator Jackson's letter continued: "Furthermore, as we discussed, the federal government, led by the Coast Guard, is reiterating its instructions to BP to take immediate steps to significantly scale back the overall use of dispersants."[61] A May 26, 2010 directive provided that "BP shall eliminate the surface application of dispersants" except in "rare cases where there may have to be an exemption."[62]

On June 30, 2010, EPA released results of its own testing of eight dispersants.[63] EPA had conducted acute toxicity tests with two Gulf of Mexico aquatic species, and *in vitro* cytotoxicity (cell damage) and endocrine screening assays using human cell lines. EPA's results indicated that none of the eight dispersants displayed significant endocrine disrupting activity. It also suggested that Corexit 9500 was not overall more toxic than alternatives: "While the dispersant products alone—not mixed with oil—have roughly the same impact on aquatic life,

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[53] Jackson Press Conference.
[54] *Id.*
[55] *Id.*
[56] *Id.*
[57] Letter from Lisa P. Jackson, EPA Administrator, to David Rainey, V.P. of Gulf of Mexico Exploration, BP Exploration and Production (May 26, 2010), *available at* http://www.epa.gov/bpspill/dispersants/Rainey-letter-052610.pdf.
[58] *Id.*
[59] *See id.*
[60] *See id.*
[61] *Id.*
[62] *See* EPA, DISPERSANT MONITORING AND ASSESSMENT DIRECTIVE FOR SUBSURFACE DISPERSANT APPLICATION–ADDENDUM 3 (May 26, 2010), *available at* http://www.epa.gov/bpspill/dispersants/directive-addendum3.pdf.
[63] *See* Press Release, Deepwater Horizon Incident Joint Information Center, *EPA Releases First Round of Toxicity Testing Data for Eight Oil Dispersants* (July 1, 2010), *available at* http://www.deepwaterhorizonresponse.com/go/doc/2931/731363/ The dispersants were Corexit 9500A, Dispersit SPC 1000, JD-2000, Nokomis 3-AA, Nokomis 3-F4, SAF-RON GOLD, Sea Brat #4 and ZI-400.

JD-2000 and Corexit 9500 were generally less toxic to small fish and JD-2000 and SAF-RON GOLD were least toxic to mysid shrimp."[64]

The effort to scale back use of dispersants had some effect. During the week of May 18, 2010, BP applied 190,000 gallons total.[65] The following week, it applied roughly two-thirds as much (135,000 gallons).[66] Surface use fell from 120,000 gallons the week of May 18, 2010, to 40,000 gallons the week of May 25, 2010, although it then rose again and remained steady for several weeks at 80-90,000 gallons per week. By the end of May, BP had used a total of 950,000 gallons of dispersants, of which 740,000 were applied on the surface and 210,000 subsea.[67] As the following table shows, use of dispersants remained at a roughly constant level through most of June, but then began to decline again later in the month through early July:

Table 1: Weekly Use of Dispersants June 1-July 12[68]

Week	**Weekly Use of Dispersants (gallons)**	**Total Use of Dispersants to Date (gallons) (lower bound)[69]**
June 1 – June 7	171,000 (total): 50,000 (surface) 121,000 (subsea)	1.12 million (total): 790,000 (surface) 331,000 (subsea)
June 8 – June 14	163,000 (total): 92,000 (surface) 71,000 (subsea)	1.28 million (total): 882,000 (surface) 402,000 (subsea)
June 15 – June 21	169,000 (total): 88,000 (surface) 80,000 (subsea)	1.45 million (total): 970,000 (surface) 482,000 (subsea)
June 22 – June 28	112,000 (total): 30,000 (surface) 83,000 (subsea)	1.56 million (total): 1 million (surface) 565,000 (subsea)
June 29 – July 5	145,000 (total): 40,000 (surface) 92,000 (subsea)	1.71 million (total): 1.06 million (surface) 645,000 (subsea)
July 6 – July 12	90,000 (total) 10,000 (surface) 90,000 (subsea)	1.8 million (total) 1.07 (surface) 735,000 (subsea)

[64] *Id.*
[65] *See* Restore the Gulf Estimates.
[66] *Id.*
[67] *Id.*
[68] *Id.* Note that "totals" may not exactly correspond to the sum of components, apparently due to rounding, use of different data sources, or minor calculation errors in the original source. Weekly totals in the table are calculated by subtracting the government figures for cumulative use between weeks; the results do not always correspond to the amounts reported separately for subsea and surface use. The discrepancies in the government figures appear to be relatively minor, however.
[69] The "lower bound" refers to the fact that, according to the source, use was "more than" these amounts.

Despite the joint Coast Guard-EPA directive that BP "eliminate the surface application of dispersants" except in "rare cases where there may have to be an exemption," the use of surface dispersants was not eliminated after May 26, 2010. The "rare cases" were not very rare. Until late June, surface use in most weeks remained at about 40% of the pre-directive rate. The directive remained in effect despite suggestions that it be modified as responders became aware that the oil flow was much larger than previously believed.[70]

After the well was capped on July 15, 2010, there was virtually no further use of dispersants. By that time, BP had applied a total of 1.84 million gallons, of which 1.07 million gallons were applied on the surface and 771,000 gallons were subsea.[71] As Table 1 indicates, the amounts injected underwater became larger than the amounts applied to the surface during the last three weeks. The week before the well was capped, only about 10% of dispersants used were applied to the surface. The National Incident Command estimated in an August 4, 2010 report that approximately 8% of the oil emanating from the well was chemically dispersed, either subsea or on the surface, while about three times that much evaporated or dissolved, and twice that much was dispersed naturally at the wellhead.[72]

Although the use of dispersants had ended earlier in the month, debate about the use of dispersants surfaced again at the end of July. On July 12, 2010, Admiral Allen's Chief of Staff informed Rep. Edward Markey that dispersants were used "only when absolutely necessary to preserve the health and safety of workers at the well site and to minimize shoreline impacts."[73] On July 30, 2010, Rep. Markey sent a letter to Admiral Allen pointing to more than 74 BP exemption requests in 48 days, of which all but ten were fully approved by the Coast Guard. Rep. Markey alleged "these applications appear to be rubber stamped by the Coast Guard."[74]

The next day, in a conference call, Admiral Allen and Administrator Jackson replied that they had cooperated closely and nearly attained the goal of a 75% reduction in dispersant use.[75] On August 1, 2010, Admiral Allen said in a press conference that field commanders on a case-by-case basis decided to use dispersants where surveillance aircraft spotted oil and no other method of cleaning it up was available in the area. Admiral Allen noted that the decision to use the dispersants did not rest with BP. Rather, he said, "it's a decision by the Federal on-scene coordinator" through a "very disciplined doctrinal process."[76]

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[70] Letter from Rear Admiral James A. Watson, Federal On-Scene Coordinator, to Regional Response Team, Federal Region VI (June 22, 2010), *available at* http://markey.house.gov/images/DISPERSANTDOCUMENTSJUNE22-24.pdf.

[71] *Id.*

[72] *See* notes 94 and 95, *infra*.

[73] Letter from Peter Gautier, Chief of Staff, National Incident Command, to Rep. Edward J. Markey (July 12, 2010), *available at* http://markey.house.gov/docs/07-30-10ejmtocgdispersants.pdf.

[74] Letter from Rep. Edward J. Markey to Admiral Thad W. Allen, National Incident Commander, United States Coast Guard (July 30, 2010), *available at* http://markey.house.gov/docs/07-30-10ejmtocgdispersants.pdf.

[75] Matthew L. Wald, *Despite Directive, BP Used Dispersant Often, Panel Finds*, N.Y. TIMES (Aug. 1, 2010). Commission staff has learned from EPA staff that this claim was based on a comparison to the highest daily rate of use, rather than a comparison of amounts used on a weekly basis. *See* Table 1.

[76] Press Conference with Thad Allen, National Incident Commander, U.S. Coast Guard (Aug. 1, 2010), *available at* http://www.restorethegulf.gov/release/2010/08/01/transcript-press-briefing-national-incident-commander-admiral-thad-allen-0.

In a *CNN* interview the following day, Admiral Allen elaborated upon the working relationship between Coast Guard and EPA regarding the use of dispersants. According to the Admiral, he and Administrator Jackson "talk daily about dispersant use," the Coast Guard "ha[s]n't ignored EPA's guidelines," and he was "satisfied" with dispersant use in the Deepwater Horizon disaster.[77] Relatedly, *CNN* quoted an EPA spokesman as saying that, "[w]hile EPA may not have concurred with every individual waiver granted by the federal on-scene coordinator, the agency believes dispersant use has been an essential tool in mitigating this spill's impact, preventing millions of gallons of oil from doing even more damage to sensitive marshes, wetlands and beaches and the economy of the Gulf coast."[78] These statements suggested that coordination with EPA did not mean that the Federal On-Scene Coordinator heeded EPA's advice on all occasions. Given the pre-approval of dispersant use, the Federal On-Scene Coordinator was not required to do so.

II. Assessing the Federal Government's Use of Dispersants During the Deepwater Horizon Spill

It is too early to assess many aspects of the federal government's use of dispersants in response to the Deepwater Horizon spill between the explosion on April 20, 2010, and the containment of the well on July 15, 2010. In making any assessment, moreover, it is important to distinguish between three inquiries: (1) whether the federal government adequately prepared in advance for the possible use of dispersants to address such a spill; (2) whether, once the spill occurred, the government's decisions regarding the use of dispersants were reasonable in light of the resources and the information then available; and (3) whether, with the benefit of hindsight, those government decisions, regardless of their reasonableness or unreasonableness when made, resulted in benefits that outweighed harms.

A. The Adequacy of the Government's Contingency Planning

The first of these three questions is the one most easily answered. The government was not adequately prepared for the use of dispersants to address such a large oil spill. Notwithstanding the National Contingency Plan's express requirements for planning regarding the use of dispersants, including pre-authorization to deal with emergencies, EPA clearly did not anticipate the potential demands of an oil spill of the kind the nation faced after the Macondo well explosion. In particular, EPA did not consider, in its roles on the National Response Team and the relevant Regional Response Teams, the possibility that dispersants might have to be used in the massive volumes required in the Gulf. And EPA did not consider the distinct possibility that massive volumes of dispersants might be needed at the subsea level.

Neither omission can be justified on the ground that a major subsea spill was wholly unforeseeable. The oil and gas industry has been extracting high volumes of oil from reservoirs in the Gulf for twenty years. This is not a new, unanticipated development. Nor is deepwater drilling. Yet, just as the Minerals Management Service and industry failed to plan adequately for a blowout of this magnitude and duration (topics to be discussed in other staff work), EPA did

[77] *Allen 'satisfied' with dispersant use in Gulf oil disaster,* CNN (Aug. 2, 2010), http://edition.cnn.com/2010/US/08/01/gulf.oil.spill/index.html#fbid=CAHE69XH089.
[78] *Id.*

not consider adequately the challenges of dispersant use flowing from large-scale drilling operations, especially operations in deepwater. EPA did not require studies or testing that took account of the likely amounts or locations of dispersant use necessary in the event of a well blowout, in particular a deepwater blowout.

Nor had NOAA adequately planned for such an event. NOAA has significant responsibility to provide scientific support for national response and contingency planning pursuant to the Clean Water and Oil Pollution Acts.[79] Its related expertise arises out of its work in many areas, including its duties under the Endangered Species Act,[80] Marine Mammal Protection Act,[81] and Magnuson-Stevens Fishery Conservation and Management Act[82] to protect endangered and threatened species of marine life, marine mammals, and the nation's fisheries in U.S. waters. Yet NOAA had also not previously evaluated the potential impacts of voluminous and extended use of dispersants on marine life and the nation's fisheries.

As a result, the National Incident Commander, the EPA Administrator, and the NOAA Administrator were seriously handicapped when the Macondo well explosion occurred and decisions had to be made immediately in the absence of adequate contingency planning. These officials had to make difficult choices with insufficient information about the critical trade-offs identified by the National Academy of Sciences for the use of dispersants: the value of the dispersants in reducing the harm caused by released oil versus the potential risks of harm from the dispersants themselves. The limited toxicity data they possessed was questionable and limited to acute lethal effects on two estuarine species.[83] It did not consider potential environmental persistence resulting from repeated or continuous sublethal effects, such as endocrine disruption.

The absence of adequate contingency planning had a further negative impact on the effectiveness of the government's response. It made unclear the lines of authority between various federal agencies in determining whether dispersants should be used. In particular, there was uncertainty regarding the extent to which the Coast Guard needed to secure EPA's approval before permitting the use of dispersants. Notwithstanding the lack of any requirement that the Federal On-Scene Coordinator defer to EPA on the use of dispersants at the surface (given EPA's pre-approval), and the lack of a clear requirement with regard to the subsea, EPA decided to exercise substantial control over both types of dispersant use, which at times led to delays in necessary decision-making (and, according to Coast Guard responders, to some avoidable shoreline impacts from oil as a result of the inability to use dispersants quickly).[84]

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[79] 40 C.F.R. §§ 300.145, 300.175, 300.210.
[80] 7 U.S.C. §§ 1531 *et seq.*
[81] 16 U.S.C. §§ 1361 *et seq*.
[82] 16 U.S.C. §§ 1801 *et seq*.
[83] *See supra* note 26; Biello, *Fighting Pollution with Pollution* (quoting toxicologist Carys Mitchelmore's statement that "[i]f you think the data on COREXIT is bad, try to find any decent toxicology data on the alternatives").
[84] In interviews with Commission staff, responders stated that EPA representatives on the scene, unlike representatives from other government agencies, were not empowered to make binding decisions notwithstanding EPA's claims of authority over the use of dispersants. Instead, those EPA representatives had to relay information to agency superiors, which inevitably delayed decisions that needed to be made quickly. In addition, these response participants from other federal agencies stated that the EPA on-scene representatives sometimes lacked the necessary experience in oil spill response and that EPA scientists with such experience were not being adequately consulted in EPA's decision-making process. Finally, these individuals expressed an overall concern that EPA's

B. The Reasonableness of the Government's Decision To Authorize the Use of Dispersants at the Time It Was Made

As described above, the reasonableness of the federal government's decision to authorize the use of dispersants is distinct from the questions of whether there was adequate contingency planning (which there was not) and whether the decision ultimately turned out to be prudent. This inquiry instead focuses on whether the government acted reasonably given the limited knowledge and resources that it possessed at the time. Based on the information currently available to the Commission staff, we cannot conclude that the government acted unreasonably in deciding to approve the use of massive volumes of dispersants at the subsea and surface.

Because federal agencies had failed to plan adequately, they did not possess the scientific information that officials most certainly would have wanted to guide their choices. They had to make choices nevertheless: Millions of gallons of oil were flowing from the Macondo well into the Gulf of Mexico every day, imperiling the responders who worked in the immediate vicinity of the spill, residents living along the Gulf Coast, the Gulf marine ecosystem, and the fishing and tourism industries.

Given the conditions under which officials like Admiral Allen and EPA Administrator Jackson were acting, there is no clear evidence that their decisions to authorize high volumes of dispersants, including at the subsea, were unreasonable. They instead appear to have acted reasonably in the difficult circumstances in which they were placed. For instance, officials directed the Regional Response Teams to seek input as quickly as possible from fifty expert scientists.[85] On June 4, 2010, the experts reported a consensus that "use of dispersants and the effects of dispersing oil into the water column has generally been less environmentally harmful than allowing the oil to migrate on the surface into the sensitive wetlands and near shore coastal habitats."[86] In the experts' view, though gaps in relevant information existed, the environmental trade-off between the deep-ocean ecosystem and the shoreline made dispersants an acceptable choice.

There are, however, three caveats regarding the decision-making process. First, Commission staff heard repeated reports that EPA could have done a better job of ensuring that its on-scene representatives had both the expertise and the authority to make decisions regarding the use of dispersants, so as to avoid the delays that reportedly occurred because of the absence of such authority and expertise. For example, the Commission staff has heard from two sources

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internal decision-making procedures were simply not organized to make the kind of rapid decisions necessary in the oil spill context, which are quite different from the lengthier deliberative processes that mark the kind of long-term regulatory rulemakings in which EPA more routinely engages.

[85] In May, the Regional Response Teams asked for scientific input to direct their future dispersant use and, to that end, fifty experts met together on May 26 and 27, 2010, at Louisiana State University for the "Deepwater Horizon Dispersant Use Meeting." Coastal Response Research Center, DEEPWATER HORIZON DISPERSANT USE MEETING REPORT 5 (June 4, 2010) *available at* http://www.crrc.unh.edu/dwg/dwh_dispersants_use_meeting_report.pdf. In the meeting, the experts split into four breakout groups: (1) efficacy and effectiveness of surface and deep ocean dispersants use; (2) physical transport and chemical behavior of dispersants and dispersed oil; (3) exposure pathways and biological effects resulting from deep ocean application of dispersants; and (4) exposure pathways and biological effects resulting from surface application of dispersants. *Id.*

[86] *Id.* at 4.

that EPA waited until late June to permanently install one of the Agency's most senior officials at the Unified Command Center in Robert, Louisiana.[87]

The second caveat relates to implementation of the planned approach for decision-making regarding dispersants. The planning documents for the area require the Regional Response Teams to make decisions about novel uses of dispersants, upon request from the Federal On-Scene Coordinator. Here, as the issue of dispersant application became more and more prominent in the media and for the public, the decisions to apply both surface and subsea dispersants were taken out of hands of the Regional Response Teams. Admiral Allen and Administrator Jackson to a large extent bypassed the National and Regional Response Team structures and instead issued decisions regarding dispersant policy through joint directives. Though this reflected the high level at which the issues were being evaluated, it was outside of the process that responders were supposed to implement.

These two caveats aside, the Commission staff has reason to believe that there was generally a sound and cooperative working relationship between the federal agencies on the question of dispersants.[88] While the National and Regional Response Teams did not play the coordinating and decision-making role envisioned under the National Contingency Plan, the Federal On-Scene Coordinators worked directly with EPA and NOAA on dispersant policy. That coordination resulted in, among other things, the specific designation of subsea dispersants as an appropriate response technology subject to stringent limits on amounts as well as expansive testing and monitoring guidelines. In addition, the Federal On-Scene Coordinators and EPA worked together to reduce significantly the application of surface dispersants and to resolve the disagreements between the two agencies.

The third caveat relates to the role of BP. The fact that BP itself (or its oil spill response contractors) directly applied the dispersants authorized by the federal government led to the impression that BP rather than federal officials was in charge of decisions regarding dispersant use. Commission staff has not discovered any evidence that such a usurpation of government authority occurred. Nor could Commission staff conclude, based on interviews with Coast Guard responders, that BP or its contractors ever intentionally violated government directives regarding dispersant use (*e.g.*, regarding the permitted locations for such use). Yet, the impression remained and fueled public distrust of the decision to use dispersants.

C. The Prudence, in Hindsight, of the Federal Government's Decision To Permit Use of High Volumes of Dispersants at the Surface and Subsea

It is too soon to answer this final question with the degree of certainty necessary for scientific analysis. The gap between what federal government officials should know prior to the use of high volumes of dispersants at the surface and subsea and what they in fact know has begun to narrow. But closing that gap will require rigorous scientific inquiry based on years of

[87] Interviews with government officials.

[88] The Unified Command's working relationship with the state of Louisiana on the issue of dispersant use may not have been as cooperative. Commission staff heard in multiple interviews with state and federal government officials that Louisiana disagreed with the Unified Command's decision to apply dispersants subsea.

data collection and analysis, followed by the essential process of peer review, before any conclusions can be drawn upon which future government officials can safely rely.

With this crucial limitation in mind, EPA's preliminary analyses do not suggest that the government's use of dispersants caused major problems. Just the opposite, they support the possibility that the benefits of dispersant use outweighed the costs.

First, it appears that the subsea use of dispersants served an important function by increasing the safety of the working conditions faced by responders in the immediate vicinity of the spill. That group included individuals working on containment efforts—to cap the well—and those seeking to retrieve, burn, and skim oil. The very real concern had been that high concentrations of volatile organic compounds within the oil would be a serious safety and health hazard to response workers. The use of subsea dispersants, by reducing the volume and concentration of the oil reaching the surface, likewise reduced those associated risks.[89]

Second, EPA's subsequent toxicity tests, while still preliminary, have not revealed major problems. On August 2, 2010, EPA released the results of additional tests on the toxicity of dispersants, which the Agency contended "confirm that the dispersant used in response to the oil spill in the gulf, Corexit 9500A, is no more or less toxic than the other available alternatives."[90] The EPA report itself concluded:

> Overall, the dispersants/L[ouisiana] S[weet] C[rude]mixtures were classified as being highly toxic to moderately toxic depending on the test species and dispersant. The ZI-400/ L[ouisiana] S[weet] C[rude] mixture was the exception and would be considered only slightly toxic to *Menidia*. Corexit 9500A, the dispersant that has been applied offshore at the surface and in the deep ocean, falls into the moderately toxic category for both species. For all eight dispersants in both test species, the dispersants alone were less toxic than the dispersant-oil mixture.[91]

Finally, EPA also reported on August 2, 2010, that the dispersants seemed to have succeeded in protecting the coastal area from greater contamination from the oil spill. The Agency referred to "fluorescence data that indicated the dispersants are working to keep the oil away from the shore. . . . [T]he dispersants are working to keep oil off our precious shorelines and away from sensitive ecosystems."[92] The Agency further noted that "EPA monitoring has not found dispersant chemicals in water or sediment near coasts or wetlands."[93]

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[89] Interviews with government officials. EPA staff has told Commission staff that, while decreasing volatile organic compounds at the surface was not a primary justification for permitting subsea dispersant use, it was an important benefit that became apparent after use commenced, even without conclusive proof of a causal link between subsea use and the reduction.

[90] *See* DISPERSANTS TOXICITY Q&A.

[91] EPA, COMPARATIVE TOXICITY OF LOUISIANA SWEET CRUDE OIL (LSC) AND CHEMICALLY DISPERSED LSC TO TWO GULF OF MEXICO AQUATIC TEST SPECIES (July 31, 2010), *available at* http://www.epa.gov/BPSpill/reports/phase2dispersant-toxtest.pdf.

[92] Conference Call with Paul T. Anastas, EPA Assistant Administrator (Aug. 2, 2010), *available at* www.epa.gov/bpspill/dispersants/conference-call-transcript-08022010.pdf [hereinafter Anastas Conference Call]. Later data supports this conclusion about oxygen levels. *See* Paul Voosen & Katie Howell, *Gulf Spill Roundup: Subsurface Oil Increasingly Difficult to Detect—NOAA*, E& E NEWS (Sept. 2, 2010), http://www.eenews.net/eenewspm/print/2010/09/07/1.

[93] *See* Anastas Conference Call.

On August 4, 2010, experts from NOAA, the National Institute of Standards and Technology, and the United States Geologic Survey released two reports that lent support to the claim that dispersants decreased the harms that might have otherwise resulted from the oil spill, by indicating that a significant percentage (8%) of the oil was chemically dispersed: the *Deepwater Horizon MC252 Gulf Incident Oil Budget* and a supporting document entitled *BP Deepwater Horizon Oil Budget: What Happened to the Oil* (collectively, the Oil Budget).[94] These reports have since been the subject of controversy for potentially overstating in significant respects and understating in other respects the amount of oil from the spill "remaining" in the Gulf.[95] One major focal point of criticism was the failure of the Oil Budget to analyze and take account of biodegradation, which chemical dispersants are intended in part to promote.[96] Several subsequent, non-governmental reports have debated how quickly subsurface Macondo oil is biodegrading.[97]

The ongoing debate regarding the fate of subsurface Macondo oil underscores the futility of trying now to evaluate conclusively the government's decision to use high volumes of dispersants. Even without application of dispersants subsea, the turbulent mixing of oil and gas from the wellhead could have created the deepwater plume of dispersed oil. According to the Oil Budget, subsea dispersant use only added to the amount of oil in the plume.[98] As more scientific research occurs, a better understanding of the degradation and impacts of this naturally and chemically dispersed oil will undoubtedly emerge.[99] It will also take time and research to determine whether the dispersants themselves, used in such high volumes and subsea, have any longer-term detrimental effects on marine life or public health. For now, there has not been compelling evidence of harmful effects to indicate that decision-makers misjudged the risks versus the benefits of applying dispersants.

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[94] DEEPWATER HORIZON MC252 GULF INCIDENT OIL BUDGET (Aug. 4, 2010), *available at* http://www.noaanews.noaa.gov/stories2010/PDFs/DeepwaterHorizonOilBudget20100801.pdf; Jane Lubchenco et al., BP DEEPWATER HORIZON OIL BUDGET: WHAT HAPPENED TO THE OIL? (Aug. 4, 2010), *available at* http://www.deepwaterhorizonresponse.com/posted/2931/Oil_Budget_description_8_3_FINAL.844091.pdf.

[95] For further discussion, see the Draft Staff Working Paper on the amount and fate of the oil.

[96] *Id.*

[97] The subsequent reports include, ordered by their release date: The Georgia Sea Grant report (Aug. 17, 2010), *available at* http://uga.edu/aboutUGA/joye_pkit/GeorgiaSeaGrant_OilSpillReport8-16.pdf, which suggested that only a small amount of biodegradation had occurred; a peer-reviewed Woods Hole Oceanographic Institution Team report (Aug. 19, 2010), which suggested the existence of an "oil plume" and that rapid biodegradation might not be occurring (*see* Camilli et al., *Tracking Hydrocarbon Plume Transport*); a peer-reviewed article published by a team from the Lawrence Berkeley National Laboratory (Aug. 24, 2010), which found evidence of increased microbial respiration within the "plume" and concluded that biodegradation rates were "faster than expected" (*see* Hazen, et al., *Deep-Sea Plume*); and, most recently, a peer-reviewed report published in *Science Express* on September 16, 2010 (David L. Valentine et al., *Propane Respiration Jump-Starts Microbial Response to a Deep Oil Spill*, SCIENCE EXPRESS), which added another nuance by suggesting that, while most of the initial degradation was of gaseous hydrocarbons (not liquid oil), this could prime bacteria to degrade other hydrocarbons in the aging plume.

[98] DEEPWATER HORIZON MC252 GULF INCIDENT OIL BUDGET (Aug. 4, 2010), *available at* http://www.noaanews.noaa.gov/stories2010/PDFs/DeepwaterHorizonOilBudget20100801.pdf (concluding that 16% of the oil was naturally dispersed at the wellhead, while only 8% was chemically dispersed subsea or at the surface).

[99] For example, as explained by NOAA Administrator Jane Lubchenco, "one of the worst case scenarios involving longer exposures due to dispersed oil—big losses of spawning bluefish tuna populations—may not be detectable for years." *See* Eli Kintisch, *An Audacious Decision in Crisis Gets Cautious Praise*, 329 SCIENCE 735, 736 (2010).

III. Issues for Commission Consideration

This final part describes policy implications for Commissioner consideration that arise from possible lessons learned from the use of dispersants during the Deepwater Horizon spill response. These lessons and related policy implications are not intended as exhaustive of those that may flow naturally from the above analysis, but merely illustrative of the possibilities.

A. Further Research

Perhaps more than anything, the Deepwater Horizon experience with dispersants reveals the paucity of the kind of information that government officials need to make intelligent decisions about dispersant use in response to an oil spill. Although the absence of such information was well known before April 20, 2010, its practical effect had not been so glaringly realized.

As of 1999, EPA reported, "few long-term environmental effects tests have been conducted after a dispersant application."[100] In 2005, the National Research Council noted that U.S. research funding to support oil spill response was "extremely limited and declining" (with an annual total below $10 million).[101] The Council called on the relevant federal agencies to develop an integrated research plan focusing on peer-reviewed information.[102] Only a quarter of the $40 million in proposed research funding on dispersants and chemically dispersed oil ever materialized.[103]

The Deepwater Horizon oil spill confirms the urgency of these prior funding requests and suggests additional needs as well, including, for example, studies about the impacts of high volumes of dispersants, subsea impacts, and the long-term fate and effects of dispersants and dispersed oil—none of which appear to have been meaningfully addressed or at least addressed to the extent that now seems essential.[104] Efforts are ongoing to learn more about dispersant impacts in the Gulf. On August 3, 2010, the National Incident Commander recommended a detailed monitoring strategy, with NOAA as the operational lead, to evaluate the "distribution of indicators of break-down products of dispersants used in oil spill response activities."[105]

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[100] EPA, UNDERSTANDING OIL SPILLS AND OIL SPILL RESPONSE 13 (1999).
[101] NRC Report at 4.
[102] *Id.*
[103] *Id.* at 5-8*; see* Elana Schor, *Oil Spill Dispersants Shifting Ecosystem Impacts in Gulf, Scientists Warn*, N.Y. TIMES (July 30, 2010) ("[Dr. Nancy] Kinner said the National Research Council's report outlined a $40 million plan for dispersant research, but a quarter of the money materialized over the past five years.").
[104] *See* CRRC Report at 7 (confirming need for research into "chemical dispersion," including understanding "the long-term fate of chemically dispersed oil" and "investigating...multiple oil (including heavy) and dispersant types.").
[105] Memorandum from Admiral Thad. Allen, National Incident Commander, Deepwater Horizon Response, to Rear Admiral Paul Zukunft, Federal On-Scene Coordinator (Aug. 3, 2010), *available at* http://www.deepwaterhorizonresponse.com/external/content/document/2931/875939/1/SUB-SURFACE%20OIL%20AND%20DISPERSANT%20DETECTION,%20SAMPLING%20AND%20MONITORING%20STRATEGY.pdf; *see also* Press Conference with Admiral Thad Allen, National Incident Commander, Deepwater Horizon Response, and Dr. Jane Lubchenco, NOAA Administrator (July 27, 2010), *available at* http://www.deepwaterhorizonresponse.com/go/doc/2931/829055/.

The development of dispersant alternatives should also be a priority. So-called "green chemistry" carries promise. Dispersants would seem to be a potentially important market for efforts to find new chemical products that are effective, less toxic, and more readily biodegradable.

Research and development, of course, requires funding. Offshore drilling provides a context within which substantial funding should be in reach. The nation's need for oil and gas from the outer continental shelf is undeniable. But so too are the massive revenues those reserves yield in the market and the harm, as recent events demonstrate, if drilling goes awry. The smallest fraction of those revenues, whether charged directly to industry or originating in what the government already receives, would provide a major benefit in terms of potential to mitigate the impact of oil spills from offshore drilling.

B. Government Contingency Planning and Decision-Making Procedures

Government contingency planning for the use of dispersants was, as described, lacking. The federal agencies charged with planning did not adequately anticipate the need for dispersants in high volumes and at subsea locations. Federal officials must now survey existing and future offshore facilities and locations and consider systematically the particular challenges they present for spill response. In the future, officials should not find themselves similarly faced in the future with the need to make immediate decisions in the absence of adequate information.

Contingency planning reform should extend to rethinking both testing requirements and the use of pre-approved lists of dispersants. Plainly, the pre-approval process has significant advantages in the immediate aftermath of an oil spill and for that reason should not be abandoned. Indeed, it should be more rigorously applied by ensuring that those dispersants that are pre-approved are subject to more comprehensive testing.

There is clearly a need for expanded testing and greater information regarding dispersants placed on the National Contingency Plan Product Schedule, to include characteristics such as effectiveness and persistence under different environmental conditions. Testing should also be based on the use of higher volumes, including subsea. Moreover, current EPA protocols for industry testing may not be adequate to yield reliable and consistent results.[106] Given the ever-changing nature of the underlying science, periodic updating of testing and testing protocols is essential.

The Deepwater Horizon spill also suggests the possibility of including temporal, spatial, and/or volumetric limits on the pre-approval of dispersants for use in a geographic area. It is one thing to pre-approve based on the frequently reliable assumption that the response action will be limited in time, space, and dispersant volume. But, as the Deepwater Horizon spill dramatically illustrated, where those assumptions no longer hold, the force of a pre-approval is diminished. In particular, there is more reason to allow for federal officials other than the On-Scene Coordinator, such as EPA officials who possess particular expertise, to play a role in decision-making during the actual response. To that end, contingency planning for the use of dispersants

[106] *See, e.g.,* Biello, *Fighting Pollution with Pollution.*

during oil spill response should consider distinguishing between types of oil spills, based on their temporal duration, spatial reach, and volume.

With greater authority comes greater responsibility. During the Deepwater Horizon spill, there were reports that on-scene EPA representatives lacked the expertise and authority essential in a response action. Any enhancement of EPA's authority therefore must be coupled with assurances that EPA has the resources and clear lines of decision-making authority necessary for effective spill response. Ultimately, any recommendations for changes in the unified command structure should turn not just on the recent experience with the use of dispersants, but on a more cross-cutting inquiry, which is the subject of a separate Commission staff working paper. The issues surrounding dispersant use should inform that broader set of recommendations.

Finally, federal officials must from the outset leave no question in the public's mind regarding who is in charge during an emergency response, especially when, as happened with dispersants, public concern with the wisdom of the government's decisions is great. Here, a mistaken impression was created in the minds of too many that BP was making the decisions based on its own interests. That misimpression fueled the controversy over the potentially harmful impacts of dispersants, which itself harmed the public, creating real fears that had economic consequences to the extent they affected tourism and other consumer choices. In the future, government officials must leave no doubt that they, and not private industry, are making difficult decisions.