Hastings Environmental Law Journal

Volume 18
Number 1 *Winter 2012*

Article 6

1-1-2012

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I. Introduction

One of the oil spill response methods approved by the Environmental Protection Agency ("EPA") is the use of dispersants. Dispersants are chemicals that physically break apart oil slicks into smaller oil droplets so that the oil can be easily broken down.[1] These chemicals, however, vary in effectiveness and toxicity. Although there has been much research into the effects of dispersants and the development of less toxic variants, there is no scientific or environmental consensus on whether or not dispersant use is a viable or environmentally sustainable method of responding to an oil spill. This paper examines the historical use of dispersants in oil spill responses, the controversy behind their use, and the legal framework that provides for their use. Finally, a new legal framework is proposed in light of the recent Deepwater Horizon oil spill.

II. The Science behind Dispersants

A. Why Use Dispersants in an Oil Spill Response?

There is no consensus on the best way to clean up an oil spill. According to the law of conservation of mass, matter can neither be created nor destroyed. It can, however, be rearranged in the confines of a closed system. When an oil spill occurs on the surface of the ocean inside the closed system of the Earth and its atmosphere, the oil simply has to go somewhere. The questions researchers are trying to answer are where should the oil go and in what form.

It is well known that oil and water do not mix.[2] Known methods of removing oil from the surface of the ocean include chemical, biological, and

1. R.R. Lessard & G. Demarco, *The Significance of Oil Spill Dispersants*, 6 Spill Science & Technology Bulletin 59, 60 (2000).

2. In order for liquids to mix, their bonds must be broken and new bonds are formed between the two liquids. Since water has stronger bonds than oil, it is energetically unfavorable for them to mix. This is also known as the 'Like Dissolves Like Rule.' *See* Kenneth J. Williamson, *Macroscale and Microscale Organic Experiments* 40 (2nd ed. 1994).

mechanical techniques. Mechanical techniques include skimming the oil off of the ocean's surface using skimmers, booms, or the use of sorbent materials.[3] Biological techniques utilize the various microorganisms that are known to naturally biodegrade oil by either their addition or the introduction of fertilizers to seed their growth, or both, to the area of a spill.[4] Both aforementioned techniques, however, are inherently limited. For example, mechanical methods of oil removal are problematic where the slick is spread over a vast area. Large amounts of resources and manpower are required to recover the oil in a timely manner. Biological methods are problematic because the small-scale microorganisms can only biodegrade the oil to which they have access. Since the only accessible portion of the oil is that which lies at the oil-water interface, biodegradation can be highly time consuming where slicks have surface areas on the scale of hundreds of square miles.

These limitations can be overcome by the use of dispersants. Dispersants consist of surfactants that are dissolved in one or more solvents, and are therefore included in the chemical category of oil spill response techniques.[5] Surfactants, also known as surface active chemicals, consist of elongated molecules having endpoints with different properties.[6] One end is hydrophilic, or water loving, while the other is hydrophobic, or water repelling.[7] The result of applying a dispersant to an oil slick on the ocean's surface is the reduction of the surface tension of the oil-water interface.[8] This phenomenon converts the monolithic oil slick into vast amounts of smaller oil droplets which drastically increases the surface-area-to-volume ratio of the oil.[9] Thus, the microscopic organisms that are able to biodegrade the oil now have greater access to it, thereby significantly reducing the time necessary to eliminate the contents of a spill.[10] This benefit, however, can only occur if a sufficient population of such organisms is present at the site of a spill.[11] Thus, the larger the spill, the greater the number of organisms required to biodegrade the oil.

3. U.S. EPA, Section on Spill Response Techniques, http://www.epa.gov/osweroe1/content/learning/oiltech.htm (last visited Nov. 16, 2011).

4. *Id.*

5. Lessard & Demarco, *supra* note 1, at 60.

6. *Id.*

7. G.P. Canevari, *Some Observations on the Mechanism and Chemistry Aspects of Chemical Dispersion*, *Chemical Dispersants for the Control of Oil Spills*, American Society for Testing and Materials 5, 6 (1978).

8. *Id.* at 7.

9. *Id.* at 12.

10. *Id.* at 12.

11. Ian MacDonald, Professor of Biological Oceanography, Address at Florida State University: Energy, Oil, Emissions and the Future of Florida (Sep. 21, 2010).

Despite overcoming the limitations of mechanical and biological oil spill response methods, chemical methods, such as the application of dispersants, are also limited. The chemicals themselves can be highly toxic to the very marine environment in which they are being introduced. Recall the law of conservation of mass. Just as the oil has to go somewhere, the dispersant and the resulting oil-dispersant mixture have to go somewhere as well. A great analogy is mixing solid sugar into tea.[12] It may no longer be visible, but it is still there and able to cause harm (e.g., tooth decay).[13] The effectiveness and toxicity of the use of dispersants in an oil spill response is still a subject of major scientific inquiry and controversy. This paper will explore this controversy and the legal framework of dispersant use in oil spill responses in the context of the aftermath of the Deepwater Horizon Oil Rig disaster.

B. Dispersant Controversy

Determination of the toxicity of dispersants is a complicated task. One must consider not only the toxicity of the dispersant chemicals themselves, but the toxicity of the dispersant-oil mixture and the toxicity of the eventual small-scale oil droplets themselves. Therefore, to fully understand why the use of dispersants in oil spill responses is still controversial today, it is important to first understand the factors that contribute to their effectiveness. Dispersant application is not the ideal response for each and every oil spill. The most significant damage caused by oil spills has occurred when oil enters the near-shore or intertidal zones.[14] Therefore, the use of dispersants is most desirable in the open sea and in high sea-energy conditions. High sea-energy conditions refer to the water's ability to mechanically distribute the oil droplets throughout the water column. For example, high winds, rough waves, and strong currents can themselves, or in combination, spread the oil droplets out over large areas.[15] Conversely, if low sea-energy conditions are present, the dispersant-oil mixture may not be diluted in the water column very well.

Extremely thick and viscous oils are by far the most difficult to disperse. In fact, the longer crude oil is exposed to the elements, the more viscous it becomes.[16] This is due to the loss of the more volatile

12. *Id.*

13. *Id.*

14. A. Lewis & D. Aurand, *Putting Dispersants to Work: Overcoming Obstacles*, API Publication Number 4562A, Washington, DC (1997).

15. Lessard & Demarco, *supra* note 1, at 61.

16. Richard A. Kerr, *As Oil Becomes 'Mousse' Then 'Tarballs,' Chemistry Could Determine Coast's Fate*, SCIENCE INSIDER, May 3, 2010, http://news.sciencemag.org/scienceinsider/2010/05/as-oil-becomes-mousse-then-tarb.html.

components.[17] As exposure time to the seawater increases, the crude oil emulsifies, or forms what is known as a mousse.[18] Since a mousse is too viscous to disperse, there is what is known as a "window of opportunity," or a limited amount of time in which dispersant use can even be considered.[19] This time frame can vary from merely a few hours to a few weeks depending on the viscosity of the oil and the strength of the dispersant.[20] Thus, this proverbial ticking of the clock can perhaps be the biggest impairment to dispersant effectiveness.

It is the trade-off between effectiveness and toxicity that is at the heart of the dispersant controversy.[21] The oil droplets that are formed by the dispersants themselves are still just as toxic as before the application of any dispersants. In fact, some argue that the net effect of dispersing the oil is even more toxic because the now smaller droplets can more easily enter the systems of marine life.[22] Instead of a slick of oil floating on just the surface of the water, the same amount of oil is now dispersed throughout the water column in what is still a relatively small area, depending on the amount of time it takes for the droplets to spread throughout the water column. Since this time is dependent of the sea energy, the efficiency of dispersants in actual spills is not an exact science.[23] This, however, creates the issues that environmental groups are most worried about. One issue is for just how long is marine life exposed to the initially high concentration of small-scale oil droplets and dispersants. Once this threshold question can be answered, the next question is under what conditions dispersants should then be used, if at all.

C. Use of Dispersants to Date

If the use of dispersants was an exact science, then the controversy over the trade-off between toxicity and effectiveness would dissolve one way or another. For now, however, we can explore the effects of dispersants that have been used in the cleanup of past oil spills thus far and how it can effect decision making today.

17. *Id.*

18. *Id.*

19. Lessard & Demarco, *supra* note 1, at 62.

20. *Id.*

21. Merv Fingas, Prince William Sound Regional Citizens' Advisory Council, *A Review of Literature Related to Oil Spill Dispersants* 1997-2008, iii (2008), http://www.pwsrcac.org/docs/d0053000.pdf.

22. Amanda Mascarelli, *Debate Grows Over Impact of Dispersed Oil*, NATURE NEWS, July 10, 2010, http://www.nature.com/news/2010/100710/full/news.2010.347.html.

23. Fingas, *supra* note 21, at 34.

Some countries have routinely used dispersants since the 1960s.[24] In nearly all cases, however, toxic dispersants were used in the responses to small-scale coastal oil spills.[25] It was their role in the *Torrey Canyon* oil spill and the resulting damage to the environment which sparked public aversion to the use of dispersants in oil spill responses.[26] The *Torrey Canyon* was an oil tanker which ran aground off the western coast of Cornwall, England on March 18, 1967.[27] According to the National Oceanic and Atmospheric Association ("NOAA"), approximately 36,100,000 gallons of crude oil were released into the sea.[28] In the immediate aftermath, a panel of scientific experts was established to examine the proposed cleanup procedure.[29] A mere twelve hours after the spill, the Royal Navy sprayed BP1002 dispersant onto the oil slick.[30] As a result of the aforementioned environmental backlash, there was a push to develop less toxic dispersants.[31]

Since the *Torrey Canyon* spill, dispersants have been used in oil spill responses over 213 times in the past fourty years in locations around the world.[32] One of the most notable oil spills in that time period was the *Exxon Valdez* tanker spill in Prince William Sound, Alaska. On March 24, 1989, the Exxon Valdez vessel released 10.9 million gallons of crude oil when it ran aground, striking Prince William Sound's Bligh Reef.[33] According to response documents, five aircraft dispersant trials using COREXIT 9527 dispersant were conducted from March 25-28.[34] However, on March 26, the very same day that permission was granted to use dispersants, a severe

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24. Lessard & Demarco, *supra* note 1, at 60.

25. Patrick Barkham, *Oil Spills: Legacy of the Torrey Canyon*, GUARDIAN, June 24, 2010, http://www.guardian.co.uk/environment/2010/jun/24/torrey-canyon-oil-spill-deepwater-bp.

26. Lessard & Demarco, *supra* note 1, at 60.

27. NOAA Incident News, http://www.incidentnews.gov/incident/6201 (last visited Nov. 16, 2011).

28. *Id.*

29. *Id.*

30. Patrick Barkham, *Oil Spills: Legacy of the Torrey Canyon*, GUARDIAN, June 24, 2010, http://www.guardian.co.uk/environment/2010/jun/24/torrey-canyon-oil-spill-deepwater-bp. This dispersant was manufactured by British Petroleum (now BP).

31. Etkin, D.S., *Factors in the Dispersant Use Decision-Making Process: Historical Overview and Look to the Future*, PROCEEDINGS OF THE TWENTY-FIRST ARCTIC AND MARINE OILSPILL PROGRAM TECHNICAL SEMINAR 281, 287 (1998) http://www.environmental-research.com/erc_papers/ERC_paper_27.pdf.

32. Alexis Steen & Abigail Findlay, 2008 OIL SPILL CONFERENCE, FREQUENCY OF DISPERSANT USE WORLDWIDE, 646 (2008), http://www.iosc.org/papers/2008%20108.pdf.

33. NOAA Incident News, http://www.incidentnews.gov/incident/6683 (last visited Nov. 16, 2011).

34. NOAA Incident News, http://www.incidentnews.gov/entry/515612 (last visited Nov. 16, 2011).

storm emulsified a large quantity of the discharged oil.[35] Therefore, on March 29, the Regional Response Team ("RRT") abandoned the use of dispersants.[36]

Many reports of adverse health effects on the responders were reported and even linked to COREXIT 9527 and the ingredient 2-Butoxyethanol.[37] The Materials Safety Data Sheet ("MSDS") for COREXIT 9527 lists it as a chronic and acute health hazard.[38] Symptoms of exposure are listed as "central nervous system effects, nausea, vomiting, anesthetic or narcotic effects."[39] Regarding butoxyethanol exposure, "injury to red blood cells (hemolysis), kidney or the liver" may occur.[40]

Soon after the catastrophe, Exxon responded by developing an improved dispersant that could dissipate heavier oils and even oils that had been exposed to the elements.[41] This advanced dispersant, COREXIT 9500, was able to disperse oils that were previously considered to be undispersible in laboratory and tests conducted in the early 1990s.[42] The first application of COREXIT 9500 was in the *Sea Empress* oil spill that occurred at the entrance of the Milford Haven Waterway in Pembrokeshire, Whales in 1996.[43] Despite the final report deeming its application a success, the effectiveness was not reported due to a short observation window.[44]

Although dispersants were only used in six of the seventy-seven oil spills in Europe from 1995-2005, those numbers reflect poor weather and sea energy conditions rather than an increasing aversion to use dispersants.[45] It is noteworthy, however, that COREXIT dispersants were banned in the United Kingdom on July 30, 1998, after failing to pass the required rocky shore test indicating that crustaceans would not be able to properly adhere to rocks along the shore after exposure.[46] However, the U.K.

35. *Id.*

36. *Id.*

37. EIN Presswire, NOAA *Official Asks* EINNEWS *to Withdraw Story Questioning Safety of Gulf Seafood*, PR-INSIDE, Nov. 5, 2010, http://www.pr-inside.com/noaa-official-asks-einnews-to-withdraw-r2230792.htm.

38. BP Gulf of Mexico Regional Oil Spill Response Plan, fig. 18-10.

39. *Id.*

40. *Id.*

41. Lessard & Demarco, *supra* note 1, at 62.

42. *Id.*

43. *Id.* at 63.

44. *Id.*

45. H. Chapman et al., *The Use of Chemical Dispersants to Combat Oil Spills at Sea: A Review of Practice and Research Needs in Europe*, 54 Marine Pollution Bulletin 827, 838 (2007).

46. MARINE MANAGEMENT ORGANISATION, OIL SPILL TREATMENT PRODUCTS APPROVED FOR USE IN THE UNITED KINGDOM, 10 http://www.marinemanagement.org.uk/protecting/pollution/documents/approval_approved_products.pdf.

is still allowing existing stockpiles of COREXIT to be used in offshore conditions.[47]

A 2006 study has shown that some dispersants actually hinder native bacteria from consuming the oil.[48] Although the surface-area-to-volume ratio is increased, the actual mechanism occurs via the specialized dispersant molecules which physically bind to the surface of the oil. Therefore, if those molecules remain bound to that surface, the bacteria will be sterically hindered from accessing it. However, experiments showed that some dispersants even catalyze the consumption of oil by bacteria.[49] Most surprisingly, this study also hypothesized that dispersant toxicity increases with exposure to sunlight.[50]

D. Possible Future Controversy: Nanotechnology

The latest turn in the controversy over using dispersants to dissipate oil slicks is likely to center on the toxicity of the small-scale oil droplets, even in dilute quantities in the ocean. Because real-time use of dispersants has not been studied extensively, it is still unknown just how small the oil droplets become after dispersion and possible subsequent partial consumption by bacteria. It is very possible that they may become as small as the nanoscale.[51] This may be problematic for several reasons.

Within the past decade, research into nanotechnology has exploded. Materials can behave completely different at the nanoscale.[52] For example, compounds that are normally solid at a larger scale can become liquid at the nanoscale and vice versa, even at the same temperature and pressure.[53]

In particular, research has aimed to understand the large surface-area-to-volume ratio phenomenon. This phenomenon is unique to nanoparticles and is what gives unique properties to materials which utilize them.[54] In

47. Nalco Inaccuracy vs. Fact About COREXIT Products, http://www.nalco.com/applications/4348.htm (last visited Nov. 16, 2011).

48. Committee on Understanding Oil Spill Dispersants: Efficacy and Effects (National Research Council of the National Academies), *Transport and Fate*, Chapter 4, in Oil Spill Dispersants: Efficacy and Effects 135-192 (2006).

49. *Id.*

50. *Id.* at 266.

51. See Ian MacDonald, Professor of Biological Oceanography, Address at Florida State University: Energy, Oil, Emissions and the Future of Florida (Sep. 21, 2010) (explaining that Southern Louisiana Crude Oil forms 100 μm droplets before reaching the surface of the ocean).

52. Emil Roduner, *Size Matters: Why Nanomaterials are Different*, 35 Chem. Soc. Rev. 583, 583 (2006).

53. *Id.* at 586.

54. It has been found that composite materials exhibit superior properties when nanoparticles are introduced into a matrix over those using macroparticles. For example, nanofluids, or fluids with nanoparticles dispersed throughout, exhibit

sum, the surfaces of materials possess a high surface energy due to the large amount of dangling bonds located there.[55] More and more, researchers are gaining insight into this phenomenon and using it to engineer new materials.

This does not mean, however, that researchers have sound understanding of how nanoparticles interact with both humans and animals. Nanoparticles are materials of any chemical composition that have a mean diameter of 10^{-9}m or less.[56] In other words, nanoparticles are 1000 times smaller than microparticles. It has been hypothesized that nanoparticles, even those derived from traditionally nontoxic bulk materials, can enter the systems of humans and animals via their pore structures, ingestion, or inhalation.[57] Once inside the bodies of humans or animals, much is still unknown about the effects of the presence of nanoparticles. However, it is hypothesized that nanoparticles could wreak havoc on the human body since they are able to travel deeper into tissue and organs than larger particles.[58]

Although studies into nanoparticle toxicity have been ongoing for the past few years, it is still difficult to precisely determine exactly what humans and animals can tolerate.[59] The problem is that there is a plethora of both

superior thermal conductivity over fluids with dispersed macroparticles. The exact mechanism remains unknown. *See* Yimin Xuan & Qiang Li, *Heat Transfer Enhancement of Nanofluids*, 21 Int'l Journal of Heat and Fluid Flow 58, 58 (2000).

55. Dangling bonds are incomplete bonds. These leave unpaired electrons at the surface creating a localized high energy condition. The smaller the volume of material, the more effective this localized surface energy becomes for a desired engineering purpose. *See* K.K. Nanda et al., Higher *Surface Energy of Free Nanoparticles*, 91 Physical Review Letters 106102-1, 106102-3 (2003).

56. Cristina Buzea et al., *Nanomaterials and Nanoparticles: Sources and Toxicity*, 2 Biointerphases 17, 22 (2007).

57. Armelle Baeza, *Toxicity of Nanoparticles*, Invited oral at E-MRS Fall Meeting 2008, Symposium D.

58. We already know that even the now relatively large microparticles can cause major health problems once inside the human body. Take asbestos for example, where glass microparticles are able to travel far into the small capillaries of the lungs, thereby clogging them not only by themselves, but by the scar tissue they create along the way in. *See* Craig A. Poland et al., *Carbon Nanotubes Introduced into the Abdominal Cavity of Mice Show Asbestos-Like Pathogenicity in a Pilot Study*, 3 Nature Nanotechnology 423, 423 (2008).

59. It is important to note here that it has also been hypothesized and studies have shown that nanoparticles can have therapeutic effects on the human body as well. For example, the ability of nanoparticles to cross certain organ barriers can make them useful as vehicles for drug delivery. *See* Günter Oberdörster et al., Nanotoxicology, An Emerging Discipline Evolving from Studies of Ultrafine Particles, 113 Environmental Health Perspectives 823, 824 (2005).

toxic and traditionally nontoxic materials to study at the nanoscale.[60] This, coupled with other variables, such as the precise size of the nanoparticles, their concentration in the body, and which of the various biological processes they affect generates the need for more comprehensive studies in the future.[61] Perhaps the biggest problem of all derives from the fact that in dilute concentrations, nanoparticles are extremely hard to detect. Thus, prevention methods may not even be taken at all to prevent their entry into the human body.

III. Existing Legal Framework

Unfortunately, oil spills are unexpected events that do not wait until scientific research answers every lingering question about dispersants. This section summarizes the current legal framework that gives U.S. officials the discretion to use dispersants in the event of an oil spill despite the current uncertainties and controversy with their use.

A. Clean Water Act (1972 Amendments to the Federal Water Pollution Control Act)

Under the Clean Water Act ("CWA"), the President of the United States has a duty to create and publish a National Contingency Plan ("NCP") for the removal of spills of oil and hazardous substances.[62] The CWA also requires the President to revise the NCP.[63] President George H. Bush delegated this authority to the Administrator of the EPA in an executive order announced on October 18, 1991.[64] Under this executive order, the Administrator of the EPA also has a duty to perform all other functions vested in the President by § 311(d)(1) of the Federal Water Pollution Control Act and § 4201(c) of the Oil Spill Pollution Control Act of 1990.[65]

In general, the NCP "shall provide for efficient, coordinated, and effective action to minimize damage from oil and hazardous substance discharges, including containment, dispersal, and removal of oil and hazardous substances."[66] It establishes the National Response Team ("NRT")

60. Armelle Baeza, *Toxicity of Nanoparticles*, Invited oral at E-MRS Fall Meeting 2008, Symposium D.

61. *Id.*

62. 33 U.S.C. § 1321(d)(1) (2011).

63. 33 U.S.C. § 1321(d)(3) (2011).

64. Exec. Order No. 12,777, 56 F.R. 54757.

65. *Id.* These functions include revising the NCP no later than one year from the date of the executive order and to implement the amendments.

66. 33 U.S.C. § 1321(d)(2) (2011).

and RRTs for "planning and coordination of regional preparedness and response actions."[67]

Specifically, this plan must include "procedures and techniques to be employed in identifying, containing, dispersing, and removing oil and hazardous substances."[68] The plan must also provide a schedule of dispersants, if any, that may be used in the event of a spill.[69] Finally, it must specify the quantities and locations for safe dispersant usage.[70]

The NCP was written and published in 1968, approximately one year after the *Torrey Canyon* spill.[71] It was first revised in 1973[72] as required by the CWA of 1972.[73] Revisions were subsequently made in 1980 and 1990 in response to new legislation.[74] It has not been updated since 1994 when it was amended for consistency with the Oil Pollution Act ("OPA").[75] Recall that the President has a duty to revise the NCP.[76] However, the CWA only stipulates that "[t]he President, may from time to time, as the President deems advisable, revise or otherwise amend the National Contingency Plan," thus rendering the duty discretionary.[77]

B. Outer Continental Shelf Lands Act

Drilling operators must also provide Oil Spill Response Plans of their own under the Outer Continental Shelf Lands Act ("OCSLA").[78] The OCSLA was enacted in 1953 after the Truman Declaration of 1945 claimed exclusive jurisdiction to the U.S. over oil and gas resources outside of the states' territorial seas.[79] Outer continental shelf ("OCS") oil and gas leases are regulated under OCSLA.[80] The four stages of the OCS leasing process are the leasing plan stage, the lease sale stage, the exploration stage, and the

67. Exec. Order No. 12,777, 56 F.R. 54757.

68. 33 U.S.C. § 1321(d)(2)(F) (2011).

69. 33 U.S.C. § 1321(d)(2)(G)(i) (2011).

70. 33 U.S.C. § 1321(d)(2)(G)(ii)-(iii) (2011).

71. 40 C.F.R. § 300 (2011).

72. *Id.*

73. 33 U.S.C. § 1321 (2011).

74. *Id.*; 55 F.R. 8666-01.

75. U.S. EPA National Oil and Hazardous Substances Pollution Contingency Plan Overview, http://www.epa.gov/oem/content/lawsregs/ncpover.htm#key (last visited Nov. 16, 2011).

76. 33 U.S.C. § 1321(d)(1) (2011).

77. 33 U.S.C. § 1321(d)(3) (2011).

78. 43 U.S.C. § 1331 (2011).

79. JOSEPH J. KALO ET AL., COASTAL AND OCEAN LAW 443 (3d ed. 2007).

80. 43 U.S.C. § 1331 (2011).

development stage.[81] The two stages of OCS leases this section will focus on are the exploration and development stages.

The exploration stage refers to the preliminary and exploratory drilling afforded to OCS lessees under the OCSLA.[82] This stage cannot commence until the Bureau of Ocean Energy Management ("BOEM") approves an Exploration Plan ("EP") submitted by the lessee operator.[83] The EP must be accompanied by an approved Oil Spill Response Plan.[84] The regional supervisor of the BOEM then has fifteen days to request additional information.[85] Finally, the EP is sent to the governors' offices and coastal zone management agencies of the potentially affected states.[86]

The regional supervisor then has a thirty-day window to either approve or reject the EP or ask the operator lessee for corrections.[87] An EP can only be rejected if it would "probably cause serious harm or damage to life (including fish or aquatic life) . . . or the marine, coastal, or human environment . . . and the proposed activity cannot be modified to avoid the condition(s)."[88]

The subsequent development stage is the final stage of the OCS leasing administrative process and constitutes the actual production and development of oil and natural gas.[89] Before this stage can commence, an operator lessee must submit a Development and Production Plan (DPP).[90] As with the submission of EPs during the aforementioned exploration stage, all DPPs must be accompanied by an approved Oil Spill Response Plan.[91]

Interestingly, a DPP is only required for OCS development in what are known as frontier regions, or regions in which there has been no significant OCS development to date.[92] Therefore, operator lessees in the Gulf of Mexico region are exempt from the requirement to submit a DPP.[93] Instead, they are only required to submit what is known as a Development Operations Coordination Document ("DOCD").[94] This is a more abbreviated

81. Secretary of the Interior v. California, 464 U.S. 312, 337 (1984).

82. *Id.* at 321. Also, Abbott v. BP Exploration and Production Inc. 781 F.Supp.2d 453, 463 (2011).

83. 43 U.S.C. § 1340(c)(1) (2011).

84. 30 C.F.R. § 550.219(a)(1) (2011).

85. 30 C.F.R. §§ 550.231 (a)-(b) (2011).

86. 30 C.F.R. §§ 550.232(a)(1)-(2) (2011).

87. 43 U.S.C. § 1340(c)(1) (2011).

88. 30 C.F.R. § 550.233(b)(3) (2011).

89. *Tribal Vill. of Akutan v. Hodel*, 869 F.2d 1185, 1188 (9th Cir. 1988).

90. 43 U.S.C. § 1351(a)(1) (2011).

91. 30 C.F.R. § 550.250(a)(1) (2011).

92. 43 U.S.C. § 1351(a)(1) (2011).

93. 30 C.F.R. § 550.201(a)(1) (2011).

94. 30 C.F.R. § 550.201(a)(2) (2011).

plan.[95] The regional supervisor then has a sixty-day window in which he must reject or approve the DOCD or ask for corrections.[96] During this window, the regional supervisor may consider comments made by the governors of the affected state(s) and any other interested person(s).[97]

Once an operator is approved to drill anywhere seaward of the coastline, they must submit an Oil Spill Response Plan for approval by the BOEM before actual drilling can commence from a facility.[98] Overall, the plan must demonstrate the operator's ability to respond quickly and effectively to an oil spill generated by the drilling facility.[99] A facility, however, may begin operation upon submission of the plan provided the operator submits in writing that he is able to respond to a worst-case spill scenario.[100] Thus, an operator can begin drilling before the Oil Spill Response Plan is even reviewed, let alone approved.

The content of any submitted Oil Spill Response Plan must be consistent with the NCP and any applicable Area Contingency Plan(s) ("ACP(s)").[101] The plan must "provide for [a] response to an oil spill from the [drilling] facility" with said response being immediately carried out in the event of a spill.[102] However, the drilling operator shall take "all appropriate actions necessary to immediately abate the source of a spill and remove any spills of oil."[103]

The format of the plan must begin with an introduction and contents, followed by an emergency response action plan.[104] The third and final section of the plan is the appendices, which must include a dispersant use plan appendix.[105] The dispersant use plan must be consistent with the NCP product schedule and the corresponding ACP(s).[106] "The plan must include:

> (a) An inventory and a location of the dispersants and other chemical or biological products which [an operator] might use on the oils handled, stored, or transported at the facility;

95. See MIN. MGMT. SERV., DEPT. OF INTERIOR, GUIDELINES FOR ENVIRONMENTAL REPORT/ENVIRONMENTAL INFORMATION FOR PLANS SUBMITTED IN THE GULF OF MEXICO OUTER CONTINENTAL SHELF REGION 3-4.

96. 43 U.S.C. § 1351(h)(1) (2011).

97. *Id*.

98. 30 C.F.R. § 254.2(a) (2011).

99. 30 C.F.R. § 254.1(a) (2011).

100. 30 C.F.R. § 254.1(b) (2011).

101. *Id*.

102. 30 C.F.R. § 254.5(a) (2011).

103. 30 C.F.R. § 254.5(c) (2011).

104. 30 C.F.R. § 254.21(b) (2011).

105. *Id*.

106. 30 C.F.R. § 254.27 (2011).

> (b) A summary of toxicity data for these products;
>
> (c) A description and a location of any application equipment required as well as an estimate of the time to commence application after approval is obtained;
>
> (d) A discussion of the application procedures;
>
> (e) A discussion of the conditions under which product use may be requested; and
>
> (f) An outline of the procedures [an operator] must follow in obtaining approval for product use."[107]

C. Oil Spill Pollution Act of 1990

The Oil Spill Pollution Act of 1990[108] overhauled previous federal cleanup and liability provisions pertaining to oil spills. Under OPA, the federal government has oil removal authority.[109] Specifically, "[t]he President shall, in accordance with the National Contingency Plan and any appropriate Area Contingency Plan, ensure effective and immediate removal of a discharge, and mitigation or prevention of a substantial threat of a discharge, of oil or a hazardous substance" in the Gulf of Mexico.[110] The President's options for carrying out this duty are either cleaning up the spill via the federal government, monitoring the efforts of the oil company's response, or to direct the oil company's response.[111]

D. Other Applicable Laws

More laws come into play during the aforementioned oil and gas lease approval process. The Coastal Zone Management Act ("CZMA")[112] stipulates that a state may require more information than required by the BOEM regarding EPs and DPPs.[113] Also, the National Environmental Policy Act ("NEPA")[114] applies to the approval of a DPP and stipulates that either an Environmental Impact Statement ("EIS") must be prepared or determined to

107. 30 C.F.R. § 254.27(a)-(f) (2011).

108. 33 U.S.C. § 4201 (2011).

109. 33 U.S.C. § 4201(c)(1)(A) (2011).

110. *Id*.

111. 33 U.S.C. § 4201(c)(2)(B)(i)-(ii) (2011).

112. 16 U.S.C. § 1451-65 (2011).

113. Robert B. Wiygul, *The Structure of Environmental Regulation on the Outer Continental Shelf: Sources, Problems, and the Opportunity for Change*, 12 J. Energy Nat. Resources & Envtl. L. 75, 133 (1992).

114. 42 U.S.C. § 4321 et. seq. (2011).

be unnecessary.[115] Although they are routinely prepared in the California region, never has an EIS been prepared for Western or Central Gulf of Mexico regions.[116]

IV. The Deepwater Horizon Oil Spill and the Need for a New Legal Framework

A. The Disaster

On April 20, 2010, the Deepwater Horizon drilling platform, located fifty miles southeast of the Mississippi River Delta, exploded.[117] The platform was manufactured by Transocean and leased by BP.[118] On April 22, the semisubmersible drilling platform capsized and sank along with the approximately 700,000 gallons of unburned oil.[119] Several initial attempts at shutting-in the well were unsuccessful as crude oil and natural gas continued to escape uncontrollably from the riser pipe of the well.[120] British Petroleum responded by applying COREXIT 9527, the same dispersant used in *Exxon Valdez*, until supplies were depleted.[121] The remainder of dispersant application consisted of COREXIT 9500, which was developed in response to *Exxon Valdez*.[122]

B. Dispersant Schedules

1. NCP Product Schedule

The EPA lists eighteen dispersants in the NCP Product Schedule.[123] Among these dispersants are COREXIT 9500 and 9527.[124] Nalco Energy

115. Wiygul, *supra* note 113 at 133.

116. *Id.*

117. NOAA Incident News, http://www.incidentnews.gov/incident/8220 (last visited Nov. 16, 2011).

118. David Pagaine, *Deepwater Horizon Contract Extended*, OFFSHORE, Nov. 1, 2009, http://www.offshore-mag.com/index/articledisplay/6112303380/articles/offshore/volume-69/issue-11/departments/gulf-of_mexico/gulf-of_mexico.html.

119. NOAA Update 22 Apr 10, PM. http://www.incidentnews.gov/entry/526081 (last visited Nov. 16, 2011).

120. *Id.*

121. EIN Presswire, NOAA *Official Asks* EINNEWS *to Withdraw Story Questioning Safety of Gulf Seafood*, PR-INSIDE, Nov. 5, 2010, *available at* http://www.pr-inside.com/noaa-official-asks-einnews-to-withdraw-r2230792.htm. British Petroleum is now BP.

122. *Id.*

123. U.S. EPA, National Contingency Plan Product Schedule, http://www.epa.gov/emergencies/content/ncp/product_schedule.htm (last visited Nov. 16, 2011). (The NCP Product Schedule lists 18 dispersant products, 14 of which are unique chemical formulas. Therefore, some may report that there are only 14

Services, L.P. is listed as the manufacturer and primary distributer of both dispersants.[125] Provided in the schedule are the toxicity and effectiveness of each dispersant.[126]

Toxicity values are given using LC_{50} values in parts per million (ppm). The LC_{50} value represents the dose lethal to fifty percent of the population of a particular species after a specific testing duration.[127] Therefore, the lower the LC_{50} value, the more toxic the dispersant. The only two species used in the toxicity tests were Menidia (silverside fish) and Mysidopsis (Mysid shrimp).[128] The length of the Menidia and the Mysidopsis tests were ninety-six hours and forty-eight hours, respectively.[129] COREXIT 9500 is listed as having an LC50 value of 2.61 ppm for the Menidia test and 3.40 ppm for the Mysidopsis test.[130] These values represent the lowest LC_{50} values for the Menidia test and the ninth lowest for the Mysidopsis test.[131] COREXIT 9527 is listed as having an LC_{50} value of 4.49 ppm for the Menidia test and 6.60 ppm for the Mysidopsis test.[132] These LC_{50} values represent the second lowest for the Menidia test and the sixth highest for the Mysidopsis test.[133]

Effectiveness values were generated using a swirling flask dispersant effectiveness test performed on South Louisiana and Prudhoe Bay crude oils.[134] They are given in percentages. To qualify for inclusion into the NCP product schedule, a dispersant must have an effectiveness value of at least forty-five percent.[135] COREXIT 9500 is 54.70 percent effective on Southern Louisiana crude oil, and COREXIT 9527 is 63.4 percent effective on the same. This renders fifteen of the eighteen dispersants in the schedule more

dispersants listed in the NCP Product Schedule. The newest revision of the NCP Product Schedule also claims to only contain 14 dispersants in its initial summary but lists all 18 by their product name as required by § 300.915(a)(1) of the NCP).

124. *Id.*

125. *Id.*

126. *Id.*

127. 40 C.F.R. § 300 Appendix C (2011).

128. *Id.*

129. *Id.*

130. *Id.*

131. *Id.*

132. *Id.*

133. Having the second lowest LC50 value for the Menidia test does not bode well, considering that the lowest value belongs to the dispersant that was developed X years later as an improvement over this one.

134. ASTM, F2059-06 *Standard Test Method for Laboratory Oil Spill Dispersant Effectiveness Using the Swirling Flask*, http://www.astm.org/Standards/F2059.htm (last visited Nov. 16, 2011). This test is the standard test for dispersant effectiveness as provided by the American Society for Testing and Materials.

135. 40 C.F.R. § 300.915(a)(7) (2011).

effective than COREXIT 9500, and twelve of the eighteen dispersants listed more effective than COREXIT 9527 on Southern Louisiana crude oil.[136]

Most notable in the schedule are the 100% effectiveness values for DISPERSIT SPC 1000 and the SEACARE E.P.A. dispersants on Southern Louisiana crude oil. Both dispersants have the same LC_{50} values for each of the two toxicity tests and are less toxic that either COREXIT dispersant in both tests.[137]

2. BP's Gulf Of Mexico Regional Oil Spill Response Plan

BP's Gulf Of Mexico Regional Oil Spill Response Plan is a 582-page document that was issued on December 1, 2000.[138] The latest revision at the time of the Deepwater Horizon explosion was made on June 30, 2009, with the next review date scheduled for June 30, 2011.[139] The Dispersant Use Plan ("DUP") consists of forty-one pages.[140]

The DUP begins by explaining the aforementioned basics of dispersants: effectiveness and toxicity.[141] Toxicity data are provided only for the two COREXIT dispersants on marine species determined to be the most at risk for the negative impacts of dispersant application.[142] These species were chosen because they are known to be "present at the water surface and/or in the upper water column."[143] However, these data are only provided for four marine species: two species of shrimp and two species of fish.[144]

The next set of data provided in the DUP is for dispersant effectiveness.[145] The results are from a swirling flask dispersant effectiveness test performed on South Louisiana and Prudhoe Bay crude oils.[146] Again, only data for the COREXIT dispersants are provided. The chart lists COREXIT 9500 as 54.7 percent and 45.4 percent effective on South Louisiana

136. Included in the 12 more effective dispersants is COREXIT 9500.

137. National Contingency Plan Product Schedule, *supra* note 123. These values are 7.90 ppm for the Menidia test and 8.20 ppm for the Mysidopsis test.

138. British Petroleum, *Gulf of Mexico Regional Oil Spill Response Plan* (2009), *available at* http://publicintelligence.net/bp-gulf-of-mexico-regional-oil-spill-response-plan/ [hereinafter BP's Response Plan].

139. *Id.*

140. *Id.* at § 18.

141. *Id.* at §§ 18(A)-(D).

142. *Id.* at § 18(C).

143. *Id.*

144. *Id.* The species of shrimp are Artemia salina (brine shrimp) and Mysidopsis bahia (mysid shrimp). The species of fish are Menidia beryllina (inland silverside) and Fundulus heteroclitus (mummichog).

145. *Id.* at § 18(D).

146. ASTM, *supra* note 134. This test is the standard test for dispersant effectiveness as provided by the American Society for Testing and Materials.

Crude oil as provided by the vendor lab report and the EPA Office of Research and Development report, respectively.[147] The results listed for COREXIT 9527 are 63.4 percent and 31 percent, respectively.[148] Thus, the effectiveness data obtained by the vendor lab report are identical to that provided in the EPA's NCP Product Schedule, yet the data provided by the EPA's own Office of Research and Development Report provide effectiveness values that are 9.3 percent and 32.4 percent lower for COREXIT 9500 and 9527, respectively. It is highly doubtful that these discrepancies are within any scientific margin of error. Perhaps most importantly, the thirty-one percent effectiveness value reported for COREXIT 9527 in the EPA's own Office of Research and Development Report is below the forty-five percent threshold value for inclusion in the NCP Product Schedule.[149]

Next, the DUP provides guidelines for making the decision to use dispersants.[150] First, the application methods and equipment are listed.[151] The only two methods provided are aerial dispersant application and marine dispersant application.[152] Aerial dispersant application involves the spraying of dispersant onto the ocean's surface via an aircraft, while marine dispersant application involves the same, only from workboats.[153] The aerial dispersant application option is listed as one of the methods preapproved by the RRT. Approval by additional agencies is required prior to the initiation of marine dispersant application.

The Dispersant Inventory for the Gulf Coast consists of only four of the eighteen dispersants on the NCP schedule.[154] The dispersants accounted for in the quantities available at specific stockpile locations are: COREXIT 9500,

147. British Petroleum, supra note 139.

148. *Id*.

149. 59 F.R. 47394 (1994). The NCP Product Schedule lists 7 dispersants with effectiveness values less than forty-five percent in an individual test. However, the Product Schedule also includes an average effectiveness value for each dispersant using the values reported in the tests on Prudhoe Bay and Louisiana crude oils. No average effectiveness values listed are under forty-five percent. Assuming that the NCP threshold is forty-five percent for this average value, COREXIT 9527 was only 51% effective on Prudhoe Bay crude oil according to the EPA Office of Research and Development Report, thus yielding an average effectiveness value of only forty-one percent. Thus, this value still stands below the forty-five percent threshold requirement. Of course, there is the possibility that a typographical error switched the values for the two reports in the BP Response Plan. Environmental Protection Agency, National Contingency Plan: Product Schedule (2011), *available at* http://www.epa.gov/osweroe1/docs/oil/ncp/schedule.pdf.

150. BP's *Response Plan*, *supra* note 130 at §§ 18(E)-(H).

151. *Id*. at §§ 18(E)-(F).

152. *Id*. at § 18(F).

153. *Id*.

154. *Id*. at fig.18-2.

COREXIT 9527, SPC 1000, and BIO Disperse.[155] The total amount of dispersant stockpiled accounted for in this document is 174,486 gallons.[156] The quantities of SPC 1000 and BIO Disperse combined only account for a mere 1,265 gallons, or 0.72 percent, of this total.[157] The remaining stockpiles listed are for the COREXIT dispersants. Although the title of the inventory is "Dispersant Inventory – Gulf Coast," it lists stockpile locations as far as Maine, Hawaii, Singapore, and the United Kingdom.[158]

The MSDSs for COREXIT 9500 and 9527 dispersants account for the last twenty-one pages of the DUP.[159] Every page of the MSDSs provided for the COREXIT dispersants prominently displays the Nalco company trademark. Both MSDSs list a portion of the dispersants as proprietary ingredients. Regarding toxicological information, both MSDSs state that "no toxicity studies have been conducted" on either product. No MSDSs are provided for any other dispersants.

C. The Response

NOAA provided oil spill trajectories and weather forecast support to the newly established Unified Command responsible for coordinating the response.[160] The initial trajectory on April 22 estimated that the oil would remain offshore for at least seventy-two hours.[161] By April 23, "scattered black oil and sheens" had been observed extending several miles from the site of the incident.[162] On this day, a new oil spill trajectory estimated that oil would not reach land through at least April 27.[163]

At this time, it is unclear exactly when BP initiated the use of dispersants. Most media reports reveal the aerial application of dispersants on May 3 with a report of the Department of Defense providing BP with two C-130 cargo aircraft with dispersant application capabilities on May 1.[164] Approximately one week earlier, however, NOAA, in their April 23 advisory update, reported that dispersant application was already ongoing using

155. *Id.*

156. *Id.*

157. *Id.*

158. *Id.*

159. *Id.* at figs.18-9 & 18-10.

160. NOAA's Office of Response and Restoration, NOAA U*pdate* 22 A*pr* 10, PM., http://www.incidentnews.gov/entry/526081 (last visited Nov. 16, 2011).

161. *Id.*

162. NOAA Update 23 April 2010, AM., http://www.incidentnews.gov/entry/526105 (last visited Nov. 16, 2011).

163. *Id.*

164. *US Oil Production, Shipping Unaffected by Spill So Far*, AFP, (May 1, 2010), http://www.google.com/hostednews/afp/article/ALeqM5hew_8EkXXu79vuYRZ96WrFWDzQOw.

several vessels already staged in the surrounding area of the incident, most likely indicating that marine dispersant application had already commenced.[165] This advisory update was the first mention of dispersant application by NOAA.[166]

BP's use of dispersants, however, was not limited to their application at the ocean's surface. Subsurface use of dispersants was employed at the wellhead itself to disperse the escaping oil well before it could surface. It is also unclear when this method was initiated, but, on May 14, it was reported that the EPA approved this method of dispersant application after three tests.[167] Then, BP also began monitoring oil droplet particle size and the amount of dissolved oxygen in the water column.[168] The EPA posted the first of this data on May 17 and continued to release data daily until August 10, noting that there was no indication of significant effects on marine life and that the decrease in oil droplet particle size was a good indicator that the dispersant was working.[169]

It may come as a surprise, then, that on May 20, thirty-one days after the leak began, the EPA issued a directive to BP requesting that the company cease the use of the COREXIT dispersants in favor of less toxic alternatives on the NCP Product Schedule.[170] On May 20, the EPA and the Department of Homeland Security ("DHS") wrote a letter to BP requesting that they make all known information on the spill available to the public.[171] The company did not, however, switch to safer dispersants, citing availability issues.[172] The letter also stated that although the government was unaware of any confidential business information ("CBI") belonging to BP, that any CBI would be treated subject to applicable law.[173]

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165. NOAA *Update* 23 *April* 2010, AM., *available at* http://www.incidentnews.gov/entry/526105 (last visited Nov. 16, 2011).

166. NOAA INCIDENT NEWS, http://www.incidentnews.gov/browse/entries/8220/response/by-date (last visited Nov. 16, 2011).

167. The Associated Press, *Some Oil Spill Events from Friday, May* 14, 2010, ABC News Money, May 14, 2010, http://abcnews.go.com/Business/wireStory?id=10649335.

168. U.S. EPA, BP's Analysis of Subsurface Dispersant Use, http://www.epa.gov/bpspill/dispersants-bp.html (last visited Nov. 16, 2011).

169. *Id.*

170. EPA DISPERSANT MONITORING AND ASSESSMENT DIRECTIVE (2010), http://www.epa.gov/bpspill/dispersants/directive-addendum2.pdf.

171. LETTER FROM JANET NAPOLITANO, SECRETARY OF HOMELAND SECURITY AND LISA P. JACKSON, EPA ADMINISTRATOR TO DR. TONY HAYWARD, BP GROUP CHIEF EXECUTIVE (2010) http://www.epa.gov/bpspill/bp-hayward-dhs-epa.pdf.

172. LETTER FROM DOUGLAS J. SUTTLES, BP CHIEF OPERATING OFFICER TO REAR ADMIRAL MARY LANDRY, COMMANDER, EIGHT COAST GUARD DISTRICT AND SAMUEL COLEMAN, DIRECTOR, SUPERFUND DIVISION U.S. EPA REGION 6 (2010) http://www.epa.gov/bpspill/dispersants/5-21bp-response.pdf.

173. LETTER FROM JANET NAPOLITANO, *supra* note 171.

BP and Nalco used the CBI defense to refrain from disclosing the information and data on the COERXIT dispersants. The EPA responded by looking to § 14 of the Toxic Substances Control Act to compel BP to disclose the information.[174] In June 2010, a class action lawsuit was filed by Louisiana residents against BP and Nalco for their use of dispersants in the Deepwater Horizon response.[175] Eventually, the ingredients were made public, but not the exact amounts.[176] The company provided the EPA with the proportions but asked that they be kept from the public for proprietary reasons.[177]

D. Cleanup to Date and the Aftermath

The Deepwater Horizon oil spill released approximately 185 million gallons of oil into the Gulf of Mexico making it the largest marine oil spill since the inception of the petroleum industry and twenty times the amount spilled in *Exxon Valdez*.[178] Current estimates indicate that a total of 1.9 million gallons of COREXIT dispersants were sprayed in the Gulf.[179] This is over ten times the amount of stockpiled COREXIT dispersants accounted for in BP's Response Plan.[180]

The dispersants were applied on the surface and underwater at the wellhead for nearly all of the eighty-four days the oil escaped uncontrollably from the Macondo well.[181] According to the EPA, the dispersion of the oil at the wellhead was successful.[182] It has been reported that the resulting

174. OMB Watch, *As EPA Takes Action, Trade Secrets Continue Threatening Health and Safety*, June 2, 2010, http://www.ombwatch.org/node/11045.

175. *See* Complaint for Damages, Parker v. Nalco Co., (2010) (No. 10-01749) (E.D. LA) *available at* www.courthousenews.com/2010/06/17/Disperse.pdf.

176. Nalco COREXIT Ingredients, http://www.nalco.com/news-and-events /4297.htm (last visited Nov. 16, 2011).

177. *Id.*

178. Campbell Robertson & Clifford Kraus, *Gulf Spill is the Largest of Its Kind, Scientists Say*, THE NEW YORK TIMES, August 2, 2010, http://www.nytimes.com/2010/08 /03/us/03spill.html?_r=2&fta=y.

179. Dahr Jamail, *BP Dispersants "Causing Sickness,"* ALJAZEERA, Oct. 29, 2010, http://english.aljazeera.net/indepth/features/2010/10/20101027132136220370.html.

180. *See* BP Gulf of Mexico Regional Oil Spill Response Plan, *supra* note 38, at fig. 18-10.

181. Surface application began on at least May 3rd. Subsurface application was monitored by the EPA from May 17th to August 10th.

182. *BP's Analysis of Subsurface Dispersant Use*, EPA (Oct. 14 2011), http://www. epa.gov/bpspill/dispersants-bp.html.

underwater plumes of oil have dissipated and were most likely eaten by bacteria.[183]

Unfortunately, the best predictors of the effects of an oil spill of this magnitude stem from studying the aftermath of an actual disaster of comparable size. Therefore, we must seize this opportunity to learn all we can about exactly what happened in this spill in order to not only respond more efficiently to future events but to prevent them from occurring in the first place. Fortunately, scientific research into the use of dispersants in this spill has already begun.

It has been known that light, sweet, Louisiana crude oil is known to form 100 μm droplets of oil.[184] A mass of oil droplets this size behaves like a cloud with different density fronts in the water column.[185] Eventually, the droplets will spread out and then join together locally into mats which are typically what one sees at the ocean surface when a spill has occurred.[186] It is here that the oil becomes heavily emulsified.[187]

The aforementioned masses of oil droplets, or deepwater plumes were also discovered.[188] However, studies have shown that the plumes did not disappear as was previously reported.[189] Instead, they simply moved. Thus, the oil was not eaten by bacteria. Dr. Ian MacDonald, Professor of Biological Oceanography at Florida State University, has twenty-five years experience in analyzing samples collected from underwater seeps in the Gulf of Mexico. Dr. MacDonald collected samples from the Gulf in the aftermath of the spill and used gas chromatography to detect the presence of n-alkanes. These straight chain compounds are easily cleated, and therefore consumed by bacteria first. Gas chromatography results showed the presence of n-alkanes, thus indicating that bacteria were not consuming the oil.[190] At this time it is unknown whether a reservoir of native bacteria exists in the Gulf to biodegrade the oil.

183. Jeffrey Kofman, *BP Oil Spill: Undersea Plumes Nowhere to be Found as Tests Show Seafood to be Safe*, ABC WORLD NEWS, July 30, 2010, http://abcnews.go.com/WN/gulf-oil-spill-oil-plumes-eaten-bacteria-tests/story?id=11292159.

184. Ian MacDonald, Professor of Biological Oceanography, Address at Florida State University: Energy, Oil, Emissions and the Future of Florida (Sep. 21, 2010).

185. *Id.*

186. *Id.*

187. *Id.*

188. Christine Dell'Amore, *Giant Underwater Plume Confirmed – Gulf Oil Not Degrading*, NATIONAL GEOGRAPHIC DAILY NEWS, Aug. 19, 2010, http://news.nationalgeographic.com/news/2010/08/100819-gulf-oil-spill-bp-underwater-plume-science-environment/.

189. Terry C. Hazen et al., *Deep Sea Oil Plume Enriches Indigenous Oil-Degrading Bacteria*, 330 Science 204, 207 (2010).

190. Ian MacDonald, Professor of Biological Oceanography, Address at Florida State University: Energy, Oil, Emissions and the Future of Florida (Sep. 21, 2010).

One of the biggest concerns of scientists and environmentalists thus far is the lack of evidence of dead animals.[191] Although this would be assuring to the general public, it does not tell the whole story of how the ecosystem has been or will be affected in the future. Instead, the real measure of the effects of an environmental disaster is the effect on overall activity and biodiversity.[192] Even a fifteen percent reduction in overall activity and biodiversity can be considered a large deficit.[193] The worst-case scenario would result from tipping effects. Tipping effects are environmental events that lead to an irreversible consequence and are most likely to occur when an ecosystem is already stressed.[194] This occurred in the aftermath of *Exxon Valdez* where the herring fishery was closed, and after being reopened for one year the fishery crashed.[195] Before the Deepwater Horizon explosion, sperm whales were considered to be subject to tipping effects based on their population.[196] Bluefin tuna, an endangered species, are also subject to tipping effects as they spawn in the summer within the area of the spill.[197] A loss of a large number of fish from a single year-class would pose a threat to the species.[198]

On October 27, 2010, Al Jazeera reported on the effects of the COREXIT dispersants in the Gulf region.[199] Their article reports hemorrhaging in dolphins and humans.[200] It is highly likely that the dispersants are to blame because hemorrhaging in animals is the dispersion of bodily fluids.[201] There are also reports by fishermen who volunteered in the cleanup effort of dispersants literally eating through boat hulls and rubber equipment.[202]

191. *Id.*

192. *Id.*

193. *Id.*

194. *Id.*

195. *Id.*

196. *Id.*

197. Mark Schleifstein, *Bluefin Tuna Particularly Vulnerable to Gulf of Mexico Oil Leak*, NOLA.COM (May 13, 2010), http://www.nola.com/news/gulf-oil-spill/index.ssf/2010/05/bluefin_tuna_particularly_vuln.html.

198. *Id.*

199. Dahr Jamail, *BP Dispersants 'Causing Sickness,'* ALJAZEERA (Oct. 29, 2010), http://english.aljazeera.net/indepth/features/2010/10/20101027132136220370.html.

200. *Id.*

201. *Id.*

202. Stuart Smith, *Boat Operators Should Be Concerned About the Damage Caused By Oil and Dispersants in the Gulf Waters*, GULF OIL DISASTER RECOVERY (Aug. 22, 2010), http://www.gulfoildisasterrecovery.com/web/index.asp?mode=full&id=761.

V. The Response to the Response: Foundations for a New Legal Framework

A. National Contingency Plan Revision under the CWA

Since its inception in 1968, the NCP has only been revised four times. The last revision was made on September 15, 1994.[203] Again, recall that the President has discretion to revise the NCP under the CWA, but only as deemed advisable.[204] As outlined earlier, each revision was in response to new legislation. Since new legislation is typically a response to a recent oil spill, it appears that the government has gotten into the habit of reviewing the NCP not only when it has to, but also when it has to in response to an environmental disaster. This is an unsustainable way of ensuring that government agencies are best prepared for an unexpected oil spill. Therefore, it is highly recommended that the EPA review the NCP by mandate at least once every ten years.

Specifically, the NCP should be amended to include at least some sort of toxicity threshold.[205] As mentioned before, the only threshold is that a dispersant possesses an effectiveness value of forty-five percent.[206] Further, the CWA and the NCP should provide for a mechanism for the EPA to remove dispersants. Although it is obvious from a glance at the NCP Product Schedule that dispersants have been removed, and in some cases relisted, there is no provision in the NCP that provides a regular review of the listed dispersants based on scientific and environmental studies which are published quite frequently these days.[207] In fact, many dispersants have been removed simply because they have been discontinued by their manufacturers.[208]

The NCP Product Schedule was revised on October 28, 2010, and includes the COREXIT 9500 and 9527 dispersants used by BP in the Deepwater Horizon response.[209] The NCP Product Schedule Technical Notebook was also revised on October 28, 2010, and recommends the application of 2-10 gallons per acre, or a 1:50-1:10 dispersant-to-oil ratio, for

203. 59 F.R. 47394 (1994).

204. 33 U.S.C. § 1321(d)(3) (2011).

205. Or, more specifically, an effectiveness-to-toxicity ratio.

206. 40 C.F.R. § 300.915(a)(7) (2011).

207. COREXIT 9527 was removed on 03/10/78 and relisted on 12/18/95. COREXIT 9500 was removed on 04/13/94 and was also relisted on 12/18/95. Recall that COREXIT 9527 was applied in initial dispersant tests from March 25-28, 1989 in the *Exxon Valdez* response.

208. ENVIRONMENTAL PROTECTION AGENCY, NATIONAL CONTINGENCY PLAN: PRODUCT SCHEDULE (2011), *available at* http://www.epa.gov/osweroe1/docs/oil/ncp/schedule.pdf.

209. *Id.*

both dispersants.[210] If current estimates are correct that 185 million gallons of oil escaped from the Deepwater Horizon rig and the Macondo well, BP's addition of 1.9 million gallons of the COREXIT dispersants comes out to approximately a 1:100 dispersant-to-oil ratio. Although this amount is well below the EPA's suggested quantity, never has this vast quantity of dispersants ever been used. Additionally, the NCP Product Schedule Technical Notebook only discusses aerial and boat applications of all listed dispersants.[211] Therefore, the EPA is most likely assuming that the dispersants will remain near the surface of the ocean as opposed to miles below where most marine life dwell.

There is no precedent or data available for the application of dispersants at the wellhead. Unfortunately, the Deepwater Horizon disaster is probably the best source of data available assuming it can be studied properly. Although the University of South Florida has sent out research vessels into the Gulf, it may be years before the effects of this quantity of dispersants and their subsea application are fully understood.[212]

In the meantime, Senator Frank Lautenberg has introduced legislation titled the Safe Dispersants Act.[213] This proposed legislation would provide for stricter testing before a dispersant can be included in the NCP Product Schedule as well as a toxicity threshold as proposed here earlier.[214] Stricter tests would include long-term tests in addition to the swirling flask tests that only examine toxicity in a few short days.[215] They would also include testing of more than just the two species currently tested by the EPA.[216]

The Better Oil Spill Response Plan Act of 2010[217] was introduced by Representative Edward Markey and proposes to amend the CWA to require the President to provide Area Committees with the worst possible oil discharge scenario possible in each area covered by an ACP every five years. If the worst-case scenario were to change, the President would be required to revise the NCP.[218]

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210. GUIDE TO USING THE NCP PRODUCT SCHEDULE NOTEBOOK (2010), http://www.epa.gov/oem/docs/oil/ncp/notebook.pdf

211. *Id.*

212. Vickie Chachere, *R/V Weatherbird II To Return Friday*, UNIVERSITY OF SOUTH FLORIDA NEWS (Sept. 2, 2010), http://usfweb3.usf.edu/absoluteNM/templates/?a=2670&z=123.

213. S. 3661; H.R. 6119, 111th Cong. (2nd Sess. 2010). *available at* http://lautenberg.senate.gov/assets/dispersants.pdf.

214. Senator Frank R. Lautenberg Press Release, http://lautenberg.senate.gov/newsroom/record.cfm?id=326743 (last visited Nov. 16, 2011).

215. *Id.*

216. Menidia (smallfish) and Mysidopsis (shrimp).

217. H.R. 5608 111th Cong. (2nd Sess. 2010).

218. *Id.*

B. Oil Spill Response Plan Review Process under OCSLA

It is now well known that BP's Gulf Of Mexico Regional Oil Spill Response Plan contained typographical errors and outdated information.[219] For example, it lists resources for the rescue of several species of animals that are not even present, let alone native to the Gulf region.[220] It also lists a scientist who was deceased four years before the latest revision.[221] Although this is suggestive of BP's reuse of information from response plans in other drilling regions, it may be unreasonable to imagine that the thirty day period in which the regional supervisor of the BOEM has to review the details of BP's 582-page response plan is sufficient to catch everything. Further, the oil spill response plan is only a portion of the EP that is reviewed in this window.

Currently, there is proposed legislation to change the OCS oil and gas lease approval process. The Consolidated Land, Energy, and Aquatic Resources ("CLEAR") Act[222], introduced by House Natural Resources Committee Chairman Nick J. Rahall, would amend the OCSLA to increase the review period for BOEM approval from thirty days to ninety days. In addition to the extension of time for the BOEM to review operator response plans, the lenient regulations for the Gulf of Mexico region also need to become more stringent. As of now, there is a sixty-day period in which the BOEM regional supervisor has to approve the abbreviated DOCDs allowed for this region, yet only a thirty-day period to review EPs. Extending the review period for EPs should be sufficient to eliminate the errors in approved Oil Spill Response Plans. Additionally, doing away with DOCDs altogether in favor of DPPs for the Gulf of Mexico region should also be considered along with a sufficient to review period for the lengthier DPPs. Perhaps most importantly, an operator should no longer be allowed to proceed with oil and gas drilling prior to the approval of an Oil Spill Response Plan.

The decision to use dispersants and select the proper products is a difficult decision that has to be made quickly at the onset of a spill. Therefore, response plans need to convey as many dispersant options as

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219. Andrew Clark, BP *Contingency Plan for Dealing With Oil Spill Was Riddled With Errors*, GUARDIAN (June 9, 2010), http://www.guardian.co.uk/environment/2010/jun/09/bp-oil-spill-contingency-plan.

220. BP's Gulf Of Mexico Regional Oil Spill Response Plan, fig. 11-3. (The species listed are sea lions, seals, sea otters, and walruses.)

221. Domenick Pilla, *BP's Emergency Plan: Dead Scientist to Rescue Non-Existent Otters and Walruses*, EXAMINER, (June 10, 2010), http://www.examiner.com/cultural-issues-in-national/bp-s-emergency-plan-dead-scientist-to-rescue-non-existent otters-and-walruses-6-live-feeds. Peter Lutz is listed as a National Specialist in Wildlife and Marine Life in Appendix F of BP's Response Plan.

222. H.R. 3534, 111th Cong. (2nd Sess. 2010).

possible. The BP Response Plan only listed toxicity and effectiveness information and the MSDSs for Nalco's COREXIT dispersants. Other dispersants provided in the stockpile listings of available dispersants likely to be used in a response consisted of a dismal 0.72 percent of the total quantity listed. Even a thorough reading of the DUP gives the impression that the COREXIT dispersants are the best and most widely available dispersants in the Gulf of Mexico Region. Therefore, in addition to the extension of the approval window, additional criteria for approval need to be provided. For example, requiring an operator to provide the entire NCP Product Schedule in the response plan would show an initial decision maker all of the available options. This is not likely to present a burden on operators or the initial decision maker because the NCP Product Schedule only lists eighteen dispersants and already provides the data for their toxicity and effectiveness. Another example would require operators to list all of the available quantities of each NCP approved dispersant within a reasonable distance of the drilling operation. This would also show the initial decision maker a wider variety of dispersants to choose from, assuming that most are regionally available. This is also not likely to present a burden on operators, at least in light of the fact that BP listed stockpiles of COREXIT as far away as Singapore and the United Kingdom.

C. Best Dispersants Available

BP used the dispersants developed for heavier oils on a light crude oil without considering the more effective, less toxic dispersants on the NCP Product Schedule. If the oil rigs themselves need to be operated using the best available and safest technology under the OCSLA, then why can't the equipment and chemicals used to recover any escaped oil also be of the best available technology (i.e., the best combination of effectiveness and toxicity)?[223] The CWA has a similar requirement for pollutant control. Specifically, it requires the best available technology economically feasible for the control of pollutants classified as toxic and nonconventional.[224]

In the end, BP used an estimated 1.9 million gallons of the COREXIT dispersants during the Deepwater Horizon response. Prior to the explosion, they had only stockpiled less than ten percent of this amount as indicated in their Oil Spill Response Plan. Therefore, BP had to order more dispersants. Thus, although it may be burdensome for an operator to immediately locate available dispersants in the wake of a spill, it was likely not a burden for BP to seek safer dispersants at the time it had to order more. Therefore, the requirement to use the best dispersants available can be a flexible, tiered system depending on the circumstances at the time dispersants are sought.

223. 43 U.S.C. § 1347(b) (2011).
224. 40 C.F.R. § 125.3 (2011).

Because this would likely create a scenario in which COREXIT dispersants only accounted for 10% of the total amount of dispersants used, opponents of using COREXIT dispersants in particular are likely to be pleased.[225]

Finally, the President should be given more authority to change the dispersant schedule when feasible during an oil spill response. Expanded authority would especially be needed when new information on dispersants, and even new dispersants themselves, has arisen since the last revision of the NCP Product Schedule.

D. Transparency in the Oil Spill Response Process

Although BP eventually submitted the ingredients of the COREXIT dispersants used in the Deepwater Horizon response to the EPA, the information is inadequate without their precise proportions. Under the proposed Better Oil Spill Response Plan Act of 2010, the President cannot place a new dispersant on the NCP Product Schedule unless the manufacturer publicly discloses the constituent ingredients.[226] The proposed Safe Dispersants Act would require not only the public disclosure of ingredients of dispersants, but their exact quantities as well.[227] It is important to note, however, that public disclosure of proportions of ingredients may provide a disincentive for private entities to develop better dispersants.

VI. Conclusion

Dispersants have been controversial in oil spill response efforts because of their toxicity. The most recent chapter in the controversy arises from their use in unprecedented quantities in the Gulf of Mexico in response to the Deepwater Horizon oil spill including their application at the wellhead. Almost instantly, BP was subject to harsh scrutiny by environmentalist groups for their decision to use dispersants. Much of the outcry was based on the aforementioned toxicity-effectiveness issue regarding dispersant use and that BP was basically trying to keep the oil out of sight to avoid more economic rather than environmental damages.[228] BP

225. This rationale assumes that there are no chemical incompatibilities between the initial dispersant used and the new dispersant being sought. We know, however, that despite the similar product name, the ingredients of both COREXIT dispersants used by BP contained different ingredients. It is therefore likely that combined use of other dispersants would be safe.

226. H.R. 5608 111th Cong. (2nd Sess. 2010).

227. S. 3661; H.R. 6119 111th Cong. (2010) *available at* http://lautenberg.senate.gov/assets/dispersants.pdf.

228. Margaret Cronin Fisk, *BP, Nalco Sued Over Dispersant Used in Gulf Spill* (Correct), BLOOMBERG BUSINESSWEEK, June 18, 2010, http://www.businessweek.com/news/2010-06-18/bp-nalco-sued-over-dispersant-used-in-gulf-spill-correct-.html.

has specifically come under fire by environmentalists for referring to dispersants as detergents. But that is precisely what they are, only more toxic than cleaning agents approved for household use. In lay terms, detergents used in the home disperse oil and dirt particles throughout the water being used, be it bathwater, water in the kitchen sink, or water in a washing machine.

Environmentalists would point out that the distinction, however, is that all of the aforementioned water containers have drains to remove the unwanted oil, dirt, and detergent while the ocean does not. Plus, they would point out that there are no living organisms in the water. Proponents of dispersant use would argue that the vast ocean is sufficient to dilute the unwanted chemicals and native bacteria will consume the oil faster because of the increased surface-area-to-volume ratio provided by the newly formed oil droplets.

Until scientific research can support a definite decision to cease the use of dispersants, they remain a viable option in responding to an oil spill. Although they are approved by the U.S. government, a new legal framework is necessary to ensure that only the best dispersants are used and that they are used responsibly.

As underscored throughout this paper, perhaps the best estimation on the effects of future dispersant use is to study an actual response. This is because it is hard to determine exactly what will happen in a spill such as Deepwater Horizon. Or is it? In recent weeks, it has been discovered that what is known as Operation Deep Spill was carried out prior to the disaster. In 2000, off the coast of Norway, BP, with the knowledge of the U.S. government, conducted a real-time experiment using a wellhead that was strategically leaking oil from the ocean floor.[229] It is alleged that the experiment revealed the presence of underwater oil plumes.[230] This prior knowledge may bring to the surface a need for more changes to the existing legal framework regarding oil spill preparedness and response. For example, operators may be held responsible for monitoring underwater plumes in light of the fact that BP most likely knew beforehand that they would form.

This paper has proposed a new legal framework to address regulatory gaps in the oil spill response process regarding dispersants. First, requiring the revision of the NCP would keep the NCP Product Schedule in harmony with the latest dispersant technology. Requiring stricter toxicity testing with a reasonable toxicity threshold requirement will yield a product schedule with only the safest, most effective dispersants commercially available. Since underwater use of dispersants is unprecedented, new effectiveness

229. Ian MacDonald, Professor of Biological Oceanography, Address at Florida State University: Energy, Oil, Emissions and the Future of Florida (Sep. 21, 2010).

230. *Id.*

studies should be conducted for use in such an environment, and these values should also be reported in the NCP Product Schedule.

Next, the Oil Spill Response Plan review process under the OCSLA should be amended to provide ample time to review the large and scientifically detailed response documents that are required as part of the oil and gas leasing process. Extending the window for approval from thirty days to at least ninety days would provide sufficient time for review. Additionally, a new requirement that the entire NCP Product Schedule be listed in an operator's Oil Spill Response Plan should not impose a burden on operators since there are only eighteen dispersants currently approved by the EPA. This would prevent an initial responder from unnecessarily thinking they may only have between two and four dispersants to choose from.

Further, the proposed legal framework aims to give more flexibility in the selection and use of dispersants in the oil spill response itself. If better dispersants become available or new quantities of dispersants must be ordered after an initial response, operators should be required to acquire only the best dispersants available. This flexibility would be most effective in responses to spills such as Deepwater Horizon where very large quantities of dispersants may be utilized.

Finally, a transparency requirement would ensure that all of the ingredients as well as their proportions are disclosed. A requirement of disclosure to the general public would harm the dispersant industry and may have a chilling effect on the development of safer, more effective dispersants. However, a requirement to disclose such information to the EPA would ensure that the information is at least reviewed by a regulatory agency while still eliminating any chilling effect. This is imperative because it would be a moot point to implement a new legal framework to promote the use of the best dispersants available if that framework would hinder the development of new and improved dispersants.