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Washington State Case Study and Guidance Developed on the Closing and Re-Opening of a Shellfishery Due to Oil Contamination

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ABSTRACT 299962:

The 128 foot F/V Deep Sea was illegally anchored on Washington state-owned aquatic lands in Whidbey Island's Penn Cove from December 24th 2011 until it sank on May 14th, 2012, following a fire aboard the vessel. Penn Cove is the home of Penn Cove Shellfish, LLC, the United States' largest and oldest mussel farm. The Deep Sea sank within approximately 200 meters of Penn Cove LLC's mussel raft growing system with an unknown amount of oil aboard. After the vessel sank Penn Cove Shellfish, LLC, voluntarily ceased harvesting their shellfish. Not long after the Washington State Department of Health closed commercial and recreational harvest of shellfish in Penn Cove. Although efforts were made to plug the vessel's vents and seal the vessel's fuel tanks a cracked vent allowed fuel to leak from the sunken vessel, later identified as marine diesel by the Washington State Department of Ecology. Sheen was documented over the mussel rafts.

Based on sensory testing the Washington State Department of Health re-opened Penn Cove's shellfish harvest in stages, with sampling plan and testing assistance from the National Oceanic and Atmospheric Administration.

Following response to the F/V Deep Sea all agencies involved in the shellfish closure that was as result of this incident convened to establish guidelines on the best way to run the closure and subsequent re-opening process for inclusion in the Northwest Area Contingency Plan, based off of lessons learned from the response. This was especially important since shellfishery closures due to oil spill contamination are not common in Washington State. This paper outlines those lessons learned during the F/V Deep Sea response in regards to closing and then re-opening a shellfishery in Washington State, and includes the guidelines that were established and incorporated into the Northwest Area Contingency Plan as a result.

BACKGROUND:

The 128 foot fishing vessel *Deep Sea* was illegally anchored on Washington state-owned aquatic lands in Whidbey Island's Penn Cove from December 24th 2011 until it caught fire on May 12th 2012, and subsequently sank on May 14th, 2012. Penn Cove is the home of Penn Cove Shellfish, LLC, the United States' largest and oldest mussel farm (Penn Cove Shellfish, 2013). The F/V DEEP SEA sunk within approximately 200 meters of Penn Cove LLC's mussel raft growing system with an unknown amount of oil aboard. Although efforts were made to plug the vessel's vents and seal the vessel's fuel tanks a cracked vent allowed fuel to leak from the

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sunken F/V DEEP SEA. Attempts to contain the sheen on the surface of the water failed, and sheen was documented over the mussel rafts on May 15th. This oil contact was likely not an isolated event. Due to the potential of oil contamination, Penn Cove Shellfish, LLC voluntarily shut-down their commercial mussel harvest, and subsequently the Washington Department of Health closed all the commercial and recreational harvest of shellfish in Penn Cove.

The F/V DEEP SEA continued to sheen off and on until it was floated on June 4th, with oil reaching the mussel rafts at times despite repeated attempts at containing the sheen. The vessel was removed by tug on June 6th. Washington State Department of Ecology identified the oil as marine diesel.

Through collaborative effort, the Washington Department of Health (WA DOH) and the National Oceanic and Atmospheric Administration (NOAA) Seafood Inspection Program (SIP) developed a shellfish sampling plan for reopening both commercial and recreational shellfish harvest in Penn Cove. The NOAA Office of Response and Restoration facilitated the chemical-analytical testing of mussels collected from different sites, and the NOAA SIP facilitated the sensory testing of the mussels collected, along with additional sensory experts from the U.S. Food and Drug Administration (USFDA).

Sensory testing that took place on June 5th determined that some shellfish were tainted, though all mussels tested passed the standard chemical-analytical testing, thus were technically safe for consumption. Even when seafood samples from spill areas pass the standard chemical-analytical tests (the levels of polycyclic aromatic hydrocarbons are below the limits permitted as determined by human health risk assessment), flavor or odor may still be affected, and they are then “tainted”. Taint in seafood renders it adulterated and unfit for human consumption according to U.S. law (Federal, Food, Drug and Cosmetics Act, US Code 21, Chapter IV, Sec. 402 [342], a.3). After the initial sensory test on June 5, as part of the incident specific re-opening procedures developed jointly between WA DOH and NOAA SIP, only the northern parts of Penn Cove were opened to recreational harvest and the commercial rafts and southern beaches remained closed due to detected taint. Following the second sensory testing on June 8, the commercial mussel raft samples passed and commercial harvest re-opened, while the southern beaches remained closed for recreational harvest. Finally on June 22 all shellfisheries were opened (WA DOH. 2012, Mearns, Shigenaka, Meyer, and Drury. 2014).



Image 1 Sheen among commercial mussel rafts

After the F/V DEEP SEA incident concluded the agencies involved in the incident, and specifically those involved with either the shellfishery closure/re-opening or messaging of the shellfishery closure, convened to discuss the process by which Penn Cove shellfish harvest had been closed and then re-opened, and, following, to document this process for inclusion in the Northwest Area Contingency Plan (NWACP) for reference during future incidents. Shellfish closures due to oil spills are not common in Washington State waters – prior to the F/V DEEP SEA incident the only other spills that significantly impacted shellfish growing areas were the Dalco oil spill in October 2004 and the Foss Maritime spill at Point Wells in December 2003, thus having this debrief and documentation exercise was important for being able to easily address this type of specialized issue in the future.

Shellfish aquaculture is an important economic resource in Washington State, adding an estimated \$270 million a year into the region’s economy and providing over 3,200 jobs, the majority in coastal communities (NOAA Fisheries Service. 2012). Knowing how the closing/re-opening process works is important to know given the impacts the closure may have on the local economy and community, apart from the many other impacts inherent with oil spills.

This guidance documented in the NWACP is to help responders become knowledgeable quickly on the topic of shellfish closures due to oil contamination, to specify the authorities in Washington State under which this happens, and by which process shellfisheries are opened again. It is not a technical document in which specific instructions on testing and information on contamination levels can be found, but is general directions to assist a response with this specific issue. There are publications available that address testing and contamination levels, later referenced, and those standards may change based on testing and spill experiences.

The guidance developed after the incident is what optimally should occur, based on the process that occurred during the F/V DEEP SEA incident, and adjustments that would have helped along the process of closure and reopening. This documentation is intended to ensure that if this type of scenario were to happen again there would be less confusion over which agency was expected to do what, and how they play into the Incident Command System structure. Also addressed was the “how” of reopening a shellfish harvest area once it is closed, as during the

incident it was a relatively straight forward decision to close the shellfish harvest area, however, it took much coordination to determine the criteria under which the harvest area would be opened. This is a common issue in closures during spill responses, as fishery closures due to oil spills are not common state to state (Mauseth, G.S. and G.E. Challenger, 2001, Yender, 2003). This NWACP inclusion may be modified in the future as more experience is gained.

NOAA's "Managing Seafood Safety After an Oil Spill" provides guidance for the decision process for managing seafood safety after an oil spill, an extremely helpful tool that the Washington Department of Health generally follows (Yender, Michel and Lord, 2002). Whereas "Managing Seafood Safety after an Oil Spill" helps the response determine appropriate seafood management actions in response to a spill, the guidelines established post the F/V DEEP SEA incident are specific to Washington State, focus on communication strategies among the different stakeholders, and include what should be covered during each point of the decision of closing and re-opening a shellfishery due to oil contamination. Additionally, the guidance focuses only on shellfish, as in Washington State WA DoH only regulates bivalve molluscan shellfish. Other fisheries are regulated by Washington Department of Fish and Wildlife.

LESSONS LEARNED FOR POTENTIAL FUTURE INCIDENTS:

Perhaps the biggest lesson learned among agencies involved with the F/V DEEP SEA response, and that are accustomed to the Incident Command Structure, is that the Washington Department of Health is the sole decision maker of whether or not a shellfishery will be closed in Washington State Waters during an oil spill, or threat of oil spill, incident. Washington Department of Health makes this decision outside of the Incident Command Structure and Unified Command. Additionally, during the initial response, after the shellfishery had already been closed, there was confusion over what agency's responsibility seafood safety was, as the difference between state and federally regulated waters caused some uncertainty if it was NOAA or Washington State's responsibilities. The incident was in state waters, so it was Washington State's decision to close and establish under what criteria Penn Cove shellfish harvest would open, not NOAA's.

If an incident were to impact a tribal shellfishery the management of the closure would depend on if the tribe had agreed to maintain their own program, in which they then follow the USDA's National Shellfish Sanitation Program (NSSP), or if they defer to WA DOH to determine closure and re-opening. In Washington, at the time of this paper writing, there are no known tribes with shellfisheries that do not defer to WA DOH to run the sanitation portion of their shellfishery (WA DOH).

While the Department of Health is the final decision maker, they may call on the expertise of other agencies for help in order to base decisions on the most up-to-date information available on shellfish oil exposures. This was true for the F/V DEEP SEA incident; the NOAA Seafood Inspection Program had recent guidelines developed out of the Deepwater Horizon oil spill (USFDA. 2013). By using this guidance the response was in no way being compared to the Deepwater Horizon Incident, as was possibly misinterpreted during the response by response stakeholders, but was an effort to use the most current protocols. For example, the NOAA

Seafood Inspection Program learned during the Deepwater Horizon Incident response that the guidance to place samples for sensory testing in heavy foil and then plastic bags not only killed the product, but also confused the sensory analysis. Therefore, the NOAA Seafood Inspection Program has since modified their recommendation for transport of samples for sensory sampling to be delivered as though being prepared for market – to deliver the shellfish samples in bushel baskets or coolers to optimally arrive alive, then to be shucked at the sensory lab (Wilson. 2012). The Washington State Department of Health took advantage of NOAA Seafood Inspection Program’s expertise in develop re-opening procedures for the Penn Cove shellfisheries (both commercial and recreational), and this relationship is now documented in the Northwest Area Contingency Plan for future consideration if an incident involving oil contamination of shellfish occurs.

SECTION 9409: GUIDELINES IN THE NORTHWEST AREA CONTINGENCY PLAN:

There are best management practices for all involved with a response that can be followed during a spill event impacting shellfisheries that will aid in good communication and information transfers. As applicable, this model can be adopted for other states that may face the same issues during a spill, or would like to plan for such an incident. The following is the guidance that is now in the Northwest Area Contingency Plan, the inclusion topics summarized in figure 1 and the process flowchart in section 4.

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| <p><u>Section 9409 of the Northwest Area Contingency Plan</u> Washington State Waters: Process Guide for Shellfish Growing Area Closure and Opening Due to Oil Contamination</p> <ol style="list-style-type: none"> 1. Introduction 2. Roles Specific to Shellfish Closures and Reopening During a Spill, or Potential Spill, Response 3. Best Management Practice Particular to Shellfishery Closure During an Oil Spill, or Potential Oil Spill, Incident 4. Flowchart of Shellfishery Closure and Opening Process in Washington State 5. Contact List 6. References |
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Figure 1: Layout of section 9409 of the NWACP

Washington State Waters: Process Guide for Shellfish Growing Area Closure and Opening Due to Oil Contamination

1. Introduction

When an oil spill occurs shellfish may be exposed to petrochemicals. Because shellfish are filter feeders, they can readily accumulate substances from the water column and may become unsafe to eat, and/or tainted, i.e. technically safe to eat but have altered flavor due to petrochemical exposure. In Washington State waters, the Washington State Department of Health (WA DoH) is responsible for evaluating commercial and recreational shellfish growing areas to determine if shellfish are safe to eat, if a shellfish growing area will be closed due to an oil release, or potential for release, and when the shellfish growing area will be opened again.

This document is not meant as a comprehensive guide for all the steps of a closure and opening of a shellfish growing area due to oil contamination, but as a quick reference to assist during an oil spill response. The guide should also be scalable to the size of the event, thus when an On Scene Coordinator is mentioned, a representative may be sufficient. This document intends to provide a rudimentary understanding of the authorities governing the closure and re-opening of shellfish harvest, roles of involved agencies, the general process, and guidance on best management practices for the process during the threat of, or actual, petrochemical spill event to shellfish growing areas in Washington State waters.

2. Roles Specific to Shellfish Closures and Reopening During a Spill, or Potential Spill, Response

- *Washington State Department of Health (WA DoH)*

WA DoH is the state agency responsible for ensuring minimum performance standards for the growing, harvesting, processing, packing, storage, transporting, and selling of shellfish for human consumption. WA DoH will temporarily close shellfish growing areas when it is determined that there is an actual or imminent threat to public health during an oil spill, or threat of oil spill. This is not a Unified Command decision.

The WA DoH is the only agency that can re-open a growing area closed by them. It is important to note that WA DoH only regulates bivalve molluscan shellfish, and their authority sometimes overlaps with Washington Department of Fish and Wildlife (particularly for recreational harvest). Other fisheries are regulated by Washington Department of Fish and Wildlife. Although WA DoH decisions are outside of Unified Command, effective communication between WA DoH and the Unified Command is essential.

For reopening the growing areas following oil contamination, WA DoH generally follows criteria from the NOAA document, 'Managing Seafood Safety After an Oil Spill'. This document has been used following oil spills in Oregon, Washington, and Alaska. The document outlines the following reopening criteria:

- Abatement of the risk of oil further contaminating the growing area
- Lack of visible oil sheen on the water throughout the commercial growing areas
- Shellfish tissue samples must meet the risk-based criteria for all analytes (substance that is of interest in an analytical chemistry test) of concern in the source oil relative to the potential health risk posed by certain cancer-causing polycyclic aromatic hydrocarbons

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- Tissue samples must pass an independent sensory test conducted by a panel of experts from the NOAA Seafood Inspection Program

WA DoH will use the best available guidance for reopening shellfish growing areas, and will consult with FDA and NOAA if specific questions arise.

- *WA DoH operating authorities*

For the safe and sanitary control of the growing, processing and shipping of shellfish, WA DoH follows FDA guidance and is monitored by the FDA and audited annually.

Commercial Shellfish Rules

Chapter 246-282 WAC, Sanitary Control of Shellfish

- The National Shellfish Sanitation Program Guide to the Control of Molluscan Shellfish national rule is adopted by reference in WAC 246-282-005.
- In the National Shellfish Sanitation Program there is no specific reference to oil spills, however, in Chapter 2, @.03 there is the “Presence of Toxic Substances in Shellfish Meats” section.

Chapter 69.30 RCW, Sanitary Control of Shellfish

Recreational Shellfish Rules

Chapter 246-280 WAC, Recreational Shellfish Beaches

Chapter 43.20.050 RCW, State Board of Health Delegation of Authority

- *Closure notification*

For notification of closures, WA DoH manages a listserv of growers, local health authorities, and stakeholders. WA DoH also manages a tally for which growing areas are closed or open. WA DoH will individually notify growers to inform them of closure affecting their shellfish growing area.

- *Enforcement of closure*

WA DoH has an agreement with the WDFW to patrol harvest areas during closures to ensure no harvesting occurs. WA DoH has the authority under WAC 246-282 to confiscate and/or recall unapproved shellfish for sale and issue penalties.

Washington Department of Fish and Wildlife (WDFW) issues permits for recreational shellfish and can set closures based on the conservation of the resource. WDFW also sets seasons for recreational harvest and public health considerations can be a part of that decision.

- *Local health authority role*

Local health departments, through their public health authority, can close recreational beaches of their own accord, and usually follow WA DoH recommendation on beach status. WA DoH also contracts with local health departments to perform certain tasks in managing recreational shellfish beaches, which include water quality monitoring, pollution source identification and correction, and public notification.

- *NOAA Seafood Inspection Safety Program role: Sensory testing*

WA DoH may decide to do sensory testing for affected shellfish. Even when seafood samples from the spill area pass the standard chemical-analytical tests (the levels of polycyclic aromatic hydrocarbons are below the limits permitted as determined by human health risk

assessment), flavor or odor still may be affected, known as taint. Taint in seafood renders it adulterated and unfit for human consumption according to U.S. law (Federal Food, Drug, and Cosmetics Act, US Code 21, Chapter IV, Sec. 402 [342], a.3). The NOAA Seafood Inspection Program (SIP) has trained expert seafood assessors that use their sense of smell and taste to detect any unusual odors and flavors in seafood.

In the event that WA DoH decides to use sensory testing for the monitoring of taint in shellfish, WA DoH would contact the NOAA Scientific Support Coordinator (SSC) for connection to NOAA's SIP. The SSC would then contact the Chief Quality Officer at NOAA SIP headquarters. The SSC would act as a facilitator between the SIP and WA DoH on a sampling procedure and timeline to test the affected shellfish.

NOAA SIP works together with the FDA on sensory testing, and NOAA sensory testers may be augmented with FDA sensory testers. Testing would most likely happen at the Seattle offices for a Washington oil spill. NOAA SIP is organized nationally and results from a sensory analysis are not final until cleared through the Chief Quality Officer at NOAA SIP headquarters. The results are then shared with WA DoH, which then makes the final decision on the shellfishery status.

3. Best Management Practice Particular to Shellfishery Closures During an Oil Spill, or Potential Oil Spill, Incident

Although WA DoH is the authority on the closing and opening of shellfisheries in Washington State waters, there are best management practices that can be followed during a spill event impacting shellfisheries that will aid in good communication and information transfer. These "best management practices" are supplemented by a flowchart in section 4.

- *Initial WA DoH notification*

In the event of an oil spill, or potential oil spill, near a shellfish growing area the WA Department of Ecology (WA ECY) has an early recognition program to notify WA DoH of a potential threat to shellfish. WA DoH should be notified immediately by the Unified Command if there is an eminent threat to shellfish growing areas, or if a major event happens during the response that could lead to contamination, or further contamination, of a shellfish growing area.

- *Communications*

To stay informed of on-scene observations and operations, WA DoH should be included on daily briefings through the Incident Command Structure.

As applicable, the NOAA SSC will act as a liaison between WA DoH and NOAA SIP, and can help facilitate the creation of a sampling and procedure plan for sensory testing. NOAA SSC will keep NOAA SIP informed of on-scene observations and operations.

- *Communicating the closure to the Unified Command and other stakeholders*

After the WA DoH decides that a shellfishery should be closed due to oil contamination, or threat of oil contamination, then a conference call should be convened by the State On Scene Coordinator (SOSC) for all stakeholders and subject matter experts. This will ensure all stakeholders in the response have the same information about the shellfish closure. This call will most likely include representatives from:

- WA DoH

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- USCG
- NOAA
- WA ECY
- Local health department
- Local shellfish grower(s)
- Identified subject matter experts

This call should generally cover the following:

- WA DoH will cover when and why the shellfishery was closed
- What the best available guidance is for opening procedures
- How WA DoH will stay informed of on-scene observations of the situation; including observations of sheen, oiling, etc., and any major events that may lead to contamination or further contamination
- Discuss the best available guidance for opening procedures
- Answer, or attempt to answer, any questions that arise having to do with shellfish testing and reopening procedures
- *Strategizing the closing/opening of a shellfishery*

Outside of the overall communication call, a separate call between WA DoH, FDA and NOAA (and any other subject matter experts) will likely occur to determine the sampling plan, organize a sensory panel, and organize any other testing that may need to occur for reopening. This communication will probably be an on-going process throughout the reopening of a shellfish growing area.

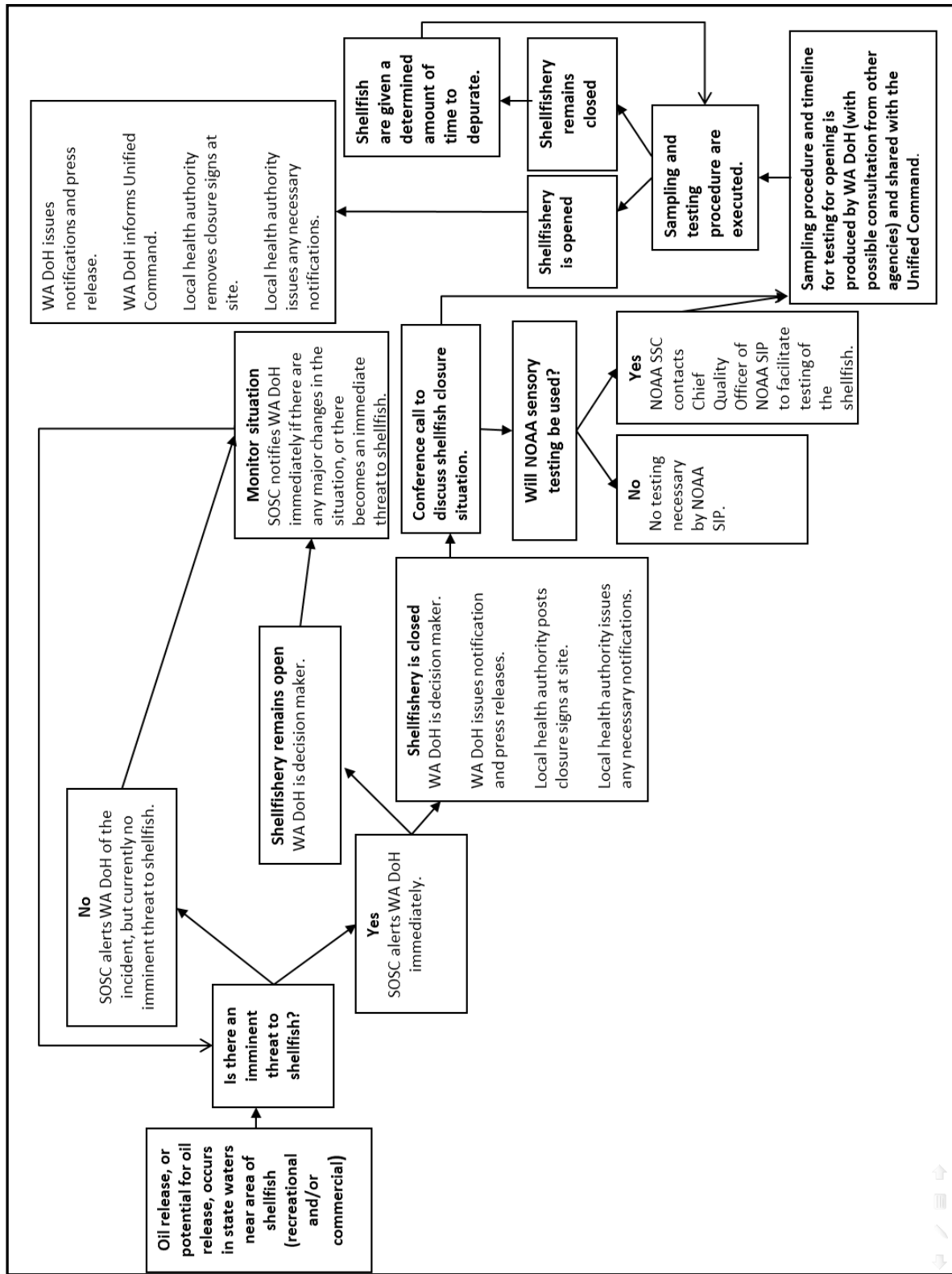
The NOAA SSC is a resource for connecting to subject matter experts within NOAA for seafood safety concerns post oil contamination.

After the first sampling and testing has occurred the test results may reflect the shellfish are either unsafe to eat, or are tainted. The shellfishery may not be opened after the first round of testing. Shellfish need time to deplete, or, in other words, shellfish need time to filter out the petrochemicals. The shellfishery will remain closed until the opening standards have been met.

- *Opening of the shellfish growing area*

Once it has been determined the shellfish growing area will be opened WA DoH will perform their routine notifications and press release. The Unified Command should also be informed. In some instances, a partial reopening may occur if contamination is persistent in a well-defined portion of the growing area. If this occurs, notifications shall include enough detail (map illustration, landmarks, coordinates or beach names) for ready identification of areas that are open and areas that will remain closed.

4. Flowchart of Shellfishery Closure and Opening Process in Washington State



5. Contact List

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- Washington State Emergency Management Division
- Washington State Department of Health contact for notifying of threat to shellfish growing areas
- NOAA Scientific Support Coordinator

6. References*Washington State Legislature**Washington Commercial Shellfish Rules*

Chapter 246-282 WAC, Sanitary control of shellfish

<http://apps.leg.wa.gov/WAC/default.aspx?cite=246-282>

Chapter 69.30 RCW, Sanitary control of shellfish

<http://apps.leg.wa.gov/RCW/default.aspx?cite=69.30>

Washington Recreational Shellfish Rules

Chapter 246-280 WAC, Recreational shellfish beaches

<http://apps.leg.wa.gov/WAC/default.aspx?cite=246-280>

RCW 43.20.050, Powers and duties of state board of health—Rule making—Delegation of authority—Enforcement of rules.

<http://apps.leg.wa.gov/RCW/default.aspx?cite=43.20.050>

*U.S. Food and Drug Administration**National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish
2011 Revision*

This document is intended to provide guidance and shall supersede the 2007 NSSP Model Ordinance. It represents the Agency's current thinking on the safe and sanitary control of the growing, processing, and shipping of molluscan shellfish for human consumption. It does not create any rights for or on any persons and does not operate to bind FDA or the public under federal law. However, through their participation in the National Shellfish Sanitation Program and membership in the Interstate Shellfish Sanitation Conference, states have agreed to enforce the Model Ordinance as the requirements which are minimally necessary for the sanitary control of molluscan shellfish.

www.fda.gov/Food/FoodSafety/ProductSpecificInformation/Seafood/FederalStatePrograms/NationalShellfishSanitationProgram/

National Oceanic and Atmospheric Administration Managing Seafood Safety After an Oil Spill

This 2002 guide was written to help seafood managers and other spill responders determine appropriate seafood management actions in response to a spill.

<http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/seafood-safety-after-oil-spill.html>

Guidance on Sensory Testing and Monitoring of Seafood for Presence of Petroleum Taint Following an Oil Spill

This 2001 guidance document describes how to conduct sensory testing on seafood suspect of petroleum taint. In addition, it also contains the following useful information:

- Explanation of sensory evaluation protocols, including flowcharts of the testing sensory testing process
- Normative References—Existing Guidelines, Standard Practices, And Sampling Plans for Sensory Testing
- Definitions, Terminology, and References used in Sensory Training for Petroleum Taint

<http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/seafood-safety-after-oil-spill.html>

NOAA Seafood Inspection Program: Memorandum of Understanding with the U.S. FDA regarding cooperation and information sharing in seafood inspection

http://www.seafood.nmfs.noaa.gov/2009_FDA-NOAA_MOU_seafood%20inspection.pdf

DISCUSSION/CONCLUSION:

Determining when to re-open fisheries post oil contamination, or threat of oil contamination, can be a confusing process in state waters, as oil spills that close fisheries are not common state to state (Mauseth, Martin, and Whittle, 1997 Yender, 2003). The Unified Command may not be familiar with the process, the On Scene Coordinator for the agency may have changed, or some guidance may have changed since last it was an issue. By documenting the process from the F/V DEEP SEA incident, including some best management practice updates, and including it in the Northwest Area Contingency Plan, the process should be straightforward if it were to happen again, and answers are now readily available to questions the Unified Command may have regarding shellfish contamination due to oil exposure in Washington State.

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There has been one other incident since the F/V Deep Sea in which a shellfish closure occurred due to oil contamination. In February 2014 there was a release of an estimated 1400 gallons of an unknown oily bilge water mixture in Puget Sound's Hood Canal, of that it was estimated that 805 gallons were oil, resulting in an emergency closure of the recreational shellfish harvest area directly surrounding the release site, and a harvest advisory issued for other areas on the Hood Canal. WA DOH chose to employ the use of the NOAA SIP sensory testing panel. The process of connecting WA DOH to NOAA SIP and developing a sampling plan for re-opening was efficient and streamline for this event, in large part because the involved parties now had experience with such a shellfishery closure in Washington, and because the process was debriefed following the F/V Deep Sea incident. Every oil spill is a unique situation, and will have different challenges every time, but overall discussing and documenting discrete response processes can be a valuable exercise.

This guidance is only for Washington State. Each state differs in how seafood is managed, and each body of water has different environmental conditions which influence how an oil spill may affect shellfish. These differences become challenges with managing seafood safety, especially when responders come to an incident accustomed to the structured Incident Command System. While all shellfish is bound by national standards for inter-state commerce (USFDA. 2013) each state differs in their call-down process and how they choose to handle closures and re-openings. This information is important to the public and to Unified Command. Understanding how the process of closure/re-opening of fisheries in happen due to oil spill contamination is important to know prior to dealing with the issue in the heat of spill response, when there are undoubtedly numerous other issues to be also addressed. As there is no national standard on the issue (Mauseth and Challenger. 2001) it may be worth the time and coordination to document this process for coastal states for fishery closures in the contingency plans, like was done with Washington shellfish, in order to avoid confusion about the process and effort to coordinate answers to basic questions regarding the closure/re-opening process during an actual event.

DISCLAIMER:

The information in this paper reflects the views of the authors and does not necessarily reflect the official positions or policies of the National Oceanic and Atmospheric Administration or the Department of Commerce.

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