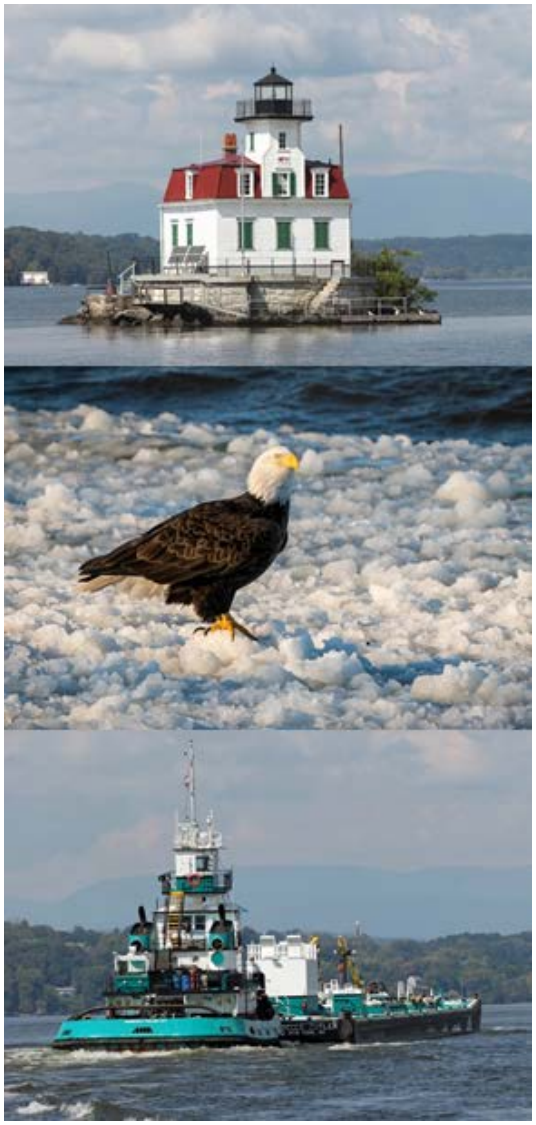
ENVIRONMENTAL RESEARCH CONSULTING



Hudson River Oil Spill Risk Assessment

Volume 7: Spill Scenario Summaries

Prepared for
Scenic Hudson, Inc.-
One Civic Center Plaza
Suite 200
Poughkeepsie, NY 12601-3157

Prepared by
Dagmar Schmidt Etkin, PhD
Environmental Research Consulting
41 Croft Lane
Cortlandt Manor, NY 10567-1160

Deborah French McCay, PhD
Jill Rowe and Deborah Crowley
RPS ASA
55 Village Square Drive
South Kingstown, RI 02879-8248

John Joeckel
SEAConsult LLC
P. O. Box 243
Wachapreague, VA 23310-0243

Andy Wolford, PhD
Risknology, Inc.
3218 Quiet Lake Drive
Katy, TX 77450-5721

May 2018

RPS

SEAConsult LLC
Providing Solutions for Both Industry and Government

Risknology
risk technology for the real world

Acknowledgments

This project was commissioned by Scenic Hudson, Inc., of Poughkeepsie, New York, under a Professional Services Contract with Environmental Research Consulting (ERC). RPS ASA, SEAConsult LLC, and Risknology, Inc., were all subcontractors to ERC under separate contracts.

The HROSRA research team acknowledges the invaluable inputs and discussions with Scenic Hudson over the course of the study period (September 2017 through May 2018), including the selection and development of the hypothetical spill scenarios. The contents of the report, data, analyses, findings, and conclusions are solely the responsibility of the research team and do not constitute any official position by Scenic Hudson. The Hudson River Oil Spill Risk Assessment was conducted as an independent, objective, technical analysis without any particular agenda or viewpoint except to provide quantitative and qualitative information that could be used to work to a common goal of spill prevention and preparedness. The study is intended to inform officials, decision-makers, stakeholders, and the general public about oil spill risk in the Hudson River.

The diligent efforts of the RPS SIMAP modeling team of Deborah Crowley, Jenna Ducharme, Matt Frediani, Emily Skeehan, and Matt Bernardo provided the necessary data, results, maps, and graphics that formed the foundation of much of the analysis in the HROSRA.

The research team also acknowledges the Launch 5 Foundation of Ossining who provided the team with transportation on a two-day river cruise between the Tappan Zee Bridge in Tarrytown and the Port of Albany, New York, on the *Patrolman Henry A. Walburger No. 5* ("Launch 5") on 15-16 September 2017. The Launch 5 was piloted by Greg Porteus and Steve Kardian. The 26-hour two-way trip allowed the research team to personally see, photograph, evaluate, and measure the features of both banks of the Hudson River, as well as observe vessel traffic and river conditions.

Cover Photograph Credits

The photographs on the report cover were taken by Dagmar Schmidt Etkin (Esopus Meadows Lighthouse and articulated tank barge) and Steve Kardian (bald eagle) on the Hudson River.

Contents

Acronyms and Abbreviations

ACP: Area Contingency Plan

AMPD: average most-probable discharge

ATB: articulated tank barge

bbl: barrels of oil (equivalent of 42 gallons)

bbl/hr: barrels per hour

BTEX: benzene, toluene, ethylbenzene, and xylene

CBR: crude-by-rail

ERC: Environmental Research Consulting

F: degrees Fahrenheit

ft: feet

gal: gallons

gpm: gallons per minute

GRP: geographic response plan

GRS: geographic response strategy

g/m^2: grams per square meter

HFO: heavy fuel oil

HHO: home heating oil

hr: hours

kts: knots

Lat: latitude

LFL: lower flammability limit (lower end of the concentration range over which a flammable mixture of gas or vapor in air can be ignited at a given temperature and pressure)

Lon: longitude

mi: miles

mi^2: square miles

mil: million

mg/l: milligrams per liter

MMPD: maximum most-probable discharge

NCP: National Contingency Plan

OSRO: oil spill removal organization

p: probability

psi: pounds per square inch (pressure)

RP: responsible party

SCAT: Shoreline Cleanup Assessment Technique

UFL: upper flammability limit (upper end of the concentration range over which a flammable mixture of gas or vapor in air can be ignited at a given temperature and pressure)

USCG: US Coast Guard

VRP: vessel response plan

WCD: worst-case discharge

Hudson River Oil Spill Risk Assessment Report Volumes

The Hudson River Oil Spill Risk Assessment (HROSRA) is composed of seven separate volumes that cover separate aspects of the study.

Executive Summary (HROSRA Volume 1)

The first volume provides an overall summary of results in relatively *non-technical* terms, including:

- Purpose of study;
- Brief explanation of risk as "probability times consequences" and the way in which the study addresses these different factors;
- Brief discussion of oil spill basics;
- Results – the "story" of each spill scenario, including the oil trajectory/fate/exposure, fire/explosion brief story (if applicable), and a verbal description of the consequence mitigation (response – spill and fire emergency); and
- Brief summary of spill mitigation measures with respect to response preparedness and prevention.

HROSRA Volume 2

The second volume provides an overview of the study approach and general introduction to unique features of the Hudson River.

HROSRA Volume 3

The third volume reviews the potential sources of oil spillage. It also presents the analyses of the probability of occurrences of spills of varying sizes from the potential sources under different conditions of traffic and oil transport.

HROSRA Volume 4

The fourth volume presents the analyses of the potential consequences or impacts of hypothetical spills, including the trajectory and fate of spills to the water, and the potential exposure of resources above thresholds of concern, based on oil modeling (including Appendices with detailed figures, etc.).

HROSRA Volume 5

The fifth volume presents the analyses of potential consequences or impacts of hypothetical fire and explosion events that may occur in addition to oil spills.

HROSRA Volume 6

The sixth volume presents the analyses of spill mitigation measures to reduce the risk of spills through prevention, preparedness, and response. The volume includes response and preparedness considerations for the specific modeled scenarios, as well as overall response issues for the Hudson River. It also includes more generic descriptions of prevention measures (vessels, trains, facilities, etc.).

HROSRA Volume 7

The seventh volume presents the summary tables with data – including probabilities, spill modeling, fire/explosion analysis, and response considerations for each of the 72 modeled spill scenarios. This volume pulls together everything from HROSRA Volumes 3, 4, 5, and 6.

Research Team

Dagmar Schmidt Etkin, PhD (Environmental Research Consulting)

Dr. Etkin has 42 years of experience in environmental analysis–14 years investigating issues in population biology and ecological systems, and 28 years specializing in the analysis of oil spills. Since 1999, she has been president of Environmental Research Consulting (ERC) specializing in environmental risk assessment, and spill response and cost analyses. She has been an oil spill consultant to the US Coast Guard, EPA, NOAA, Army Corps of Engineers, the Bureau of Ocean Energy Management, the Bureau of Safety and Environmental Enforcement, various state governments, the Canadian government, the oil and shipping industries, and non-governmental organizations. She is internationally recognized as a spill expert and has been a member of the UN/IMO/UNEP/UNESCO Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) since 1997. She has a BA in Biology from University of Rochester, and received MA and PhD degrees from Harvard University in Organismic/Evolutionary Biology, specializing in ecological modeling and statistics.

Deborah French McCay, PhD (RPS Ocean Science)

Dr. French McCay (formerly Dr. French) specializes in quantitative assessments and modeling of aquatic ecosystems and populations, oil and chemical transport and fates, and biological response to pollutants. She has developed water quality, food web and ecosystem models for freshwater, marine and wetland ecosystems. She is an expert in modeling of oil and chemical fates and effects, toxicity, exposure and the bioaccumulation of pollutants by biota, along with the effects of this contamination. Her population modeling work includes models for plankton, benthic invertebrates, fisheries, birds and mammals. These models have been used for impact, risk, and natural resource damage assessments, as well as for studies of the biological systems. She has provided expert testimony in hearings regarding environmental risk and impact assessments. She has over 30 years of experience in analyzing oil spills and is considered one of the leading international experts on the fate and effects of oil spills. She has a BA in Zoology from Rutgers College, and a PhD in Biological Oceanography from the Graduate School of Oceanography, University of Rhode Island.

Jill Rowe (RPS Ocean Science)

Jill Rowe specializes in biological and environmental data gathering, analysis and management; natural resource damage assessment (NRDA) modeling and analysis of pollutant fates and effects; ecological risk assessment; impact assessment of dredging and development projects, preparing sections of Environmental Impacts Statements; providing NEPA support, and GIS mapping and analysis. Ms. Rowe has applied her marine biological and GIS expertise to biological data set development, as well as mapping habitats and biological resource distributions that could ultimately be affected by oil/chemical spills and development projects. She performs quantitative assessments and modeling of aquatic ecosystems and populations, pollutant transport and fates, and biological response to pollutants. The populations to which she applies these models include plankton, benthic invertebrates, fisheries, birds and mammals. She has analyzed data and has applied water quality, food web and ecosystem models to case studies in freshwater, marine and wetland ecosystems. She has a BA in Biology from DePauw University, and an MS in Marine Biology from the College of Charleston.

Deborah Crowley (RPS Ocean Science)

Deborah Crowley is a senior consulting environmental scientist and project manager at RPS. She has experience working on issues and projects related to various aspects of environmental science such as environmental data analysis, hydrodynamic and water quality modeling and analysis, coastal processes, oil and gas fate and transport assessment in the environment, operational discharge modeling and assessment, renewable energy project development assessment support, environmental impact assessment in coastal and marine environments and permitting and regulatory compliance analysis and support. Ms. Crowley's experience with renewable energy projects includes cable burial studies, wind resource assessment, climatology assessment including extremal analysis, wind turbine siting, turbine power production and site capacity analysis, turbine impacts assessment, turbine visualizations, regulatory, permitting and zoning review, planning and management of terrestrial met tower deployment and associated data management and analysis. Areas of experience include numerical modeling, model development and application, field program design and support, data analysis and visualization in Matlab™ and geospatial analysis in ArcGIS™. She has a BS in Mechanical Engineering from Worcester Polytechnic Institute and an MS in Civil & Environmental Engineering from University of Rhode Island.

John W. Joeckel (SEAConsult LLC)

Mr. Joeckel is an executive management professional with a broad-based background in multi-modal transportation, oil, chemical and gas industry sectors, and manufacturing and production. He has extensive experience in legislative advocacy and regulatory compliance, crisis and consequence management, emergency preparedness and response, including hands-on response as an Incident Commander on multiple major emergency incidents and development of all hazard response/crisis management programs and plans including training and exercises. He has experience in ports, waterways and facility maritime security vulnerability analysis and security plan development including personnel training and exercise. Mr. Joeckel has a BS in Maritime Transportation from SUNY Maritime College, as well as many years of training in oil spill response. He has been involved in response research and development and supervising many spill response operations, including the BP Gulf of Mexico Deepwater Horizon incident, the Enbridge Pipeline Michigan oil tar sands crude oil spill in the Kalamazoo River, and the Exxon Valdez spill in Alaska.

Andrew J. Wolford, PhD (Risknology, Inc.)

Dr. Wolford is founder and President of Risknology, Inc., a company specializing in risk analysis of hazardous facilities. He is an expert risk engineer with 29 years of experience. He has directed risk assessments on a diverse range of engineered systems including; offshore and onshore oil and gas installations, mobile offshore drilling units, marine and land-based transportation systems, chemical and nuclear fuel processing plants, nuclear power and test reactors, and the Space Shuttle program. He has a BA in Physics from Wittenberg University, a BA in Nuclear Engineering from Georgia Institute of Technology, and a ScD from Massachusetts Institute of Technology.

Keys to Summary Tables

The large amount of data generated in the modeling and analysis of the 72 hypothetical oil spill scenarios and five fire/explosion scenarios were summarized into tables that capture the key points. The more detailed SIMAP modeling results are presented in HROSRA Volume 4 and its appendices. The spill response considerations for these spill scenarios are presented in greater detail in HROSRA Volume 6. The fire/explosion scenarios are described in greater detail in HROSRA Volume 5.

Key to Spill Scenario Results Summary Tables

The table template below was used to summarize the results from the modeling and analysis of the 72 hypothetical spill scenarios. An annotated version is shown (broken into section components). The first section describes the scenario. This unique description defines each of the 72 scenarios.

	Location	Source	Volume	Oil Type	Season	Tide Stage
Scenario Description	Hypothetical release point or stretch (for trains)	Vessel type or train	Release or spill volume in barrels (bbl)	Bakken crude, home heating oil (HHO), heavy fuel oil, diluted bitumen, or gasoline	Spring-high flow Summer-low flow Winter-medium flow with ice	High or low tide at the spill location

The second section presents the probabilities of spills like the one in the hypothetical scenario. The purpose of this is to put a probabilistic perspective on the spill, which helps to provide a sense of the risk. The spill scenario, which may be very large, is relatively unlikely. The probabilities indicated are for spills of this type (source) and/or volume and *not for the specific location*. For example, it provides the likelihood of a spill of 150,000 bbl from an articulated tank barge (ATB) *somewhere along the river in the study zone*, not specifically at the proposed Kingston Anchorage. The probability that the incident would happen in exactly the same spot (and under exactly the same circumstances) as the hypothetical spill scenario are much smaller. The probabilities of the spill scenarios by volume are based on the likelihood of a spill *anywhere* along the study area of the Hudson River, not specifically in that location. In theory, the probability of spillage needs to be spread out over the 115-mile length of the river.

	Annual Probability Anywhere in Hudson River		Historical Annual Frequency (2000-2015)	
	Spill of Type (Any Volume)	**Spill of this Type and Volume**	**US**	**Hudson**
Spill Probability	Annual probability of spill from this type of source in Hudson regardless of volume (Any oil type involved)	Annual probability of spill in Hudson from this source and of this volume (or larger) (Any oil type involved)	Spill number of this volume (or more) from this source that occurred annually in the US 2000-2015.	Spill number of this volume (or more) from this source that occurred annually in Hudson River 2000-2015.

The third section specifies the environmental and conditional inputs into the modeling. If the same spill (volume and oil type) were to occur at a different time the outcome would be different. It is important to note that these are hypothetical spills. The release date/time does not indicate that a spill actually occurred on this date. The specific environmental conditions (weather, wind, currents, tide) on that specific historic

date were applied in the modeling. The results show what would have happened had there been a spill of that volume for that type of oil in that location.

	Lat/Lon	Release Rate	Release Date/Time	Run Duration	Winds	Water Temperature
Conditions	Release location in decimal degrees	Spill rate as bbl/hour over the course of number of hours	Hypothetical release date/ time (weather, wind, currents on that date)	Oil spill trajectory and fate model was run for this length of time (i.e., 30 days)	Direction and speed at time of release	Assumed water temperature at time of release

The fourth section provides the mass balance or fate of the spilled oil after the duration of the model run of 30 days. It shows what happened to the oil after it spilled. The tables list the amount of oil on the water surface and in the water at 30 days post-spill. Typically, the maximum amount in these two environmental compartments occurs earlier in the spill simulation, such that little to none might be in these compartments after 30 days. The amounts in the atmosphere (i.e., evaporated), on shorelines and sediments, and degraded (by microbes and light-induced photo-degradation) increase in time as the processes leading to these fates ensue.

For each scenario, the sum of all the listed compartmental percentages adds up to, but may be less than, 100%. The remaining fate (completing the sum to 100%) is that amount of oil that has exited the modeled domain into New York Harbor.

	Mass Balance at End of Model Run (After 30 Days)						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	Percent of original oil spilled that is in each of these categories at the end of 30 days					
	bbl	Volume (in bbl) of original oil spilled that is in each of these categories at the end of 30 days					
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological			**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
	Whole Oil (1 mg/l)[1]	**Dissolved[2] (0.001 mg/l)**		**Ecological[3] 10 g/m²**	**Socioeconomic (0.01 g/m²)**	**Ecological[4] 100 g/m²**	**Socioeconomic 1 g/m²**
SIMAP Modeling Results	Overall volume (surface area times water depth) affected to concentrations of oil above the threshold			Water surface area exposed to concentrations above threshold multiplied by the days of exposure.		Total shore length (miles) oiled above threshold that could potentially cause ecological effects.	Total shore oiled above threshold for potential socio-economic impacts.

[1] 1 mg/l (1 milligram per liter) is the equivalent of 1 part per million (ppm).

[2] 0.001 mg/l = 1 microgram/l = 1 part per billion (ppb). Water column effects for both ecological and socioeconomic (e.g., seafood) resources could potentially occur at concentrations exceeding 1 ppb. A threshold of 1 ppb is typically used as a screening threshold for potential effects on sensitive organisms and early life stages (e.g., ichthyoplankton). This would be a conservative screening threshold for most adult and juvenile pelagic and demersal fish and invertebrates.

[3] Mortality of birds on water has been observed at and above this threshold. Sublethal effects on marine mammals, sea turtles, and floating *Sargassum* communities are of concern.

[4] This is a screening threshold for potential ecological effects on shoreline flora and fauna, based upon a synthesis of the literature showing that shoreline life has been affected by this degree of oiling. Sublethal effects on epifaunal intertidal invertebrates on hard substrates and on sediments have been observed where oiling exceeds this threshold.

The oil spill modeling summaries include the extent of oiling over specified thresholds. There are different thresholds for oil exposure above which ecological effects and socioeconomic (including cultural) impacts might occur. The basis for the thresholds is explained in HROSRA Volume 4 in the description of the model approach. The thresholds for socioeconomic impacts are much lower than those for potential ecological effects. There would be effects on tourism, property, etc. with even light amount of staining which occurs at much lower oil concentrations than would actually cause any ecological damage.

Note that all of these potential impacts assume that there has been no mitigation by spill response or protective booming strategies. In an actual spill situation, some of the oiled areas may be protected by timely and effective deployment of booms, assuming weather and current conditions are not counteracting the effectiveness. In addition, there may be some oil removal on the water surface that may reduce some of the spread and stranding of oil.

The fifth section specifies oil exposures on different types of shorelines and habitats that could cause some degree of ecological effects. Again, these oil exposures assume that there has been no mitigation by spill response or protective booming strategies. In an actual spill situation, some of the oiled areas may be protected by timely and effective deployment of booms, assuming weather and current conditions are not counteracting the effectiveness. In addition, there may be some oil removal on the water surface that may reduce some of the spread and stranding of oil.

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	Miles of shoreline of different types oiled over the ecological threshold by shoreline type.				
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	Miles of brackish/estuarine wetland of different types oiled over the ecological threshold by wetland type.				
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	Miles of freshwater wetland of different types oiled over the ecological threshold by wetland type.				

The sixth section includes a brief summary of potential socioeconomic and cultural effects of the spill and/or the response operations for the specific scenario.[5] Again, there may have been some mitigation of these effects with timely and effective spill response.

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Potential socioeconomic impacts, including: water intakes potentially affected by oil in water column; port activities affected by presence of oil and/or response; tourism impacts by presence of oil and/or response; other notable impacts to cultural and socioeconomic features.

[5] Impacts are noted by community or stretches of river from X community to Y community on the west and east shores. A list of the communities by river mile in the GRPs may be found in Appendix A of this volume. More detailed information about the riverfront and river vicinity features of the communities and towns can be found in HROSRA Volume 2.

This section describes the level of response activation that would be required as well as classifies the spill volume with respect to the National Contingency Plan (NCP) and USCG regulations. The NCP classifies all inland spills (including Hudson River spills) of 10,000 gallons (238 bbl) or larger as "major spills." The USCG considers a worst-case discharge (WCD) spill to be the largest foreseeable discharge – usually the size of the largest storage tank. An average most-probable discharge (AMPD) for a facility is 50 bbl or 1% of the WCD, whichever is smaller. A facility maximum most-probable discharge (MMPD) is 1,200 bbl or 10% of the WCD, whichever is smaller. For vessels, the WCD is the discharge of the vessel's entire fuel or cargo oil, whichever is greater. An AMPD is 50 bbl or 1% of the oil cargo, whichever is smaller. For a vessel with an oil capacity of 25,000 bbl or greater, the MMPD is 2,500 bbl. For vessel with a capacity of less than 25,000 bbl, the MMPD is 20% of the vessel's oil capacity. *Note that there are no current definitions for AMPD, MMPD, or WCD for rail spills.*

The amount of equipment specified by the tier response requirements merely specifies the minimum required. This does not mean that this is the only equipment that would be required to conduct an effective response operation. The areas specified in geographic response plans (GRPs) and geographic response strategies (GRSs) that would actually be affected based on the trajectory and spread of the oil are identified. This does not mean that other geographic areas would not prepare (deploy boom, etc.) if this hypothetical spill were to occur. In the event of an actual spill, the trajectory (path) and spread of the spill will not be accurately predicted.

The rail-related GRPs are more specifically designed for emergency response railroad-related spills. In the summary tables they only apply to the immediate area around the track on which the accident occurred. Any spillage into the river is dealt with in the river-related GRPs and GRSs. The oil may flow a considerable distance once it enters the river. Therefore, there may be many miles of river affected. For the GRPs and GRSs, the plans that would most likely be activated in the first seven days are noted. During this time there might be floating oil on the water surface that could be diverted or excluded from sensitive areas that are boomed according to the GRP or GRS.

In addition, the specific challenges with respect to protective booming, mechanical containment and recovery operations, and shoreline cleanup with this particular spill scenario are summarized.

Note that the response equipment described is the minimum that must be on site by the prescribed time. There would most likely be at least a minimal amount of equipment that would be deployed as soon as possible when the spill was discovered based on equipment available on the vessel, at the facility, or at the nearest response equipment cache. The amount of equipment described would not be sufficient for a full response to a worst-case discharge or even a moderately-large spill. The EDRC is not necessarily reflective of the actual amount of oil that could be recovered in field conditions.

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (hrs)	**Tier 2 (hrs)**	**Tier 3 (hrs)**	**Rail Miles**	**River Miles**
	NCP volume classification; USCG volume classification for response planning.	Required response times and response equipment for each stepped tier based on the National Contingency Plan. This is the minimum equipment that needs to be on scene at the spill scene in the specified time. Protective boom (ft) Containment boom (ft) Oil recovery equipment (bbl/day EDRC[6]) Recovered oil storage (bbl)			Rail-related GRPs and GRSs that would be activated in the first 7 days of spill response.	River-related GRPs and GRSs that would be activated in the first 7 days of spill response.
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming	**Mechanical Recovery**		**Shoreline Cleanup**	**Other Challenges**	
	Issues related to the protective (exclusion and diversionary) booming of sensitive sites expected in this spill scenario.	Issues related to the mechanical recovery of oil expected in this spill scenario.		Issues related to the shoreline cleanup of oil expected in this spill scenario.	Other challenges that may occur in this spill scenario (e.g., submerged oil).	

Key to Summary Tables for Fire/Explosion Scenarios

For each of five of the hypothetical scenarios, there was an additional scenario added that assumes that there is an ignition, which could cause a pool fire and/or a vapor cloud explosion. For these scenarios, an additional summary table is included. The first three sections are identical to the ones for the spill scenarios, as described above.

The fourth section provides the probabilities that there will be a pool fire and/or vapor cloud explosion *if there is first a spill in that location*, and the probability that there would be pool fire and/or vapor cloud explosion at all somewhere along the river. The second set of probabilities incorporates the probability that there would be a spill of this volume. It is important to remember that the probabilities of these fire/explosion events occurring first depend on the probability of there being a spill or release of oil. Then the conditions need to favor a fire or explosion, including a source of ignition or pressure buildup. The probabilities of a fire or explosion were calculated based on the conditions at the specific hypothetical spill locations. The probabilities of the spill scenarios by volume are based on the likelihood of a spill anywhere along the study area of the Hudson River, not specifically in that location. In theory, the probability of spillage needs to be spread out over the 115-mile length of the river.

Fire/Explosion Probabilities	**Pool Fire Probability/Incident**	**Pool Fire Probability**	**Vapor Cloud Explosion/Incident**	**Vapor Cloud Explosion Probability**
	Probability that given a spill incident, there is a pool fire.	Probability that a pool fire of this size would occur somewhere on river.	Probability that given a spill incident, there is a vapor cloud explosion.	Probability that a vapor cloud explosion of this size would occur somewhere on river.

The fifth section describes the general types of emergency response that might be required in the hypothetical scenario, as well as the extent of the required evacuation zone. Any relevant health and safety issues important to the response are also summarized.

[6] Effective daily recovery capacity.

Fire/Explosion Response	Emergency Response	Evacuation Zone	Health/Safety Issues
	Emergency response actions.	Recommendations for evacuation.	Potential health/safety issues for responders and public.

The sixth section summarizes the specific safety impacts of a fire or explosion.

Safety Impacts	Flammable Distance	Impacts from Fire (Acres)				
		Total	Residential	Commercial	Industrial	Public Use
	Distance in feet	Acres affected	Acres affected	Acres affected	Acres affected	Acres affected
	Downwind Distance	Impacts from Explosion (Acres)				
		Total	Residential	Commercial	Industrial	Public Use
	Distance in miles	Acres affected	Acres affected	Acres affected	Acres affected	Acres affected

Sequential Probabilities for Scenarios

The probability that any one of the hypothetical scenarios with or without fires and explosions would occur on the Hudson River depends on a series of probabilities.

When several independent events need to occur for a final outcome to occur, the probabilities of each of the independent events are multiplied together. For example, in dice games, the probability of getting two "threes" when rolling dice is the probability of getting a "three" on the first die multiplied by the probability of getting a "three" on the second die. There is a 1 in 6 probability of getting a "three" with each die. The probability gets smaller with each added die.

"Three" on one die = 1/6 = 0.167 (a 1 in 6 chance)

"Three" on two dice = (1/6) times (1/6) = 0.0278 (a 1 in 36 chance)

"Three" on three dice = (1/6) times (1/6) times (1/6) = 0.0046 (a 1 in 216 chance)

The different events can have different probabilities that also can be multiplied together to calculate the probability of all of the events occurring. For example, the probability of rolling a "six" on two dice and also getting a "heads" on a coin toss is:

"Six" on two dice plus "heads" = (1/6) times (1/6) times (1/2) = 0.014 (a 1 in 72 chance)

This chance is with each roll/toss opportunity. If the action is repeated many times, the probability increases.

For the spill and fire/explosion scenarios, a sample series of hypothetical probabilities is shown in Figure 1. This demonstrates the sequential probabilities that need to be multiplied to determine the likelihood of a tanker fire or explosion somewhere along the Hudson River for a single tanker trip.

This *hypothetical* example shows that the probability of an accident with a tanker is 0.0035 each time the tanker transits the Hudson River. Then there is a 0.19 chance that the accident will result in a spill of any volume – small to large. Then, there is a 0.0001 chance that the spill will be a large (150,000 bbl) incident. Then there is a 0.10 chance that there is an ignition that causes the spilled oil to burn and/or explode. This series of probabilities are multiplied together to give a 0.000000007 chance of a tanker fire

or explosion each time a loaded tanker takes a trip up or down the river. That's a 1 in 154 million chance. But, this is for each time there is a tanker trip.

If there are 1,000 loaded transits per year, this increases the *annual* probability to 1 in 154,000. Over 25 years, this means a probability of 1 in 6,000. But, one also needs to consider that there are 115 miles of the Hudson River between Spuyten Duyvil and the Federal Lock at Troy. If the incident is just as likely to occur anywhere along the 115 miles and the effect of such a fire/explosion incident is felt in a two-mile radius, the probabilities can be roughly divided into about 58 separate zones. The probability of the incident happening in any one specific zone during those 25 years is about 1 in 348,000.

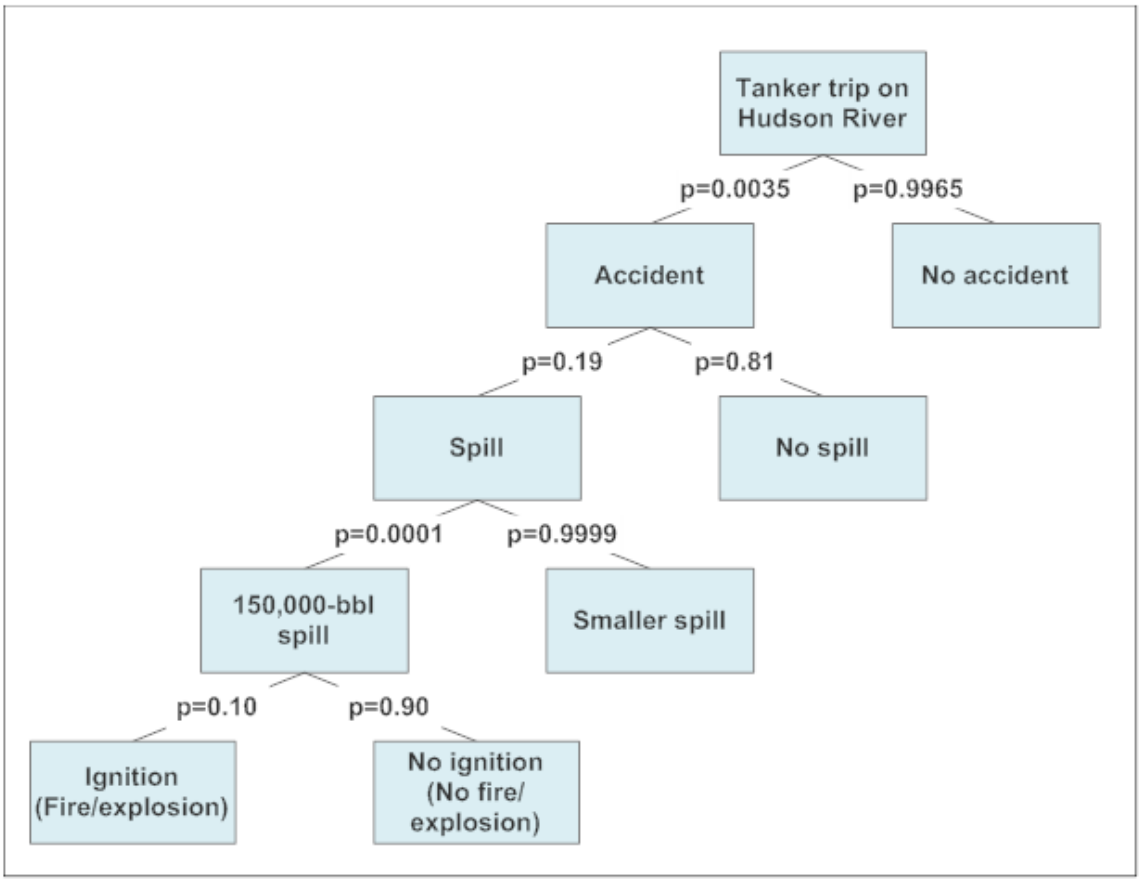


Figure 1: Example Hypothetical Probability Sequence for Large Tanker Fire/Explosion[7]

[7] This figure demonstrates the way in which sequential probabilities are multiplied together. The probability values are hypothetical.

Albany 155,000-bbl Bakken Crude Tanker Loading Accident

Albany 155,000-bbl Bakken Crude Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Port of Albany	Tanker loading accident (dock)	155,000 bbl	Bakken crude	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.61673 -73.76020	38,750 bbl/hr over 4 hrs	6 April 2015 6:00am	30 days	South / light (<10 kts)	46°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.1%	45.0%	36.5%	1.0%	6.4%	10.9%
	bbl	156	69,806	56,508	1,541	9,907	16,932
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	704,875 mil gal	297,084 mil gal	83 mi^2-days	84 mi^2-days	200 mi	240 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	21.3 mi	90.8 mi	1.3 mi	60.7 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	0 mi	0.1 mi	0.6 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	2.9 mi	15 mi	5.4 mi	1.5 mi	0.2 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 240 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 200 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to Albany, and on the east shore from Rhinebeck to Rensselaer. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: OGS Mile 145; AMRI Rensselaer Mile 144; PSE&G Mile 141; Bethlehem Mile 137; Castleton Mile 136; Ulster Mile 96; Rondout Creek & Rhinebeck Village Mile 91; Port Ewen Mile 89. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Albany 155,000-bbl Bakken Crude Spill (Spring-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>55 river miles
Mile 90-145
2016-47 to 2016-6</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">River currents between 0.3 kts on flood and 0.8 kts on ebb, will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>45% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>Approximately 6% on shoreline. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 37% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Albany 155,000-bbl Bakken Crude Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Port of Albany	Tanker loading accident (dock)	155,000 bbl	Bakken crude	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.61673 -73.76020	38,750 bbl/hr over 4 hrs	6 April 2015 1:00am	30 days	South / light (<10 kts)	46°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.1%	46.9%	34.7%	1.2%	6.9%	10.2%
	bbl	215	72,620	53,740	1,901	10,655	15,741
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	702,725 mil gal	281,088 mil gal	92 mi^2-days	94 mi^2-days	211 mi	249 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	21.9 mi	98.3 mi	1.9 mi	63.9 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	0 mi	0.2 mi	0.8 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	3.1 mi	13.7 mi	5.7 mi	1.4 mi	0.4 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 249 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 211 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to Albany, and on the east shore from Rhinebeck to Rensselaer. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: OGS Mile 145; AMRI Rensselaer Mile 144; PSE&G Mile 141; Bethlehem Mile 137; Castleton Mile 136; Ulster Mile 96; Rondout Creek & Rhinebeck Village Mile 91; Port Ewen Mile 89. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Albany 155,000-bbl Bakken Crude Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>55 river miles
Mile 90-145
2016-47 to 2016-6</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">River currents between 0.3 kts on flood and 0.8 kts on ebb, will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>47% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>Approximately 7% will end up on shoreline. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 35% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Albany 155,000-bbl Bakken Crude Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Port of Albany	Tanker loading accident (dock)	155,000 bbl	Bakken crude	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.61673 -73.76020	38,750 bbl/hr over 4 hrs	2 August 2015 1:30pm	30 days	South / light (<10 kts)	77°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.1%	50.4%	32.9%	0.4%	1.0%	15.2%
	bbl	83	78,174	51,065	633	1,475	23,570
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	3,669 mil gal	2,711 mil gal	27 mi^2-days	27 mi^2-days	12 mi	18 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	9.5 mi	0 mi	2.6 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 18 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 12 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Bethlehem to Albany, and on the east shore from Schodack to Troy. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: OGS Mile 145; AMRI Rensselaer Mile 144; PSE&G Mile 141 Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Albany 155,000-bbl Bakken Crude Spill (Summer-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3" rowspan="2">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>10 river miles
Mile 145-155
2016-6 to 2016-1</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">River currents between 0.3 kts on flood and 0.8 kts on ebb, will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>50% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>Only about 1% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 30% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Albany 155,000-bbl Bakken Crude Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Port of Albany	Tanker loading accident (dock)	155,000 bbl	Bakken crude	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.61673 -73.76020	38,750 bbl/hr over 4 hrs	2 August 2015 6:00am	30 days	South / light (<10 kts)	77°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	50.7%	31.3%	0.3%	0.9%	16.8%
	bbl	68	78,558	48,482	393	1,392	26,107
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	3,070 mil gal	2,121 mil gal	30 mi^2-days	30 mi^2-days	11 mi	17 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	9.2 mi	0 mi	2.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 17 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 11 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Bethlehem to Albany, and on the east shore from Schodack to Troy. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: OGS Mile 145; AMRI Rensselaer Mile 144; PSE&G Mile 141. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Albany 155,000-bbl Bakken Crude Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>10 river miles
Mile 145-155
2016-6 to 2016-1</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">River currents between 0.3 kts on flood and 0.8 kts on ebb, will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>51% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 1% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 31% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Albany 155,000-bbl Bakken Crude Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Port of Albany	Tanker loading accident (dock)	155,000 bbl	Bakken crude	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.61673 -73.76020	38,750 bbl/hr over 4 hrs	3 January 2015 3:00pm	30 days	Light and variable (<5 kts)	33°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	18.0%	48.9%	9.5%	1.1%	17.4%	5.1%
	bbl	27,923	75,791	14,764	1,656	26,970	7,897
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	178,056 mil gal	131,807 mil gal	292 mi^2-days	345 mi^2-days	188 mi	208 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	18.6 mi	68 mi	2.1 mi	64.3 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.3 mi	0.1 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	3.5 mi	22.9 mi	6.3 mi	1.3 mi	0.2 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 208 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 188 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Albany to Catskill, and on the east shore from Rensselaer to Livingston. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: OGS Mile 145; AMRI Rensselaer Mile 144; PSE&G Mile 141; Bethlehem Mile 137; Castleton Mile 136. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Albany 155,000-bbl Bakken Crude Spill (Winter-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>35 river miles
Mile 145-110
2016-6 to 2016-32</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">River currents between 0.3 kts on flood and 0.8 kts on ebb, will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions can impact boom deployment.</td><td>49% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may negatively impact mechanical recovery operations</td><td>About 17% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 10% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Albany 155,000-bbl Bakken Crude Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Port of Albany	Tanker loading accident (dock)	155,000 bbl	Bakken crude	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.61673 -73.76020	38,750 bbl/hr over 4 hrs	3 January 2015 10:00pm	30 days	Light and variable (<5 kts)	33°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	17.7%	50.5%	10.0%	0.5%	17.8%	3.4%
	bbl	27,508	78,348	15,555	710	27,547	5,331
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	198,378 mil gal	95,488 mil gal	295 mi^2-days	349 mi^2-days	186 mi	205 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	18.3 mi	67.6 mi	2.1 mi	63.3 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0.1 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	3.9 mi	22.6 mi	6.3 mi	1.4 mi	0.4 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 205 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 186 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Albany to Saugerties, and on the east shore from Rensselaer to Clermont. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: OGS Mile 145; AMRI Rensselaer Mile 144; PSE&G Mile 141; Bethlehem Mile 137; Castleton Mile 136. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Albany 155,000-bbl Bakken Crude Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>40 river miles
Mile 145-105
2016-6-2016-36</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td colspan="2">Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td>River currents between 0.3 kts on flood and 0.8 kts on ebb, will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions can impact boom deployment.</td><td colspan="2">49% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.
Potential ice conditions may negatively impact mechanical recovery operations</td><td>About 17% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 10% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Albany 155,000-bbl Bakken Crude Spill with Fire/Explosion

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide**
	Port of Albany	Tanker loading accident (dock)	155,000 bbl	Bakken crude	Summer	High
Spill Probability	**Annual Probability**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type in Hudson		**Spill Volume in Hudson**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Run Duration**	**Winds**	**Temperature**
	42.61673 -73.76020	38,750 bbl/hr over 4 hrs	2 August 2015 1:30pm	30 days	South / light (<10 kts)	77°F

Fire/Explosion Probabilities	**Pool Fire Probability/Incident**	**Pool Fire Probability**	**Vapor Cloud Explosion/Incident**	**Vapor Cloud Explosion Probability**
	0.08	0.00000012	0.027	0.00000004

Fire/Explosion Response[8]	**Emergency Response**	**Evacuation Zone**	**Health/Safety Issues**
	This event may have both fire and a spill on the water simultaneously. Specific incident decision needs to be made early as to whether to attack fire or allow it to burn out. Port of Albany has small firefighting vessel, *Marine 1* with a 1,500 gpm water monitor. This unit may be insufficient for the potential size of this fire event. Kingston, Albany and Newburgh FD have NYS supplied foam trailers w/monitors for rail crude oil derailment fires but equipment and foam quantity would be insufficient for this larger vessel spill/fire. RP would be required to implement and mobilize VRP Firefighting contractor resources in order to provide manpower, foam and equipment to respond to a potential large fire event.	As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Large Spill • Consider initial downwind evacuation for at least 300 meters (1000 feet). Fire • ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.	Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Light, sweet crude oils will normally contain lighter flammable gasses such as butane and propane (unless these gases have been removed). These flammable gasses can readily ignite if released, when they come in contact with an ignition source. These crude oils may also contain hydrogen sulfide, a toxic inhalation hazard material. Due to the characteristics of crude oil, in an accident scenario, the behavior of this product may range from that of gasoline for the lighter (sweet) crude oils to diesel fuel for the heavier (sour) crude oils. Air monitoring should be performed for responder and public safety.

Safety Impacts	**Flammable Distance**	**Impacts from Fire (Acres)**				
		Total	**Residential**	**Commercial**	**Industrial**	**Public Use**
	581 feet	0.3 acre	0.1 acre	0.1 acre	0 acres	0.1 acre
	Downwind Distance	**Impacts from Explosion (Acres)**				
		Total	**Residential**	**Commercial**	**Industrial**	**Public Use**
	1.66 miles	476 acres	305 acres	47 acres	124 acres	0 acres

[8] If concurrent with a spill to the water, see also spill response tables. If there is a fire and/or explosion, some or even most of the oil may be consumed by the fire, reducing the amount of oil that would spill into the river and affect shorelines. In most cases, it would be necessary to conduct at least some oil spill cleanup in addition to fire-fighting, though those operations would be secondary to emergency fire-fighting operations.

Coxsackie 25,000-bbl Home Heating Oil Spill

Coxsackie 25,000-bbl Home Heating Oil Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Coxsackie	Tanker grounding or collision	25,000 bbl	Home heating oil	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.35119 -73.78982	Instantaneous	1 April 2016 3:00am	30 days	SW / moderate (5-20 kts)	46°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	44.5%	32.2%	0.8%	4.9%	17.6%
	bbl	11	11,115	8,046	201	1,232	4,395
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	148,283 mil gal	217,821 mil gal	9 mi^2-days	13 mi^2-days	88 mi	175 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	14.6 mi	46.7 mi	1.5 mi	15.9 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0.1 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.2 mi	6 mi	2.7 mi	0.5 mi	0.1 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 175 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 88 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Coxsackie to Lloyd, and on the east shore from Stuyvesant to Hyde Park. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Coxsackie 25,000-bbl Home Heating Oil Spill (Spring-High Tide) Response

<table>
<tr><td rowspan="8">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>48 river miles
Mile 123-75
2016-22 to 2016-58</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">An average current velocity of 1.1 kts results in high currents that will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>45% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 5% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 32% in water column leading to water intake and fish kill concerns; perform water column tracking.</td></tr>
</table>

Coxsackie 25,000-bbl Home Heating Oil Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Coxsackie	Tanker grounding or collision	25,000 bbl	Home heating oil	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.35119 -73.78982	Instantaneous	1 April 2016 11:00am	30 days	SW / moderate (5-20 kts)	46°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.1%	46.3%	28.1%	0.8%	6.3%	18.5%
	bbl	21	11,563	7,025	191	1,564	4,636
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	136,030 mil gal	197,435 mil gal	13 mi^2-days	17 mi^2-days	107 mi	202 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	17.5 mi	57.3 mi	1.4 mi	18.5 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	0.2 mi	0.1 mi	0.6 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.6 mi	8.1 mi	2.2 mi	0.5 mi	0.1 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 202 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 107 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Coxsackie to Lloyd, and on the east shore from Stuyvesant to Hyde Park. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Coxsackie 25,000-bbl Home Heating Oil Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>45 river miles
Mile 123-78
2016-22 to 2016-56</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">An average current velocity of 1.1 kts results in high currents that will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>46% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 6% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 28% in water column leading to water intake and fish kill concerns; perform water column tracking.</td></tr>
</table>

Coxsackie 25,000-bbl Home Heating Oil Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Coxsackie	Tanker grounding or collision	25,000 bbl	Home heating oil	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.35119 -73.78982	Instantaneous	7 August 2016 2:00am	30 days	Light / variable (<5 kts)	77°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	70.3%	7.4%	0.3%	18.6%	3.4%
	bbl	0	17,574	1,858	70	4,638	860

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
32,178 mil gal	41,820 mil gal	41 mi^2-days	48 mi^2-days	70 mi	100 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	1.6 mi	16.6 mi	0 mi	42.8 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0.1 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1 mi	3.2 mi	3.1 mi	1.4 mi	0.1 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 100 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 70 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Coxsackie to Bethlehem, and on the east shore from Stuyvesant to Schodack. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: PSE&G Mile 141; Bethlehem Mile 137; Castleton Mile 136. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Coxsackie 25,000-bbl Home Heating Oil Spill (Summer-High Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2 (48 hrs)**	**Tier 3 (72 hrs)**	**Rail Miles**	**River Miles**
	Major MMPD-WCD	25,000 ft boom 1,000 ft + 300 per skimming system 1,875 bbl/day 3,750 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 3,750 bbl/day 7,500 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 7,500 bbl/day 15,000 bbl storage	n/a	15 river miles Mile 123-138 2016-22 to 2016-12
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	An average current velocity of 1.1 kts results in high currents that will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		70% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 19% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 7% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking.	

Coxsackie 25,000-bbl Home Heating Oil Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Coxsackie	Tanker grounding or collision	25,000 bbl	Home heating oil	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.35119 -73.78982	Instantaneous	7 August 2016 6:30am	30 days	Light / variable (<5 kts)	77°F

SIMAP Modeling Results

Mass Balance at End of Model Run (After 30 Days)

Fate	Surface	Atmosphere	Water Column	Sediment	Ashore	Degraded
%	0.0%	70.1%	6.8%	0.3%	19.4%	3.4%
bbl	0	17,536	1,694	68	4,846	856

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)

Water (Volume) – Ecological		Surface (Area x Days Exposed)		Shoreline (Length)	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
27,011 mil gal	37,388 mil gal	38 mi^2-days	45 mi^2-days	69 mi	95 mi

Ecological Shoreline Exposures

Shoreline Exposure by Shore Type (Miles over Ecological Threshold)

Bedrock	Unconsolidated Rock	Sand Beach	Mud or Timber	Artificial Shore
1.6 mi	17.5 mi	0 mi	42.2 mi	0 mi

Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)

Saltmarsh	Upper Intertidal Mix	Lower Intertidal Mix	Phragmites Wetland	Shrub/Scrub and Forested Wetland
0 mi	0.3 mi	0.1 mi	0 mi	0 mi

Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)

Cattail Marsh	Upper Intertidal Mix	Lower Intertidal Mix	Phragmites Wetland	Shrub/Scrub and Forested Wetland
0.9 mi	2.4 mi	2.3 mi	1.3 mi	0.1 mi

Socioeconomic Impacts

Potential Socioeconomic Impacts from Spill and Response Operations

Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 95 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 69 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Coxsackie to Bethlehem, and on the east shore from Stuyvesant to Rensselaer. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: OGS Mile 145; Rensselaer Mile 144; PSE&G Mile 141; Bethlehem Mile 137; Castleton Mile 136. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Coxsackie 25,000-bbl Home Heating Oil Spill (Summer-Low Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2 (48 hrs)**	**Tier 3 (72 hrs)**	**Rail Miles**	**River Miles**
	Major MMPD-WCD	25,000 ft boom 1,000 ft + 300 per skimming system 1,875 bbl/day 3,750 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 3,750 bbl/day 7,500 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 7,500 bbl/day 15,000 bbl storage	n/a	22 river miles Mile 123-145 2016-22 to 2016-6
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	An average current velocity of 1.1 kts results in high currents that will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		70% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 19% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 7% in water column leading to water intake and fish kill concerns especially near spill site prior to dilution; perform water column tracking.	

Coxsackie 25,000-bbl Home Heating Oil Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Coxsackie	Tanker grounding or collision	25,000 bbl	Home heating oil	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.35119 -73.78982	Instantaneous	1 January 2016 3:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	66.3%	0.9%	0.3%	30.2%	2.4%
	bbl	0	16,564	217	69	7,550	599
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	869 mil gal	71,765 mil gal	57 mi^2-days	66 mi^2-days	99 mi	117 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	12.5 mi	38.5 mi	1.1 mi	27.8 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0.1 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1.4 mi	12.9 mi	4.1 mi	0.3 mi	0.1 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 117 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 99 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Coxsackie to Kingston, and on the east shore from Stuyvesant to Rhinebeck. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Coxsackie 25,000-bbl Home Heating Oil Spill (Winter-High Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2 (48 hrs)**	**Tier 3 (72 hrs)**	**Rail Miles**	**River Miles**
	Major MMPD-WCD	25,000 ft boom 1,000 ft + 300 per skimming system 1,875 bbl/day 3,750 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 3,750 bbl/day 7,500 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 7,500 bbl/day 15,000 bbl storage	n/a	30 river miles Mile 123-93 2016-22 to 2016-45
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	An average current velocity of 1.1 kts results in high currents that will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.		66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may affect mechanical recovery operations.	About 30% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 1% in water column leading to potential negative water intake and fish concerns especially in areas near the spill site prior to dilution; perform water column tracking.	

Coxsackie 25,000-bbl Home Heating Oil Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Coxsackie	Tanker grounding or collision	25,000 bbl	Home heating oil	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	42.35119 -73.78982	Instantaneous	1 January 2016 9:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	66.2%	0.6%	0.3%	30.6%	2.3%
	bbl	2	16,544	147	64	7,661	582
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	1,322 mil gal	62,096 mil gal	47 mi^2-days	54 mi^2-days	92 mi	106 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	8.1 mi	34.5 mi	0.6 mi	30.9 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0.1 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1.8 mi	10.4 mi	4.2 mi	0.8 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 106 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 92 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Coxsackie to Ulster, and on the east shore from Stuyvesant to Red Hook. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Coxsackie 25,000-bbl Home Heating Oil Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>28 river miles
Mile 123-95
2016-22 to 2016-44</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td>An average current velocity of 1.1 kts results in high currents that will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Potential ice conditions may affect mechanical recovery operations.</td><td>About 31% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 1% in water column leading to potential negative water intake and fish concerns especially in areas near the spill site prior to dilution; perform water column tracking.</td></tr>
</table>

Proposed Kingston Anchorage 150,000-bbl Home Heating Oil Spill

Kingston 150,000-bbl Home Heating Oil Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Home heating oil	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	1 April 2016 3:00am	30 days	South / moderate (2-15 kts)	48°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	1.0%	51.9%	25.7%	0.8%	1.5%	19.1%
	bbl	1,430	77,827	38,538	1,187	2,301	28,717
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	592,012 mil gal	566,340 mil gal	60 mi^2-days	65 mi^2-days	110 mi	208 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	19.6 mi	74.6 mi	0.1 mi	7.7 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.6 mi	0.1 mi	0 mi	1.4 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	5 mi	1.2 mi	0 mi	0.2 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 208 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 110 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to Highlands, and on the east shore from Rhinebeck to Philipstown. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Home Heating Oil Spill (Spring-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>35 river miles
Mile 90-55
2016-47 to 2016-73</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">An average current velocity of 1.1 kts results in high currents that will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>52% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 2% is anticipated to cause shoreline contamination Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 26% in water column leading to water intake and fish kill concerns; perform water column tracking.</td></tr>
</table>

Kingston 150,000-bbl Home Heating Oil Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Home heating oil	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	1 April 2016 3:00am	30 days	South / moderate (2-15 kts)	48°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	1.0%	51.9%	25.7%	0.8%	1.5%	19.1%
	bbl	1,430	77,827	38,538	1,187	2,301	28,717

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
692,275 mil gal	700,652 mil gal	75 mi^2-days	79 mi^2-days	126 mi	226 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	20.7 mi	85.4 mi	0.2 mi	9.5 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.7 mi	0 mi	0 mi	1.6 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.2 mi	6.6 mi	1.1 mi	0 mi	0.1 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 226 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 126 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to Cornwall, and on the east shore from Rhinebeck to Philipstown. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Home Heating Oil Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>32 river miles
Mile 90-58
2016-47 to 2016-71</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">High currents averaging 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>46% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 2% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 31% in water column leading to water intake and fish kill concerns; perform water column tracking.</td></tr>
</table>

Kingston 150,000-bbl Home Heating Oil Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Home heating oil	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	7 August 2016 0:00am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.3%	66.3%	21.1%	0.8%	3.2%	8.4%
	bbl	380	99,443	31,609	1,180	4,758	12,630

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
190,327 mil gal	214,927 mil gal	266 mi^2-days	268 mi^2-days	89 mi	108 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	15.6 mi	39.7 mi	2.2 mi	15.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	2.9 mi	11.5 mi	1.7 mi	0.2 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 108 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 89 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Esopus to Catskill, and on the east shore from Hyde Park to Hudson. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Home Heating Oil Spill (Summer-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>33 river miles
Mile 80-113
2016-55 to 2016-30</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">High currents will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 3% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 21% entrainment in water column leading to water intake and fish kill concerns; perform water column tracking.</td></tr>
</table>

Kingston 150,000-bbl Home Heating Oil Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Home heating oil	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	7 August 2016 6:30am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.2%	66.2%	21.2%	0.6%	3.2%	8.6%
	bbl	301	99,324	31,830	889	4,764	12,892

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
196,345 mil gal	239,059 mil gal	264 mi^2-days	266 mi^2-days	91 mi	114 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	12.1 mi	35 mi	2.1 mi	21.3 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	3.3 mi	13.8 mi	1.9 mi	0.5 mi	1.1 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 114 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 91 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Esopus to Coxsackie, and on the east shore from Stuyvesant to Hyde Park. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Home Heating Oil Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>43 river miles
Mile 80-123
2016-55 to 2016-23</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">High currents averaging 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 3% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 21% entrainment in water column leading to water intake and fish kill concerns; perform water column tracking.</td></tr>
</table>

Kingston 150,000-bbl Home Heating Oil Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Home heating oil	Winter	High

Spill Probability	**Annual Probability Anywhere in Hudson River**		**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)	**Spill of Type and Volume**	**US**	**Hudson**
	0.732	0.0000015	0	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	1 January 2016 3:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	10.5%	64.6%	8.6%	0.9%	7.1%	8.2%
	bbl	15,790	96,871	12,966	1,379	10,666	12,328

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
219,259 mil gal	205,461 mil gal	361 mi^2-days	443 mi^2-days	120 mi	136 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	19.1 mi	81.6 mi	0.7 mi	9.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.8 mi	6.6 mi	1.9 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 136 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 120 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Saugerties to Lloyd, and on the east shore from Poughkeepsie to Red Hook. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Home Heating Oil Spill (Winter-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>30 river miles
Mile 100-70
2016-39 to 2016-61</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Ice conditions may hinder response operations; high currents will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>65% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may affect mechanical recovery operations.</td><td>About 7% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 9% entrainment in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking.</td></tr>
</table>

Kingston 150,000-bbl Home Heating Oil Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Home heating oil	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	1 January 2016 9:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	10.7%	64.4%	8.6%	0.7%	7.1%	8.5%
	bbl	16,085	96,592	12,857	1,111	10,678	12,678
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	214,377 mil gal	212,355 mil gal	373 mi^2-days	448 mi^2-days	120 mi	135 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	18.6 mi	80.6 mi	0.9 mi	9.4 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.9 mi	7.1 mi	2.3 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 135 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 120 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Saugerties to Lloyd, and on the east shore from Poughkeepsie to Red Hook. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Home Heating Oil Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>27 river miles
Mile 100-73
2016-39 to 2016-60</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Ice conditions may hinder response operations; high currents will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>Ice conditions may hinder response operations; 64% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may affect mechanical recovery operations.</td><td>About 7% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 9% entrainment in water column leading to water intake and fish kill concerns especially in areas near spill site prior to dilution; perform water column tracking.</td></tr>
</table>

Proposed Kingston Anchorage 150,000-bbl Diluted Bitumen Oil Spill

Kingston 150,000-bbl Diluted Bitumen Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Diluted Bitumen	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	1 April 2016 3:00am	30 days	South / moderate (2-15 kts)	48°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	51.5%	28.2%	1.2%	0.6%	5.6%	4.4%
	bbl	77,192	42,245	1,730	843	8,361	6,540
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	70,481 mil gal	184,274 mil gal	185 mi^2-days	185 mi^2-days	184 mi	304 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	21.8 mi	120.3 mi	0.4 mi	18.7 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1.6 mi	1.1 mi	0.2 mi	3.7 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	2.1 mi	11.7 mi	2 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 304 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 184 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to Cornwall, and on the east shore from Rhinebeck to Beacon. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77: Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Diluted Bitumen Spill (Spring-High Tide) Response

	Response Equipment and Plan Activation					
	NCP and USCG Type	Tier Response Requirements			GRPs/ GRSs Activated (7 days)	
		Tier 1 (24 hrs)	Tier 2 (48 hrs)	Tier 3 (72 hrs)	Rail Miles	River Miles
	Major WCD	25,000 ft boom 1,000 ft + 300 per skimming system 1,875 bbl/day 3,750 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 3,750 bbl/day 7,500 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 7,500 bbl/day 15,000 bbl storage	n/a	30 river miles Mile 90-60 2016-47 to 2016-69
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		Mechanical Recovery	Shoreline Cleanup	Other Challenges	
Spill Response[9]	An average current velocity of 1 kt results in high currents w reducing boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		Average 1 kt current velocities may affect skimmer operations, 28% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	Approximately 6% impact on shoreline. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Potential for submerged oil in high-sediment areas especially as the diluents evaporate; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 1% entrainment in water column which may lead to water intake and fish kill concerns in areas near spill site prior to dilution; perform water column tracking, perform bottom drags to determine extent of submerged oil on river bottom however at <1%, may not be detectable.	

[9] Non-floating oil, therefore OSROs are required to be certified having capabilities as follows: detection; recovery; storage; and optional containment for submerged oil.

Kingston 150,000-bbl Diluted Bitumen Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Diluted Bitumen	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	1 April 2016 11:00am	30 days	South / moderate (4-15 kts)	48°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	51.9%	28.1%	1.2%	0.8%	6.1%	4.5%
	bbl	77,896	42,089	1,817	1,163	9,184	6,789
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	83,502 mil gal	183,616 mil gal	193 mi^2-days	193 mi^2-days	193 mi	321 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	22.9 mi	125.8 mi	0.6 mi	19.7 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1.6 mi	1.3 mi	0.2 mi	2.8 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	2.6 mi	12.7 mi	2.4 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 321 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 193 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Esopus to Cornwall, and on the east shore from Rhinebeck to Philipstown. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Diluted Bitumen Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response[10]</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>34 river miles
Mile 92-58
2016-46 to 2016-75</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">An average current velocity of 1 kt results in high currents w reducing boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>Average 1 kt current velocities may affect skimmer operations, 28% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>Approximately 6% impact on shoreline. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Potential for submerged oil in high-sediment areas especially as the diluents evaporate; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 1% entrainment in water column which may lead to water intake and fish kill concerns in areas near spill site prior to dilution; perform water column tracking, perform bottom drags to determine extent of submerged oil on river bottom however at <1%, may not be detectable.</td></tr>
</table>

[10] Non-floating oil, therefore OSROs are required to be certified having capabilities as follows: detection; recovery; storage; and optional containment for submerged oil.

Kingston 150,000-bbl Diluted Bitumen Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Diluted Bitumen	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	7 August 2016 0:00am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	58.9%	28.9%	1.3%	0.8%	6.0%	4.1%
	bbl	88,336	43,315	1,924	1,157	9,075	6,201
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	53,137 mil gal	107,423 mil gal	411 mi^2-days	411 mi^2-days	135 mi	139 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	16.4 mi	50.2 mi	2.2 mi	32.1 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	5.6 mi	23.1 mi	3.9 mi	0.2 mi	1.7 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 139 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 135 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Catskill to Milton, and on the east shore from Hudson to Poughkeepsie. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Diluted Bitumen Spill (Summer-High Tide) Response

Spill Response[11]	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2 (48 hrs)**	**Tier 3 (72 hrs)**	**Rail Miles**	**River Miles**
	Major WCD	25,000 ft boom 1,000 ft + 300 per skimming system 1,875 bbl/day 3,750 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 3,750 bbl/day 7,500 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 7,500 bbl/day 15,000 bbl storage	n/a	40 river miles Mile 115-75 2016-28 to 2016-58
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	An average current velocity of 1 kt results in high currents w reducing boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		Average 1 kt current velocities may affect skimmer operations, 28% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	Approximately 6% impact on shoreline. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Potential for submerged oil in high-sediment areas especially as the diluents evaporate; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 1% entrainment in water column which may lead to water intake and fish kill concerns in areas near spill site prior to dilution; perform water column tracking, perform bottom drags to determine extent of submerged oil on river bottom however at <1%, may not be detectable.	

[11] Non-floating oil, therefore OSROs are required to be certified having capabilities as follows: detection; recovery; storage; and optional containment for submerged oil.

Kingston 150,000-bbl Diluted Bitumen Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Diluted Bitumen	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	7 August 2016 6:30am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	59.0%	28.9%	1.2%	0.8%	5.9%	4.2%
	bbl	88,486	43,325	1,736	1,188	8,922	6,350
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	68,235 mil gal	116,945 mil gal	406 mi^2-days	406 mi^2-days	131 mi	134 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	14.6 mi	45.7 mi	2.2 mi	32.9 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0.1 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	6.2 mi	23.8 mi	4.3 mi	0.2 mi	0.7 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 134 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 131 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Athens to Lloyd, and on the east shore from Hudson to Hyde Park. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Diluted Bitumen Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response[12]</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>35 river miles
Mile 115-80
2016-28 to 2016-55</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">An average current velocity of 1 kt results in high currents w reducing boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>Average 1 kt current velocities may affect skimmer operations, 28% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>Approximately 6% impact on shoreline. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Potential for submerged oil in high-sediment areas especially as the diluents evaporate; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 1% entrainment in water column which may lead to water intake and fish kill concerns in areas near spill site prior to dilution; perform water column tracking, perform bottom drags to determine extent of submerged oil on river bottom however at 1%, may not be detectable.</td></tr>
</table>

[12] Non-floating oil, therefore OSROs are required to be certified having capabilities as follows: detection; recovery; storage; and optional containment for submerged oil.

Kingston 150,000-bbl Diluted Bitumen Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Diluted Bitumen	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	1 January 2016 3:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	57.6%	28.1%	1.4%	0.5%	7.9%	4.6%
	bbl	86,347	42,136	2,067	790	11,808	6,864
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	66,709 mil gal	119,254 mil gal	178 mi^2-days	178 mi^2-days	150 mi	157 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	22.8 mi	98.4 mi	1.1 mi	13.4 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.1 mi	0 mi	0.5 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1.9 mi	9.8 mi	2.3 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 157 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 150 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Athens to Lloyd, and on the east shore from Hudson to Poughkeepsie. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Diluted Bitumen Spill (Winter-High Tide) Response

Spill Response[13]	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2 (48 hrs)**	**Tier 3 (72 hrs)**	**Rail Miles**	**River Miles**
	Major WCD	25,000 ft boom 1,000 ft + 300 per skimming system 1,875 bbl/day 3,750 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 3,750 bbl/day 7,500 bbl storage	25,000 ft boom 1,000 ft + 300 per skimming system 7,500 bbl/day 15,000 bbl storage	n/a	35 river miles Mile 115-75 2016-28 to 2016-58
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	An average current velocity of 1 kt results in high currents w reducing boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.		Average 1 kt current velocities may affect skimmer operations, 28% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may affect skimmer operations.	Approximately 8% impact on shoreline. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Potential for submerged oil in high-sediment areas especially as the diluents evaporate; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 1% entrainment in water column which may lead to water intake and fish kill concerns in areas near spill site prior to dilution; perform water column tracking, perform bottom drags to determine extent of submerged oil on river bottom however at 1%, may not be detectable.	

[13] Non-floating oil, therefore OSROs are required to be certified having capabilities as follows: detection; recovery; storage; and optional containment for submerged oil.

Kingston 150,000-bbl Diluted Bitumen Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Proposed Kingston Anchorage	ATB collision	150,000 bbl	Diluted Bitumen	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.93017 -73.95700	37,500 bbl/hr over 4 hrs	1 January 2016 9:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	57.8%	28.1%	1.6%	0.4%	7.6%	4.6%
	bbl	86,649	42,129	2,365	540	11,429	6,901
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	70,968 mil gal	103,822 mil gal	182 mi2-days	182 mi2-days	147 mi	153 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	22.6 mi	95.7 mi	1.4 mi	12.5 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1.9 mi	10 mi	2.2 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 153 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 147 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Saugerties to Newburgh, and on the east shore from Germantown to Beacon. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Kingston 150,000-bbl Diluted Bitumen Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response[14]</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>38 river miles
Mile 103-65
2016-38 to 2016-65</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">An average current velocity of 1 kt results in high currents w reducing boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>Average 1 kt current velocities may affect skimmer operations, 28% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may affect skimmer operations.</td><td>Approximately 6% impact on shoreline. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Potential for submerged oil in high-sediment areas especially as the diluents evaporate; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 1% entrainment in water column which may lead to water intake and fish kill concerns in areas near spill site prior to dilution; perform water column tracking, perform bottom drags to determine extent of submerged oil on river bottom however at <2%, may not be detectable.</td></tr>
</table>

[14] Non-floating oil, therefore OSROs are required to be certified having capabilities as follows: detection; recovery; storage; and optional containment for submerged oil.

Rondout 75,421-bbl Bakken Crude Spill (ACP Scenario)

Rondout 75,421-bbl Bakken Crude Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Tank barge spill	75,421 bbl	Bakken crude	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	1 April 2016 3:00am	30 days	South / moderate (2-15 kts)	48°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	47.5%	19.1%	0.3%	2.9%	8.3%
	bbl	2	35,791	14,416	243	2,187	6,226
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	479,385 mil gal	391,035 mil gal	31 mi^2-days	32 mi^2-days	87 mi	123 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	15.9 mi	58.4 mi	0 mi	5.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.1 mi	0 mi	0.2 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	5.8 mi	1.7 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 123 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 87 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to Cornwall, and on the east shore from Rhinebeck to Philipstown. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 75,421-bbl Bakken Crude Spill (Spring-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>30 river miles
Mile 90-60
2016-47 to 2016-69</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>48% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 3% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 19% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Rondout 75,421-bbl Bakken Crude Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Tank barge spill	75,421 bbl	Bakken crude	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	1 April 2016 3:00am	30 days	South / moderate (2-15 kts)	48°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	38.6%	24.1%	0.3%	2.4%	11.3%
	bbl	0	29,096	18,178	211	1,819	8,551
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	536,573 mil gal	520,133 mil gal	20 mi^2-days	21 mi^2-days	82 mi	116 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	14.5 mi	53.6 mi	0.1 mi	5.9 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	5.9 mi	1.6 mi	0 mi	0.2 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 116 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 82 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to Cornwall, and on the east shore from Rhinebeck to Philipstown. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 75,421-bbl Bakken Crude Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>30 river miles
Mile 90-60
2016-47 to 2016-69</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>39% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About <3% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 24% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Rondout 75,421-bbl Bakken Crude Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Tank barge spill	75,421 bbl	Bakken crude	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	7 August 2016 0:00am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.1%	52.8%	37.3%	0.1%	6.6%	3.1%
	bbl	109	39,787	28,165	90	4,942	2,327

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
170,510 mil gal	72,848 mil gal	228 mi^2-days	229 mi^2-days	89 mi	108 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	15.6 mi	39.7 mi	2.2 mi	15.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	2.9 mi	11.5 mi	1.7 mi	0.2 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 108 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 89 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Catskill to Lloyd, and on the east shore from Hudson to Poughkeepsie. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Ulster Mile 96; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 75,421-bbl Bakken Crude Spill (Summer-High Tide) Response

<table>
<tr><td rowspan="8">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>38 river miles
Mile 113-75
2016-30 to
2016-58</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>33% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About <7% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 37% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Rondout 75,421-bbl Bakken Crude Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Tank barge spill	75,421 bbl	Bakken crude	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	7 August 2016 0:00am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.1%	52.7%	37.4%	0.1%	6.5%	3.2%
	bbl	65	39,748	28,239	55	4,922	2,392

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
173,294 mil gal	75,446 mil gal	224 mi^2-days	224 mi^2-days	95 mi	117 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	15 mi	42.2 mi	2 mi	18.8 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	3.1 mi	11.8 mi	2 mi	0.2 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 117 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 95 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Athens to Lloyd, and on the east shore from Stockport to Poughkeepsie. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 75,421-bbl Bakken Crude Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="8">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>45 river miles
Mile 120-75
2016-25 to 2016-58</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td colspan="2">Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td>Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td colspan="2">53% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About <7% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 37% in water column leading to water intake and fish kill concerns; perform water column tracking, and air monitoring.</td></tr>
</table>

Rondout 75,421-bbl Bakken Crude Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Tank barge spill	75,421 bbl	Bakken crude	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	7 August 2016 6:30am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	21.6%	51.1%	10.6%	0.1%	14.1%	2.5%
	bbl	16,305	38,566	7,967	56	10,661	1,865
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	129,155 mil gal	80,830 mil gal	336 mi^2-days	353 mi^2-days	124 mi	139 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	19.9 mi	83 mi	0.6 mi	10 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0.3 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1 mi	7.3 mi	2 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 139 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 124 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Ulster to Newburgh, and on the east shore from Rhinebeck to Beacon. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 75,421-bbl Bakken Crude Spill (Winter-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>28 river miles
Mile 93-65
2016-45 to 2016-65</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td>Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>51% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers; potential ice conditions may affect skimmer operations.</td><td>About 14% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 11% in water column leading to water intake and fish kill concerns especially in areas near the spill prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Rondout 75,421-bbl Bakken Crude Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Tank barge spill	75,421 bbl	Bakken crude	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	1 January 2016 9:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	21.2%	51.1%	10.8%	0.1%	14.3%	2.5%
	bbl	15,969	38,552	8,166	58	10,802	1,874
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	123,916 mil gal	86,162 mil gal	333 mi^2-days	349 mi^2-days	124 mi	137 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	19.9 mi	82 mi	1.1 mi	10.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1 mi	7.6 mi	1.9 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 137 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 124 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Ulster to Marlboro, and on the east shore from Red Hook to Poughkeepsie. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 75,421-bbl Bakken Crude Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD-WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>25 river miles
Mile 95-70
2016-44 to 2016-62</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td>Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>51% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers; potential ice conditions may affect skimmer operations.</td><td>About 14% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. Potential for submerged oil in high-sediment areas; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 11% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Rondout 75,421-bbl Bakken Crude Spill with Fire/Explosion

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide**
	Off Rondout Creek	Tank barge spill	75,421 bbl	Bakken crude oil	Summer	High
Spill Probability	**Annual Probability**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type in Hudson		**Spill Volume in Hudson**		**US**	**Hudson**
	0.732		0.012		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Run Duration**	**Winds**	**Temperature**
	41.91833 -73.96333	Instantaneous	7 August 2016 0:00am	30 days	Light/variable (<5 kts)	75°F
Fire/Explosion Probabilities	**Pool Fire Probability/Incident**		**Pool Fire Probability**		**Vapor Cloud Explosion/Incident**	**Vapor Cloud Explosion Probability**
	0.08		0.0096		0.024	0.0029

	Emergency Response	**Evacuation Zone**	**Health/Safety Issues**
Fire/Explosion Response[15]	This event may have both fire and a spill on the water simultaneously. Specific incident decision needs to be made early as to whether to attack fire or allow it to burn out. Port of Albany has small firefighting vessel, *Marine 1* with a 1,500 gpm water monitor. This unit may be insufficient for the potential size of this fire event. Kingston, Albany and Newburgh FD have NYS supplied foam trailers w/monitors for rail crude oil derailment fires but equipment and foam quantity would be insufficient for this larger vessel spill/fire. RP would be required to implement and mobilize VRP Firefighting contractor resources in order to provide manpower, foam and equipment to respond to a potential large fire event.	As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Large Spill • Consider initial downwind evacuation for at least 300 meters (1000 feet). Fire • ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.	Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Light, sweet crude oils will normally contain lighter flammable gasses such as butane and propane (unless these gases have been removed). These flammable gasses can readily ignite if released, when they come in contact with an ignition source. These crude oils may also contain hydrogen sulfide, a toxic inhalation hazard material. Due to the characteristics of crude oil, in an accident scenario, the behavior of this product may range from that of gasoline for the lighter (sweet) crude oils to diesel fuel for the heavier (sour) crude oils. Air monitoring should be performed for responder and public safety.

Safety Impacts	**Flammable Distance**	**Impacts from Fire (Acres)**				
		Total	**Residential**	**Commercial**	**Industrial**	**Public Use**
	581 ft	0.8 acres	0 acres	0 acres	0.4 acre	0.4 acre
	Downwind Distance	**Impacts from Explosion (Acres)**				
		Total	**Residential**	**Commercial**	**Industrial**	**Public Use**
	2.19 miles	418 acres	155 acres	134 acres	50 acres	79 acres

[15] If concurrent with a spill to the water, see also spill response tables. If there is a fire and/or explosion, some or even most of the oil may be consumed by the fire, reducing the amount of oil that would spill into the river and affect shorelines. In most cases, it would be necessary to conduct at least some oil spill cleanup in addition to fire-fighting, though those operations would be secondary to emergency fire-fighting operations.

Rondout 14,000-bbl Heavy Fuel Oil Spill (ACP Scenario)

Rondout 14,000-bbl Heavy Fuel Oil Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Cargo vessel spill	14,000 bbl	Heavy Fuel Oil	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	4.073		0.031		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	1 April 2016 3:00am	30 days	South / moderate (2-15 kts)	48°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	1.8%	5.7%	0.0%	0.0%	70.3%	22.2%
	bbl	248	802	0	0	9,836	3,112
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	59 mil gal	1,918 mil gal	12 mi^2-days	12 mi^2-days	113 mi	125 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	18.7 mi	77.8 mi	0 mi	6.8 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.4 mi	7 mi	2.1 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 125 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 113 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to New Windsor, and on the east shore from Rhinebeck to Philipstown. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; ; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 14,000-bbl Heavy Fuel Oil Spill (Spring-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>29 river miles
Mile 92-63
2016-46 to 2016-67</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>Only 6% evaporation with the bulk of the spill contaminating the shoreline will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers designed for heavy oils; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 70% is anticipated to cause shoreline contamination and will require significant shoreline cleanup of contaminated sediment, and debris. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a heavy oil spill is not a significant danger, Potential for significant shoreline cleanup, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of oil in water column not a significant factor, responders need to wear disposable Tyvek coveralls.</td></tr>
</table>

Rondout 14,000-bbl Heavy Fuel Oil Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Cargo vessel spill	14,000 bbl	Heavy Fuel Oil	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	4.073		0.031		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	1 April 2016 11:00am	30 days	South / moderate (4-15 kts)	48°F

SIMAP Modeling Results

Mass Balance at End of Model Run (After 30 Days)

Fate	Surface	Atmosphere	Water Column	Sediment	Ashore	Degraded
%	1.2%	5.7%	0.0%	0.0%	70.8%	22.2%
bbl	171	802	0	0	9,915	3,112

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)

Water (Volume) – Ecological		Surface (Area x Days Exposed)		Shoreline (Length)	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
64 mil gal	1,272 mil gal	11 mi^2-days	11 mi^2-days	115 mi	125 mi

Ecological Shoreline Exposures

Shoreline Exposure by Shore Type (Miles over Ecological Threshold)

Bedrock	Unconsolidated Rock	Sand Beach	Mud or Timber	Artificial Shore
19.4 mi	78.2 mi	0.1 mi	7.5 mi	0 mi

Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)

Saltmarsh	Upper Intertidal Mix	Lower Intertidal Mix	Phragmites Wetland	Shrub/Scrub and Forested Wetland
0.1 mi	0 mi	0 mi	0 mi	0 mi

Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)

Cattail Marsh	Upper Intertidal Mix	Lower Intertidal Mix	Phragmites Wetland	Shrub/Scrub and Forested Wetland
0.4 mi	7.3 mi	2.2 mi	0 mi	0.3 mi

Socioeconomic Impacts

Potential Socioeconomic Impacts from Spill and Response Operations

Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 125 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 115 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Kingston to Balmville, and on the east shore from Rhinebeck to Wappinger. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 14,000-bbl Heavy Fuel Oil Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>23 river miles
Mile 90-67
2016-47 to 2016-64</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>Only 6% evaporation with the bulk of the spill contaminating the shoreline will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers designed for heavy oils; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 71% is anticipated to cause shoreline contamination and will require significant shoreline cleanup of contaminated sediment, and debris. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a heavy oil spill is not a significant danger, Potential for significant shoreline cleanup, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of oil in water column not a significant factor, responders need to wear disposable Tyvek coveralls.</td></tr>
</table>

Rondout 14,000-bbl Heavy Fuel Oil Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Cargo vessel spill	14,000 bbl	Heavy Fuel Oil	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	4.073		0.031		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	7 August 2016 0:00am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	17.1%	6.4%	0.0%	0.0%	54.4%	22.2%
	bbl	2,395	891	0	2	7,609	3,102
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	20 mil gal	11,131 mil gal	83 mi^2-days	83 mi^2-days	71 mi	73 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	14.1 mi	32.3 mi	2.2 mi	10.7 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	2.2 mi	8.5 mi	0.5 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 73 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 71 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Saugerties to Lloyd, and on the east shore from Clermont to Hyde Park. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 14,000-bbl Heavy Fuel Oil Spill (Summer-High Tide) Response

<table>
<tr><td rowspan="8">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>25 river miles
Mile 103-78
2016-38 to 2016-56</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>Only 6% evaporation with the bulk of the spill contaminating the shoreline will reduce amount that can be recovered mechanically although 17% is projected to remain floating on surface; mobilize floating self-propelled skimmers designed for heavy oils; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 54% is anticipated to cause shoreline contamination and will require significant shoreline cleanup of contaminated sediment, and debris. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a heavy oil spill is not a significant danger, Potential for significant shoreline cleanup, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of oil in water column not a significant factor, responders need to wear disposable Tyvek coveralls.</td></tr>
</table>

Rondout 14,000-bbl Heavy Fuel Oil Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Cargo vessel spill	14,000 bbl	Heavy Fuel Oil	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	4.073		0.031		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	7 August 2016 6:30am	30 days	Light / variable (<5 kts)	75°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	18.2%	6.4%	0.0%	0.0%	53.2%	22.2%
	bbl	2,553	894	0	2	7,448	3,102
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	14 mil gal	10,830 mil gal	84 mi^2-days	84 mi^2-days	69 mi	72 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	12.9 mi	31.3 mi	2.2 mi	11.6 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	1.7 mi	8.7 mi	0.5 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 72 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 69 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Catskill to Esopus, and on the east shore from Hudson to Hyde Park. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 14,000-bbl Heavy Fuel Oil Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="8">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>30 river miles
Mile 112-82
2016-31 to 2016-53</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>Only 6% evaporation with the bulk of the spill contaminating the shoreline will reduce amount that can be recovered mechanically although 18% is projected to remain floating on surface; mobilize floating self-propelled skimmers designed for heavy oils; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 53% is anticipated to cause shoreline contamination and will require significant shoreline cleanup of contaminated sediment, and debris. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a heavy oil spill is not a significant danger, Potential for significant shoreline cleanup, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of oil in water column not a significant factor, responders need to wear disposable Tyvek coveralls.</td></tr>
</table>

Rondout 14,000-bbl Heavy Fuel Oil Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Cargo vessel spill	14,000 bbl	Heavy Fuel Oil	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	4.073		0.031		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	1 January 2016 3:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	5.1%	3.6%	0.0%	0.0%	68.9%	22.4%
	bbl	713	499	4	0	9,651	3,134
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	663 mil gal	624 mil gal	0.9 mi^2-days	0.9 mi^2-days	75 mi	78 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	12.1 mi	50 mi	0.5 mi	6.5 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.2 mi	3.8 mi	1.5 mi	0 mi	0.3 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 78 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 75 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Ulster to Marlboro, and on the east shore from Rhinebeck to Poughkeepsie. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 14,000-bbl Heavy Fuel Oil Spill (Winter-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="6">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3" rowspan="2">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>20 river miles
Mile 93-73
2016-44 to 2016-59</td></tr>
<tr><td colspan="6">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>Only 4% evaporation with the bulk of the spill contaminating the shoreline will reduce amount that can be recovered mechanically although 5% is projected to remain floating on surface; mobilize floating self-propelled skimmers designed for heavy oils; set up shoreline containment boom areas with vacuum-trucks and skimmers; potential ice conditions may affect skimmer operations.</td><td>About 69% is anticipated to cause shoreline contamination and will require significant shoreline cleanup of contaminated sediment, and debris. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a heavy oil spill is not a significant danger, Potential for significant shoreline cleanup, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of oil in water column not a significant factor, responders need to wear disposable Tyvek coveralls.</td></tr>
</table>

Rondout 14,000-bbl Heavy Fuel Oil Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Off Rondout Creek	Cargo vessel spill	14,000 bbl	Heavy Fuel Oil	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	4.073		0.031		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.91833 -73.96333	Instantaneous	1 January 2016 9:00am	30 days	Light / variable (<5 kts)	32°F

SIMAP Modeling Results

Mass Balance at End of Model Run (After 30 Days)						
Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
%	4.8%	3.6%	0.0%	0.0%	69.2%	22.4%
bbl	667	504	2	2	9,692	3,133

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)					
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
538 mil gal	539 mil gal	0.9 mi^2-days	0.9 mi^2-days	75 mi	79 mi

Ecological Shoreline Exposures

Shoreline Exposure by Shore Type (Miles over Ecological Threshold)				
Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
12.3 mi	48.7 mi	1 mi	7.4 mi	0 mi
Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
0 mi	0 mi	0 mi	0 mi	0 mi
Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
0.3 mi	3.9 mi	1.5 mi	0 mi	0.3 mi

Socioeconomic Impacts

Potential Socioeconomic Impacts from Spill and Response Operations

Response operations may cause major impacts to ports in Albany and throughout river for at least several days. 79 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 75 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Ulster to Lloyd, and on the east shore from Red Hook to Poughkeepsie. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Ulster Mile 96; Rondout Mile 92; Rhinebeck Mile 92; Port Ewen Mile 89; Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Rondout 14,000-bbl Heavy Fuel Oil Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="8">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>20 river miles
Mile 95-75
2016-43 to 2016-58</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>Only 4% evaporation with the bulk of the spill contaminating the shoreline will reduce amount that can be recovered mechanically although 5% is projected to remain floating on surface; mobilize floating self-propelled skimmers designed for heavy oils; set up shoreline containment boom areas with vacuum-trucks and skimmers; potential ice conditions may affect skimmer operations.</td><td>About 69% is anticipated to cause shoreline contamination and will require significant shoreline cleanup of contaminated sediment, and debris. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a heavy oil spill is not a significant danger, Potential for significant shoreline cleanup, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of oil in water column not a significant factor, responders need to wear disposable Tyvek coveralls.</td></tr>
</table>

Newburgh Waterfront Crude-by-Rail 11,000-bbl Bakken Crude Spill

Newburgh CBR 11,000-bbl Bakken Crude Spill (Spring-High Tide) Effects

<table>
<tr><td rowspan="2">Scenario Description</td><td>Location</td><td>Source</td><td>Volume</td><td>Oil Type</td><td>Season</td><td>Tide Stage</td></tr>
<tr><td>Newburgh Waterfront</td><td>CBR train spill</td><td>11,000 bbl</td><td>Bakken crude</td><td>Spring</td><td>High</td></tr>
<tr><td rowspan="3">Spill Probability</td><td colspan="4">Annual Probability Anywhere in Hudson River</td><td colspan="2">Historical Annual Frequency (2000-2015)</td></tr>
<tr><td colspan="2">Spill of Type (Any Volume)</td><td colspan="2">Spill of Type and Volume</td><td>US</td><td>Hudson</td></tr>
<tr><td colspan="2">0.0000046</td><td colspan="2">0.00000035</td><td>0.2</td><td>0</td></tr>
<tr><td rowspan="2">Conditions</td><td>Lat/Lon</td><td>Release Rate</td><td>Release Date/Time</td><td>Model Run Duration</td><td>Winds</td><td>Water Temperature</td></tr>
<tr><td>41.51523
-74.00694
41.50517
-74.00572</td><td>Instantaneous</td><td>1 April 2016
5:00pm</td><td>30 days</td><td>Light / variable (<5 kts)</td><td>43°F</td></tr>
<tr><td rowspan="6">SIMAP Modeling Results</td><td colspan="7">Mass Balance at End of Model Run (After 30 Days)</td></tr>
<tr><td>Fate</td><td>Surface</td><td>Atmosphere</td><td>Water Column</td><td>Sediment</td><td>Ashore</td><td>Degraded</td></tr>
<tr><td>%</td><td>0.1%</td><td>42.3%</td><td>6.3%</td><td>0.2%</td><td>8.6%</td><td>7.6%</td></tr>
<tr><td>bbl</td><td>6</td><td>4,650</td><td>695</td><td>22</td><td>948</td><td>834</td></tr>
<tr><td colspan="7">Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)</td></tr>
<tr><td colspan="2">Water (Volume) – Ecological</td><td colspan="2">Surface (Area x Days Exposed)</td><td colspan="2">Shoreline (Length)</td></tr>
<tr><td>Whole Oil (1 mg/l)</td><td>Dissolved (0.001 mg/l)</td><td>Ecological (10 g/m^2)</td><td>Socioeconomic (0.01 g/m^2)</td><td>Ecological (100 g/m^2)</td><td>Socioeconomic (1 g/m^2)</td></tr>
<tr><td>72,442 mil gal</td><td>175,951 mil gal</td><td>4 mi^2-days</td><td>4 mi^2-days</td><td>40 mi</td><td>93 mi</td></tr>
<tr><td rowspan="6">Ecological Shoreline Exposures</td><td colspan="5">Shoreline Exposure by Shore Type (Miles over Ecological Threshold)</td></tr>
<tr><td>Bedrock</td><td>Unconsolidated Rock</td><td>Sand Beach</td><td>Mud or Timber</td><td>Artificial Shore</td></tr>
<tr><td>7.2 mi</td><td>28.9 mi</td><td>0 mi</td><td>2.6 mi</td><td>0 mi</td></tr>
<tr><td colspan="5">Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)</td></tr>
<tr><td>Saltmarsh</td><td>Upper Intertidal Mix</td><td>Lower Intertidal Mix</td><td>Phragmites Wetland</td><td>Shrub/Scrub and Forested Wetland</td></tr>
<tr><td>0.3 mi</td><td>0.2 mi</td><td>0 mi</td><td>0.5 mi</td><td>0 mi</td></tr>
<tr><td rowspan="3"></td><td colspan="5">Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)</td></tr>
<tr><td>Cattail Marsh</td><td>Upper Intertidal Mix</td><td>Lower Intertidal Mix</td><td>Phragmites Wetland</td><td>Shrub/Scrub and Forested Wetland</td></tr>
<tr><td>0 mi</td><td>0.5 mi</td><td>0 mi</td><td>0 mi</td><td>0 mi</td></tr>
<tr><td>Socioeconomic Impacts</td><td colspan="6">Potential Socioeconomic Impacts from Spill and Response Operations
Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 93 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 40 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Newburgh to Haverstraw, and on the east shore from Beacon to Cortlandt. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65; Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.</td></tr>
</table>

Newburgh CBR 11,000-bbl Bakken Crude Spill (Spring-High Tide) Response

	Response Equipment and Plan Activation					
	NCP and USCG Type	Tier Response Requirements			GRPs/ GRSs Activated (7 days)	
		Tier 1	Tier 2	Tier 3	Rail Miles	River Miles
	Major Not defined	No requirement	No requirement	No requirement	2 rail miles QR-58 to QR-56	22 river miles Mile 62-40 2016-68 to 2016-85
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming	Mechanical Recovery	Shoreline Cleanup	Other Challenges		
Spill Response[16]	Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.	51% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 23% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 24% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.		

[16] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Newburgh Waterfront	CBR train spill	11,000 bbl	Bakken crude	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.51523 -74.00694 41.50517 -74.00572	Instantaneous	1 April 2016 11:00am	30 days	Light / variable (<5 kts)	43°F

SIMAP Modeling Results

Mass Balance at End of Model Run (After 30 Days)

Fate	Surface	Atmosphere	Water Column	Sediment	Ashore	Degraded
%	0.0%	25.9%	7.5%	0.4%	4.2%	13.5%
bbl	3	2,853	827	39	462	1,489

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)

Water (Volume) – Ecological		Surface (Area x Days Exposed)		Shoreline (Length)	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
100,462 mil gal	219,195 mil gal	3 mi^2-days	3 mi^2-days	34 mi	73 mi

Ecological Shoreline Exposures

Shoreline Exposure by Shore Type (Miles over Ecological Threshold)

Bedrock	Unconsolidated Rock	Sand Beach	Mud or Timber	Artificial Shore
5.7 mi	24.1 mi	0 mi	3.4 mi	0 mi

Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)

Saltmarsh	Upper Intertidal Mix	Lower Intertidal Mix	Phragmites Wetland	Shrub/Scrub and Forested Wetland
0.1 mi	0.3 mi	0 mi	0.1 mi	0 mi

Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)

Cattail Marsh	Upper Intertidal Mix	Lower Intertidal Mix	Phragmites Wetland	Shrub/Scrub and Forested Wetland
0 mi	0.1 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts

Potential Socioeconomic Impacts from Spill and Response Operations

Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 73 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 34 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Newburgh to Haverstraw, and on the east shore from Beacon to Cortlandt. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65; Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response[17]</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major
Not defined</td><td>No requirement</td><td>No requirement</td><td>No requirement</td><td>2 rail miles
QR-58 to QR-56</td><td>22 river miles
Mile 62-41
2016-68 to 2016-83</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td>Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>26% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 23% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 24% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

[17] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Newburgh Waterfront	CBR train spill	11,000 bbl	Bakken crude	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.51523 -74.00694 41.50517 -74.00572	Instantaneous	7 August 2016 1:30pm	30 days	NW / Light (<6 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	50.7%	23.9%	0.0%	22.5%	2.8%
	bbl	0	5,579	2,631	5	2,479	306

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
28,220 mil gal	32,093 mil gal	9 mi^2-days	9 mi^2-days	45 mi	54 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	4.4 mi	34.8 mi	0 mi	2.9 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	3.3 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 54 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 45 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Newburgh to Haverstraw, and on the east shore from Beacon to Cortlandt. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65; Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Summer-High Tide) Response

Spill Response[18]	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major Not defined	No requirement	No requirement	No requirement	2 rail miles QR-58 to QR-56	22 river miles Mile 62-41 2016-68 to 2016-83
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming	**Mechanical Recovery**		**Shoreline Cleanup**	**Other Challenges**	
	Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.	44% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.		About 39% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 12% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.	

[18] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Newburgh Waterfront	CBR train spill	11,000 bbl	Bakken crude	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.51523 -74.00694 41.50517 -74.00572	Instantaneous	7 August 2016 6:30am	30 days	NW / light (<6 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	50.7%	26.2%	0.1%	20.1%	3.0%
	bbl	0	5,580	2,879	6	2,209	327
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	18,129 mil gal	53,428 mil gal	11 mi^2-days	11 mi^2-days	45 mi	52 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	2.8 mi	36.1 mi	0 mi	2.3 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	2.8 mi	0.6 mi	0 mi	0.1 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 52 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 45 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Newburgh to Highlands, and on the east shore from Wappinger to Philipstown. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response[19]</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major
Not defined</td><td>No requirement</td><td>No requirement</td><td>No requirement</td><td>2 rail miles
QR-58 to QR-56</td><td>9 river miles
Mile 65-54
2016-66 to 2016-74</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td>Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>51% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 20% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 26% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

[19] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Newburgh Waterfront	CBR train spill	11,000 bbl	Bakken crude	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.51523 -74.00694 41.50517 -74.00572	Instantaneous	1 January 2016 3:00pm	30 days	SW / light (<8 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	44.2%	11.9%	0.2%	39.3%	4.4%
	bbl	3	4,861	1,306	18	4,326	486
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	11,574 mil gal	73,083 mil gal	2 mi^2-days	2 mi^2-days	60 mi	64 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	9.3 mi	44.4 mi	0 mi	5.4 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.2 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	1 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 64 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 60 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Marlboro to Stony Point, and on the east shore from Poughkeepsie to Peekskill. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Winter-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response[20]</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major
Not defined</td><td>No requirement</td><td>No requirement</td><td>No requirement</td><td>2 rail miles
QR-58 to QR-56</td><td>20 river miles
Mile 68-48
2016-64 to 2016-78</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td>Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.
Potential ice conditions may negatively impact boom deployment.</td><td>44% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.
Potential ice conditions may negatively impact skimming operations.</td><td>About 39% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 12% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

[20] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Newburgh Waterfront	CBR train spill	11,000 bbl	Bakken crude	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.51523 -74.00694 41.50517 -74.00572	Instantaneous	1 January 2016 9:00am	30 days	SW / light (<8 kts)	32°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	43.9%	12.2%	0.0%	39.0%	4.9%
	bbl	5	4,829	1,338	5	4,286	536

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
14,582 mil gal	60,412 mil gal	2 mi^2-days	2 mi^2-days	58 mi	62 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	9.3 mi	43.4 mi	0 mi	4 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.2 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	0.1 mi	1.6 mi	0 mi	0 mi	0 mi
	0.1 mi	1.6 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 62 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 58 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Marlboro to Stony Point, and on the east shore from Poughkeepsie to Peekskill. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Newburgh CBR 11,000-bbl Bakken Crude Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response[21]</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major
Not defined</td><td>No requirement</td><td>No requirement</td><td>No requirement</td><td>2 rail miles
QR-58 to QR-56</td><td>20 river miles
Mile 68-48
2016-64 to 2016-78</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td>Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.
Potential ice conditions may negatively impact boom deployment.</td><td>44% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.
Potential ice conditions may negatively impact skimming operations.</td><td>About 39% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 12% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

[21] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Newburgh CBR 11,000-bbl Bakken Crude Spill with Fire/Explosion

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide**
	Newburgh Waterfront	CBR train spill	11,000 bbl	Bakken crude	Winter	High
Spill Probability	**Annual Probability**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type in Hudson		**Spill Volume in Hudson**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Run Duration**	**Winds**	**Temperature**
	41.51523 -74.00694 41.50517 -74.00572	Instantaneous	1 January 2016 3:00pm	30 days	SW /light (<8 kts)	32°F
Fire/Explosion Probabilities	**Pool Fire Probability/Incident**		**Pool Fire Probability**		**Vapor Cloud Explosion/Incident**	**Vapor Cloud Explosion Probability**
	0.086		0.00000003		0.025	0.0000000084
Fire/Explosion Response[22]	**Emergency Response**		**Evacuation Zone**		**Health/Safety Issues**	
	Specific incident decision needs to be made early as to whether to attack fire or allow it to burn out. Port of Albany has small firefighting vessel, *Marine 1* with a 1,500 gpm water monitor. Kingston, Albany and Newburgh FD have NYS supplied foam trailers w/monitors for rail crude oil derailment fires.		As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Large Spill • Consider initial downwind evacuation for at least 300 meters (1000 feet). Fire • If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.		Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Light, sweet crude oils will normally contain lighter flammable gasses such as butane and propane (unless these gases have been removed). These flammable gasses can readily ignite if released, when they come in contact with an ignition source. These crude oils may also contain hydrogen sulfide, a toxic inhalation hazard material, in the vapor space of the tank car. Due to the characteristics of crude oil, in an accident scenario, the behavior of this product may range from that of gasoline for the lighter (sweet) crude oils to diesel fuel for the heavier (sour) crude oils. Air monitoring should be performed for responder and public safety.	
Safety Impacts	**Flammable Distance**	**Impacts from Fire (Acres)**				
		Total	**Residential**	**Commercial**	**Industrial**	**Public Use**
	581 feet	0.2 acre	0 acres	0.1 acre	0 acres	0.1 acre
	Downwind Distance	**Impacts from Explosion (Acres)**				
		Total	**Residential**	**Commercial**	**Industrial**	**Public Use**
	0.33 mile	34 acres	22 acres	8 acres	0 acres	13 acres

[22] If concurrent with a spill to the water, see also spill response tables. If there is a fire and/or explosion, some or even most of the oil may be consumed by the fire, reducing the amount of oil that would spill into the river and affect shorelines. In most cases, it would be necessary to conduct at least some oil spill cleanup in addition to fire-fighting, though those operations would be secondary to emergency fire-fighting operations.

Bear Mountain Bridge 2,500-bbl Home Heating Oil Spill

Bear Mountain 2,500-bbl Home Heating Oil Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Bear Mountain Bridge	Tanker collision with vessel	2,500 bbl	Home heating oil	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.024		0.58	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.32198 -73.98311	Instantaneous	1 April 2012 2:00am	30 days	SW / light (<4 kts)	45°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	67.8%	1.3%	0.7%	15.7%	4.3%
	bbl	0	1,695	32	17	393	108
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	3,293 mil gal	6,680 mil gal	5 mi^2-days	12 mi^2-days	15 mi	55 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	3.43 mi	9.99 mi	0 mi	1.46 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.21 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 108 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 15 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Lloyd to Stony Point, and on the east shore from Hyde Park to Peekskill. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Hyde Park Mile 80; Poughkeepsie Mile 77; Highland Mile 76; IBM Mile 72; Danskammer Mile 66; Chelsea Mile 66; Roseton Mile 65; Charles Point Mile 43; Indian Point Mile 42. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Bear Mountain 2,500-bbl Home Heating Oil Spill (Spring-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD</td><td>4,000 ft boom
1,000 ft + 300 per skimming system
1,200 bbl/day
2,400 bbl storage</td><td>n/a</td><td>n/a</td><td>n/a</td><td>7 river miles
Mile 44-77
2016-81 to 2016-80</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">High currents averaging 0.7 kts will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>68% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 16% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for >1% entrainment in water column may lead to water intake and fish kill concerns especially in areas near spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Bear Mountain 2,500-bbl Home Heating Oil Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Bear Mountain Bridge	Tanker collision with vessel	2,500 bbl	Home heating oil	Spring	Low

Spill Probability	**Annual Probability Anywhere in Hudson River**		**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)	**Spill of Type and Volume**	**US**	**Hudson**
	0.732	0.024	0.58	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.32198 -73.98311	Instantaneous	2 April 2012 9:00am	30 days	SW / light (<4 kts)	45°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	55.7%	5.4%	2.4%	1.3%	10.8%
	bbl	0.6	1,394	136	59	32	271

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
13,532 mil gal	28,928 mil gal	0.2 mi^2-days	4.7 mi^2-days	5 mi	34 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	1.51 mi	2.45 mi	0 mi	0.1 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	0 mi	0 mi	0.52 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 34 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 5 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Peekskill to Ossining, and on the east shore from Stoney Point to Haverstraw. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Bear Mountain 2,500-bbl Home Heating Oil Spill (Spring-Low Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major MMPD	4,000 ft boom 1,000 ft + 300 per skimming system 1,200 bbl/day 2,400 bbl storage	n/a	n/a	n/a	7 river miles Mile 44-37 2016-81 to 2016-87
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	High currents averaging 0.7 kt s will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		56% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About >1% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for >5% entrainment in water column may lead to water intake and fish kill concerns especially in areas near spill site prior to dilution; perform water column tracking, and air monitoring.	

Bear Mountain 2,500-bbl Home Heating Oil Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Bear Mountain Bridge	Tanker collision with vessel	2,500 bbl	Home heating oil	Summer	High

Spill Probability	**Annual Probability Anywhere in Hudson River**		**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)	**Spill of Type and Volume**	**US**	**Hudson**
	0.732	0.024	0.58	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.32198 -73.98311	Instantaneous	1 August 2012 4:00pm	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.002%	73.8%	3.6%	0.1%	20.0%	2.6%
	bbl	0.04	1,846	89	2	499	64

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
26 mil gal	16,836 mil gal	8 mi^2-days	11 mi^2-days	17 mi	49 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	3.6 mi	11 mi	0 mi	1.8 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.2 mi	0.2 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 49 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 17 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Peekskill to Ossining, and on the east shore from Stoney Point to Haverstraw. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Bear Mountain 2,500-bbl Home Heating Oil Spill (Summer-High Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major MMPD	4,000 ft boom 1,000 ft + 300 per skimming system 1,200 bbl/day 2,400 bbl storage	n/a	n/a	n/a	7 river miles Mile 44-37 2016-81 to 2016-87
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	High currents averaging 0.7 kt s will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		74% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 20% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for <4% entrainment in water column may lead to water intake and fish kill concerns especially in areas near spill site prior to dilution; perform water column tracking, and air monitoring.	

Bear Mountain 2,500-bbl Home Heating Oil Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Bear Mountain Bridge	Tanker collision with vessel	2,500 bbl	Home heating oil	Summer	Low

Spill Probability	**Annual Probability Anywhere in Hudson River**		**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)	**Spill of Type and Volume**	**US**	**Hudson**
	0.732	0.024	0.58	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.32198 -73.98311	Instantaneous	1 August 2012 8:00am	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0004%	70.1%	7.2%	0.1%	18.9%	3.6%
	bbl	0.01	1,754	179	3	474	90

SIMAP Modeling Results	**Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)**					
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
	2,583 mil gal	14,488 mil gal	5 mi^2-days	7 mi^2-days	16 mi	41 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	4.9 mi	10.9 mi	0 mi	0.5 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 41 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 16 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Peekskill to Ossining, and on the east shore from Stoney Point to Haverstraw. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Bear Mountain 2,500-bbl Home Heating Oil Spill (Summer-Low Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major MMPD	4,000 ft boom 1,000 ft + 300 per skimming system 1,200 bbl/day 2,400 bbl storage	n/a	n/a	n/a	7 river miles Mile 44-37 2016-81 to 2016-87
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	High currents averaging 0.7 kt s will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		70% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 19% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for >7% entrainment in water column may lead to water intake and fish kill concerns especially in areas near spill site prior to dilution; perform water column tracking, and air monitoring.	

Bear Mountain 2,500-bbl Home Heating Oil Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Bear Mountain Bridge	Tanker collision with vessel	2,500 bbl	Home heating oil	Winter	High

Spill Probability	**Annual Probability Anywhere in Hudson River**		**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)	**Spill of Type and Volume**	**US**	**Hudson**
	0.732	0.024	0.58	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.32198 -73.98311	Instantaneous	1 January 2012 8:00am	30 days	South / moderate (4-18 kts)	34°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.005%	65.9%	6.8%	0.5%	19.4%	6.9%
	bbl	0.11	1,646	170	12	485	172

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
6,650 mil gal	5,986 mil gal	1.6 mi^2-days	2.5 mi^2-days	26 mi	48 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	5.5 mi	18.3 mi	0 mi	1.6 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.2 mi	0.2 mi	0 mi	0.1 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 48 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 26 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Peekskill to Ossining, and on the east shore from Stoney Point to Haverstraw. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 42; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Bear Mountain 2,500-bbl Home Heating Oil Spill (Winter-High Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major MMPD	4,000 ft boom 1,000 ft + 300 per skimming system 1,200 bbl/day 2,400 bbl storage	n/a	n/a	n/a	7 river miles Mile 44-37 2016-81 to 2016-87
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	High currents averaging 0.7 kt s will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.		66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may affect mechanical recovery operations.	About 19% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for 7% entrainment in water column may lead to water intake and fish kill concerns especially in areas near spill site prior to dilution; perform water column tracking, and air monitoring.	

Bear Mountain 2,500-bbl Home Heating Oil Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Bear Mountain Bridge	Tanker collision with vessel	2,500 bbl	Home heating oil	Winter	Low

Spill Probability	**Annual Probability Anywhere in Hudson River**		**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)	**Spill of Type and Volume**	**US**	**Hudson**
	0.732	0.024	0.58	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.32198 -73.98311	Instantaneous	1 January 2012 2:30am	30 days	South / moderate (4-18 kts)	34°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.1%	66.0%	7.4%	0.6%	17.6%	7.4%
	bbl	1.4	1,649	185	14	441	186

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
7,787 mil gal	9,387 mil gal	2.4 mi^2-days	3.6 mi^2-days	27 mi	56 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	5.3 mi	18.8 mi	0 mi	2.4 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.3 mi	0.3 mi	0 mi	0.1 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 56 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 27 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Peekskill to Ossining, and on the east shore from Stoney Point to Haverstraw. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for much or all of the river.

Bear Mountain 2,500-bbl Home Heating Oil Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD</td><td>4,000 ft boom
1,000 ft + 300 per skimming system
1,200 bbl/day
2,400 bbl storage</td><td>n/a</td><td>n/a</td><td>n/a</td><td>7 river miles
Mile 44-37
2016-81 to 2016-87</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">High currents averaging 0.7 kt s will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may affect boom deployment.</td><td>66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may affect mechanical recovery operations.</td><td>About 18% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for >7% entrainment in water column may lead to water intake and fish kill concerns especially in areas near spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Iona Island Crude-by-Rail 11,000-bbl Bakken Crude Spill

Iona Island CBR 11,000-bbl Bakken Crude Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Iona Island	CBR train spill	11,000 bbl	Bakken crude	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.31363 -73.98598 41.30628 -73.98100	Instantaneous	1 April 2012 2:00am	30 days	SW / light (<4 kts)	45°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	50.6%	6.8%	5.4%	8.2%	4.5%
	bbl	0	5,563	751	598	898	498
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	49,340 mil gal	12,781 mil gal	11 mi^2-days	17 mi^2-days	32 mi	112 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	5.5 mi	21.5 mi	0.1 mi	3.1 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.4 mi	0.2 mi	0 mi	1.4 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 112 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 32 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Stony Point to Alpine, New Jersey, and on the east shore from Peekskill to Yonkers. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Spring-High Tide) Response

	Response Equipment and Plan Activation					
	NCP and USCG Type	Tier Response Requirements			GRPs/ GRSs Activated (7 days)	
		Tier 1	Tier 2	Tier 3	Rail Miles	River Miles
	Major Not defined	No requirement	No requirement	No requirement	2 rail miles QR-40 to QR42	26 river miles Mile 44-18 2016-81 to 2016-100
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming	Mechanical Recovery	Shoreline Cleanup	Other Challenges		
Spill Response[23]	Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.	51% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 8% is anticipated Tappan Zee to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 7% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.		

[23] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Iona Island	CBR train spill	11,000 bbl	Bakken crude	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.31363 -73.98598 41.30628 -73.98100	Instantaneous	2 April 2012 9:00am	30 days	SW / light (<4 kts)	45°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	42.3%	6.1%	39.2%	1.3%	4.4%
	bbl	0	4,655	674	4,311	140	489
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	8,691 mil gal	26,262 mil gal	2 mi^2-days	3 mi^2-days	6 mi	24 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	1 mi	2.9 mi	0 mi	0.5 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.2 mi	0 mi	0 mi	1.4 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 24 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 6 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Stony Point to Haverstraw, and on the east shore from Peekskill to Croton Point. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Spring-Low Tide) Response

Spill Response[24]	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major Not defined	No requirement	No requirement	No requirement	2 rail miles QR-40 to QR42	4 river miles Mile 44-40 2016-81 to 2016-84
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming	**Mechanical Recovery**		**Shoreline Cleanup**	**Other Challenges**	
	Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.	42% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.		About 1% is anticipated to cause shoreline contamination which may result in limited shoreline cleanup operations. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 6% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.	

[24] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Iona Island	CBR train spill	11,000 bbl	Bakken crude	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.31363 -73.98598 41.30628 -73.98100	Instantaneous	1 August 2012 4:00pm	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	53.0%	31.5%	0.3%	12.1%	3.0%
	bbl	0	5,832	3,467	36	1,334	331
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	50,800 mil gal	55,203 mil gal	19 mi^2-days	19 mi^2-days	33 mi	40 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	6.3 mi	20.1 mi	0 mi	5.9 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.1 mi	0.2 mi	0.2 mi	0.2 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 40 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 33 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Highlands to Haverstraw, and on the east shore from Philipstown to Croton Point. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Summer-High Tide) Response

	Response Equipment and Plan Activation					
	NCP and USCG Type	Tier Response Requirements			GRPs/ GRSs Activated (7 days)	
		Tier 1	Tier 2	Tier 3	Rail Miles	River Miles
	Major Not defined	No requirement	No requirement	No requirement	2 rail miles QR-40 to QR42	15 river miles Mile 55-40 2016-73 to 2016-84
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming	Mechanical Recovery	Shoreline Cleanup	Other Challenges		
Spill Response[25]	Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.	53% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 12% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 32% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.		

[25] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Iona Island	CBR train spill	11,000 bbl	Bakken crude	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.31363 -73.98598 41.30628 -73.98100	Instantaneous	1 August 2012 8:00am	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	52.5%	32.9%	0.6%	10.6%	3.3%
	bbl	0	5,778	3,623	64	1,167	368
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	51,760 mil gal	79,658 mil gal	17 mi^2-days	17 mi^2-days	32 mi	39 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	6.1 mi	19.4 mi	0 mi	5.9 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.2 mi	0.2 mi	0.2 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 39 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 32 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Highlands to Haverstraw, and on the east shore from northern Cortlandt to Croton Point. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Summer-Low Tide) Response

Spill Response[26]	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major Not defined	No requirement	No requirement	No requirement	2 rail miles QR-40 to QR42	12 river miles Mile 50-38 2016-76 to 2016-84
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming	**Mechanical Recovery**		**Shoreline Cleanup**	**Other Challenges**	
	Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.	53% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.		About 11% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 33% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.	

[26] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Iona Island	CBR train spill	11,000 bbl	Bakken crude	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.31363 -73.98598 41.30628 -73.98100	Instantaneous	1 January 2012 8:00am	30 days	South / moderate (4-18 kts)	34°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	50.4%	21.7%	3.6%	16.7%	6.6%
	bbl	1	5,541	2,389	394	1,835	724
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	34,964 mil gal	10,874 mil gal	10 mi^2-days	11 mi^2-days	49 mi	70 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	8.3 mi	33.2 mi	0.2 mi	5.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.2 mi	0.8 mi	0 mi	1.6 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 70 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 49 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Highlands to Nyack, and on the east shore from northern Cortlandt to Sleepy Hollow. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Winter-High Tide) Response

	Response Equipment and Plan Activation					
	NCP and USCG Type	Tier Response Requirements			GRPs/ GRSs Activated (7 days)	
		Tier 1	Tier 2	Tier 3	Rail Miles	River Miles
	Major Not defined	No requirement	No requirement	No requirement	2 rail miles QR-40 to QR42	12 river miles Mile 50-33 2016-76 to 2016-87
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming	Mechanical Recovery	Shoreline Cleanup	Other Challenges		
Spill Response[27]	Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may negatively impact boom deployment.	50% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may negatively impact skimming operations.	About 17% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill. wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 22% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.		

[27] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Iona Island	CBR train spill	11,000 bbl	Bakken crude	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.31363 -73.98598 41.30628 -73.98100	Instantaneous	1 January 2012 2:30am	30 days	South / moderate (4-18 kts)	34°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	50.4%	21.1%	3.6%	17.2%	6.4%
	bbl	0	5,547	2,319	401	1,889	707
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	35,267 mil gal	19,840 mil gal	10 mi^2-days	12 mi^2-days	50 mi	69 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	8.5 mi	33.4 mi	0.2 mi	5 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.3 mi	0.6 mi	0 mi	1.6 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. Freight rail traffic may be affected for a few days until the derailed and/or burned train cars are removed. 69 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 50 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Highlands to Nyack, and on the east shore from northern Cortlandt to Sleepy Hollow. Additional impacts may be experienced in other towns along the river. Water intakes that may be affected include: Charles Point Mile 43; Indian Point Mile 42; West Haverstraw Mile 38. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Iona Island CBR 11,000-bbl Bakken Crude Spill (Winter-Low Tide) Response

Spill Response[28]	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major Not defined	No requirement	No requirement	No requirement	2 rail miles QR-40 to QR42	12 river miles Mile 50-33 2016-76 to 2016-87
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	Average river currents of 1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may negatively impact boom deployment.		50% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may negatively impact skimming operations.	About 17% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a Bakken spill is a significant danger, as are high benzene vapors in area around the spill; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 21% in water column leading to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.	

[28] At this time, there is no federal regulatory requirement for any specific contracted tiered response resource requirement. This does not mean that no response will take place.

Iona Island CBR 11,000-bbl Bakken Crude Spill with Fire/Explosion

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide**
	Iona Island	CBR train spill	11,000 bbl	Bakken crude	Summer	High
Spill Probability	**Annual Probability**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type in Hudson		**Spill Volume in Hudson**		**US**	**Hudson**
	0.0000046		0.00000035		0.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Run Duration**	**Winds**	**Temperature**
	41.31363 -73.98598 41.30628 -73.98100	Instantaneous	1 August 2012 4:00pm	30 days	SW / light (<4 kts)	81°F
Fire/Explosion Probabilities	**Pool Fire Probability/Incident**		**Pool Fire Probability**		**Vapor Cloud Explosion/Incident**	**Vapor Cloud Explosion Probability**
	0.086		0.00000003		0.025	0.0000000084
Fire/Explosion Response[29]	**Emergency Response**		**Evacuation Zone**		**Health/Safety Issues**	
	Specific incident decision needs to be made early as to whether to attack fire or allow it to burn out. Port of Albany has small firefighting vessel, *Marine 1* with a 1,500 gpm water monitor. Kingston, Albany and Newburgh FD have NYS supplied foam trailers w/monitors for rail crude oil derailment fires		As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Large Spill • Consider initial downwind evacuation for at least 300 meters (1000 feet). Fire • If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.		Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Light, sweet crude oils will normally contain lighter flammable gasses such as butane and propane (unless these gases have been removed). These flammable gasses can readily ignite if released, when they come in contact with an ignition source. These crude oils may also contain hydrogen sulfide, a toxic inhalation hazard material, in the vapor space of the tank car. Due to the characteristics of crude oil, in an accident scenario, the behavior of this product may range from that of gasoline for the lighter (sweet) crude oils to diesel fuel for the heavier (sour) crude oils.	
Safety Impacts	**Flammable Distance**	**Impacts from Fire (Acres)**				
		Total	**Residential**	**Commercial**	**Industrial**	**Public Use**
	581 feet	0.2 acre	0 acres	0 acres	0 acres	0.2 acre
	Downwind Distance	**Impacts from Explosion (Acres)**				
		Total	**Residential**	**Commercial**	**Industrial**	**Public Use**
	0.84 mile	68 acres	0 acres	0 acres	0 acres	68 acres

[29] If concurrent with a spill to the water, see also spill response tables. If there is a fire and/or explosion, some or even most of the oil may be consumed by the fire, reducing the amount of oil that would spill into the river and affect shorelines. In most cases, it would be necessary to conduct at least some oil spill cleanup in addition to fire-fighting, though those operations would be secondary to emergency fire-fighting operations.

Tappan Zee 2,500-bbl Home Heating Oil Spill

Tappan Zee 2,500-bbl Home Heating Oil Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee Bridge	Tanker Allision with Bridge Abutment	2,500 bbl	Home heating oil	Spring	High

Spill Probability	**Annual Probability Anywhere in Hudson River**		**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)	**Spill of Type and Volume**	**US**	**Hudson**
	0.732	0.024	0.58	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	2 April 2012 0:00am	30 days	North / moderate (10-20 kts)	50°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	65.9%	2.6%	0.6%	0.9%	4.8%
	bbl	1	1,649	66	14	24	121

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
9,640 mil gal	19,429 mil gal	1 mi^2-days	7.5 mi^2-days	0 mi	46 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	0 mi	0 mi	0.05 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.26 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 46 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (<1 mile). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to south of Englewood Cliffs, New Jersey, and on the east shore from Dobbs Ferry to Manhattan. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Tappan Zee 2,500-bbl Home Heating Oil Spill (Spring-High Tide) Response

<table>
<tr><td rowspan="8">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD</td><td>4,000 ft boom
1,000 ft + 300 per skimming system
1,200 bbl/day
2,400 bbl storage</td><td>n/a</td><td>n/a</td><td>n/a</td><td>16 river miles
Mile 24-8
2016-97 to 2016-109</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About <1% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of <3% in water column may lead to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Tappan Zee 2,500-bbl Home Heating Oil Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	2,500 bbl	Home heating oil	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.024		0.58	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	7 April 2012 10:00am	30 days	North / moderate (4-16 kts)	50°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	68.9%	1.4%	0.5%	1.2%	4.4%
	bbl	0	1,722	36	12	31	110
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	9,495 mil gal	15,827 mil gal	1 mi^2-days	14.1 mi^2-days	1 mi	55 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	0.1 mi	0 mi	0.1 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.31 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 55 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 1 mile). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to south of Englewood Cliffs, New Jersey, and on the east shore from Dobbs Ferry to Manhattan. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Tappan Zee 2,500-bbl Home Heating Oil Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD</td><td>4,000 ft boom
1,000 ft + 300 per skimming system
1,200 bbl/day
2,400 bbl storage</td><td>n/a</td><td>n/a</td><td>n/a</td><td>12 river miles
Mile 24-12
2016-97 to 2016-105</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>69% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About >1% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of <2% in water column may lead to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Tappan Zee 2,500-bbl Home Heating Oil Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	2,500 bbl	Home heating oil	Summer	High

Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.024		0.58	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	1 August 2012 4:00pm	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	79.0%	12.6%	0.2%	4.0%	4.2%
	bbl	0	1,974	316	4	101	105

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
1,917 mil gal	23,165 mil gal	18 mi^2-days	27 mi^2-days	3 mi	21 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0.2 mi	2.6 mi	0 mi	0.3 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	0 mi	0 mi	0 mi	0 mi	0 mi
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 21 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 3 miles). Shoreline impacts would be limited to a small part of Fort Lee, New Jersey on the west shore and Manhattan on the east shore. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Tappan Zee 2,500-bbl Home Heating Oil Spill (Summer-High Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1 (24 hrs)	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Major MMPD	4,000 ft boom 1,000 ft + 300 per skimming system 1,200 bbl/day 2,400 bbl storage	n/a	n/a	n/a	0 river miles[30] Mile 2 2016-97
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		79% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 4% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of <13% in water column may lead to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.	

[30] Note: Spill stays around bridge.

Tappan Zee 2,500-bbl Home Heating Oil Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	2,500 bbl	Home heating oil	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.024		0.58	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	1 August 2012 8:00am	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	75.9%	13.2%	0.2%	6.1%	4.7%
	bbl	0	1,896	330	4	153	116
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	3,639 mil gal	26,184 mil gal	11 mi^2-days	18 mi^2-days	5 mi	16 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0.2 mi	5 mi	0 mi	0.3 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.1 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 16 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 5 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to Englewood, New Jersey, and on the east shore from Dobbs Ferry to Manhattan. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Tappan Zee 2,500-bbl Home Heating Oil Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD</td><td>4,000 ft boom
1,000 ft + 300 per skimming system
1,200 bbl/day
2,400 bbl storage</td><td>n/a</td><td>n/a</td><td>n/a</td><td>2 river miles
Mile 24-26
2016-97 to 2016-96</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>76% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 6% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of >13% in water column may lead to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Tappan Zee 2,500-bbl Home Heating Oil Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	2,500 bbl	Home heating oil	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.024		0.58	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	1 January 2012 8:00am	30 days	South / moderate (4-18 kts)	35°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	66.2%	5.3%	1.5%	5.4%	9.3%
	bbl	1	1,655	133	37	135	232
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	10,425 mil gal	8,131 mil gal	2 mi^2-days	5 mi^2-days	2 mi	60 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0.1 mi	1.8 mi	0 mi	0.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.4 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 60 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 2 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to Alpine, New Jersey, and on the east shore from Hastings to Yonkers. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Tappan Zee 2,500-bbl Home Heating Oil Spill (Winter-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD</td><td>4,000 ft boom
1,000 ft + 300 per skimming system
1,200 bbl/day
2,400 bbl storage</td><td>n/a</td><td>n/a</td><td>n/a</td><td>3 river miles
Mile 24-21
2016-97 to 2016-98</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Potential ice conditions may negatively impact boom performance.</td><td>66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Potential ice conditions may negatively impact skimmer operations</td><td>About >5% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of >5% in water column may lead to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Tappan Zee 2,500-bbl Home Heating Oil Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	2,500 bbl	Home heating oil	Winter	Low

Spill Probability	**Annual Probability Anywhere in Hudson River**		**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)	**Spill of Type and Volume**	**US**	**Hudson**
	0.732	0.024	0.58	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	1 January 2012 2:30am	30 days	South / moderate (4-18 kts)	35°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	66.3%	5.0%	1.4%	7.0%	9.1%
	bbl	1	1,658	124	35	174	229

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
10,611 mil gal	10,746 mil gal	1 mi^2-days	5 mi^2-days	3 mi	54 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0.1 mi	2.3 mi	0 mi	0.2 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.4 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause some impacts to vessel traffic along river for a few days. 54 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 3 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Orangetown to Englewood, New Jersey, and on the east shore from Hastings-on-Hudson to Riverdale. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Tappan Zee 2,500-bbl Home Heating Oil Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major MMPD</td><td>4,000 ft boom
1,000 ft + 300 per skimming system
1,200 bbl/day
2,400 bbl storage</td><td>n/a</td><td>n/a</td><td>n/a</td><td>8 river miles
Mile 23-15
2016-97 to 2016-103</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Potential ice conditions may negatively impact boom performance.</td><td>66% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Potential ice conditions may negatively impact skimmer operations</td><td>About 7% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of 5% in water column may lead to water intake and fish kill concerns especially in areas near the spill site prior to dilution; perform water column tracking, and air monitoring.</td></tr>
</table>

Tappan Zee 50-bbl Heavy Fuel Oil Spill

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	50 bbl	Heavy Fuel Oil	Spring	High

Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.093		17.2	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	2 April 2012 0:00am	30 days	North / moderate (10-20 kts)	50°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	8.7%	0.0%	0.0%	69.2%	22.1%
	bbl	0	4	0	0	35	11

SIMAP Modeling Results	**Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)**					
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
	2 mil gal	<100 gal	0.41 mi^2-days	0.41 mi^2-days	0 mi	38 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.31 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Minor impacts to vessel traffic from response operations. 38 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about <1 mile). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to Fort Lee, New Jersey, and on the east shore from Dobbs Ferry to Manhattan, though the oiling of shorelines would likely be limited to patchy areas and tarballs. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the immediate vicinity of the spill.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Spring-High Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Not major AMPD[31]	n/a	n/a	n/a	n/a	19 river miles Mile 24-5 2016-97 to 2016-110
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		Only 9% evaporation is anticipated thus evaporation and rapid spreading will minimally reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 69% is anticipated to cause shoreline contamination so anticipation would be for a significant shoreline cleanup operation. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment in this scenario is for 0% in water column; however, still perform water column tracking, and air monitoring.	

[31] Required only when transferring cargo; underway allisions, no specific AMPD requirement, though a spill response would be undertaken.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	50 bbl	Heavy Fuel Oil	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.093		17.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	7 April 2012 10:00am	30 days	North / moderate (4-16kts)	50°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	8.2%	0.0%	0.0%	69.6%	22.1%
	bbl	0	4	0	0	35	11
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	3 mil gal	<100 gal	0.43 mi^2-days	0.43 mi^2-days	1 mi	35 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	0.36 mi	0 mi	0.1 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.26 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Minor impacts to vessel traffic from response operations. 35 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 1 mile). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Orangetown to Alpine, New Jersey, and on the east shore from Hastings-on-Hudson to Yonkers, though the oiling of shorelines would likely be limited to patchy areas and tarballs. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the immediate vicinity of the spill.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Spring-Low Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Not major AMPD[32]	n/a	n/a	n/a	n/a	19 river miles Mile 23-18 2016-97 to 2016-101
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		Only 8% evaporation is anticipated thus evaporation and rapid spreading will minimally reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.	About 70% is anticipated to cause shoreline contamination so anticipation would be for a significant shoreline cleanup operation. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment in this scenario is for 0% in water column; however, still perform water column tracking, and air monitoring.	

[32] Required only when transferring cargo; underway allisions, no specific AMPD requirement, though a spill response would be undertaken.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	50 bbl	Heavy Fuel Oil	Summer	High

Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.093		17.2	0

Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	1 August 2012 4:00pm	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	8.6%	0.0%	0.0%	69.4%	22.1%
	bbl	0	4	0	0	35	11

SIMAP Modeling Results	**Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)**					
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
	<100 gal	5 mil gal	1.65 mi^2-days	1.65 mi^2-days	3 mi	13 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0.16 mi	2.97 mi	0 mi	0.26 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Minor impacts to vessel traffic from response operations. 13 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 3 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to Alpine, New Jersey, and on the east shore from Tarrytown to Yonkers, though the oiling of shorelines would likely be limited to patchy areas and tarballs. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the immediate vicinity of the spill.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Summer-High Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Not major AMPD[33]	n/a	n/a	n/a	n/a	5 river miles Mile 27-22 2016-98 to 2016-99
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**		**Shoreline Cleanup**	**Other Challenges**
	Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.		Only 9% evaporation is anticipated thus evaporation and rapid spreading will minimally reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.		About 69% is anticipated to cause shoreline contamination so anticipation would be for a significant shoreline cleanup operation. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment in this scenario is for 0% in water column; however, still perform water column tracking, and air monitoring.

[33] Required only when transferring cargo; underway allisions, no specific AMPD requirement, though a spill response would be undertaken.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	50 bbl	Heavy Fuel Oil	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.093		17.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	1 August 2012 8:00am	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	8.1%	0.0%	0.0%	69.8%	22.1%
	bbl	0	4	0	0	35	11
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	<100 gal	5 mil gal	1.56 mi2-days	1.56 mi2-days	5 mi	8 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0.16 mi	4.68 mi	0 mi	0.42 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0.05 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Minor impacts to vessel traffic from response operations. 8 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 5 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore in Orangetown, and on the east shore from Sleepy Hollow to Dobbs Ferry, though the oiling of shorelines would likely be limited to patchy areas and tarballs. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the immediate vicinity of the spill.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Not major AMPD[34]</td><td>n/a</td><td>n/a</td><td>n/a</td><td>n/a</td><td>8 river miles
Mile 24-32
2016-98 to 2016-91</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.</td><td>Only 8% evaporation is anticipated thus evaporation and rapid spreading will minimally reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.</td><td>About 70% is anticipated to cause shoreline contamination so anticipation would be for a significant shoreline cleanup operation. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td>Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment in this scenario is for 0% in water column; however, still perform water column tracking, and air monitoring.</td></tr>
</table>

[34] Required only when transferring cargo; underway allisions, no specific AMPD requirement, though a spill response would be undertaken.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	50 bbl	Heavy Fuel Oil	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.093		17.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	1 January 2012 8:00am	30 days	South / moderate (4-18 kts)	35°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	6.1%	0.0%	0.0%	71.7%	22.2%
	bbl	0	3	0	0	36	11
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	10 mil gal	<100 gal	0.14 mi^2-days	0.14 mi^2-days	1 mi	9 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	0.94 mi	0 mi	0.1 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Minor impacts to vessel traffic from response operations. 9 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 1 mile). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to Alpine, New Jersey, and on the east shore from Hastings-on-Hudson to Yonkers. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the immediate vicinity of the spill.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Winter-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1</td><td>Tier 2</td><td>Tier 3</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Not major AMPD[35]</td><td>n/a</td><td>n/a</td><td>n/a</td><td>n/a</td><td>3 river miles
Mile 24-21
2016-97 to
2016-98</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td>Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td>Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Potential ice conditions may negatively impact boom performance.</td><td>Only 6% evaporation is anticipated thus evaporation and rapid spreading will minimally reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Potential ice conditions may negatively impact skimmer operations</td><td>About 72% is anticipated to cause shoreline contamination so anticipation would be for a significant shoreline cleanup operation. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.</td><td colspan="2">Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment in this scenario is for 0% in water column; however, still perform water column tracking, and air monitoring.</td></tr>
</table>

[35] Required only when transferring cargo; underway allisions, no specific AMPD requirement, though a spill response would be undertaken.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Tappan Zee	Tanker Allision with Bridge Abutment	50 bbl	Heavy Fuel Oil	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.093		17.2	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	41.07195 -73.88333	Instantaneous	1 January 2012 2:30am	30 days	South / moderate (4-18 kts)	35°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	6.1%	0.0%	0.0%	71.7%	22.2%
	bbl	0	3	0	0	36	11
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	10 mil gal	<100 gal	0.08 mi2-days	0.08 mi2-days	2 mi	5 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0.16 mi	1.3 mi	0 mi	0.16 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Minor impacts to vessel traffic from response operations. 5 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 2 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to Alpine, New Jersey, and on the east shore from Hastings-on-Hudson to Yonkers. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the immediate vicinity of the spill.

Tappan Zee 50-bbl Heavy Fuel Oil Spill (Winter-Low Tide) Response

Spill Response	**Response Equipment and Plan Activation**					
	NCP and USCG Type	**Tier Response Requirements**			**GRPs/ GRSs Activated (7 days)**	
		Tier 1	**Tier 2**	**Tier 3**	**Rail Miles**	**River Miles**
	Not major AMPD[36]	n/a	n/a	n/a	n/a	3 river miles Mile 24-22 2016-96 to 2016-97
	Response Overview: Expected Outcomes and Challenges					
	Protective Booming		**Mechanical Recovery**	**Shoreline Cleanup**	**Other Challenges**	
	Average river currents of 0.7 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas. Potential ice conditions may negatively impact boom performance.		Only 6% evaporation is anticipated thus evaporation and rapid spreading will minimally reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers. Potential ice conditions may negatively impact skimmer operations	About 72% is anticipated to cause shoreline contamination so anticipation would be for a significant shoreline cleanup operation. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; oiled dock structures; oiled debris removal.	Flammability during a heating oil spill is not significant danger, wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment in this scenario is for 0% in water column; however, still perform water column tracking, and air monitoring.	

[36] Required only when transferring cargo; underway allisions, no specific AMPD requirement, though a spill response would be undertaken.

Yonkers Anchorage 155,000-bbl Gasoline Spill

Yonkers Anchorage 155,000-bbl Gasoline Spill (Spring-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Yonkers Anchorage	Tanker collision/allision at anchorage	155,000 bbl	Gasoline	Spring	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	40.97341 -73.90003	38,750 bbl/hr over 4 hrs	2 April 2012 0:00am	30 days	North / moderate (10-20 kts)	50°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	91.8%	0.1%	0.1%	0.0%	3.9%
	bbl	0	142,366	122	226	48	6,109
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	82,445 mil gal	274,544 mil gal	7 mi^2-days	10 mi^2-days	0 mi	63 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	0 mi	0 mi	0 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.26 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 63 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about <1 mile). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Alpine to Hoboken, New Jersey, and on the east shore from Yonkers to Manhattan. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Yonkers Anchorage 155,000-bbl Gasoline Spill (Spring-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>18 river miles
Mile 18-0
2016-113</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of >1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Consideration by Unified Command to not containing gasoline might be prudent to eliminate gas vapor concentrations and potential flammable incidents.</td><td>92% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Consideration by Unified Command of not performing skimming operations may be prudent in light of the potential flammability issues.</td><td>Minimal % is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; contaminated debris removal; BTEX residue may remain in shore sediment.</td><td>Flammability during a gasoline spill is an extremely significant danger as are high BTEX vapors to responder and public health and safety in the spill areas; notify public to potential fire danger; ensure firefighting resources are on scene and mobilized; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of small % in water column may not lead to water intake and fish kill concerns since most spilled material is evaporating into the atmosphere; perform water column tracking, and air monitoring.</td></tr>
</table>

Yonkers Anchorage 155,000-bbl Gasoline Spill (Spring-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Yonkers Anchorage	Tanker collision/allision at anchorage	155,000 bbl	Gasoline	Spring	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	40.97341 -73.90003	38,750 bbl/hr over 4 hrs	7 April 2012 10:00am	30 days	North / moderate (4-16 kts)	50°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	93.4%	0.2%	0.1%	0.1%	3.2%
	bbl	3	144,807	233	137	82	4,923
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	60,959 mil gal	343,291 mil gal	12 mi^2-days	16 mi^2-days	1 mi	83 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	0.05 mi	0 mi	0.1 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.68 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 83 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 1 mile). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Alpine to Hoboken, New Jersey, and on the east shore from Yonkers to Manhattan. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Yonkers Anchorage 155,000-bbl Gasoline Spill (Spring-Low Tide) Response

<table>
<tr><td rowspan="4">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>22 river miles
Mile 22-0
2016-98 to 2016-113</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of >1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Consideration by Unified Command to not containing gasoline might be prudent to eliminate gas vapor concentrations and potential flammable incidents.</td><td>93% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Consideration by Unified Command of not performing skimming operations may be prudent in light of the potential flammability issues.</td><td>Minimal % is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; contaminated debris removal; BTEX residue may remain in shore sediment.</td><td colspan="2">Flammability during a gasoline spill is an extremely significant danger as are high BTEX vapors to responder and public health and safety in the spill areas; notify public to potential fire danger; ensure firefighting resources are on scene and mobilized; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of small % in water column may not lead to water intake and fish kill concerns since most spilled material is evaporating into the atmosphere; perform water column tracking, and air monitoring.</td></tr>
</table>

Yonkers Anchorage 155,000-bbl Gasoline Spill (Summer-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Yonkers Anchorage	Tanker collision/allision at anchorage	155,000 bbl	Gasoline	Summer	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	40.97341 -73.90003	38,750 bbl/hr over 4 hrs	1 August 2012 4:00pm	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	93.9%	1.4%	0.1%	0.0%	4.6%
	bbl	0	145,470	2,237	105	54	7,134
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	64,687 mil gal	301,648 mil gal	51 mi^2-days	52 mi^2-days	3 mi	31 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	2.76 mi	0 mi	0.1 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.21 mi	0 mi	0 mi	0.42 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 31 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 3 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Orangetown to Englewood Cliffs, New Jersey, and on the east shore from Hastings-on-Hudson to Riverdale. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Yonkers Anchorage 155,000-bbl Gasoline Spill (Summer-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>7 river miles
Mile 22-15
2016-98 to 2016-103</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of >1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Consideration by Unified Command to not containing gasoline might be prudent to eliminate gas vapor concentrations and potential flammable incidents.</td><td>94% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Consideration by Unified Command of not performing skimming operations may be prudent in light of the potential flammability issues.</td><td>Minimal % is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; contaminated debris removal; BTEX residue may remain in shore sediment.</td><td>Flammability during a gasoline spill is an extremely significant danger as are high BTEX vapors to responder and public health and safety in the spill areas; notify public to potential fire danger; ensure firefighting resources are on scene and mobilized; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of small >1 % in water column may not lead to water intake and fish kill concerns since most spilled material is evaporating into the atmosphere; perform water column tracking, and air monitoring.</td></tr>
</table>

Yonkers Anchorage 155,000-bbl Gasoline Spill (Summer-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Yonkers Anchorage	Tanker collision/allision at anchorage	155,000 bbl	Gasoline	Summer	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	40.97341 -73.90003	38,750 bbl/hr over 4 hrs	1 August 2012 8:00am	30 days	SW / light (<4 kts)	81°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	94.1%	1.4%	0.1%	0.0%	4.3%
	bbl	0	145,858	2,227	161	45	6,708
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	61,736 mil gal	227,957 mil gal	37 mi^2-days	38 mi^2-days	2 mi	23 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	1.77 mi	0 mi	0.21 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0.05 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 23 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 2 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Nyack to Fort Lee, New Jersey, and on the east shore from Hastings-on-Hudson to Riverdale. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Yonkers Anchorage 155,000-bbl Gasoline Spill (Summer-Low Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>7 river miles
Mile 22-10
2016-98 to
2016-105</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of >1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Consideration by Unified Command to not containing gasoline might be prudent to eliminate gas vapor concentrations and potential flammable incidents.</td><td>94% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Consideration by Unified Command of not performing skimming operations may be prudent in light of the potential flammability issues.</td><td>Minimal % is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; contaminated debris removal; BTEX residue may remain in shore sediment.</td><td>Flammability during a gasoline spill is an extremely significant danger as are high BTEX vapors to responder and public health and safety in the spill areas; notify public to potential fire danger; ensure firefighting resources are on scene and mobilized; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of small >1 % in water column may not lead to water intake and fish kill concerns since most spilled material is evaporating into the atmosphere; perform water column tracking, and air monitoring.</td></tr>
</table>

Yonkers Anchorage 155,000-bbl Gasoline Spill (Winter-High Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Yonkers Anchorage	Tanker collision/allision at anchorage	155,000 bbl	Gasoline	Winter	High
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	40.97341 -73.90003	38,750 bbl/hr over 4 hrs	1 January 2012 8:00am	30 days	South / moderate (4-18 kts)	35°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	93.8%	0.3%	0.2%	0.1%	4.1%
	bbl	5	145,461	441	322	204	6,291

Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**	
Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**
68,167 mil gal	410,866 mil gal	6 mi^2-days	8 mi^2-days	3 mi	103 mi

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0 mi	1.72 mi	0 mi	0.16 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.88 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 103 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 3 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Orangetown to Alpine, New Jersey, and on the east shore from Yonkers to Riverdale. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Yonkers Anchorage 155,000-bbl Gasoline Spill (Winter-High Tide) Response

<table>
<tr><td rowspan="6">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>4 river miles
Mile 21-17
2016-98 to 2016-101</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td>Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of >1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Consideration by Unified Command to not containing gasoline might be prudent to eliminate gas vapor concentrations and potential flammable incidents.

Potential ice conditions may negatively impact boom deployment.</td><td>94% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Consideration by Unified Command of not performing skimming operations may be prudent in light of the potential flammability issues.

Potential ice conditions may negatively impact skimming operations.</td><td>Minimal <1% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; contaminated debris removal; BTEX residue may remain in shore sediment.</td><td>Flammability during a gasoline spill is an extremely significant danger as are high BTEX vapors to responder and public health and safety in the spill areas; notify public to potential fire danger; ensure firefighting resources are on scene and mobilized; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of small <1 % in water column may not lead to water intake and fish kill concerns since most spilled material is evaporating into the atmosphere; perform water column tracking, and air monitoring.</td></tr>
</table>

Yonkers Anchorage 155,000-bbl Gasoline Spill (Winter-Low Tide) Effects

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide Stage**
	Yonkers Anchorage	Tanker collision/allision at anchorage	155,000 bbl	Gasoline	Winter	Low
Spill Probability	**Annual Probability Anywhere in Hudson River**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type (Any Volume)		**Spill of Type and Volume**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Model Run Duration**	**Winds**	**Water Temperature**
	40.97341 -73.90003	38,750 bbl/hr over 4 hrs	1 January 2012 2:30am	30 days	South / moderate (4-18 kts)	35°F

SIMAP Modeling Results	**Mass Balance at End of Model Run (After 30 Days)**						
	Fate	**Surface**	**Atmosphere**	**Water Column**	**Sediment**	**Ashore**	**Degraded**
	%	0.0%	93.1%	0.3%	0.2%	0.1%	5.0%
	bbl	8	144,294	410	357	199	7,677
	Spatial Extent of Exposure over Threshold (Up to 30 Days After Spill)						
	Water (Volume) – Ecological		**Surface (Area x Days Exposed)**		**Shoreline (Length)**		
	Whole Oil (1 mg/l)	**Dissolved (0.001 mg/l)**	**Ecological (10 g/m^2)**	**Socioeconomic (0.01 g/m^2)**	**Ecological (100 g/m^2)**	**Socioeconomic (1 g/m^2)**	
	66,833 mil gal	431,354 mil gal	8 mi^2-days	10 mi^2-days	2 mi	95 mi	

Ecological Shoreline Exposures	**Shoreline Exposure by Shore Type (Miles over Ecological Threshold)**				
	Bedrock	**Unconsolidated Rock**	**Sand Beach**	**Mud or Timber**	**Artificial Shore**
	0.05 mi	1.61 mi	0 mi	0.16 mi	0 mi
	Brackish/Estuarine Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Saltmarsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0.62 mi	0 mi	0 mi	0 mi	0 mi
	Freshwater Wetland Habitats Exposed (Miles over Ecological Threshold)				
	Cattail Marsh	**Upper Intertidal Mix**	**Lower Intertidal Mix**	**Phragmites Wetland**	**Shrub/Scrub and Forested Wetland**
	0 mi	0 mi	0 mi	0 mi	0 mi

Socioeconomic Impacts	**Potential Socioeconomic Impacts from Spill and Response Operations**
	Response operations may cause major impacts to ports in Albany and throughout river for at least several days; evacuations and precautionary clearance zones might cause further impacts to vessel traffic. Evacuation of populated areas could cause effects on communities and businesses. 95 miles of shoreline would be oiled above the level of concern for socioeconomic effects; shorefront marinas, beaches, parks, and real estate would be affected by oil, including residue and odor. SCAT operations and cleanup would be focused on areas more heavily oiled (about 2 miles). Riverside parks, marinas, beaches, industry, commercial property, and shorefront real estate would be most affected on the west shore from Orangetown to Fort Lee, New Jersey, and on the east shore from Hastings-on-Hudson to Manhattan. Additional impacts may be experienced in other towns along the river. No water intakes would be affected. Additional precautionary fishing advisories would likely be instituted for certain parts of the river in the vicinity of the spill.

Yonkers Anchorage 155,000-bbl Gasoline Spill (Winter-Low Tide) Response

<table>
<tr><td rowspan="5">Spill Response</td><td colspan="5">Response Equipment and Plan Activation</td></tr>
<tr><td rowspan="2">NCP and USCG Type</td><td colspan="3">Tier Response Requirements</td><td colspan="2">GRPs/ GRSs Activated (7 days)</td></tr>
<tr><td>Tier 1 (24 hrs)</td><td>Tier 2 (48 hrs)</td><td>Tier 3 (72 hrs)</td><td>Rail Miles</td><td>River Miles</td></tr>
<tr><td>Major WCD</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
1,875 bbl/day
3,750 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
3,750 bbl/day
7,500 bbl storage</td><td>25,000 ft boom
1,000 ft + 300 per skimming system
7,500 bbl/day
15,000 bbl storage</td><td>n/a</td><td>12 river miles
Mile 22-10
2016-98 to
2016-106</td></tr>
<tr><td colspan="5">Response Overview: Expected Outcomes and Challenges</td></tr>
<tr><td colspan="2">Protective Booming</td><td>Mechanical Recovery</td><td>Shoreline Cleanup</td><td colspan="2">Other Challenges</td></tr>
<tr><td colspan="2">Average river currents of >1 kt will reduce boom effectiveness, containment and diversionary boom configurations to be angled to prevent entrainment and splash over; exclusion and deflection configurations to be used to protect sensitive areas.

Consideration by Unified Command to not containing gasoline might be prudent to eliminate gas vapor concentrations and potential flammable incidents.

Potential ice conditions may negatively impact boom deployment.</td><td>93% evaporation and rapid spreading will reduce amount that can be recovered mechanically; mobilize floating self-propelled skimmers; set up shoreline containment boom areas with vacuum-trucks and skimmers.

Consideration by Unified Command of not performing skimming operations may be prudent in light of the potential flammability issues.

Potential ice conditions may negatively impact skimming operations.</td><td>Minimal <1% is anticipated to cause shoreline contamination. Perform SCAT; wetland flushing; some substrate removal due to penetration on sandy beaches; contaminated debris removal; BTEX residue may remain in shore sediment.</td><td colspan="2">Flammability during a gasoline spill is an extremely significant danger as are high BTEX vapors to responder and public health and safety in the spill areas; notify public to potential fire danger; ensure firefighting resources are on scene and mobilized; wetland access may be challenge; disturbance of wetlands during response may cause effects; potential for entrainment of small <1% in water column may not lead to water intake and fish kill concerns since most spilled material is evaporating into the atmosphere; perform water column tracking, and air monitoring.</td></tr>
</table>

Yonkers Anchorage 155,000-bbl Gasoline Spill with Fire/Explosion

Scenario Description	**Location**	**Source**	**Volume**	**Oil Type**	**Season**	**Tide**
	Yonkers Anchorage	Tanker collision/allision at anchorage	155,000 bbl	Gasoline	Summer	High
Spill Probability	**Annual Probability**				**Historical Annual Frequency (2000-2015)**	
	Spill of Type in Hudson		**Spill Volume in Hudson**		**US**	**Hudson**
	0.732		0.0000015		0	0
Conditions	**Lat/Lon**	**Release Rate**	**Release Date/Time**	**Run Duration**	**Winds**	**Temperature**
	41.91833 -73.96333	38,750 bbl/hr over 4 hrs	1 August 2012 2:00pm	30 days	SW / light (<4 kts)	81°F
Fire/Explosion Probabilities	**Pool Fire Probability/Incident**		**Pool Fire Probability**		**Vapor Cloud Explosion/Incident**	**Vapor Cloud Explosion Probability**
	0.08		0.00000012		0.027	0.00000004
Fire/Explosion Response[37]	**Emergency Response**		**Evacuation Zone**		**Health/Safety Issues**	
	Very low flash point: Use of water spray when fighting fire may be inefficient. For small fire: Dry chemical, CO_2, water spray or regular foam. For large fire: Water spray, fog or regular foam. Do not use straight streams. Move containers from fire area if possible without risk. Fire involving tanks or car/trailer loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. • Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • ALWAYS stay away from tanks engulfed in fire. • For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. RP will need to activate VRP Contracted Fire and Salvage Resources. Use of high capacity foam pumps/monitors, significant foam volumes fitted on a floating vessel in river to approach the needed proximity to the burning vessel.		Large Spill • Consider initial downwind evacuation for at least 300 meters (1000 feet). Fire • If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions		Health Safeguards • May cause toxic effects if inhaled or absorbed through skin. • Inhalation or contact with material may irritate or burn skin and eyes. • Fire will produce irritating, corrosive and/or toxic gases. • Vapors may cause dizziness or suffocation. • Runoff from fire control or dilution water may cause pollution. Protective Clothing • Wear positive pressure self-contained breathing apparatus (SCBA). • Structural firefighters' protective clothing will only provide limited protection	

[37] If concurrent with a spill to the water, see also spill response tables. If there is a fire and/or explosion, some or even most of the oil may be consumed by the fire, reducing the amount of oil that would spill into the river and affect shorelines. In most cases, it would be necessary to conduct at least some oil spill cleanup in addition to fire-fighting, though those operations would be secondary to emergency fire-fighting operations.

Safety Impacts	Flammable Distance	Impacts from Fire (Acres)				
		Total	Residential	Commercial	Industrial	Public Use
	1,473 feet	3.1 acres	0 acres	1.6 acres	1.6 acres	0 acres
	Downwind Distance	Impacts from Explosion (Acres)				
		Total	Residential	Commercial	Industrial	Public Use
	0.033 mile	166 acres	103 acres	27 acres	8 acres	27 acres

Appendix A: Hudson River Communities by River Mile[38]

Table 1: Hudson River Study Area West Bank Communities in New Jersey	
Town/Village (County)	**Approximate River Miles**
Englewood Cliffs (Bergen)	13 – 15
Alpine (Bergen)	15 – 21

Table 2: Hudson River Study Area East Bank Communities in New York	
Town/Village (County)	**Approximate River Miles**
Riverdale (Bronx)	14 – 17
Yonkers (Westchester)	17 – 22
Hastings-on-Hudson (Westchester)	22 – 24
Dobbs Ferry (Westchester)	24 – 25
Irvington[39] (Westchester)	25 – 27
Tarrytown (Westchester)	27 – 30
Sleepy Hollow[40] (Westchester)	30 – 33
Scarborough[41] (Westchester)	33 – 34
Ossining (Westchester)	33 – 35
Cortlandt[42] (Westchester)	35 – 43, 45 – 52
Peekskill (Westchester)	43 – 44
Philipstown[43] (Putnam)	52 – 63
Beacon (Dutchess)	63 – 65
Fishkill (Dutchess)	65
Wappinger[44] (Dutchess)	65 – 68
Poughkeepsie[45] (Dutchess)	68 – 75
Hyde Park[46] (Dutchess)	75 – 87
Rhinebeck[47] (Dutchess)	87 – 95
Red Hook[48] (Dutchess)	95 – 103
Clermont (Columbia)	103 – 105
Germantown (Columbia)	105 – 109
Livingston[49] (Columbia)	109 – 112
Hudson (Columbia)	112 – 119

[38] For more information about the riverside features of each community, refer to HROSRA Volume 2.
[39] Includes: Ardsley-on-Hudson
[40] Hudson River adjacent part of Town of Mt Pleasant.
[41] Riverfront part of Briarcliff Manor.
[42] Includes: Croton-on-Hudson, Crugers, Verplanck, Buchanan, Montrose, and Cortlandt Manor.
[43] Includes: Garrison and Cold Spring
[44] Includes: Chelsea.
[45] Includes: New Hamburg and Wappingers Falls.
[46] Includes: Staatsburg
[47] Includes: Rhinecliff
[48] Includes: Barrytown, Annandale-on-Hudson, and Tivoli.
[49] Includes: Linlithgo.

Table 2: Hudson River Study Area East Bank Communities in New York	
Town/Village (County)	**Approximate River Miles**
Stockport (Columbia)	119 – 123
Stuyvesant (Columbia)	123 – 132
Schodack[50] (Rensselaer)	132 – 141
Rensselaer (Rensselaer)	141 – 146

Table 3: Hudson River Study Area West Bank Communities in New York[51]	
Town/Village (County)	**Approximate River Miles**
Orangetown[52] (Rockland)	23 – 35
Haverstraw (Rockland)	35 – 43
Stony Point[53] (Rockland)	43 – 50
Highlands[54] (Orange)	50 – 58
Cornwall (Orange)	58 – 60
New Windsor (Orange)	60 – 63
Newburgh (Orange)	63 – 66
Balmville (Orange)	66 – 67
Marlboro (Ulster)	67 – 72
Milton (Ulster)	72 – 73
Lloyd[55] (Ulster)	73 – 80
Esopus[56] (Ulster)	80 – 90
Kingston (Ulster)	90 – 93
Ulster[57] (Ulster)	93 – 97
Saugerties[58] (Ulster)	97 – 105
Catskill[59] (Greene)	105 – 115
Athens (Greene)	115 – 122
Coxsackie (Greene)	122 – 128
New Baltimore (Greene)	128 – 133
Coeymans[60] (Albany)	133 – 136
Bethlehem[61] (Albany)	136 – 145
Albany (Albany)	145 – 153

[50] Includes: Castleton-on-Hudson
[51] Based on most recent data available in Wikipedia or other sources.
[52] Includes: Piermont and Grand View-on-Hudson, Nyack, and South Nyack.
[53] Including: Tomkins Cove.
[54] Includes: West Point, Highland Falls, and part of Bear Mountain State Park
[55] Includes: Highland
[56] Includes: West Park and Port Ewen.
[57] Includes: East Kingston and Ulster Landing.
[58] Includes: Glasco and Malden-on-Hudson.
[59] Includes: Hamburg.
[60] Includes: Ravena
[61] Includes: Glenmont