DEPARTMENT OF ECOLOGY
State of Washington

Final Regulatory Analyses

Including the:

- Final Cost-Benefit Analysis
- Least-Burdensome Alternative Analysis
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

Chapter 173-228 WAC
Vessel Sewage No Discharge Zones

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Chapter 173-228 WAC

Vessel Sewage No Discharge Zones

by

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for the

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List of Acronyms

APA	Washington Administrative Procedure Act
AWO	American Waterways Operators
CBA	Final Cost-Benefit Analysis
CDC	US Centers for Disease Control
CFR	Code of Federal Regulation
DNR	Washington Department of Natural Resources
DOH	Washington Departments of Health
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
FTEs	Full-time employees
LBA	Least-Burdensome Alternative Analysis
MOU	Memorandum of Understanding
MSD	marine sanitation device
NAICS	North American Industry Classification System
NDZ	No Discharge Zone
NMTA	Northwest Marine Trade Association
NOAA	National Oceanic and Atmospheric Administration
NPFVOA	North Pacific Fishing Vessel Owner's Association
NYBA	Northwest Yacht Brokers Association
OFM	Washington Office of Financial Management
Parks	Washington State Parks and Recreation Commission
PCGSA	Pacific Coast Shellfish Growers Association
PSP	Puget Sound Partnership
RBAW	Recreational Boaters Association of Washington
RCW	Revised Code of Washington
RFA	Washington Regulatory Fairness Act
USC	US Code
USCG	United States Coast Guard
WBA	Washington Boating Alliance
WDFW	Washington Department of Fish and Wildlife

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Executive Summary

This report presents the determinations made by the Washington State Department of Ecology (Ecology) as required under chapters 34.05 RCW and 19.85 RCW, for the Vessel Sewage No Discharge Zones rule (chapter 173-228 WAC; the "rule"). This includes the:

- Final Cost-Benefit Analysis (CBA)
- Least-Burdensome Alternative Analysis (LBA)
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

The rule sets the following requirements not required by other laws or rules:

- Establishes a No Discharge Zone (NDZ) in all the marine waters of Washington State inward from the line between New Dungeness Lighthouse and the Discovery Island Lighthouse to the Canadian border, and in the fresh waters of Lake Washington, Lake Union, and connecting waters between and to Puget Sound.
- Requires all vessels with installed and operable toilets to have a Type III marine sanitation device (MSD) to allow for complete and adequate sewage holding capacity while in the NDZ.
- Requires all vessels with MSDs to secure the devices to prevent discharge of sewage in the NDZ.
- Requires vessels without installed toilets to dispose of any collected sewage from portable toilets or other containment devices at facilities in a manner that complies with state law.
- Delays requirements for tug boats, commercial fishing vessels, small commercial passenger vessels, and National Oceanic and Atmospheric Administration (NOAA) research and survey vessels for five years.
- Exempts public vessels actively involved in emergency, safety, security, or related contingency operations where it would not be possible to comply with the NDZ requirements.

Summary of costs

Total 20-year present value costs for retrofits are estimated to be between $511 million and $551 million, including all costs estimated. Isolating only costs to businesses and government, this number is $113 million to $153 million.

Retrofit costs may be reduced by:

- Using scheduled dry-dock maintenance schedules.
- Investing in more water-efficient onboard toilet facilities.
- Fewer necessary storage days.

In light of variance and uncertainty in use of these methods to reduce compliance costs, however, we chose to overestimate costs to support a conservative approach to estimating net benefits.

Total 20-year present value costs associated with pumpouts are estimated to be between $191 million and $212 million, including all costs estimated.

While additional pumpouts are not required, we chose to include information on the cost of pumpouts developed for convenience. Recreational pumpout construction cost is estimated to be approximately $183 thousand[1] and can be largely paid for with funds from the federal Clean Vessel Act grant program. Commercial pumpout construction cost is estimated to be at least $300 thousand.[2] If the rule results in significant additional demand for commercial pumpout facilities, vessel owners may invest in additional pumpouts if this cost is lower than direct cost, time cost, or lost revenues while using existing pumpouts. If additional demand results in a business opportunity for a pumpout operator, this may result in additional market entry.

This analysis is limited to direct costs and benefits of the rule.

Summary of benefits

The rule is likely to support the following benefits, by significantly reducing vessel sewage entering Puget Sound:

- Human health
    - Disease risk:
        - Gastrointestinal illnesses carry a direct economic cost of approximately:
            - $50 for illness that does not require a physician visit.
            - $500 for illness that requires a physician visit.
            - $10,000 for illness that requires hospitalization.
            - Additional costs of:
                - Lost work hours.
                - Missed school days.
                - Chronic and quality of life impacts.
                - Impacts to family such as need for childcare.
    - Shellfish consumption:
        - Reduce a contributor to the toxins accumulated in shellfish. Reducing risk of illness will allow the public to reduce their potential medical, productivity, and quality of life losses. Reducing the likelihood of closures reduces potential impacts to communities that rely in part on income from recreational shellfish diggers.
        - Neurotoxic shellfish poisoning can result in estimated costs of:

[1] High-end estimate. WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Condition, Vessel Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 2.

[2] Communication between Port of Bellingham and Amy Jankowiak, Ecology. Email, 7/6/17. Subject: Funding Status for Agreement No. OTGP-VER1-BellPo-00024.

        - $58 to $240 for medical treatment not requiring hospitalization.
        - $335 in lost productivity (3 days).
- Businesses
    - Shellfishery closures:
        - The Puget Sound shellfish industry harvests over 20 million pounds per year, and the closure of an acre of commercial shellfish beds can result in revenue loss of $10 thousand to $20 thousand *per year*.
        - The rule's goal is to eliminate vessel sewage from contacting shellfish harvesting areas, thereby, reducing the potential for ongoing or increasing commercial shellfishery closures. While we cannot confidently estimate the quantitative relationship between the rule and avoided increases in shellfishery closures, we can provide an illustrative estimate that this benefit alone could offset the entire estimated cost of retrofitting tugs ($91 million in 20-year present value) if it caused between 350 and 700 acres of commercial shellfishery to avoid future closure beginning in year 6.
    - Potential growth in shellfish acreage:
        - Per acre, commercial Pacific oyster beds are estimated to produce between $10 thousand and $20 thousand per year. 700 potential additional acres would then be able to produce $7 million to $14 million per year in additional product, resulting in a 20-year present value of between $125 million to $250 million alone.
- Environmental
    - Nutrients and oxygen depletion:
        - Reducing the additional nutrients added to the natural levels brought in by currents and rivers that contribute to oxygen depletion.
    - Toxic chemicals:
        - Reducing potential wildlife exposure to toxic chemicals.

This analysis is limited to direct costs and benefits of the rule.

Conclusion

Ecology concludes, based on reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the rule, that the benefits of the rule are likely greater than the costs.

After considering alternatives to the rule's contents, as well as the goals and objectives of the authorizing statute, Ecology determined that the rule represents the least-burdensome alternative of possible rule contents meeting these goals and objectives.

We concluded that the rule is likely to have disproportionate impacts on small businesses within the industries that incur compliance costs, based on identifiable data, and therefore Ecology must include elements in the rule to mitigate this disproportion, as far as is legal and feasible. Where the relative ratios are unknown, Ecology must also mitigate costs to small businesses.

The rule will result in transfers of money within and between industries. Because pumpouts and dump stations could be public or private, we conservatively assumed that those expenditures were made at public facilities, which does not result in additional jobs or spending in the WA Office of Financial Management model (the model does not include a public sector). It was also not possible to confidently assume what proportion of retrofit expenditures would stay in state. This means job losses are overestimated, and net impacts to jobs will likely be smaller due to some types of expenditure staying in the state and funding positions such as public or private pumpout facility staff.

Under the low cost assumptions, the Washington State economy could experience a net loss of 215 full-time employees (FTEs) over 20 years, across all private industries in the state. Most of these losses would be within the most-impacted industry, with a projected loss of 62 FTEs in shipping and transportation support industries.

Under the high cost assumptions, the Washington State economy could experience a net loss of 242 FTEs over 20 years, across all industries in the state. Similarly to the estimate under low-cost assumptions, most of these losses would be within the most-impacted industry, with a projected loss of 62 FTEs in shipping and transportation. The higher total job losses stem from higher estimated costs for commercial fishing.

These prospective changes in overall employment in the state are the sum of multiple small increases and decreases across all industries in the state. These estimates include only the impacts of compliance cost expenditures, and do not include potential job growth from increases in harvestable shellfish acreage.

Chapter 1: Background and Introduction

1.1 Introduction

This report presents the determinations made by the Washington State Department of Ecology (Ecology) as required under chapters 34.05 RCW and 19.85 RCW, for the Vessel Sewage No Discharge Zones rule (chapter 173-228 WAC; the "rule"). This includes the:

- Final Cost-Benefit Analysis (CBA)
- Least-Burdensome Alternative Analysis (LBA)
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

The Washington Administrative Procedure Act (APA; RCW 34.05.328(1)(d)) requires Ecology to evaluate significant legislative rules to "determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the law being implemented." Chapters 1 – 5 of this document describe that determination.

The APA also requires Ecology to "determine, after considering alternative versions of the rule…that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives" of the governing and authorizing statutes (RCW 34.05.328(1)(d)). Chapter 6 of this document describes that determination.

The APA also requires Ecology to make several other determinations (RCW 34.05.328(1)(a) – (c) and (f) – (h)) about the rule, including authorization, need, context, and coordination. Appendix A provides the documentation for these determinations.

All determinations are based on the best available information at the time of publication, as well as input received during the public comment period.

The Washington Regulatory Fairness Act (RFA; Chapter 19.85 RCW) requires Ecology to evaluate the relative impact of rules that impose costs on businesses in an industry. It compares the relative compliance costs to small businesses to the largest businesses affected. Chapter 7 documents that analysis, when applicable.

1.1.1 Motivation for this rulemaking

Under current regulations, boaters in Puget Sound must treat waste with a marine sanitation device if discharged within three nautical miles of shore, or discharge untreated waste beyond three miles. Potentially millions of gallons of minimally treated or untreated sewage are discharged to Puget Sound each year. Vessels may also choose to transport waste to an appropriate disposal facility (including pumpout or dump station). Millions of gallons have been collected at state pumpouts and other stations. Even within areas with required treatment, vessel discharges are not considered sufficiently safe in all parameters, for humans and the

environment. This means vessel sewage poses a potential risk to human health and the environment at beaches, in shellfish, in aquatic life habitat, and in waters prone to nutrient enrichment, algae blooms, and oxygen depletion. Risks to human health include, but are not limited to, fecal coliform bacteria, and diseases such as norovirus.

1.2 Summary of the rule

The rule would set the following requirements not required by other laws or rules:

- Establishes a No Discharge Zone (NDZ) in all the marine waters of Washington State inward from the line between New Dungeness Lighthouse and the Discovery Island Lighthouse to the Canadian border, and in the fresh waters of Lake Washington, Lake Union, and connecting waters between and to Puget Sound.
- Requires all vessels with installed and operable toilets to have a Type III marine sanitation device to allow for complete and adequate sewage holding capacity while in the NDZ.
- Requires all vessels with marine sanitation devices (MSDs) to secure the devices to prevent discharge of sewage in the NDZ.
- Requires vessels without installed toilets to dispose of any collected sewage from portable toilets or other containment devices at facilities in a manner that complies with state law.
- Delays requirements for tug boats, commercial fishing vessels, small commercial passenger vessels, and National Oceanic and Atmospheric Administration (NOAA) research and survey vessels for five years.
- Exempts public vessels actively involved in emergency, safety, security, or related contingency operations where it would not be possible to comply with the NDZ requirements.

1.3 Reasons for the rule

1.3.1 Establishing the NDZ

A No Discharge Zone (NDZ) will prevent vessels from discharging sewage (including treated and untreated) into Puget Sound. Vessels will instead be required to dispose of sewage (blackwater) at stationary pumpout stations, mobile pumpouts, or outside of the NDZ as allowed. A reduction in vessel discharge will reduce risk to human health and the environment from bacteria, diseases, and nutrients contained in sewage.

The area of the NDZ in the rule is based on identifiable and known navigation landmarks, pumpout availability, conditions in Puget Sound, and locations of vulnerable areas such as shellfish beds.

1.3.2 Requiring vessels with toilets to have Type III marine sanitation device (MSD)

The rule requires vessels with installed toilets to have Type III marine sanitation devices (MSDs). These devices are storage tanks that do not discharge sewage (treated or untreated) to the water, and they store sewage until the vessel can discharge to a disposal facility (including pumpout stations, mobile pumpouts, or in an allowable discharge area).

1.3.3 Requiring vessels with MSDs to secure devices to prevent discharge

The rule requires vessels with MSDs to secure their devices to prevent discharge of sewage. This will prevent accidental discharge of sewage.

1.3.4 Requiring vessels without toilets to dispose of sewage appropriately

Proper disposal of sewage allows it to be treated appropriately, in accordance with water quality and solid waste laws and regulations.

1.3.5 Delaying requirements for some vessels

During the development of the rule, owners of some types of vessel expressed concern that they would have difficulty complying with a NDZ. The rule allows some types of vessel an additional five years from the effective date of the rule to make the modifications necessary to comply.

1.3.6 Exempting emergency operations

Some types of emergency operations are exempt from the rule, when active. This allows emergency operations to achieve urgent goals without risking noncompliance with the rule.

1.4 Document organization

The remainder of this document is organized in the following chapters:

- Baseline and the rule (Chapter 2): Description and comparison of the baseline (what would occur in the absence of the rule) and the rule requirements.
- Likely costs of the rule (Chapter 3): Analysis of the types and sizes of costs we expect impacted entities to incur as a result of the rule.
- Likely benefits of the rule (Chapter 4): Analysis of the types and size of benefits we expect to result from the rule.
- Cost-benefit comparison and conclusions (Chapter 5): Discussion of the complete implications of the CBA.
- Least-Burdensome Alternative Analysis (Chapter 6): Analysis of considered alternatives to the contents of the rule.

- Small Business Economic Impact Statement (Chapter 7, when applicable): Comparison of compliance costs to small and large businesses; mitigation; impact on jobs.
- RCW 34.05.328 determinations not discussed in Chapter 5 or 6 (Appendix A).
- Map of NDZ Area (Appendix B).

Chapter 2: Baseline and the Rule

2.1 Introduction

We analyzed the impacts of the rule, within the context of all existing requirements (federal and state laws and rules). This context for comparison is called the baseline, and reflects the most likely regulatory circumstances that entities would face if the rule were not adopted. It is discussed in Section 2.2, below.

2.2 Baseline

The baseline for our analyses generally consists of existing rules and laws, and their requirements. This is what allows us to make a consistent comparison between the state of the world with and without the rule.

For this rulemaking, the baseline includes:

- Chapter 90.48 RCW – Water Pollution Control.
- 33 U.S.C. §1251 et seq. (1972) – US Clean Water Act.
- Environmental Protection Agency (EPA) 2013 Vessel General Permit for Discharges Incidental to the Normal Operation of Vessels.
- There is no existing No Discharge Zone rule in Washington State.

2.3 Adopted rule

The rule elements that differ from the baseline and are not *specifically* dictated in the authorizing statute or elsewhere in law or rule include all elements of the rule:

- Establishes a No Discharge Zone (NDZ) in all the marine waters of Washington State inward from the line between New Dungeness Lighthouse and the Discovery Island Lighthouse to the Canadian border, and in the fresh waters of Lake Washington, Lake Union, and connecting waters between and to Puget Sound. (See Appendix B for map.)
- Requires all vessels with installed and operable toilets to have a Type III marine sanitation device to allow for complete and adequate sewage holding capacity while in the NDZ.
- Requires all vessels with marine sanitation devices (MSDs) to secure the devices to prevent the discharge of sewage in the NDZ.
- Requires vessels without installed toilets to dispose of any collected sewage from portable toilets or other containment devices at disposal facilities (including pumpouts) in a manner that complies with state law.

- Delays requirements for tug boats, commercial fishing vessels, small commercial passenger vessels, and National Oceanic and Atmospheric Administration (NOAA) research and survey vessels.
- Exempts public vessels actively involved in emergency, safety, security, and related contingency operations where it would not be possible to comply with the NDZ from requirements.

2.3.1 Establishing a NDZ

Baseline

None.

Adopted

Prohibits discharge of vessel sewage in:

- All the marine waters of Washington State inward from the line between New Dungeness Lighthouse (N 48° 10’ 54.454”, 123° 06’ 37.004” W) and the Discovery Island Lighthouse (N 48° 25’ 26.456”, 123° 13’ 29.554” W) to the Canadian border (intersecting at: N 48° 20’ 05.782”, 123° 11’ 58.636” W).
- All the fresh waters of Lake Washington, Lake Union, and connecting waters between and to Puget Sound.

Expected impact

In combination with other requirements of the rule, this means vessels operating in the NDZ area will need to have appropriate storage for sewage, and access to disposal facilities (including pumpout or dump stations).

2.3.2 Requiring all vessels with installed toilets to have a Type III MSD

Baseline

None.

Adopted

Vessels with installed and operable toilets must have a Type III marine sanitation device (MSD) to allow for complete and adequate sewage holding capacity while in the NDZ.

Expected impact

Vessels with installed toilets (non-portable toilets) that do not currently have Type III MSDs – even if they have Type I or Type II treatment MSDs – will need to install Type III storage for sewage. This will benefit the public and environmental health through elimination of discharge of vessel sewage that is insufficiently treated to prevent risk of bacterial or viral contamination.

2.3.3 Requiring all vessels with MSDs to secure their devices

Baseline

None.

Adopted

Vessels with MSDs must secure the devices to prevent the discharge of sewage per 33 CFR 159.7 while in no discharge zone waters. The federal law referenced is the Requirements for Vessel Operators section of Marine Sanitation Devices regulations, and it requires MSDs in a NDZ to be secured in one of the following ways.

Type I or Type II:

- Closing the seacock and removing the handle.
- Padlocking the seacock in the closed position.
- Using a non-releasable wire-tie to hold the seacock in the closed position.
- Locking the door to the space enclosing the toilets with a padlock or door handle key lock.

Type III:

- Closing each valve leading to an overboard discharge and removing the handle.
- Padlocking each valve leading to an overboard discharge in the closed position.
- Using a non-releasable wire-tie to hold each valve leading to an overboard discharge in the closed position.

Expected impact

We expect this requirement to have minimal cost impact in addition to installation of Type III MSDs or operation of existing Type III MSDs, as it requires only a padlock, wire tie, lock, or single handle removal operation. We do, nonetheless, identify this as a cost. This will benefit the public and environmental health by preventing accidental discharge of sewage, reducing risk of bacterial or viral contamination.

2.3.4 Requiring vessels without installed toilets to properly dispose of sewage

Baseline

None.

Adopted

Vessels without installed toilets must dispose of any collected sewage from portable toilets or other containment devices at facilities in a manner that complies with state law.

Expected impact

Vessels with portable toilets or similar devices storing sewage will need to use disposal facilities regardless of where in Puget Sound they were coming from, if they are in the NDZ. This will likely benefit the public and environmental health by preventing the discharge of raw sewage to Puget Sound, reducing risk of bacterial or viral contamination.

2.3.5 Delaying requirements for certain types of vessel

Baseline

None.

Adopted

Requirements of the rule will be delayed five years from the effective date of the rule if adopted for:

- Tug boats.
- Commercial fishing vessels.
- Small commercial passenger vessels.
- National Oceanic and Atmospheric Administration (NOAA) research and survey vessels.

Expected impact

The above types of vessels can phase-in the costs of compliance (retrofit, using pumpouts) over five years, allowing them time to plan for retrofits as part of their maintenance or replacement cycles, to arrange financing, or make other business arrangements.

2.3.6 Exempting certain emergency operations

Baseline

None.

Adopted

Public vessels actively involved in emergency, safety, security, and related contingency operations where it would not be possible to comply with the requirements in the rule, are exempted.

Expected impact

Vessels participating in emergency, safety, security, and related contingency operations will not need to comply with the NDZ requirements when not operationally possible. We do not expect this to be frequent in occurrence, and so while retaining the vessels' ability to perform emergency actions, minimal impact to water quality is likely.

Chapter 3: Likely Costs of the Rule

3.1 Introduction

We estimated the likely costs associated with the rule, as compared to the baseline. The rule and the baseline are discussed in detail in Chapter 2 of this document.

This analysis is limited to direct costs and benefits of the rule.

3.2 Cost analysis

We analyzed the costs of the rule based on vessel type. The data used is based on a series of reports published during the development of the NDZ and the rule. All data have been updated to estimated current vessel populations and 2017-dollar costs.[3]

General cost types included costs of retrofits and costs of using disposal facilities. The vessel types for which costs were analyzed were:

- Harbor vessels:
    - Tugboats (various types)
    - Commercial fishing vessels
    - Small commercial passenger ships
    - NOAA research and survey vessels
    - Ferries
    - Military and other government
    - Excursion vessels
- Oceangoing vessels:
    - Container ships, cargo, and carriers
    - Large and medium cruise ships
- Recreational vessels:
    - Less than 26 feet
    - Greater than 26 feet
- Various:
    - Building pumpouts

3.2.1 Tugboats and similar vessels

Due to potentially similar retrofit and pumpout needs, we grouped the following vessel types for this cost analysis.

- Ocean tugs

[3] US Bureau of Labor Statistics (2017). Consumer Price Index. https://www.bls.gov/cpi/detailed-report.htm

- Harbor tugs
- Workboats
- Assist and escort vessels

This group is likely to incur significant costs of retrofit and pumpouts. Estimates are based on the following assumptions:

- A population of 174 vessels in 2005.[4]
- 21 consecutive days at sea without access to pumpouts.[5]
- An industry growth rate for commercial shipping to Pacific Northwest ports of 5.2 percent.[6]
- A per-tug cost of approximately $169 thousand.[7]

MSD retrofit costs

We estimated the total cost of approximately $49 million will be incurred in year 6. This is based on the delayed implementation allowed under the rule. Note that rather than incurring all costs in year 1 or year 6, compliance costs will realistically be incurred over time, in preparation for required compliance. Costs incurred in the first year, compared to the 6th year, are approximately 7 percent higher in present value than those summarized in section 3.3.

In subsequent years, we conservatively assumed that all additional growth in the industry will not have Type III MSDs under the baseline, and so new vessels will also need retrofitting. These calculations were based on the assumption that most of these vessels will need retrofitting.

Pumpout costs

Pumpouts were estimated to be a larger long-run cost, based on approximately $1 thousand per pumpout via truck, every two weeks, for each vessel. This total annual cost of approximately $8 million was assumed to begin in year 6 and be incurred (with vessel population growth) each year following.

Tugboat operators identified difficulties in their ability to pumpout with necessary frequency without losing time of doing business. This was due to incompatibility and limited availability of mobile pumpouts for these vessels.[8] Estimated losses of revenues during each extra trip to

[4] WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Vessel Population and Pumpout Facilities. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 3.
[5] This assumption is consistent with three thousand gallons of discharge used in past modeling, based on input from tugboat operators. While concern was expressed that this assumption is an overestimate of time without access to pumpouts, it allowed for modeling better representing a broader set of vessels, from small recreational vessels to larger cruise ships.
[6] Northwest Seaport Alliance (2017). The Northwest Seaport Alliance 5-Year Cargo Volume History.
[7] WA Department of Ecology (2016). Technical Memorandum: Puget Sound NDZ Commercial Vessel Economic Evaluation. From Neil Brauer and Joy Michaud, Herrera Environmental Consultants, Inc. to Amy Jankowiak, Ecology. Publication no. 16-10-015.
[8] WA Ecology (2012). Phase 2 Vessel Population and Pumpout Facility Estimates, Puget Sound No Discharge Zone for Vessel Sewage. Publication no. 12-10-031 Part 4.

pumpout were estimated to be between $2,500 and $3 thousand. This revenue loss will only be incurred in cases where billable work was foregone to instead use a pumpout, and not during time between jobs, or at times when mobile pumpouts are not available and compatible.

3.2.2 Commercial fishing vessel costs

Commercial fishing vessels are likely to incur significant costs of retrofit and pumpout, if they do not currently have a Type III MSD. Estimates are based on the following assumptions:

- A population of 347 vessels in 2011.[9]
- A near-zero growth rate for commercial fish landings.[10]
- Between 1/2 and 1/3 of vessels needing retrofit.[11]

MSD retrofit costs

We estimated approximately 115 to 174 vessels needing retrofit. At a cost of $183 thousand to $366 thousand per vessel[12], the total cost of $21 million to $64 million was assumed to be incurred in year 6.[13] This is based on the delayed implementation allowed under the rule.

Pumpout costs

Pumpouts were estimated to be a larger long-run cost, based on approximately $1 thousand per pumpout via truck, every two weeks, for each vessel. This total annual cost of approximately $3 million was assumed to begin in year 6 and each year following.

Commercial fishing vessels were also assumed to incur the costs of displaced fish hold, due to the space needed for sewage storage tanks. The size and value of this cost is variant, and we note it qualitatively here.

3.2.3 Small commercial passenger ship costs

We define small commercial passenger vessels as carrying up to 249 overnight passengers by lower berth. Most small commercial passenger ships identified reported that they currently comply with the requirements of the rule. Those that comply do so using an existing Type III MSD and pumpout facilities or trucks. Small ships with storage tanks can hold sewage for one or two days, and whale watching vessels can hold their sewage for three days.

[9] WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Vessel Population and Pumpout Facilities. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 3.
[10] National Oceanic and Atmospheric Administration, National Marine Fisheries Service (2017). Commercial landings for all species combined. Annual 2011 – 2015. Washington State.
[11] WA Department of Ecology (2016). Technical Memorandum: Puget Sound NDZ Commercial Vessel Economic Evaluation. From Neil Brauer and Joy Michaud, Herrera Environmental Consultants, Inc. to Amy Jankowiak, Ecology. Publication no. 16-10-015.
[12] Ibid.
[13] Note that rather than incurring all costs in year 1 or year 6, compliance costs would realistically be incurred over time, in preparation for required compliance. Costs incurred in the first year, compared to the 6th year, are approximately 7 percent higher in present value than those summarized in section 3.3.

MSD retrofit costs

Some small commercial overnight passenger ships, such as small cruise ships, may need to retrofit to comply with the rule. Three such vessels were identified.[14] We used a cost of approximately $680 thousand per vessel for retrofit.[15]

Because small cruise ships are allowed to delay compliance for five years under the rule, the retrofit cost of approximately $2 million will occur in year 6.[16]

Small commercial passenger vessel operators expressed concerns that retrofits may not be possible financially or practically for some or all of their vessels. This is due to physical limitations in space, as well as limitations in tonnage and definitions of vessel class. There may be a possibility, however, of switching vessel operations between NDZ and non-NDZ locations.

Pumpout costs

While we initially assumed pumpouts would be available to small commercial passenger vessels while docked, we received input during the public comment period that access to pumpouts was not available, and only the potential for pumping and removing sewage by truck would be possible. Costs were estimated at $25 thousand per vessel, per year.[17] Corresponding to the delayed compliance assumption for vessel retrofits, we assumed this annual cost for three vessels will be incurred beginning in year 6.

3.2.4 NOAA vessel costs

National Oceanic Atmospheric Administration (NOAA) vessels are likely to incur significant costs under the rule. We estimated costs based on the following assumptions:

- A population of four identified vessels.[18]
- A per-vessel cost of approximately $169 thousand.[19]

[14] WA Department of Ecology (2016). Technical Memorandum: Puget Sound NDZ Commercial Vessel Economic Evaluation. From Neil Brauer and Joy Michaud, Herrera Environmental Consultants, Inc. to Amy Jankowiak, Ecology. Publication no. 16-10-015.
[15] Ibid. $680 thousand is updated for inflation from $650 thousand. $650 thousand is based on input from the small passenger industry to Ecology, during the rule development process. The industry noted that this cost could be higher, but provided no additional financial details.
[16] Note that rather than incurring all costs in year 1 or year 6, compliance costs would realistically be incurred over time, in preparation for required compliance. Costs incurred in the first year, compared to the 6th year, are approximately 7 percent higher in present value than those summarized in section 3.3.
[17] Public comment received from Susan Hayman. See the associated Concise Explanatory Statement for this rulemaking, comment O-12-4.
[18] WA Department of Ecology (2012). Phase 2 Commercial Vessel Sewage Management and Pumpout, Puget Sound No Discharge Zone for Vessel Sewage. Prepared by Herrera Environmental Consultants, Inc. and Veda Environmental. Publication No. 12-10-031 Part 6.
[19] WA Department of Ecology (2016). Technical Memorandum: Puget Sound NDZ Commercial Vessel Economic Evaluation. From Neil Brauer and Joy Michaud, Herrera Environmental Consultants, Inc. to Amy Jankowiak, Ecology. Publication no. 16-10-015.

MSD retrofit

We estimated the total cost of approximately $676 thousand will be incurred in year 6. [20]

Pumpout costs

Pumpouts were estimated to be a larger long-run cost, based on approximately $1 thousand per pumpout via truck, every two weeks, for each vessel. This total annual cost of approximately $5.5 million was assumed to begin in year 1 and be incurred each year following.

3.2.5 Ferry costs

No additional costs were estimated for ferries under the rule. Washington State Ferries use Type III MSDs and use their own pumpout facilities at their ports and docks. The Alaska Marine Highway System is already entirely compliant in this way.[21]

3.2.6 Military and other government vessel costs

US Navy, WA Department of Transportation, and US Coast Guard were identified as using Type III MSDs and pumpouts at their own facilities.[22] No additional cost was estimated for these vessels under the rule.

Armed forces vessels were identified as already using Type III storage devices, discharging in open ocean, and using pumpouts at their facilities.[23] They were therefore not estimated to incur additional costs under the rule.

3.2.7 Excursion vessel costs

The 60 excursion vessels in Washington[24] were identified as being currently compliant with the requirements of the rule.[25] Therefore no additional cost was estimated for them under the rule. This includes certified and non-certified charter boats.

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[20] Note that rather than incurring all costs in year 1 or year 6, compliance costs would realistically be incurred over time, in preparation for required compliance. Costs incurred in the first year, compared to the 6th year, are approximately 7 percent higher in present value than those summarized in section 3.3.

[21] WA Department of Ecology (2012). Phase 2 Commercial Vessel Sewage Management and Pumpout, Puget Sound No Discharge Zone for Vessel Sewage. Prepared by Herrera Environmental Consultants, Inc. and Veda Environmental. Publication No. 12-10-031 Part 6.

[22] WA Department of Ecology (2012). Phase 2 Commercial Vessel Sewage Management and Pumpout, Puget Sound No Discharge Zone for Vessel Sewage. Prepared by Herrera Environmental Consultants, Inc. and Veda Environmental. Publication No. 12-10-031 Part 6.

[23] WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Vessel Population and Pumpout Facilities. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 3.

[24]WA Department of Ecology (2012). Phase 2 Commercial Vessel Sewage Management and Pumpout, Puget Sound No Discharge Zone for Vessel Sewage. Prepared by Herrera Environmental Consultants, Inc. and Veda Environmental. Publication No. 12-10-031 Part 6.

[25] WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Vessel Population and Pumpout Facilities. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 3.

3.2.8 Container ship, cargo, and carrier costs

Commercial oceangoing vessels, including container and cargo ships, were assumed to wait to discharge until they are in waters outside of the NDZ in the rule. They have large holding tanks, and their current practice is to hold sewage until on the ocean. We therefore estimated no additional cost for them under the rule.

3.2.9 Large and Medium Cruise ship costs

We define medium cruise ships as carrying approximately 250 to 500 overnight passengers by lower berth, and large cruise ships as carrying over 500 overnight passengers. We estimated no additional costs for large and medium cruise ships to comply with the rule. Existing large and medium cruise ships have sewage holding capacity of two or three days. Cruise ships are usually in Washington waters only about ten to 14 hours. Therefore, there is adequate holding capacity to retain sewage on-board while within the Puget Sound NDZ. These vessels can discharge in areas outside of the NDZ in the rule, or the ships can use existing pumpout truck capacity when docked at terminals.[26]

3.2.10 Recreational vessel less than 26 feet costs

Recreational vessels less than 26 feet in length are not likely to have installed toilets, and are therefore not assumed to incur additional costs under the rule. This is also based on the assumption that users of portable toilets are correctly disposing of stored waste in available dump sites at docks and state facilities.

3.2.11 Recreational vessel greater than 26 feet costs

Recreational vessels greater than 26 feet long are expected to incur significant costs under the rule, if they do not currently use a Type III MSD. We estimated costs based on the following assumptions:

- A recreational boater survey indicating 91 percent of boaters with this size of vessel had a Type III MSD.[27]
- Registered recreational boaters in Puget Sound-adjacent counties.[28]
- Approximately 2,013 vessels will need retrofit with Type III MSDs, as well as pumpout facilities.

[26] WA Department of Ecology (2012). Phase 2 Commercial Vessel Sewage Management and Pumpout, Puget Sound No Discharge Zone for Vessel Sewage. Prepared by Herrera Environmental Consultants, Inc. and Veda Environmental. Publication No. 12-10-031 Part 6.
[27] WA Department of Ecology (2012). Puget Sound Recreational Boater Survey Results, Puget Sound No Discharge Zone for Vessel Sewage. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 5.
[28] WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Vessel Population and Pumpout Facilities. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 3.
WA Department of Transportation (2016). 2016 fiscal year vessel registrations.

MSD retrofit costs

At a cost of approximately $1,500 per retrofit[29], we assumed this cost of $8.3 million was incurred in year 1. Based on a growth rate of between 22 and 33 percent in the number of registered recreational vessels in Puget Sound-adjacent counties[30], we assumed growth in the population of recreational boaters will have the same proportion of new vessels needing retrofit each year.

Pumpout costs

Pumpouts for recreational vessels, as well as the time it will take for them to use them, and the fuel and value of time for a diverse population of boaters was difficult to confidently quantify. Instead, we discuss the cost of developing additional pumpouts for convenience in the NDZ (see section 3.2.12).

3.2.12 Building additional pumpouts

Based on EPA standards for the ratio between vessels and pumpouts (300 to 600 vessels per pumpout), there are sufficient pumpouts in the NDZ area in the rule (92 to 171 vessels per pumpout facility).[31] A survey of recreational boaters, however, suggested recreational boaters could benefit from additional local facilities, such as in the San Juan Islands and the coast of Whatcom County. This indicates some recreational boaters could incur additional time cost traveling to pumpouts. It is difficult to quantify the value of time across a diverse population of boaters and potential locations and distances. In lieu of such an estimate, we are including discussion of the cost of building additional pumpouts (while not required under EPA standards).

EPA determined that the number of commercial pumpouts in Washington was sufficient without needing additional construction.[32]

While additional pumpouts are not required, we chose to include information on the cost of pumpouts developed for convenience. Recreational pumpout construction cost is estimated to be approximately $183 thousand[33] and can be largely paid for with funds from the federal Clean Vessel Act grant program. Commercial pumpout construction cost is estimated to be at least $300 thousand.[34] If the rule results in significant additional demand for commercial pumpout facilities, vessel owners may invest in additional pumpouts if this cost is lower than direct cost, time cost, or lost revenues while using existing pumpouts. If additional demand results in a business opportunity for a pumpout operator, this may result in additional market entry.

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[29] WA Department of Ecology (2016). Final Petition to Designate the Waters of Puget Sound as a No Discharge Zone. Publication no. 16-10-020.
[30] WA Department of Transportation (2016). 2016 fiscal year vessel registrations.
[31] US Environmental Protection Agency (2017). Washington State Department of Ecology Prohibition of Discharges of Vessel Sewage; Final Affirmative Determination. Federal Register, Vol. 82, No. 33, Tuesday, February 21, 2017.
[32] Ibid.
[33] High-end estimate. WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Condition, Vessel Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 2.
[34] Communication between Port of Bellingham and Amy Jankowiak, Ecology. Email, 7/6/17. Subject: Funding Status for Agreement No. OTGP-VER1-BellPo-00024.

3.3 Cost Summary

To be able to summarize costs, Ecology converts costs that occur in different years (costs discussed above are values at the time they occur) into present values, using a discount rate that is based on compounded average short-term rates of return.[35] All future values are converted to a present value, depending on how far in the future they occur, and summed. The table below summarizes the present value costs (high and low where data was available) estimated for the rule, by vessel group.[36]

Table 1: Total 20-year present value costs for retrofits and pumpouts

Vessel Type	20-Year Present Value Retrofit Costs	20-Year Present Value Pumpout Costs
Harbor vessels:		
Tugboats and similar vessels	$91,233,047	$148,190,365
Commercial fishing vessels (low)	$19,649,836	$40,635,387
Commercial fishing vessels (high)	$59,544,958	$61,568,768
Small commercial passenger ships	$1,912,107	$907,911
NOAA research and survey vessels	$633,447	$1,419,453
Ferries	$0	$0
Military and other government	$0	$0
Excursion vessels	$0	$0
Oceangoing vessels:		
Container ships, cargo, and carriers	$0	$0
Large and medium cruise ships	$0	$0
Recreational vessels:		
Less than 26 feet	$0	$0
Greater than 26 feet	$397,589,940	$0

Total 20-year present value costs for retrofits are estimated to be between $511 million and $551 million, including all costs estimated. Isolating only costs to businesses and government, this number is $113 million to $153 million.

Retrofit costs may be reduced by:

- Using scheduled dry-dock maintenance schedules.
- Investing in more water-efficient onboard toilet facilities.
- Fewer necessary storage days.

In light of variance and uncertainty in use of these methods to reduce compliance costs, however, we chose to overestimate costs to support a conservative approach to estimating net benefits.

[35] US Treasury Department (2017). Fixed annual discount rates on I Bonds. September 1998 – May 2017.
[36] Note for vessel types allowed delayed compliance under the proposed rule: Rather than incurring all costs in year 1 or year 6, compliance costs would realistically be incurred over time, in preparation for required compliance. Costs incurred in the first year, compared to the 6th year, are approximately 7 percent higher in present value than those summarized in section 3.3.

Total 20-year present value costs associated with pumpouts are estimated to be between $191 million and $212 million, including all costs estimated.

While additional pumpouts are not required, we chose to include information on the cost of pumpouts developed for convenience. Recreational pumpout construction cost is estimated to be approximately $183 thousand[37] and can be largely paid for with funds from the federal Clean Vessel Act grant program. Commercial pumpout construction cost is estimated to be at least $300 thousand.[38] If the rule results in significant additional demand for commercial pumpout facilities, vessel owners may invest in additional pumpouts if this cost is lower than direct cost, time cost, or lost revenues while using existing pumpouts. If additional demand results in a business opportunity for a pumpout operator, this may result in additional market entry.

This analysis is limited to direct costs and benefits of the rule.

[37] High-end estimate. WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Condition, Vessel Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 2.

[38] Communication between Port of Bellingham and Amy Jankowiak, Ecology. Email, 7/6/17. Subject: Funding Status for Agreement No. OTGP-VER1-BellPo-00024.

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Chapter 4: Likely Benefits of the Rule

4.1 Introduction

We estimated the likely benefits associated with the rule, as compared to the baseline (both described in Chapter 2 of this document).

This analysis is limited to the direct costs and benefits of this rule.

4.2 Benefit analysis

It is inherently difficult to fully quantify the benefits of the rule. This is because the goals of the rule's restrictions on discharge of sewage to the NDZ in the rule relate to outcomes that are impacted by other releases of sewage and contaminants. The incremental impact to risk of human illness from the reduction of sewage discharged to Puget Sound is confounded by shoreline and stationary sources of sewage and disease. Nutrient concentrations are impacted not only by vessel sewage, as they are also impacted by other discharges from the shoreline such as stormwater and stationary water dischargers. In addition, these health and environmental variables are affected by historic contamination as well as ongoing discharges. Finally, it is often difficult to assign a specific monetary value to improved environmental protection.

Consequently, this analysis was not able to fully calculate summary 20-year present value estimates to directly compare to cost estimates in Chapter 3. Instead, in line with the intent of the APA, we used quantitative and qualitative data to inform and illustrate the potential benefits of the rule.

The rule is likely to support the following benefits:

- Human health
    - Decrease in disease risk.
    - Enhanced protection for shellfish consumption.
- Businesses
    - Decrease in shellfish closures.
    - Increase in shellfish acreage.
- Environmental
    - Reduction in nutrients and oxygen depletion.
    - Reduction in toxic chemicals.

4.2.1 Decrease in disease risk

A primary disease concern related to sewage discharge is fecal coliform bacteria as an indicator. Multiple areas of Puget Sound are listed as impaired based on this bacteria.[39] Similarly to dissolved oxygen, fecal coliform bacteria concentrations are higher near developed areas and in areas with poor flushing from currents and tides.[40] Bacterial concerns frequently result in the closures of swimming beaches.

Norovirus is another potential disease risk stemming from sewage discharge to waters. Norovirus is a highly contagious disease that causes stomach pain, nausea, diarrhea, and vomiting.[41] According to the US Centers for Disease Control (CDC), Norovirus is the leading cause of illness outbreaks from contaminated food in the US. While this accounts for transmission from infected food preparers, the CDC notes that infections also "occur from foods, such as oysters, fruits, and vegetables, that are contaminated at their source."

Nearly 400 thousand people recreate on Puget Sound beaches each year.[42] The average historic rate of beach closures for bacterial contamination (enterococcus) in Washington from 2004 – 2016 is 15.7 percent of sampled beaches.[43] This rate was most recently 7.6 percent in 2016.

Gastrointestinal illnesses carry a direct economic cost of approximately:

- $50 for illness that does not require a physician visit.
- $500 for illness that requires a physician visit.
- $10,000 for illness that requires hospitalization.[44]
- Additional costs of:
    - Lost work hours.
    - Missed school days.
    - Chronic and quality of life impacts.
    - Impacts to family such as need for childcare.

Young children, the elderly, and pregnant women are particularly susceptible to levels of illness that require hospitalization.

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[39] WA Department of Ecology (2016) Washington State Water Quality Assessment: 303(d) List. https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx

[40] High-end estimate. WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Condition, Vessel Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 2.

[41] US Centers for Disease Control (2017). Burden of Norovirus Illness and Outbreaks. https://www.cdc.gov/norovirus/php/illness-outbreaks.html

[42] High-end estimate. WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Condition, Vessel Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 2.

[43] WA Department of Ecology (2016). 2016 Washington State BEACH Program Annual Report. http://www.ecy.wa.gov/programs/eap/beach/AnnualReport.html

[44] Ralston, EP, H Kite-Powell, and A Beet (2011). An estimate of the cost of acute food and water borne health effects from marine pathogens and toxins in the United States. J Water Health. 2011 Dec; 9(4): 680–694. doi: 10.2166/wh.2011.157.

It is difficult to tie illness outbreaks to shellfish and then specifically to vessel discharge, due to the nature of discharge and waterways, but an example of such a case occurred in Louisiana during the 1996-97 season.[45] Gastroenteritis (a Norovirus-like illness) caused by oyster consumption spread to at least 179 people. This was tied to harvester discharge of sewage at their facility.

Other ongoing cases can tie disease to shellfish, but have difficulty identifying a specific source, potentially due to sewage exposure from multiple transient boats (rather than local harvesters in the example above) contaminating multiple locations.[46] These cases result in hundreds of cases of illness and multiple shellfishery closures from a single discharge containing a highly contagious illness.

The rule's goal is to eliminate vessel sewage from contacting shellfish and swimming areas, thereby, reducing a contributor to human illness from exposure to bacteria and highly contagious viruses.

4.2.2 Enhanced protection for shellfish consumption

Fecal coliform bacteria are a primary cause of shellfishery closures, as is potential poisoning from toxic chemicals produced by algae that accumulate in shellfish. Exposure to contaminated shellfish can result in illness or death. Exposure could potentially result from purchased shellfish, but individuals harvesting shellfish recreationally are likely to be exposed as well.

The US Environmental Protection Agency (EPA) estimates that one case of neurotoxic shellfish poisoning can result in estimated costs of:

- $58 to $240 for medical treatment not requiring hospitalization.
- $335 in lost productivity (3 days).[47]

Recreational shellfisheries are also a significant source of income for coastal communities. Recreational diggers spend money on fuel, lodging, food, and supplies while traveling to recreational shellfish beds and while residing near them, sometimes for multiple days.

The rule's goal is to eliminate vessel sewage from contacting shellfish harvesting areas, thereby, reducing a contributor to human illness from exposure to bacteria and highly contagious viruses. Reducing risk of illness will allow the public to reduce their potential medical, productivity, and quality of life losses. Reducing the likelihood of closures reduces potential impacts to communities that rely in part on income from recreational shellfish diggers.

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[45] US Centers for Disease Control (1997). Viral Gastroenteritis Associated with Eating Oysters – Louisiana, December 1996 – January 1997. https://www.cdc.gov/mmwr/preview/mmwrhtml/00049999.htm

[46] Powell, D (2017). British Columbia Oysters and Norovirus: Another fairytale, as hundreds of cases in months that end with an "r". http://www.barfblog.com/2017/06/british-columbia-oysters-and-norovirus-another-fairytale-as-hundreds-of-cases-in-months-with-an-r/

[47] US Environmental Protection Agency (2015). A Compilation of Cost Data Associated with the Impacts and Control of Nutrient Pollution. EPA 820-F-15-096.

4.2.3 Decrease in shellfish closures

Shellfish farms are a large and successful industry in Puget Sound. There are approximately 190 thousand acres of commercial shellfish tidelands that rely on clean water and environment to produce their product. They are at risk of liability and loss of business if they expose the public to illness or toxins. They also lose the ability to produce their product when shellfish beds are closed due to bacteria or toxic contamination.

The Puget Sound shellfish industry harvests over 20 million pounds per year. The closure of an acre of commercial shellfish beds can result in revenue loss of $10 thousand to $20 thousand per year.[48]

The rule's goal is to eliminate vessel sewage from contacting shellfish harvesting areas, thereby, reducing the potential for ongoing or increasing commercial shellfishery closures. While we cannot confidently estimate the quantitative relationship between the rule and avoided increases in shellfishery closures, we can provide an illustrative estimate that this benefit alone could offset the entire estimated cost of retrofitting tugs ($91 million in 20-year present value) if it caused between 350 and 700 acres of commercial shellfishery to avoid future closure beginning in year 6.

4.2.4 Increase in shellfish acreage

There are currently areas of Puget Sound that would otherwise be available for shellfisheries, but are not able to be due to fecal coliform contamination. The WA Department of Health estimates at least 700 acres of shellfishery could reopen, primarily around marinas, under the NDZ in the rule.[49] This estimate accounts for concurrent contamination that will continue to limit reopening. If other sources of contamination are reduced, this potential reopened acreage increases to one thousand acres.

Per acre, commercial Pacific oyster beds are estimated to produce between $10 thousand and $20 thousand per year.[50] 700 potential additional acres would then be able to produce $7 million to $14 million per year in additional product, resulting in a 20-year present value of between $125 million to $250 million alone.

4.2.5 Reduction in nutrients and oxygen depletion

Nitrogen in Puget Sound comes mostly from natural sources, but excess dissolved nitrogen comes from human sources. Excess nitrogen and other nutrients lead to the growth of algae, and can result in algae blooms. When these blooms die and decompose, they deplete the oxygen in the water. There are multiple Puget Sound locations that are designated as impaired based on low

[48] High-end estimate. WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Condition, Vessel Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 2.
[49] Personal communication with Mark Toy, WA Department of Health. 9/13/17.
[50] High-end estimate. WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Condition, Vessel Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 2.

dissolved oxygen levels.[51] They are found more frequently near urban areas or bays that flush poorly. In addition, some algae blooms produce toxins that can accumulate in shellfish and harm people and animals. Most such poisonings occur in the summer, when harmful algae blooms are nourished by excess nutrients from human sources.

The rule reduces vessel sewage entering Puget Sound, reducing some of the additional nutrients added to the natural levels brought in by currents and rivers. While reduction of nutrient discharge is not the primary goal of the rule, and other sources of nutrients (such as runoff) are more significant contributors, we note this benefit as a potential contribution of the rule.

4.2.6 Reduction in toxic chemicals

It has become increasingly evident that chemicals found in sewage discharged in Puget Sound remain in Puget Sound. These include ammonia, chlorine, pharmaceuticals, and personal care products. Even advanced wastewater treatment MSDs fail to treat for most toxic chemicals, allowing them to enter the Sound with currently allowable treated wastewater. Pharmaceuticals and personal care products, including endocrine disruptors such as hormones and steroids, can affect the ability of marine life to successfully reproduce.

The rule reduces vessel sewage entering Puget Sound, contributing to reductions in potential human and wildlife exposure to toxic chemicals in vessel sewage. While reductions in toxic chemical discharge are not the primary goal of the rule, and other sources of toxic chemicals (such as sewage treatment facilities) are more significant contributors, we note this benefit as a potential contribution of the rule.

4.3 Benefit Summary

The rule will support the following benefits, by significantly reducing vessel sewage entering Puget Sound:

- Human health
    - Disease risk:
        - Gastrointestinal illnesses carry a direct economic cost of approximately:
            - $50 for illness that does not require a physician visit.
            - $500 for illness that requires a physician visit.
            - $10,000 for illness that requires hospitalization.
            - Additional costs of:
                - Lost work hours.
                - Missed school days.
                - Chronic and quality of life impacts.
                - Impacts to family such as need for childcare.
    - Shellfish consumption:
        - Reduce a contributor to the toxins accumulated in shellfish. Reducing risk of illness will allow the public to reduce their potential medical,

[51] WA Department of Ecology (2016) Washington State Water Quality Assessment: 303(d) List. https://fortress.wa.gov/ecy/approvedwqa/ApprovedSearch.aspx

productivity, and quality of life losses. Reducing the likelihood of closures reduces potential impacts to communities that rely in part on income from recreational shellfish diggers.

        - Neurotoxic shellfish poisoning can result in estimated costs of:
            - $58 to $240 for medical treatment not requiring hospitalization.
            - $335 in lost productivity (3 days).

- Businesses
    - Shellfishery closures:
        - The Puget Sound shellfish industry harvests over 20 million pounds per year, and the closure of an acre of commercial shellfish beds can result in revenue loss of $10 thousand to $20 thousand *per year*.
        - The rule's goal is to prevent vessel sewage from contacting shellfish harvesting areas, thereby, reducing the potential for ongoing or increasing commercial shellfishery closures. While we cannot confidently estimate the quantitative relationship between the rule and avoided increases in shellfishery closures, we can provide an illustrative estimate that this benefit alone could offset the entire estimated cost of retrofitting tugs ($91 million in 20-year present value) if it caused between 350 and 700 acres of commercial shellfishery to avoid future closure beginning in year 6.
    - Potential growth in shellfish acreage:
        - Per acre, commercial Pacific oyster beds are estimated to produce between $10 thousand and $20 thousand per year. 700 potential additional acres would then be able to produce $7 million to $14 million per year in additional product, resulting in a 20-year present value of between $125 million to $250 million alone.
- Environmental
    - Nutrients and oxygen depletion:
        - Reducing the additional nutrients added to the natural levels brought in by currents and rivers that contribute to oxygen depletion.
    - Toxic chemicals:
        - Reducing potential wildlife exposure to toxic chemicals.

Chapter 5: Cost-Benefit Comparison and Conclusions

5.1 Summary of the costs and benefits of the rule

Summary of costs

Total 20-year present value costs for retrofits are estimated to be between $511 million and $551 million, including all costs estimated. Isolating only costs to businesses and government, this number is $113 million to $153 million.

Retrofit costs may be reduced by:

- Using scheduled dry-dock maintenance schedules.
- Investing in more water-efficient onboard toilet facilities.
- Fewer necessary storage days.

In light of variance and uncertainty in use of these methods to reduce compliance costs, however, we chose to overestimate costs to support a conservative approach to estimating net benefits.

Total 20-year present value costs associated with pumpouts are estimated to be between $191 million and $212 million, including all costs estimated.

While additional pumpouts are not required, we chose to include information on the cost of pumpouts developed for convenience. Recreational pumpout construction cost is estimated to be approximately $183 thousand[52] and can be largely paid for with funds from the federal Clean Vessel Act grant program. Commercial pumpout construction cost is estimated to be at least $300 thousand.[53] If the rule results in significant additional demand for commercial pumpout facilities, vessel owners may invest in additional pumpouts if this cost is lower than direct cost, time cost, or lost revenues while using existing pumpouts. If additional demand results in a business opportunity for a pumpout operator, this may result in additional market entry.

This analysis is limited to direct costs and benefits of the rule.

Summary of benefits

The rule is likely to support the following benefits, by significantly reducing vessel sewage entering Puget Sound:

- Human health

[52] High-end estimate. WA Department of Ecology (2012). Puget Sound No Discharge Zone for Vessel Sewage, Puget Sound Condition, Vessel Sewage Discharge, and the Costs and Benefits of Establishing a NDZ. Prepared by Herrera Environmental Consultants, Inc. Publication no. 12-10-031 Part 2.
[53] Communication between Port of Bellingham and Amy Jankowiak, Ecology. Email, 7/6/17. Subject: Funding Status for Agreement No. OTGP-VER1-BellPo-00024.

- Disease risk:
    - Gastrointestinal illnesses carry a direct economic cost of approximately:
        - $50 for illness that does not require a physician visit.
        - $500 for illness that requires a physician visit.
        - $10,000 for illness that requires hospitalization.
        - Additional costs of:
            - Lost work hours.
            - Missed school days.
            - Chronic and quality of life impacts.
            - Impacts to family such as need for childcare.
- Shellfish consumption:
    - Reduce a contributor to the toxins accumulated in shellfish. Reducing risk of illness will allow the public to reduce their potential medical, productivity, and quality of life losses. Reducing the likelihood of closures reduces potential impacts to communities that rely in part on income from recreational shellfish diggers.
    - Neurotoxic shellfish poisoning can result in estimated costs of:
        - $58 to $240 for medical treatment not requiring hospitalization.
        - $335 in lost productivity (3 days).

- Businesses
    - Shellfishery closures:
        - The Puget Sound shellfish industry harvests over 20 million pounds per year, and the closure of an acre of commercial shellfish beds can result in revenue loss of $10 thousand to $20 thousand *per year*.
        - The rule's goal is to prevent vessel sewage from contacting shellfish harvesting areas, thereby, reducing the potential for ongoing or increasing commercial shellfishery closures. While we cannot confidently estimate the quantitative relationship between the rule and avoided increases in shellfishery closures, we can provide an illustrative estimate that this benefit alone could offset the entire estimated cost of retrofitting tugs ($91 million in 20-year present value) if it caused between 350 and 700 acres of commercial shellfishery to avoid future closure beginning in year 6.
    - Potential growth in shellfish acreage:
        - Per acre, commercial Pacific oyster beds are estimated to produce between $10 thousand and $20 thousand per year. 700 potential additional acres would then be able to produce $7 million to $14 million per year in additional product, resulting in a 20-year present value of between $125 million to $250 million alone.
- Environmental
    - Nutrients and oxygen depletion:

        - Reducing the additional nutrients added to the natural levels brought in by currents and rivers that contribute to oxygen depletion.
    - Toxic chemicals:
        - Reducing potential wildlife exposure to toxic chemicals.

5.2 Conclusion

Ecology concludes, based on reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the rule, that the benefits of the rule are likely greater than the costs.

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Chapter 6: Least-Burdensome Alternative Analysis

6.1 Introduction

RCW 34.05.328(1)(e) requires Ecology to "...[d]etermine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection." The referenced subsections are:

> (a) Clearly state in detail the general goals and specific objectives of the statute that the rule implements;
>
> (b) Determine that the rule is needed to achieve the general goals and specific objectives stated under (a) of this subsection, and analyze alternatives to rule making and the consequences of not adopting the rule;
>
> (c) Provide notification in the notice of proposed rulemaking under RCW 34.05.320 that a preliminary cost-benefit analysis is available. The preliminary cost-benefit analysis must fulfill the requirements of the cost-benefit analysis under (d) of this subsection. If the agency files a supplemental notice under RCW 34.05.340, the supplemental notice must include notification that a revised preliminary cost-benefit analysis is available. A final cost-benefit analysis must be available when the rule is adopted under RCW 34.05.360;
>
> (d) Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented;

In other words, to be able to adopt the rule, Ecology is required to determine that the contents of the rule are the least burdensome set of requirements that achieve the goals and objectives of the authorizing statute(s).

Ecology assessed alternative rule content, and determined whether it met the goals and objectives of the authorizing statutes. Of those that meet these goals and objectives, Ecology determined whether those chosen for the rule were the least burdensome to those required to comply with them.

6.2 Goals and objectives of the authorizing statutes: RCW 90.48.030 and 90.48.035; and 33 U.S.C. Sec. 1322

The goals and objectives of the authorizing statutes are:

- RCW 90.48:

- To maintain the highest possible standards to insure the purity of all waters of the state consistent with public health and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life, and the industrial development of the state, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the state of Washington.
- To retain and secure high quality for all waters of the state.
- In recognition of the federal government's interest in the quality of the navigable waters of the United States, of which certain portions thereof are within the jurisdictional limits of this state, proclaims a public policy of working cooperatively with the federal government in a joint effort to extinguish the sources of water quality degradation, while at the same time preserving and vigorously exercising state powers to insure that present and future standards of water quality within the state shall be determined by the citizenry, through and by the efforts of state government, of the state of Washington.
- Control and prevent the pollution of streams, lakes, rivers, ponds, inland waters, salt waters, water courses, and other surface and underground waters of the state of Washington.

- 33 U.S.C. Sec. 1322:
  - A state may completely prohibit the discharge from all vessels of any sewage, whether treated or not, into such waters, except that no such prohibition shall apply until the Administrator determines that adequate facilities for the safe and sanitary removal and treatment of sewage from all vessels are reasonably available for such water to which such prohibition would apply. (Ecology chose to perform rulemaking in lieu of directly taking the federal approval approach.)

6.3 Alternatives considered and why they were not included

6.3.1 Including all Puget Sound in the NDZ

Ecology considered including all of Puget Sound, including the Strait of Juan de Fuca, in the NDZ. After identifying potential highly vulnerable areas, considering pumpout availability, and consulting with stakeholders and the public, however, Ecology determined that the goals and objectives of the statutes will be best served with smaller burden on covered parties by defining the geography of the NDZ using known and easily identifiable border points.

This alternative would have increased burden on those required to comply with the rule.

6.3.2 Not establishing an NDZ in Puget Sound

Ecology considered not establishing a NDZ in Puget Sound. This would not have met the goals and objectives of the authorizing statutes, as Ecology is directed to protect those waters, and therefore needs to address the raw and minimally treated sewage entering the state’s surface waters.

6.3.3 Establishing a piecewise NDZ

Ecology considered including only a subset of areas of Puget Sound in the NDZ in the rule. Because the Puget Sound is interconnected, and currents transport contaminants from one area to another, this alternative would not meet the goals and objectives of the authorizing statutes.

6.3.4 Immediate implementation for all vessels

Immediate implementation of the rule would increase burden to covered parties. This is because some vessel types are likely to have difficulty comply immediately with a NDZ, due to technological, mechanical, or financing limitations. This could potentially mean early noncompliance in an immediate implementation scenario, which would not aid environmental health.

6.3.5 No exemptions

Ecology considered not exempting any type of vessel in any activity, but found that this imposed unnecessary burden to support the goals and objectives of the authorizing statutes. Certain emergency activities provide for public safety, and are also infrequent, so that they do not put the goals of the authorizing statutes at risk. This alternative would have imposed excess burden on vessel owners.

6.3.6 Phase in for all vessels

Ecology considered phasing in the rule for all vessels, rather than delaying compliance requirements for some vessel types. Many types of vessel, however, are already functionally in compliance with the rule. Those vessels that would likely see limited difficulties, if any, in complying with a NDZ would not need the additional time of a phase in. Phasing in all vessels would delay the pollution prevention of the NDZ.

6.3.7 Grandfathering and limited coverage

Ecology considered public comments suggesting grandfathering certain vessels or applying the NDZ only to a limited set of vessels, such as those with existing holding. Ecology petitioned for an NDZ under the Clean Water Act, 33 U.S.C. §1322 (f)(3), which authorizes the designation of NDZs. This authorization does not have conditions to allow for certain treatment technologies to be exempted, as it applies to all vessels. Moreover, the rule applies to all vessels in order to best protect water quality and public health.

6.4 Conclusion

After considering alternatives to the rule's contents, as well as the goals and objectives of the authorizing statute, Ecology determined that the rule represents the least-burdensome alternative of possible rule contents meeting these goals and objectives.

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Chapter 7: Regulatory Fairness Act Compliance

7.1 Introduction

The Regulatory Fairness Act (RFA; RCW 19.85.070) requires Ecology to perform a set of analyses and make certain determinations regarding the rule.

This chapter presents the:

- Results of the analysis of relative compliance cost burden.
- Consideration of lost sales or revenue.
- Cost-mitigating action taken by Ecology, if required.
- Small business and local government consultation.
- Industries likely impacted by the rule.
- Expected net impact on jobs statewide.

The RFA limits the analyses in this chapter to changes in compliance costs.

A small business is defined by the RFA as having 50 or fewer employees. Estimated costs are determined as compared to the existing regulatory environment—the regulations in the absence of the rule. The RFA only applies to costs to "businesses in an industry" in Washington State. This means that impacts, for this document, are not evaluated for non-profit or government agencies.

The existing regulatory environment is called the "baseline" in this document. It includes only existing laws and rules at federal and state levels.

7.2 Quantification of Cost Ratios

Ecology calculated the estimated per-business costs to comply with the rule, based on the present-value costs estimated in Chapter 3. In this section, Ecology summarizes compliance cost per employee at affected businesses of different sizes.

The average affected small business likely to be covered by the rule employs approximately 7.5 people.[54] The largest ten percent of affected businesses with available employment data employ an average of 140.5 people.[55] Based on present-value cost estimates from Chapter 3, we estimated the following compliance costs per employee.

[54] WA Employment Security Department (2017) Establishment size by number of Employees 2016. https://www.esd.wa.gov/labormarketinfo/establishment-size
[55] Ibid.

Table 2: 20-year present value costs per employee for small vs. large businesses

RETROFITS	20-Year Present-Value Cost per Employee IF SMALL	20-Year Present-Value Cost per Employee IF LARGEST
Commercial passenger	$137,094	unknown
Commercial fishing -- LOW	$9,934	unknown
Commercial fishing -- HIGH	$30,102	unknown
Tugboats	$8	$0.04
PUMPOUTS	**20-Year Present-Value Cost per Employee IF SMALL**	**20-Year Present-Value Cost per Employee IF LARGEST**
Commercial passenger	$3,426	unknown
Commercial fishing -- LOW	$20,542	unknown
Commercial fishing -- HIGH	$31,125	unknown
Tugboats	$12.97	$0.51

Unknown cost ratios are due to limited data availability for the largest businesses, which could be potentially individually identified in aggregate data.[56] Note that commercial fishing values are based on entire commercial fishing vessel population of 347 initial 2005 population, and commercial passenger estimates are based on an initial population of 3 if they choose to retrofit.

We concluded that the rule is likely to have disproportionate impacts on small businesses within the industries that incur compliance costs, based on identifiable data, and therefore Ecology must include elements in the rule to mitigate this disproportion, as far as is legal and feasible. Where the relative ratios are unknown, Ecology must also mitigate costs to small businesses. Note that employment distributions were available at the three-digit North American Industry Classification System (NAICS) level, which combined different sizes of vessel (such as small commercial passenger vessels that are primarily large businesses, and large cruise ships owned exclusively by large businesses) and were identified at the facility or location level. This means the disproportionate impact identified in the table above is likely overestimated.

7.3 Loss of sales or revenue

Businesses that will incur costs could experience reduced sales or revenues if the costs significantly affect the prices of the goods they sell. The degree to which this could happen is strongly related to each business's production and pricing model (whether additional lump-sum costs significantly affect marginal costs), as well as the specific attributes of the markets in which they sell goods, including the degree of influence of each firm on market prices, as well as the relative responsiveness of market demand to price changes.

Businesses could also lose sales and revenue under the rule if they need to take time away from business operations to comply. Based on the assumption that tugs would need to take additional time off of doing business, and a reported cost of between approximately $2,500 and $3,000 in lost revenues per pumpout event for tugs that were not retrofitted with a Type III MSD.[57]

[56] Ibid.
[57] WA Ecology (2012). Phase 2 Vessel Population and Pumpout Facility Estimates, Puget Sound No Discharge Zone for Vessel Sewage. Publication no. 12-10-031 Part 4.

7.4 Action Taken to Reduce Small Business Impacts

The RFA (19.85.030(2) RCW) states that:

> Based upon the extent of disproportionate impact on small business identified in the statement prepared under RCW 19.85.040, the agency shall, where legal and feasible in meeting the stated objectives of the statutes upon which the rule is based, reduce the costs imposed by the rule on small businesses. The agency must consider, without limitation, each of the following methods of reducing the impact of the proposed rule on small businesses:
>
> a) Reducing, modifying, or eliminating substantive regulatory requirements;
>
> b) Simplifying, reducing, or eliminating recordkeeping and reporting requirements;
>
> c) Reducing the frequency of inspections;
>
> d) Delaying compliance timetables;
>
> e) Reducing or modifying fine schedules for noncompliance; or
>
> f) Any other mitigation techniques including those suggested by small businesses or small business advocates.

Ecology considered all of the above options, and included the following legal and feasible elements in the rule that reduce costs. In addition, Ecology considered the alternative rule contents discussed in Chapter 6, and excluded those elements that would have imposed excess compliance burden on businesses.

For vessel types that expressed concern about being able to comply – which included small businesses – the rule allows an additional five years before compliance is required. Other NDZs, such as in Massachusetts, required immediate compliance.

7.5 Small Business and Government Involvement

Ecology involved small businesses and local government in its development of the rule as part of its overall engagement strategy, summarized in the table below.

Table 3: Outreach to the public, stakeholders, tribes, and governments

Outreach Activity	Date	Description	Attendees/Audience
Washington State Department of Health (DOH), Washington State Parks and Recreation Commission (Parks), Washington State Fish and Wildlife (WDFW), consultations	2011-2012	Ecology included other state agencies in the early planning process of NDZ evaluation.	DOH, Parks, WDFW, WA Sea Grant, Puget Sound Partnership
Annual Cruise Ship Memorandum of Understanding (MOU) Meetings	January 13, 2011 February 16, 2012 February 28, 2013	At each of these annual MOU meetings, Ecology briefed the cruise industry, the Port of Seattle, and the public on the No Discharge Zone Evaluation Project progress to-date.	Cruise Lines/Assoc, Port of Seattle
Washington Environmental Council People for Puget Sound meetings	2011-2012	Ecology involved People for Puget Sound on the first phase of the NDZ, to provide input and help with research.	People for Puget Sound
Clean Boating Foundation Meeting	January 9, 2012	Ecology provided a presentation, open discussion, and answered questions on the NDZ evaluation project.	Clean Boating Foundation
Clean Marina Washington Meeting	June 13, 2012	Ecology provided a presentation, open discussion, and answered questions on the NDZ evaluation project.	Clean Marina WA
Ballast Water Workgroup Meeting	June 14, 2012	This meeting was focused on the vessel general permit, but Ecology briefly mentioned/discussed the NDZ with commercial vessel stakeholders.	WA Ports Assoc, Port of Seattle, various commercial vessel reps
Washington Sea Grant	Summer 2012	Ecology worked with Washington Sea Grant on a survey for recreational boats during the summer of 2012.	WA Sea Grant, rec boaters

Outreach Activity	Date	Description	Attendees/Audience
Recreational Boaters Association of Washington (RBAW) Meeting	September 6, 2012	This meeting was a result of e-mail exchanges between RBAW folks and Ecology and included a discussion session on the NDZ evaluation project, clarifications, and technical discussions.	Rec boaters/RBAW
Washington Boating Alliance (WBA) Meeting, Tacoma	December 13, 2012	Ecology provided a presentation, open discussion, and answered questions on the NDZ evaluation project.	Rec boaters/WBA: RBAW, Northwest Marine Trade Association (NMTA), Northwest Yacht Brokers Association (NYBA), United States Coast Guard (USCG), yacht clubs, Parks, WDFW, PSP
Washington Department of Natural Resources (DNR)	January 9, 2013	Through phone conversation with Naki Stevens, Ecology provided a brief overview on the NDZ evaluation and answered questions.	DNR
Cruise Line Association and Port of Seattle Meeting	February 28, 2013	Ecology met with the Cruise Line Association and the Port of Seattle; provided a presentation, open discussion and answered questions on the NDZ evaluation project.	Cruise Lines/Assoc, Port of Seattle
Washington Boating Alliance Meeting, Bellevue	March 4, 2013	WBA requested a meeting with Ecology to openly discuss the NDZ evaluation and options.	Rec boaters/WBA
E-mail sent to approximately 50 tribal stakeholders	February 13, 2013	Ecology sent e-mail to approximately 50 tribal contacts to provide a summary of the evaluation, a link to our website and a request for input. Emails sent through Tom Laurie.	tribal

Outreach Activity	Date	Description	Attendees/Audience
Email sent to approximately 300 stakeholders.	February 21, 2013	Ecology sent e-mail out to approximately 300 stakeholder groups/associations/entities and individuals to provide a summary of the evaluation, a link to our website and a request for input. Received numerous e-mails and letters from interested parties.	all
Outreach letters in response to questions and comments from stakeholders.	2012-2013	Ecology received phone calls and e-mails from interested stakeholders. Sent responses to letters to Shilshole Liveaboard Association, WBA, WA Ports Association, RBAW and NYBA.	all
Northwest Marine Trade Association (NMTA) Meeting	April 4, 2013	Ecology met with NMTA to discuss the NDZ evaluation project, engage in open discussion and answer questions.	Rec boaters/NMTA
Washington Liveaboard Association (WLA) Meeting	April 4, 2013	Ecology met with Washington Liveaboard Association to discuss the NDZ evaluation project, engage in open discussion and answer questions.	Rec boaters/WLA
Recreational Boaters Association of Washington (RBAW) Meeting	May 9, 2013	Ecology met with RBAW to discuss the NDZ evaluation project, engage in open discussion and answer questions.	Rec boaters/RBAW
Ecology's NDZ Advisory Group meeting	June 20, 2013	This was the first of two Advisory Group meetings that included various stakeholders.	All (see attendee list)
Ecology's NDZ Advisory Group meeting	July 11, 2013	This was the second of two Advisory Group meeting that included various stakeholders.	All (see attendee list)
Tug and Barge industry Meeting	August 13, 2013	Ecology met with a group of tug and barge industry representatives to discuss the details of sewage management on the various tug and barge vessels and the NDZ.	Tug and Barge industry, Port of Seattle

Outreach Activity	Date	Description	Attendees/Audience
Puget Sound Partnership (PSP) Ecosystem Coordination Board	September 19, 2013	Ecology provided a briefing on the NDZ evaluation project and answered questions.	PSP
E-mail sent to approximately 50 tribal stakeholders	November 7, 2013	Ecology sent e-mail to approximately 50 tribal contacts to provide a summary of the evaluation, a link to our website and a request for input. Emails sent through Tom Laurie.	tribal
NW Marina & Boatyard Conference	November 8, 2013	Ecology provided a presentation on the NDZ and answered questions.	Marinas, boatyards, rec boaters
Boater Safety Checks and Boarding Discussion, WBA and agencies	November 20, 2013	Ecology took part in a discussion requested by WBA on inspections and boardings by the various agencies.	USCG, WDFW, local sheriffs, WBA, others
RBAW Annual Meeting	November 23, 2013	Ecology provided a presentation on the NDZ and answered questions.	Rec boaters/RBAW
Tug and other vessel operator meeting at the North Pacific Fishing Vessel Owner's Association (NPFVOA) building	November 25, 2013	Ecology provided a presentation on the NDZ and answered questions.	More than 60 mostly commercial (tugs, fishing, small passenger vessel) and some rec vessel operators
U.S. Environmental Protection Agency (EPA)	On-going	Ecology has included EPA since the beginning of the evaluation process and provides regular updates.	EPA
Ecology's NDZ Website	On-going	Ecology's NDZ website has been on-line since August 2012 and has been updated regularly. The website has the following information: background on NDZs; relevant reports; a summary of the process; status updates; links to related sites; and contact information for questions or comments.	all
Puget Sound Partnership (PSP) Leadership Council	December 12, 2013	Ecology provided a briefing on the NDZ evaluation project and answered questions.	PSP, environmental groups

Outreach Activity	Date	Description	Attendees/Audience
Small Passenger Vessel site visit and meeting	January 9, 2014	Ecology toured 2 vessels and met with two companies (Un-Cruise and Linblad Expeditions) along with a naval architect. Discussed logistics of sewage management, etc.	Small passenger vessel industry
NDZ Marine Alliance, Director Mellon meeting	February 3, 2014	Discussed the concerns from the NDZ Marine Alliance on the NDZ.	NDZ Marine Alliance (RBAW, American Waterways Operators (AWO), fishing industry, NMTA, small cruise industry)
Cherry Point Aquatic Reserve meeting	February 18, 2014	Ecology provided a presentation on the NDZ and answered questions.	Aquatic Reserve committees, boaters, general public
NDZ Marine Alliance meeting	March 11, 2014	Discussion on NDZ concerns with the NDZ Marine Alliance.	NDZ Marine Alliance (RBAW, AWO, fishing industry, NMTA, small cruise industry)
Schooner Adventuress	March 17, 2014	Discussion on NDZ with Schooner Adventuress (Living Boat Foundation concept).	Schooner Adventuress
Seattle Yacht Club	May 29, 2014	Ecology provided a presentation on the NDZ and answered questions.	Rec boaters
Washington Boating Alliance meeting	June 12, 2014	Ecology provided a brief on the NDZ and answered questions.	Rec boaters/WBA
American Waterways Operators meeting (and others) at Foss Maritime Company	August 25, 2014	NDZ status update and discussion on concerns, costs, and pumpouts.	Tug and Barge industry, and other vessel operators (small passenger vessels, rec, etc.)
Shellfish stakeholders meeting	September 4, 2014	NDZ status update, general feedback discussion and answered questions.	Shellfish industry
Pacific Coast Shellfish Growers Association (PCGSA) annual conference	September 25, 2014	Ecology provided a brief on the NDZ and answered questions.	Shellfish industry
House Committee work session	September 29, 2014	Ecology provided a brief on the NDZ and answered questions.	House Committee and interested parties
Small Passenger Vessel meeting	October 6, 2014	NDZ status update and discussion on concerns and costs	Small passenger vessel industry

Outreach Activity	Date	Description	Attendees/Audience
American Waterways Operators meeting (and others) at Harley Marine Services	January 15, 2015	NDZ status update and discussion on costs, and pumpouts.	Tug and Barge industry
Puget Soundkeeper Alliance	March 9, 2015	Ecology met with Puget Soundkeeper Alliance to provide a status update and answer questions.	NGO
Cruise Line Association International North West & Canada and Port of Seattle Meeting	March 12, 2015	Ecology provided a status update and answered questions on the NDZ evaluation project.	Cruise Lines/Assoc, Port of Seattle
Washington Boating Alliance (WBA) Meeting	April 9, 2015	Provided a brief update on the NDZ	Rec boaters/WBA
American Waterways Operators call with Herrera Environmental Consultants, Inc.	May 7, 2015	Led a call to coordinate technical information to Herrera for work done on studying cost impacts	Tug and barge industry
Washington Boating Alliance (WBA) Meeting	November 12, 2015	Presented an update on the NDZ	Rec boaters/WBA
NDZ Implementation Planning Meeting	December 3, 2015	Review of Draft Implementation Plan and planning meeting	State agencies, environmental groups, and other implementation partners
Ecosystem Coordination Board Meeting	January 14, 2016	Provided NDZ status update and answered questions	Board Members
NDZ Marine Alliance representatives Meeting	February 1, 2016	Provided an update on modeling results and recent studies	Tug and Barge industry, cruise ships, recreational boaters, NDZ Marine Alliance
NDZ Marine Alliance Meeting	February 23, 2016	Update and discussion on modeling results and the NDZ	Tug and Barge industry, NDZ Marine Alliance representatives, Governor's Office
NDZ Marine Alliance representatives Meeting	March 3, 2016	Discussion on modeling results	Tug and Barge industry, cruise ships

Outreach Activity	Date	Description	Attendees/Audience
Cruise Lines and Port of Seattle Meeting	April 5, 2016	Ecology met with the Cruise Line International Association North West & Canada and the Port of Seattle; provided a status update and answered questions on the NDZ.	Cruise Lines/Assoc, Port of Seattle
Washington Department of Fish & Wildlife Briefing	April 7, 2016	Provided a briefing on the NDZ and answered questions.	State agencies
Salish Sea Conference	April 13, 2016	Provided a presentation on the NDZ and modeling work	Various
American Petroleum Institute	June 14, 2016	Provided a briefing on the NDZ and answered questions.	Oil tanker companies and tug and barge industry
NDZ Marine Alliance representatives Meeting	July 19, 2016	Discussion on status of NDZ, implementation challenges and long term infrastructure planning.	Tug and Barge industry, NDZ Marine Alliance representatives, Governor's Office
Northwest Straits Commission	August 26, 2016	Provided a briefing on the NDZ and answered questions.	NW Straits Commission members
United States Coast Guard (USCG)Meeting	December 20, 2016	Discussion on potential NDZ implementation	USCG
United States Coast Guard (USCG)Meeting	August 3, 2017	Discussion on vessel logistics and enforcement strategies	USCG
Lower Elwha Klallam Tribe, Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe Government to Government consultation Meeting	September 25, 2017	Government to Government Consultation	Lower Elwha Klallam Tribe, Jamestown S'Klallam Tribe, Port Gamble S'Klallam Tribe
Recreational Boaters Association of Washington (RBAW) and Northwest Marine Trade Association (NMTA) Meeting	November 7, 2017	NDZ Status meeting and discussion	Recreational boaters
NDZ Enforcement Committee Planning Meeting	February 9, 2018	Roll-out planning meeting	Federal and State agencies

Outreach Activity	Date	Description	Attendees/Audience
NDZ Education and Outreach Committee Implementation Planning Meeting	February 22, 2018	Roll-out planning meeting	State agencies, environmental groups, and other implementation partners
Various phone calls	Ongoing	Various calls with stakeholders to either answer questions or brief with an update or discussion	various

7.6 NAICS Codes of Impacted Industries

The rule is likely to impact North American Industry Classification System (NAICS) codes:

- 1141 – Fishing (includes shellfish industry)
- 4831 – Deep Sea, Coastal, and Great Lakes Water Transportation
- 4872 – Scenic and Sightseeing Transportation, Water
- 4883 – Support Activities for Water Transportation

7.7 Impact on Jobs

Ecology used the Washington State Office of Financial Management's (OFM) 2007 Washington Input-Output Model[58] to estimate the impact of the rule on jobs in the state. The model accounts for inter-industry impacts and spending multipliers of earned income and changes in output.

The rule will result in transfers of money within and between industries. Because pumpouts and dump stations could be public or private, we conservatively assumed that those expenditures were made at public facilities, which does not result in additional jobs or spending in the OFM model (the model does not include a public sector). It was also not possible to confidently assume what proportion of retrofit expenditures will stay in state. This means job losses are overestimated, and net impacts to jobs will likely be smaller due to some types of expenditure staying in the state and funding positions such as public or private pumpout facility staff.

Under the low cost assumptions, the Washington State economy could experience a net loss of 215 full-time employees (FTEs) over 20 years, across all private industries in the state. Most of these losses would be within the most-impacted industry, with a projected loss of 62 FTEs in shipping and transportation support industries.

Under the high cost assumptions, the Washington State economy could experience a net loss of 242 FTEs over 20 years, across all industries in the state. Similarly to the estimate under low-cost assumptions, most of these losses would be within the most-impacted industry, with a

[58] See the Washington State Office of Financial Management's site for more information on the Input-Output model. http://www.ofm.wa.gov/economy/io/2007/default.asp

projected loss of 62 FTEs in shipping and transportation. The higher total job losses stem from higher estimated costs for commercial fishing.

These prospective changes in overall employment in the state are the sum of multiple small increases and decreases across all industries in the state. These estimates include only the impacts of compliance cost expenditures, and do not include potential job growth from increases in harvestable shellfish acreage.

References

RCW 34.05.272 requires Ecology to categorize sources of information used in significant agency actions made in the Water Quality Program.

Independent peer review: Review is overseen by an independent third party.

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External peer review: Review by persons that are external to and selected by Ecology.

n/a

Open review: Documented open public review process that is not limited to invited organizations or individuals.

n/a

Legal and policy documents: Documents related to the legal framework for the significant agency action, including but not limited to: federal and state statutes, court and hearings board decisions, federal and state administrative rules and regulations, and policy and regulatory documents adopted by local governments.

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Records of the best professional judgment of Ecology employees or other individuals.

Personal communication with Mark Toy, WA Department of Health. 9/13/17.

Public comment received from Susan Hayman. See the associated Concise Explanatory Statement for this rulemaking, comment O-12-4.

Other: Sources of information that do not fit into other categories.

Communication between Port of Bellingham and Amy Jankowiak, Ecology. Email, 7/6/17. Subject: Funding Status for Agreement No. OTGP-VER1-BellPo-00024.

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Appendix A: Administrative Procedure Act (RCW 34.05.328) Determinations

Describe the general goals and specific objectives of the statute that this rule implements. RCW 34.05.328(1)(a)
See Chapter 6.
Explain why this rulemaking is needed to achieve the goals and objectives of the statute. RCW 34.05.328(1)(b)
See Chapters 1 and 2.
Describe alternatives to rulemaking and the consequences of not adopting this rule. RCW 34.05.328(1)(b)
Alternatives considered were public outreach and guidance to encourage vessel sewage no discharge. Without rulemaking, enforcement capabilities of a No Discharge Zone would not occur and the status quo would exist with discharges occurring. **Please see the Least Burdensome Alternative Analysis, Chapter 6 of this document, for discussion of alternative rule content considered.**
A preliminary cost-benefit analysis was made available. RCW 34.05.328(1)(c)
Notice was provided in the proposed rulemaking notice (CR-102 form) filed under RCW 34.05.320.
Do the probable benefits of this rulemaking outweigh the probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented? RCW 34.05.328(1)(d)
See Chapters 1 – 5.
Is this rule the least burdensome alternative for those required to comply? RCW 34.05.328 (1)(e)
Please see Chapter 6 and record for rulemaking.
Does this rule require those to whom it applies to take an action that violates requirements of another federal or state law? ☐ **Yes** ☒ **No** **Explain how that determination was made.** RCW 34.05.328(1)(f)
There are no actions in this rule that violate other federal or state laws.
Does this rule impose more stringent performance requirements on private entities than on public entities? RCW 34.05.328 (1)(g)

Describe the general goals and specific objectives of the statute that this rule implements. RCW 34.05.328(1)(a)

☐ **Yes. Provide a citation. Explain.**

☒ **No**

This rule applies to all recreational and commercial vessels in the same way (a ban on sewage discharges) whether public or private.

Do other federal, state, or local agencies have the authority to regulate this subject?

☒ **Yes. List below.** ☐ **No**

Is this rule different from any federal regulation or statute on the same activity or subject?

☒ **Yes** ☐ **No**

If yes, check all that apply. The difference is justified because:

☒ **A state statute explicitly allows Ecology to differ from federal standards. (If checked, provide the citation.)**

☐ **There is substantial evidence that the difference is necessary to achieve the general goals and objectives of the statute that this rule implements. (If checked, explain.)**

RCW 34.05.328 (1)(h)

The Clean Water Act and the EPA's determination allows the State to prohibit the discharges of sewage from all vessels and RCW 90.48.260(1) designates Ecology as the state agency for purposes of the federal Clean Water Act. Baseline regulatory authority: US Coast Guard, Ecology. Regulatory authority under the adopted rule: other federal, state, or local agencies as authorized.

Explain how Ecology ensures that the rule is coordinated with other federal, state, and local agencies, laws, and rules. RCW 34.05.328 (1)(i)

Ecology worked with tribes to discuss rule activities and seek input. We worked with Washington State Department of Licensing in research and information on registered vessels. Other coordinating federal and state agencies include the United States Environmental Protection Agency, United States Coast Guard, Washington State Department of Health, Puget Sound Partnership, Washington State Fish and Wildlife, Washington State Parks and Recreation Commission, and Washington State Department of Natural Resources. See Chapter 7 for a table of meetings and other communications.

Appendix B: Map of NDZ Area