



**SUMMARY REPORT: TRACKING REPORTS AND
PROJECTS OF POTENTIAL POLLUTION SOURCES IN
THE DRAYTON HARBOR WATERSHED 1991 – 2003**

Submitted to
Washington State Department of Health

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Introduction

Drayton Harbor is located in the northwestern corner of Whatcom County, Washington, just south of the international border with Canada (Figure 1). The City of Blaine is located between the Canadian/U.S. border and Drayton Harbor. The Blaine Marina is at the northwest entrance of the Drayton Harbor, and Semiahmoo Spit with the Semiahmoo Marina is on the southwest side of the Harbor's entrance. Blaine Marina has 680 boat slips and over 700 square feet for visitor moorage. Semiahmoo Marina can accommodate almost 300 recreational boats. Drayton Harbor is connected to Semiahmoo Bay and the Strait of Georgia by a 500-foot passage (Peterson, 1995). This narrow entrance, with a wide, shallow bay may make Drayton Harbor more susceptible to elevated fecal coliform levels (Herrera, 1998).

The Drayton Harbor Watershed, draining to Drayton Harbor, is 35,372 acres in size. Primary drainages in the watershed are California and Dakota Creeks (PSCRBT, 1991). Dakota Creek drains 52% of the watershed, while California Creek drains 38% of the watershed. Ten percent of the land base drains directly into Drayton Harbor. Land uses in the California and Dakota Creek drainages include commercial dairies, berry farms, large livestock operations, and about 200 non-commercial farms. Population within the Drayton Harbor watershed is approximately 10,645.

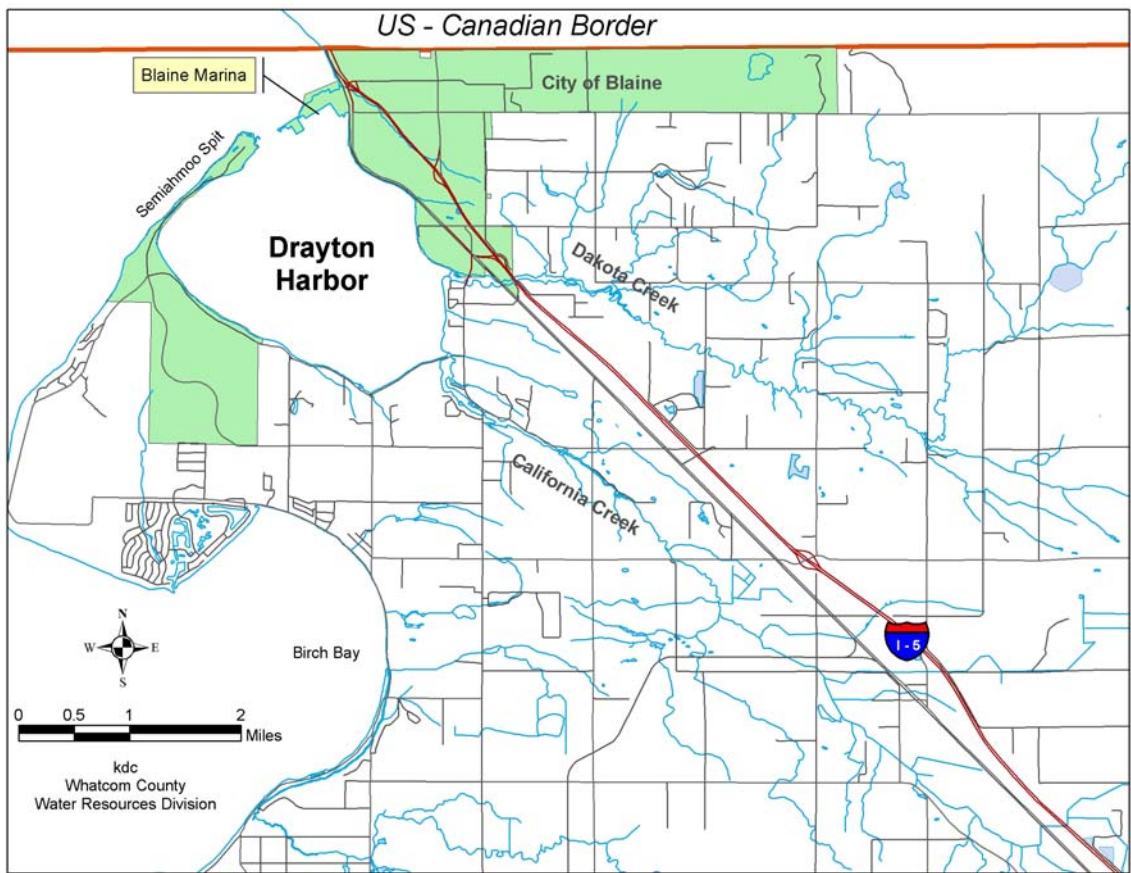


Figure 1: Location Map of Drayton Harbor

Importance of Drayton Harbor

In 1988, the Whatcom County Watershed Ranking Final Report ranked the Drayton Harbor watershed as a number one priority watershed. Drayton Harbor was ranked first place due to threatened beneficial uses from existing or potential nonpoint pollution sources (Creahan, 1988). The beneficial uses in place by 1988 were the commercial shellfish beds, recreational activities such as swimming, boating and bird watching in the Harbor, and productive salmon and trout streams (Creahan, 1988). These beneficial uses are sensitive to declining water quality levels and possible sources were identified as agricultural practices within the watershed, septic systems, and runoff from the urban areas surrounding the Harbor (Creahan, 1988).

The Drayton Harbor system is a unique estuary with a long history of commercial oyster farming, tribal clam harvesting for both commercial and ceremonial uses, and recreational shellfish harvesting. Due to ongoing point and nonpoint source pollution within the Drayton Harbor ecosystem, opportunities for safe shellfish and oyster harvesting have declined since the 1980s. Years of study on the declining water quality have not yet clearly identified major sources of fecal coliform bacteria, and water quality continues to not meet state standards at some sites (Beard and Conner, 2002).

Closure

On January 11, 1995, the Washington State Department of Health (DOH) downgraded portions of the shellfish growing areas of Drayton Harbor to *Restricted* and *Prohibited* from *Approved*. By fall of 1999, shellfish harvesting was *Prohibited* in the entire harbor. This downgrading was based on water quality data and evaluation of the pollution sources.

DOH certifies any area used for commercial shellfish harvesting by conducting sanitary surveys and water quality data evaluations. The sanitary surveys include water quality and shoreline investigations that identify potential sources of contamination. If the data indicate that fecal material, pathogenic microorganisms, marine biotoxins, or poisonous substances are present in levels that are a danger to human health, DOH will prohibit or restrict shellfish harvesting at that site. Classification of the shellfish beds is based on the 30 most recent samples taken from each sampling station around the harvest areas. Presence of certain levels of fecal coliform bacteria is an important indicator of water quality. Fecal coliform is associated with viral and bacterial pathogens and are commonly found in the feces of warm-blooded animals. The source of fecal coliform is typically traced to human sewage or animal fecal matter. Water quality standards limit fecal coliform amounts (FC) to the levels described in Table 1.

Table 1: Fecal Coliform Water Quality Standards

Class of Water	Part 1	Part 2
Freshwater – Class A	FC are not to exceed a geometric mean of 100 organisms per 100 ml of water.	Not more than 10% of the samples are to exceed 200 organisms per 100 ml of water.
Marine water – Class AA and Class A	FC are not to exceed a geometric mean of 14 organisms per 100 ml of water.	Not more than 10% of the samples are to exceed 43 organisms per 100 ml of water.

The water quality data from the January 1995 downgrade showed elevated amounts of fecal coliform in Drayton Harbor. The January 1995 reclassification attributed the sources of pollution to the following (Meriwether, 1995):

- Failing on-site sewage systems in or near the harbor shoreline and creeks
- City of Blaine sewage treatment and bypass
- Storm water runoff
- Blaine and Semiahmoo Marinas
- Agricultural practices in California and Dakota Creek Watersheds
- Fish processing wastewater

Further sources were identified in the 1999 downgrade (Meriwether, 1999):

- Runoff contamination associated with stormwater events
- Marine mammals
- Possible leaks from the forcemain of the Blaine STP collection system near the harbor mouth

Response to Closure

The Initial Closure Response Strategy (Ecology, 1995) identified activities that began prior to the January 1995 downgrade that attempted to protect and restore water quality. These actions included (Ecology, 1995):

- Watershed Planning by the Whatcom Council of Governments, which published the Drayton Harbor Watershed Action Plan
- Implementation of Best Management Practices on farms

- Improvements to the sewer collection systems by the City of Blaine
- Extension of sewer line to areas with failing on-site septic systems
- Addition of pump out stations at the marinas

Further actions to restore water quality after the closure were outlined as (Ecology, 1995):

- Fluorometer test of sewer line across the mouth of the harbor to determine if the line is leaking
- Water quality sampling and flow measurements of stormwater outfalls and tributaries to the Harbor
- Identification of possible problem areas with the marinas with shellfish tissue samples

The Drayton Harbor Shellfish Protection District (DHSPD) was formed in 1995 (Ordinance 95-036). The District was formed based on the Revised Code of Washington (RCW) Chapter 90.72 that requires the county legislative authority to create a shellfish protection district within 180 days after the State Department of Health (DOH) closes or downgrades a shellfish growing area due to a degradation of water quality as a result of pollution.

The shellfish protection district creates a forum, through the formation of an advisory committee, to address point and non-point sources of pollution that may be affecting water quality over the shellfish beds, with the intent of developing strategies to help restore the areas for shellfish harvesting. The ultimate goal of the committee is to make improvements to the water quality of the shellfish district, enabling the shellfish beds to be re-classified to an approved status. The committee has met on a monthly basis since August 1995 and provided two reports (1998 and 2000) outlining their Shellfish Protection Program to the Whatcom County Council. The 2000 Report was adopted by Whatcom County as the shellfish protection program for Drayton Harbor.

Current Activities

The Drayton Harbor Shellfish Protection District Advisory Committee continues to vigorously pursue improvements in the water quality of Drayton Harbor. The Committee is committed to its efforts in education and study of, and solutions for the water quality issues within the Harbor, and is actively distributing information to the community around Drayton Harbor and interested parties in Whatcom County and the Puget Sound area. The Committee holds annual Open

Houses as a forum for educating the public and improving communication between agencies. In addition, the Community Oyster Farm was formed in 2001 as a Puget Sound Restoration Fund Project. The intent of the Community Oyster Farm is to build community support for water quality improvement, eliminate sources of pollution, and to generate revenue for water quality improvements. During June 2001, approximately 800,000 oysters were planted in Drayton Harbor with the estimated harvest date this spring.

Water quality continues to be monitored and recorded in Drayton Harbor. Washington Department of Health currently has seven sites (1 near the entrance and 6 within the Harbor) that are monitored monthly for fecal coliform levels. One of these sites, Station #4, represents the Community Oyster Farm location.

In 2002, Washington Department of Health provided the Drayton Harbor Shellfish Protection District Advisory Committee and Community Oyster Farm with three criteria that the must be met in order to harvest shellfish (Meriwether, 2003):

- 1) Water quality standards at the shellfish growing areas must be met
- 2) Contamination at Stations #8 and #15 must be sufficiently diluted during a flood tide before getting to the shellfish beds
- 3) It is shown that the shellfish beds are not impacted by human fecal contamination

For criterion #1, the water quality has continued to improve. Prior to the winter of 2003 to 2004, water quality at stations 4 and 6 were showing signs of improvement. But poor results, with the exception of Stations 8 and 15, were detected during November and December 2003, and in January 2004. These results were associated with precedent rainfall events. Preliminary analysis by DOH indicates that stations 3, 4, 5, 6, and 12 meet the shellfish growing standards when wet weather data is excluded. This creates the opportunity for considering a reclassification for portions of Drayton Harbor to “Conditional” status.

Criterion #2 was satisfied with the Department of Health dye and drogue study in summer of 2003 that found that Station #8 does not have significant impact on Station #4 (Meriwether, 2003). Under criterion #3, several efforts have been undertaken to identify, better understand, and control human sources of pollution. The primary efforts include: Marine Drive sewer (video, repair, and dye testing); dye tests of sewer lines in Blaine to document no cross connections with

high priority storm drains; circulation studies conducted by PSRF in and around the commercial portion of Blaine Harbor; and inspection and repair of onsite Septic Systems (OSS) in South Drayton Harbor. These studies and accompanying reports are listed and summarized in the following section.

The following is a summary of reports and projects of primary significance undertaken within the Drayton Harbor Watershed from 1991 to 2003. The reports and projects are broken down by year with the reports listed alphabetically by author. The projects follow the reports and are listed alphabetically by agency. Every attempt was made to track down all reports of importance to Drayton Harbor water quality issues and potential pollution sources, but no guarantee is made that all reports are included.

Summary of Reports and Projects by Year

1991

Cook, Susan, 1991. Water Quality in Drayton Harbor, Whatcom County, Washington 1989 – 1990. Prepared for the Semiahmoo Company, Blaine, Washington by Susan Cook.

This study, and a similar one performed in 1987, sampled locations in Drayton Harbor, California and Dakota Creeks, and stormwater drainages each month. The results of these two studies found a distinct seasonal pattern to water quality parameters that are correlated to freshwater flow. Increased levels of nutrients and fecal coliform were found during storm events, with California and Dakota Creeks identified as the primary sources for fecal coliform.

Puget Sound Cooperative River Basin Team. 1991. Drayton Harbor Watershed, Whatcom County Washington. USDA Soil Conservation Service, USDA Forest Service, Washington State Department of Fisheries, Washington State Department of Ecology, and US Environmental Protection Agency. Prepared for Whatcom County Council of Governments, October 1991. 106 pages.

This technical report was designed to support development of the Drayton Harbor Watershed Action Plan. After an inventory of the watershed, the team found:

- Shellfish beds open at the time were threatened by bacterial pollution
- Anadromous fish in California Creek are negatively impacted by loss of habitat and low stream flows
- Significant bacterial contamination from animal waste on both commercial and hobby farms from high livestock concentrations and poor management
- Potential contributions of bacterial contamination and nutrients to surface and groundwater from on-site septic systems due to poor soil conditions and inadequate maintenance
- Conversion of land from forest or agriculture to urban uses poses a threat to water quality by increasing erosion, increasing pollutants in runoff, and increasing the loss and degradation of wetlands and riparian habitat
- Disturbance to most wetlands has reduced their capability to improve water quality and to regulate stream flows
- Stormwater needs to be adequately controlled by both Whatcom County and the City of Blaine

The Drayton Harbor Watershed water quality survey found that over 79% of residents surveyed said they would support a program to improve water quality. However, the report cautions that if the solutions are not socially, economically, and politically feasible, it is doubtful that any real progress can be made in protecting the waters of Drayton Harbor Watershed.

Dickes, B. 1992. Water Quality Screening in the Dakota, Bertrand, and Fishtrap Creek Watersheds, Whatcom County, Washington. Washington State Department of Ecology, Olympia, WA.

A water-quality screening was done in Bertrand, Dakota, and Fishtrap Creek Watersheds from February to March 1992. The objective was to identify water quality problem areas during wet season runoff conditions in order to assist in prioritizing areas for further investigation and targeting of source controls. However, precipitation was low and runoff conditions did not occur during the study period. To fully characterize the potential of nonpoint pollution to surface waters, additional wet season monitoring was suggested. However, high fecal coliform bacteria concentrations appear to be associated with concentrated commercial dairies and other livestock farms. To further identify impacts from specific agricultural uses, failing septic systems, and groundwater, intensive studies are necessary with emphasis on the following high priority items:

1. In the Dakota Creek Watershed, the South Fork drainage had the worst water quality in the watershed and sources need to be identified for the elevated bacteria and low oxygen.
2. In the Bertrand Creek Watershed, the upper drainage area of Duffner Ditch had particularly poor water quality and lower drainage areas had elevated bacterial levels.
3. In the Fishtrap Creek Watershed, water quality needs to be improved along Double Ditch Road.
4. Near the intersection of Visser and Depot Roads, the drainage ditch had the worst water quality of all three watersheds in the study.
5. Fecal coliform criterion was violated in the ditch alongside Bender Road at multiple sites.

Saban, L., and R. Matthews. 1992. Drayton Harbor Watershed Study Final Report, Huxley College of Environmental Studies, Western Washington University, Bellingham, Washington. November 1992. 47 pages.

This report describes the results of a water quality assessment prepared for the Whatcom County Council of Governments. It consisted of ambient water quality monitoring and investigative/remedial action monitoring. In the ambient program, six sites were selected, including three freshwater sites (California Creek, Dakota Creek, and one storm drain outfall from the city of Blaine); two marine sites in Drayton Harbor; and one marine site outside the channel to Drayton Harbor. The more intensive investigative sampling was undertaken in the watersheds of California Creek and Dakota Creek and along the Drayton Harbor beach to identify areas of potential water quality concern for future remediation. Both the ambient and investigative sampling programs indicated that many of the tributaries flowing into Drayton Harbor, as well as the harbor itself, failed to meet freshwater or marine Class A water quality standards. The most common problems at freshwater sites were high fecal coliform counts or low dissolved oxygen concentrations. A number of California Creek tributaries and a few Dakota Creek tributaries had

exceptionally high nutrient concentrations. In Drayton Harbor, the average fecal coliform concentrations at all sites were slightly above Class A standards for marine waters. This report suggested that future efforts should focus on

- Developing a management plan that has specific recommendations for controlling direct discharge of untreated residential and urban runoff
- Performing detailed on-site inspections of sites listed as high priority sites to determine sources of pollution (i.e. leaking septic systems, poor agricultural runoff management, and improper storm drain hook-ups)
- Follow-up, site specific, water quality monitoring to determine effectiveness of remedial actions
- Continuing ambient monitoring at a reduced level while targeting specific goals such as determining effectiveness of remedial actions

Whatcom County, 1992. Category 1 Wetlands, Abridged with Color Photographs, Whatcom County Environmental Resources Report Series, Whatcom County Planning and Development Services Planning Division, Bellingham, Washington. April 1992. 47 pages.

This document summarizes the results of a paper and field inventory, which identified and described some of the wetlands, which have been given a preliminary designation as Category 1 Wetlands based on the Whatcom County Wetlands Rating System. Category 1 Wetlands are defined as having exceptional resource value based on the unique qualities, presence of rare wetland communities, and sensitivity to disturbance, with one or more of the following features:

- A. Documented habitat for endangered or threatened plant, fish, or animal species or for potentially extirpated plant species recognized by State or Federal agencies; or
- B. Wetland communities which qualify as quality Natural Heritage wetlands; or
- C. High quality wetlands with irreplaceable ecological functions, including peat wetlands, estuarine wetlands, or mature forest wetlands; or
- D. Wetlands of exceptional local significance. The criteria for such designation includes, but not limited to, rarity, groundwater recharge areas, significant habitats, unique educational sites, or other specific functional values within a watershed.

Within this report, the Dakota Creek estuarine system, located in the lower third of the Drayton Harbor watershed, was ranked as a Category 1 Wetland. The reasoning for this ranking was the size of the wetland (11 acres) since it is an estuarine wetland over five acres, and all of the meander bend salt marshes are hydrologically connected by a large tidal channel. This is the largest relatively undisturbed estuarine wetland in the county with the exception of the Nooksack River Estuary.

Hrutford, David, 1993. Sedimentation in Drayton Harbor. Unpublished paper. Western Washington University. Bellingham, Washington. 22 pages.

This study reviewed series of maps and air photos over the last 67 years to determine the rate of sedimentation in Drayton Harbor. The study found that the sediments in the southern half of the bay are mainly from California and Dakota Creeks and that increasing grain size near the mouth of the bay is due to infilling from the tides. This study concluded that Drayton Harbor is filling up with sediments faster than the tides are able to transport them out.

Eissinger, A. 1994. Significant Wildlife Areas, Whatcom County, Washington. Whatcom County Environmental Resources Report Series, Whatcom County Planning and Development Services Planning Division, Bellingham, Washington. December 1994.

This document is a comprehensive wildlife report, which serves as a background document for local wildlife resources. Significant Wildlife Areas are defined as a presence of high quality habitat, which supports native species of concern and/or large concentrations of native species and/or areas of high biological diversity. Drayton Harbor is located under Marine and Shoreline Areas and represents an estuarine embayment, rich with invertebrate and vertebrate marine life and a great diversity of marine associated birds.

Cykler, J., M. Haggerty, and R. Matthews, 1995. Fecal Coliform Contamination Study of Drayton Harbor. Submitted to the Washington State Department of Ecology. Western Washington University, Bellingham, WA. 53 pages, plus appendices.

This study was conducted to help identify and delineate sources contributing to the fecal coliform contamination problem that led to the shellfish downgrade in Drayton Harbor. This task was listed as a high priority for Drayton Harbor in the 1995 Initial Closure Response Strategy. This study was conducted for a short period of time and found that

- The Blaine Marina appears to be a significant source of fecal coliform pollution.
- Results show that almost all the freshwater tributaries into the Harbor failed to meet the water quality standards for fecal coliform concentrations.
- Nineteen of twenty-six outfalls tested were identified as high priority for follow-up on fecal bacteria source identification.
- Oyster tissue samples, collected in the summer, met the criteria for marketable shellfish, although this could be due to low levels of contaminated freshwater entering the Harbor and therefore not having much effect on water quality.
- The sewage pipe that crosses the mouth of the harbor did not appear to be a significant source of fecal coliform concentrations during the time frame of this study.

The study recommended:

- Signs should be posted at all locations that are classified as RESTRICTED or PROHIBITED.
- Signs should be posted at the entrance of the Harbor and Blaine Marina notifying users of the delicate nature of Drayton Harbor and requesting sewage not be dumped for any reason.
- Blaine Marina and fish processors need to implement a monitoring and management group to eliminate the dumping of sewage into harbor waters.
- Complete a circulation study of marina and harbor waters so that delineation of fecal coliform pollution can be better understood.
- The shellfish district should take full advantage of its powers granted to control and minimize fecal coliform pollution in Drayton Harbor and its tributaries.
- Conduct a thorough investigation of septic tank systems, especially those close to polluted drainages. Connection of all residents and businesses to a sewer line should be encouraged.
- Use of, and aid in the implementation of best management practices, particularly on dairy farms and other commercial lands that may contribute to fecal coliform pollution.
- Signs should be posted on all freshwater tributaries indicating that there may a human health hazard.
- Signs should be posted on all outfall pipes discouraging people and children from playing in or around them.
- Pollution prevention should be encouraged when evaluating methods of treatment for drainages with non-point pollution problems.

- Short-term integrity tests of the sewage pipe should be made, followed by monthly test of the pipe, until absolute integrity is justified.

This study was submitted to Ecology in May 2000 for evaluation as to its fitness for establishing a TMDL for Drayton Harbor.

Peterson, B. 1995. Drayton Harbor Watershed Management Plan. Whatcom County Council of Governments, Drayton Harbor Watershed Management Committee, Bellingham, Washington. July 1995. 200 pages.

In 1988, the Drayton Harbor Watershed was ranked by local governments and affected parties as Whatcom County's priority watershed under the Puget Sound Water Quality Authority's nonpoint program. Following this prioritization, the City of Blaine requested that the Whatcom County Council of Governments (WCCOG) apply for Centennial Clean Water Funds to develop a plan to address nonpoint pollution in this watershed. Funding was secured in 1990. Following the completion of a watershed characterization study (PSCRB, 1991), the Drayton Harbor Watershed Management Committee (DHWMC) was formed to protect the beneficial uses in the harbor and larger watershed, develop a plan recommending actions to control nonpoint pollution and identify a lead agency to monitor and implement the recommendations in the plan. The Drayton Harbor Watershed Plan was approved by Ecology in July 1995 and contained sixty-one recommendations for controlling various sources of nonpoint pollution. These recommendations are categorized by source and are summarized below:

Agriculture

1. Provide informational packets on improving water quality to noncommercial farms.
2. Establish a loan program for noncommercial or 'hobby' farms to implement best management practices.
3. Add owner responsibility for best management practices to zoning ordinance.
4. Pursue funds to establish a staff position to work exclusively on implementing agriculture recommendations.
5. Explore commercial use of animal waste solids.
6. Ensure conservation plans continue to be used on commercial farms.
7. Inventory commercial farms in California Creek subbasin.

Boats and Marinas

8. Develop a method to meter pump out facilities to compare number of boats using the marina to number of boats using the pump out facility.
9. Develop and implement an educational program for all boaters with emphasis on water quality.
10. Erect signs at marinas and at the entrance to Drayton Harbor to promote water quality protection.
11. Explore the possibility of erecting signs on land routes to Drayton Harbor.
12. Ensure compliance with all state and federal water quality standards with strategies for enforcing regulations.
13. Increased Coast Guard inspection of all vessels for waste holding and treatment facilities.
14. Consider alternative methods of disposal for waste at the Blaine Marina, such as a mobile pump out facility.
15. Recommend that all marina operators use moorage agreements that educate and promote environmental regulations.

16. Distribute educational materials regarding water quality at all boat license renewal sites.
17. If Blaine Marina expands, an additional pump out facility that is easily accessible should be installed.
18. Continue exploring all waste disposal and recycling methods at marinas.
 - On-site Sewage Treatment and Disposal Systems
19. Undertake a sanitary survey in high risk areas within a half a mile of Drayton Harbor.
20. Establish a program for financial assistance to low or fixed income homeowners.
21. Establish a program that would require system maintenance every five years.
22. Increase staff to assist in implementation of recommendations for on-site sewage systems.
23. Place a high priority on complaints filed in Drayton Harbor.
24. Use volunteer educators for a door-to-door campaign on the importance of septic maintenance.
25. Send out reminders for septic maintenance with tax notices.
26. Conduct an economic and environmental analysis of hooking up to city sewers in prioritized areas.
27. Include educational materials on septic maintenance in City of Blaine's newsletter.
28. Require topping of sand mounds with a grain size smaller than sand.
29. Require property owners to show the system is in proper operating condition before a title transfer, if a mortgage company is not involved with the sale.
 - Stormwater Runoff/Erosion
30. Identify alternatives to non-permeable surfacing materials in regulatory documents.
31. Provide incentives to incorporate alternative surfacing in building projects.
32. Adopt development standards that require erosion and stormwater control on all sites.
33. Recommend that Blaine adopt a filling, clearing, and grading ordinance (same as #54).
34. Address enforcement of development standards (two alternatives are offered in the Plan).
35. Review stormwater plans and inspect stormwater facilities for major developments during the wet season and then every two years to ensure compliance.
36. Request DHWMC participation in the City of Blaine's stormwater management plan.
37. Lead agency staff and DHWMC members should review Blaine's Critical Areas Ordinance.
38. A coordinated spill response plan should be developed due to the transportation corridors within the watershed.
39. Conduct workshops on best management practices for erosion and stormwater control.
40. Culverts, draining to Drayton Harbor and critical areas in Dakota and California Creeks, should be monitored on a regular basis.
41. Based on studies and monitoring of culverts and drainages, retrofitting and addition of new treatment facilities will be needed and should reflect the concerns and recommendations of any spill response plan.
42. Inventory existing culverts to determine if they block fish passage and take appropriate action to replace those that impede fish passage.
43. Agencies will assist in replacing culverts blocking fish passage.
44. Review subdivision and short plat requirements for revisions related to cluster development.

45. The City of Blaine's stormwater program and plan should include Urban Growth Boundaries.

Land Conversions

46. Review the exemption in County Ordinance 90-24, exemption list 3.101 subpart D item #4 that allows construction of roadway access in close proximity to streams.
47. Ground cover should be established in a timely manner to reduce soil erosion.
48. Promote planting of native western red cedar, western hemlock, or Sitka spruce with low canopy shrubs along streams.
49. Delay soil conversion/land disturbances until building permit has been applied for.
50. Encourage land conversion projects be conducted during the dry season to minimize soil erosion.
51. Raise public awareness about availability of landowner assistance programs.
52. Recommend DNR conduct a Timber, Fish, and Wildlife Watershed Analysis of Drayton Harbor watershed.
53. Consider zoning changes that take into account the sensitive areas in the Drayton Harbor watershed.
54. Recommend that Blaine adopt a filling, clearing, and grading ordinance (same as #33).

General Recommendations

55. Revise tax assessments to provide incentives to property owners for maintaining riparian and wetlands in their natural conditions.
56. Develop and implement a long term monitoring program in the watershed.
57. Identify public land acquisition for riparian and wetland areas.
58. Develop a directory of enforcement authority and responsibility.
59. Recruit volunteers for educational activities that promote water quality.
60. Recommend that the County Council consider Water Quality Protection Districts as a long-term strategy for funding programs addressing water quality.
61. Oversight of Plan implementation and evaluation to ensure elements of the Plan are carried out as intended by the DHWMC.

Most agencies, which were identified for specific tasks in the Plan's recommendation section provided letters of concurrence. Initially WCCOG was identified as the lead agency to implement the plan. After the loss of experienced personnel within this agency, subsequent attempts by the committee to identify an alternative suitable lead agency were not supported by the Department of Ecology. Portions of this plan have been implemented by various agencies during the past, primarily through efforts of the Drayton Harbor Shellfish Protection District Advisory Committee, which was formed in July 1995. This Watershed Action Plan is still considered a valuable body of work in the continuing effort to control bacterial pollution in this watershed.

Meriwether, F., 1995. Sanitary Survey of Drayton Harbor. Washington State Department of Health, Office of Shellfish Programs, Olympia, WA. January 1995. 35 pages

Based upon review of water quality, evaluation of pollution sources, and a 1994 shoreline survey, the Prohibited area in the southeastern portion of the bay is expanded to include approximately two-thirds of the bay. The southwestern portion of the bay remains *Approved* and the existing shellfish tract near stations 4 and 6 are downgraded to *Restricted* allowing for relay of commercial oysters to an Approved area prior to harvest. The outside of Semiahmoo Spit is classified as *Prohibited* and all of Drayton Harbor will

be closed following a bypass of sewage into the harbor from the City of Blaine's sewage collection system. Pollution sources include: failing onsite sewage systems near the shoreline, farm management practices in the Dakota and California Creek watersheds, the two marinas near the mouth of Drayton Harbor, sewage bypasses from the City of Blaine's sewage collection system, the Blaine Sewage treatment plant outfall located outside of Drayton Harbor, and process wastewater discharges from the seafood processors. Summarized conclusions from this survey are

1. North and eastern portion of Drayton Harbor should be classified as *Prohibited* and the southeastern portion should continue to be *Prohibited*.
2. Water quality analysis show that Drayton Harbor should not be a Conditionally Approved based on rainfall because of exceedences that occur during dry periods.
3. Water quality in the eastern portion of Drayton Harbor is impacted during ebb and flood tide indicating various pollutant source locations.
4. Documented sources of pollution along the eastern and southern shorelines include the Port of Blaine Marina area, the Portal Way drain, and both California and Dakota Creeks.
5. Recommended sanitary lines for Drayton Harbor place the two marina closure zones inside the Prohibited Area as fecal coliform pollution may be from lack of boat waste pump out station or from discharge at seafood processing facilities.
6. Improvements in the sewage collection system and renovation of pumps have decreased the frequencies of sewage discharge.
7. The recommended Prohibited Area for the Blaine STP includes all of the outside of Semiahmoo Spit to the mouth of the harbor. This is due to the potential of upsets rather than documented water quality degradation.

The existing commercial shellfish tract appears to meet the required criteria in the National Shellfish Sanitation Program Manual for Restricted Area classification.

Washington State Department of Ecology, 1995. Drayton Harbor Shellfish Growing Area Initial Closure Response Strategy. Washington State Department of Ecology, May 1995.

Initial (short-term) response strategy led by the Department of Ecology lists actions that can be quickly implemented to address the fecal contamination of shellfish beds in Drayton Harbor. The closure response strategy group identified thirty-three high priority actions. There were sixty-five participants from twenty-one organizations including citizens who participated in this process. These actions are compiled in a matrix, which is organized by pollution source and identifies the responsible authority to implement each action. The Bellingham Ecology office, according to this plan, will track implementation of the Closure Response Strategy. This report suggests that Whatcom County should convene an implementation committee for the 1995 Drayton Harbor Watershed Action Plan, and that a subcommittee of this group should focus on shellfish issues and track implementation of the actions identified in this report. At the time, and contingent upon grant funding, Whatcom County was prepared through Washington State University Cooperative Extension to implement the Drayton Harbor Watershed Action Plan. In the event that an implementation committee is not formed in 1995, this report states that Ecology will reconvene the participants in the closure response group in the fall of 1995 to track implementation. [Note: Whatcom County attempted but did not receive funding to implement the Drayton Harbor Watershed Action Plan; Ecology did not reconvene the response strategy participants in the fall of 1995; tracking implementation of the plan has

fallen to a volunteer citizens advisory committee, the Drayton Harbor Shellfish Protection District Advisory Committee, which was formed following the 1995 shellfish closure.]

The high priority Response Strategy Actions are as summarized:

1. Increased inspections by the U.S. Coast Guard of all vessels for waste holding and treatment facilities while making Drayton Harbor a priority for inspections and education.
2. Install signs at marinas that read, "Do not dump sewage – sensitive area".
3. Install pump out services.
4. Operate current pump out facilities year-round.
5. Recommend that all marina operators use moorage agreements to educate lessees and promote environmental regulations.
6. Distribute educational material regarding water quality, boats and marinas at boat license renewal sites in Whatcom County.
7. Extend sewer service to Sunday Harbor requiring hook-up for on site-systems.
8. Install signs at Semiahmoo and Peace Arch Park explaining where pump outs are and the need to use them to protect water quality.
9. Letters to homeowners in the Birch Bay Sewer and Water District notifying them that they must hook-up to the sewer service.
10. Designate Drayton Harbor as an Area of Special Concern through public process.
11. Require a Maintenance and Operation Program for on-site systems.
12. Enforce existing on-site regulations.
13. Support Whatcom Health Department's authority to enforce regulations.
14. Identify and provide incentives to abandon old/failing septic systems and upgrade to a newer system (i.e. tax credits).
15. Investigate source of low interest loans for hook-up or repairs.
16. Establish a program for low or fixed income homeowners for on-site septic system remediation and sewer hook-up expenses.
17. Prioritize and revisit suspected failing on-site systems and use charcoal dye and physical inspection of the system for re-evaluation.
18. Monitor storm water culverts and drainages discharging to Drayton Harbor in a short-term water quality study and long-term monitoring program. Investigate sewer line along Marine Drive.
19. Check integrity of Marine Drive sewer line with TV camera and repair the line if necessary.
20. Convene meetings between farmers, local drainage districts, State Fisheries and the Nooksack Salmon Enhancement Association to discuss water quality issues, watershed plan implementation, and closure strategy with the initial focus on the California Creek subbasin.
21. Enforce water quality laws.
22. Voluntarily sample agricultural outfall discharge and report results.
23. Ecology inspector will sample outfall discharges for fecal coliform during inspections.
24. Provide permanent or temporary pump-out for large boats at Sea-K.
25. Continue to reduce infiltration and inflow of stormwater into sewage collection system.
26. Enforcement of compliance with NPDES permit by Ecology.
27. Conduct fluorometer test of sewer line crossing harbor mouth to determine if it is leaking.
28. Seek funds to replace sewer line across harbor mouth.

29. Determine Canadian source impact from White Rock with a circulation study.
30. Whatcom County Council develops a Water Quality Protection District as a long-term strategy for water quality education and protection programs.
31. Expand State Department of Health's monitoring in frequency and sites. Monitoring should be done on a monthly basis.
32. Enforcement of existing Regulations, Ordinances and Plans.
33. Begin a water quality study to further delineate sources of fecal coliform. The study will be coordinated with the responsible party for implementing the long-term water quality monitoring recommendation from the watershed plan.

Whatcom County Health Department. 1995. Summary Report, On-Site System Survey, Drayton Harbor Watershed. Whatcom County Health Department, Environmental Health Division. May 1995. 28 pages.

This report discusses a septic system survey of 146 residences in the unincorporated area of Whatcom County in approximately ½ mile vicinity of the Drayton Harbor shoreline. This survey identified 10 documented failing and 64 suspect on-site systems. The survey found that 54% of residences are greater than twenty years old and 38% of the systems evaluated did not meet current design standards. Many systems were installed in areas, which due to soil conditions are considered unsatisfactory for conventional on-site treatment. This report recommended that

- Drayton Harbor be designated an “Area of Special Concern”, which is a special designation under the Rules and Regulations of the State Board of Health, for environmentally sensitive areas
- Actions be taken to identify and correct all failing and substandard systems in the vicinity of Drayton Harbor
- Develop a strategy to abate existing problems and prevent future problems
- Pursue grant opportunities to follow up this survey with additional monitoring, maintenance, education, and abatement efforts

Woods, B. 1995. Report and Recommendations on the Required Creation of a Water Quality Related Special District as Specified in the Shellfish Protection Act – RCW 90.72. Whatcom County. April 1995. 42 pages.

This report covers the issue of establishing a district. Due to the downgrade of the shellfish beds in Drayton Harbor by the Department of Health, Whatcom County is required by RCW 90.72.045 to perform two actions: 1) Form a shellfish protection district and 2) Establish a program that addresses the causes of pollution. The author gives a number of recommendations:

1. The council should merge the legal authority of the Shellfish Protection Act – RCW 90.72 into the existing county-wide Flood Control Zone District. This will avoid duplication of bureaucratic agencies and jurisdictional overlap; increase coordination; and allow for future potential consolidation of other water related efforts.
2. For purposes of addressing the Drayton Harbor issue, a separate Drayton Harbor Watershed Sub-District be formed, with a specified sunset date, and a sub-district advisory group to be formed. This will allow the operational focus to remain local; provide the ability to raise additional funds from the

area being benefited; and allow citizens the ability for a referendum to abolish the district after mandatory downgrade condition is lifted.

3. The merged district will have the ability to utilize the broad range of authorities allowed under both RCW 86.05 and RCW 90.72 to deal with storm water and non-point water pollution problems including services such as:
 - a. Flood and Storm Water Control
 - b. Drainage Systems
 - c. Monitoring, Inspecting, and Fixing Septic Systems
 - d. Sewer Systems
 - e. Animal Grazing Management
 - f. Manure Management
 - g. Education Programs
4. The Lake Samish Lake Management District should be dissolved, and the operational activities assumed under the Flood Control Zone District.
5. Necessary operations of the district should be overseen by existing County departments so that no separate administrative entity is formed. Contracts with service providers, whether public or private entities, would be through normal County procedures.
6. For purposes of addressing the Drayton Harbor problems, the Cooperative Extension Service should be named lead agency and should be delegated the authority necessary to assure that appropriate County operations perform assigned steps as will be required when the response plan is adopted.
7. Funding for activities necessary to achieve the responsibilities of the District should not be specifically limited to any single approach, but use any of the allowed sources, as necessary or appropriate:
 - a. Existing County General Revenues
 - b. Grants
 - c. Fees for Services
 - d. Inspection Fees
 - e. Charges and Rate for specific operations programs
 - f. Property Taxes/Special Assignments
8. Funding sources should be based on particular activity program being pursued and targeted to those receiving the benefits and/or causing the problems. Project funding should be specified under the appropriate statutes, either RCW 85.15 or RCW 90.72, and must be restricted to the lawful uses under the particular statute.
9. The initial funding of the District be limited to the existing funding mechanism used by the Flood Control Zone District. No additional funding should be provided for the Drayton Harbor Sub-District until such time as a specific work program has been adopted, and only then if existing funding is insufficient to carry out the required work.
10. No program or activity proposed by the district shall replace or consolidate existing activities performed by the cities or other non-county provided water-related special purpose districts with their consent. In formulating new program consultation and coordination shall occur with cities and other water related special districts.

Vasey Engineering, 1995. The Resort Semiahmoo, Drayton Harbor Water Quality Program, 1994 –1995 Monitoring Results. Prepared for the Semiahmoo Company. Vasey Engineering, Seattle Washington, June 1995. 27 pages.

This report provides water quality monitoring results from four stations near the Resort Semiahmoo community. The stations include two saltwater locations, one at Semiahmoo Marina and one just offshore of the planned Drayton Harbor Hillside development, plus two drainage ditch stations, one that drains from the Semiahmoo golf course and some residential and street runoff, and one that primarily drains Drayton Harbor Road and some residential areas. Samples were collected six times and analyzed for fecal coliform, nutrients, metals, pesticides, and conventional constituents. The results showed that one stormwater culvert of two sampled from Semiahmoo Resort exceeded part of the freshwater Class A standard for fecal coliform bacteria and that marine fecal coliform levels along the shoreline of Drayton Harbor Hillside and within the Semiahmoo Marina exceeded one part of the marine Class A water quality standard. However, there were not enough samples taken in this study to accurately apply the standard. The author concluded that Semiahmoo runoff and marina activities are not major sources of fecal coliform contamination to the harbor.

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- **Whatcom County Council:** On July 18, 1995, the County Council established the shellfish protection district for Drayton Harbor watershed and created a citizen advisory committee to help implement the recommended actions.

Washington State Department of Health. 1996. *Letter to Janet Hansen, Drayton Harbor Watershed Committee, Regarding Water Quality Monitoring in Drayton Harbor.* Washington State Department of Health, Office of Shellfish Programs, Olympia, WA. September 20, 1995. 2 pages plus enclosures.

This letter describes the monitoring done by Washington Department of Health in Drayton Harbor. Under the Closure Response Plan, Department of Health expanded and increased water quality monitoring in the Harbor. This monitoring showed continued deterioration of water quality with some of the stations in the 'Approved' areas nearing failing water quality standards. Three problem areas were noted

1. The commercial area of Blaine Marina
2. The three main creek discharges to Drayton Harbor (California, Dakota and Cain Creeks)
3. Storm drain discharge near the City of Blaine's lift station #5.

As the water quality has not shown improvement, the Health Department decided to reduce sampling and cautioned that further declines in water quality would lead to further downgrades in Drayton Harbor.

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- **City of Blaine Replacement of the Underwater Sewer Line:** City of Blaine replaced the 10" diameter fiberglass force main sewer pipe that was leaking and failing, with a 14" diameter ductile iron, segmented pipe.

Matthews, R., J. Vandersypen, A. Pomada and T. Henderson, 1997. Drayton Harbor Watershed Monitoring Project, Final Report, January – December 1997. Prepared for the Whatcom Conservation District. Western Washington University, Geology Department and Institute for Watershed Studies, Bellingham, WA. 36 pages.

The results of this monitoring project in Dakota and California Creeks indicate that Class A standards were not met at most sites for at least part of the year. Fecal coliform bacteria were very high at every site. Nutrient concentrations were also high, particularly in California Creek. Very high levels of ammonia were detected at one site along California Creek and action was recommended to determine the upstream source. Dissolved oxygen concentrations were low, particularly during the summer with most sites falling below the 8.0 mg/L Class A Standard. The study recommended that future monitoring should focus on the south fork of Dakota Creek and California Creek at Willeys Lake Road to help delineate sources of pollution

Port of Bellingham, 1997. Sanitary Sewer Dye Test, Blaine Harbor, Blaine, Washington. Prepared by Alan Birdsall, Blaine Harbormaster for Art Choat, Director of Marinas, Port of Bellingham, January 1997. 44 pages.

This is a report on testing conducted by the Port of Bellingham to assess the integrity of the sanitary sewer collection system along Marine Drive in Blaine, WA. The test was performed in response to issues raised by the Drayton Harbor Shellfish Protection District Committee about the possible inadvertent introduction of raw sewage into the Blaine Harbor via direct discharge or cross-connections with stormwater piping. Background levels of natural fluorescence were determined by placing charcoal packets in numerous stormwater outfalls around Blaine Harbor. These were in place for one week. These were removed, stored and replaced with new charcoal packets prior to introducing dye to all toilets in each of the businesses around the Blaine Harbor. Comparison of fluorescein dye levels in the background samples to dye levels after the dye test was completed was used to determine if there was any sewage exiting any of the stormwater outfalls. Sixteen spotters made observations at various points in the system during the test to document dye in either the sanitary sewer lines or in outfalls. Port personnel made hourly checks of marine water for discoloration for five hours after the dye was introduced into the system. Dye was detected in only one stormwater outfall (parking lot drain), but it was determined due to the wavelength and concentration of dye in this sample, that the source was probably engine coolant rather than dye introduced in this test. This test did not detect any cross connections between toilets and known stormwater outfalls to Blaine Harbor nor direct sewer discharges from toilets into Blaine Harbor.

Sipsey, T. and B. Marcy, 1997. Drayton Harbor Water Quality Improvement Project. Prepared for Whatcom County Planning and Development Services, Bellingham, Washington. July 1997. 45 pages

This report characterizes the sub-drainage basins associated with each of the eighteen priority outfalls identified in the 1995 Cykler and Haggerty study and addresses pollution

sources in and around the Blaine Harbor. The intensity and short duration of the sampling effort in the priority drainages was generally not enough to zero in on specific sources of fecal pollution, but potential sources were listed for each of the 18 drainages and additional recommendations were made which included:

- Further monitoring of fish processing discharge and the status of liveboards' marine sanitation devices in Drayton Harbor
- Ensure houses along drainages are hooked up to the sewer system
- Install vegetated buffers between houses and streams
- Physically inspect the sanitary and stormwater systems to eliminate the possibility of cross-connections
- The Whatcom Conservation District should consider a water quality monitoring plan to track the results of Best Management Plans

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□ **City of Blaine Public Works:**

- Replacement of Drayton Harbor crossing force main from Lift Station No. 1
- Replacement of 5,200 feet of leaky residential sewer pipe in North Blaine

DHSPDAC, 1998 Drayton Harbor Shellfish Protection District Status Report and Recovery Plan. Drayton Harbor Shellfish Protection District Advisory Committee, September 1998. 17 pages

First report to the community from the Drayton Harbor Shellfish Protection District Advisory Committee, which was formed in June 1995, following the January 1995 shellfish closure in Drayton Harbor. This report was adopted by the Whatcom County Council and the Whatcom County Water Resources Division as the shellfish protection plan for Drayton Harbor. This report identifies accomplishments of agencies through September 1998 and highlights key recommendations from the Initial Closure Response Strategy yet to be implemented. Water quality data from Washington State Department of Health shows deteriorating conditions since the 1995 downgrade and threatened areas within the *Approved* portion of the harbor. Key need identified in the report is to re-convene the core group agencies to establish a coordinated and focused effort to reduce fecal pollution in Drayton Harbor.

Herrera Environmental Consultants, Inc. and Samadpour, Mansour, 1998. Draft Fecal Coliform Bacteria Source Tracking Report, City of Blaine Stormwater Management Program Implementation. Prepared for City of Blaine and Earth Tech by Herrera Environmental Consultants, Inc., Seattle Washington and Dr. Mansour Samadpour of University of Washington. October 1998. 36 pages.

One of the objectives of the Blaine Stormwater Management Program Implementation Plan was to “engage and involve other agencies in region-wide activities to improve water quality in Drayton Harbor and its tributary drainages” (EES, 1995). Since fecal coliform is a primary water quality issue, this report presents the results from a baseline study of fecal coliform sources from March 1998 to May 1998. The following conclusions were reached:

- No ribotype matches were observed between fecal coliform from water quality stations in Drayton Harbor and human fecal bacteria
- Human fecal contamination was confirmed in Dakota Creek
- Ribotype matches in streams draining to Dakota Creek match land use (i.e. livestock in rural areas and pet waste in urban areas)
- Drayton Harbor fecal samples matched those from livestock, seals, and waterfowl
- One Drayton Harbor station had fecal bacteria matching bacteria from fish processing
- Oysters from the restricted area had fecal bacteria matching those from livestock and seals

Recommendations from the study were listed as:

- Livestock activities should be targeted for the control and management of waste
- Sanitary surveys done by Whatcom County Health Department should be expanded to include the upper reaches of Dakota and California Creeks
- Within the City of Blaine and Urban Growth Area, education programs focusing on controlling pet waste should be initiated
- Further investigate the discharge of fish processing waste into the Harbor

Menzies G., 1998. Circulation Studies in Semiahmoo Bay to Evaluate Patterns of Water Movement from the Blaine Sewage Treatment Plant Outfall Under Flood Tides. Prepared as a component of the volunteer sampling program for the Drayton Harbor Shellfish Protection District Advisory Committee, January 1998, 9 pages.

This study was undertaken to help determine potential threats from sewage effluent released from the Blaine treatment plant outfall to nearby shellfish resources within and near Drayton Harbor. This series of circulation studies showed that during “spring” (a tide of greater than average range) flood tides, subsurface water originating near the Blaine sewage treatment plant outfall pipe reaches the mouth of Drayton Harbor in approximately four to five hours. On “neap” (a tide of minimum range) flood tides, surface and deep-water movement from the Blaine sewer outfall is northward towards White Rock. This study supported earlier findings (Schwartz, 1976) that due to circulation patterns in this area, Birch Point is the preferred location for the Blaine sewer treatment plant outfall in order to achieve optimum dilution and mixing of the effluent.

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- **City of Blaine Public Works:** Pipe burst and slip lining of Peace Portal Drive gravity trunk sewer.

Meriwether, F., 1999. Sanitary Survey of Drayton Harbor. Washington State Department of Health, Office of Shellfish Programs, Olympia, WA September 1999. 38 pages

Revision of the 1995 Sanitary Survey based on a review of current water quality data, evaluation of pollution sources, and shoreline survey information. This report downgrades the shellfish classification in all of the *Approved* area to *Prohibited* and maintains the *Prohibited* classification of the remainder of the marine waters in and around Drayton Harbor due to a variety of pollution sources including

- Farm management practices in the Dakota and California Creek watersheds
- The two marinas near the mouth of Drayton harbor
- Sewage from City of Blaine's sewage treatment system
- Stormwater runoff contamination
- Marine mammals fecal waste
- Process wastewater discharges from seafood processors on Marine Drive

Due to the poor water quality, all of Drayton Harbor was downgraded to *Prohibited* for commercial shellfish growing and harvest. This survey identifies the flooding tide cycle as the adverse tidal condition for degraded water quality in Drayton Harbor.

NWIC, 1999. Northwest Indian College Water Quality Monitoring: Subcontract with Whatcom County Conservation District for Department of Ecology Grant G 9900096. Northwest Indian College, Lummi Reservation, March 1999. 11 pages.

The objective of this project is to reopen downgraded shellfish beds in Portage Bay and Drayton Harbor. The sampling program is stratified so that main stem sites are primarily for long-term trends monitoring of watershed-wide Best Management Practices while tributary sites are primarily for general source identification. Sampling will be conducted on a random basis within the bimonthly sample schedule. In addition, this project will augment the monitoring conducted by the DOE TMDL study, DOH ambient monitoring, monitoring by the tribes, and other planned monitoring. This monitoring plan will also strongly encourage community involvement in nonpoint pollution issues.

Pacific International Engineering. 1999. Blaine Harbor Moorage Expansion, Dye Study. Technical Memorandum to Art Choat from Glenn Grette of Pacific International Engineering, Seattle, Washington. June 16, 1999.

This memorandum summarizes field studies conducted prior to Phase 1 of the Blaine Harbor Marina Moorage Expansion and Dredging Project. The purpose of the studies was to investigate actual or potential sources of fecal coliform within Blaine Harbor. This memorandum presents findings of the facilities testing study to identify any locations where wastewater maybe emptying into the harbor rather than the city's wastewater conveyance system. Several system failures were identified during the study: a broken floor drain at Boundary Fish, leaky toilet at Westman Marine, and a disjointed PVC pipe beneath Sea-K fish. All three companies confirmed that the leaks were repaired.

Pacific International Engineering. 1999. Blaine Harbor Moorage Expansion, Enclosure One Results (Excluding Dye Study). Technical Memorandum to Art Choat from Glenn Grette of Pacific International Engineering, Seattle, Washington. June 16, 1999.

This memorandum summarizes field studies conducted prior to Phase 1 of the Blaine Harbor Marina Moorage Expansion and Dredging Project. The purpose of the studies was to investigate actual or potential sources of fecal coliform within Blaine Harbor. This memorandum presents findings from sump investigations, bird exclusion system investigations, pier area inspections, offload monitoring, sediment assessment, and inspection of leased upland facilities.

- The sump investigation found that the sumps may contain favorable conditions for the growth of fecal coliform.
- The bird exclusion system findings included securing lids to carcass containers, clean the offloading area between and after shifts, and installation of bird netting around primary waste screens would all reduce the number of birds and accumulation of bird waste.
- Pier area inspection found that concentrations of phosphorus or nitrogen were at or below detection limits and were not considered to be at elevated concentrations.
- Due to reduced catch and processing capacity only two offloading events were observed. Results from fecal coliform testing were variable with no correlation determined between the number of birds gathered during offloading and the concentrations of fecal coliform in the water.
- For the sediment assessment, no correlation was apparent between grain size distribution and fecal coliform concentrations.
- No upland facilities were found to be connected to on-site septic systems and results from the dye test found that facilities surrounding the harbor were properly connected to the wastewater conveyance system.

Whatcom County, 1999. Whatcom County Comprehensive Water Resource Plan. Element three: Shellfish Protection. Whatcom County Water Team Member, Bellingham, Washington. February 9, 1999. Pages 32 – 42.

The Plan suggests that the County addresses the issues that are contributing to decreasing water quality in Drayton Harbor. The Plan lists the six potential sources for fecal coliform as identified by DOH in 1995, and lists the local responses to each. Long term responses were (1) a long-term monitoring program of water quality in Drayton Harbor, and (2) development of a long-term monitoring program that speeds agreement between agencies, guides projects and activities, and assesses progress in meeting water quality standards.

Whatcom County Health Department. 1999. Final Project Report, Drayton Harbor On-site Shellfish Project for the Repair of Failing On-site Sewage Systems. Whatcom County Health Department, Environmental Health Division, March 1999. 4 pages.

This report discusses the findings of a follow-up survey and abatement program to repair failing on-site sewage systems in the vicinity of Drayton Harbor. This project was funded by the Special On Site Shellfish Grant Program and put into action a high priority recommendation of the Drayton Harbor Shellfish Protection District and the Initial Closure Response Strategy. Of 252 sites that were surveyed between August 1997 and February 1998, 54 (21%) were found to be failing. As of March 1999, fifty-two of these failing systems were repaired. Of thirty applications for grant funds to repair systems, twenty-one were approved with over \$141,000 awarded to eligible applicants. Failing systems were replaced with various on-site sewage system types including pressure mound, gravity mound, Glendon Biofilter, and conventional gravity systems.

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- ❑ **City of Blaine Illicit Connections Project:** City of Blaine conducted smoke and dye testing in some of the older portions of the wastewater collections system. Based on the results of these tests, 49 illicitly connected services were discovered. Most were fixed.
- ❑ **City of Blaine Public Works:** Lift Station No. 1 piping change to allow use of 60,000 gallon storage tank.
- ❑ **City of Blaine Public Works:** Lift Station No. 1 piping change to allow emergency pump-around.

City of Blaine. 2000. Wet Weather Action Plan: Wastewater Management Procedures During High Flow Conditions. Revised November 14, 200. City of Blaine, Public Works Department, Blaine Washington. 14 pages.

This plan was developed in compliance with Administrative Order No. DE99WQ-N392 to take the place of the plan submitted in 1995 and established procedures intended to prevent sanitary sewer overflows that are driven by excess flow from rainfall-derived inflow and infiltration. The plan also guides operational changes at the Blaine's Public Works wastewater treatment plant to accommodate high flow conditions.

DHSPDAC, 2000. Drayton Harbor Shellfish Protection District Status Report and Recovery Plan. Drayton Harbor Shellfish Protection District Advisory Committee May 2000. 48 pages

This report provides an update to the community on accomplishments made by various agencies to implement recommendations from the 1995 Closure Response Strategy, and re-prioritizes recommendations for nonpoint pollution control needed to improve the water quality in order to reclassify shellfish growing areas in the harbor. Summaries of Washington State Department of Health's ambient sampling program show ongoing chronic fecal pollution in the commercial portion of the Blaine Marina and continued violations of the shellfish standards in most sites in Drayton Harbor. Fecal contamination within the commercial portion of the Blaine Marina is also confirmed by extensive sampling performed by the Port of Bellingham from October 1997 through April 2000. Source identification efforts by the Shellfish Committee and other interested parties have focused on the City of Blaine's sewer collection system and the fish processor waste stream in and around the mouth of Drayton Harbor. In addition, improvements have been made to decrease pollution from on-site septic systems and commercial livestock. The Committee will continue to focus on water runoff and urbanization with the goal of improved and sustained water quality in Drayton Harbor. With that goal in mind, the following recommendations are summarized in eight objectives:

1. Establish coordinated water quality program for Drayton Harbor
 - a. by pursuing grants, loans or dedicated funds.
2. Identify pollution sources and monitor water quality
 - a. By conducting a TMDL study
 - b. Developing a water quality monitoring program
 - c. Developing a Memorandum of Agreement for sampling agencies
 - d. Reviewing Drayton Harbor watershed studies since 1973 and creating an abstract bibliography
 - e. Obtaining commitments for an ongoing long-term water quality plan development and funding
3. On-site sewage systems (OSS)
 - a. Enforce existing OSS regulations
 - b. Establish a countywide Operation and Maintenance Program
 - c. Establish a permanent program for financial assistance for OSS repairs
 - d. Placing high priority on complaints to Whatcom County Health Department

- e. Designate Drayton Harbor as an area of special concern
- f. Requiring proof that an OSS is functioning prior to real estate transactions
- 4. Control stormwater sources
 - a. Investigating and controlling potential sources impacting storm drains
 - b. Controlling pet waste within the City of Blaine
 - c. Appointing a member of DHSPDAC to the storm water committee
- 5. Blaine municipal sewage sources
 - a. Complete sewage treatment improvements
 - b. Investigate sewage treatment plant outfall location
 - c. Videotape Marine Drive old sewer line and laterals to waterfront
 - d. Reduce inflow and infiltration from sanitary sewer collection system
 - e. Enforcement by Ecology when Blaine is out of compliance with NPDES permit
 - f. Replacement of underwater force main sewer crossing
- 6. Agriculture
 - a. Provide financial assistance to diaries from implementing manure management plans
 - b. Provide technical assistance to develop manure management plans
 - c. Provide technical assistance to small/non-commercial farmers to develop manure management plans
 - d. Conduct farm inspection program
 - e. Reach a cooperative between the EPA, DOE, and Whatcom County
 - f. Report violations and actions taken to DHSPDAC
 - g. Work with Nooksack Salmon Enhancement Association (NSEA) to update stream projects
- 7. Boats and marinas
 - a. Report on number and types of Marine Sanitation Devices in Blaine Harbor
 - b. DOE ensures that Blaine Seafood Processors are meeting the requirements of the NPDES permits
 - c. Compliance by the Port with 401 Water Quality Certification
 - d. Distribute educational materials regarding specific Drayton Harbor water quality issues
 - e. Review Blaine Seafood Processors NPDES permit
 - f. Provide permanent or temporary pumpouts for large boats at Sea K
- 8. General recommendations
 - a. Critical areas need to be identified and mapped
 - b. Identify and communicate land acquisitions programs
 - c. Make Drayton Harbor Shellfish Protection District Advisory Committee a part of record on all NPDES permits
 - d. Conduct a circulation study
 - e. Maintain a user-friendly webpage
 - f. Increase community involvement and circulation of educational materials
 - g. Continue working on *Shared Waters, A Cooperative Approach to Restoration of Shellfish Growing Area* with the Boundary Bay and Georgia Basin Ecological Initiative Group

Halasz, E. 2000. Drayton Harbor Watershed On-Site Sewage System Survey, Final Report. Whatcom County Health and Human Services Department, Environmental Health Division, Bellingham, Washington. April 2000. 33 pages.

The Drayton Harbor On-Site Sewage (OSS) Survey began August 25, 1997 and was completed February 27, 1998. Within Drayton Harbor watershed, 69% of the homes use OSS and 31% are serviced by the public sewer system. A total of 252 sites were surveyed. Of those surveyed, 3% were between 21 and 30 years old, 53% sites have not been pumped within the recommended period (5 years), and 54% of the sites were failing and by April 2000, all failing sites, but one, were repaired. Recommendations made by the report are

- Explore the feasibility of a public sewer line in areas of historical OSS failures
- Initiation of a proactive education program and Operation and Maintenance program for Whatcom County OSS
- Designate Drayton Harbor as an “Area of Special Concern”
- Establish a permanent program for financial assistance for OSS repair
- Require proof that a residence has a functioning OSS for all real estate transactions

Hirsch Consulting Services, 2000. Coordinated Water Quality Monitoring Framework for Drayton Harbor Shellfish Protection District. Prepared for the Whatcom County Drayton Harbor Shellfish Protection District, January 2000. 47 pages.

This plan describes the efforts of all organizations collecting water quality data related to fecal coliform loading in the Drayton Harbor Shellfish Protection District and submits strategies for monitoring water quality changes with coordination among participating organizations. It provides a framework to implement the long-standing recommendation in the 1995 Drayton Harbor Watershed Action Plan and subsequent plans including the Whatcom County Comprehensive Plan to “develop a coordinated, comprehensive, long term monitoring scheme for guiding pollution control projects and activities and for assessing progress towards meeting water quality standards.” Ongoing funding for a long term sampling program, development of a quality assurance plan, and agency commitment to data collection and reporting are identified as key needs.

Hirsch Consulting Services. 2000. Drayton Harbor Shellfish Protection District Water Quality Summary. Prepared for Whatcom County and Drayton Harbor Shellfish Protection District by Hirsch Consulting Services, Bellingham, Washington. October 2000. 37 pages.

This report summarizes fecal coliform data collected by participating agencies and makes recommendations for follow-up investigations and actions to reduce fecal contamination of Drayton Harbor so that the shellfish beds can be reopened. Data were provided by Washington State Department of Health, the Port of Bellingham, the Northwest Indian College, the City of Blaine, and Blaine Seafood Processors. The data showed that fecal coliform levels in Drayton Harbor and the watershed draining to the Harbor, have remained the same or increased over time.

- 81 to 82% of the marine stations failed to meet the National Shellfish Sanitation Program (NSSP) estimated 90th percentile criteria

- 39 to 44% of the marine stations had geometric means greater than 14 fecal coliform colonies/100 mL, failing both NSSP criteria for Approved shellfish growing areas and Class A state water quality standard
- 92% of the marine stations exceeded 200 colonies/100 mL violating Class A state water quality standard in more than 10% of samples
- 70% of the freshwater samples had geometric means greater than 100 colonies/100 ML violating Class A state water quality standard for fresh water
- 10% of the time, freshwater samples failed to meet the Class A state water quality standard
- Marine sample stations were the most contaminated at the commercial section of Blaine Harbor
- Cain Creek storm drain and Cain Creek were the most contaminated freshwater stations
- Fecal coliform densities were the most correlated with 4-day cumulative rainfall than with the 24-hour rainfall
- Flood tide has the most adverse tidal condition at stations in the western and central portions of Drayton Harbor

It was recommended that this report be submitted to Ecology to support continued candidacy of Drayton Harbor for a TMDL for fecal coliform bacteria, along with the following summarized recommendations:

- Further investigations and corrective actions around the Blaine commercial marina
- Place Cain Creek on Ecology's 303(d) list
- Further investigations into the storm drains and corrective actions at 'hot spots' in the California and Dakota Creek basins
- Further monitoring of correlation of rainfall and contamination at Department of Health stations to determine if shellfish beds can be upgraded to conditional status

Pacific International Engineering. 2000. Port of Bellingham Fecal Coliform, Fecal Coliform Concentrations in Drayton Harbor. Technical Memorandum to Art Choat from Lawrence Lehman of Pacific International Engineering, Seattle, Washington. July 14, 2000. 22 pages.

Port of Bellingham engaged the services of Pacific International Engineering to analyze water quality data collected by the Port of Bellingham and identify possible sources of fecal coliform. The sample sites showed correlations with several variables such as air temperature, tide movement and levels, and winds. Additional correlation was found between sample locations and vessel presence at certain locations. The analysis found no single factor that influences the levels of fecal coliform although coliform levels dropped significantly between 1998 and 1999.

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□ **City of Blaine Projects:**

- **Overflow Storage:** City of Blaine installed four 50,000-gallon inflatable storage bladders at Lift Station #1 on Marine Drive to provide additional storage for sewage during storm/overflow events. The bladders were used for the first time

in December 2001 preventing untreated sewage from releasing in and around Drayton Harbor.

- Lift Station No. 1 replacement of pump access rails and discharge piping.
- City of Blaine Inspection and Repair of the Sewer Line along Marine Drive: This project was funded and supported by the WRIA 1 Early Action Funding, Washington State Department of Ecology, Semiahmoo First nation, City of Blaine Public Works, Puget Sound Restoration, and the Drayton Harbor Shellfish Committee. Repairs were made to 8 manholes, 8 joints, 1 lateral plug, and 5 pipe breaks as a result of a video inspection done on the Marine Drive sewer line.

City of Blaine, Public Works Department. October 9, 2001. Gravity Sewer Repair, Marine Drive, Construction Completion Report.

This completed project included repairs to documented problems in manholes and sewer lines in the City of Blaine's sanitary sewer system along Marine Drive. The goal of this project was to prevent the abrupt failure of a critical conveyance pipeline and to seal pipe joints and manholes that presented visual evidence of possible leakage. The scope of this repair project was initially developed with input from stakeholder groups that had an opportunity to review video inspection tapes from May 2000.

In conformance with state bid laws, the City of Blaine selected GELCO Services, Inc. to perform the needed repairs. GELCO was able to successfully complete the manhole patching and grout injection of pipe joints, but was unable to complete line repairs in the most severely damaged clay pipe sections. Blaine Public Works staff mobilized to complete the line repairs following completion of GELCO's work.

This project was made possible through the financial contributions of WRIA No. 1 Early Action Grant (\$11,000), State Department of Ecology's Coastal Protection Fund (\$9,000), a contribution from the Semiahmoo First Nation (\$5,000), staff support from the Puget Sound Restoration Fund, and the strong support and encouragement of the Drayton Harbor Shellfish Protection District.

Northwest Indian College and Whatcom County Council of Governments. 2001. Water Quality Monitoring – Drayton Harbor, February – July 2001. Northwest Indian College and Whatcom County Council of Governments, Bellingham, Washington. Contractor Agreement CZMDH-001. 6 pages.

The purpose of this sampling was to identify possible sources of fecal coliform in Drayton Harbor. Results of the sampling were compared to previous efforts from March 1998 to September 2000. Fecal coliform levels decreased at two Cain Creek sample sites, at five Dakota Creek sites and at three sites on California Creek. However, the sample site at Lift Station #5 had extremely high concentrations of fecal coliform and continued monitoring of that site was recommended.

Praxis Pacific. 2001. Shared Waters, A Cooperative Approach to Restoration of Shellfish Growing Waters in Semiahmoo Bay/Drayton Harbor. Workshop Proceedings at Aston Pacific Inn, Surrey, British Columbia. Prepared for Environment Canada by Praxis Pacific, North Vancouver, British Columbia, Canada. February 1, 2001. 64 pages.

This workshop brought together individuals and organizations from both sides of the Canada/US border to learn more about shellfish and marine water quality issues in Semiahmoo Bay/Drayton Harbor. The objectives of the workshop were

- Share information
- Identify pressing needs
- Consider next steps
- Explore opportunities to network

* * * *

□ **City of Blaine Projects:**

- Pressure Testing of Sewer Force Main: The City of Blaine tested their underwater 14” force main that carries untreated sewage across the harbor to the treatment facility. The 3700 feet of line were tested at 100psi. The main passed the test. The City continues to test the line on an annual basis.
- City of Blaine’s Mutt Mitt Program: The city installed three mutt mitt stations along Marine Drive to allow pet owners an easy way to pick up after their pets. Since the installation in 2001, over 330 packs have been used, which total to over 17,000 mitts used, removing over 1.4×10^{13} (14,000,000,000,000) fecal coliform bacteria from entering the harbor waters.

□ **Community Oyster Farm Projects:**

- The Community Oyster Farm was initiated by the Puget Sound Restoration Fund to raise awareness of the problems within Drayton Harbor.
- The Community Oyster Farm volunteers planted Japanese oyster seed on 2 acres of prime mudflat in Drayton Harbor.
- Community Oyster Farm’s Volunteer Shoreline Monitoring Project: Volunteers from the Community Oyster Farm monitored 10 stormwater outfalls each month from June to December. The volunteers took rough flow estimates and, when possible, collected samples for fecal coliform testing. The program was designed to prioritize drainages that should be targeted for additional studies to identify pollution sources (see 2002 reports section, Menzies, G., 2002).

- **Whatcom County Health Department:** The Health Department developed and sent out 6,000 flyers in the Drayton Harbor watershed. The flyers contained information on proper operation and maintenance of on-site septic systems.

Beard, L. and L. Conner. 2002. Fecal Coliform in Drayton Harbor. Technical Memorandum, Laudau Associates, Edmonds, Washington. July 24, 2002. 30 pages.

The technical memorandum summarized the fecal coliform loading in Drayton Harbor and summarizes some of the previous water quality monitoring done in the Harbor. From this information, an analysis was done on possible source loading. This memorandum concluded that rural land practices that allow runoff with bacteria to enter creeks and the harbor along with any remaining failing sewage systems (municipal or septic) are the greatest sources of fecal coliform found in Drayton Harbor.

Menzies, G., 2002. Drayton Harbor Community Shoreline Water Quality Sampling Program. For Whatcom County Water Resources Division, Shellfish Protection Program by Geoff Menzies through the Puget Sound Restoration Fund. February 1, 2002. 19 pages.

This report was provided to DOH. This study was undertaken to identify which if any stormwater outfalls along the Eastern shoreline of Drayton Harbor posed a significant threat to fecal coliform contamination at DOH stations 4 and 6. Freshwater samples were collected from 10 locations from Marine Drive to the mouth of California Creek from July 2001 through December 2001. Marine samples were collected from Washington Department of Health sites from July to October 2001. This study found

- fecal coliform concentrations and flow from the freshwater drainages vary over time
- every drainage sampled had violated freshwater standards at least once
- the mouths of Dakota and California Creeks, and the storm drain near the mouth of California Creek, were the only sites that met part A of the freshwater standard during the sampling period
- marine water sampling near the Community Oyster Farm was in the acceptable range
- sites near the Blaine Marina had high fecal coliform concentrations, exceeding the water quality standards

Recommendations given

- participants should meet soon to review the study and suggest follow-up actions
- continue sampling of sites with further investigation of upstream areas
- dye-testing near Chuck's Diner to determine if there is any cross connection with the sanitary sewer
- further sampling most be done at Blaine Marina to understand and control pollution sources in that area by
 - controlling fish processors waste stream
 - implementing Best Management Practices at the fish processing facilities
- targeting boaters with educational materials
- dye-testing collection lines and manholes to determine if human fecal waste is impacting the Marina
- conducting Antibiotic Resistance Analysis of fecal coliform for fecal source identification

- **Community Oyster Farm Projects:**
 - Community Oyster Farm’s Volunteer Shoreline Monitoring Project: Under the Countywide PLEDGE program (2002-2004), volunteers from the Community Oyster Farm continued to assist with urban stormwater sampling. Final results of this project are being written up by Hirsch Consulting and PSRF. This report should be completed in April 2004.
 - Educational Signs were posted in the commercial area of the Blaine Harbor, at the entrance to Drayton Harbor, and at a common anchorage area inside the Harbor. The signs alert boaters to the sensitive nature of Drayton Harbor and discourage discharge of septage.
 - A series of six Tideflat Tours were conducted to educate and inform more than forty decision-makers about shellfish restoration efforts in Drayton Harbor. These tours focused on City of Blaine Council members and Planning Commissioners, Whatcom County Council members and Planning Commissioners, Members of the Marine Resources Committee, Blaine Public Works staff, and interested citizens.

- **Hay and Company Consultants Circulation Study:** The Shared Waters Roundtable, a transboundary group of Canadian and US citizens and agencies, hired Hay and Company Consultants, Inc., to develop a circulation model for Semiahmoo Bay that incorporates input from three Canadian sources (Serpentine, Nicomekl, and Little Campbell Rivers) and three US sources (Dakota and California Creeks and the Blaine sewage treatment plant’s outfall).

- **Nutrient Management Plans:** There are 35 commercial farms within the border of the Drayton Harbor Shellfish District. As of July 2002, all of these farms have an approved nutrient management plan in place. The farms should have the plans implemented by December 2003.

DeJong, Mandy, 2003. Fecal Contamination due to Bird Populations in Drayton Harbor, Washington. Unpublished paper. Trinity Western University. April 2003. 27 pages.

This report studied the fecal contamination of Drayton Harbor due to bird populations, to determine if birds are a primary source of fecal bacteria in the Harbor. The study found the bird population was larger at the Blaine Marina than at the Semiahmoo Marina. The fecal matter created by the birds was highest in the cormorant population, although the seagulls had the highest impact on the Harbor due to the large size of the seagull population. Based on a previous study (Determen, 1993), birds have an overwhelming contribution to contamination of shellfish beds in comparison to other animals. However, DeJong determined that the birds did not contribute as much fecal bacteria to the Harbor as did the industries surrounding the Harbor and suggested further studies on the runoff and leakage from the seafood processing plants.

Hay and Company Consultants. 2003. Semiahmoo Bay Circulation Study, Technical Report. Hay and Company Consultants, Vancouver, Canada. March 2003. 228 pages.

This report describes a study of fecal coliform in Semiahmoo Bay and Drayton Harbor, which consisted of a numerical simulation of circulation in the waters and the resulting distribution of fecal coliform. The model was validated with a program of field observations. The model simulations presented complex circulation patterns in Semiahmoo Bay and Drayton Harbor such as eddies forming in the surface layer during slack tide and flow in adjacent layers going in opposite directions. Model results using simulated loadings of fecal coliform found that Little Campbell River had the greatest effect. The Serpentine River and Dakota Creek also had sizable effects but California Creek had only one month of predicted contamination. The model simulations also predicted that Nicomekl River and Blaine STP never caused exceedance of the water quality standard. The resulting modeled concentrations were less than sample amounts, indicating that the model contains inaccuracies in the loading data and/or model processes that over-dilute loading concentrations. Preliminary work was begun on a new model that contained various layers that appear and disappear as the tide fluctuates. A preliminary simulation shows a larger area with fecal coliform concentrations exceeding water quality standards. This new model was recommended for future simulations as it provided more realistic concentrations. The report also suggested further studies simulating the sources to Drayton Harbor such as the outfalls along the shoreline and the Blaine commercial marina.

Menzies, G. 2003. Blaine Harbor Circulation Studies, January through April 2003. Report Submitted to Whatcom County Water Resources Division by Geoff Menzies, The Puget Sound Restoration Fund. April 30, 2003. 15 pages.

The Puget Sound Restoration Fund (PSRF) under contract with Whatcom County, conducted a series of circulation studies, to gain a better understanding of how water is exchanged from the commercial portion of Blaine Harbor to the surrounding marine water. These studies showed that it is primarily deeper water instead of surface water

exiting Blaine Harbor during the ebbing tide cycle. Results indicate that there is little interchange between the surface water of Blaine Harbor and Drayton Harbor. Therefore, fecal coliform bacteria inside Blaine Harbor has little impact on water quality in Drayton Harbor. This report has been submitted to DOH.

Menzies, G. 2003. Marine Drive Dye Test. Report Submitted to Puget Sound Action Team by Geoff Menzies, The Puget Sound Restoration Fund. June 13, 2003. 11 pages.

This dye study was designed to determine whether sewage, possibly leaking from main lines and manholes, is partly responsible for fecal coliform contamination in the commercial portion of Blaine Harbor. All of the main sanitary sewer lines and manholes in proximity to the commercial portion of Blaine Harbor and the two lines immediately upstream of Lift Station 1 were dye-tested with Fluorescein tracer dye provided by Ozark Underground Laboratory. Using absorbent charcoal packets, which were suspended from crab pot floats at several key marine stations, no tracer dye was detected in the surrounding waters over a period of almost two weeks after the sanitary sewer system was dyed. Based upon these test results, it does not appear that the main sanitary sewer system is contributing to the high fecal coliform levels observed in Blaine Harbor.

In addition, although not the focus of this study, the absence of dye retrieval near the entrance to Drayton Harbor indicates that leakage from the underwater force main was unlikely during this testing period. Both the underwater sewer force main and the sanitary collection system in the commercial marina area have been suspected for some time by many as contributors to this problem area. Eliminating human sources of pollution is important in order to achieve a shellfish upgrade in Drayton Harbor. This study makes a strong case that human waste from the main sewer collection system is not causing pollution in the commercial portion of Blaine Harbor. This report has been submitted to DOH.

Menzies, G. 2003. Peace Portal Dye Test, March through April, 2003. Report Submitted to Whatcom County Water Resources Division by Geoff Menzies, The Puget Sound Restoration Fund. April 30, 2003. 7 pages.

Based on a review of the Drayton Harbor Community Shoreline Water Quality Sampling Program, Final Report (Menzies, 2002), sewer lines in central Blaine were dye tested using Fluorescein tracer dye to determine if high fecal coliform levels detected at two storm drain sample sites were due to cross-connections between the sanitary sewer and storm water conveyance systems. Absorbent charcoal packets fixed at the end of storm drains were used to capture dye in storm water. Analysis of charcoal packets was conducted by DOH (visual) and by Ozark Underground Laboratory (spectrofluorometer). This report summarizes the results from this 2-month study. No dye was found at any of the field sites during the study, indicating that the high fecal coliform levels in the storm drains are not due to any cross-connection with the sanitary sewer system in the area. This report has been submitted to DOH.

Meriwether, F. 2003. A Dye and Drogue Study in Drayton Harbor. August 11, 2003. Washington Department of Health, Office of Food Safety and Shellfish Programs, Olympia, Washington. 14 pages.

This study conducted on July 14, 2003, was performed to determine if pollution at Station #8 received enough dilution to not present a shellfish water quality concern at Stations #4 and #6. Results from the dye study establish that dilution of Station #8 was rapid and substantial during the middle and latter portions of the flood tide. The drogue pathways found that water from Station #8 can pass through the area of Station #6 as incoming water begins to cover adjacent mudflats. The recommendation from the Washington Department of Health is that no shellfish is harvested near Station #6, although harvesting in the area of Station #4 is possible if the following criteria are satisfied: Criterion #1) Water quality standards are met at Station #4, and Criterion #3) Shellfish beds are shown to be not impacted by human fecal contamination.

Northwest Indian College. 2003. Lummi Nation TMDL Implementation Monitoring in WRIA 1 Project, First Annual Report, March 1, 2002 through February 28, 2003. Clean Water Act Section 319 Nonpoint Source Fund Grant, Northwest Indian College Contract 24-02. Northwest Indian College, Bellingham, Washington. 32 pages.

The Northwest Indian College collected and analyzed water quality samples at 64 sites in Water Resources Inventory Area 1, twice a month from March 1, 2002 through February 28, 2003. The samples were analyzed for fecal coliform, temperature and dissolved oxygen. Within the Drayton Harbor Watershed, five sites were sampled: Dakota Creek, California Creek, Cain Creek, Cain Creek Overflow, and Lift Station 5. Cain Creek, Cain Creek Overflow and Lift Station 5 contain storm water runoff from the City of Blain. These sites had high 90th percentile values but have low flow or are at a great distance from the Harbor, thus having a little affect upon the fecal coliform levels in Drayton Harbor. Both sites on Dakota and California Creeks met the geometric mean and estimated 90th percentile water quality standards.

Stanley, S., S. Grigsby, C. Donoghue, and G. Menzies. 2003. Drayton Harbor Focused Watershed Analysis: Remediating Water Quality Impacts Through Application of Landscape Principles. Washington Department of Ecology and Puget Sound Restoration Fund, Olympia, Washington. August 11, 2003. 81 pages.

This focused watershed analysis was conducted in order to develop specific land use recommendations and restoration measures that will potentially result in the restoration of ecological processes, structure and functions related to the improvement of water quality in the Drayton Harbor basins of Dakota and California Creeks.

During the past 10 years water quality sampling (i.e. fecal coliform) and algal surveys (i.e. increase in ulvoid species coverage and algal bloom) have provided indications that the watershed processes that deliver nutrients to the Harbor may have been significantly altered. By developing a sampling program for water quality attributes within individual sub-basins of Dakota and California Creeks this watershed analysis detected a clear pattern of significant alteration of the water and nutrient delivery process within the upper sub-basins of Dakota Creek and one mid watershed sub-basin in California Creek. The land uses of both areas were dominated by commercial agricultural relative to other sub-basins in the surveyed watersheds.

Research has demonstrated that riparian wetlands with an aquiclude and groundwater discharge provide a substantial degree of denitrification. Additionally, an increase in residence time of at least 2 to 7 days results in the reduction of fecal coliform colonies by approximately 50%. Presently, the channelized riparian waters in the upper reaches of Dakota Creek reach Drayton Harbor within 11 hours after a moderate winter storm.

By restoring overbank flooding in portions of Dakota and California Creeks, the historic riparian wetlands could be allowed to regain their habitat structure and water quality functions. Such restoration would result in greater residence time and improved removal of nutrients and harmful bacteria. Based on GIS layers identifying areas of “potential wetlands” and areas of greatest process change, one primary area in Dakota and California Creek were identified for restoration of riparian habitat.

Areas along the shoreline of Drayton Harbor were also evaluated for their public access and recreational potential (Figure 20).

Management recommendations from this analysis were separated into ‘nutrient and fecal coliform management’, ‘protection and restoration of watershed processes and habitat’, and ‘public access and recreation management for Drayton Harbor shoreline’; and are summarized below:

Nutrient and Fecal Coliform Management

1. Overall Recommendation: Expansion of farms plans in areas identified with water quality problems.
2. Dakota Creek Commercial Agricultural Area: Acquisition of riparian restoration easements or development of incentive measures for landowner restoration of floodplain areas between sampling stations 14 and 15.
3. California Creek Commercial Agricultural Area: Acquisition of riparian restoration easements or development of incentive measures for landowner restoration of floodplain areas downstream of sampling stations C5 and C4 to the intersection of Ham and Birch Bay Roads.
4. California Creek Rural Agriculture: Acquisition of riparian restoration easements or development of incentive measures for landowner restoration of floodplain areas between sampling stations C7 and C10.
5. California Creek: Implement an education program with rural landowners upstream of sample station C14.

Protection and Restoration of Watershed Processes and Habitat

6. Overall Recommendations for Both Basins: To further the restoration process
 - i. Protect existing and potential wetlands from conversion to upland habitat or urban uses, and provide for the restoration of these potential wetland areas
 - ii. Protect and restore existing forest habitat to a minimum of 65% cover
 - iii. Limit effective impervious area to 10%
7. Dakota Creek: Watershed habitat protection in
 - i. Areas with glaciomarine drift formations
 - ii. Headwater wetlands in the upper portion of the subbasin draining to sampling station D7
8. California Creek: Watershed habitat protection in
 - i. Areas with glaciomarine drift formations

- ii. Wetlands located on peat deposits
- 9. Work with Local Fisheries Enhancement Organizations to identify additional key areas for restoration of habitat.
- 10. Develop funding sources to implement watershed restoration measures.
- 11. Seek funding for ongoing monitoring of key sample station sites to determine effectiveness of restoration measures.

Public Access and Recreation Management for Drayton Harbor Shoreline

- 12. Implement a comprehensive public access and recreation plan for the Drayton Harbor Shoreline with acquisition of easements, public trails, and the implementation of an ongoing monitoring, education and research program.
- 13. Implement Restoration of Drayton Harbor Shoreline, including restoration of historic tidal marsh habitat.

Strayer, J. and J. Hirsch. 2003. Drayton Harbor Water Quality Monitoring Summary for 2002 and Recommendations for Monitoring in 2003. Technical Memorandum, The Environmental Company, Inc., from Jason Strayer and Julie Hirsch of Hirsch Consulting Services, to Mike Stoner, Port of Bellingham. February 6, 2003. 32 pages.

This memorandum describes the water quality monitoring results for Drayton Harbor for 2002. The data were collected as part of Port of Bellingham's continuing monitoring project for Drayton Harbor. The study describes source control activities, summaries the data, and provides recommendations for future activities. Source control activities in 2002 for the Harbor included:

- City of Blaine upgrading the lift station #1 on Marine Drive and adding a detention pond to the stormwater system
- Installation of a new breakwater that is expected to improve circulation in Blaine Marina
- Fecal coliform discharge from Blaine Seafood Processors has dropped
- Bird noise device was installed at Sea-K-Fisheries that appears to be effective in keeping birds away
- Signs were installed around the Marina asking boaters not to discharge waste
- Language was added to lease agreements at Blaine Marina acknowledging Drayton Harbor as a sensitive area and prohibiting the discharge of pollutants into the water
- Education activities continue in and around the Harbor itself

Conclusions from the water monitoring activities are summarized here:

- Fecal coliform levels were higher for 2002 than 2001
- Fecal coliform densities near the commercial section of Blaine Marina continue to be high, and therefore the Marina continues to be considered as a source for fecal coliform loading
- Highest densities of fecal coliform were recorded during a January rainfall event
- Fecal coliform levels were strongly correlated to temperature at one sample site
- Results from 2001 and 2002 indicate that fecal coliform densities in Semiahmoo Bay continue to be low, indicating that Semiahmoo Bay can not be considered as a source for fecal coliform loading in Drayton Harbor

Recommendations from the memorandum:

- Reduce Semiahmoo sample stations to just one site
- Continue monthly sampling at Blaine Marina throughout 2003
- Continue analysis of fecal coliform bacteria by MF and MPN methods
- Determine whether previous dye studies provide enough information to eliminate Blaine's sewage collection system, commercial sanitary hookups, and Blaine's Seafood Processor's discharge system as sources of fecal coliform to Blaine Marina
- Runoff from fish processor's decks should be sampled during the monthly water quality sampling
- Conduct inspections of the Blaine Marina commercial area during the season when fecal coliform levels are historically high
- Install additional bird deterrent devices at Blaine Harbor
- Explore approaches for preventing build-up of bird feces on the dock areas
- Continue to ensure proper pump-out procedures
- Inspections and efforts to work with sea food processors should be associated with the Non-Point Pollution Solution Centennial Grant Project
- The monitoring program should remain in place for at least one year after the modifications to the marina's breakwater are finished

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❑ **Community Oyster Farm Projects:**

- Sanitary Sewer Investigations in 2001 identified leaks in the sewer system, which were repaired. Follow-up work was conducted during 2003 to dye-test the sewer lines for potential impacts to marine waters and storm water runoff. City of Blaine and DOH partnered in these studies and have reviewed the reports (listed above). No leaks were found and the sewer lines were eliminated as a potential source of bacterial contamination.
- Circulation studies conducted in and around Blaine Harbor (Reports listed above).
- Wetlands study, with the Washington State Department of Ecology, produced a report that identifies key areas for wetland restoration (listed above).
- Shuckin' on the Spit was held for the second year in a row in partnership with the Resort Semiahmoo. The primary goal of the event is to raise community awareness of the marine resources of Semiahmoo Bay and Drayton Harbor, and to enjoy a shellfish and seafood feed. . Over 1,000 people attended this event in 2002 and 2003.
- Signs were installed on the oyster beds to discourage public from poaching.

❑ **Department of Agriculture:** Agriculture is currently responsible for inspecting all dairy farms in the Washington state since July 2003. Inspectors are currently being hired and will begin inspections in January of 2004.

❑ **Department of Ecology:** Ecology performed inspections of 18 dairy farms in the Drayton Harbor watershed until July 2003.

❑ **Port of Bellingham Projects:**

- On-site Pump-out Facilities: The Port of Bellingham has installed 4 pump-out facilities at its Blaine Marina as part of the expansion project. Three of the facilities are portable units. The Port is currently working on getting a pump out

station with various adapters to allow for different commercial vessels to hook up to the station. The Semiahmoo Marina across Drayton Harbor also has a portable pump-out facility on-site.

- Language Changes: The Port added language to the live-aboard agreements in Drayton Harbor that emphasizes that Drayton Harbor is a sensitive area and no discharging is allowed in marina or harbor,
 - Signage: The Port add signage to the marina area that directs boats to the pump-out facilities, and alerts boaters to penalties associated with illegal discharge of sewage.
 - Water Quality Monitoring: The Port samples water each month to monitor the water quality in the Harbor and to target potential pollution sources.
 - The Port of Bellingham inspected marine sanitation devices (MSD) on all fifty live-aboard vessels in Blaine Harbor. These inspections detected five boats, which had Y-valves in the holding tank position but not secured. These five were secured during the inspection. All vessels had correct Type III MSDs. During inspections, most customers reported that they use shore side facilities the majority of the time.
- **Whatcom County Health Department:** The Health Department sends out reminders to on-site septic system owners to have their systems pumped out and inspected every 3 to 5 years.
- **The Whatcom County Marine Resources Committee (MRC):** The MRC is partnering with the Port of Bellingham and Drayton Harbor Shellfish Advisory Committee in the Blaine Marina Pilot Project to meet these objectives:
- Evaluate bird and rat populations in the commercial portion of the Blaine Marina that may be contributing to fecal coliform bacteria levels.
 - Evaluate structural components in the marina to better understand how stormwater moves in the area.
 - Develop strategies for reducing/eliminating pollution sources in the commercial portion of the marina.
 - Implement a selected management option(s) and monitor its effectiveness at reduction of fecal coliforms.

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