KITSAP PUBLIC HEALTH DISTRICT
ENVIRONMENTAL HEALTH DIVISION
WATER POLLUTION IDENTIFICATION & CORRECTION PROGRAM

LIBERTY BAY WATERSHED RESTORATION PROJECT
FINAL REPORT

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Funding by:

Clean Water Kitsap
Partners in Stormwater Solutions

WASHINGTON STATE DEPARTMENT OF ECOLOGY

KITSAP PUBLIC HEALTH DISTRICT

Kitsap Conservation District

WASHINGTON STATE UNIVERSITY KITSAP COUNTY EXTENSION

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ACKNOWLEDGMENTS

The authors would like to thank all of the project area residents who provided access to their properties for inspection and educational outreach. Special thanks goes to residents who installed new septic systems, agricultural best management practices, etc., to help improve public health and water quality. We would also like to thank fellow Kitsap Public Health District staff, the Washington State Department of Ecology, the Kitsap Conservation District, and Kitsap County Surface and Storm Water Management for their assistance in completing the Liberty Bay Watershed Restoration Project.

1.0 EXECUTIVE SUMMARY

Liberty Bay Watershed Restoration
Kitsap Public Health District
Agreement No: G1000301
Project opened November 3, 2009 and closed June 16th, 2014
Final Total Project Cost: $666,666
Final Ecology Grant Contribution: $500,000

Project Description

In 2008, fresh water fecal pollution levels in the Liberty Bay watershed were too high, so Ecology initiated a Total Maximum Daily Load Study (TMDL) in 2009. Kitsap Public Health District (KPHD) was awarded a Centennial Clean Water Fund (CCWF) grant to conduct early implementation of the TMDL in Spring 2009.

Many Liberty Bay onsite septic systems (OSS) experience risk factors that can lead to inadequate sewage treatment and failure including: age, no permits, shallow ground water, inadequate setbacks to surface waters, and deep drainfield installations. This resulted in the Health District designating Liberty Bay as a Marine Recovery Area in June 2008. KPHD inspected OSS and provided site-specific recommendations to prevent premature failure.

KPHD partnered with Kitsap Conservation District (KCD) to provide free technical assistance for high priority farms in the watershed. Cost share money for livestock and agricultural animal manure land management practices was a good catalyst resulting in behavior change

Liberty Bay Facing Northwest from Keyport

Project Accomplishments

867 watershed residents received education related to prevention of FC sources during Health District property inspections.

47 high priority farms were investigated. Nine (9) farms were found to have water quality concerns.

Eight (8) farms were proven to be in violation of local solid waste regulations due to runoff issues.

98 best management practices were implemented at 41 locations in the watershed.

47/50 (97%) of failing OSS identified during the project have been repaired.

752 samples were collected from 328 individual discharges to the Liberty Bay shoreline. 23 shoreline fecal coliform hot spots were confirmed and investigated during this project. Ten (10) failing OSS were identified and corrected, three (3) leaking sewer connections were found and corrected, and five (5) hot spots were linked to wildlife activity.

Water Quality Improvements

Eight (8) Liberty Bay tributaries have seen reductions in FC levels since project inception. These include Big Scandia, Daniels, Dogfish (Main), Dogfish (South), Little Scandia, Unnamed (south of Daniels Creek), Lemolo, and Sam Snyder

Seven of eight (88%) salt water stations in Liberty Bay currently meet standard.

Station LB07 met standard for five consecutive years so can be moved from Category 5 to Category 1.

Station LB09 met standard for the past four years so can be moved from Category 5 to Category 1.

The Next Steps for Continued Success

Continue to research and pilot potential methods to build public trust. The cost share funding incentive program for livestock and agricultural BMPs builds public relations and partnerships and minimizes expensive and time-consuming enforcement. Good land management practices prevent erosion that forms run-off channels through riparian zones into streams and shorelines.

Liberty Bay shoreline drainages will be monitored on a regular basis through county wide shoreline monitoring program beginning in 2014. Also, federal funds have been received which will enable local heath to conduct fecal source identification and correction in the City of Poulsbo.

Lessons Learned

Shoreline surveys were an effective method of finding OSS failures. Extreme low tide shoreline surveys can be an effective method of finding direct discharges into the shoreline.

Cost share money for livestock and agricultural animal waste best management practices was a good catalyst resulting in behavior changes that protect water quality. The incentive program has proved effective in achieving water quality improvements in challenging situations and during adverse economic conditions.

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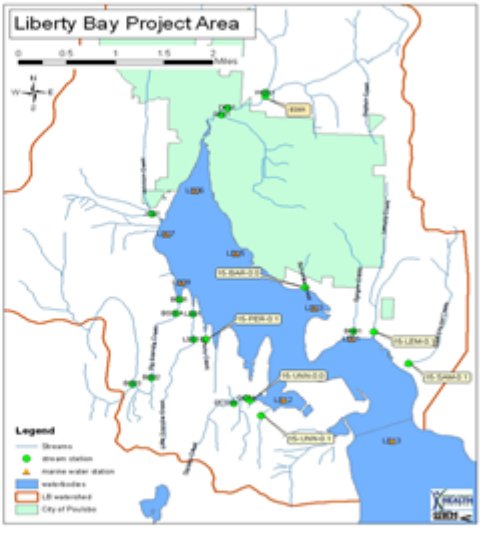


Liberty Bay Project Area

EXECUTIVE SUMMARY (CONT)

Table E1 below describes how this project met its Goals, Anticipated outcomes, and Required Deliverables:

Goals	***Status***	***Comments***
• Designated beneficial uses will be restored and protected	**Progress**	**Eight (8)** Liberty Bay tributaries have seen reductions in FC levels since project inception. All but one salt water station meet state standard.
• Healthy waters prevented from being degraded	**Progress**	**854** watershed residents received education related to prevention of FC sources during Health District property inspections.
• Water bodies on the 303(d) list for fecal coliform bacteria contamination will be restored to water quality standards.	**Progress**	**Eight (8)** Liberty Bay tributaries have seen reductions in FC levels since project inception. All but one salt water station meet state standard. Station LB07 met standard for five consecutive years so can be moved from Category 5 to Category 1. Station LB09 met standard for the past four years so can be moved from Category 5 to Category 1.
Water Quality & Environmental Outcomes	***Status***	
• Reduce fecal coliform (FC) levels to standard in project area streams and marine waters.	**Progress**	**Eight (8)** Liberty Bay tributaries have seen reductions in FC levels since project inception. All but one salt water station meet state standard. Station LB07 met standard for five consecutive years so can be moved from Category 5 to Category 1. Station LB09 met standard for the past four years so can be moved from Category 5 to Category 1.
• Sample 95% of drainages flowing to Liberty Bay during 2 dry and 2 wet shoreline surveys	**Achieved**	**752** samples collected from **328** unique drainages during **four (4**) complete shoreline surveys and necessary follow up sampling.
• Reduce FC pollution in shoreline drainages and storm water outfalls.	**Progress**	
• Inspect 80% of estimated 1000 onsite sewage systems in project area	**Exceeded**	Inspected **854** OSS during the project.
• Correct 100% failing onsite sewage systems.	**Progress**	**43/49 (88%)** of failing OSS identified during the project have been repaired.
• Inspect high and medium priority agricultural properties.	**Achieved**	**Two (2)** farms proven to be in violation of local solid waste regulations due to runoff issues.
• Install best management practices at agricultural properties. Correct 100% of livestock manure management problems	**Achieved**	**98** best management practices implemented at **41** watershed farms
• Distribute pet waste buckets.	**Achieved, revised by West Sound Environmental Outreach Group**	
• Implement marina pump out outreach program by distributing 100 educational boat seat cushions and monitoring pump out use before and after distribution.	**Achieved.** Revised by WSU Extension	
• Provide public meetings and workshops for a total of 150 participants.	**Exceeded**	**224** people participated in **eight (8)** public meetings and workshops
• Provide Washington State University training workshops for an anticipated thirty realtors.	**Achieved**	
Performance Items & Deliverables	***Status***	
• Project administration/management	**Achieved**	All required reports and billings have been submitted.
• Public education and outreach	**Exceeded**	All requirements met.
• Pollution Identification and Correction	**Achieved**	All requirements met.
• Final report	**Achieved**	Submitted

As presented in Table E1 above, the primary findings of the Liberty Bay Watershed Restoration Project are:

- Many of the OSS in the area experience risk factors that can lead to failure including age, lack of permit records, shallow ground water, inadequate setback to surface waters, and deeper installation depths that can degrade the ability of soil bacteria and microbes to provide adequate treatment. OSS without permit records have not been evaluated and inspected for conformance with installation requirements that minimize failure risk including: size and depth of tanks and drain field, type of materials used, and level drain field trenches for equal effluent distribution.

- Shoreline surveys are an effective method of finding OSS failures and other pollution sources.

- Cost share money for livestock and agricultural animal manure land management practices has been a good catalyst, resulting in behavior change and increased landowner stewardship. This incentive program has proven effective in achieving water quality improvements in challenging situations and during adverse economic conditions. This method minimizes expensive and time-consuming enforcement that also damages public relationships and strains partnerships. Good land management practices prevent erosion that forms run-off channels through the riparian zone and transports pollution to streams and shorelines.

- Poor garbage and grease housekeeping practices provide a food source for urban wildlife that results in fecal pollution.

- Kitsap County residents are urged not feed wildlife. Multiple FC “hot spots” in the growing area were confirmed or suspected to be wildlife related. Feeding wildlife is not healthy for wildlife, water quality or public health.

- Non-point pollution is best addressed by visiting as many watershed residents as possible and door-to-door surveys are an excellent way to provide site-specific information about how to reduce bacterial and nutrient sources.

- This watershed needs an ongoing effort to protect water quality because many of the OSS are well past the average functional lifespan of approximately 30 years.

- Periodic shoreline surveys along Liberty Bay will continue to be needed to identify and correct new sources of fecal bacteria. Liberty Bay is included in the Health District’s shoreline monitoring program, and is scheduled for survey/sampling in 2014.

- Continue the strong partnership with DOH, Ecology and other water quality agencies to implement the Liberty Bay Watershed Fecal Coliform Bacteria Total Maximum Daily Load.

- Kitsap Health should continue to be involved in the Liberty Bay watershed through public complaint response, water quality trend monitoring, and follow-up of reports submitted by certified monitoring and maintenance specialists and pumpers. In addition, continue to flag properties with ongoing concerns in Kitsap Health records to assist future inspections.

- Research potential methods to better build public trust, by actively working to provide accurate and representative data upon which to base regulation and legislation.

- Utilize and develop public outreach and education materials based on social marketing principles that will result in measurable behavior changes.

2.0 BACKGROUND AND PROBLEM STATEMENT

The "Water Quality Standards for Surface Waters of the State of Washington" are codified in Chapter 173-201A of the Washington Administrative Code. The surface waters in the project area are currently designated in the WAC as Extraordinary Primary Contact Recreational Waters. Freshwater and marine water standards for fecal coliform (FC) bacteria are shown in Table 1.

Table 1
Washington State Surface Water Quality Standards
(Chapter 173-201A-030 WAC)

Parameter	Freshwater - Extraordinary Primary Contact	Marine - Extraordinary Primary Contact
Fecal Coliform Bacteria (FC)	**Part 1: ≤ 50 FC**/100ml (geometric mean) **Part 2:** Not more than **10%** of all samples obtained for calculating a geometric mean **>100 FC**/100 ml	**Part 1: ≤ 14 FC**/100ml (geometric mean) **Part 2:** Not more than **10%** of all samples obtained for calculating a geometric mean **>43 FC**/100 ml

Table 2, Table 3, and Table 4 provide a summary of pre-project FC data collected by the Health District for Liberty Bay tributaries and salt water stations. As you can see, during the 2008 water year, most Liberty Bay streams failed the applicable standard, whereas marine water quality was excellent.

Table 2
Summary of Historical Fecal Coliform Data for
Liberty Bay Streams

Stream Mouth	2008 Water Year (October 2007 – September 2008)					
	Number of samples	Range (FC/100 ml)	GMV (FC/100 ml)[1,2]	#Samples exceeding standard	%Samples exceeding standard [2]	Meets Washington Dept. of Ecology Standard?
Dogfish Creek DF01	12	8-240	49	4	33	**No**
Dogfish Creek South Fork SF01	12	4-900	73	6	50	**No**
Dogfish Creek East Fork ED01	12	4-300	27	2	17	**No**
Dogfish Creek West Fork WD01	12	8-130	33	1	8	Yes
Johnson Creek JC01	12	2-110	17	1	8	Yes
Big Scandia BS01	12	8-300	75	5	42	**No**
Little Scandia Creek LS01	12	13->1600	168	8	67	**No**
Daniels Creek DC01	12	6-500	65	4	25	**No**
Bjorgen Creek BN01	12	7-500	58	6	50	**No**

1. GMV = geometric mean value
2. Shaded entries indicate an exceedance of the applicable water quality standard (**Extraordinary Primary Contact** - Chapter 173-201A-030 WAC) during Water Year 2008. FC levels shall not exceed a GMV of 50 FC/100ml, and not have more than 10% of all samples exceed 100 FC/100 ml

Table 3
Summary of Historical Fecal Coliform Data for
Liberty Bay Marine Waters

Marine Station	2008 Water Year (October 2007 – September 2008)					
	Number of samples	Range (FC/100 ml)	GMV [1] (FC/100 ml)	#Samples >43 FC/100 ml	%Samples >43 FC/100 ml [2]	Meets Washington Dept. of Ecology Standard?
LB06	8	<2-23	2	0	0 %	YES
LB05	6	<2-17	3	0	0%	YES
LB01	8	<2-4	2	0	0 %	YES
LB13	6	<2-8	2	0	0%	YES
LB12	8	<2-23	2	0	0%	YES
LB09	8	<2-8	2	0	0%	YES
LB07	8	< 2-4	2	0	0%	YES

1. Shaded entries indicate an exceedance of the applicable water quality standard (**Extraordinary Primary Contact** - Chapter 173-201A-030 WAC) during Water Year 2008. FC levels shall not exceed a GMV of 14 FC/100ml, and not have more than 10% of all samples exceed 43 FC/100 ml

3.0 PROJECT AREA DESCRIPTION

The Liberty Bay watershed project area is mapped in Figure 1 and Figure 2 below.

Figure 1
Project Area Overview

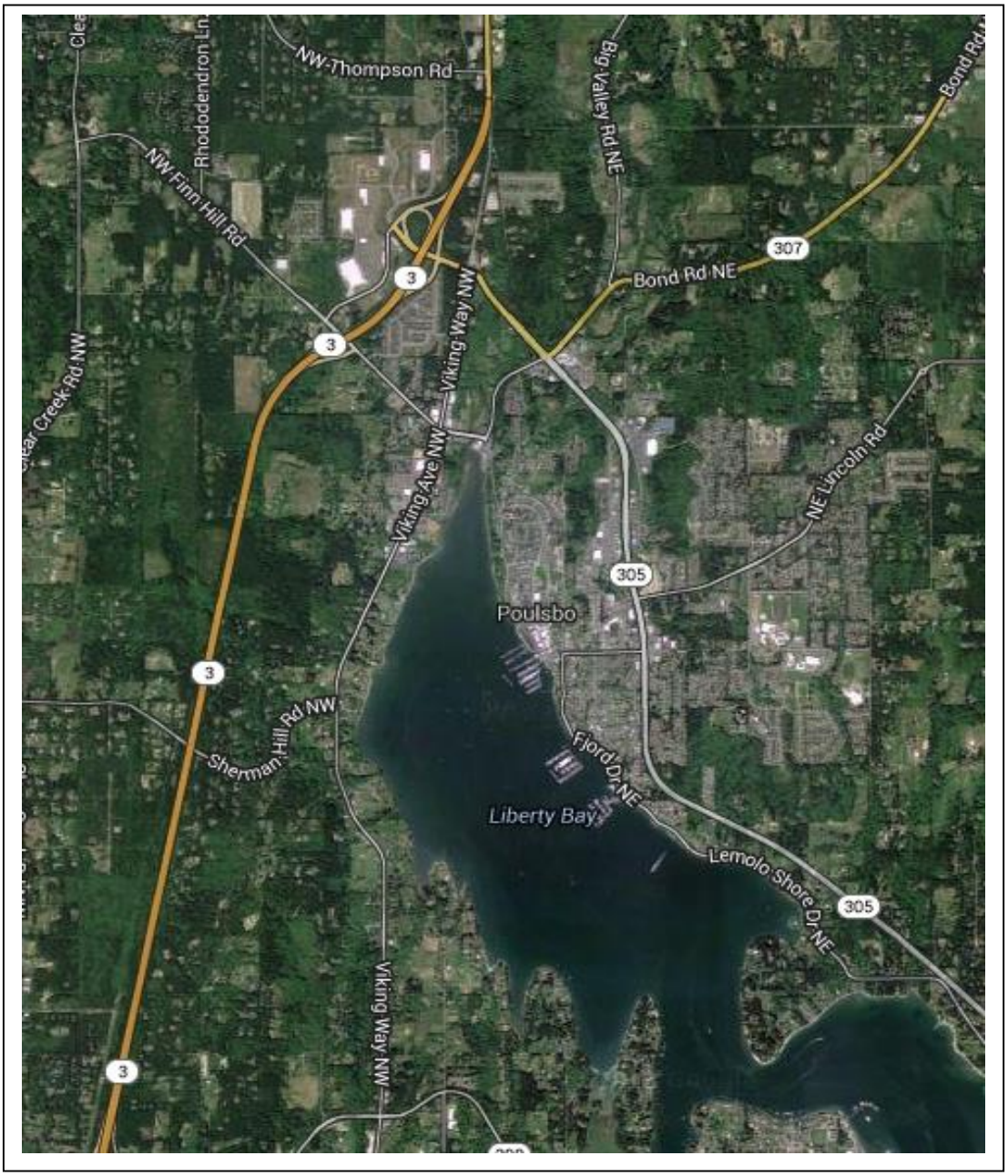
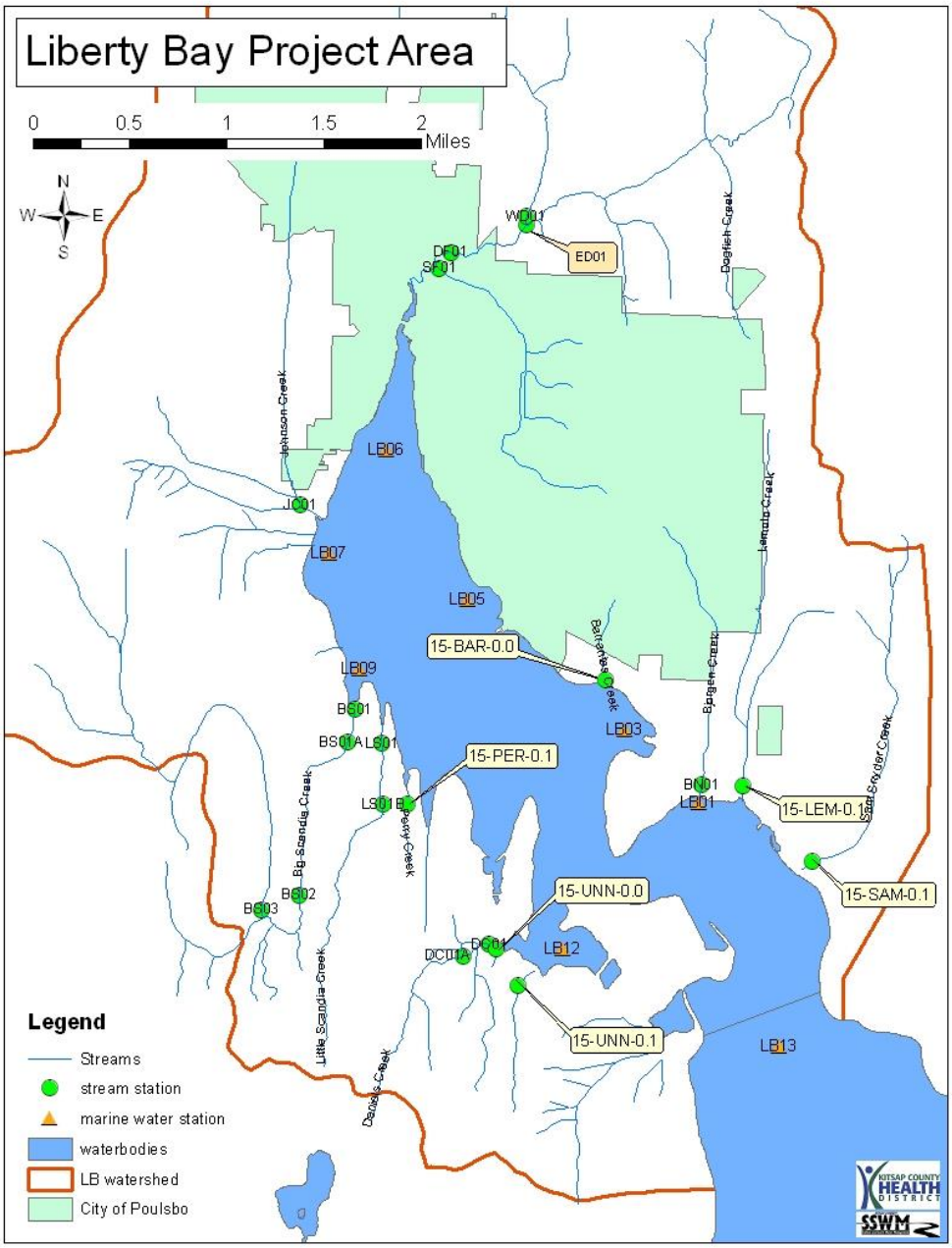


Figure 2
Project Area Detail



4.0 GOALS, OUTCOMES, AND PROJECT DELIVERABLES

The Water Quality Project Goals of the Liberty Bay Watershed Restoration Project were:

1. Designated beneficial uses will be restored or protected, 303(d) Listed water bodies restored to water quality standards, healthy waters prevented from being degraded.
2. Regulatory compliance with a consent decree, compliance order, TMDL or waste load allocation, etc. achieved.

The Water Quality Project Outcomes of the Liberty Bay Restoration Project were:

1. Sample 95% of drainages flowing into Liberty Bay for FC during a minimum of 4 distinct monitoring events; two during dry weather and two during wet weather.
2. Inspect 80% of on-site sewage systems in the project area. (The final project area will be determined based upon results of the marine shoreline survey, review of historical stream monitoring data collected by Kitsap Health, review of stream monitoring data collected by Ecology pursuant to the TMDL monitoring plan, etc.)
3. Ensure corrective actions are implemented on 100% of farms with documented violations of local solid waste handling regulations (e.g. poor animal waste management practices).
4. Ensure repair or replacement of 100% of failing on-site sewage systems identified during the project.
5. Reduce fecal coliform bacteria (FC) levels within Liberty Bay streams and the number of FC standard exceedances in receiving marine waters.
6. Inspect 95% of on-site sewage systems in the Liberty Bay watershed that are reported as “deficient” (e.g. failing or not operating properly) by a Health District certified pumper or maintenance specialist.
7. Inspect 95% of public complaints registered by watershed residents alleging a water quality problem and/or failing onsite sewage system.

The Water Quality Outcomes of the Liberty Bay Restoration Project were:

1. Reduce fecal coliform bacteria (FC) levels within Liberty Bay streams and the number of FC standard exceedances in marine waters.

The Performance Items and Deliverables required by this project were:

- Administer and manage the project
- Provide public education and outreach
- Identify and correct fecal pollution sources
- Conduct post corrective monitoring to document improvements in water quality
- Prepare a final project report

5.0 PROJECT DESIGN AND METHODS

5.1 Shoreline Surveys

This section describes the Health District's four tier plan that was implemented to accomplish the goals and expected outcomes listed above in Section 3.0. The core activity completed by the Health District to achieve project goals and outcomes was marine shoreline surveys in the project area. Two wet season shoreline surveys and two dry season shoreline surveys were conducted during the project period. Wet season shoreline surveys screen for OSS that fail due to surface or groundwater intrusion. Dry season surveys can identify failures masked by dilution during the wet season.

During the shoreline survey, all significant discharges to the marine environment were sampled for FC bacteria. Typical discharges included: curtain drains, bulkhead drains, roof drains, culverts, small streams and bank seeps. Samples were collected at low tide to target the discharge of fresh water versus the drainage of residual marine water.

Sampling stations were given an identification number in sequence from the starting point to the endpoint of the survey. They were also photographed, noted, and global position system (GPS) coordinates were recorded. Location descriptions were recorded at each sample station in the field notebook.

Discharges exceeding screening criteria of 200 FC/100ml were resampled twice to confirm contamination. If the geometric mean of the samples exceeded screening criteria, then the location was designated a hot spot and the source identification process was initiated. The purpose of this is to ensure that only stable and consistent "hot spots" are investigated, which improves our efficiency.

Properties associated with the FC hot spots were inspected to identify and correct any human caused FC sources.

5.2 Property Surveys

In addition to inspecting properties associated with FC hot spots, the Health District inspected additional properties that had the possibility of impacting stream or marine water quality. Property survey results are located in Section 5.2.

Individual property surveys were conducted according to the "Manual of Protocol: Fecal Coliform Bacteria Pollution Identification and Correction". A property survey consisted of an OSS record search, homeowner/resident interview, field inspection, and water sampling and dye test when necessary. The purpose of the survey was to identify all potential sources of FC pollution and to provide information to property owners about how to operate and maintain

their OSS and manage animal waste and other nutrient sources to prevent fecal and nutrient pollution. Inspectors identified any concerns that could cause premature OSS failure. Property owners were given copies of their OSS records, a fact sheet about the project, and information about septic loan programs when appropriate. Homeowners were encouraged to inspect their drain field and tank areas with Health District staff to learn the symptoms of a failing OSS. Often these inspections revealed potential problems, such as improper placement of roof drains, damage to a drain field by parking vehicles over the laterals, or unwanted growth of blackberry bushes and tree roots that could obstruct the disposal lines. Many properties were selected based on the watershed boundaries, but others were selected based upon proximity to marine shoreline FC “hot spots”, public sewage complaints and "deficient” OSS monitoring and maintenance or pumper reports.

Some of the surveys required additional inspections due to conditions that suggested a failing OSS. These “suspect” systems required laboratory samples of surface water and dye testing. A system with suspect conditions, such as a saturated drain field area, or a negative dye test with high FC counts, received a rating of “suspect,” and the homeowner was encouraged to take the necessary steps to improve the operation of the OSS. When an OSS received a rating of “non-conforming,” such as non-permitted repairs or alterations or additional bedrooms added to the home, the homeowner was informed of the issues, their impact on the OSS, and the necessary steps to resolve the issues. Suspect and non-conforming systems found during this project were recorded in Health District records without corrective enforcement.

Inspectors also identified potential non-OSS FC sources like pet waste, livestock and agricultural waste, as well as nutrient sources during the survey. If a problem with animal waste was observed, the owner or resident was informed that pet and other animal waste is a fecal pollution source.

If a problem with pet waste was observed, the owner was educated on how to manage it correctly. This includes a discussion of what the regulations require, and outreach materials from the West Sound Storm water Outreach Group (WSSOG). Kitsap County and the Cities of Poulsbo, Bremerton, Port Orchard, and Gig Harbor began working together in 2008 to jointly develop, implement, and fund Permit-required outreach via interlocal agreements. In early 2012, the cities of Bainbridge Island and Port Angeles joined and signed interlocal agreements and the group assumed the name WSSOG to align with other similar groups across Puget Sound under the Storm water Outreach for Regional Municipalities (STORM) outreach umbrella.

One of the focuses of the WSSOG is pet waste and they developed a Mutt Mitt program that provides dog waste bags and disposal that resulted in an estimated 89 tons of dog waste diverted from surface waters in 2012. WSSOG also developed a Backyard Pet Waste Program with new outreach materials to address the estimated eleven plus tons of dog waste dropped on the Kitsap Peninsula daily. This daily load is consistent with other Puget Sound communities. In extreme cases, the pet owners can be enforced to comply with local pet waste regulations.

Wildlife can adversely affect water quality by digging latrines, obstructing storm water conveyances and burrowing into drain fields. Raccoons, mountain beavers, otters, waterfowl, bears, mice, deer, etc. are present throughout the project area, and can be found in dense populations in certain areas. Additional site specific information on the potential effect of wildlife on the project is discussed below in the Shoreline Survey Results section.

If a problem with livestock and agricultural animal waste was observed during the survey, the owner or resident was informed about Kitsap's solid waste regulations requirement that animal waste not be allowed to accumulate in any place where it can pollute surface water or drinking water. The property owner or resident was informed about the non-regulatory KCD, asked permission to share their contact information, and the parcel was referred to a KCD planner.

5.3 Agricultural Inventory, Farm Planning and BMP Implementation

There is a significant amount of livestock and agricultural animal activity in the Liberty Bay watershed. Kitsap Health partnered with Kitsap Conservation District (KCD) to identify and address high priority farm activities with the potential to impact water quality.

The Health District contracted with KCD to inventory and prioritize farms, to provide free technical assistance, farm planning and best management practice implementation in the project area. The inventory is an office and field evaluation of all livestock and agricultural properties in the watershed to evaluate their potential for creating fecal and nutrient contaminated runoff. Farm planning and best management practice implementation were carried out according to Washington Conservation Commission and United States Department of Agriculture Natural Resource Conservation Service standard practices and requirements.

Kitsap Health investigated high priority farms and landowners with water quality violations were referred to KCD to address water quality violations due to animal waste management.

5.4 Education and Outreach

Educating homeowners on potential FC and nutrient sources and how to prevent them was a critical part of the project. Public education was accomplished in four primary ways:

- During property surveys
- Public meetings
- Outreach at project area marinas
- KCD informational mailings
- KCD landowner workshops and Real Estate Workshops
- During KCD technical visits

5.5 Water Quality Monitoring

Water quality monitoring was conducted pursuant to the approved "Liberty Bay Watershed Restoration Project Quality Assurance Project Plan" (August, 2009).

5.5.1 Trend Monitoring

The Health District conducted monthly trend monitoring of **11** stream mouth stations and **8** marine stations in the vicinity of the project area. Please see Appendix A for a list of monitoring stations, and Figure 1 for their locations.

6.0 RESULTS AND DISCUSSION

This section describes project results as compared to the goals and expected outcomes listed in section 3.0. Table E-1 in the Executive Summary compares project results to project goals, outcomes and deliverables.

The following is a detailed discussion of project results organized by major activity. Each activity was one of the components of the Health District's four tier plan designed to clean up the degraded portions of the Sinclair Inlet watershed

6.1 Shoreline Surveys

752 samples were collected from **328** individual discharges to the Liberty Bay shoreline. Of these samples:

- **31%** of the samples were 100FC/100ml or greater (Part 2 of EPC FC Standard)
- **22%** of samples were 200FC/100ml or greater (threshold for further investigation)
- **14%** of samples were 500FC/100ml (high probability of nearby FC source)

Figure 3 describes the location of the hot spots that were identified during the shoreline surveys. **Twenty-three** shoreline fecal coliform hot spots were confirmed and investigated during this project. **Ten** failing OSS were identified and corrected, **3** leaking sewer connections were found and corrected, and **5** hot spots were linked to wildlife activity. The shoreline will be surveyed through the new county-wide shoreline survey program funded through the storm water utility. Any fecal hotspots will be investigated and fecal sources will be identified and corrected.
Figure 3 describes the location of the hot spots that were identified during the shoreline surveys.

- *23 shoreline fecal coliform hot spots were confirmed and investigated during this project.*
- *10 failing OSS were identified and corrected,*
- *3 leaking sewer connections were found and corrected,*
- *5 hot spots were linked to wildlife activity.*

The shoreline will be surveyed through the new county-wide shoreline survey program funded through the storm water utility. Any fecal hotspots will be investigated and fecal sources will be identified and corrected

Figure 3 shows that there was only one fecal hot spot on the west side of Liberty Bay between the mouth of Johnson Creek and Keyport. This is good news as this area is currently being evaluated by the Washington State Department of Health for commercial shellfish harvest. There are streams in that continue to fail the FC standard, but work will continue to identify and correct sources in their watersheds.

6.2 Property Surveys

Pollution Identification and Correction (PIC) OSS surveys were conducted from September 2009 through March, 2014. Residents of **854** properties participated in the PIC survey and based upon the results of each survey, OSS were categorized as “Failing,” “Suspect,” “Non-Conforming”, “Concern”, “No Records,” or “No Apparent Problems.” Table 5 summarizes the project OSS survey results. OSS were rated according to “Criteria for Rating OSS” in Appendix B**.**

Figure 3
Location of Shoreline Hot Spots

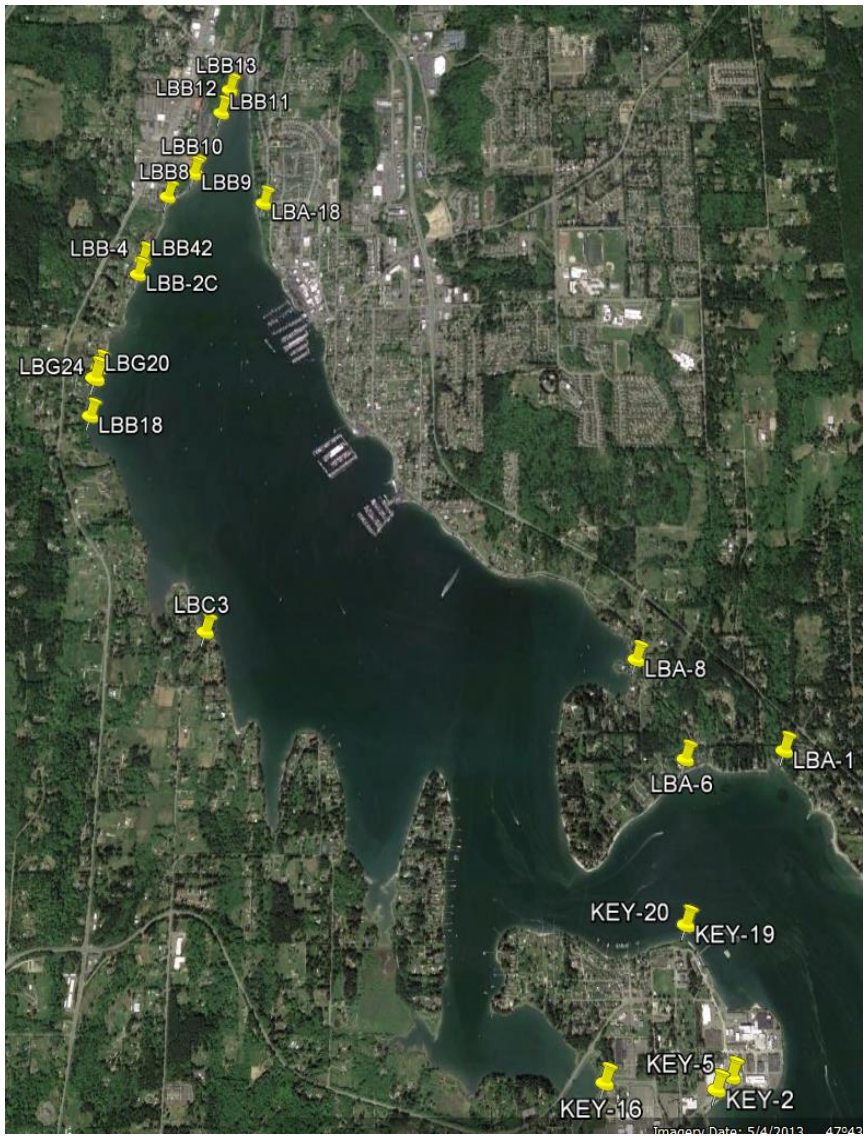
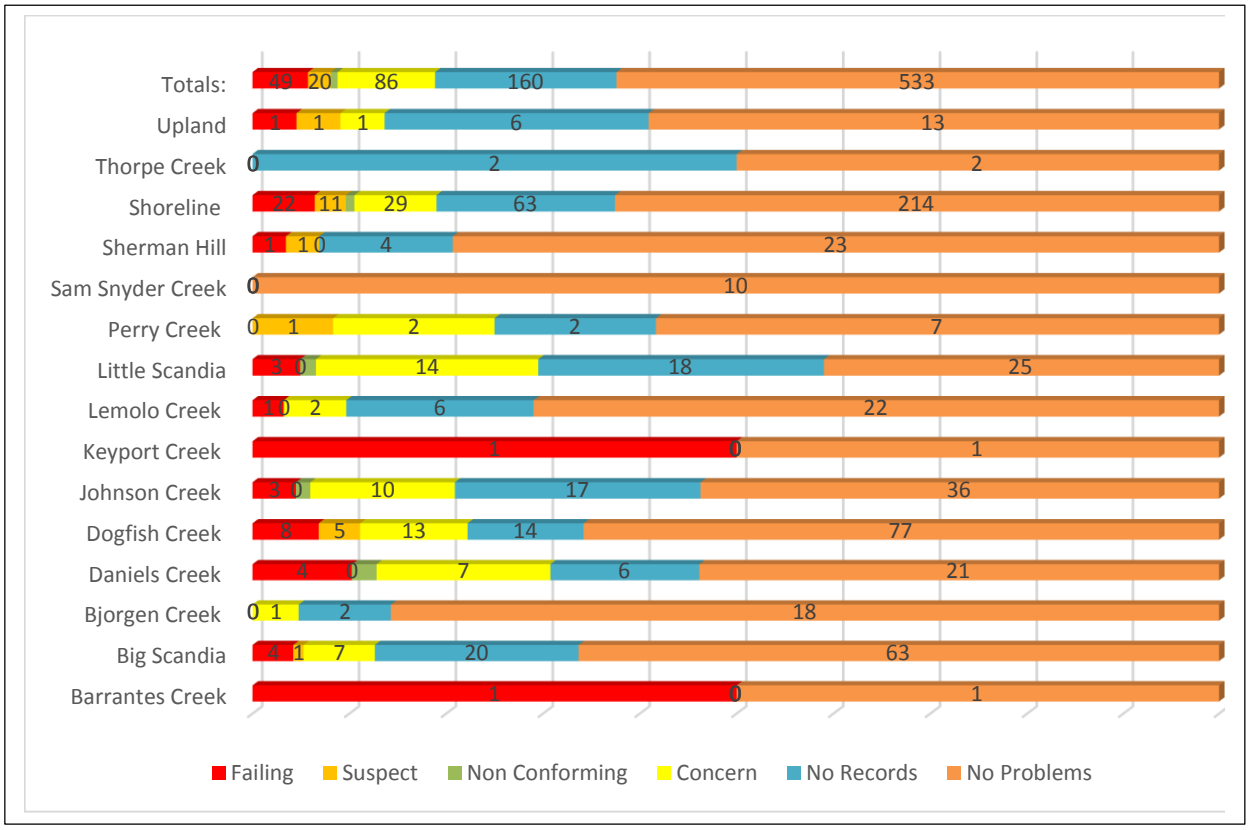


Table 4. Summary of PIC Property Inspection Results 9/01/2009 – 3/31/2014

Sub Area	Total	Failing		Suspect		Non Conforming		Concern		No Records		No Problems	
		#	%	#	%		%		%	#	%	#	%
Barrantes Creek	**2**	1	*50%*	0	*%*	0	*%*	0	*%*	0	*%*	1	*50%*
Big Scandia	**95**	4	*4%*	1	*1%*	0	*0%*	7	*7%*	20	*21%*	63	*67%*
Bjorgen Creek	**21**	0	*0%*	0	*0%*	0	*0%*	1	*5%*	2	*10%*	18	*85%*
Daniels Creek	**39**	4	*10%*	0	*0%*	1	*3%*	7	*18%*	6	*15%*	21	*54%*
Dogfish Creek	**117**	8	*7%*	5	*4%*	0	*0%*	13	*11%*	14	*12%*	77	*66%*
Johnson Creek	**67**	3	*5%*	0	*0%*	1	*1%*	10	*15%*	17	*25%*	36	*54%*
Keyport Creek	**2**	1	*50%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*	1	*50%*
Lemolo Creek	**31**	1	*3%*	0	*0%*	0	*0%*	2	*6%*	6	*19%*	22	*72%*
Little Scandia	**61**	3	*5%*	0	*0%*	1	*2%*	14	*23%*	18	*30%*	25	*41%*
Perry Creek	**12**	0	*0%*	1	*8%*	0	*0%*	2	*17%*	2	*17%*	7	*58%*
Sam Snyder Creek	**10**	0	*0%*	0	*0%*	0	*0%*	0	*0%*	0	*0%*	10	*100 %*
Sherman Hill	**29**	1	*3%*	1	*3%*	0	*0%*	0	*0%*	4	*14%*	23	*79%*
Shoreline	**342**	22	*6%*	11	*3%*	3	*1%*	29	*9%*	63	*18%*	214	*63%*
Thorpe Creek	**4**	0	*0%*	0	*0%*	0	*0%*	0	*0%*	2	*50%*	2	*50%*
Upland	**22**	1	*5%*	1	*5%*	0	*0%*	1	*5%*	6	*27%*	13	*58%*
Totals:	**854**	**49**	***6%***	**20**	***2%***	**6**	***1%***	**86**	***10%***	**160**	***19%***	**533**	***62%***

Figure 4. Summary of Pollution Identification and Correction Results 9/1/2009 – 3/31/2014



As presented in Table 5 and Figure 3, **19%** of the onsite sewage systems in the project area were failing, suspected to be failing, or at higher risk of failing because of conditions noted during the inspection. This percentage is average as compared to the six other most recent projects. Properties rated as Suspect are typically inspected one year after the original inspection. Properties rated as "Non-Conforming" are flagged in our onsite and drinking water tracking system to alert inspectors to the condition when property conveyance, plans or permits are entered for that property. We currently do not have the resources to re inspect or track "concern" properties, but the owner is made aware of the condition and its potential impacts to the longevity of their septic system.

6.2.1 Analysis of Failures

Historically, the average life expectancy for onsite sewage systems in Kitsap County is approximately thirty years. Misuse and environmental factors can shorten their life and regular maintenance and good home practices can lengthen it. The most common factors observed in the project area that contributed to OSS failure were:

- Age of the OSS
- Poor soil types
- Shallow depth to water table or an impervious layer
- Hydraulic overload by the residents
- Inadequate or lack of maintenance of the OSS
- Root intrusion into OSS components

Of the **51** failures identified during the project, the most common identifying characteristic was sewage coming to the surface of the ground from the OSS. Table 5 displays the types of failures observed during the project.

Table 5. Onsite Sewage System Failure Type

Number	Percent of total	Description
24	47%	Surfacing on ground
9	18%	Cross connection to drain system
6	12%	Direct discharge to ground surface
5	10%	Backing into structure
5	10%	Discharge to surface water
1	3%	Un permitted repair

Table 6 describes how many of the failing onsite sewage systems were repaired, and how they were repaired. **43 of 49** (**88%**) failing systems have been repaired, the rest will be repaired as soon as possible.

Table 6. Onsite Sewage System Repair Type

Number	Percent of total	Description
19	44%	New alternative system
13	30%	Minor repair
7	16%	Sewer connection
3	7%	New gravity system
1	3%	Structure vacated

As presented in Table 6, **44%** of the systems were replaced with an alternative system. Alternative systems are installed when soils and/or the location of the replacement area are not suitable for gravity flow systems. Note that 30% of the systems received minor repairs. Minor repairs are fixing broken pipes, adding 10 feet of drain field, etc.

Figure 5 describes the location of the failing OSS and illustrates that most of the failing OSS were located within 200 feet of the shoreline.

Figure 5. Location of OSS Failures

6.3 Agricultural Inventory, Farm Planning & Best Management Practice Implementation

Kitsap Conservation District made inventories of agricultural properties within the Liberty Bay watershed, contacted owners of these properties to offer technical assistance, and worked with landowners to implement BMPs that would reduce non-point source pollution.

Public outreach within Liberty Bay Watershed included mailings, public meetings and workshops. An initial mailing of an introductory post card explaining District services was sent to 90 agricultural landowners on July 29, 2009. These landowners were on previous inventory lists. Following completion of farm inventory, a general letter was sent on January 6, 2010 to all agricultural landowners in the watershed informing them of services available from the District as a result of Liberty Bay Grant funding. On October 1, 2013 a flier providing information on KCD Backyard Habitat Program was mailed to 70 landowners in Dogfish Creek Watershed.

Four public meetings were held within the watershed during the grant period. Also 2 KCD workshops were held within the watershed during the period, and several tours. In addition, numerous County wide informational/educational activities were conducted by the District during the period, and will continue into the future. See “Task 2: Public Information and Outreach” for a list of activities by quarter during the grant period.

Eighteen farm conservation plans (two with a significant forestry component) were developed for landowners. An additional 3 plans are in progress and should be finished by the end of the grant period. These plans inventory existing conditions and evaluate resource needs and challenges. KCD provided cost share assistance for implementing BMPs, and $17,756.57 has been awarded so far. Additionally, 3 landowners applied for and were funded by Environmental Quality Incentives Program (EQIP) with USDA-Natural Resources Conservation Service (NRCS) to receive incentive payments for implementing their farm conservation plans. Ninety-eight BMPs, both physical and management, have been implemented. KCD will continue to provide technical assistance to landowners as they implement their plans. See “Appendix A (table)” for farm planning and implementation details.

Challenges and Successes within Liberty Bay Watershed:

BMP Implementation Agricultural properties in the target watershed were prioritized based on their potential to pollute. Factors such as land use, livestock numbers, proximity of livestock use areas to surface water, presence of critical areas, pasture management, and facilities for waste were taken into consideration. A priority scale of 1 – 5 was used, with 1 indicating the highest

potential to pollute and 5 indicating the lowest potential. Most landowners of high and medium-high priority farms (1,2 and 3) and some landowners of lower priorities (4 and 5) within this watershed willingly implemented BMPs to reduce the likelihood for pollution. As implementation occurred, priority ratings were appropriately reduced

There is no standard BMP to resolve all risks to pollute, but the following BMPs or combination thereof have been used effectively on most farms to reduce risks: Access control to exclude livestock from surface water and wet fields (with an adequate setback for filtering of runoff). Removing manure from livestock confinement areas or elsewhere through waste transfer when use areas are prone to runoff into surface water. Manure storage in a high dry location with cover during the rainy season. A waste storage facility with a roof is the best method to accomplish this, but is usually not implemented due to expense. A more common practice is covering the pile with a tarp during the rainy season. Strategic fencing is integral to accomplish goals of most farm plans. Gutters and downspouts (roof runoff structure) and underground outlet piping are necessary to route roof water away from livestock confinement areas. Surfacing of confinement areas (heavy use area protection) may be necessary if mud is an issue and manure collection isn't possible.

Cost-sharing has historically been very effective at encouraging BMP implementation, but unfortunately is usually of limited availability. Additional cost sharing assistance would greatly improve landowners' ability/willingness to construct BMPs.

Landowner resistance to government agencies – Only a few landowners within this watershed were resistant to government entities and for this reason did not want to work with KCD. A bigger issue was that landowners who worked with KCD knew the District is non-regulatory, and as a result did not always feel a sense of urgency regarding correcting conditions or changing management on their farms. Working in conjunction with Kitsap Public Health District helped address this particular challenge.

Education - It appeared that KCD educational events such as workshops had an impact because some landowners throughout this watershed voluntarily implemented BMPS on their own.

Table 7 summarizes the BMP's that were implemented during this project. **Figure 6** presents the location of farms that implemented best management practices during the project.

Figure 6. Location of Properties with Implemented BMP

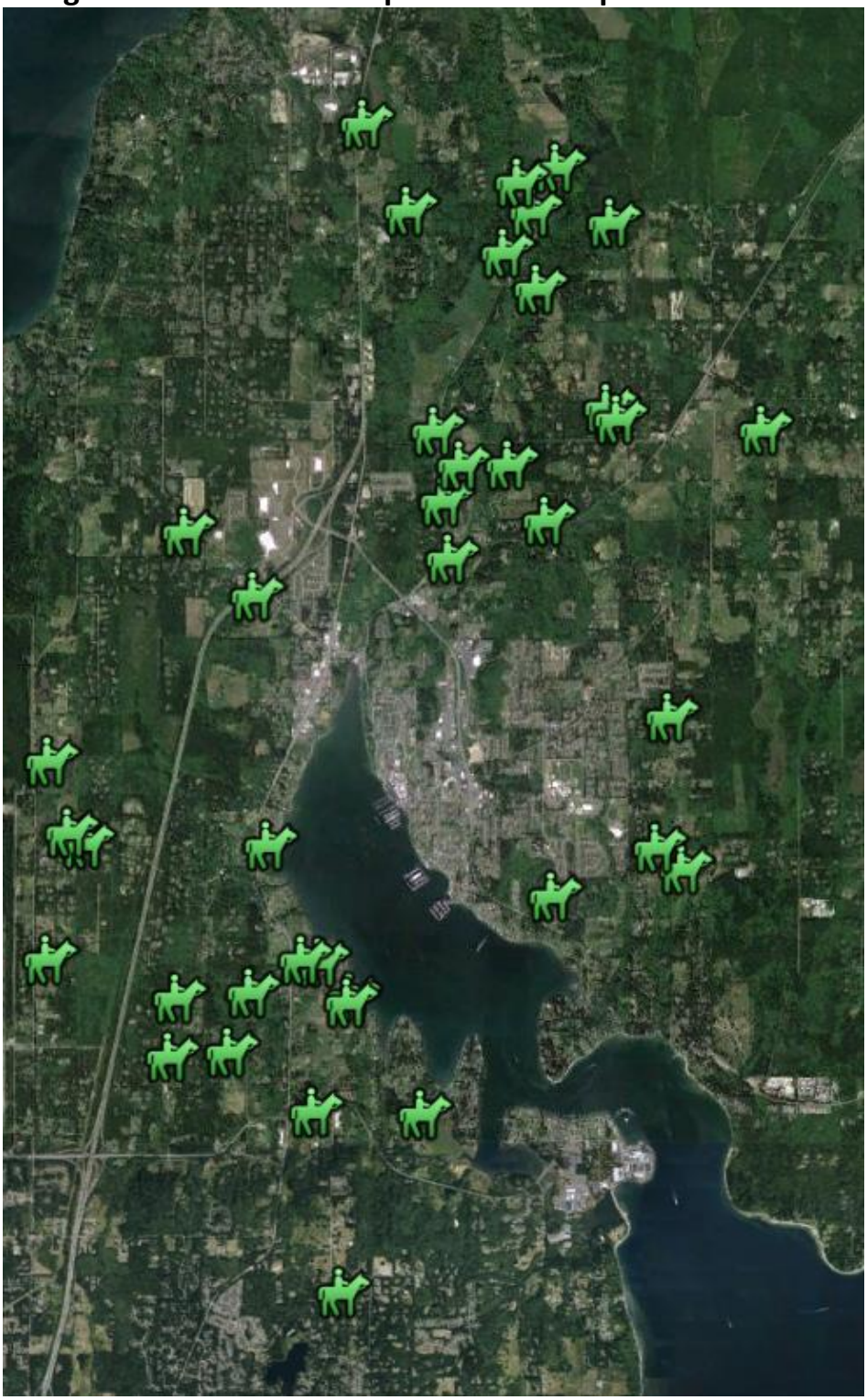


Table 7. Agricultural BMP Implementation Summary

Type of BMP	Quantity
Heavy Use Area Protection	**0.50 Acres**
Livestock Access Control	**120.5 Acres**
Fencing	**9809 Feet**
Filter Strip	**9 Acres**
Livestock Waste Transfer	**17 Acres**
Waste Storage Structures	**4 Structures**
Drainage Water Management	**4 Acres**
Roof Runoff Structure	**478 feet**
Structure for Water Control	**1 structure**
Nutrient Management	**5.50 Acres**
Tree/Shrub Establishment	**0.1 Acres**
Watering Facility	**1 facility**
Underground Outlet	**529 feet**

Only **two** farms were proven by KPHD to be in violation of local solid waste regulations because of nuisance conditions related to improper manure management. One of those farms implemented BMP's to address the problem. The other farm owner refused to cooperate with the Conservation District, but did take some action to reduce runoff from their property. The farm is under investigation again as those actions have not had a lasting effect. Appendix C contains the Kitsap Conservation District's final report for this project.

6.4 Education and Outreach

During property inspections, Kitsap Health staff provided homeowners with educational brochures, a copy of the sewage disposal permit, as-built, and OSS plans for their home. Kitsap Health staff also emphasized that operation and maintenance is crucial to prevent premature septic system failures and for protecting water quality in Liberty Bay. During the OSS inspection, staff shared site-specific recommendations on how to get the most life out of their system. Any practice that might stress the system or reduce performance was identified and possible solutions were provided. Informational brochures and water-conserving fixtures were made available to all residents. Four public meetings and four OSS workshops were conducted during the project. Table 8 presents detail on these outreach events:

Table 8. Summary of Education & Outreach Events

Date	Location	Event	# Attendees
8/5/2009	Poulsbo Marine Science Center	Project Kick Off Meeting	47
10/13/2010	Poulsbo Library	OSS Workshop	16
2/5/2012	Poulsbo City Council Chambers	Council Update	35
3/8/2012	Gala Pines Homeowner's Assoc.	OSS Workshop	29
4/26/2012	Poulsbo Fire Station	OSS Workshop and Project Update	19
3/21/13	Poulsbo City Council Chambers	TMDL Public Meeting	50
10/13/13	Poulsbo Library	OSS Workshop	28
		Total:	**224**

The Kitsap Conservation District's final report in Appendix C provides good detail on education and outreach performed by them during the project period.

The grant agreement tasked the Health District with the implementation of a boat waste education project. Staff met with WSU Cooperative Extension to discuss ways in which the education requirements for this grant and the Sinclair grant could be met more efficiently (simultaneously). It was decided to revise the boat waste education component as follows: Written surveys were created to assess boater awareness and use of sewage pump-out facilities. The first phase involved meeting with boaters in local marinas, discussing the issues with them, and requesting that they complete a written survey. This was done on Friday evening prior to Labor Day weekend in September 2011. Clean Boating Kits were distributed along with the initial survey. These contained printed materials on clean boating, tips for preventing pollution and boat fires, small spill kits and Boater Guide Maps. In addition, bilge Bio Soks (oil & fuel absorbents) were provided to each boater that completed the survey as a "thank you" gift. Educational materials were developed in partnership with the WSU Extension and Puget Sound Keeper Alliance.

The second survey was mailed to boaters who completed the first survey in December 2011. This survey asked follow up questions about which educational materials the boaters found most helpful, and what changes in attitude or behavior (if any) had occurred since the first survey. To encourage boaters to complete the second survey, a No Spill Fuel Recovery container was offered as a gift. Even with this incentive, and multiple efforts to contact participants, only 55% of participants returned the second survey.

Appendix D contains a report that details the results of boater education efforts. In summary, the pre and post boater's surveys provided information about boating habits and behaviors. The small number of participants did not provide definitive information regarding a change in boater knowledge or behavior related to sewage discharge. Generally the educational materials were reported to be helpful, and with respect to the recognition of the pump out symbol, these may have increased awareness as indicated by the responses to that question. However this

increase in knowledge was not statistically different. In future, it is recommended that a similar pre and post survey be conducted, with a larger group of boaters and combine the distribution of educational materials with a workshop or presentation.

6.5 Water Quality Monitoring

6.5.1 Trend Monitoring Results

The Health District conducted monthly trend monitoring in the project area. This section summarized the data collected and a discussion of the results.

Table 9

Summary of 2013 Water Year (FC) data for
Liberty Bay Freshwater Tributaries
Extraordinary Primary Contact

Stream Mouth	2013 Water Year (October 2012 – September 2013)					
	Number of samples	Range (FC/100 ml)	GMV (FC/100 ml)[1, 2]	# Samples exceeding standard	% Samples exceeding standard [2]	Meets Washington Dept. of Ecology Standard?
Barrantes (15-BAR-0.0)	10	10 - 510	70	3	30%	**No**
Big Scandia (BS01)	12	4 - 740	54	4	33%	**No**
Big Scandia (BS01A)	12	4 - 670	54	4	33%	**No**
Big Scandia (BS02)	12	4 - 330	33	3	25%	**No**
Big Scandia (BS03)	12	4 - 720	36	2	17%	**No**
Bjorgen (BN01)	12	4 - ≥2000	79	6	50%	**No**
Daniels (DC01)	10	4 - 310	30	4	40%	**No**
Daniels (DC01A)	11	4 - 230	28	2	18%	**No**
Dogfish (DF01)	12	4 - 680	36	4	33%	**No**
Dogfish (SF01)	12	20 - ≥2000	87	3	25%	**No**
Dogfish (WD01)	12	4 - 520	35	2	17%	**No**
Dogfish (ED01)	12	4 - 510	51	6	50%	**No**
Johnson (JC01)	12	4 - 790	28	2	17%	**No**
Lemolo (LM01)	10	4 - 380	29	3	30%	**No**
Little Scandia (LS01)	12	10 - ≥2000	113	6	50%	**No**
Little Scandia (LS01B)	12	4 - 970	83	7	58%	**No**
Perry (15-PER-0.1)	10	4 - 760	66	4	40%	**No**
Sam Snyder (15-SAM-0.1)	10	4 - 240	24	2	20%	**No**
Unn. Tributary (15-UNN-0.1)	10	4 - 250	21	2	20%	**No**
Unn. Tributary (15-UNN-0.0)	5	50 - 280	139	3	60%	**No**

1. GMV = geometric mean value
2. Shaded entries indicate an exceedance of the applicable water quality standard

(**Extraordinary Primary Contact** - Chapter 173-201A-030 WAC) during Water Year 2009. FC levels shall not exceed a GMV of 50 FC/100ml, and not have more than 10% of all samples exceed 100 FC/100 ml

Table 11 presents Liberty Bay streams that improved during the project:

Table 10
Summary of Liberty Bay Tributaries Showing Reductions in FC

Stream	2009 Water Year GMV FC/100 ml	2013 Water Year GMV FC/100 ml
Big Scandia	**67/100 ml**	**54/100ml**
Daniels Creek	**67/100 ml**	**30/100ml**
Dogfish Creek (Main)	**52/100ml**	**36/100ml**
Dogfish Creek (South)	**95/100ml**	**87/100ml**
Little Scandia	**196/100ml**	**113/100ml**
UNN01 *	**35/100ml**	**21/100ml**
Lemolo Creek *	**46/100ml**	**29/100ml**
Sam Snyder Creek *	**30/100ml**	**24/100ml**

* This stream not monitored until 2010 water year

Table 11
Summary of 2013 Water Year (FC) data for Liberty Bay Marine Waters

Marine Station	2013 Water Year (October 2012 – September 2013)					
	Number of samples	Range (FC/100 ml)	GMV (FC/100 ml)	#Samples >43 FC/100 ml	%Samples >43 FC/100 ml	Meets Washington Dept. of Ecology Standard?
LB01	11	<2 - 11	2	0	0%	YES
LB03	11	<2 - 24	<2	0	0%	YES
LB05	11	<2 - 54	4	1	9%	YES
LB06	11	<2 - 54	4	2	18%	**NO**
LB07	11	<2 - 73	4	1	9%	YES
LB09	11	<2 - 20	5	0	0%	YES
LB12	11	<2 - 19	<2	0	0%	YES
LB13	11	<2 - 8	<2	0	0%	YES

Table 12
Summary of Last 30 Samples FC 90th Percentiles for Liberty Bay Marine Stations
Pre vs Post Project Start

Area	Station	Pre Start	Post Start	Change	Explanation
Near shore Ne Si Ka Bay / Lemolo mouth of Bjorgen Creek	LB01	8.5	10.1	Decline	Elevated FC in Bjorgen Creek
Near shore north end Poulsbo Marina	LB05	14	14	Same	
Near shore head of Liberty Bay, mouth of Dogfish Creek	LB06	23.7	47.2	Decline	Elevated FC in South Fork Dogfish and outfall at American Legion Park in Poulsbo. Intermittent failure of building side sewer on Lindvig Way.
Near shore Johnson Creek	LB07	14	16	Decline	Johnson Creek failed standard in 2013 water year after meeting standard for the previous three.
Near shore Big Scandia Creek	LB09	23	17	Improve	FC levels dropping in Big Scandia Creek
Dogfish Bay, near shore, mouth of Daniels Creek	LB12	17.6	5.2	Improve	FC levels dropping in Daniels Creek
Mid channel, west of Point Bolin	LB13	8.3	2.0	Improve	Two (2) direct discharges removed at Keyport

As presented in Tables 9, 10 and 11, FC concentrations have dropped in eight (8) Liberty Bay tributaries, and salt water FC concentrations are ostensibly the same, except for station LB06 which is located towards the head of the Bay off the mouth of Dogfish Creek. As presented in Table 12, the calculated 90th percentile for FC at LB06 has risen from 23.7 to 47.2 FC/100ml. This is most likely due to FC concentration increases at station SF01, the south fork of Dogfish Creek, elevated FC concentrations in a storm water outfall at American Legion Park, and intermittent failure of a building side sewer on Lindvig Way.

Figure 7 presents FC sampling at the mouth of Daniels Creek since 1996. As a result of intensive PIC work during this project and previous efforts, resulting in the repair of four (4) failing septic systems, stream FC levels have a statistically significant improving trend.

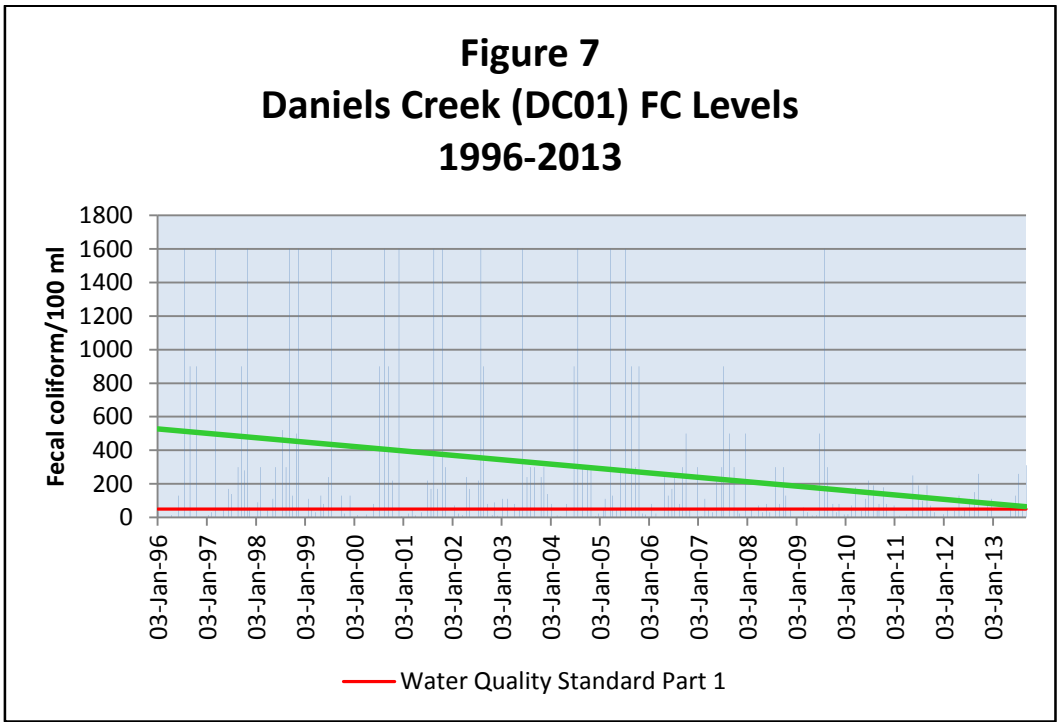
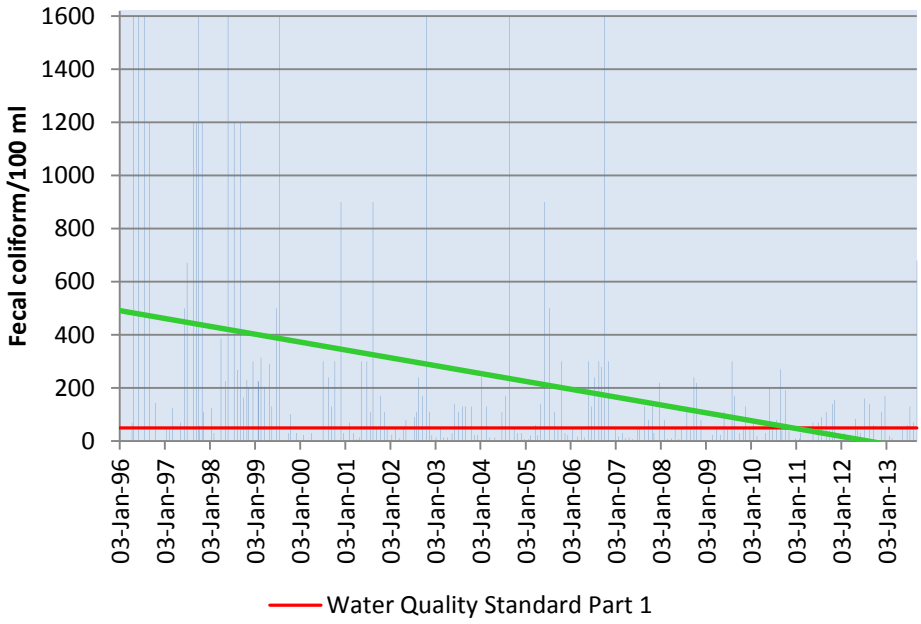


Figure 8 presents FC sampling at the mouth of Dogfish Creek, station DF01, since 1996. Note that because of tidal influence station DF01 is not inclusive of station SF01, so each is analyzed separately. As a result of intensive PIC work during this project and previous efforts, resulting in the repair of four (4) failing septic systems, stream FC levels have a statistically significant improving trend.

Figure 8
Dogfish Creek (DF01) FC Levels
1996-2013



7.0 CONCLUSIONS

- FC concentrations in many of the problem drainages have been reduced. The Health District expects to see more improvements after additional OSS repairs and follow-up work is completed. It is important to note that meeting the Extraordinary Primary Contact Standard for FC is extremely difficult for streams in this watershed. Given the level of development in this watershed, the Primary Contact Standard for FC is more appropriate. For example there has been a 37% increase in the population of the city of Poulsbo over the past twelve years (2000-2012).

- **44 of 51 (86%)** of the sewage sources have been corrected. We plan to have all sources corrected by September 2014.

- Analysis of wet and dry season monitoring indicates that FC levels are significantly higher during the dry season then during the wet season in various drainages. Decreased stream flow and external sources such as runoff from impervious surfaces may contribute to higher bacteria levels during dry weather.

- Many of the OSS in the area experience risk factors that can lead to failure including age, lack of permit records, shallow ground water, inadequate setback to surface waters, and deeper installation depths that can degrade the ability of soil bacteria and microbes to provide adequate treatment.

- Shoreline surveys were an effective method of finding OSS failures. OSS inspections and water quality monitoring activities are effective in the wet season to find OSS failures caused by surface or ground water intrusion. Dry season inspections and monitoring are effective to find OSS failures that are masked by storm water or are only occupied in the summer.
- Kitsap Health's Operation and Maintenance program ensures that owners of alternative systems have a certified maintenance contract, required inspections are being conducted, and that needed repairs are made. Owners of gravity systems need to have their systems inspected every three years and pumped when necessary as implemented through permit applications including the Permit program and Property Conveyance Inspection process.

- Cost share money for livestock and agricultural animal manure land management practices has been a good catalyst, resulting in behavior change and increased landowner stewardship. This incentive program has proven effective in achieving water quality improvements in challenging situations and during adverse economic conditions. This method minimizes expensive and time-consuming enforcement that also damages public relationships and strains partnerships. Good land management practices prevent erosion that forms run-off channels through the riparian zone and transports pollution to streams and shorelines.

- Poor garbage and grease housekeeping practices provide a food source for urban wildlife that results in fecal pollution. Two shoreline "hotspots" were associated with restaurants. One was washing greasy mats outdoors near a storm drain and both had leaky garbage and grease receptacles.

- Kitsap County residents are urged not to feed wildlife. Multiple FC "hotspots" in the growing area were confirmed or suspected to be wildlife related. Feeding wildlife is not healthy for wildlife, water quality or public health.

- Non-point pollution is best addressed by visiting as many watershed residents as possible. Door-to-door surveys are an excellent way to provide site-specific information on local water quality problems and how to reduce bacterial and nutrient pollution sources.

7.0 RECOMMENDATIONS

The following recommendations are presented as a result of interaction with homeowners, experience gained, and evaluation of sample results from the Liberty Bay Watershed Restoration Project:

- Complete correction of the remaining OSS failures and investigate remaining FC hotspots found through subsequent shoreline surveys.

- This watershed will need an ongoing effort to protect water quality because many of the OSS are well past the average functional lifespan of approximately 30 years. Older OSS designed through percolation tests provide disposal and may not provide adequate effluent treatment.

- Continue to track water quality trend data at mouth stations for post-corrective analysis and long-term correction. The Health District's annual project area ranking process automatically assesses water quality for FC problem areas. These are ranked by KCSSWM partners and guide program activities.

- Continue to conduct marine shoreline surveys in the area to protect beneficial uses and restore surface waters to standard.

- Continue the strong partnership with DOH, Ecology and other water quality agencies to coordinate, assess and implement ongoing water quality restoration and protection tasks. Communicate significant water quality issues with DOH, Ecology and other appropriate agencies.

- Continue to be involved in the Liberty Bay watershed through public complaint response, water quality trend monitoring, and follow-up of reports submitted by certified monitoring and maintenance specialists and pumpers. Properties with ongoing concerns are flagged in Kitsap Health records.

- Recommended follow-up work will be conducted through ongoing KCSSWM funding, the trend monitoring program, shoreline monitoring program, public OSS/water quality complaint process, and review and follow up of deficient tank pumping reports.

- Continue to seek technology and methods to better identify and correct FC pollution sources.

- Research potential methods to build public trust, by actively working to provide accurate and representative data upon which to base regulation and legislation.

- Utilize and develop public outreach and education materials based on social marketing principles that will result in measurable behavior changes.

- Develop specific educational materials that apply to water quality impacts of wildlife. A brochure should be developed that highlights the importance of not feeding wildlife and managing garbage, manure, compost, etc. in such a way that prevents attractive nuisance.

8.0 REFERENCES

Kitsap County Board of Health Ordinance No. 2008A-01, "Rules and Regulations Governing On-Site Sewage Systems." 2008.

Bremerton-Kitsap County Health District, Ordinance 2010-1, Solid Waste Regulations. July 6, 2010.

Kitsap County Health District, Trend Monitoring Plan. March 2010.

Kitsap County Health District, Manual of Protocol: Fecal Coliform Bacteria Pollution Identification and Correction Projects. 2011.

Kitsap County Health District. Water Quality Monitoring Report. 2011-2012.

Kitsap County Storm water Management Manual, Appendix 8A Maintenance Guidelines. April 1997.

Washington State Department of Ecology. Chapter 173-201A of the Washington Administrative Code Water Quality Standards for Surface Waters of the State of Washington. 1992.

Washington State Department of Ecology, Clean Water Act Section 303(d) List of Impaired Surface Waters. 1996, 1998, 2005, 2008 and 2012.

Washington State Department of Health, 2009 Shoreline Survey of the Port Orchard Passage Shellfish Growing Area, March 2009

APPENDIX A
LIST OF MONITORING STATIONS

List of Freshwater Trend Monitoring Stations

Water body	*Station ID*	*Location description*	*Latitude*	*Longitude*
Dogfish Creek	DF01	Access @ Liberty Bay Dental Center off Bond Rd., #20855	47.75207	122.64696
Dogfish Creek (south fork)	SF01	Downstream culvert @ Bond Road across from 1st Ave, Bondwood Apts	47.75116	122.64829
Dogfish Creek (east fork)	ED01	Downstream culvert @ 20919 Little Valley Rd	47.75445	122.63874
Dogfish Creek (west fork)	WD01	Downstream culvert @ 21088 Little Valley Rd	47.75506	122.63872
Johnson Creek	JC01	Downstream Viking Way Culvert south of Norfin Lane	47.73291	122.66359
Big Scandia Creek	BS01	Access at 17139 Scandia Ct	47.71813	122.65606
Big Scandia Creek	BS01A	Downstream culvert @ 633 Scandia Rd	47.715728	122.657132
Big Scandia Creek	BS02	Upstream culvert HWY 308-trail to ravine before museum sign	47.704271	122.662003
Big Scandia Creek	BS03	Downstream culvert Hwy 308 @ DOT "Big Scandia Crk" Sign, West of Cox Ave	47.703117	122.666147
Little Scandia Creek	LS01B	Downstream culvert Blomster Road, past #419 (yellow house)	47.71117	122.653067
Little Scandia Creek	LS01	Upstream culvert Scandia Road near Scandia Bible Church	47.7156649	122.653375
Daniels Creek	DC01	Upstream culvert @ 14510 HWY 308 Opposite Norbut Lane	47.700830	122.640930

Daniels Creek	DC01A	Downstream culvert @ 14980 Virginia Loop Rd by 30 mph sign	47.700035	122.643778
Bjorgen Creek	BN01	Upstream Lemolo Shore Rd., near Tukwila Rd @ 16647 Lemolo Market	47.71319	122.61816
Perry Creek	15-PER-0.1	Mainstem at 90 deg right turn in Thorpe Rd, upstream side of culvert	47.71124	122.65026
Sam Snyder Creek	15-SAM-0.1	Mainstem at Lemolo Shore Dr. downstream side of culvert (dry during dry season)	47.70835	122.60308
Lemolo Creek	15-LEM-0.1	Mainstem at Lemolo Shore Dr. east of Delate Rd access from first private drive east of creek, 75 ft. upstream of culvert	47.71307	122.61369
Barrantes Creek	15-BAR-0.0	Mainstem at Lemolo Shore Dr, downstream of culvert. Sample at low tide.	47.72067	122.6297
Unnamed tributaries to Liberty Bay	15-UNN-0.1	Tributary east of Daniels Ck at Hwy 308 near “support our troops” sign, 30 ft upstream of culvert.	47.69789	122.63778
Unnamed tributaries to Liberty Bay	15-UNN-0.0	Tributary flowing into bay right next to Daniels Ck mouth. Sample at low tide.	47.70054	122.64027

List of Marine Trend Monitoring Stations

Station ID	*Location description*	*Latitude*	*Longitude*
LB13	Mid channel west of Point Bolin	47.698	122.608
LB01	Nearshore NE SI KA Bay/ Lemolo-mouth of Bjorgen Creek	47.710	122.622
LB12	Dogfish Bay Offshore Daniels Creek	47.701	122.634
LB09	Nearshore Big Scandia Creek	47.722	122.654
LB07	Nearshore Johnson Creek	47.732	122.658
LB06	Nearshore Head of Liberty Bay, mouth of Dogfish Creek	47.737	122.653
LB05	Nearshore North End Poulsbo Marina	47.730	122.645
LB03	Nearshore Lemolo Bay	47.717	122.626

APPENDIX B
CRITERIA FOR RANKING OSS

Criteria for rating OSS inspection results

Rating Classification	Criteria for Meeting Classification	Action
No Apparent Problems	• Completed/signed Sewage Disposal Permit on file at Health District, or provided by owner at time of inspection and entered into our systems by support staff. • No illegal repairs or alterations have been performed on OSS. • All applicable setbacks and conditions in effect at the time of permitting are in place.	None
No Records	• No completed/signed Sewage Disposal Permit on file at the Health District, or in possession of the owner/occupant. • No Concern, Suspect or Failure conditions were observed.	None
Concern	Concerns include, but are not limited to: • System with no records and drain field less than 50 feet from surface waters or wells • Improper use of designated reserve area • Vehicular traffic and/or pavement on OSS components • Roof drains or other drainage/infiltration systems potentially impacting the OSS • Unpermitted expansion or modification of existing structure(s), or addition of new structures, or recreational vehicle connections, that impacts the OSS • Unpermitted work conducted on the OSS • Excavation or excess fill within the OSS area, or a cut down slope of the OSS that has the potential to impact the performance of the OSS.	For un permitted alterations, expansions, repairs, connections or new construction, consult with Program Manager regarding enforcement options. No Logger flag without Program Manager approval
Suspect	• Drainfield area is saturated. • Collected water sample results from bulkhead drains, curtain drains, or other pipes or seeps, **at or above 500 FC/100 ml (or 406 EC/100ml) and a positive non visual dye test** confirmed by Ozark Underground Laboratories • Collected water sample results from bulkhead drains, curtain drains, or other pipes or seeps, **less than 500 FC/100 ml (or 406 EC/100ml) and positive visual dye-test**.	Mail Suspect Letter Follow up with wet season dye trace Flag Logger (Other)
Failure	• Sewage on the surface of the ground • Sewage discharged directly to surface water or upon the surface of the ground unless the discharge is under permit from WA DOE. • Sewage backing up into, or not draining out of a structure caused by slow soil absorption of septic tank effluent. • Sewage leaking from a septic tank, pump tank, holding tank, or collection system. • Any component of an onsite sewage system or public sewer connection found to be broken, in disrepair, or not functioning as intended. • Inadequately treated sewage effluent contaminating ground or surface water. • Collected water sample result from bulkhead drains, curtain drains, or other pipes or seeps, at or above 500 FC/100 ml (or 406 EC/100ml) **and** positive visual dye-test results. • Cesspools or seepage pits where evidence of ground water or surface water quality degradation exists, or inadequately treated effluent contaminating ground or surface water • Non compliance with standards stipulated on the permit, with the regulations in effect at the time the system was approved for use, or with the regulations in effect at the time the structure was constructed or modified. • Straight discharge (greywater or blackwater) from any indoor plumbing, including recreational vehicles, is observed and documented	Enforcement Flag Logger (Failure)

APPENDIX C
KITSAP CONSERVATION DISTRICT FINAL REPORT

KITSAP CONSERVATION DISTRICT FINAL REPORT
April, 2014

Liberty Bay Fecal Pollution Reduction

Interlocal Agreement between Kitsap Public Health District & Kitsap Conservation District, for Washington State Department of Ecology Centennial Clean Water Program

Grant Number G1000301

Project Summary

Kitsap Conservation District made inventories of agricultural properties within the Liberty Bay watershed, contacted owners of these properties to offer technical assistance, and worked with landowners to implement BMPs that would reduce non-point source pollution.

Public outreach within Liberty Bay Watershed included mailings, public meetings and workshops. An initial mailing of an introductory post card explaining District services was sent to 90 agricultural landowners on July 29, 2009. These landowners were on previous inventory lists. A CREP mailing was sent on October 9, 2009 to agricultural landowners along Dogfish Creek. Following completion of farm inventory, a general letter was sent on January 6, 2010 to all agricultural landowners in the watershed informing them of services available from the District as a result of Liberty Bay Grant funding. On October 1, 2013 a flier providing information on KCD Backyard Habitat Program was mailed to 70 landowners in Dogfish Creek Watershed.

Four public meetings were held within the watershed during the grant period. Also 2 KCD workshops were held within the watershed during the period, and several tours. In Addition, numerous County wide informational/educational activities were conducted by the District during the period, and will continue into the future. See “Task 2: Public Information and Outreach” for exhaustive list of activities by quarter during the grant period.

Eighteen farm conservation plans (two with a significant forestry component) were developed for landowners. An additional 3 plans are in progress and should be finished

by the end of the grant period. These plans inventory existing conditions and evaluate resource needs and challenges. Assistance was provided in procuring cost share assistance for implementing BMPs, and $17,756.57 has been awarded so far. Additionally, 3 landowners applied for and were funded by Environmental Quality Incentives Program (EQIP) with USDA-Natural Resources Conservation Service (NRCS) to receive incentive payments for implementing their farm conservation plans. 98 BMPs, both physical and management, have been implemented. KCD will continue to provide technical assistance to landowners as they implement their plans. See "Appendix A (table)" for farm planning and implementation details.

Challenges and Successes within Liberty Bay Watershed:

BMP Implementation - Most of landowners of high and medium-high priority farms and some landowners of lower priorities within this watershed willingly implemented BMPs to reduce the likelihood for pollution. As implementation occurred, priority ratings were appropriately reduced. Of those that remain in the highest two priorities, only 1 was unwilling to work with the District. Another is downsizing with the goal of eliminating most livestock and feels BMPs will be unnecessary with reduced numbers. Another has an EQIP contract to install an animal crossing, stream exclusion fencing and off-stream livestock watering; and once implemented, priority will ultimately be 3. Another has installed numerous BMPs and has excluded livestock from a ditch, but is unwilling to do further setback from the ditch during the rainy season due to small acreage available for confinement. Several others have taken annual measures each fall to minimize potential to pollute during the rainy season. Others have implemented several management practices to somewhat reduce the potential, but need to do more.

There is no standard BMP to resolve all risks to pollute, but the following BMPs or combination thereof, need to be used effectively on most farms to reduce risks. Access Control to exclude livestock from surface water and wet fields can be effective, but there must be an adequate setback and filter for runoff - vegetative Filter Strip. Removing manure from livestock confinement areas or elsewhere through Waste Transfer is especially important when use areas are prone for runoff into surface water. Manure storage should be in a high dry location and pile should be covered with a tarp during the rainy season; a Waste Storage Facility with a roof is the best method to accomplish this, but is usually not implemented due to expense. Strategic Fencing is integral to accomplish goals of most any farm plan. Gutters and downspouts (Roof Runoff Structure) and Underground Outlet piping are necessary to route roof water away from livestock confinement areas. Surfacing of confinement areas (Heavy Use Area Protection) may be necessary if mud is an issue and manure collection isn't possible.

Cost-sharing is always helpful as an incentive to implementation, but unfortunately is usually of limited availability. Additional cost sharing assistance would greatly improve landowners' ability/willingness to construct BMPs.

Landowner resistance to government agencies – Only a few landowners within this watershed were resistant to government entities and for this reason did not want to work with KCD. A bigger issue was that landowners who worked with KCD knew the District is non-regulatory, and as a result did not always feel a sense of urgency regarding correcting conditions or changing management on their farms. Working in conjunction with Kitsap Public Health District helped address this particular challenge.

Education - It appeared that KCD educational events such as workshops had an impact because some landowners throughout this watershed voluntarily implemented BMPS on their own.

Task 1 – Program Administration and Reporting

KCD will develop and maintain the project budget. Quarterly reports will be submitted to the KPHD regarding the progress of activities related to the project. KCD will provide billings to the KPHD. Due: Quarterly reports are due on the 15th of the month following the end of the quarter.

The project was managed to meet the goals of the grant. Records were kept by the Financial Coordinator and all planners involved in the grant. Quarterly project reports and vouchers were completed and submitted in a timely fashion.

Task 2 – Public Education & Outreach

Prepare and hold special interest workshops to educate landowners, realtors and other stakeholders about best management practices, low impact development and other activities that lead to improved natural resource stewardship. One workshop will be exclusively offered to Liberty Bay watershed residents. Due: December 2010 for Liberty Bay Workshop. June 2014 for additional workshops.

Targeted exclusively to Liberty Bay Mailings/Meetings/Workshops –

July 29, 2009 - Initial mailing - An introductory post card was sent explaining District services to 90 agricultural landowners in the watershed. This preliminary number was taken from old watershed inventories.

August 5, 2009 - Initial PIC meeting for Liberty Bay with KPHD. Approximately 60 people attended

September 12, 2009 – "Livestock Mortality Composting Demonstration" at the District office. **Liberty Bay Watershed agricultural landowners received an invitation to the workshop** and it was advertised on Craigslist.

October 9, 2009 - CREP mailing – CREP information was mailed to agricultural landowners along Dogfish Creek.

January 6, 2010 – A letter was sent to all agricultural landowners in Liberty Bay Watershed informing them of services available from the District due to Liberty Bay Grant funding.

4th Qtr 2010 – Liberty Bay Project Update Meeting – KCD attended this meeting sponsored by the KPHD to update project activities and provide septic system information at the Poulsbo Library. KCD staff briefly explained the agricultural services and rain garden programs the District provides.

October 16, 2010 – "Managing Mud, Manure, and Pastures Workshop" – KCD held a workshop at the Skelly property near Poulsbo, to provide livestock owners information on how to protect the natural resources and improve the productivity of their farms.

January 2012 - Liberty Bay EPA Shellfish Update Meeting – District made presentation on status of work with agricultural producers in the watershed – 12 contacts.

January 15, 2013 – Tour of Liberty Bay Farms that are working with the District, for DOE Grant staff

3/21/2013 – Liberty Bay TMDL Meeting in Poulsbo – KCD Display, and District staff made a presentation on District programs – 40 attendees

7/16/2013 – Kitsap County Surface and Storm Water Management (SSWM) Advisory Group Tour – At a stop by the group in Liberty Bay Watershed, Kitsap Public Health District and KCD staff explained our respective roles and accomplishments as part of the Liberty Bay Watershed Restoration Project. 10 participants.

10/1/2013 – Mailed flier providing information on KCD Backyard Habitat Program to 70 landowners in Dogfish Creek watershed within Liberty Bay Watershed.

Non-Targeted Public Education and Outreach Activities

The following educational events were not funded by the Grant, however they were advertised & available to Liberty Bay residents. KCD participated in or sponsored the following:

August – September, 2009

- KCD Annual Meeting held at the District office in Poulsbo. This meeting was attended by watershed landowners and included discussions of Best Management Practices related to streams and livestock management.
- KCD populated a booth at the 2009 Great Peninsula Future Festival in Port Gamble. This was a county-wide event.
- KCD had information available at the WSU Extension booth at the Kitsap County Fair.

October – December, 2009

- Workshop: NW ECO Building Guild – Rain Garden Development section (presentation)
- Workshop: November, 2009 – Women in Ag Workshop – 50 attendees county-wide (display on BMPs and personal contact)
- Workshop: December, 2009 – Women in Ag Workshop – 45 attendees county-wide (display on BMPs and personal contact)
- Workshop: Environmental Conference 'Dirt' – 100 attendees county-wide (presentation on soils and soil management)

January – March, 2010

- Realtor Workshop on septic systems at WSU Extension in Puyallup. KCD offered scholarships to workshop for Kitsap County realtors. (600 contacted; 2 attendees from Kitsap County.)
- KCD Native Plant Workshop that included a class on Rain Gardens for storm water (35 attendees)
- Special presentations to Olympic College students – Presentations on Soils and Rain Garden Infiltration to students in Environmental Sustainability class and to Natural Resources class. (60 students)
- EcoGuild Meeting – Presentation on rain garden installation to landscapers and building contractors. (26 attendees)

- Mailing to 121 builders and landscapers with rain garden information and on training opportunities
- Kitsap Home show – KCD assisted Water Pak at a booth at the Home Show to promote rain gardens.
- Stillwaters Environmental Learning Center – KCD presented classes on soil types, manure and compost management, and chicken processing at the Barnyard Workshop (25 attendees)

April – June, 2010

- Realtor Workshop on Shorelines at WSU Extension in Puyallup. KCD offered scholarships to workshop for Kitsap County realtors. (600 contacted; 3 attendees from Kitsap County.
- Realtor Workshop on Landscaping at WSU Extension in Puyallup. (No attendees from Kitsap)
- Presentation to Olympic College students in Environmental Biology class and to Natural Resources class on rain garden installation (52 students) 10 of the students assisted with rain garden installations.
- Kitsap Water Festival: KCD made classroom type presentations to 4th graders from all over Kitsap County on water quality.
- Poulsbo Farmers Market: KCD Booth with rain garden information. 8 landowners signed up for cost-share to install rain gardens.

July – September, 2010

- KCD Annual Meeting at District office– Approximately 40 landowners attended this meeting and were given a tour of Low Impact Development features that have been implemented.
- Peterson Open Farm – KCD set up informational booth and staff served as tour guides of the farm. People were informed of the importance of BMPs, livestock management, and the preservation of Clear Creek. (300 attendees)

- KCAA Annual Harvest Meal – KCD education booth.

October – December, 2010

- KCD staff presented a class for WSU's Small Farm Series on BMPs and farm planning to registered participants county-wide. (15 attendees)

January – March, 2011

- KCD Annual Tree Sale and Newsletter – Tree Sale Newsletter was mailed to approximately 7900 people, which includes Liberty Bay Landowners. Numerous people purchased trees and shrubs to plant in natural areas.
- WSU Small Farm Expo – KCD staff made presentation at this Expo at Olympic College on mud and pasture management.

April – June, 2011

- Kitsap County Agricultural Alliance presentation on raingardens – 25 people attended
- Puget Sound Naval Shipyard earth day presentation on raingardens – 10 people attended
- Earth Day presentation on water as a resource to Kitsap County Democratic Party – 50 people attended
- Stillwaters Ecofest presentation on raingardens – 100 people attended
- Waterfestival presentation on raingardens: - 700 people attended
- Manchester Library Workshop on raingardens – 10 people attended
- Mapping and Inventory assistance provided to Kitsap County Food and Farm Policy Council – 30 people
- Mapping and Inventory assistance provided to Kitsap County Food and Farm Policy Council – 30 people

July – September, 2011

- Kitsap County Fair Display. This display by the District was in place for 5 days, providing rain garden information to the public.
- Peterson Farm Open Farm Day- Tours of the farm by District staff for the public to demonstrate Agricultural BMPs and farming practices. The District had a display and dedicated staff to tour the most interested attendees wanting to learn Best Management Practices on farms. 950 attended with 100 taking special tours.
- Kitsap Conservation District quarterly newsletter sent to 7000 cooperators via regular mail and to an additional 1000 via email.
- Bremerton Farmers Market – estimated that 50 people viewed the District display on raingardens.
- Bremerton Farmers Market - District staff made presentation on raingardens. 50 people in attendance.
- Kitsap Conservation District annual meeting. 15 people from the farming community were in attendance.
- Harvest Fair on Bainbridge Island – estimated that 200 people viewed the District Display.
- Presentation by District staff to Kitsap County Agricultural Alliance on soils and erosion. 20 people in attendance.

October – December, 2011

- WSU Extension Professional Landscaper Rain Garden Workshop

  About 30 attendees participated.

- Water Courses – Connecting West Sound With over 36 speakers, this

  symposium is one of the largest educational events held about water issues in Kitsap County. About 50 attendees participated.

- Salish Sea Ecosystem Conference was held October 25 to 27 at the

  Sheraton Wall Centre in Vancouver, British Columbia. This outstanding event brought together a diverse group of government officials, community leaders, First Nations and tribal members, environmental managers, scientists and academics to learn from each other about the state and threats to our shared ecosystem. Over 950 delegates attended. Conference attendees were able to hear from elected officials, Coast Salish leadership and regional leaders during

plenary sessions, and learn from the many scientists, resource managers and academics through oral and poster presentations. The latest scientific information was presented on topics such as land use and growth, contaminants and storm water, adapting to climate change, and habitat restoration among others. KCD presented the Rain Garden Database Session 7A = 100+ attendees.

- Wildwood Home Owners Association – rain garden workshop for a

  Kingston community neighborhood about 11 attended

- Brookwood Lane – Rain Garden Maintenance Workshop for a

  Bremerton neighborhood. About 10 attended

January – March, 2012

- Bremerton Yacht Club District presentation on rain gardens – 25 contacts.
- District tree sale workshop with presentation on native plants and rain gardens – 15 contacts.
- Keyport Mercantile (WSU Extension event) – District presentation on rain gardens – 20 contacts.
- Bainbridge Island Wilkes School - District presentation on rain gardens – 25 contacts.
- West Sound Small Farm Expo (WSU Extension event) - District completed a presentation on irrigation water management, water catchment and raingardens – 20 contacts.
- District tree sale event display board set up – 300 contacts.
- Norm Dicks (WSU Extension event) - District presentation on rain gardens – 60 contacts.
- Kitsap Home and Garden Show – Approximately 200 contacts at the District booth promoting farm planning, rain gardens and Stream Stewards during the show over 2 days. Also 12 people attended rain garden tours.
- Storming the Sound Conference at IslandWood (Bainbridge Island) – Water wisdom – i.e. rainwater catchment and rain gardens – 8 contacts.
- WSU Extension Farm Walk – Display and water catchment tour – 60 contacts.

April – June, 2012

- Poulsbo Farmers Market – display booth, 46 contacts.
- Puget Sound Naval Shipyard Earth Day – display booth, 8 contacts.
- Port Orchard Farmers Market – display booth, 34 contacts.
- Farm to Table Conference – display booth, purpose of the conference was primarily to connect local farmers with buyers, 3 signups – one each for rain garden, stream stewardship and farm technical assistance, 75 attendees.
- Silverdale Farmers Market – display booth, 33 contacts.
- Kingston Open House – display booth to educate and expose citizens to District activities and programs, 5 signups for rain gardens, 180 attendees.
- Ios Ranch farm walk – presented along with WSU Extension, 50+ attendees. Purpose was to demonstrate/educate landowners with livestock on BMPS to protect water quality.
- Hood Canal GreenSTEM event – ~ 700 students attended, Enviro-Scape model set up to demonstrate in a participative manner how water pollution occurs and steps which can be taken to protect water quality, also defined and discussed watersheds and benefits of rain gardens.
- Bremerton Farmers Market (2 times) – display booth, 20 contacts.
- Ecofest – display booth to educate local people regarding District activities and programs, 3 rain garden cost-share site visit signups, 27 contacts, and approximately 250 total people in attendance.

July – September, 2012

- KCD LID tour and Open House – 50 attendees
- Heyday Farm Tour (Bainbridge Island) – educational booth and led tour of BMPs – 15 attendees
- Kitsap Public Health District BMP cost-share meeting – 4 attendees

- Tour and Open House Peterson Farm – educational booth and led farm tour – 1000 attendees
- Bainbridge Island Environmental Conference – educational booth – 75 attendees
- Keyport Target Area Outreach Meeting – participant and educational booth – 12 attendees
- Bainbridge Island Harvest Fair – educational booth – 1000 attendees

October – December, 2012

- National Estuary Program Grant meeting with attendees from Kitsap Public Health District – 4 attendees
- Home and Remodel Show – KCD informational booth – 311 attendees, 18 signups for site visits
- Kitsap County Agriculture Alliance local foods dinner – KCD informational booth – 100 attendees
- Participated in No-till/Composting Workshop at Suymatsu-Bentryn Farm on BI put on by WSU Extension – 40 attendees
- Washington Tilth Conference – KCD Educational booth – 600 attendees
- Presentation at WSU Extension Small Farm Class on pasture and livestock management – 9 attendees
- Presentation for Bremerton Green Drinks Group (small business owners and residents) on rain gardens/LID – 19 attendees

January – March, 2013

- Landscape Professionals meeting in Vancouver, WA – District staff made a presentation on rain garden program in Kitsap County – approximately 200 attendees
- Presentation to Kitsap County Commissioners – District staff made a presentation on District programs and accomplishments to Kitsap County Commissioners – 12 attendees
- Olympic College – District staff made presentation to Susan Digby's class on rain gardens – 30 attendees
- Small Farm Expo at Olympic College – KCD booth, and District staff made presentation to 50 people on Pasture and Hay Management – approximately 200 attendees

- Surface and Storm Water Management community outreach meetings in Suquamish and Indianola – KCD Informational Booth - approximately 35 total attendees
- Surface and Storm Water Management community outreach meeting in Keyport – KCD Informational Booth – approximately 20 attendees
- Kingston Open House – KCD display – approximately 200 attendees
- Kitsap County Fairgrounds LID tour – District staff lead a tour of LID practices the District has implemented at the Fairgrounds through DOE Grant – 10 attendees
- KCD Tree Sale – KCD display, and approximately 200 people received their tree and shrub orders.
- Kitsap Home and Garden Show – KCD informational booth – 5000 attendees, 283 people stopped by the booth for information, 18 people signed up for rain gardens, 78 people obtained water quality program information
- Bremerton High School Energy Week – District staff made presentation on rain gardens - 65 attendees
- Pheasant Farm Walk – District staff led a tour of the farm looking at BMP's, crops, etc. – 20 attendees
- Orchard Bluff Retirement Home - District staff made a presentation to leadership/owner group on rain gardens – 12 attendees
- District Legislative Day in Olympia – District staff presented information in person on projects and accomplishments of KCD to legislators representing Kitsap County that are on Natural Resource or Ag committees – representatives Appleton, Angel, Seaquist, and Haigh, and senators Sheldon, Schlicher and Rolfes were recipients of this information
- KCD Face book Page – 2769 views to get information on "Doo for You" event, Sustainable Ag, and ag BMPs such as waste storage facility, pasture planting, and heavy use area protection.

April – June, 2013

- Kitsap Water Festival in Bremerton – KCD staff presented 4 sessions titled " Infiltration Station." We used a watershed model to illustrate surface runoff, pervious surface and pollution, and toured the rain gardens and pervious

surfaces on site to demonstrate how they work. 4 classes of thirty 4th graders each attended the presentations. 700 students from throughout Kitsap attended the Festival itself.

- GAP Workshop at Pheasant Field Farm – KCD staff led a tour of Agricultural BMPs – 30 attendees.
- WSU Thurston County Extension conducted a clock hour credit LID Training for Real Estate Professionals – Part of this training was a tour of LID practices at Kitsap CD office by KCD staff – 32 attendees.
- Washington State Environmental Health Association State Meeting – KCD staff made a presentation on PIC program in Kitsap County – 200 attendees.
- Fairgrounds LID tour for Life on the Edge group by KCD staff – 11 attendees.
- WSU Plant Sale – KCD Rain Garden Informational Display – 150 attendees.
- WSU Extension Realtors LID Training - KCD staff led a tour of LID practices at Kitsap CD office – 32 attendees.
- Kitsap Surface and Storm Water Management Partner meeting at Kitsap CD office - First hour of this meeting was a tour of KCD LID practices and a training on water catchment/cisterns – 10 attendees.
- KCD office LID tour by KCD staff for Hedl Landscaping – 5 attendees.
- Kitsap Pre-Fair Horse Show – KCD staff attended the event and spoke with individuals about manure management and heavy use area protection practices – 15 people interacted with KCD staff.
- Ecofest 2013 at Stillwaters Environmental Center in Kinston, WA – KCD Informational Booth – Approximately 150 total attendees.
- KCD office LID tour by KCD staff for Washington Conservation Corps crew – 10 attendees.

July – September, 2013

- Concrete Clinic held at Kitsap Conservation District – Hands-on training on pouring concrete for a waste storage facility. 8 participants.
- Kitsap Conservation District Annual Meeting – At this meeting, a presentation was made on existing Fire Wise Programs in Kittitas and Skagit Counties to promote this program in Kitsap County. Fire Department managers were invited from throughout Kitsap County, as well as timber owners. 50 participants.

- Kitsap County Fair and Stampede – KCD educational display. 300 stops at display with 27 signups for technical assistance.
- Peterson Farm Fall Fair – A tour of the farm was led by KCD staff, and KCD educational display was set up. 700 participants.
- Bainbridge Island Harvest Festival - KCD educational display. 1500 in attendance.
- Kitsap Community Agricultural Alliance's Kitsap Grown Harvest Dinner – KCD staff representation and KCD educational display, 200 participants

October – December, 2013

- Home and Remodel Show at Fairgrounds – KCD staffed educational display. 22 signups for LID/rain gardens, 4000 (estimate) participants.
- WSU Foundation Auction - KCD staffed educational display. 5 signups for LID/rain gardens, 150 (estimate) participants.
- Kitsap Lady Riders - Presentation by KCD staff and educational display. 7 participants.
- Sustainable Farming Class – Presentation by KCD staff and educational display. 8 participants.
- Constant Contact promotion from KCD. 875 people.
- KCD Newsletter posted on website. Newsletter detailed District accomplishments, programs and annual tree sale.

Task 3: Pollution Identification and Correction – KCD will:

- ***Conduct an agricultural property inventory of the entire Liberty Bay watershed and update and maintain the inventory throughout the project period. Inventory will be in a format that can be imported into Arc GIS.***

Table 1: Parcels by Priority

Priority Level	12/15/09	3/31/14
1	7	2
2	40	7
3	68	90
4	55	49
5	57	64
TOTAL	**227**	**212**

Agricultural properties in the target watershed were prioritized based on their potential to pollute. Factors such as land use, livestock numbers, proximity of livestock use areas to surface water, presence of critical areas, pasture management, and facilities for waste were taken into consideration. A priority scale of 1 – 5 was used, with 1 being the highest priority.
As conditions changed on farms, priority levels were changed accordingly. Additional farms were added to the inventory during the course of the grant.

Priority Rating Criteria

1. High: Pasture poor. Livestock access to surface water and/or high probability of runoff. Evidence of contamination.
2. Medium-High: Pasture poor. Some reason to believe conditions could get worse seasonally. Probability of runoff.
3. Medium: Pasture fair. Open water in vicinity of the property but with limited access or little evidence of use.
4. Medium-Low: Pasture good. No open water in vicinity and/or a low probability of contaminated runoff reaching surface water.
5. Low: Visual inspection from roadside indicates historic or recent past farming activity. No livestock currently on site

Inventory completed in GIS database and Excel spreadsheet by December 15, 2009, and updated quarterly.

- ***Contact (by telephone and/or site visit) all high and medium-high priority agricultural properties and offer technical and financial assistance.***

There were 4 separate mailings to agricultural landowners in Liberty Bay watershed. The initial mailing was on July 29, 2009 to 90 agricultural landowners based on existing inventories. A CREP mailing was sent on October 9, 2009 to agricultural landowners along Dogfish Creek. On January 6, 2010 a letter was sent to all agricultural landowners in Liberty Bay watershed based on the recently completed Liberty Bay watershed inventory. The July 29th and January 6th letters explained District services available through the Liberty Bay Grant. On 10/1/2013 a flier was mailed to 70 landowners in Dogfish Creek watershed providing information on KCD Backyard Habitat Program.

All current high and medium-high priority farms have received on-on-one technical assistance from KCD. The one hostile landowner who had been offered assistance was not interested.

All landowners who were previous referrals from the KPHD, who agreed to implement BMPs each fall to protect water quality during the rainy season, received an annual reminder letter from KCD in fall, outlining the agreed-to measures. These landowners also received a follow-up visit to document implementation.

- ***Complete the installation of agricultural best management practices, and install one innovative, high visibility agricultural or urban best management practice, or low impact development project.***

Farm plans contain an average of fifteen BMPs, and KCD's work in the watershed will continue well past the grant's end as landowners continue to implement their farm plans and to construct BMPs.

See Appendix A for further details. Appendix A contains only the landowners who received BMP designs and/or completed BMPs and/or received a farm conservation plan.

Cost-shared Waste Storage Facility and roof in Liberty Bay watershed

Cost-shared Gutter installation in hog paddock in Liberty Bay watershed

The KCD high visibility project is the LID project at Slippery Pig Brewery (795 NW Finn Hill Road) near Poulsbo. It is a Rain Garden located at the entrance to the brewery. Facility buildings had gutters and downspouts installed onto roofs, and underground outlet piping installed to route this roof water into a vegetated diversion channel and ultimately the rain garden. The outlet to the rain garden is a structure for water control. This project was cost-share funded by KCD with $2143 in WSCC funds. This Brewery holds weekly events throughout much of the year for the public.

Slippery Pig Brewery Raingarden

District Rain Garden Program – During the grant period within Liberty Bay Watershed, there have been 75 site visits by KCD staff and 43 contracts signed for rain gardens. A total of 11 rain gardens have been installed in Liberty Bay watershed with technical assistance and cost-sharing from KCD. The KCD Rain Garden Program is funded by Kitsap County Surface & Storm water Program providing $500 in cost-share funding for

each LID project. A total of $7143 has been paid to date to landowners through this program within the watershed. Recently the incentive was increased $1000 for each project.

District Backyard Habitat Program – During the grant period within Liberty Bay Watershed, there were 50 site visits to 7 landowners by KCD staff to provide technical assistance regarding the District Backyard Habitat Grant Program. This program is funded by Kitsap County Surface & Storm water Program through Stream Stewards to provide technical assistance, volunteer labor, planting materials and reimbursement for stream and shoreline habitat enhancement/improvement. There have been 6 projects completed within the watershed through this program. Dogfish Creek projects included removing noxious weeds and replanting with native plants, and installing logs with root wads and spawning gravel in the channel. Near the mouth of an unnamed salmon stream in the Scandia area projects included removing noxious weeds and replanting with native plants, and removing a fish barrier. The total length of streams directly benefitted by these projects is approximately 4750 feet, with 9 acres of buffers being improved. Much of the work was completed by Mission Creek Department of Corrections crews. A total of $31,335.37 has been paid through this program to reimburse landowners for expenses.

Before:

Fish barrier in unnamed salmon stream in Scandia area

After:

After fish barrier removal in unnamed salmon stream in the Scandia area

- ***Notify the KPHD of solid waste and/or water quality issues discovered during the inventory and/or site visits.***

KCD completed on ongoing basis.

- ***Submit final report to the KPHD by June 2014***

Completed by KCD in April 2014

APPENDIX D
BOATER EDUCATION SUMMARY REPORT

Boater Education Project Summary for Liberty and Sinclair Project Reports

S. Ultican/E.Crim 11.6.13

Background

Sinclair Contract

A boat waste education program will be performed throughout Dyes and Sinclair Inlets which hosts six marinas. Seat cushions printed with a boat waste slogan and a map of the locations of pump outs on the cushion in Kitsap County will be given to boaters. Effectiveness will be measured by establishing a waterproof log-in station at the Port Orchard Marina on Sinclair Inlet. Users will log pump out use during the summer of 2008. Seat cushions will be distributed beginning Spring 2009 and continue through Fall 2010. Comparing the pump out station usage before and after distribution will monitor post-distribution effectiveness. Kitsap Health will maintain the log out station by visiting every two weeks.

Project Description: Goals and Challenges

One component of the education and outreach tasks under this project focused on reducing discharge of sewage from boats. The intent was to improve the awareness and understanding of boaters regarding the cumulative impact of sewage discharge, and measure changes in behavior through monitoring use of sewage pump-out stations at local marinas.

The following marinas were included in this project:

- Sinclair Inlet; Bremerton Marina (221 slips), and Port Orchard Marina (378 slips). 13 months of pump out data.
- Liberty Bay; Port of Poulsbo (399 slips), Poulsbo Yacht Club (155 slips), and Liberty Bay Marina (177 slips). 20 months of pump out data.

Meters were installed on pump-outs at these marinas, and data was collected in Sinclair Inlet over 13 months. However, discussions with boaters and marina operators revealed that the economic changes during the project period were a confounding factor in the accuracy of using marina pump-out data as a measurement tool. Fewer people were using their boats and pump-outs during this period due to the economic downturn, independent of our educational efforts. So, the Health District implemented a new approach to accomplish the goals of the project regarding boat waste education.

Education and Outreach Efforts

Written surveys were designed as assessment tools and conducted in two phases, combined with distribution of educational materials to boaters. The goal of the surveys was to assess boater's awareness and use of sewage pump-out facilities. The first phase involved meeting with boaters in local marinas, discussing the issues with them, and requesting that they complete a written survey. This was done on Friday evening prior to Labor Day weekend in September 2011. Clean Boating Kits were distributed along with the initial survey. These contained printed materials on clean boating, tips for preventing pollution and boat fires, small spill kits and Boater Guide Maps. In addition, bilge Bio Soks (oil & fuel absorbents) were provided to each boater that completed the survey as a "thank you" gift. Educational materials were developed in partnership with the WSU Extension and Puget Sound keeper Alliance.

The second survey was mailed to boaters who completed the first survey in December 2011. This survey asked follow up questions about which educational materials the boaters found most helpful, and what changes in attitude or behavior (if any) had occurred since the first survey. To encourage boaters to complete the second survey, a No Spill Fuel Recovery container was offered as a gift. Even with this incentive, and multiple efforts to contact participants, only 55% of participants returned the second survey.

Results and Conclusions

Boater survey #1 (pre-survey) was completed by 79 boaters. This same group of individuals received Boater survey #2 (post-survey) approximately three months after completing the pre-survey and receiving a variety of educational materials. Of this group, 44 boaters responded to the second survey. The data from the pre and post surveys were analyzed from the responses received from this group of 44 respondents.

Information regarding vessel types and uses are summarized below. The majority of the respondents (63%) owned power boats versus sailboat (36%); 80% of the boat lengths were greater than 26 ft, and 97% of the respondents indicated they used their boats for recreational purposes. Only 5% of respondents indicated that they did not have any type of marine sanitation device. 90% of respondents had a Type III MSD holding tank.

Question	Frequency
Vessel type	
Power	28 (63%)
Sail	16 (36%)
Vessel Length	
16 to 26 ft	9 (20%)
Greater than 26 ft	35 (80%)
Vessel Use	
Recreational	43 (97%)
Commercial	1 (3%)
Live aboard	
Yes	6 (14%)
No	38 (86%)
Use	
Day	32 (73%)
Multi day	12 (27%)
Saltwater	41 (93%)
Freshwater	3 (7%)
Type of MSD	
None	2 (5%)
Type I onboard	2 (5%)
Type II better treatment	0
Type III holding tank	40 (90%)
Don't know	

A comparison was conducted between the responses to survey #1 (pre) and survey#2 (post) to determine what changes may have occurred with respect to boater's knowledge and/or behavior. The 95% confidence intervals were calculated to determine whether there was statistical significance between the pre and post surveys.

Recognition of Pump out symbol. There was an increase in symbol recognition from 32 to 43 respondents however this was not statistically different.

When asked whether it is **illegal to dump untreated sewage within 3 miles of shore**, there was essentially no difference between the pre and post survey. The majority of respondents (42 to 43 respondents, out of a total of 44) indicated that YES it was illegal to dump untreated sewage.

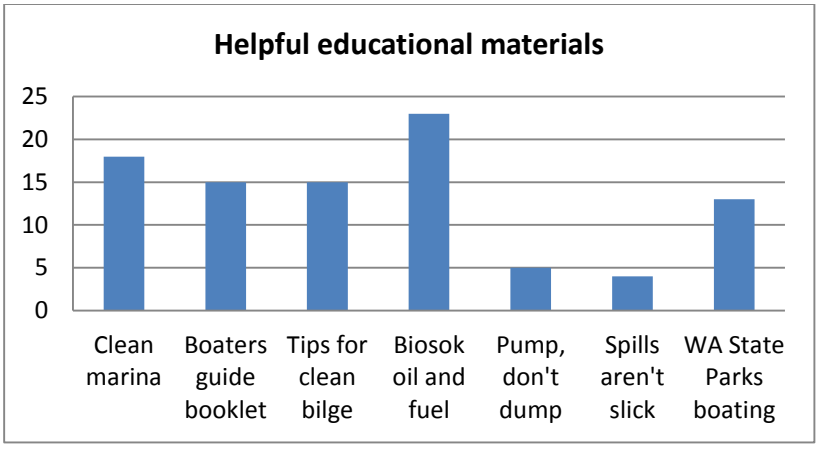
When asked whether **untreated sewage from boats was biodegradable and generally harmless**, the majority of respondents for both pre and post surveys indicated that they did not agree.

When asked whether **untreated sewage from boats can harm the environment**, there was a slight increase from 35 to 38 of respondents who agreed with this statement, however this was not statistically different.

The majority of respondents stated that they do not **discharge their tank into the water when pump out facilities are not convenient**, but again this was not a statistically significant difference.

The post boater survey included several questions regarding motivating factors that influenced changes in boating habits. Marina rules and educational materials were the top two responses to this question as shown below. Among educational materials the BioSok oil and fuel was ranked as the most helpful.

Motivating factor	**Number**	**Percent**
Marina rules	9	21%
Educational materials	8	19.50%
Law	5	12.2%
Word of mouth	5	12.2%
Friends or family	3	3.40%



Conclusions

The pre and post boaters surveys provided information about boating habits and behaviors however due to the small sample did not definitely provide information regarding a change in boater knowledge or behavior related to sewage discharge. Generally the educational materials were reported to be helpful, and with respect to the recognition of the pump out symbol, these may have increased awareness as indicated by the responses to those questions. However this increase in knowledge was not statistically significant.

In future, it is recommended that a similar pre and post survey be conducted, with a larger group of boaters and combine the distribution of educational materials with a workshop or presentation.