Nooksack River Watershed Bacteria Total Maximum Daily Load

Submittal Report

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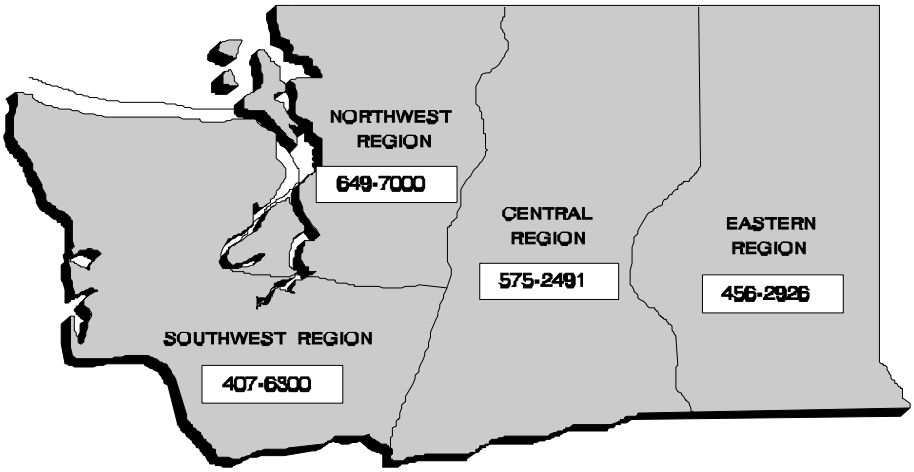

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Components of the TMDL

The Washington State Department of Ecology (Ecology) is establishing a Total Maximum Daily Load (TMDL) for fecal coliform in the Nooksack River watershed. This TMDL will address potential impairments of beneficial uses on the 18 segments of the streams and creeks in the watershed listed in the 1998 Section 303(d) list of impaired surface waters.

The five components of any TMDL as required by the Clean Water Act are defined as:

Loading Capacity: The amount of pollutants that a waterbody can receive without violating water quality standards. In the case of the Nooksack River watershed, the loading capacity for fecal coliform criteria is better stated as a set of bacteria population distributions, since the bacteria do not consistently vary with flow.

Wasteload Allocation: The portion of a receiving water's loading capacity that is allocated to one of the existing or future point sources of pollution. The Nooksack River watershed has three Waste Water Treatment Plants (WWTPs) and two dairies covered by NPDES permits. All of the permitted facilities will be discharging fecal coliform bacteria at or below the main stem target. The dairy permits do not allow effluent or waste discharges, therefore the Wasteload Allocations for all current and future permitted dairies are zero. The wasteload allocations for the WWTPs are calculated based on meeting the proposed water quality-based permit limits.

Load Allocations: The portion of a receiving water's capacity that is attributed either to one of its existing or potential nonpoint sources of pollution or to natural background sources. There are 230 commercial dairies in the Nooksack basin. The Nooksack load allocations for fecal coliform are equal to the loading capacities for each of the tributaries listed. Reductions in fecal coliform needed to achieve the load allocations range from 23 percent to 98 percent. The preventative target for the upper portion of the Nooksack basin requires fecal coliform bacteria reduction of 4.5 percent in nonpoint sources.

Margin of Safety: There are several implicit assumptions in the loading capacity calculations that provide a margin of safety. In addition, the sum of the tributary, upper basin, and WWTP reductions are greater than needed to meet the main stem reduction target.

Seasonal Variation: Fecal coliform data collected in the Nooksack watershed does not show a strong seasonal pattern. There is a correlation between rainfall and bacteria loads, but it is not strong enough to make accurate predictions on which a seasonal or event-based loading capacity can be calculated.

Introduction

Section 303(d) of the federal Clean Water Act mandates that the state establish Total Maximum Daily Loads (TMDLs) for surface waters that do not meet standards after application of technology-based pollution controls. The U.S. Environmental Protection Agency (EPA) has established regulations (40 CFR 130) and developed guidance (EPA, 1991) for setting TMDLs.

Under the Clean Water Act, every state has its own water quality standards designed to protect, restore, and preserve water quality. Water quality standards consist of designated uses, such as cold water biota and drinking water supply, and criteria, usually numeric criteria, to achieve those uses. When a lake, river or stream fails to meet water quality standards after application of required technology-based controls, the Clean Water Act requires the state to place the water body on a list of "impaired" water bodies and to prepare an analysis called a **Total Maximum Daily Load (TMDL)**.

The goal of a TMDL is to ensure the impaired water will attain water quality standards. A TMDL includes a written, quantitative assessment of water quality problems and of the pollutant sources that cause them. The TMDL determines the amount of a given pollutant that can be discharged to the water body and still meet standards, called the **loading capacity,** and allocates that load among the various sources. If the pollutant comes from a discrete source (referred to as a **point source**) such as an industrial facility's discharge pipe, that facility's share of the loading capacity is called a **wasteload allocation**. If it comes from a diffuse source (referred to as a **nonpoint source**) such as a farm, that facility's share is called a **load allocation**.

The TMDL must also consider seasonal variations and include a **margin of safety** that takes into account any lack of knowledge about the causes of the water quality problem or its loading capacity. The sum of the individual allocations and the margin of safety must be equal to or less than the loading capacity.

The general purposes of this document are to:

- Provide fecal coliform data from monthly sampling of the lower Nooksack River watershed at 21 sampling sites between March 1997 and February 1998;
- Provide an analysis of those data;
- Identify likely and potential point and nonpoint sources of fecal coliform;
- Summarize actions recommended for meeting water quality standards and ongoing monitoring to verify whether standards are being met;
- Fulfill requirements of the federal Clean Water Act.

A detailed implementation plan will be developed as a result of information in this document.

Background

The Nooksack River basin is located in northwestern Washington State between the city of Bellingham and the Canadian border (Figure 1). The basin's 826 square miles (mi^2) encompass the northwestern slopes of the Cascade Mountain Range through foothills and lowlands to Bellingham Bay. The eastern mountainous part of the basin, the upper basin with an area of 589 mi^2, is drained by three forks of the Nooksack River. The North and Middle forks are glacial fed. The lower basin, the source of the listings leading to the TMDL study, lies below river mile (RM) 36.6 and mostly drains valley lands below 500 ft elevation. Anderson Creek and Smith Creek are exceptions with some of their drainage areas above 3,000 ft elevation. Most of the basin is located in Whatcom County. Small portions (48. mi^2) of the lowland and North Fork basins are in Canada, and some of the upper South Fork Nooksack River is located in Skagit County (Figure 1). The Lummi Reservation is located on 33 mi^2 of land at the mouth of the Nooksack River. The Nooksack Tribal offices are at Deming near the confluence of the three forks. The Nooksack basin is ceded land under the Treaty of Point Elliot and the tribes maintain usual and accustomed rights within the basin.

The upper and lower basins have distinctively different land use characteristics. Timber management and recreational activities on private, federal, and state lands predominate in the upper basin. Some agriculture, commercial, and residential developments occur along the valley floors. In contrast, most land in the lower basin is privately held, and is intensively used for agricultural purposes. Dairy farms are abundant (~180 farms in 1998), especially on the Lynden Terrace between Bertrand Creek and the Sumas River. Until 1998, Whatcom County, and the lower Nooksack River valley in particular, had the highest concentration of dairy cows (> 68,000 in the county) in the state, and the seventh highest poultry production (Washington Agricultural Statistics Service, 1997). Whatcom County also is a top producer of raspberries and is western Washington's leading harvester of forage crops (silage corn and hay).

Few point sources are located within the basin. Most towns support agricultural or timber industries, and all have fewer than 10,000 residents. The largest municipalities are in the lower basin: Lynden, Ferndale, Everson, and Nooksack. Suburban and rural housing developments have been expanding along the Interstate 5 corridor and toward Ferndale and Lynden in response to growth around Bellingham. Municipal sewage plants discharging to the Nooksack River are located at Everson, Lynden, and Ferndale. Darigold at Lynden is the only direct industrial discharger to the Nooksack River. Condensate water from the dry milk process is discharged to the river, and other wastewater is discharged to the Lynden sewage plant. Dean Foods and RECOMP (waste incinerator) are two other industrial facilities that may have indirect discharges to groundwater from surface applications of wastewater. However, the Dean Foods plant has been closed and the wastewater lagoon was fully drained in October 1997.

The Nooksack river enters marine water at Bellingham Bay. Six miles from the most downstream sampling site, commercial shellfish beds are operated by members of the Lummi Nation. Protection of downstream shellfish beds is considered one of the most restrictive characteristic uses of the Nooksack because fecal coliform criteria for marine water is much more restrictive than for freshwater.

Applicable Criteria

Within the state of Washington, water quality standards are published pursuant to Chapter 90.48 of the Revised Code of Washington (RCW). Authority to adopt rules, regulations, and standards to protect the environment is vested with the Department of Ecology. Under the federal Clean Water Act, the EPA Regional Administrator must approve the water quality standards adopted by the state (Section 303(c)(3)). Through adoption of these standards, Washington has designated certain characteristic uses to be protected and established the criteria necessary to protect these uses [Washington Administrative Code (WAC), Chapter 173-201A]. These standards were last adopted in November 1997.

The Nooksack River has Class A and Class AA waters. The characteristic beneficial uses and water quality criteria for these classifications are listed below. Waters with these classifications support the broadest range of uses, though numeric water quality standards are slightly more stringent for Class AA waters. State law does not establish a ranking or priority among the beneficial uses, but individual waters are expected to support all uses within the classification. The river is classified Class A from its mouth to river mile (RM) 49.7, at Maple Creek (Figure 1). Above Maple Creek, the river is Class AA. The Middle Fork is Class AA. The South Fork is Class A to RM 14.3, at Skookum Creek. Above Skookum Creek, it is Class AA. All tributaries to the Class AA portions of the Nooksack system are AA; likewise, tributaries to the Class A part are Class A. Bellingham Bay is a Class A marine water.

This TMDL is designed to address impairments of characteristic uses caused by high fecal coliform. The characteristic uses designated for protection in the Nooksack watershed streams are as follows:

"Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam and mussel rearing, spawning, and harvesting.

Crayfish rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation."

[WAC 173-201A-030(1)] and [WAC 173-201A-030(2)]

The water quality standards describe criteria fecal coliform for the protection of characteristic

uses. Listed streams in the Nooksack watershed are designated as Class A. Class A waters have assigned fecal coliform criteria to protect the characteristic uses:

Class AA

"fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL."

[WAC 173-201A-030(1)(c)(i)(A)]

Class A

"Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL."

[WAC 173-201A-030(2)(c)(i)(A)]

Class A

"Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL."

[WAC 173-201A-030(2)(c)(i)(B)]

The water quality standards describe the averaging periods in the calculation of the geometric mean for the fecal coliform criteria:

"In determining compliance with the fecal coliform criteria in WAC 173-201A-030, averaging of data collected beyond a thirty-day period,… shall not be permitted when such averaging would skew the data set as to mask noncompliance periods."

[WAC 173-201A-060(3)]

In cases where natural background conditions exceed a standard, the water quality standards state the following:

"Whenever the natural conditions of said waters are of a lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria."

[WAC 173-201A-070(2)]

Water Quality and Resource Impairments

As a result of measurements made that show criteria are exceeded, thirteen segments are included on Washington's 1996 Section 303(d) list (Table 1). The technical study was conducted in 1997 and 1998. Several segments in the basin have been added to the 1998 Section 303(d) list (Table 2) after the study was initiated. As a result of the study, several segments not meeting fecal coliform criteria were identified which have not yet been listed (Table 3).

Table 1. Nooksack Watershed 1996 Section 303(d) Fecal Coliform Listed Stream Segments Addressed by TMDL

Waterbody ID 1996 listing	Waterbody ID 1998 listing	Stream Name	Segment Location (Township-Range-Section)
WA-01-1010	ZA83VD	Nooksack River	39N - 02E - 32
WA-01-1012	FY02EA	Tenmile Creek	39N - 02E - 20
WA-01-1014	DR81WH	Deer Creek	39N - 02E - 27
			39N - 02E - 26
WA-01-1015	AC76JK	Kamm (Stickney) Slough	40N - 03E - 15
	LS95QH		40N - 03E - 21
	QG38LP		40N - 03E - 11
WA-01-1016	LS95QH	Mormon Ditch	40N - 03E - 22
WA-01-1110	MI36KN	Bertrand Creek	40N - 02E - 24
WA-01-1115	LN43IE	Fishtrap Creek	40N - 03E - 19
			40N - 03E - 06
	NK26OD		41N - 03E - 32
	RC87WC		40N - 03E - 06
	RN53NC		40N - 02E - 25
			40N - 03E - 09
	UI16IQ		40N - 03E - 04
			40N - 03E - 16
WA-01-1116	LN43IE	Double Ditch Drain	40N - 03E - 07
			40N - 03E - 07
			40N - 03E - 19
	MI36KN		40N - 03E - 18
WA-01-1117	GP43XI	Benson Road Ditch	40N - 03E - 19
WA-01-1118	NK26OD	Depot Road Ditch	41N - 03E - 32
WA-01-1119	UI16IQ	Bender Road Ditch	40N - 03E - 16
			40N - 03E - 09

Table 2. Nooksack Watershed Section 303(d) Fecal Coliform Listed Stream Segments Addressed by TMDL and Added To 1998 List

Waterbody ID 1996 listing	Waterbody ID 1998 listing	Stream Name	Segment Location (Township-Range-Section)
WA-01-1111*	KG72JQ	Duffner Ditch	40N - 02E - 13
WA-01-1115	RN53NC	Fishtrap Creek	40N - 03E - 16
WA-01-1116	LN43IE	Double Ditch Drain	41N - 03E - 31
	RC87WC		40N - 03E - 06
			41N - 03E - 31
WA-01-1118	NK26OD	Depot Road Ditch	40N - 03E - 17

*No segments listed per 1996 segmentation scheme

Table 3. Nooksack Watershed Unlisted Fecal Coliform Stream Segments Addressed By TMDL

Waterbody ID 1996 listing	Waterbody ID 1998 listing	Stream Name	Segment Location (Township-Range-Section)
WA-01-1120		Anderson Creek	39N - 4E - 19
WA-01-1125		Smith Creek	39N - 4E - 21
		LLPL Drain	40N - 2E - 36
	UZ70KA	Wiser Lake Creek	39N - 2E - 09
	BX84LO	Keefe Lake Outlet	40N - 3E - 31
	AR42TO	Scott Ditch	39N - 2E - 04

Table 4. Nooksack Watershed Stream Segments Addressed by TMDL As Preventative Measure

Waterbody ID 1996 listing	Waterbody ID 1998 listing	Stream Name	Segment Location (Township-Range-Section)
WA-01-1020		Nooksack River	
WA-01-1030	CQ54VT	South Fork Nooksack River	
WA-01-1080	OS27OC	North Fork Nooksack River	
WA-01-1060	UL53CF	Middle Fork Nooksack River	

Water quality data collected in the Nooksack watershed does not show a definite pattern of seasonal variation. Bacteria violations occur during all seasons and under all kinds of climatic conditions.

The Nooksack watershed TMDL addresses protection of downstream shellfish beds. Of all of the characteristic uses of Class A water, support of shellfish has the most restrictive bacteria criterion. The Nooksack River is considered to be the major source of bacterial contamination to the Portage Bay shellfish harvest area, but a complete TMDL evaluation of the bay was not performed.

Modeling Approach

Over a period of one year, samples were collected at monthly intervals at nearly 20 stations. Several stations on the main stem and in two representative sub-basins were sampled intensively on three storm events. Ten of the stations were located at the mouths of tributaries to the Nooksack between North Cedarville and Brennen. Four stations monitored the three WWTPs and the Darigold condensate water. The fecal coliform data indicate a weak correlation between rainfall and fecal coliform concentration and between rainfall and fecal coliform loads. All of the above data, as well as data from Ecology ambient monitoring program, Institute of Watershed Studies, and Nooksack Tribe sampling was applied to the Beales ratio estimator to calculate annual loads. Loads for areas draining directly to the Nooksack River, but not represented by a tributary station, were assigned average values per square mile resulting in an estimated ungaged area load. The residual load from an annual mass balance loading analysis was assigned to unidentified sources.

For all stations the 90th percentile criterion is more restrictive than the geometric mean criterion in terms of meeting the water quality standards. A percent reduction in fecal coliform densities was calculated using the statistical rollback method described in Ott (1995). The distributions of TMDL generated fecal coliform data were used at the tributary stations, and TMDL and long-term monitoring data distributions were used at the main stem stations. The reductions required to meet the 90th percentile criterion of 200 cfu/100 mL in Class A freshwater and 100 cfu/100 mL in Class AA freshwater result in a target geometric mean (targets) below the criteria established in WAC 173-201A. Targets were established for the Nooksack River at North Cedarville based on Class AA criteria, and at the Nooksack River at Brennan based on Class A criteria. Ecology maintains long-term ambient monitoring stations at both of these sites. Targets were also established for the 10 tributaries sampled as part of the TMDL. WWTP effluent targets were calculated by applying the main stem geometric mean target of 39 cfu/100 mL to the water quality-based permit limit calculation sheet (Ecology, 1994).

The post-TMDL loads were estimated by applying the fecal coliform reductions to each of the tributary loads, the WWTP loads and the North Cedarville upper basin load. The mass balance analysis was performed again to ensure the cumulative load reductions met the main stem reduction target at Brennan. Permitted dairies are not assigned a wasteload allocation so are not separated from the loads from ungaged and tributary loads.

To evaluate the protection of water quality in the shellfish beds at Portage Bay, a relationship was developed between the fecal coliform concentration in the Nooksack River at river mile 1.3 and the northernmost shellfish area located five miles away. A first order decay rate model was used to calculate monthly fecal coliform distributions in the shellfish area through a Monte Carlo simulation. The monthly distributions of fecal coliform and discharge at river mile 1.3 were used in the model along with the distribution of the fecal coliform reduction rate estimated from 42 surveys between the river and shellfish beds. The relative accuracy of the model was tested by comparing the model's monthly geometric mean and 90th percentile fecal coliform densities after 10,000 iterations to statistics based on Department of Health data collected in the shellfish

area from 1989 to 1998. The post-TMDL water quality conditions in the shellfish bed were estimated by running the model again with a 48 percent fecal coliform density reduction applied to reflect the TMDL target at Brennan. The results showed a substantial reduction in fecal coliform densities in the shellfish area, which would lead to reopening harvesting if the river remains the primary source of bacterial contamination.

Seasonal Variation

Fecal coliform data collected in the Nooksack watershed does not show a definite pattern of seasonal variation. Bacteria violations occur during all seasons and under all kinds of climatic conditions. There is a correlation between rainfall and bacteria loads, but it is not strong enough to make accurate predictions on which a seasonal or event-based loading capacity can be calculated.

Loading Capacity

Identification of the loading capacity is an important step in developing TMDLs. The loading capacity provides a reference for calculating the amount of pollutant reduction needed to bring a water body into compliance with water quality standards. By definition, a TMDL is the sum of the allocations. An allocation is defined as the portion of a receiving water's loading capacity that is assigned to a particular source. EPA defines the loading capacity as "the greatest amount of loading that a water can receive without violating water quality standards."

Fecal coliform criteria are based on concentration and the population distribution at the monitoring site (i.e., the geometric mean and 90th percentile fecal coliform densities). The loading capacity is not a single value since loads vary with flow. For the TMDL, the relationship between concentration and flow was used to develop the 1997-98 fecal coliform loads, and the statistical roll back was used to calculate the reductions necessary to achieve compliance with water quality for the main stem river and each of the tributaries – the loading capacities for these sites. The loading capacity based on sampling in the 1997-98 TMDL study is given in Table 5 as an annual capacity. When compared to existing long-term records, the 1997-98 monitoring period was not unusual in terms of discharge, rainfall, or fecal coliform density distributions.

Table 5. Loading Capacity for Tributaries in Nooksack Watershed TMDL. Loads are in cfu/100 mL/cfs/year

WBID	Tributary	TMDL Reduction Required	Existing Load (1997-98)	Loading Capacity
WA-01-1020	Nooksack at Cedarville	4.5%	265,524	253,575
WA-01-1125	Smith Creek	60%	5,199	2,067
WA-01-1120	Anderson Creek	89%	22,265	2,505
WA-01-1015	Kamm Creek	94%	51,051	3,109
N/A	Scott Ditch	80%	35,260	7,017
N/A	LLPL Ditch	98%	18,008	421

WBID	Tributary	TMDL Reduction Required	Existing Load (1997-98)	Loading Capacity
WA-01-1115	Fishtrap Creek	91%	187,374	16,189
WA-01-1110	Bertrand Creek	84%	246,695	40,162
N/A	Wiser Lake Outlet	23%	2,747	2,113
N/A	Keefe Lake Outlet	50%	4,080	2,045
WA-01-1012	Tenmile Creek	87%	50,475	6,431
WA-01-1010	Nooksack at Brennan	48%	995,118	517,461

For the tributaries to the tributaries (sub-tributaries) in the study the same target geometric mean will be applied upstream of the mouth of the tributary. Assuming the flow is based on the land area, the loading capacity is directly related to the land area drained in the sub-tributary area.

Table 6. Loading Capacity of Sub-Tributaries; Loads are in cfu/100 mL/cfs/year

Tributary	Tributary Weight	Tributary Loading Capacity	WBID	Sub-Tributary	Sub-Tributary Weight	Sub-Tributary Loading Capacity
Tenmile Creek	22,700 ac.	6,431	WA-01-1014	Deer Creek	4,370 ac.	1,238
Kamm Creek	5850 ac.	3,109	WA-01-1016	Mormon Ditch	1870 ac.	994
Fishtrap Creek	23,700 ac.	16,189	WA-01-1116	Double Ditch Drain	3790 ac.	2,589
Fishtrap Creek	23,700 ac.	16,189	WA-01-1117	Benson Road Ditch	1160 ac.	792
Fishtrap Creek	23,700 ac.	16,189	WA-01-1118	Depot Road Ditch	1480 ac.	1,011
Fishtrap Creek	23,700 ac.	16,189	WA-01-1119	Bender Road Ditch	976 ac.	667
Bertrand Creek	26,900 ac.	40,162	WA-01-1111	Duffner Ditch	2370 ac.	3,538
Nooksack River at Cedarville	386,000 ac.	253,575	WA-01-1030 WA-01-1040 Combined	Nooksack South Fork	130,000 ac.	85,401
Nooksack River at Cedarville	386,000 ac	253,575	WA-01-1060	Nooksack Middle Fork	65,300 ac.	42,898
Nooksack River at Cedarville	386,000 ac	253,575	WA-01-1050 WA-01-1070 WA-01-1080 Combined	Nooksack North Fork	188,000 ac.	123,503

ac = acres

Margin of Safety

A requirement of the TMDL technical evaluation is a discussion of the margin of safety in the TMDL targets and recommendations. The size of the margin of safety is inversely proportional to the confidence in the data used to make TMDL load allocations or targets. The margin of safety can be placed either implicitly in the assumptions, or explicitly as a separate load allocation or an additional target component. The FC targets recommended for the Nooksack River TMDL contain the following implicit margin of safety factors:

- There is a better technical basis that the geometric mean and 90th percentile criteria will be met with the statistical rollback method than if targets were arbitrarily set at the usual Class A or AA criteria. The statistical rollback method uses the variability of the fecal coliform distribution at a site to generate a more restrictive geometric mean count than the Class A or AA geometric mean criteria.
- The water quality-based permit limits recommended for Ferndale, Lynden, and Everson WWTPs are more restrictive than current technology-based limits. The recommended limits assume a background FC density of 39 cfu/100 mL so that effluent will not have an effect.
- The 39 cfu/100 mL lower main stem target and 48% percent FC reduction are based on a ten-year monthly monitoring record, plus the 1997 and 1998 TMDL data. Data from the past five years, or from the TMDL survey alone, would be much less restrictive.
- The TMDL targets for the tributaries, point source, and the upper basin yield a cumulative FC load reduction to the lower river of 56 percent That is 8 percent more than the 48% percent reduction required by the main stem target, and almost twice the 29 percent reduction needed for the main stem based on the 1997-98 data set.
- The upper watershed TMDL target is set to be protective of Class AA criteria. The water being monitored is both Class A and AA. In addition, the rollback method was applied to the 1997-98 Ecology ambient database where a 90 th percentile count over the Class AA criterion of 100 cfu/100 mL was calculated. Calculations applied to the long-term data set do not generate a 90 th percentile count this high.
- The loading equations and calculations for the targets assume there is no FC decay rate in the river water column, (i.e., all FC bacteria entering the river from tributaries or other sources will make it to the mouth of the river). A drogue study suggested that this may be the case, but more studies would be required to verify this assumption in other river reaches and during different seasons.
- No reductions were assumed in making the load allocation for the ungaged tributary area. Yet the several sub-tributaries of the ungaged area will receive targets that result in reduced loading capacity. Implementation will take place on all area regardless of targets.
- No reductions were assumed in the unknown sources. Implementation activities will address all probable sources so unknown sources should be reduced.
- Incorporation of storm events provides a bias to high load events, resulting in more stringent targets.

Load and Wasteload Allocations

There are three WWTPs in the watershed. All discharge directly into the Nooksack River. The target at Brennan will be used to set permit limits. Therefore the WWTPs are assigned a wasteload allocation of zero.

There are two dairies under the NPDES dairy general permit in the Nooksack watershed. There are 16 dairies in the Nooksack watershed that will be under the dairy general permit within a month. The permit only allows those discharges caused by chronic or catastrophic storm events prompting an overflow from facilities designed for a 25-year, 24-hour storm event. Federal requirements adopted by reference in the permit prohibit discharges that would cause an exceedance of water quality criteria. Therefore, the waste load allocations for these streams will remain at zero. The implementation of the Washington State Dairy Nutrient Management Act may result in other dairies being covered by the NPDES Dairy permit and also receiving a wasteload allocation of zero.

A summary of the permits and the associated wasteload allocations is provided in Table 7. Permits have not been issued for several of the dairies that need to obtain coverage.

Table 7. Wasteload Allocations of Nooksack Watershed TMDL

Permit Id	Facility Name	Wasteload Allocation
WA0020435C	Everson WWTP	0
WA0022454C	Ferndale WWTP	0
WA0022578C	Lynden WWTP	0
WAG013002A	Sand Road Dairy Farm Inc	0
WAG013014A	Dyna Moo Dairy	0-
N/A	Aldergrove Farms, Inc.	0
N/A	Behling Dairy Management #2	0
N/A	Bloomquist Dairy Inc.	0
N/A	Bouma Farms, Inc.	0
N/A	Burgler Dairy	0
N/A	De-Gro View Dairy, Inc.	0
N/A	DeGroot Dairy LLC	0
N/A	Glen Blankers Dairy	0
N/A	H & H Farms	0
N/A	Hovander Dairy	0
N/A	Lagerwey Dairy	0
N/A	MJD Farms L.L.C.	0
N/A	Steensma Dairy	0
N/A	North Prairie Dairy	0
N/A	VanderHaak Dairy	0
N/A	Winterberg Dairy	0

The load allocations are based in the loading capacity given above. The targets are closely related to the loading capacity and so both are summarized below.

Table 8. Load Allocations of Nooksack Watershed TMDL

WBID	Tributary or Sub-Tributary	Target Geometric Mean (cfu/100 mL)	Load Allocation (cfu/100 mL/cfs/year)
WA-01-1050 WA-01-1070 WA-01-1080	North Fork Nooksack	14	123,503
WA-01-1060	Middle Fork Nooksack	14	42,898
WA-01-1030 WA-01-1040	South Fork Nooksack	14	85,401
WA-01-1020	Nooksack at Cedarville	14	253,575
WA-01-1125	Smith Creek	85	2,067
WA-01-1120	Anderson Creek	40	2,505
WA-01-1015	Kamm Creek	35	3,109
WA-01-1016	Mormon Ditch	35	994
N/A	Scott Ditch	49	7,017
N/A	LLPL Ditch	19	421
WA-01-1115	Fishtrap Creek	39	16,189
WA-01-1116	Double Ditch Drain	39	2,595
WA-01-1117	Benson Road Ditch	39	792
WA-01-1118	Depot Road Ditch	39	1,011
WA-01-1119	Bender Road Ditch	39	667
WA-01-1110	Bertrand Creek	49	40,162
WA-01-1111	Duffner Ditch	49	3,538
N/A	Wiser Lake Outlet	59	2,113
N/A	Keefe Lake Outlet	45	2,045
WA-01-1012	Tenmile Creek	39	6,431
WA-01-1014	Deer Creek	39	1,238
WA-01-1010	Nooksack at Brennan	39	517,461

Summary Implementation Strategy

Overview

The Lower Nooksack River and several of its tributaries have chronically violated the fecal coliform criteria of the Washington Water Quality Standards (WAC 173-201A). The Lower Nooksack River Basin Bacteria Total Maximum Daily Load (Nooksack Bacteria TMDL) is a process to reduce the fecal coliform (bacteria or FC) levels in the Nooksack River. An evaluation of the bacteria sources and dynamics in the lower Nooksack River was completed in January 2000 (Joy, 2000) and is available for review at local libraries, the Washington Department of Ecology's (Ecology) Bellingham Field Office, and at http://www.wa.gov/ECOLOGY/biblio/0003006.html. The study uses the statistical rollback to set target geometric means that will be protective of the 90th percentile criterion. The study recommends reductions in fecal coliform of 48% in the Nooksack River and reductions in tributaries of 23% to 98%.

Ecology, the Natural Resources Conservation Service (NRCS), Whatcom Conservation District (WCD), Lummi Nation, Nooksack Tribe, Washington Department of Health (DOH), various Whatcom County Agencies, and the U.S. Environmental Protection Agency (EPA) contributed technical assistance to the development of the Nooksack Bacteria TMDL evaluation.

The strategy to implement the Nooksack Bacteria TMDL is based upon many existing efforts underway to reduce and eliminate fecal coliform contributions to the Nooksack River. The implementation plan will comply with the federal mandate of the Clean Water Act (CWA), state laws to control point and non-point source pollution, and the 1997 Memorandum of Agreement between the EPA and Ecology.

Development of the Implementation Plan

Pursuant to the Memorandum of Agreement between Ecology and the EPA, a Summary Implementation Strategy (SIS) must be included in the TMDL Submittal Report to the EPA in order for the EPA to approve the TMDL. The SIS is an outline of the activities required to implement the TMDL. After the SIS has been developed, a Detailed Implementation Plan (DIP) is developed which describes the specific activities that will be performed to achieve the TMDL targets.

The following lists key milestones in the overall Nooksack TMDL and implementation effort:

May 1995: Ecology's then Nooksack Watershed Initiative hosted a scoping meeting of all interested parties to share water quality data for the Nooksack River basin. More than 50

individuals participated. Representatives were from federal, tribal, state and local agencies; Western Washington University; private consultants and the Nooksack Watershed Task Force.
June 1996: Ecology publishes the "Needs Assessment for the Nooksack Watershed" as a result of data and information presented at the 1995 scoping and in subsequent discussions with numerous individuals.
February 1997: Quality Assurance/Quality Control plan for sampling Nooksack River and tributaries is developed by Ecology.
March 1997- February 1998: Monthly water samples collected at 21 sites along the Nooksack River watershed. Periodic updates are provided to the Whatcom Co. Natural Resources Committee, Lummi and Nooksack water quality and natural resources staff and others.
September 1998 - March 1999: Analysis of sampling data and evaluation of computer modeling options is carried out by Ecology with input from numerous local interests.
March 1999 – January 2000: Waste load allocations developed by Ecology with input from sewage treatment plant operators, dairies, local governments, tribes and others.
April 15, 2000: Draft Summary Implementation Strategy distributed to more than 300 people for public comment.
April and May 2000: Presentations to numerous groups; legal notices published; media interviews conducted
May 31, 2000: Public comment period closes; written comments received from four entities.
June 2000: Final TMDL report, and Summary Implementation Strategy and responses to public comments developed for submittal to U.S. EPA by June 30.
July 2000: EPA initiates review of submittal
June 2001: Detailed implementation strategy completed, though many recommended actions already underway (eg., first round of dairy inspections completed in June 2000).

Point sources (wasteload allocations) will be addressed through reissuance or modification of National Pollution Discharge Elimination System (NPDES) permits. The non-point sources (load allocations) will be addressed by the actions identified in Table 1. Monitoring of implementation activities and water quality will be used to assess TMDL implementation.

Implementation Activities

The targets recommended for tributaries to the Lower Nooksack in the technical study will be applied upstream to the entire sub-basin. The NPDES permits for the permitted facilities will be written or revised with water quality based effluent limits that are protective of the TMDL targets for the Lower Nooksack River or the appropriate tributary. The permit limits for the WWTPs discharging to the Nooksack River will have three fecal coliform limits. The maximum monthly geometric mean will be 28 cfu/100mL. This is based on the model used for setting water quality based monthly limits to be protective of the long term average of 39 cfu/100 mL. It will replace the technology-based limit of a monthly geometric mean of 200 cfu/100mL. The second limit will be the existing technology based limit of 400 cfu/100 mL. The third limit will be a maximum of 10 percent of the last 30 samples to exceed 200 cfu/100 mL. This is designed to be protective of the 90^{th} percentile criterion. These limits will be implemented in the reissuance of the permits summarized in SIS Table 1.
Disinfection at the WWTP for the city of Lynden has been improved since the completion of the sampling for the technical study. Permit limits have been met by a comfortable margin for the

last year. However, the plant is not capable of meeting the limits proposed above. The city is currently designing a new plant that will be capable of meeting the proposed limits. In the interim the city will be issued a new permit with limits below the technology-based limits. When the new plant is completed in three to five years, the permit will be modified or reissued to incorporate the limits protective of the TMDL targets.

SIS Table 1. NPDES Permits for WWTPs Discharging to the Nooksack River

Permit Id	Facility Name	Monthly Geometric Mean	Weekly Geometric Mean	Percent of last 30 samples over 200 cfu/100 mL
WA0022454C	Ferndale WWTP	39 cfu/100 mL	400 cfu/100 mL	10%
WA0022578C	Lynden WWTP	100 cfu/100 mL	400 cfu/100 mL	10%
WA0020435C	Everson WWTP	39 cfu/100 mL	400 cfu/100 mL	10%

The Dairy Nutrient Management Plan will be implemented. All Class A dairies will have implemented farm plans by December 2003.

All county residents with an on-site sewage system (OSS) will receive information on required maintenance during the next 5 years, from Whatcom County Health and Human Services (WCHHS). WCHHS will also certify contractors performing OSS maintenance.

- **Responsible Entities**

SIS Table 2 lists the responsible entities for the implementation of the Nooksack Bacteria TMDL.

Ecology is the lead agency for the Nooksack Bacteria TMDL. Ecology will coordinate closely with the Portage Bay Shellfish Protection District (PBSPD) to avoid duplication of effort and to provide a regulatory backstop. Where goals and/or timelines are not filled in below, they will be determined as part of the preparation of the DIP. The DIP will identify all known potential fecal coliform sources and list the entities with primary responsibility for addressing the sources.

SIS Table 2. Entities, Agencies, and Permittees with responsibility for TMDL implementation

Entity, Agency or Permittee	Actions / Responsibilities	Goals	TIMELINES
Everson Waste Water Treatment Plant WWTP	NPDES permit compliance	Comply with reissued permit	Summer/Fall 2000 unless a compliance schedule is required for significant plant upgrades
Ferndale WWTP	NPDES permit compliance	Comply with amended permit	Summer/Fall 2000 unless a compliance schedule is required for significant plant

Entity, Agency or Permittee	Actions / Responsibilities	Goals	TIMELINES
			upgrades
Lynden WWTP	NPDES permit compliance	Comply with reissued permit	Summer/Fall 2000 unless a compliance schedule is required for significant plant upgrades
Portage Bay Shellfish Protection District (PBSPD)	Implement adopted Shellfish Protection District workplan	Coordination of activities to promote reopening of Portage Bay shellfish beds	See Appendix D Funded through September 2000
WCHHS	OSS operation and maintenance	Distribute information to owners and educate and certify operators	All watersheds targeted in next 5 years.
Whatcom County Planning and Development Services (WCPDS)	Critical Areas Ordinance	Critical Areas Protection	On-going
	Land use ordinances	Compliance with ordinances	On-going
Whatcom County Public Works and Drainage Districts (WCPW)	Riparian vegetation establishment	Pollution Prevention	On going
Washington State University – Cooperative Extension (WSU)	Agricultural support	Funding and technical assistance	On-going
	Educational outreach and research	Pollution Prevention	On-going
Washington Department of Ecology (Ecology)	Dairy Nutrient Management Act (DNMA)	Compliance with DNMA	Full compliance by December 2003
	Reissue National Pollution Discharge Elimination (NPDES) permits	Compliance with wasteload allocations	Summer/Fall 2000 unless a compliance schedule is required

Entity, Agency or Permittee	Actions / Responsibilities	Goals	TIMELINES
	Fund implementation activities	CWA Section 319, Centennial Clean Water grants, and Ecology funds to implement the TMDL	Annually
	Enforcement of CWA violations	Compliance with CWA	On-going
Washington Department of Health (DOH)	Collection of marine FC data	Additional data to be used to evaluate TMDL and reopen Portage Bay shellfish beds	On-going
Whatcom Conservation District (WCD)	DNMA	Farm Plan preparation	July 2002
	Agricultural support	Farm Plans and technical assistance	On-going
	Financial assistance	Coordinate Farm Plan implementation, financing	On-going
	Manage loans for OSS repair fund	Eliminate OSS bacteria contributions	On-going
	Public outreach and education	Pollution Prevention	On-going
Environmental Protection Agency (EPA)	Evaluate TMDL	Approve TMDL	Submit to EPA by June 30, 2000
	Funding Implementation Activities	Pollution Prevention and Compliance with TMDL	Annual, On-going
	Enforcement of CWA violations	Compliance with CWA	On-going
Natural Resource Conservation Service (NRCS)	Assist farmers to comply with state and federal laws	Technical assistance and funding for implementation of Farm Plans	On-going

Entity, Agency or Permittee	Actions / Responsibilities	Goals	TIMELINES
	Develops Best Management Practices (BMPs) implanted by Farm Plans	Compliance with federal laws	On-going
Northwest Indian College (NWIC)	Water quality monitoring	Determine compliance with TMDL and source identification	On-going, although only funded through September 2000
International Joint Commission and/or Environment Canada	Canadian contribution to the bacteria contamination	Reduce or eliminate contamination from Canada	On-going

♦ Goals For Meeting Nooksack Bacteria Targets

The goal is to meet the TMDL targets as soon as possible, and in no more than 5 years. The targets are expected to be maintained after compliance is achieved. The interim goal is for fecal coliform levels to decline steadily.

Administrative actions that are scheduled to be completed and are necessary for TMDL implementation are listed below with the date they will be completed.

- Farm Plans must be implemented by December 2003
- NPDES permit reissuance Summer/Fall 2000
- Amendment of Ferndale NPDES permit Summer/Fall 2000
- Enforcement of existing laws

The following actions do not have scheduled completion dates. They are also necessary for effective TMDL implementation:

- Coordination with WRIA 1 Watershed Planning Project
- Source identification
- Technical assistance
- Public education and outreach

♦ Summary of Public Involvement

The public comment period was open from Mid April through the end of May 2000.
To solicit public input and feedback on the proposed final SIS, public presentations were advertised and made at regularly scheduled meetings of Whatcom Co. Council Natural Resource Committee and of the city councils of Nooksack, Ferndale and Everson. The city of Lynden elected to schedule a presentation after the public comment period was closed. Presentations were also made to the Whatcom Co. Water Resources Team, the Agriculture Preservation

Committee, and at a public meeting of the Whatcom Conservation District Board. Articles and paid legal notices appeared in the Bellingham Herald and Lynden Tribune and are included in Appendix A. Presentations were also offered to Lummi Indian Business Council, Nooksack Tribe and the North Cascades Chapter of Audubon Society.

An Ecology "Focus" summary was handed out at all public meetings and presentations and was mailed to:

- 90 elected officials of Lummi and Nooksack Tribes, Whatcom County government and cities of Nooksack, Everson, Lynden, Ferndale
- approximately 20 local government public works and planning directors, and sewage treatment plant operators of Everson, Nooksack, Lynden, Ferndale
- 230 Whatcom Co. dairy farms
- leadership of North Cascades Audubon Society, People for Puget Sound, Watershed Defense Fund, and ReSources
- Bellingham Herald, KGMI radio, Lynden Tribune, Ferndale Record Chronicle, Whatcom Watch
- Mary Dumas the WRIA 1 Watershed Management Project, Planning Unit facilitator, for distribution to each of the planning unit caucus representatives.

♦ Coordination of Activities

On-going public involvement during the implementation of the TMDL will be carried out by Ecology in coordination with the Portage Bay shellfish committee BSPD and, when appropriate, the WRIA 1 watershed management effort. Included in Appendix D is a copy of the most recent matrix used by the shellfish committee to coordinate activities.

♦ Adaptive Management

Where fecal coliform sources not previously identified are discovered, they will be corrected through the appropriate jurisdiction. Where planned implementation activities are not producing expected or required results, the source of the shortfall will be identified. If the shortfall has an apparent cause, it will be remedied through the appropriate jurisdiction (e.g., dairies have implemented Best Management Practices [BMPs], but several OSSs have not been inspected). If the shortfall does not have an apparent cause (e.g., everyone is implementing required BMPs and all potential sources have been addressed), then more stringent actions will be required.

At the end of five years, the TMDL will be evaluated. The targets will be reevaluated to see if they are sufficiently protective of the shellfish beds in Portage Bay.

Fecal coliform loads in streams entering Washington State from Canada will be evaluated. Efforts will be made to ensure the water entering the state meets the targets of the TMDL.

Monitoring Strategy

Ongoing monitoring has been taking place by NWIC. Quarterly reports are available at http://www.nwic.edu/sbr.

- **Monitoring of Implementation Activities**

Ecology is the lead and will coordinate with the PBSPD and/or WRIA 1 Watershed Planning Project.

- **Ambient Water Quality Monitoring – Goal Attainment**

Water quality will be monitored in the lower Nooksack River and its tributaries to determine if Nooksack Bacteria TMDL targets are being met or if progress is being made in meeting the targets. The monitoring will include monthly samples taken on the Nooksack River at Brennan and Cedarville as well as samples from near the mouth of all of the major tributaries taken at regular intervals.

- **Compliance Water Quality Monitoring – Source Identification**

Where ambient water quality monitoring shows that progress toward targets is not occurring or targets are not being met, compliance water quality monitoring will occur. Compliance water quality monitoring will be designed to identify the specific source(s) of fecal coliform loading. Sampling over time will be adjusted to locate the source by narrowing the geographic area where contamination is occurring.

Potential Funding Sources

Ecology will provide funds and technical assistance to perform monitoring work necessary to implement the TMDL. The Centennial Clean Water Fund, Section 319 grants under the federal Clean Water Act, and State Revolving Fund (SRF) grants are available to fund activities by jurisdictions to help implementation of the TMDL. Non government organizations can apply to be funded by a 319 grant to provide additional assistance. Ecology will work with the stakeholders to prepare appropriate scopes of work, to implement this TMDL, and to assist with applying for grant opportunities as they arise.

The Environmental Quality Incentives Program (EQIP) is a federal cost share program available to all farms. The state has provided additional cost share assistance through the Washington Conservation Commission for commercial dairies that are required by the Dairy Nutrient Management Act to develop and implement farm plans.

Funding from the County Clean Water District is also available for funding PBSPD activities.

SIS Table 3 shows the funds that have been spent or budgeted to date on implementing the PBSPD plan by general sources. The existing expenditure of approximately $4 million demonstrates a commitment to the implementation activities necessary to implement the Nooksack Bacteria TMDL. More detailed information is available in the Matrix in Appendix D.

SIS Table 3. Funding Committed by Source to PBSPD Activities up to May 2000

Source	Amount
Federal – EPA	$60,000
Federal-NRCS	$574,155
Washington State	$1,420,632
Producer Match to NRCS and Conservation Commission Grants	$1,896,000
Whatcom County Funds	$73,734
Total	$4,024,521.00

WCHHS has available a SRF loan of $300,000 to help owners finance repair of OSS countywide. WCD will be managing the loan program. A high priority will be given to applicants in the shellfish protection districts.

SIS Table 4 shows activities not currently funded but necessary to implement the PBSPD work plan. These activities will result in reductions in fecal coliform loading to the shellfish beds.

SIS Table 4. Funding shortfalls identified by PBSPD

Activity	Budget
Additional funding for small farm technical assistance	$60,000
Additional assistance developing farm plans	$53,000
Ensure that public sewers are connected to all residences or OSSs are inspected	$5,000
PBSPD coordination through December 2000	$21,500
PBSPD coordination future	$25,000 / yr

Acronyms and abbreviations used

The Lower Nooksack River Basin Bacteria Total Maximum Daily Load	Nooksack Bacteria TMDL
Portage Bay Shellfish Protection District	PBSPD
Whatcom County Health and Human Services	WCHHS
Whatcom County Planning and Development Services	WCPDS
Whatcom County Public Works and Drainage Districts	WCPW
Washington State University – Cooperative Extension	WSU
Washington Department of Ecology	Ecology
Washington Department of Health	DOH
Whatcom Conservation District	WCD
Environmental Protection Agency	EPA
Natural Resource Conservation Service	NRCS
Northwest Indian College	NWIC
Environmental Quality Incentives Program	EQIP

References Cited

Joy, J. 2000. Lower Nooksack River Basin Bacteria Total Maximum Daily Load Evaluation. Washington Department of Ecology, Environmental Assessment Program. Publication No. 00-03-006

Ott, W., 1995. Environmental Statistics and Data Analysis. Lewis Publishers, New York, NY.

Figures

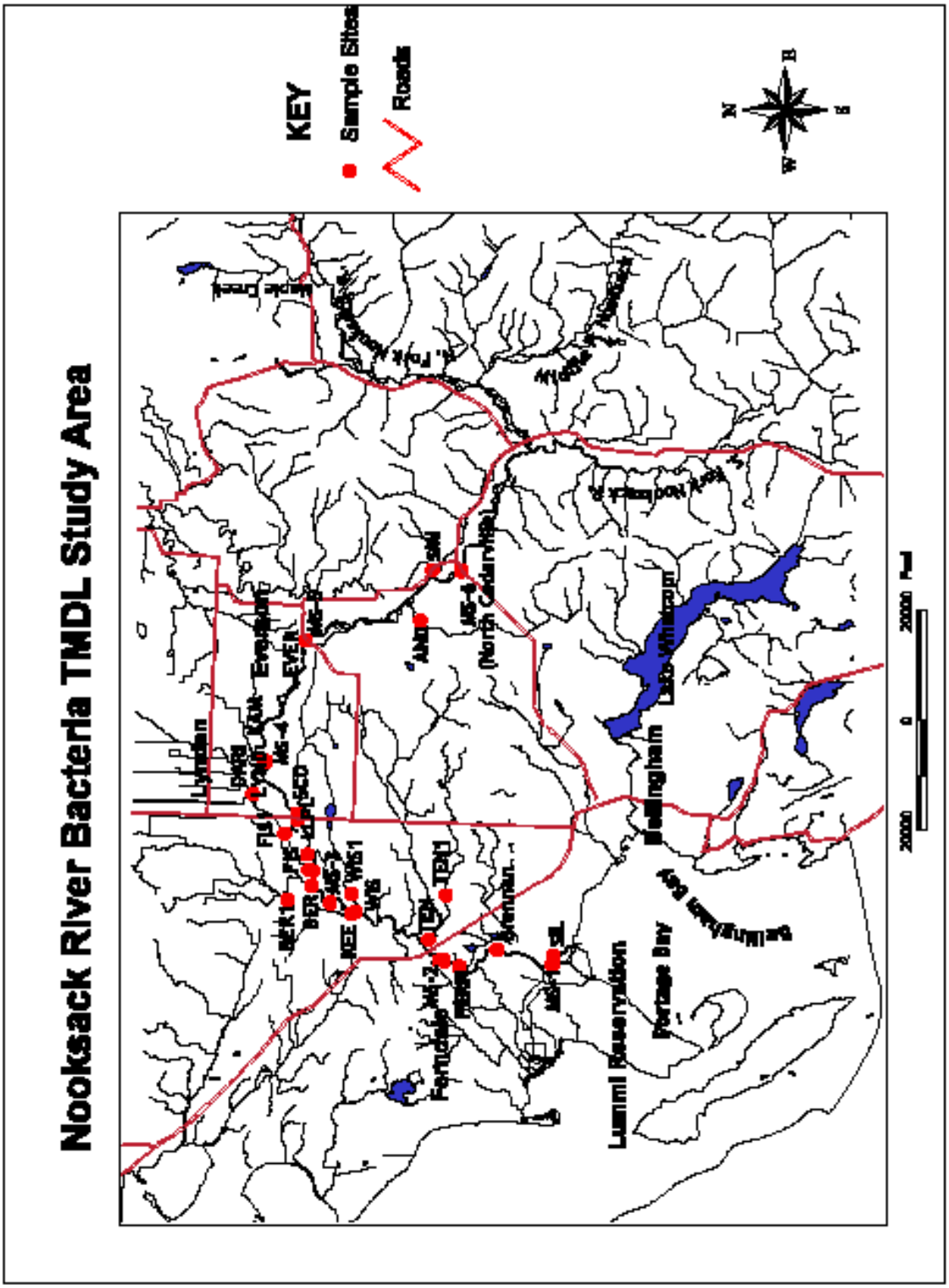

Figure 1. Nooksack Watershed Map

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Appendix A

Public Participation Materials

Summary of Responses to Comments

Ecology received written comments from four people: Steve Jilk, City of Lynden; Bruce Roll, Whatcom Co. Water Team; Llyn Doremus, Nooksack Tribe Natural Resources; Andy Ross, Lummi Natural Resources. Comments and Ecology's responses are summarized below.

City of Lynden

1. (paraphrased) General comment: Throughout the TMDL evaluation report, Lynden WWTP is portrayed as having ongoing problems meeting its permit requirements, poor lab procedures, and an overall high fecal coliform bacteria discharge. Although Lynden WWTP was having problems during the TMDL survey period, many of the upgrades/improvements made between February 1998 and January 2000 which have addressed these problems were not mentioned.

   Response: The evaluation report states the water quality conditions and causes of those conditions during the TMDL study period. The TMDL submittal includes several documents, not just the evaluation report. The improvements and upgrades at the Lynden WWTP are addressed in the *Strategic Implementation Summary*.

2. page.v, paragraph 2, sentence 6: Wastewater Treatment Plants (WWTP) laboratories are presently certified annually. Justification should be given for requiring quarterly certification.

   Response: Certification is a separate process. A more rigorous quality assurance (QA) procedure (not a certification procedure) is warranted to lower the human health risk in the river and to meet the TMDL targets. Justification is given on page 54, paragraph 2 of the Technical Report. The recommendation allows for reducing the frequency of QA sample reporting after reliability is demonstrated and a quality assurance project plan is approved.

3. (paraphrased) p. vii, paragraph 3, sentences 3 & 10; p. viii, item 8: The disinfection and laboratory problems have been addressed and the permit limits should be based on recent upgrades.

   Response: Noted. See response to comment 1.

4. p.9, paragraph 4: Clarification is needed that the Darigold sample is from cooling/cow water.

   Response: "Table 3. Sampling sites for the lower Nooksack River TMDL study, 1997-98" referenced in paragraph 4 states the Darigold sample is condensate as described in paragraph 3 of page 1.

5. p.13, paragraph 1, sentence 1: The evaluation states that several changes occurred that affected sampling continuity. Are the evaluation results valid.

Response: The evaluation is valid within the bounds of the quality assurance results. These are described in pages 13 and 14. The qualifications on the loading estimates and TMDL target recommendations based on these data are discussed throughout relevant sections of the document and in the Margin of Safety section.

6. p.19, paragraph 3: Since the data period identified (1997) the City has corrected/upgraded laboratory equipment.

   Response: Noted. See response to comment 1.

7. p.25, bullet 4: The examples listed should be listed as "potential sources."

   Response: All the examples were documented sources of fecal coliform contamination during dry weather conditions while monitoring the Nooksack River.

8. p.28, bullet 3 & 6: Recent upgrades to the disinfection process at Lynden's WWTP have proven this statement false. With the recent disinfection upgrades to the WWTP, Lynden should be added to the list of other treatment plants that contribute insignificant FC loads to the river.

   Response: The statements are true for the study period and based on the data collected during that time. See response to comment 1.

9. p.39, paragraph 2: WWTP effluents should not be targeted for the limit of 39 cfu/100 mL. The evaluation recommends a water quality based limit. If this method is utilized consideration for volume and percent contribution to the total TMDL should be included.

   Response: The water quality-based limit of 39 cfu/100 mL was used as an estimate to ensure that effluent from the WWTPs have no effect on the river. If Lynden WWTP consistently reduces the bacterial density and variability of its effluent (as the reviewer claims has occurred with the upgrades and corrections), it should have no problem meeting the recommended TMDL limits.

10. p.40, Table 10: Lynden's data should be updated or the table should identify that recent upgrades to the WWTP's disinfection has resolved the FC problems.

    Response: Noted. See response to comment 1.

11. p.40, Table 10: The evaluation proposes the City to reduce by 81% however, page 38 states that only a 48% reduction in lower basin FC is required. This 48% reduction should be used for WWTP discharge limits (ex: 104 cfu/100 mL monthly, 208 cfu/100 mL maximum weekly).

    Response: The 48% lower basin reduction is a cumulative reduction that indirectly takes into account loads. If all of the tributary and point sources were only required to make a 48% reduction, the overall reduction at the main stem compliance point would be only 32% - not

enough to meet criteria.

12. p.54, paragraph 1: The word practice should be deleted. The City does not intentionally promote overflows in it's collection system.

    Response: Agree, "the practice" will be replaced with "it" to modify the tone of the sentence.

Whatcom County Public Works, Water Division

1) The SIS should support fecal coliform survival studies during development of the Detailed Implementation Plan (DIP). The TMDL developed during this process did not assume there was die off of fecal coliform. Once such studies have been conducted then the TMDL should be readjusted if needed.

   Response: The fecal coliform survival studies will not be immediately necessary. The DIP could recommend survival studies as a part of the five-year review process, if substantial reductions in tributary and point sources have been attained but targets are not being met. We agree that if significant die-off is shown through further study, then the TMDL would be re-considered.

2) The DIP should include work that identifies the genera of fecal coliforms detected. Some fecal coliform may be coming from sources other than the fecal waste. The specific genera detected would be very helpful in this regard.

   Response: A majority of the fecal coliform colonies detected in the TMDL samples were *E. coli*, so their source as fecal waste is highly likely (page 28 to 33). By the time the DIP is written, the new bacteria indicator for Washington State should be decided (i.e. *E. coli* or enterococcus) and will need to be taken into account for the TMDL. Speciation should be reserved for problem sources that cannot be identified after a detailed sanitary survey and reach-specific monitoring are performed.

3) Coordination with the WRIA should occur during phase I of the data assessment portion of this project.

   Response: Agree that coordination with the WRIA 1 planning process should occur when the WRIA effort is in a position to address substantive regulatory issues within proscribed deadlines. Whatcom County Water Resources Division, Health and Human Services and Planning Dept. staff reviewed Nooksack River data at several points throughout the sampling and analysis stages.

4) The monitoring strategy needs to be defined very early in the process (within the first year). The SIS should set a date for this to occur.

   Response: Agree, an overall monitoring strategy done in cooperation with the WRIA 1 effort and the Shellfish Protection District should be designed as early as possible. Some TMDL compliance monitoring is already underway. The Northwest Indian College is conducting this work for the Whatcom Conservation District through an Ecology grant. However, a comprehensive strategy that incorporates monitoring for source identification, BMP effectiveness, and special issues (e.g., groundwater sources, sediment archiving, and die off, etc.) should be considered.

5) Given a majority of the fecal coliforms are derived from non-point source pollution, how will sources be identified in the monitoring program?

   Response: Some sources have already been identified through sanitary surveys, site inspections, and reach-specific monitoring. This systematic and iterative style of monitoring requires cooperation from several groups, but is generally effective at identifying field scale sources. Elements of the response to comment 4 on strategy are also important components for this level of monitoring.

6) Costs associated with monitoring need to be identified in detail in the DIP.

   Response: Agree, once the effectiveness of the current monitoring and corrective action program is evaluated, an overall monitoring strategy can be designed and its costs can be estimated.

Nooksack Tribe Dept. of Natural Resources

1) Paraphrased: A general statement of the findings of the original TMDL should be included in the overview and should include an overall statement of problems and findings, history of fecal coliform exceedances in the Nooksack River, results of the statistical analysis of data and reductions in fecal coliform numbers. A general statement about the purpose of the document should be included to outline the strategy and actions proposed and note that a detailed implementation plan will be based on the document.

   Response: Agree. See language inserted on page 2, paragraph 5.

2) Paraphrased: Under the implementation section, a brief description of the scope of each step should be included.

   Response: Agree. See language inserted on page 14 paragraph 2.

3) Paraphrased: Specific actions, procedures or approaches to implementation should be identified along with known deadlines or other dates.

Response: More detail has been included in the implementation matrix. A greater level of specificity will be included in the "Detailed Implementation Plan" scheduled for completion by July 2001.

4) Paraphrased: Section 3.4 should be moved to the "Ongoing Monitoring" section and renamed "Adaptive Management."

Response: Done.

4) Paraphrased: Locations, frequency of monitoring should be specified and the difference between ambient monitoring and compliance monitoring discussed.

Response: This level of detail will be worked out with affected parties during development of the "Detailed Implementation Plan."

5) Paraphrased: Funds committed, fund sources and funding needed for implementation should be included.

Response: The $4 million already committed by various entities for implementation is summarized in the SIS appendix. Also included is information about funds already spent and funds still needed.

6) Paraphrased: A description of expected outcomes should be included in the document.

Response: Agree. See section Goals For Meeting Nooksack Bacteria Targets on page 19.

Lummi Natural Resources

1) Paraphrased: Proof-reading and editing suggestions were submitted for pages 1-9 of the draft Summary Implementation Strategy.

Response: Most suggestions were incorporated.

Appendix B

Quality Assurance Project Plan

Appendix C

Technical Report

Lower Nooksack River Basin Bacteria Total Maximum Daily Load Evaluation
January 2000
Publication No. 00-03-006

Appendix D

Implementation Information

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WASHINGTON STATE UNIVERSITY—COOPERATIVE EXTENSION

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PORTAGE BAY SHELLFISH PROTECTION DISTRICT MATRIX

UPDATED 6/9/99

OBJECTIVES & TASKS	TIMELINE	ASSIGNMENT	FUNDED	SOURCE	UNFUNDED	SOURCE	STATUS
Objective 1: Control Agricultural Sources							
Provide Technical/Financial Assistance to Farms							
Task 1.1: Provide Financial Assistance to 45 Dairies to implement manure management plans	October 19910-September 1999 July 1997- June 1999 10/1/99 – 7/31/01 10/99 – 9/00	Natural Resources Conservation Service (NRCS) Whatcom Conservation District (WCD) WCD NRCS	$227,155 $75,7110 $446,000 $1,446,000 $450,000 $450,000	Federal – EQIP Producer Match State – WCD Grant Producer Match WA Conservation Commission Producer Match NRCS Producer Match			**17 completed plans compliant with SB 6161 45 dairies have requested updates to current plans into compliance with SB 6161. By 2002 103 more dairies need to have a dairy plan compliant with SB 6161 and all must be implemented by 2003**
Task 1.2: Provide Technical Assistance to 100 Dairies to develop manure management plans	July 1997 – June 1999 10/1/99 – 7/31/01	NRCS & WCD	$350,000 $325,000 $300,000	Federal – NRCS * State – WCD Grant WA Conservation Commission/WCD Grant			Met: provided technical assistance on manure management questions, and about techniques such as manure pond covers and composting.

OBJECTIVES & TASKS	TIMELINE	ASSIGNMENT	FUNDED	SOURCE	UNFUNDED	SOURCE	STATUS
Task 1.3: Provide technical assistance to small/non-commercial farmers and landowners to develop conservation plans.	July 19910 – October 1999 10/1/99 – 7/31/01	WCD	$60,000 $60,000	State – WCD Grant State – WCD Grant	$60,000	General Fund Shellfish/Clean Water District funds	2 small farm planner s are currently working on 4 conservation plans for small farms in the watershed, including assistance with compost facilities, filter strip establishment, pasture management, fencing, and livestock crossings.
B. Implement Whatcom County Critical Areas Program and Other Clean Water Legislation							
Task 1.5: Assist farmers to develop conservation plans consistent with CAO requirements. Approve, condition, disapprove plans.	1997-910 6/10/99 – 10/00	WCD	$35,000 $13,734	97/910 County Budget County Budget	$35,000 $110,000	General Fund Shellfish/Clean Water District funds ""	WCD has worked with dairies and small farms to develop conservation plans and implement NRCS filter strip specifications which are based on soil type and slope; these are exemptions to CAO stream buffers.
Task 1.6: Reach a cooperative agreement between the EPA, DOE and WC regarding their respective enforcement activities.	March 19910	EPA, DOE & WC	With existing staff	Respective Budgets			Verbal agreement has been reached amongst the parties involved.
Task 1.7: Adopt Manure Management Ordinance	ASAP	WC	With existing staff	97/910 County Budget			adopted September 12, 19910
Task 1.6: Reach a cooperative agreement between the EPA, DOE and WC regarding their respective enforcement activities.	March 19910	EPA, DOE & WC	With existing staff	Respective Budgets			Verbal agreement has been reached amongst the parties involved.
Objective 2: Control Stormwater Sources							
Task 2.1: Complete the regulatory review begun in 1997.	Will complete in March 19910	Whatcom County	$5,000	97/910 County Budget			

OBJECTIVES & TASKS	TIMELINE	ASSIGNMENT	FUNDED	SOURCE	UNFUNDED	SOURCE	STATUS
Task 2.2: Use results from Task 2.1 to continue development of a Comprehensive Stormwater Program to comply with the County Comprehensive Plan, Puget Sound Water Quality Plan, and Department of Ecology requirements.	19910-1999	Whatcom County	$20,000	97/910 County Budget			
Objective 3: Control STP's and OSS's Sources							
Task 3.1: A formal On-site Sewage (OSS) survey should be completed in the Marietta, Rural Ave, and Country Lane area.							Survey has been completed. Survey showed out of 175-200 sites that were checked only about 10 failures.
Phase 1: Residences along Marine Drive in Marietta should be surveyed immediately. (Approx. 30)	Immediately	WC Health Department Lummi Tribe	With existing staff	97/910 County Budget			completed
Phase 2: Formal OSS Survey be completed at all remaining residences (approx. 150) in the Country Lane/Rural Ave area.	February 1999	WC Health Department			$25,000	General Fund Shellfish/Clean Water District funds	completed
Task 3.2: Apply for DOE OSS grant funding to assist homeowners with repair of failing OSS.	September 19910	WC Health Department	With existing staff	97/910 County Budget			Funds have not been available.

OBJECTIVES & TASKS	TIMELINE	ASSIGNMENT	FUNDED	SOURCE	UNFUNDED	SOURCE	STATUS
Task 3.3: Apply for State Revolving Fund (SRF) low interest loan program to assist homeowners with repair of failing OSS.	January 19910	WC Health Department	With existing staff	97/910 County Budget			funds have been awarded and approved by Council
Task 3.4: Adopt a formal OSS enforcement policy to ensure adequate enforcement of regulations regarding repairs of failing OSS.	January 19910	WC Health Department	With existing staff	97/910 County Budget			This was completed and adopted by Council in December of 1997 and is being enforced since that time.
Task 3.5: In development of the County OSS Operations and Maintenance Program insure that consideration is given to areas such as the Nooksack drainage which have a potential impact on shellfish resources so that the resulting program ensures preventative O & M in these areas.	December 19910	WC Health Department	With existing staff	City of Bellingham Interlocal Agreement			draft plan has been approved by the Board of Health
Task 3.6: Distribute OSS maintenance reminders to property owners in the Nooksack River drainages of North Fork 10-1, Middle Fork 10-2 and South Fork 10-3.	December 19910	WC Health Department	With existing staff	City of Bellingham Interlocal Agreement			Task complete as of December 19910

OBJECTIVES & TASKS	TIMELINE	ASSIGNMENT	FUNDED	SOURCE	UNFUNDED	SOURCE	STATUS
Task 3.7: Ensure that all residences within public sewer service areas are either connected to public sewer or that any existing OSS are adequately functioning.	December 19910	WC Health Department, City of Ferndale, City of Lynden, Lummi Water and Sewer			$5,000	General Fund Shellfish/Clean Water District funds	list of sites has been received from the cities of Lynden, Ferndale and Lummi.
Task 3.10: Review STP Records & Report on performance relative to compliance with existing permits	December 19910	DOE					Ongoing review. BFO and NWRO are actively sharing data. These duties are being transitioned to the Bellingham Field Office
Task 3.9: Make recommendations as to changes in operation for future permits for STPs		DOE					Accomplished at time of renewal. Technical assistance is always part of inspection process.
Task 3.10: Review STP Q/A & Q/C plans and make recommendations for improvement.		DOE					Ongoing review. These duties are being transitioned to the Bellingham Field Office

OBJECTIVES & TASKS	TIMELINE	ASSIGNMENT	FUNDED	SOURCE	UNFUNDED	SOURCE	STATUS
Task 3.11: Review Q/A & Q/C data of STP operations through closure response period.	February 19910 to December 1999	DOE & WCDOH					Ongoing review. These duties are being transitioned to the Bellingham Field Office
Objective 4: Monitor Water Quality							
Task 4.1 Conduct Fecal Coliform Transport Sampling Project (Mainstem to Bay)	19910-1999	Northwest Indian College	$60,000	EPA Grant			ongoing
Task 4.2 Conduct Portage Bay Sampling	19910-1999	State Department of Health					ongoing
Task 4.3 Conduct Water Quality Monitoring in Nooksack Basin Including Fecal Testing/Pilot Projects	19910-1999	Partnership of Nooksack & Lummi Tribes, WCD & DOE			$150,000	General Fund Shellfish/Clean Water District funds	ongoing
Object 5: Establish Education/Outreach Program							

OBJECTIVES & TASKS	TIMELINE	ASSIGNMENT	FUNDED	SOURCE	UNFUNDED	SOURCE	STATUS
Task 5.1: Hire an Education/Outreach Coordinator and Develop an Educational and Outreach Program for general public and agencies. Implement an Educational/Involvement Program for general public and agencies	3/1/99 – October 2000	WSU-Cooperative Extension, WCD	$103,706 $20,926	Centennial Clean Water Fund Grant (DOE) WCD		General Fund Shellfish/Clean Water District funds	Hired 2 people for information and education for small farm owners and public schools. The program includes: landowner workshops on environmentally sensitive horsekeeping, composting on small farms, and cattle; educational displays at Farmers' Market, NW Washington Fair, Cattlemen's Winterschool, and Salmon Summit; newsletter articles highlighting water quality issues and concerns for farmers; school presentations and workshops. To date: have conducted water quality workshops with elementary and middle school students; distributed environmental education materials to elementary schools; presented displays on conservation-oriented farming practices at educational seminars; quarterly newsletter published with articles highlighting environmental issues and farming solutions

OBJECTIVES & TASKS	TIMELINE	ASSIGNMENT	FUNDED	SOURCE	UNFUNDED	SOURCE	STATUS
Task 5.2: Develop an Education & Outreach Program for Dairy Producers Implement an Education & Outreach Program for Dairy Producers	February 19910 February 19910 WSU-Cooperative Extension	WSU-Cooperative Extension WCD			See task 5.1 above	See task 5.1 above	WCD: In the context of the Manure Management Ordinance, educational flyers were sent out to all dairy producers. WCD: In February of 1999, a presentation on Integrated Pest Management was given to about 30 growers who responded to an open invitation to all dairy producers, which covered how to properly manage manure (nutrient sampling, timing and application).;an informational newsletter is sent out quarterly; an annual nutrient management workshop is conducted; a Cooperator of the Year Model Farm Open House is put on every year; an educational display was developed and is ongoing at the Whatcom County Museum

Objective 6: Establish Funding District and Program							
**Task 6.1: Analyze options, determine preferred approach and develop draft program describing boundaries, budget, projects/services, rate structures and other details.	May 19910	Whatcom County, WCD, County Council, Water Resources Council	$2,000	97/910 County Budget State -- WCD Grant			accomplished

**Task 6.2: Revise and adopt final district and program.	September 19910	Whatcom County, WCD, County Council, Water Resources Council	$1,000	97/910 County Budget State -- WCD Grant			Ordinance adopted March 24th, 19910
Task 6.3 Administer, periodically evaluate and, as necessary, revise the program. Report progress to elected officials and the public.	February 19910-September 2000	Whatcom County, WCD, County Council, Water Resources Council	$65,000		$15,000	General Fund Shellfish/Clean Water District funds	
Totals			$ 3,724,000		**$ 596,000**		ongoing

*Assumes current staffing levels at the Lynden NRCS Field Office.
** County Executive has determined to fund program through 1999, then fund it year by year through the general fund or through flood assessment increa