



# **Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load**

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## **Detailed Implementation Plan**

**December 2002**

Publication No. 03-10-004

 *Printed on Recycled Paper*



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## **Detailed Implementation Plan**

by  
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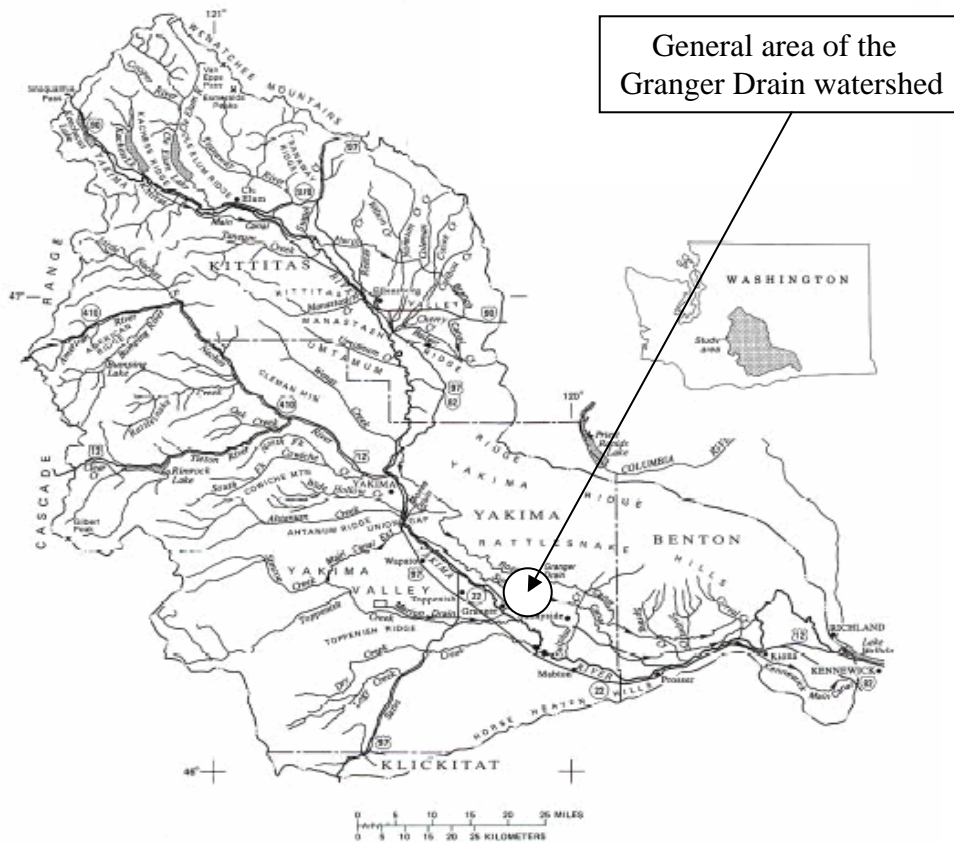
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**Figure 1: Yakima River Basin**





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## **ACKNOWLEDGMENTS**

A thank you is due to all of the active *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load* Technical Advisory Workgroup members for their participation in the drafting of the Summary Implementation Strategy, which was the forerunner of this Detailed Implementation Plan. A special thank you goes to all those entities that have agreed to contribute to the monitoring and implementation actions described in this plan.

## EXECUTIVE SUMMARY

The following Detailed Implementation Plan (DIP) details how and when fecal coliform (FC) bacteria reductions will be achieved in order to meet Washington State water quality standards in the mainstem Granger Drain and the Sunnyside Valley Irrigation District (SVID) irrigation supply canal.

Violations of water quality standards for FC have been documented in the mainstem Yakima River immediately downstream of the Granger Drain outfall since the 1970's. However, the vast amount of documentation of the actual watershed's ambient water quality began to be collected in 1992. In December 2001, Ecology established interim and final FC targets for the mainstem Granger Drain and the watershed's irrigation supply canals through adoption of a Total Maximum Daily Load (TMDL) analysis.

As required under an agreement between Ecology and EPA<sup>1</sup>, the following DIP indicates how implementation will occur to achieve FC pollution reductions specified in the *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Assessment and Evaluation*. This document provides a framework for: (1) implementing BMPs; (2) identifying the contributing entities and their proposed contributions; (3) monitoring bacterial densities throughout the duration of the *Granger Drain TMDL*; and (4) tracking compliance with TMDL targets.

The final FC targets for the watershed are based on the *Water Quality Standards for Surface Waters of the State of Washington* (Chapter 173-201A WAC). There are two Class A criteria for FC bacteria. The first criterion sets a maximum density of bacteria for the geometric mean criteria (100 cfu/100 mL). The second criterion sets a maximum density of bacteria for the 90<sup>th</sup> percentile<sup>2</sup> (200 cfu/100 mL). Of the two criteria, the 90<sup>th</sup> percentile criterion is typically the most difficult to comply with, as it represents the infrequent higher bacterial densities. Based on FC reductions obtained since 1992, the *Granger Drain TMDL* contains an interim 90<sup>th</sup> percentile target of 510 cfu/100 mL and a final 90<sup>th</sup> percentile target of 200 cfu/100 mL (water quality standards). It is against these interim and final targets that future compliance will be measured for both the mainstem Granger Drain and the Sunnyside Valley Irrigation District (SVID) irrigation supply canal.

<sup>1</sup> The *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Assessment and Evaluation* was written to meet the requirements of the *Memorandum of Agreement Between the United States Environmental Protection Agency and Washington Department of Ecology Regarding the Implementation of Section 303(d) of the Federal Clean Water Act*, October 29, 1997.

<sup>2</sup> A 90<sup>th</sup> percentile, for compliance with the *Granger Drain Fecal Coliform Bacteria TMDL*, shall be interpreted as the single data point that represents the beginning of the highest ten percent (10%) of data points after ranking all applicable data points, from highest to lowest. For example: if a sample contains 1 to 19 data points, the 90<sup>th</sup> percentile shall be the data point with the highest value; if a sample contains 20 to 29 data points, the 90<sup>th</sup> percentile shall be the data point with the second highest value; if a sample contains 30 to 39 data points, the 90<sup>th</sup> percentile shall be the data point with the third highest value

The *Granger Drain TMDL* fully expects that if BMP implementation for reducing suspended sediment runoff continues at its present rate, the final TMDL target for the mainstem Granger Drain and the irrigation supply canals will be met by the year 2013. Throughout the duration of the *Granger Drain TMDL*, adaptive management methods will be used to identify whether, and where, additional BMP efforts are needed. In addition, if such adaptive management analyses demonstrate that existing types of BMPs are not adequate, then new types of BMPs will need to be developed and implemented.

National Pollutant Discharge Elimination System (NPDES) permits, under the federal Clean Water Act, regulate several concentrated animal feeding operations<sup>3</sup> (CAFOs) in the Granger Drain watershed, the majority of which are dairy operations. The watershed also contains other dairies that are regulated only under Washington's *Dairy Nutrient Management Act* because such facilities have not been found, or suspected, to have discharged wastewater and, therefore, have not been classified as CAFOs by Ecology. In addition, the Granger Drain watershed contains a multitude of smaller non-dairy animal feeding operations<sup>4</sup> (AFOs) and "hobby farms"<sup>5</sup> that are operated near surface waters or subsurface drainage.

The *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Assessment and Evaluation* established that the FC pollution limits associated with CAFOs are based on a wasteload allocation (WLA) of zero (0). A WLA of "0" means that there shall not be any discharge from those facilities. (The manure application land area(s) under ownership or control of the CAFOs are considered to be an extension of the CAFO and subject to the same WLA of "0".) Due to the mainstem Granger Drain being listed on the state's 303(d) list for excessive FC pollution, the various other dairies and AFOs in the watershed will also be assigned a "load" allocation of zero for their agricultural activities.

Since 1992, there has been noted a significant reduction (90%) of FC densities in the downstream mainstem Granger Drain. The reduction occurred in conjunction with the implementation of various BMPs for minimizing sediment runoff, as well as better manure management on-site activities at local dairies. The *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Assessment and Evaluation* determined that the predominant source of FC pollution within the watershed is directly related to runoff from irrigated agricultural fields.

<sup>3</sup> A concentrated animal feeding operation (CAFO) is defined as: an animal feeding operation, which discharges at any time other than during only a 25-year, 24-hour or greater storm event. The Granger Drain watershed has a 25-year, 24-hour storm event of 1.6 inches.

<sup>4</sup> An animal feeding operation (AFO) is defined as: a commercial lot or facility where animals have been, are, or will be stabled, or confined and fed or maintained for a total of 45 days or more in any 12-month period. The animal stable or confinement area cannot sustain crops, vegetation, forage growth, or post-harvest residues in the normal growing season. It is not necessary that the same animals are fed or maintained on the lot for the 45-day period nor do the 45 days need to be consecutive.

<sup>5</sup> A "hobby farm" is defined as: a facility that is operated on a part-time basis with off-farm income being the principal income for the owner/operator. Such facility typically has only a few animals and very little cropland, but may have several acres of pasture. Such facility can have any combination of types of animals (i.e., horses, cattle, sheep, llamas, goats). Any facility operated commercially shall not be considered a "hobby farm", but rather an AFO.

The primary means of tracking and ensuring compliance with the *Granger Drain TMDL* is through bi-annual (every two years) comparisons of water quality monitoring data with the applicable TMDL target. Ecology will also track the implementation milestones to be achieved by a variety of entities contributing to the *Granger Drain TMDL*. Several such entities have already begun working in the Granger Drain watershed as part of the BMP implementation plan for the previously instituted *Lower Yakima River Suspended Sediment TMDL*.



## I.

## INTRODUCTION

The federal Clean Water Act requires the U.S. Environmental Protection Agency (EPA) or delegated states to develop water cleanup plans for rivers, lakes and streams that fail to meet water quality standards. The mainstem Granger Drain and the Sunnyside Valley Irrigation District (SVID) irrigation supply canal within the Granger Drain watershed are among more than 650 waterbodies that fail to meet the surface water quality standards of the state of Washington.

A plan to clean up fecal coliform (FC) pollution in the Granger Drain watershed was proposed by the Ecology and approved by the EPA in December 2001. The water cleanup plan, called a “total maximum daily load” (TMDL), sets forth the goals, objectives and tactics for achieving clean water in the mainstem Granger Drain and SVID canal.

As part of an agreement on the implementation of section 303(d) of the federal Clean Water Act, the state must prepare a “detailed implementation plan” (DIP) which includes a monitoring plan and a measures of success. This document is the DIP for the Granger Drain watershed. Other documents related to the *Granger Drain Fecal Coliform Bacteria TMDL*<sup>6</sup> (*Granger Drain TMDL*) are available through the Washington State Department of Ecology (Ecology) web site at <http://www.ecy.wa.gov/programs/wq/tmdl/index.html>. This DIP is based on the information contained in those previously published documents, especially the Summary Implementation Strategy (SIS), which is contained in the *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Submittal Report*.

The basic implementation concept for achieving bacterial reductions in the Granger Drain watershed is through continued implementation of existing types of “best management practices” (BMPs) directed at controlling sediment runoff. Due to documented bacterial adsorption to sediment particles, these same BMPs should also result in the mainstem Granger Drain and the SVID irrigation canal meeting the *Granger Drain TMDL* targets. This DIP provides the detail of how monitoring of water quality and implementation activities will be used to track progress as well as indicate when adaptive management procedures need to be employed.

This DIP document is organized as follows:

- Section I is the introduction.
- Section II outlines the general approach to implementing the *Granger Drain TMDL*.
- Section III identifies and describes FC bacteria sources in the watershed.
- Section IV identifies the entities contributing to pollution reduction.
- Section V presents a schedule of contributions.
- Section VI describes the water quality monitoring plan.
- Section VII describes existing methods for adaptive management and investigating problems and additional control measures.

<sup>6</sup> *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Assessment and Evaluation* (Washington State Department of Ecology, 2001); *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Submittal Report* (Washington State Department of Ecology, 2001).

- Section VIII addresses reasonable assurance.

- Section IX addresses public involvement.
- Section X addresses funding opportunities.
- Section XI addresses enforcement.
- Section XII contains the references cited in the text.

## II. APPROACH

The Roza-Sunnyside Board of Joint Control (RSBOJC) currently collects and analyses water quality data in support of its own water quality program. The RSBOJC will continue to provide this data to outside agencies, such as Ecology, for their use. If necessary, additional data will be arranged by Ecology. The data will be evaluated by Ecology, every two years, for progress toward ultimately meeting the state’s water quality standards. Table 1 contains the *Granger Drain TMDL* implementation responses to the two potential outcomes of the present BMP implementation schedule:

**Table 1 – TMDL Implementation Responses**

	Water Quality Target Being Met	Water Quality Target Not Being Met
Response	<i>State I</i> -- No change needed.	<i>State II</i> – Accelerate implementation schedule and/or add new BMPs.

A description of each of the categories from Table 1 follows:

- *State I*: Ambient water quality target is being met; thus no change will be required for implementation schedule or different BMP types.
- *State II*: Ambient water quality target is not being met, thus the response will be to accelerate implementation schedule and/or to develop and implement new types of BMPs.

The final TMDL target, which commences with the 2012 irrigation season, is based on a future assumed 90% decrease in FC bacterial densities. Based on FC reduction rates since 1992, Ecology has determined that the present BMP implementation schedule should continue and that no new types of BMPs need to be presently developed specifically for FC bacteria. However, if for any reason the respective interim or final TMDL targets are not met, or appear not going to be met, the implementation schedule will need to be accelerated and/or new types of BMPs will need to be developed and implemented.

BMP implementation should be occurring year-round, as the mainstem Granger Drain is not in compliance with the TMDL’s final FC targets even during the non-irrigation season. This approach will allow for maximized FC reductions throughout the watershed. Additionally, the continuation of a year-round implementation schedule promotes the concept of a level “playing field” throughout the regulated community.



### III.

## POLLUTION SOURCES

The potential sources of FC pollution within the Granger Drain watershed are varied, with Table 2 summarizing such sources.

**Table 2 - Potential Fecal Coliform Bacteria Sources**

Source	Explanation
Agriculture	Improper manure application and/or storage practices. Improper pasture management techniques. Runoff from CAFOs, AFOs and hobby farms. Runoff and drainage water from fields and pastures.
On-Site Septic Systems	Faulty or improperly designed residential septic tanks and/or drainfields that allow the discharge of inadequately treated wastewater. High water tables in area of concentrated septic tanks (Outlook) during irrigation season.
Stream Sediment	Bacteria are “stored” in stream sediment and are re-suspended under conditions of disturbance. Animal access to streams causes disturbance.
Stormwater	Runoff of residential pet waste and stormwater from urban areas.
Wildlife	Considered as “non-agricultural” natural conditions bacteria level and typically lower than the state’s water quality standards.

#### A. Agriculture

##### 1. Animal Feeding Operations

The majority of animal feeding operations (AFOs) in the Granger Drain watershed are dairies. Most dairy farms in the Granger Drain watershed are located adjacent to surface waters of the state, which makes them vulnerable to pollute. Milk-house drainage, runoff from animal confinement areas, land application of manure and discharges from manure collection and storage facilities are all potential sources of FC polluted discharges from dairies. Class A dairies are regulated by Washington’s *Dairy Nutrient Management Act* (Chapter 90.64 RCW) and thus are required to implement nutrient management plans. In addition, all AFOs that have discharged wastewater will be classified by Ecology as concentrated animal feeding operations (CAFOs) and will be required to obtain coverage under an NPDES permit.

Water pollution caused by AFOs can be minimized through the implementation of BMPs that include: (1) having a manure management plan; (2) proper collection, storage and utilization of manure; (3) diverting clean water “run-on”; (4) “armoring” heavy-use areas with wood chips or similar materials; and (5) routing of all manure discharges and run-off from animal confinement areas into waste storage facilities. In addition, livestock themselves are contributors of FC pollution to streams through direct deposition and re-suspension of sediment. Therefore, livestock need to be excluded, whenever possible, from having direct access to surface waters.

Contributions, performance measures, and milestones are listed in Table 3.

## **2. Irrigated Agriculture**

In recent years, the FC pollution found in the Granger Drain watershed has been principally attributed to irrigated agriculture. Since FC bacteria adsorb to fine sediment particles, the transport of sediment via runoff (overland and subsurface) from irrigated agriculture also carries bacterial populations. Therefore, BMPs for removing suspended sediment from runoff should be implemented by the entire irrigated agriculture community. Such BMPs include, but are not limited to: PAM (polyacrylamide), sedimentation basins, conversion from rill to sprinkler and drip irrigation, and vegetated riparian buffer (filter) strips.

Of special interest, Sylvester and Seabloom (1962) noted a specific area of subsurface drainage within the Granger Drain watershed: 3 miles north of Outlook on Hudson Road, just east of its intersection with Price Road. All subsurface drainage should be investigated to determine their condition and linkage to the mainstem Granger Drain.

Contributions, performance measures, and milestones are listed in Table 3.

### **B. On-site Septic Systems**

Residential septic systems are designed to use unsaturated soil beneath their drainfields to remove bacteria from sewage and household wastewater. Soil compaction, clogging with solids, high ground water levels, and hydraulic overload can all cause failures of an on-site septic system. High ground water levels during the irrigation season are extensive in the community of Outlook, which is located adjacent to the upper end of the mainstem Granger Drain. This situation combined with numerous failing on-site septic systems poses a serious human health risk. In fact, the Yakima Health District (YHD) issued a *Declaration of Public Health Emergency* (11/19/1999) stating: "Outlook is experiencing a sewage treatment problem that poses a serious and immediate threat to the environment, health and safety of the community." Ecology and Yakima County have been trying for years to get the community connected to the City of Sunnyside sanitary sewer system. Yakima County needs to apply for funding from Ecology or other sources as soon as possible. The community of Outlook should be completely connected by the irrigation season of 2012. In the mean time, the RSBOJC and Ecology will refer all on-site septic system problems to the YHD for follow-up.

### **C. Stream Sediment**

Bacteria and other organic contaminants adhere to sediment particles and once settled, can easily be re-suspended via physical disturbance of the streambed. Physical disturbance can be caused by livestock walking through the stream, as well as by higher water flows scouring the streambed. Sediment has been isolated as a source of bacteria in at least one case locally where a specific and documented discharge of manure into a

waterway resulted in high bacteria levels well after the time at which the direct input of manure had ceased. This phenomenon has been documented elsewhere in the scientific literature and is referred to as “sediment archiving” of FC bacteria.

#### **D. Stormwater**

Stormwater can carry FC bacteria in runoff from lands contaminated by non-point sources such as AFOs, “hobby farms”, urban areas and fertilizers. Analysis of FC densities monitored just upstream and downstream of the town of Granger, the only urbanized area in the watershed, indicated no significant difference between those bacterial densities. This suggests that no significant FC bacterial pollution is being discharged in the urban runoff from the town of Granger. “Hobby farms” on the other hand, typically allow direct access of their livestock to surface waters for stock watering, which can contribute to increased downstream FC densities through direct deposition as well as physical disturbance of “archived” bottom sediments. The relative contribution of bacterial pollution from “hobby farms” in the Granger Drain will increase in the future as the CAFOs and AFOs implement more and more BMPs, which will reduce their bacterial pollution contributions.

#### **E. Wildlife**

Similar to other non-point sources, wildlife manure assuredly contributes to part of the FC bacterial loadings within the watershed. However, the amount of such loading has been assumed to be significantly less than that compared to the other potential sources described in this section. Recent E. coli DNA analysis data<sup>7</sup> reported by SYCD has indicated that various wildlife species account for bacterial pollution in the mainstem Granger Drain (i.e., birds, raccoon, squirrel, muskrat). The DNA analyses of E. coli bacteria determined that the most “frequent isolate type” was identified as belonging to bovine animals (30.8% of the bacterial isolates); and that birds were identified from 14.4% of the E. coli tests.

This appears to contradict Ecology’s original assumption that wildlife contributed only a very minor part in the bacterial pollution of the watershed. However, since the DNA analysis methodology is qualitative and not quantitative, Ecology’s original assumption has not been disproved. Owing to the number of livestock in the watershed, the management of manure definitely represents a tremendous potential for improvement, especially concerning manure application to irrigated agriculture fields.

<sup>7</sup> *Granger Drain DNA Fecal Analysis Project* (SYCD, 2002).

## IV. ENTITIES CONTRIBUTING TO POLLUTION REDUCTION

The following entities are cooperating on the implementation of the *Granger Drain TMDL* by making specific contributions:

### A. Technical Advisory Workgroup (TAW)

The TAW is composed of several active members that represent local agricultural groups, the local irrigation districts, the local conservation district, a local newspaper, Town of Granger, Yakima County, WSU-Cooperative Extension, Yakama Nation, USGS, EPA, and Ecology. The TAW will:

- Identify future monitoring to identify source, transport and fate of FC bacteria, as well as develop monitoring strategy and identify funding sources.
- Identify needed testing on new FC-specific BMPs including manure spreading and discuss results of such testing, as well as determine appropriate locations for implementation.
- Discuss results of DNA testing and subsurface drainage outfall monitoring for determining priority sub-basins for BMP implementation.
- Determine if changes in monitoring sites, tests or frequency are necessary.
- Review if TMDL targets have been met, and if not, devise action and implement appropriate action plan.

### B. Roza-Sunnyside Board of Joint Control (RSBOJC)

The RSBOJC provides irrigation water throughout the entire watershed and has been collecting water quality samples throughout the watershed. The RSBOJC will not take a leadership role and assumes no responsibility related to Granger Drain TMDL. If properly funded, the RSBOJC will:

- Continue to collect FC data of the mainstem Granger Drain and the SVID and RID irrigation water supply canals, and to provide additional FC lab work for outside agencies.
- Provide existing FC data to other entities for review.
- Consider requests for additional monitoring sites and/or other projects.
- Report dairy waste violations to Ecology if not resolved following landowner contact by the respective Irrigation District.
- Report septic tank/field violations to the Department of Health if not resolved following landowner contact by the respective Irrigation District.
- Continue to encourage buffer strips and fencing along drains.
- Continue to fund, when available, BMP implementation for controlling agricultural runoff and suspended sediment in drains according to the *Lower Yakima River Suspended Sediment TMDL*.

### **C. South Yakima Conservation District (SYCD)**

The SYCD provides substantial technical and financial assistance to various agriculturalists in the watershed. The agency helps dairy farmers in developing nutrient management plans, which are critical components of good environmental practices by agricultural operations. The SYCD will:

- Fund, when available, implementation of new FC-specific BMPs related to manure management.
- Report on planned DNA analyses.
- Investigate new technologies in FC bacteria source identification.
- Continue to fund, when available, BMP implementation for controlling agricultural runoff and suspended sediment in drains according to the *Lower Yakima River Suspended Sediment TMDL*.

### **D. Washington State University Cooperative Extension (WSU-CE)**

The WSU-CE has been researching BMPs for manure management and has written several papers concerning manure management on both large and small farms. The WSU-CE will:

- Extend, when needed, outreach efforts and technical assistance in Spanish and English to residents (i.e., AFOs and hobby farms) of the watershed concerning manure management and sanitary wastewater.
- Continue investigating manure management BMPs.

### **E. Washington Department of Ecology (Ecology)**

Ecology has been delegated authority by the EPA to implement many aspects of the federal Clean Water Act. This includes NPDES permitting and the TMDL program. Ecology has one inspector in the Central Regional Office (CRO) who implements RCW 90.64 (the *Washington Dairy Nutrient Management Act*) in the Granger Drain watershed. It is through NPDES permits, inspection, effectiveness monitoring and enforcement programs that the wasteload allocations (WLAs) of the *Granger Drain TMDL* will be enforced. Ecology also helps local governments meet water quality goals through technical assistance and grants or loans. Ecology will:

- Continue dairy inspections.
- Review effectiveness monitoring data.
- Review applications for grant and load funding.
- Update and issue dairy NPDES permits, as required.
- Determine if the *Granger Drain Fecal Coliform Bacteria TMDL's* final 90<sup>th</sup> percentile target of 200 cfu/100 mL is achievable, or needs to be changed.
- Determine if the 7 mg/L TSS final target of the *Lower Yakima River Suspended Sediment TMDL* is appropriate, or needs to be amended.
- Determine if alternate outreach efforts are needed.
- Continue to fund, when available, BMO implementation for controlling agricultural runoff and suspended sediment in drains according the *Lower Yakima River Suspended Sediment TMDL*.

**F. Dairies**

Most of the dairies within the watershed will need to continue to comply with the requirements of the *Washington Dairy Nutrient Management Act* of 1998.

**G. Concentrated Animal Feeding Operations (CAFOs)**

All of the CAFOs in the watershed will need to continue to comply with the requirements of their NPDES permits, and any other requirements established in law.

**H. Irrigated Agriculture**

All of the irrigated agriculture farms that utilize animal manure for fertilization will need to apply the manure at agronomic rates and minimize suspended sediment in agricultural return waters. All irrigated agriculture should only apply irrigation water at agronomic rates and should not produce excessive runoff.

**I. Yakima County (County)**

Yakima County has indicated an interest in helping get the community of Outlook connected to the City of Sunnyside POTW. Since the community of Outlook is located outside the growth management area of Sunnyside, the county has indicated that it would be responsible for operation and maintenance of a collection system for the community of Outlook. The County has put the collection system project for the community of Outlook on its wish list and has expressed an opinion that such project could be completed by 2013.

**J. Yakima Health District (YHD)**

The Yakima Health District is responsible, among other things, for the proper operation of all on-site septic systems within the Granger Drain watershed. Any such system which is found to be malfunctioning shall be reported to them for their inspection. The community of Outlook is in need of help from that agency. Therefore, it would be highly desirable if the YHD would conduct a special project for determining the status of all septic tanks in the area. This would compliment their November 19, 1999 Declaration of Public Health Emergency that was issued by the YHD concerning the community of Outlook.

**K. U.S. Environmental Protection Agency (EPA)**

The Environmental Protection Agency is responsible for validating the Department of Ecology's implementation of the *Granger Drain TMDL* and enforcement of the Clean Water Act. EPA may conduct oversight inspections in the watershed. EPA provides funding to states and tribes to implement the Clean Water Act. Some of the funding Ecology receives from EPA is the source for the competitive grants made each year.

## **V. SCHEDULE OF CONTRIBUTIONS**

Table 3 is a schedule of the contributions, performance measures and milestones for the contributing entities. The pollution source or sources for which an entity is most directly associated is also provided. There is not a one-to-one correspondence between the items in the columns headed Contribution, Sources, Performance Measures, and Milestones. Some contribution areas apply to more than one source while others contribution areas or sources are not amenable to setting performance measures. Presently, there are no additional resources identified. Over time, additional funding needs may develop and will be reported. The listed entities will endeavor to complete their contributions according to the schedule, to the greatest extent possible. However, depending upon future funding opportunities all listed contributions may not be completed within the milestones given herein.

## **VI. MONITORING PLAN**

Compliance with the TMDL's targets by the mainstem Granger Drain, the SVID irrigation supply canal and the RID irrigation supply canal will be based upon year-round water quality monitoring that coincides with ongoing monitoring being conducted by RSBOJC. Ecology will evaluate at two-year intervals (biannually), beginning in 2003, the progress made toward meeting the TMDL's goals, as well as to determine the adequacy of BMPs implementation. Every two years, concurrent with the above analyses, Ecology will prepare and publish concise *Granger Drain TMDL Effectiveness Monitoring Reports* that will be provided to the TAW, EPA and other interested persons. Each such report will examine the prior two years of sampling data in order to determine if prior BMP implementation appears to be achieving the TMDL's targets. Ecology will, at appropriate times, issue public service announcements (PSAs) to the press regarding progress with the *Granger Drain TMDL*.

### **A. Ambient Water Quality**

Water quality samples from the mainstem Granger Drain and SVID irrigation supply canal are currently collected and analyzed by the RSBOJC. Samples are collected in the mainstem Granger Drain at or near the mouth of most of the watershed's sub-basins, and in the RID and SVID irrigation supply canals at the downstream end of the canal segments that pass through the Granger Drain watershed. All samples are analyzed for FC coliform using the membrane filtration method.

### **B. Implementation**

The NRCS, RSBOJC and SYCD have all been funding the majority of the BMP implementation throughout the watershed. Ecology will work with those agencies to try to provide additional funding for BMP research and development.

**Table 3 – Schedule of Contributions**

Entity	Contribution	Sources	Performance Measures	Milestones
<p><b>Department of Ecology</b></p>	<p><b>Education:</b> Provide outreach and technical assistance to residents in watershed concerning manure and sanitary wastewater management. Biannually evaluate and report on <i>Granger Drain TMDL</i> implementation and FC bacteria densities. Determine the applicable 90<sup>th</sup> percentile TSS concentration for the <i>Lower Yakima River Suspended Sediment TMDL</i>.</p> <p><b>Enforcement:</b> Inspect dairies under <i>Dairy Nutrient Management Act</i> (RCW 90.64 ). Delegated by the EPA to issue NPDES permits under Clean Water Act to CAFOs. Establish Water Quality Standards. Establish TMDLs. Enforce State Water Pollution Control Act (RCW 90.48 ). Respond to public sector complaints concerning water quality.</p> <p><b>Financial Assistance:</b> Review grant and loan applications and provide funding through 319 Funds, Centennial Grants, and State Revolving Loan Funds.</p>	<p>Agriculture – non-permitted sites such as AFOs and hobby farms.</p> <p>Agriculture – permitted sites such as NPDES controlled CAFOs.</p> <p>Agriculture – non-permitted irrigated crop fields that receive animal manure applications.</p> <p>Agriculture – direct access to streams by farm animals.</p> <p>Stormwater from hobby farms and residences.</p> <p>Wildlife – natural conditions.</p>	<p>Completion of required dairy inspections per quarter. (25 per quarter)</p> <p>Maintain permit issuance up-to-date.</p> <p>Complete biannual effectiveness monitoring reports.</p> <p>Maintain a 10% reduction in FC densities every year.</p> <p>Achieve an interim 90<sup>th</sup> percentile target of 510 cfu/100mL by irrigation year 2007.</p> <p>Achieve a final target of full compliance with state water quality FC standard (geometric mean of 100 cfu/100mL and 90<sup>th</sup> percentile of 200 cfu/100mL) by irrigation year 2012.</p>	<p>Effectiveness monitoring reports to be submitted to EPA by December 31 of 2003, 2005, 2007, 2009, 2011, and 2013.</p> <p>By December 31, 2003, verify that all dairies have had their site-specific Dairy Nutrient Management Plans certified as having been completely implemented.</p>



Entity	Contribution	Sources	Performance Measures	Milestones
<b>Environmental Protection Agency</b>	<p><b>Enforcement:</b> Enforce Clean water act including oversight of state responsibility to implement both NPDES and TMDL programs. Possibility of oversight inspections.</p> <p><b>Financial Assistance:</b> Grants to states and tribes to fund water quality facilities and activities.</p>	Agriculture – point source sites.	Review biannual effectiveness monitoring reports submitted by Ecology.	Effectiveness monitoring reports to be submitted by December 31 of 2003, 2005, 2007, 2009, 2011, and 2013.
<b>Technical Advisory Workgroup</b>	<p><b>Data Analysis:</b> Identify future source, transport and fate monitoring needs for manure. Identify if testing of new FC-specific BMPs is needed. Discuss results of DNA analyses and other experiments. Determine if changes in monitoring sites are needed. Discuss if TMDL targets have been met, and if not, devise an action plan.</p> <p><b>Technical Assistance:</b> Assist Ecology biannually to adjust TMDL goals and encourage new BMP development, as needed.</p>	<p>Agriculture – irrigated crop fields that receive animal manure applications.</p> <p>Agriculture – point source sites.</p> <p>Stormwater from hobby farms.</p> <p>Wildlife – natural conditions.</p>	<p>Review biannual effectiveness monitoring reports from Ecology.</p> <p>Help to maintain a 10% annual decrease in mainstem Granger Drain FC densities.</p> <p>Help to achieve a 90% decrease of mainstem Granger Drain FC densities by 2012.</p>	<p>Effectiveness monitoring reports to be reviewed in December of 2003, 2005, 2007, 2009, 2011, and 2013.</p> <p>Review compliance with TMDL targets in December 2007 and 2013.</p>
<b>Roza-Sunnyside Board of Joint Control</b>	<p><b>Monitoring:</b> Continue ambient water quality monitoring of drainage waters.</p> <p><b>Technical Assistance:</b> Assist Ecology in achieving TMDL goals.</p> <p><b>Enforcement:</b> The RSBOJC has its own water quality policy that restricts the amount of suspended sediment that can be discharged from a property receiving irrigation water.</p>	<p>Agriculture – irrigated crop fields that receive animal manure applications.</p> <p>Agriculture – point source sites.</p> <p>Stormwater from hobby farms.</p>	Conduct annual effectiveness monitoring and analysis of data.	Submit effectiveness monitoring data to Ecology by November 15, 2003, 2005, 2007, 2009, 2011, and 2013.

<b>Entity</b>	<b>Contribution</b>	<b>Sources</b>	<b>Performance Measures</b>	<b>Milestones</b>
<b>Dairies</b>	<b>Education:</b> Education of dairy operator and workers. Need to obtain an approved Nutrient Management Plan. Need to implement all BMPs described in Nutrient Management Plan.	Agriculture - non permitted.  Agriculture – point source sites.  Manure application.	Comply with requirements of Washington Dairy Nutrient Management Act.	By December 31, 2003, all dairies shall have their Dairy Nutrient Management Plans certified as having been implemented
<b>Concentrated Animal Feeding Operations</b>	<b>Education:</b> Education of CAFO operator and workers. Need to obtain coverage under an NPDES permit. Need to implement applicable BMPs.	Agriculture – point source sites.  Manure application.	Comply with requirements of NPDES permits.	Every CAFO has site specific timing schedules in their permits.
<b>Irrigated Crop Growers that Fertilize with Manure</b>	<b>Education:</b> Irrigated crop growers need to learn that fertilization with manure is not a simple process. Need for implementing BMPs for reducing suspended sediment in runoff.	Agriculture – irrigated crop fields that receive animal manure applications.	Elimination/reduction of suspended sediment from tailwaters.	By 2012, comply with final TSS targets listed in Lower Yakima River Suspended Sediment TMDL.
<b>Yakima County</b>	<b>Financial Assistance:</b> Connect community of Outlook to the City of Sunnyside POTW. Provide collection system operation and maintenance. Apply for appropriate funding from Ecology and other sources, as needed.	On-site septic systems.  Stormwater.	Complete connection to Sunnyside sanitary sewer system.  Assume responsibility for operation and maintenance of collection system in community.	Connect community of Outlook to Sunnyside sanitary sewer system by 2013.

Entity	Contribution	Sources	Performance Measures	Milestones
<b>Yakima Health District</b>	<p><b>Education:</b> Education of on-site septic systems owners. Provide education to community of Outlook concerning a Declaration of Public Health Emergency issued on November 19, 1999.</p> <p><b>Enforcement:</b> The YHD is responsible for overseeing that all on-site septic systems within the watershed are functioning properly. All non-functioning on-site septic tanks will need to be reported to the YHD for their action.</p>	On-site septic systems.	<p>Assume responsibility for advising the public of the Declaration of Public Health Emergency.</p> <p>Assume responsibility for correcting the circumstances surrounding the Declaration of Public Health Emergency at Outlook, WA.</p> <p>Provide Ecology with schedule of future activities.</p>	August 6, 2002: Newspaper article appeared in the Tri-City Herald regarding the sewage problems at Outlook. YHD has yet to commit to any timelines.
<b>South Yakima Conservation District (SYCD)</b>	<p><b>Education:</b> Provides technical assistance to farmers in the form of Farm Plans and Nutrient Management Plans. Investigate background levels associated with wildlife.</p> <p><b>Plan Approval:</b> Assist dairies in obtaining approval or approved Nutrient Management Plans.</p> <p><b>Financial Assistance:</b> Allocates financial assistance to farmers.</p>	<p>Agriculture – irrigated crop fields that receive animal manure applications.</p> <p>Agriculture – point source sites.</p> <p>Stormwater from hobby farms.</p> <p>Wildlife – natural conditions.</p>	<p>Writing farm plans per requests.</p> <p>DNA analysis of FC bacteria.</p> <p>Irrigation conversion from rill to sprinkler or drip.</p> <p>Allocate funds every year for BMP implementation.</p>	Each year the SYCD writes various Nutrient Management Plans for requesters. They also allocate various funds for BMP implementation.
<b>Washington State University -Cooperative Extension</b>	<p><b>Education:</b> Public education and outreach in Spanish and English. Technical assistance for agriculture. Investigate alternate forms of bacteria transport</p> <p><b>Financial Assistance:</b> Conduct experiments for agriculture.</p>	<p>Agriculture – irrigated crop fields that receive animal manure applications.</p> <p>Agriculture – point source sites.</p> <p>Stormwater from “hobby farms”.</p>	Conduct experiments and write reports.	Report on activities at TAW meetings to be held in December of 2003, 2005, 2007, 2009, 2011, and 2013

### **C. Source Identification**

Where ambient water quality monitoring identifies persistent hot spots, or sub-basins of concern, a representative from Ecology or another agency will follow up with additional sampling to track the bacteria source. Any necessary referral will be made by the RSBOJC to ensure that the pollution problem is addressed by the organization with the most direct authority. This model has proven effective in other watersheds where on-going bacteria problems in agricultural areas have in fact been traced back to failing residential septic systems, AFOs or “hobby” farms.

### **D. Effectiveness Monitoring**

The purpose of effectiveness monitoring is to provide assurance that control measures put in place during TMDL implementation achieve the expected load reductions. Ecology is responsible for determining, through effectiveness monitoring analysis, the status of waterbodies subsequent to the development and implementation of each TMDL. The timing of such monitoring will be dependent upon the pollution parameters addressed in the TMDL, the period after which positive results should be identifiable, and the availability of resources. Effectiveness monitoring priorities will be selected by Ecology and verified through the annual scoping process.

In order to be thorough in accomplishing this task, monitoring personnel will follow a review sequence. The sequence will include consultations with the original TMDL modeler to determine critical parts of the implementation plan and to verify critical locations. They will also contact the Ecology regional office TMDL coordinator to learn the results of implementation monitoring and the status of the TMDL implementation plan. Both monitoring and Ecology regional staff will make an effort to identify a local partnership to assist with the actual data collection. On completion of these steps, an examination of the resulting data will be made and a water quality status determination will be announced for the waterbody in the applicable effectiveness monitoring report.

The target FC densities for the *Granger Drain TMDL* include an interim target 90<sup>th</sup> percentile (510 cfu/100 mL) commencing with the 2007 irrigation season, and a final target 90<sup>th</sup> percentile (200 cfu/100 mL) and a final target geometric mean (100 cfu/100 mL) commencing with the 2012 irrigation season. If the target FC densities are not met at the beginning of the applicable irrigation season, then it will be necessary to either increase implementation of BMPs and/or begin developing and implementing new FC-specific BMPs. Table 4 outlines the TMDL targets, which have been set to be achieved on a very conservative timeline. Such timeline was based on the assumption that the targets would actually have been met two years earlier as projected by regression analysis. This was done in acknowledgement that not all of the FC pollution in the Granger Drain watershed is derived from domestic animal manure and that future bacterial reductions probably will not decrease as fast as prior declines.

**Table 4 – Fecal Coliform Bacteria Targets and Timeline**

<b>Irrigation Season</b>	<b>90<sup>th</sup> Percentile Target (cfu/100 mL)</b>	<b>Geometric Mean Target (cfu/100 mL)</b>
2007	510	-
2012	200	100

Monitoring of BMP effectiveness is an ongoing part of monitoring implementation and measuring results. It will provide information about specific BMPs and will provide insight through identification of less effective BMPs. All of the watershed's dairies will have fully implemented farm plans in the near future. In addition, effectiveness monitoring of suspended sediment loadings will determine the effectiveness of BMPs utilized by irrigated agriculture. All entities involved with the *Granger Drain TMDL* will work together to identify opportunities and cooperate to develop and implement BMPs.

## **VII. ADAPTIVE MANAGEMENT RESPONSE AND INVESTIGATIONS**

### **A. Adaptive Management**

The basic adaptive approach assumes that the water quality monitoring, along with implementation tracking, is expected to yield one of two possible outcomes, as outlined in Table 1. It is only when ambient water quality targets are not being met that adaptive management is required. The first response will be to identify the source of the increased FC bacteria densities. If tracking the source and applying existing implementation activities does not or is not expected to result in achieving targets, then further source increased BMP implementation or new types of BMPs will need to be developed and implemented. Finally, Ecology can utilize its regulatory powers to gain compliance (BMP implementation) in those few cases where landowner resistance is greatest and pollution is occurring.

The following thresholds are established for certain milestones:

- Additional implementation focus will be placed on the poorest performing sub-basins following every TMDL effectiveness monitoring report. Effectiveness will be measured by comparing actual FC densities with the values established in Table 4. If an actual value is more than twice the respective estimated value, then Ecology may determine that adaptive approach should be initiated.
- If, after the next bi-annual effectiveness monitoring report, the same sub-basins still appear to not be on track for complying with the TMDL targets, then it will be necessary to develop and implement new types of BMPs specifically developed for FC bacteria removal.

For adaptive management to be successful there must be a good understanding of pollution sources and bacteria transport mechanisms. The following investigations will be important for effective adaptive management.

## **B. Investigate Alternate Sources**

Two sources that have not been locally investigated in depth are FC bacteria contributions from archived sediments and wildlife. A recent SYCD report has indicated that wildlife sources may be responsible for more bacterial pollution in the watershed than Ecology assumed in the *Granger Drain TMDL*. The SYCD report indicated that approximately 40% of the *E. coli* isolates collected from the mainstem Granger Drain were identified as belonging to wildlife animal species (deer/elk, squirrel, avian, raccoon, muskrat, and rodent). However, since the report was based on a methodology that did not identify every bacterial colony from each water sample, it is not a direct measurement (quantitative) of the bacterial source loadings throughout the watershed, but rather only gives an indirect general idea of the various bacterial sources (qualitative) contributing to the pollution of the mainstem Granger Drain.

## **C. Investigate Bacteria Transport Mechanisms**

The *Granger Drain TMDL* indicated that the major bacteria transport mechanism in the watershed is through surface runoff and its connection to suspended sediment. Septic system operation and manure management assume that unsaturated soil will remove bacteria through adsorption. During portions of the year when wet weather conditions or irrigation is prevalent, there may not be adequate depth of unsaturated soil to provide the degree of treatment or filtering expected from soils. This phenomenon might also warrant investigation. There may be other transport mechanisms, such as direct discharge of wastewater from AFOs into subsurface drainage that then delivers the contaminated water to the mainstem Granger Drain. As these are identified they should be investigated.

# **VIII. REASONABLE ASSURANCES**

BMPs are actions taken by an individual land-owner to eliminate FC bacteria from entering waters of the state. As outlined in Table , larger entities have several types of other contributions that can be made including: education and financial assistance. Education might take the form of technical assistance or public outreach. These activities are directed at informing individuals what BMPs are appropriate, removing financial barriers to taking those actions, and finally ensuring that BMP implementation occurs appropriately.

Ecology, through delegation from EPA, ultimately has enforcement responsibility for elements of this DIP. Education, outreach, technical and financial assistance, and enforcement will all be used to ensure compliance with the *Granger Drain TMDL*. Generally, the first step in implementing BMPs will be a referral to agencies with technical or financial assistance missions. Enforcement will only be used when those first-step tools are not effective in achieving implementation of BMPs.

## **IX. PUBLIC INVOLVEMENT**

The timelines for BMP implementation activities have been created in consultation with all of the entities involved. Earlier versions of this DIP, which were labeled Summary Implementation Strategy, have been presented to all of those same entities for comment prior to publication and have also been presented to the *Granger Drain TMDL* technical advisory workgroup (TAW). This DIP has incorporated all of the comments that were received from those entities.

During the entire TMDL implementation period, monitoring data and status reports will be available for public review, and periodic updates will be provided to area media and other interested parties. Special programs to recognize CAFOs and dairies with exemplary compliance records are already administered by Ecology.

## **X. FUNDING OPPORTUNITIES**

There are several sources of funding available from agencies mentioned in this document. The Natural Resources Conservation Service, SYCD and RSBOJC make money available to agricultural producers for farm plan implementation and conservation improvements on farms. Ecology has opportunity for both grant and loan funding for water quality facilities and activities. Potential sources of funding have been identified as Ducks Unlimited, Inc. and various other environmental and governmental agencies.

## **XI. ENFORCEMENT**

The *Water Pollution Control Act* (Chapter 90.48 RCW) provides broad authority to issue permits and regulations, and prohibits all discharges to water. The act openly declares that it is the policy of the state to maintain the highest possible standards to ensure the purity of all waters of the state and to require the use of “all known, available, and reasonable means of prevention, control, and treatment” regarding water pollution. The act defines waters of the state and pollution and authorizes the Ecology to control and prevent pollution, to make and enforce rules, including water quality standards. The act also designates Ecology as the state water pollution control agency for all the purposes of the federal Clean Water Act. Under this statute, Ecology is authorized to administer wastewater disposal permits and to require prior approval of plans and methods of operation of sewage or other disposal systems.

## **XII.**

## **REFERENCES**

South Yakima Conservation District. (2002) *Granger Drain DNA Fecal Analysis Project*. May, 2002. 13 pgs.

Sylvester, R.O. and R.W. Seabloom. (1962) *A Study on the Character and Significance of Irrigation Return Flows in the Yakima River Basin*. University of Washington, Department of Civil Engineering. February, 1962. 104 pp.

U.S.E.P.A. (1997) *Memorandum of Agreement Between The United States Environmental Protection Agency and Washington Department of Ecology Regarding the Implementation of Section 303(d) of the Federal Clean Water Act*, October 29, 1997, 22 pgs.

Washington State Department of Ecology. (2001) *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Assessment and Evaluation*. Publication Number 01-10-012. 67 pgs.

Washington State Department of Ecology. (2001) *Granger Drain Fecal Coliform Bacteria Total Maximum Daily Load Submittal Report*. Publication Number 01-10-062. 23 pgs.