Exempt Wells

Chehalis Basin Watershed Planning Issue Paper

What is the Issue?

The issue is the use and impact of exempt wells on water resources in the Chehalis Basin.

What are some important laws, rules, and opinions, and court decisions related to exempt wells?

Washington State's Groundwater Code, RCW 90.44.050:

This law requires anyone who wants to withdraw public groundwater to apply for a permit through the State Department of Ecology (Ecology). The Code allows exceptions for certain specific uses:

- Stock watering *(Note: Amounts used for this purpose may exceed 5,000 gallons per day.)*
- Watering a lawn or non-commercial garden not exceeding one-half acre in area
- Single or group domestic uses of up to 5,000 gallons per day[1]
- Industrial use not to exceed 5,000 gallons per day

Additionally, the Code states that:

- Water used under this exemption must regularly be used beneficially.
- Ecology may require the water user to furnish information as to the means for and the quantity of that withdrawal.

Wells drilled under this provision are commonly referred to as "exempt wells." The exempt well statute provides a means by which landowners may access water for domestic purposes, including small-scale irrigation and industrial purposes, without applying for and obtaining a water right through Ecology. The exemption saves the appropriator of "small withdrawals" the trouble and expense of applying for a permit where the impact of the withdrawal is slight and saves the state the trouble and expense of processing applications for "small withdrawals" that would have little effect on water availability.

While small withdrawals are exempt from the requirements that an application be made and a permit received from Ecology prior to withdrawal of public groundwater, they are not exempt from any of the other substantive provisions of the Ground Water Code. For example, small withdrawals

1. "Attorney General Issues New Guidelines on Exempt Wells," The Confluence, Ecology Newsletter, Winter/Spring 1998.

- Cannot affect surface water rights
- Must be beneficially used.
- Are subject to the same system of priorities as all other appropiators (that is, where another right is first in time, it is first in right)

Attorney General's Opinion:

In the 1990s, the Departments of Ecology and Health requested the opinion of the Washington State Office of the Attorney General regarding exempt ground water withdrawals to settle differences of opinion among various parties about the intent and meaning of the exemption. The resulting Attorney General's opinion states that a project that will use more than 5,000 gallons of water per day will need a permit, regardless of the number of wells that would be tapped.[1]

Campbell & Gwinn Supreme Court Decision

The Washington Supreme Court supported this opinion in its 2002 decision that housing developments that would be served by multiple drinking-water wells need a water-right permit before construction begins if the wells together would withdraw more than 5,000 gallons a day. The court ruled that when homes are part of a development they should be treated as one group under the exemption. In its decision, the court said, "The Legislature did not intend unlimited use of the exemption for domestic uses, and did not intend that water appropriation for such uses be wholly unregulated."

The Chehalis Instream Resource Protection Program (IRPP) rule WAC 173-522-040[1]

This rule states, in part, that "Rights for domestic use, including irrigation of lawn and noncommercial garden not to exceed one-half acre, and livestock use excluding feedlot operation, shall be superior to all other consumptive and non-consumptive uses." This appears to conflict with the1945 Groundwater Law provision that small withdrawals cannot affect surface water rights and that exempt wells are subject to the same system of priorities as all other appropriators. This important conflict needs to be resolved in the Chehalis Basin.

Why are exempt wells a concern?

Exempt wells affect water quantity, a required element of watershed planning. They can also impact the three remaining elements in the Chehalis Basin Watershed Plan: water quality, habitat, and instream flows. The concern is that the proliferation of exempt wells could reduce the total amount of water available in the Chehalis Basin. In particular, exempt wells and the associated uses can reduce

- water available to senior water right holders,

1. "Attorney General Issues New Guidelines on Exempt Wells," The Confluence, Ecology Newsletter, Winter/Spring 1998.

- the amount of water available for aquifer recharge, and
- instream flows.

By withdrawing ground water, exempt wells can also negatively affect water quality and habitat.

Ground water pumping affects the relationship between ground water and surface water sources. It may intercept water otherwise available to recharge a stream or capture water from the stream itself. A watershed assessment conducted by Ecology in 1995 confirmed the hydraulic continuity between ground and surface water in the Chehalis Basin and concluded that a large portion (if not most) of the ground water allocated since 1975 directly affected surface water flows. The construction of exempt wells in aquifers that are in hydraulic continuity with flow impaired surface waters will directly result in further depletion of surface water flows.

While water quality can be a concern in all wells, it can be of particular concern in exempt wells because they tend not to be maintained regularly and because they often take water from the shallowest aquifer, the aquifer most likely to be contaminated from surface impacts.

Studies conducted by the U.S. Geological Survey and Ecology, coupled with data from local governmental agencies, reveal the following health concerns associated with exempt wells:

- Exempt wells can be contaminated by withdrawal of water from contaminated aquifers.
- Pumping can cause saltwater intrusion along the coast.
- Nitrates from agriculture can contaminate the groundwater.
- Exempt wells are also quite susceptible to contamination from wastewater, typically septic tank/leach field systems.

What is the effect of exempt wells on water quantity in the Chehalis Basin? At present, information related to the number of exempt wells in the Chehalis Basin is limited. However, technical work completed as part of the watershed planning process provided estimates of the number of households on exempt wells, the amount of average annual daily water use per household and associated consumptive use (that is, water that is not returned to ground water after use), and the overall impact of exempt wells on water quantity and instream flows in the basin. GIS information indicates high concentrations of exempt wells in areas where stream flows already do not meet regulatory minimums; these wells may have an impact on stream flows.

Figure 1. Exempt Well Consumptive Water Use illustrates the amount of water typically used for various household activities. It also illustrates the amount of water that is consumed, or does not make it back to groundwater after use, by a household that draws water from an exempt well and returns water through

a septic system and drain field. This daily household water use estimate was based on the assumptions that indoor and outdoor water use represent 59% and 41%, respectively, and that 87% of the indoor water use and 57% of the outdoor water use make it back into the groundwater.

The consumptive water use illustration is an estimate of the average water used by rural households in the basin. (Because data are not available, this estimate does not include water used for irrigated agriculture, stock watering, or industry.) In general, indoor water use remains consistent throughout the year. Households typically do not use water for irrigation in the winter but they do in the summer. The numbers in the illustrations are based on year-round usage; that is, over a 12-month period, the low winter usage is averaged with higher summer usage.

Exempt well usage and its impact on stream flows is a complex hydrogeologic issue. There is little information available about the specific impact of exempt wells on stream flows. To fully understand the dynamic, site-specific studies and analysis would be necessary.

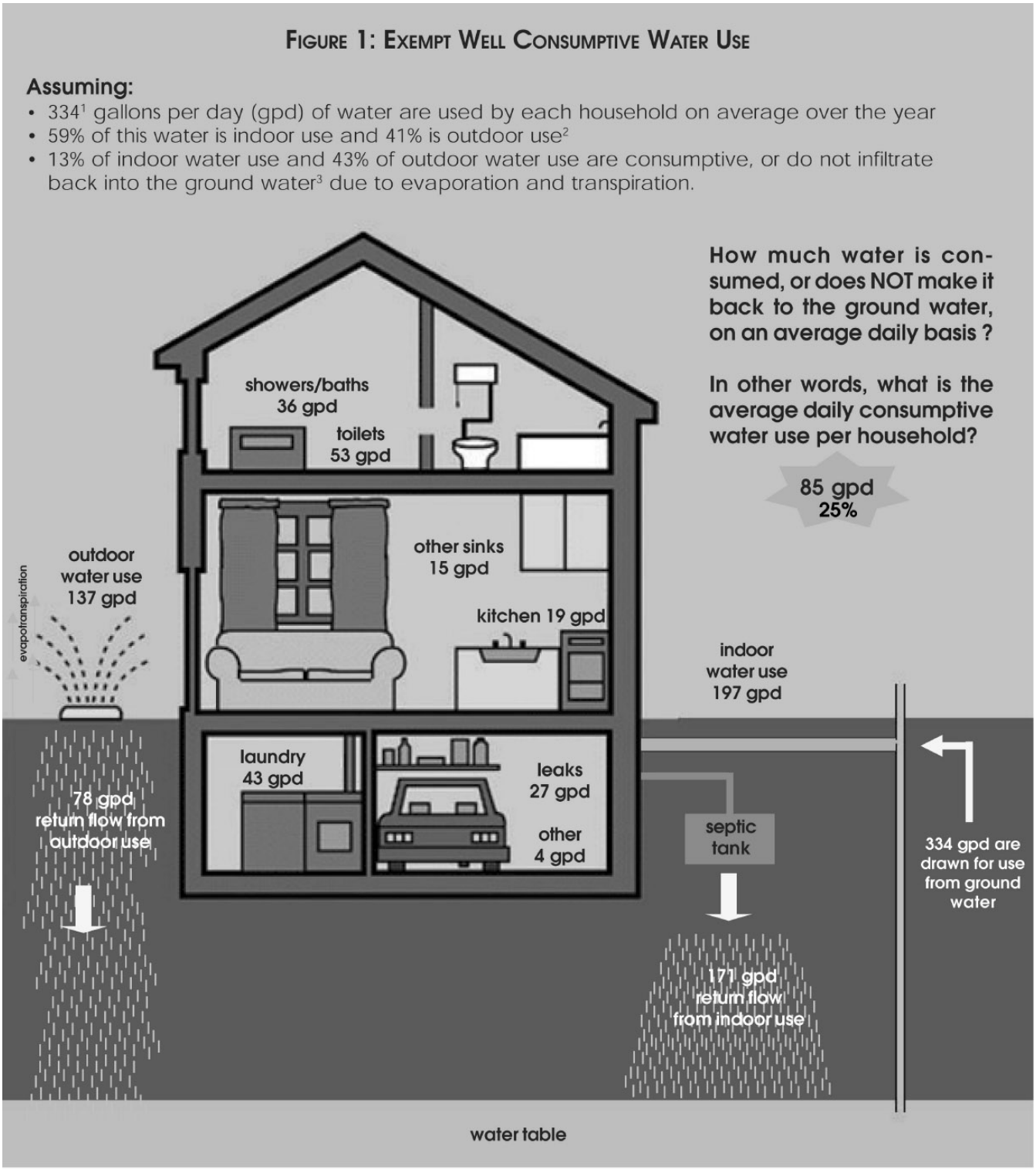
Figure 2. Map of Distribution of Exempt Wells in Chehalis Basin shows the boundaries of the public water systems and a range of numbers of households on exempt wells in each sub-basin.

The number of households on exempt wells was estimated by WRIA and sub-basin in the following manner:[2] For regions outside water purveyor service areas, the population was estimated on a density per acre basis; this estimated population was divided by 2.5 persons per household to determine the number of households per sub-basin not on a public water system. For these households outside of water purveyor service areas, an estimate was made of the number of households that have an Ecology-issued water right. Then, this number was subtracted from the total number of unserved households to develop an estimated number of households on exempt wells.

2. The following sources were used in the process described above:

- GIS maps from Lewis, Thurston, and Grays Harbor Counties and hard copy maps from a number of water districts. Where boundary information was not available, estimated boundaries were developed based on incorporated area, urban growth area, or aerial photographs.
- Water Rights Application Tracking System (WRATs) data, section and sub-basin GIS maps, shape files of priority one group rights, and other base map shape files from EPA
- 2000 Census GIS maps from the State Department of Health and State Office of Financial Management
- Maps of wells from Department of Health and Lewis County.
- Level 1 Assessment report information

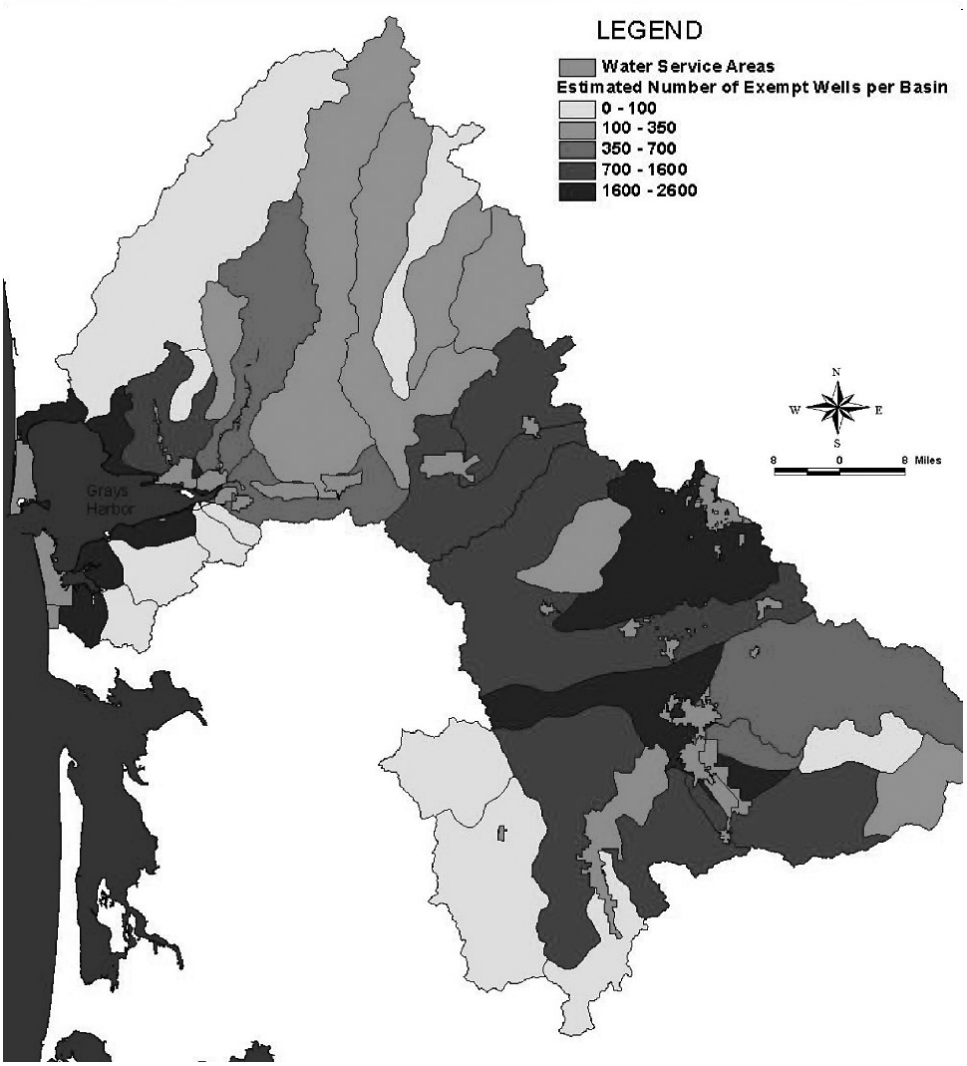
FIGURE 1: Estimated Consumptive Water Use of Household on Exempt Well [3]



The figure above illustrates approximately how much water is actually consumed (i.e. does not make it back to groundwater after use) by households that draw water from exempt wells and return water through a septic system and drainfield.

[1] Chehalis Basin Watershed Level 1 Technical Assessment (an average of the amounts identified for WRIAs 22 and 23)
[2] *Nature of Residential Water Use and Effectiveness of Conservation Programs,* James P. Heaney, William DeOreo, Peter Mayer, Paul Lander, Jeff Harpring, Laurel Stadjuhar, Beorn Courtney, and Lynn Buhlig (Figures for Eugene, Oregon)
[3] Solly, W. B., Pierce, R.R. and Perlman, H.A. 1993. Estimated Use of Water in the United States in 1990: U.S. Geological Survey Circular 1081.

FIGURE 2: Exempt Well Distribution in Chehalis Basin



Estimated Households on Exempt Wells and Related Water Use in Chehalis Basin

An estimated 16,947 households draw water from exempt wells in the Chehalis Basin. (See Table 1.)

Average amount of water use per household

Estimated across the entire Chehalis basin over the course of a whole year, an average residential household uses approximately 334 gallons per day (gpd) of water on an annual basis. However, average daily use can rise to unknown amounts of water. Based on Department of Health figures, however, it is assumed that total household summer use might rise to the range of 700 gpd of water (period of highest use).

Amount of consumptive water use per household

For households on exempt wells, approximately 85 gpd (of the 334 gpd used) or about 25% of the average water used, is estimated not to return to the aquifer. This 85 gpd is often called consumptive water use. This means that, on average, 85 gpd of the water drawn from the exempt well does not return to the water source (ground or surface water).

Amount of household water use and consumptive water use from exempt wells in Chehalis Basin

The 16,947 households on exempt wells in the Chehalis Basin use an estimated 5,660,298 gpd (8.25 cfs) of water, of which, 1,440,495 gpd (2.23 cfs) or 25% is consumptive water use. PLEASE NOTE: this estimate does not include agricultural, industrial, commercial or stock watering uses. This quantity may appear insignificant when looking at the basin as a whole, especially considering that the Chehalis River summer flow is in the 300 to 400 cfs range. However, impacts of exempt well usage on specific subbasins can be significant, as shown by the following two examples:

- In the Salzer Creek subbasin, average daily Salzer Creek flows in August drop to the 0.033- 0.085 cfs range, meaning the creek is nearly dry. There are an estimated 310 exempt wells in the Salzer Creek subbasin. Assuming that these exempt wells would be used for indoor and outdoor domestic supply during this period and that an estimated 700 gpd of water would be used during the higher usage months of the summer, the resultant total withdrawal rate would be equivalent to 0.33 cfs from exempt wells, 10 times the lowest average daily flows. If consumptive water use is looked at, this would equate to 0.08 cfs, still a high percentage of the streamflow in the subbasin.
- In the Black River subbasin, average Black River daily flows in August and September range from 10.4 – 21.2 cfs. There are an estimated 2,400 exempt wells in the Black River subbasin. Using a 700 gpd (higher summer water usage amount) withdrawal per exempt well would equate to a withdrawal rate of 2.6 cfs. Using a simplistic comparison approach, the estimated exempt well withdrawal rate is equal to between 10 and 25% of the average Black River flow during this period. For consumptive water use amounts, this would equate to 2.5 to 6.0% of the average Black River streamflow. Note that the Black River flow information is from a gauging station located 10 miles upstream from the bottom of the basin.

Table 1: Estimated Population and Households Served by Public Water Systems, Water Rights and Exempt Wells

	Lower Chehalis	*Upper Chehalis*	*Lower/Upper Chehalis*
Estimated Total Population	62,452	78,779	141,231
• Estimated Population Served by Public Water System	36,427	38,064	74,491
• Estimated Population Not Served by Public Water System	26,025	40,715	66,740
• Estimated Households Not Served by Public Water System	10,844	16,965	27,809
• Estimated Households Served by Water Right	3,013	7,849	10,862
• Estimated Households Served by Exempt Wells	7,831	9,116	16,947

Table 2: Streamflow – Water Use Comparison Table

Example River Segments	Summer Stream Flow (in cfs)	Exempt Well Water Use - Whole Basin (Using 700 gpd high summer use volume)		Exempt Well Water Use - Salzer Creek Basin (Using 700 gpd high summer use volume)		Exempt Well Water Use - Black River (Using 700 gpd high summer use volume)	
		Total Use	*Consumed*	*Total Use*	*Consumed*	*Total Use*	*Consumed*
Chehalis	300-400	17.29 cfs (average of 5% of stream-flow)	4.67 cfs (average of 1.3% of streamflow)	NA	NA	NA	NA
Salzer	0.033 - 0.085	NA	NA	0.33 cfs (average of 600% of stream-flow)	0.083 cfs (average of 166% of streamflow)	NA	NA
Black	10.4 – 21.2	NA	NA	NA	NA	2.6 cfs (average of 5% of streamflow)	0.65 cfs (average of 4% of streamflow)

The results of Table 2 indicate that, while the total Chehalis Basin's exempt well water use is fairly small compared to the Chehalis River flow, the estimated exempt well use in some subbasins could be a much more significant percentage of the subbasin streams. For instance, it is a very significant factor in Salzer Creek but less of a factor in Black River. Consequently, use of exempt wells in specific subasins may need to be considered in terms of their impact on instream flows, both now and in the future.

What are possible solutions?

The CBP evaluated the following options related to exempt wells, arrayed from least to most complex to implement.

Alternative Solutions	*Expected Outcomes*	*Comments*
1. Status Quo	• Continued use of existing exempt wells, • Proliferation of new exempt wells, • Lack of focus on community systems	
2. White Paper on proliferation of exempt wells vs. community systems	Providing policy makers with information on the impacts of exempt wells, especially on ability to manage growth	
3. Study of the quantity of water loss Collect data to refine consumptive use estimates and assess the effect on the timing of use.	Development of understanding of consumptive use levels of exempt wells to better understand impacts on base flows	
4. Request that Ecology address the exempt well issue on a statewide basis	Statewide consistency in addressing exempt wells, both existing systems and future wells	
5. Allow exempt wells with conditions. Some suggestions to consider include: • Set basin-wide standard for number of houses allowable per exempt well • Reduce exemption amount from 5,000 gpd, since most homes use only 3-400gpd (WA Dept. of Health allotment is 800 gpd for development) • Require septic tank/leach field discharge back to aquifer • Conserve water • Limit numbers to one septic field or equivalent residential unit per exempt well • Define allowable consumptive use • Require exempt wells to connect to deep aquifers OR allow connection to shallow ones if study is done to show no negative impact on stream flows • Others?	Ability to use exempt wells but with conditions that will lessen losses of water and depletion of stream flows	The real question remains: How do we encourage new residents to use purveyor systems instead of exempt wells when new residents cannot get onto a purveyor system in a reasonable time frame (i.e. planned and coordinated growth, including impacts on environment)
6. For exempt well problem areas, identify/develop mitigation (e.g. convert to public water system)	Lessening of impact on stream flows	
7. Identify a density trigger where exempt wells are not allowed above a certain level (What level is trigger?)	Control of number of exempt wells and therefore shifting of focus to community systems	Relate to stream flow levels?
8. Prohibit exempt wells in closed basins	• Assurance that exempt wells will not negatively impact stream flows	
9. Do not allow new exempt wells through regulatory approach or stipulation that UGA's/Growth areas would not allow exempt wells	• Focus on community systems • Better focus on drinking water quality • Better focus on growth controls	Property takings would be an issue

What actions are recommended?

1. Until the steps below are taken, maintain the status quo with regard to exempt wells.

2. The CBP believes that exempt wells are a statewide issue, caused in part by many inconsistencies and conflicts in existing laws and requirements and the Attorney General's 1998 opinion on exempt wells, as well as a lack of enforcement. The CBP therefore recommends that State/Ecology address the exempt well issue on a statewide basis following the existing laws, rules, and opinions.

   - Regulations:
     1. State should enforce current regulations, including addressing any excessive uses of exempt wells and situations that conflict with the Attorney General's opinion
     2. Evaluate current regulations on exempt wells for adequacy in protecting surface waters (quantity and quality)

   - Clarify and resolve the science around the impacts of exempt wells on surface water

   - If local governments are to have a role in managing exempt wells, State resources must be allocated for this purpose.

   - The CBP recommends the following actions for Ecology to consider in its evaluation of the exempt wells statewide:
     1. Ecology should conduct its evaluation in an open process involving stakeholders
     2. Ecology should sponsor subregional and regional workshops on exempt wells, leading to a Statewide Workshop/Forum/Task Force on exempt wells to better quantify technical aspects of exempt wells and to identify policy and cost factors related to exempt wells
     3. Ecology should develop an educational program related to the use of exempt wells and their potential impact on instream flows and water quality
     4. Ecology should develop criteria for when it will require use of deeper aquifers as a source of exempt well water. If deeper aquifers are used for household use, shallow aquifers would be available to supplement stream flows.
     5. Ecology should address the timing of withdrawals and the possibility or requirement that withdrawals minimize impacts on stream flows

3. The CBP believes that the Department of Health should prepare a white paper that compares use of exempt wells per parcel vs use of community water systems (Class B). In particular, it should address the benefits that Class B community water systems have from a water quality perspective.

4. In the Chehalis Basin, the CBP believes that a conflict exists among the 1945 Groundwater Law, the Attorney General's opinion, and the Chehalis IRPP as to whether small withdrawals can affect surface water rights and whether they are subject to the same system of priorities as all other appropriators. The CBP recommends that Ecology or the Attorney General's office address this conflict in the Chehalis Basin.

5. The CBP has discussed exempt wells and its members have widely divergent opinions on whether or not exempt wells are a concern in the Chehalis Basin. Some believe that exempt wells have minimal impact while others believe that exempt wells have or will have an impact, especially on stream flows. Nonetheless, based on the data evaluation that shows that there may be concerns with exempt wells in certain subbasins and from the belief that future conditions may give rise to concerns in other subbasins, the CBP has agreed to recommend the following specific statement and recommendation regarding exempt wells in the Chehalis Basin:

Statement of the Concern Related to Exempt Wells in the Chehalis Basin	1. The CBP believes that exempt wells may be a problem in specific subbasins of the Chehalis Basin where rural development and/or hydrogeologic and/or streamflow conditions create cause for concern. 2. The CBP further believes that exempt wells may be a potential future problem in other subbasins where future rural development combined with existing hydrogeologic and/or existing or future streamflow conditions may create cause for concern
Recommended Actions Related to Exempt Wells in the Chehalis Basin	• Prioritize subbasins in the Chehalis Basin based on concerns about exempt wells and conduct specific hydrogeologic studies and evaluations to identify specific problem areas. Areas of higher concern are those that have substantial human development now or projected in the future, poor hydrogeological conditions and/or hydraulic continuity, or low stream flows. • Pursue funding sources for investigating possible solutions for identified subbasin problem areas in order to: – Focus on these subbasins and areas within these subbasins in developing alternative options for exempt wells, for example, providing water purveyor service, using deep aquifers where supplemental water may improve streamflow conditions, and/or considering means to influence the timing of withdrawals to benefit stream flows; – Develop educational materials and program for informing basin/state residents, agriculture and businesses on how to use exempt wells and to lessen their impact on the environment.

Flooding in the Chehalis River Basin

Chehalis Basin Watershed Planning Issue Paper

Issue

The Chehalis River Basin is unique in western Washington. It has the largest drainage area of all rivers on the west slopes of the Cascade Range. In addition, it does not adjoin the crest of the range, and contains very little high elevation terrain. Hence, snowmelt plays only a small role in its runoff patterns. Rather, the basin responds directly and relatively quickly to rainfall events, the largest of which occur typically in the fall and early winter months. Flooding – both the benefits and damages associated with flooding occur during this rainy season.

The cities of Chehalis, Centralia, and surrounding communities in Lewis and Thurston Counties, Washington have a long history of flooding and flood damages to private and public property and periodic closure of critical transportation routes. These problems have been acknowledged and studied for many years. More recently, heightened environmental awareness and the potential listing of area aquatic species as threatened and endangered have resulted in a need for increased focus on development of flood control alternatives that minimize environmental impacts and that incorporate environmental features to mitigate any adverse impacts to fish and wildlife communities and habitats.

Definition

Rivers and streams flood because of prolonged heavy rainfall, a rapidly melting snow pack or a combination of the two. Historically, it must rain an average of 2-5 inches per day for two or three days in a row for flooding to occur in the Chehalis Basin. The actual duration and rainfall amounts needed to cause flooding depend on the condition of the river or stream, groundwater conditions, and run off conditions. However, once the conditions are right, water within the river or stream channel overflows onto normally dry land and the area floods.

In the Chehalis Basin, flooding and conditions conducive to flooding generally occur in the fall and winter months as a result of heavy rainfall. The effect of flooding is intensified within the basin by the general north-south alignment of the river basin and the location of the Olympic Mountains. Storms move up the Chehalis Valley and push moisture-laden clouds against the mountains, where it is released as heavy rainfall. Winter storms also cause tidal surges that can result in even higher flooding at cities located in the lower watershed, at the confluence of major rivers or streams.

Localized flooding occurs throughout the basin for a myriad of reasons that range from lack of capacity of some cities storm/sewer systems to undersized culverts under private and public roads.

Although there are no requirements in 2514 for flooding, it is recognized that water quantity, habitat, and water quality are all intimately correlated to flooding which affects all these things.

Background

Flooding within the Chehalis River Basin has occurred and been recorded almost yearly since settlers first acquired lands by squatter's rights and donation land claims in the mid 1800's. Damaging severe floods in the Centralia and Chehalis areas have occurred almost once every ten years since records began being kept in the early 1900's. Areas subject to flooding in the lower watershed are reclaimed tidelands along the lower Chehalis, Wishkah, and Hoquiam River estuaries. The cities of Aberdeen, Hoquiam, and Cosmopolis lie at the confluence of these estuaries in Grays Harbor. The combination of large river discharges, high tides and storm conditions cause flooding on a regular basis in these areas. Filling in tidelands, establishment of urban and suburban areas along tidal estuaries, and continued development of the floodplains of the Chehalis River and major tributaries has escalated flood damage costs over time, and increased the likelihood that flooding will damage commercial or personal properties. Flooding may last as long as one week in some areas. Most of the remaining floodplain is devoted to agricultural or related purposes.

Flooding is a reoccurring incident throughout the Chehalis Basin. It occurs with frequency each year. Urbanized areas experience high flows and damage to structures and buildings and property. In rural areas, bank erosion is predominantly the issue.

Bridge construction causes some obstruction to flood flows, as do railroad trestles. Road construction within the floodplain has sometimes created low levees throughout the basin. Levee construction has been proposed and in some cases, constructed on the Chehalis River, Skookumchuck River, Newaukum River, and Salzer and China Creeks. Levees occur throughout the basin, both constructed by public entities and built by private property owners.

The Wynoochee and Skookumchuck dams were built in the upper watershed of their respective rivers for water supply, irrigation and to try to limit damage by flooding over time.

The Corps of Engineers has studied flooding within this basin a total of 26 times from 1931 to present. These studies included river surveys, cost estimates, floodplain information, hydraulic studies, Environmental Impact Statements (EIS), flood warning systems, dam modifications, levees, flood mapping, and alternative means to control flooding.

Numerous modifications to river channels (i.e., bank protection, dredging, etc.) have occurred throughout the basin, which in some cases, speeds river flows to downstream areas, which are in turn inundated more frequently than before. Land use practices over time, including forest harvest practices, have reduced resident time of water on the land and increased the likelihood and frequency of flash flood conditions throughout the basin which exacerbates erosion and increases flood damage.

Artificial alterations of flow regimes affect aquatic biodiversity. One reason is that aquatic species have evolved their life history strategies in response to the natural flow regime, as it existed prior to European settlement. Altering flows out of synchrony with the natural hydrological cycle may result in fish species which have adapted to certain flows becoming less successful in reaching spawning grounds, in incubating their eggs to hatching, in rearing, or in migrating downstream, and subsequently those species' numbers may decline.

Periodic flooding is important to the ecology of a stream. Flood flows maintain the natural hydrology of a river by allowing the river to meander unconstrained and thereby creating off-stream channels. Coho and other fish species then utilize these channels for over winter rearing. The Olympic mudminnow (Novumbra hubbsi) is a fish whose entire world distribution is centered in the Chehalis Basin, with a few isolated populations extending to Lake Ozette and Puget Sound. It thrives in flooded wetlands of low gradient streams and vegetated oxbow lakes in the Chehalis Basin.

High flows also increase the amount of available habitat (because streams are wider) and tend to enhance the availability of food (because insects fall from trees and shrubs). Rivers that are bank full up to the vegetated riparian zone provide needed cover for spawning fish and for juveniles who need rearing cover as protection from predators.

Coho salmon production in the Chehalis Basin increases following high flows during spawning migrations because spawners can get to spawning habitat that is otherwise inaccessible in the upper reaches of the tributaries. Thus their offspring have more space to grow in, resulting in more fish.

Steep and undercut banks that provide excellent rearing habitat for juvenile salmon and trout are maintained by erosion at high flows. High flows move sand and silt, keeping spawning gravel loose enough for fish to move them and permeable enough that oxygen-rich water can flow among the incubating eggs.

It should be noted here that while the above details advantages of floods, unnatural floods due to urban development or unmitigated land clearing could cause problems that are not advantageous to the environment.

Encroachment on floodplains, whether by structures or by fill material, reduces the flood-carrying capacity of the river, increased the flood heights and

velocities, and increases the flood hazards in areas outside of the encroachment.

Floodplains are areas that are frequently covered by water when rivers overflow their banks. Floodplains are also defined as low-lying area of land formed by river channels as the channels have occupied portions of the river valley over time. The lateral movement of channels and depositing of sediment raises or lowers the overall elevation of the river valleys by aggradition or erosion.

The channels of rivers meander across floodplains as they flow downstream. Channel bends reduce the amount of energy or velocity of flowing water. The degree of meander can vary, from almost straight channels, which migrate laterally slowly, to fully developed meander patterns, to braided patterns were a stream or river is characterized by mid-channel islands and unpredictable channel changes.

How rivers transport gravel is determined by water depth and surface slope. Gravel and sediment transport ability increases as depth and water volume increase and as river incline increases. It is not uncommon for most annual gravel movement to occur during one or several storm events.

Most gravel travels along the channel bed and onto bars on the inside of bends. The deposition of gravel on the inner bank and the undermining of the outside bank can lead to a lateral shifting of the entire channel. As the river moves away from the inner bank, it leaves behind outward accreting deposits, which become gradually capped by a successively thicker accumulation of fine sand and silt settling from the suspended load during over bank floods. With time plants grow on the surface. The surface built up by the processes is called the floodplain.

Slope erosion, soil creep, bank erosion and riverbed erosion contribute to a mixture of gravel silt and debris to rivers. Once the material reaches the rivers, it is rinsed and sorted by flowing water. The heavier material settles to the bottom. This heavier material is transported downstream by sliding, rolling and bouncing along the riverbed. Material that stays within three inches of the riverbed is referred to as bed load.

There are two general types of gravel movement in rivers. One is accretion on point bars associated with erosion of the opposite bank and shifts in the river channel at a particular meander. The other is general movement of gravel from steeper, upstream areas to the flatter, lower reaches of the river.

The slope of many rivers is reduced as they descend into the lowlands. This causes the coarse portion of a rivers load to be deposited on gravel bars. Where the deposition is most rapid and intense, gravel bars are formed in mid-channel, as well as on point bars along the inside banks of bends, causing the river channel to braid. Point bar deposits force the river to divert around the bar and toward a bank, causing lateral migration of the channel.

In some cases, there is a noticeable buildup of gravel on the riverbed called aggradation. This typically results from the combination of a reduced channel incline and a large discharge of coarse bed material into the river from sources not far upstream.

The greatest amount of bed load movement occurs during high flows. At these times, river depth is greater and available energy is increased, which increases the size and amount of gravel transported. A few peak flows may transport the majority of the bed load for a single year.

A typical river erodes in the headwaters due to steeper slope and energy, deposits near the mouth due to excess bed load, and meanders through transitional areas.

Mining gravel from a river can change the rivers physical balance and cause unwanted effects. A new balance may require adjustments by the river degrading the bed, meandering and bank erosion, or bringing gravel from new channel sources upstream. Gravel removal can affect patterns of bank erosion and change the elevation and form of the riverbed. These changes can also affect fish and wildlife habitat, flooding, and development. The relationship of mining gravel from rivers and reduced flood risks is a relationship of forces and time. Whether mining excess gravel from rivers can reduce flood risks depends on how it affects the balance between the flow, available channel capacity, and amount of gravel carried by the rivers.

Solutions & Toolbox

A. Flood Hazard Management Plans exist for three of the eight counties within the Chehalis Basin [Thurston, Lewis and Grays Harbor Counties]. The most recent, *Grays Harbor County Comprehensive Flood Hazard Management Plan* was completed in 2001. This document distinguishes between structural and nonstructural methods to reduce flood hazards within the basin.

   Structural alternatives for flood hazard management tend to address problems that already exist that have been identified. Nonstructural measures refer to land use regulations and policies that exist or may be adopted to reduce damages related to flooding. The recommended nonstructural measures that can be taken to improve flood management capabilities include the following:

   - Continue enforcement of existing land use regulations and permitting processes. This alternative includes ensuring that existing land use regulations and permitting processes continue to be strictly enforced. Floodplain management regulations, land use regulations and subsequent permitting processes can be used to ensure that development occur in a manner that not only protects citizens and property from flooding, but also does not contribute to increased flooding.

- Evaluate revisions to FEMA mapping. This alternative includes revising the existing FEMA mapping. Accurate floodplain rate maps allow the County to regulate new development in flood prone areas and assist landowners in assessing the risk of flooding to their property and the need for flood insurance.
- Continue inter-jurisdictional coordination. For effective flood hazard management, it is important to coordinate flood hazard planning and regulatory enforcement with other jurisdictions within the same watershed to ensure consistency.
- Develop floodplain conservation easement program. Floodplain conservation easement programs are a cost effective means of protecting land within the floodplain from property losses and damages.
- Provide educational material on flood hazard management. Developing posters, maps, pamphlets, and other materials to inform residents of the flooding issues throughout the basin helps property owners understand land use regulations and permitting processes for development activities within the floodplain.
- Improve flood monitoring system. Installing new water gauges on several major rivers within the basin would improve the river monitoring system that notifies the National Weather Service and NW River forecast Center of impending floodwaters.
- Use new design, construction and maintenance standards. Utilize environmentally sensitive design elements in river repair projects (i.e., bank stabilization projects).
- Join the National Flood Insurance Program Community Rating System Program. By joining this program, more homeowners and renters in flood-prone areas can purchase flood insurance, and this may also reduce flood insurance by 5 to 45 percent.
- Provide flood proofing guidance to residents.
- Develop home elevation and buyout program. Elevation and buy out and relocation projects provide a permanent, cost-effective alternative to repetitive maintenance. The properties can be improved for environmental enhancement and can reduce the danger of flooding of homes and businesses downstream. Properties that are bought out can be left as permanent open space.

The recommended structural measures that can be taken to improve flood management capabilities include the following:

- Biostabilization and other engineered solutions. Use existing guidance manuals for using biostabilization techniques to stabilize embankments.
- Consider capital projects in areas with repetitive damages.
- Move vulnerable activities out of the floodplain.
- One of the best ways to reduce damages related to flooding and to protect human life and property is to ensure that development activities take place outside the floodplain of rivers in the basin.

Consider moving people out of the floodplain if a cost-benefit analysis shows repeated flooding is more costly than moving people. Industrial, commercial, and residential development in the floodplain should be restricted by local planning or development authorities and types of land use that are more appropriate to frequently flooded areas (agriculture, for example) should be encouraged.

- Cluster densities outside of the floodplain, instead of within the floodplain.
- Functioning floodplains, complex stream channels, wetlands, and riparian areas all contribute to retaining runoff locally and/or improving the infiltration of precipitation, which reduces the flashiness of flood waters. Local jurisdictions should make it their goal to contribute to the protection and restoration of these natural systems. Natural flood storage areas should be identified and protected. Where the connection between the river and its floodplain has been severed through levees or berms, opportunities should be examined to open up flood storage areas through levee setbacks or removal. An analysis of areas within the basin, which historically had wetlands should be undertaken to determine if restoration or creation of wetlands in these areas might help increase natural flood storage. Riparian vegetation, which helps with infiltration of precipitation, should be protected where it exists and restored where it has been removed. Large woody debris and numerous logjams historically acted to create complex, meandering stream channels that could hold more water than simplified, channelized streams. Large wood should not be removed from streams and rivers.
- Further analysis within the basin should be done to determine positive restorative actions that might be taken to improve the natural functioning of floodplains, wetlands, and riparian areas, including reconnecting rivers to their historic floodplains, streambank rehabilitation and conversion of land uses (i.e., buyouts, easements, etc).
- Actions that would help retain storm runoff in the upper and middle watershed would include removal of agricultural drain tiles, wetland restoration and creation, and the addition of large woody debris and log jams. In addition, opportunities exist to remove levees throughout the basin or to set existing levees back to allow more flood storage.
- Local jurisdictions should work with the state and federal authorities to develop floodplain management plans that integrate land use planning, current knowledge of the extent of flooding, and an understanding of naturally functioning rivers and floodplains. Areas with a history of flooding should be identified and protected to provide valuable flood storage, ecological values, and potential restoration. These areas should be targeted for buyouts, easements, or other programs that offer incentives to landowners.

B. *Thurston County* completed a *Comprehensive Flood Hazard Management Plan* in 1999. It was identified in this plan that Thurston County residents are faced with a variety of different flood hazards. These include: flooding and erosion from urban stormwater runoff; river valley flooding that destroys roads, homes, farm buildings and erodes miles of shoreline; seasonally high water table areas which flood foundations and access roads isolating these areas for weeks; and areas located outside of designated flood area which can be destroyed by excessive streambank erosion during flood events.

A type of stream flooding characterized by a quick rise and fall of water level is the flash flood. Flash floods generally result from intense storms dropping large amount of rain within a short period of time onto watersheds that cannot absorb or slow the flow. The natural terrain of Thurston County helps to reduce the potential for flash floods. However, many smaller streams react in a "flashy" manner, making them more difficult to forecast. As development continues, increasing the distribution and proportion of impervious surfaces, the threat from flash floods will increase.

Groundwater flooding occurs whenever there is a high water table and persistent heavy rains. The situation is caused in areas where an upper, thin layer of permeable soils overlays an impermeable layer of hardpan soils. As the ground absorbs more and more rainwater, the groundwater table rises and shows itself as flooding in areas where the land surface is below the water table. This condition has historically been most severe in the second and subsequent years of consecutive wet years.

The Skookumchuck Dam on the Skookumchuck River in Thurston County is identified as a potential high hazard dam, which could fail and potentially cause significant economic loss and environmental damage.

Dam failures can be caused by nature, such as flooding or an earthquake, but mostly they are caused by human error such as poor construction, operation, maintenance or repair. There are many effects of a major dam failure: loss of life, destruction of homes and property, damage to roads, bridges, power lines, and other infrastructure; loss of power generation and flood control capabilities; disruption of fish stock and spawning beds; and the erosion of stream and river banks.

Lands within Thurston County flow both to the Pacific Ocean and to Puget Sound. Approximately 43% of the County flows into various drainage's within the Chehalis Basin (Chehalis River, Black River, Skookumchuck, and the Black Hills) to the Pacific Ocean.

The long term objectives of Thurston County's Plan include:

- Protect the public from natural hazards.

- Minimize the need for emergency rescues.
- Protect the unique, fragile and vulnerable parts of the environment.
- Minimize the cost of replacing public facilities.
- Alert the public to these critical areas.
- Recognize that water quantity, quality and instream habitat is related.
- Avoid the public subsidy of private developments.
- Encourage voluntary efforts to restrict development within hazardous areas.
- Work in concert with other land use regulations.
- Coordinate efforts with adjacent jurisdictions.

The short-term objectives of the Plan include:

- Provide the highest degree of flood protection at the least cost by working with natural systems and using prevention as a first priority.
- Design the entire flood plan to address the program needs of the National Flood Insurance Program, Community Rating System.
- Improve existing development regulation implementation by providing more accurate mapping (i.e., 100-year floodplain, high groundwater and wetlands).
- Reconstitute the multi-development county flood mitigation team to implement the flood plan.
- Rely upon a combination of state or federal grants and locally generated funds (for the required grant match) to implement the flood plan.
- Work with adjacent jurisdictions to resolve common flooding issues.

The *Thurston County Flood Hazard Management Plan* recommends a combination of projects and activities needed to achieve the goals of the overall strategy for flooding. These include:

- Apply to FEMA to be included into the Community Rating System (CRS Program) as a part of the National Flood Insurance Program.
- Secure funding for flood related projects within the 20-year Stormwater Capital Facilities Plan.
- Expand the Thurston County stormwater utility rate boundary to include all unincorporated areas.
- Thurston County should continue to be actively involved in the multiple jurisdictions flood hazard reduction efforts within the Chehalis River Basin.

- Place flood elevation poles and staff gauges along major rivers and within chronic groundwater flooding areas.
- Create a countywide Water Resources Data Base.
- Develop a system to track flood elevation certificates for individual homes.
- Prepare a public information program, which focuses on the consequences of floods.
- Provide a set of all flood management documents for each Timberland library within the county.
- Mail flood insurance information to residents and property owners who live in a floodplain and the real estate offices.
- Remap floodplains using new 2-foot contour data for all rivers and submit the changes to FEMA for map revisions.
- Remap the location of streams using the new 2-foot contour data.
- Map high quality riparian habitat, river reaches for all rivers and including the extent of historic meander belts along the Nisqually River.
- Map 190 square miles of wetlands in Nisqually, Chehalis, Black and Skookumchuck watersheds.
- Develop mapping protocols to archive all flood maps and data sets so they can be reused at a later date.
- Reevaluate land uses and zoning bases upon new floodplain maps.
- Adopt development regulations for high groundwater areas.
- Revise shoreline regulations to encourage "shoreline protective structures" to be bioengineered.
- Work with other to determine the width and conditions of forested corridors along river and stream shorelines.
- Draft a comprehensive plan policy, which encourages the creation and use of wetland mitigation banks.
- Amend the Stormwater Ordinance (TCC 15.05) to allow for enforcement capabilities.
- Prepare new drainage basin plans in priority areas such as Salmon and Yelm Creeks.
- Draft a prioritized list of which floodplain residences the county would acquire (buyout) if state and federal monies were available.
- Draft a priority list of which residences the county would help elevate above the 100-year floodplain, if state or federal monies are available.
- Work with landowners and others to establish reforested corridors along river and stream shorelines.

- Encourage research into bioengineering and other techniques which provide streambank protection an improve fisheries through the use of large woody debris. Support local demonstration projects, which could provide such research.
- Develop a warning system for the Skookumchuck River dam with its property owner, the Dept of Ecology, the downstream communities and the Skookumchuck Valley residents.

C. *Lewis County* completed a *Flood Hazard Management Plan* in December 1994. Three major watersheds are located in Lewis County, the Chehalis, Nisqually, and Cowlitz River watersheds. The Nisqually and Cowlitz Rivers originate in the Cascade Mountains within the eastern part of Lewis County. Floods on these two rivers tend to be heavily impacted by the snow pack conditions in the Cascades. The headwaters for the Chehalis River are in the foothills south and east of the city of Chehalis. Snow pack is not normally a factor in Chehalis River flooding because of the low elevation headwaters. The river is extremely prone to flooding from heavy precipitation events that regularly occur during the fall and winter.

This plan addresses flood issues on the Chehalis, Nisqually, and Cowlitz Rivers. The major focus for the plan is on the Chehalis/Centralia region where flooding has historically caused millions of dollars in damages. Specific flood issues and problem areas were analyzed, and recommendations made for alleviating these problem situations. Flood problems on the Nisqually and Cowlitz Rivers were examined in less detail. For these two rivers, specific problem sites were inventoried, and flood control efforts were documented.

Extreme floods on the Chehalis River and its tributaries have caused considerable damage. The 1990 and 1996 floods were the largest recorded on the Chehalis River during the period of record. The floods caused millions of dollars in damages throughout the watershed.

Because flooding has been a chronic problem in the Centralia/Chehalis region for so long, much effort has been spent historically on developing flood control solutions. The U.S. Army Corps of Engineers (COE) has been particularly active in analyzing and proposing flood control solutions. Most of the COE-proposed solutions have involved large flood control structures. Construction of large flood control structures is the only alternative that will actually prevent flooding from occurring in the Centralia/Chehalis region, but to date none of these structures has ever been built.

One of the results of the many studies conducted on flooding in the watershed has been the Corps/Lewis County recommendation to construct the Centralia Flood Damage Reduction Project. A study of the flooding in the Centralia/Chehalis area commenced in 1998 and ended in 2002 with a recommendation to build a series of setback levees within

the Chehalis River floodplain and along the lower Skookumchuck River, and make modifications to Skookumchuck Dam. The Army Corps of Engineers suggests that the Centralia Flood Damage Reduction Project will make significant and measurable improvements in the ecosystem and flood damage protection for the cities of Chehalis and Centralia. The study area includes the main stem Chehalis River, its floodplain and tributaries from the South Fork Chehalis River confluence to Grand Mound, and includes the cities of Centralia and Chehalis, in Lewis County, Washington. Tributaries entering the study area include the Skookumchuck and Newaukum rivers, Salzer, China, Coal, Bunker, and Lincoln creeks, among others. Studies along the Skookumchuck River extend upriver of Skookumchuck Dam and include the town of Bucoda in Thurston County. A detailed cost estimate was developed for the selected plan to construct setback levees and modify Skookumchuck Dam. The project cost estimate is $94,000,000 and includes design and construction costs, mitigation costs[1], operation and maintenance costs, real estate acquisition costs, contingency, and interest during construction.

The following principles are fundamental to *Lewis County's Comprehensive Flood Hazard Management Plan* strategy:

- Respect the river's natural hydrologic processes. Traditional flood control efforts have focused on controlling the river's natural tendencies of channel shifting and over bank flow during floods. It is often more cost-effective in the long term and more environmentally sound to accommodate these natural river processes, rather than attempting to control them.
- Focus on the cause of flood damage. Flood damage can be related to upstream land management and development in flood-prone areas. Recognizing that flooding is a natural process, and only becomes a problem when people develop in areas that flood, is an important concept.
- Consider the entire watershed, not just local conditions. Because watersheds do not respect political boundaries, local flood management activities impact downstream jurisdictions.
- Incorporate public participation and coordinate among all affected agencies. Because flood hazard reduction affects most people in the county and overlaps with the responsibilities of other governmental agencies, it is necessary for these groups to be involved in the planning process. Without involvement from these groups, it is nearly impossible, in the end, to get support from them.
- Examine all the issues. In the past, many flood control efforts have taken place immediately following a flood. Usually, there is

1. The mitigation costs are estimated on the impacts of a 35 percent design of the project; further minimization of the impacts will be conducted in further studies, thus reducing the costs. This is consistent with the EIS process. During design of the project mitigation costs tied specifically to the minimized impacts will be identified and the appropriate portions of the plan will be utilized.

not enough time to consider flood causes and alternative solutions when planning is done in this crisis mode. True comprehensive planning for flood hazard reduction must be carried out in a manner, which allows thorough examination of the issues and solutions.

- Incorporate other resource protection goals. Coordinating flood hazard reduction measures with other resource protection programs is obviously the best use of financial resources.
- Coordinate between public works, planning, and building departments, and other department activities. Because of their differing mandates and responsibilities, these departments can sometimes work at cross-purposes in the area of comprehensive flood hazard reduction. Each department must remember to look past their daily permitting decisions to the ultimate goals of the county or city in flood hazard reduction.
- Incorporate comprehensive planning solutions. Flood hazard reduction should be part of the county or city's overall comprehensive plan. When flood control structures are necessary, recreation and public access might be integrated into the project.

During the planning stages of the flood hazard management plan, long-term goals and short-term objectives were developed. The overall long-term goals of this CFHMP are to:

- Reduce flood hazards and
- Reduce long-term flood control costs to Lewis County.

These goals are to be accomplished through the following short-term objectives:

- The emphasis of the CFHMP will be on the populated areas along the Chehalis River and its major tributaries. Most of the detailed analysis of flood hazard reduction strategies focuses on this region.
- The CFHMP will focus on nonstructural measures that will help prevent the worsening of flood impacts in the future. Research completed through October 1992 documented that numerous major structural flood control measures have been proposed since 1935, but none of them has ever been built. Because it is unlikely that financing for such structures will be easier to obtain in the future, it was agreed that the CFHMP should not reconsider major structural measures to prevent flooding from occurring in the Centralia/Chehalis area.
- The emphasis for the Cowlitz and Nisqually River basins is to identify potential flood hazards in the parts of these drainage that lie in Lewis County. A complete analysis of flood hazard reduction measures will not be attempted.

- Public education was identified as an important element of this CFHMP. This objective was met by prioritizing public awareness and public education on flood hazard reduction alternatives.
- Lewis County expressed the desire to be a good neighbor to downstream residents on the river covered by this plan. Impacts to downstream jurisdictions of the various actions evaluated in this plan were analyzed.

Since 1935, the Corps and other agencies have proposed numerous structural flood control measures to prevent flooding in the Chehalis River valley. These measures include:

- Modification of Skookumchuck Dam
- Flood-proofing structures
- Construction of several multipurpose storage projects (Ruth Dam, North Fork Newaukum Dam, South Fork Newaukum Dam, Boistfort Dam, Meskill Dam, and Skookumchuck Dam)
- Small headwater dams
- Channel clearing
- Channel excavation
- Urban area levees
- Pump stations
- A combination of the flood control measures listed above

It is generally understood that flood prevention in Centralia/Chehalis area can only be accomplished with major structural flood control measures. However, it was also recognized that none of the major structural flood control measures investigated during the past 60 years have ever been constructed and therefore it was concluded to focus this CFHMP on nonstructural flood hazard management measures. In accepting that flooding will continue during extreme flood events, this CFHMP has focused on:

1. How to minimize the impacts of flooding in those areas of the flood plain that are already developed
2. Preventing development or other activities that will create a new flood hazard for themselves or increase the flood hazard for others

The recommended nonstructural flood management measures address both of these concerns. These measures include:

- Ongoing improvements in flood warning and emergency response procedures;
- Flood-proofing of individual structures;
- Conducting flood audits for residential and commercial buildings on the flood plain;

- Modifying the flood damage prevention ordinances of Centralia, Chehalis, and Lewis County to achieve consistency in the valley; using best available historical flood records to assess flood hazards; and modifying Federal Insurance Rate Maps (FIRMs) so that they represent flood hazard areas based on the actual flood inundation history. An inherent characteristic of nonstructural solutions for flood hazard management is the difficulty in addressing very specific flood problems. In general, nonstructural recommendations are more procedural or policy-oriented and, therefore, do not usually focus on a specific flood location. Although the flood hazards in the Chehalis/Centralia valley are general in nature, it was possible to identify specific urgent problem areas where flooding is particularly troublesome or expensive to residents. These specific flood hazard areas are addressed in the CFHMP.

The recommendations in the *Lewis County CFHMP* include:

Flood warning and emergency response:

- Install additional river gauging stations. Current river monitoring provides flow information for a large portion of the Chehalis River; however, flood responsiveness could be increased with additional gauge sites. Flood preparation lead time would be increased with gauge installation within the upper reaches of the Chehalis drainage. Additional telephone-linked gauges would reduce personnel needed to visually inspect river levels. New gauges are recommended for the ungauged sections of the upper Chehalis River, the South Fork of the Chehalis River, and for major tributaries in the Centralia/Chehalis region. The Newaukum gauge near Chehalis should be updated to provide telephone-linked capabilities.
- Establish regional coordination on flood forecasting. Lewis County, Chehalis, and Centralia currently each have independent efforts for flood forecasting. Combining resources for flood forecasting is recommended.
- Formalize and update road closure database. This information could be linked to river stages adding more predictability and lowering response time to road closures.
- Increase distribution of flood information materials. Lewis County should expand the distribution of flood information.

Flood-Proofing:

- Distribute flood-proofing fact sheets and reference materials to citizens residing in flood prone areas.
- Acquire the Corps of Engineers flood audit program. Lewis County should continue the flood audit program themselves.
- Establish elevation and relocation as the preferred flood-proofing method for the Centralia/Chehalis area.

Ordinance Interpretation and Enhancements:

- Revise ordinances for consistency. Lewis County, Chehalis and Centralia's flood hazard ordinances should be modified to be consistent.
- Pursue revision of the FIRMs. Lewis County should submit the COE Flood Warning Map to FEMA along with a request for a "Letter of Map Revision* to the FIRM in the Centralia/Chehalis area.
- Update local flood elevation database. This CFHMP recommends that Lewis County compile a database of historical flood elevations and areas of inundation. Where these data show flooding beyond the limits shown on the FIRM, Lewis County should require applicants for development to elevate their structures accordingly.
- Add compensatory storage requirements to the Flood Damage Prevention Ordinance to minimize the cumulative effect of fill material in the flood plain.
- Establish a forum for coordination between Lewis County, Chehalis, and Centralia flood officials. These officials should meet regularly to discuss flood issues. Through this forum they can maintain consistency among all flood programs and share ideas and resources.
- Increase public disclosure. Lewis County should include notification of flood plain status with all county permitting for land development, and purchase and sale of property. In addition, it should develop a method for ongoing notification to existing landowners, such as through a notice sent with tax mailings.
- Upgrade critical facilities. The county should inventory the existing critical facilities for conformance with its Flood Damage Prevention Ordinance. A remedial plan should be developed for nonconforming facilities.
- Pursue FEMA community rating system. FEMA's Community Rating System is a program that allows communities to lower their flood insurance rates by engaging in activities that will lessen flood hazard. Since many of the COE activities discussed in this plan would count for credit in the Community Rating System, Lewis County should apply for inclusion.
- Implement rigorous administration of variances. Variances should be granted very infrequently.
- Adopt stormwater management ordinance and technical manual. These stormwater management tools will help Lewis County deal with its stormwater more effectively
- Lewis County should create a countywide surface water management utility to assist with funding for flood projects.
- Once it has created a surface water management utility, Lewis County should undertake basin planning. Using a basin plan-

ning approach, the county will plan for entire watersheds, resulting in the most successful surface water management.

Analysis

Certain commonalities exist among the three flood hazard management plans. These are tantamount to recommendations and are as follows:

- Evaluate FEMA Mapping, remap areas (if necessary), and apply for Community Rating System Program, part of National Flood Insurance Program. Reevaluate land use and zoning bases using this new information and revise, amend or create new regulations based on findings.
- Continue Inter-Jurisdictional Coordination. Be a good neighbor to downstream jurisdictions. Modify floodplain development regulations so they are consistent throughout the basin.
- Educate the public about flooding – develop materials that inform residents of flooding issues within the basin and land use practices and regulations affecting development within the floodplain. Additionally, inform them of consequences of development in the floodplain and applicable flood insurance rates/restrictions and flood proofing techniques. Provide flood management documents/information to all libraries within the basin.
- Improve flood monitoring/warning/forecasting and emergency response procedures within the basin. Flood elevation poles, staff gauges should be placed along major rivers and within chronic groundwater flooding areas. Existing (and new) gauges should be updated to provide telephone-linked capabilities. Conduct flood audits for residential and commercial structures within the floodplain.
- Accommodate rivers natural hydrologic processes. Protect areas (i.e., wetlands, floodplains, stream corridors, riparian areas, etc) that naturally absorb floodwaters via conservation easements; and move structures (i.e., buyout or elevate homes) that are repetitively damaged out of harms way. Resist development efforts to place fill or structures within the floodplain and minimize the need for emergency rescues by using prevention as the first line of defense against flooding. Recognize that flood prevention represents the highest level of flood protection at the least cost by working with the basins natural systems.
- Identify areas within the basin that contribute to natural flood storage. Protect areas still intact, restore areas degraded by development or other activities, and create areas that will store floodwaters in the winter and can be used to augment stream flows during low flow conditions.
- Utilize nonstructural measures to prevent or lessen flooding whenever possible. If structural measures are needed, utilize bioengineering or environmentally sensitive methodologies to reduce flood hazards.

Further review by the Chehalis Basin Partnership led to additional recommendations:

- Encourage all participating counties in the basin to apply to FEMA for the Community Rating System.
- Ensure that local floodplain management plans are updated to include new structures within the Chehalis floodplain and the overall philosophy and guidelines of the Watershed Management Plan, and to promote consistency related to floodplain management across jurisdictions.

Political/policy factors

The U.S. Congress established the National Flood Insurance Program (NFIP) with the passage of the National Flood Insurance Act of 1968. The NFIP is a Federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for State and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement between communities and the Federal Government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the Federal Government will make flood insurance available within the community as a financial protection against flood losses. This insurance is designed to provide an insurance alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. Information on Flood Insurance Rate Maps from FEMA can be found on the following website: http://www.fema.gov/mit/tsd/

The Washington State Department of Ecology has recently remapped potential flood hazard zones in Washington State. The maps for the Chehalis Basin can be found at: http://www.ecy.wa.gov/services/gis/maps/wria/flood/flood.htm. The flood maps on this site are a general purpose, watershed area view of potential flood hazard zones and are not intended for the detailed identification of local property, insurance claims, or emergency needs (Figures 1 & 2).

Unanswered questions

- Will the synthesis of the current Comprehensive Flood Hazard Management Plans for the three dominant jurisdictions in this basin lead to a revision of the existing documentation?
- How will the local authorities ensure that areas of the basin that currently provide flood storage will be preserved or restored?
- How can we accommodate the rivers natural hydrologic processes and require that development activities within the floodplain are restricted?
- How will the different jurisdictions in this region revise and enforce floodplain regulations in the future?
- How will the Lewis County/Corps Centralia Flood Damage Reduction Project (if constructed) affect the rivers natural processes? How will we ensure that future floodplain development doesn't threaten the integrity of this large structural project?

References/Suggested Reading

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Water Quality Impairment

Chehalis Basin Watershed Planning Issue Paper

What is the issue?

The water that flows through the Chehalis Basin is used by many people for many purposes. Each of those uses relies upon having ample supplies of suitable quality water. Some uses require water of very high quality; other uses can make do with water of lower quality. State and federal laws require that water quality be protected or restored to ensure that all water-dependant uses are supported.[1]

Surface waters that do not meet state water quality standards are considered to be "impaired" - a term that comes from section 303d of the federal Clean Water Act. The list of impaired waters is sometimes referred to as the "303d list." Under federal law, a water that is identified as impaired **must** receive special attention with the goal of restoring its quality so that it meets state standards. The Clean Water Act has a process for applying this special attention — it is called a Total Maximum Daily Load (TMDL). TMDLs are not optional. TMDLs start with a detailed study of the problem and result in specific clean-up strategies. Federal regulations are specific about what results must be accomplished under TMDLs, but there is some flexibility in how those results are accomplished. In Washington State, the settlement of a federal court case specified how the state will work towards completing TMDLs for all impaired waters within 15 years. This paper describes what is meant by water quality impairment, the purpose of water quality standards, and federal requirements when water bodies are identified as impaired. TMDLs are discussed in detail in a separate issue paper.

What is the background to this issue?

The Chehalis Basin Partnership established the following water quality goals for the Chehalis Basin Watershed Plan: to prevent degradation of and/or to improve water quality to have clean water (as defined in the Washington State Water Quality Standards) for all fish, wildlife and human uses.

State surface and groundwater quality standards have been developed to protect designated 'beneficial uses' including the following: in-home domestic use, livestock watering, supporting different species and life stages of fish, irrigation, industrial use, primary contact recreation (swimming), and secondary contact recreation (boating, fishing).

- Surface water quality monitoring data show that some areas of the Chehalis River and some tributaries meet current state surface water quality standards, but others do not. Some areas do not meet state

1. This paper does not currently address drinking water and drinking water quality standards which are overseen by the Washington State Department of Health.

water quality standards because they are too warm, or the level of dissolved oxygen is too low, or there are too many fecal coliform bacteria present. Other possible causes of impairment include high nutrient levels, pH levels that are too high or too low, sediment, and invasive aquatic plants.

- Water that is identified as impaired must receive special attention with the goal of restoring its quality so that it does meet the state standards. The process for bringing water quality back up to meet standards is called a TMDL. TMDLs are most often prepared by the Washington State Department of Ecology (Ecology) but they may be done by others as long as they meet EPA approval.
- Although unseen, ground water is a vital resource to the citizens, economy, and environment of Washington State. Ground water supplies more than a quarter of the total state water demand and is estimated to provide at least 65% of the drinking water for the state's residents. As a fundamental component of the hydrologic cycle, ground water also plays a critical role in sustaining stream and river base flow and maintaining the quality of riparian and wetland ecosystems. Because surface water is already extensively allocated in many areas, ground water will undoubtedly supply an increasing percentage of our water needs as our population grows. Ground water data show that nitrate concentrations are a concern in some areas.
- Surface and ground water quality monitoring data are limited, and we may be unaware of areas that do not meet state surface or groundwater quality standards because they have not been monitored.

What are some possible solutions?

1. **Continue implementing existing programs with existing resources (status quo)** - This alternative will result in outcomes similar to those seen to date. Ecology is responsible for identifying impaired waters and initiating clean up activities (TMDLs). Ecology will continue to carry out this role using available resources. Public involvement in Ecology-led processes includes the opportunity to comment on proposed revisions to state water quality standards and on TMDL priority setting processes and priority lists. The public can also participate in the development and implementation of TMDLs.
2. **Basin-wide comprehensive monitoring plan** - Implementation of a basin-wide comprehensive monitoring plan being developed as part of the watershed plan for the Chehalis Basin will identify improvements in areas with impaired water quality and identify additional areas that may be impaired. Monitoring data will also help prioritize areas for cleanup and protection.
3. **Protection of areas of healthy water so that they do not become impaired** - This alternative is the subject of an issue paper on its own. Briefly, preventing impairment is much less time consuming and expensive than cleaning up impaired waters and results in fewer regulated outcomes. "Protection" in the context of this alternative for this

issue paper is defined broadly and includes the option of protection through voluntary actions. One example of voluntary actions would be the development and implementation of a farm conservation plan through the local conservation district. Protection in the context of this alternative does not mean recommending additional regulations to prevent normal use of private lands. It does mean that water quality standards will be met, a requirement that already exists under existing laws and/or regulations.

4. **Proactive water quality clean up of impaired waters before TMDLs are developed** - The goal of the Clean Water Act is protecting the quality of waters that meet or exceed water quality standards and restoring those that do not. While the Clean Water Act contains tools such as TMDLs for restoring water quality, it recognizes restoration or cleanup that occurs as a result of other processes. The key is to study the situation enough to understand the causes of degradation, to identify practices that will effectively halt the degradation, to implement those practices, and to track (monitor) results.

   Programs to clean up impaired waters can be implemented at the local level without waiting for state or federal intervention. Effective tools that can be used within the context of a coordinated effort to clean up impaired waters include local or site specific resource planning, implementation of best management practices (agriculture, forestry, stormwater), local land use controls (density, buffers, Critical Area Ordinances, buffers), etc.

   The benefit of this approach is that problems can be resolved without federal or state oversight, using processes and practices that are supported at the local level. To be successful, this approach requires local leadership, local support, and the resources to implement it.

5. **Recommend use-based water quality standards for the Chehalis Basin** - The proposed new water quality standards for Washington State contain a provision for water quality criteria based on the actual use of a specific water body. For example, under the current standards, unless a water body is specifically classified as being "class AA," "class B," or "class C," the default is for the water body to be classified as "class A" water. All "class A" waters in the current water quality standards are assumed to support salmonid spawning and rearing and to have a dissolved oxygen criterion and temperature criterion designed to support those uses whether or not salmonids are actually present. Use-based standards, on the other hand, would first determine the actual uses in various portions of the basin and then set the water quality criteria based on those actual uses.

6. **Regional (basin) water quality management district** - A regional water quality management district could assume oversight of water quality in the basin. This alternative may require state legislative action to allow delegation of water quality protection from Ecology to the local board. It would certainly require funding support and would result in the need for on-going coordination. If this alternative were considered, additional research would have to be done on existing laws and authorities.

What actions are recommended?

#2 Basin Wide Water Quality Monitoring Plan

#3 Protect areas of high-quality water so that they don't become impaired

#4 Proactive water quality clean up of impaired waters before TMDLs are developed

#5 Recommend Use-Based Water Quality Standards for the Chehalis Basin

How can the recommendations be implemented?

The experience of relying upon TMDLs to restore water quality in the Chehalis Basin has not been a pleasant one for any of the parties involved. What has been learned from that experience is that TMDLs are time consuming and expensive; they leave people feeling they have been forced into implementing actions they are not convinced will have real and positive effects on water quality.

Effective management of impaired water quality will require a coordinated effort among all jurisdictions and interest groups. The water quality element of the watershed plan can provide a framework for that coordinated effort. If a locally-controlled water quality program is to be successful, each jurisdiction will have to contribute. The difficulty is that every one of the jurisdictions that has a role in protecting or restoring water quality faces the same problem — limited resources and competing demands for those resources. Unless preventing additional water quality impairments and voluntary clean up of identified impaired waters are made priorities for everyone involved, the chances are good that, by default, TMDLs will continue to be the tool the state is forced to use to clean up impaired waters.

To effectively implement the four recommendations above, the watershed plan should achieve the following results:

- Establishment of a joint local coordinating body with limited authority to provide continued oversight, direction and mid-course corrections as needed.
- Formal agreement that identifies the actions each participant commits to undertake. This agreement would probably have to be revised at least annually to address new conditions.
- Local and state commitment to participating in a comprehensive, basin-wide monitoring effort designed to identify areas that meet, do not meet, or are at risk of not meeting, state water quality standards. This will have to be an on-going program.
- Local oversight of new and existing land uses to ensure that water quality is not degraded.

- Local implementation programs with the ability to clean up waters that have been identified as impaired. These programs will have to include schedules for achieving results and a follow-up monitoring program to document results.
- State acceptance of this locally-controlled program and a commitment to support local priorities and provide a fair share of the necessary funding.
- Local sources of funding.

These actions will be controversial. The pay-off for taking on this responsibility is more local influence on the outcome. The result of not taking it on will be more TMDL-driven outcomes.

What are significant data gaps?

- The quality of water where monitoring has not been done
- The effects on water quality of invasive exotic plants or animal species.
- The effects of pesticides used to control invasive aquatic or terrestrial plants and animal species on water quality.
- The effects of seals on water quality in Grays Harbor
- The quantified effects of individual sources of water quality impairment such as: septic systems, stormwater runoff, livestock wastes, etc.
- A map of impaired waters and contaminated ground water that is legible at a scale that can be included with this issue paper.

Protection of Existing Areas with High Quality Waters

Chehalis Basin Watershed Planning Issue Paper

What is the issue?

Areas with high water quality are those which meet or exceed existing Washington State Water Quality Standards. The Chehalis Basin enjoys some of the highest quality waters in the State of Washington. The Watershed Planning Act does not specifically require protection of areas with high quality waters. The Washington Water Quality Standards Anti-degradation provisions afford some protection to waters that are of higher quality than the applicable criteria and also allow a lowering of water quality in such waters under some circumstances. Prevention of water quality degradation is one of the Chehalis Basin Partnership goals, and the issue was raised in the planning process because of its importance, cost effectiveness, and the opportunity for success through voluntary efforts.

What is the background to this issue?

It is much easier and less costly to protect high quality waters than it is to clean up waters that are already polluted. In most watersheds, there are at least a few and sometimes many areas of high water quality. These areas are generally associated with areas of intact, high quality habitat. In a cost effective strategy, the highest priority should be to identify these areas, understand why they support high quality water, and protect them from deterioration.

To address related habitat issues, including fish habitat, a further goal is to begin restoring "connectivity" between those strongholds to enlarge them and to provide refuges in the event an existing stronghold is severely damaged by a storm or other severe event. This concept is based on the premise that damaging effects of storm events tend to be confined to relatively small geographic areas, so if such a storm event wipes out a stronghold area, there will be another in adjacent lands that can serve as refuges while the original recovers or is restored.

More intensive land uses tend to increase the amount of pollution from runoff and lessen the amount of water recharged to groundwater and streams. The percentage of impervious surface (pavement, roofs, etc.) increases as land use becomes more intensive. Intensive land uses not only increase pollution but also have adverse affects on stream flow. As flows decline, stream temperatures increase and temperature standards are exceeded; this can lead to fish mortality and sublethal effects.

A major obstacle in promoting non-degradation as a priority is overcoming the fairly widespread belief that environmental standards are totally protective, i.e., many believe that there are no, or few, downsides to allowing degradation of high quality waters provided they do not degrade below standards or destroy these resources.

Existing Law and Regulations:

The Clean Water Act's National Pollutant Discharge Elimination System (NPDES) permit system provides significant protection to water quality from point sources. This program has generally been effective, and as a result most of the remaining threats to water quality come from nonpoint source pollution (runoff).

Clean Water Act Section 404 regulations are intended to ensure that materials placed in waters or other aquatic resources like wetlands will not have a negative impact on the overall water resources within a region.

State Water Quality Standards (WQS) regulations, which are issued pursuant to the Federal Clean Water Act, require an anti-degradation policy as part of state Water Quality Standards. The Confederated Tribes of the Chehalis have their own water quality standards.

Nonpoint source pollution is largely a function of land use. Land use is regulated primarily by county and city government.

What does the available science indicate?

CBP Level 1 Analysis, (Appendix C – Water Quality) included a review of water quality data by subbasin and concluded that there were very few subbasins with poor water quality.

In cooperation with Ecology, EPA conducted field sampling in the upper Chehalis (WRIA 23) during 1997 to assess the status of ecological resources in the basin and to examine the association between ecological conditions and natural and human influences. This study concluded that many of the sites examined exhibited good environmental conditions, including indicators representative of water quality and habitat.

Other resources that may provide information on areas of high quality water include the following:

- **Ecology Water Quality Data**: Much of the data was gathered for the TMDL program. This program focuses on water quality problems, but some of its data could be used to identify areas with good water quality.

- **Chehalis Basin Education Consortium Monitoring**: Ecology made a total of about 50 thousand dollars in grants to help and the U.S. Fish and Wildlife Service helped to fund water quality monitoring by students (ages 6 thru 18) in throughout the Chehalis Basin. This involved two small grant awards in 2000 and 2001
- **Land Trusts**: Several environmental land trusts operate in counties that are at least in part in the Chehalis Basin.
- **Public Lands**: There are extensive public lands in the basin. These include local, state, and federal entities. These entities may have special protection and/or monitoring programs for their lands and may be able to provide data on high quality waters.
- **Private Forest Lands**: As a broad rule of thumb, forestlands produce higher water quality than other land uses; however, the degree to which this is true depends on the particular forest management practices followed. There are very extensive private forestlands in the Chehalis Basin. These are subject to a variety of historical and current management practices which may be expected to produce diverse water quality conditions. Areas that are subject to up-to-date, science-based practices would be expected (eventually) to produce good water quality – for example, lands governed by a Habitat Conservation Plan prepared under the Endangered Species Act.

What are possible alternatives?

- **No Action Alternative/Status Quo**: Maintain the current focus on water quality problems. State Water Quality Cleanup Plans (or TMDLs) will continue to be the dominant approach to water quality issues in the Chehalis, no special efforts would be made to protect high quality waters/habitat.

  Analysis: Presumably water quality would continue to deteriorate in response to population growth and economic development in the basin.
- **Proactive Voluntary Approach**: To be recognizably different from Status Quo, a proactive voluntary approach must be more than general encouragement to take those actions that may improve water quality and to refrain from those that do not. To be effective, a proactive voluntary approach should include at least the following general elements:
  1. Identify and inventory areas with high quality waters beyond those identified in Level 1 Assessment
  2. Assemble and publicize information on those locations where water quality is high
  3. Assess existing protections that these high quality waters have and understand how and why they support high quality waters
  4. Identify areas where existing protection programs are not likely to be effective

5. Identify voluntary mechanisms and incentives which can improve protection where needed
6. Obtain resources to implement voluntary approaches
7. Provide technical assistance
8. Publicize successful voluntary efforts/recognize successful individuals and institutions
9. Monitor to assess success
10. Apply adaptive management to make improvements where needed

- **Enforcement of existing regulations**: The existing Washington Water Quality Standards (WQS) regulations contain anti-degradation provisions that should serve to protect high quality waters. Long term benefits of protecting high quality waters through enforcement of existing laws will likely outweigh the short term costs to stakeholders of such enforcement, though a cost-benefit analysis would be difficult.
- **New Regulations**: New regulations to protect high quality waters (that go beyond the anti-degradation provisions in WQS regulations) could work in theory but probably not in practice. It would require a combination of legislative action, technical resources, and administrative resources. Costs could be significant, and the political will to legislate, fund, and implement such an initiative would be difficult to muster as long as other alternatives can demonstrate progress.

  Analysis: The state has anti-degradation provisions in its existing WQS regulations and is proposing revisions to these regulations. The agency certainly would want to complete its current revision of WQS/anti-degradation before considering further changes. Above all, a new regulatory initiative in this area would not be consistent with the Chehalis Basin Partnership's preference for voluntary efforts.

Analysis:

Cost Effectiveness: Generally the most cost effective strategy and therefore the highest priority should be to identify areas of high water quality/habitat value and to protect them from further deterioration.

Political/Policy Factors: Some individuals have perceived the identification and subsequent protection of their lands as an infringement of their rights. They fear that this identification and protection will limit what they can do on their land. This is a legitimate concern, which must be addressed as a key element in any successful effort.

Identifying areas where water quality is high is challenging because there are limited funds for water quality monitoring and because much of the monitoring is driven by concerns about poor water quality. As a result, existing data tends to document water quality problems. A water quality monitoring program designed to represent the entire basin would be expensive and could compete for clean up and prevention efforts for funding. Nevertheless such

an effort is essential to monitor trends and measure success.

Technical Issues: Design of comprehensive monitoring to support a good water initiative would require effort, but there are ample precedents available and some monitoring efforts underway. These could form the basis for a "Comprehensive Chehalis Basin Monitoring Program."

Proactive Voluntary Compliance: Support for a proactive voluntary approach is consistent with enforcement of existing regulations. In fact, appropriate enforcement of regulations is essential to the success of a voluntary approach. Most individuals will not make voluntary changes to protect the environment at their own expense if they believe that others who are subject to legal or regulatory pollution abatement requirements are allowed to violate them with impunity.

Recommendations:

Reject the status quo approach because it does not provide sufficient focus on the protection of high quality waters.

Reject the additional regulatory approach as inconsistent with the Chehalis Basin Partnership's goals and objectives, too costly, lacking in public acceptance, inconsistent with Ecology's current revision of their anti-degradation policy, and politically unrealistic.

Implement the proactive voluntary approach outlined above in Alternatives and as discussed further below.

Management strategy: The initial step should be to create an inventory of high quality waters — we must know where such waters are located if we are to be able to protect them. This should begin by launching a "Good Water Initiative." Select a lead entity. Begin by identifying areas of high water quality. Follow up on the information sources identified above under "Technical – Available Science" to develop and maintain a database of good waters. Expand the initiative to include other elements listed under Voluntary Approach included above in "Alternatives/Toolbox." Tap the local knowledge base and sound science to understand why certain areas support high quality waters. Coordinate with agencies involved in habitat protection by developing and implementing strategies to promote connectivity between high water quality areas.

Jurisdiction: Expand the scope of the Chehalis Basin Partnership Water Quality Committee beyond its current focus on TMDLs to add a "Good Water Initiative." The Chehalis Basin Partnership Water Quality Committee would be an ideal group to assist in developing and carrying out such an initiative. It would work closely with institutions with the authority and responsibility to protect water quality. Specific partner agencies would depend on land ownership and the actions needed to overcome threats to particular water bodies.

Policy or policies needed: At present, water quality management is driven by pollution problems that are addressed by the TMDL program. The Clean Water Act presumes that good water quality will be protected through state water quality standards programs, particularly anti-degradation. However, these provisions of the Clean Water Act have not generated programs to protect high quality waters that are as aggressive as those developed to clean up waters that are impaired. This is particularly true where the impairment results from nonpoint source pollution.

The critical first step would be to develop an inventory of such waters in the Chehalis Basin and to determine which governmental entities (local, state or federal) are responsible for and best able to provide the required protection. A second step would be to raise public consciousness regarding the importance of protecting high quality waters, and to increase its priority among governments at all levels (local, state, and federal). Subsequent steps would involve working with specific jurisdictions to strengthen protection accorded to the specific waters identified and others as discussed above under "Alternatives/ Toolbox – Voluntary Approach."

Resources/funding needed: TBD — Resources would be needed for

1. Developing a database on high quality waters
2. Assessing existing protections and developing programs to upgrade any that are deficient
3. Developing an understanding of how and why certain areas support high quality waters
4. Providing technical assistance4
5. Publicity and recognition
6. Monitor high quality waters
7. Adaptive management7
8. Overall responsibility for management of the initiative

Data and ideas to protect high quality waters are available. Resources would be needed for pulling these together into a program that would motivate people and institutions in the Chehalis Basin to support a Good Water Initiative in a meaningful way.

Unanswered Questions/Issues:

- Resources for operating the program and for developing an inventory of areas with high water quality.
- Potential success of voluntary efforts.
- Knowledge of how and why certain areas support high quality waters.
- Responsibility for carrying out the program.