

CHAPTER 6: RECOMMENDED PLAN

The plan recommendations have been developed from the analysis of alternatives presented in chapter 5. Recommendations have been selected in order to provide a basic level of service which will fulfill the goals developed by the Chambers Citizen Advisory Task Force and meet local governments' responsibility to provide service and protect public resources.

The introduction explained the basin plan's general goals and objectives, developed by local stormwater managers and revised by the citizen task force. The task force devoted considerable time and discussion to additional specific management objectives and recommendations for flooding, water quality and habitat in Chambers basin.

The plan recommendations are presented below in the same order as the problems described in chapter 5, grouped into three categories: flooding, water quality, and habitat. A summary of the county and citizen task force's objectives precedes each group of recommendations. The recommendations are each keyed to problems described in chapter 5, and drawings throughout the chapter show the specific locations of recommended solutions. The estimated costs include new activities and activities that could be covered by existing programs and budgets; the tables at the end of chapter 7 break out the additional costs for new items.

6.1 FLOODING RECOMMENDATIONS

The flooding recommendations are designed to meet the following objectives. The Chambers Task Force and staff recommended that:

- Chambers Ditch should be managed primarily for flood control to protect property, but protecting water quality and preventing impacts to downstream habitat are also important goals.
- Local governments' primary responsibility should be preventing roads and structures from flooding in order to protect public health and safety.
- Chambers Ditch should be managed to meet local flood protection standards for new development.
- Any higher level of flood protection for the ditch should be the responsibility of the Chambers Drainage District.
- The drainage district should not be responsible for funding increased maintenance caused by development outside of the district boundaries.

RECOMMENDATION 6.1.1 The Chambers Drainage District should expand its boundaries and continue to maintain Chambers Ditch to prevent flooding from existing and future 100-year flows, with assistance from Thurston County.

Problems Addressed: 5.1.1-Flooding on Chambers Ditch

Description: This recommendation includes four basic elements: recommended maintenance; definition of roles and responsibilities; funding; and implementation.

1) Recommended Maintenance:

- Remove brush and debris frequently
- Remove accumulated sediments periodically
- Install trash racks if needed

Chambers Ditch would be mowed or brushed and the debris removed frequently, from Chambers Lake at least as far as Yelm Highway. Accumulated sediments would be removed periodically to maintain existing capacity. If the ditch culverts continue to clog, trash racks would be installed on them. Guidelines would be developed to insure that maintenance activities comply with environmental regulations. Modeling indicates that this level of regular maintenance will be sufficient to contain current and future 100-year flood flows within the existing ditch and wetlands, without major ditch improvements such as enlargement.

2) Definition of roles and responsibilities:

- Drainage district maintains ditch from lake at least to Yelm Highway
- Drainage district or landowners may maintain below Yelm Highway
- County assists with developing maintenance guidelines and performs surveys, engineering, monitoring, culvert improvements, etc.

The Chambers Drainage District would continue to maintain the ditch at least to Yelm Highway, which would accomplish the county's stormwater management goals for preventing the flooding of roads, driveways and homes depicted in the maps in chapter 5. The drainage district or individual landowners may elect to maintain the ditch farther south, which could reduce frequent flooding of some pastures and wetlands between Yelm Highway and Rich Road. Maintenance would comply with all relevant local, state and federal permit requirements, regardless of who maintains the ditch.

Thurston County would provide assistance to the drainage district for developing the maintenance guidelines. The county would conduct periodic surveys of the ditch to monitor its capacity, and would inform the drainage district if the ditch starts to fill in. The county would monitor the ditch and wetlands to insure that new ditch runoff does not increase downstream

flooding or enlarge the wetlands. If monitoring indicates that stormwater runoff from new development enlarges wetlands or causes downstream impacts in the future, the county would take remedial action such as additional upstream detention.

The drainage district would take the lead in implementing minor ditch improvements. The county would take the lead on improvements to county culverts on the ditch, and would provide technical assistance to the drainage district, including hydrologic and hydraulic analyses and stormwater engineering. Improvements currently needed may include installing trash racks on culverts to prevent road and driveway crossings from flooding.

The drainage district would obtain easements along the unsecured sections of the ditch from the lake at least to Yelm Highway, with assistance from the county. The county would provide assistance to the drainage district for estimating the program costs and preparing the necessary documents to expand.

3) Funding:

- Drainage district assesses all landowners within the ditch's contributing area
- County and cities fund district maintenance activities that accomplish county or city stormwater management objectives
- County and cities contribute funds by reducing the stormwater rates for drainage district ratepayers

The drainage district would seek to increase revenues by ensuring that all landowners in the ditch's contributing area pay drainage district fees. This would require the district to expand its boundaries and, if needed, increase its rates in order to finance the recommended program.

The county and city stormwater utilities would provide financial assistance to the drainage district for expanding the ditch maintenance activities that accomplish county and city stormwater management goals. The cost of providing additional benefits would be borne by the drainage district. The county would also provide direct technical assistance for expanding the district boundaries.

The county and cities' financial contribution would be provided in the form of a reduced stormwater rate, offset by an equal increase in drainage district fees (the county rate ordinance, resolution 9345, already requires this). The net impact would be no increase in rates paid by landowners. Olympia does not currently reduce the stormwater rate for drainage district customers within its stormwater utility, so a new arrangement would have to be worked out for Olympia to support its share of the district's activities.

4) Implementation:

- Drainage district expands its boundaries

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- If drainage district expansion fails, the county maintains the ditch from the district boundary to Yelm Highway
- The county takes remedial action if stormwater runoff impacts areas below Yelm Highway

The Chambers Drainage District would expand its boundaries to encompass all the land draining to the ditch at least as far south as Yelm Highway. The district may elect to expand farther south and provide additional maintenance south of Yelm Highway. The district boundaries could be expanded by either a majority vote of the landowners or an act of court, in accordance with the state's drainage district laws (RCW 80.06).

If the district chooses not to pursue expansion, or if expansion fails to be approved, the county would take responsibility for maintenance outside the district's boundary. The county would maintain the ditch to meet current standards, which may provide a lower service level than the drainage district provides. The county would only maintain the ditch south of Yelm Highway or take other remedial actions if roads, homes or public health and safety were threatened, or if monitoring showed that new runoff causes additional impacts below Yelm Highway.

Benefit: Flooding of roads and homes near the Chambers Ditch would be reduced or eliminated. Water quality contamination resulting from flooding would be reduced.

Estimated Cost \$190,977 - Initial start-up: maintenance guidelines, surveys, engineering, easements, trash racks
\$(96,837) - Low-end start-up estimate, assumes 80% of easements conveyed at no charge & reduced staff time for negotiating easements
\$ 2,500 - Annual

Participants: Chambers Drainage District, Thurston County, Olympia, Lacey

RECOMMENDATION 6.1.2 The Chambers Drainage District and the local jurisdictions should educate homeowners on the proper disposal of yard waste.

Problems Addressed: 5.1.1-Flooding on Chambers Ditch
5.1.2-Flooding on Wiggins Ditch
5.1.4-Local Flooding Near Chambers Ditch

Description: The Chambers Drainage District and the local jurisdictions would cooperatively distribute information to homeowners on proper disposal of yard waste. Yard waste is a significant cause of clogged culverts and flooding on Chambers and Wiggins ditches and in neighborhood stormwater ponds. The education would be targeted at people who own

property adjacent to drainage ditches and around stormwater ponds. Information would be distributed through a variety of means, including homeowners association meetings, drainage district mailings, and possibly neighborhood workshops. Information could also be included in waste hauler billings. Most of the printed materials have already been prepared by various groups including the county solid waste utility and the Thurston County Master Gardeners Foundation. Most of the workshops would be included in the solid waste utility's existing work program and budget, requiring no additional revenues.

Benefit: Local flooding problems due to clogged culverts would be reduced at several locations. Chambers and Wiggins ditches would require less frequent maintenance because they would not fill up with debris as quickly. Proper yard waste disposal offers additional benefits such as extending the life of county solid waste facilities.

Estimated Cost \$1,040 (could be accomplished within existing budget and work plan)

Participants: Chambers Drainage District, Thurston County, Olympia, Lacey

RECOMMENDATION 6.1.3 Olympia and Thurston County should install larger culverts on Wiggins ditch, and increase maintenance frequency to provide 100-year flood protection.

Problems Addressed: 5.1.2-Flooding on Wiggins Ditch

Description: The existing 1.5' and 2.5' diameter culverts on Wiggins ditch between Morse-Merryman Road and the confluence with Chambers Ditch would be replaced with 3' and 4' diameter pipes, trash racks would be installed, and 570' of 3' diameter pipe would be installed just north of Herman Road. In addition, Olympia and Thurston County would increase the frequency at which they inspect and maintain the ditch (see figure 6-1).

Benefit: Flooding from clogged culverts would be reduced. Flooding of Wiggins Road from the existing and future 25-year event would be eliminated and flooding from the 100-year event would be substantially reduced. Water quality contamination from flooded roadways would be reduced.

Estimated Cost \$238,623

Participants: Olympia, Thurston County

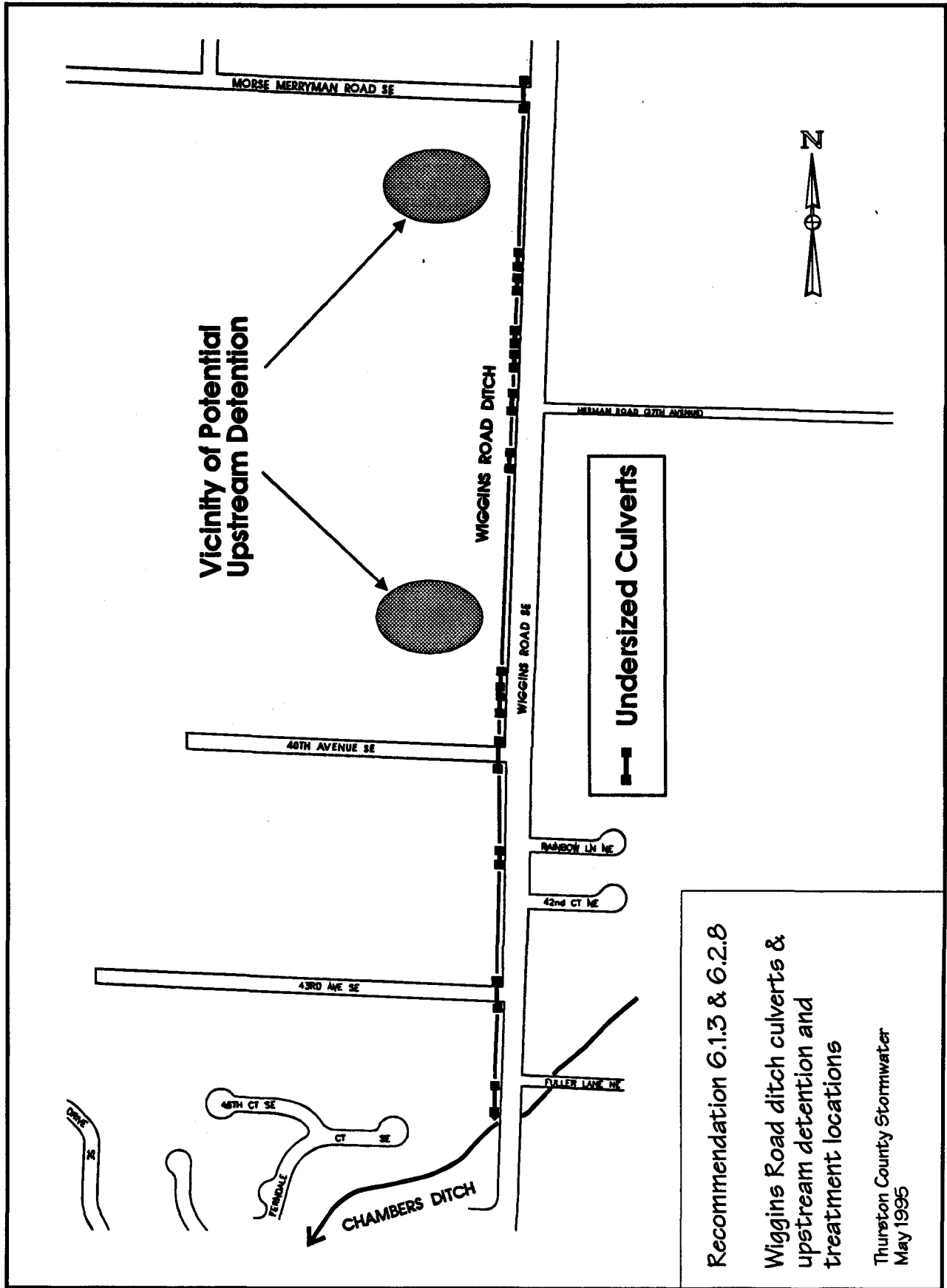


Figure 6-1 Proposed Wiggins Road improvements

RECOMMENDATION 6.1.4 Thurston County and Olympia should improve and expand the Wilderness drainage system that discharges to the Boulevard Road pond, and prohibit new discharges to the drainage system.

Problems Addressed: 5.1.3-Flooding on Boulevard Road

Description: The drainage system that discharges from Wilderness to the pond on Boulevard Road would be improved and enlarged to accommodate the 100-year flows, which would meet the drainage standards for new development (there are no standards for retrofitting existing systems). Improvements would include:

- The ditch along Boulevard Road would be armored or a storm drain system installed to withstand 100-year flows without erosion.
- The culvert under Wilderness Drive at Boulevard Road would be enlarged.
- The pond in Wilderness subdivision would be enlarged to 399,000 cubic feet.
- An overflow pipe would be installed under Boulevard Road with a control structure to meter overflows from the Wilderness pond into the pothole west of Boulevard Road.
- The pothole west of Boulevard Road would be enlarged.

In addition to these improvements, new developments in the sub-basin would be prohibited from discharging to the Wilderness pond drainage system (see figure 6-2).

Benefit: The existing and future flooding problems at Boulevard Road and Wilderness Drive would be substantially reduced or eliminated. Maintenance costs associated with the Wilderness drainage system would be reduced. Water quality contamination caused by road flooding would be reduced or eliminated.

Estimated Cost \$397,514

Participants: Olympia, Thurston County

RECOMMENDATION 6.1.5 Thurston County should construct a stormwater detention pond in Wilderness, on community open space land south of Limerick Street.

Problems Addressed: 5.1.5-Flooding on Wilderness Drive
5.1.3-Flooding on Boulevard Road

Description: A stormwater detention pond would be constructed on vacant community open

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space land south of Limerick street. The stormwater system that drains Wilderness Court, Highline Drive and Wilderness Loop would be routed to the new pond, which would provide at least 47,000 cubic feet of capacity. (See figure 6-2.)

Benefit: Road flooding from the 100-year event would be reduced or eliminated at this location. If the pond is built in combination with the recommended improvements to the Boulevard Road pond, flooding of Boulevard Road from the 100-year event would also be eliminated. Water quality contamination from flooded roadways would be reduced.

Estimated Cost \$119,040

(96,496 - Low-end estimate, assumes land conveyed by Homeowner Association at no cost.)

Participants: Thurston County

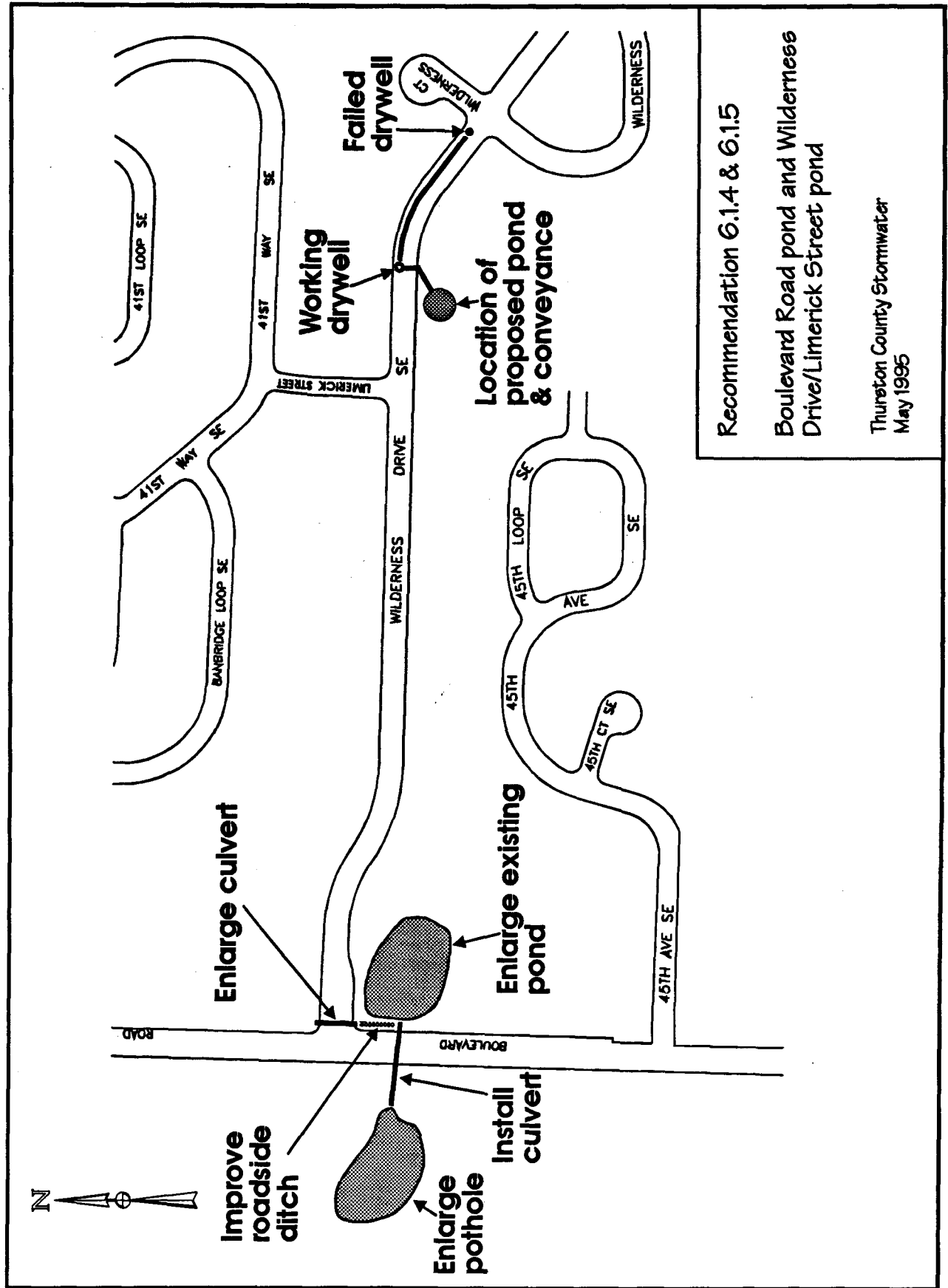


Figure 6-2 Proposed Wilderness area drainage improvements

RECOMMENDATION 6.1.6 Existing inadequate and failing stormwater facilities that discharge to Chambers Ditch should be enlarged or rebuilt to reduce flooding and peak flows, where possible.

Problems Addressed: 5.1.4-Local Flooding Near Chambers Ditch

5.1.1-Flooding on Chambers Ditch

Description: Existing stormwater facilities that cause flooding, peak flow or water quality problems due to inadequate capacity or poor condition would be enlarged or rebuilt. Infiltration and treatment would be maximized. Problem facilities that would be improved under this recommendation include:

- 60th Loop
- Donnelly Drive
- Glenmore
- Rainbow Lane
- 42nd Avenue

These facilities could be enlarged to provide 5-30% more capacity. Other facilities would be evaluated and scheduled for remedial maintenance, if needed, as part of the county's stormwater facility inspection and maintenance program.

Benefit: Local road flooding would be reduced. Water quality degradation from road flooding and from untreated discharges to Chambers Ditch would be reduced or eliminated. Flows that cause flooding along Chambers Ditch would be reduced slightly.

Estimated Cost \$185,850

Participants: Olympia, Thurston County

RECOMMENDATION 6.1.7 Thurston County should construct a stormwater detention pond adjacent to Ferndale Court immediately north of Wilderness Drive.

Problems Addressed: 5.1.4-Local Flooding Near Chambers Ditch
5.1.1-Flooding on Chambers Ditch

Description: The culvert under Ferndale Court at 46th Court SE would be enlarged and a stormwater detention pond would be constructed on an open space tract owned by the homeowner association, north of Wilderness Drive. The pond would provide 2 acre-feet of stormwater detention and treatment, to accommodate flows from north of Ferndale Court. (See figure 6-3.)

Benefit: Road flooding from the 100-year storm would be reduced or eliminated at the low spot on Ferndale Court and 46th Court. Peak flows that cause flooding along Chambers Ditch would be reduced slightly. Water quality degradation from untreated stormwater discharge to Chambers Ditch would be reduced.

Estimated Cost \$233,724
(211,181 - Low-end estimate, assumes land conveyed by Homeowner Association at no cost.)

Participants: Thurston County

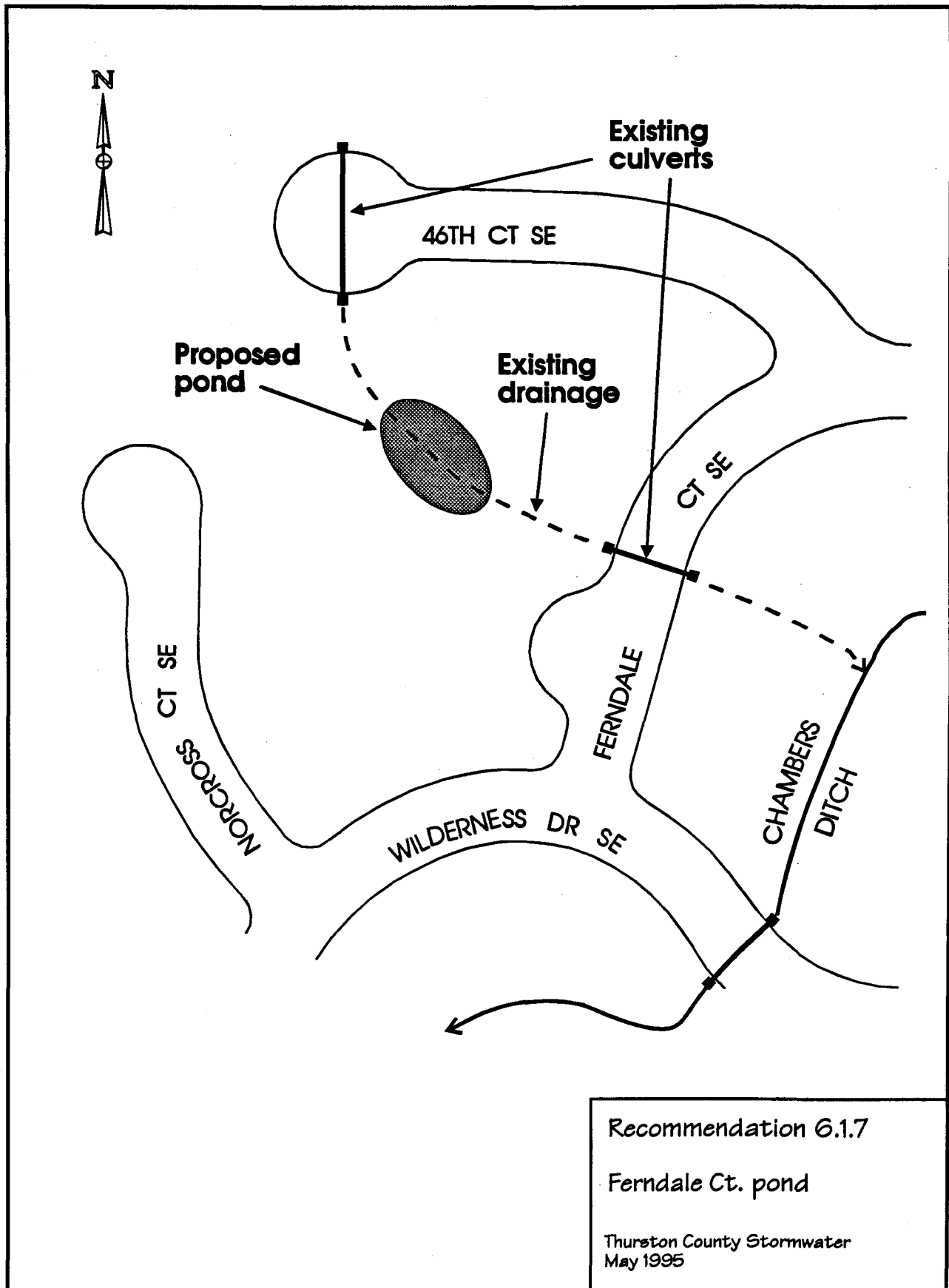


Figure 6-3 Proposed Ferndale Court stormwater detention pond

RECOMMENDATION 6.1.8 Thurston County should improve the hydrological model of the South Tributary

Problems Addressed: 5.1.6-Future Flooding in Southern Chambers Basin

Description: Additional stream flow data would be collected from several locations along the South Tributary. The data would be used to refine the calibration of the existing hydrologic model of southern Chambers basin. Future growth scenarios would be modeled to verify the initial results. Additional recommendations might be developed based on the results of the hydrologic modeling.

Benefit: The potential for future flooding, water quality and habitat problems from development in the south basin would be reduced.

Estimated Cost \$20,000

Participants: Thurston County

6.2 WATER QUALITY RECOMMENDATIONS

Water quality recommendations are based on the following objectives. The Chambers Task Force and staff recommended:

- Solutions to water quality problems should focus on eliminating known pollution sources, and costly treatment facilities should only be considered as a last resort, if monitoring shows that other measures have been ineffective.
- Direct, uncontrolled stormwater discharges into the basin's lakes, streams and ditches should be discontinued when feasible.
- Where elimination of direct discharge is not feasible, alternatives including source reduction, source controls, structural best management practices or treatment should be applied.
- The water quality of stormwater discharges should be monitored.

RECOMMENDATION 6.2.1 Thurston County Health Department should conduct septic system surveys of residential areas suspected of containing failing septic systems.

Problems Addressed: 5.2.1-Fecal coliform contamination of Herman Road ditch and Chambers Ditch

5.2.3-Fecal coliform contamination of Wilderness drainage ditch

5.2.4-Fecal coliform contamination of Chambers Ditch at Yelm Hwy

5.2.6-Fecal coliform contamination of Wilderness Drive outfall

5.2.7-Fecal coliform contamination of Chambers Creek at Rich Road

5.2.8-Fecal coliform contamination of Chambers Creek mouth

5.2.12-Fecal coliform contamination of Ward Lake

Description: Local jurisdictions would contract with the Thurston County Health Department to conduct a house-to-house survey of on-site septic systems in neighborhoods suspected of having leaking septic systems. The septic survey would use dye-tracing techniques developed previously. Targeted areas would include:

- Mobile home parks on Herman Road
- Wilderness subdivision
- Del Ridge subdivision
- Glenmore subdivision
- South end of Ward Lake

The Wilderness septic survey would start with homes adjacent to Chambers Ditch and stormwater systems that drain into the ditch. Houses farther away from the drainages would be surveyed if the initial surveys failed to locate the problem sources. Failing septic systems would be scheduled for repair or replacement. Owners of failing systems would be eligible for low-interest loans to make the needed repairs.

Estimated Cost \$108,000

(66,000 - Low-end estimate, assumes lower cost per house and Del Ridge not feasible to survey.)

Participants: Olympia, Lacey, Thurston County

RECOMMENDATION 6.2.2 Local jurisdictions should present septic system maintenance training workshops and informational materials for homeowners in Chambers basin.

Problems Addressed: 5.2.1-Fecal coliform contamination of Herman Road ditch and Chambers Ditch
5.2.3-Fecal coliform contamination of the Ferndale ditch
5.2.4-Fecal coliform contamination of Chambers Ditch at Yelm Hwy
5.2.6-Fecal coliform contamination of Wilderness Drive discharge
5.2.8-Fecal coliform contamination of Chambers Creek
5.2.11-Fecal coliform contamination of Ward Lake at 42nd Avenue outfall

Description: The local jurisdictions would present neighborhood training workshops on septic system maintenance, and provide printed informational materials on septic maintenance. The workshops and materials have already been developed by Thurston County and an abbreviated workshop has been presented to the Wilderness Homeowners Association. The jurisdictions would pursue new avenues for disseminating septic maintenance information, such as providing information packets to new homeowners and distributing materials through septic pumping businesses. Education efforts would be targeted at the following neighborhoods:

- Herman Road mobile home parks
- Wilderness subdivision
- Del Ridge subdivision
- Glenmore subdivision
- Ward Lake

Benefit: Water quality contamination due to failing or poorly maintained septic systems would be reduced at numerous locations throughout the basin.

Estimated Cost \$16,067

Participants: Olympia, Lacey, Thurston County, WSU Cooperative Extension

RECOMMENDATION 6.2.3 Lacey should build a stormwater treatment facility on Herman Road east of Chambers Ditch, if needed.

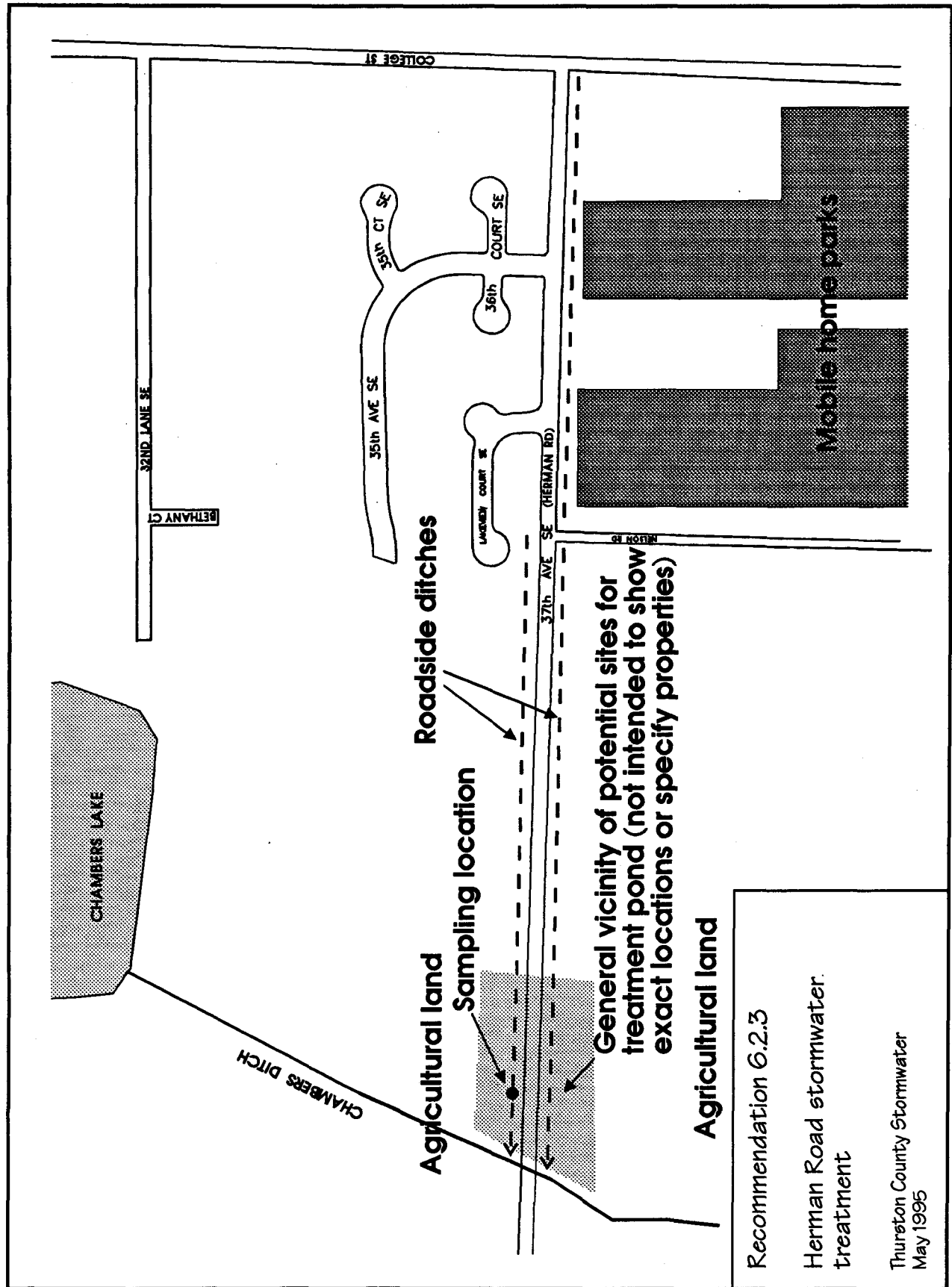
Problems Addressed: 5.2.1-Fecal coliform, nutrient and sediment contamination of Herman Road ditch

Description: A phased approach would be implemented to reduce contamination of runoff in Herman Road ditch. First, the mobile home parks on Herman Road would be investigated for leaking effluent, and any necessary repairs would be made. Second, farm plans would be developed and implemented for agricultural land draining to the ditch. Finally, the runoff would be sampled again, and a wet pond or artificial wetland would be constructed on Herman Road east of Chambers Ditch to treat stormwater runoff in the roadside ditch only if it was still contaminated. A roadside swale may also be installed. (See figure 6-4.)

Benefit: Water quality of stormwater runoff in the roadside ditch, which currently fails state standards for surface waters, would improve substantially. Water quality improvements would also benefit downstream fish habitat.

Estimated Cost \$216,439 (Treatment pond only if needed; sampling included in monitoring budget)

Participants: Lacey



RECOMMENDATION 6.2.4 The Thurston Conservation District should work with farm owners to develop conservation plans for farms along Chambers Ditch, Wiggins ditch, Chambers Creek and the South Tributary

Problems Addressed: 5.2.1-Fecal coliform and nutrients in Herman ditch and Chambers Ditch
5.2.2-Fecal coliform and nutrients in Wiggins ditch
5.2.7-Fecal coliform and nutrients in Chambers Creek at Rich Road
5.2.8-Fecal coliform and nutrients in Chambers Creek mouth

Description: The Thurston Conservation District, which assists farm owners with developing good management practices, would prioritize and work with farms along Chambers Ditch and Creek to develop conservation plans. Conservation plans would address practices with the potential to degrade water quality, such as manure storage and application, stream access for farm animals, and stormwater drainage. After conservation plans have been completed, the Conservation District would work with the farm owners to implement the BMPs.

Benefit: Fecal coliform and nutrient contamination from farm practices would be reduced at several locations in the Chambers basin.

Estimated Cost \$60,000 (up to 10 farms on extreme or high aquifer sensitive soils could be served under existing TCD grant funds)

Participants: Thurston Conservation District

RECOMMENDATION 6.2.5 Thurston County Health Department should implement a long-term water quality monitoring program for Chambers basin, and sample additional untreated stormwater discharges.

Problems Addressed: 5.2.1-Contamination of Herman Road ditch and Chambers Ditch
5.2.2-Contamination of Wiggins ditch
5.2.4-Contamination of Chambers Ditch at Yelm Highway
5.2.5-Contamination at Yelm Highway Storm Drain
5.2.7-Contamination of Chambers Creek at Rich Road
5.2.8-Contamination of Chambers Creek mouth
5.2.9-Contamination of the South Tributary
5.2.10-Contamination of Chambers and Little Chambers Lakes
5.2.11-Contamination of Hewitt Lake
5.2.12-Contamination of Ward Lake
5.2.13-Untreated Stormwater Discharges

Description: Local jurisdictions would contract with the Thurston County Health Department to sample ditch and creek and stormwater runoff at several locations as the basin plan measures are implemented. Sampling could indicate that some proposed facilities would not be needed because basin plan measures and changing land uses will affect water quality in the future. The following locations would be monitored to evaluate the effects of those changes:

- CK10-Chambers Ditch at Herman Road
- CK11-Chambers Ditch at Yelm Highway
- CK12-Chambers Ditch at Rich Road
- CK13-South Tributary
- CK14-Chambers Creek mouth
- New Station-Chambers Ditch at Wiggins Road
- Chambers Lake stations
- Hewitt Lake stations
- Ward Lake stations

In addition, the untreated stormwater discharges that drain directly to a surface water body, listed in chapter 5, would be sampled for sediment contamination and for conventional surface water parameters.

Benefit: The water quality trends in the basin would be assessed and additional action sites would be identified.

Estimated Cost \$14,800 ambient annual
2,500 ambient every 5 years
24,960 follow-up outfall sampling

Participants Olympia, Lacey, Thurston County

RECOMMENDATION 6.2.6 Local jurisdictions should educate homeowners on geese control and pursue a coordinated action program.

Problems Addressed: 5.2.1-Fecal coliform in Chambers Ditch at Herman Road
5.2.7-Fecal coliform in Chambers Creek at Rich Road
5.2.10-Fecal coliform in Chambers and Little Chambers Lakes
5.2.11-Fecal coliform in Hewitt Lake
5.2.12-Fecal coliform contamination of Ward Lake

Description: Local jurisdictions would work with the Washington Department of Fish and

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Wildlife and the U.S. Department of Agriculture Animal Damage Control Program to present homeowner associations with guidance on controlling Canada Geese populations. The jurisdictions would work together to develop a coordinated goose control program.

Benefit: Fecal coliform contamination from non-migratory geese populations would be reduced.

Estimated Cost \$4,583

Participants: Olympia, Lacey, Thurston County, DFW, USDA

RECOMMENDATION 6.2.7 Local jurisdictions should educate homeowners on home practices that protect water quality from all nonpoint sources of pollution.

Problems Addressed: 5.2.1-Nutrient contamination of Chambers Ditch below Chambers Lake
5.2.2-Nutrient and organics contamination of Wiggins ditch
5.2.4-Nutrient contamination of Chambers Ditch at Yelm Highway
5.2.10-Nutrient loading of Chambers and Little Chambers Lakes
5.2.11-Nutrient loading of Hewitt Lake
5.2.12-Nutrient loading of Ward Lake

Description: The local jurisdictions would provide homeowner education on practices to protect water quality including workshops and printed materials on: least-toxic household products such as cleansers and solvents; proper disposal of hazardous products such as paints and pesticides; and applying techniques to reduce use of chemical pesticides and fertilizers. The jurisdictions would build on existing programs, including Common Sense Gardening and moderate risk waste and household hazardous waste programs, which have already developed educational materials. Efforts would be targeted at homeowners in the following areas:

- Developments along Chambers Ditch and Creek
- Chambers and Little Chambers Lake sub-basin residents
- Ward Lake sub-basin residents
- Hewitt Lake sub-basin residents

Benefit: Water quality degradation due to household practices would be reduced at several locations throughout the basin. Nonpoint sources of pollution loading would be reduced.

Estimated Cost \$4,802

Participants: Olympia, Lacey, Thurston County

RECOMMENDATION 6.2.8 Thurston County and Olympia should construct a water quality treatment facility on Wiggins Road ditch above the confluence with Chambers Ditch, if needed.

Problems Addressed: 5.2.2-Fecal coliform and nutrient contamination of Wiggins ditch

Description: A phased approach would be implemented to reduce contamination of runoff in Wiggins Road Ditch. First, opportunities to store and treat stormwater upstream would be developed as part of the Wiggins Road flooding solutions (R-6.1.3). Second, farm plans would be developed and implemented for agricultural land draining to the ditch. Homeowner training in septic system maintenance would also be provided. Finally, the runoff would be sampled again, and Thurston County and Olympia would construct an artificial wetland to treat water in Wiggins ditch before it discharges to Chambers Ditch only if the runoff is still contaminated. The facility would be sized to treat the 6-month storm, and would be located west of Wiggins Road and just above the confluence with Chambers Ditch. (See figure 6-1.)

Benefit: Water quality degradation in Wiggins Road ditch and Chambers Ditch would be reduced.

Estimated Cost \$ 50,000 Upstream detention engineering study
387,226 (construction of treatment facility only if needed; monitoring included in 6.2.5)

Participants: Thurston County, Olympia

RECOMMENDATION 6.2.9 Thurston County should investigate sources of sediment in Chambers Creek and Ditch.

Problems Addressed: 5.2.4-High TSS in Chambers Ditch at Yelm Highway
5.3.3-Sedimentation of Chambers Creek at Rich Road

Description: County staff would conduct field reconnaissance of Chambers Creek and Ditch to identify sources of sediment in Chambers Creek at Yelm Highway and Rich Road. Recommendations would be developed to reduce sedimentation, based on the results of the survey.

Benefit: Water quality of Chambers Ditch and Creek would improve, and fish habitat in

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Chambers Creek at Rich Road would improve.

Estimated Cost \$1,401 (could be accomplished within existing budget and work plan)

Participants: Thurston County

RECOMMENDATION 6.2.10 Thurston County should monitor the stormwater discharge to Chambers Ditch at Yelm Highway and implement treatment or source controls if discharge fails standards

Problems Addressed: 5.2.5-Contaminated sediment from Yelm Highway storm drain

Description: A stormwater infiltration trench drains the area of Yelm Highway west of Chambers Ditch, and discharges to the ditch. Stormwater discharges to the ditch would be monitored. Untreated direct discharges would be eliminated, if possible. Water quality treatment facilities or other alternatives including source reduction, source controls, and other structural best management practices would be installed on all direct, untreated stormwater discharges where water quality contaminants exceed state standards and criteria, and elimination of the discharges is not feasible. (See figure 6-5.)

Benefit: Water quality degradation of Chambers Ditch would be reduced.

Estimated Cost \$68,185 (Cost of new facility only, if needed; sampling included in 6.2.5)

Participants: Thurston County

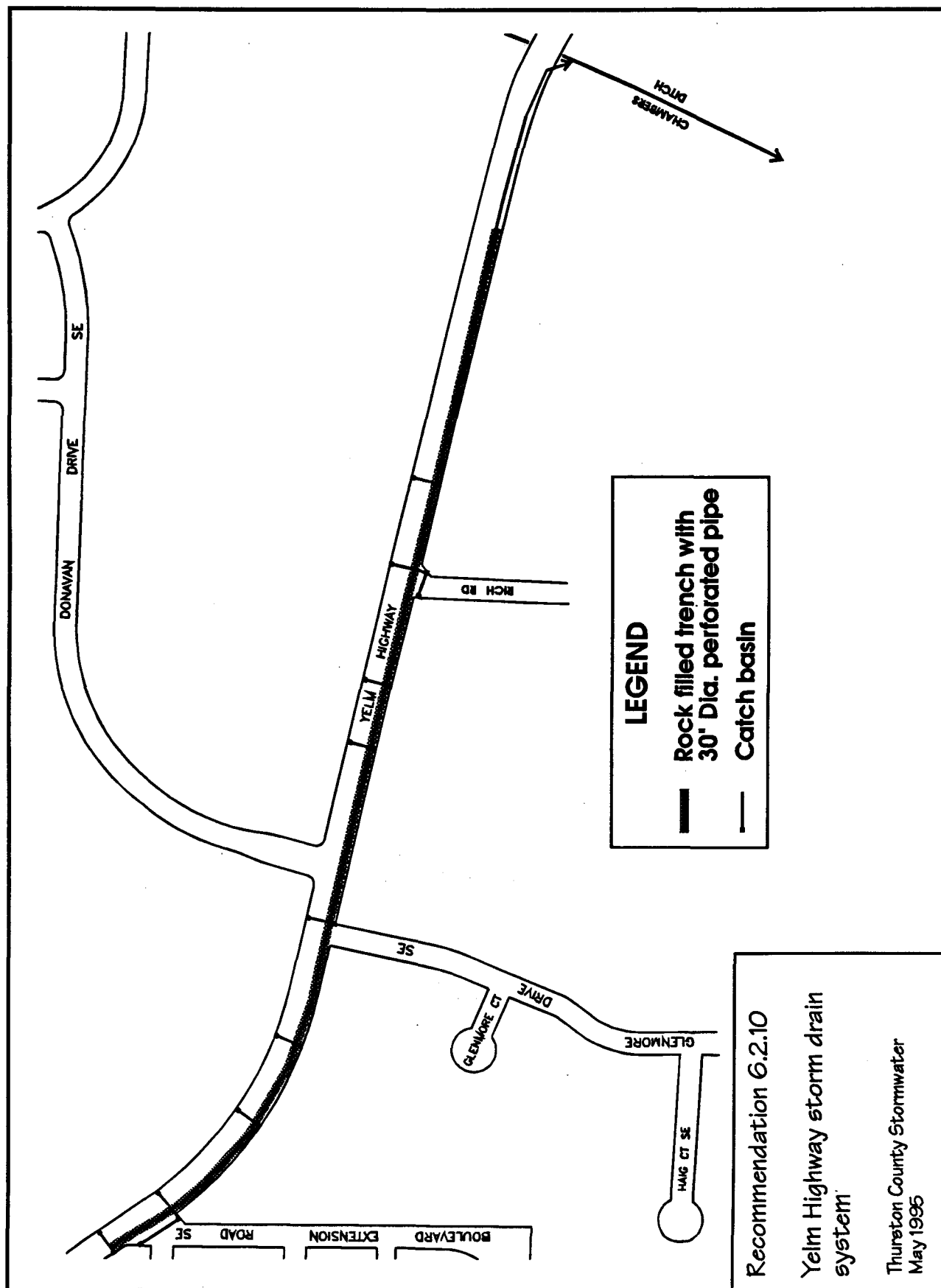


Figure 6-5 Yelm Highway stormwater system west of Chambers Ditch

RECOMMENDATION 6.2.11 Lacey should implement the remaining recommendations of the *Chambers Lake Stormwater Management Plan*.

Problems Addressed: 5.2.10-Contamination of Chambers and Little Chambers Lakes
5.3.6-Chambers and Little Chambers lake level fluctuations
5.1.1-Flooding problems on Chambers Ditch

Description: Lacey's *Chambers Lake Stormwater Management Plan* (1992) proposed remedial actions for several stormwater systems that discharge contaminated runoff to the lake (see figure 6-6). Lacey has started to implement the proposed solutions for the two highest priority outfalls: 14th Avenue SE, west of the railroad (S1); and south of 26th Loop SE, NE end of Chambers Lake (S7). The plan also proposed remedial actions for the other outfalls. Lacey would incorporate these recommendations into its stormwater management program and implement them as soon as possible. The recommendations include:

Stormdrains S4, S5, and S6: These are predominantly within Panorama City, a private development. Swales, filter strips and sediment traps would be constructed throughout the sub-basins, and source controls and education programs (such as covering garbage dumpsters, not feeding waterfowl, disposing of pet wastes, or washing cars on lawns) would be implemented. Lacey would conduct an engineering study to identify the exact locations of facilities.

Stormdrain S9: This stormdrain system drains a relatively small sub-basin (25 acres) to a pond at the outlet end of the stormwater conveyance system. The pond could easily be retrofitted to accommodate an extended detention pond, an artificial wetland, or a wet pond in order to reduce pollutant loading.

Benefit: The projects would improve water quality and fish habitat of Chambers and Little Chambers lakes, decelerate eutrophication and help preserve recreational lake uses. The projects would also help reduce lake level fluctuations that degrade habitat, and would help to prevent increased downstream flooding by preserving the lakes' stormwater detention capacity.

Estimated Cost: S4 - \$167,703
S5 - \$218,085
S6 - \$169,400
S9 - \$182,005
Total: \$737,193

Participants Lacey

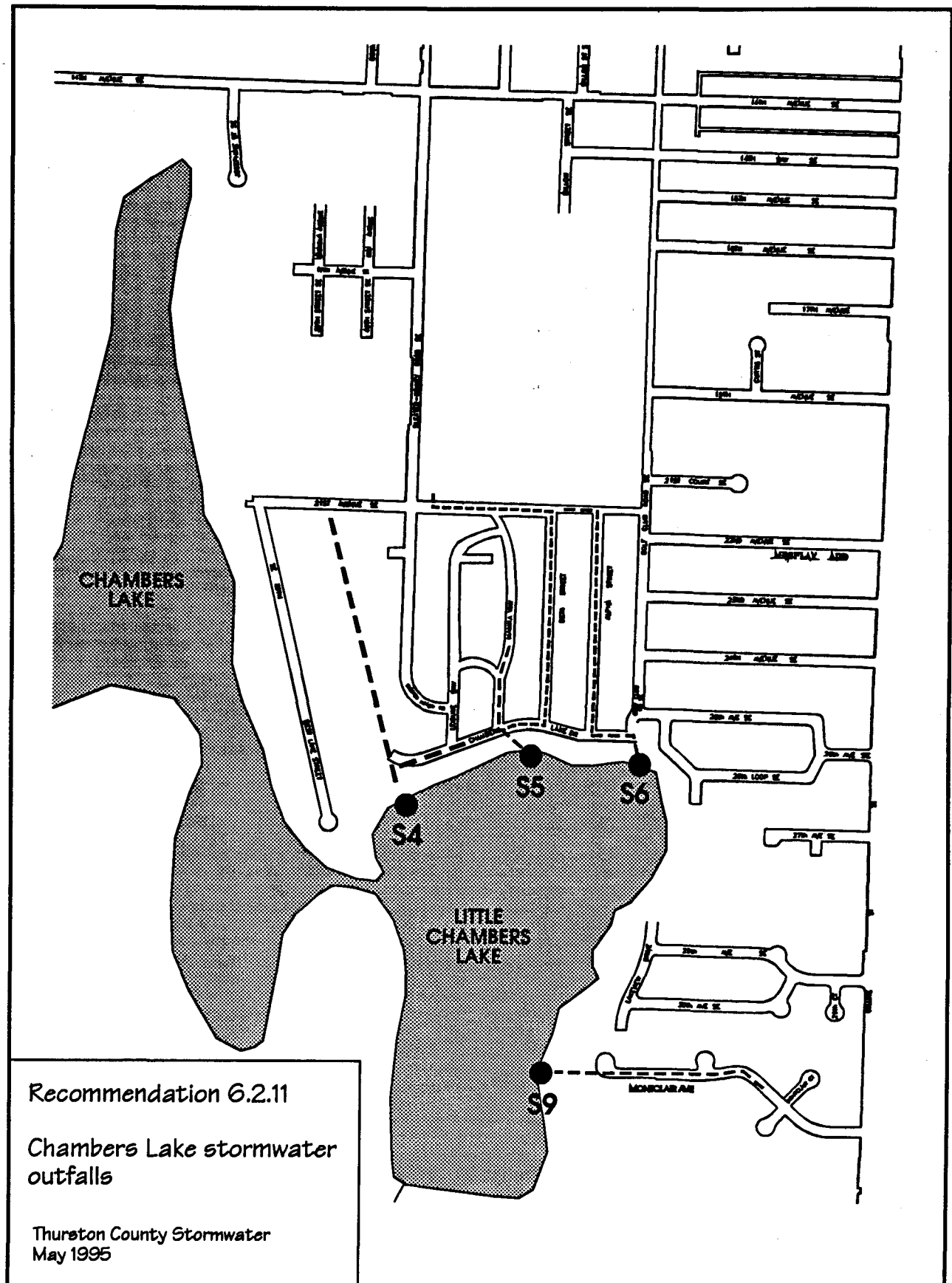


Figure 6-6 Chambers Lake stormwater outfalls

RECOMMENDATION 6.2.12 Thurston County should monitor the stormwater discharges to Hewitt Lake and implement treatment or source controls for discharges that fail water quality standards.

Problems Addressed: 5.2.11-Contamination of Hewitt Lake
5.3.5-Hewitt Lake habitat degradation

Description: Four stormwater facilities discharge directly to Hewitt Lake: two on Yelm Highway, one on Brassfield, and one on Laura Street. Stormwater discharges from these facilities to Hewitt Lake would be monitored. Untreated direct discharges would be eliminated, if possible. Solutions for problem discharges would use a phased approach consisting of three basic steps: 1) maintenance of the facilities would be increased; 2) additional monitoring would be conducted, and; 3) additional solutions would be developed if needed.

Additional solutions could include water quality treatment facilities and other alternatives such as source reduction, source controls, and other structural best management practices. Additional measures would be implemented for all direct, untreated stormwater discharges where water quality contaminants continue to exceed state standards and criteria, and elimination of the discharges is not feasible. Long-term monitoring would be incorporated into the remediation program to determine the effectiveness of management measures. Additional lake studies would be initiated if stormwater monitoring failed to identify the causes of algae blooms and nutrient enrichment in the lake.

Benefit: Water quality degradation of Hewitt Lake would be reduced.

Estimated Cost \$390,000 (Construction of treatment facilities only, if needed; monitoring included in 6.2.5)

Participants: Thurston County

RECOMMENDATION 6.2.13 Thurston County should monitor the stormwater discharges to Ward Lake and implement treatment or source controls for discharges that fail water quality standards.

Problems Addressed: 5.2.12-Contamination of Ward Lake
5.3.5-Ward Lake habitat degradation

Description: Two stormwater facilities discharge directly to Ward Lake: one on Lakewood Drive and one at the end of 42nd Avenue SE. Samples from the 42nd Avenue outfall exhibited high

levels of toxic metals in the sediments, and fecal coliform and turbidity in the runoff. Untreated direct discharges from this outfall would be eliminated, if possible. Solutions for problem discharges would use a phased approach consisting of three basic steps: 1) maintenance of the facilities would be increased; 2) additional monitoring would be conducted, and; 3) additional solutions would be developed if needed.

Additional solutions could include water quality treatment facilities and other alternatives such as source reduction, source controls, and other structural best management practices. Additional measures would be implemented for all direct, untreated stormwater discharges where water quality contaminants continue to exceed state standards and criteria, and elimination of the discharges is not feasible. Long-term monitoring would be incorporated into the remediation program to determine the effectiveness of management measures.

Stormwater samples were not obtained from the Lakewood Drive outfall, although the outfall has a documented history of problems, including algae blooms, raw sewage spills and toxic chemical spills. The drain and outfall configuration precludes containment of spills. This outfall would be monitored and, if additional problems are documented, the discharge would be eliminated or other treatment solutions would be developed.

Benefit: Water quality degradation of Ward Lake would be reduced.

Estimated Cost \$254,600 (Construction of treatment facilities only, if needed; monitoring included in 6.2.5)

Participants: Thurston County, Olympia

RECOMMENDATION 6.2.14 Thurston County should monitor the stormwater discharges to Smith Lake and implement treatment or source controls for discharges that fail water quality standards.

Problems Addressed: 5.2.13-Untreated direct stormwater discharges

Description: Two stormwater conveyances discharges directly to Smith Lake at View Ridge Circle on the south end of Smith Lake. Stormwater discharges from the outfalls to Smith Lake would be monitored. Untreated direct discharges would be eliminated, if possible. Solutions for problem discharges would use a phased approach consisting of three basic steps: 1) maintenance of the facilities would be increased; 2) additional monitoring would be conducted, and; 3) additional solutions would be developed if needed.

Additional solutions could include water quality treatment facilities and other alternatives such as

Recommended Plan

source reduction, source controls, and other structural best management practices. Additional measures would be implemented for all direct, untreated stormwater discharges where water quality contaminants continue to exceed state standards and criteria, and elimination of the discharges is not feasible. Long-term monitoring would be incorporated into the remediation program to determine the effectiveness of management measures.

Benefit: Water quality degradation of Smith Lake would be reduced.

Estimated Cost \$222,666 (Construction of treatment facilities only, if needed; monitoring included in 6.2.5)

Participants: Thurston County

RECOMMENDATION 6.2.15 Thurston County should increase the frequency of stormwater maintenance in Chambers basin.

Problems Addressed: 5.2.5-Contaminated sediment at Yelm Highway storm drain
5.2.10-Contamination of Little Chambers and Chambers Lakes
5.2.11-Contamination of Hewitt Lake
5.2.12-Contamination of Ward Lake

Description: Thurston County currently relies on the general county road maintenance program to provide stormwater maintenance. The county would increase the frequency of maintenance in Chambers basin, especially the cleaning of storm drains, vaults and oil/water separators, mowing ditches and cleaning culverts. Increased maintenance would target facilities with known problems, including facilities with planned repairs or upgrades that have not been constructed yet.

Benefit: The risk of contamination from unmaintained stormwater systems would be reduced, especially during the first fall rains.

Estimated Cost \$16,325 (annual)

Participants: Thurston County

6.3 FISH HABITAT RECOMMENDATIONS

Fish habitat recommendations were based on the following objectives. The Chambers Citizen Advisory Task Force and staff determined that:

- Stream and ditch habitat should be managed to improve water quality, and prevent future downstream impacts to habitat in Chambers Creek below Rich Rd.
- Lake habitat should be managed to protect and enhance existing lakeshore vegetation and improve appreciation of lakes.

RECOMMENDATION 6.3.1 Thurston County should work with volunteers to replant native riparian trees and shrubs at selected problem locations

Problems Addressed: 5.3.2-Degraded Riparian Habitat on Chambers Creek
 5.3.3-Sedimentation at Rich Road
 5.2.4-Suspended sediment in Chambers Ditch at Yelm Highway
 5.2.7-High temperature and low dissolved oxygen in Chambers Creek at Rich Road

Description: Thurston County and the Conservation District would work with volunteer groups such as the interjurisdictional Stream Team to plant native shrubs and trees at selected problem sites. Some of the sites would be identified through the investigation proposed in recommendation 6.2.8. Other sites would include streambanks on Chambers Creek below the Glenmore subdivision and immediately above Rich Road.

Benefit: Chambers Creek fish habitat would improve, sedimentation would be reduced, and temperature and dissolved oxygen conditions would improve at Rich Road.

Estimated Cost \$9,076

Participants: Thurston County, Thurston Conservation District, volunteers

RECOMMENDATION 6.3.2 Thurston County should augment the gravels in Chambers Creek below Rich Road.

Problems Addressed: 5.3.3-Sedimentation at Rich Road

Description: After upstream sediment sources have been identified and controlled, Thurston County would work with volunteers to augment the gravel in Chambers Creek below Rich Road.

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New gravel would be added to the stream bed below Rich Road at a location with sufficient flow, recommended by the Department of Fish and Wildlife. The gravel would meet Washington Department of Fish and Wildlife guidelines.

Benefit: Fish habitat in Chambers Creek would improve.

Estimated Cost \$590 (could be accomplished within existing budget and work plan)

Participants: Thurston County, Thurston Conservation District, DFW, volunteers

RECOMMENDATION 6.3.3 Thurston County and the Thurston Conservation District should periodically monitor the condition of fish habitat in Chambers Creek.

Problems Addressed: 5.3.2-Degraded riparian habitat on Chambers Creek
5.3.3-Sedimentation at Rich Road

Description: Thurston County would monitor the fish habitat in Chambers Creek in order to establish baseline conditions, identify problem sites and determine trends over time. The stream would be comprehensively surveyed once every ten years, or more frequently as conditions require. Between comprehensive surveys, volunteers would conduct abbreviated surveys. All potential obstructions would be mapped and catalogued. The Department of Fish and Wildlife would review and analyze the survey results and make recommendations on stream enhancements and remedial actions.

Benefit: Habitat problems would be identified and addressed quickly, before habitat deteriorates further, ultimately benefiting fish in the creek and the Deschutes River.

Estimated Cost \$4,000

Participants: Thurston County, Thurston Conservation District, DFW, volunteers

RECOMMENDATION 6.3.4 Local jurisdictions should increase education programs for lake users and lakeshore residents.

Problems Addressed: 5.3.5-Ward and Hewitt Lake habitat degradation
5.2.10 - Little Chambers and Chambers Lakes degradation

Description: The local jurisdictions would increase education and involvement programs to encourage appreciation of the lakes, including recreational values, and increase awareness of nonpoint pollution threats. The programs would build on the successful existing Stream Team program. Activities would include a volunteer lake-watch program and educational materials for lake residents. Interpretive signs would be installed at the Ward Lake boat launch.

Benefit: Residents would take more responsibility for protecting the lakes, which would improve habitat and reduce nonpoint pollution.

Estimated Cost \$17,165

Participants: Olympia, Lacey, Thurston County