

CHAPTER 7: RECOMMENDED ALTERNATIVE - SERVICE LEVEL 1

This chapter describes specific recommendations intended to meet the service level 1 goals described in chapter 6. The recommendations are numbered and listed in the same order as the problem descriptions in chapter 4. The recommendations include nonstructural measures such as monitoring and public education, and structural measures such as stormwater treatment and detention ponds. Service level 1 also proposes completing implementation of the remaining regional nonstructural management program measures (see table 6-1).

Estimated costs include initial, planning, and final estimates. Initial estimates are based on the cost of similar facilities or programs from elsewhere in the county. Planning estimates are based on field reconnaissance and developed from unit costs for the construction line items needed for each particular recommendation. The unit costs are based on average item costs contained in bids for county road jobs in the past three years. Final estimates were determined by completed engineering studies for the proposed facilities which included detailed site investigation, or pertain to the cost of conducting an engineering study only.

7.1 WOODLAND BASIN LEVEL 1 FLOODING RECOMMENDATIONS

Recommendation WL1 Identify and rebuild the Forest Glen infiltration systems that cause flooding and install pretreatment

Description: Conduct an engineering study to identify and design solutions for the problematic infiltration systems in Forest Glen. Replace the existing problem infiltration systems with new infiltration facilities designed to meet service level 1 standards. Provide additional infiltration capacity as determined by the engineering analysis performed to in accordance with the current drainage requirements. Install pretreatment systems such as wet vaults or oil/water separators to prevent sedimentation of the new infiltration facilities.

Benefits: The project would eliminate chronic flooding and property damage around the intersection of Forestglen Court and Alderglen Drive in the Forestglen subdivision, and extend the life of the infiltration facilities.

Estimated cost: \$24,000 (Final estimate for engineering report only)
The engineering report will determine the cost of the needed improvements.

Participating jurisdictions: Thurston County

Recommendation WL3 Construct a new stormwater infiltration pond west of the School Street/Steilacoom Road intersection and connect the existing ponds to the new pond

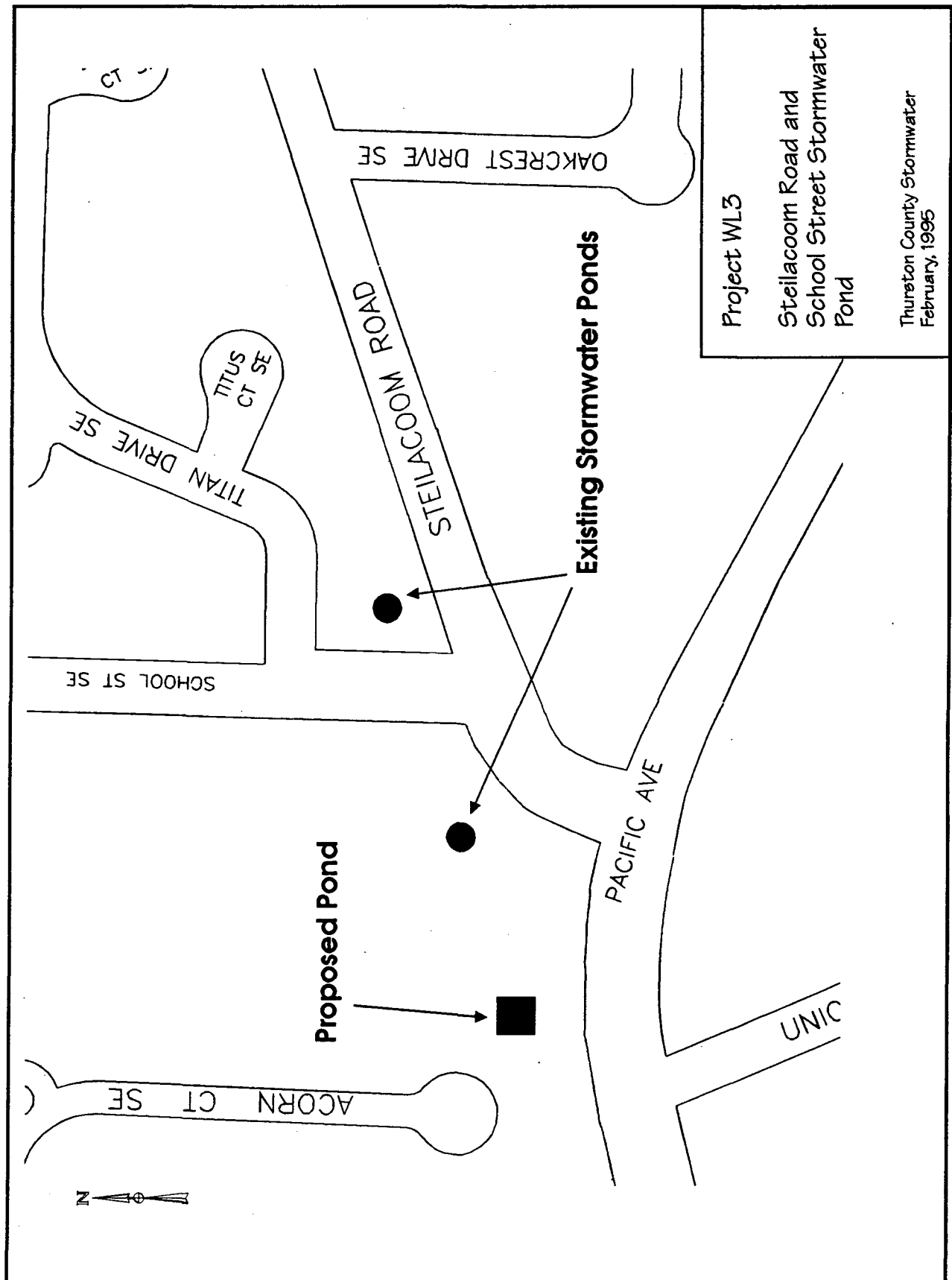
Description: Install a culvert under School Street to connect the stormwater ponds on both sides of the street, which the county owns. Construct a new infiltration pond on additional land between Acorn Court and Steilacoom Road, and connect the existing pond west of School Street to the new pond (see figure 7-1).

Benefit: The project would eliminate flooding on Steilacoom Road and increase emergency vehicle access on this arterial.

Estimated cost: \$120,000 (Final estimate)

Participating jurisdictions: Thurston County

Figure 7-1



Recommendation WL4 Rebuild and expand the capacity of the Tanglewilde Division 9 drainage system and increase the frequency of maintenance and inspection

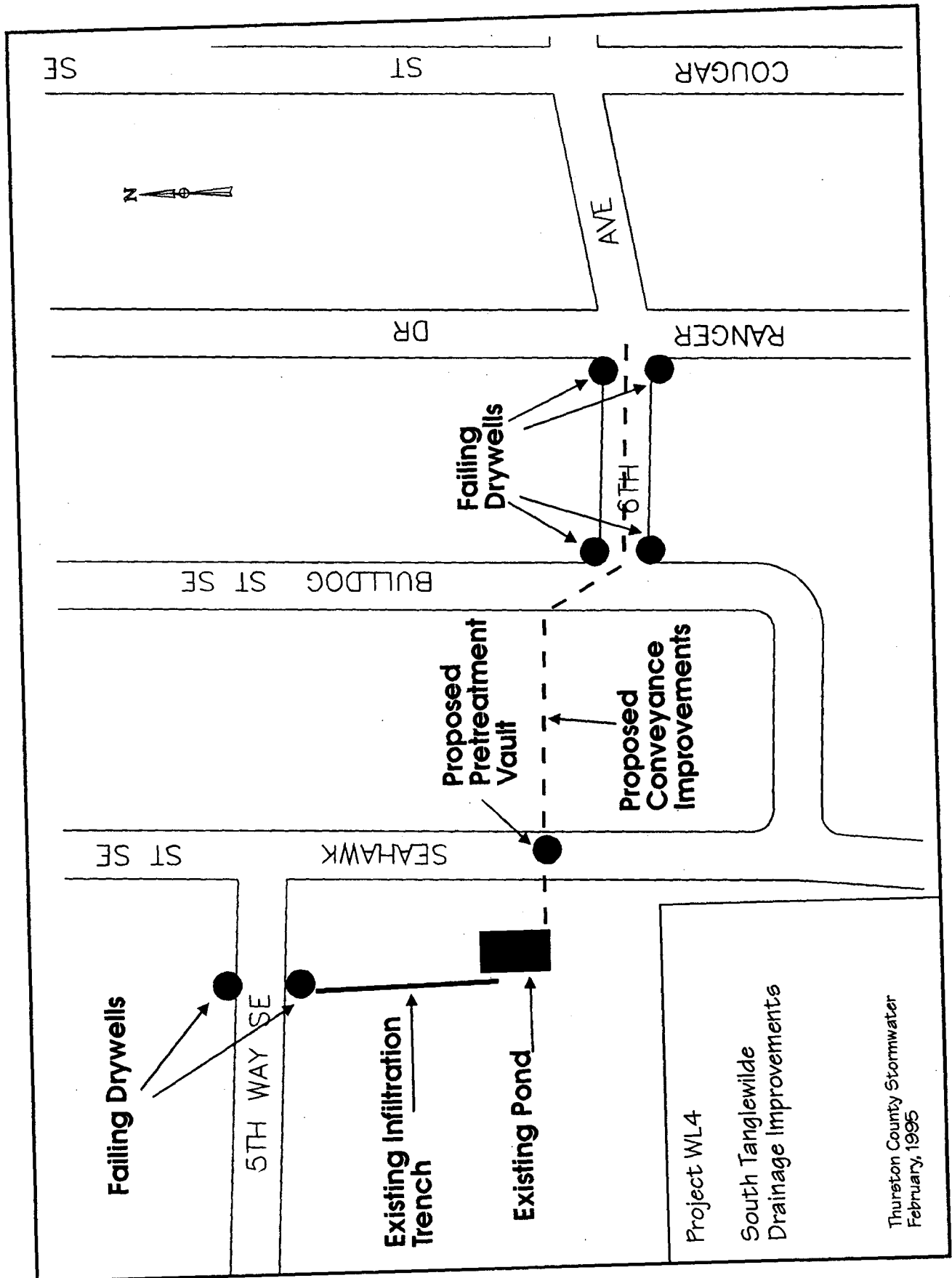
Description: Replace the failing dry wells on 6th Avenue with new infiltration facilities that include pre-treatment to prevent system clogging. Upgrade the conveyance pipe to the pond on Seahawk Street, and enlarge the pond to meet current design standards if needed (a remedial maintenance project in 1992 doubled the pond's capacity). Install pretreatment on the conveyance pipe ahead of the pond, to prevent sedimentation of the pond. Increase the frequency of catch basin cleaning and pond maintenance. Develop a maintenance agreement with the homeowner association and inspect the facilities regularly for compliance. A rise separates this area from the sub-basin served by project WL4, and prevents this area from connecting to that project (see figure 7-2).

Benefits: The project would reduce or eliminate chronic flooding of roads and homes at 6th Avenue SE and Bulldog Street SE, Ranger Drive and Cougar Street, and 5th Way and Seahawk Street, and would extend the life of the infiltration facilities.

Estimated cost: \$3,537,120 (Planning estimate)

Participating jurisdictions: Thurston County, Lacey

Figure 7-2



Recommendation WL5A Improve and expand the capacity of the drainage conveyance system serving the Husky Way area of Tanglewilde

Description: Install larger conveyance pipes in the Husky Way area of Tanglewilde. Connect the existing dry wells to the conveyance system. Connect the dry well conveyance system to the trunk line that feeds the proposed Carpenter Road Treatment Facility (WL15A) (see figure 7-4).

Benefits: The project would reduce or eliminate chronic flooding of roads and homes in the Tanglewilde subdivision south of Martin Way flood frequently, particularly at the Husky Way SE/Kinwood Road SE intersection.

Estimated cost: \$4,593,840 (Final estimate)

Participating jurisdictions: Thurston County, Lacey

Recommendation WL5B Improve and expand the capacity of the drainage conveyance system serving the Martin Way area of Tanglewilde

Description: Install larger conveyance pipes in the area of Tanglewilde that will continue to drain to Martin Way after the proposed Carpenter Road facility (WL15A) and the Martin Way outfall remedial maintenance (WL15B) projects have been constructed (see figure 7-4).

Benefits: The project would reduce or eliminate chronic flooding of roads and homes, particularly near the Carpenter Road/Martin Way intersection.

Estimated cost: \$1,277,030 (Final estimate)

Participating jurisdictions: Thurston County, Lacey

Recommendation WL6 Replace failing infiltration facilities in Tanglewilde East

Description: Conduct an engineering study to develop solutions for the 6 failing dry wells in Tanglewilde East. Options could include replacing the dry wells and provide additional infiltration capacity as determined by the engineering analysis performed to in accordance with the current drainage requirements. Install pretreatment systems such as wet vaults or oil/water separators to prevent sedimentation of the new infiltration facilities.

Benefit: The project would reduce flooding on Quinalt Drive, improve treatment of runoff and extend the life of the infiltration facilities.

Estimated cost: \$12,000 (Final estimate for engineering report only)

Participating jurisdictions: Lacey, Thurston County

Recommendation WL7 Build a stormwater swale along 15th Avenue NE, replace the culvert under Enterprise Road, and look for opportunities for additional, upstream stormwater detention

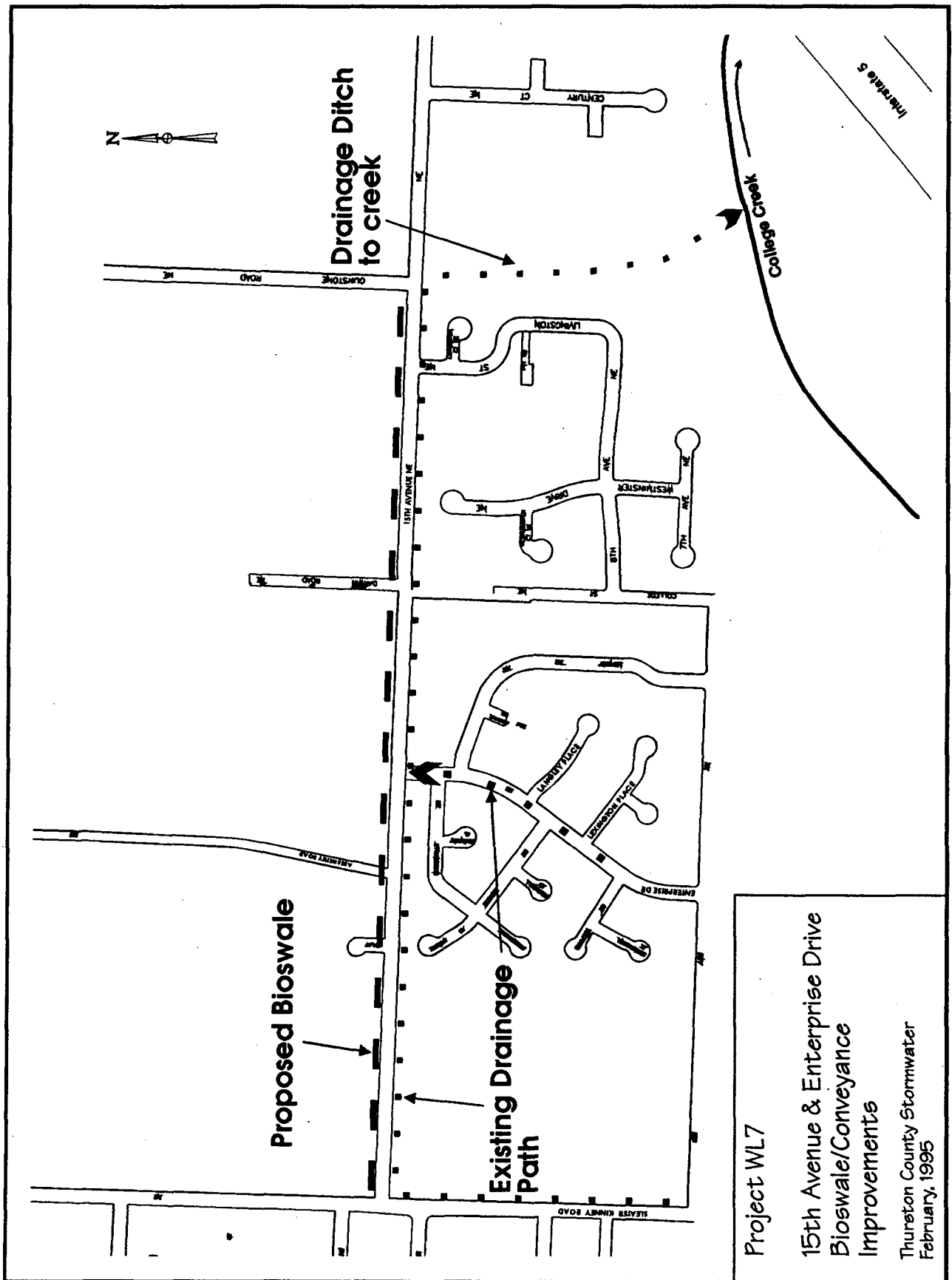
Description: Install a larger culvert on the 15th Avenue ditch under Enterprise Drive and install trash racks on all the culverts along the ditch. Increase the frequency of ditch maintenance. Acquire additional right-of-way along the north side of 15th Avenue NE and install a grassy swale, and divert some of the runoff from the ditch on the south side of the road to the swale. Prohibit new developments from discharging to the ditch and swale. Conduct an engineering study to recommend projects to detain additional runoff upstream from the ditch, and sample water quality in the ditch (see figure 7-3).

Benefits: The project would eliminate flooding at the corner of 15th Avenue and Judd Street, and provide treatment for road runoff before it drains to College Creek.

Estimated cost: \$141,720 (Planning estimate)

Participating jurisdictions: Lacey, Olympia, and Thurston County

Figure 7-3



Recommendation WL8 Connect the houses with flooded septic systems to the sewer

Description: The homes with septic systems that are vulnerable to flooding would be hooked up to the sanitary sewer system.

Benefit: Water quality contamination of Woodland Creek due to flooded septic systems below Long Lake would be eliminated.

Estimated cost: Unknown

Participating jurisdictions: Thurston County, Lacey

Recommendation WL9 Schedule the infiltration systems on 35th Avenue SE and 36th Avenue SE for remedial maintenance, and monitor the facilities to insure that they function properly

Description: Schedule the failing drainage facilities for remedial maintenance in Lacey's maintenance program. Remedial maintenance may require excavating and rebuilding the facilities. Monitor the repaired facilities to insure that they function properly, and develop additional drainage facilities if needed.

Benefit: The flooding problem at the low spots on 35th Avenue SE and 36th Avenue SE near Ida Jane Drive would be corrected.

Estimated cost: Included in Lacey's maintenance budget

Participating jurisdictions: Lacey

Recommendation WL10 Schedule the failing dry wells around Homann Drive for remedial maintenance and monitor the facilities to insure that they function properly

Description: Schedule the failing infiltration facilities for remedial maintenance in the Lacey stormwater maintenance program. Remedial maintenance may require excavating and rebuilding the facilities. Monitor the repaired facilities to insure that they function properly, and develop additional drainage facilities if needed.

Benefit: The flooding problem at Homann Drive near the intersections of 13th, 15th, 16th and 17th Avenues would be corrected.

Estimated cost: Include in Lacey's maintenance budget

Participating jurisdictions: Lacey

Recommendation WL11 Schedule the failing dry wells on Alder Drive for remedial maintenance and monitor the facilities to insure that they function properly

Description: Schedule the failing infiltration facilities for remedial maintenance in the Lacey stormwater maintenance program. Remedial maintenance may require excavating and rebuilding the facilities. Monitor the repaired facilities to insure that they function properly, and develop additional drainage facilities if needed.

Benefit: The flooding problem in the vicinity of Alder Street and Gemini Street SE would be corrected.

Estimated cost: Included in Lacey's maintenance budget

Participating jurisdictions: Lacey

Recommendation WL12 Construct a wet vault in the road right-of-way at the intersection of 49th Avenue SE and Lakemont Drive SE

Description: Construct a wet vault under the road at the intersection, connected to the drain between lots 46 and 47.

Benefit: This project would eliminate flooding of road and homes at 49th Avenue SE and Lakemont Drive, prevent untreated runoff from draining to Pattison Lake, and extend the life of the infiltration facilities.

Estimated cost: \$90,000 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation WL13A Conduct engineering studies to identify and propose solutions for repairing or replacing failing public drainage systems throughout Woodland basin in order to meet Service Level 1 standards

Description: Conduct engineering studies to identify and propose solutions for repairing or replacing the failing public drainage systems in Woodland basin which do not meet service level 1 standards, described in chapter 6. Emphasize increased maintenance of existing systems rather than new facilities whenever possible. Prioritize failing systems and develop a schedule so that all failing systems are eventually brought up to current standards for new facilities.

Benefit: Local flooding problems throughout the basin would be eliminated, and direct overflows of untreated stormwater runoff to surface water bodies would be eliminated for all but the most extreme storm events.

Estimated Project Cost: \$192,000 (Final estimate for engineering studies only)
The engineering studies will determine the cost of the needed improvements.

Participating jurisdictions: Thurston County

7.2 WOODLAND BASIN LEVEL 1 WATER QUALITY RECOMMENDATIONS

Recommendation WL14 Construct an artificial wetland treatment facility for the stormwater system at Ruddell Road near Hicks Lake

Description: Replace the existing stormwater conveyance system and construct a treatment facility for the runoff. The City of Lacey is currently designing a treatment system for this problem.

Benefit: The treatment facility would remove sediments and pollutants from stormwater contaminated with heavy metals, oil by-products, volatile organic compounds, nutrients, and elevated levels of fecal coliform prior to discharge into Hicks Lake.

Estimated cost: \$898,300 (planning estimate)

Participating jurisdictions: Lacey

Recommendation WL15A Construct a water quality treatment facility at the Thurston County gravel pit on Carpenter Road and divert runoff from the Martin Way outfall to the new facility

Description: Intercept the existing storm drain system on Husky Way and Kinwood, and divert the runoff to the Thurston County gravel pit on Carpenter Road. Build a new treatment and infiltration facility at the gravel pit. Monitor the new facility for pollutant removal and stormwater capacity (see figures 7-4 & 7-5).

Benefit: The facility would remove sediments and pollutants from runoff to Woodland Creek contaminated with phthalates, PCBs, copper, lead and zinc. Stream peak flows in Woodland Creek would be reduced and fish habitat sedimentation problems from stormwater runoff would be significantly reduced.

Estimated cost: \$2,488,350 (Final estimate)

Participating jurisdictions: Thurston County, Lacey

Recommendation WL15B Install water quality treatment improvements such as swales and vaults on the stormwater outfall at Martin Way east of Woodland Creek to treat the remaining runoff

Description: Install water quality improvements on the stormwater outfall to Woodland Creek at Martin Way. Improvements could include installing a wet vault or oil/water separator at the outfall and constructing a biofiltration swale along Martin Way between the stormwater outfall and Woodland Creek. The water quality treatment improvements would be designed to treat the remaining discharge that cannot be diverted to the Carpenter Road facility (WL15A) (see figures 7-4 and 7-5).

Benefit: Water quality of the remaining runoff discharging to Woodland Creek after construction of the gravel pit facility would improve, and fish habitat sedimentation problems from stormwater runoff would be significantly reduced.

Estimated cost: Included in existing Lacey stormwater maintenance program

Participating jurisdictions: Lacey

Figure 7-4

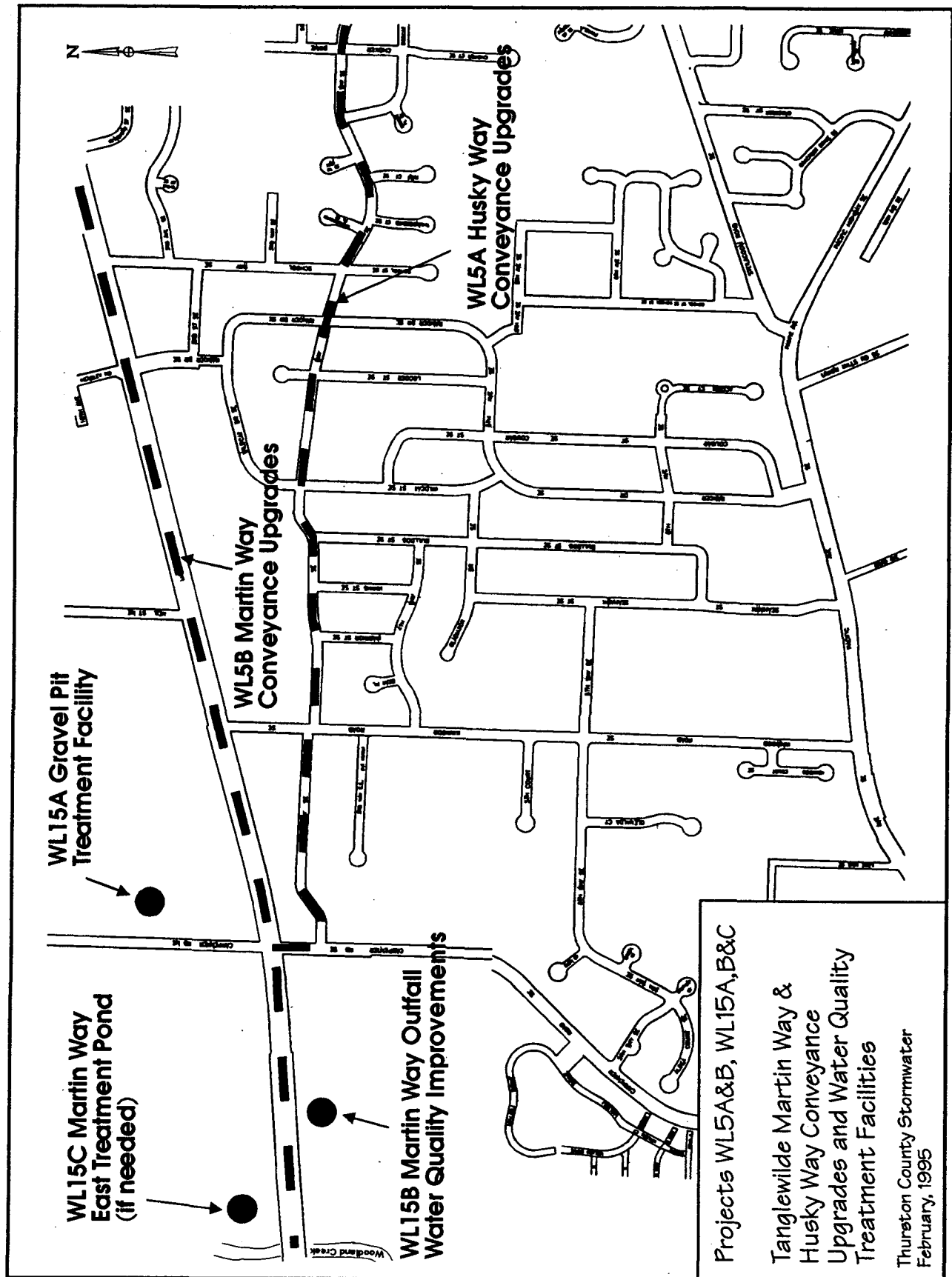
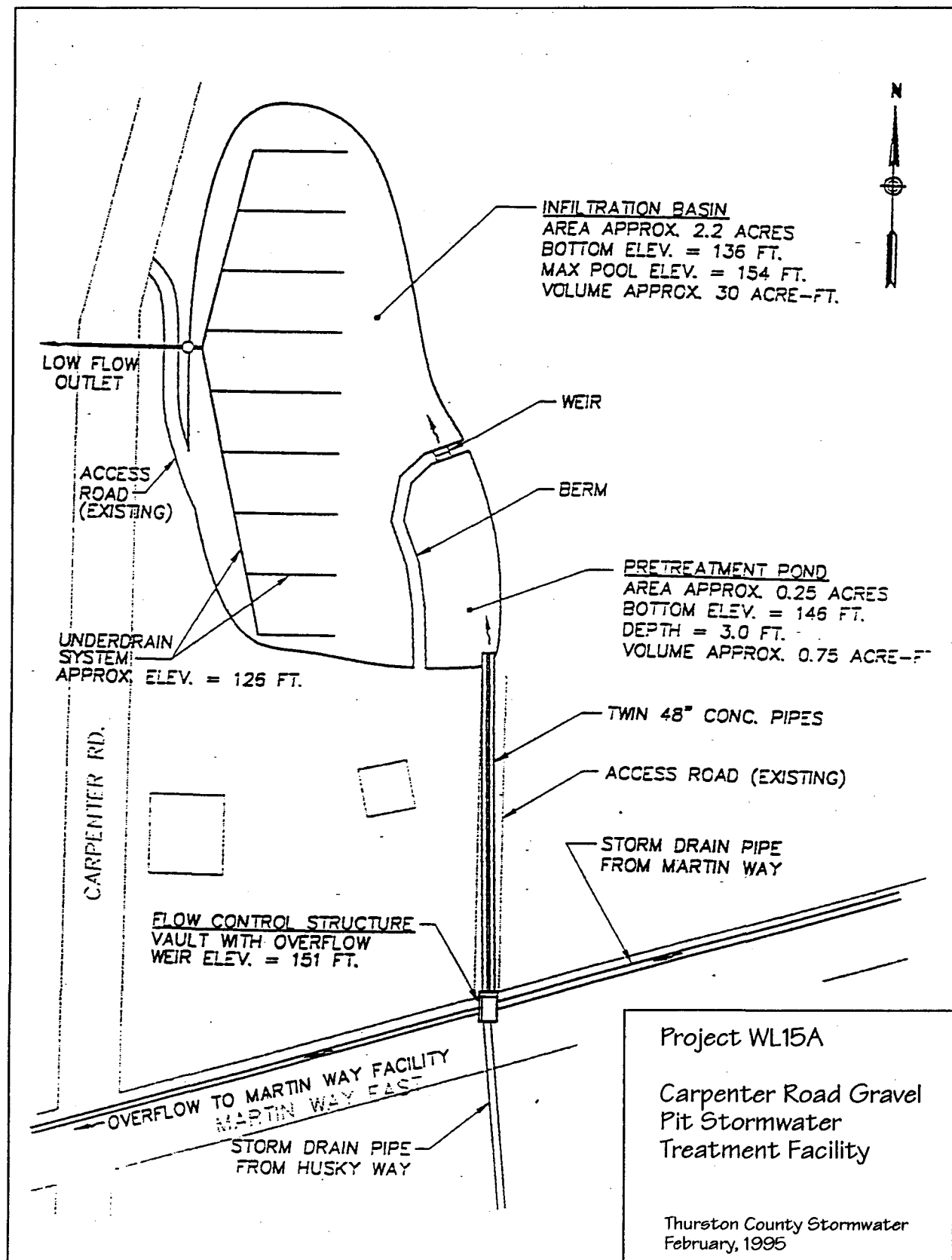


Figure 7-5



Recommendation WL15C If needed, construct a treatment and detention pond on Martin Way east of Woodland Creek to treat overflow from the Carpenter Road facility described in WL15A

Description: If the Carpenter Road facility (WL15A) proves to be too small for the flows from Tanglewilde, route the overflow back to Martin Way and construct a treatment and detention facility to treat the overflow before discharging to Woodland Creek (see figures 7-4 and 7-5).

Benefit: Stream peak flows in Woodland Creek would be reduced and water quality of runoff discharging to Woodland Creek from overflows at the gravel pit facility would improve.

Estimated cost: \$4,857,990 (Final estimate)

Participating jurisdictions: Thurston County, Lacey

Recommendation WL16 Intercept the College Creek stormwater discharge pipe and build an artificial wetland treatment system on St. Martin's property

Description: Construct a treatment facility on St. Martins campus, and reroute the existing stormwater pipe on the St. Martin campus to the new treatment facility. The city of Lacey has prepared preliminary facility designs for this site (see figure 7-6).

Benefit: The water quality of runoff contaminated with oil by-products and heavy metals discharging to College Creek would improve and peak stream flows in the creek would be reduced.

Estimated Cost: \$2,150,000 (Planning estimate)

Participating jurisdictions: Lacey

Recommendation WL17A Construct runoff treatment facilities on the Interstate-5/Martin Way interchange outfalls to College Creek, if needed

Description: Untreated runoff from west of the Martin Village shopping center on Martin Way and from the I-5 ramps drains directly into College Creek. The runoff is highly likely to be contaminated because it drains heavy traffic, commercial areas. The runoff would be sampled, and, if it is contaminated, wet vaults would be installed (see figure 7-6).

Benefit: Sediments and pollutants would be removed from the runoff before it drains to the creek.

Estimated cost: \$540,000 (Planning estimate)

Participating jurisdictions: Lacey, Olympia, WDOT

Recommendation WL17B Install treatment facilities on the outfalls that discharge from Interstate 5 to the downstream crossing of College Creek, if needed

Description: Untreated runoff from Interstate 5 discharges directly to College Creek where the creek crosses back under the freeway north of the Martin Way interchange. The runoff is highly likely to be contaminated because of the high level of traffic on the freeway. The runoff would be sampled, and, if it is contaminated, bioswales or wet vault treatment facilities would be installed (see figure 7-6).

Benefit: Sediments and contaminants would be removed from the runoff before it drains to the creek.

Estimated cost: \$33,770 (planning estimate)

Participating jurisdictions: DOT

Recommendation WL17C Construct bioswales to treat runoff draining into Woodland Creek from the west on Martin Way, if needed

Description: Untreated stormwater runoff discharging directly to Woodland Creek from the west is likely to be contaminated because it drains from a heavy traffic, commercial area. The runoff and sediment would be sampled, and, if it contaminated, a bioswale would be constructed along the south side of Martin Way west of the Creek. Lacey has proposed to construct these swales in 1995 in conjunction with a bike lane construction project (see figure 7-6).

Benefit: The bioswale would provide treatment and trap sediment, improving the water quality of the runoff discharging to Woodland Creek.

Estimated cost: \$237,367 (Planning estimate)

Participating jurisdictions: Lacey

Recommendation 17D Install stormwater treatment facilities on the Interstate 5 outfalls to Woodland Creek, if needed

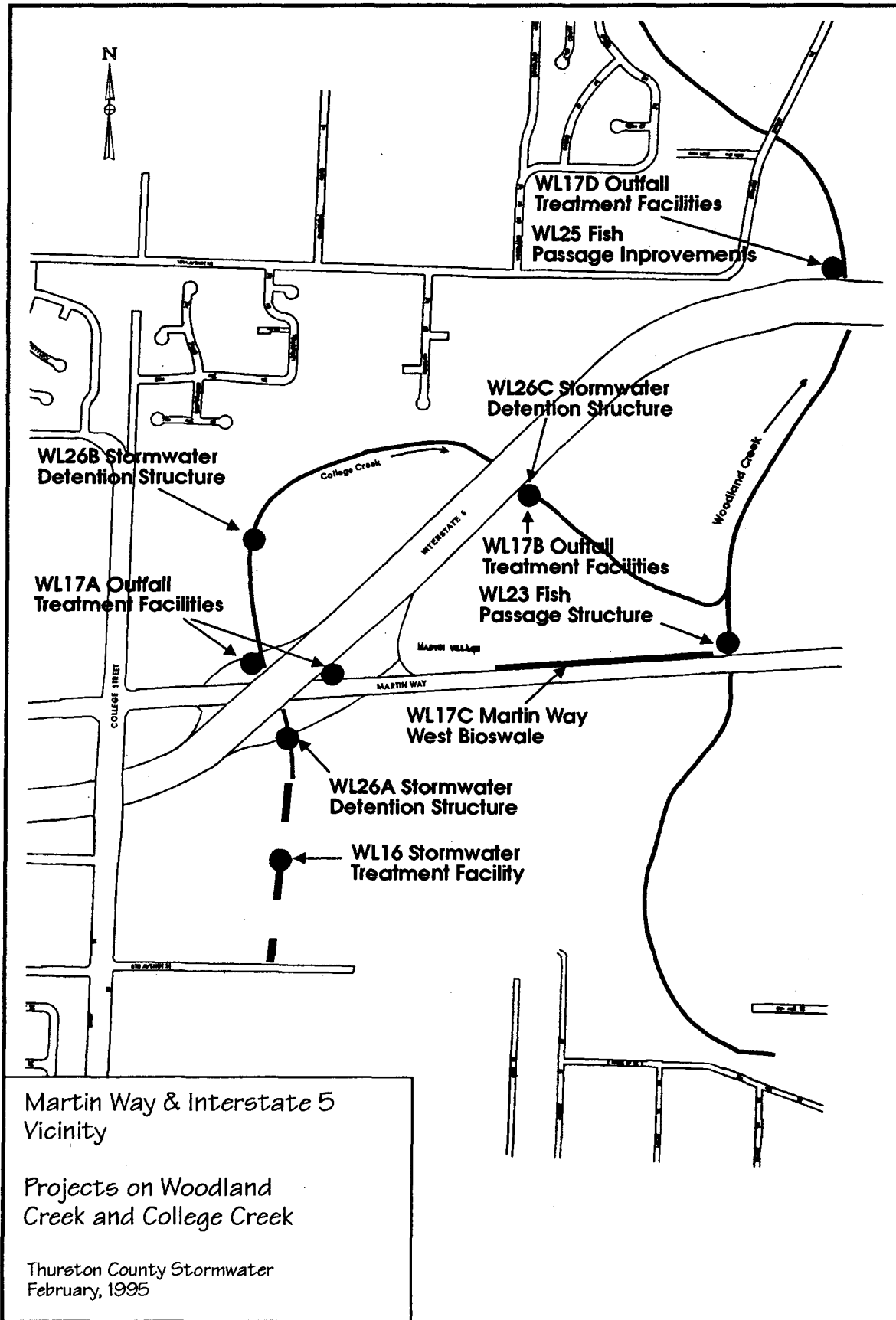
Description: Interstate 5 discharges runoff directly into the Woodland Creek. Extremely high concentrations of lead and oil were found coming from the Interstate 5 storm drain during wet sampling periods (*Woodland Creek: A Baseline Study*, Dobbs 1977). The runoff from Interstate 5 would be sampled to confirm the results of the 1977 study and determine the level of contamination. If the runoff is contaminated, a wet vault or a biofiltration swale along the north side of I-5 from Martin Way and a stormwater treatment facility would be installed (see figure 7-6).

Benefits: The project will remove sediments and contaminants from the runoff before it drains to Woodland Creek.

Estimated cost: \$34,976 (Planning estimate)

Participating jurisdictions: WDOT

Figure 7-6



Recommendation WL17E Monitor the water quality of direct, untreated discharges in Woodland basin and develop treatment or mitigation measures for problem outfalls

Description: Prioritize and sample the water quality of the remaining untreated, direct discharges in Woodland basin which have not been sampled. Prioritize the discharges which fail to meet state surface water quality standards, fail to meet state freshwater sediment criteria, or contain EPA priority pollutants, and develop treatment or mitigation measures for them. Include the proposed treatment facilities in the annual updates to the county Capital Facilities Plan.

Benefit: The water quality of Woodland Creek would improve.

Estimated Cost: \$136,100 (Final estimate for monitoring only)

Participating jurisdictions: Lacey, Olympia, Thurston County

7.3 WOODLAND BASIN LEVEL 1 FISH HABITAT RECOMMENDATIONS

Recommendation WL18 Replace the Pleasant Glade NE & Woodland Creek culverts

Description: Replace the two 48" RCP culverts with a bridge or natural bottom arch culvert, or install fish passage baffles and ladders.

Benefit: The project would reduce the high velocities during storms, which would decrease damage to fish habitat and improve fish passage through the culvert. Improving passage would allow more fish to utilize rearing and spawning habitat upstream, and help insure the future survival of fish in the creek.

Estimated cost: \$163,370 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation WL19A Establish a citizen stream watch program for Woodland Creek

Description: Add a citizen stream watch component to the Stream Team program, to train residents of the basin to monitor streams and drainage facilities in their neighborhoods for illegal dumping and land clearing.

Benefit: Compliance with environmental regulations would improve and basin residents would become more involved in protecting the creek.

Estimated cost: \$2,000 (Planning estimate)

Participating jurisdictions: Lacey, Thurston County

Recommendation WL19B Restore native riparian vegetation and install habitat enhancements in Woodland Creek

Description: Restore native vegetation and in-stream habitat in Woodland Creek, using volunteer Stream Team crews and assistance from the Department of Fish and Wildlife. Prioritize project sites for revegetation according to the severity of the problem.

Benefit: Fish habitat would be restored as closely as possible to natural conditions, providing long-term economic and environmental benefits. Erosion would decrease, benefiting fish habitat and protecting property from damage, which would reduce long-term costs to county residents.

Estimated Cost: \$25,000 (Planning estimate)

Participating jurisdictions: Lacey, Thurston County

Recommendation WL23 Improve fish passage through the Martin Way & Woodland Creek culvert

Description: Improve fish passage through the culvert by building a drop structure at the outlet and/or installing baffles in the culvert, if possible. As a last resort, the culvert may need to be replaced. This project should be constructed in conjunction with Recommendation WL16.

Benefit: The project would eliminate an existing barrier and ensure that fish can migrate to upstream spawning and rearing habitat, which would help to maintain anadromous fish runs in the creek.

Estimated Cost: \$73,000 (Planning estimate)

Participating jurisdictions: Lacey

Recommendation WL25 Improve fish passage through the Interstate 5 & Woodland Creek culvert

Description: Develop measures to improve fish passage through the Interstate 5 culvert, in conjunction with the state Department of Transportation. The most practical alternative is likely to require backing water up into the culvert by installing a drop structure on the downstream side, in order to slow down the velocities through the culvert (see figure 7-6).

Benefit: Fish would be able to pass through the culvert and reach habitat upstream, which would improve the long-term viability of the Woodland Creek fish runs.

Estimated Cost: \$94,843 (Planning estimate)

Participating jurisdictions: Lacey, WDOT

Recommendation WL26 Prevent increased peak stream flows in Woodland Creek due to runoff from new development

Description: New developments in sub-basins where modeling indicates future peak flow increases would be required to implement sufficient stormwater controls to preserve the existing sub-basin peak flows (listed in appendix C). This requirement would apply to sub-basins WL15, 15A, 15B, 17, 21, 22, 25, and 27. This may be accomplished by, in preferred order:

- 1) preserving additional forested open space on-site
- 2) increasing on-site stormwater retention
- 3) decreasing on-site stormwater release rates
- 4) constructing regional detention facilities

Development proponents would be encouraged to develop creative solutions to prevent downstream impacts using the preferred methods. The county would maintain and provide the continuous hydrologic model for the basin, which the proponents would use to evaluate the downstream impacts of their proposals. Developments would participate in land acquisition and construction of the regional projects described below, which would provide the minimum capacity to prevent peak flow increases, only if they cannot implement other on-site alternatives. The jurisdictions would acquire the land needed for the regional facilities, but they would be constructed only if increased sub-basin discharges are measured.

Benefit: Fish habitat would be preserved, additional erosion would be prevented, and the stream channel integrity would be stabilized.

Estimated Cost: The cost of the regional facilities is outlined below.

REGIONAL FACILITIES TO REDUCE DAMAGING PEAK FLOWS ON WOODLAND CREEK

Most of Woodland Creek contains few logs or pools, and several stream banks are eroding because winter stream peak flows are extremely high, while summer flows are low or nonexistent (described in detail in chapter 4, problem WL26). When the basin is fully developed in the future, the peak flows from the 2-year storm are predicted to increase by 15% at Martin Way, and by 37% downstream at the mouth. The peak flows from the 100-year storm are predicted to increase by 10% at Martin Way and by 60% at the mouth

Recommended Alternative - Service Level 1

Several detention projects for preventing future increases in peak flows were analyzed. The following proposed regional detention ponds proved most effective for attaining the service level 1 goal of no peak flow increases. The projects are listed below, in order from upstream to downstream locations.

The basin's topography and drainage patterns, existing developments, and approved new developments limit the availability of sites for regional detention ponds. The proposed projects were field-checked to insure that sufficient undeveloped land is available. The following projects would reduce damaging future peak stream flows predicted in Woodland Creek under build-out conditions, by detaining a maximum of 552 acre-feet of runoff at seven locations. Figures 7-7 and 7-8 show the effect of the proposed projects on Woodland Creek peak flows at several locations.

Figure 7-7: Impact of service level 1 projects on Woodland Creek 2-year peak flows

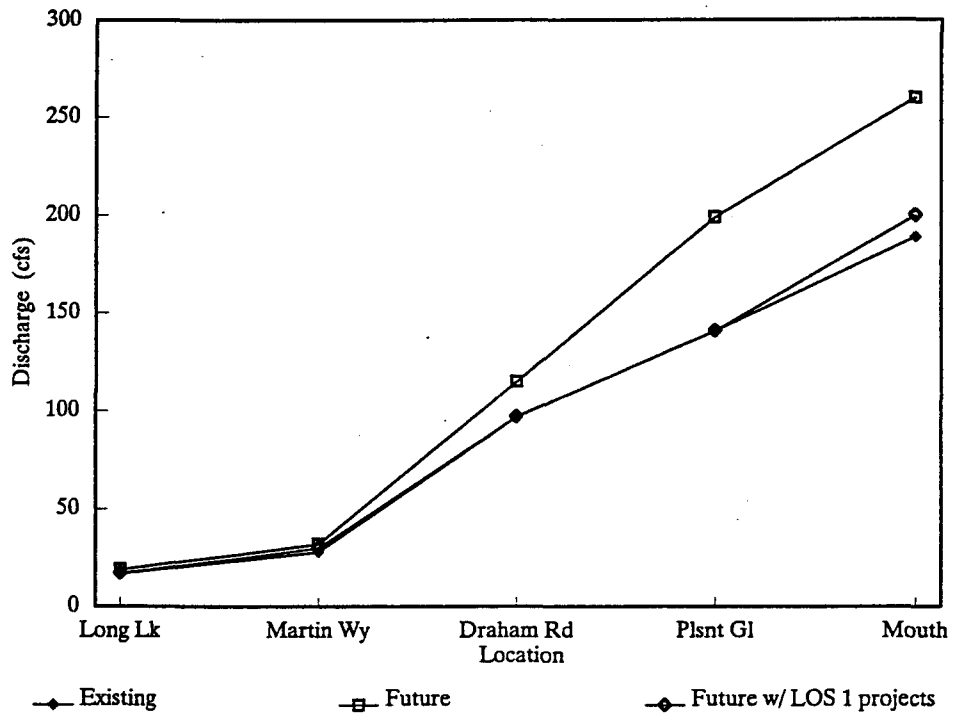
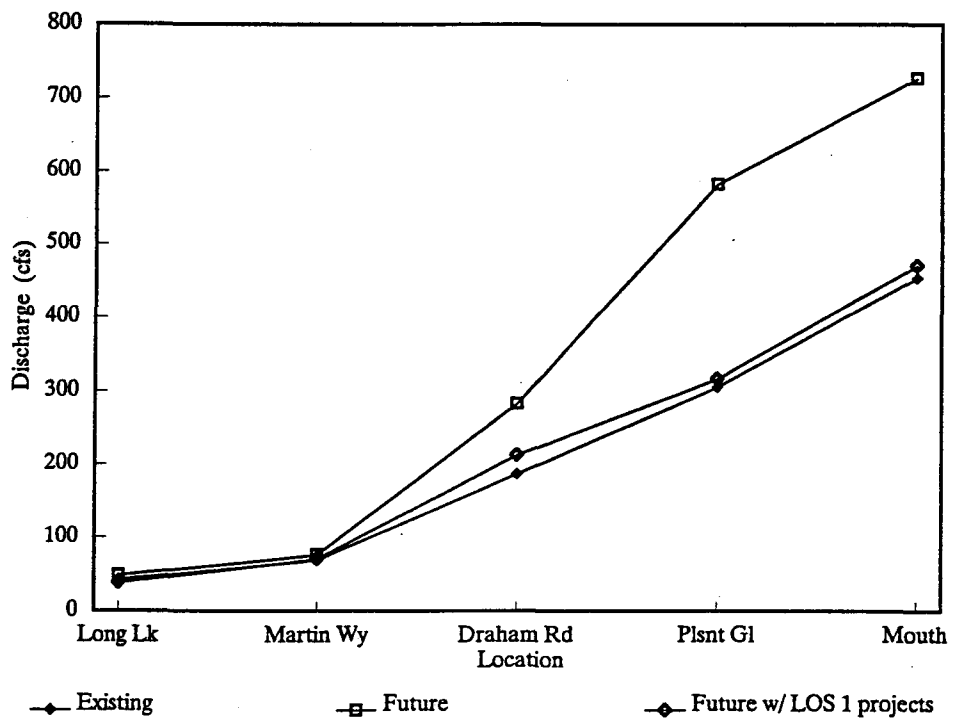


Figure 7-8: Impact of service level 1 projects on Woodland Creek 100-year peak flows



Recommendation WL26A Install a stormwater detention structure on College Creek above the Interstate-5 northbound exit ramp at Martin Way

Description: Construct a control structure on the College Creek culvert under the I-5 northbound exit ramp at Martin Way. This would detain a maximum of 64 acre-feet of stormwater runoff and raise the water level to 154 feet elevation during extreme rain storms, and release the runoff slowly to the creek (see figure 7-6).

Benefit: The project would detain and reduce peak flows that contribute to erosion and sedimentation problems and damage fish habitat in Woodland Creek.

Estimated cost: \$1,200,000 (Planning estimate)

Participating jurisdictions: Lacey

Recommendation WL26B Install a stormwater detention structure on College Creek near the St. Placid Priory campus

Description: Construct a flow control structure approximately half way between the two I-5 crossings, near the St. Placid Priory property on College Street to detain a maximum of 48 acre-feet of stormwater runoff and back water up to the 110 foot elevation during extreme rain storms, and release it slowly to the creek (see figure 7-6).

Benefit: Regional facilities would detain and reduce peak flows that contribute to erosion and sedimentation problems in Woodland Creek.

Estimated cost: \$918,400 (Planning estimate)

Participating jurisdictions: Lacey

Recommendation WL26C Install a stormwater detention structure on College Creek above the downstream Interstate-5/College Creek crossing

Description: Construct a control structure at the downstream I-5 and College Creek culvert, to raise the water level to 94' elevation during 100-year storms. The project would detain a maximum of 90 acre-feet of stormwater runoff during extreme rain storms and release it slowly to Woodland Creek (see figure 7-6).

Benefit: The project would reduce peak flows that cause erosion and habitat damage.

Estimated cost: \$282,000 (Planning estimate)

Participating jurisdictions: Olympia, Lacey, Thurston County

Recommendation WL26D Install a stormwater detention structure on Eagle Creek at Carpenter Road

Description: Build a control structure at Eagle Creek and Carpenter Road that backs water up to about the 75' elevation during major storms, detaining up to 40 acre-feet of runoff and releasing it slowly. Acquire a 200' easement centered on Eagle Creek. Look for other sites to provide more storage on Eagle Creek. Alternatives for achieving the needed storage on Eagle Creek include: 1) Install a detention pond at the corner of Hawks Prairie Road and Eagle Drive, or 2) enlarge the pond in Tolmie Park Estates off Hawks Prairie Road.

Benefit: The project would reduce peak flows that cause erosion and habitat damage.

Estimated cost: \$152,000 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation WL26E Install a stormwater detention structure on Palm Creek near Covington Court

Description: Use the existing wetlands between Covington Court and Palm Road to detain and store stormwater. Build a control structure west and north of Covington Court, to raise the water level to 90 feet elevation during the 100-year rainfall. Obtain 20-100 foot wide drainage easements to protect natural drainages that connect the wetlands with Sleater-Kinney Road, Abernathy Road, 15th Avenue NE and Judd Street. Build a swale on the east side of Sleater-Kinney Road to filter the runoff before it drains to the wetlands. This project would detain a maximum of 111 acre-feet of stormwater runoff during extreme rain storms and release it slowly to Woodland Creek.

Benefit: This project would reduce peak flows that cause erosion and damage fish habitat. Water quality of runoff draining to Palm Creek would improve.

Estimated cost: \$315,000 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation WL26F Install a stormwater detention structure on Fox Creek at Pleasant Glade Road

Description: A log structure immediately upstream of the Pleasant Glade culvert on Fox Creek is currently working as a control structure to detain runoff. The structure should be reinforced or rebuilt to prevent failure in the future. This would provide a maximum of 123 acre-feet of stormwater runoff detention during extreme rain storms and release it slowly to Woodland Creek.

Benefit: The facility would provide stormwater storage and help reduce peak flows that cause erosion and damage fish habitat.

Estimated cost: \$165,000 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation WL26G Install a stormwater detention structure on Jorgensen Creek

Description: Construct a stormwater detention structure on Jorgensen Creek to detain runoff in 19 acres of upstream wetlands during the 100-year rainfall. This would detain a maximum of 77 acre-feet of stormwater runoff during extreme rain storms, and release it slowly to the creek.

Benefit: The facility would provide stormwater storage and help reduce peak flows that cause erosion and damage fish habitat. The facility would cut in half the projected future peak flow increase of 350% on Jorgensen Creek.

Estimated cost: \$220,000 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation 26H Increase fish habitat monitoring of Woodland Creek

Description: Survey and map fish habitat in Woodland Creek every 5 to 7 years to determine the improvement or degradation of fish habitat. Establish permanent reference sites for monitoring physical changes to the channel.

Benefit: The effectiveness of basin plan measures would be evaluated and management of the creek would be improved.

Estimated Cost: \$5,000 (Planning estimate)

Participating jurisdictions: Lacey, Thurston County

7.4 WOODARD BASIN LEVEL 1 FLOODING RECOMMENDATIONS

Recommendation WD1 Schedule the drainage systems at 12th Avenue SE and Boone Street for remedial maintenance, and monitor the facilities to insure that they function properly

Description: Schedule the stormwater system for remedial maintenance. Remedial maintenance may require excavating and rebuilding the facilities. Monitor the repaired facilities to insure that they function properly, and develop additional drainage facilities if needed.

Benefit: Frequent flooding at 12th Avenue SE and Boone Street would be corrected.

Estimated cost: Included in Lacey's maintenance budget

Participating jurisdictions: Lacey

Recommendation WD2A Conduct engineering studies to identify and propose solutions for repairing or replacing failing public drainage systems throughout Woodard basin in order to meet Service Level 1 standards

Description: Conduct engineering studies to identify and propose solutions for repairing or replacing the failing public drainage systems in Woodard basin which do not meet service level 1 standards, described in chapter 6. Emphasize increased maintenance of existing systems rather than new facilities whenever possible. Prioritize failing systems and develop a schedule so that all failing systems are eventually brought up to current standards for new facilities.

Benefit: Local flooding problems throughout the basin would be reduced and direct overflows of untreated runoff to surface water bodies would be reduced.

Estimated Project Cost: \$28,000 (Final estimate for engineering studies only)
The engineering studies will determine the cost of the needed improvements.

Participating jurisdictions: Olympia, Thurston County

7.5 WOODARD BASIN LEVEL 1 WATER QUALITY RECOMMENDATIONS

Recommendation WD3 Monitor the new stormwater treatment facility on Fones Road ditch

Description: Olympia and Lacey completed construction of a stormwater treatment facility on Fones Road ditch in 1994. The experimental treatment facility diverts runoff into side-wall gravel filters. The facility would be monitored for effectiveness and additional treatment provided if necessary. Additional measures might include purchasing more right-of-way and widening the ditch to reduce the side slopes to 33% or less.

Benefit: Monitoring would insure that the facility functions properly. The stormwater treatment facility is designed to reduce fecal coliform, sedimentation, and toxic contamination levels of stormwater in Fones Road Ditch by 70% or more.

Estimated cost: Monitoring is already included in existing stormwater budgets

Participating jurisdictions: Lacey, Olympia, Thurston County

Recommendation WD4 Construct an artificial wetland stormwater treatment facility next to Woodard Creek north of Martin Way

Description: Divert the runoff into a constructed wetland treatment and detention facility on the site of the old Drainage District No. 8 ditch north of Martin Way and west of the creek.

Benefit: The water quality of runoff discharging to Woodard Creek, contaminated with oil by-products and heavy metals, would improve and the facility would reduce damaging peak stream flows.

Estimated cost: \$1,089,100 (Planning estimate)

Participating jurisdictions: Olympia

Recommendation WD5A Install treatment on the outfalls to Woodard Creek from Pacific Avenue and Interstate 5, if needed

Description: Sample the runoff discharging to the creek from the heavy traffic, dense commercial area on Pacific Avenue and, if necessary, install stormwater treatment facilities on the outfalls. Treatment for the Pacific Avenue outfall could include intercepting the outfalls and constructing wet vaults on both sides of I-5 at Pacific Avenue, and on the exit ramp from northbound I-5, installing spill control structures under Pacific Avenue, and/or constructing a bioswale at the Pacific Avenue outfall (see figure 7-9).

Benefit: The project would improve water quality and reduce the risk of stream contamination due to hazardous materials spills.

Estimated cost: \$1,350,000 (Planning estimate)

Participating jurisdictions: Olympia, WDOT

Recommendation WD5B Monitor the water quality of direct, untreated discharges in Woodard basin and develop treatment or mitigation measures for problem outfalls

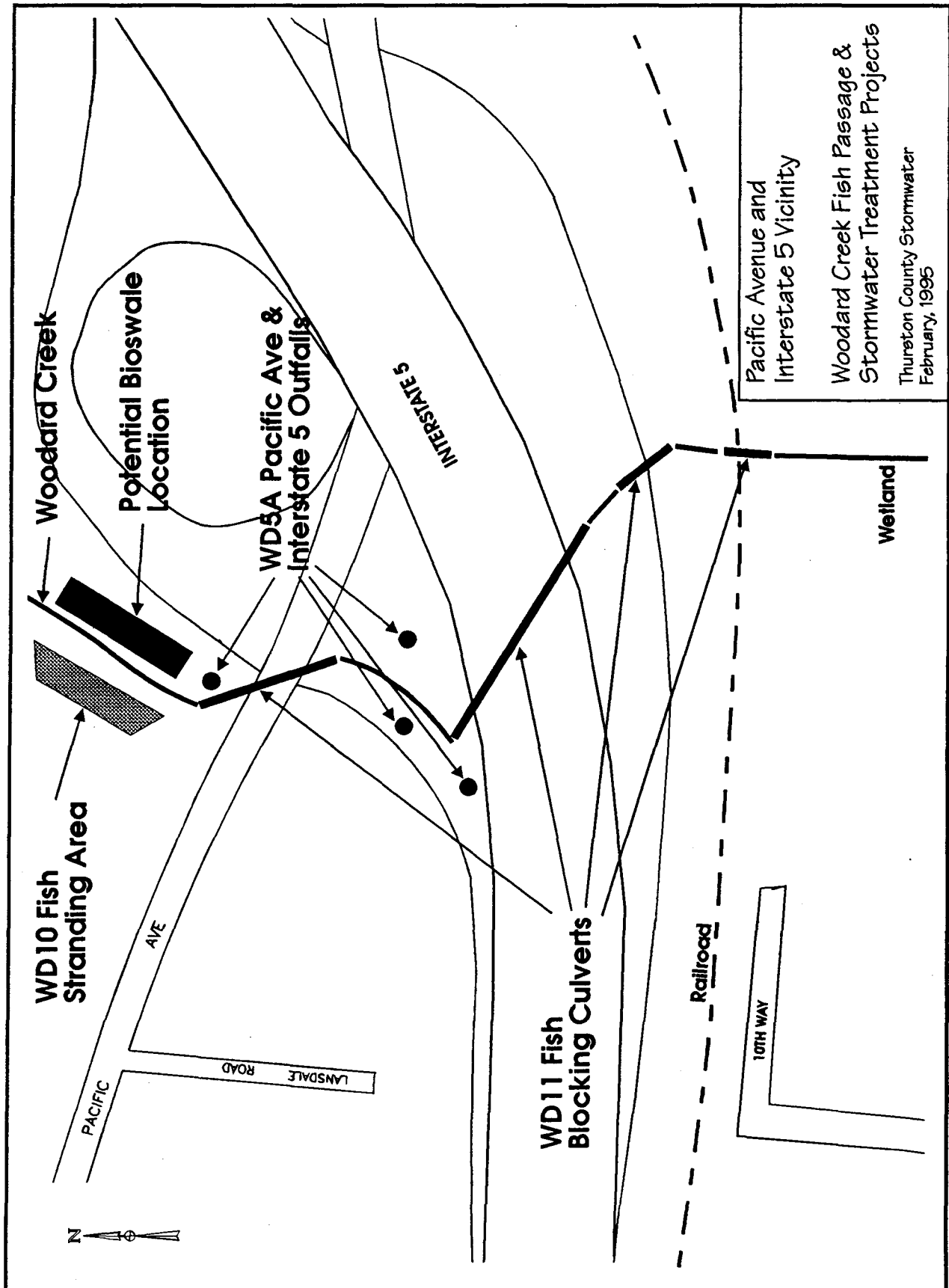
Description: Prioritize and sample the water quality of the remaining untreated, direct discharges in Woodard basin which have not been sampled. Prioritize the discharges which fail to meet state surface water quality standards, fail to meet state freshwater sediment criteria, or contain EPA priority pollutants, and develop treatment or mitigation measures for them. Include the proposed treatment facilities in the annual updates to the county Capital Facilities Plan.

Benefit: The water quality of runoff draining to Woodard Creek would improve, which would directly improve the water quality in the creek.

Estimated Cost: \$38,900 (Final estimate for monitoring only)

Participating jurisdictions: Lacey, Olympia, Thurston County

Figure 7-9



7.6 WOODARD BASIN LEVEL 1 FISH HABITAT RECOMMENDATIONS

Recommendation WD6A Establish a citizen stream watch program for Woodard Creek

Description: Add a citizen stream watch component to the Stream Team program, to train residents of the basin to monitor streams and drainage facilities in their neighborhoods for illegal dumping and land clearing.

Benefit: Compliance with environmental regulations would improve and basin residents would become more involved in protecting the creek.

Estimated cost: \$2,000 (Planning estimate)

Participating jurisdictions: Lacey, Olympia, Thurston County

Recommendation WD6B Restore native riparian vegetation and install habitat enhancements in Woodard Creek

Description: Restore native vegetation and in-stream habitat in Woodard Creek, using Stream Team crews and assistance from the Department of Fish and Wildlife. Prioritize project sites for revegetation.

Benefit: Fish habitat would be restored, providing economic and environmental benefits. Erosion would decrease, benefiting fish habitat and preventing property damage, which would reduce long-term costs to county residents.

Estimated Cost: \$25,000 (Planning estimate)

Participating jurisdictions: Lacey, Olympia, Thurston County

Recommendation WD8 Replace the 36th Avenue NE & Woodard Creek culvert

Description: Replace the 48" reinforced concrete pipe culvert with a natural bottom arch culvert or bridge large enough to prevent backwater conditions.

Benefit: The new culvert or bridge would reduce the high velocities during storms, which would decrease damage to fish habitat, help preserve the spawning gravels below the culvert, and improve fish access to upstream habitat.

Estimated Project Cost: \$66,510 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation WD9 Replace the Woodard Creek culvert under South Bay Road

Description: Replace the 48" concrete culvert carrying Woodard Creek under South Bay Road with a natural bottom, arched culvert or install fish passage baffles so the culvert meets the Department of Fish and Wildlife guidelines.

Benefit: Fish would be able to pass through the culvert and reach upstream habitat, which would improve the long-term viability of Woodard Creek's fish runs.

Estimated cost: \$66,510 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation WD10 Dig out channels so the isolated depressions near Woodard Creek drain freely back into the creek

Description: Dig out drainage channels to connect the isolated channels to the main creek channel, using Stream Team volunteers (see figure 7-9).

Benefit: Juvenile salmon that wash out of the creek during high water would make their way back to the creek, which would improve their survival chances.

Estimated cost: No cost

Participating jurisdictions: Olympia Stream Team

Recommendation WD11 Improve fish passage through the Pacific Avenue and Interstate 5 & Woodard Creek culverts

Description: Conduct an engineering study to develop measures for improving fish passage through the Woodard Creek culverts under Pacific Avenue and Interstate 5, in conjunction with the state Department of Transportation. Alternatives would include installing downstream weirs to back water up into the culverts and slow down the velocity, and installing baffles in the culverts (see figure 7-9).

Benefit: Fish would be able to pass through the culverts and reach rearing habitat upstream, which would improve the long-term viability of the Woodard Creek fish runs.

Estimated Cost: \$5,000 (Final estimate for engineering study only)

Participating jurisdictions: Olympia, WDOT

Recommendation WD12 Prevent increased peak stream flows in Woodard Creek due to runoff from new development

Description: New developments in sub-basins where modeling indicates future peak flow increases would be required to implement sufficient stormwater controls to preserve the existing sub-basin peak flows (listed in appendix C). This requirement would apply to sub-basins WD1, 2, 3, 4, 5 and 6. This may be accomplished by, in preferred order:

- 1) preserving additional forested open space on-site
- 2) increasing on-site stormwater retention
- 3) decreasing on-site stormwater release rates
- 4) constructing regional detention facilities

Development proponents would be encouraged to develop creative solutions to prevent downstream impacts using the preferred methods. The county would maintain and provide the continuous hydrologic model for the basin, which the proponents would use to evaluate the downstream impacts of their proposals. Developments would participate in land acquisition and construction of the regional projects described below, which would provide the minimum capacity to prevent peak flow increases, only if they cannot implement other on-site alternatives. The jurisdictions would acquire the land needed for the regional facilities, but they would be constructed only if increased sub-basin discharges are measured.

Benefit: Fish habitat would be preserved, additional erosion would be prevented, and the stream channel integrity would be stabilized.

Estimated Cost: The cost of the regional facilities is outlined below.

REGIONAL FACILITIES TO REDUCE DAMAGING PEAK FLOWS ON WOODARD CREEK

Most of Woodard Creek contains few logs or pools, and several stream banks are eroding because winter stream peak flows are extremely high, while summer flows are low (described in detail in chapter 4, problem WD12). When the basin is fully developed in the future, the peak flows from the 2-year storm are predicted to increase by 36% at the mouth, and the peak flows from the 100-year storm are predicted to increase by 24% at the mouth.

Recommended Alternative - Service Level 1

Several options for preventing future increases in peak flows were analyzed, including increased on-site runoff detention, preservation of additional forested open space within new developments, and construction of regional detention basins to control runoff. The following regional detention ponds proved most effective for attaining the service level 1 goal of no peak flow increases, as closely as possible.

The basin's topography and drainage patterns, existing developments, and approved new developments limit the availability of sites for regional detention ponds. The proposed projects were field-checked to insure that sufficient undeveloped land is available. The following projects would reduce damaging future peak stream flows predicted in Woodard Creek under build-out conditions, by detaining a maximum of 62 acre-feet of runoff at 2 locations during extreme rain storms. Figures 7-10 and 7-11 show the effect of the proposed projects on Woodard Creek peak flows at several locations. The projects are listed in order from upstream to downstream locations.

Figure 7-10: Impact of service level 1 projects on Woodard Creek 2-year peak flows

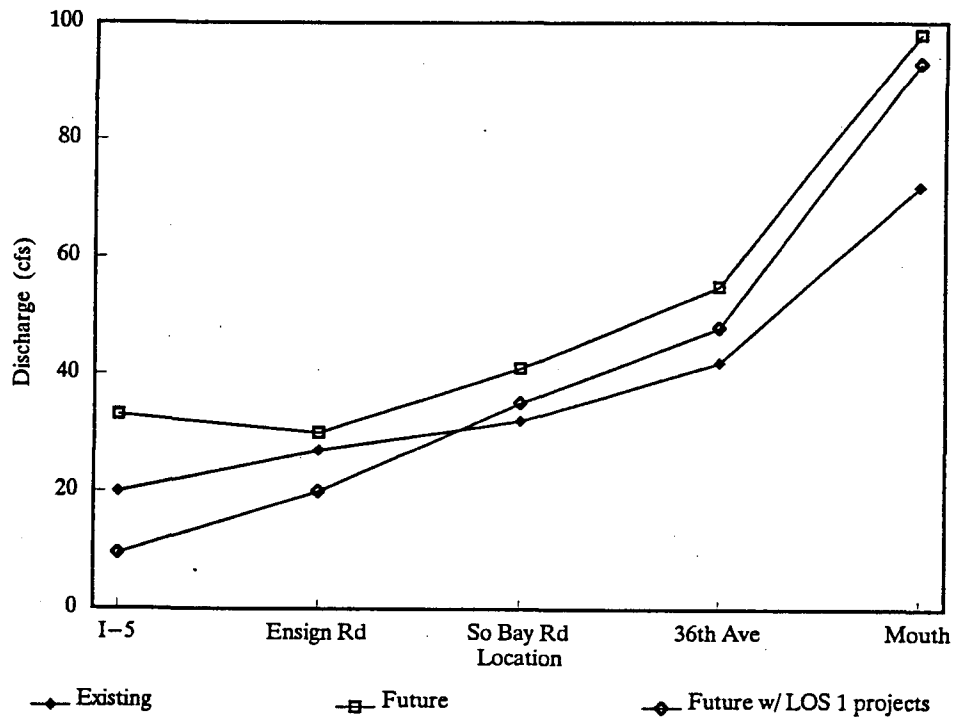
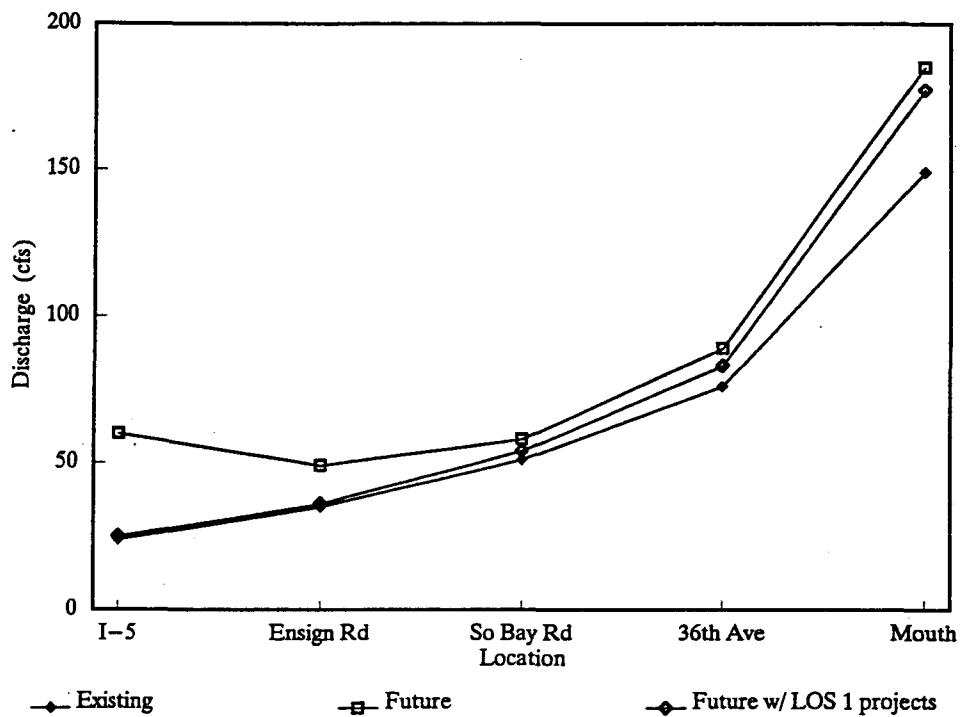


Figure 7-11: Impact of service level 1 projects on Woodard Creek 100-year peak flows



Recommendation WD12A Build a control structure to detain stormwater runoff in the wetland at the head of Woodard Creek

Description: Purchase the property immediately south of Pacific Avenue at Woodard Creek and construct a control structure on the culvert pipe conveying Woodard Creek under I-5, to back up flows to a maximum of 160 feet elevation during extreme rain storms. Pursue the interest expressed by Lacey, Olympia, and the county Parks and Recreation Department in developing the project jointly for multiple uses such as a nature center, bike trail, and/or an animal shelter.

Benefit: The facility would provide stormwater detention and help prevent increases in future peak flows and the resulting habitat damage. A regional park that includes an animal shelter and recreation opportunities would maximize the financial efficiency of the project and help fulfill public education goals for water resources.

Estimated cost: \$253,000 (Planning estimate)

Participating jurisdictions: Thurston County, Olympia, Lacey

Recommendation WD12B Construct a stormwater detention and treatment facility beside Woodard Creek at South Bay Road

Description: Construct a stormwater detention and treatment pond beside Woodard Creek at South Bay Road to detain and treat stormwater runoff and reduce peak flows in the creek. The facility would divert peak flows to a detention pond while maintaining base flows in the creek.

Benefit: The project would filter contaminants from road runoff and help to prevent increases in future peak flows, which cause erosion and damage fish habitat.

Estimated cost: \$138,000 (Planning estimate)

Participating jurisdictions: Thurston County

Recommendation WD12C Increase fish habitat monitoring of Woodard Creek

Description: Survey and map fish habitat in Woodard Creek every 5 to 7 years to determine the improvement or degradation of fish habitat. Establish permanent reference sites for monitoring physical changes to the channel.

Benefit: The effectiveness of basin plan measures would be evaluated and management of the creek would be improved.

Estimated Cost: \$5,000 (Planning estimate)

Participating jurisdictions: Olympia, Thurston County