7.0 MANAGEMENT ALTERNATIVES

Historically, surface water management in the Olympia area sought to control flooding and the associated threats to property. As described in Chapter 6, the current level of urbanization occurring in the Indian/Moxlie Creek basin has resulted in habitat and water quality problems as well as flooding. To be effective, management emphasis must shift from responses to problems to the prevention of problems. Furthermore, the problem solving approach must take place within the context of long-term ecological and social sustainability and within the constraints of costs and technical feasibility.

The effective correction of existing problems and the prevention of potential problems within the basins necessitates a comprehensive management strategy. Elements of a successful water resource management program range from the construction of stormwater facilities to public education. These elements are as follows:

- Stormwater facilities.
- Habitat enhancement/critical areas protection.
- Regulations/development controls.
- Enforcement/complaint response.
- Pollution source control programs.
- System monitoring.
- Public involvement and education.
- Cooperative program management.

Implementing adequate action plans for these management elements would ensure successful long-term storm and surface water management in the basins. Effective basin management would provide the following benefits:

- Reduction of flooding and other hazards.
- Protection of Indian and Moxlie Creeks.
- Preservation of critical areas, wildlife resources, and cultural amenities.

Problems associated with surface water in the basins can be managed at various levels with different levels of effectiveness. Current levels of service within the basin, which are largely reactive in nature, can be continued or increased to a more intensive and proactive degree of management.

Numerous nonstructural problems identified during the basin planning process are also apparent in the other basins of the north Thurston County area. These management inadequacies range from stormwater system maintenance to the need for better regulation enforcement. The regional nature of these problems prompted the development of a proposed nonstructural surface water management program in addition to the basin-specific management alternatives.

The nonstructural surface water management program, as presented in Chapter 11, has also been included in the Percival Creek Basin Plan and will be included in the upcoming Woodard/Woodland Creek Basin Plan. The recommendations of the nonstructural program address the individual management needs of Olympia, Tumwater, Thurston County, and Lacey while providing for more consistent management of the urbanizing area.

7.1 Alternative Management Plans

Three alternative management plans have been developed for the Indian/Moxlie Creek Basin Plan. The three alternatives address the flooding, habitat, and water quality problems identified in Chapter 6. These alternatives have been analyzed for their shortcomings and benefits during the planning process. Generally:

- Alternative I presents approximately the existing level of service provided by Olympia and Thurston County within the Indian/Moxlie Creek basins. Temporary grant funding supports many of the current technical and public education activities underway in the basin. These activities would be markedly reduced under Alternative I. A limited capital improvements budget would be available to construct small projects in the basin. As emergencies arise or funding becomes available, capital projects would be undertaken.

- Alternative II represents an enhanced level of service that would correct flooding problems, improve the creeks' natural resources, and prevent future problems. New projects and regulations would moderate flood flows, better manage habitat areas, encourage the preservation of naturally pervious surfaces, and enhance ongoing public involvement and education activities. The alternative would require funding above current levels.

- Alternative III is the optimum level of service considered appropriate for the basin. The alternative incorporates the overall level of management proposed for Alternative II with additional natural resource improvements to correct historical impacts to the creek. Public costs associated with Alternative III are appreciable higher than the costs of Alternative II.

An evaluation of these alternatives based on the criteria of effectiveness, sustainability, cost, feasibility, and compliance with the goals of the basin planning effort is contained in Chapter 8. The specific components of Alternatives II and III are presented in Chapters 9 and 10, respectively. An evaluation of costs and funding options is presented in Chapters 12 and 13, respectively.

The level of service provided by each management alternative is discussed below under each of the eight basin management elements mentioned above. The comparison of the alternatives includes the goal and a description of an effective surface water management program.

7.2 Stormwater Facilities

Stormwater facilities convey, treat, and store runoff in order to avoid urban flooding and natural resource degradation. A wide variety of facilities are commonly used for drainage and treatment of stormwater runoff. Low maintenance, passive facilities are generally appropriate. More elaborate structural systems may be necessary in highly developed areas where available land is scarce and contaminant levels are high.

With the recent increase in stormwater utility rates of the local jurisdictions, additional funding for municipal stormwater improvements and maintenance has become available. However, given the backlog of problems throughout the region, this revenue base is inadequate to correct existing problems. Municipalities have limited financial ability to undertake major stormwater capital improvements designed to prevent foreseeable problems. These funding shortages create an atmosphere of uncertain project scheduling, lack of infrastructure integration, and to some extent, community hardships and inequities.

7.2.1 Conveyance Facilities

GOAL: Conveyance facilities should transport stormwater runoff from its point of origin to its point of release without flooding. Open channels are the preferred method of conveyance because they provide a greater range of options for the treatment and storage of stormwater than do underground pipe systems. Grass-lined swales offer excellent water quality treatment.

Additionally, Indian/Moxlie Creeks are natural components of the basins' conveyance system and should be protected from degradation.

Conveyance Facilities: Alternative I

The *Drainage Design and Erosion Control Manual for the Thurston Region, Washington* (Regional Drainage Manual) requires that, at a minimum, conveyance systems be constructed to carry the 10-year, 24-hour storm event. For culverts passing under public roads, the minimum is the 25-year, 24-hour storm event. The drainage regulations require the use of vegetated open channels for the conveyance of stormwater. Where these are not possible other channels types or pipes are acceptable.

Proponents of new development must also evaluate the potential upstream and downstream impacts of the development. Conveyance system inadequacies that would result from new development are to be corrected.

Older conveyance systems in the basin are comprised largely of pipe networks. As development continues, the ability of existing systems to carry increasing quantities of runoff can become limited. Alternative I would ensure adequate new private conveyance systems, but would not provide funds for the correction of existing system problems. Projects aimed at upgrading systems to accommodate continued urban growth would not be undertaken in a proactive manner.

Conveyance Facilities: Alternative II

Regulations in the Regional Drainage Manual addressing conveyance for new developments would remain unchanged from Alternative I.

Alternative II encompasses a capital improvement program to correct the existing conveyance system deficiencies within the Indian/Moxlie Creek basin. These projects would focus on the middle and downstream segments of Indian Creek and the southern portion of the Moxlie basin. Flooding of property and roads would be minimized and flood flows in Indian/Moxlie Creeks would be slightly reduced.

Projects to be completed include improvements in the areas of Log Cabin/Cain Road, the Plum Street/Union Avenue intersection, Fredrick Street adjacent to Indian Creek, and to some extent, improved management of combined stormwater and sanitary sewer lines in the downtown Olympia area. The removal of several fish barrier culverts and unnecessary instream pipe sections in Indian Creek would also be completed.

Conveyance Facilities: Alternative III

In addition to the recommendations for improvements to the existing conveyance system outlined in Alternative II, this alternative proposes several system upgrades and the restoration of additional piped creek segments. These projects would focus on the downstream segment of both creeks including portions of the creek under downtown Olympia. Recreating the natural creek corridor through downtown Olympia would provide exceptional open and recreational space and eliminate approximately one-half mile of piped creek. Similar efforts have been undertaken elsewhere in the nation and have been very popular. The technical and financial difficulty of these projects is very high.

7.2.2 Storage Facilities

GOAL: Stormwater that is not promptly infiltrated should be stored in order to prevent downstream development and creek flooding. Facilities to manage stormwater generated by major storm events include a range of structures designed to store, infiltrate, and/or treat stormwater.

One of the most common types of storage facilities is the detention pond. Detention ponds can be either dry or wet. Dry ponds are designed to hold water only during storm events; during dry weather they are empty and can be used for other purposes such as parks. Yauger Park in the Percival Creek Basin is a regional dry pond facility. Wet ponds are designed to receive runoff during storm events, provide treatment, and slowly release it. These ponds can be aesthetically pleasing because they resemble natural ponds. The pond located in the Yauger Medical Park is an example of a wet pond.

Infiltration facilities are also considered storage facilities since they are designed to store runoff and discharge it to groundwater. Wetlands naturally hold and slowly release appreciable quantities of water to the creek system.

Storage Facilities: Alternative I

New facilities constructed to store and treat stormwater are currently designed according to the requirements outlined in the Regional Drainage Manual. Under Alternative I, new construction would continue to be required to provide a minimum live storage of 6,000 cubic feet per acre of impervious surface, and 2,000 cubic feet per pervious "disturbed acre."

The storage requirement provided by the Regional Drainage Manual is not sufficient to minimize continued degradation of Indian/Moxlie Creeks. Continued development would compound existing problems.

Due to the era in which most of the development in the basin occurred, stormwater storage facilities are typically nonexistent or inadequately sized. The existing program does not provide for the correction of current storage inadequacies.

Storage Facilities: Alternative II

New development would be required to provide more stormwater storage and a lower release rate than is currently required by the Regional Drainage Manual. Development designs aimed at reducing the quantity of runoff generated by the site would be encouraged. Such designs would reduce the minimum storage requirement. Chapter 11 provides additional discussion of the proposed drainage requirements.

Two regional stormwater storage facilities would be constructed to better manage runoff from existing development and Interstate 5. The construction of these facilities offers a cost-effective means to retrofit inadequate systems. Such regional facilities would serve to minimize the flooding of developments and to a minor degree reduce problematic flood flows in the creek system.

Depending upon technical and financial considerations, existing facilities would be upgraded to more effectively store water. Facilities appropriate for upgrading are identified in Appendix 3.

Storage Facilities: Alternative III

Additional regional stormwater storage facilities to correct historical deficiencies would be constructed under Alternative III. These ponds would reduce ongoing impacts to the physical integrity of the creek and contribute to the improvement of water quality conditions within the creek. Alternative III facilities are technically more difficult and therefore more costly than the two facilities presented under Alternative II.

7.2.3 Treatment Facilities

GOAL: Stormwater management should include the treatment of runoff for contaminants. Pollutants carried in stormwater can be partially removed by holding the water in detention/retention systems and allowing suspended particulates to settle out before the water is discharged. Better treatment methods include utilizing grassy swales and constructed wetlands, infiltrating stormwater and trapping pollutants in the soil, and installing oil/water separators.

The preferred methods of stormwater treatment, both regulatory and structural, are classified as best management practices (BMPs). Stormwater BMPs are those techniques that are currently believed to provide the most effective and practical means to minimize or control the quantity of pollutants carried by stormwater. Where soil conditions allow, infiltrating treated runoff to groundwater is the preferred management alternative.

Although natural wetlands are highly effective at treating contaminated waters, wetlands can become degraded by the accumulation of contaminants. Stormwater must be treated prior to discharge to natural wetlands.

Treatment Facilities: Alternative I

Until 1991, stormwater facilities did little to reduce the amount of contaminants in runoff. New requirements for the treatment of stormwater have been adopted by all local jurisdictions through the Regional Drainage Manual. Under Alternative I, all new construction is required to build stormwater treatment facilities capable of treating the

runoff generated from the six month, 24-hour storm. Innovative and cost-effective means to treat stormwater would continue to be pursued.

Efforts to construct the necessary facilities for correcting existing water quality problems would not be undertaken under Alternative I. The water quality problems in the creek system may be largely attributable to contaminated urban runoff.

Treatment Facilities: Alternative II

Water quality treatment for new development would not be changed from the requirements of the Regional Drainage Manual. Innovative and cost-effective means to treat stormwater would continue to be pursued.

Treatment of existing stormwater would be provided by the construction and upgrading of two stormwater storage facilities. These efforts would focus on reducing contamination from Interstate 5. Additional work would improve the treatment capability of existing facilities.

Treatment Facilities: Alternative III

The treatment of stormwater would be incorporated into the design of additional regional storage facilities.

7.2.4 Facility Operations and Maintenance

GOAL: Implementation of an effective stormwater management program requires adequate maintenance of private and public stormwater systems. Scheduled maintenance includes vegetation management, the dredging of ponds and ditches, and the cleaning of pipes, culverts, and catch basins.

In addition to ensuring appropriate conveyance and storage capacity, maintenance programs help preserve water quality. Much of the suspended solids and priority pollutants found in stormwater are associated with street and parking lot surfaces. Street sweeping and removing sediments from catch basins are effective means of controlling water quality contaminants.

Operations and Maintenance: Alternative I

Municipal catch basins and pipe systems within the City of Olympia are scheduled for cleaning every three years or as siltation conditions require. A system for tracking maintenance needs is being developed. This level of maintenance is appreciably better

than in past years. In recent years, the other local jurisdictions have also become aware of the need to better maintain systems.

Thurston County systems in the basin are composed of culverts and ditches. These are maintained on an as-needed basis, often in response to resident complaints.

Private system maintenance is currently a problem within the region. To ensure proper maintenance, Olympia now requires formal maintenance agreements for newly developed stormwater facilities. Maintenance schedules for older facilities are also being pursued.

These Olympia maintenance programs would continue under Alternative I. Thurston County is currently assessing the level at which maintenance should be required from private facilities.

Operations and Maintenance: Alternative II

The maintenance of municipal stormwater systems within Thurston County would be increased under Alternative II. Olympia's maintenance program under Alternative I is adequate and would not be changed under Alternative II. Public and private systems would be managed in a scheduled, proactive manner.

Operations and Maintenance: Alternative III

No change from Alternative II. Although not providing an optimal level of service, the maintenance program supported by Alternative II represents an appreciable improvement in the operation of both private and public systems.

7.3 Habitat Enhancement/Critical Areas Protection

Because urbanization impacts the hydrologic and biologic functions of drainage basins, the resource base must be managed in order to minimize degradation. Besides providing food, shelter, and water to fish and wildlife, creek corridors are aesthetically pleasing open space. By protecting the natural resource base the sustainability of an area is preserved and the quality of life for future generations maintained. Activities addressing habitat enhancement and protection are presented under the categories of revegetation, removal of fish barriers and other habitat improvements, and critical areas acquisition.

7.3.1 Revegetation

GOAL: Revegetation projects should be undertaken to enhance streambanks that are lacking in native vegetation. Streamside vegetation is critical to high-quality riparian and aquatic habitat.

Riparian vegetation serves a number of important purposes in the stream system. The roots of streamside vegetation protect the integrity of the streambanks, reduce erosion, and assist in forming pools in the stream channel and undercut banks along the side. By shading the creek, vegetation maintains cool water temperatures necessary for salmon. Overhanging branches provide cover for juvenile fish and organic matter for aquatic insects.

Revegetation: Alternative I

Revegetation projects are currently limited to small scale volunteer efforts through the Stream Team program. Two projects have occurred on Moxlie Creek adjacent to Henderson Boulevard; others are not currently planned.

Limited activity would continue to occur under Alternative I.

Revegetation: Alternative II

Resources would be available for the promotion of volunteer-sponsored revegetation projects on a regional basis. Additional projects within Indian/Moxlie Creek basin would occur under the regional program. Streamside property owners would be encouraged to participate in the revegetation efforts.

Revegetation: Alternative III

The revegetation program would remain at the level presented in Alternative II.

7.3.2 Removal of Fish Barriers and Other Habitat Improvements

GOAL: Poorly designed culverts that create barriers to fish passage should be replaced. Improperly installed culverts can create excessively high water velocities or may be placed well above the creek channel. If upstream habitat is valuable, these improvements to correct historical problems should be undertaken.

Additionally, structural changes within a creek can potentially improve existing habitat. Most often these projects involve installing woody material within the channel, providing gravel suitable for spawning, creating structures that replicate overhanging banks, and diversifying creek water velocities.

Habitat Improvements: Alternative I

The local jurisdictions do not have funds available for habitat restoration. Potential sources of grant funding typically do not support these activities.

Fish barrier culverts would not be replaced. Other unnecessary pipe systems would remain in place.

Habitat Improvements: Alternative II

Three improperly placed pipes are barriers to fish passage in Indian Creek. The pipe system near the confluence of the two creeks has been bypassed in 1992 as part of the Plum Street/Union Avenue flood mitigation project. This effort allows salmon passage to an additional 3,000 feet of viable upstream habitat.

Alternative II proposes replacing the remaining two fish barriers as well as removing several unnecessary instream pipes in the Fredrick Street area of Indian Creek. The creek channel would be restored to natural conditions following the pipe removals. Smaller projects such as placement of spawning gravels and clean-up projects within the creeks would also be conducted.

Many instream habitat improvement projects have been completed in the Pacific Northwest, but it is often uncertain how much actual habitat improvement has been created. Given the high level of uncertainty associated with instream projects, Alternative II proposes such projects be undertaken only as necessary to accommodate pipe replacement and removal projects and in man-made creek segments associated with the construction of Interstate 5.

Habitat Improvements: Alternative III

Under Alternative III, additional instream pipe systems would be removed and stream channels restored. These projects would be in addition to projects undertaken in Alternative II and would present technical difficulties and therefore appreciably high costs. Portions of the combined creek system under downtown would be reconstructed as open channels.

7.3.3 Critical Areas Acquisition

GOAL: Important critical areas should be permanently protected by donation to the public, conservation easements, or public acquisition. Public purchase should be limited to areas with unique resource and cultural values.

Critical Areas Acquisition: Alternative I

Acquisition funds would not be provided under Alternative I. Local technical assistance to private parties pursuing donations or conservation easements is minimal. The earmarking of $50,000 per year by the Olympia City Council for the purchase of critical areas within the city is expected to continue.

Critical Areas Acquisition: Alternative II

Technical assistance would be provided to private parties interested in donations and conservation easements. Preserving privately-owned critical areas would be encouraged by the jurisdictions.

Land purchases for preservation and education would be supported, but not funded, under Alternative II. Purchasing critical areas in conjunction with regional stormwater management projects would continue as appropriate.

More specifically, protection, but not purchase, of the wetlands surrounding Bigelow Lake would be pursued under Alternative II. Also, support for the preservation of the 100-acre East/West Greenway located between Eastside Street and the eastern boundary of the basin would be encouraged by the combined efforts of City of Olympia and Thurston County Public Works and Park Departments, local interest groups, and property owners. The abandoned railroad and creek corridor provides an aesthetic link between downtown Olympia, Lacey, and the Chehalis railroad grade.

Critical Areas Acquisition: Alternative III

Long-term efforts to purchase the high-quality critical areas and wildlife habitat in the Indian/Moxlie Creek corridor would be pursued by local jurisdictions. Areas of interest include the Bigelow Lake wetland and the abandoned railroad corridor adjacent to Indian Creek (East/West Corridor). Potential costs of this acquisition alternative have not been evaluated in the basin plan.

7.4 Regulations/Development Controls

Jurisdictions within the basins protect natural resources with a variety of regulations and development controls. These protection measures include surface water management requirements and numerous zoning/development regulations.

Local regulations and guidelines applicable to water resources and habitat management include site plan review, critical areas regulations, and clearing and grading regulations.

Of primary importance is the *Drainage Design and Erosion Control Manual for Thurston Region, Washington* (Regional Drainage Manual) which has been adopted by Olympia, Lacey, Tumwater, and Thurston County.

Although Washington has given local jurisdictions the authority to manage water resources, specific regulations addressing management problems have not, in many cases, been developed. For instance, the Washington State Growth Management Act requires the adoption of development regulations to protect critical areas including wetlands, flood areas, fish and wildlife habitat, and conservation areas. However, the specific tools to accomplish this goal are not outlined.

As an alternative to strict regulations, many state agencies have developed management guidelines that local jurisdictions can choose to uphold strictly or follow on a more informal level. The Puget Sound Water Quality Authority (PSWQA), Washington Department of Ecology (WDOE), and Washington Department of Fisheries (WDF) have all developed guidelines for stormwater, water resources, and/or habitat management.

A detailed discussion of federal, state, and local regulations concerning water resources and habitat management is presented in Appendix 6.

7.4.1 Drainage Regulations

GOAL: Discharge requirements regulate the amount and quality of stormwater releases and should minimize the impacts of urban stormwater on downstream developments and natural resources.

Land clearing and subsequent impervious surfaces associated with development markedly increase the quantity of runoff generated by a specific site. Many undisturbed soils, such as those found throughout the Indian/Moxlie Creek basin, generate little, if any, runoff.

Drainage Regulations: Alternative I

The Regional Drainage Manual would continue as the primary regulatory tool providing stormwater and erosion management requirements for private and public projects. The release rates required by this manual would continue to be 0.08 and 0.70 cfs/disturbed acre for 2- and 100-year storm events, respectively. Conveyance and water quality treatment methods, as addressed in the Regional Drainage Manual, would continue to be implemented.

Computer modeling indicates that existing stormwater release rates would not prevent additional flooding and creek degradation. Additionally, the staff compliment to oversee implementation of the Regional Drainage Manual is, in some cases, inadequate.

Drainage Regulations: Alternative II

New development within the basin would be required to more effectively manage stormwater. The stormwater release rate requirement as presented in the Regional Drainage Manual would be halved for new developments located on relatively impermeable soils. The implication of this requirement would be an approximate doubling in size of stormwater storage facilities located in areas of impermeable soils.

Although this reduction in release rate would result in an appreciable commitment to better manage stormwater, flows released from new developments would continue to exceed flows generated by predevelopment conditions.

Additionally, single-family in-fill development would be required to better manage and infiltrate roof runoff. The increased storage and single-family requirements would serve as a incentive for construction techniques that minimize runoff and thereby reduce storage needs. These proposed requirements are further discussed in Section 11.4.

Drainage Regulations: Alternative III

No change from Alternative II. However, research indicates that in order to manage runoff at predevelopment levels, storage facilities should be sized approximately three times larger than is currently required.

7.4.2 Fish and Wildlife Protection Regulations

GOAL: Regulations should be sufficient to protect existing critical natural resources and habitat areas. Methods of habitat protection focus on regulations pertaining to permitted activities in and around streams and wetlands.

Fish and Wildlife Regulations: Alternative I

Fish and wildlife habitat is currently protected through a variety of state and local regulatory mechanisms. Regulated buffer zones and prohibitions on disturbance of critical areas are overseen by the local jurisdictions.

Critical areas ordinances as adopted by the local jurisdictions place limitations on the proximity of new development to critical areas such as streams, wetlands, and steep slopes. The WDOE Model Wetland Ordinance (1991) as adopted by several of the local jurisdictions provides mechanisms to protect wetlands of local importance. In general, buffers and setbacks established by the jurisdictions range from 25 to 300 feet depending upon the type of development and the traits of the critical area. The jurisdictions also regulate land clearing and grading.

A detailed discussion of existing regulations is presented in Appendix 6.

Fish and Wildlife Regulations: Alternative II

Alternative II proposes only modest changes to existing regulations. Critical areas regulations facilitate the identification of areas of local significance and subsequent implementation of stronger protective measures for these areas. These measures could be used for the protection of important wetlands such as the one adjacent to Bigelow Lake.

An additional regulation would further limit development in floodways. Current regulations allow limited structural development in these areas.

Fish and Wildlife Regulations: Alternative III

Fish and wildlife protection regulations would not change from those levels presented in Alternative II.

7.4.3 Zoning

GOAL: The location of future development should address water resource concerns through the process of zoning. Water management issues could encourage decreases in maximum impervious coverage of a developable area and increased open space for the infiltration of stormwater.

Zoning: Alternative I

In general, no zoning changes are foreseen under current management strategies. However, the implementation of the long-term Urban Growth Management Area (UGMA) boundary in 1998 would change the zoning of the area north of Bigelow Lake from rural residential to more high-density land uses.

Zoning: Alternative II

Potential zoning changes have been evaluated during the basin planning process. Conceptual conflicts arise between the goal of reducing impervious surfaces by reducing the level of development in the basin UGMA and encouraging high-density development to occur within the UGMA thereby minimizing urban sprawl.

A basic premise of the basin planning efforts has been to accept and encourage high-density development in the UGMA. An exception to this approach is proposed for the

approximately 200-acre, semi-rural area north of Bigelow Lake. The area is currently zoned one residential unit per five acres, but could be upzoned to six units per acre with the implementation of the 1998 long-term UGMA boundary. The affected area is defined on Map 6 in Appendix 1.

Alternative II would maintain the current zoning for the Bigelow Lake area. Preservation of the quality of Bigelow Lake and associated wetlands is biologically and culturally important. Additionally, detrimental impacts to Bigelow Lake would affect the entire downstream creek system.

Narrower street widths, porous pavement, reduced parking areas, and improved landscaping requirements would also be encouraged under this alternative, and evaluated for their effectiveness and feasibility in reducing flood flows and increasing groundwater recharge.

Zoning: Alternative III

No zoning changes are proposed in addition to those of Alternative II. Requirements for cluster/open space development in undeveloped portions of the basin have been investigated and determined to be an ineffective management option. Land parcels are typically of insufficient acreage to benefit from clustering techniques. A description of cluster/open space development is provided in Appendix 10.

7.5 Enforcement/Complaint Response

GOAL: Regulations should be enforced and complaint response conducted in a timely manner. Ineffective regulations result from inadequate implementation and lack of response to violations. Enforcement of regulations is a critical part of any management program.

Enforcement/Complaint Response: Alternative I

The existing level of enforcement and complaint response varies among the local jurisdictions. Olympia and Thurston County have staff responsible for the review of proposed stormwater facilities associated with new development. Additionally, Olympia recently hired a code enforcement officer to enforce environmental regulations. Thurston County has one environmental enforcement officer responsible for the entire county.

This level of enforcement and complaint response would continue under Alternative I.

Enforcement/Complaint Response: Alternative II

In conjunction with the regional surface water management program, Alternative II would establish adequate enforcement programs to implement natural resource regulations throughout the multijurisdictional region. Achieving adequate enforcement and complaint response would require the employment of additional staff in Thurston County and Olympia.

Enforcement/Complaint Response: Alternative III

No change from Alternative II.

7.6 Pollution Source Control Programs

GOAL: Contaminants should be managed at the source. Once pollutants are released to the environment, corrective measures are difficult and costly. Source control programs focus on preventing the release of pollutants into the environment.

Pollution source control programs vary greatly in scope. They include nation-wide regulatory programs such as the EPA's National Pollutant Discharge Elimination System (NPDES) program, and local programs such as stencilling storm drains and educating consumers on the use of household products.

Pollution Source Control Programs: Alternative I

Several grant-funded educational programs are currently underway in north Thurston County. These programs include:

- A business education program (**Operation: Water Works**) conducted for a targeted group of businesses in Olympia, Lacey, and north Thurston County. The program is limited in scope and funding, and will conclude in 1992.

- A moderate risk waste program focusing on small generators of hazardous waste. The program includes an household educational component. Long-term funding is provided by the solid waste utility.

- Public involvement and education activities and projects successfully reach a broad spectrum of local residents. Funding for these programs would be limited under Alternative I.

State and federal regulations that address contaminants are or will be applicable within the local jurisdictions. These regulations establish management procedures as well as water quality standards. The local jurisdictions' financial ability to undertake projects to comply with these regulations in minimal.

Pollution Source Control Programs: Alternative II

Pollution source control is seen as the primary means of improving water quality in the creek system. Given the highly developed nature of the basin and the associated difficulties in identifying specific point sources through the water quality monitoring program, broad based source control is a highly practical approach to improving water quality.

Alternative II encompasses water quality investigations, public involvement and education (PIE) activities, and constructed projects. Projects would include correction of the contamination problems under downtown Olympia, identifying and repairing faulty septic systems, and treating several stormwater discharges. Program and project emphasis would be placed on the reduction of bacterial and priority pollutant contamination. The efforts would be considered successful when Washington water quality regulations are met.

Pollution Source Control Programs: Alternative III

The multifaceted source control programs presented in Alternative II would provide a long-term means to improve water quality in the creeks and lakes. Additional source control would be accomplished by construction projects addressing improved stormwater management.

7.7 System Monitoring

Monitoring is an important management tool for tracking the integrity of natural systems. Data collection allows for the early identification of problems.

7.7.1 Creek Monitoring

GOAL: Ensure the long-term monitoring of water quality, flows, and channel geomorphology. Environmental conditions in urban settings can change quickly due to flood flow and contaminant impacts, or slowly from continued exposure to low-level impacts. Urban habitat areas are sensitive and under constant pressure from development. With monitoring, potential deviations from expected conditions could be investigated promptly prior to the development of long-term problems.

Creek Monitoring: Alternative I

Under existing management programs the following monitoring activities would be provided:

- Systematic water quality monitoring would not be conducted. Intermittent monitoring projects in response to identified problems could be pursued on a very limited basis within Olympia's jurisdiction.
- Long-term flow monitoring would not be provided.
- Citizen volunteers have recently been trained in the use the EPA's Streamwalk survey for habitat and stream monitoring. Similar types of cursory monitoring by volunteers would continue through the public involvement and education program.

Creek Monitoring: Alternative II

Alternative II provides for long-term monitoring of the creek and lake systems. The following components would be included in the program:

- Water quality monitoring efforts would include analysis of creek sediments and Bigelow Lake. The proposed monitoring plan is presented in Appendix 8.
- Intermittent flow monitoring would be provided in the long term.
- Geomorphic/habitat monitoring of Indian/Moxlie Creeks would encompass volunteer monitoring efforts augmented by professional investigations every three years. The monitoring program would evaluate instream spawning and rearing habitat, geomorphology, streambank and hillslope erosion, and water quality problems.

Creek Monitoring: Alternative III

Alternative III includes more extensive and frequent monitoring of water and sediment quality. Flow and geomorphic monitoring would be as presented in Alternative II.

7.8 Public Involvement and Education

GOAL: Public involvement and education (PIE) programs should provide opportunities for interested residents to learn more about the natural resources of the area. Through education, many potential natural resource problems can be avoided.

Mandates and guidelines for public involvement and education come in many different forms. Puget Sound Water Quality Authority, WDOE, Washington State Legislature, and the comprehensive plans of local jurisdictions have all recommended more extensive education programs focusing on the environment, growth, Puget Sound, and water resource related issues.

The local jurisdictions have established formal processes for public involvement in decision making. Public involvement is defined as an ongoing dialogue between interested and affected parties and decision makers in all steps in the decision making process. Education involves more diverse audiences, materials, and activities.

PIE activities have been divided into various types of involvement and education. The categories are as follows:

- Community Grants: Providing schools, community groups and business organizations with funds to support small scale PIE and habitat restoration projects.

- Education and Training: Providing targeted audiences with practical training and education, and reaching potential audiences through lectures, field training, and neighborhood meetings.

- Outreach: Providing water resource management information through brochures, videos, television, newspapers, and newsletters.

- Coordination/Evaluation: Providing regional coordination and evaluation of PIE projects and strategies.

- Technical Support: Providing citizens and Stream Teams with technical information on PIE and jurisdictional activities.

- Data Management: Providing a comprehensive method of tracking volunteers, projects, skills, and complaints relating to water resources.

- Policy and Program Development: Facilitating citizen involvement in policy and program decisions through advisory committees and workshops.

- Special Projects: Providing short-term campaigns, utility mailings, and interpretive signs as enhancements to an ongoing PIE program.

Additional information on the current and proposed PIE programs is presented in Appendix 8.

Public Involvement and Education: Alternative I

During 1990 and 1991, local PIE activities were funded almost entirely by WDOE Centennial Clean Water grants. These grants have supported substantial levels of PIE activities. In the near future, the PIE program would be reduced due to the lack of local funding. The level of service under Alternative I is detailed below:

- Community Grants: None.
- Education and Training: Stream Team activities would continue at a reduced level in Olympia, and would not occur in the Thurston County. Ongoing household and moderate risk waste activities would continue regionally.
- Outreach: Although outreach would continue in Olympia, outreach efforts would not target the Indian/Moxlie Creek basin.
- Coordination/Evaluation: PIE staff from the local jurisdictions would continue to coordinate activities.
- Technical Support: Technical assistance would rely on limited jurisdictional, state, tribal, and volunteer support.
- Data Management: City of Olympia Stream Team register revisions and limited analysis of volunteer projects/monitoring would be provided.
- Policy and Program Development: Public workshops and briefings would occur only during plan development and adoption.
- Special Project: Limited special projects would be initiated in the Indian/Moxlie Creek basin.

Public Involvement and Education: Alternative II

Alternative II supports a regional PIE proposal developed by the Thurston Regional Educational Technical Advisory Committee (ETAC). The staff committee was appointed by the Storm and Surface Water Technical Advisory Committee (TAC) to provide assistance in the development of long-range public involvement and education programs. The proposal is based on guidelines and policies provided by PSWQA in the 1991 Puget Sound Water Quality Management Plan.

The alternative provides a regional PIE approach as discussed in Chapter 11. Regional elements establish a basic framework and funding to support ongoing PIE activities that would be common to all basin plans.

Public Involvement and Education: Alternative III

With the exception of increased public outreach and data management components, the Alternative III would remain unchanged from Alternative II.

Alternative III would expand the complaint response system regionally. Telephone numbers would be advertised to encourage public use. Accurate records of all calls would be kept and entered into the data base. The alternative would also create a regional system of analyzing and evaluating Stream Team data.

7.9 Cooperative Program Management

GOAL: The Indian/Moxlie Creek basin as well as other basins in the area encompasses portions of several jurisdictions. Coordinated activities are necessary to successfully and efficiently manage the basin. Improvements in the management of a basin can not be expected to come from the efforts of any single jurisdiction, but rather from the combined and cooperative efforts of all involved jurisdictions.

In addition to the need for coordination among the four jurisdictions, coordination with state agencies such as WDOE, WDW, and WDF is important for the effective management of resources.

Cooperative Program Management: Alternative I

Current program management activities would continue under Alternative I. These include several groups representing the four local jurisdictions:

- Storm and Surface Water Technical Advisory Committee (TAC) is responsible for assisting in the review of information and management of individual projects and policies.
- Public Works Directors steering committee.
- Thurston County Storm and Surface Water Advisory Board (SSWAB), and the Budd Inlet Urban Bay Action Committee.

The four jurisdictions have adopted a general Interlocal Cooperation Agreement for joint storm/surface water management. Programs and projects such as planning, construction, facility operation, or program management require separate project agreements among the involved jurisdictions. Numerous such agreements are in effect.

This process of formalizing the roles and responsibilities of each jurisdiction for particular projects would continue as the basis for implementation of the Indian/Moxlie Creek Basin Plan.

Cooperative Program Management: Alternative II

Alternative II proposes improvements in the regional management of surface water. Efforts to provide more consistent and effective management of basin issues would be pursued with Alternative II. A nonstructural surface water management program is presented in Chapter 11. The program is also incorporated into the Percival and Woodard/Woodland basin plans.

Cooperative Program Management: Alternative III

Alternative III supports the investigation and implementation of a comprehensive regionalized program for water resource management. While the effectiveness and efficiency of a regional program are perceivable, the overall needs and implications of a regional program have not been investigated as part of the basin planning effort.

8.0 EVALUATION OF ALTERNATIVES

The three potential management alternatives presented in Chapter 7 have been evaluated according to a set of criteria which illustrate the strengths and weaknesses of each alternative. Ultimately, the preferred alternative must embody the most effective, equitable, and feasible solutions to managing the existing and future problems in the Indian/Moxlie Creek basin.

8.1 Evaluation Criteria

The criteria used to evaluate the three management levels are as follows:

- Effectiveness in solving flooding, habitat, and water quality problems.

  Flooding: Considerations used to evaluate the effectiveness at solving flooding problems include: control of flood flows within the creek and reduction of development flooding problems.

  Habitat: Considerations used to evaluate the effectiveness of managing habitat include: creek channel form, salmon survivability, biological diversity, and riparian and wetland integrity.

  Water Quality: Effectiveness at resolving water quality problems has been evaluated according to: reduction of bacterial contamination problems, reduction of other nonpoint pollutants, and avoidance of future water quality problems.

- Environmental sustainability. The primary goal of environmental sustainability is to meet the needs of today's society without limiting the options of future generations. Sustainability is central to the basin planning process. Questions to be asked during the analysis of the basin plan include: Will the plan contribute to the long-term sustainability of the natural resources and human ecosystem of the basins? Could the proposed practices be continued indefinitely, meeting present needs without jeopardizing future prospects? Although striving for sustainability, attempts to return the creeks to predevelopment conditions have not been considered as a management alternative.

- Cost. The cost criteria includes initial and ongoing costs to residents of the region, as well as additional costs imposed upon the sponsors of new developments. For an effective management alternative, these costs should be outweighed by the benefits derived from developing adequate stormwater conveyance systems, maintaining acceptable water quality, and protecting a viable natural resource. Many of these benefits are of a long-term nature and reflect the importance of preserving the lifestyle enjoyed

by those living in the region. Ecological and social costs associated with the potential loss of an urban natural resource, and avoided costs associated with potential remedial projects, are evaluated on a qualitative basis.

- Feasibility: The management alternative endorsed by the basin plan must be feasible. The long-term implementation of the plan necessitates meeting the financial and political realities of the two jurisdictions as well as being technically appropriate. The management scenarios represent varying degrees of technical, political, and financial feasibility.

- Achievement of basin planning goals and objectives: The goals and objectives for the basin plan are discussed in detail in Chapter 2 of this plan. It is crucial that the management alternative endorsed by the basin plan meet most or all of the goals established at the beginning of the basin planning process.

8.2 Evaluation Criteria Matrix

The criteria listed above have been applied to each of the alternatives discussed in Chapter 7 as shown in the following evaluation matrix (Table 3).

Table 3: Alternative Evaluation Matrix
Indian/Moxlie Creek Basin

Criteria	Alternative I	Alternative II	Alternative III
Effectiveness in Solving Problems	Low—water quality habitat and flooding problems would remain at current levels or potentially worsen in the future.	Moderate—Considerable efforts would be made to improve water quality, protect and improve habitat, and reduce flooding problems.	High—Extensive efforts would be made to enhance water quality, improve habitat, and control flows in the creeks.
Water Quality	Low—Existing problems would not be corrected. Water quality may worsen with future development.	Moderate—Regional stormwater storage would limit flows and improve treatment. Bacterial contamination would be reduced and increased public involvement provided.	High—Additional regional storage would be provided above level in Alternative II. Public involvement would be further enhanced.
Habitat	Low—Instream habitat would continue to degrade due to poor water quality. Other habitat areas would potentially be lost due to excess stormwater discharge. Culverts creating fish blockages would not be improved.	Moderate—Water quality improvements would benefit habitat as well. Removal of improperly placed culverts would open up additional habitat. Indian Creek Greenway would protect substantial length of Indian Creek's riparian corridor.	High—Creeks would be better protected from excess flood flows.
Flooding	Low—Infrastructure improvements would not be pursued in a timely manner. Flood flows in creeks would potentially increase in the future and impact both upstream and downstream portions of the creeks.	Moderate—Flooding would be reduced by construction of regional stormwater facilities. Future flows in both creeks would be managed so as not to surpass existing levels.	High—Additional regional storage facilities would further control flows.
Environmental Sustainability	Low—The natural resource base in both basins would continue to degrade. Environmental and community sustainability would not be promoted.	Moderate—Active improvement of current degraded conditions within the creeks would enhance their role as community assets in the future.	High—Intensive effort to improve natural resources within the basins would greatly enhance the creeks' endurance as community assets into the future.

Criteria	Alternative I	Alternative II	Alternative III
Cost	High—Existing funding levels would be maintained for the management of the basins. Although the immediate costs are low, future social, ecological, and financial costs could be much higher due to lack of appropriate management.	Moderate—Increased financial costs are associated with Alternative II. The proactive approach to resolving existing and potential problems increases funding requirements which decreases feasibility, but it is highly technically feasible.	Low—Alternative III presents the highest short-term financial costs. However, it also goes the furthest of the three alternatives towards avoiding future ecological, social, and financial costs.
Feasibility	High—Alternative I is highly feasible because it maintains the existing management scenario for which implementation is already in place.	Moderate—Increased funding, regulatory efforts, and coordination between Olympia and Thurston County would be required under Alternative II. However, this proactive approach would minimize future technical and consequently financial problems. Political and financial realities reduce Alternative II's feasibility.	Low—Due to the extremely high costs associated with Alternative III, it is the least politically and financially feasible. For the promotion of sustainability and the enhancement and preservation of natural resources within the basin it is highly feasible.
Achievement of Basin Planning Goals and Objectives	Low—The existing conditions that would be maintained fall short of meeting the goals and objectives of basin planning. Solutions to existing problems are limited and allow for future degradation. Interjurisdictional coordination is sometimes inadequate and numerous program components are temporarily grant funded.	Moderate—Alternative II would effectively meet most of the goals and objectives of the plan.	High—Alternative III would most effectively meet all of the basin planning goals and objectives. It offers the highest level of service considered feasible and is designed to most completely address all the problems in the basin.